Ministry of Defence

Fundamentals of Maritime Operations

Netherlands maritime military doctrine

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Special subject index

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Memorandum of approval by the Chief of Defence

On the basis of the positive recommendation from the Armed Forces Doctrine Council, I hereby approve the doctrine publication “Fundamentals of Maritime Operations” (GMO).

The GMO serves as the doctrine for operations by the Netherlands armed forces in the maritime domain. It elaborates on the Netherlands Defence Doctrine in respect of maritime operations and replaces the Manual for Maritime Operations (LMO).

The GMO was written by order of the Commander of the Royal Netherlands Navy in his capacity as advisor on military maritime operations. In view of the cooperation with the Belgian armed forces, the content of the GMO is binationally oriented.

The content applies to both countries as the national version of NATO publication AJP-3.1 Allied Joint Maritime Operations.

My thanks are extended to those members of staff from your part of the Defence organisation who have contributed to this revised doctrine, which will serve to record current knowledge of maritime operations and to make it accessible.

13 February 2014

The Chief of Defence of the Netherlands

T.A. Middendorp
General

Introduction by the Commander of the Royal Netherlands Navy

Over the past few decades, the global security situation has changed drastically. The relatively stable (East-West) situation of the past has given way to a diffuse and uncertain state, in which interstate conflicts and thus regional instability, terrorism, organised crime and environmental and natural disasters pose the greatest threats to national and European interests. These changes clearly have implications for the Royal Netherlands Navy. The diversity of maritime operations both at sea and in coastal regions has widened. Growing emphasis is also being placed on law enforcement such as counter-illicit-trafficking and counter-piracy and on support for diplomatic activities.

A broader range of tasks and threats means that greater knowledge is required to be able to properly conduct the various forms of military action at sea and from the sea. Given that this military action increasingly occurs in conjunction with other parts of the armed forces and with other government departments, this knowledge also needs to exist or be available outside the Royal Netherlands Navy.

This publication, Fundamentals of Maritime Operations, will serve to record current knowledge of maritime operations and to make it accessible. It is aimed at a wide audience, namely people who work for the Defence organisation and those who are involved with or have an interest in the organisation, not just in the Netherlands but also in Belgium. Because of the integration with the Belgian Navy, this publication has been written in collaboration with Belgium.

The book is divided into three parts. The first part gives a description of the environment in which military operations take place at sea and from the sea, starting with the natural environments of the sea and the littorals. This is followed by an explanation of the regulations and agreements that apply at sea. The first part closes by looking at the political strategic environment with a description of the functions, roles and characteristics of maritime forces. The second part deals with actual maritime doctrine and explains maritime operating methods in terms of joint functions. This part is thus an elaboration of the Netherlands Defence Doctrine, specifically for military operations in the maritime domain. The third and final part will present the three main forms of maritime operation: maritime combat operations, maritime security operations and maritime assistance.

The mission statement of the Royal Netherlands Navy is ‘For security at sea and from the sea’. The maritime doctrine in this publication therefore sets out not only military operations on, in and above the sea, but also in particular those operations that project power from the sea to influence the situation on land. The description is not confined to the capabilities and capacities of the Dutch and Belgian navies: military operations are increasingly ‘joint’ in nature. Furthermore, military operations in the global commons of the maritime domain are almost always a multinational affair. Wherever relevant, therefore, this publication will also describe the capacities and capabilities of other armed forces and partners, both military and civil.

Doctrine is designed to create unity of opinion. The maritime doctrine contained in Fundamentals of Maritime Operations thus forms the basis for education, training and procedures for maritime forces. This book also serves as an authoritative source document and reference work for maritime terms and definitions.

Doctrine is neither dogma nor a set of rules, however. It must always be applied with common sense. Moreover, new developments may lead to new opinions, definitions and insights which, in turn, will necessitate changes in doctrine. I would ask you to use the maritime doctrine set out in this publication as a handrail when operating in the maritime domain.

Commander of the Royal Netherlands Navy
Vice Admiral M.J.M. Borsboom

Introduction

Maritime operations

The armed forces represent one of the Netherlands' state instruments of power. Through military operations, the government employs its military power to defend and protect its interests and to uphold and promote the international rule of law[1]. If those military operations are conducted at sea or from the sea, they are referred to as maritime operations.

The environment in which military operations take place comprises five domains[2]: maritime, land, air, space and information. Maritime operations are not, however, confined to the surface of the sea. Maritime operations also take place under water and in the air and space above the sea. Maritime operations may extend to areas of land that border the sea as well as the air and space above those areas. Maritime operations also use the information domain, including its digital dimension (cyberspace).

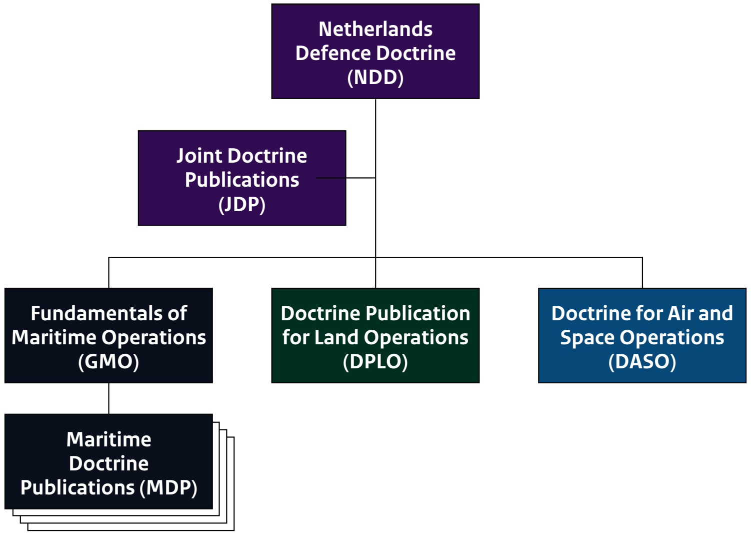
Doctrine for maritime operations

Military doctrine is the formal expression of military thinking, valid for a particular period of time. Doctrine is general in nature and describes the fundamentals, principles and preconditions for military operations at the different levels. It describes the nature and characteristics of current and future military operations, the preparations for those operations and the methods for the successful completion of military operations.

In other words: doctrine reflects our common views on the best way to operate and is designed to enhance the effectiveness of military action. It is authoritative, but must always be applied with common sense.

Dutch military doctrine is structured in a way that it ensures a vertical separation according to level and a horizontal separation according to subject. At the top of this structure is the national capstone doctrine document, the Netherlands Defence Doctrine (NDD). The NDD expresses the starting points and principles that apply to all military operations conducted by the Dutch armed forces. Two types of doctrine publication are derived directly from the NDD. The Joint Doctrine Publications (JDP) contain the doctrine for specific, non-service-based topics, such as intelligence (JDP-2) and command and control (JDP-5). There are also three publications which cover domain-specific doctrine. The doctrine for land operations appears in the Doctrine Publication for Land Operations (DPLO), and the doctrine for the deployment of airpower is contained in the Doctrine for Air and Space Operations (DASO). This doctrine publication, Fundamentals of Maritime Operations (GMO in Dutch), deals with the doctrine for maritime operations. There is no domain-specific doctrine publication for the information domain: this doctrine is included in the other doctrine publications.

1 Article 97 of the Constitution of the Kingdom of the Netherlands..
2 An environment could be unlimited, while domains (physical and/or legal) have boundaries.



Structure of the Netherlands' military doctrine publications

The GMO in turn forms the basis for derived doctrine for maritime operations, which is set out in Maritime Doctrine Publications (MDP), each of which describes a sub-area or specific subject. Existing publications such as the Field Manual for Amphibious Operations (LAO in Dutch) also belong to the family of MDPs.

As well as the doctrine for maritime operations, the Commander of the Royal Netherlands Navy (CZSK in Dutch) is also responsible for doctrine relating to military operations in the jungle, in mountainous terrain and in arctic conditions. This particular doctrine is contained in the *Leidraad Militair Optreden onder Extreme Omstandigheden* (field manual for military operations in extreme conditions) and the derived handbooks. Because of the nature of the operations, these publications fall under both the GMO and the DPLO.

Correlation with international doctrine

The armed forces usually operate in a multinational context (combined), in collaboration with other government organisations (interagency) and with non-governmental organisations and actors (comprehensive). To ensure the required interoperability, the different doctrines must correspond with each other. The main fora in this respect are NATO, the EU and the UN. The GMO is therefore based on the applicable NATO doctrines, in particular the joint doctrine in AJP-3.1, 'Allied Joint Maritime Operations'. The GMO provides these NATO doctrines with a national context.

Purpose and target audience

The GMO is aimed primarily at personnel in the Dutch and Belgian Ministries of Defence, in particular those in the Royal Netherlands Navy and the Belgian Naval Component. The GMO is also a source of reference for education and training and provides guidance for the development of derivative doctrine publications. This also makes the GMO a starting point for further study of maritime operations and a basis for Dutch and Belgian input into international doctrine development. This doctrine can be used by non-military organisations and individuals for the purposes of information and mutual understanding.

Scope

The GMO has been written under the responsibility of the Commander of the Royal Netherlands Navy in his role as advisor to the Chief of Defence (CHOD) and the Minister of Defence in respect of military maritime operations. Because maritime operations are related to military operations in the other domains, the contents of this doctrine were synchronised across all services by the Netherlands Armed Forces Doctrine Council. The doctrine was then declared applicable to all services by the Netherlands Chief of Defence.

In view of the collaboration with the Belgian armed forces in the context of Admiral Benelux (ABNL), it was decided that the contents should be of a binational nature. Where differences exist, the GMO sets out both the Dutch and the Belgian standpoint.

Doctrine is general in nature. The publication is therefore descriptive, provides a handle for and about maritime operations, but is not a procedural handbook for a specific unit, operation or process. Wherever necessary and possible, reference will be made to other applicable publications, such as NATO doctrine publications and Dutch and Belgian doctrine documents and regulations.

Withdrawal of existing publications

The GMO replaces both the Manual for Maritime Operations (LMO in Dutch) and the Tactical Guidelines (RITA) Part 1 General. The approval of the GMO by the CHOD means the withdrawal of both the LMO and RITA part 1.

Structure

As the title suggests, the GMO sets out the fundamentals for maritime operations by the armed forces. It also looks at the contributions supplied by maritime forces to both joint and comprehensive operations in conjunction with other instruments of power. The GMO comprises thirteen chapters, divided into three parts.

Part 1 consists of three chapters which examine the maritime domain.

- Chapter 1 introduces the natural features of the maritime domain and shows how these physical characteristics affect personnel, equipment and capabilities in military operations at sea and from the sea.

- Chapter 2 discusses the ways in which man uses the maritime domain, looks at the international agreements that are made in respect of the use of the domain and shows what implications these agreements have for the possibilities for maritime operations.

- Chapter 3 deals with the use of the maritime domain for military purposes, indicates what tasks and roles maritime forces can perform to achieve strategic objectives and describes the resulting characteristics of maritime operations.

Part 2 describes the way in which maritime forces operate on the basis of the six joint functions

- Chapter 4 introduces the subject with a definition of the operational functions, a description of the levels of military operations and an explanation of the key principles of military operations, which serve as a guideline for the maritime interpretation of the joint functions.

- Chapter 5 examines the methods and the process of command and control (C2) at the different levels of maritime operations, describes the organisation and the division of tasks within the maritime component, looks at the C2 for the employment of specialist units (such as submarines, aircraft and special operations forces) and explains the C2 and communications systems required for maritime operations.

- Chapter 6 sets out the general procedure for processing data, gives an overview of the type of information needed to create maritime situational awareness, looks at the collection of information about the natural environment, deals with the maritime intelligence process, explains the methods for maritime picture compilation and shows how a common picture of the maritime environment is created and shared, with military forces as well as civil actors such as the coastguard.

- Chapter 7 defines the principles that apply to the protection of military power, looks at the application of risk management that results in protective measures, deals successively with the maritime approach to safety, the prevention of mutual interference, military security and defence, discusses the use of force for protection and describes the capabilities of maritime forces for damage control and repair.

- Chapter 8 sets out the characteristics of maritime sustainability, looks at the forms of maritime logistic support and the coordination thereof and examines successively the different functional areas of maritime logistics and sustainability: medical and psychological care, supplies, maintenance and repair of equipment, movement and transport, logistic services and relief and rotations of personnel and units.

- Chapter 9 examines the various forms of maritime striking power: the physical striking power of naval platforms (ships, submarines, aircraft, helicopters), teams (troops) and unmanned systems, the various forms of striking power in the information domain and the striking power in the electromagnetic and acoustic spectra.

- Chapter 10 defines the principles of military manoeuvre and their application in maritime manoeuvre, looks at the effects the characteristics of maritime operations have on manoeuvre methods, explains maritime manoeuvre at the different levels of operation, shows how the various activities within the maritime manoeuvre levels are coordinated and synchronised and explains the use of rules of engagement (ROE).

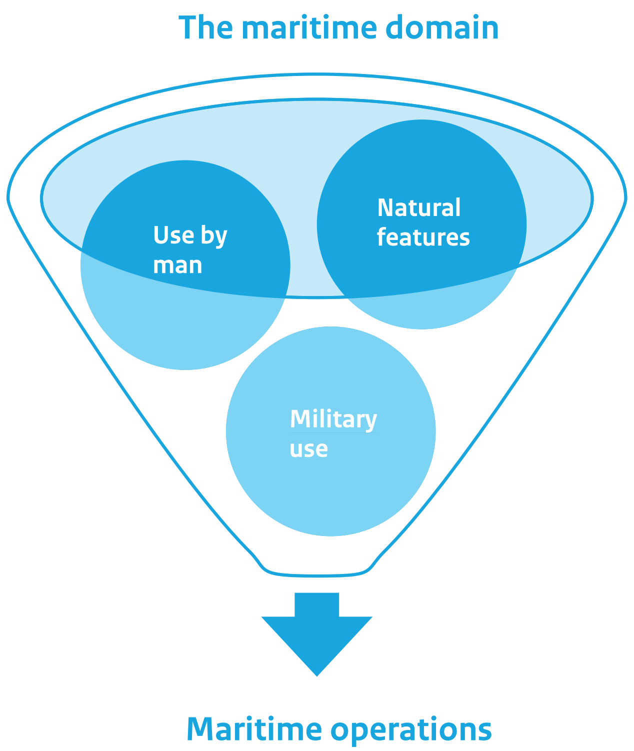
Part 3 contains the last three chapters, which elaborate further on the three main forms of maritime operation.

- Chapter 11 provides a description of **maritime combat operations**, starting with combat operations at sea (antisubmarine warfare (ASW), antisurface warfare (ASUW), anti-air warfare (AAW) and naval mine warfare (NMW)), followed by combat operations conducted from the sea, namely amphibious operations, maritime strike operations, maritime special operations and riverine operations.

- Chapter 12 examines the operating methods in **maritime security operations**, starting with maritime interdiction operations and followed by operations to counter violent crime and terrorism; it will then describe a typical form of action in such operations, namely that of a boarding.

- Chapter 13 looks at the various forms of **maritime assistance**, starting with maritime assistance to diplomacy, such as naval presence, maritime capacity building and evacuation of civilians, followed by assistance to civil authorities, namely emergency response at sea and from the sea and the various forms of (specialist) assistance and support.

PART 1 THE MARITIME DOMAIN



1. NATURAL FEATURES OF THE MARITIME DOMAIN

1.1 Introduction

Maritime forces operate in and from the maritime domain. The specific features of this maritime domain largely determine the ways and means in which military operations can be conducted both at sea and from the sea. Like all other users, maritime forces have to deal with the natural features of the domain. The weather, sea state and water depth affect the usability of sensors such as radar and sonar. Fog banks, shallows and breakers limit freedom of movement for vessels. The vast expanse of the oceans, the destructive power of water whipped up by storms and the water pressure in deep seas impose heavy demands on man and materiel.

The natural characteristics of the sea and the coast share a common feature in that they cannot in principle be influenced by man: they are a given. A good understanding of the characteristics and their effect on personnel, equipment and capabilities in military operations is, however, vital in order to cope with or circumvent the disadvantages and to fully exploit the advantages. It is for that reason that this first chapter will examine the geographical, oceanographic, hydrographic and meteorological characteristics and their effects in further detail. First, the characteristics of the sea will be discussed, looking at the characteristics of seawater, the seabed, the sea surface and the air above the sea. The chapter will then focus on the coastal waters and the shoreline to investigate the effects that occur when the sea meets the land. The chapter will close with a paragraph on the general implications of the maritime domain's natural features for people for whom the sea is their working environment.

1.2 The world's seas and oceans

Seen from space, earth is a blue planet. This is because two thirds of the earth's surface is covered with the salt water of the world's seas and oceans. The rest is made up of land: the continents and islands. Round both poles, there are also large sections of land and water covered with ice.

Together, the world's seas and oceans make up a gigantic quantity of water. Most of this water is in the oceans, which, with their deep water, surround the continents. Wherever the oceans reach the edges of the continents, there we find the shallower marginal seas, such as the North Sea.

1.2.1 *Seawater*

The water in the world's seas and oceans does not have the same composition everywhere and so has varying characteristics according to location. The effects of seawater on the means and capabilities for operations in or on that water are therefore different in each part of the sea. This paragraph sets out those effects by looking at the weight, content of salt and other solubles, temperature, clarity and movement of seawater.

Different measurements at sea – nautical miles, knots and fathoms

At sea, distance is measured not in kilometres but in nautical miles. Originally, people used sea miles, the length of which is defined as the length of one arc minute along the meridians, the imaginary lines from the equator to the poles. Between the equator and a pole, a meridian is divided into 90 degrees, each degree equalling 60 arc minutes. The distance from the equator to the North Pole (10,000 km) is thus 5,400 sea miles, whereby the length of a sea mile was 1851.851 meters. The earth is not a perfect sphere, however, and so an arc minute is not the same length everywhere in the world. During the International Extraordinary Hydrographic Conference in Monaco in 1929, the length of the international **nautical mile** was set at exactly 1,852 meters.
The advantage of using the arc minute as a measurement of distance lies in the fact that distance can thus be measured easily on a nautical chart. Because a nautical chart is used to determine positions and directions, the chart grid represents the geographic division into degrees and arc minutes. The upright edge of the chart, bearing the division into latitudes and minutes, is thus the distance gauge.
At sea, the speed of ships, aircraft, water and wind is expressed in **knots** (nautical miles per hour).
Nowadays, water depth is expressed in meters, although there are still nautical charts that show the water depth in fathoms. One **fathom** was originally the span of the arms of an adult man, later defined as 6 feet (1.8288 meters). The fathom harks back to the time when water depth was measured by hand with a lead line, a rope with a heavy weight at the end. The water depth was measured by pulling in the rope between the hands of the outstretched arms.

1.2.1.1 *The weight of water*

Water is heavy, certainly in comparison to air. Further more, water, unlike air, is only compressible to a very limited extent. The combination of these two properties has various implications for the way in which the medium can be used for communication and transport.

Firstly, the weight (or density) of water means that considerable effort is required to move something through this medium: resistance is greater than air or rolling resistance. Streamlining is thus important for the hull shape of vessels, particularly that of submarines.

The second effect of water density is that high-frequency (electromagnetic) waves, such as radio, radar and light, barely penetrate. A submarine moving under water thus has only limited capacity for radio communications, and the ability to operate underwater robots radiographically is also limited. Water is, however, a good conductor for pressure waves, such as sound. Under water, sound propagates five time faster than in the air, and it also travels much further. Whales can thus communicate with each other over great distances. For detecting objects under water, measuring water depth or for communications, we use a sound-based sensor: sonar.

Sonar and echo sounders

Because water conducts sound much better than light or radio waves, a sound-based sensor is used under water: the sonar. Sonar can be used in two ways: actively and passively. An active sonar works on the same principle as radar: you transmit sound and from the returning echoes you can determine intensity, direction, distance and sometimes even approach speed (Doppler effect). A passive sonar is in effect a specialised microphone with which you can determine what sounds are present in the area. The useful range of sonar depends heavily on the composition of the seawater (particularly temperature and salinity), the water depth, seabed composition (rock or sand) and other (background) sound, such as that from marine animals, shipping or heavy rains. In almost all conditions, the useful range of passive sonar is (much) greater than that of active sonar. Active sonar has a large counter-detection range: a submarine can hear the active sonar of another vessel at a much greater distance than that from which it can be detected as an echo on the sonar of that other vessel. Passive sonar is not only used to pick up signals from active sonar, but all forms of sound and noise that occur under water (propeller noise, hum of ships' engines, and so on). Hence the extra attention that is devoted to quiet propeller blades, engines and machinery when building naval ships.

A simple type of active sonar is the **echo sounder**, which is used to measure the distance to the seabed and thus the depth of the water.

Various subsurface weapons, such as torpedoes and sea mines, may also use sonar to detect their targets.

The fact that pressure waves can propagate easily in water has implications for the use of explosives. In water, any given charge has a greater effect than in the air, and it can also be observed at greater distances. Subsurface weapons such as depth charges, torpedoes and sea mines can thus create their intended effect without making direct contact with the target. Sea mines in particular make use of the effect of the pressure wave reflected by the seabed. It has already been mentioned that the friction encountered by objects in the water is considerable. Fragmentation explosives are thus of little use under water.

The propagation of pressure waves in water is also used as a means of detection. Every vessel that moves through the water creates a pressure change, which can be seen in the bow wave. By measuring pressure differences, it is possible to detect the presence of (large) moving objects. One way in which this is used is in the activation mechanism of sea mines. This in turn imposes requirements on the construction of naval ships: the pressure change caused by the ship's hull must be as small as possible.

A third consequence of the high density and limited compressibility of water is the enormous power it has once it is in motion. It is only by means of broad dunes and sturdy dikes that we in the Netherlands and Belgium can keep our feet dry in a northwesterly storm. The enormous power inherent in moving water imposes stringent requirements on the construction of ships and equipment. The word seaworthy implies just that: not every ship is worthy to withstand the power of the sea.

Another consequence of the density of water is that pressure increases rapidly with depth. For each ten metres of depth, the pressure rises by approximately 1 bar or 1000 hPa. The enormous water pressure at greater depths limits the ability of humans to remain under water (divers, for example). Water pressure also imposes heavy demands on all constructions and equipment that are used under water, such as submarines, underwater robots and sea mines.

The density and limited compressibility of seawater also have benefits. An object in the water experiences an upward force equal to the weight of the volume of water displaced by that object (Archimedes principle). The result is that objects remain afloat if they are lighter than what their volume would weigh in water. A piece of steel is heavier than water of the same volume and will sink, but a steel box will float. Water is thus an excellent medium for transporting large objects or large volumes.

Previously, we saw that resistance to movement in water is greater than that in the air or on land. Because resistance increases exponentially with speed, transport by water is thus only more efficient at relatively low speeds in terms of energy consumption compared with air or land transport. Transport by sea is, therefore, not fast, but it can be efficient when large quantities are transported together.

Trimming a submarine under water

Submarines are specifically designed to sail under water. Ships remain afloat on the surface because they have positive buoyancy: the weight of the ship is less than its equivalent volume of water. For a floating ship, the weight of the displaced water is equal to the weight of the ship; the excess volume is the part that remains above the water. To be able to sail under water, the submarine needs to have neutral buoyancy: it must weigh exactly the same as the volume of water it is displacing. To be able to submerge (and to re-surface), a submarine must, therefore, be able to adjust its weight. To do so, a submarine is equipped with ballast and trim tanks, which can be filled with air or seawater. When submerging, the large ballast tanks are filled with seawater: the submarine becomes heavier and sinks. By varying the amount of seawater in the smaller trim tanks, the submarine can be brought to and maintained at neutral weight (‘trimmed’). When fully trimmed, the submarine will not rise or sink at rest; it will float in the water. The trim must then be monitored constantly and adjusted according to the conditions. At greater depth, the volume of the submarine will decrease because of compression by water pressure. Less volume means less upward force: the submarine becomes relatively heavier and sinks deeper. The trim can also be disrupted if the density of the surrounding water changes as a result of a change in temperature or salinity. In areas where the properties of the seawater differ sharply, for instance in the case of strong currents and near estuaries, keeping the submarine trimmed may require a great deal of effort on the part of the crew.

1.2.1.2 *Salinity*

Many substances are soluble in water. In seawater, that is mainly salt. Because of the dissolved salts and other substances, seawater is heavier than fresh water (by an average of 25 grams per litre). Salinity is not the same everywhere. It varies because of precipitation and evaporation, ice formation and melting ice, mixing and currents and by the addition of fresh water from rivers. In cold regions with a large influx of river and melt water, seawater is less salty, for example in the Baltic Sea. Seawater in hot regions with a lower influx of fresh water has a higher salinity, for example in the Mediterranean Sea, the Red Sea and the Persian Gulf. Because the effects on salinity occur on the surface and in the uppermost layer of water, the salinity at greater depths is much more constant.

Water masses with different levels of salinity only mix gradually, which means that water masses with different salinity can occur at different depths. Water with higher salinity is heavier and will sink to lower depths. Thus the water from the Mediterranean Sea that flows into the Atlantic Ocean at Gibraltar can be identified from its composition far into the ocean. The Mediterranean water is saltier and warmer than the Atlantic water. Because of the higher density, the water from the Mediterranean sinks in the Atlantic to a depth at which it has the same density as the surrounding colder but less salty water.

Because of its salinity, seawater is not drinkable by humans. To avoid being dependent on rain water, seafarers either need to have sufficient supplies of drinking water with them or have equipment to convert seawater into drinking water (evaporators or [reverse] osmosis systems).

The salinity of seawater partly determines the density of the water and so has implications for the propagation of sound. A changing salinity level will mean that the sound wave will be refracted. As a result, 'blind spots' (silent zones) can occur where sound from the sonar barely penetrates. Objects located there are thus difficult to detect.

The salt in the seawater and in the air over the sea has a highly corrosive effect on many materials. To prevent damage, therefore, use should be made of materials that are resistant to or protected against the effects of water and salt. This places additional demands on the materials that are used for ships and equipment, as well as for aircraft and helicopters that have to operate above the sea.

1.2.1.3 *Other dissolved substances in seawater*

Besides salt, seawater can contain other substances that can affect or be of benefit to maritime operations. One of those substances is oxygen, which has an indirect effect on maritime operations. Oxygen-rich water will contain more living organisms and thus more fish. The presence of fishermen can restrict maritime operations; the combination of a submarine and fishing nets can pose a danger to both the fishermen and the sub. On the other hand, the oxygen content of seawater and thus the presence or absence of fishermen could indeed be a determining factor for a maritime operation, for example for monitoring the observance of fishing rights.

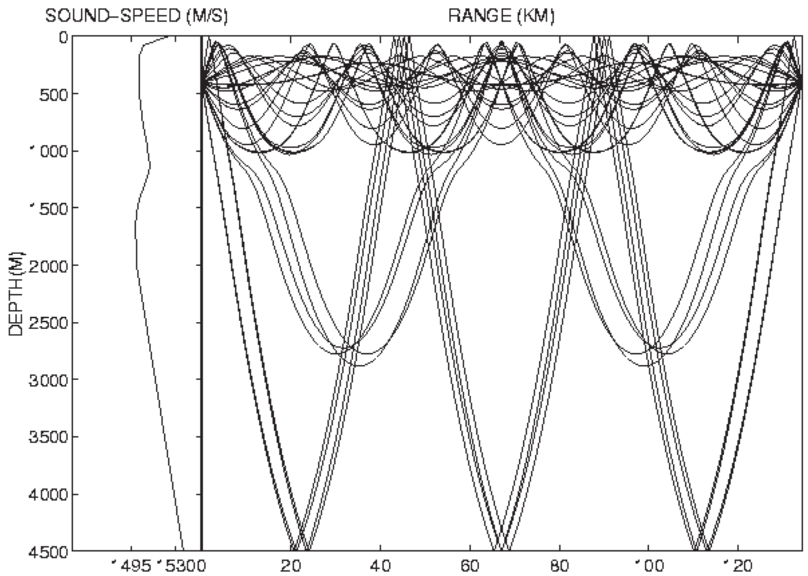
The presence of certain specific substances in seawater can be used in maritime operations to detect human activity. There are, for example, devices that can show the presence of carbon monoxide from exhaust gases. Other ships can use these to detect the presence of diesel-powered submarines.

1.2.1.4 *Water temperature*

Like salinity, the temperature of seawater is not constant. Temperature differences mainly occur in the uppermost layer, because the temperature is largely determined by warming from the sun, cooling by the air and mixing by currents, wind and waves. In many regions, the water temperature in the uppermost layer is thus related to the seasons and sometimes even to the time of day. At greater depths, water temperature is fairly constant: at the bottom of the deep sea, the temperature is approximately 4 degrees Celsius. Surface temperatures in tropical regions can reach over 30°C. Just like salinity, differing temperatures cause water masses to resist mixing. Mixing does occur, but mainly at the surface as a result of wind and waves.

Because seawater everywhere is colder than human body temperature, anyone immersed in the water without protective clothing will eventually become hypothermic. It is with good reason that divers always wear wet or dry suits. Where people are exposed to a higher risk of inadvertent immersion (such as flying in a helicopter or replenishment at sea), survival suits must be worn if the water temperature is lower than 15°C.

The water temperature partly determines water density. Cold water is heavier than warm water and water at 4°C is the heaviest. In the same way as salinity, water temperature affects the speed and passage of sound under water. Because these differences in temperature can be considerable, certainly in the upper layers of the sea, their effect on the range of sonar is greater than that of variations in salinity.



Example of refraction of sound waves as a result of variations in density.

Note: sound travels faster in seawater with higher density. If the mass of water is made up of layers with varying density, this will affect the propagation and behaviour of sound.

1.2.1.5 *Clarity and visibility under water*

Sunlight only penetrates to a limited depth in seawater. In clear ocean water, there is only a small percentage of light remaining at a depth of twenty metres. This is also because some of the sunlight is reflected from the surface, particularly if there are waves or ice. If the water is cloudier because of dissolved substances, sand, micro-organisms and so on, light penetration is reduced and visibility under water is limited.

Visibility under water is particularly important when working with divers or with cameras on underwater robots, such as when clearing sea mines. It is also a limiting factor in hydrography when lasers are used for accurate depth measurements. Greater clarity in seawater can also be a disadvantage. The water can be so clear in places such as the Mediterranean and the Indian Ocean that aircraft can identify a submerged submarine (though usually not deeper than 30 metres).

Submerged submarine: visible from the air

1.2.1.6 Seawater in motion

The water in the oceans and marginal seas is never still. Variations in temperature and salinity, wind, gravitational pull of the sun and the moon, and tectonic movements all mean that seawater is in constant motion.

Because the great ocean currents are largely related to the wind, they are discussed in the paragraph about the sea surface (1.2.4).

The gravitational pull of the sun and moon is responsible for the tidal movement of seawater. Because the effects of tidal movement are mainly seen in coastal regions, they are examined in paragraph 1.3.1. The effects of earthquakes and so forth on seawater will be discussed in the paragraph about the ocean floor (1.2.3).

1.2.2 Marine life

The sea is home to a huge diversity of animal and plant life. Animal life may interfere with military operations, but human activities can also interfere with or damage life in the sea.

Marine mammals such as whales and dolphins use sound to navigate, communicate and detect prey and predators. Other animals also produce sound. The presence of these animals and the sounds they emit can have an adverse effect on the usability of active and passive sonar.

On the other hand, there are concerns that the use of active sonar could lead to hearing damage and disorientation for marine mammals.

To protect animals against these damaging effects, restrictions may be imposed on the use of active sonar in certain areas.[3]

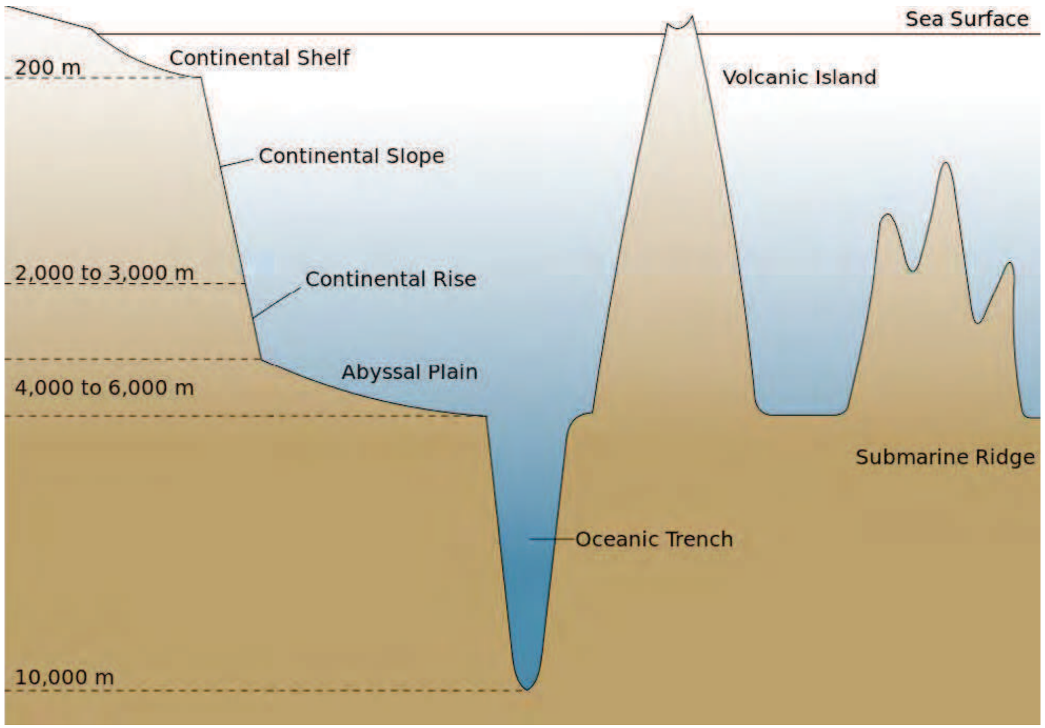
Marine life can also affect maritime operations as a result of what is known as bioluminescence. Many organisms in the sea are able to produce light, and some types of plankton do so if they are moved by currents or turbulence. The turbulence caused by ships' propellers can create an illuminated trail in nocturnal seawater; this effect can be a hindrance, for example in covert amphibious operations.

1.2.3 The ocean floor

Oceans are for the most part around five kilometres in depth. These deep-sea plains are bounded by deep valleys, known as trenches, by underwater mountain ridges and by the continents. Spread throughout the deep-sea plains are also mountains and volcanoes. Trenches can be extremely deep, with the Mariana Trench in the northwest of the Pacific Ocean being the deepest at eleven kilometres. The mountain ridges and volcanoes can be so high that they rise above the surface to form islands, for example, Iceland and the Azores.

Just as on land, the composition of the seabed is not the same everywhere. Rocks, mud, sand, vegetation, organic and plant material constantly replace each other. The type of bed and the slope of the deep-sea floor are important for maritime operations, as they determine whether or how sound waves from sonar will be absorbed and/or reflected.

3 See Dutch ACZSK DOPS 131 Responsible use of active sonar



Topographic cross-section of the ocean floor

1.2.3.1 The continental slope and the continental shelf

Wherever the oceans border the continents, there is a fairly steep slope rising from the deep-sea floor. This is called the continental slope. At a water depth of around 200 metres, the slope ends and the floor becomes a plateau: the continental shelf. This shelf extends to the continent's shoreline. The breadth of the continental shelf varies enormously. On the Californian coast, the continental slope is some two kilometres from the beach, while the continental shelf on the northern coast of Siberia extends up to 900 kilometres from the shoreline. Despite its name, the continental shelf is not necessarily flat all over; the seabed may rise above sea level and form islands, such as the British Isles. It could also contain deep trenches, such as the Norwegian Trench in the north of the North Sea.

The continental shelf is particularly important for mining; because of the relatively limited depth, it is easier to extract minerals such as oil and gas from sites located here than those on the deep-sea floor.

1.2.3.2 Tsunamis

Movements of the ocean floor and seabed can set sufficient quantities of seawater in motion to have huge repercussions. The shock wave from a (subsea) earthquake, a landslide on the continental slope or from an underwater volcanic eruption can propagate in the sea and result in what is known as a tsunami (Japanese for 'harbour wave'). In deep water, the effects of a tsunami are minimal, because although the wave travels extremely fast, it is not very high (a few decimetres). In shallow water, however, the speed is reduced, causing the build-up of towering tidal waves that can wreak devastation far inland.

1.2.4 The sea surface

The sea surface is the boundary between seawater and the atmosphere and the point at which both mediums affect each other. Heat is exchanged, causing such phenomena as hurricanes or the formation of pack ice. Water from the sea that is absorbed into the atmosphere through evaporation eventually returns to the sea in the form of precipitation and river water. Movements of air cause the seawater to move and produce waves and currents. All these phenomena have an effect on maritime operations.

Using the earth's magnetic field

The earth's magnetic field has helped seafarers for centuries. The invention of the magnetic compass enabled people to navigate out of sight of the land without getting lost. Nowadays, magnetic compasses are increasingly giving way to more accurate gyroscopic compasses that use spinning discs or ring lasers.

The earth's magnetic field has some other military uses. These uses are based on the fact that the presence of (large amounts of) magnetic materials, such as iron, cause localised disruption of the magnetic field. By searching for these anomalies in the pattern of the magnetic field, it is possible to detect the presence of steel vessels. This is done by maritime patrol aircraft, which use a magnetic anomaly detector (MAD) to detect submarines.

This also occurs in sea mines, which can use magnetic disturbance as part of the activation mechanism. The latter use in particular has in turn led to countermeasures. Most steel naval ships are, for example, fitted with a network of electrical cables and reels to compensate for their magnetic signature. Furthermore, ships that are mainly used to detect and destroy sea mines (minesweepers and minehunters) are often built from non-magnetic materials (polyester hull, bronze propellers, and so on). They can then sail safely over the mines and, once past, activate them with a sweeping device in which strong electrical currents induce an artificial magnetic field.

1.2.4.1 *Ice formation, pack ice and icebergs*

Sea ice is formed in one of two ways. Cold air can cause seawater to freeze, creating a layer of ice that can grow into pack ice several metres thick. Pieces of land ice can also break off into the water and float out to sea as icebergs or ice shelves.

Sea ice

When the air temperature over water drops far enough below freezing, even salt seawater will freeze. Depending on the conditions, different forms of ice, with appropriate or strange names such as pancake ice, slush and nilas, can develop at different stages. If ice formation takes long enough, it will eventually become a tightly formed crust of ice, or pack ice. Along the coasts of Antarctica, the pack ice is approximately one metre thick, because most of it melts away in the summer. At the North Pole, not all the pack ice melts, so the northern pack ice may consist of the layers of many seasons and can measure three to four metres in thickness. Melting pack ice that has broken away in the form of ice floes may be driven by current and wind far beyond the polar regions.

Ice formation at sea can impose serious restrictions on and pose significant danger to shipping. A mixture of water and ice crystals (slush) will not hinder a vessel, but if the ice crystals clump in the cooling water inlet, ship's engines or generators may fail due to a lack of coolant. Thicker ice sheets and pack ice will restrict or even block a ship's passage, certainly if the ship's hull is not designed for navigating through ice.

Ice formation and accumulation on the decks of a ship can damage equipment and reduce the ship's stability to such an extent that there is a risk of capsizing. Operating at sea in arctic conditions thus places extra demands on ships and equipment. There are international standards with which ships must comply to be able to operate safely in polar regions; these are called ice classes. Most naval ships do not comply with ice class standards and are therefore of limited use in arctic conditions.[4]

Icebergs

An iceberg or ice shelf is a floating mass of land ice that has come from a glacier or an ice cap. Because only a small part of an iceberg – one-fifth to one-seventh – rises above the water, they pose a danger to shipping. This applies particularly to the small pieces which are barely visible on radar. Many countries that border on seas in which icebergs occur, such as Canada, have set up special warning systems to alert shipping to their presence.

1.2.4.2 *The effect of wind on the sea surface*

Wind above the sea produces various effects, each of which has its own impact on maritime operations.

4 The guidelines for operating with (naval) ships in arctic conditions are contained in ATP-17 Naval Arctic Manual.

Waves, wind sea and swell

The best known effect of wind on the sea is the formation of waves. The height of the waves is dependent on wind speed, the length of time the wind is blowing from the same direction, the length of the sea surface over which the wind has blown (the 'fetch'), and the depth of the water. The wave motion of the sea surface consists of two types of wave: wind sea and swell. **Wind seas** are the (often steep) waves that are caused by the wind blowing in that area. **Swell** consists of the (often longer, more rounded) waves created (earlier) by wind in another sea area. It could, therefore, be the case that an area has no wind but that there are pretty high (swell) waves.

The best known effect of wind seas and swell on people is sea sickness, which is fortunately of a transient nature. The effects of waves on ships depend mainly on the size of the vessel. Large sea-going ships will only be restricted in their movements by the high waves that occur during a storm. The effect of smaller waves and swell will normally be minimal, even if the resulting movement of the ship restricts the ability of helicopters or aircraft to operate or to carry out replenishment at sea. Small vessels are more likely to be affected by wave motion. The height of the waves, expressed as the sea state, may make it impossible to launch small vessels, to launch landing craft from the dock of an amphibious assault ship or to use sonar from a hovering helicopter.

Sea State	Description	Average wave height [m]	Effect
0	Calm	0	-
1	Calm (rippled)	0 - 0.1	Waves do not break on the shore
2	Smooth	0.1 - 0.5	Some waves break at some points on the beach
3	Slight	0.5 - 1.25	Waves move buoys and small boats; Launching/hoisting small vessels and underwater robots difficult.
4	Moderate	1.25 - 2.5	Sea looks rippled; Operating with landing craft and take-off/landing of helicopters becoming difficult.
5	Rough	2.5 - 4	Sea very rippled; Operating with mine countermeasures vessels becoming difficult
6	Very rough	4 - 6	Sea very agitated with rollers and steep waves; progress of larger vessels impeded
7	High	6 - 9	Sea very agitated with rollers and steep waves; Damage (sand movement) on the shoreline; Progress of larger ships severely impeded, risk of damage to ships
8	Very high	9 - 14	Very high sea
9	Exceptionally high waves and wild sea	>14	Heavy spray, dense foam; only seen in hurricanes

Table: Effects of the sea state on maritime operations

Ocean currents

In the earth's atmosphere, there are fixed weather and wind patterns that have their origins in the warming of the earth by the sun and the earth's rotation on its axis. In the tropics, there are the trade winds, which blow from the east virtually all year round. In temperate regions, westerly winds prevail. In the tropics, there are seasonal winds - monsoons – which develop as a result of the warming of air above land. If the wind over the sea blows from one direction for a long time, it drives the water and a current is created. These ocean currents are not only created by wind, but they are large water cycles that are also driven by the effects of temperature and gravity. The best known example is the Gulf stream in the northern Atlantic, where the westerly wind drives the warmer and thus lighter water on the surface to the north east. At the North Pole, this water cools, sinks, and then, at depth, flows back to the south to replace the warmer water that has flowed northwards. All oceans contain such currents, some of which are also seasonal.

Surface currents in the Atlantic and Indian Ocean in February (Source: www.oceanatlas.com)

Although water in oceanic currents generally moves slowly (a few knots at most), the direction and strength of a current could be important over long distances, certainly for ships which sail slowly themselves, such as a tug. In the case of longer crossings, an oceanic current could shorten or extend the travelling time.
An important feature of oceanic currents is that there are significant variations in direction and strength at different depths. Awareness of this is particularly vital for submarines.

Tropical depressions and cyclones

In the tropics, the combination of an area of low pressure in the atmosphere and moist, rising air warmed by seawater will result in the formation of a tropical depression. If this continues to be fed by warm, moist air, the depression may grow in strength and size and form a tropical cyclone. Depending on the location in which they occur, these tropical cyclones are called hurricanes (Atlantic Ocean), typhoons (western Pacific Ocean) or willy-willies (Australia). These tropical cyclones bring with them extremely high wind speeds, high waves and a great deal of precipitation. They can cover an area stretching from 250 to 1000 nautical miles, with the strong winds occurring in the innermost 10-50 nautical miles. Consequently they pose a danger to shipping and can hamper military operations or prevent them altogether. Just as for icebergs, there is a warning system for tropical cyclones.

1.2.5 The air above the sea

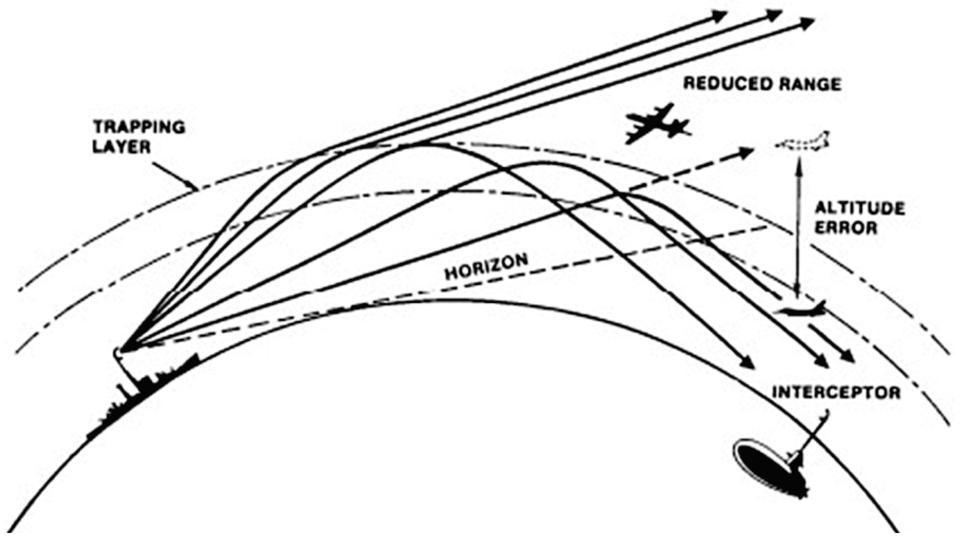
Besides the wind, there are other conditions in the air that affect maritime operations. Rain, snow, fog and dust restrict visibility and affect sensors such as radar. The wind direction and temperature affect the trajectory of projectiles (ballistics) and affect operations by helicopters and aircraft.

Horizon, detection ranges

Unlike the situation on land, the field of vision of the human eye or radar is not limited at sea by buildings, vegetation or mountains. The ability to observe other objects on the sea surface is determined by three factors. The main factor is the curvature of the earth's surface, which makes the range dependent on the height of the observer and the height of the object to be observed. This not only applies to sight, but also to radars or high-frequency radio signals such as the maritime VHF (the civil VHF radio link on board all ships). This is why radar and radio antennas are always placed as high as possible on a ship. Under normal circumstances, two ships can see each other, detect each other on radar and communicate by maritime VHF radio up to a distance of 10-20 nautical miles.

An observer high in the air has a greater horizon range. so aircraft and helicopters are an important means of increasing the detection range for objects on the sea surface. When observing objects from the sea surface that are higher up in the atmosphere, such as aircraft, the curvature of the earth is not a factor; greater ranges are therefore possible.

Besides being affected by the curvature of the earth, range is also dependent on propagation. Atmospheric conditions (humidity, temperature, air pressure) can lead to refraction or attenuation of the signal. The range can be increased (refraction and super-refraction) or restricted (fog, dust). Some lower frequency radio signals (HF and MF, for example) 'bend' with the earth's surface: for these systems, atmospheric conditions are the main factor in determining the range.



Propagation of signals in the atmosphere

Lastly, the atmospheric range of sensors depends on the capability of the transmitter and the sensitivity of the receiver. This applies particularly to sensors on which the curvature of the earth has little or no effect, such as lower-frequency radio links (HF and MF) and air warning radars.

These transmitters work with high power levels in order to achieve long ranges; air warning radars are therefore able to detect aircraft at distances of over 200 nautical miles.

Precipitation

The different forms of precipitation -rain, hail, snow- affect the performance of sensors in particular. A heavy shower could mask objects behind it, even on radar. Heavy rain also results in increased background noise under water and reduces the useful range of passive sonar. Rain can also have advantages; heavy rainfall can, for instance, have an attenuating effect on the waves. Rain also means that a ship is less likely to be detected by the infrared sensors with which some guided missiles are fitted, as rain water reduces the temperature difference between the ship and its surroundings.

Fog and dust

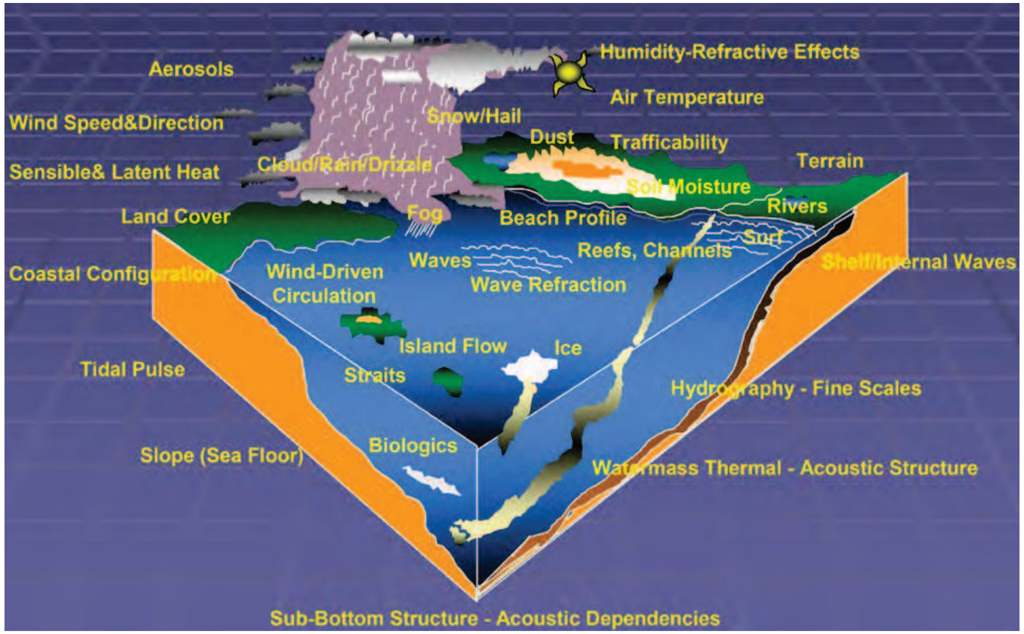
Fog and dust can seriously reduce visibility. Fog patches and areas at sea that are filled with (desert) dust have presented obstacles for shipping for centuries. In reduced visibility, therefore, ships use foghorns to announce their presence to others and avoid collision. Although the invention of radar made it possible to 'see' through fog and dust, caution is still advised. The usability of optical and thermal sensors (cameras, infrared) is also restricted by fog and dust. Fog and dust thus remain a limiting factor for maritime operations, not only for ships but also for maritime aircraft and helicopters.

Air humidity and temperature

The ratio of moisture and warmth in the atmosphere above the sea not only affects the usability of the various sensors. Temperature and air humidity also affect the performance of combustion engines, which aircraft, ships and some missiles use for propulsion or the generation of electricity. In warmer and more humid air, the maximum power and efficiency of combustion engines will be lower than those in cold, dry air. When operating in the tropics, therefore, a ship's fuel consumption will be higher and the effective range of helicopter and missiles will be shorter than on a clear winter's day on the North Sea.

Light

Sunlight at sea is no different to anywhere else in the world, but it does have an important effect on maritime operations. Out at sea, the only light comes from the sun, the moon and the stars. That means that on an overcast, moonless night, it is pitch dark at sea and darkness is virtually complete. Coming out of an illuminated environment, the human eye needs quite some time (sometimes as long as fifteen minutes) to fully adjust to that darkness. That adjustment period can be shortened if the human eye is coming out of an environment with a single colour of light. Many ships use red light for this reason; at night in the ship's interior, the usual white light is turned off and red illumination is switched on. Red light does, however, have a disruptive effect on the night vision goggles (NVG) used in helicopters, for example. although this equipment is not affected by green light. On ships where helicopters are operating, therefore, green night illumination is used instead of red.



Natural features of coastal waters and the shoreline

1.3 Marginal seas, littoral waters and shoreline

The preceding paragraphs have described a wide range of natural factors that affect maritime operations. They apply without exception to the high seas of the oceans. Wherever the oceans touch continents and islands, the effect of the land can be seen. That effect manifests itself in variations on the factors described, and also in a number of new phenomena. These will be discussed in the following paragraphs, which will look at water and tides, the seabed, sea surface, coastline and rivers.

1.3.1 *The seawater in littoral waters*

The shallower waters above the continental shelf and the proximity of land affects the composition and the properties of seawater.

Compressibility of water

Where water becomes shallower, its limited compressibility has implications for the maximum speed that larger ships can reach. The pressure wave generated by a moving ship, in particular the stern wave caused by the propellers, is slowed by the proximity of the seabed. As a result, ships are often unable to reach their maximum speed in shallower water. If the speed is too high in relation to the depth of the water, crews run the risk of losing steerageway and damaging the ship's propellers. For ships the size of a frigate, this effect becomes noticeable as soon as the water depth is less than 50 metres.

Salinity

Fresh river water flows into the sea from the coast. In the areas around estuaries, therefore, the differences in salinity levels will be greater than they are out to sea. Because fresh water is lighter, there is also a greater risk that fronts will form between water masses of different compositions, and this has a significant impact on the performance of underwater equipment such as sonar and torpedoes.

Temperature

Shallower water warms faster because of the absence of the attenuating effect of the deeper, colder water. This causes the seawater above the continental shelf and below the coast to be more sensitive to seasonal influences and to the daily process (warming by day and cooling by night). This not only affects the performance of sonar equipment, but also means that atmospheric conditions can change more rapidly (fog formation, for instance).

Tidal movements

Ebb and flood tides are caused by the gravitational pull of the sun and the moon. This gravitational pull creates an extremely long, slow wave movement in every sizeable water mass. Because the moon is closer to earth, it has a more powerful effect on the tides. Most of the earth's coastlines have a semidiurnal – twice-daily – tide: flood tide (rising water level) and ebb tide (falling water level) occur twice a day, with two high tides and two low tides each day. Along some coasts, there is a diurnal, or once-daily, tide: ebb and flood tides occur only once each day.

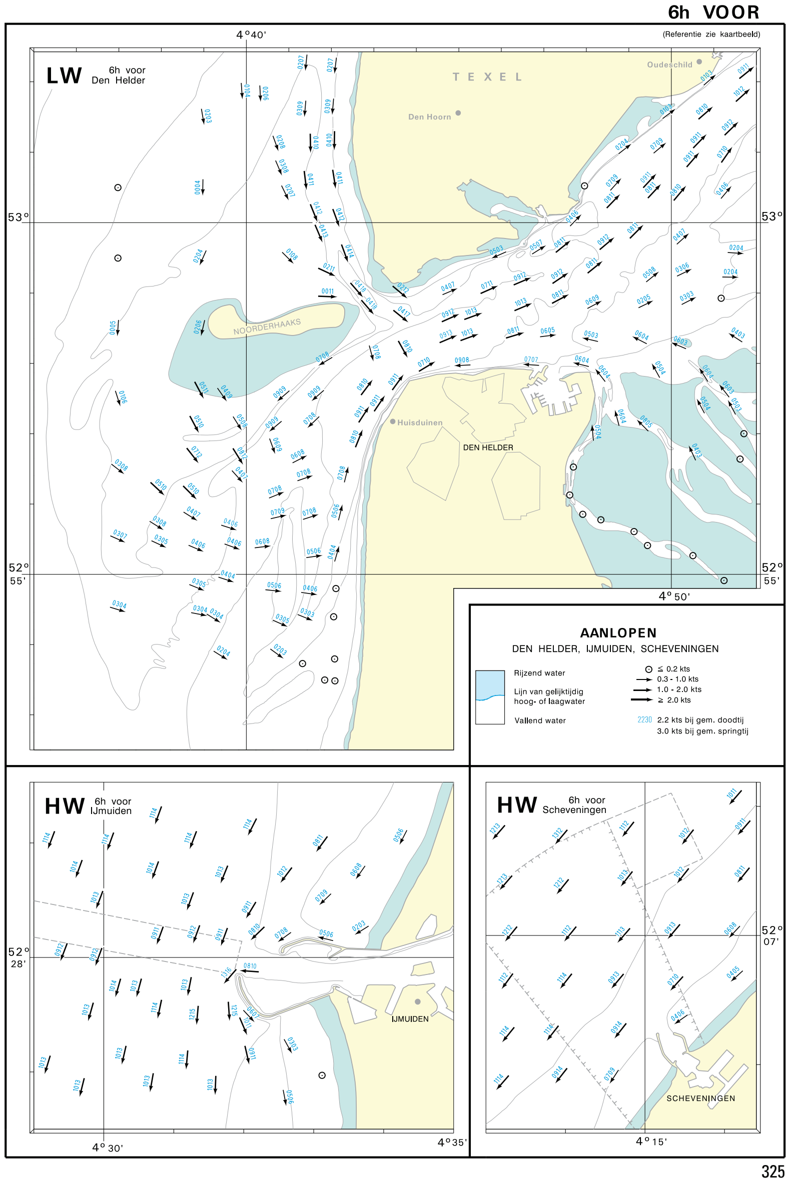
The sort of tide and the difference in water levels between high and low tide (the range) vary at different locations and depend heavily on the shape of the coastline. There are shorelines with a barely noticeable tidal range, while in the Canadian Bay of Fundy, a record tidal range of no less than 17 metres has been observed.

The height of the range is not the same every day, but depends largely on the position of the moon. When there is a full or new moon, the sun and the moon are in a straight line, and this is when the combined gravitational pull is strongest. Most places have their greatest tidal range (spring tide) around those days. Around the time of the half moon, the tidal range is usually at its lowest (neap tide).

The changes in water level mean that large quantities of water are moving to and from the coast: the tidal stream. The difference between a tidal stream and the ocean current discussed earlier is that a tidal stream changes direction, or 'turns', with the same frequency as high and low tides. In the open waters of the marginal seas, tidal streams rarely reach speeds of more than two knots. Wherever the water is forced through narrow channels, such as the tidal inlets between the Wadden Islands, tidal streams can reach considerable speeds. In the Pentland Firth, which connects the North Sea to the Atlantic Ocean on the north coast of Scotland, tidal streams can reach speeds of 12 to 16 knots. That is faster than the normal sailing speed of most ships.

In most coastal areas, tidal motion is extremely regular and thus easy to predict. This does not always apply to estuaries, however, where flows and water levels are affected by water levels and currents in the river (amount of water outflow, or discharge). At some places in the world, the characteristics of the tide, the shape of the estuary and the current in the river create a flood wave. This phenomenon involves a sudden high tide in the form of a wave several metres high, which can create a dangerous situation.

A knowledge of local tidal movements is not only important for safe navigation or to determine the most economically favourable moment of passage; particularly for amphibious and riverine operations and diving activities, an up-to-date knowledge of tides and water levels is vital to be able to assess the capabilities, restrictions and risks. A knowledge of local tides is also essential for determining the possibility of safe passage through areas in which the presence of sea mines is known or suspected.



Tidal stream atlas (source: Netherlands Hydrographic Service, HP33)

Clarity and visibility under water

Because of the proximity of the seabed, the motion and turbulence of the water due to waves and tides, and the influx of rivers, seawater nearer to the shoreline contains many different substances, such as sand, clay, mud and so on. The clarity of the water is thus greatly reduced in comparison to that in the high seas.

1.3.2 The floor of marginal seas and littoral waters

From the edge of the continental shelf to the coast, the influence of the seabed is increasingly evident. Rocks, sandbanks, shallows and wrecks can form obstacles for shipping. The composition of the floor – sand, shells, mud, rocks, vegetation – affects the performance of underwater sensors and also often determines visibility under water. The composition of the seabed also determines whether certain areas are suitable for anchorage. Good cartography by means of hydrographic survey is thus extremely important for maritime operations. In areas with sandy seabeds and strong tidal streams, the floor can change, and objects on the seabed (such as subsea cables and pipelines, as well as sea mines) could be covered with sand or indeed be exposed. It is important, therefore, to conduct surveys more frequently in these areas.

1.3.3 The surface of marginal seas and littoral waters

As discussed earlier in this chapter, the sea surface near the coast is influenced by the tides. It is, of course, also affected by the wind. In shallower water, due to the proximity of the seabed, the waves caused by a strong wind are shorter and higher (steeper) than in the deeper waters of the ocean.

When the wind waves reach the very shallow water along the coastline, they break and create surf. The falling water from the breakers causes powerful turbulence. Navigation through the breakers by (small) vessels can be dangerous and requires a highly experienced helmsman. The amount of surf thus plays a significant role in amphibious operations.

Tide and wind can reinforce each other's effect on the sea surface. The storm surges that accompany high waves are notorious, created when a storm whips up the already high water of a spring tide even further. The reverse happens when a strong land wind blows away the water from the spring tide leaving an extremely low water level that can severely restrict shipping or even prevent it altogether.

1.3.4 The coast

In no two places on earth is the coast the same. The natural shape of the coast is determined by the geological features of the land mass and the by the ferocity with which air and water have affected it and continue to do so. There are sandy beaches with shallow coastal waters or tidal plains (the Wadden Islands), high, rocky cliffs that rise up steeply from deep water (Norway), atolls with coral reefs, mangrove forests, bays and river deltas.

The topography of the coast is important for maritime operations in two respects. First of all, the land mass impacts on the effect of sensors and weapons systems. The reflection of electromagnetic radiation from the coast can disrupt radio communications, thus restricting the possibilities for communications or for the employment of weapons. Secondly, the type of coast is important for amphibious operations, which are more easily conducted on a relatively flat beach than on a steep, rocky coast. The suitability of a coastline for use by landing craft is largely dependent on the gradient and negotiability of the beach. The accessibility and negotiability of the immediate hinterland also play a role.

1.3.5 Estuaries and rivers

Estuaries form the transition from fresh to salt water. Insofar as rivers are negotiable, they represent inland freedom of movement from a maritime perspective. To make use of that requires a knowledge of those rivers and their estuaries. Generally speaking, estuaries are characterised by fluctuations in current and in the composition and temperature of the water and the estuary floor. In any event, a similarly laden ship will have a deeper draught in fresh (and thus less heavy) river water, which could restrict the space for manoeuvre. Submarines in the changing conditions near rivers have to adjust their trim (neutral buoyancy) frequently.

1.4 Man and the characteristics of the sea

The preceding paragraphs looked at the natural properties of the world's seas and coastal waters. These properties affect the way in which man can use this domain. Although this chapter looks specifically at the effect of natural features on military operations, these properties and influences apply to anyone who puts to sea: sailors, fishermen, merchant seamen and naval personnel.

The world's seas form a vast water surface area. Sailing this huge surface on ships that travel relatively slowly means that people on board those ships are stuck with each other and on the ship for long periods of time. The advent of satellite communications has done little to change that. There is not normally much privacy and you can’t avoid each other (for very long, at least). For seafarers, a ship is more than just a means of transport or a place of work: it is their living room, dining room, bedroom, power station, drinking water factory. The ship is also the warehouse, as replenishment cannot be taken for granted.

Everyone knows that they all need each other to save the ship in the event of a calamity or damage; the alternative is to drown together. Life on board makes seafarers independent and enables them to solve problems by themselves, but it also makes them aware that they have to be able to trust each other completely.

The oceans are an empty space. That emptiness and the knowledge that you will have little chance if in distress create a great sense of solidarity among seafarers. Mutual assistance is taken as read and nationality plays no role.

The sea is also changeable. This inconstancy means that seafarers are prepared for changing situations and try to keep as close an eye as possible on the indicators of change, in particular the weather. International cooperation with regard to safety is thus regarded as a matter of course, as illustrated by the hurricane and iceberg warning services referred to earlier. Seafarers know that the dangers increase nearer the coastline, in the form of tides, shallows and fog. So he understands the value of a good chart, a reliable compass and an effective lookout.

1.5 Summary

The maritime domain is characterised by a great number of different natural factors. Each of these has a specific but often combined impact, both on seafarers in general and in particular on the means with which and the way in which military operations can be conducted, both at sea and from the sea.

Insufficient or inaccurate knowledge of the natural features in the area can have a seriously adverse effect on the planning and execution of maritime operations. It could mean that the wrong equipment is chosen, that sensors do not function properly or that weapons systems are unusable. Knowledge of the natural features of the maritime domain is therefore vitally important for maritime operations.

2. MAN AND THE MARITIME DOMAIN

2.1 Introduction

Besides the natural features discussed in the previous chapter, the maritime domain has other characteristics that affect maritime operations. The common denominator for these other features is that they relate to man's use of the maritime domain.

The world's seas and oceans are used by man for fishing, extracting raw materials, generating energy, for transport and trade, recreation, exercising power and waging war. Over the course of history, various agreements have been established to steer the use of the sea in the right direction and to regulate the rights of countries and users. Many of these agreements affect maritime operations, by imposing restrictions, setting requirements for equipment and specifying tasks. A good understanding of the various agreements relating to use of the maritime domain is thus vitally important for maritime operations. This chapter will, therefore, look at these agreements and treaties in more detail.

It will look first at the various forms of man's use of the maritime domain, to be followed by a description of the main overarching agreement relating to the use of the sea: the United Nations Convention on the Law of the Sea. Various agreements and regulations regarding the safety of shipping, aviation and the environment will then be examined, before looking at measures to combat various forms of undesirable behaviour and criminal activity. Attention will then be given to the rules that apply to military use of the maritime domain in times of conflict and war. The chapter will close by summarising the implications of all these agreements for maritime operations.

2.2 Man's use of the maritime domain

The sea is extremely important to humans. Half the world's population lives within 200 kilometres of a coastline. More than 150 of the 192 United Nations member states have a coastline and thus an interest in the sea. The ways in which man uses the sea can be split into four categories:

- a source of food, raw materials and energy;
- a means for transport, trade and communication;
- a natural environment and habitat;
- an area in which to exercise power.

The categories are all interrelated. Fishing, shipping and military operations impact on the environment, and trade activities or fishing can give rise to conflicts and necessitate the use of power. The following paragraphs elaborate further on the four categories.

2.2.1 *The sea as a source of food, raw materials and energy*

The sea is an important source of food. Fishing provides 15% of the world's requirement for animal protein. Most of the fish is caught in continental shelf waters around the continents. For some countries, fishing is an important economic factor: in a number of African countries, fishing revenues account for 30% of the national economy. Disputes over fishing rights, whether or not in connection with over-fishing, can lead to conflicts.

The sea is also an important source of raw materials, the most important of which are oil and gas. The seabed is thought to contain a third of the world's supplies of oil and gas. As the reserves of fossil fuels on land become more and more depleted, the subsea exploration of these supplies becomes increasingly important. Because many shallow-water sources are also becoming exhausted, the focus of the offshore industry is shifting to deeper water. The economic importance of exploitable oil and gas reserves is huge. Any suspicions of the presence of oil and gas under the seabed can thus easily lead to disagreement and conflict.

The sea is also an important source of other raw materials. Sand extraction takes place in many areas, and seawater is also a major source of salt and elements such as bromine and iodine. Most of the world's magnesium, one of the main light metals, is produced from sea salt.

Although seawater is itself not fit for human consumption, it is becoming increasingly important in the production of drinking water. Particularly in coastal regions with a dry (arid) climate, the desalination of seawater is often required to meet the need for drinking water and water for agriculture.

The sea itself serves increasingly as a source of energy. Wind farms and tidal power plants allow humans to exploit the virtually inexhaustible natural energy generated by the wind and the tides. Wind farms can, however, create obstacles for other uses of the sea, such as fishing and transport.

Apart from being a source of energy, the sea is also a means for discharging surplus energy (heat). Industries that are dependent on large quantities of cooling water, such as steelworks and power stations, are therefore often located very close to the sea.

2.2.2 *The sea as a means for transport, trade and communication*

Sea transport is by far the greatest economic interest of the maritime domain for humans. More than 90% of the volume of global trade is done through shipping, most of it by sea. One third of that trade is made up of oil and petroleum products, half of which comes from the Middle East and is destined for Europe and Japan. Other transported goods are containers (15% of sea transport), iron ore (11%), coal (8%) and grain (5%). The economic importance of sea transport does not only lie in the volume, however. Because keeping high stocks is expensive, an increasing amount of trade is based on the principle of 'just enough, just in time': having precisely the right amount at the time it is needed. Consequently, economies have become more vulnerable to disruptions of the sea lines of communication (SLOC).

It is not only goods that are transported by sea, but also people, services and information. From time immemorial, there have been close links between shipping, trade and the exchange of culture. It was by ship that Islam was spread from the Middle East to Indonesia and Malaysia, and Christianity to South America and the Philippines. The 20th century saw significant shifts in this respect, however. Aviation took over most of the transoceanic passenger transport, and the role of the sea in the dissemination of information was largely taken over by telephony, internet and satellite communications. However, subsea cables still form the backbone of the information domain with 95% of transoceanic telecommunications and data traffic passing through.

Sea transport can also present dangers. Some goods (weapons, drugs), some people (illegal immigrants, terrorists, enemy troops) and some reporting (by radio pirates) are not always welcome. Furthermore, sea transport can have harmful side-effects, such as the spread of diseases and of harmful non-indigenous plants and animals.

Transport and trade may themselves come under threat, for instance from piracy, terrorism or conflict and war.

Maritime transport: pillar of the Dutch and Belgian economies

The major sea ports in the Netherlands and Belgium – Rotterdam, Antwerp and Amsterdam – represent an important economic pillar. The added value generated by the ports comes largely from the transshipment of goods that are transported by sea. Goods are transshipped for a service area that covers a large part of northwest Europe. The transshipment itself is not the only engine driving prosperity and the economy, however. The excellent connections, both by sea and with the hinterland, mean that Dutch and Belgian companies have relatively easy and inexpensive access to foreign markets. The ports and industrial complexes are home to many globally operating companies which demand the best from service providers and suppliers, which in turn leads to innovations in countless areas.
The major sea ports are not only an important but also a stable pillar for the economy and prosperity. Despite shifts in global trade, the coming decades are expected to see continued increase in the total amount of transshipment, even in the event of a more pessimistic economic growth.[5]

5 Source: Havenvisie 2030 Port Compass (Port of Rotterdam, 2011).

2.2.3 *The sea as a natural environment and habitat*

Man also uses the sea as a natural environment for recreation (pleasure craft, cruises, diving) and as a means of creating new land (empoldering and landfill). The sea is also important, albeit indirectly in many cases, as a natural environment for humanity as a whole. The sea plays an important role in the production of oxygen and the absorption of carbon dioxide. Ocean currents help to shape the climate in large parts of the world. Just as they do on land, some human activities damage the marine environment; over-fishing, dumping and discharge of (toxic) waste, accidents in oil exploration and transport and the spread of non-indigenous animal and plant life distort the natural balance. These disruptions can also have a direct impact on man, if, for example, fishing grounds are depleted or poisoned, or if seawater is too polluted to be used to produce drinking water. Damage of this sort to the maritime environment can then give rise to friction with public interest groups such as Greenpeace or Sea Shepherd, or even to interstate conflicts.

The sea can also pose a direct threat to the living environment of people in coastal regions. Storms, hurricanes and tsunamis can cause storm damage and flooding, as a result of which it may become necessary to provide help, by sea, for those affected by such natural disasters.

2.2.4 *The sea as an area in which to exercise power*

The sea serves as an area for exercising power in three ways. One way is by regarding the sea as (an extension of) the territory of a coastal state. That state can claim the adjacent fishing grounds and minerals, and can control shipping. In this way, the sea can contribute to prosperity and power. The more able a coastal state is to defend its territorial interests at sea, the more power it can exercise over others. This form of power play is particularly apparent around straits. A strait is a narrow stretch of water connecting two seas, such as the Strait of Gibraltar. A typical characteristic of a strait is that it is completely within the claimed territorial waters or one or more coastal states. The only way to get from one sea to the other is thus via a coastal state's territorial waters.
Especially when major trade routes run through a strait, coastal states on its border can use the route to exercise power. This is the case, for instance, in the Strait of Hormuz (access to the Persian Gulf) and the Strait of Malacca (a major waterway between the Indian Ocean and the Pacific Ocean).

Another way to exercise power is by using the sea as diplomatic terrain. In this case, the sea is used to influence developments at sea and on land. The presence of maritime forces can on the one hand reinforce friendly relations (showing the flag). On the other, a show of military power, conducting exercises or the execution of an embargo could be used to exert political pressure.

The third way of exercising power is to use the sea as a combat zone, where battles are fought with the enemy or where the enemy's interests are undermined. The sea forms the battle area for direct confrontations and for the attack on or defence of each other's interests, such as trade routes. The sea can also function as the maritime flank for military operations on land. In terms of the offensive, the sea serves as a base of operations for actions in enemy territory, for example by means of an amphibious operation, or for providing support for a land operation in the form of logistics or fire support. From a defensive point of view, the sea can serve as an extension of a country's coastal defences.

2.3 The maritime domain as global commons

Over the course of history, there have been many different views about the use of the sea and about the rights of coastal states in respect of sections of the sea. The most famous example of this is the 1609 thesis entitled *Mare Liberum* (The Free Seas) by the Dutch scholar and jurist, Hugo de Groot. The ideas that he set out in that book formed the basis for the present-day international law of the sea.

The essence of this perception is that the maritime domain should be regarded as global commons. The sea, the seabed and the airspace above the sea belong to no-one and at the same time belong to everyone. No one nation alone has the right to determine the use of the sea or the airspace above it, and no one nation has sole rights to mineral resources or fishing grounds.

The perspective of the maritime domain as global commons means that any agreements on man's use of that commons must be made jointly by all nations. The general agreements that currently apply to the use of the maritime domain have thus been established under the umbrella of the United Nations. Other agreements also exist between certain countries in cases where they have a mutual interest in a particular use of the sea or of a certain section of the sea.

2.4 The boundaries of the high seas: 1982 United Nations Convention on the Law of the Sea

The main overarching international agreement on the use of the sea is the United Nations Convention on the Law of the Sea (UNCLOS). This Convention was agreed in 1982 and it entered into force on 16 November 1994. The aim of UNCLOS is to establish *"a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment"*.[6]

As the aim suggests, UNCLOS contains rules and arrangements for almost all the forms of the use of the sea listed in paragraph 2.2. Only one form of use is not covered by UNCLOS: warfare conducted at sea and from the sea. This is because UNCLOS aims to promote the peaceful use of the sea. Maritime warfare is governed by the rules of the San Remo Manual on International Law applicable to Armed Conflicts at Sea, which are discussed in paragraph 2.7.

UNCLOS states which forms of jurisdiction apply in different parts of the sea, the seabed and the airspace above it. It also sets out a number of prohibited activities (such as piracy) and a number of obligations, and it contains the regulations for scientific research and the protection of the maritime environment.

6 United Nations Convention on the Law of the Sea (1982), Preamble.

UNCLOS entered into force in 1994, once it had been ratified by a sufficient number of states, but it has not been signed and/or ratified by all countries. Despite the validity of UNCLOS, there are countries which do not wish to adhere to certain rules contained within it.[7]

The following paragraphs will first explain the main stipulations of UNCLOS, before looking at the freedoms and restrictions which apply to warships and military aircraft under the convention. This section will close with a look at the tasks for maritime forces that can be derived from UNCLOS.[8]

7 Countries such as Venezuela, Iran, Libya, North Korea and the United States have not (yet) signed or ratified UNCLOS.
8 Further explanation of the Convention and its implications for military operations can be found in the Juridisch Handboek Commandant [Commanding officer's Legal Handbook].

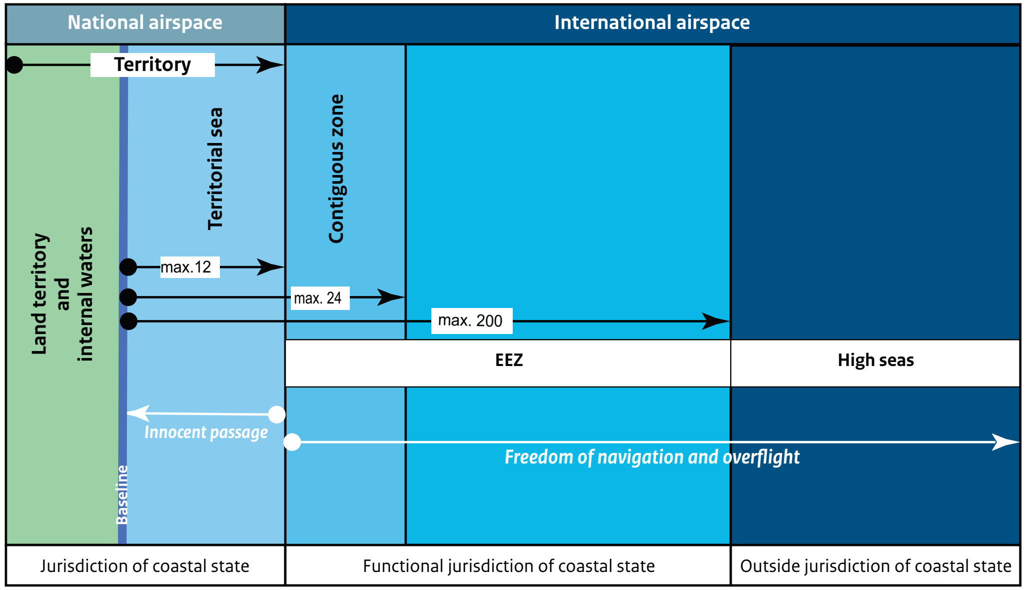
2.4.1 Jurisdiction in the different sea zones

UNCLOS stipulates the maximum distance from the coast to which a coastal state may exercise certain forms of jurisdiction. Jurisdiction is the authority of a state to establish and enforce regulations and to prosecute any contravention of those regulations. A state's jurisdiction is in principle restricted to that state's territory (**territoriality principle**). A state's jurisdiction can be extended with functional jurisdiction, for example at sea, and limited through immunity from prosecution, as in the case of diplomats and warships. Jurisdiction over a ship at sea lies in principle with the **flag state**: in other words, the state in which the ship is registered and whose flag it flies (the **flag principle**).

For the purposes of jurisdiction, UNCLOS divides the sea into different zones: the internal waters, the territorial sea, the contiguous zone, the exclusive economic zone (EEZ) and the high seas (see illustration). The maximum breadth of these zones is measured from the baseline, which is generally considered to be the low-water line: the boundary between land and water at the lowest point of the tide. Along very irregular coastlines (in Norway, for example) and at estuaries, bays and straits (such as the Wadden Sea), there may also be straight stretches of baseline. Not all zones apply automatically: every coastal state must, for example, officially establish an contiguous zone and an EEZ.[9]

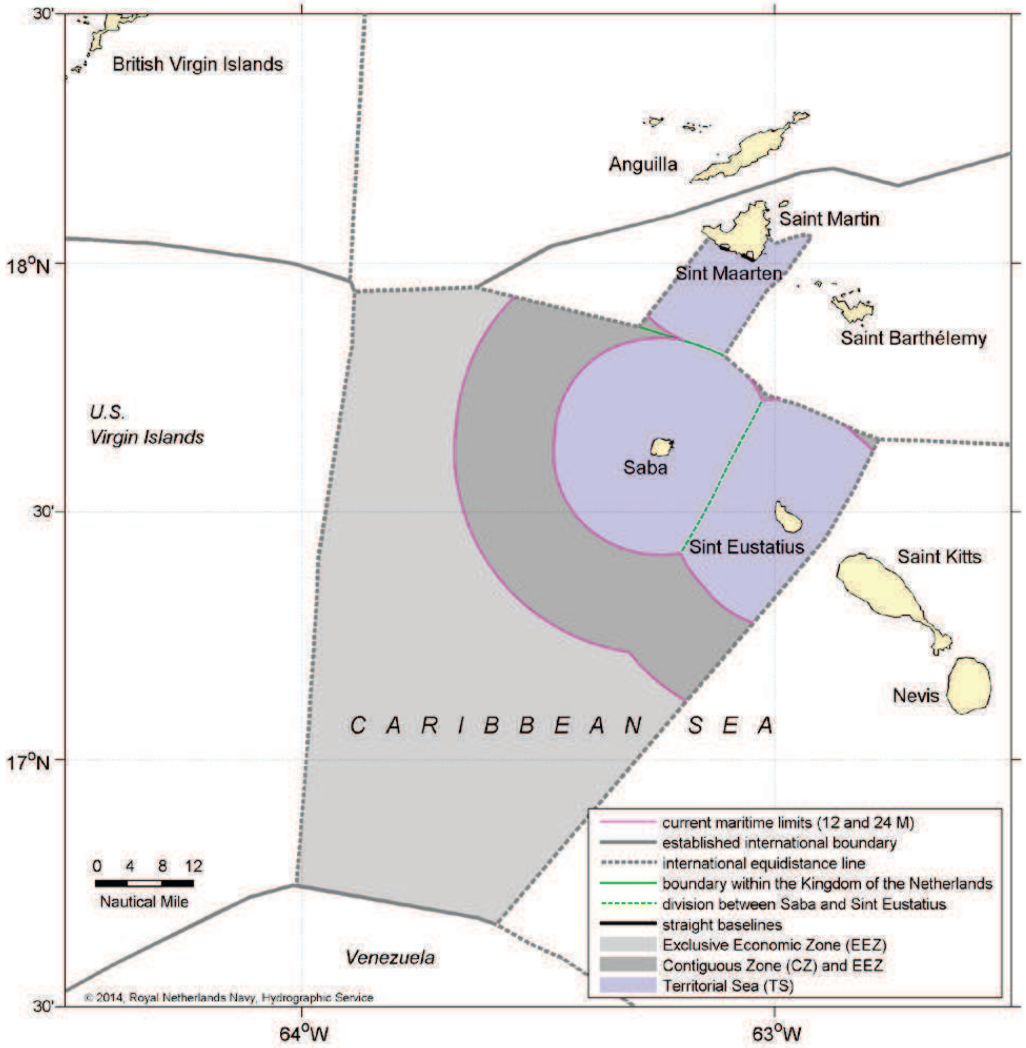
Where the zones of different states overlap, those states need to settle their international sea borders between themselves. That is how the Netherlands and Belgium established their mutual border, and how the EEZs in the North Sea were agreed among all coastal states. Where there is (as yet) no agreement about a delimitation, an equidistant line is used: the line from which the distance to the baseline of both countries is equal.

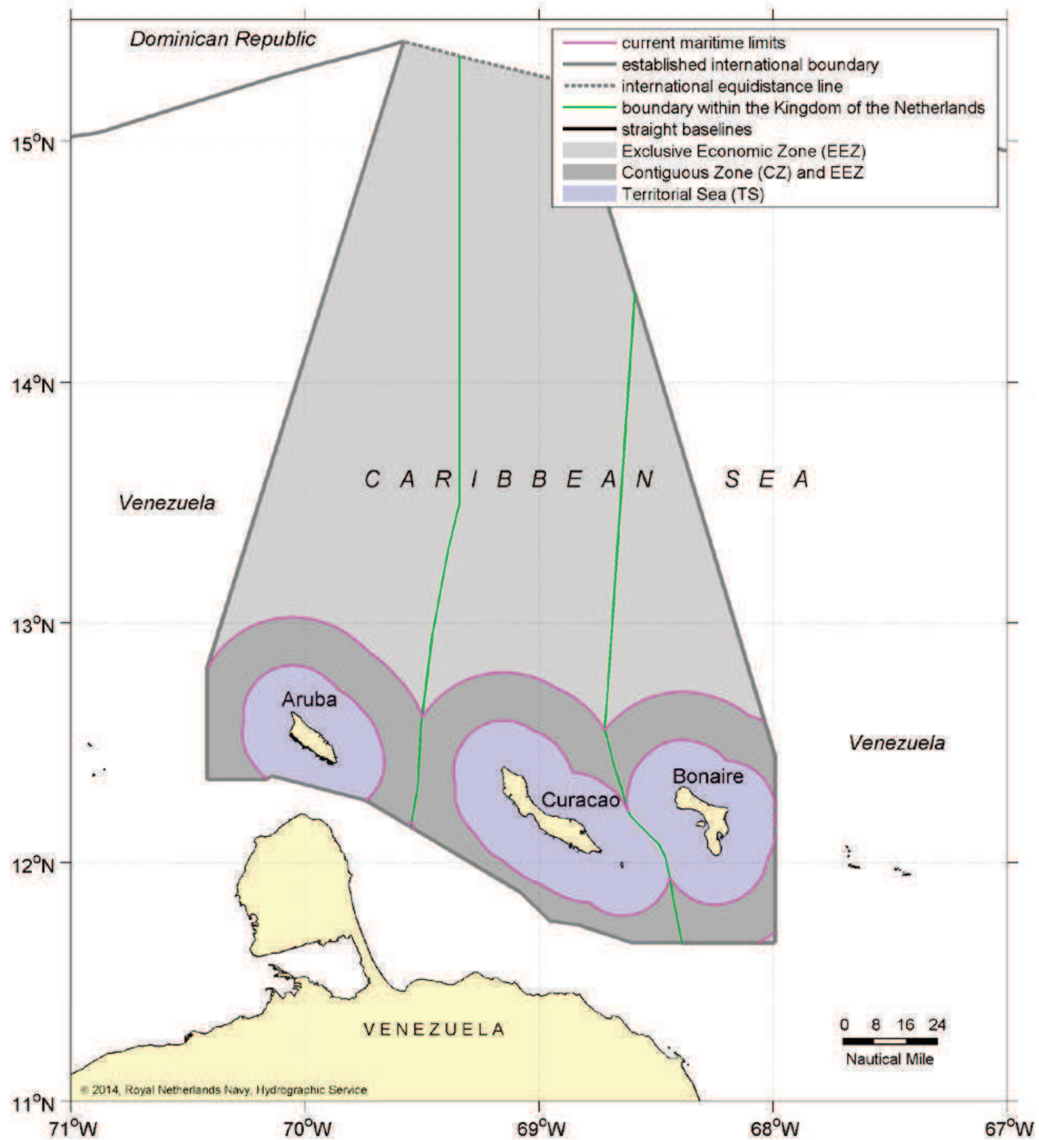
UNCLOS also contains provisions that apply to straits and archipelagos.



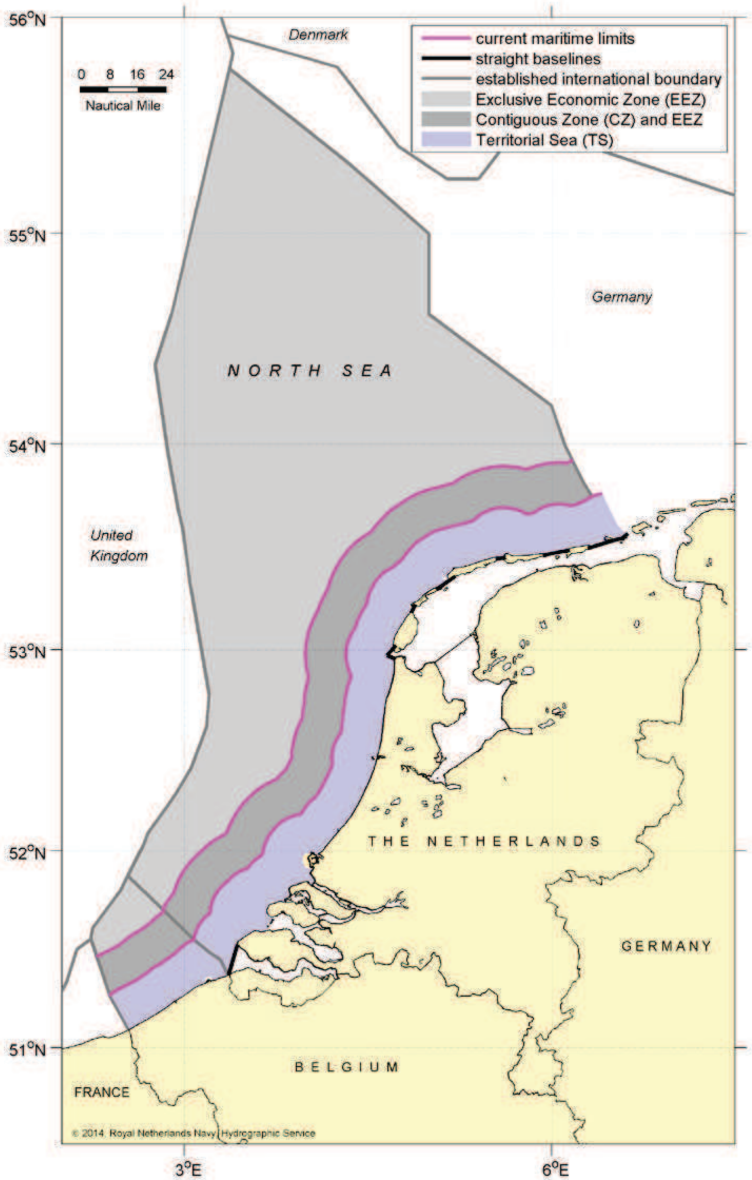
Overview of maritime zones according to UNCLOS 1982

9 There are also states that claim wider zones than are permitted by UNCLOS. These are called excessive maritime claims. The US Department of Defense keeps a record of these claims in the DOD 2005.1-M US Maritime Claims Reference Manual. This can be found at www.dtic.mil (search on title).





Maritime zone boundaries of the Kingdom of the Netherlands in the Caribbean



Dutch and Belgian maritime zone boundaries

Internal waters

All waters on the land side of the baseline make up the internal waters of a coastal state and fall within the jurisdiction of that state, as does the land. In principle, all ships navigating the internal waters are subject to the legislation of that coastal state, which can therefore deny ships access to or passage through those waters.

Territorial sea and the right of innocent passage.

A **territorial sea** is a stretch of water within which the coastal state has jurisdiction. Each coastal state has the right to establish the width of its territorial sea up to a maximum of 12 nautical miles from the baseline (less than 12 miles is thus also permissible).

Within the territorial sea, all ships have the **right of innocent passage**. Rules apply to innocent passage: the passage must, for example, be continuous and expeditious.

There is no such provision for aircraft. The airspace above the territorial sea is national airspace: foreign aircraft may only enter this airspace with authorisation from the coastal state.

Contiguous zone

The **contiguous zone** is a stretch of water that borders on the territorial sea and which is no wider than 24 nautical miles from the baseline. In this zone, coastal states may exercise the control necessary to prevent infringement of its customs, immigration, fiscal or public health laws; it is thus an extra zone in terms of the enforcement of certain laws.

Exclusive economic zone and the continental shelf

An **exclusive economic zone** (EEZ) is an area in which a coastal state has sovereign rights to natural resources from the waters and the seabed, such as fishing and oil and gas exploration. Within the EEZ, a coastal state does not have full jurisdiction, but does have jurisdiction in respect of artificial installations (such as drilling platforms), scientific research and the protection of the environment.

Every coastal state has the right to declare an EEZ up to a maximum breadth of 200 nautical miles from the baseline. The coastal state must set out in its national legislation how the sovereign rights to the resources are to be exercised. For example, some coastal states have a fishing licence system, under which foreign fishing vessels can pay to fish in an EEZ.

In some places, the continental shelf extends further than the EEZ. In those cases, a coastal state may claim rights to mineral resources up to a maximum distance of 350 nautical miles from the baseline. This is the case in the North Pole region, where Russia is claiming part of the Siberian continental shelf outside the EEZ.

High seas

The rest of the sea that does not fall under one of these zones is referred to as the high seas. No country has jurisdiction over the high seas. UNCLOS does, however, specify a number of exceptions, in which ships from one country can exercise jurisdiction over others. This would happen in the event of actions that would be regarded as universal crimes, such as piracy and slave trading. These are examined in more detail in paragraph 2.4.4.

On the waters outside the territorial sea, freedom of navigation (for shipping) and freedom of overflight apply. This freedom only exists as long as the same freedom is not restricted for others. A state could, for example, for security reasons, lay temporary claim to a particular area of the high seas or EEZ and the airspace above it. This could be required for military operations, exercises or weapons testing, or for other activities that could pose a danger to navigation, such as cable laying. A warning zone such as this should be declared (by means of a notice to mariners (NtM) and notice to airmen (NOTAM), but it does not give a state the right to exclude ships or aircraft from the area or force them to change course.

International straits and the right of transit passage

An **international strait** is a natural strait that is used by international shipping between one part of the high seas or EEZ and another part of the high seas or EEZ. In straits used for international navigation all ships and aircraft enjoy the **right of transit passage**, which is a milder regime than the right of innocent passage through a territorial sea. Submarines do not, for instance, need to sail on the surface, and onboard aircraft may take off from and land on a ship. These aircraft and/or helicopters should, however, also adhere to the principle of transit passage, which again should be continuous and expeditious through the strait.

In some straits, however, additional restrictions apply to the right of transit passage. For example, the passage of warships through Turkish waters of the Dardanelles and the Bosporus (between the Mediterranean and the Black Sea) is still subject to the strict rules of the 1936 Montreux Convention.

Man-made links between two seas, such as the Panama Canal and the Suez Canal, are not international straits in a legal sense, but internal waters. Both the Panama Canal and the Suez Canal are subject to separate treaties, which in principle allow passage to anyone, providing they fit into the canal in terms of size and providing they pay the required toll.

Chart of the Strait of Gibraltar (© UK Hydrographic Office)

Archipelagic states

For general and historically recognised island states, such as Indonesia and the Philippines, there are different rules. The waters enclosed by the (straight) baseline between the islands form the archipelagic sea, regardless of the distance to an island coast and regardless of the depth of the water. The archipelagic state can establish internal waters within this archipelagic sea, which is surrounded by the territorial sea, and the right of innocent passage applies in both. In addition, the milder regime of the right of transit passage applies on recognised transit routes through the archipelago.

Definition of a warship

UNCLOS gives different rights to warships. A warship is defined as *"a ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline."*

A warship possesses full immunity, even if it is located in a port or territorial sea of another state. That coastal state has no jurisdiction over the warship. Immunity is obviously not a licence to break the rules, and the coastal state may deny a warship access to a port or the internal waters, or could request it to leave the territorial sea if the state is of the opinion that the warship is not observing the rules that apply to innocent passage.

The definition shows that, for legal purposes, it does not matter if a warship is armed or whether it is painted grey. >

Strictly speaking, any Dutch or Belgian armed forces vessel is a warship if it is flying the commissioning pennant.[10] Dutch warships that fly the pennant have the prefix HNLMS (His Netherlands Majesty's Ship) in front of the ship's name.[11]

However, there are also ships and vessels of the armed forces that do not fly the commissioning pennant. Vessels that are supported by a mother ship, such as landing craft and RHIBs (rigid hull inflatable boats) are part of that warship; as such, they are also regarded as warships without the pennant.

Other vessels that do not fly the pennant, such as diving vessels, coastguard cutters, Royal Netherlands Marechaussee vessels and the Van Kinsbergen training ship, are not warships from the point of view of maritime law. They are regarded as "government ships operated for non-commercial purposes". This distinction has no implications for maritime operations: these government ships have the same immunity and the same rights as warships.

Flag and commissioning pennant (in this case on a submarine)

2.4.2 *Duty to render assistance*

UNCLOS also contains an article (Article 98) that defines an obligation that mariners take for granted: to render assistance to any person found at sea in danger of being lost. This article also requires that coastal states, ideally in conjunction with each other, have a "*search and rescue service regarding safety on and over the sea*". Paragraph 2.5.2 looks at this search-and-rescue (SAR) task in more detail.

10 For the Netherlands, this is defined in the Royal Decree of 19 March 1956 pertaining to the markings of a Dutch warship.
11 In Dutch: Zr.Ms. ('*Zijner Majesteits*' or His Majesty's) or Hr.Ms. ('*Harer Majesteits*' or Her Majesty's); the latter if the monarch is a queen.

2.4.3 Freedoms and restrictions for maritime operations

In the waters outside the territorial sea, the freedoms of navigation and overflight apply. There are in principle no restrictions for maritime operations and that has a major impact on the nature of those operations. This is because in the global commons of the maritime domain, all users are in principle free to come and go as they please. An important characteristic of maritime operations is global mobility in that maritime forces have access to most areas and have the freedom of movement to get there and stay there. However, this mobility also applies to other users of the maritime domain. In virtually all cases, the military use the maritime domain along with many other users: merchant ships, fishing vessels, pleasure craft, civil aviation, as well as navy ships and military aircraft from other countries. This means that an almost constant effort is needed to gain full control of (part of) the sea and to deny opponents and other users access to it. It also means that a great deal of effort is required to establish the identity and the intentions of the other users. On the other hand, the freedom of movement at sea makes it easy to operate in conjunction with units from other countries (in multinational or combined operations).

In the territorial sea of other states, there is no freedom of navigation or overflight. What does apply is the right of innocent passage and, in international straits and archipelagos, ships and aircraft have the right of transit passage. Both these rights have rules which in effect restrict or prevent maritime operations as the territorial sea should be seen as an extension of the territory of a coastal state. A warship entering the territorial sea of another state could be seen as an infringement of that state's territory.

Innocent passage

Passage through another state's territorial sea must be innocent: the passage must not be prejudicial to the peace, good order or security of the coastal state. This means that a (war)ship, among other things:

- may not use force or threaten to use force;
- may not exercise or practice with weapons or weapons systems;
- may not gather intelligence (radar must therefore be turned off, except for that needed for safe navigation);
- may not launch, land or take on board any military equipment (such as helicopters, boats, etc).

Warships too enjoy the right of innocent passage, with the caveat that submarines must sail on the surface and fly their flag of nationality. Some coastal states demand that warships request prior permission to enter the territorial sea; this is not compulsory for the warship intending to exercise its right of innocent passage. The policy in the Netherlands and Belgium is to avoid provocation in these cases and use diplomatic clearance (dipclear), whereby diplomatic channels are used to request prior permission from another state to, for example, enter its territorial waters. Dipclear is always required for entry into internal waters or for a port visit.

A coastal state can temporarily suspend the right of innocent passage through its territorial sea, for example for security reasons or because of military exercises. A suspension like this must, however, apply to all foreign ships, regardless of their nationality.

Passage through straits and archipelagos
For navigation of the territorial sea in international straits and navigation of recognised transit routes through archipelagic territorial waters, the right of transit passage applies, to ships as well as aircraft. Transit passage is in effect a form of freedom of navigation and overflight, as it applies at sea, on condition that passage is continuous and expeditious. Warships and military aircraft may conduct their transit passage in their normal mode of operation, so submarines are permitted to remain submerged. There are no restrictions with regard to equipment, provided that there is no actual or threatened use of force against the coastal state.

2.4.4 *Law enforcement: maritime tasks derived from UNCLOS*
The aim of UNCLOS is to settle issues relating to the law of the sea. There is, however, no international police force at sea to uphold that law; that has to be done by national organisations, working together. Maritime forces are one of those national organisations and can be deployed to enforce international law at sea.

For the purposes of law enforcement, it is important to establish which state has jurisdiction: the coastal state or the flag state. It is also important to establish which law is to be enforced: the national laws of either the coastal or flag state, or the international law. The two are related, however; a state can of course only prosecute a contravention of international law if that action is a criminal offence under national legislation.

Flag state and nationality

According to the flag principle, jurisdiction over a ship at sea lies in principle with the flag state: in other words, the state in which the ship is registered and whose flag it is flying. The flag is the symbol of the ship's nationality and indicates that there is a definite link between ship and flag state.

Because of the flag state's jurisdiction, only the flag state itself may enforce the law in respect of one of its ships. Law enforcement by ships from a state other than the flag state itself can, therefore, in principle only occur with permission from that flag state. Given that warships and government vessels have immunity, obviously no law enforcement action can be taken if these ships contravene certain laws.

For many civil vessels, there are often more nationalities involved than merely the flag state, which means that several states will have an interest in one ship. Besides the flag state, the following, possibly different, nationalities may be involved:
- the nationality of the shipowner;
- the nationalities of the owners of the cargo;
- the nationalities of the master and the crew members.

This complex situation is particularly relevant when it comes to the application of economic sanctions, such as the enforcement of an embargo (see paragraph 2.7.2).

National law enforcement by a coastal state
A coastal state has different forms of jurisdiction in the various zones at sea. The coastal state may deploy its coastguard, police, customs, border control or military assets for:

- the enforcement of national laws and regulations in the internal waters, the territorial sea and the artificial islands in the EEZ;

- monitoring the observance of national legislation in respect of customs, immigration, fiscal or public health matters in the contiguous zone;

- controlling the marine environment and fishing in the EEZ, and the legal exploitation of mineral resources in the EEZ and on the continental shelf outside the EEZ.

International law enforcement outside the territorial sea
As mentioned previously, there is no international maritime police force to enforce the law outside the territorial sea of coastal states. Law enforcement is carried out by the states themselves, in accordance with two principles. The first follows on from the flag principle: a flag state has jurisdiction over the ships that operate under its flag. The flag state may thus take action anywhere at sea against its own ships which breach regulations and commit crimes, except in the territorial waters of another coastal state. The second principle follows on indirectly from the first; because a flag state has jurisdiction, no other state may detain a ship on the high seas.

Several exceptions apply to the second principle, namely actions that are specified in UNCLOS as unlawful (universal crimes):
- piracy;
- slave trading;
- unauthorized broadcasting, i.e. sound radio or television broadcasts contrary to international regulations;
- a ship without nationality (stateless: a ship that is not displaying a flag).

In these four cases, warships have the right to take law enforcement action against ships from another state and against stateless ships without prior permission from the flag state. This is known as the **right of visit**, and the execution of this visitation is referred to as **boarding**.[12] A boarding is conducted to gather evidence of the crime of which the ship is suspected. If the search shows that suspicions were correct, the next steps will depend on the type of crime and the legislation of the state that carried out the boarding.

UNCLOS allows all states to proceed with seizure and trial in cases of piracy. Because not all states have designated piracy as a criminal offence in their legislation, prosecution will not always be possible.[13]

Enforcement in these four cases is not the exclusive province of warships. Any government ship recognisable as such has the right of visit. Coastguard ships or police vessels may also, therefore, take action against piracy, slave trading, unauthorized broadcasting and statelessness.

12 See Chapter 12, paragraph 12.6 (Boarding).
13 Piracy is a criminal offence in both the Netherlands and Belgium: article 381 of the Dutch Penal Code, and the Belgian Act pertaining to the fight against piracy at sea, 30 December 2009.

Besides the four universal crimes, UNCLOS designates some other actions as unlawful, without allowing the right of visit in respect of those actions. Enforcement by a state other than the flag state itself cannot, therefore, be carried out on the basis of UNCLOS, but only if other joint or mutual treaties exist in relation to these actions. The enforcement activities in question are:

- actions against deliberate pollution of and damage to the maritime environment;
- monitoring agreements in respect of fishing on the high seas, such as international agreements about whaling and tuna fishing;
- overseeing the extraction of minerals from the deep sea floor;
- suppression of the illicit traffic in narcotic drugs.

Over time, international agreements have been made in a number of these areas. These will be discussed in the following paragraphs.

2.5 Agreements for safe use of the maritime domain

Besides UNCLOS, there are many other international agreements for the peaceful use of the maritime domain. This paragraph looks in more detail at the agreements that have been established for the safe use of the sea and the airspace above it (**maritime safety**). These are mainly agreements that were made under the auspices of two United Nations specialized agencies: the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO). Both agencies are tasked with the promotion of safe, durable and efficient shipping and aviation, respectively. Some of the agreements made in the IMO and the ICAO also have implications for maritime operations.

The following paragraphs will first look at the overarching agreement for the safety of human life at sea, followed by agreements which cover in more detail the rescue of persons in distress and the rules governing traffic at sea. The agreement on prevention of pollution from ships will then be discussed. The section will close by examining the agreements for the safe use of the airspace over the sea.

2.5.1 *International Convention for the Safety of Life at Sea (SOLAS)*

The aim of the **SOLAS Convention** is to promote the safety of life at sea, the safety and efficiency of navigation and the protection of the maritime environment. It contains stipulations and obligations in relation to the following:

- minimum standards for the design, construction, layout and equipment of sea-going vessels, particularly in respect of watertight integrity, stability, firefighting, life-saving equipment, radio communications and navigation equipment;

- obligations for coastal states to maintain such facilities as search-and-rescue (SAR) services, hydrographic services, weather services and services for the buoyage of waterways and navigational hazards;

- conditions for ship routing systems (see text box) and vessel traffic services (VTS);

- measures to improve the safety of ships and port facilities.

The convention serves as a basis for further detailed arrangements in derived agreements in various areas. This is the case, for instance, in respect of SAR, which will be discussed in more detail in paragraph 2.5.2.

Many states assign the safety and navigation tasks identified by the SOLAS convention to a coastguard organisation or to the armed forces. In the Netherlands, the task of charting the waters of the Kingdom (in the Netherlands as well as in the Caribbean) has been assigned to the Hydrographic Service which is a part of the Royal Netherlands Navy. In Belgium, the hydrographic task has been allocated to the Flemish Hydrography, part of the Flemish government's Agency for Maritime and Coastal Services.

IMO number

Under the SOLAS convention, passenger and cargo ships (with a water displacement of more than 100 and more than 300 tons respectively) must have a unique registration number, known as the IMO number. This number has a similar function to that of the chassis number on a car: it must make it possible to identify the ship. The IMO number is allocated at the time of construction and will in principle never change. To make identification easier for ships and aircraft, the number should be displayed legibly on the ship's exterior (usually on the stern).

The IMO number is an important tool in criminal investigation. Just like the chassis number of a car, the number makes it tricky to give a new identity to hijacked or stolen ships.

Because ships can be clearly identified by their IMO number, it is a useful tool in the picture compilation that is so important for maritime operations.

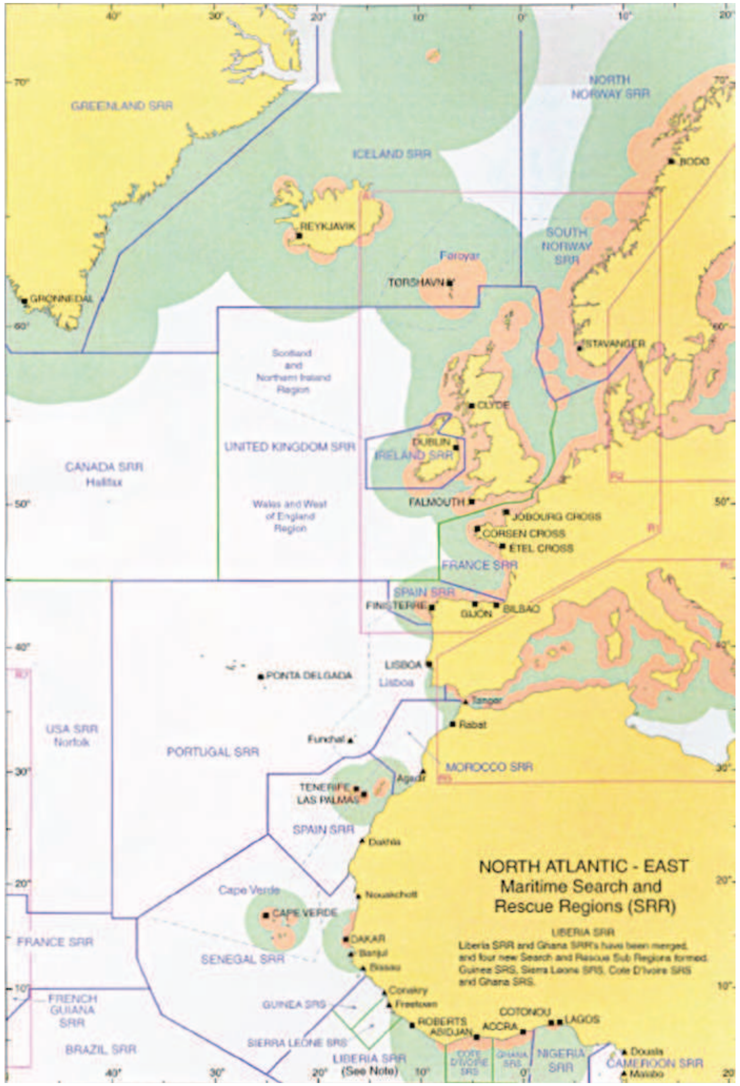
Merchant ship with her IMO number

2.5.2 *International Convention on Maritime Search and Rescue*

Chapter 1 showed that a person in distress at sea would normally have little chance of survival if help does not arrive quickly. UNCLOS and the SOLAS Convention thus make it obligatory to render assistance to those in need. Under the SOLAS Convention, coastal states are also required to provide SAR services for their area of responsibility. Further arrangements in respect of assistance at sea, both for mariners and airmen, are worked out in the International Convention on Maritime Search and Rescue (**SAR Convention**).

In this convention, the world's seas, so also the high seas, are divided into areas of responsibility. It must after all be possible to render assistance to someone in distress within a reasonable space of time even on the high seas. It is up to the states to make arrangements between themselves in respect of the sea area and the airspace above the sea in which they intend to take responsibility for the SAR task. The IMO and the ICAO will then coordinate these arrangements. For the purposes of maritime SAR, the world's oceans are divided into **search and rescue regions** (SRRs) (see illustration). The SRRs are not connected to the zoning in UNCLOS (such as the EEZ), nor does the size of an SRR have any relation to the size of a state or its coastline or territorial sea. Each SRR has a **rescue coordination centre** (RCC) that coordinates SAR operations. The world's airspace is divided into flight information regions (FIRs), and these are in principle used for aeronautical SAR. An FIR may coincide with an SRR, but could also cover a different area.

Specific rules for the execution of SAR are set out in the International Aeronautical and Maritime Search and Rescue Manual. This IAMSAR Handbook is a joint publication by the IMO and the ICAO.

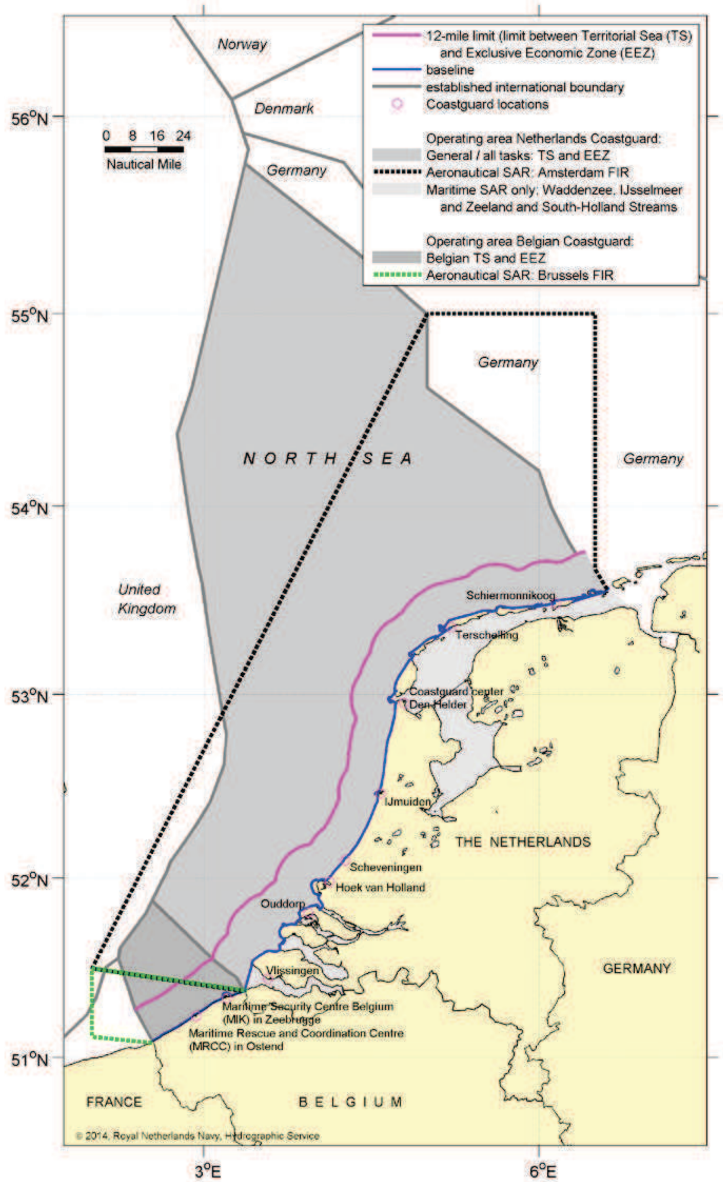


Zoning of the northeastern Atlantic Ocean into SRRs (Source: Admiralty List of Radio Signals, Volume 6. © UK Hydrographic Office)

The Kingdom of the Netherlands has responsibility for an SRR in two locations. In the North Sea, the Coastguard Centre of the Netherlands Coastguard in Den Helder coordinates SAR operations in the Dutch EEZ and the Amsterdam FIR. In the Caribbean, RCC Curaçao, manned by the Coastguard of the Kingdom of the Netherlands in the Caribbean, is responsible for the Curaçao FIR in the central part of the Caribbean Sea.[14] This area is approximately four times the size of the Dutch area of responsibility for SAR in the North Sea.

The Belgian SAR area is made up of the Belgian EEZ and the Brussels FIR. In these areas, coordination falls to RCC Zaventem in the event of aircraft incidents; MRCC Ostend is responsible for maritime SAR.

The execution of SAR at sea is more than a logical obligation for maritime forces. Naval ships are in principle always available to perform SAR tasks, in conjunction with or on behalf of an RCC. This could mean that a ship has to stay at sea longer than originally planned, which is why naval ships almost always carry a high minimum supply of fuel on board (usually 30% of the maximum capacity). Maritime helicopters play an important role in SAR, and not only from ships. Both in the Netherlands and Belgium, maritime helicopters assist in the SAR task above the North Sea, from their respective air bases of De Kooy (7 Squadron) and Koksijde (40 Squadron).



Map of Dutch and Belgian SRRs (Source: Netherlands Hydrographic Service)

14 The international waters around the Windward Islands of St Maarten, Saba and St Eustatius fall within an SRR coordinated by France (from RCC Fort de France on Martinique).

Netherlands Antilles SRR, area of responsibility of RCC Curaçao (Source: Admiralty List of Radio Signals, Volume 6. © UK Hydrographic Office)

2.5.3 *Convention on the International Regulations for Preventing Collisions at Sea*

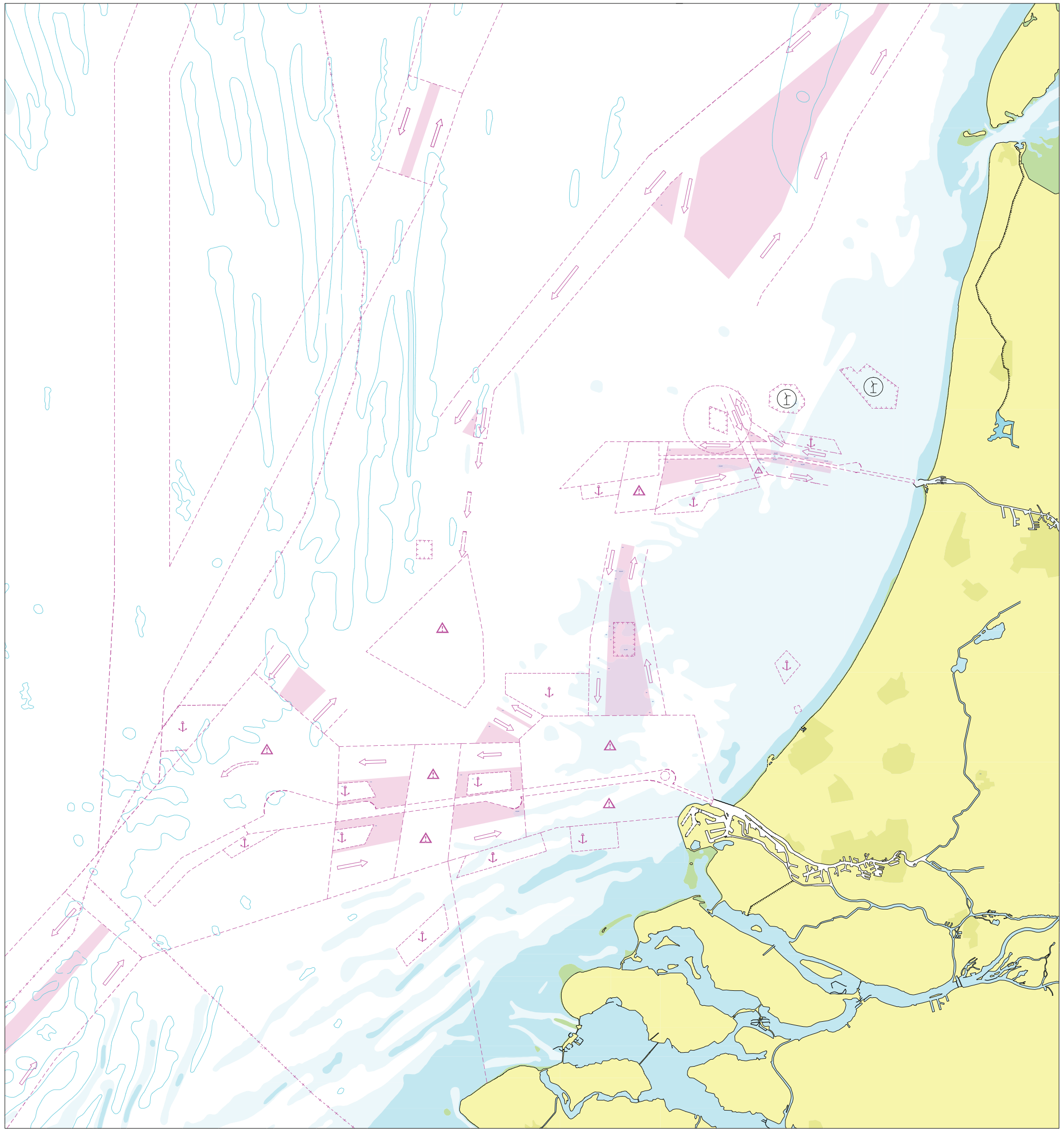
Traffic regulations are necessary at sea. Since 1972, these regulations have been contained in the **Convention on International Regulations for Preventing Collisions at Sea**, also referred to as COLREGS. The articles in the COLREGS set out collision avoidance rules, rules for traffic separation schemes (see box) and rules for lights, day shapes and sound and light signals. Just like all other users of the maritime domain, maritime forces are bound by these 'traffic regulations'. The COLREGS allow naval ships and ships in convoy to use different lights, day shapes and sound signals. The COLREGS contain specific rules for lights and day shapes that apply to (naval) ships performing mine clearance activities.

Traffic separation scheme

At various locations at sea, shipping is steered in the right direction with the aid of a traffic separation scheme (TSS) or a shipping lane. Ship routing systems such as these were originally designed to prevent collisions by separating the busy lanes of traffic moving in opposite directions. Most TSSs, therefore, can be found at choke points such as straits, narrows, capes and routes to and from busy ports. TSSs consist of zones (traffic lanes) assigned to each traffic flow, with a separation zone or line in the middle. Transit shipping should use the traffic lanes and avoid the separation zone as much as possible. Where possible, the boundaries of the traffic lanes are marked with buoys.

Routing of shipping is also used increasingly to physically separate transit shipping from other uses of the sea, such as drilling platforms for oil and gas, wind farms and military training areas. In addition, mandatory shipping routes are used to keep shipping out of certain hazardous areas (for example, shallows or mine fields), or to force shipping with hazardous cargoes (such as large oil and chemical tankers) to take a safer route further away from the coast.

Routing of shipping outside territorial waters requires international agreements, and these routing systems therefore need to be enforced and publicised by the IMO. The exact geographical location of official TSSs and shipping routes is indicated on official nautical charts.



Ships' routing systems in the North Sea (Source: Netherlands Hydrographic Service)

Shipping is a human activity, so not all shipping adheres to the COLREGS traffic rules at all times. Maritime forces can be deployed to monitor compliance with the COLREGS, for instance to ensure the correct use of TSSs or mandatory shipping routes.

2.5.4 *International Convention for the Prevention of Pollution from Ships*

The sea is no longer regarded as a bottomless rubbish dump, but as a delicate ecosystem that must be protected against pollution caused by human activity. The MARPOL Convention is an elaboration of the articles in UNCLOS about combating deliberate pollution. MARPOL stands for marine pollution. The convention contains restrictions for the discharge by ships of oil, chemicals, waste water and domestic refuse. A supplementary regulation covering air pollution by ships was established in 1997. As a result of the extensive environmental damage caused by accidents involving oil tankers, agreement was reached in April 2005 to phase out single-hulled tankers.

Maritime forces must also adhere to the MARPOL convention. That means that the MARPOL requirements also apply to the construction of and equipment on navy ships.

Observance of the MARPOL convention also needs to be monitored; maritime forces could, for example, be deployed to check on illegal dumping at sea.

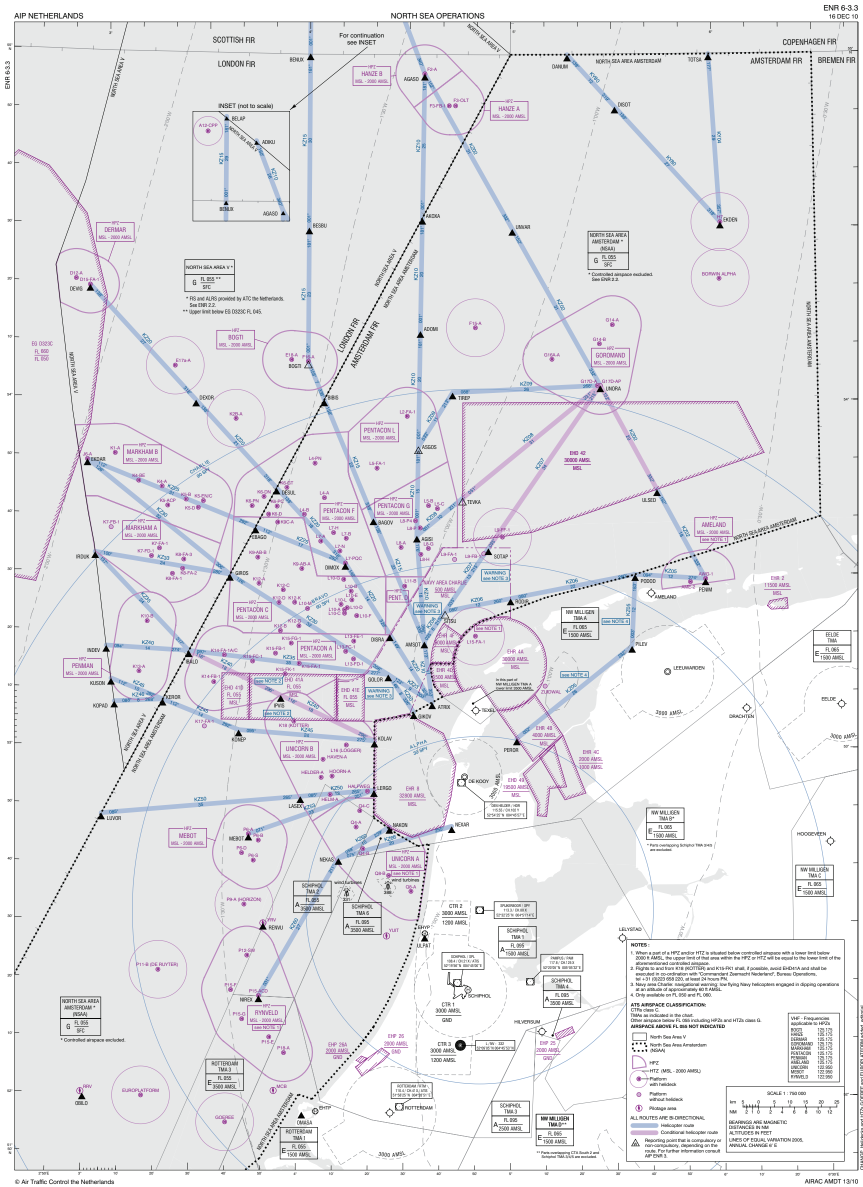
2.5.5 *Agreements for safe use of the airspace above the sea*

The airspace above the earth is in principle divided into two categories: national airspace (over the land and territorial sea of individual states) and international airspace (over the sea outside territorial waters). As indicated in paragraph 2.4.1, freedom of overflight exists in international airspace, but permission is required from coastal states before entering national airspace.

Air traffic moves considerably faster than road or sea transport and any aviation incidents often have catastrophic consequences. The aviation industry therefore places great emphasis on air safety and air traffic control. As a result, aviation is more highly regulated than shipping. As mentioned previously, the airspace above land and sea is divided into FIRs, in which various rules apply for the safe operation of air traffic. Military use of the airspace can pose risks for other airspace users and is therefore not automatically permitted at all times and in all locations. In principle, therefore, maritime use of the airspace also needs to be coordinated with the authorities within an FIR and is subject to the regulations that apply there.

Special air traffic areas: danger areas, restricted areas and prohibited areas

To minimise the dangers, airspace authorities might designate special areas for activities such as military (live firing) exercises. In such cases, other air traffic must stay clear. Many states have permanently designated areas for this within their FIR, which are indicated on aeronautical maps and, when in use, are activated by NOTAM. The location of such an area is important. In international airspace, where the right of overflight applies, such areas are called danger areas; they indicate that flying in the area could be dangerous but cannot be prohibited.



Aeronautical chart (low level) of part of the North Sea (source: AIP NL)

In national airspace, the state could actually close the airspace, partially or completely, making these restricted and prohibited areas, respectively. If these areas are active, unauthorised entry into them is a criminal offence.

The Netherlands has designated several permanent exercise areas in the North Sea.[15] Two of these, EHD 41 and EHD 42, are intended for live firing exercises by ships: the designated airspace begins at the sea surface. Exercise areas EHD 1 to 9, for fighter aircraft training, are located in the airspace to the north of the Wadden Islands. In these areas, the designated airspace does not begin at the sea surface, but only from a certain height above it. In addition, the territorial waters near Den Helder contain restricted area EHR 8, which can be closed for live firing exercises by ships or from the coast. In the Netherlands, the task of establishing and declaring special air traffic areas for military use falls to the Military Aviation Authority (MLA in Dutch). The activation of these areas through NOTAM is done by the Air Operations Control Station (AOCS) Nieuw Milligen, part of the Royal Netherlands Air Force.

Belgium has also designated a number of fixed training areas. Two of these, EHD 7 and EHD 9, are intended for live firing exercises by ships or from the coast. Located in the airspace above them are temporary reserved airspace (TRA) 13 and 14, intended for fighter aircraft training. In Belgium, the Air Component (COMOPSAIR) is the authority responsible for establishing and activating special air traffic areas.

15 For more information, see Dutch ACZSK DOPS 139 *Richtlijnen voor het gebruik van vliegtuigen en helikopters en luchtruimmanagement t.b.v. maritieme oefeningen*. [Guidelines for the use of aircraft and helicopters and airspace management for maritime exercises.]

2.6 Agreements for law enforcement and crime fighting

As indicated in paragraph 2.4.4, UNCLOS only allows states other than the flag state to take action in the event of the four specified universal crimes (piracy, slave trading, unauthorized broadcasting and statelessness), and then only outside territorial waters. Apart from the suppression of the illicit traffic of narcotic drugs, UNCLOS does not deal with other forms of criminal activity. For these, states therefore need to make separate arrangements among themselves. The following paragraphs look more closely at other agreements that have been made in respect of **maritime security**, namely those to counter drug trafficking, maritime terrorism, illegal immigration and human trafficking.

2.6.1 Counter-drug-trafficking agreements

UNCLOS states that countries must make their own supplementary agreements in respect of the suppression of the illicit traffic in narcotic drugs. One of those supplementary agreements in respect of drug trafficking in general is the 1988 Vienna Convention.[16] Like UNCLOS this convention does not contain a direct legal basis for acting against ships suspected of trafficking that are from other states (no right of visit). A sound legal basis can only be established once the states involved have made specific arrangements.

16 Full title: United Nations Convention against illicit traffic in narcotic drugs and psychotropic substances.

In the Caribbean, this has been done through the Caribbean Regional Maritime Agreement[17] by several states in the region and a number of other interested states. The Netherlands and the Caribbean territories of the Kingdom of the Netherlands are signatories to this agreement.[18] This means that Dutch naval ships in the Caribbean can operate against ships suspected of drug trafficking that come from states that are also signatories, even outside the territorial waters of the islands. The agreement grants the right of visit: the flag state's permission for a boarding is laid down in the agreement.

The countries of Europe have signed a similar agreement, namely the Strasbourg Agreement on Illicit Traffic by Sea (1995).[19] Unlike the Caribbean Regional Maritime Agreement, this agreement does not include automatic permission from the flag states, which means that action can only be taken against drug trafficking in European waters if prior permission has been received from the flag state.

17 Full title: Agreement concerning co-operation in suppressing illicit maritime and air trafficking in narcotic drugs and psychotropic substances in the Caribbean area.
18 Belgium is not party to the Caribbean Regional Maritime Agreement.
19 Currently in 2014, this agreement has not yet come into force for the Netherlands, as the implementation legislation needs to be completed first. Belgium has not yet signed this agreement.

2.6.2 *International agreements on maritime counter-terrorism*

After several ships were hijacked by terrorists in the 1980s, agreements were established to combat maritime terrorism. These agreements were contained in two conventions: the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (the **SUA Convention**), and the Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms located on the Continental Shelf. After the terrorist attacks by Al Qaida in 2001, supplementary regulations were deemed necessary; both conventions were revised accordingly in 2005. The IMO also agreed the International Ship and Port Facility Security (**ISPS**) Code.

The 'unlawful acts' in the title of the SUA Convention and the Protocol relate to the preparation and execution of acts of terrorism and the transportation of and trade in (parts of) weapons of mass destruction. Both agreements give warships or other government ships the right of visit in respect of ships that are suspected of these acts. Prior permission is, however, required from the flag state.

The ISPS Code does not affect maritime forces directly, but it could lead to the deployment of parts of the navy. Certain ships that put into port could represent a threat or a target and thus necessitate heightened security. National maritime units may then be employed to perform pre-bomb checks or to provide protection for ships.[20]

20 See text box on port security in Chapter 12, paragraph 12.5 (Countering violent crime and terrorism in the maritime domain).

2.6.3 *Agreements to counter illegal immigration*

The sea is one way for people to get from one country to another. Passenger transport by sea refers not only to ferries and cruise ships, but also to the transportation of people who are not welcome at the intended destination, such as illegal immigrants and people who are 'trafficked' against their will.[21]

From a legal point of view, the undesirable transportation of people by sea falls into three different categories: slave trading, human trafficking and illegal immigration. **Slave trading** involves people who are traded against their will as the property of other people. **Human trafficking** relates to the forced transportation of persons for the purpose of exploitation by, for example, forced labour or prostitution. **Illegal immigration** involves gaining access to a state in which the person involved is not a resident or has no right of access or residence (such as a visa).

Taking action against these forms of undesirable transportation of people on the high seas is complicated, because it is not always clear why people are travelling by sea or whether they are under any form of coercion. Although UNCLOS allows for actions against slave trading, it does not provide a clear definition of slavery. The dividing line between human trafficking and illegal immigration is also vague; it is often unclear whether people have paid voluntarily for the voyage or whether they have been forced to do so. It is also possible that the people involved are refugees, people who have fled their own country to avoid starvation, poverty, violence or persecution.

Because the transportation of people almost always involves access to another country, any action against undesirable access is in principle the task of the immigration service and the coastguard of the country of destination. Maritime forces can assist in this task.

Illegal immigration, human trafficking and refugees can hamper or complicate maritime operations when the sea transport is taking place in unseaworthy vessels. There is always the duty to render assistance to anyone in distress at sea. The rendering of assistance itself is not usually a problem for navy ships; a more serious challenge arises, however, when the rescued individuals are unable to continue their journey under their own steam and they cannot be put ashore in the nearest country. Having a (large) group of 'passengers' on board and the potentially long period of time it will take to get them to a safe place on land can hamper or even prevent the maritime operation in which the ship is involved at the time.

21 The main agreements on this subject are the United Nations Convention against Transnational Organized Crime, the supplementary Protocol against the Smuggling of Migrants by Land, Sea and Air, and the supplementary Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women and Children.

2.7 Agreements for use of the sea for exercising power and for warfare

Until now, this chapter has only discussed agreements relating to use of the sea for peaceful purposes and to actions against acts at sea that are regarded as unlawful. However, man also uses the maritime domain to exercise power and to wage war. There are also agreements for these forms of use. In the event of an international armed conflict between states, the maritime domain is subject to the maritime part of International Humanitarian Law (IHL)[22]: the **San Remo Manual on International Law Applicable to Armed Conflicts at Sea**. The following paragraphs will first examine this law of armed conflicts at sea, and will then discuss what international agreements and restrictions apply to military operations outside times of armed conflict.

2.7.1 Agreements applicable to maritime operations in armed conflict: the San Remo Manual

The San Remo Manual[23] is part of IHL. All the principles of IHL, such as proportionality and the distinction between combatants and non-combatants, apply fully to an armed conflict at sea. IHL, and so also the San Remo Manual, applies to all conflict situations involving the use of force; there does not need to be a declaration of war or a situation designated as war.

22 All applicable treaties, etc., relating to International Humanitarian Law can be found in the Dutch Ministerial Publication MP 11-20.

23 The Law applicable to Armed Conflicts at Sea consists of (parts of) various treaties. The San Remo Manual on International Law Applicable to Armed Conflicts at Sea is normally used in reference to that law. The San Remo Manual was established in 1994 and is internationally accepted as the most authoritative and comprehensive overview of the international law applicable to armed conflict at sea. Further explanation of this law and its implications for military operations can be found in the Juridisch Handboek Commandant [Commanding officer's Legal Handbook].

The division of the parties involved is important for the application of the San Remo Manual: the states involved in the armed conflict (belligerents) and the states that are not involved (neutral parties).[24]

The San Remo Manual sets out the restrictions that are imposed in respect of areas of operation, weapons to be used and military objectives. It also stipulates how ships and aircraft from neutral states should be dealt with.

2.7.1.1 Constraints for maritime hostilities

Neutral waters and straits

As well as on the high seas, maritime forces are, as a general rule, permitted to conduct hostile actions in, on or above the land, internal waters, territorial sea, contiguous zone and EEZ of the parties involved in the conflict. Operations may also be conducted in the EEZ of neutral states. In the EEZ and on the high seas, however, the belligerents have to bear in mind the rights of third parties or neutral states in the area in question, such as fishing rights or the freedom of navigation.

Hostile actions are not permitted in neutral waters: the internal waters and the territorial sea of neutral states. Belligerent forces are also prohibited from hiding in neutral waters or from using this area as a base.

Hostile actions are also prohibited in international straits that overlap the territorial waters of neutral states. Warships and military aircraft of the warring parties do, however, retain the right of transit passage through these neutral international straits.

24 Both in the Netherlands and in Belgium it is government policy to apply the IHL also to armed conflicts involving non-state actors.

Attack or capture of enemy ships and aircraft

Under the San Remo Manual, attacks are only permitted on military targets. A military target is defined as an object which, by virtue of its nature, location, purpose or use, makes an effective contribution to military action, and whose total or partial destruction, capture or neutralisation, in the circumstances ruling at the time, offers a definite military advantage.

Enemy civil ships and aircraft do not, therefore, automatically constitute a military object that may be attacked. Enemy ships and aircraft may, however, be detained and seized; in other words, captured. The San Remo Manual specifies the type of ships and aircraft that are exempt from attack under certain conditions.

Restrictions on military equipment

The San Remo Manual imposes conditions on the use of certain weapons, such as long-range missiles, sea mines and torpedoes. The use of sea mines is permitted, albeit under limited conditions. Sea mines may not, for example, be laid in neutral waters.

2.7.1.2 *Restriction of the freedom of navigation: maritime zones and blockades*

The right of free navigation and overflight is an important principle that also continues to apply in the event of a conflict at sea. Belligerents as well as neutral states may, therefore, continue to make free use of the high seas and the EEZs. The San Remo Manual does, however, allow belligerents to impose (temporary) restrictions on shipping and aircraft, for example to create space between the themselves and neutral traffic. These restrictions take the form of maritime zones, such as **warning zones** (warning that combat actions are taking place) or **total exclusion zones** (denying access to all shipping and aircraft). There are specific rules with which a belligerent must comply before establishing this type of zone. The zone must, for example, be officially announced by means of a declaration, and made known to all belligerents and neutral states; the declaration should indicate the commencement, location, duration and size of the zone and the measures imposed. The starting point is that, when establishing a zone or area of operations, belligerents are not relieved of their obligations under international (humanitarian) law.

A **blockade** is a method of warfare in which a belligerent seals off a particular port or stretch of coastline for all shipping. Specific requirements apply to a blockade; it must, for example, be effectively enforced, and it must be non-discriminatory in its applicability to all shipping from all states. A belligerent that has reasonable grounds to suspect that civil ships are in breach of a blockade is authorised to capture those vessels. He is also permitted to attack vessels which, after prior warning, continue to resist capture.

2.7.1.3 *Searching and seizing neutral ships and aircraft*

A ship sailing under a neutral flag should in principle be left alone by belligerents. In some cases, however, the San Remo Manual grants belligerents the right of visit and search. They are permitted to board neutral ships outside neutral waters if there is good reason to suspect that they:

- are carrying contraband (see text box);
- are operating directly under any form of enemy control;
- are presenting irregular or fraudulent documents, lack necessary documents or are destroying, defacing or concealing documents;
- are violating regulations established by a belligerent within an area of maritime operations;
- are breaching or attempting to breach a blockade.

Belligerents also have a similar right of visit in respect of neutral, civil aircraft. They have the right to divert aircraft to their own airbase for inspection, for example for contraband.

The San Remo Manual also specifies certain conditions under which neutral ships and civil aircraft are exempt from the right of visit and seizure.

Contraband and prize capture of goods and ships

The San Remo Manual defines contraband as goods which are (ultimately) destined for territory under the control of the enemy and which may be susceptible for use in armed conflict. To exercise the right of capture, a belligerent must have published a contraband list. Goods not on the contraband list are free goods. As a minimum, these include:

- religious objects;
- articles intended exclusively for the treatment of the wounded and sick and for the prevention of disease;
- goods intended for the civilian population, such as clothes and foodstuffs;
- items destined for prisoners of war.

If a ship has been found by a boarding or other means to be carrying contraband, these goods may be seized. This seizure is referred to as '**prize capture**'. The prize capture of a neutral ship and/or goods is not the same as the capture of an enemy unit. The prize capture is concluded by adjudication of the goods as prize. This is done by a court, known as a prize court, which is set up by the party that has made the seizure. The prize court decides who the new rightful owner of the seized goods will be.

2.7.2 *Agreements for maritime operations outside times of war*

At times when there is no armed conflict between two or more states, there are in principle no special arrangements for maritime operations. At those times, the maritime domain is subject to the provisions of UNCLOS and other agreements, as discussed in this chapter. The deployment of maritime forces and the use or threat of force may, however, be required to settle disputes and contain crises.

Disputes between states or groups of people can arise for a multitude of reasons. These reasons might lie in the maritime domain itself, such as disagreements about fishing rights or territorial claims. Even if the reasons for a crisis or conflict are on land, maritime action could be necessary or desirable. In these situations, deployment occurs within (the interpretation of) the boundaries of international law. The freedom of navigation and overflight means that, by their presence, maritime forces can provide deterrence or compellence in support of the diplomatic process. Maritime forces can also be deployed for the evacuation of a state's own or friendly citizens from a conflict region or for the provision of aid to refugees.

A dispute or a crisis can escalate to such an extent that the parties involved resort to armed force. Such a situation then becomes a conflict, but not yet necessarily an actual war. As a rule, military action, and thus also maritime action, to contain such a conflict will only occur if the United Nations Security Council (UNSC) has adopted a resolution to that effect.

The UN is the only organisation that can allow (temporary) deviations from international law (such as UNCLOS) and authorise the use of force outside cases of national defence. UNSC resolutions should, therefore, be regarded as (temporary) international agreements in times of crisis and conflict. The San Remo Manual also often applies in these situations.

If the conflict (or part of it) is fought out at sea, maritime forces could be deployed to separate the belligerents and to protect shipping from them. Maritime forces could also be deployed to provide sea-based assistance to contain the conflict on land. In the first instance, maritime forces could then be deployed for the maritime enforcement of an embargo declared by the UNSC. An embargo is in effect the same as a blockade under the San Remo Manual, the difference being that for an embargo, the sanctions and the type of contraband are determined by the UNSC. In the second place, maritime forces can provide sea-based support for operations that are being conducted on land. They could do so by, for example, providing logistic support, executing (elements of) command and control or providing the means for defence and escalation dominance (such as fire support).

2.8 Summary

This chapter has described the various ways in which man uses the maritime domain and what international agreements exist for those forms of use. Most of these agreements are designed to bring about the peaceful and safe use of the sea, and they apply to everyone who uses the sea: sailors, fishermen, merchant seamen and military personnel.

Maritime forces are among those users. Although navy ships often have immunity or are exempt from certain regulations, they are expected to adhere to the rules and agreements as much as possible. Maritime forces also have a part to play in providing assistance and in monitoring, upholding and if necessary enforcing agreements in respect of the peaceful use of the sea. A knowledge of the agreements relating to use of the maritime domain is thus vitally important for maritime operations. Together with a knowledge of the physical properties of the sea discussed in Chapter 1, this means that navy personnel need to be mariners first and foremost, with a knowledge of how to fight at sea and from the sea.

The international law of the sea regards most of the maritime domain as global commons. The freedom of navigation and overflight in these commons means that maritime forces have worldwide mobility; they have access to most areas and have the freedom of movement to get there and stay there.

This mobility also applies to other users of the maritime domain, however: merchant ships, fishing vessels, pleasure craft, civil aviation, as well as navy ships and military aircraft from other countries. This could impose restrictions on maritime operations and in most cases necessitates cooperation and consultation with other users. On the other hand, the freedom of movement at sea makes it easy to operate in conjunction with maritime forces from other countries (multinational or combined operations).

The agreements on the peaceful use of the sea contain a number of tasks for maritime forces. The first concerns service providing and assistance tasks, such as hydrography and SAR. Secondly, the tasks are for the purpose of law enforcement, for example measures against piracy and terrorism, and the interception of trafficking in drugs, people and weapons. Lastly, maritime forces can help the coastguard and other local authorities to monitor compliance with various agreements in respect of the use of the sea, such as the traffic regulations, environmental agreements and fishing rights.

Deployment of maritime forces in times of conflict and war is subject not only to agreements for the peaceful use of the sea, but also to the rules of the San Remo Manual, whether or not those are supplemented by measures and rules in the form of a UNSC resolution.

3. MILITARY USE OF THE MARITIME DOMAIN

3.1 Introduction

The last chapter looked at how man uses the maritime domain for different purposes. One of those purposes is the exercise of power, for which the maritime domain can be used in three ways: as part of a state's own territory, as diplomatic terrain or as a theatre for armed conflict.

States and other actors exercise power to safeguard their interests and to pursue their objectives. This chapter will look at how this exercise of power translates into roles and tasks for the military use of the maritime domain. Attention will be given to the strategic objectives that states and actors wish to achieve and what military and maritime operations could help them to do so. This chapter provides a definition that applies in general terms, looking from time to time at the situation specific to the Netherlands and Belgium.

The chapter begins with a general explanation of national interests, instruments of power, security policy and state strategies. This will be followed by seven strategic functions for which a state will employ its instruments of power. Each strategic function will then be examined in terms of how the military use of the maritime domain and the deployment of maritime forces can contribute to it. The chapter will then focus briefly on the different forms of support and cooperation that may be required in maritime operations. The characteristics of maritime operations will then be discussed, as determined by the features of the domain and the types of operation. It will close with a summary of military use of the maritime domain.

3.2 Strategic interests and power

3.2.1 National interests and strategic objectives

The fundamental objective of every state is to secure its national interests while maintaining its own standards and values. These interests include independence, integrity, stability and the prosperity of the state and its people. A state might also pursue higher objectives that are often connected to norms and values and which usually contribute (indirectly) to the safeguarding of the national interest. The promotion of the international rule of law and the prevention of human rights violations are examples of such strategic aims. The national interests and strategic objectives of a state are usually expressed in a national or grand strategy.

The Netherlands and Belgium have no specific grand strategy; the national interests and objectives in both countries are set out in the Constitution.

The Dutch Constitution contains several articles setting out national interests, such as promoting the provision of employment (Article 19), securing the means of subsistence and the distribution of wealth (Article 20) and promoting the health of the population (Article 22). The Constitution also contains a strategic objective, namely the promotion of the international rule of law (Article 90).

The Belgian Constitution also sets out national interests, such as the pursuit of lasting development in its social, economic and environmental aspects (Article 7bis) and ensuring a level of employment that is as stable and high as possible (Article 23).

3.2.2 Instruments of power

States can use a range of instruments of power to realise their objectives and safeguard their interests. These instruments are intended to induce another actor to take a course of action favoured by the party using the instrument.

- The **diplomatic instrument** of power: holding consultations or negotiations, signing agreements and participating in cooperative groups (alliances, coalitions).

- The **economic instrument** of power: promoting or indeed preventing trade, and distributing (development) aid in the form of money or goods.

- The **military instrument** of power: the possession of a military force and the threat or actual use of force.

- **Information** as an instrument of power: the collection and exploitation of knowledge, the protection of vital information and the controlled release of information.

Instruments of power are not, however, reserved exclusively for states. Other actors also have means that can be categorised under one of the four instruments of power. These other actors are, for example:

- international organisations, such as the Untied Nations, the European Union and NATO;
- non-governmental organisations (NGOs), such as humanitarian relief organisations and pressure groups (Red Cross, Greenpeace);
- large international companies (multinationals);
- terrorist groups and criminal organisations;
- influential or powerful individuals or groups.

Comprehensive approach

In order to be able to exercise power effectively, a combination of instruments is usually required, applied over the five domains of land, air, sea, space and information. The power of diplomacy is intensified if, for example, a state demonstrates its willingness to deploy other instruments as well, such as economic measures or military intervention. The coordinated deployment of means of power is referred to as the **comprehensive approach**, in which the instruments of power available to a state are deployed in a coordinated and cohesive manner, ideally in a coalition with other countries and in conjunction with international and non-governmental organisations.

Maritime power

It is also possible to deploy a combination of instruments within one domain. The use of instruments of power in and from the maritime domain is referred to as **sea power**. Sea power is thus more than the joint deployment of naval, land and air forces in the maritime domain; a state's sea power is also made up of the civil maritime power formed by the available maritime assets, knowledge and infrastructure:

- The geographic location of a state (length and type of coastline, natural harbours, proximity to a strait, land reclamation);
- The size of the maritime industry (merchant shipping, fishing, mining, civil engineering (dredging industry), inland shipping, water sports, shipbuilding, suppliers);
- Maritime tradition and expertise (maritime education, research & development of maritime technology);
- Maritime infrastructure (ports and port authorities, maritime service industry, coastguard and police).

The totality of maritime assets, expertise and infrastructure (both military and civil) is known as a **maritime cluster**. If a state or the various actors in the cluster formulate joint objectives, this is then known as a national maritime strategy[25] or national maritime policy. In the Netherlands, the maritime cluster belongs to one of the designated top sectors, namely the Topsector Water. Further cooperation and advocacy between the actors in the maritime cluster occurs in the Dutch Maritime Network (NML) and the Royal Dutch Association 'Onze Vloot' (KNVOV).

25 See also paragraph 3.2.5 for the difference between naval and maritime strategy.

3.2.3 National security policy and national security strategy

A state's political level determines the combined use of its instruments of power. The activities that are expected from the various ministries are expressed by the government in its strategy and policy. The difference between the two is as follows:

- A strategy states in general terms how objectives from the national political strategy (grand strategy) in a particular area should be realised. A strategy is generally conceptual.
- Policy is used by a government to specify ambitions and capacities in a particular area.

Depending on the objectives, we talk about security, foreign, economic or defence policy and about a security or a military strategy.
With regard to security, a distinction is often made between internal security (within a state) and external security (threats from external sources). The Netherlands, for example, has a National Security Strategy, which is aimed at protecting vital interests inside the country. Belgium too has a national security strategy; this contains the security aspects of the Federal Public Service Home Affairs.

A state's internal security is, however, often dependent on events abroad, as territorial security can be endangered not only by an internal threat (terrorism, guerrilla warfare, civil war), but also by external factors (another state or an international terrorist network). In addition, for trading nations such as Belgium and the Netherlands, economic security is sensitive to disruptions in international trade, even if those disruptions occur a long way from national territory.

Global trade, worldwide socio-cultural communication via internet and the media, cross-border organised crime and international terrorism can all affect a state's vital national interests, which means that security and foreign policy cannot be seen in isolation from each other. In order to be able to safeguard national interests and to realise strategic objectives, an integrated foreign and security policy will therefore need to be formulated. In the Netherlands, that policy is expressed in the International Security Strategy (see text box).

Vital Dutch interests

In 2007, five vital Dutch interests were identified in the **National Security Strategy**:[26]

- Territorial security: the undisturbed functioning of the Netherlands as an independent state, and more specifically the territorial integrity of our country. Territorial integrity is jeopardised, for example, if there is a threat of occupation of the territory of the Kingdom of the Netherlands.
- Economic security: the undisturbed functioning of the Netherlands as an effective and efficient economy. Economic security could be affected if, for example, trade with an important foreign partner is discontinued.
- Ecological security: Having sufficient self-restorative capacity in the environment to repair damage. Ecological security can be threatened by, for example, disturbances in the management of surface waters and also by climate change.
- Physical security: the undisturbed functioning of humans in and around the Netherlands. Physical security is compromised if, for example, public health is threatened by the outbreak of an epidemic, or in the event of a catastrophic breach of a dike or an accident in a chemical factory.
- Social and political stability: the undisturbed existence of a social climate in which groups of people can coexist peacefully within the confines of the democratic constitutional state and shared core values. Social and political stability can be threatened if changes occur in the demographic makeup of society (e.g. solidarity between generations), in the social cohesion or in the extent to which the population participates in social processes.

The five interests are all interconnected; damage to one of them may lead to damage to others. An infringement of physical security could thus also jeopardise social and political stability.

In 2013, Dutch security interests in the international arena were stated in the **International Security Strategy 'A Secure Netherlands in a Secure World'**,[27] and three main tasks were identified:

- defence of national and allied territory
- a well-functioning international rule of law
- economic security

These three strategic interests relate directly to the vital interests in the National Security Policy, in particular territorial and economic security.

26 National Security Strategy, Ministry of the Interior and Kingdom Relations, 2007 (Lower House of the States-General, 2006-2007, 30821 no. 1).

27 International Security Strategy 'A Secure Netherlands in a Secure World', Ministry of Foreign Affairs, 21 June 2013 (Lower House of the States-General, 2012-2013, 33694 no 1).

3.2.4 International security cooperation

There is strength in numbers. When states have common interests and objectives, they can increase their power and influence by working together. States may join forces (temporarily) to achieve specific objectives together, for instance in a coalition. They may also link their interests through treaties in an alliance or joint international organisation. In the case of the latter, accession often means that a state's interests are expanded, for example to include defence of common territory. Cooperation can take place in all kinds of areas, such as politics, the economy, security or a combination of any of those. The North Atlantic Treaty Organisation (NATO), for example, is primarily a security organisation, geared to the multinational deployment of the military instrument. The European Union was originally set up for the purpose of economic cooperation, but has developed into an alliance with cooperation in virtually all government terrains. The EU now has its own European Security and Defence Policy (ESDP).

There are alliances, usually of a regional nature, all over the world, such as the African Union (AU), the Association of Southeast Asian Nations (ASEAN) and the Gulf Cooperation Council (GCC).

The only global organisation that is also concerned with security is the United Nations. Virtually every country in the world is represented in the UN, which gives this organisation a unique authority. By adopting resolutions, the UN Security Council (UNSC) can authorise coercive measures to be taken against actors who threaten security or the international rule of law.

Small countries with relatively substantial economic interests, such as Belgium and the Netherlands, benefit from the joint protection of interests and realisation of objectives. Both Belgium and the Netherlands are, therefore, members of the UN, NATO and the EU.

Military actions by the two countries are conducted wherever possible under the NATO or EU flag, according to an internationally legal mandate (for example, a UNSC resolution).[28]

3.2.5 Defence policy and military strategy: tasks for the armed forces

The armed forces represent a state's military instrument of power. Military power will be used if a state's (national) interests and objectives are jeopardised to such an extent that political leaders consider the threat or actual use of (large-scale) force to be necessary. A state's military strategy indicates how the military instrument will be used to achieve the strategic objectives. Many military alliances also formulate their own military strategy.[29] Defence policy then specifies the military ambitions and capacities of the state or the alliance.

28 For Dutch policy pertaining to a mandate acceptable under international law, see the Notitie Rechtgrondslag (legal framework memorandum) and mandate for missions involving participation by Dutch military forces (Second Chamber of the States-General, 2006-2007, 29521 no. 41).
29 Such as NATO's Strategic Concept (November 2010).

Some countries define a maritime strategy as well as their military strategy. The content of the two may differ, depending on the area they cover. If it is purely military deployment in the maritime domain, it is in effect a naval strategy.[30] A maritime strategy, however, could also be a maritime security strategy, if it also extends to other players, such as the coastguard[31] and (port) police. A maritime strategy could also be a broad national strategy for maritime power. Such a strategy would then encompass the entire 'maritime cluster': naval forces, coastguard, merchant navy, fisheries, offshore industry, pleasure cruises, ports, hydraulic engineering, inland shipping, shipbuilding, nautical education and maritime services.

Dutch defence policy

The Netherlands has not formulated a military or maritime strategy, but the Constitution and defence policy do define tasks for the armed forces. Article 97 of the Constitution states that there shall be armed forces *"for the defence and protection of the interests of the Kingdom, and in order to maintain and promote the international rule of law"*.

The 2000 Defence White Paper elaborated further on that by defining three **main tasks** for the Dutch military:

1. the integrity of national and allied territory, including the Caribbean region of the Kingdom;
2. Promoting the international rule of law and stability;
3. Supporting civil authorities in law enforcement, disaster relief and humanitarian assistance, both nationally and internationally.

These tasks reflect the strategic objectives of Article 90 of the Constitution (international rule of law), and they also contain elements from the National Security Strategy (including territorial and physical security). In addition, each of the three main tasks reflects the fact that military deployment is intertwined with foreign policy.

Belgian defence policy

Like the Netherlands, Belgium has not formulated any specific military or maritime strategy. In Articles 182-186, the Belgian Constitution states that there must be a military force, but does not specify any tasks. These tasks are, however, defined in the policy documents issued by the Minister of Defence. The 2008 Political Orientation Memorandum states that *"the objective of the Ministry of Defence is to create the required secure space in which democracy, human rights, justice and social progress are allowed to flourish"*.

30 Such as NATO's Alliance Maritime Strategy (C-M(2011)0023 of 16 March 2011).
31 Such as the US Cooperative Strategy for 21st Century Seapower (October 2007): Navy, Marine Corps and Coast Guard combined.

To substantiate this objective, the Orientation Memorandum identifies three themes (collective defence, human security and homeland security), incorporating the following defence tasks:

- collective defence;
- defence diplomacy;
- military operations for crisis prevention, peacekeeping operations and peace-enforcement operations in response to regional crises;
- disaster relief, refugee aid, humanitarian relief;
- non-combatant evacuation operations (NEO);
- military assistance to the state in the event of natural or humanitarian disasters;
- participation in national security tasks and in those to counter terrorism, the proliferation of weapons of mass destruction or mass effect and organised crime;
- protection of maritime routes.

Both the Belgian and Dutch defence tasks illustrate that the armed forces not only focus on the threat or use of (large-scale) force; they also perform law enforcement tasks and provide rapid and/or widespread support in disasters and crises. The tasks for maritime forces, as identified in Chapter 2, are thus in keeping with the military tasks described here for both countries.

Threats: crisis, confrontation, conflict and disaster

National interests can be threatened in many ways and those threats can in turn have different causes. A distinction is made here between a crisis, a confrontation, a conflict and a disaster.

A **crisis** occurs when a state or a group of people loses control of a situation. Crises have no set pattern; each crisis has its own dynamic and characteristics. Generally speaking, a crisis does not arise because of a single specific event, but because of a series of events spread over time. Conflicting interests often play a major role in the cause of a crisis.

In a **confrontation**, there is an escalating difference of opinion about aims that are so crucial that neither party is willing to concede. The cause of the dispute is normally rooted in conflicting economic or diplomatic interests. The solution thus needs to be sought in those domains, and occasionally the threat of the deployment of military power is involved. Confrontations can be extremely protracted, as, for example, in the case of the Cold War (which was thus in fact not a war).

In an **armed conflict**, the dispute has escalated to such an extent that parties take up arms to secure their own interests. A conflict may be small scale and localised, but it can also lead to the use of all-out military force between states. A (large-scale) armed conflict will be regarded as a war if a formal declaration is made to that effect. >

A **disaster** involves the severe disruption of public safety, usually caused by a single, brief and catastrophic event at one location. When a disaster occurs, a great number of people are put in grave danger, and there is extensive material damage or significant damage to the environment, all within a short space of time. Disasters can be caused by human actions (major accidents) or by natural events (earthquakes, hurricanes, flooding, pandemics). The deployment of military forces can help to limit the consequences, provide humanitarian assistance or ensure safety.

3.3 Strategic functions

A state uses its instruments of power to safeguard its (national) interests and to realise its objectives. The functions that the various instruments of power need to fulfil depend on the objectives that need to be achieved. Obviously, the functions will differ according to the situation; it might be a case of protecting a particular interest, of intervening in a developing conflict or of stabilising a situation after a conflict or disaster. The purpose of deploying the armed forces is always to contribute to the fulfilment of a strategic function in order to achieve a strategic objective. With regard to the maritime domain, that not only means that a function is designed to produce an effect at sea, but also that an effect on land can be achieved from the sea.

The strategic functions for which a state may deploy its instruments of power are as follows:

- **Anticipation**: to be prepared for foreseen and unforeseen developments and events that could affect national interests and strategic objectives.
- **Prevention**: to operate within and outside national borders to prevent a threat to national interests and strategic objectives.
- **Coercion**: to discourage activities that are at odds with national interests and strategic objectives by presenting the prospect of credible retaliatory measures.
- **Protection**: to protect and if necessary defend national and allied territory and guarantee the safety of citizens at home and abroad and of state-registered assets (such as ships and aircraft).
- **Intervention**: to enforce a change of behaviour in actors deemed to pose a threat to national security interests and strategic objectives.
- **Stabilisation**: to help to end a conflict and to promote stable political, economic and social development in a former conflict area to serve national interests and strategic objectives.
- **Normalisation**: to restore acceptable living conditions after a conflict or a man-made or natural disaster.

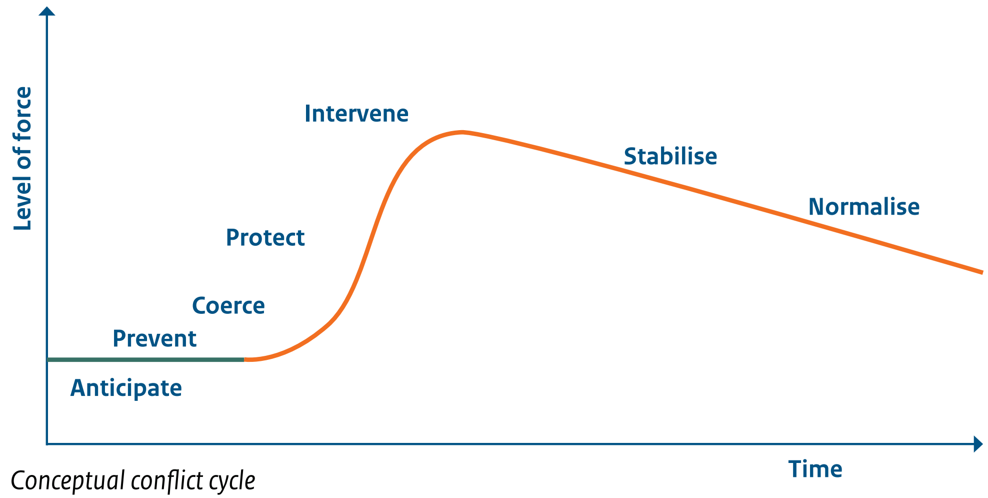
Strategic functions

For a proper understanding of the strategic functions, the following aspects are important.

- A strategic function will hardly ever be performed by the armed forces or by a service alone. Generally speaking, it will need to be associated with the deployment of other services (joint), armed forces of other countries (multinational or combined) and other instruments of power (interdepartmental, interagency). For some functions, the military contribution will be greater or more influential, while for other functions the military contribution will be limited to support for other instruments of power. In the case of the prevention and coercion functions, deployment of the armed forces is usually in support of diplomacy, whereas the stabilisation and normalisation functions involve military support for the local civil authorities.

- Although there is a logical sequence to the functions, they do not necessarily follow on from each other. Nor is there always a clear division -in time or space- between the functions. It is often necessary to perform several functions simultaneously and the relative importance may change over time. If, for example, deterrence of an aggressor has not been effective, an intervention might be needed; at the same time, more emphasis will be placed on the protection of national interests.

- The logical sequence of the functions is particularly relevant in crises and conflicts (see illustration of the conceptual conflict cycle).



Conceptual conflict cycle

Some interests or objectives are, however, too vital to allow certain situations to escalate: the resulting damage could simply be too extensive or irreversible. In those cases, the emphasis must be on prevention, coercion and/or protection. A comparison can be made to the Delta plan: the consequences of flooding would be so catastrophic for the Netherlands that every possible effort must be made to keep the flood defences sufficiently high and strong. The safeguarding of some vital interests may thus require permanent vigilance, and in such cases, permanent military deployment might be needed. The continuous deployment of navy ships and infantry companies to protect the Caribbean territories of the Kingdom of the Netherlands (first military main task) falls into this category.

There are also situations in which there is no sequence to the functions, but in which all efforts are focused on one or two specific functions. This is particularly true in the case of threats that are difficult to predict and over which little, if any, influence can be exerted, such as natural disasters and major accidents. In those cases, one can do little more than be prepared 'in case of' (anticipation) and limit the damage after fate has struck (normalisation).

- There is no direct correlation between the strategic functions and the level of force required. In conflict control, the intervention and stabilisation functions could obviously be expected to involve a high force level (see the conflict cycle figure). On the other hand, the protection and defence of other interests could also involve all-out force; for example, for the protection of merchant shipping against aggressors or for the evacuation of civilians from a war zone. In the case of coercion, the effect is only achievable if the threatened retaliatory measure is credible. This means that a state must be willing to actually use the (large-scale) force that it threatened with.

3.4 Strategic functions of maritime operations

The seven strategic functions are set out in more detail in the following paragraphs. For each function, an indication is given of the roles and tasks the armed forces can perform, looking specifically at the use of the maritime domain and the deployment of maritime forces.[32]

3.4.1 Anticipation

Anticipation means 'being prepared'. On the one hand, this means that a state must be ready to deploy its armed forces; it must have the requisite military equipment, personnel and capabilities. On the other hand, it is about preparing that military force for the tasks and roles in the other strategic functions.

For maritime operations, anticipation means, in a broad sense, that a state must establish and maintain a navy: in other words, it must set up and adapt a naval organisation, procure and maintain ships and equipment, recruit and train naval and marine corps personnel, formulate doctrine and prepare and train units. A state must also monitor and analyse events and developments; to do so, it needs to establish and maintain a strategic intelligence position for the timely identification of potential threats. This requires an intelligence service[33] and information and intelligence will need to be gathered, for instance through embassy attachés or through the deployment of units such as submarines.

32 The involvement of the coastguard is not assumed here. The extent to which the coastguard and the navy are interwoven differs per country. In both the Netherlands and Belgium, the coastguard is a civil organisation with service-providing, monitoring and enforcing tasks in national waters. See box about the coastguard in Chapter 13, paragraph 13.3.2 (Coastguard tasks).

33 In the Netherlands, this is the Military Intelligence and Security Service (MIVD); in Belgium, it is the General Intelligence and Security Service (ADIV), also known by its military name of Staff Department of Intelligence and Security (ACOS IS).

The organisation, capabilities and deployment of the navy will need to be adjusted quickly on the basis of that information. Anticipation in a broad sense also means establishing agreements with like-minded states in respect of future maritime deployment; for example, NATO membership, standardisation of work methods and doctrines, exchange of personnel and joint training.

Interoperability – the silent power of NATO

The freedom of navigation and overflight gives maritime forces worldwide mobility. This freedom of movement makes it easy to operate in conjunction with units from other countries. Multinational operations can, however, run aground because of misunderstandings or the inability to communicate or collaborate. In order to operate together, therefore, it is important that forces from different countries use the same equipment and work methods. Standardisation of equipment leads above all to improved efficiency, while interoperability and unity of procedures and tactics are of particular benefit to effectiveness.

Soon after NATO had been set up, it became clear that interoperability was vital and that standardisation was needed to achieve it. Consequently, the Military Agency for Standardization was set up in 1951 and tasked with overseeing the standardisation of war materiel and of operational and administrative procedures. In the decades that followed, NATO member states agreed many Standardization Agreements (STANAGs) on a multitude of subjects, such as operational and tactical doctrines and procedures, technical specifications and training requirements. In 2014, the former Military Agency for Standardization was renamed NATO Standardization Organisation (NSO), which currently looks after some 2000 STANAGs and publications.

A considerable number of the STANAGs are concerned with maritime subjects. Virtually all conceivable maritime tactical doctrines are set out in a large number of Allied Tactical Publications (ATPs). Because of the increasing number of multinational maritime operations conducted together with nations other than NATO member states, the most important of these maritime ATPs were released for use by other countries at the beginning of the 21st century. Some of these publications now serve as the globally accepted maritime standard, such as MTP-1 Volume I (Multinational maritime tactical instructions and procedures) and ATP-57 (Submarine search and rescue).

Maritime operations continue to develop, however. Standardised tactics and doctrines will also have to be revised regularly and adapted to the latest insights and experiences. NATO maritime standardisation uses experimental tactics (EXTACs) for this. By first setting out new or modified doctrine in the form of an EXTAC, it can be tested by various navies in exercises and trials. Once an EXTAC has been approved by NATO member states, it will be incorporated into the relevant ATP as new or improved doctrine. Existing EXTACs can be found in NATO publication AXP-5 NATO Experimental Tactics and Amplifying Tactical Instructions.

Anticipation in a narrow sense means the preparation for maritime operations that needs to take place for the other six strategic functions, namely:

- The formulation of plans for operations of a predictable nature (contingency plans), such as plans and standard operation orders for disaster relief operations and evacuation operations. Examples of these are the plans for emergency aid following a hurricane in the Caribbean[34] and operation orders for the provision of military assistance to civil authorities in the Netherlands.[35]

- Deploying forces and establishing forward (naval) bases, support facilities and supplies in or near the expected area of interest or conflict (pre-positioning), including the required strategic sealift. Examples of this are the NATO POL depots (fuel supplies) spread throughout Europe or the US military bases and units in the Middle and Far East (Bahrain, Diego Garcia, Japan).

- Gathering targeted information in the potential or expected area of interest for the benefit of operational or tactical intelligence, for example by deploying hydrographic units, submarines or other ships.[36]

For maritime operations, anticipation could well mean the deployment of maritime forces. This is made possible by the freedom of navigation and overflight, and often necessitated by the relatively slow speed of advance of naval ships. The early deployment of maritime forces purely for anticipation normally only takes place in the event of predictable threats and dangers that cannot be influenced, such as heavy storms and hurricanes. In all other cases, anticipatory deployment will usually be conducted in combination with other functions (prevention, coercion, protection). The mobility of maritime forces thus provides optimal freedom of choice for political leaders. In all cases, the overt presence of maritime forces sends out a signal that can have a de-escalating as well as an escalating effect. If an overt presence is not desirable, the deployment of submarines could be an alternative.

3.4.2 Prevention

The best way to protect interests and achieve objectives is to prevent a threat from arising in the first place. For this function, the military instrument of power is normally deployed in the context of preventive diplomacy. Military power supports diplomacy by demonstrating resolve: on the one hand to reassure and support friendly actors and, on the other, to send a warning signal to potential adversaries. This used to be known as gunboat diplomacy, but is now referred to as naval diplomacy. The effect of a military presence can be further reinforced by operating in military alliances or coalitions; this strengthens mutual trust and sends out a signal of unanimity.

With their mobility and worldwide reach, maritime forces are highly suited to perform this strategic function. The sea offers manoeuvre space and the necessary access to exert influence at the required location without infringing on the territorial integrity of other countries. Furthermore, because of their relatively high degree of logistic independence, maritime forces are able to maintain a presence in the intended area for longer periods of time. From this position, the effect can easily be heightened (show of force, deterrence)

34 For example, Dutch CZMCARIB OPORD no. 1: Pre-deployment to St. Maarten, St. Eustatius and Saba in the event of a hurricane.
35 For example, Dutch CZSK OPORD 10400 / CMS (Intensification of Civil-Military Cooperation).
36 In the Netherlands and Belgium, certain methods of military intelligence collection are legally restricted to the national military intelligence services (MIVD and ADIV). Maritime forces always, therefore, gather intelligence in conjunction with or in support of these services. See Chapter 6, paragraph 6.7.6 (Position and role of national intelligence services).

or forces can withdraw without loss of face. Freedom of navigation also simplifies collaboration with maritime forces from other states. From a political point of view, maritime forces thus constitute a flexible instrument of power to nip threats in the bud and help to prevent conflict, even at a considerable distance from their own state.

Maritime forces perform the following roles and tasks, amongst others, in the context of preventive maritime deployment:

- Permanent maritime presence, in both national and multinational contexts. Examples are the ready duty ship (in the North Sea), the guard ship in the Caribbean and participation in the standing NATO maritime groups (SNMG, SNMCMG).[37]

- Maritime cooperation with states of political or military strategic importance. Examples are joint or combined exercises and the exchange of personnel.

- Providing support and advice to local maritime security organisations such as the navy, coastguard and marine corps, instructing and training their personnel and assisting in law enforcement (maritime capacity building as part of security sector development (SSD)).

- Monitoring compliance with (peace) agreements, for example by routing and boarding ships. This applies mainly when a conflict or confrontation is brought to an end and a resurgence must be prevented. This is in effect a transition between the functions of stabilisation and prevention.

- Showing the flag. Naval ships can serve as a platform for reaffirming and maintaining friendly relations by making port visits and supporting trade missions and state visits.

The hallmark of these forms of preventive maritime deployment is the use of influence: the specific correlation with diplomacy and – in principle – the absence of the use of force. Maritime presence and showing the flag are unique in this respect: this form of preventive influence can only be achieved through the deployment of naval forces, and not by land or air forces.

Although strictly speaking it is not a military task, maritime forces can also be employed to prevent contraventions of customs, immigration, fiscal, public health, fishing, environmental or traffic regulations, by assisting the relevant civil authorities (coastguard, police). This task is known as maritime monitoring and is usually performed on a national basis.[38]

37 The Standing NATO Maritime Group (SNMG) and Standing NATO Mine Countermeasures Group (SNMCMG) are permanent NATO maritime forces made up of frigates (SNMG) and mine countermeasures vessels (SNMCMG). Command of these groups rotates between the participating navies.

38 Border control also takes place in a European context. The agency Frontières Exterieures (FRONTEX) was set up to ensure the integrated control of the external borders of the Schengen area. Maritime border control is also conducted under the authority of FRONTEX, with the assistance of European maritime forces. Naval ships then serve as floating platforms for local law enforcement authorities.

3.4.3 Coercion

Sometimes a threat to national interests or strategic objectives cannot be prevented, in which case the instruments of power are used to exercise coercion. There are two forms of coercion: deterrence and compellence.

Deterrence

Deterrence is designed to force the other party not to do something: he must be deterred from undesirable or damaging behaviour by presenting a credible prospect of retaliation. This deterrence applies mainly in the case of an actual threat to vital interests and could be either permanent (such as nuclear deterrence) or temporary (as in conflicts and crises).

Again, it is the mobility of maritime forces that makes them ideal for providing a military deterrent. Maritime deterrence involves the following forms of deployment:

- strategic nuclear deterrence by means of submarines equipped with ballistic missiles (SSBNs);[39]
- The deployment of maritime forces with obvious offensive capability, such as aircraft carriers, submarines, amphibious assault ships and embarked troops or ships with offensive weapon systems such as cruise missiles. This is a logical extension of the preventive deployment and can be readily combined with it.

39 SSBN is the NATO abbreviation for submarine, ballistic, nuclear missile (APP-20 Standard Ship Designator System).

Compellence

Compellence goes a step further than deterrence. In this case, there is already undesirable or damaging behaviour and the other party must be compelled to change this behaviour. Compellence normally takes place in the event of (impending) escalation, usually for the purpose of preventing the transition to the deployment of assets on a larger scale. It is, therefore, usually of a temporary nature and is normally carried out by naval or air forces. Compellence may necessitate the use of force – in that case, coercion could become intervention. The boundary between compellence and intervention is often blurred: it is a sliding scale of increasing levels of coercion and the use of force.

The deployment of naval forces for maritime compellence depends on the purpose of the coercion. Firstly, compellence may be required to influence the situation on land, and there is a distinction here between compellence at sea and compellence from the sea.

- Compellence at sea takes the form of an (arms) embargo or a blockade.[40] In this case, maritime forces are employed to ensure that certain ships, goods or persons do not reach a particular area or state. They do so by stopping, interrogating and, if necessary, boarding ships to check for contraband, with ships being diverted or brought in or the cargo seized as a result. This type of deployment is also known as a maritime interdiction operation (MIO).

40 For the difference between a blockade and an embargo, see Chapter 2, paragraph 2.7.2 (Agreements for maritime operations outside times of war).

- Compellence from the sea involves the threat or targeted employment of offensive capability against land and air objectives, for example with attack aircraft, cruise missiles or amphibious forces. This is also known as (maritime) **power projection**.

The purpose of compellence may also be to influence the situation at sea, and the form of coercion (and thus the deployment of assets) depends on the detrimental behaviour of the adversary. An example of a mild form is the deployment of naval ships to challenge an excessive legal claim of a coastal state by deliberately entering the disputed area, in what is known as a freedom of navigation operation. Other forms are the breaching of blockades or the hampering of the opponent's maritime operations; for example, with the threat of submarine deployment or by laying sea mines. The invisible threat of a submarine in particular sends a powerful political-military message.

3.4.4 Protection

The strategic function of protection entails:

- the protection and if necessary the defence of national and allied territory;
- guaranteeing the safety of a state's citizens, at home and abroad;
- guaranteeing the safety of a state's registered property such as ships and aircraft.

This involves protection and defence against as many forms of threat as possible, ranging from military force and terrorism to organised crime and disturbance of the public order or the rule of law.[41]

For the maritime domain, this protection takes three forms. Firstly, maritime forces perform a task in protecting interests against violence emanating from a military threat. This would involve the following.

- The defence and protection of national and allied land and sea territory against military attack. This includes not only defence against a maritime adversary, but also, for example, sea-based ballistic missile defence (BMD) and clearance of sea mines and explosives.

- The protection of maritime infrastructure (drilling and production platforms, wind farms, ports, pipelines, cables).

- Protection of merchant shipping and fishing against military actions, for example by routing, formation of convoys or escorting. This also includes the defence of merchant ships against attack from the coast and ensuring that shipping routes are kept free of mines.

- Protection of friendly forces (for example, land and air forces) outside national territory against a maritime or air threat. This covers the protection of strategic sealift as well as the defence of the maritime flank of land operations.

41 Protection against (natural) disasters and (major) accidents is a civil task. Military action in principle only takes place in the form of humanitarian assistance and/or disaster relief in the aftermath of a disaster or accident. For more on this subject, see paragraph 3.4.7 (Normalisation).

Secondly, maritime forces have to protect interests against breaches of the (international) rule of law. This involves actions against terrorism and various forms of (organised) crime, as described in the previous chapter: piracy, slave trading and trafficking in drugs, weapons and people. Such operations to enforce the rule of law at sea are also referred to as maritime security operations (MSO).[42] The monitoring of civil shipping is the focus of these operations. Maritime law enforcement may take place in or near national or allied territorial waters, but could also be conducted elsewhere, for instance near international shipping lanes, or sea lines of communication (SLOCs).

Lastly, maritime forces can provide sea-based protection for national citizens and friendly troops by removing them from a dangerous situation and getting them to a place of safety. A distinction is made here between, on the one hand, the evacuation of own or friendly civilians (non-combatant evacuation operation, NEO) and, on the other, the extraction of friendly forces (amphibious withdrawal, extraction operations and personnel recovery (PR)). Evacuation (NEO) is led by the diplomatic service (embassy or consulate), while amphibious withdrawal, extraction and recovery are all military-led operations. In both cases, maritime forces have the advantage of independence and the ability to act without restrictions imposed by a host nation.

Protective maritime operations are seldom conducted purely for protection and defence, as there will be a threat against which protection is needed: in many cases, therefore, measures will be taken to prevent or deter that threat. The threat may also take such a form that coercion and protection alone no longer suffice, and it will then need to be dealt with by means of an intervention.

3.4.5 Intervention

Intervention is designed to bring about a change of behaviour in actors who damage national interests or obstruct the realisation of strategic objectives. An intervention could exist in its own right or it could be an extension of coercion as described in paragraph 3.4.3, if coercive measures have not produced the desired result. In an intervention, all necessary means (of force) will be used to achieve the objective, i.e., cessation of the detrimental behaviour.

An intervention encroaches directly on the will, the assets and the capabilities of the opponent(s), so normally outside national or allied territory. The freedom of navigation and the transport possibilities offered by the maritime domain mean that maritime forces are suited to conducting interventions anywhere at sea and from the sea, anywhere in the world. If an intervention needs to be carried out at short notice and a long way from the home base, naval ships' relatively slow speed of advance could be restrictive. Early forward deployment – pre-positioning – is thus the preferred option, and freedom of navigation and sustained reach make it possible.

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42 See Chapter 12 for further details of maritime security operations.

In the maritime domain, intervention with military means can take three different forms: intervention at sea, intervention from the sea and maritime support for an intervention on land.

Intervention at sea

In an intervention at sea, the maritime operation is focused on detrimental behaviour that occurs at sea and that therefore needs to be dealt with there. This could involve the following:

- Military activities by naval and air forces of the other party or parties: warships, submarines, aircraft, sea mines;
- Maritime terrorism, for example attacks with explosive-laden ships or aircraft;
- Violent crime, such as piracy.

Maritime actions at sea against a regular military opponent usually take the form of combat operations. Depending on the aims of the intervention, the emphasis will be on anti-air warfare (AAW), antisurface warfare (ASUW), antisubmarine warfare (ASW) and naval mine warfare (NMW). These types of combat operation can be conducted simultaneously and they are supported by electronic warfare (EW) and acoustic warfare.[43]

Maritime combat operations at sea are generally of a high intensity, involving the use of main weapon systems: guided missiles, torpedoes, guns and bombs. Combat operations at sea tend to focus on the physical destruction of the enemy's warfighting assets. At sea, an attack is normally a more powerful form of warfare than it is on land. This is because it is impossible to occupy positions on the high seas and because - with the exception of submarines - the use of camouflage is severely limited.

In maritime operations against non-military, terrorist and criminal actors, the use of main weapon systems is not usually involved. Because these MSO are designed to stop, search and if necessary detain ships, cargoes or crews, the emphasis is on boardings and the use of lighter weapons, such as machine guns and small arms.

Interventions at sea can be conducted in many different ways; for example, by means of blockades, denial of use of an area or the targeted disruption of enemy activity. Sometimes intervention at sea also necessitates (minor) operations on land, such as attacks on sensor and weapon systems, bases, support facilities or enemy headquarters. In virtually all cases, interventions at sea are not conducted in isolation but usually as part of a broader (joint) approach. For example, protection will often need to be provided for friendly troops and merchant shipping while at the same time a maritime embargo or an amphibious operation is being conducted to influence the situation on land. An intervention at sea alone will not generally suffice to force the opponent(s) to cease their detrimental behaviour. The causes of that detrimental behaviour will normally be land-based, and for a definitive solution, land-based intervention will be required.

43 See Chapter 11, paragraph 11.2, for further information about the various forms of maritime combat operations at sea.

Intervention from the sea

If an intervention is required on land, it could be initiated and/or executed from the maritime domain. This will usually occur if prevention and deterrence of the threat have not produced the desired result, and (maritime) power projection will then need to be implemented to its full extent.

An intervention from the sea can vary from a short, specific action against a particular target to the setting in motion of a major land operation. They could be stand-alone actions, or they could serve as direct or indirect support for a land operation. In most cases, an intervention from the sea will be part of a (larger) joint operation with air and land forces, and the roles and tasks of maritime forces could include the following:[44]

- Taking action against specific land-based targets. This could be done with a maritime strike operation (with the aid of aircraft, cruise and other missiles, or naval guns), the employment of special operations forces or by means of an amphibious raid. These operations may be designed to achieve the desired strategic objective themselves, but they could also be part of a broader operational or tactical plan.[45]
- Creating access for land forces by means of an amphibious assault. Such access could be designed to provide initial entry for the land operation, but it could also be used to open a new front in an existing operation.

The use of the sea as a springboard for a land-based intervention has a number of advantages, but it also has limitations. The mobility and access offered by the maritime domain provides flexibility: the intervention can be executed at a time and place of choice, without hindrance from the territorial, diplomatic or logistic restrictions of other states. Amphibious operations have the added advantage of being less dependent on non-existent or unusable infrastructure, such as airports or sea ports, for the deployment of troops. Furthermore, a group of ships is usually easier to protect than an operating base in another state. There are also disadvantages, however; depending on the available assets, the physical inland range of a maritime intervention is limited.

The use of (a group of) maritime units as an afloat operating base and support facility for a land operation is also known as sea basing.[46]

Maritime support for a land-based intervention

The capabilities used by maritime forces in an intervention from the sea can also be useful in support of an intervention being conducted on land. A distinction is made here between direct and indirect support for a land or air operation.

44 See Chapter 11, paragraph 11.3, for further information about the various forms of maritime combat operations from the sea.
45 See Chapter 4, paragraph 4.3 for an explanation of the levels of military operations (strategic, operational, tactical).
46 See Chapter 8, paragraph 8.3.2.3 (Sea-based logistic support for land operations).

Maritime forces can deliver the following forms of **direct** support:
- creation of a new front by means of an amphibious operation;
- delivery of fire support;
- execution of (part of) the air defence, including BMD;
- provision of (initial) command and control;
- provision of logistic and medical support;
- provision of transport (both strategic sealift to the area of operations and tactical sea- and airlift within that area);
- execution of amphibious withdrawal, extraction and personnel recovery.

An intervention from the sea and direct maritime support for a land-based intervention will normally also be accompanied by the simultaneous execution of maritime tasks that have an **indirect** impact on the situation on land:
- Binding opposing troops by means of the threat emanating from the presence of maritime offensive capacity, particularly amphibious forces. The threat of an offensive action will force the adversary to maintain a (sizeable) defence capacity. This will allow the creation of (more) favourable conditions for the friendly (land) operation elsewhere in the area of operations.
- Protecting and securing the maritime flank of a land operation.
- Conducting a maritime embargo or blockade.
- Protecting strategic sealift.

3.4.6 Stabilisation

The strategic function of stabilisation is defined as assistance in the ending of a conflict and the creation of a secure situation as a precondition for successful rebuilding. Logically speaking, this function thus comes into play once an intervention, military or otherwise, has brought the crisis or conflict to a halt. The dividing line between intervention and stabilisation is not always clear, however. During the stabilisation phase, conflicts may (partially) reignite, potentially necessitating new interventions. Furthermore, the permanent eradication of the deep-rooted causes of a crisis or conflict is often a lengthy process. The military contribution to stabilisation focuses on the creation of a secure situation as a precondition for initiating effective political, economic and social development. That secure situation must ultimately be one that can be maintained by local security services (such as the armed forces, police and the judiciary).

Military deployment for the purpose of the strategic function of stabilisation is therefore characterised by the following:

- The need to be able to quickly ramp up the military power on the spot if the situation deteriorates (escalation dominance);
- The need for a high level of sustainability (in terms of years or decades), but with the understanding that the military contribution will gradually be reduced as the security situation improves;
- Actions are in principle to support local government;
- The establishment, education and training of a local security structure to which the tasks can eventually be transferred (security sector reform, SSR).

The military contribution to stabilisation is thus designed to create the necessary preconditions: to ensure for as long as necessary that local security services are able to take on the tasks themselves. This may ultimately mean a transition to the strategic function of prevention, involving long-term or even structural military cooperation. At the same time, stabilisation creates the required (minimum level of) security, as a result of which any necessary work can also be done in the context of the strategic function of normalisation: the restoration of acceptable living conditions.

In the maritime domain, the strategic function of stabilisation translates into:

- separation at sea of (war)ships from the parties involved, surveillance of maritime buffer zones and the regulation of shipping;
- protection of local maritime interests (and intervention if required) against military, terrorist or criminal activities;
- instruction and training for the local coastguard and/or navy (maritime capacity building);
- provision of specialist maritime assistance, for example for clearance of sea mines and explosives and for charting waterways.

3.4.7 Normalisation

The aim of the strategic function of normalisation is to restore acceptable living conditions. Although this is primarily a civil responsibility, military employment might be necessary if the local government and NGO aid organisations are no longer or not yet able to cope with an emergency situation. This military employment is then intended as 'first response' until the local authorities and/or aid agencies take over the relief effort.
Such actions are therefore referred to as humanitarian assistance and disaster relief (HADR), in the course of which forces will help to minimise the damage, provide humanitarian relief and/or ensure security. Military employment for the provision of HADR is generally of limited duration: it will end as soon as civilian organisations are (again) able to cope with the relief effort themselves.[47]

There are two different situations in which humanitarian assistance may be required: during or after a conflict and after a man-made or natural disaster.

In the case of normalisation during or after a conflict, the aim is usually to provide humanitarian assistance to refugees and the local population in or near the conflict area, with the emphasis on initial reception, provision of basic necessities (water, food, shelter) and protection. The role of maritime forces in this kind of aid effort is twofold. Firstly, mobility in and access from the maritime domain enable maritime forces to provide assistance independently in a particular (coastal) area, certainly if that area is difficult to access in other ways. Amphibious forces in particular can be extremely useful.

47 The maximum duration for Dutch disaster relief abroad is in principle six weeks. Belgian disaster relief is in principle limited to a maximum deployment period of ten days.

A major advantage is that naval ships have their own capacity for producing drinking water and are equipped with (mobile) means for communication, firefighting, energy generation and medical care. Secondly, a refugee problem could also extend out to sea if refugees are trying to flee a conflict area by boat. Maritime forces can then help to pick up and look after these boat refugees.

Normalisation after a man-made or natural disaster is in effect the delivery of disaster relief. The emphasis here lies more on damage control, saving lives, delivering acute medical care and providing basic necessities. Here, too, there is a distinction between disaster relief provided from an offshore base and disaster relief at sea.

- Maritime forces, and particularly amphibious forces, are again ideally suited to the task of providing disaster relief from an offshore base. This applies especially to littoral areas, as these are more vulnerable to natural disasters such as flooding, hurricanes and tsunamis.

- Disaster relief at sea relates primarily to the search-and-rescue (SAR) activities described in the previous chapter, for instance in the event of a ship disaster or an air accident over the sea. Naval ships can also provide assistance in salvage operations in cases where it is not possible to wait for the arrival of civil salvage vessels.

Disaster relief could be needed anywhere in the world, even at home. In the Netherlands and Belgium, as well as in the Caribbean, maritime forces can, just like land and air forces, assist the local authorities if required in the event of a (natural) disaster or (major) accident.[48] If the disaster or accident occurs within the EEZ, the assistance effort will be led by the relevant coastguard organisation.

3.5 Support and collaboration in maritime operations

The previous paragraphs have described how maritime operations can contribute to the execution of the seven strategic functions. Maritime operations comprise more than just actions by maritime forces at sea and from the sea. For many roles and tasks, collaboration with or support from other services, ministries and NGOs is required. This section will discuss – albeit not exhaustively – several forms of support and collaboration in maritime operations.

3.5.1 Air support

In many maritime operations, support will be needed from shore-based aircraft. This applies primarily where maritime forces do not have their own organic air support, such as an aircraft carrier. Shore-based air support may comprise:

- maritime patrol aircraft, maritime helicopters and unmanned aerial vehicles (UAVs);

48 In the Netherlands, this military assistance is regulated in the Security Regions Act (Article 51). For the Caribbean part of the Kingdom, this assistance is regulated in the BES Security Act for Bonaire, St Eustatius and Saba, and in the Royal Decree of 3 July 1987 for Aruba, Curaçao and St Maarten. The regulation has been set out for the Defence organisation in Directive SG A972 *Handboek militaire ondersteuning civiele authoriteiten* [Handbook for military support for civil authorities].
In Belgium, the Royal Decree pertaining to Emergency and Intervention Plans (2006) serves as a point of departure for various forms of assistance. Military assistance is regulated further in the Guidelines for Homeland Operations (GHO).

- fighter aircraft, both to support the air defence and to attack enemy ships;
- supporting aircraft such as AEW (airborne early warning) aircraft or tanker aircraft;
- tactical airlift.

The distance between the airports available for this air support and the maritime operational area itself can be restrictive for maritime operations. The greater the distance, the less time available for the aircraft in question to stay in the area of operations.

As well as support from shore-based airborne assets, most forms of maritime operation also require support from space. Satellites are vital for such aspects as (precision) navigation, communication and the procurement of various forms of information (detection of shipping and aviation, weather data).

3.5.2 *Intelligence*

Naval ships have effective sensors, such as radar and sonar, for the purpose of picture compilation and collecting target information. As well as their own sensors, intelligence from other sources is vital to complete the situational awareness and to obtain details of an opponent's intentions.[49] Much of the required intelligence is provided by joint organisations, such as military intelligence services. In some cases, it might be necessary for specialist personnel and/or equipment from these services, such as listening devices, interpreters and interrogators, to sail with the ships. Maritime forces are thus not only users of intelligence, but also suppliers of the information needed to produce good intelligence.

49 See Chapter 6 for further details about the role of intelligence in maritime operations.

3.5.3 *Logistics*

Although naval ships are built to be able to operate independently for prolonged periods, supplies on board are finite and capabilities for medical care and repairs are limited. In more prolonged operations and/or those at a greater distance from the home base, replenishment will therefore have to take place in or near the area of operations. Ideally, local facilities for specialist medical care and equipment repairs should also be available. Most supplies can be replenished from a supply ship in a process known as replenishment at sea (RAS); for other forms of logistics, onshore support will be needed, for example in port. This logistic and medical support can be arranged through military channels or through local civil organisations and companies.[50]

3.5.4 *Law enforcement and monitoring of regulations*

Maritime operations may focus on various forms of (organised) crime: piracy, slave trading and trafficking in drugs, arms and people. This type of enforcement action is designed to ensure that offenders are prosecuted. The legal process is the responsibility of the judicial authorities. To guarantee a correct and fair legal process, close cooperation is required with the police and the judiciary, for example in respect of the detention of suspects and the collection and securing of evidence.

Similar cooperation takes place in respect of maritime monitoring, when naval forces help to monitor compliance with rules and regulations in relation to (traffic) safety, the environment and so on. These actions are always conducted in close collaboration with the responsible supervising agency, such as the coastguard, inspection services or ministries.

50 See Chapter 8 for further details about logistics in maritime operations

3.5.5 *Civil shipping*

Many forms of maritime operation involve interaction with civil shipping (merchant shipping, fishing, pleasure cruising). Sometimes maritime action is conducted for the direct benefit of shipping (protection against hostilities, terrorism or piracy), and sometimes ships sail for the benefit of a military operation (strategic sealift). When a maritime embargo is enforced, civil shipping itself becomes the focus of the maritime operation. In all these cases, it is important that maritime forces can communicate and collaborate with civil shipping, ship owners and port authorities, and they do so by using the Naval Cooperation and Guidance for Shipping organisation (NCAGS).[51]

Naval Cooperation and Guidance for Shipping (NCAGS)

The NCAGS contributes to maritime operations by way of coordination, supervision and, if necessary, direction of international trade shipping and seagoing fishing vessels, both in peacetime and in times of confrontation and conflict. The purpose of cooperation with civil shipping is as follows:

- to deconflict military operations and other shipping through the exchange of information;
- to heighten (situational) awareness of civil shipping present in the area of operations;
- to improve the safety of shipping in the vicinity of military operations;
- to promote the efficient and effective execution of embargos;
- to minimise disruption of civil shipping as a result of threats or military operations.

The NCAGS is also involved in the escort of strategic sealift. If the situation arises, military liaison officers will sail on board merchant vessels carrying military or other sensitive cargoes.

Collaboration and coordination with civil shipping can take various forms, ranging from voluntary cooperation to naval supervision, depending on the prevailing threat and the expected intensity (see Figure). >

51 The NCAGS guidelines are set out in ATP-2 Volume I, Naval Cooperation and Guidance for Shipping Manual, and in ATP-02.1, NCAGS Guide to Owners, Operators, Masters and Officers.

Levels of cooperation with civil shipping by the NCAGS organisation

In areas in which military operations are being conducted, guidance and advice can be given to civil shipping. In areas with a demonstrable threat, liaison can also be established and assistance provided, for instance accompaniment of ships. In the event of a high threat level, a shipping risk area can be declared and shipping cooperation points (SCPs) established, to which ships report when entering or leaving the risk area. Recommended shipping routes can then also be established. The most intensive and coercive form of involvement is naval supervision of shipping, whereby naval forces can form convoys or conduct leadthrough operations through mine risk areas.

The exchange of information is the cornerstone of good cooperation between naval forces and civil shipping. Notification of warnings is normally given through civil maritime warning systems such as GMDSS and NAVTEX.[52] NATO also has the Allied Worldwide Navigational Information System (AWNIS), which is activated in times of crisis and conflict to disseminate security alerts among both military and civil shipping.

In peacetime, the NATO Shipping Centre (NSC) in Northwood (England) is tasked with the day-to-day coordination and synchronisation with civil shipping organisations and owners.

In the Netherlands and Belgium, the NCAGS Staff Officer of the Maritime Headquarters Admiral Benelux (MHQ ABNL) in Den Helder is the central point of contact for NCAGS matters. In consultation with his Belgian colleague, he coordinates the contribution supplied by both countries to NCAGS, both in NATO and nationally, and acts as a liaison between the two navies and civil shipping organisations.

52 GMDSS = Global Maritime Distress and Safety System, NAVTEX = Navigational Text Messages.

3.6 Characteristics of maritime operations

This chapter looks at the different roles and tasks with which maritime forces can contribute to the seven strategic functions. Together with the features of the maritime domain described in Chapters 1 and 2, these roles define the characteristics of maritime operations. Maritime forces have the following permanent characteristics that make them useful in a broad spectrum of operations: mobility, access, influence, sustained reach and versatility.

3.6.1 Mobility and access

Chapter 2 has already shown that mobility and access are the two main characteristics of maritime operations. Freedom of navigation and overflight means that maritime forces have worldwide mobility; they have access to most areas and the freedom of movement to get there and stay there. Mobility and access are essential for the contribution that maritime forces can make to the strategic functions. They are at the core of the political and strategic freedom of movement needed to exert influence, but they also provide tactical freedom of movement. At the same time, of course, that freedom of movement also applies to partners as well as to opponents. The advantage is that it is easy to operate in a multinational - combined - setting in the maritime domain. The disadvantage is that it requires a great deal of effort to gain control of a section of the sea and/or deny its use to opponents.

3.6.2 Influence

Because of their mobility and access, maritime forces can be used to exert influence, also on land, without infringing on the territorial integrity of other countries. That influence is flexible: maritime forces can be used as a threat, but they can also serve to strengthen alliances and forge coalitions. Influence can be increased easily or forces can withdraw without loss of face. From a political point of view, maritime forces thus constitute a flexible instrument of power to nip threats in the bud and help to prevent crises, if necessary at considerable distances from home.

The influence of maritime forces can be exerted in peacetime: maritime operations are thus ideal for prevention, enforcement and primary intervention. In a (larger) conflict, however, the influence of maritime operations is limited: maritime forces will seldom be able to decide such a conflict on their own. They can, however, create the necessary conditions for the decision: given that a conflict is usually decided on land, air and land forces will also be needed to bring about that decision.

3.6.3 Sustained reach

The world seas are vast. Most (war)ships are therefore equipped to be able to operate independently for prolonged periods and to cover great distances. Maritime forces thus have a huge range and the capacity for a constant presence at a particular location for a prolonged period with limited logistic dependence.

A maritime group's speed of advance, however, is limited (a few hundred nautical miles a day) and can be affected by weather conditions, making movements relatively time-consuming. This requires early or forward deployment of maritime forces, and mobility and access in the maritime domain make this possible.

The limited speed of advance over water is, however, relative. Naval forces can normally move more quickly over long distances than large land forces, and this aspect contributes significantly to the effect and power of an amphibious force.

3.6.4 Versatility

Maritime forces can contribute to all seven strategic functions. They are multifunctional in their deployability; with their presence and actions, they can perform several functions simultaneously and can switch quickly from one task to another. It is also the case that the larger the ship, the more functions it can perform.

Chapter 1 described how the natural features of the maritime domain affect everyone who puts to sea on board a ship, and how for seafarers a ship is not merely a (temporary) home, but also a power plant and a drinking water factory. Because of the different roles and tasks that can be taken on by maritime forces, naval ships also perform other functions.

A naval ship in combat at sea will serve as manned equipment: it is an artillery position, radar station and command post in one. Larger ships also serve as launch platforms for guided missiles and as an airbase. In the event of combat from the sea and in maritime security operations, the ship also serves as a headquarters, as a base camp for amphibious troops and boarding parties and as a mother ship for small(er) vessels. Furthermore, a naval ship is always a warehouse, a maintenance workshop and a hospital, for the ship itself and her crew as well as for others. If the situation requires, a naval ship can also serve temporarily as an embassy, church, refugee camp or prison.

The versatility of maritime forces is not only determined by the many functions that the ship itself can perform. Marine corps units increase this multifunctionality even further with their ability to influence the situation on land from the sea, even in poorly accessible terrain and in extreme weather conditions.

This versatility stems from the personnel: it is the men and women of the navy and the marine corps who ensure that maritime forces are able to perform all these functions. They are able to switch between circumstances and tasks, as members of a combat unit, as law enforcers, as diplomats, as instructors or as rescue workers.

3.7 Summary

This chapter has described how the exercise of power in the maritime domain translates into roles and tasks for the military, particularly for maritime forces.

States and other actors use power to safeguard their interests and to pursue strategic objectives; to do so, they employ their diplomatic, military and economic instruments of power. The coordinated deployment of those instruments of power in the maritime domain is called sea power or maritime power.

Power, so also military power, is used to achieve strategic objectives, and this is done by means of seven strategic functions: anticipation, prevention, coercion, protection, intervention, stabilisation and normalisation. Within each function, there are specific roles and tasks for maritime forces. Together they provide a wide range of deployment options, from showing the flag, joint exercises, disaster relief, protection of merchant shipping and fighting crime to interventions at sea and from the sea and support of military operations on land.

The mobility and access offered by the maritime domain represent the main characteristics of maritime operations; they make it possible for maritime forces to exert influence wherever and whenever it is needed. This applies not only to the situation at sea but also to the situation on land that can be influenced from the sea. Consequently, maritime forces are more suited than land or air forces to the tasks of prevention and coercion; they can help to prevent threats or conflicts and consequently the need for intervention. As well as mobility, access and influence, maritime forces have the added advantages of sustained reach and versatility.

PART 2 FUNCTIONS IN MARITIME OPERATIONS

4. MARITIME OPERATIONS – FUNCTIONS, LEVELS AND PRINCIPLES

4.1 Introduction

In the first two chapters, the maritime domain was described on the basis of its natural features and of man's use of the domain. Chapter 3 then looked at the military use of the maritime domain by examining how maritime forces can contribute to the strategic functions in and from their domain.

This second part will now describe how maritime forces operate, using the joint functions and the levels of military operations, for which the principles of military operations serve as a guideline. Because this fourth chapter forms the introduction to this description, it will start with an explanation of the joint functions, followed by an explanation of the levels of military operations and a summary of the principles of military operations.

4.2 Joint functions

The joint functions (or combat functions) are a conceptual aid for considering all aspects of military operations. Together, the joint functions define miltary power. They must, therefore, always be considered in relation to each other. Only a mission in which the functions are fulfilled and synchronised will have any chance of success. Furthermore, it is not the case that a particular operational function can be linked to a particular functionality or service. More than one functionality and service are usually involved in performing an joint function. On the other hand, one functionality or unit can contribute to more than one joint function.

For each form of military operation, the following six joint functions need to be fulfilled:[53]

- command and control (C2)
- intelligence
- force protection
- sustainability
- striking power (fires and information activities)
- manoeuvre

Maritime operations are military actions in the maritime domain. The joint functions can, therefore, also be seen in maritime operations. In order to cover all aspects of maritime operations, the following chapters will look at these operations in the context of the joint functions, with the emphasis on usage and methods in general, irrespective of the type of operation. The description is not confined to the maritime domain, but extends to aspects in other domains (land, air, space and information) that are relevant to maritime action.

53 Joint functions are often put on a par with the Essential Operational Capabilities (EOC) developed by NATO. While EOCs correspond roughly to the joint functions, they are intended as a guide in the policy development of military capabilities rather than as a conceptual model for military action. With the issue of the new NATO policy document MC 0400/3, EOCs were replaced by main capability areas.

4.3 Levels of military operations

As in all forms of military operation, maritime operations occur at different levels: strategic, operational, tactical and technical.[54] The level indicates the relationship between an activity and the type of objective it is designed to achieve.

- **Political-strategic level**. The political-strategic level specifies the coordinated, systematic development and use of all the instruments of power of a state, an alliance or coalition. At this highest level, a government translates the strategic interests into political objectives and decides which instruments of power will be required to achieve the objectives (grand strategy).[55] Finally, it will draw up additional guidelines for the use of the instruments of power, such as size, duration and mandate, but without describing the mission in detail.

  The political-strategic level consists of national governments or, in the case of alliances and coalitions, of strategic councils, such as NATO's North Atlantic Council (NAC) and the EU's Political and Security Committee (PSC).

- **Military-strategic level**. Military strategy is the coordinated, systematic development and use of military resources of a state, alliance or coalition to achieve political objectives. The military-strategic level is closely linked to the grand strategy, because of the essential correlation between military action and the deployment of other instruments of power.[56] At this level, the military-strategic authority translates the political objectives into military-strategic objectives, or ends. The same authority also decides which means will be used to achieve those ends, and the ways in which this will happen, without getting involved in the detail of execution.

  The military-strategic level comprises the headquarters of the national or allied (supreme) commander.

- **Operational level**. The operational level is where the planning, direction and execution of campaigns takes place to achieve the military objectives set by the military-strategic commander in his strategic directive. For this purpose, the operational level commander will establish the operational objectives of the campaigns. A **campaign** is defined as a set of military operations planned and conducted to achieve the operational objective within a given time and geographical area. In a campaign, the deployment of land, naval and air forces is synchronised, so the military staffs that form the operational level are always joint.

54 For further details about the levels of military operations, see Netherlands Defence Doctrine (2013), paragraph 5.2, and Dutch JDP-5, paragraph 1.6.
55 See also Chapter 3, paragraph 3.2 (Strategic interests and power).
56 The comprehensive approach, discussed in Chapter 3, paragraph 3.2.2 (Instruments of power).

- **Tactical level**. Tactics are the employment of and actions by formations and units to enable them to conduct military activities in a particular correlation and sequence, whereby they come into direct contact with the target groups of those activities. These tactical activities contribute to the realisation of the operational objectives of a campaign and usually only contribute indirectly to the accomplishment of strategic and political objectives. In some cases, however, activities at tactical level do make a direct contribution to the realisation of military-strategic objectives. This applies, for example, to certain forms of employment of special operations forces, the deployment of a submarine for strategic intelligence collection or a strategic bombardment by one or more combat aircraft.

- **Technical level**. The technical level is concerned with the methods of employment and actions of individual units, platforms, individual personnel or weapon systems.

The joint functions referred to earlier apply to all levels. The following chapters will therefore indicate how each joint function applies to the different levels of maritime operations.

The terms ‘operation’ and ‘operational level’

In the Dutch language, the words that translate as ‘operation’ and ‘operational’ have different meanings – as they do in English. Besides the fact that both words also have non-military meanings, the two words also have several meanings in a military sense.

In a military context, the term ‘operation’ has two meanings:

1. A plan for the use of military means to achieve a strategic objective. which relates to actions at operational level (a campaign). A specific operation may be given a code name, for example Operation OCEAN SHIELD.

2. Actual military operations conducted for a specific purpose (mission), in contrast to training activities.

Unless otherwise indicated, this publication uses the term ‘operation’ in the latter sense.

The term ‘operational’ has three meanings:

1. Being associated with the operational level of military activity (in other words, the level between strategy and tactics). Take, for example, ‘operational art’. >

2. Being associated with operations; for example, 'operational deployment' and 'operational service'.

3. Capable of conducting military operations, as opposed to 'defective' or 'not combat-ready'.

Unless otherwise indicated, this publication uses the term 'operational' in the second sense. When the other meanings are intended, they shall be written in full, e.g. 'headquarters at operational level'.

It is also important to note that the term 'operational level' has a different meaning in business than it does in military circles. Unlike the military, the business world uses the classification strategic - tactical - operational. In this case, tactics refer to decision making for the medium term (several years) and the operational level is the lowest, executing level (the shop floor).

4.4 Principles of military operations

The fulfilment of the joint functions results in military power. The method of fulfilling those functions and the use of military power are based on general principles. These principles apply to all military action: at every level (from strategic to technical) and in every type of operation and activity. The principles of military operations also thus apply fully to maritime operations.

In both the Dutch and Belgian armed forces, the following twelve principles apply:[57]

- **Selection and maintenance of the aim**. The aim of the military operation must be clearly established, maintained and clear to everyone involved, both military personnel and others. This relates not only to the immediate military objective, but also to the underlying aim, the political objectives and the relationship with the other instruments of power. This also underlines the importance of the operation.

- **Initiative**. Act sooner and faster than the opponent instead of merely responding to the actions of other actors. This will increase freedom of action and can turn the course of the operation or battle to friendly advantage. Initiative means the identification and exploitation of opportunities. It requires a style of leadership that allows considered risks to be taken and encourages unorthodox solutions to be sought. Taking initiative does not mean, however, that patience is not required in some cases.

- **Concentration of force**. To win a conflict, you need to be stronger than your opponent. That strength is gained through the concentration of striking power at a certain time and place. Striking power is not just about numbers, but also about skills, technological capabilities, morale, accuracy and other abilities that can produce the desired effects. A concentration of power at the right moment creates decisive superiority, although it does mean that there will inevitably be relative weakness elsewhere.

57 Sources: Netherlands Defence Doctrine (NDD) and AJP-01 Allied Joint Doctrine.

- **Economy of effort**. People and assets are finite. Hence the principle: don't waste energy, use people and assets as efficiently as possible. This could be done by making full use of the available resources – mutual support – and by selecting the most effective means and methods.

- **Surprise**. The effect of a military operation is enhanced many times over if the opponent is not expecting it or is expecting something else. Wrong-footing an adversary will create a temporary operational advantage. Surprise is based on speed, secrecy and deception.

- **Unity of effort**. Effective action requires coordination of all available assets and activities, and with other (non-military) actors. Unity of effort is achieved by common objectives, joint doctrine, standardized procedures, a clear command structure and synchronisation.

- **Simplicity**. Military action is characterised by chaos, stress and friction. Straightforward plans and clear orders help to counteract confusion and misunderstanding and thus increase the chances of success.

- **Security**. Security is an essential precondition for maintaining friendly military power and the freedom of action. Protection of friendly assets and information serves to reduce vulnerability and to prevent surprise actions by an opponent.

- **Flexibility**. Circumstances change. A plan should offer enough leeway to cope with setbacks and exploit new opportunities. Flexibility requires freedom of movement: not only in physical terms, but also in terms of space to make independent decisions.

- **Sustainment**. It is also important to be able to sustain a military effort. It is after all impossible to say beforehand when an operation will begin to produce the desired effect. Sustainment is achieved by good logistic support, sufficient operational reserves and the efficient use of assets.

- **Legitimacy**. Legitimacy increases support for military operations, both from the home front and from troop-contributing nations and local populations. Legitimacy relates to the legal basis for an operation as well as the ethical and legally sound execution of that operation. Collateral damage, for example, undermines legitimacy; it is thus vital to keep any collateral damage resulting from military actions to a minimum. Legal legitimacy is in any event an absolute fundamental; it cannot be discounted in favour of other principles.

- **Maintenance of morale**. People make the difference. Individual morale as well as that of the unit is extremely important for the effectiveness of a unit; morale is the foundation of military power. Morale can be boosted by a sense of (group) identity, self-confidence, inspiration, striving for realistic and legitimate objectives and care for personnel. For commanding officers, this means taking good care of all aspects of their personnel and making sure that morale is kept high.

The principles must always be considered in relation to each other. Complying fully with one principle may make it impossible to take another into consideration. There is, however, a master principle: selection and maintenance of the aim. The way in which the other principles are adhered to must never be allowed to damage the selection and maintenance of the aim of an operation.

4.5 Maritime interpretation of the joint functions

The following chapters describe the way in which maritime forces operate on the basis of the six joint functions.

- Chapter 5: Command and control
- Chapter 6: Intelligence
- Chapter 7: Force protection
- Chapter 8: Sustainability
- Chapter 9: Striking power
- Chapter 10: Manoeuvre

The descriptions in these six chapters show how these functions are put into practice at the different levels of maritime operations. They will also indicate as far as possible how the maritime execution of these functions complies with the principles of military action.

5. MARITIME COMMAND AND CONTROL

5.1 Introduction

Command and control (C2) is the direction, coordination and control of a military operation. C2 brings the other joint functions together and enables the effective and efficient deployment of military capabilities to achieve the desired objectives.

C2 is essential for compliance with the principles of military operations. It enables selection and maintenance of the aim and unity of effort. If used correctly, C2 also makes it possible to gain and maintain the initiative and enables flexibility in the response to changing circumstances. Good C2 is characterised by simplicity. Unity of command is an important principle in military – and thus maritime – operations.

C2 is necessary at all levels of military action, from the strategic to the technical level. This chapter starts by specifying these levels within the maritime domain and goes on to explain command authorities. After looking at forms of C2, the chapter will discuss the maritime application of the four steps in the process: analysis, planning, execution and assessment. The way in which maritime forces are normally organised within a maritime component will then be examined, together with what maritime C2 looks like at tactical level. Attention will then be given to C2 in specific maritime actions, such as amphibious operations and the employment of special units, such as submarines, aircraft and special operations forces. The chapter will go on to look briefly at possible support relationships that could arise between (groups of) maritime units. After a brief look at the features of maritime headquarters, the chapter will close by examining the C2 and communications assets needed for maritime operations.

5.2 Levels of maritime C2

C2 takes place at each of the four levels of military operation: strategic, operational, tactical and technical.

- **Military-strategic C2**. Military-strategic decisions about maritime operations concern the composition and employment of groups of maritime units (ships, aircraft, marine corps units) which could contribute to the achievement of the strategic objectives.

  In the Netherlands and Belgium, the military-strategic level is formed by each country's Chief of Defence, who heads the respective Defence Staffs.

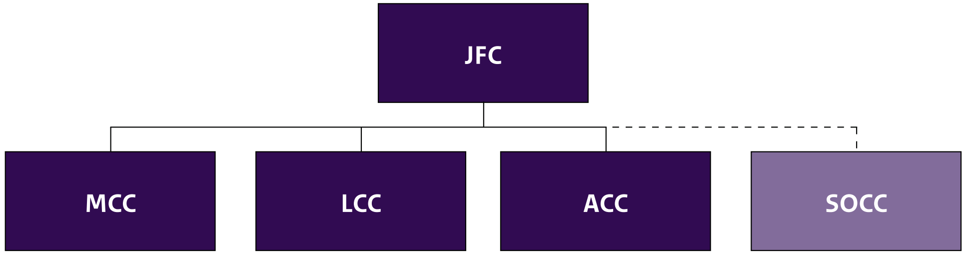
  There may also be a military-strategic level in multinational organisations. In NATO, the Supreme Allied Commander Europe (SACEUR) is the highest military authority; in the EU, that is the European Union Military Committee.

- **C2 at operational level**. The operational level is where the planning, direction and execution of campaigns take place, including the synchronisation of land, naval and air forces. Military staffs at operational level are therefore always joint in their composition.[58] The commander at operational level decides what form the maritime contribution to the campaign should take. He will decide, for example, when and where a maritime or amphibious task force will be deployed.

  The Netherlands and Belgium do not have deployable staffs at the operational level; the Defence Staff's Directorate of Operations (Netherlands) and the Department of Operations and Training's Operations Division (Belgium) function as permanent staffs at operational level. For the preparation of maritime forces and for their support during an operation, both national staffs are assisted by a binational maritime headquarters, the Maritime Headquarters Admiral Benelux (MHQ ABNL) in Den Helder. Both countries also supply staff members for the HQs at NATO's operational level (in Brunssum and in Naples).

  In missions under the NATO flag, the military campaign is led by a joint force commander (JFC).

- **Tactical C2**. C2 at tactical level is usually divided per component. Depending on the nature and scale of the operations within the campaign, the JFC will have a maritime, a land and an air component commander (MCC, LCC and ACC respectively, see Figure). As well as the service components, there may also be functional components, for example for special operations (SOCC).



Joint Force Commander and Component Commanders

Maritime C2 at tactical level is about leading the planning, execution and evaluation of a maritime operation.[59] It is also about task allocation and the employment of units in a maritime task force. Examples are the organisation of the defence of a flotilla and the execution of an amphibious landing.

58 Dutch joint doctrine for C2 for the operational level is set out in JDP-5, Command & Control.

59 NATO doctrine for maritime tactical command and control is set out in AJP-3.1, Allied Joint Maritime Operations.

The Netherlands armed forces have a deployable maritime staff that is equipped for various forms of maritime C2 at tactical level: the Netherlands Maritime Force (NLMARFOR) Staff.[60] The NLMARFOR Staff is a multinational staff, made up of Dutch, Belgian, US, French and British military personnel.

Level	Type of decision	Maritime examples
Political-strategic	Deployment of military means to achieve an objective	• Decision by British government to recapture the Falkland Islands by military means (1982) • Decision to tackle the consequences of piracy in Somalia, partly by deployment of military means
Military strategic	Specification of military-strategic objectives, composition, deployment period and area of operation for the military means	• Decision to construct and despatch a Royal Navy task force to recapture the Falkland Islands • Composition, mission and area of operations of the EU's Operation Atalanta to combat piracy around Somalia
Operational	Stipulation of the nature of the maritime contribution to the campaign	• Orders for the Royal Navy task force to conduct an amphibious assault on the Falkland Islands in order to capture the capital, Port Stanley • Decision to specify a permanent shipping lane in the Gulf of Aden, along which naval ships are present to protect merchant vessels against pirate attacks
Tactical	Definition of tasks that designated maritime forces need to perform and effects they need to produce	• Decision on when, where and in what order amphibious troops should land in the Falklands • Assignment of designated naval ships to positions along the permanent shipping lane in the Gulf of Aden and allocation of tasks among these ships and assigned maritime patrol aircraft
Technical	Determining the use of (weapon) systems and personnel	• When and how to fire a naval weapon system • Task allocation in a boarding party • Task allocation among landing forces on a landing beach

Table: Levels of maritime C2, with examples

60 For further details of NLMARFOR, see box at paragraph 5.6 (Organising the maritime component).

- **C2 at technical level**. This level of C2 concerns the coordination of the employment of weapons (systems) and personnel in order to optimise effectiveness and prevent interference.

  Maritime C2 at technical level takes two different forms. The first form is the same as that in other military operations and concerns the employment of personnel and the conduct of tasks by members of team ('equipped men'). Examples would be task allocation in a boarding party or in a marine corps platoon. The second is more specifically maritime and concerns the employment of a ship's sensor and weapon systems ('manned equipment'), an example of which is the use of jammers and guided missiles for air defence.

5.3 Command authorities and transfer of command

To enable selection and maintenance of the aim and unity of effort, command authorities and relationships between the C2 levels need to be clearly defined. To indicate the level of authority held by a commander, maritime operations -just as other forms of military operation- make use of the degrees of authority established by NATO:[61]

- **Full command** (FULLCOM) is the highest military authority and encompasses all aspects of military operations. FULLCOM only exists at national level and rests with the national government or supreme commander. If a state assigns military forces to a multinational group, it will always retain full command over those forces.

61 For a more detailed account of command authorities and relationships, see Dutch JDP-5 Annex 2-1 and NATO AJP-3 Chapter 1.

- **Operational command** (OPCOM) means that a commander has the authority to assign missions and tasks to subordinate commanders and to organise, deploy and if necessary reassign forces. An OPCOM authority may delegate OPCON or TACON to subordinate commanders.

- **Operational control** (OPCON) means that a commander is authorised to direct forces assigned in order to accomplish his missions and tasks, which are usually limited by location or time: OPCON therefore usually concerns deployment in a particular area and within a specified time frame.

- **Tactical command** (TACOM) gives a commander the authority to assign tasks and activities to forces under his command to thus accomplish the mission assigned by higher authority.

- **Tactical control** (TACON) is the authority to direct specific and often local activities to accomplish an assigned task or mission. TACON often relates to movements, manoeuvres and the employment of weapons.

In the Netherlands, the Chief of Defence (CHOD) has full command over the armed forces. The Defence Staff's Director of Operations (D-OPS) has OPCOM over deployed military forces, including maritime forces.[62]

In Belgium, too, the Chief of Defence has full command. The Assistant Chief of Staff for Operations and Training (ACOS O&T) has OPCOM over deployed units.

Full command always rests with the national commander. In NATO-led military operations, SACEUR will thus at most have OPCOM over assigned forces. Usually, however, units will be placed under OPCON of a JFC.

The transfer of command from OPCOM or OPCON over a military unit from national command to the JFC is called a **transfer of authority** (TOA); the return to national command is known as a reverse TOA. Because of the freedom of movement at sea, it may be the case in the maritime domain that a naval ship passes through different command or operating areas during transit or deployment. In such cases, OPCON over the unit could be passed from one commander to the other at operational level. This transfer of OPCON is referred to as a **change of operational control** (CHOP).

A JFC will normally have OPCON over the forces under his command. He will usually delegate TACOM over the maritime forces to the MCC. Whether TACOM and TACON are delegated further will depend on the organisation and task allocation within the maritime component, as established during the planning.

62 See Dutch CHOD Directive A-300, *Aansturing van militaire operaties*.

Unity of command and/or unity of effort

Unity of command is an important principle for C2, as the fact that one person is directing the operation increases the effectiveness of selection and maintenance of the aim and the unity of effort. When different countries are involved in multinational operations, however, situations may arise in which unity of command is not feasible or in which unity of effort is difficult to achieve because of national differences.

Military operations in an allied context or in a coalition usually have single leadership. Participating nations can, however, set conditions or restrictions (known as caveats) in respect of their military contribution. These could be expressed in, for example, the rules of engagement (ROE).[63] In allied operations (NATO-led, for example), countries can introduce caveats into the common ROE. When operating in a coalition, countries usually operate under national ROE. To nonetheless achieve maximum unity of effort in multinational operations, a thorough knowledge of these differences is vital. A national contingent commander (CONTCO) or senior national representative (SNR) could be helpful in this respect.[64]

Sometimes, however, unity of command is not feasible. Situations could arise in which different countries are conducting military operations in the same area, with more or less the same (military) objectives, but in which countries wish to operate independently of each other. This is perfectly possible in the maritime domain, as freedom of navigation applies at sea. The co-existence of different (national) maritime operations with the same objective is particularly common in the case of maritime security operations, such as counter-piracy and counter-trafficking operations. The absence of unity of command does not necessarily mean, however, that unity of effort cannot be achieved. Much can be achieved through consultation and the coordination of activities, for example through liaison officers, although this does require openness and diplomacy.

Unity of effort: tactical discussions between NATO and Russian maritime commanders about how to combat piracy around Somalia.

63 See Chapter 10, paragraph 10.6 (Restrictions and Rules of Engagement)
64 See Dutch JDP-5 Command and control, paragraph 2.7 for further details about the tasks of the CONTCO and SNR.

5.4 Methods of command and control

Effective C2 depends on finding a balance between controlling the execution on the one hand and freedom of movement for subordinates on the other. There are two different methods of C2 at opposite ends of the scale: detailed control and mission command.[65]

- **Detailed control**
  This form of C2 places the emphasis on explicit, detailed orders and tight control of their execution. Detailed control reduces a commander's uncertainty and benefits unity of effort and simplicity. It is particularly useful when certain rules and procedures need to be strictly adhered to, for example with regard to safety (accident prevention) or in operations with a high level of political or military risk (such as special operations). In addition, C2 is often detailed if assets are in short supply, for example for the allocation and employment of aircraft and helicopters. However, detailed control does not work effectively in rapidly changing circumstances, because a higher commander will not usually be fully aware of these local circumstances in time. If the exchange of information and orders is disrupted (for example, if communications are lost), detailed control virtually ceases to function.

- **Mission command**
  Under mission command, executive authority is delegated to the lowest appropriate level for the most effective and efficient employment of equipment and capabilities. This is achieved by including in the orders as much detail as possible regarding the intent (the 'what'), leaving the way it should be achieved (the 'how') as far as possible to subordinate commanders. This creates flexibility and room for initiative. Mission command is ideally suited to rapidly changing circumstances or to situations in which there is a high risk of disruption to communications with the higher commander.

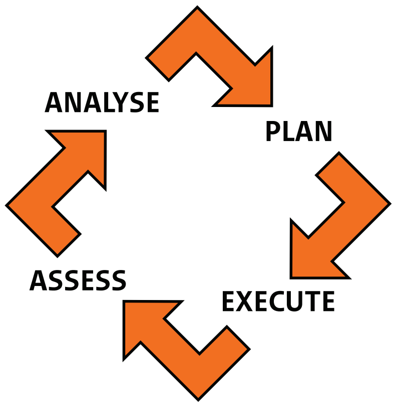
The appropriate style of C2 depends on the nature of the operation or task and on the environment, the opponent and the quality of friendly personnel. Mission command is usually the preferred option in the Dutch and Belgian armed forces. Maritime forces traditionally use mission command. On the one hand, this is due to the limited communications capabilities with and between ships at sea and, on the other, because operating in small, self-supporting groups is often the norm.

Nonetheless, some maritime operations do favour detailed control. A task force commander who sends some of his ships on a specific mission (for example, to find an opponent) will use mission command. Defence of a flotilla against an air attack, however, requires tight control of the employment of weapon systems on the ships involved; in such cases, detailed control is needed to avert the attack effectively.

65 For more details, see Dutch JDP-5 Command and Control, paragraph 2.8

5.5 Command and control as a process

C2 is a cyclical process of analysis, planning, execution and assessment. This process is ongoing, regardless of the phase in which a military campaign, operation and/or action happens to be. The process also takes place at each level of military operations. At each level, the prevailing situation must be examined for opportunities and threats (analysis), solutions and actions need to be conceived (planning) and executed (execution) and subsequently evaluated in terms of whether they have produced the desired results and effects (assessment). This is no different in maritime operations than in any other form of military operation.



C2 as a cyclical process

Analysis and planning result in the issue of a directive or order. The execution of the order and the assessment of the results generate reports. Both products are known as **staff work**.

5.5.1 *Planning and issuance of orders*

The analysis of and planning for military operations take place at different levels within military and maritime operations. Analysis of the situation is performed on the basis of the best possible situational awareness, obtained from intelligence, picture compilation and reports.[66] **Planning** consists of designing actions to exploit opportunities and to counter threats. Analysis and planning result in a directive (order) to subordinates. There are different types of directive, depending on the level of C2.

- **Military-strategic level**
  In the Netherlands, the planning for all military deployment, including maritime, is done by the Defence Staff.[67] Once the government has informed parliament of the deployment of maritime forces, the issuance of orders will take place. In the event of multinational deployment, that will be 'CHOD Operation directive' (OA CDS in Dutch). In the event of national deployment, the CHOD does not issue an OA, but an 'operation order'.

  In Belgium too, the planning for military deployment is done by the Defence Staff. After parliamentary approval, orders are issued by means of a CHOD OPORD.

  Planning for NATO-led military operations is done by SACEUR's staff on the basis of the Allied Command Operations Comprehensive Operations Planning Directive (ACO COPD).[68]

66 See Chapter 6 Maritime intelligence and picture compilation
67 See Dutch CDS *Leidraad 2 Operationeel Planning Proces* (CDS OPP).
68 The Belgian Defence Staff also uses this ACO COPD for planning purposes.

This planning results in the issuance of a strategic operation plan (strategic OPLAN). EU military planning is based on the same system.

- **Operational level**
  The JFC's staff looks after the planning for the operations within the campaign. This planning results in the formulation of an operation plan (OPLAN) and the neccessary supplementary plans (SUPPLANs).[69] This OPLAN and any SUPPLANs also contain the organisation, orders and tasks for the maritime component.

- **Maritime tactical level**
  The MCC is responsible for the execution of maritime operations within the campaign as described in the JFC's OPLAN. The tactical analysis and planning for these maritime operations are performed by the MCC's staff and in principle result in an operation order (OPORD).[70]

  Depending on the size and organisation of the maritime component, tactical planning will also be done in other parts of the component (for example by the staff of an amphibious task force, an escort group or a mine countermeasures group; see paragraph 5.6).

  For this tactical analysis, both the Dutch and Belgian navies use the maritime operational planning process (MOP),[71] which is based on the British seven-questions model.

  This planning results in the issuance of detailed maritime tactical instructions for the units involved: the OPGEN, the OPTASKs and, if applicable, the 5-paragraph orders.[72]

  o **OPGEN** (operational general matters) is an overarching tactical directive used to promulgate instructions that are general in nature and that apply to the various forms of maritime operation that are being conducted by the particular group of units within the military campaign.

  o **OPTASK** (operational tasking) is a specific tactical- or technical-level directive that contains detailed instructions for a particular area of maritime action within a group of units (for example, OPTASK AAW for air defence, OPTASK COMMS for communication, OPTASK RAS for replenishment at sea).

  o A **5-paragraph order** (or fragmentary order, FRAGO) is a directive used at tactical or technical level by marine corps units and in operations by teams (such as boarding, diving or emergency response teams).

  An OPGEN is normally issued by the TACOM authority (OTC, see paragraph 5.7) directly under the MCC. The various OPTASKs are issued by units which have been assigned a particular duty (see paragraph 5.7).

69 NATO doctrine for planning at operational level is set out in AJP-5 Allied Joint Doctrine for Operational-Level Planning. The format for OPLANs and SUPPLANs is given in ACO COPD, Annex D, Appendix 3 (main text) and Annex E (annexes).
70 The format for an OPORD is set out in STANAG 2014 Formats for Orders and Designation of Timings, Locations and Boundaries, Annex B.
71 For details, see the Dutch *Handboek Maritiem Operationeel Planningsproces* (HB MOP).

72 The format for an OPGEN and the various forms of OPTASKs can be found in APP-11 NATO Message Catalogue. The format for a 5-paragraph order (FRAGO) is set out in STANAG 2014 Formats for Orders and Designation of Timings, Locations and Boundaries, Annex D.

- **Maritime technical level**
  C2 at lower tactical and at technical level is characterised by a short cycle time. Analysis, planning, execution and assessment follow on from each other at a high tempo and overlap. Because the steps of the C2 process are so interwoven at this level, they are discussed together in the following section.

5.5.2 *Directing the execution*

Direction of the execution occurs at all levels of C2, although the emphasis in the execution of military – including maritime – actions lies with the tactical and technical levels.

At the military-strategic level, the execution consists mainly of steering the selected strategy on the basis of results achieved by the operational and lower levels.

Execution at the operational level focuses on monitoring the progress of the campaign and the operations within it. This takes place within the **battle rhythm**: the fixed daily roster of meetings, briefings and decision points.[73]

73 For further details about execution at operational level, see Dutch JDP-5 Command & Control, paragraph 4.5.

Execution at tactical level

Directing the execution at the maritime-tactical level is the province of the MCC and his task force commanders (CTF/CTG). These staffs also have their daily battle rhythm, in which the emphasis is on battlespace management: direction and adjustment of the maritime operation(s). The beating heart of the tactical staff is the seat of the battle watch, for example the joint operations room (JOR) on board Dutch amphibious assault ships. From there, communications are maintained with the warfare commanders and the coordinators to whom particular duties have been delegated (see paragraph 5.7).

C2 at technical level

C2 at lower tactical and technical level is characterised by a short cycle time. Analysis, planning, execution and assessment follow on from each other at a high tempo and overlap. Because tasks and feedback follow each other in quick succession, there is a strong emphasis at this level on the use of oral communications, voice radio nets and real-time digital communication facilities such as chat and data link. As indicated in paragraph 5.2, maritime C2 at the technical level takes two forms.

- The first form concerns the employment of the ship as a whole and of the sensor and weapon systems ('manned equipment'). C2 is the exclusive province of the ship's commanding officer: there are no 'subordinate commanding officers' on board a ship. There are two areas on board that are important in the employment of a naval ship: the (navigation) bridge and the operations room, or opsroom.[74] In principle, the bridge

74 The operations room is often also referred to as combat information center or CIC.

ensures safe navigation and visual observation, while the ship's systems are employed from the operations room, which is usually elsewhere on the ship. In principle, a commanding officer will therefore execute his command from the operations room. Only in cases where events are occurring in the immediate vicinity of the ship or where means other than the ship's weapon systems are being used might his presence on the bridge be the preferred option. This would be the case, for instance, in the event of a boarding (deployment of a boarding party) or close-in defence of the ship (employment of small arms).
C2 of 'manned equipment' is also the case for an onboard helicopter. During the flight, the helicopter is the 'manned equipment' under the direction of the flight commander.

Tactical and technical C2 in the operations room of a frigate during battle stations

- The second form concerns the deployment of personnel and the conduct of tasks by members of a team ('equipped men'). C2 is conducted by the commander of that unit or team. In marine corps units this will be the commanding officer of the marine combat group (MCG), the commanding officer of the raiding squadron or the leader of the raiding platoon. This form of C2 is also used on board ships, for example for the deployment of a boarding party (by the boarding officer).

5.5.3 *Assessment and reporting*

Within the cyclical process of C2, **assessment** is the step that links execution back to analysis. Assessment entails the evaluation of actions taken to determine whether they are producing the desired results. Depending on the outcome of this evaluation, an intended plan or action will either be able to continue unchanged or will need to be adjusted (through new planning).

For an accurate assessment of actions taken, it is important that the intended results be measured as objectively as possible. The criteria used to determine success should be clear, as should the way in which this is measured. Directives and orders (such as a joint OPLAN or a maritime OPGEN or OPTASK) should therefore not only indicate the desired objectives or results, but also the success criteria.

Like the other steps in the process, assessment is performed at all levels of C2.

- At operational and strategic level, assessment focuses on monitoring the progress of the campaign plan or the selected strategy (campaign assessment, strategic assessment).[75]

- The assessment of tasks at tactical and operational level is known as combat assessment (CA). Because success at these levels depends on creating effects (changing a situation or behaviours), it is more difficult to establish the degree of success. For CA, therefore, operational analysis techniques are used, such as measurement of effectiveness (MOE) – "are we doing the right things?" – and measurement of performance (MOP) – "are we doing things the right way?".

- Assessment of weapon employment (technical/tactical level) is called **battle damage assessment** (BDA). This usually concerns results that can be measured specifically (in terms of destroyed or neutralised ships or installations). Success is measured on the basis of damage criteria, and in many cases a **collateral damage assessment** (CDA) will also be performed at the same time to determine the extent of collateral damage.

Assessments at the different levels of C2 are all connected to each other. Wherever directives from a higher level generate orders at lower levels, the assessments performed at lower levels feed those performed at higher levels; whether or not objectives are achieved at technical or tactical level (for example, the neutralisation of an enemy ship or the complete and timely landing of a landing force) will have implications for whether or not higher-level objectives are achieved (for example, the elimination of a maritime threat, the creation of a bridgehead for an intervention force or a reduction in smuggling and piracy).

As well as determining the degree of success, reporting plays a significant role in the assessment. Recording (in image, sound and/or writing) of actions taken and results achieve is important for the following:

- **Lessons for future deployment**. Past experiences (lessons identified) form the basis for the development of new doctrine, new equipment or other innovations (lessons learned).[76]

- **Accountability**. Reporting is necessary to ensure the existence of legal evidence for subsequent investigation and reconstruction (in the event of accidents, for example)[77] or for political accountability.

- **Creation of a historical picture**. Collected information provides a source for databases that are used in C2 or in the intelligence process.[78] Examples are the results of hydrographic surveys, measurement of radar and sonar signals or data on shipping in particular parts of the sea.

75 For instructions on Dutch reporting in the national chain of command (SITREP A/B), see CDS *Aanwijzing A-301 Informatievoorziening en rapportages tijdens vredesoperaties*.

76 See Dutch CDS Aanwijzing A-1200 *Het evalueren van de deelname aan operaties* and Dutch ACZSK DOPS 119 *Evaluatie van Operaties en Oefeningen*.

77 For the Netherlands, see *Aanwijzing SG A/963 Melden van voorvallen*. For Belgium, see ACOT-SPS-DOCREP-ONXQ-001 *Notificatie van ernstige gebeurtenissen*.

78 Chapter 6 will look more closely at the importance of information collected and recorded by ships for the intelligence process.

Because of the importance of such information, maritime forces are increasingly being equipped with (digital) recording devices. Ideally, recording should be directly linked to sensors or to the C2 system (see paragraph 5.11.1).

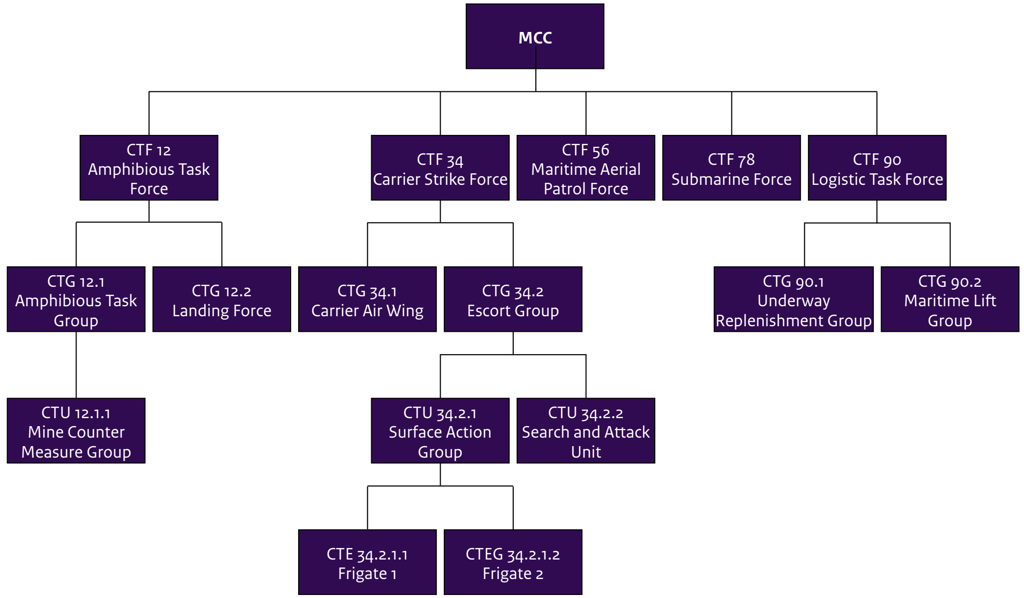
5.6 Organising the maritime component

Within a joint force, the MCC has command over the assigned (maritime) forces. The way in which the MCC organises and assigns his allocated assets is primarily determined by the mission he needs to conduct and by the type of units at his disposal to do so. He will set out his selected organisation in his OPLAN or OPORD.

Forces in a maritime component are usually assigned in two different ways:

- Task organisation: arrangement whereby units with the same task (amphibious operations, escorts) are grouped together.
- Type organisation: arrangement whereby units of the same type (submarines, MCM vessels) are grouped together.

The organisation of a maritime component is often a combination of the two forms (see fictitious example in the figure).



Example of the organisation of a maritime component

As shown in the figure, a task force structure is used to illustrate the subdivision of the organisation, and the terms task force (TF), task group (TG), task unit (TU) and task element (TE) are used to indicate the hierarchical levels. Between these levels, there is normally a command relationship (OPCON, TACOM, TACON). Numbering is used to distinguish between (groups of) units at the same level (the figure shows, for example, TG 34.1 and TG 34.2; these numbers are fictitious).

Netherlands Maritime Force (NLMARFOR)

NLMAFOR is a deployable staff capacity that provides maritime C2 at tactical level, similar to that of a land forces' brigade staff. It comprises a permanent core staff of 60 personnel and is set up according to the functional structure (command group and staff sections).[79] Because NLMARFOR's main task is to direct amphibious operations, it is divided into a maritime ('blue') part (sections N1 to N9) and a 'green' part of the landing force (sections G1 to G9). Depending on the circumstances, the staff can be increased by augmentees to a maximum size of 155 personnel.[80]

NLMARFOR is capable of conducting the following tasks independently:

- Commander Amphibious Task Force (CATF) and Commander Landing Force (CLF).
  This is the largest possible form, in which NLMARFOR is responsible for directing amphibious operations. The NLMARFOR commander (COMNLMARFOR) acts as the CATF and the deputy commander (DCOM) acts as the CLF.

- Commander of a maritime task group (CTF/CTG), for example an escort group comprising frigates, supply ships and organic helicopters. A submarine may also be assigned to the group.

- Commander of a group of MCM vessels (mine countermeasure tasking authority, MCM TA).

- A national contingent commander (CONTCO) or senior national representative (SNR) in multinational operations.

Regardless of these roles, NLMARFOR may also take on the C2 of a maritime assistance operation, such as humanitarian assistance, evacuation or disaster relief.

As well as the above-mentioned forms of activity as independent staff capacity, NLMARFOR can also be placed in existing or ad hoc (inter)national command structures. One of these is the collaboration with the British navy, in which COMNLMARFOR acts as the Deputy Commander United Kingdom Netherlands Amphibious Task Group (DCOM UKNLPHIBGRU).

Although NLMARFOR is the maritime equivalent of an army brigade staff, there is one important difference. Unlike the brigade staffs, no ships or units are permanently assigned to NLMARFOR. On deployment, NLMARFOR operates as the staff element of the forces assigned to that operation, regardless of their nationality. Freedom of navigation and interoperability of maritime forces make it easy to operate in a multinational context. For each specified operation, COMNLMARFOR assembles a tailor-made staff, which embarks on the unit most appropriate for C2 (see paragraph 5.10).

79 For details of the functional staff structure, see Annex 2A of AJP-3 Allied Doctrine for Joint Operations.
80 Further information about the composition and methods of NLMARFOR can be found in the NLMARFOR CATF/CLF Amphibious Handbook (classified).

5.7 Maritime tactical C2: the warfare organisation

A specific form of task organisation is used for maritime C2 at tactical level: the warfare organisation. Although this form of task organisation and C2 was originally only intended for the execution of combat operations, this proven and NATO-standardised method is used as much as possible in the execution of maritime security operations (MSO) and maritime assistance operations.

The highest authority in the warfare organisation is the officer in tactical command (OTC). The OTC is the commander of a task group or task force designated by the MCC, usually the commanders of the task groups in the maritime component (such as the carrier battle group or amphibious task force). Depending on the size of the maritime component and the assigned mission, the MCC himself could thus act as OTC or appoint one or more of his task force commanders as OTC for their group or in their area of operations.

The warfare organisation enables an OTC to keep charge of his own mission or to delegate (sub)tasks to commanding officers of ships in his group. The tasks involved are combat tasks (air defence, antisubmarine warfare, and so on), support tasks (such as electronic warfare and replenishment) and the coordination of scarce assets (such as helicopters and submarines).

The OTC allocates tasks on the basis of duties and functions:

- A **function**[81] is a specifically defined activity, for example “coordinating and controlling subsurface surveillance”. A function can be delegated separately, but it is usually delegated as part of a duty.

- A **duty**[82] is a set of tasks comprising a number of related functions, for example the anti-air warfare commander (AAWC) duty. The OTC will often not only delegate a duty, but he will also designate a standby duty. This officer will take over the tasks if the original officer is no longer able to perform them (backup).

When delegating a duty, the delegating authority may delegate all the related functions, but he may also retain certain functions related to the duty himself. The function “coordinating with land-based air defence authorities” is, for example, usually part of the AAWC duty, but the OTC might decide that he would rather keep control of this specific activity himself.

There are different types of duty:

- **Principal warfare commanders**. These officers are responsible for a sub-area of the maritime operation at sea:
  - o *anti-air warfare commander (AAWC);*
  - o *antisurface warfare commander (ASUWC);*
  - o *antisubmarine warfare commander (ASWC).*

81 All functions are listed in ATP-1 Volume I, Tables 1-1 to 1-13 (classified).
82 All duties are listed in ATP-1 Volume II, Supplementary Table D.

If the maritime operation also involves actions against specific targets on land (maritime strike operations, strike warfare), a separate strike warfare commander (SWC) may be appointed.
As a rule, these warfare commanders are given TACON over their forces to perform their task.

- **Functional group commanders** are appointed to perform a specific (often temporary) task with an (often separate) group of units.
  - o search and attack unit commander (SAUC, in ASW);
  - o surface action group commander (SAGC, in ASUW);
  - o underway replenishment group commander (URGC);
  - o maritime interdiction operations commander (MIOC).

- **Coordinators** who coordinate the employment and use of particular assets and allocate them among the warfare or functional group commanders, such as:
  - o electronic warfare coordinator (EWC);
  - o mine warfare coordinator (MWC);
  - o air coordinator (AC);
  - o air resource element coordinator (AREC);
  - o helicopter element coordinator (HEC);
  - o submarine element coordinator (SEC);
  - o primary control ship (PCS, coordination of attack waves in amphibious operations)

In smaller groups, in groups with a limited set of tasks or in low threat level situations, duties can be combined. A common combination is that of the sea combat commander (SCC). The SCC acts as the ASUWC and ASWC, often in combination with the MIOC duty.

Command	**Officer in Tactical Command (OTC) (MCC, CTF or CTG)**		
Principal Warfare Commanders	AAWC	ASuWC	ASWC
Functional Commanders	MIO Cdr	SAG Cdr	SAU Cdr
Coordinators	EWC AREC	AC HEC	SEC MWC

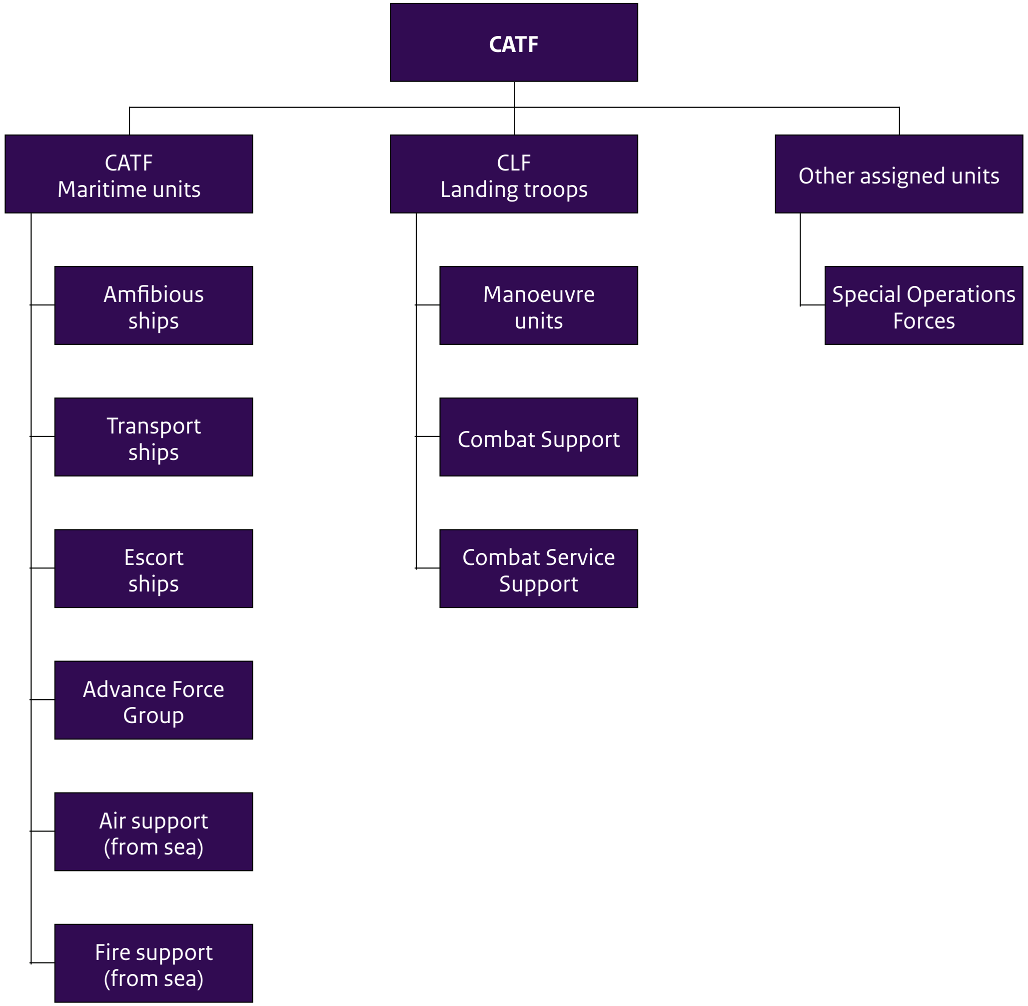
Duty allocation in a warfare organisation

The OTC will set out his chosen organisation and assignment of duties and functions in his OPGEN. also indicating which duties and/or functions he is not delegating but retaining for himself.

5.8 C2 in specific operations and units

The warfare organisation described in the previous paragraph is used in the majority of maritime operations. In specific operations or for the employment of special types of unit, however, different and/or additional C2 structures are used, specially adapted for the operation or the type of unit. The operations/units concerned are:

- amphibious operations;
- employment of submarines;
- employment of airborne assets;
- employment of special operations forces (SOF);
- collaboration with and employment of civil shipping.



Organisation of an amphibious task force

5.8.1 *C2 in amphibious operations*

Amphibious operations[83] are characterised by the transition from maritime action to land action (and vice versa). An amphibious task force (ATF) comprises not only ships and aircraft but also landing forces with their transport assets and combat support. As well as a commander amphibious task force (CATF), an ATF therefore also has a commander landing force (CLF) (see figure). CATF is responsible for the whole amphibious operation and has command over both the maritime and landing forces for combined activities by the two elements. The CLF has command over the landing forces for activities performed solely by the LF.[84]

Supporting/Supported

The relationship between CATF and CLF can also be expressed in terms of the support relationship 'supporting/supported'.[85] The supported commander is the commander who directs the main effort of the operation. In an amphibious assault, CATF could thus initially be the supported commander. As soon as enough feet are on the ground, the CLF will take over the command of the land operation; the CATF can then support the CLF. Ultimately, the CLF could be given a different position in the joint force; he may no longer come under the MCC's command, but be part of the land component under the LCC. In this case, the LF no longer forms part of the ATF.

83 See Chapter 11, paragraph 11.3.1 (Amphibious operations).
84 For further details of command and control in amphibious operations, see Dutch Field Manual for Amphibious Operations Chapter 2 and paragraph 6.6, and NATO ATP-8(B) Volume I, Doctrine for Amphibious Operations Chapter 2.
85 For further details about the supporting/supported relationship, see Dutch JDP-5 Chapter 2, paragraph 2.5.2.

The reverse applies in an amphibious withdrawal, in which case the CLF is initially the supported commander. At a given moment, usually when the main force has safely withdrawn from the shore, CLF will be the supporting commander to CATF.

Amphibious Objective Area

In amphibious operations, there is a great deal of activity in what is usually a limited area, both below and on the sea surface, on land and in the airspace over land and sea. As well as troop transports, fire support needs to be delivered and forces at sea and on land need to be protected against all potential threats. In order to ensure selection and maintenance of the aim, unity of effort and simplicity in all the various activities, centralised command and coordination are essential. This is achieved partly by designating an amphibious objective area (AOA). An AOA is normally effective from the moment the main amphibious force arrives in the area until the moment the amphibious operation has ended. Within the AOA, CATF is responsible for the coordination and execution of all activities. This means that CATF is also responsible, for example, for use of the airspace within the AOA (see paragraph 5.8.3). In his staff, therefore, the CATF has elements that take on the different forms of coordination, such as a tactical air control centre (TACC) and a supporting arms coordination centre (SACC). These staff elements also ensure the necessary coordination with other authorities, such as the ACC and the LCC. Liaison officers in the other components play a key role in this respect.

5.8.2 *C2 in submarine operations*

The power of submarines stems from the fact that they operate under water, which means that they can usually remain undetected. There are two disadvantages, however. First of all, communication with a submarine is not always possible in all circumstances. Furthermore, friendly forces must be aware of the presence of an 'invisible' submarine to prevent interference and blue-on-blue situations. Submarines can operate independently, often in a strategic role (for example, as a deterrent or to gather intelligence), but they could also be part of a maritime task force (for example, to provide protection for an aircraft carrier or an amphibious operation). All this has implications for the direction of operations involving submarines. This direction takes the form of detailed C2, with liaison with commanders involved in submarine operations. NATO has arrangements for this.[86]

Central to submarine C2 is the submarine operating authority (SUBOPAUTH). This commander directs all movements of and operations by friendly submarines, and in principle has OPCON over the assigned submarines. Depending on the scale of the (maritime) operation, the SUBOPAUTH will be located at the operational level HQ (with the JFC) or at the tactical level with the MCC.

86 For details about C2 in submarine operations, see ATP-18 Allied Manual of Submarine Operations (classified).

If TACOM or TACON over a submarine is delegated to a TF or TG commander, authorisation for and coordination of the employment of the submarine will be provided by a specialist team assigned to the TF/TG staff. Subject to the position and role, this team is known as the submarine operations coordinating authority (SOCA), submarine element coordinator (SEC) or submarine advisory team (SAT).

An important part of C2 in submarine operations is the prevention of interference, both between the submarines themselves and between submarines and other underwater activities. All underwater activities are deconflicted either by separating them in terms of time and location or by imposing restrictions on certain activities. These restrictions can take two different forms:[87]

- **Waterspace Management** (WSM) is a system of procedures and arrangements to prevent inadvertent engagement of friendly submarines (blue-on-blue incidents). Responsibility for WSM rests with the submarine movement advisory authority (SMAA), who is usually responsible for a particular area. The waters of the NATO treaty area are divided among three SMAAs, which issue their WSM measures in close consultation with the relevant SUBOPAUTHs.
- **Prevention of Mutual Interference** (PMI) is a system of procedures and arrangements to prevent other activities that could endanger a submarine. This could mean, for example, the presence of other submarines and such activities or devices as mine countermeasures, underwater robots or ship-towed underwater sensors. Coordination of PMI is the responsibility of the SUBOPAUTH. The starting point for this is, however, that each unit undertaking activities that could potentially lead to interference makes this known to the SUBOPAUTHs.

The SUBOPAUTH for Dutch submarines is the Director of Operations (D-OPS) of the Royal Netherlands Navy. If necessary, the CHOD can transfer OPCON over Dutch submarines to another (local) SUBOPAUTH.

There are personnel in NLMARFOR who can act as the SEC or SOCA, enabling COMNLMARFOR to exercise TACOM or TACON over an assigned submarine.

5.8.3 C2 in the employment of (unmanned) aircraft and helicopters

In virtually all forms of maritime operation, there is an important role to be played by air power. In a joint campaign, the ACC is responsible for all air operations. This means that there is nearly always close collaboration and coordination between the MCC and the ACC.

87 For details about waterspace management, see ATP-1 Volume I Chapter 6 Section VII and ATP-18 Allied Manual of Submarine Operations (both publications are classified).

This cooperation is referred to as air-maritime co-ordination[88] and focuses on the following aspects:

- **Airspace control** (ASC). Maritime forces use the airspace in different ways: with aircraft and helicopters, and also for artillery ammunition and guided missiles. All forms of airspace use must be coordinated in order to prevent mutual interference and accidents, and this includes coordination and deconfliction with civil airspace users, such as airliners. This airspace control is generally the responsibility of the ACC. In his capacity as airspace control authority (ACA), the ACC will formulate an airspace control plan (ACP) and issue an airspace control order (ACO). The MCC submits the requirement for airspace use by maritime forces to the ACC (via ACO feeder message), after which the ACC will prioritise and coordinate.

  In some cases, the ACC may delegate local coordination of airspace use to a maritime commander. For example in the case of amphibious operations: the ACC will then designate CATF as sub-area airspace control authority (SACA) of the AOA.

- **Air defence** (AD). Maritime forces usually have their own air defence in the form of aircraft, guided missiles, gun systems and jammers. They can create their own air picture by means of radar and other sensors. This maritime air defence does not stand alone, however, but forms an integral part of the air defence of the entire operational area and of the whole joint force, under the responsibility of the ACC's air defence commander (ADC).

  For his air defence, therefore, the maritime AAWC works very closely with the ADC and other integrated air defence elements.

- **Allocation of airborne assets**. Airborne assets are usually in short supply, and the allocation of these scarce assets throughout the joint force requires prioritisation. Furthermore, all units in the joint force need to be aware of planned flight movements by friendly forces. Both matters are covered in the apportionment and allocation process for airborne assets, which ultimately results in the daily air tasking order (ATO) issued by the ACC.

  The distinction between organic and non-organic is important in the allocation of airborne assets.

  - Organic airborne assets are assigned to a maritime commander and form part of the relevant TF, TG or TU. The airborne assets in question are usually those which operate from ships, such as onboard helicopters or the aircraft on an aircraft carrier. Aircraft that operate from land may also belong organically to maritime forces; for example, maritime patrol aircraft that are assigned to the MCC. For organic aircraft, the maritime commander concerned has OPCON, TACOM or TACON, while the ACC merely coordinates and deconflicts.

  - Non-organic airborne assets are those aircraft that are not assigned to the MCC. If maritime forces require the support of non-organic aircraft (for example, shore based fighter aircraft), they must submit requests to the ACC in good time.

88 For further details, see AJP-3.3.3 Air-Maritime Co-ordination.

5.8.4 *C2 in employment of special operations forces*

SOF are also used in maritime operations,[89] usually being employed to achieve objectives at strategic or operational level. This requires a high degree of secrecy. SOF are therefore normally organised in a joint component, the special operations component command (SOCC; see organogram in paragraph 5.2). Within this component, SOF units are organised into special operations task groups (SOTG), which consist of several special operations task units (SOTU).[90]

As in the employment of aircraft, employment of SOF thus also requires close cooperation and coordination between the relevant component commanders. A special operations command and control element (SOCCE) and liaison functions (special operations liaison element, SOLE) are used for this coordination. The SOCCE is usually located with the staff of another component commander (for example, the MCC) and has OPCON or TACON over the SOTGs and/or SOTUs involved.

The supporting/supported relationship often comes into play in the employment of SOF. Maritime units may be supporting if they serve as the base of operations (and safe point of return) for special operations. This is the case, for example, when a ship or submarine is conducting a special operation together with a SOTU. Maritime forces could also be supported if SOF are supporting a maritime operation, for instance by conducting reconnaissance of intended landing sites prior to a landing as part of the advance force operations.

89 See Chapter 9, paragraph 9.2.5 (Maritime SOF) and Chapter 11 paragraph 11.3.3 (Maritime special operations).
90 For more information on the organisation of SOF, see AJP-3.5 Allied Doctrine for Special Operations.

5.8.5 *C2 in cooperation with and employment of civil shipping*

Sometimes maritime action is conducted for the direct benefit of shipping (protection against hostilities, terrorism or piracy), and sometimes ships sail for the benefit of a military operation (strategic sealift). In these cases, maritime forces may cooperate with civil ships, shipping companies and port authorities. This collaboration is in effect also a form of C2, manifested through the use of the naval cooperation and guidance for shipping (NCAGS).[91]

5.9 Support relationships

Just as in other forms of military action, situations arise in maritime operations in which units or groups of units that do not fall under the same command structure are operating in the same area. From the point of view of economy of effort, certain units may be able to provide support for the actions of others. To achieve unity of effort, collaboration between the various units needs to be coordinated. Arrangements for this collaboration at horizontal level are referred to as **support relationships**. A distinction is made in maritime operations between support situations between different groups of units and those between groups and individual units.[92]

91 See Chapter 3 paragraph 3.5.5. (Cooperation with civil shipping).
92 For further details about maritime support relationships, see AJP-3.1, Chapter 2, Section IV.

5.9.1 *Support relationships between groups of units*

Support relationships between maritime units (TF/TG) take three forms:

- **Support Situation A**. The supported group integrates with the supporting group, and the next higher joint authority will designate a new commander for the combined group.
- **Support Situation B**. The two groups do not integrate. The extent to which the two groups support each other will be determined by the most senior group commander.
- **Support Situation C**. The two groups do not integrate. The commander of the supporting group determines the extent and form of the support. This situation would arise, for example, if the supporting group has to support more than one other group.

5.9.2 *Support relationships with individual units*

There are also situations in which an individual unit supports one or more groups of units. There are three different forms:

- **Direct Support**. This is a form of support in which the main task of a unit or formation not attached to the supported unit or formation is to provide support to that unit or formation. A unit that is designated to provide direct support falls under TACON of the supported unit or formation. OPCOM and TACOM remain with the allocating commander.
- **Associated Support**. For a unit designated to provide associated support, the command relationships remain unchanged. The unit performs its main task primarily within its own command relationship. Insofar as the conduct of the main task allows, it also provides support to others, for example by exchanging information and by contributing to the picture compilation. In this form of support, the emphasis is on the efficient use of scant resources and the elimination of hindrance and/or uncertainty. Associated support mainly occurs when units are in transit through an area where other units are operating.
- **Area Operations**. Area operations involve remote support, whereby the command relationships remain unchanged. A unit or formation tasked with area operations conducts its main task within a particular area. It also provides support, usually in the form of additional protection (defence in depth), to other units or formations making their way through its allocated area.

These forms of support are primarily geared to units or formations which usually operate independently, such as submarines, or those that can cover a large area and support several (groups of) units operating in that area, such as maritime patrol aircraft, AEW aircraft and unmanned aerial vehicles (UAVs).

5.10 Maritime headquarters and command facilities

To be able to exercise his command effectively, a (maritime) commander requires specialist personnel (a staff) and supporting assets (a C2 system) that are collocated at a headquarters (HQ) or on a staff ship. This paragraph looks more closely at the specific features, requirements and limitations of maritime headquarters.

Military-strategic HQs are normally situated at a fixed location on land. In many cases, this also applies to headquarters at operational level, but a JFC may decide to opt for a sea-based HQ, which is often ready-made and rapidly deployable. The transit time to the area of operations can be used effectively: work-up of the staff can be done during the voyage and C2 can be commenced. Freedom of navigation makes it possible to reach and remain in or near the area of operations without affecting other countries and with a minimum requirement for external logistic support. A sea-based HQ also has limitations. The space available on the command ship is limited, for instance, and determines the number of embarked personnel. A specially equipped afloat command platform is required to be able to carry a larger joint HQ. Communication devices and the bandwidth required for communications are in principle more limited than those of a land-based HQ.

A sea-based HQ can also provide (tactical) C2 for operations other than those in the maritime domain. Operations by land and air forces can also be directed from a command platform afloat, for example by embarking the staff of the LCC, of a combined air operations centre (CAOC) or a control and reporting centre (CRC). This could take place in the start phase of a military campaign if there are not yet enough land-based headquarters available, but also in cases where a land-based HQ is not feasible for political or force protection reasons. Because of the often limited space available on board, this would normally involve part of the staff in question (forward deployed staff).

At the tactical level of maritime operations, C2 is in principle conducted at sea. The size of the maritime component and the assigned mission will determine whether the MCC and OTCs require specific afloat command platforms (a specialist command ship) or whether a ship providing extra staff rooms and assets (aircraft carriers, amphibious assault ships, cruisers, destroyers or specially equipped frigates) would suffice. Specific tactical command tasks (duties such as AAWC or EWC) are usually delegated to ships that are organically suited to them.

In some circumstances, tactical maritime C2 can also be conducted from the shore. This is usually only the case if the ships involved are operating in a limited area near the coast and if they cannot themselves accommodate a tactical and/or technical staff on board. Mine countermeasures and harbour protection are the types of maritime action in which C2 may be conducted from the shore.

Command facilities in the Dutch and Belgian navies

Whether or not a naval ship is capable of serving as a command platform or a staff ship depends on the onboard availability of:

- communications assets;
- information processing systems (networks, C2 systems);
- working and living accommodation for (extra) staff members;
- transport assets (helicopters).

Some ships are specially equipped with these facilities in order to serve as command platforms. Other ships lack these facilities, but because of their organic sensors, systems and crew they can nonetheless perform certain duties as part of maritime C2. Below is a summary of the command facilities offered by the ships of the Dutch and Belgian navies and of the marine corps' command facilities.

HNLMS Johan de Witt
This landing platform dock (LPD) was built as an amphibious assault ship and as a sea-based command platform. It has extra rooms, accommodation and communications assets that allow it to function as a command platform for all kinds of staff at maritime tactical level (MCC, OTC, CATF/CLF and lower) or for smaller staffs at operational level (deployable JFC). The ship can also serve as a command platform for other staffs at tactical level, such as a (deployable) LCC or CAOC.

HNLMS Rotterdam
HNLMS Rotterdam is also an LPD, but has less extensive facilities in terms of staff accommodation and communications assets. The ship can thus serve as a command platform for staffs at lower tactical level, such as CTG or (limited) CATF/CLF.

Air defence and command (LC) frigates
As the name of this class suggests, LC frigates were partly designed to function as command platforms. The ships have extra accommodation, rooms and communications assets in order to serve as staff ships for staffs of maritime task groups at tactical level (OTC, CTG). The extra staff accommodation is less extensive than that of an LPD, however, which means that an LC frigate is not suitable to serve as a command platform for a CATF. Because LC frigates are also specially designed for air defence tasks, they are also well suited to serve as a headquarters for a deployable CRC.

Multipurpose (M) frigates
The M-frigates are not equipped with extra staff facilities. With their sensors, communications and C2 systems, however, these ships can perform tasks at the lower level of tactical C2 (duties). Examples of such tasks are to function as principal warfare commander (particularly ASWC or ASUWC) or functional group commander (such as SAUC or SAGC). >

HNLMS Karel Doorman

This joint support ship (JSS) has only limited staff facilities to support logistic processes, allowing the ship to function as underway replenishment group commander (URGC) and group logistic coordinator (GLC)[93].

BNS Godetia

Belgium's support ship BNS Godetia has extra accommodation. With her organic communications assets, she can function as a staff ship for smaller maritime task groups, for example a group of MCM units (MW coordinator duty).

Mobile Forward Support Facility (MFSF)

As well as the above-mentioned onboard command facilities, the Dutch navy also has a mobile command facility for MCM operations: the mobile forward support facility (MFSF). The MSFS consists of nine containers that can be placed on land as well as on board ships. The containers are set up as a mobile workshop, office and communications centre, and were originally designed for maintenance and repairs of minehunters away from the home port. The MFSF can, however, also be deployed as a mobile HQ for C2 at lower, local tactical level. It can thus be used as a coordination centre for, for example, MCM and diving operations, harbour protection, a forward logistic site (FLS) or a shipping cooperation point (SCP).

Marine Corps

The Netherlands Marine Corps is made up of marine combat groups (MCG), raiding squadrons and raiding platoons. At battalion level (MCG), units are directed from the main command post (MCP). Because of the required mobility, the MCG commander and his staff elements use light vehicles (such as the Viking) and tents containing the necessary C2 and communication assets.

Joint operations room on HNLMS Johan de Witt

93 See Chapter 8, paragraph 8.4 (Coordination of maritime logistic support).

MFSF on (training) location in Scotland

Marine Corps MCP

5.11 Maritime C2 and communications systems

C2 revolves around information. For all four phases of C2 - analysis, planning, execution and assessment - information needs to be collected, processed, edited, shared and protected. To do so, maritime units and staff use different C2 systems and various types of communication.[94]

5.11.1 *Maritime C2 systems*

Maritime forces use various types of C2 system. There are a number of reasons as to why there is not just one all-encompassing system. First of all, each level of C2 has a different information processing requirement. The higher levels need more of an overview than details, whereas at lower levels, real-time data and direct links to weapon systems are vital. Secondly, differences in systems are caused by the domain or by the specific function for which a system was developed. A naval ship is a mobile artillery position, radar station and command post in one. C2 systems for naval ships are therefore different from those for land and air forces. Thirdly, national differences exist because many countries build their own systems.

Finally, the combination of the latter two reasons can also result in differences. If combined operations are more likely to occur than joint operations, this usually means that within the armed forces of a single nation there exist different systems for the same functions.

94 The combination of C2 and communications systems are also referred to as C4 (command, control, communications and computers). In some cases, battle management (BM) is added to this and it becomes BMC4. If the intelligence sphere is introduced (intelligence, surveillance and reconnaissance, ISR), it becomes C4I, C4ISR or BMC4ISR.

C2 systems used by maritime forces can be broken down as follows:
- ships' tactical data systems (TDS);
- tactical communication and information systems used by amphibious troops;
- operational communication and information systems (operational CIS).

Tactical data systems
These computer systems were originally developed to link a ship's onboard sensors (radar, sonar, EW receivers) to the weapon systems (guns, guided missiles, torpedoes, jamming devices), with the aim of achieving faster and more effective employment of weapons, if necessary entirely automatically (i.e., without any human intervention). A TDS enables the combination of different sensor data to form a real-time recognised picture.[95] With the aid of proven algorithms (threat evaluation and weapon assignment, TEWA), this picture can be used to calculate and execute the most effective weapon employment.

A TDS is thus in effect the 'brain' of a naval ship, directing the actions of the 'hands' (the weapons) based on observations by the 'senses' (the sensors). The system of sensors, weapons and TDS is called the SEWACO system (sensor, weapon and command system).

95 Chapter 6, paragraph 6.8 (Maritime picture compilation) looks further at the way in which this real-time recognised picture is created.

TDSs from different ships can communicate with each other with the aid of special data links. These allow groups of ships to create and exchange a common picture. Some data links also enable the transmission of orders for weapon employment.

TDSs, just like other computer systems, continue to develop further. Most systems now have databases, for example for hydrographic and geographical data or for signal recognition. Ever improving applications are also being added in the form of decision support tools, or tactical decision aids (TDAs), and for (data) recording and reporting. In many cases, it is also possible to establish links with other (external) information sources, such as the automatic identification system (AIS), which is used worldwide by civil shipping.[96] Expansions such as this are no longer referred to as a TDS, but as a **combat management system** (CMS).

Most Dutch and Belgian naval ships have a CMS and data links. Large surface ships (frigates, amphibious assault ships, ocean-going patrol vessels and supply ships) and submarines have a version of the Guardion™ CMS specifically adapted to the type of ship.[97] Most of these ships have Link 11, Link 22 and/or Link 16 data link system,[98] which enable real-time information exchange with ships and aircraft from NATO countries and various others (such as Australia and New Zealand).

96 For further details on AIS, see the box in Chapter 6, paragraph 6.3.2.2.
97 Guardion™ CMS is developed and manufactured by the Centre for Automation of Mission Critical Systems (CAMS Force Vision) of the Netherlands Ministry of Defence.
98 For further details about data link systems, see Chapter 6, paragraph 6.8.1.4 (Disseminating the real-time picture).

Operations room (CIC) of an LC frigate with CMS consoles

The minehunters from the two countries have the specially designed integrated mine countermeasure system (IMCMS); they do not have a data link.

Communication and information systems used by amphibious troops
These systems are closely related to the C2 systems used in land operations, but are particularly suited to use in the maritime domain. The new integrated marines communication and information system (NIMCIS), used by units of the Netherlands Marine Corps, belongs to this type of system. NIMCIS is a combination of a communications and a C2 system. It is a radio network (VHF, UHF and HF; see paragraph 5.11.2) that provides voice and data links. The data network is a military variant of the civil internet protocol and is suitable for exchanging text messages (e.g. operation orders) or maps showing the distribution of units (overlays).

NIMCIS has two variants: a man-portable version and one that can be integrated into vehicles. A vehicle with NIMCIS can be used as a mobile command post for other units. The portable version is identical to the vehicle version, but has a more limited transmission capability (and thus a shorter range). Each NIMCIS device can emit an automatic positioning signal (GPS) for a position overview of friendly troops.

Operational communication and information systems (CIS)
TDS and CMS systems are specifically built for real-time picture compilation and weapon employment: they are optimised for maritime C2 at technical and lower tactical level. Supporting C2 at higher levels places different demands on the processing of information. Supporting the analysis, planning, issuance of orders and assessment at tactical and operational level does not require a direct link with weapons and sensors. There is, however, a need for various forms of office automation (word processing, image processing, spreadsheets, presentation programmes) and capabilities for exchanging the products (shares, web pages, e-mail, chat, telephony, video teleconferencing). There is also a requirement for an up-to-date common operational picture (COP), capabilities for issuing plans and orders and receiving reports (messaging system) and the ability to record results and evaluations (reporting, databases). Furthermore, this should all be secured at the required classification level.

C2 systems that provide this support are known as operational communication and information systems(operational CIS) , which usually consist of networks based on civil standards (internet protocol, VoIP) and civil software (Windows, Office), supplemented by specific military applications. Modern operational CIS are no longer specifically developed for a particular domain, and can now be used by all components. The military applications installed on the network, however, are (still) specific to a single component.

MFSF) have one or more of the following operational networks:[99]

- **NLSWAN** (Netherlands secure wide area network) is a Dutch national classified network. Besides office software, this network also has messaging applications (message handling system, MHS).

- **NSWAN** (NATO secure wide area network) is NATO's classified network. As well as the usual office applications, this network also provides a wealth of information. All NATO HQs, and the larger organisations and units maintain web pages containing both administrative and operational information. The network also has military applications, a number of which are used for maritime operations. One example is the RMP (recognised maritime picture) that is fed by the MCCIS[100] servers of ships and HQs and which allows users to view the (worldwide) maritime picture.

  Another example is ICC (integrated command and control), which enables users to view the recognised air picture (RAP) managed by the CAOCs. ICC also gives access to the applicable air tasking order (ATO) and airspace control order (ACO). As a third example, NSWAN also provides access to intelligence networks such as BICES[101] (with authorisation).

- **TITAAN** (Theatre independent army and air force network) is the network system originally developed for the Dutch army and air force. TITAAN functions as the transport layer for other applications and comes in two versions. TITAAN Rood [Red] is a classified network (mission secret); TITAAN Zwart [Black] is unclassified (department confidential) and forms the link with the static internal network (MULAN), thus providing access to supporting logistics, financial, medical and personnel-related applications. As soon as they are landed, Marine Corps units make use of both versions of TITAAN for the connection from the area of operations to the Netherlands. The aim is for all Dutch naval ships to be equipped with both versions of TITAAN.

- **BEMILOPCIS** (Belgian military operational communication and information system) is the Belgian equivalent to the Dutch NLSWAN.[102]

99 Most large Belgian and Dutch naval ships have provisions for five networks, three of which are reserved for classified operational information management and C2; the other two are used for the unclassified internal business network (such as MULAN or TITAAN Zwart) and for internet for private use (welfare).
100 Maritime command and control information system, see Chapter 6, paragraph 6.8.1.4.
101 Battlefield information collection and exploitation system, see Chapter 6, paragraph 6.7.4.4.
102 BEMILOPCIS will eventually be replaced by the static secure defence network (SSDN).

- **CENTRIXS** (combined enterprise regional information exchange system) is an American network system that is used in maritime operations by coalitions that include non-NATO countries. As well as the usual office software, CENTRIXS also contains applications for the real-time (maritime) picture (command and control personal computer, C2PC), for messaging and for VoIP/chat.

This list of operational networks is not exhaustive. Use can also be made of other networks that have been specially set up for a particular operation or which are needed to enable (temporary) collaboration with certain partners.

As well as the closed military networks, maritime forces also use publicly accessible networks, such as internet, for C2 and picture compilation, as many forms of maritime operation involve interaction with civil shipping and other civil organisations. Civil shipping obviously does not have access to the closed military networks, but many merchant ships and fishing vessels do have internet access. As well as traditional communications such as the maritime VHF radio, internet can also be used, via satellite, to exchange information with merchant ships and fishing vessels. This is certainly the case in maritime operations designed to protect civil shipping, for example in counter-piracy operations.

5.11.2 *Maritime communication systems*

Without communications, effective C2 is impossible. Maritime C2 also stands or falls with the ability to exchange information. The previous paragraph listed the data links and operational networks, but there are other means available for maritime forces to use. Some are standard communications, such as radio links and networks, that are also used by other military or civil actors. Other communication methods are, however, specific to use by maritime forces.[103] This paragraph will look further at the different ways in which maritime units, both fleet and marine corps, can exchange information, not only with each other but also with land and air forces and with civil actors, such as the merchant navy.

Communications can be classified in different ways. First of all, there is a difference in terms of the 'carrier' that is used to transmit information: electromagnetic waves, light or sound, creating the difference between radio, optical and sound signals. For each 'carrier', there is then a difference in terms of the signal form in which the information is transmitted: data, codes, speech or image. This is then divided into (digital) data, telegraphy, telephony and television or other forms, such as Morse or flags.

103 NATO imposes minimum requirements on maritime communication and information systems. These are stated in MC 195 NATO minimum interoperability fitting standards for communications and information systems (CIS) equipment on board ships, submarines and maritime aircraft.

Radio communications

Radio communications[104] make use of the electromagnetic spectrum, although the different frequencies (wave lengths) in this spectrum do not all behave in the same way. Radio communications are thus often designated with the frequency band in which they function: (V)LF, MF, HF, VHF, UHF, SHF or EHF.[105] Maritime forces make the following use of radio communications in the different frequency bands.

- Low frequency connections (VLF/LF) have worldwide range and also penetrate the uppermost layers of seawater. The disadvantage is that they are sensitive to atmospheric conditions and that they have an extremely limited bandwidth. Furthermore, these communications need such high transmission masts and so much power that VLF/LF transmitters can only be sited on land.
  Maritime forces use VLF/LF communications for messaging (telegraphy) to submarines.

- Medium or high-frequency connections (MF/HF) have a long range (beyond line of sight). The disadvantages, however, are that they have a large counter-detection range and that they are also sensitive to changing atmospheric conditions. Furthermore, this type of connection can only cope with limited data speed. MF/HF communications require large antennas and relatively high-powered transmitters, although that does not pose a problem for most ships.
  Maritime forces use MF/HF connections for messaging (telegraphy), voice communications (telephony) and data links, both between ships and with onshore contacts. These MF/HF connections often serve as backup for satellite communications.

- Very high-frequency connections (VHF/UHF/SHF/EHF) have a limited range, usually not much further than the horizon (line of sight). The advantage is the small counter-detection range, certainly if bundling is used (directional broadcast). Because data capacity increases at higher frequencies, UHF and SHF connections are particularly suited to satellite communications for digital data traffic (networks).

  Maritime forces use very high-frequency communications in the following ways:

  o VHF and UHF are used for direct (tactical) communications between ships, aircraft and onshore stations, particularly for voice (radiotelephony) and data. VHF communications are used for civil applications (such as the maritime VHF radio, AIS and aviation communications) and military communications (such as NIMCIS and for aircraft).
  UHF communications are usually military, used for voice, messaging (telex) and data (data link). The communication system for the Dutch emergency response services, C2000, also works in the UHF band; Dutch naval ships will also have this system on board.

104 Detailed arrangements for radio communications and communications plans for units of the Dutch and Belgian navies can be found in ACZSK DOPS 123.1 IV-diensten ABNL (classified).
105 Respectively: (very) low frequency, medium frequency, high frequency, very high frequency, ultra high frequency, super high frequency and extremely high frequency

- o UHF, SHF and EHF are used for satellite communications, both civil (INMARSAT, Iridium) and military (MILSATCOM). Besides message traffic (telex) and voice, satellite communications are mainly used for network connections, thus enabling the transmission of other forms of information (such as photos, videos, databases, and so on). The bandwidth for satellite communications constitutes a restriction, however: it is (much) lower than that of a (glass-fibre) cable on land.

In their operations, maritime forces usually use a range of different radio channels, most of them at the same time. Within the warfare organisation of a maritime task force, each warfare discipline has its own radio network and there are also command nets, network connections, data links and radiotelegraphic connections. Most of the larger naval ships therefore carry a large amount of radio equipment. The average frigate will easily have ten sets for UHF, six to ten sets for HF, three sets for maritime VHF and two sets for UHF/SHF SATCOM, possibly supplemented with sets for military VHF. To ensure the correct and undisrupted use of all these (radio) communications within a maritime task group, a solid **communication plan** (COMPLAN) is essential. A COMPLAN includes arrangements for the following aspects and situations:

- Prevention of interference, not only with other naval or military users, but also with civil communications;
- Allocation of backup frequencies in case of interference or deliberate jamming;
- Correlation with plans and measures in relation to restrictions on (radio) transmissions (emission control, or EMCON, plan);[106]
- Availability of scarce means (such as satellite capacity);
- Encryption of communications.

Within the NATO treaty area, there are standard (maritime) communication plans,[107] subdivided into regions. The purpose of this subdivision is to prevent interference with the radio spectra of member states and at the same time enhance interoperability.

The Netherlands and Belgium also have national COMPLANs,[108] which are in keeping with those of NATO. For other (expeditionary) maritime operations, a maritime COMPLAN is based on the communication annexes of an OPLAN. A task group commander (OTC, CTF or CTG) issues his orders and instructions in relation to communications by means of an OPTASK COMMS message.

Optical communications

Optical communications use light and visible symbols (such as flags). Although radio communications are the most commonly used,

Signalling with the 10" day flashing light

106 See Chapter 7, paragraph 7.8.3.2 (Operations Security (OPSEC)).

107 For NATO COMPLANs, see NATO supplement of ACP-176 Allied Naval and Maritime Air Communication Instructions (classified).

108 See Dutch ACZSK DOPS 123.1 IV-diensten ABNL (classified).

optical communications remain important for maritime forces, particularly in situations of radio silence. Optical communication devices have a limited range and low transmission speed and are thus only suitable for transmitting short tactical announcements and orders.[109] For maritime forces, typical optical communication devices are the flashing light (Morse code) and signal flags.

Sound communications

Sound can also function as a carrier of information, both in the air and under water. In the air, this is the use of the (amplified) human voice. This could be a megaphone, or it could be in the form of a directional and extra amplified sound bundle, as produced by the LRAD (long-range acoustic device). The LRAD can be used to transmit voice messages over distances of up to a few kilometres.[110]

Underwater sound communications can be effected in three different ways. The first is the underwater telephone, with which speech is modulated into a sonar signal. Ships and submarines can thus communicate with each other, although the range is normally very limited and transmission speed is low. Use can also be made of special buoys that propagate sound signals or of electronic signal underwater sound (ESUS) devices, or a series of explosive devices (grenades) can be launched. In the case of the two latter methods, communication is one-way (transmission only), and they are used if information needs to be conveyed but there is (as yet) no other form of communication available.[111] This is the case, for example, when an unidentified submarine is detected (and there is a need to establish each other's identities and intentions) or when a submarine is in distress. Lastly, in the case of diving activities, use is made of diver recall signals, which involve communication with divers by means of underwater telephone or by means of explosive signals under water.

Long Range Acoustic Device (LRAD)

109 Within NATO, these maritime tactical signals are standardized; see ATP-1 Volume II, Allied Tactical Signal and Manoeuvring Book.

110 Use of the LRAD is described in Dutch/Belgian ACZSK DOPS 130 / ACOT-GID-DOCSOP-NOXQ-200 Long Range Acoustic Device LRAD.

111 The use of (E)SUS and the meaning of codes and sequences are set out in ATP-28 Allied Antisubmarine Warfare Manual (classified).

6. MARITIME INTELLIGENCE AND PICTURE COMPILATION

6.1 Introduction

The previous chapter showed that (maritime) C2 is all about understanding the prevailing situation. This understanding is necessary on the one hand to identify opportunities and threats (analysis and planning) and, on the other, to determine whether actions are producing the desired result (execution and assessment). At every level and at any given time, therefore, optimum situational awareness (SA) is required.

Situational awareness is created by using expertise and experience to link the available information about what is happening in the area and why to a particular time and location and to friendly activities (task, mission).

The purpose of situational awareness is to fully understand the circumstances and to make the behaviour of other actors as predictable as possible. The more predictable other actors' responses to our activities, the better able a commander will be to make the right decisions, namely those that bring the accomplishment of the objectives closer.

Optimum situational awareness is essential to enable compliance with the principles of military operations. It enables identification and exploitation of opportunities, allowing initiative to be taken and advantage to be gained from surprise. It is also extremely important for security, as it allows threats and risks to be identified and dealt with. Timely, relevant and accurate information about targets or target groups increases accuracy of actions and reduces the risk of collateral damage. This adds to the legitimacy of the action and enables further concentration of power. Sharing of the real-time picture with as many of those involved as possible also makes a valuable contribution to the economic use of scarce resources.

Situational awareness covers three areas:
- Information about friendly forces;
- information about the natural environment ('weather and terrain');
- information about other actors: opponents, supporters and others that are involved or present.

The joint function 'intelligence' provides as complete and current a picture as possible of the natural environment and the actors within it, created by the targeted collection, processing and dissemination of data. All kinds of data are involved, originating from a variety of sources and sensors. These data must be usable. Good data are thus always validated; it is vital to know the reliability of the source and credibility of the information. Because not all available data are always relevant and because some relevant information is often missing, data collection and processing is always targeted.

The information needed for maritime operations is distinguishable by the fact that it focuses on aspects specific to the maritime domain. Maritime situational awareness is only possible if there is sufficient information about the natural features of the sea and the littorals (for example, water depths, currents, temperature differences and the presence of sea life) and about all possible forms of human activity in, on and above the sea and the littorals (besides military activities, also about aviation and shipping routes, fishing, mineral extraction, beaches and ports).

In maritime operations, the joint function of intelligence therefore consists of three types of activity. The first focuses on information about the natural environment: the hydrographic, oceanographic, geographical and meteorological state of the sea, the littorals and the air above them. The other two activities – picture compilation and intelligence gathering – focus on information about the other actors in the area.

- **Picture compilation** is the process of obtaining data through observation and by means of sensors, both the unit's own and those of other units in the same area of operations, with the emphasis on the real-time picture.[112]

- **Intelligence gathering** involves the collection of high-quality, analysed data (intelligence) via other, often specialist, units or agencies. Intelligence may relate to the current situation, or consist of background information or detail data.

Strictly speaking, information about friendly units does not form part of the intelligence function. For the sake of completeness, however, this type of information will be discussed here.

This chapter first sets out a number of terms, such as data, information, intelligence and the general method of data processing. There then follows an overview of the type of data needed to create maritime situational awareness. The chapter will then examine the four elements that make up the maritime picture: data relating to friendly forces and units, data relating to the natural environment, maritime intelligence and real-time data from maritime picture compilation. It will close with a paragraph about collaboration with civil actors, such as the coastguard, in compiling a maritime picture.

This chapter represents a maritime-specific elaboration of the intelligence doctrine as set out in NATO's AJP-2 Allied Joint Intelligence, Counter-Intelligence and Security Doctrine and in the Netherlands' JDP-2 Intelligence.

6.2 Data, information and intelligence

The joint intelligence function is all about gathering, processing and disseminating data, information and intelligence.

- **Data** are rudimentary building blocks of information and usually consist of simple facts and statistics. Examples of data are:
  - o radar echoes that are displayed as contacts on a screen;
  - o nautical charts and land maps, tide tables;
  - o catalogues and databases with, for example, IMO numbers and nationalities of civil ships.

112 Picture compilation was formerly referred to with the term 'combat information'.

- **Information** is created when data are significant or newsworthy to the receiver because they fit into a particular context. Information is thus a subjective concept. Examples of information are:
  - a nautical chart or land map when it is being used for navigation;
  - the IMO number, nationality and port of destination of a specific merchant ship;
  - weather forecasts, warnings of dangers to shipping;
  - current temperature of the air or seawater.

- **Intelligence is created by analysing data and linking it to actors and factors** that influence friendly activities in a specific environment. Intelligence differs from 'ordinary' data and information in that it is produced by specific collection and analysis methods (the intelligence process).

The word 'data' is in principle used in this chapter to denote data in a broad sense, in other words, all three forms. For specific forms, the words 'information' or 'intelligence' are used.

The word 'intelligence' has three different meanings [in this context] and to distinguish them in this chapter, they are designated as follows:
- where it concerns the joint function: 'the joint intelligence function';
- where it concerns the process used to create intelligence: 'the intelligence process';
- where it concerns the specific form of high-quality data: 'intelligence'.

6.2.1 *Value of data*

Data become information at the point at which they have value for the user, which is the case when they help to improve situational awareness. To do so, data must meet a number of criteria.
- They must be available at the right time (timeliness, availability);
- They must come from a reliable source (reliability);
- They must be objective and accurate (integrity, accuracy):
- They must apply to the current or future situation (relevance).

In the case of data collected through observation or from friendly sensors, the user himself needs to be able to estimate the reliability and accuracy. For data collected from external sources, the user cannot do that himself; reliability and credibility will depend on the source and the communication method. There are three different types of data:

- **Unregulated data**. These are data for which accuracy and reliability are difficult to establish. This is the case, for instance, for data collected from open sources (such as the media) or from unsecured channels (such as internet and telephone). Caution is thus advised when using such data.

- **Regulated data** are those for which reliability is high as they come from a reliable source. Regulated data usually come from official organisations that can vouch for their accuracy. They may be fairly accessible to everyone: nautical charts are a good example. Data that come from closed networks (such as data links) are also classed as regulated data.

- **Intelligence**. Intelligence is a special form of regulated data, resulting from specific collection and analysis methods (the intelligence process). During this process, data are evaluated for their reliability and credibility. If intelligence is shared with other units, this value assessment must be indicated; established norms are used in order to avoid any misunderstanding.[113]

Data are particularly valuable in informative terms if they are predictive in nature: in other words, if they say something about the future. Some events are easy to predict, even in the long term (for example, the time of sunrise and sunset). Events that depend on more than one factor or actor are more difficult to predict (such as the weather) or even impossible (the stock markets). However good the intelligence position may be, there will always be uncertainty as a result of a lack of information. Wherever there is (still) a lack of data, assumptions will have to be made. Data are then particularly valuable if they support or contradict these assumptions.

Data will not always meet the four conditions (timeliness, reliability, accuracy and relevance). Those that do not can still be highly valuable if they make up an essential or critical part of the information shortfall. For data that quickly lose their value (such as the whereabouts of an important person), timeliness is thus more important than integrity. In such cases, it might for instance be acceptable to use an unsecured means of communication.

113 See Dutch JDP-2 Intelligence, Annex 2 – Source, information and intelligence evaluation. These norms are based on the NATO norm STANAG 2511 Intelligence Reports.

6.2.2 *Fixed and variable data: the time factor*

A wide variety of data is required to ensure optimum situational awareness. Some data are not or barely subject to change, and thus retain their value for longer. Other data do change, however, which means that they become outdated after a while and thus lose their value. Changes may occur slowly (e.g., seawater temperature) or rapidly (e.g., position of an aircraft). Furthermore, those changes could be random (e.g., rain) or part of a pattern (e.g., climate or tides).

Depending on the extent to which data are variable, they can be categorised as follows:

- **Fixed data** are those that are not or barely subject to change. These data are ideal for recording in databases. Some forms of fixed data are highly valuable and are thus classed as intelligence (e.g., characteristics of weapons, sensors and platforms (ships, aircraft)).

- **Patterns** relate to data that are subject to change, but for which changes occur very slowly or can be predicted. Patterns and trends occur in data on the environment (tides) as well as in data on human activity (e.g., shipping routes or fishing zones). The latter is referred to as a **pattern of life** (PoL). Identification of patterns and trends usually requires long-term observation and recording: this is then referred to as historical data. Some patterns can be converted into mathematical models, allowing future values to be predicted.

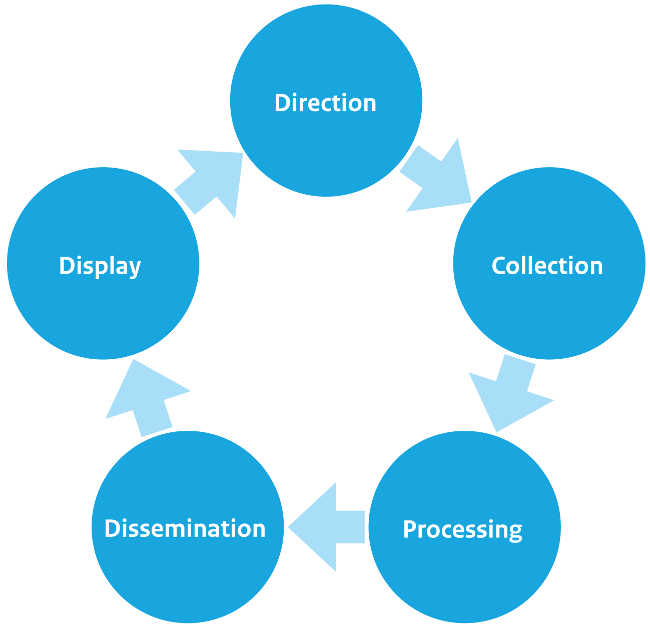
- **Variable data** are those that are subject to rapid and more or less random change. To retain their value, these data need to be gathered repeatedly, either constantly or at regular intervals. These are known as (near) real-time or current data.

6.2.3 Data processing

Data only have value for situational awareness if they meet the criteria defined above. Information processes must therefore focus on meeting these criteria as fully as possible, and thus follow the same pattern:

- **Direction**: determining the requirement for information or intelligence.
- **Collection**: gathering data, information or intelligence.
- **Processing**: collating and analysing the collected data, information and intelligence.
- **Dissemination**: distributing the analysed and value-estimated information and intelligence to users.
- **Displaying**: presenting the information and intelligence in an optimum form for the user (text, fixed format, graphically or a combination of these).

The steps in this pattern can be identified in the three activities of the joint intelligence function: the intelligence process, the picture compilation process and the process of mapping out the natural environment. The rate at which the steps should be undertaken depends on the type of data. For the collection of fixed data, it may be acceptable to take a long time (months, for example) going through the steps, provided the required data is available when needed. For some forms of rapidly changing data, such as positions of moving targets, the steps may have to be completed in a matter of seconds. This is the case, for example, in the event of air and missile defence or the neutralisation of a key individual.



Data processing

6.2.4 *Information requirement*
The first step in the various information processes is to determine the information requirement: the commander's critical information requirements (CCIR), which could cover all data terrains. The CCIR serve as a starting point for such requirements as:
- the intelligence requirement;
- the requirement for information about the natural environment;
- the friendly forces information requirement (FFIR): reports by friendly forces on status, position, etc.

The formulation of the CCIR is usually the first step in the preparations for an operation or activity. It is therefore also the first step in the planning process for military operations.

There will always be an information requirement, whatever the type of operation or activity. It can, however, vary widely, depending on the circumstances and the mission. A ship conducting a transport from one port to another in peacetime will only require information that is important for safe navigation: a nautical chart, a weather forecast and a picture of shipping in the immediate vicinity. A maritime task group conducting an amphibious operation near an enemy coast will have a very extensive information requirement.

The information requirement is not static; if the situation or the mission changes, so will the information requirement. A commander will thus need to examine and revise his CCIR on a regular basis.

6.3 The building blocks of situational awareness

Optimum situational awareness requires a great deal of data, which can be split into data relating to the natural environment ('weather and terrain') and data relating to human activities.

6.3.1 *Data relating to the natural environment*
The natural environment of the maritime domain involves not only the sea, but also the air and space above it, as well as the littoral region. Chapter 1 looked at the natural features of the maritime domain, many of which influence maritime operations. Safe navigation requires data relating to water depth, current, tide, wind, wave height and ice formation. The performance of sensors and weapons systems depends on air and water temperature, salinity of seawater, air humidity, presence of precipitation or dust particles in the atmosphere, wind direction and speed and air pressure. The potential for conducting maritime operations may be limited by high waves, strong winds, shallows or inaccessibility of the coast.

Maritime situational awareness requires the availability of data relating to these natural features, such as:

- Data relating to the seabed (depth, composition, seismic activity, likelihood of change due to shifting sand, etc, presence of obstructions such as wrecks);
- Data relating to the coast and the hinterland (geographical composition, accessibility, presence of drinking water, poisonous flora and fauna, disease, etc);

- Data relating to the water column (temperature, salinity, current, animal life);
- Data relating to the water surface (ice formation, tidal movements, waves, swell, surf);
- Data relating to the atmosphere (temperature, humidity, wind, cloud cover, precipitation, dust, radioactivity);
- Data relating to celestial bodies (period of daylight, position of moon and stars, magnetic field, sunspots/solar winds).

6.3.2 Data relating to human activity

As described in Chapter 2, humans use the maritime domain for the following activities:

- as a source of food, raw materials and energy;
- as a means for transport, trade and communication;
- as a natural environment and habitat;
- as an area in which to exercise power.

It is not only human activities in the maritime domain that are important for the generation of situational awareness. Human activities in the other domains (air, land, space and the information domain) can also affect the maritime domain. Data relating to relevant activities in the other domains must therefore also be available.

To obtain the best possible picture, the following data is needed in respect of human activities in these domains.

- Presence or absence of human activity (establish/detect presence).
- Intentions behind the human activities present and the capacities available.
- Possible ways of influencing these intentions and/or capacities.

Establishing the presence or absence of activities and the nature thereof is the province of picture compilation. To establish the intentions and capacities and the ways in which they can be influenced will normally require validated intelligence. In some cases, the picture compilation process may provide sufficient information about intentions, particularly at tactical level.

6.3.2.1 Data relating to the presence of human activity

Sea, air and space: data relating to objects

One characteristic of large sections of the maritime domain (the sea, the air and space) is that they do not form a natural environment for man. Humans can only conduct activities in those domains by using fixed or movable objects. The process of gathering data on human activities in the sea, on the sea, in the air or in space therefore starts with establishing the presence or absence of these man-made objects.

- Objects on the sea floor
    - Subsea cables, pipelines and drilling wells
    - Sea mines and other unexploded explosive ordnance (UXO)
    - Subsea sensors
    - Wrecks and other sunken debris

- Objects in the water column
    - Submarines and unmanned underwater vehicles (UUVs)
    - Underwater objects towed by ships or helicopters, such as sonar devices
    - Sea mines and torpedoes
    - Divers and their vessels

- Objects on the sea
    - Warships (own, friendly, neutral and opposing)
    - Merchant ships, cruise liners and ferries
    - Fishing vessels
    - Pleasure craft
    - Other shipping, such as coastguard, police, customs, pilot vessels, hydrographic ships, maintenance ships, ships belonging to pressure groups
    - Offshore installations, such as production platforms
    - Navigational aids such as lightships, buoys and beacons
    - Wind farms

- Objects in the air
    - Military aviation (own, friendly, neutral and opposing); not only manned and unmanned aircraft and helicopters, but also other military objects traversing the air, such as guided missiles and grenades
    - Civil aviation (scheduled flights and private aircraft and helicopters, hot-air balloons)
    - Other aviation (police, coastguard)
    - Obstructions to aviation (towers, cranes, wind turbines, cables)

- Objects in space
    - Satellites, space stations, shuttles and re-entry vehicles
    - Ballistic weapons
    - Space debris

Land: data relating to objects and people
On land too, man-made objects are important for maritime operations.
- Military units, vehicles and other objects that are significant in military terms (own, friendly, neutral and opposing)
- Ports and airports
- Navigational aids such as lighthouses and radio beacons

In contrast to the sea, the air and outer space, however, land is a natural environment for humans. Data on the presence of man-made objects is not enough on land; the actual presence of people also needs to be established.

Information domain: data relating to relevant information
In the information domain, there is no question of tangible objects or people. Nonetheless, certain forms of data can be regarded as ‘information objects’ that are important for maritime operations. Examples of these are the various agreements regarding the use of the maritime domain, as discussed in Chapter 2:

- Data relating to maritime zones and boundaries (traffic management systems, boundaries of maritime zones (territorial waters, EEZ), boundaries of other areas of responsibility (e.g., of a rescue coordination centre, RCC)).
- Data relating to aviation zones and boundaries (flight routes, danger areas, boundaries of national airspace, FIR boundaries).
- Data relating to agreements on the use of the electromagnetic spectrum and on the use of communication means (such as the maritime VHF radio).
- Data relating to shipping routes, fishing zones, ferry services.

6.3.2.2 Data relating to the presence of human activity
For each human activity that is confirmed or suspected, there must be as clear an idea as possible as to what the intentions and capacities are. A distinction is made between objects, people and other actors.

Objects
Every object (such as a ship, aircraft, vehicle or building) normally belongs to a person or an organisation and there is a reason for it to be in a certain place at a certain time. Ascertaining intentions and capacities starts with recognition on the basis of the characteristics of an object.[114] Characteristics can represent a great amount of data, as illustrated by the following examples for a ship:

- Type of ship: e.g., merchant ship, ferry, warship, fishing vessel, yacht.
- Type or class:
  - o Warship: e.g., aircraft carrier, frigate, submarine.
  - o Merchant ship: e.g., container ship, tanker, coaster, tug.
- Nationality (flag state).
- Nature of activities: e.g., in transit from port A to port B, or fishing.
- All sorts of characteristics of onboard equipment, e.g., propulsion, radar and other sensors, weapons.
- People present and their designation: captain, personnel, passengers.
- Organisations involved: shipowners, cargo owners, insurers.

Which characteristics determine the required level of recognition depends on the type of object and on the task or mission. In combat operations, for example, the main focus will be on military objects such as warships. In that case, the only information required for a merchant ship would be the nationality. To track down drug trafficking, however, more attention will be focused on other characteristics of civil ships, particularly the cargo and the organisations involved.

114 See paragraph 6.8.1.3 for further explanation of recognition and identification in picture compilation.

Some of these characteristics are variable and can only be ascertained on the spot, for instance the nature of the activities or the nationality of those aboard. Other characteristics are more or less fixed data, such as ship's name, IMO number, flag state, capacity of onboard equipment and means. These fixed data can be collected at other times (in advance) and stored in databases. Once these fixed characteristics are known, general recognition of an object (e.g., an M-class frigate) will provide knowledge of the capabilities and capacities of that object (e.g., threat level). Databases with known characteristics can also help to identify anomalies: for example, if a flag state or home port declared by a ship does not match the data supplied by the flag state itself.

Automatic identification system (AIS) and long-range identification and tracking (LRIT)

Civil users of the maritime domain also have a requirement for the best possible situational awareness. Merchant shipping, the fishing industry, coastguard, port authorities and waterway management all have their own interest in knowing what ships are present and where. Not only for safe navigation or to be able to render timely assistance, but also, for instance, to optimise the use of port capacity or to improve the enforcement of laws and regulations. To meet this information requirement, two highly automated maritime information systems have been developed: the automatic identification system (AIS) and long-range identification and tracking (LRIT).

AIS is an automatic transponder system that works in the VHF band (like the maritime VHF radio). Ships equipped with AIS broadcast data about themselves at regular intervals and receive similar data from other ships located within horizon range. These data consist of variable data (such as position, course, speed, cargo and destination) and fixed data (such as ship's name, IMO number and dimensions).

LRIT is a transmitter only, not a receiver. It broadcasts only limited data (identification and position) and at much less frequent intervals than AIS (every 6 hours). These data are not transmitted to surrounding stations, but via satellite to a (multi)national data centre, which then disseminates the data to interested parties, such as shipowners and port authorities.

AIS and LRIT are both obligatory for passenger ships and for large freighters. AIS is also obligatory for all other ships over 300 tons.

Warships do not have to be equipped with AIS or LRIT. The data that can be obtained with AIS are, however, an important addition to situational awareness. It also makes it much easier to collect and process data that would otherwise only be obtained by interrogation (via the maritime VHF radio or through a boarding). Dutch and Belgian naval ships are therefore equipped with AIS. Generally speaking, naval ships will not broadcast on this AIS themselves; they will use the system mainly to gather information.[115] On ships equipped with a combat management system (CMS), AIS data received is automatically transmitted to the CMS. >

115 Guidelines for the use of AIS on board Dutch and Belgian naval ships are contained in ACZSK DOPS 124 / EDIR ACOT-SPS-OPSNAV-NMSC-200/NCCM *Navigatie*, Chapter 8000.

The coastguard in the Netherlands, Belgium and the Caribbean also use AIS and LRIT. They obtain data from onshore stations or satellites (AIS) and from data centres (LRIT).

Because AIS and LRIT equipment on board can be manipulated, received data are not always completely reliable; data are usually correct, but that is not necessarily the case.

Individuals

In some cases, it is not enough to ascertain the intentions of objects; the intentions of individuals also need to be established. This applies in any event to land operations and thus also to, for example, the land element of an amphibious operation. As regards other maritime operations, it also applies to boardings; the intentions of crew members or passengers on board may differ from those of the captain or the owner.

To be able to assess the intentions of individuals, a large amount of data is required, usually relating to historical, social and cultural background (ethnicity, language, faith, ideology) and to the extent to which an individual feels an affinity with certain groups, communities and organisations. Because the maritime domain is a public space that is freely accessible for everyone and all possible nationalities could be found there,[116] these background data must be global.

One example of background information required for individuals is proof of identity (passport, etc). Maritime forces must be able to verify the identity of an individual; they must therefore be able to establish the authenticity of a passport.

Other actors

Apart from the objects and people that are physically present in the area of operations, other actors also play a role in the background of maritime operations. Good situational awareness requires clarity as to the role, influence and intentions of actors involved, such as:

- International organisations (IOs), both global (e.g., the UN, IMO) and regional (e.g., NATO, EU, ASEAN or UNASUR), as well as national governments and local authorities;
- non-governmental organisations (NGOs), such as humanitarian relief organisations and pressure groups (Red Cross, Greenpeace);
- companies and business organisations, such as shipowners, port businesses, airline companies, cargo owners (e.g., oil companies), insurers and investors;
- terrorist groups and criminal organisations;
- influential or powerful individuals or groups.

Data about these actors relate mainly to their instruments of power (diplomatic, military, economic and informational) as well as to their historical, cultural, social and religious background.[117]

116 See also box in Chapter 2, paragraph 2.4.4, on flag states and nationalities.

117 Such information is normally ordered according to the acronym PMESII: political, military, economic, social, infrastructure and information. See Dutch JDP-5 paragraph 4.4.2.2.

Examples of fixed data relating to these other actors are, for example, UN Security Council resolutions, defence plans of the countries involved or data on trade flows.

6.3.2.3 Data relating to possible ways of influencing intentions and capacities

Military - and thus also maritime – operations are geared towards achieving certain objectives. As described in Chapter 3 in the strategic functions of military operations, those objectives can in many cases only be achieved if other actors can be persuaded to change their behaviour and thus their activities. To achieve this, data will therefore need to be available on the possible ways in which the intentions and capacities of the actors involved can be influenced.

This category of data requires a deeper understanding of what motivates individuals and of the technical capabilities of the various systems. This requires lengthy research and analysis and is thus mainly the province of intelligence.

Intelligence about what motivates (groups of) individuals is particularly important for the protection and execution of information activities[118] at all levels of operation, although it is also useful in communications with relevant actors in the area of operations, for example in the event of boardings and for visits to or discussions with local shipping or fisheries.

Intelligence about the technical capabilities of systems are primarily important at the tactical and technical levels. An example of this is the functioning of sensor and weapon systems, such as the guidance section of guided missiles and torpedoes and the setting options of sea mines, (hand-held) firearms and improvised explosive devices (IEDs). Intelligence on these aspects is necessary to be able to design effective countermeasures, such as jamming programmes or decoys.

118 See Chapter 9, paragraph 9.3 (Maritime striking power in the information domain).

6.4 Picture compilation: COP, RMP and ISR

The previous paragraphs listed the building blocks for maritime situational awareness. These separate building blocks need to be brought together to create the fullest possible situational awareness, and an important tool for this is the common operational picture (COP).[119]

The COP should provide a commander with an understanding of as many aspects as possible that are important for the execution of his mission. Because of the differences between the levels of C2 and the differences in missions and tasks within the levels, the contents of the COP required for situational awareness will also differ according to level and to mission, task or activity. The overall content of the COP should, however, be as unambiguous as possible and able to be shared with as many involved parties as possible. A picture that is shared by everyone will ensure that everyone has the same perception of the prevailing situation. A shared COP is thus an important requirement for achieving unity of effort and efficient use of means.

119 To emphasise that the COP encompasses the picture of and for all domains, it is also referred to as the joint common operational picture (JCOP).

The contents of the COP consist of:

- positions, intentions and capacities of our own and friendly forces and units (blue picture);
- state of the natural environment; this is also called the recognised environmental picture (REP) or brown picture.
- positions, intentions and capacities of (potential) opponents (red picture);
- positions, intentions and capacities of civil actors (white picture) and those of neutral parties (green picture).

The colours are based on those used for similar objects when presented graphically in C2 systems.[120]

The COP content is created in different ways. Firstly, forces in the various domains compile their own recognised picture. For the maritime domain, that is the recognised maritime picture (RMP). The RMP is the maritime contribution to the COP and is in turn created from various elements, such as the recognised air picture (RAP), the recognised surface picture (RSP), the picture of the situation under water and on land, with the addition of the recognised environmental picture (REP). Secondly, the COP (and RMP) building blocks come from different sources and organisational elements:

- Data relating to our own and friendly forces and units come from our own (line) organisation, namely the various staffs and units.
- Data relating to the natural environment are collected and compiled by specialists in the fields of geography, hydrography, oceanography and meteorology.
- Data relating to other actors (opponents, supporters and others) come from the intelligence process and the picture compilation process.

The collection of data relating to the latter category of actors is referred to as **intelligence, surveillance and reconnaissance** (ISR).[121] ISR is used to refer not only to the combined process of intelligence and picture compilation (surveillance and reconnaissance), but also to the assets deployed specifically for the purpose. A ship or maritime patrol aircraft could thus be assigned an 'ISR mission'.

The following paragraphs will first look at the data relating to friendly forces and units, before examining the compilation of the recognised environmental pictures (REP). This will be followed by a description of the two elements of ISR: first the intelligence process and then the picture compilation process.

6.5 Data relating to own and friendly forces and units

Besides data relating to the natural environment and to other actors (opponents, supporters and others), situational awareness also needs data relating to own and friendly forces, for example the following:

- status of personnel and materiel and that of supplies (fuel, ammunition);
- position and intended movements;
- other details, such as the presence of specific or different personnel or materiel.

120 In accordance with NATO norm APP-6 Joint Military Symbology.

121 Previously known as ISTAR or JISTAR: (joint) intelligence, surveillance, target acquisition and reconnaissance.

The requirement for information about own forces forms part of the CCIR. Compared to other data, much of that relating to own forces is easy to obtain by means of reports. To meet this information requirement, a commander will therefore have to include the duty to report in his orders. Examples of general reports used by maritime forces are as follows:[122]

- OPSTAT UNIT (operational status unit) and OWNSITREP (own land forces situation report) contain data relating to a unit's personnel and materiel status and to other details specific to the unit.
- NAVOPDEF (naval operational defect) is a message reporting (temporary) shortfalls in terms of personnel or materiel readiness.
- NAVPOSREP (naval position report) contains the position and intended movements of a unit or group of units.
- NAVSITREP (naval situation report) is a general message reporting specific events and changes in situation, status or level of readiness. Other forms of report, such as the daily SITREP and the DOWNREP contain similar data.

As well as these general reports, data relating to own forces are also exchanged via other channels. In the picture compilation, for example, the current position and identity of own forces is kept up to date. Through the use of C2 systems and data links, other data can also be maintained at real-time level, such as the readiness of sensor and weapon systems on board other ships and aircraft.

6.6 Recognised environmental picture

Paragraph 6.3.1 gave a rundown of the data relating to the natural environment that are important in maritime operations. In order to contribute to situational awareness, this huge amount of data has to be processed into a usable picture of the natural environment: a recognised environmental picture (REP). The REP consists of geographical, hydrographical, oceanographic and meteorological data in the following forms:

- **Historical data**. These are previously collected data that are collated in such a way that they form the most reliable representation possible of the expected weather and terrain. Examples of these are land maps and nautical charts, tidal stream atlases, tidal charts and almanacs, as well as what are known as dockets. A docket contains detailed historical meteorological, oceanographic, climatological and biological data for a particular area.

122 For the format and content of these (and other) reporting messages, see APP-11 NATO Message Catalogue.

- **Current data**. These are measurements taken on the spot, indicating the current situation. Current data are needed for current situational awareness, to supplement missing data and to confirm or adjust historical data.

- **Predictions**. Calculation or estimation on the basis of historical and current data of the effects the environment will have on operations, sensors, weapon systems and other equipment, now or in the near future.

- **Abstract geographical data** (routes, zones and boundaries). These are geographical data related to arrangements and regulations for the use of the maritime environment, such as:
  - o areas of responsibility, such as national borders, territorial waters, search and rescue regions and flight information regions;
  - o areas such as danger areas, restricted areas and traffic separation systems;
  - o specific military data such as zones and routes for waterspace management and airspace control, mine-free shipping lanes (known as Q-routes) and training and operating areas.

To create an REP, the same data-processing steps are followed as in the intelligence and picture compilation processes: direction, collection, processing, dissemination, presentation. The direction of the information requirement relating to the natural environment forms part of the CCIR (see paragraph 6.2.4). The following paragraphs will look at each of the other steps in turn.

6.6.1 Collection and processing of current data relating to the maritime environment

Maritime forces are constantly collecting data about the maritime environment.[123] They are equipped to do so with various types of measuring devices and sensors. Some equipment is standard for all ships and aircraft (thermometers, anemometers); other specialist equipment is found on a limited number of ships (such as hydrographic survey equipment) or has to be obtained from elsewhere (e.g., equipment for geographical terrain analysis).

Current data relating to the maritime environment consist of:

- Hydrographic data: depth soundings and seabed data, obtained by means of echo sounders or special survey equipment, such as the REMUS underwater robot.[124]

- Meteorological data: measurements of, for example, air temperature, air pressure, air humidity, wind direction and speed, using permanent equipment on board ships or with the aid of weather balloons and radio sondes. Also observed phenomena, such as cloud cover, thunderstorms and ice formation.

- Oceanographic data: measurements of water temperature, salinity, etc, using permanent equipment or sondes (XBT, XSV),[125] tidal stream measurement, measurement of level of ambient noise in the seawater.

123 Guidelines for the collection of environmental information are set out in Dutch ACZSK DOPS 113 *Operationele Data Voorziening*. This also contains the guidelines for a request for REA support.
124 See Chapter 9, paragraph 9.2.9 (Unmanned systems).
125 XBT = expandable bathy thermograph; XSV = expandable sound velocimeter.

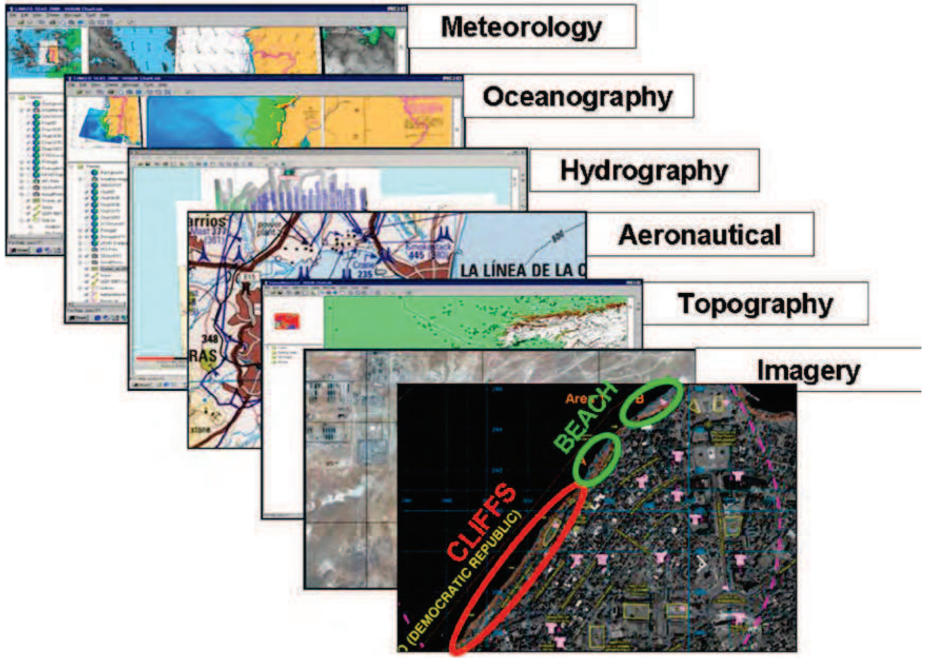
- Biological data: observations of relevant animal life, such as whales, and other phenomena such as bioluminescence.

- Geographical data: photographic and video pictures, usually taken by airborne assets. If the need arises, use can also be made of externally sourced data, such as satellite images (remote sensing);

- Chemical and radiological data: measurements of levels of toxic chemicals and radioactive radiation, using fixed devices such as RADIAC and CADS.[126]

The current data collected about the environment is not only used for current situational awareness; measurements are also used to determine the effects of the environment on sensors, communication and weapon systems, mainly to predict detection ranges, detection probability and impact probability (prediction, see paragraph 6.6.2). They are also registered and used to supplement historical data and as a supplement to measurements by meteorological, oceanographic and hydrographic institutes. For the latter, ships transmit their meteorological and oceanographic measurements at fixed times to military weather organisations which in turn make them available to civil weather organisations, such as the Royal Netherlands Meteorological Institute (KNMI) and the Royal Meteorological Institute of Belgium (RMI). Once a naval ship is at sea, it always serves as a mobile observation station.

126 RADIAC: radioactivity detection, indication and computation; CADS: chemical agent detection system.



Elements of the recognised environmental picture (REP)

6.6.2 *Predicting the effects of the natural environment*

As described in Chapter 1, many of the natural features of the maritime domain affect maritime operations. The capability to conduct them can be limited by weather, wind and water depth. Furthermore, the state and composition of the seawater and the air above the sea determine the performance of sensors and communication and weapons systems. By understanding these effects and ideally being able to predict them, negative effects can be avoided and positive effects can be fully exploited. Making optimum use of the prevailing natural environment is known as **tactical exploitation of the environment** (TEE).

Predictions of environmental effects are obtained and used in the following ways.

- **Weather impact matrix**. The weather impact matrix is compiled on the basis of historical data, own measurements and weather forecasts and alerts received from military and civil meteorological services. This matrix gives an overview of the impact that the expected weather conditions (wind, precipitation, wave height, visibility) will have on certain activities, such as operating helicopters or small craft (landing craft, RHIBs).

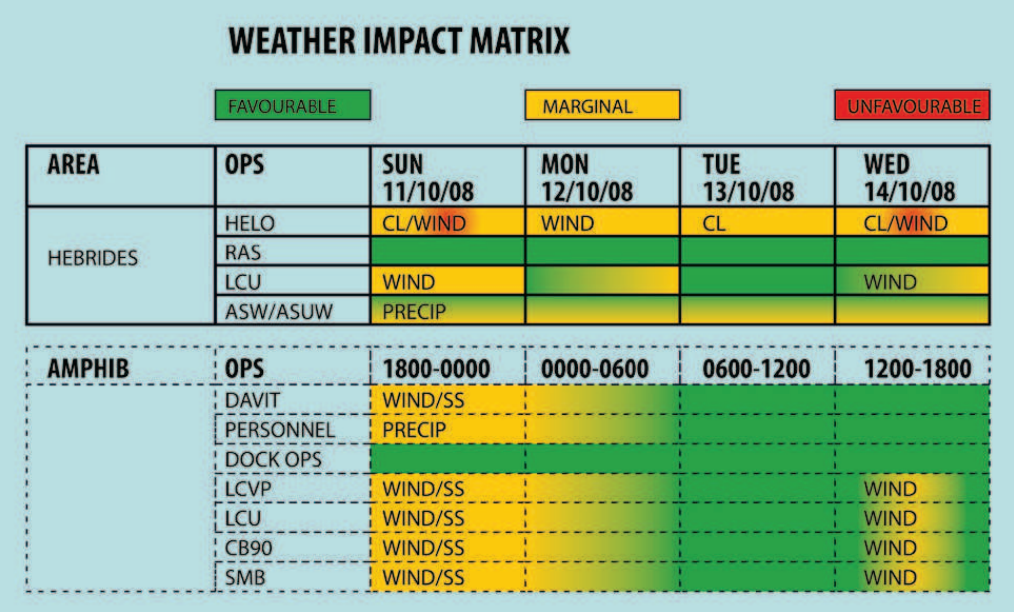
- **Sensor prediction**. Special predictive programmes can use historical profiles and current measured variables to calculate and predict the transmission and detection range of sensors (radar, sonar and optical) and radio transmitters. Sensors and transmission devices can then be set up for optimum range. Sensor predictions are also important for determining the optimum operating depth for submarines and towed sonars and for determining the effectiveness of radar jammers and of guided missile and torpedo sensors. If technical data relating to the opponent's sensors is known, his current detection ranges can also be determined. These counter-detection ranges are particularly important if detection by the opposing forces is to be avoided (for example, a maritime patrol aircraft or submarine on covert patrol).

- **Ballistic profiles**. If the current atmospheric composition and air movements within it are known, the behaviour of missiles during flight can be predicted more accurately, thereby increasing the accuracy and effectiveness of artillery (guns, mortars, snipers).

- **Surf zone prediction**. One of the critical factors in an amphibious operation is the amount of surf near the intended landing beaches. With the aid of mathematical models and current data about the shape of the seabed, wind direction and speed, predictions can be made as to whether the amount of surf will hamper the operation.

- **Recommendations in the event of a CBRN threat**. There may be a possibility of the use or threat of chemical, biological, radiological or nuclear weapons and/or other toxic industrial substances (following an factory accident, for example). In such situations, it is important to be aware of the prevailing condition of the seawater and the atmosphere in order to avoid a hazardous area, minimise the time spent in the danger zone or determine the duration and effect of the hazard. Predictive programmes can show dispersal and risk areas on the basis of current data.

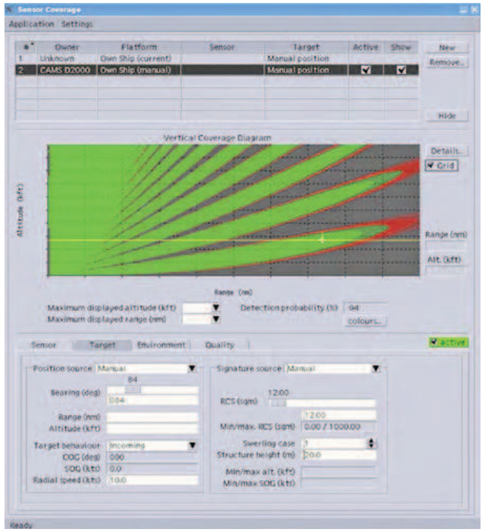
- **Weather routing**. Weather routing is routing advice given to shipping and aviation for the purpose of avoiding dangerous or unfavourable environmental conditions, such as tropical storms or areas with high seas or ice formation. Routing requires information about the current and forecast weather situation a long way from the current position, so it is usually provided by supporting onshore meteorological services.


WEATHER IMPACT MATRIX

FAVOURABLE | MARGINAL | UNFAVOURABLE

AREA	OPS	SUN 11/10/08	MON 12/10/08	TUE 13/10/08	WED 14/10/08
HEBRIDES	HELO	CL/WIND	WIND	CL	CL/WIND
	RAS				
	LCU	WIND			WIND
	ASW/ASUW	PRECIP			
AMPHIB	**OPS**	**1800-0000**	**0000-0600**	**0600-1200**	**1200-1800**
	DAVIT	WIND/SS			
	PERSONNEL	PRECIP			
	DOCK OPS				
	LCVP	WIND/SS			WIND
	LCU	WIND/SS			WIND
	CB90	WIND/SS			WIND
	SMB	WIND/SS			WIND

Example of a weather impact matrix



Predicting radar ranges

These prediction methods support the decision-making process. By integrating predictive programmes into C2 systems, the results can be clearly shown immediately, for example by presenting the predicted radar range on the radar screen. Direct links with measuring devices then enable a rapid response to changing circumstances.

6.6.3 *Presentation of data relating to the maritime environment*

Many data about the natural environment are related to geographical positions and the best way to show these is by using maps. The traditional method is to use paper maps, with the addition of special map versions or transparent plastic overlays to show information specific to military use. If electronic information systems are available, geographical data can be presented in electronic or digital maps. This is the case, for example, for:

- C2 systems such as the fleet's combat management system (CMS) and the marine corps' NIMCIS;
- navigation systems, such as the (warship) electronic chart display and information system ((W)ECDIS).

Additional military layers (AMLs) are used to show military geographical data in these systems. Because the specifications of these data are standardised within NATO,[127] AMLs produced by other countries or parties can be used in all systems. There are various types of AML, for example those for large and small objects on the ocean floor, for depth lines and for routes, zones and boundaries.

127 STANAG 7170.

In the Netherlands, the Hydrographic Service is responsible for producing AMLs for the Netherlands' hydrographic area of responsibility. The AMLs for the Belgian area of responsibility are produced by the ABNL Naval Mine Warfare Mission Support Centre (NMWMSC) in Ostend.

6.6.4 Rapid Environmental Assessment (REA)

The previous paragraphs described how maritime forces collect and use historical and current data relating to the natural environment and how they determine what impact the environment will have on current and future operations. These activities are known collectively as a **rapid environmental assessment** (REA). REA at technical level, in other words at the level of individual units and for employment of the unit itself, is generally conducted by the ship's own crew or the marine corps unit. In other cases, the REA is conducted by specialist personnel, often using specialist equipment.

This is the case, for example, in the event of:

- support of staffs at operational or tactical level, such as NLMARFOR;
- operations in which weather and terrain constitute critical success factors, as in amphibious and riverine operations;
- operations in regions where key environmental information is unavailable or where existing data are no longer reliable (for example, following an earthquake or passage of a hurricane).

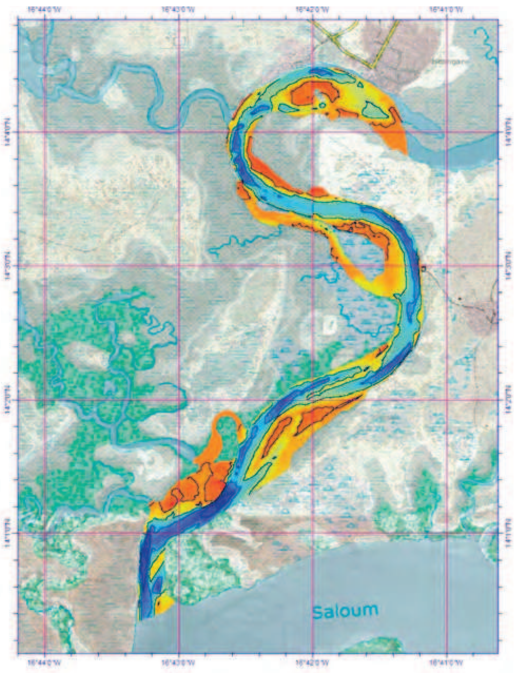
The form and scale of this REA support depends entirely on the situation. The support may consist of one specialist (e.g., a METOC (meteorological and oceanographic centre) searider) or a REA team made up of different specialists with its own measuring equipment. Support could also mean the employment of specialist ships, such as hydrographic survey vessels.

There are four categories of REA support:

- REA category 1 (remote REA) involves identifying the information requirement in the preparation and planning phase and meeting that requirement as far as possible from existing data sources.
- REA category 2 (precursor REA) comprises overt on-the-spot collection of missing key data before the arrival of the task group in the area of operations.
- REA category 3 (covert REA) consists of the same activities as category 2, but they are conducted covertly, for example by special operations forces or submarines.
- REA category 4 (operational REA) is on-the-spot collection of key data that is still missing during the execution of the operation, once the task group has arrived in the area of operations.

In the Netherlands, the central coordination of REA support of maritime operations takes place at the Maritime Environmental Information Centre (MEIC), which is part of the Hydrographic Service. The MEIC itself provides the hydrographic and oceanographic support and coordinates the meteorological and geographical support, which are supplied respectively by the Joint Meteo Group (part of the Royal Netherlands Air Force) and the Geographical Service and the Joint ISTAR Command (both part of the Royal Netherlands Army).

In Belgium, REA support is coordinated by the Mine Warfare Unit in Zeebrugge in collaboration with the Naval Mine Warfare Mission Support Centre (NMWMSC) in Ostend.



REA Category 2: survey data from a tributary of the River Saloum in Senegal, in preparation for (an exercise in) riverine operations.

6.7 Maritime intelligence

Situational awareness about the positions, capacities and intentions of opponents and other actors is generated by the intelligence and picture compilation processes. The intelligence process delivers high-quality data: intelligence. Intelligence may be either fixed data, patterns or highly variable data. It results mainly from specialist or even covert collection methods and/or from specialist analysis and data compilation.

The intelligence process is inextricably linked with the picture compilation process. Intelligence supports picture compilation by providing supplementary data and/or background information. In reverse, picture compilation also serves as a source of intelligence.

The following paragraphs explain how intelligence contributes to the creation of the red and the white pictures of the COP and to the acquisition of the situational awareness needed for maritime operations. The first three paragraphs describe the various categorisations used for intelligence, namely the categorisation according to the level of operations, the nature of the intelligence and the source or collection method. The steps of the intelligence process will then be discussed, followed by a description of those who conduct the process: the intelligence organisation and the intelligence chain. The intelligence section of this chapter will close with a paragraph on the special role and position of the national intelligence services. The entire description shows how these categorisations, processes and organisations fit into maritime operations.

6.7.1 *Levels of intelligence*

At every level of operations, there is a requirement for information. Intelligence can be subdivided according to the level for which it is intended.

- **Strategic intelligence** is intelligence that is required at political-strategic level for decision making in respect of the deployment of a state's instruments of power and at military-strategic level for the planning and execution of military operations. Strategic intelligence includes the following:

  - o intelligence relating to the strategic political and military intentions of other states and actors (indication and warning, I&W).
  - o Intelligence of an operational, tactical or technical nature that have a strategic impact, for example the current location of an opponent's political or military leader (high-value individual, HVI).
  - o Intelligence that is important for formulation of policy and requirements (e.g., technical data for a weapon system, so that appropriate defence methods or means can be devised).

- **Operational intelligence** is intelligence needed for the planning and execution of military campaigns and operations at operational level. In the planning phase, operational intelligence serves as the basis for the intelligence preparation of the environment (IPE, see paragraph 6.7.4). During the execution, operational intelligence is needed to determine whether the intended effects are being realised and whether the operational objectives are being achieved.

- **Tactical intelligence** is intelligence needed for the planning and execution of military activities at tactical and technical level. Tactical intelligence is usually accurate and directly actionable, but is perishable (only limited validity in time). In maritime operations, tactical intelligence and picture compilation are closely correlated and mutually complementary.

The distinction between the levels is not always clear. Tactical intelligence may have direct strategic significance, and strategic intelligence could impact directly on the actions of the lower levels.

6.7.2 *Types of intelligence*

Intelligence can also be categorised according to its nature. There are four types of intelligence, each of which can be applied within the three levels of intelligence.

- **Basic intelligence** is high-quality background information about actors and factors. These are usually fixed data or data that rarely change. Examples of basic intelligence are geographical and historical data and patterns or data relating to organisational structures, doctrines and personal designations.

- **Current intelligence** reflects the current situation developments in the short term. Because of its currency, it has time-limited validity. Picture compilation plays a key role in obtaining current intelligence in maritime operations.

- **Target intelligence** provides an accurate specification of physical targets and target audiences, their relative importance to the friendly operation and that of the opponent, and any weaknesses or sensitive areas. Target intelligence is not only important during the planning (targeting process), but it also enable effects to be measured afterwards in the battle damage assessment (BDA).

- **Technical intelligence** is a specific form of basic intelligence and relates to technological developments, capabilities and capacities of materiel that is or could be used for military purposes. Technical intelligence is important at tactical level to help with fingerprinting (recognition and identification) and the development of countermeasures. At strategic level, technical intelligence is used in the formulation of requirements for new or adapted assets. Specific maritime types of technical intelligence relate to the properties and capacities (parametric data) of ships and aircraft, radars and sonars (especially if they are linked to or form part of a weapon system) and the weapon systems themselves (e.g., guided missiles, torpedoes and sea mines).

6.7.3 Sources and collection methods

Intelligence can, regardless of the categorisation in terms of level or nature, also be divided according to the source and/or the collection method. These categories are designated by acronyms with the suffix 'INT'. The following types are important in maritime operations.

Acoustic intelligence (ACINT)

ACINT is intelligence derived from the collection and processing of acoustic phenomena in the sound spectrum. Because sound is one of the few ways of detecting objects under water or of communicating under water, the application of ACINT is predominantly maritime. Two types of source are used. The first are sources that inadvertently emit signals and generate noise, such as diesel engines and ships' propellers. The others are sources that deliberately generate sound for communication, navigation and/or localisation, such as active sonar emissions. Naval ships and maritime helicopters obtain raw acoustic data from both types of source mainly by means of passive acoustic sensors or sonar devices.

There are two ways of processing collected raw acoustic data to form ACINT. In real-time tactical analysis on board, data is compared to historical parametric data from databases to aid picture compilation, particularly for the purposed of identification. More extensive analysis later serves to update databases on the one hand and, on the other, to gather technical intelligence on what are usually permanent weaknesses in other actors' systems.

Signals intelligence (SIGINT)
SIGINT is the generic term for intelligence derived from data from the electromagnetic spectrum. It includes communications intelligence (COMINT) and electronic intelligence (ELINT).

Communications Intelligence (COMINT)
COMINT is intelligence derived from electromagnetic communications and communication systems by interception and analysis by other than the intended recipients or users. There are two forms of analysis of the intercepted signal. One form attempts to derive the content of the communication (communications - internal); the other is used to investigate the characteristics of the sender or the means of transmission, such as frequency, modulation or encryption (communications - external).

The external part of the intercepted data is processed into COMINT in the same way as it is for ACINT: on the one hand, direct tactical intelligence to support picture compilation and, on the other, subsequent analysis for the benefit of technical intelligence.

Electronic Intelligence (ELINT)
ELINT is intelligence derived from electromagnetic signals (except those used for communications) by interception and analysis by other than the intended recipients or users. This mainly concerns radar signals, but also signals from lasers or from non-imagery infrared systems. Intercepted signals are processed into ELINT in the same way as those for ACINT and external COMINT; on the one hand, tactical real-time analysis and comparison for the purpose of identification and, on the other, subsequent updating of databases and the production of technical intelligence.

Radars are important sensors in maritime picture compilation and weapon employment. The ability to quickly identify radar signals from other parties means that ELINT forms an important branch of maritime tactical intelligence. NATO also recognises the importance of ELINT; the organisation's knowledge about electromagnetic emitters is kept up to date and exchanged via a common ELINT database, the NATO emitter database (NEDB).

Imagery Intelligence (IMINT)
IMINT is intelligence that is derived from the analysis and interpretation of images, which can be obtained by means of various sensors: optical, electro-optical, infrared, multispectral, laser or radar. These sensors can be found on a variety of platforms: on the ground, in vehicles, ships or aircraft or in satellites. In maritime operations, images are mainly collected by sensors on board maritime patrol aircraft, submarines and unmanned aerial vehicles (UAVs) and by maritime special operations forces.

IMINT is used mainly in the preparation of an operation or action. If real-time images and image processing are possible, IMINT can also be used as tactical intelligence during the execution.

Human Intelligence (HUMINT)
HUMINT refers to intelligence that is derived from data collected and provided by human sources. The required data can be obtained through direct observation, a casual conversation (e.g., with a local fisherman or merchant seaman), a debriefing (e.g., refugees) or an interrogation (e.g., suspects). More indirect methods may also be used, such as the recruitment of sources.

Each serviceman or woman can contribute to HUMINT by reporting data they have obtained from observations or conversations with third parties. The targeted collection of information from personal contact, however, is the job of specialist personnel. This collection process may be overt, discrete or covert.[128] Because of their high level of sensitivity, risks and possibly clandestine aspects, discrete and covert HUMINT activities may only be conducted by authorised personnel.[129]

HUMINT can be particularly important in the collection of data and information that cannot be obtained by technical means (SIGINT, ACINT, forensic investigation), for example plans and intentions of opponents. In maritime operations, HUMINT contributes in two ways. The first is at sea, on occasions such as boardings, where there is personal contact with other seafarers. The second is on land in, for example, amphibious reconnaissance, special operations or during port visits, when there is contact with the local population, local authorities and other actors.

128 For further details on the various forms of HUMINT, see AJP-2.3 Allied Joint Doctrine for Human Intelligence (classified).
129 For authorisations within the Netherlands armed forces in respect of HUMINT collection, see CHOD directive A-201 Human Intelligence.

Open Source Intelligence (OSINT)
OSINT is intelligence obtained by means of data from publicly accessible sources, such as radio, television, internet, social media, press and other unclassified media. There is an enormous amount of data available in the public domain. OSINT is generated by combining relevant public data, preferably from sources of differing interest or background, and is the primary source for basic intelligence.

Other types of intelligence
Other types of intelligence categorised according to source or collection method are, for example, geographical intelligence (GEOINT) and medical intelligence (MEDINT).[130] Lastly, intelligence can be gathered by using or hacking digital systems (internet and other computer systems and networks). This kind of digital intelligence gathering is known as computer network exploitation (CNE).

6.7.4 The intelligence process
Intelligence is generated by the intelligence process, which follows the steps described in paragraph 6.2.3: direction, collection, processing, dissemination and display. These steps are performed at each level for every commander, regardless of whether he is in command of a military force, a campaign, an operation or a tactical activity. The execution of the intelligence process at the various staff levels is the job of an intelligence service, intelligence section or intelligence cell (see paragraph 6.7.5). Because the intelligence process makes use of specialist collection and analysis methods, the steps have a number of specific features, which are described below.

130 For a more detailed description of these and other forms of intelligence, see Annex 1 of the Dutch JDP-2 Intelligence and NATO AJP-2.1 Intelligence Procedures, Chapter 2 Section V.

6.7.4.1 *Directing the intelligence requirement*

The **intelligence requirement** is that part of the commander's critical information requirement (CCIR) which can only be met by means of intelligence. A commander will indicate which part of this requirement needs to be prioritised; this is known as the priority intelligence requirement (PIR).

In order to direct the collection of required data, a commander may specify one or more **named areas of interest** (NAIs). If the area in question is one in which (target) data needs to be collected in relation to specific objects or people, then it is referred to as a **target area of interest** (TAI).[131]

In the maritime domain, the information requirement will often relate to vessels. For example, because the position of an enemy (war)ship is not known or because more certainty is required as to the intentions of a ship suspected of smuggling. To direct the process of answering these questions, such vessels are designated in orders and reports with the terms **critical contact or interest** (CCOI), **contact of interest** (COI) or **vessel of collection interest** (VOCI). This term is usually supplemented with an indication of the (type of) reason for the interest, for example military, terrorism or drug trafficking.[132]

6.7.4.2 *Collection of required data and intelligence*

The collection of data and intelligence can follow two different paths. The first is collection by forces that form part of the organisation (organic collection units). In this case, the (priority) intelligence requirement is translated into a mission, possibly ISR, for the unit in question. Examples of this are a submarine deployed for an I&W mission, a ship or maritime patrol aircraft that needs to establish the position and/or characteristics of a (C)COI, or a field HUMINT team (FHT) tasked with ascertaining the intentions of a certain group of actors. The other collection path is followed if the required information is not expected to be found within the organisation. In these cases, the information requirement is sent out to other intelligence staffs, usually higher up in the command structure. This is done by means of a request for information (RFI).

Although every military unit is capable of gathering intelligence, certain forms of collection are reserved for specialist units or services (see paragraph 6.7.6).

It is obviously vital that intelligence personnel retain a good overview of the deployment of assets for the collection of information (the intelligence collection plan, ICP), and of the outstanding questions and those that have already been answered. This subprocess is called collection coordination and information requirements management (CCIRM).

131 See Chapter 10, paragraph 10.5.1 (The targeting process).
132 For the definitions of types CCOI, COI and VOCI, see NATO document MC 0367 – NATO Maritime Surveillance Coordination Concept and the Surveillance Coordination Centres.

6.7.4.3 Processing collected data into intelligence

Answers are fed back from the collection step. Ideally, these consist of high-quality intelligence that answers the questions in full. In that case, no processing is required and the answer can be disseminated to the initiator. In many cases, the collected data still has to be processed, for example to further establish reliability, accuracy and relevance. By complementing the data from different types of sources, collection units and collection methods, intelligence staff will try to enhance the reliability of the intelligence and minimise the risk of deception. This is known as **all-source intelligence**.

A special form of processing involves the use of (remains of) material and documents that have been found or captured. This is known as **exploitation** and can reveal valuable data relating to opponents and their networks, methods and logistics. Exploitation is not always a matter of course; in law enforcement operations (for example, counter-illicit-trafficking and counter-piracy operations), any material found often serves as evidence, which means that it is no longer available for further analysis.

Intelligence products are generated by processing, and the following types of intelligence product are among those used in maritime operations.

- **Intelligence preparation of the environment (IPE)**[133] is the initial all-source intelligence product for the benefit of planning. The IPE should give the commander an idea of the opportunities and capabilities the operating environment offers him and the risks and threats he will face there in the course of his mission or operation. It describes all actors and factors in the operating environment, the ways in which they might affect each other and what possible developments could occur in that environment. This description often involves the use of an analytical framework, for example the PMESII model used by NATO. An IPE lays the basis for a situational awareness common to all those involved in the mission, operation or activity; in most cases, therefore, planning processes start with an IPE.[134] An IPE is not static, however, but represents a springboard for the intelligence process; it continues to run throughout the execution of the operation and is constantly modified with additional, new or improved data and intelligence.

133 In some cases, the terms intelligence preparation of the battlefield (IPB) or joint intelligence preparation of the operational environment (JIPOE) are used instead of IPE. The meaning is the same, however.
134 For further details of working with IPE/IPB and its role in the planning process, see Dutch JDP-2 Intelligence, paragraphs 3.7 and 3.8. For the use of IPE in maritime planning, see *Handboek Maritiem Operationeel Planningsproces*, Question 1.

There are also products that are derived from the IPE for use at tactical and technical level. One example is the '*Herkenningsgids*' (Threat Order of Battle, Threat ORBAT), a book containing data and images of units (ships, aircraft, vehicle and so on) that are expected to be in the area of operations. The purpose of this booklet is to help (duty) personnel with visual identification.

- **Databases**. An important part of the picture compilation process – and thus of the COP – is the ability to quickly recognise and identify detected objects in the area of operations. The use of databases with validated technical intelligence can extensively automate and thus accelerate identification/recognition with the aid of sensors. Because naval ships and military aircraft are equipped with numerous sensors (radar, sonar, electromagnetic and optical sensors), they should also have relevant databases with validated intelligence on the characteristics (parameters) of systems and objects. Examples of these are specific ACINT, ELINT and COMINT databases and the more general weapons and platform databases (which contain all sorts of data about ships, aircraft, sea mines, and so on).

- **Current and target intelligence**. Background data from the IPE and the databases is supplemented during the execution with current and target intelligence. These supplement the picture compilation process by maritime forces, usually in relation to factors and actors beyond the range of friendly sensors.

6.7.4.4 Dissemination and presentation of intelligence

The intelligence generated by the collection and processing needs to be disseminated to the initiator/user and presented to him in the most appropriate form. The methods of dissemination and presentation vary widely according to the product or the user. An IPE may take the form of an extensive briefing of a staff at operational or tactical level (e.g., NLMARFOR) or it might simply consist of a short part of a pre-action briefing of a helicopter crew or a boarding party. An IPE may also form a written part of an OPLAN, OPORD or OPGEN. Current intelligence is disseminated by means of data links,[135] by message (e.g., an INTREP (intelligence report) or an INTSUM (intelligence summary)) or via networks (as a presentation or via shared maps or files).

Because intelligence always consists of high-quality data, it is important that integrity is preserved. Intelligence is therefore disseminated via secure communications and computer networks that are often separated from other information channels and networks. One example of this is NATO's intelligence network, the battlefield information collection and exploitation system (BICES). While the network can be approached via the general NATO secure wide area network (NSWAN), it is only accessible for authorised personnel because of its encryption and access regulations.

135 See paragraph 6.8.1.4 (Disseminating the RMP).

6.7.5 *Intelligence organisation and the intelligence chain*

Intelligence is made up of high-quality and sensitive data. The task of conducting the intelligence process is therefore the domain of specially trained and screened personnel, usually working in specialist parts of the organisation found at each command level, from strategic to technical. Together they make up the intelligence organisation.

As a rule, intelligence organisations are organised nationally; every country has its own armed forces and thus also its own military intelligence organisation.[136] This usually consists of three different elements:

- **A central military intelligence service**. In the Netherlands, this is the Military Intelligence and Security Service (MIVD); in Belgium, it is the General Intelligence and Security Service (ADIV, also known by its military name of Staff Department of Intelligence and Security, ACOS IS). These services not only provide strategic intelligence, but the law also assigns them special powers for intelligence collection and the exchange of intelligence with foreign powers (see paragraph 6.7.6). They also support the intelligence divisions of the operational staffs and units.

  For Dutch staffs and units, this support is provided by a National Intelligence Support Team (NIST) or a National Intelligence Point of Contact (NIPOC). An NIST is a team of intelligence service personnel assigned to a staff or unit; it provides the liaison between the intelligence service and the operational staff or unit. An NIPOC is an official from the staff or unit itself who liaises with the intelligence service if no NIST is available or required. An NIST and an NIPOC strengthen a commander's intelligence process by opening up intelligence sources.

  Instead of an NIST or NIPOC, Belgian staffs and units use a military intelligence liaison officer (MILO). This is an intelligence service official assigned to the staff or unit to boost the intelligence process.

- **Intelligence divisions in the command line**. In principle, every commander at every level has his own intelligence staff, section or cell. This ranges from intelligence staffs at strategic and operational level (J2), via intelligence sections with tactical staffs, to intelligence officials with the units. The Maritime Headquarters Admiral Benelux (MHQ ABNL) in Den Helder and NLMARFOR have their own N2 section and marine corps units have S2 sections.

  Ships of the Dutch and Belgian navies do not have their own organic intelligence section; the intelligence task on board is performed by the maritime intelligence team (MINT). While the members of this team are specially trained for this task, they perform it as a secondary function.[137]

136 In the Netherlands, the Military Intelligence and Security Service (MIVD) does not form part of the armed forces, which are headed by the CHOD. The MIVD belongs to the civil service part of the Ministry of Defence, which is headed by the Secretary-General.

137 For more information about how the intelligence chain is organised in Dutch maritime units and staffs, see ACZSK DOPS 133 *Operationele Inlichtingen* (OPINTEL).

- **Collection and processing agencies**. Some forms of data and intelligence can be collected by military units with their own means. This is particularly true in maritime operations, where ships compile a picture using their own sensors. Other forms of intelligence, however, require special expertise or special equipment and are thus collected by specialist units or individuals. These could be military units, such as those from the Joint ISTAR Command (JISTARC) of the Royal Netherlands Army, maritime special operations forces (MARSOF) or specialist field HUMINT teams. On the other hand, they could also be teams of specialists from the national intelligence service (MIVD or ADIV/ACOS IS). This applies if the form of collection is one that is legally reserved for the national intelligence service (see paragraph 6.7.6).

  Apart from the fact that maritime forces can collect information and gather intelligence with their own sensors and means, they can also function as a platform for specialist intelligence collection. In these cases, they carry specialist personnel and equipment on board, for example SIGINT specialists during a mission to gather strategic intelligence, or IMINT and GEOINT specialists with NLMARFOR in an amphibious operation. This specialised intelligence collection may be performed for the actions of the unit itself (supporting), or as a main task (supported, i.e., the ship provides support for the intelligence activity).

  The same distinction between regular and specialist units or organisations also applies to the processing of data into intelligence. This can often take place within the intelligence chain; in some cases, special equipment and organisations are needed and, in specific cases, processing has to be done by the intelligence service. One example of a specialist organisation in the field of intelligence processing is the Data and Analysis Section of the Maritime Warfare Centre (MWC) of the Royal Netherlands Navy. For Dutch maritime forces, this section functions as the central organisation responsible for the analysis and data management relating to maritime ACINT and ELINT. The MWC also provides technical support for Belgium's Electronic Warfare Coordination Centre (EWCC), which is responsible for the ELINT data management for Belgian maritime forces.

Multinational operations obviously require a shared intelligence organisation, which normally only consists of an intelligence chain of staffs, sections and cells, given that intelligence services and most specialist collection agencies are all organised on a national basis. In maritime operations, which are usually multinational in nature, the shared intelligence chain does itself have access to the intelligence generated by the picture compilation process by friendly ships and units. For the remaining intelligence requirement, recourse will have to be made to national collection and processing capacities. The exchange of nationally classified intelligence is, however, reserved for national intelligence services.

A national intelligence cell (NIC) or a national intelligence liaison officer (NILO) is used to facilitate the exchange of national intelligence with the intelligence chain of a multinational operation. An NIC or NILO forms the link between the national intelligence services and collection agencies on the one hand, and the intelligence staff or cell of the multinational staff or unit on the other. NICs and NILOs are normally found with staffs at operational or tactical level.

To then combine the various national intelligence contributions into one multinational intelligence product, multinational operations usually make use of an intelligence or data fusion cell. This group collates the data and intelligence supplied via national channels and processes it into actionable intelligence for units in the multinational operation.

6.7.6 Position and role of the national intelligence services

Naval ships and military aircraft and helicopters are equipped with a multitude of sensors, enabling them to provide picture compilation and a large part of the intelligence supply for themselves and for the organisation to which they are assigned. The collection of data could, however, represent an infringement of certain basic laws, for example those relating to privacy, inviolability of the mail and medical confidentiality, as well as inviolability of the home and bodily integrity. The use of collection methods that breach those basic laws, such as phone tapping, is a special power that is subject to strict conditions and assurances. These special powers are therefore laid down in national legislation in both the Netherlands and Belgium. In the Netherlands, that is the 2002 Intelligence and Security Services Act (WIV 2002); in Belgium, it is the 1998 Act regulating the intelligence and security services.

Both laws prescribe that the use of collection methods that breach certain basic laws is in principle reserved for the intelligence services (such as MIVD and ADIV/ACOS IS). Certain specific collection methods may only be used by intelligence service personnel, for example the use of agents or cover organisations. Other special collection methods may also be used by other military units during deployment outside national territory,[138] for example, for searching closed areas, intercepting encrypted communications or using informants. The powers for these collection methods should be stipulated in the operation directive or OPORD and are usually reflected in the applicable rules of engagement (ROE).

Both the laws referred to above stipulate that the exchange of nationally classified information and intelligence with intelligence services of other countries is reserved for the national (military) intelligence service. In the specific case of maritime operations, this does not mean that there is a restriction on the exchange of (current) information (picture compilation data) with other ships or units within the group. It does mean, however, that authorisation is required from the MIVD or ADIV/ACOS IS if analysed and validated national intelligence (e.g., parametric data from national ACINT or ELINT databases) is to be made available to other countries or to multinational organisations, such as NATO or the EU.

138 The Dutch armed forces are governed here by the policy of Directive SG A/974 concerning operational deployment of intelligence means in military operations abroad.

6.8 Maritime picture compilation

Situational awareness of the positions, capacities and intentions of opponents and other actors is generated by intelligence and picture compilation. The previous section set out the contribution of maritime intelligence. This paragraph sets out how, by means of picture compilation, a recognised maritime picture (RMP) is compiled and shared. This RMP represents the maritime contribution to the common operational picture (COP), in particular the red and white pictures within it.

Picture compilation is the collection, processing and dissemination of data obtained through observation and sensors, both the unit's own and those of other units in the same organisation or task group. It relates mainly to the real-time picture at the tactical and technical levels. The picture compilation product, the RMP, serves as a basis for and helps to consolidate the real-time picture at the operational and strategic levels.

Picture compilation is a continuous activity and not just during operations. There must be picture compilation for every moment that a ship is at sea, for the purpose of safe navigation and protection. Even if a ship is at anchor or berthed in port, picture compilation continues for the purpose of ship security.

Picture compilation is the execution of **intelligence, surveillance and reconnaissance** (ISR). As the term suggests, it thus involves three types of activity:

- **Intelligence** gathering means, in picture compilation, the collection of data or intelligence for further processing in the intelligence process.

- **Surveillance** is the process of using all possible means for the systematic and continuous observation of the area for the purposes of compiling a real-time picture. It is conducted under all circumstances: each unit observes its own immediate area and compiles a picture accordingly. Surveillance may also be a task assigned to a unit: the observation of a specific area or specific objects in an area. An example of the latter is a maritime patrol aircraft that is tasked with surface surveillance: detecting the presence of ships and, if possible, establishing the identity and intentions of those ships.

- **Reconnaissance** is the targeted search for data or intelligence relating to certain actors or factors, usually in a limited area. Reconnaissance (recce) is usually assigned as a task. It can be conducted by specially equipped reconnaissance units, for example maritime special operations forces (MARSOF) reconnoitring a landing beach. Other units may also be given a reconnaissance task; for example, a ship, submarine or aircraft that is sent out to locate an enemy flotilla. A recce task is often designated by its target (e.g., a beach recce or an ice recce) or by the method of data collection (such as radar reconnaissance).

Maritime picture compilation takes two forms which differ in terms of environment and method: picture compilation by ‘manned equipment’ and that by ‘equipped men’.[139]

The first form is picture compilation as it is performed at sea by platforms (ships, submarines, aircraft). Typical features here are that a platform has more than one type of sensor and that the data from those sensors are normally presented and processed in a central area or central information system. Another characteristic is that picture compilation is geared towards the detection of objects (ships, aircraft, guided missiles, submarines, sea mines) or signals being emitted by such objects (radar signals, acoustic noise). The area covered by this form of picture compilation is vast. Even at the technical level, it may extend to hundreds of nautical miles surrounding a platform or task group.

The other form of picture compilation is used when operations are conducted by a team in an area where other people are present. In maritime operations, this second form not only occurs in land-based actions, such as an amphibious or special operation, evacuation or relief action; it also occurs in boardings or when a ship is in port. The hallmarks here are the strong emphasis on humans as sensors, the dispersion of these human sensors over the object or the area of operations and the fact that picture compilation is partly geared to the positions and intentions of individuals. The area covered at technical level by this form is much smaller, a few nautical miles (or kilometres) at most.

139 See also Chapter 5, paragraph 5.5.2, about C2 at technical level.

6.8.1 Picture compilation by ships, submarines and aircraft

Picture compilation is geared towards obtaining information about human activity. In large sections of the maritime domain (the sea, the air and outer space), human activity can only take place with the use of fixed or movable objects: ships, aircraft or other installations. Maritime picture compilation is thus geared towards the collection of data relating to these objects.

The natural features of the maritime domain affect the capabilities for picture compilation at sea.

- Ships on the sea surface cannot conceal themselves from visual observation or radar detection. However, the vastness of the surface of the oceans and seas means that only small areas can be constantly monitored. Permanent surveillance of larger areas requires the use of aircraft or satellites. Particularly on the high seas, ships can remain undetected for long periods, especially if they make no active emissions (no use of radar or sonar, sailing under blackout conditions), have a limited signature (low levels of radar reflection andnoise emissions) and keep well away from busy shipping lanes.

- The water below the sea surface offers better possibilities for remaining undetected for longer periods, for submarines and sea mines, for example. Water is largely impenetrable for visual observation or for radar, and sensors that do penetrate water, such as sonar, usually have a limited range.

- Compared to the high seas, coastal waters offer more possibilities for avoiding detection. as heavy shipping traffic and the presence of islands and other obstacles hamper the picture compilation process.

- The range of most sensors (radar, sonar, human eye) depends on conditions in the environment (temperature, pressure, air humidity (fog), rain, sand). It is therefore important to understand the influence of these factors, not only to ensure optimum use of friendly sensors, but also to be able to avoid detection by others.

The purpose of the maritime picture compilation process is to establish positions, capacities and intentions of objects in, on and above the sea: the recognised maritime picture (RMP). Because picture compilation revolves around data processing, it follows the same pattern as the intelligence process: direction, collection, processing, dissemination and display.

6.8.1.1 Directing the picture compilation

The requirements for maritime picture compilation are specified by the maritime commander (MCC, CTF, CTG) and set out in the OPORD and the OPGEN. He will issue supplementary instructions for the sub-areas (air picture, subsurface picture, surface picture) in the relevant OPTASKs. The OPTASK AAW, for example, contains the instructions for compiling the recognised air picture (RAP).

In his instructions for picture compilation, the commander will include the following specifications:

- the area in which picture compilation is needed (area of interest, surveillance area);
- the positioning of forces within that area, based partly on the (anticipated) range of the various sensors;
- the division of duties in the picture compilation process;
- the criteria for recognition and identification;
- the priorities.

These instructions for picture compilation always depend on the prevailing situation and the mission of the task group or the unit. A change in circumstances or a change of task will thus necessitate reconsideration and possible adjustment of the picture compilation.

6.8.1.2 Data collection for picture compilation

Data relating to objects in the area are collected by a variety of sensors, many of which have been specifically developed for the purpose:

- **Radar**. Early warning radar is the main system for the detection of objects in the air and on the water. Some radar systems, such as the inverse synthetic aperture radar (ISAR), can also distinguish silhouettes at long range and thus contribute to object identification. If highly accurate and current data are required for a particular object, for example for weapon employment, directable fire-control radar will be used.

- **Sonar**. Sonar systems function as sensors under water and can be used either actively or passively.[140] that occur under water: propeller noise, hum of ships' engines, sounds made by animal life and even the noise from low-flying aircraft and helicopters. Not only can it detect the presence of sound sources, but in many cases it can also determine the direction and characteristics of the sound or noise. It is the characteristics of the sound that are particularly important for recognition.

- **Optical and thermal sensors**. The naked eye and daylight, night-vision and infrared cameras are important sensors in object recognition.

- **Electronic warfare support measures** (ESM). Special sensors used to pick up electromagnetic signals, for example from radar and radio transmitters. Similarly to passive sonar, ESM devices can determine the presence and usually also the direction and signal characteristics, making them valuable for both detection and recognition.

- **Identification systems**. AIS (see box at paragraph 6.3.2.2) is important in the identification of (civil) shipping. IFF (identification friend or foe) is a useful aid in the identification of warships and aircraft.

6.8.1.3 Picture compilation data processing

Data collected by friendly sensors are brought together in the C2 system (TDS, CMS) of a ship or aircraft, where they are merged with data received from other units and with supporting data from databases and intelligence. The purpose of processing is to establish as clearly as possible the positions and intentions of all relevant objects in the area. To do so, the following steps are performed: detection, localisation, recognition and identification.

- **Detection** is the observation of the presence of an object. This may occur because the object itself is picked up by a sensor, for example in the form of a radar or sonar echo, or with the naked eye. In this case, there is said to be 'contact'. Detection may also occur, however, because signals emitted by an object are picked up, for example a radar signal, the sound of a foghorn or propeller noise.

  Every detection of a contact is recorded in the C2 system, creating a **track**. The combination of different detections that seem to relate to the same object is called **correlation**.

140 See box in Chapter 1, paragraph 1.2.1.

Radar, optical equipment, IFF and radio transmitters and receivers in the integrated mast of a Dutch ocean-going patrol vessel (Photo: Edwin Benschop)

- **Localisation** is the determination of the position and movements (course, speed) of an object. If there is a (radar or sonar) contact, the position and movement of the detected object (track) can usually be determined and calculated fairly easily. In many cases, only the determination of altitude (in the air) or depth (under water) is less straightforward. Localisation is considerably more difficult if detection consists only of the direction (bearing) of a received signal, as is the case with ESM or passive sonar. In these cases, localisation can only be done by combining bearings for different positions (by triangulation from several stations or by target motion analysis (TMA)). It is not usually possible to determine altitude or depth on the basis of bearings.

- **Recognition** is the determination of as many characteristics of a detected object as possible. This is done by combining all available data: not only those from various sensors, but also those provided by intelligence and databases.

  First of all, the nature (category) of the object needs to be established: subsurface, surface or air. There is often little room for doubt, as active sensors such as radar and sonar are usually set for a specific category of object. In some cases, however, the nature of an object is more difficult to establish. A radar contact that is not moving could be on the surface (a ship, a drilling rig or a rock), or it could be a helicopter hovering in the air.

  Once the category of object has been established, the question of whether the object is of natural origin will be considered. A moving sonar contact is not necessarily a submarine; it could also be a whale or a shoal of fish.

If it is clear that the object in question is a submarine, ship or aircraft, the next step is to determine whether the object is civil or military. After that, further recognition must follow to ascertain nationality, type of vessel or aircraft, and so on.

In his picture compilation instructions, the commander will indicate how and to what level of detail recognition needs to be performed. Because of the differences in areas, each category (air, surface and subsurface) has its own system. For surface ships, the system uses **recognition levels** (RECLEVEL) and the associated recognition confidence levels (indicated as certain, probable or possible).[141] For subsurface objects, there are two systems, each of which uses **classification**. Antisubmarine warfare uses the classifications CERTSUB (certain submarine), PROBSUB (probable submarine), POSSUB (possible submarine) and NONSUB (not a submarine).[142] In naval MCM operations, the classifications are mine-like objects (MLOs) and non-MLOs. There is no separate system of recognition levels for aircraft; identification criteria are used instead.

141 For the definitions of recognition confidence levels, see ATP-1 Volume 1 article 6243.
142 For definitions of submarine contact classification terms, see ATP-1 Volume 1 article 9202.

- **Identification** is the allocation of one of the standard identities.[143] The aim is to allocate positive identities only: hostile, friendly or neutral. If the identity is still uncertain, it can be designated as assumed friend, suspect or unknown. In these cases, more data will need to be obtained in order to make a positive identification.

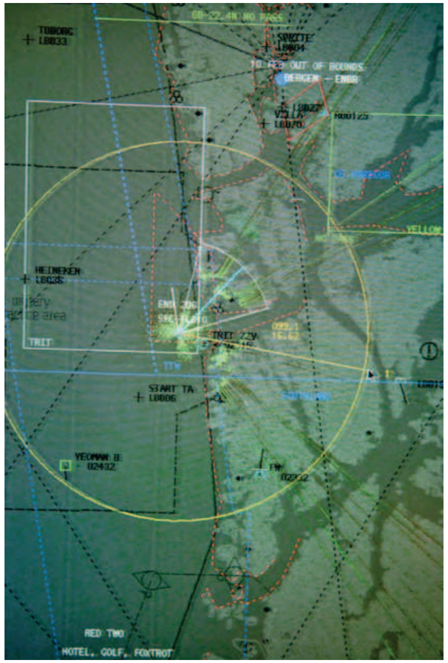
As for recognition, the allocation of identity also depends on the criteria set by the commander. These **identification criteria** (IDCRITs) are usually made up of a combination of observations and behaviours.[144] An identity is allocated to an object that meets that combination. It could thus be determined that a ship that is approaching at high speed and not responding to calls via the maritime VHF radio is initially ‘suspect’, and only designated as ‘hostile’ if weapons are visible.

The standard identities were originally developed for use in combat operations, in which actions are directed at a military opponent (naval and air forces). For other forms of maritime operation, for example law enforcement and embargos, the standard identities do not provide sufficient discriminatory capacity. In such cases, identities are supplemented with separate identifiers, e.g., a ‘cleared vessel’ (cleared following a search) or a ‘diverted vessel’ (detained for further investigation).

143 The identities used are standardised in NATO in STANAG 1241 - NATO Standard Identity Description Structure for Tactical Use.
144 For examples of commonly used maritime identification criteria, see Table 6-1 in ATP-1 Volume 1.

The steps listed for the processing of data for picture compilation do not necessarily proceed in the order stated. The time needed to perform the steps may also vary considerably. The detection of the signal from a characteristic radar of an enemy combat aircraft may, for instance, lead directly to a positive identification and thus to the immediate deployment of defensive measures. On the other hand, it may take hours before the process of localisation, interrogation, boarding and searching of a merchant vessel has been completed and the presence of contraband on board has been established.

The picture compilation process does not stop once one of the three positive standard identities has been allocated to an object. Available data relating to all known contacts also needs to be constantly verified and updated. The various steps will need to be repeated or even restarted from the beginning if, for example, an identified object has disappeared from view and a new contact is detected in the same position, such as an aircraft that has been out of radar range or a submarine with which sonar contact was lost.



Picture compilation: display on a CMS monitor on board a frigate

6.8.1.4 Disseminating the RMP

The result of the continuous process of collecting and processing data is the maritime picture. Each unit (ship, submarine, aircraft) will in principle compile its own picture, based on data from its own sensors and sources. The aim is, however, to compile the best possible common and shared picture: a recognised picture that contributes to the common operational picture (COP).

Data links are used to enable collaboration with other units for the purpose of picture compilation. A data link connects C2 systems from different units with each other, thus enabling real-time sharing of picture compilation data with other units, not only within the organisation but also outside it. In reverse, units can also use a data link to supplement their own picture with data from units and sensors outside their own organisation, for example maritime patrol aircraft or satellites. Data link also enables picture compilation to be done by a single unit, which will then distribute it to others. This may be the preferred option if there are reasons for using as few active sensors as possible, for example to avoid detection or recognition. In such cases, one unit operates as (for example) a radar guard.

Maritime forces use the following data link systems, which are used by NATO countries and a number of other partner nations:[145]

- **Link 11** is the primary maritime tactical data link, which enables the automatic exchange not only of data relating to all forms of picture compilation, but also of the status of weapons and sensors of friendly units. It is also suitable for giving orders for the employment of weapons. Link 11 can be used on both UHF and HF radio frequencies. It is flexible in use: it is easy to set up a Link 11 network and adjust the number of participants. Although the data traffic is encrypted, Link 11 is vulnerable to jamming. Link 11 is not only used by ships and submarines; many types of maritime patrol aircraft and helicopters are also equipped with it. By using shore-based ship-shore-ship buffers (SSSB) or AEW (airborne early warning) aircraft, Link 11 can be used for the exchange of recognised (air) pictures with combined air operations centres (CAOCs).

  Dutch submarines, large Dutch surface ships (frigates, amphibious assault ships, ocean-going patrol vessels and supply ships) and Belgian frigates are all equipped with Link 11, as are the NH-90 maritime helicopters.

- **Link 16** is a data link that uses more sophisticated techniques and is thus less vulnerable to jamming. It is, however, less flexible: much planning and preparation is needed to set up a new network or adapt an existing one. Generally speaking, Link 16 has limited range, as it uses specific UHF frequencies. An additional disadvantage is that use of these frequencies is not permitted in all parts of the world because of interference with civil communication systems. In some cases, Link 16's range can be increased by using satellites. Although it is suitable for all forms of picture compilation (surface, subsurface and air), the emphasis is usually on picture compilation and orders for air defence and ballistic missile defence.

  Link 16 is available on the four Dutch LC-frigates, on the two Dutch and the two Belgian M-frigates and on the LPD HNLMS Johan de Witt. Furthermore, the Dutch and Belgian F-16 fighter aircraft, the Dutch Patriot air defence missile system and the Dutch ground-based air defence system (GBADS) are also equipped with Link 16.

145 Further information about these data links can be found in the Dutch MDP *Gebruik van datalink* [use of datalink] and in the NATO publication ADatP-33 Multilink Standard Operating Procedures.

- **Link 22** is the planned successor to the technically outdated Link 11 as the primary maritime tactical data link. It combines the sophisticated technology of Link 16 with the flexibility of Link 11: it is more resistant to jamming, can function on both UHF and HF, and the task of setting up and managing a network has been greatly simplified. Because of the similar protocols, the exchange of data (data forwarding) between the different networks (both Link 16 and Link 22) is also easier.

  Link 22 will replace Link 11 in all units currently equipped with it: the Dutch submarines, the large Dutch surface ships (frigates, amphibious assault ships and ocean-going patrol vessels) and the Belgian frigates.

The recognised maritime picture (RMP) compiled by maritime forces is not only used for the purposes of direct task execution at technical and tactical levels; it also serves as the maritime contribution to the common operational picture (COP), which is used for situational awareness at operational and strategic levels.

For the maritime contribution to the COP, NATO uses the maritime command and control information system (MCCIS), which is not a real-time tactical C2 systems, but a operational information system. It is therefore not linked to sensors or weapon systems. The operational picture in MCCIS is fed by units' C2 systems (TDS, CMS), by data link networks and by message traffic. MCCIS is not geographically limited and can thus in principle reflect the maritime situation all over the world.

Because the content of MCCIS comes from a variety of sources (ships, aircraft, headquarters), there is a high risk of conflicting data; NATO agreements have therefore been made regarding RMP management in MCCIS.[146]

The surface ships and submarines of the Dutch and Belgian navies are equipped with MCCIS. The binational maritime headquarters (MHQ ABNL) in Den Helder also has MCCIS; here, data supplied by the ships are filtered and transmitted for the RMP at NATO HQs (see box).

6.8.1.5 Displaying the compiled RMP

Picture compilation is not an objective in itself, but a means of supporting C2. The result of the (shared) picture, the recognised maritime picture (RMP), is thus displayed at locations where C2 is conducted.

On board ships and submarines, that is in the operations rooms, on the bridge and in the staff areas if applicable. For maritime aircraft and helicopters, it is at the position of the tactical coordinator (TACCO) and/or mission commander (MC) of the aircraft or helicopter. The C2 system (TDS, CMS) of the ship or aircraft is key here: this is where the real-time processing of the (sensor) data takes place, where the resulting picture is displayed and where a direct link with weapon systems is possible.

146 These agreements are set out in the NATO Recognized Maritime Picture Standard Operating Procedures (RMP SOP).

Coordination of maritime surveillance in NATO

NATO's primary task is to defend the territory of its member states. To support this task and the various operations it conducts, NATO needs the best possible situational awareness. The maritime element of this -maritime situational awareness (MSA)- is created by **maritime surveillance**: the coordinated collection of relevant data relating to the maritime domain. These data concern not only military forces, but also other ships and aircraft that are of interest from a security perspective (CCOI, COI and VOCI, see paragraph 6.7.4). The collection is in principle performed by all maritime forces of the member states. The collected data are submitted to NATO directly or via national HQs by means of the maritime command and control information system (MCCIS), Coordination of this permanent surveillance rests with the Surveillance Coordination Centre (SCC) that is incorporated in NATO's Maritime Component Command (MCC) in Northwood (England).[147] The SCC supplements the supplied data with details from (national) intelligence channels. Information about civil shipping is then added, having been obtained from the NATO Shipping Centre (NSC), which is also based in Northwood.

In principle, Dutch and Belgian naval ships contribute constantly to this permanent surveillance by transmitting relevant data from their own picture compilation via MCCIS to the MHQ ABNL in Den Helder. This HQ then forwards these data to the SCC, filtering the data or applying corrections if necessary.

For staffs and HQs, the RMP is presented by means of MCCIS. The staff or HQ does not necessarily need to have its own MCCIS; MCCIS content is also available via the RMP application on the NATO Secure Wide Area Network (NSWAN).

6.8.2 Picture compilation by teams

The previous paragraph described maritime picture compilation as performed on board ships and aircraft and in HQs and staffs, where sophisticated sensor and information systems are used to ascertain the positions and intentions of other ships and aircraft.

Maritime operations also involve another form of picture compilation, namely in the event of actions by teams in an area where other people are present, as in the following examples:

- land operations, such as an amphibious operation, a special operation, an evacuation or a disaster relief action;
- a boarding, for example as part of an embargo or counter-illicit-trafficking operation;
- protection of a merchant vessel, or a naval ship that is moored or at anchor.

147 See NATO document MC 0367 – NATO Maritime Surveillance Coordination Concept and the Surveillance Coordination Centres.

There are several reasons why this form of picture compilation differs from that on board ships and aircraft. Firstly, this form of picture compilation is not confined to localisation and identification of larger objects such as vehicles, but extends to positions and intentions of individuals and to small objects that are difficult to detect, such as weapons, explosives, drugs, and so forth. Secondly, humans themselves are the main sensors in this form of picture compilation. Thirdly, these 'human sensors' are not in one central location, but spread throughout an object (ship, installation) or over a section of terrain. Furthermore, the team members are often out of sight of each other, not only in the terrain, but also, for example, in a boarding if the team is moving around a ship that may be unfamiliar to them.

This has repercussions for the way in which the required situational awareness can be created. Firstly, automation of the picture compilation process is not easy, as humans are the main sensors; this means that each observation first has to be fed separately and manually into a system. Furthermore, because a team is normally dispersed throughout an object or section of terrain, there is a strong emphasis on man-portable communication devices (personal radios). Because team members often operate out of sight of each other, there is much emphasis on the (preferably automatic) exchange of positional data for friendly troops. Lastly, specialist search techniques are required in many cases to find small or deliberately concealed objects (see box on Maritime search).

Picture compilation by teams: amphibious troops and boarding party

In operations with teams, picture compilation at technical level - so between the team members - is performed mainly by means of communication. The NIMCIS used by the Netherlands Marine Corps is thus primarily a means of communication, in which only the positions of friendly troops are automatically visible.[148] At tactical level, if there is a requirement in the main command post (MCP) or the joint operations room (JOR) for an overview of several teams in a larger area, this form of picture compilation is supported

148 See Chapter 5, paragraph 5.11.1 (Maritime C2 systems)

by information systems, such as the NIMCIS combat application. This is thus often the point at which this form of picture compilation and the intelligence process meet.

A similar situation arises in a boarding or protection of a ship or other object. The operations room thus forms the command post, the point at which the reports by team members are collated and processed in a plot and from where intelligence obtained elsewhere is disseminated to the team members.
Just like the MCP or the JOR, the operations room forms the link for transmitting the compiled picture to other units and staffs. One example of this is the reporting of the results of a boarding.

Picture compilation: display on an NIMCIS monitor

Maritime Search

The creation of the required situational awareness may mean that a particular area (terrain, building, ship) has to be checked for the presence of poorly detectable small objects, such as weapons, IEDs, drugs or documents. This thorough and systematic check is referred to as military search.[149]

Military search was originally conceived as a method in the battle against IEDs and other forms of irregular threat. The specialist search techniques used in military search are, however, also useful in other military activities, such as searches of ships in anti-smuggling operations. Military search not only aids picture compilation, but is also useful in the collection of intelligence relating to means and methods of an opponent and in securing evidence for criminal prosecution. Military search also supports force protection by establishing safe routes.

In the maritime domain, however, the search is not only for materials that can be found on land or on board a vehicle, aircraft or ship. Subsurface searches also need to be conducted, for example on the ship's hull, on maritime installations, at quays and anchorage sites or at sites used for amphibious landings. The use of military search in the maritime domain is therefore referred to as **Maritime Search**. >

149 For more details, see ATP-73 Military Search.

Like military search, maritime search has three levels, both on and under the surface:

- Maritime basic search is a basic skill of all naval and marine corps personnel that allows them to recognise hazardous materials (such as IEDs), for example when inspecting embarking goods and people.

- Maritime intermediate search is a higher-level skill that is needed to be able to safely perform activities in an environment with a heightened IED risk or to search for specific materials, for example in boardings.

- Maritime advanced search covers the full range of required skills and equipment. This level is a requirement for personnel whose main task is maritime search, such as divers and personnel responsible for explosive ordnance disposal.

Subsurface maritime search in particular makes use of specialist equipment, in many cases fitted with sonar. An example of such equipment is the REMUS unmanned underwater vehicle (UUV), which enables large areas under water to be searched quickly and thoroughly.[150]

Maritime intermediate search of ships during a boarding

150 See Chapter 9, paragraph 9.2.9 (Unmanned systems).

6.9 Integrated maritime situational awareness (MSA)

The purpose of the military intelligence function is to support C2 by providing as complete and current a picture as possible of the natural environment and the actors within it. This chapter has placed the emphasis for the creation of maritime situational awareness on military units and organisations. Besides the military organisation, however, there are many other government and civil organisations which, because of their tasks and interests, have a requirement for a real-time maritime picture; for example, the coastguard, police, customs, immigration services, fisheries inspectors and port and airport authorities.

There are several reasons why it is logical for maritime forces to cooperate with these organisations in respect of intelligence and picture compilation. Firstly, both parties will benefit. The military picture supplements the picture compiled by the organisations involved; in reverse, the data supplied by these organisations helps to enhance military situational awareness. Furthermore, maritime forces may also be deployed for tasks directly concerned with these civil organisations, namely law enforcement and security in, on and above the sea. Interagency cooperation with other civil maritime and aviation organisations is thus perfectly in keeping with the comprehensive approach: the coordinated deployment of a state's instruments of power.

6.9.1 National exchange of civil maritime data and intelligence

Government tasks such as defence, law enforcement and control are by definition organised on a national basis. In the first instance, therefore, maritime information is exchanged via national organisations and is virtually always focused on a limited part of the sea, namely the internal waters, territorial waters, the contiguous zone and the EEZ. Because multiple organisations are involved, most countries use a central point at which the exchange of maritime data and intelligence is coordinated and which in effect functions in the same way as an intelligence fusion cell in multinational military operations (see paragraph 6.7.5).

The Netherlands and Belgium have opted for the establishment of a **Maritime Security Information Centre** (MIK in Dutch). In the Netherlands, the Coastguard Centre in Den Helder functions as the MIK for Dutch waters. In the Caribbean, this role is filled by the Coastguard Centre in Curaçao. In Belgium, the MIK is based in Zeebrugge.

6.9.2 International exchange of civil maritime data and intelligence

Because most of the sea is designated as global commons, its use is free to everyone. Information about the use of the sea cannot therefore be restricted to national channels and organisations. International cooperation is taking place with increasing frequency in relation to information on maritime law enforcement and security. That international cooperation is, however, often limited to a specific area of interest, such as efforts to counter drug trafficking or illegal immigration. Furthermore, regional cooperation exists in many cases.

Examples of international interagency exchange of civil maritime data and intelligence are:

- **Maritime Analysis and Operations Centre – Narcotics** (MAOC-N): a Lisbon-based centre that focuses on countermeasures against drug trafficking over the Atlantic Ocean to Europe. MAOC-N is a platform for cooperation by a number of western European countries, including the Netherlands.

- ***Frontières extérieures*** (FRONTEX): a European Union agency, focusing on border control of the Schengen countries. Within FRONTEX, data and intelligence are exchanged in relation to illegal immigration, thus including that by sea.

- **Virtual Regional Maritime Traffic Centre** (VRMTC): a cooperation platform of countries around the Mediterranean and the Black Sea that deals with general shipping information.

- **Joint Interagency Task Force South** (JIATFS): a US-led collaborative group targeting illicit trafficking in the Caribbean. The Netherlands Flag Officer in the Caribbean (CZMCARIB) also serves as the JIATFS subordinate commander (CTG 4.4).[151]

6.9.3 Exchange of civil maritime data during maritime operations

Virtually every maritime operation is conducted amid other users of the maritime domain. Some maritime operations are even specifically directed at those other users (an embargo, for example) or are conducted for the benefit of seafarers (for example, counter-piracy operations). Regardless of where such maritime activities are conducted, it is thus always useful to exchange information with civil maritime organisations from the nations involved and from those that border the area.

Not all coastal states have a coastguard or another organisation tasked with law enforcement and security at sea. It may also be the case that there is such an organisation but that it cannot do its job adequately, if at all. In such cases, it may be in the interests of the maritime operation for maritime forces to assist in setting up and/or improving local maritime security organisations (maritime capacity building as part of security sector development (SSD)).

151 See box 'Counter-illicit-trafficking operations in the Caribbean' in Chapter 12, paragraph 12.4 (Maritime interdiction operations).

7. MARITIME FORCE PROTECTION

7.1 Introduction

Maritime operations are defined as the pursuit of objectives in the maritime domain through the use of military power. This military power is made up of three elements. Firstly, there must be availability of means: materiel, personnel and information (the physical element). Then there must be ways of using those means effectively (the conceptual element). Thirdly, there must be the will to achieve the required objectives with the available means and ways (the element of morale).

For a commander, it is of the utmost importance that his military power be maintained during all stages of an operation. Military power will be undermined if one or more of the three elements – means, ways and/or will – are affected. If the ways of operating are jeopardised or if the will to conduct the operation is at risk of crumbling, there is said to be a **threat to the mission**. Countering this damage to military power is the domain of the joint function 'manoeuvre', which is discussed in Chapter 10. If the military means or the morale (will) is at risk, then there is said to be a **threat to the force**. This is countered by the joint function 'force protection', which is examined in this chapter.

Military means encompass the personnel, the materiel and the information available to a commander, and these means are affected in the event of:
- casualties, illness and fatalities, missing or captured personnel;
- damage to morale;
- breakdown, damage or loss of materiel;
- corruption or loss of data.

To be able to maintain the military means, every possible effort must be made to prevent these situations from arising: military means must be protected. The force protection function concerns all measures and means designed to prevent or minimise the effect of potential threats on friendly military means.

Force protection is essential to enable observance of the principles of military operations. Not only does it provide the safety and security necessary for maintaining operational effectiveness and freedom of action; protection of own and friendly personnel, materiel and information also means that surprise actions can be conducted and that sustainment and morale can be maintained. Force protection thus contributes to the success of the mission.

The joint function 'force protection' is not the same as the strategic function 'protection'. In the **strategic** function, military power is used to protect national or allied interests, whereas the **joint** function is geared towards the protection and preservation of military means. In some cases, one function may be an extension of the other, or the two might overlap. The protection of merchant shipping against piracy, for example, is a maritime operation in the context of the strategic function of protection. If these merchant ships also form part of a strategic sealift, then naval escort ships will also provide force protection for that military transport.

There are, however, a number of specific threats in the maritime domain (such as enemy warships or sea mines) as well as specific dangers (such as high waves and shallows), and military means also need to be protected against these specific maritime threats and hazards. This chapter looks at all forms of threat and hazard that could harm military means, although the emphasis will be placed on protection against the potential threats and dangers specific to the maritime domain.

This chapter begins with an overview of different causes and effects of damage to military power, and will then set out the principles that apply to effective protection against them. It will then look at how risk management can be used to produce effective protection measures. The four forms of protection will then be examined: first safety, then prevention of mutual interference, followed by military security and finally defence. In each of the four forms, emphasis will be placed on the potential dangers and threats specific to the maritime domain. After discussing the use of force in protection and defence, the last part of the chapter will look at ways to control and repair the damage sustained.

7.2 Causes and effects of threats and hazards

7.2.1 Causes

Protection revolves around the preservation of friendly military means, which can be affected by a multitude of threats and dangers, with three different causes.

First of all, military means may be damaged by **accidents** or by **unfavourable conditions**. Such cases are said to involve a **hazard**, caused by the prevailing conditions, by human action or by a combination of the two. Hazardous situations arise because of events or conditions such as fire, disease, climate (excessively high or low temperatures, pressure), weather conditions (storms, wind seas and swells, lightning strikes), hazardous materials (explosives, chemicals, high voltage) and transport (traffic accidents, collisions, stranding).

Military means may also be compromised by **unintended negative effects resulting from own or friendly actions**. In this case, there is said to be **interference**, the most serious form of which is an attack by friendly units, known as friendly fire (fratricide, blue-on-blue).
Other forms of interference occur when units are ‘in each other’s way’. This could be in a physical sense, if, for example, different units all want to use the same stretch of water or airspace for their own task. Interference could also occur in the electromagnetic and acoustic spectra, for instance if one unit’s radar, sonar or radio transmission devices have a damaging or negative effect on another unit’s personnel and/or equipment.

Lastly, there may also be **deliberate damage** to military means by an adversary. This is then said to be a **threat**, often of a military nature, which could consist of targeted attacks with weapons of mass destruction, guided missiles or torpedoes, IED attacks, sabotage, espionage, disruption to information flows or the influencing of personnel. A threat may also emanate from criminal activity, such as theft, hostage taking, extortion or piracy.

7.2.2 Effects

Hazards, interference and threats can have an adverse effect on military means: personnel, materiel and data.

- Adverse effects on personnel are said to be the case if those personnel are rendered incapable of being (fully) employed. These adverse effects may be physical or psychological. Physical damage could mean death, injury, illness, extreme fatigue, disappearance or capture. Psychological effects mean damage to morale, psychological resilience or mental capacity.

- Material damage occurs in the event of breakdown, damage or loss of equipment.

- With regard to data, three different adverse effects could occur. Firstly, access to information could be disrupted (damage to accessibility). Secondly, data could be corrupted (damage to integrity). Finally, data might fall into the wrong hands (breach of exclusivity or confidentiality, compromise).

The purpose of force protection is to prevent or at least minimise these adverse effects.

7.3 Principles of force protection

Force protection is intended to preserve military power so that the mission can be successfully executed and completed. Full force protection could, however, impede the execution of a mission. A commander will need to find a responsible balance between full force protection on the one hand and the execution of the task on the other. Ultimately, it is about achieving the assigned objective and not purely about protecting friendly forces. Force protection therefore requires a constant balancing between risk taking and the implementation of protective measures.

Adequate protection is based on the following principles:

- **A well-founded assessment of threats and hazards**. Protection against a non-existent threat is pointless. Ignoring a real threat, however, is highly dangerous. The right level of protection should therefore be based on the best possible assessment, during both preparation and execution, of all the threats and hazards that could arise; for this, optimum situational awareness based on intelligence and picture compilation is indispensable (see Chapter 6). A commander who understands the threats and hazards knows where he can allow risks to be taken, thus giving himself room to concentrate his means to achieve his objectives.

- **Risk management**. Force protection should be based on the management of risks rather than the elimination of every possible risk, as the means available to a commander are always limited. Economy of effort requires that a commander take risks where he can and reduces risks where necessary.

- **Prioritisation**. In practice, it is not usually possible to protect or defend all elements or units to the same level. This means that priorities have to be set, with the highest priority being given to the force's own centre of gravity, to units that are vital to the completion of the mission (mission essential units or high-value units, HVUs) or to essential elements of friendly information (EEFI). At the tactical level of maritime operations, priority is usually on the protection and defence of the aircraft carrier, the amphibious assault ships or the convoy. At the technical level of maritime operations, a (ship's) commanding officer clearly specifies the protection priorities in his command aim and his command priorities. Prioritisation often means that a commander must choose which threat or hazard should be managed or countered as a priority. The focus should in principle be on the most obvious threat: 'fight the known threat'.

- **Jointness**. Protection against threats and dangers is enhanced if all available units have synchronised their measures and are supporting each other. This applies not only to military units but also to friendly actors such as merchant navies or local authorities. Jointness ensures unity of effort and facilitates a layered defence. It also means that protection is something provided by everyone for everyone. Each pair of eyes and ears is needed to detect and then respond to potential threats and hazards.

- **Flexibility**. The threats and hazards that could affect military power are not only diverse and complex, but are also subject to change. Force protection can, therefore, only remain adequate if there are sufficient capabilities to anticipate changing threats and hazards: to tighten up protective measures, but also to relax them. Force protection requires constant attention and constant adjustment.

7.4 Risk management

Hazardous situations, interference and threats put military personnel, materiel and/or data at risk. The purpose of force protection is to implement measures to minimise the risk of danger and, if a threat or hazard arises, to limit the adverse effects as much as possible. Force protection is said to be adequate if potential threats and hazards have been identified, the associated risks have been assessed and steps have been taken to manage them.

The process that leads to adequate force protection is called **risk management**. It is a logical and structured process that highlights risks and thereby makes them manageable. Risk management ensures that personnel, materiel and data are exposed to the lowest possible risk, while maintaining the effectiveness of an action or operation at as high a level as possible.

7.4.1 Risk management as a process

Risk management is made up of the systematic execution of the following steps:

- threat assessment;
- criticality and vulnerability assessment;
- risk assessment;
- identification of measures to manage risks, evaluation of their effect and of the residual risk;
- implementation of risk controls;
- supervision of the intended effect of the measures taken and review if necessary.

Decision making about force protection is part of C2. The C2 cycle (analysis, planning, execution and assessment)[152] is therefore reflected in the risk management steps. Similarly to C2, risk management is a cyclical and continuous process. A commander (or whoever is in charge) should constantly be assessing whether the implemented measures are providing the intended level of protection (neither too low nor too high). He must also look out for changing circumstances, such as an increased (or diminished) threat or a deteriorating (or improving) weather situation.

In each case, the risk management steps must be performed again to determine whether the protective measures need to be adjusted: tightened if necessary, relaxed if possible.

7.4.2 Different forms of risk management

The way in which risk management is conducted depends on the situation. There are certain threats and hazards that can arise under different circumstances and in many different forms of military operation. These threats and hazards are predictable and often expected, and risk analyses can be conducted and protective measures designed (long) in advance of these 'standard' situations. Because there is in principle no time pressure, those analyses and plans can (and should) be extensive and thorough. Examples of risk management for these standard situations are:

- risk identification and evaluation (RI&E) for occupational safety;
- development of standard operating procedures (SOPs) for the safe execution of certain activities, such as amphibious landings, parachute drops, and so forth;
- design of measures to prevent interference, such as airspace control measures (ACM) and frequency management;
- risk identification for the protection of objects, buildings and information systems;
- development of tactics and techniques, for example, for air defence or ASW.

152 See Chapter 5, paragraph 5.5 (C2 as a process).

In the preparation and execution of actual military operations, consideration must then be given to the threats and hazards that could be expected in specific situations. This application of risk management is referred to as **operational risk management** (ORM).[153] The purpose of which is to determine whether the operation will involve additional risks for which supplementary protective measures will be required. ORM is part of C2 and thus also takes place at the different C2 levels.

- At **military strategic level**, ORM is designed to ascertain the strategic risks of military deployment. If additional risks are identified in terms of a threat to the force, this may result in the allocation of additional means or the implementation of supplementary measures to protect the force. Examples would be the allocation of extra frigates for the protection of a task group or the provision of increased medical support.

- At **operational and tactical level**, ORM determines the risks associated with the operational or tactical plan. The results of this ORM generate (supplementary) measures for protection and defence, which are reflected in the force protection annex of an OPLAN and in the different sections of the various OPTASKs.

- At **technical level**, ORM is designed to assess the risks of an activity in a specific situation, for example the boarding of a suspect merchant vessel, a nocturnal amphibious landing or a helicopter transport in adverse weather conditions. The specific circumstances at the time (potential resistance, bad weather, proximity of other activities) may necessitate the implementation of supplementary protective measures. Unlike ORM at strategic, operational or tactical level, ORM at technical level is usually subject to time pressure. In this time-critical ORM – the last-minute risk analysis (LMRA) – the steps of the process are not, therefore, performed continuously, but at least once (before commencement of the activity).

Principles of risk management

Although personnel and materiel will always be exposed to a certain degree of risk, risk management is a tool to ensure that these personnel and materiel are exposed to as low a risk as possible, while the effectiveness of an action or operation is maintained at the highest possible level. To achieve this, commanders should adhere to the following principles when using risk management:

- **Do not accept unnecessary risk.**
  Risk management helps to prevent a situation in which risks go unnoticed. There may be (significant) risks that could be eliminated or minimised with minimum impact. >

153 For an explanation of the application of ORM, see Dutch ACZSK ALG 008 Operational Risk Management.

- **Accept risk when yield outweighs cost.**
  A certain degree of risk is permissible if the effective result of an activity outweighs the (adverse effects of the) risk.

- **Make decisions about risk at the right level.**
  Decisions about protective measures and the acceptance of risk must be made by individuals with the necessary authority to judge the acceptability of the risk and to announce measures and have them implemented. A commander who feels that he is faced by unacceptable risk should take this up with his superiors (escalate in the line).

- **Apply risk management systematically and continuously, both in the planning and the execution of the operation.**
  "Look before you leap". For every form of activity, there is an appropriate form of risk management, ranging from risk identification and evaluation (RI&E) for working conditions, via operational risk management (ORM) to last-minute risk analysis (LMRA).

7.4.3 Protective measures

The risk management process leads to the implementation, adjustment or relaxation of protective measures. Because a risk consists of the chance of an event and the adverse effects thereof, protective measures are always geared to these two factors.

A protective measure aims to create the following effects (in order of effectiveness):

- **Prevention**: limitation or elimination of the possibility that an adverse event will occur. Prevention usually means removal of the cause of the hazard or avoidance of the hazard. Examples are:
  - o blocking enemy ports and airports;
  - o keeping out of the (weapon or sensor) range of an opponent;
  - o using camouflage or signature reduction to prevent detection by an adversary (counter-detection);
  - o using manoeuvres (e.g., zigzag course) to deceive an opponent;
  - o not posting secret data on open systems or networks.

- **Intercept**: the eradication of the adverse effects of an event. If an event cannot be prevented, attempts must be made to prevent the adverse effects of that event. Examples of protection by intercept are:
  - o the use of weapon systems to destroy weapon carriers and/or incoming projectiles (**hard kill**) and the use of deception techniques to disrupt or avoid incoming projectiles (**soft kill**);
  - o the use of protective means such as flak jackets, safety goggles, armour, CBRN masks and insulating clothing;
  - o vaccination, (malaria) prophylaxis and impregnation of clothing;
  - o access regulations for objects and information systems.

- **Damage control**: reduction of adverse effects. If an event cannot be prevented and interception has proved impossible or unsuccessful, damage must be kept to a minimum. Examples would be:
  - o firefighting;
  - o prevention of the spread of damage (containment, compartmentalisation);
  - o ensuring redundancy of systems.

- **Repair**: reduction or elimination of damage incurred. This category includes (emergency) repairs and treatment of casualties.

Tailor-made measures
Full protection is not usually possible. The principle of 'economy of effort' dictates that the most effective protective measure must be sought. Depending on the gravity of the threat or the hazard, different categories of measure will be required. To increase the chance of success, it might even be necessary to implement several measures with the same protective effect (such as a layered defence, see paragraph 7.9.1).

Economy of effort means that the protective measures also need to be adaptable to a changing level of threat or hazard. This requires flexibility.

Examples of such scalable measures are:

- occupational safety procedures, duties and stations (such as a special sea duty, see box);
- security measures associated with security alert states;
- readiness levels of sensors and weapons, watch systems for personnel (two, three or four sections);
- "Stand to", the procedure whereby a marine corps unit takes up a defensive position in the terrain as quickly as possible.

Degrees of readiness, watch systems and special duties on board naval ships

The **degree of readiness** is the extent to which a unit is able to respond to a task or an incident. The higher the readiness, the faster action can be taken to perform certain tasks. Increasing the degree of readiness also serves as a protective measure; if a risk level rises, readiness will also be raised to allow a more rapid response to a hazard or a threat. This is done by preparing equipment for immediate use and by employing extra personnel.

As well as the risk level, personnel are also an important factor in determining the degree of readiness, as people are subject to fatigue. A balance will therefore have to be sought between the minimum time needed for action or reaction, the number of personnel required and the period of time for which this reaction time will need to be sustained. Degrees of readiness are thus usually linked to the division of personnel into shifts: the watch system. >

The following general degrees of readiness[154] and watch systems are used on board naval ships.

- Degree of readiness 5 is in force when a ship is at anchor or in a safe harbour. Only a small part of the crew will be on duty for watch, security and initial emergency response.

- Degree of readiness 4 applies to a ship at sea that is in principle doing nothing more than safe navigation in open water, for example during a transit. A small section of the crew will be on duty for safe navigation, regular safety and initial emergency response.

- Degree of readiness 3 applies in the event of increased activity or heightened risk. Personnel and equipment needed to perform the required activity or to avert an immediate threat or danger are directly available. This degree of readiness must in principle be sustainable for longer periods (several weeks to several months). This normally means that a third of the crew is on duty (three-section watch system).

- Degree of readiness 2 provides the highest possible degree of readiness that can be sustained over a prolonged period (two to three weeks). Generally speaking, this means that half the crew is on duty (two-section watch) and that as many systems as possible are available immediately or at extremely short notice.

- Degree of readiness 1 ('battle stations') means maximum readiness. The entire crew is on post and immediate employment of all systems and functionalities is possible. This degree of readiness can only be sustained for a limited period.

In specific circumstances or activities with an increased risk, it is not efficient to raise the ship's general degree of readiness. In those cases, it will suffice to employ a tailor-made package of extra personnel and equipment to be able to safely perform the activity and to reduce the reaction time to incidents. These are known as **special duties** or **stations**. One example is the special sea duty, which comes into force when a ship has to navigate narrow or shallow waters or in the immediate vicinity of other ships or objects. Another example is flying stations which close up for the employment of the onboard helicopter or a UAV.

154 The general degrees of readiness are standardised within NATO. See ATP-1 Volume 1, paragraph 1430, General Degrees of Readiness.

Emergency procedures

It may also be the case that the *nature* of a threat or hazard is predictable, but that its *timing* is difficult or impossible to predict. In these cases, there is insufficient time to perform the entire risk management process and appropriate (emergency) procedures will need to be implemented. Examples of these are as follows:

- 'close all red openings', the emergency procedure for ensuring maximum watertight integrity of a ship;
- evacuation procedure in the event of a bomb alert;
- pre-planned responses in the defence, such as ship manoeuvres to evade torpedoes or contact drills by marine corps units in (fire) contact with opponents.

Concurrence and interference of protective measures
Protective measures can reinforce each other or contribute to protection in more than one area. The optimum allocation of sensors will thus not only increase the chance of detection, but at the same time will also reduce the risk of interference and minimise the opportunity for an opponent to gather important information about the sensors.

Protective measures could also have a negative effect on other forms of protection, however. For example, the use of jamming and decoy equipment could result in interference with friendly sensors. Another example would be the measures to protect against radar and radio radiation hazard (RADHAZ, see paragraph 7.7.3), which could limit the use of friendly radar and radio transmitters.

In these cases, prioritisation and flexibility should ensure maximum concurrence and minimal interference.

7.4.4 Detection, warning and reporting

Protection starts with the awareness that a threatening or hazardous situation may arise. It is not without reason that the first step in risk management is to identify potential threats, hazards and vulnerabilities. To be able to maintain adequate protection during an operation or activity, awareness of (new) threatening or hazardous situations is essential. Only when the threat or hazard has been detected will there be time and space to implement protective measures.

Detection and warning are crucial for protection against threats. An opponent intent on inflicting damage will after all have the advantage of surprise: he will try to breach or circumvent whatever protection is in place. Adequate protection against threats thus starts with the prevention of surprise by the earliest possible detection and warning.

Maritime intelligence and picture compilation should meet this requirement: they provide the necessary situational awareness. For the purpose of permanent area security, naval ships, maritime aircraft and helicopters and marine corps units are equipped with a multitude of different detection devices (sensors).

Warning also plays an important role in respect of hazards that could have huge implications and that require rapid intervention (such as fire or collision) and/or in respect of major hazards that can only be avoided if sufficient warning is given (such as hurricanes, icebergs, avalanches, poisonous gas clouds). There are, therefore, usually detection and alert systems in place for this type of hazard, from fire alarms to reporting systems (navigational warnings).

As well as detection and warning, reporting of incidents is also important for force protection. As soon as a hazardous situation or a threat arises (an accident, a security breach or an attack), information about the incident must be gathered and reported.[155]

155 For the Netherlands, see *Aanwijzing SG A/963 Melden van voorvallen* [Reporting incidents]. For Belgium, see ACOT-SPS-DOCREP-ONXQ-001 *Notificatie van ernstige gebeurtenissen* [Notification of serious incidents].

Reporting, both during and after the incident, serves the following purposes:

- **Enhancement of situational awareness**. Reporting incidents 'in the line' gives other commanders an insight into the status of friendly units (blue picture).[156] This makes the implications for the performance of the task/mission clear so that corrective measures can be implemented or assistance provided. This applies particularly if the incident has resulted in casualties, damage or compromised data.

- **Lessons identified**. Lessons can be drawn from every incident and used to improve (future) protection, for example through the modification of doctrine, procedures, training or equipment.

- **Improvement of intelligence position (exploitation)**. Breaches of security or attacks suffered are particularly useful as the information gathered may provide an insight into an opponent's means and methods. This knowledge can then be used to improve protection and defence.

- **Prosecution of perpetrators**. Data relating to a security breach could serve as evidence for a criminal prosecution of the perpetrators.

156 See Chapter 6, paragraph 6.5 (Data relating to own and friendly forces and units).

7.5 The four forms of protection

There are three different causes of potential damage to military power: hazards, interference and threats. It is for that reason the protection methods also differ. Protective measures stem from at least one of the four forms of protection:
- Safety
- Prevention of mutual interference (PMI)
- Military security
- Defence

The following paragraphs look briefly at the scope of these four forms of protection. The chapter will go on to examine in more detail the various protective measures used to create these forms of protection in maritime operations.

7.5.1 Safety
Safety is the protection of military power against damage by accidents and unfavourable circumstances. It comprises all procedures that ensure safe working conditions and the protection of the physical and mental health of personnel.

In principle, safety measures, including those in the maritime domain, apply under all circumstances, so in the normal running of the organisation as well as in actual military operations. Paragraph 7.6 takes a closer look at measures used to increase safety in maritime operations.

7.5.2 *Prevention of mutual interference*

The **prevention of mutual interference** (PMI) is designed to prevent damage to military power by the inadvertent adverse effects of own or friendly actions. Interference can occur in many ways, but they all come down to one of the following three situations:

- a unit experiencing adverse effects of a friendly weapon (fratricide, blue-on-blue incidents);
- different units wanting to use the same stretch of water, land or airspace for their own task (physical interference);
- the radar, sonar or radio transmitting devices of one unit have a damaging or negative effect on another unit's personnel and/or equipment (electromagnetic or acoustic interference).

Mutual interference is prevented by separating, or deconflicting, the forces and means in question. Interference can occur in different terrains: in the air, on the water, under water, on land, in the electromagnetic spectrum and in the acoustic spectrum. There are therefore different methods for effecting the required separation in the different terrains. Paragraph 7.7 explains the different methods used to counter interference in maritime operations.

7.5.3 *Military security and defence*

Protection of military power against deliberate damage by an opponent can take two forms:

- **Security** concerns the implementation of measures to safeguard a military unit, area or object against (surprise) enemy operations, sabotage, subversive activities, terrorism and crime[157] or to minimise the effects thereof.
  Security focuses on three areas which together encompass the military means. The first area concerns personnel security: the implementation of measures to ensure the reliability of personnel, for example by screening. The second area concerns the physical security of military materiel (terrains, buildings, installations, ships, etc). The last area is that of information security, which concerns measures to safeguard the availability, integrity and exclusivity of data used within the organisation.

- **Defence** is the combat form of military security, in which the means, capabilities and/or the will of an attacker are damaged to such an extent that he is no longer willing or able to sustain his offensive action.

Security and defence are not separate aspects, but rather an extension of each other. Integral security measures apply at all times and in all circumstances, and the level of procedure increases as the threat level rises. These measures change to defensive measures if it is clear that an attack is in the offing or in progress.

157 NATO documents sometimes refer to these threats with the acronym TESSOC: terrorism, espionage, sabotage, subversion and organised crime.

Paragraphs 7.8 and 7.9 look at specific work methods and measures that are used for the purposes of security and defence in maritime operations.

Security and defence provide protection against deliberate damage. This may mean that force has to be used to stop an opponent, and paragraph 7.10 will examine the possibilities for and restrictions on the use of force in security and (self-)defence.

7.6 Maritime safety

Operating in the maritime domain means that besides the usual occupational safety, a commander must be mindful of the specific hazards and vulnerabilities that can arise in, on and above the sea. Maritime safety therefore has a number of typical areas of attention, such as:
- safe navigation (prevention of collisions and strandings);
- seaworthiness of ships (watertight integrity, stability and fire safety);
- survival at sea (protective equipment, emergency provisions and rescue equipment);
- working in overpressure (diving).

The safety norms in these areas apply in principle to all users of the maritime domain. They are therefore usually subject to international agreements, such as the SOLAS convention[158] and to national legislation. These civil norms also serve as a starting point for the maritime safety of naval forces.

158 See Chapter 2, paragraph 2.5.1.

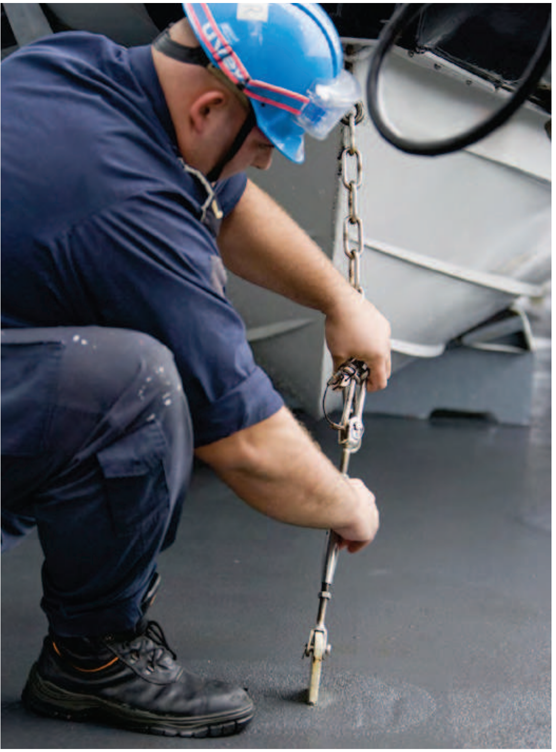
Maritime forces also need to bear in mind the specific hazards inherent in military equipment and work methods, such as:

- dealing with weapon systems, ammunition and explosives;
- dealing with high-powered electromagnetic and acoustic transmission equipment (radar, sonar and radio transmitters);
- underwater navigation;
- navigating/entering waters, areas and objects for which potential hazards have not been (fully) identified;
- special nautical activities such as replenishment at sea (RAS) and operating small vessels in extreme conditions;
- parachute drops over water.

7.6.1 Management of safety risks in maritime operations

In the Dutch armed forces, the Defence safety management system (VMS Def)[159] sets the guidelines for safety within the organisation. For maritime forces, the VMS Def is elaborated further in the safety and environmental management system (VMMS)[160]. In the Belgian military, the Defence General Prevention Plan (GPD) performs the same function, and it is applied on the shop floor by means of Dynamic Risk Management.

159 See Dutch Ministerial Publication (MP) 12-100 *Veiligheidsmanagementsysteem Defensie* (VMS Def) [Defence Safety Management System].
160 See Dutch ACZSK ALG 001 *Veiligheids- en Milieumanagementsysteem* (VMMS) [Safety and Environmental Management System].



Maritime safety

These systems involve risk identification and evaluation (RI&E) and countless safety regulations and procedures relating to living and working conditions. They also involve regulations and procedures for air safety,[161] maritime safety (navigation, seaworthiness, diving activities, survival at sea)[162] and for military safety (e.g., working with ammunition[163] or high-voltage transmitters[164]).

In the preparation and execution of actual military operations and activities, ORM is used to identify any additional hazards and to implement supplementary protective measures. If, for example, a boarding needs to be conducted, aspects that need to be considered are the weather conditions (sea state, heat/cold) and risks on board the vessel to be boarded (infectious diseases, vermin, explosives, risk of falling down).

161 Such as ACZSK ALG 010 *Opereren met helikopters aan boord van CZSK-eenheden* [Operating with helicopters on board RNLN ships] and ACZSK ALG 011 *Opereren met SRTUAS aan boord van CZSK-eenheden* [Operating with short range tactical unmanned air systems on board RNLN ships].
162 Such as ACZSK DOPS 124 / EDIR ACOT-SPS-OPSNAV-NMSC-200/NCCM *Navigatie* [Navigation], ACZSK DOPS NLMF STC 164.3 *Overleven op zee* [Survival at sea] and VKM 007 *Arbeid onder overdruk* [Working in overpressure].
163 Such as ACZSK DOPS 129 *Voorschrift betreffende de veiligheid bij schiet- en lanceeroefeningen* [Regulations for safety in gunnery and missile or torpedo launch exercises] and the Dutch ammunition regulations from the VS 9 series.
164 Such as the Hazard States, see Dutch ACZSK DOPS NLMF STC 170.3A *Standaard Orderboek Commandant Wapentechnische Dienst* [Commanding Officer's Handbook, Weapons Engineering Service], Annex K.

Secure for sea & Secure for action

A ship is a moving platform. Wave motion means that a ship is constantly moving along its longitudinal axis (roll), the lateral axis (pitch) and the vertical axis (yaw). On a moving platform like this, any loose objects pose a danger, as shifting and falling objects can result in damage and injury. That is why a ship, before putting to sea, must be '**secured for sea**'. This means that all loose objects must be secured or stowed in such a way that they cannot move or fall.

In combat situations, 'secured for sea' is not sufficient to prevent damage or injury caused by unsecured objects, and more extensive measures are needed because of the power and blasts of explosions and the risk of fire. Not only to prevent damage or injury, but also to prevent loose objects from getting in the way of combat actions or damage control (see paragraph 7.11). In combat situations, therefore, a naval ship must be '**secured for action**'. This means that breakable objects (such as mirrors) must be removed or made safe and all objects not immediately required must be stowed in cupboards or racks.

Tailor-made measures
Safety measures also need to be adaptable to changing levels of danger, and this is achieved partly by using degrees of readiness and special duties (see box at paragraph 7.4.3), such as the special sea duty. Another example of a scalable safety measure is the use of conditions, with which the ship's watertight and gastight integrity can be adjusted gradually.

Emergency measures
Dangerous or life-threatening situations may also arise in respect of occupational safety, requiring the implementation of emergency measures. One example is 'Close all red openings' the emergency procedure used in the event of collision risk to ensure a ship's maximum watertight integrity. Another example is 'Man overboard', a procedure for the urgent rescuing of someone who has fallen into the sea.

7.7 Prevention of mutual interference

Mutual interference arises when friendly forces or equipment get in the way of each other. Unlike safety and military security and defence, interference is the result of actions by own or friendly forces. Given that these forces can be directed in terms of behaviour, measures focus fully on prevention.

Mutual interference is prevented by separating, or deconflicting, the units in question. This can take two forms: separation in location and separation in time.

- **Separation in location** means the creation of sufficient distance to ensure that simultaneous activities remain possible but the risk of interference is minimal. This type of separation is effected by the imposition of safe distances, security sectors, corridors, separating air and water layers, etc. In the electromagnetic and acoustic spectrum, separation in location can also be effected through separation in frequency.

- **Separation in time** means that activities that could lead to interference may not take place simultaneously, and is effected mainly by the use of timetables. Another form of separation in time is the imposition of restrictions on what units may do: a unit may well be permitted to be in a certain location, but not to conduct certain activities at that location. This situation would arise if, for example, a ship or an aircraft is in the same area as a friendly submarine and is prohibited from taking any action against underwater objects.

Separation of activities requires coordination. Separation and deconfliction are performed either on the basis of prior agreements and procedures (procedural control) or by real-time coordination on the spot (positive control). Positive control offers the most flexibility, but it does require that units be in contact with each other. In terrains where communication is difficult or impossible (for example, under water, over extremely long distances or in situations of intense activity or complexity), procedural control is normally used.

There are different methods for separating activities in order to prevent interference; the following paragraphs will look at the methods used for activities under water, on the surface and in the air, and in the electromagnetic and acoustic spectra.

7.7.1 Prevention of physical interference under water

The section of the maritime domain below the surface of the water is the terrain of submarines, underwater robots, sea mines, torpedoes, divers and ship- and helicopter-towed objects such as variable depth sonars (VDS) and minesweeping gear. Mutual interference between these units and objects is prevented by two methods: waterspace management (WSM) and prevention of mutual interference (PMI).[165]

Because communication with and between units under water cannot usually be guaranteed and because identification of objects underwater is particularly tricky, both methods are based mainly on prior agreements and procedures relating to physical separation (three-dimensional or in time).

7.7.2 Prevention of physical interference in the air, on water and on land

In maritime activities on water, in the air and on land, it is of the utmost importance to ensure that own or friendly forces do not experience any adverse effect from friendly (weapons) systems.

165 See Chapter 5, paragraph 5.8.2 (C2 in submarine operations).

To prevent these blue-on-blue situations, the following measures are used:

- a safety check procedure on employment of weapon systems to ensure that there are no unintended objects in the intended trajectory of the weapon).[166]

- The use of airspace control measures (ACM), weapon control orders (WCO) and fire support coordination measures (FSCM) for the employment of weapon systems. A commander can thus regulate the employment of weapons and declare certain stretches of water, airspace and or land (sectors, corridors) temporarily off limits for weapon employment or for friendly forces.[167]

- The use of the allied worldwide navigational information system (AWNIS) to inform own and friendly forces of hazards, such as own or friendly minefields.[168]

An important factor for the prevention of blue-on-blue situations is a constant awareness of the actual position and intentions of own and friendly forces (blue picture).[169] It is vital that own and friendly forces are and remain immediately recognisable as such.

166 For this and other sensor and weapon employment procedures, see Dutch ACZSK DOPS 137.3, *Inzetprocedures SEWACO-systemen* [SEWACO systems employment procedures].
167 For details, see AJP-3.3.5 Allied Joint Doctrine for Airspace Control.
168 For details, see AHP-1 The Allied Worldwide Navigational Information System (classified).
169 See Chapter 6, paragraph 6.5 (Data relating to own and friendly forces and units).

This is not only necessary to create clarity in chaotic situations, but also for units joining the force, for units transiting another area of operations and for units coming back from the forward area. All these units need to be recognised promptly so that they are not mistaken for an opponent or an attacker. There are thus various ways and means to establish a prompt and positive identification of friendly units:

- automatic, secure identification systems such as IFF (identification friend or foe);
- reporting own position and supplementary information, for example by means of data links and NIMCIS (combat ID, blue force trackers);
- previously agreed identification methods, such as flying in a particular pattern or route;
- use of a safety zone (identification safety range), which forces may only enter once they have been positively identified as friendly;
- specification of routes that military units (in transit) must use for movements.

Each maritime task group will normally have an official responsible for identifying and updating incoming and departing friendly air traffic: the force marshaller.

Apart from the fact that own or friendly forces must not fall victim to the use of friendly weapons, measures are also needed to ensure that forces do not physically hinder each other in other ways. Airspace control measures, as referred to previously, are used to establish the necessary, safe, three-dimensional separation between the various activities in the air (aircraft, guided missiles, grenades).

At sea and on land, activities are physically separated, if necessary, by means of zones, sectors and/or boxes. These may be geographically oriented (in coordinates) or they may move with the activity (relative to a point or object). Much use is made in maritime operations of adaptable formations, such as a sector screen or a 4W disposition.[170]

The various measures designed to prevent blue-on-blue incidents and mutual interference in the air, on the water and on land are normally made up of a mix of procedural and positive control. The choice between the two is always dependent on the situation, in particular on the traffic density (complexity) and the possibilities for communication and identification.

7.7.3 Prevention of electromagnetic and acoustic interference

There is said to be interference if own or friendly units emit or reflect electromagnetic or acoustic energy that produces an adverse (side) effect on other units' equipment and/or personnel. This may arise in the following situations:

- The performance of sensors, weapon systems and communication devices is reduced because of the use of similar equipment (e.g., one radio link that jams another);
- The performance of sensors, weapon systems and communication devices is reduced as a side effect of deliberate jamming or because of the use of deceptive devices such as chaff (metallic strips that reflect radar signals);
- The use of electromagnetic energy disrupts the functioning of other (electronic) devices or has a detrimental effect on personnel.

170 For the usual formations, dispositions and screens, see ATP-1 Volume 1 Chapter 3.

Prevention of electromagnetic and acoustic interference between similar equipment

This form of interference can be countered by separation in frequency and by separation in physical distance. This can be done by taking account of interference risks when drawing up frequency plans. For radio communications, this is done by making the allocation of frequencies partly dependent on potential interference when formulating the communication plan (COMPLAN)[171] For radar devices, this is effected by drawing up the **radar frequency plan** (RADFREQPLAN), which is designed to optimise the use of possible radar transmission frequencies. For active sonar devices, it is done by formulating an **active sonar interference avoidance plan** (ASIAP).

Prevention of electromagnetic interference by deliberate jamming

The use of jammers can also have adverse effects on the performance of friendly radio and radar devices. A **joint restricted frequency list** (JRFL) is used to minimise interference caused by friendly jammers. A JRFL is established on the basis of vulnerability analysis and contains frequencies that need to be protected against interference by friendly jamming. It has three categories of protection: essential (safety) frequencies that must never be jammed (taboo), frequencies that may only be jammed with authorisation (guarded) and important frequencies where jamming must be avoided (restricted).

171 See Chapter 5, paragraph 5.11.2 (Maritime communication systems).

Prevention of electromagnetic interference with other equipment or personnel

Maritime forces use high-powered radars and radio devices.[172] The large amount of electromagnetic energy that is released can have an adverse effect on personnel and equipment in another unit. This is referred to as **radar and radio radiation hazard** (RADHAZ) and is particularly common when units are operating in close proximity to each other, for example two ships during replenishment at sea or a helicopter coming to land on a ship. The radiated energy can cause interference with devices or damage the health of personnel.

To limit this form of interference, data must be available on the transmitter(s) (frequencies) and on the vulnerabilities (on which frequencies, at what power and over what distances adverse effects occur). These data are processed into index numbers (TRAD/SRAD).[173] If comparison of the index numbers reveals a high risk of interference, measures will have to be implemented. These may involve increasing the intervening distance, reducing the power of the transmitter or switching off the transmitter altogether. Sector blanking may also offer a solution; a sender will then transmit no (or considerably less) energy in certain directions.[174]

172 Specifically air warning radars and MF/HF radio transmitters; see Chapter 1 paragraph 1.2.5.
173 TRAD = transmitter RADHAZ designator, SRAD = susceptibility RADHAZ designator. See AECP-2 NATO Naval Radio and Radar Radiation Hazards Manual. Ships must state these index numbers in their OPSTAT UNIT report.
174 The same measures also apply to other forms of harmful energy, such as lasers.

7.8 Maritime security

Maritime Security concerns protection against (surprise) enemy actions, sabotage, subversive activity, terrorism and organised crime. This (integral) security covers three areas: personal, physical and information security. Operating in the maritime domain means that besides the usual security measures, a commander must also be mindful of the specific threats and vulnerabilities that can arise in this domain.

Maritime security therefore has a number of typical areas of attention, such as:

- Security of ships, not only under way but also at anchor or berthed in port;

- Security against specific maritime threats, such as pirates, divers and attacks involving small vessels or underwater explosives.

Security in maritime operations is based on the regulations for integral security that apply to the armed forces as a whole, supplemented by specific measures geared towards maritime security risks.

7.8.1 Integral security in maritime operations

In the Netherlands, the package of measures for military security is referred to as **integral security**. The application of integral security is laid down in Defence security policy (DBB) and is under the supervision of the Security Authority (BA).

In Belgium, military security measures are laid down in regulation IF5. The Assistant Chief of Staff for Intelligence and Security (ACOS IS) is responsible for their implementation.

Both regulations are based on the application of risk management; after identification of the threat and vulnerabilities, a commander will weigh up the risks and order the implementation of measures to manage their adverse effects.

Identification of the threat

The level of the threat for which protective measures are needed will be determined in one of two ways. The standard level is determined using what is known as the actor profile drawn up with the aid of national intelligence services. This profile is regarded as the minimum permanent threat level for military objects, regardless of their location. As soon as maritime forces roll out their activities (transits, port visits, exercises or operations), a tailored threat assessment will serve as a basis for assessing the threat level and as a starting point for operational risk management at the tactical and technical levels. This threat assessment is in principle supplied by the national intelligence services, but in multinational operations it could also be supplied by intelligence staffs.

The task of assessing the threat of sabotage, subversive activities, terrorism and organised crime, both for the general actor profile and for the more specific threat assessment, is the domain of **counter-intelligence** (CI).[175]

Identification of vulnerabilities: security risks

The identification of vulnerabilities is also performed in two ways. Risk analysis identifies vulnerabilities in the regular organisation (**protective interests**, PI). PI may be objects (buildings, ships) or of networks, information systems or the data contained in them. PI are divided into categories according to the level of damage incurred if the protective interest is damaged. The category determines the level of protection that is required: security for data classified as NATO Secret (PI category 1) must meet more stringent demands that those classified as NATO Restricted (PI category 4).

In the preparation and execution of actual maritime operations and activities, more potential vulnerabilities need to be identified, usually the friendly centre of gravity or means, personnel and data essential to the completion of the mission. Examples of such critical vulnerabilities in maritime operations are mission essential units (MEU) or high-value units (HVU). Data could also be of essential value to the success of the operation and may therefore constitute a vulnerability; these are the essential elements of friendly information (EEFI).

Protective measures and prioritisation

Protective measures must protect the identified vulnerabilities against the expected threat posed by sabotage, subversive activity, terrorism and organised crime. These measures relate to the three areas of integral security: reliability of personnel (personnel security), the integrity of military objects (physical security) and the availability, integrity and exclusivity of data (information security).

Because the procedures for personnel security (screening, security clearances, etc) are the same in all forms of military operation, they will not be discussed further in this maritime doctrine. Paragraphs 7.8.2 and 7.8.3 look in more detail at the protective measures that fall under physical and information security, with the emphasis on their use in maritime operations.

Measures for the purpose of physical security include access and key regulations, anti-intrusion systems, lock-up rounds and surveillance. Examples of measures for information security are the use of passwords, classifications and encryption, physical separation of networks and the use of security software (such as virus scanners).

Implementation of security measures will also need to be prioritised. Those priorities are largely determined by the categorisation of the protective interests. Furthermore, first priority is usually given to personnel safety, then to the protection of the mission essential goods, services or data, and finally to the prevention of material damage.

175 See the Dutch JDP-2 Intelligence, Chapter 4 Counterintelligence and security. For Dutch implementing provisions, see CDS *Aanwijzing A-200 MIVD ondersteuning op het gebied van CI&V bij vredesoperaties* [Military Intelligence & Security Service support for counterintelligence and security in peace operations].

Tailor-made measures: security alert states
Security begins with the standard measures prescribed in national security policy (in the Netherlands the DBB, in Belgium the IF5). If a higher than normal threat is identified, security alert states and supplementary protective measures will be announced. An **alert state** is a designation of a certain threat level with which a fixed list of supplementary measures is associated; these measures come into force if that particular alert state is declared. If necessary, this package of measures can be supplemented further with measures associated with a higher alert state. There are four different alert states - Alpha, Bravo, Charlie and Delta - in escalating levels of protection.

Alert states serve to establish a (temporarily) increased level of security in order to deal with new or increased threats in respect of protective interests (PI). The objectives are as follows:

- to alert personnel to potential threats;
- to establish a structural increase in surveillance and security of an object or unit, depending on the threat level;
- to minimise disruption to normal business;
- to show that extra security measures are in place and thus make the object or unit a less attractive target.

The announcement (and downgrading) of an alert state and the associated measures is a line responsibility. In the Netherlands and Belgium, it is determined by the respective CHODs, on the advice of the BA and the MIVD/ ACOS IS. If a unit is part of a multinational task group to which OPCOM or OPCON has been transferred, the relevant force commander will decide on the security level. If forces are in the territory of another state (for example, during a port visit), the commander will decide on the appropriate alert state and the associated measures in consultation with the local authorities. In the case of port visits, the local civil ISPS security level[176] usually helps to determine the required level of surveillance and security.

176 The ISPS Security Level is the civil security level according to the International Ship and Port Facility Security (ISPS) Code. See Chapter 2, paragraph 2.6.2 (International agreements on maritime counter-terrorism).

7.8.2 Physical security in maritime operations

Physical security is the protection of military materiel (terrains, buildings, installations, units, ships, etc) and personnel against (surprise) enemy actions, sabotage, subversive activities, terrorism and organised crime. As with all protective measures, those for physical protection are designed to create the effects listed in paragraph 7.4.3: prevention, interception, damage control and repair. Protective measures obviously focus as much as possible on preventing the occurrence of a dangerous situation and, failing that, on the earliest possible interception of the threat.

Mobility plays an important role in physical protection in the maritime domain. Firstly, moving objects such as ships and aircraft are more difficult to approach than a fixed object such as a building. Mobility also allows units to win time or to evade a threat. Whether a ship is moving or is at anchor or berthed at a quayside thus makes a difference for physical security.

Maritime actions are not only conducted with ships and aircraft (the 'manned equipment'), but also with teams (the 'equipped men'), for example in amphibious operations and boardings. Physical security for personnel and materiel is also needed in these forms of operation. The following paragraphs will therefore examine physical security in three different cases:

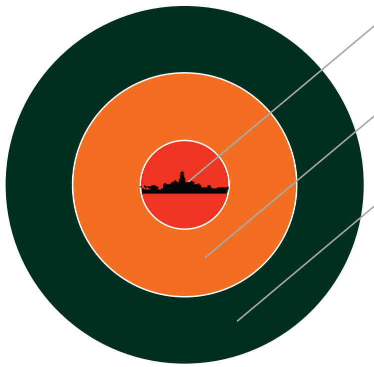
- moving units (ships, aircraft),
- ships that are berthed or at anchor,
- teams.

7.8.2.1 Physical security for units under way

If freedom of movement is not restricted, physical security is based on threat evasion. This means that a moving ship or aircraft will in principle try to avoid coming within range of the expected threat. In other words, efforts will be made to maintain a safe or stand-off distance from the threat. How great this distance needs to be will obviously depend on the expected threat. If the threat involves invaders (such as pirates intent on seizing possessions), then preventing other vessels coming alongside (something which is taken as read in safe navigation) will suffice. If the threat involves an attack, suicide or otherwise, for example with a water-borne improvised explosive device (WBIED) or firearms, the required stand-off distance will be greater. The required stand-off distance produces an imaginary zone around the unit outside which the threat needs to be kept: this is the keep-out zone (also referred to as the stand-off or security zone). The area outside it is the reaction zone, the zone in which there is still time and space to take action before there is any immediate danger.

Detection and warning are vital for threat evasion, and maritime picture compilation[177] has an important task here. Picture compilation provides for the detection, localisation and identification of objects that could pose a threat, allowing the prompt implementation of measures to maintain or establish a safe distance.

177 See Chapter 6 paragraph 6.8.1 (Picture compilation by ships, submarines and aircraft).



Physical security zones for ships

The required safe distance can be created in two ways: by evading the threat ourselves or ensuring that the threat evades us. The latter requires communication and ideally this will be done by radio link (such as the maritime VHF radio): first by hailing and making the necessary arrangements and, if this fails, by issuing warnings.[178] If radio contact fails to produce any results, the other object can be warned with the aid of other devices such as flares, LRAD or loudhailers.

Moving units may also find themselves in situations in which they can only make limited use of the advantages of mobility. This is the case in the following situations:

- if the task requires that an object be approached within the safe distance, for example in a boarding operation;
- if manoeuvring space is limited by local conditions, for example in a narrow waters such as straits or a deep channel between shallows.

In these cases, the required protection must be provided in the first instance by intercept measures. These are usually passive measures, such as anti-intrusion systems (door and hatch locks) and the use of ballistic protection (armour, reinforced glass, protective clothing).[179] They may also include active measures (such as firearms), but given that these are normally only used in the defence, they will be discussed in paragraph 7.9. At the same time, (extra) measures will need to be taken to minimise and repair any damage (damage control), for example by increasing the ship's watertight integrity and readiness for firefighting (see paragraph 7.11).

A safe stand-off distance must also in principle be observed by unmanned units, such as underwater robots and UAVs. However, because they are unmanned, often more difficult to detect and less costly than ships or aircraft, greater risks can be taken with these systems, thus enabling activities to be undertaken within the safe distance that would normally apply.

7.8.2.2 *Physical security for a ship in harbour or at anchor*

A ship that is in a harbour or lying at anchor is a static object; as such, it lacks the protection offered by mobility. Instead, the physical security will closely resemble that of other static objects such as buildings, namely the erection of (multiple) barricades to keep anyone intent on wrongdoing at a safe distance (object security). On the land side, this can be done by means of fencing, guard posts, etc, on the quay and surrounding area. On the water side, only limited barricades can be erected (float, pontoons, nets) and more emphasis will be placed on the availability of mobile security by small craft (such as the ship's own RHIBs or local police vessels). Specific attention must also be given to

178 For examples of hailings and warnings, see Dutch ACZSK DOPS 137.2.

179 Ballistic protective clothing such as a bullet-proof or flak jacket.

subsurface threats (divers, swimmers, explosives). All proposed measures must of course be agreed with the local (port) authorities, who will usually be able to meet part of the security requirement under host nation support (HNS) arrangements.

At anchor or in harbour, good security is again based on early detection of potential threats. Sensors (radar, sonar) that are optimised for use at sea are less suitable for this. As in object security for a building, detection of threats for a static ship will involve greater emphasis on close-in detection of small objects, on visual observation and on inspection of all objects, persons and goods entering the vicinity of the ship.

To improve the ability to adhere to the principle of jointness, arrangements have been made within NATO in respect of proposed measures for security and defence of ships in harbour or in a roadstead.[180] In these arrangements, internal protection measures (IPROMs) are linked to the different alert states.

180 See ATP-74 Allied Maritime Force Protection Against Asymmetric Threats in Harbour and Anchorage (classified).

7.8.2.3 Physical security for teams

Maritime actions are not only conducted by ships, submarines and aircraft ('manned equipment'). In operations on land, such as an amphibious or a humanitarian assistance operation, and in boardings of other ships, actions are conducted by teams of 'equipped men'. Such operations usually take place outside the object itself (ship, helicopter or base) in an environment shared by other people. Physical security in these cases is mainly designed to protect friendly personnel against physical threats such as IEDs and firearms. The presence of these threats cannot normally be prevented, but the vulnerability of friendly personnel to these threats can be countered by using movement, speed and dispersion (mobility) as well as protective clothing (helmet, flak jacket).

Operating in teams, humans are the main sensors, and detection of potential (physical) threats mainly takes the form of visual observation. Some threats, however, are (deliberately) difficult to find, such as improvised explosive devices (IEDs). Early detection of this type of physical threat requires specialist search techniques, known as military search. In maritime operations, these search techniques are also required for subsurface threats, so they are referred to as maritime search.[181]

181 See box about Maritime search in Chapter 6, paragraph 6.8.2 (Picture compilation by teams).

Just as in the case of security for an object, security for a team can also be provided by a separate group of 'guards'. They will provide the required security and protection so that the rest of the team can conduct the actual mission. In maritime operations, this would, for example, be the case in a boarding party, in which the security team provides protection for the personnel searching the ship (bridge team and search team).

7.8.3 Information protection in maritime operations

Information protection is the protection of the availability, the integrity and the exclusivity of data that is used, stored or transported within the organisation, irrespective of the form of the data: paper, digital or otherwise.

Information protection takes two forms. The first is **information security** (INFOSEC) and concerns general measures for the protection of sensitive data. These measures apply in all circumstances and are based on general rules for the classification of data. The second form is **operations security** (OPSEC) and concerns the (extra) protection of data that are vitally important for the success of the own mission and for the protection of friendly troops and units.

7.8.3.1 Information security (INFOSEC)

The general measures for information security are laid down in national security policy (in the Netherlands the DBB, in Belgium the IF5). These measures are no different in maritime operations than in any other form of military operation, and they focus on:

- the use of classification and labelling on the basis of the level of damage incurred if the data fall into the wrong hands;
- measures to prevent unauthorised access to (classified) information such as security clearances, counter-espionage and anti-intercept measures and guidelines for external communication;
- security measures for storage and processing systems, for example registration of documents, computer security (COMPUSEC) and password management;
- security measures for transport of classified information, such as a sealed post, encryption, network security and communications security (COMSEC).

There is also a separate operational INFOSEC measure, which is known as the **Black Hole procedure**.[182] The purpose of this measure is to prevent any unauthorised reports in the event of incidents and disasters. As soon as a commander declares a 'black hole', use of communications devices (telephone, radio, internet) is reserved for authorised reports in the command line. This measure is usually of a temporary nature: the procedure generally ends once the situation has normalised.

The use of general INFOSEC measures is demonstrated in maritime operations by, for example, restricted access to areas where sensitive information can be found, such as radio and operations rooms and staff areas. Access to systems containing sensitive information, such as the C2 system (TDS, CMS) and classified networks are also reserved for appropriately authorised personnel. Many communications such data links, networks and radio communications are also encrypted.

Besides the generally applicable measures, maritime operations also have their own INFOSEC measure: the **area risk state**. This measure is designed to prevent other parties being able to acquire sensitive information (SIGINT) through transmission devices (radar, sonar and radio). As soon as it is likely that an opposing SIGINT capability is within detection range, the use of certain secret frequencies (such as war frequencies) can be restricted by declaring another area risk state.

Cyber Security in maritime operations

Cyber Security concerns the protection of digital processes and data against deliberate damage, for example as a result of viruses, malware, botnets or a denial-of-service attack. Digital data processing is not a typical maritime responsibility, but providing security for it is extremely important in maritime operations as well. Many systems use digital processes, not only in the form of networks and C2 systems, but also communications devices (software defined radios), operating systems of sensors and weapons, operating systems for energy supply and propulsion (platform automation) and logistic support systems. Furthermore, the weapon systems themselves also use digital processes, for example the guidance section of guided missiles and torpedoes.

As part of military information security, **computer security** (COMPUSEC) focuses on protecting the availability, the integrity and the exclusivity of digital information. providing security not only for the digital information itself (the content), but also for the software. COMPUSEC is also referred to as **computer network defence** (CND).

The correct application of COMPUSEC ensures that the programming of the many (maritime) digital systems is undamaged (on design and build) and remains so (during use and modification).

182 See Dutch CHOD Directive A-303, Black Hole procedure.

7.8.3.2 Operations security (OPSEC)

OPSEC is designed to deny an opponent information about the dispositions, capabilities and intentions of friendly troops.[183] It thus focuses specifically on protecting the exclusivity of data, particularly those that are vitally important for the success of the mission (essential elements of friendly information, EEFI). OPSEC measures are designed to leave opponents in the dark in respect of the location of friendly forces (counter-detection) and what the plans are (counter-intelligence).

In maritime operations, OPSEC is of specific importance to units which can and must remain undetected for long periods (such as submarines) and in operations that use surprise (such as an amphibious raid or the employment of special operations forces). For the benefit of OPSEC, therefore, information about this type of operation is usually not only (highly) classified, but sight of it is also restricted to a select group of individuals (compartmentalisation).[184] Commanders should, however, be aware of the disadvantages of compartmentalisation. Because information (such as tasks and objectives) is not shared with all those involved, compartmentalisation is at odds with the principle of unity of effort and may obstruct the use of mission command.

In maritime operations, two specific measures in relation to OPSEC are used: emission control (EMCON) and signature management.

183 For further explanation of the use of OPSEC, see the Dutch JDP-2 Intelligence, paragraph 1.5.1. (Operational security).
184 See also Dutch CHOD Directive A-1000 *Militaire Veiligheid in het kader van Speciale Operaties* [Military security in special operations].

Emission Control

Emission control (EMCON) is the control of electromagnetic and acoustic energy emitted by a maritime task force. The purpose of EMCON is to provide the required OPSEC while at the same time sufficient means remain available for friendly picture compilation (ISR). For this, maritime forces use an emission control plan. An EMCON plan is a matrix of all forms of emitter and all types of unit present in the area. The emitters include not only radar, sonar and radio equipment, but also other devices that emit energy, such as navigation lights and signal lamps (light) and ships' propellers (noise). In the matrix, radiation status indicators (RSI)[185] indicate the restrictions for a certain emitter from a certain type of unit. For the purpose of flexibility, there are usually different EMCON plans, each tailored to the required level of OPSEC, such as overt (unlimited), restricted, guard (only specific units active), covert (maximum OPSEC) or deceptive. This enables a rapid transition to another EMCON status. One of these EMCON plans always applies to a unit or a group of units. In a larger group of units (e.g., a task force), different groups (task groups or units) may each have a different EMCON status.

185 For a table showing RSIs, see ATP-1 Volume 1, Chapter 5, Table 5-2 (classified).

		SEARCH HEIGHT FINDERS										AI/FC/GMC RADARS										NAVAIDS											ELECTRONIC COUNTERMEASURES																			
	INDEX NUMBERS	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	130	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
INDEX LETTERS	EQUIPMENT / TACTICAL UNITS	ALL BANDS	A/B BANDS	C/D BANDS	E/F BANDS	G/H BANDS	I BAND	J BAND	K BAND	CCA/ASI RADAR		ALL BANDS	E/F BANDS	G/H BANDS	I BAND	J BAND	K BAND					ALL NAVAIDS	UHF/VHF BEACON	LF/MF BEACON	RAD ALT DOPPLER	IFF 1/2/3 INTERROGATOR	IFF 1/2/3 TRANSPONDER	IFF MODE 4 INTERROGATOR	IFF MODE 4 TRANSPONDER	RADAR TRANSPONDER	TACAN	AIS	ALL JAMMERS	C/D BAND JAMMERS	E/F BAND JAMMERS	G/H BAND JAMMERS	I BAND JAMMERS	J BAND JAMMERS	K BAND JAMMERS	CHAFF CHARLIE	ALL DECM	ECHO ENHANCERS	RADAR DECOYS	COMM JAMMERS								
A	AIRCRAFT CARRIERS																																																			
B	CRUISERS																																																			
C	DESTROYERS/FRIGATES																																																			
D	PATROL BOATS																																																			
E	MINESWEEPER/HUNTER																																																			
F	SUBMARINES																																																			
G	LANDING SHIP/CRAFT																																																			
H																																																				
I																																																			
J	MAIN BODY																																																			
K	SCREEN UNITS																																																			
L	PICKETS																																																			
M	UNREP GROUP																																																			
N	AMPHIBIOUS GROUP																																																			
O	MERCHANTS/CONVOY																																																			
P																																																			
Q	HELICOPTERS																																																			
R	ASW AIRCRAFT																																																			
S	ATTACK AIRCRAFT																																																			
T	AEW AIRCRAFT																																																			
U	MP AIRCRAFT																																																			
V	RECON AIRCRAFT																																																			
W	STRIKE AIRCRAFT																																																			
X	TANKER AIRCRAFT																																																			
Y	CAP AIRCRAFT																																																			
Z																																																			
AA																																																			
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EMCON plan format (Source: ATP-1 Volume 1)

Signature management

The signature of an object is the way in which it can be detected and identified. It determines whether the object can be detected by a sensor or whether that sensor can obtain further information about the object (for the purpose of localisation, identification or intelligence gathering). By controlling the signature, an opponent's picture compilation and intelligence gathering can be influenced by hampering or evading detection and identification. Each form of observation has its own signature: light (optical or laser signature), heat (infrared signature), electromagnetic (radar signature), sound (acoustic signature), pressure (wake or seismic signature) and magnetic signature.[186]

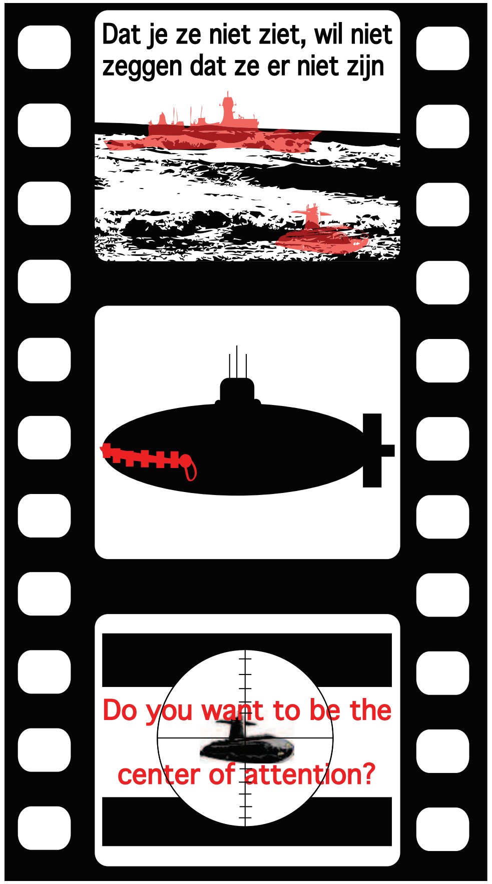
There is a difference between passive and active signatures. A passive signature is the way in which an object reflects energy, for example radar signals (radar cross section, RCS), sonar signals (target echo strength, TES) or light (reflection, camouflage). Passive signatures depend mainly on the construction of the object and the materials used; with the design and construction of a ship, aircraft or vehicle, the passive signatures are more or less fixed. However, the knowledge that a passive signature is not necessarily the same from all angles can be exploited. The angle at which a ship's radar cross section (RCS) is smallest plays a key role in the manoeuvring in air defence against guided missiles (see paragraph 7.9.3).

186 See also box in Chapter 1, paragraph 1.2.3, about using the earth's magnetic field.

An active signature is the way in which an object itself emits certain forms of energy. Besides the emitters that feature in the EMCON plan (radars, sonars, radios), these also include the magnetic signature of a ship, the acoustic signature (sound emitted by propellers, machines, etc) and the pressure signature (the variations in pressure caused by the ship's movement). Some active signatures can be controlled fully (such as energy emitted by transmission devices and lamps), to a large extent (such as propeller noise, pressure or magnetic signature) or to a limited extent (infrared signature). Like passive sonar, however, other active signatures depend directly on the construction and the materials used and are thus more or less fixed. This is the case, for instance, for sound emitted by engines, generators and pumps.

The ability to manage active signals not only serves to deny opponents access to information, but it also plays an important role in (passive) protection against guided missiles, mines and torpedoes. At the tactical level – within a task group – a commander can manage the active signatures of his units by means of the EMCON plan. Active signatures are managed at technical level by the implementation of internal measures within the unit, such as noise discipline (noise quiet state, NQS)[187] and maintaining a safe speed.[188]

187 See Dutch ACZSK DOPS 115.1 *Geluidsveiligheid Algemeen* [General noise safety].
188 See Dutch RITA Part 6 Chapter 3 *Opereren met oppervlakteschepen in mijnengevaarlijke gebieden* [Operating with surface ships in mine threat areas] (classified).



Noise safety indoctrination poster/flyer

7.9 Maritime defence

Defence is an extension of security. Security provides protection against (surprise) enemy actions, sabotage, subversive activities, terrorism and organised crime. This will turn into defensive measures if it becomes clear that an offensive is in the offing or in progress. The purpose of defence is to damage the means, capabilities and/or the will of an attacker to such an extent that he is either unable or unwilling to sustain his offensive operation or that his attack is no longer damaging.

The damaging effect of an attack stems from a deliverer of effect. This direct threat usually consists of a weapon carrying an explosive or other harmful payload (chemical, biological, radiological), such as a torpedo, a mine, a guided missile, a grenade or a bomb. The effector could also take another form of harmful or disruptive energy: electromagnetic energy (jamming), acoustic energy (deafening) or optical energy (blinding, such as a laser). In the maritime domain, with the great distances that are usually involved, most effectors will need to be taken to the target by a weapon carrier (ship, aircraft, submarine). These weapon carriers do not themselves represent a direct threat (other than that of collision), but because of their weapon systems they do pose an indirect threat. An indirect threat is also posed by units assisting in enemy picture compilation (ISR), such as reconnaissance aircraft, as they will be gathering the information needed to get weapon carriers into position (surveillance and reconnaissance) and to employ the weapons (targeting[189]).

An effector does not have to be physical in nature. In the information domain, the most damaging effects are created by disinformation (deception) and by the disruption of information processes, networks and computers.

Irregular, hybrid and asymmetric threats

The threats that could be faced by maritime forces in their operations will not necessarily be of a military nature. Just as in other forms of military operation, the operational area is made up of numerous actors. These could be states, but they could also be non-state actors such as companies, organisations or groups. Each actor has various means of power at his disposal to try to achieve his objectives.[190]

There is said to be a threat if an actor uses his means of power to (try to) damage military means. If the opponent takes the form of a state using military force as an instrument of power, this is said to be a **conventional** or **regular threat**. The term ‘conventional threat’ is also used more specifically to distinguish between a non-nuclear military threat and a nuclear threat (atomic weapons).

The adversaries could, however, be non-state actors, such as insurgents, criminals or terrorists. These actors may also use force as an instrument of power, even if they do not have access to (heavy) military assets such as warships, tanks and combat aircraft. Instead, they will use alternative means of force to achieve their objectives. These alternatives may vary from small firearms and grenade launchers (for example, to hijack a ship or aircraft) to the use of IEDs and ships, vehicles or aircraft to conduct major attacks. >

189 Targeting in the sense of target acquisition should not be confused with the targeting process used for the coordination of activities. See box entitled ‘Targeting: two meanings’ in Chapter 10, paragraph 10.5 (Coordination).

190 See Chapter 3, paragraph 3.2.2 (Instruments of power).

Because of the clear non-military nature of the violence, this is said to be an **unconventional** or **irregular threat**. If the specific aim of the violence is clear, for example personal gain or terror, it is then said to be a criminal or terrorist threat.

There may also be a mixture of regular and irregular forms of force, in which the boundary between military and civil activities becomes blurred. In these cases, actors use both conventional and irregular forms of force to achieve political, military or personal objectives. There is then said to be a **hybrid threat**, which arises in cases involving, for example, separatist movements, state-sponsored terrorist movements or political movements funded by violent crime. Examples are Colombia's FARC (*Fuerzas Armadas Revolucionarias de Colombia*) and the former Tamil Tigers (*Liberation Tigers of Tamil Eelam*, LTTE), which even had a naval division, the Sea Tigers.

Many documents and doctrines use the term **asymmetric threat** when referring to an irregular threat to which regular forces have difficulty finding an appropriate response. 'Asymmetric' has a negative connotation here ("the enemy is not playing fair!"). Asymmetry is, however, an accepted and often gainful (military) approach based on avoiding the strengths of an opponent and exploiting his weaknesses.[191]

Irregular threats are non-military and thus in effect asymmetric by definition. But many regular military threats are also asymmetric, such as the torpedo, the sea mine or the employment of special operations forces.

Defence is the countering of enemy threats, regardless of whether those threats are regular, irregular, hybrid, symmetric or asymmetric. The descriptions of the various forms of threat in this maritime doctrine are therefore based on the form (physical or non-physical) and on the medium (water, air, outer space), and not on the nature (regular, irregular, hybrid or asymmetric).

Maritime defence consists of the implementation of measures against a multitude of direct and indirect threats: subsurface, on the surface, from the air, from outer space and in the information domain. The following paragraphs, 7.9.2 to 7.9.8, will examine the defence against the various forms of physical threat, such as submarine, aircraft and ships' weapons, mines and IEDs. Paragraphs 7.9.9 and 7.9.10 will discuss defence against threats in the information domain, such as electronic, digital and psychological warfare. First, however, the general principles that apply to maritime defence will be examined.

7.9.1 Principles of maritime defence

Like the other forms of protection, defence is also geared towards creating the effects listed in paragraph 7.4.3: prevention, interception, damage control and repair. Although prevention of a threat offers the best protection, defence often focuses on the interception of a threat, as it takes place once an attack is under way or is imminent.

191 See also box on asymmetry in Chapter 10, paragraph 10.2 (Principles of manoeuvre).

Maritime defence against the various threats is based on **defence in depth**. Defence in depth makes use of the available space: the dispersal of forces hampers the opponent's picture compilation and enables early identification and interception of an attack by several units (in succession). Maritime defence uses the following principles:

- **Prevent detection by the opponent (denial of intelligence)**. This entails frustrating enemy picture compilation by obstructing one or more of the steps in his picture compilation process (detection, localisation, recognition and identification).[192] This can be achieved by:
  - **Counter-surveillance and counter-detection**: ensuring that a reconnaissance unit or a weapon carrier is unable to find the target(s).
  - **Counter-targeting**: ensuring that a weapon carrier does not get a fire control solution and is unable to use its weapons.

  Methods that can be used for this are OPSEC (EMCON, signature management), deception, evasive manoeuvres and the use of jammers.

- **Using a layered defence**. The use of more and/or different defensive means allows for a succession of 'layers' to intercept an attack. A layered defence can be used for either a group of units or an area (defensive units around the mission essential units) as well as for individual units (more than one defence system with different ranges).

- **Get the weapon bearer before he can use his weapon(s)** ("shoot the archer"). This will prevent not only a direct threat, but also the possibility of a repeat attack. The applicable rules of engagement (ROE) could, however, prevent this principle being applied in the initial defensive action (see paragraph 7.10).

To be able to apply the principles of defence in depth properly, the following criteria must be met:

- **Timely detection and identification**. The process of friendly picture compilation (detection, localisation, recognition and identification) must be completed before the enemy weapon-carrier can use its weapons or before the weapon used is within range of the defensive systems. If a carrier or weapon can be identified before it reaches the imaginary kill line, surprise can be prevented and measures implemented to ensure timely interception of the threat. This places two demands on picture compilation. Firstly, the detection and identification range must be greater than that of the protective (weapons) systems. Secondly, picture compilation must be a constant process. An opponent will always try to circumvent or breach existing protection, and to do so, he will try to avoid detection.

192 See Chapter 6, paragraph 6.8.1.3 on the processing of picture compilation data.

- **Coordination of defensive measures**. Defence in depth means the employment of multiple units and various means, and their effective and efficient employment is only possible with adequate C2, supported by real-time C2 systems. Specific coordination should also prevent interference as a result of defensive measures. Within a maritime task group, C2 for the defence is normally delegated to the principal warfare commanders (AAWC, ASUWC and ASWC).[193]

  Because the opponent is intent on surprise, two aspects are particularly important in the coordination of the defence: warnings and emergency measures.

  - **Warnings** are designed to enable all units involved to respond quickly to a detected threat. Maritime defence uses **Threat Warnings**.[194] Colour codes (white, yellow, red) are used to indicate the warfare commander's threat expectation; "air warning white" means that an air attack is not expected without timely warning, and "subsurface warning red" means that there is immediate danger of an attack by a submarine.

  - **Pre-panned responses** are designed to cope with an acute threat, such as an air or torpedo attack. Such responses simplify C2 by allowing a combination of defensive measures to be implemented on the strength of a single command (often a codeword).

193 See Chapter 5, paragraph 5.7 (Maritime tactical C2).
194 See ATP-1 Volume 1, paragraph 1, article 1470 (classified).

7.9.2 *Defence against submarines and torpedoes*

The threat posed by a submarine to other maritime units is threefold. Firstly, a submarine functions as a weapon carrier for torpedoes and guided missiles, which pose a direct threat to ships, submarines and troops on land. Submarines are usually equipped with heavyweight torpedoes: a hit by one of these torpedoes is normally fatal for the target ship or submarine. Submarines may also be equipped with guided missiles that can be employed against ships or against land targets (such as Tomahawk cruise missiles). Secondly, a submarine can serve as a base of operations for special forces, which can pose a direct threat to ships and shore-based troops. Lastly, a submarine can function as a reconnaissance unit. Submarines gather data for picture compilation, on the basis of which an opponent can launch other forms of attack (such as an air raid).

Defence against the threat posed by submarines makes up a significant element of antisubmarine warfare (ASW)[195] Defence against a submarine-launched missile is an element of air defence (see paragraph 7.9.3). For defence against special operations forces, see paragraphs 7.8.2 (physical security) and 7.9.4 (defence against surface threats).

As well as defence against submarine-launched torpedoes, this paragraph also examines the defence of submarines against torpedoes launched by aircraft, helicopters and ships.

195 See Chapter 11, paragraph 11.2.1 (ASW).

Vulnerabilities in defence against submarines and torpedoes
Surface ships are vulnerable to submarines. The range of a submarine's sensors (passive sonar, ESM) and weapons (heavyweight torpedoes) is normally greater than that of the sensors (active sonar) and weapons (lightweight torpedoes, depth charges) of surface ships. This means that if a surface ship detects a submarine on its sonar, in virtually all cases the ship is already within sensor and weapon range of the submarine. Surface ships should thus avoid submarines wherever possible.

Submarines, on the other hand, are vulnerable to aircraft and helicopters. Most submarines do not have air defence capabilities, which means that there is generally little to stop aircraft and helicopters launching an attack on submarines, as it is not necessary to observe any stand-off distance. Equipping maritime helicopters and patrol aircraft with special devices (sonar, sonar buoys and torpedoes) enables them to detect and attack submarines. Furthermore, submarines are also an excellent asset against enemy submarines, as they have similar sensor and weapon ranges.

Prevention of a submarine threat
The best way to prevent a submarine threat (and thus the threat of torpedoes or guided missiles) is to prevent enemy submarines from putting to sea. However, this requires offensive action and that falls outside the scope of defence. Should there nonetheless be enemy submarines in the area of operations, friendly ships and submarines (in any event the mission essential units) should then keep out of the enemy submarine's torpedo range (torpedo danger area, TDA) wherever possible.

Evasion will not always be possible, however; submarines are difficult to detect and their exact position is rarely known. If the submarines in question are nuclear powered, there is the added disadvantage that they are in principle faster than surface ships and other types of submarines; they can thus overtake these other units.

Prevention of a torpedo threat
If an enemy submarine is present in the vicinity but its exact position is not known, efforts must be made to prevent employment of its weapons. To ensure that the submarine is unable to get a fire control solution, the submarine's C2 must be subjected to maximum disruption. This can be achieved by denial of information (by means of OPSEC and EMCON), by deception (zigzagging) or by putting the submarine (commanding officer) under pressure and wearing him down (chasing the submarine, for example by helicopters).

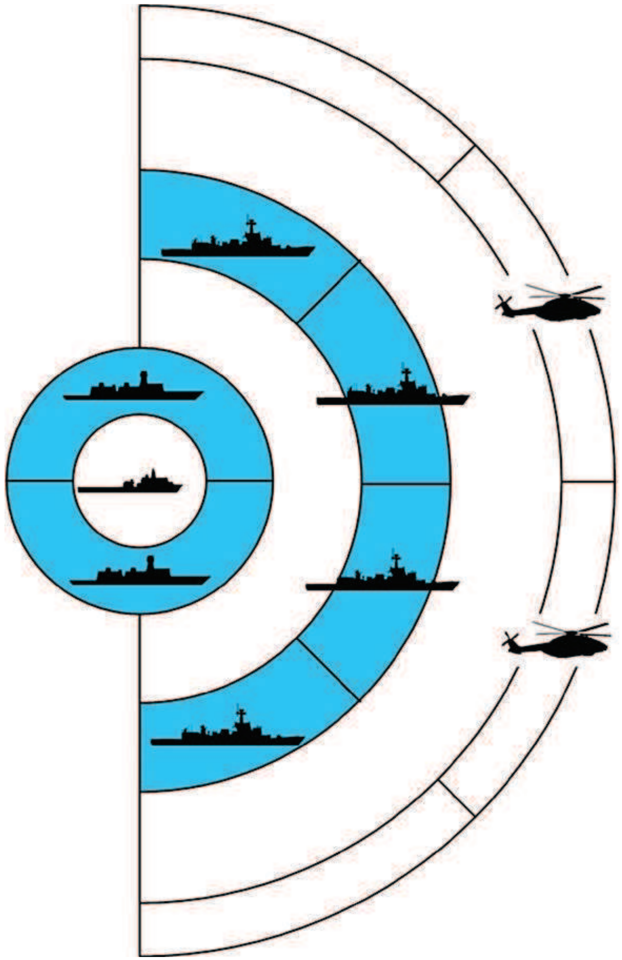
In reverse, similar tactics apply to a friendly submarine that is confronted by an enemy submarine, aircraft, helicopter or surface ship. To prevent an attack by torpedoes or depth charges, the submarine must try to remain undetected as far as possible. Without target data, attackers cannot employ their weapons effectively. Once it has been detected, the submarine must try to cause maximum frustration and deception for the enemy's picture compilation, for example by using air bubbles to create false echoes.

Intercepting a submarine threat

A submarine's strength lies in the element of surprise: a submarine is difficult to detect and will do its utmost to keep that advantage. When intercepting a submarine threat, the emphasis thus lies primarily on detection, then on evading, chasing away or attacking the threat. Maritime helicopters and aircraft run the lowest risk in the hunt for a submarine; in a layered defence against submarines, therefore, they form the outer layer around the mission essential units. The second layer is normally made up of friendly submarines, followed by a third layer of surface ships equipped for ASW (frigates). A layered screen is thus created around the units or area to be protected (see figure). Other variations are of course possible, depending on the local situation or the wish to use deception.

Intercepting a torpedo threat

If an opponent manages to launch his torpedoes, they must be prevented from reaching their target. These torpedo countermeasures (TCM) are made up of evasive manoeuvres, the use of torpedo decoy devices (soft kill) and/or the use of anti-torpedo torpedoes (hard kill). Torpedoes can be guided to their target in different ways: by wire, by friendly sonar or by detecting and tracking wake water. There are thus different TCMs, both for a surface ship that wants to evade torpedoes[196] and for a submarine that wants to avoid being hit by torpedoes launched by submarines, aircraft, helicopters and surface ships.



Example of an ASW screen

196 For more details, see Dutch MDP *Torpedodefensie voor oppervlakteschepen* [Torpedo defence for surface ships] (classified).

7.9.3 Maritime air defence

Maritime air defence is the defence of ships or an area against a physical threat from the air. It makes up an important part of anti-air warfare (AAW).[197] This threat consists of aircraft (both manned and unmanned), guided and unguided missiles and (ballistic) projectiles fired by aircraft or helicopters, by ships, by submarines and from the shore.

Maritime air defence does not stand alone, however, but in principle forms an integral part of the **air defence** of the whole area of operations and of the entire joint force, under the responsibility of the air defence commander (ADC) of the air component commander (ACC). Within that context, maritime air defence represents the maritime element of defensive counter-air (DCA) operations. Maritime air defence also includes maritime ballistic missile defence (MBMD), the maritime contribution to the joint defence against ballistic missiles (BMD).

Air threats are characterised by huge weapon ranges and high speeds. Defence against these threats thus requires short reaction times. Air defence therefore requires long-range sensors (often active radars), the capacity for real-time picture compilation and data exchange (fire control radar, data link) and as much automated weapon employment as possible. Air defence also involves frequent use of pre-planned responses, particularly in the defence against guided missiles (**anti-ship missile defence**, ASMD).

Prevention of an air threat

The best way to prevent an air threat arising is to keep out of range of that particular threat. The usually long range of aircraft, ballistic missiles and guided missiles normally make this impossible, however. Many forms of air threat can nonetheless be prevented by tackling them at source: the airbase, the aircraft carrier or the launching platform (ship, submarine, launch base). But this requires offensive operations: ASW against submarines, ASUW against surface ships or offensive counter-air (OCA) against airbases and onshore launch installations. Air threats can also be countered by counter-targeting, for instance with decoys and the correct use of OPSEC.

Intercepting an air threat

The execution of an offensive action to prevent an air threat is not always possible and may even be prohibited under the applicable ROE. The indirect air threat (from ships, aircraft and launch basis) will in that case have to be accepted and the defence should then focus on intercepting direct air threats. This is effected by means of a layered defence, consisting of air defence by a maritime task group or an area (force AAW) and self-defence by individual units. Interception involves the use of weapon systems (hard kill) and of jammers and decoy devices (soft kill).

197 See Chapter 11, paragraph 11.2.3 (AAW).

Force AAW makes up the outer layer of the air defence. Interception is effected through the use of aircraft (combat air patrol, CAP) and long-range missiles (surface-to-air missiles, SAM), supplemented with the use of jammers.

Launch of a surface-to-air missile

The inner layers of the layered air defence are made up of the self-defence systems of the units. These consist of guided missiles (such as the Sea Sparrow), naval guns and machine guns, supplemented by jammers and decoys, such as chaff (metallic radar-reflective strips) and flares (heat-radiating pyrotechnic devices). Optimum employment of self-protection means is usually coupled with manoeuvres, the purpose of which is to create open artillery arcs (open A-arcs), increase the effect of decoy devices and at the same time make the ship's signatures (such as radar cross section) facing the threat as small as possible. These protective measures are closely interrelated and, because of the short reaction times, must be implemented (extremely) quickly in almost all cases. Tactical decision aids (TDAs) in the ship's combat management system will support the crew in this task.[198]

Not all maritime units have the means for self-defence against air threats. In most cases, maritime patrol aircraft and helicopters are thus only equipped with decoys against guided missiles. MCM vessels and patrol ships usually have only machine guns. The combat forces landed in an amphibious operation do not usually have many air defence assets. If these units have to operate in an area where there is an air threat, they will need the protection of another unit (such as a frigate), which will in that case provide a defensive 'umbrella' under which the other units can safely perform their task.

198 See Chapter 5, paragraph 5.11.1 (Maritime C2 systems), Tactical data systems.

In maritime operations near land where there are also friendly air defence units, air defence needs to be coordinated. In expeditionary operations, this is done by incorporating maritime air defence into the **integrated air defence**. If maritime operations are being conducted in an area with an existing or static air defence organisation,[199] **coordinated air/sea procedures** (CASP) will be used.[200] These procedures enable mutual support between maritime air defence and air defence over land (such as surface-based air defence (SBAD) and land-based aircraft). These procedures also help to prevent interference.

7.9.3.1 Ballistic missile defence (BMD)

Ballistic missile defence forms a separate element of air defence. This is because ballistic missiles cover vast distances, in many cases even going beyond the earth's atmosphere. Furthermore, they could be carrying a nuclear or chemical payload (CBRN). The detection and intercept of such missiles at a safe distance requires not only specialised radar with extremely long range, but also guided missiles that can reach high speeds and that have extremely long range (beyond the atmosphere). Because of the vast range, BMD is a joint and multinational responsibility. Maritime BMD thus requires good coordination with various countries and with the other elements of integrated air defence.

7.9.4 Defence against surface ships

Ships can form all manner of threats for maritime forces. First of all, enemy warships can serve as (weapon) carriers for the following direct threats:

- Torpedoes and depth charges, thus posing a danger to submarines and ships; Defence against these is as described in paragraph 7.9.2.
- Aircraft and guided missiles, thus posing a danger to ships, airborne assets and land-based troops. Defence in this case is an element of air defence (see paragraph 7.9.3).
- Gun systems, thus posing a danger to ships, airborne assets and land-based troops.
- Amphibious troops and special operations forces, thus posing a danger to ships and land-based troops.
- Electronic warfare (EW) assets, such as jammers. For defence against this threat, see paragraph 7.9.9.

Besides warships, other vessels may also pose a risk to friendly forces because of the threat emanating from unconventional methods such as:

- the use of portable launchers, rocket-propelled grenade (RPG) launchers, mortars and (small) firearms;
- the use of (improvised) explosives;
- deliberate collisions;
- attempts to board for the purpose of sabotage, hijack, kidnap or robbery.

199 For example, the NATO Air Defence Ground Environment (NADGE), the treaty area's static air defence organisation.
200 For further details, see AJP-3.3.3.1 Air-Maritime Coordination Procedures.

These forms of threat are primarily directed at ships, but portable weapons and firearms can also represent a danger to aircraft and helicopters.

Lastly, each ship or small vessel can serve as a reconnaissance unit by gathering data for picture compilation and intelligence, on the basis of which an opponent can launch other forms of attack (such as a submarine attack or air raid).

Defence against the threat posed by enemy ships makes up a significant element of antisurface warfare (ASUW).[201]

Prevention of a surface threat

The best way to prevent a surface threat is to keep out of range of the source: by manoeuvre and/or by implementing counter-detection measures (deception, counter-surveillance). The prevailing circumstances and/or the mission itself may, however, make it impossible to keep out of range, certainly in a situation involving enemy aircraft carriers or warships equipped with surface-to-surface missiles (SSM). To prevent the indirect threat posed by enemy ships in those cases, offensive surface action is required, ideally before the enemy can employ his weapons. The distance at which this imaginary kill line lies will obviously depend on the direct threat (aircraft, guided missiles, guns, torpedoes) emanating from the enemy ships.

201 See Chapter 11, paragraph 11.2.2 (ASUW).

Intercepting a surface threat

The execution of an offensive action to prevent a surface threat is not always possible and may even be prohibited under the applicable ROE. The indirect threat posed by enemy ships will thus have to be accepted. In these cases, the defence should focus on evasion and interception of the direct threat emanating from the enemy ships. This includes, therefore, air defence against aircraft and guided missiles and torpedo defence against torpedoes.

If the threat comprises gunfire, firearms, (improvised) explosives or special operations forces, defence can take the form of decoys, evasive manoeuvres, counter-targeting and, finally, stopping an attacking ship by force. The latter therefore involves defensive employment of guided missiles, guns or firearms from the friendly ship or from aircraft or helicopters.

Launch of a Harpoon surface-to-surface missile

In the event of a threat of collision and/or (improvised) explosives, the aim is always to prevent the enemy ship from approaching too close or coming into physical contact with the your own ship. Evasive manoeuvres and employment of weapons must ensure that the required stand-off distance from the attacking ship is maintained.

12.7mm (.50) machine gun on board a minehunter

7.9.5 *Defence against physical land-based threats*

Maritime forces may also be faced by land-based threats. There are various forms of threat, which could be directed at ships underway, at ships that are in harbour or at anchor, or at troops coming ashore from the sea.

For all forces, one form of defence remains the same: air defence. This provides protection against aircraft, guided missiles and unguided and/or ballistic missiles and projectiles[202] launched from land (see paragraph 7.9.3).

For moving ships, the land-based threat could also take the form of torpedoes and artillery. The defensive measures against this are the same as those for the prevention and intercept of a torpedo threat (paragraph 7.9.2) and a surface threat (paragraph 7.9.4). The principle here is to keep out of range of the land-based positions insofar as circumstances and the mission allow. If that is impossible, the enemy must be prevented from employing his assets (counter-targeting), which can be achieved by means of deception or by disrupting his C2 and fire control. If these measures do not offer sufficient protection, there will be no option but to neutralise the land-based positions. This can be done by, for example, an air strike, a shore bombardment with guided missiles or naval gunfire or the employment of special operations forces.

202 In land operations these are referred to as rockets, artillery and mortars (RAM), but this term is rarely used in the context of maritime operations.

Ships at anchor may also be faced with the threat of torpedoes and artillery. A static ship is an easy target; the best response is to weigh anchor as quickly as possible.

The same applies to ships in harbour. They can also be faced with other land-based threats, such as (small) firearms, bombings, hostile crowds, and so on. When physical security (see paragraph 7.8.2.2) or defence on the land side can no longer offer sufficient protection, the ship should leave the quayside and make for a safe anchorage or the open sea.

7.9.6 Defence against sea mines

The detonation of a sea mine is usually sufficient to sink a ship or at least to disable it for the long term. Sea mines pose a grave danger to shipping. The mere suspicion that mines have been laid can bring shipping to a halt in the area in question, even if not a single mine has been found.

There are various types of sea mine. They can lie on the ocean floor (ground mines), float in the water at anchor (anchored mine) or float freely on or below the surface. The explosive charge can also be detonated in different ways: by sound (acoustic mine), by magnetic induction, by a difference in pressure, by direct contact, by remote control or by combinations of these methods. Mines can also be fitted with counters that will detonate the mine once a previously set number of activations have occurred, or with timers that activate the mine at certain times. There are also controlled mines, which can be activated or deactivated remotely. The advantage of these is that whoever controls the mines also controls freedom of movement in the minefield.

Prevention of a mine threat

The best way to prevent a mine threat is to stop mines being laid in the first place. This requires offensive actions (offensive mine countermeasures, offensive MCM), such as rendering mine stocks unusable, attacking mine layers or laying our own mine fields. If mines have or are suspected to have been laid, defensive actions are required to counter the threat (defensive MCM).

First of all, the mine threat can be prevented by evasion: in other words, by staying out of the mine-risk area. Evasion is only possible, however, if a mine or minefield has been located, and in many cases the position of enemy mines will not be known. If an opponent has mines, it is important to obtain as much information and intelligence as possible about his mine stocks and his mine-laying activities. On the basis of this information and the local conditions (water depth, current, etc), it is possible to determine where there is a real risk that the enemy has laid mines: the **mine threat area** (MTA). Friendly forces can then be assigned to routes that keep them outside the MTA. To increase the freedom of movement for friendly forces, it is important that the MTA be adapted (reduced) as soon as more information about the extent of the mine threat becomes available. If, for example, busy shipping lanes are running through the MTA without incident, these routes could be declared safe. There may also be mine-related incidents, thus giving a better indication of the location and size of the minefield. If a sea mine is found or if there is a mine-related incident, a **mine danger area** (MDA) will be declared around the site.

These MDAs are usually within the MTA and give an indication of the position of potential minefields. Special assets (usually MCM units) may be employed for reconnaissance in order to demarcate these minefields. The ideal end result here is that the MTA will cover the same area as the total MDAs, as this means that the minefields are demarcated.

Ships in or near areas with a (potential) mine risk (MTA and MDA) also need to implement protective measures to ensure that they do not activate any mines present. These measures[203] consist of creating a safe stand-off distance (horizontally and/or in terms of water depth) and minimising signatures. One example of a protective measure is to sail slowly and silently to reduce pressure differences and emitted noise. Another example is to make maximum use of deep water and the highest tide to escape contact mines, to reduce pressure differences and magnetic effects and to minimise the effects of a mine explosion. A ship may gain extra protection if it has equipment for detecting sea mines, such as mine avoidance sonar. This allows a ship itself to monitor the (horizontal) safe distance to mines and thus avoid mines and minefields.

In some cases, the mission may necessitate navigation through an area where mines have been found. The risk can then be reduced to an acceptable level by using MCM units to create a safe or swept channel. Depending on the assessment of the residual risk, other ships can then navigate the safe route independently or be given a leadthrough. In both cases, the ships will obviously need to observe the protective measures (such as safe speed) referred to earlier.

203 See Dutch RITA Part 6 Chapter 3 *Opereren met oppervlakteschepen in mijnengevaarlijke gebieden* [Operating with surface ships in mine threat areas] (classified).

Intercepting a mine threat

The removal of (suspicion) of a mine threat is a job for specialist MCM units.[204] The searching of a (potential) mine threat area, the creation of safe routes and clearance of detected mines and explosives is extremely time-consuming, however; depending on the size of the area and the circumstances, this can vary from a few days to several months.

7.9.7 Defence against (improvised) explosives

Missiles, torpedoes, rockets, bombs, grenades and (sea) mines normally derive their destructive power from the use of explosive charges. An opponent may, however, use explosives in other, more covert, ways. Firstly, this may take the form of improvised explosive devices (IEDs). Another option is the use of (military) explosive charges, for example limpet mines, laid by special operations forces. Both forms of explosive device consist of at least an explosive charge, a detonation mechanism and an energy source. The methods of activation are also similar. Both a (military) explosive charge and an IED can be activated in three ways, namely:

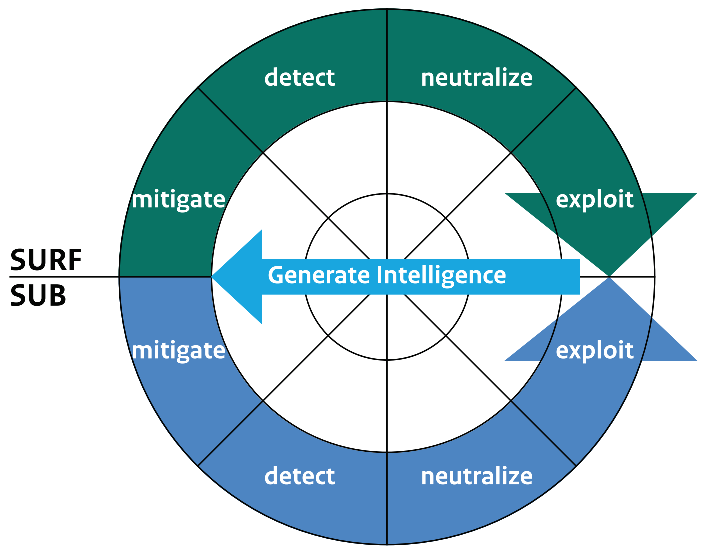
- victim operated (for example by means of a pressure switch);
- timed (for instance with a kitchen timer);
- command initiated (for example by a suicide bomber, by means of radiographic operation or with a mobile phone).

Both forms also have the common feature that they are delivered (near) to the target covertly. The difference between a (military) explosive charge and an IED is that while an IED could contain military components, it is generally made up of non-military parts and/or laid in an improvised manner.

204 See Chapter 11, paragraph 11.2.4.2 (Mine countermeasures).

In maritime operations, IEDs and explosive charges pose a particular threat to static objects (such as ships in harbour or those lying at anchor) and in activities in which teams are operating in the same environment as the opponent (as in the case of boardings, amphibious operations and special operations). For moving ships, IEDs generally only pose a threat if they are carried in a (small) vessel used as a moving bomb. Defence in this case is an element of defence against surface threats (see paragraph 7.9.4).

The package of measures used by military forces to counter the threat of (military) explosive charges and IEDs is called **counter-IED** (C-IED)[205] and covers three areas. The first of these, **attack the IED networks**, focuses on the will and means of opponents. It covers all activities designed to ensure that opponents are unable to make (improvised) explosives, or to plan and execute attacks. The purpose of the second measure, **prepare the force**, is to ensure that friendly units and troops are aware of the threat of (improvised) explosives and are familiar with the countermeasures they need to implement. The third, **defeat the device**, focuses on the ways in which opponents can use (improvised) explosives effectively. Defeating the device is the defence: it consists of measures to prevent the laying of IEDs or, if they have been laid, to detect and neutralise them in good time. These measures are geared towards the same effects that are listed in paragraph 7.4.3 (prevention, intercept and damage control), but in a different order. Defeating the device is designed to **mitigate**, **detect**, **neutralise** and **exploit** (see figure).



Defeat the device: protective measure in maritime defence to counter (improvised) explosives, both on the surface (SURF) and under water (SUB).

Mitigate: to minimize the damaging effects of (improvised) explosives
The 'attack the IED networks' activities will not be able to eliminate the threat of (improvised) explosives altogether. There will thus always be a need for protective measures to prevent the damaging effects. In the first instance, this will involve the implementation of physical security measures (see paragraph 7.8.2). Security measures are essential to prevent a charge or IED being laid somewhere where it can cause damage. Given that it will not always be possible to prevent that, measures are also needed to prevent the activation of a charge or IED.

205 For the complete C-IED doctrine, see AJP-3.15 Allied Joint Doctrine for Countering Improvised Explosive Devices. In maritime C-IED, this doctrine also applies to subsurface explosive charges.

One example of such a measure is the use of electronic jammers to disrupt the firing circuit of command-initiated charges (such as remote controlled IEDs, RCIEDs). However, this requires an accurate insight into the opponent's operating methods. Lastly, measures are needed to prevent friendly assets or personnel coming within range of an (improvised) explosive, for example by using alternative or safe routes.

Detect: to locate (improvised) explosives
Opponents use (improvised) explosives for surprise operations. Explosive charges and IEDs derive this element of surprise from covert laying and from camouflage and deception. This means that detection of (improvised) explosives is tricky and requires specific search techniques, namely military search. In the maritime domain, the search is not only for explosives that may be found on persons, on land or on board a vehicle, aircraft or ship. Subsurface searches also need to be conducted, for example on the ship's hull, at quays and anchorage sites or at sites used for amphibious landings. This is called maritime search.[206]

206 See box about Maritime search in Chapter 6, paragraph 6.8.2 (Picture compilation by teams).

Neutralize: to render detected (improvised) explosives ineffective
If an (improvised) explosive is found, measures need to be implemented to neutralise it.[207] An explosive can be neutralised in various ways. First of all, the damaging effect of the explosive can be avoided by staying out of range, for example by taking a different route. If that is impossible, the explosive must be made safe (IED disposal, IEDD). This is in principle the job of explosive ordnance disposal (EOD) specialists. Here too, maritime operations have their own specialists, whose main task is to dispose of explosives on the surface and under water.[208] EOD in shallow water (on a landing beach, for example) falls under very shallow water mine countermeasures (VSWMCM).[209] If no specialists are available, an (improvised) explosive can also be neutralised by means of a controlled detonation.

Exploit: to use knowledge gained from interception and/or dismantling
Detected and neutralised (improvised) explosives can provide valuable information. As soon as an explosive has been neutralised, as much information and material as possible should be collected. Forensic techniques can be used to secure traces that point to actors in the IED chain; these traces feed the intelligence process and thus support the protective activities conducted as part of the 'attack the networks' measure.

207 For the procedure upon discovery of an IED (confirmed or suspected) on board naval ships, see Dutch ACZSK DOPS 137.6 (IED incident plan).
208 See Chapter 9, paragraph 9.2.7 (Diving teams).
209 See Chapter 11, paragraph 11.2.4.2 (Mine countermeasures), VSWMCM element.

7.9.8 Maritime CBRN defence

CBRN defence is protection against the adverse effects of chemical, biological, radiological and nuclear weapons.[210] CBRN defence also includes protection against the harmful effects of toxic industrial materials (TIMs), regardless of whether their release is a result of an accident (hazard) or of deliberate misuse (threat).[211]

The open sea offers a certain amount of protection against chemical and biological threats, as the maritime environment is unfavourable for chemical and biological agents (dispersal by wind, dissolution in seawater), which means that only a targeted attack will have any chance of success. Mobility contributes to CBRN protection at sea, because it allows ships to avoid or escape from contaminated areas.

The closer to the littorals the maritime operation is conducted, the greater the threat or the hazard, not only because of the increasing risk of targeted attacks, but also because of the TIMs being released from shipping (chemical tankers, for instance) or from offshore installations (oil and gas). A further threat exists when boardings are conducted, when the boarding party risks exposure to CBRN agents, TIMs or contagious diseases while on board the suspect ship.

210 Formerly referred to as NBC (nuclear, biological, chemical).
211 For more details, see the Dutch JDP-3.8 *CBRN-verdediging*, NATO AJP-3.8 Allied Joint Doctrine for Chemical, Biological, Radiological and Nuclear Defence, and Dutch ACZSK DOPS NLMF STC 164.2 *CBRN Verdediging* [CBRN Defence].

Prevention of a CBRN threat

The best way to prevent a CBRN threat is to ensure that the opponent is unable to employ his means effectively. This can be achieved through offensive action (neutralisation of his weapons or weapon carriers). If that is not an option, counter-surveillance, counter-targeting and adopting a dispersed formation could help with protection.

Intercepting a CBRN threat

The active intercept of a CBRN threat means the neutralisation of the weapon carrier (for example, an aircraft or a ballistic missile) before it has been able to employ its weapon. Although an intercept will prevent employment of the weapon, a CBRN risk may still remain. The intercept may cause the weapon's active substance (nuclear, biological or chemical material) to be dispersed into the atmosphere or over the water or land (dust and rubble, debris).

In this case, and in cases where a CBRN weapon has been employed or where there has been a release of TIM, passive defence measures will have to provide the required protection. Passive intercept of a CBRN threat consists of:

- **Evasive manoeuvres**. These are used to avoid a fall-out area or gas cloud or to flee from it as quickly as possible.[212]

212 See Dutch RITA Part 6 Chapter 4 *Tactische aspecten van NBC-oorlogvoering* [Tactical aspects of NBC warfare] (classified).

- **Collective protection** (COLPRO). This keeps entire areas safe for living and working, so that personnel do not have to use individual protection. Most naval ships have the following equipment for collective CBRN protection:

  o **CBRN citadel**. This is a group of interconnected compartments that create an airtight buffer. Purified air circulates in the citadel to provide personnel with appropriate long-term protection against CBRN threats and TIM hazards. The air pressure in the citadel is higher than that outside to prevent inward leakage. Air locks allow personnel access to open decks. Personnel decontamination stations make it possible for crew members to return to the protected area.

  o **Pre-wetting system**. Sprinklers fitted on all outside decks allow seawater to be sprayed continuously over the ship's exterior. If activated early enough, pre-wetting prevents contaminants attaching to the ship and helps to wash off any existing contamination. The useful effect of the sprinkler system can be enhanced by creating the rolling and pitching movements of the ship, for instance by sailing a rapid zigzag course or by using the stabilisation installation (forced roll).

- **Individual protective equipment** (IPE) consists of, for example, a CBRN mask and CBRN protective clothing and footwear.[213] edical protection, such as vaccination against certain forms of biological weapons, also falls under IPE.

213 For details, see Dutch JDP-3.8.3 *Persoonlijke CBRN-bescherming* [Personal CBRN protection].

Timely detection and warning[214] of the presence of a CBRN threat (radiation, toxic substances) is vital to allow protective measures to be implemented. Many protective measures require preparation time before they are effective (citadel, pre-wetting). Maritime units are therefore provided with equipment to detect chemicals and radiological radiation.[215] They also have predictive programmes that can use current data relating to the sea state and the atmosphere to calculate and show dispersal and risk areas.[216]

Pre-wetting system in operation on an LC frigate

214 For details, see ATP-45 Warning, Reporting and Hazard Prediction of CBRN Incidents.
215 RADIAC and CADS, see Chapter 6 paragraph 6.6.1 (Collection and processing of current data relating to the maritime environment).
216 See Chapter 6 paragraph 6.6.2 (Predicting the effects of the natural environment).

Damage control
If a unit has been contaminated, that contamination must be controlled as much as possible. This hazard management involves contamination control, exposure control and decontamination. On board naval ships, the CBRN citadel and the pre-wetting system are the main means of contamination control. Exposure control only applies in the event of radiological contamination. This is done not only by trying to leave the fall-out area as quickly as possible, but also, as long as the ship is in a high-radiation area, by having the crew take shelter in areas inside the ship, preferably below the waterline. On board ships, personal decontamination is only possible with the aid of IPE and in the personnel decontamination station. There are only limited means available for reconnaissance and decontamination teams to perform operational decontamination of materials. Although the pre-wetting system serves to reduce contamination, it does not provide thorough decontamination. A ship can only be thoroughly decontaminated in port and by specialist decontamination teams (such as the Royal Netherlands Army CBRN defence companies).

7.9.9 *Defence against electronic warfare*
Military power can also be damaged in the electromagnetic spectrum. This occurs if an opponent engages in electronic warfare (EW)[217] to disrupt the functioning of radar, communications equipment and ESM devices. Examples of such activities are jamming (deliberate disruption of a signal) and spoofing (transmission of misleading information via radio communications).

Electronic Protective Measures (EPM) are designed to offer protection against the adverse effects of EW. Some devices have built-in technical protective capabilities, such as frequency hopping or home-on-jam (using the jammer as a beacon for terminal guidance). Information security also contributes significantly to EPM, particularly the EMCON plan and COMSEC (e.g., encryption and authentication).

Caution is advised when implementing EPM that can be detected by the opponent. The cure might be worse than the disease. Changing radio frequencies ('kick') could, for example, not only indicate that jamming has been effective, but could also result in a loss of communications. In situations where (temporary) loss of communications is undesirable (for example, during an air attack), a more favourable moment for the implementation of measures must be chosen ("fight through, then kick").

7.9.10 *Defence against information activities and digital warfare*
Information is a weapon. An opponent can damage military power by manipulating data and information systems so that the information flow and C2 will be misled or disrupted. An opponent using information as a weapon will engage in information activities such as deception, use of the media (public information via radio, television and internet), psychological operations (leaflets, influence) and inflicting damage on digital systems (digital or cyber warfare).

217 See Chapter 9, paragraph 9.4.1 (Electronic warfare).

Defence against deliberate damage to data and information systems consists of passive and active measures. Passive measures consist largely of procedures for information security (such as COMSEC and COMPUSEC; see paragraph 7.8.3.1). Deception must also be countered; situations in which decisions are based on incorrect information must be prevented. This is done by comparing and verifying collected data when it is gathered and processed (for intelligence and picture compilation, for example.[218] Shipping data, such as that obtained from the automatic identification system (AIS),[219] will need to be checked against data from other sensors, such as radar and visual observation.

Active defence can be achieved by performing information activities and, insofar as the ROE allow, conducting targeted cyber attacks (computer network attack, CNA).[220]

7.10 Use of force in security and defence

Military security and defence provide protection against deliberate damage to friendly military power. This may mean that force has to be used to stop an opponent. In principle, the ROE will determine the extent to which personnel may use (deadly) force or other actions that could be interpreted by other actors as provocative.[221] Each serviceman always has the right to defend himself, however, and the ROE may never restrict this inherent right of self-defence.

There are, however, a number of conditions that apply to self-defence. Firstly, self-defence can only be described as such if it involves defence against an attack that is actual or imminent. Force may only be used, therefore, to stop an attack or to remove a clear and present danger. Secondly, the force used must be necessary and proportional. 'Necessary' means that force may only be used if there are no longer any other means or capabilities to avert the attack. This also means that the force must cease as soon as the attack has stopped or the danger has been removed. 'Proportional' means that the force used must be in reasonable proportion to the perceived threat. In other words: do not use more force than is strictly necessary.

The right of self-defence not only applies to individuals, but also to teams and units. In the case of the latter, the decision to use force in self-defence will not rest with the individual but with the commanding officer or his deputy, for example the principal warfare officer (PWO) or the weapons officer.

NATO (and thus also the Netherlands and Belgium) also recognises the right of **extended self-defence**. This means that a unit has the right to use necessary and proportional force to avert an (imminent) attack on friendly forces. Extended self-defence enables NATO forces to fully exploit the principle of layered defence. The decision to do so rests with the force commander (OTC, CTF or CTG) or his deputy (for example, a principal warfare commander such as the AAWC or the ASWC).

218 The 'processing' step: see Chapter 6 paragraph 6.7.4.3 (Processing collected data into intelligence) and paragraph 6.8.1.3 (Picture compilation data processing).
219 See box on AIS and LRIT in Chapter 6, paragraph 6.3.2.2.
220 See Chapter 9, paragraph 9.3 (Maritime striking power in the information domain).
221 See Chapter 10, paragraph 10.6.1 (Rules of Engagement).

Not every threatening action by an actor necessarily means an (imminent) attack. While an opponent may perform an action that constitutes a threat, that threat might not be sufficiently serious or unavoidable to justify the use of force. If an adversary conducts an action that hinders operations and/or endangers personnel and materiel, it is said to be a hostile act. The laying of (sea) mines, the directing of weapon positions or fire control radar or the preparation/laying of an ambush are all situations that can be regarded as hostile acts. Something that is even further from the self-defence situation is hostile intent. There is said to be hostile intent if the opponent has the necessary capabilities and shows signs of his intentions to inflict damage.

This threat must also be based on evidence, such as observation and intelligence. Hostile intent usually involves an indirect threat, with the intent itself being shown by intelligence. Active gathering of (target) intelligence, for instance by deployment of ISR assets such as aircraft or by shadowing units, is regarded as hostile intent. The right of self-defence cannot be invoked for actions against a hostile intent or a hostile act, and activities against these threatening actions are only possible if the ROE allow.

The way in which the right of self-defence may be exercised depends on the situation at the time. For **Dutch military personnel** there is a difference between the following situations:

- **Force protection outside the Kingdom**. Maritime forces may find themselves outside the Kingdom without being deployed for an operation or mission. This would be the case, for example, during transits, port visits and exercises. In these cases, the ABNL ROE apply.[222] The need for self-defence could also arise in these situations. While a ship is in a foreign port, security is in principle the responsibility of the host nation. The right of self-defence continues to apply, however, for service personnel in the rightful execution of their force protection tasks, such as that of gangway watchkeeper. To provide clarity for the individual serviceman in these situations, both at sea and in a foreign port, the rules for the use of force are set out in the **ABNL ROE card**.

- **Force protection inside the Kingdom**. The use of force for the protection of military objects is laid down in the Act pertaining to the use of force by guards of military objects (2003) and the Decree pertaining to the use of force by Defence personnel in the execution of the surveillance and security task (2000). These regulations apply within the Kingdom of the Netherlands (thus including the Dutch Caribbean). The rules are set out in the **ROE card** (IK 2-27) for individual service personnel.

222 See Chapter 10, paragraph 10.6 (Rules of Engagement), Specific maritime ROE.

- **Military deployment outside the Kingdom**. In the event of military deployment outside the Netherlands, both the mission-specific ROE and the right of self-defence apply. To ensure that they are sufficiently clear both for individual servicemen and for commanders, the rules are set out explicitly in an ROE card (for the individual serviceman) and if necessary an aide-memoire (for commanders).[223]
  There may also be (armed) military deployment in foreign territory without specific ROE. This could arise, for example, in a humanitarian assistance operation, in which case the rules set out in the ROE for self-defence card (IK 2-15) will apply.

- **Military deployment inside the Kingdom**. Military deployment inside the Netherlands could also involve armed actions, for example in military assistance to local government. The rules that apply to the use of force will then depend on the type of national deployment and the (national) legal framework for the military assistance.[224] The same applies to the various forms of military deployment in the Dutch Caribbean.

For **Belgian military personnel**, first of all there is a distinction between situations in which international humanitarian law (IHL) applies and those in which it does not. In wartime situations, Belgian military personnel are given specific instructions for the use of force, including that in the context of self-defence. If the situation is not governed by IHL, then the use of force will be subject to the guidelines set out in Annex E (Use of force) of the operation plan and/or the operation order applicable to the operation or deployment.[225] This applies to national deployment (both in Belgium and elsewhere) as well as to deployment in a multinational context.

As the foregoing has shown, the way in which the right of self-defence can and may be exercised differs per operation and per situation. The correct use of force in (self-)defence thus requires that all personnel involved, from commanding officer down to marine and sailor, be aware of what situation they are in and which instructions apply. This means that personnel must be properly instructed for each operation, guard duty or other activity.

To be able to evaluate the legitimacy of the use of force, every incidence thereof must be reported.[226] This applies to each case of the use of force, irrespective of whether it has arisen in connection with force protection, self-defence or on the basis of the applicable ROE.

223 See Dutch CHOD Directive A-1103, *Operationeel-juridische voorbereidingen op uitzendingen* [Operational-legal preparations for deployment].
224 For details, see Dutch CZSK OPORD 10400 / CMS (*Intensivering Civiel-Militaire Samenwerking* [Intensification of Civil-Military Cooperation]).
225 For details see Belgian DGJM-APG-USEFOR-CXX-001 / LEGAD-Int *Gebruik van geweld door het personeel van Defensie buiten de situaties geregeld door het recht der gewapende conflicten* [Use of force by Defence personnel in situations other than those governed by the law of armed conflict].
226 For the Netherlands, see CHOD Directive A-159 *Rapporteren inzake geweldsaanwending militairen* [Reporting on use of force by military personnel] and Directive SG A/963 *Melden van voorvallen* [Incident reports]. For Belgium, see ACOT-SPS-DOCREP-ONXQ-001 *Notificatie van ernstige gebeurtenissen* [Notification of serious incidents].

7.11 Damage control and repair

In spite of all the protective measures for safety, security and/or defence, there may still be incidents in which personnel are injured or killed, in which materiel is damaged or in which information becomes corrupt or falls into the wrong hands.

Regardless of whether such an incident is the result of an accident, a security breach or a hit, measures must be implemented immediately for the purposes of **damage control**.[227] The earliest possible start must also be made on battle damage repair (BDR). All these measures must be geared towards repairing military power (personnel, materiel and information) as much as possible in the shortest possible time frame. At the same time, a report must be made in the command line not only of the incident itself, but also of the implications, how the repair is progressing and whether any assistance is needed (see paragraph 7.4.4).

Damage to friendly military power could consist of material damage, physical and psychological injury and damage to information. In maritime operations, there are differences in the ways of controlling and repairing damage between the 'manned equipment' (ships, aircraft) and the 'equipped men' (teams, as in amphibious operations). Paragraphs 7.11.1 and 7.11.2 will look at these in detail. Paragraph 7.11.3 will then discuss the control and repair of damage to data and the information flow.

227 Damage control in a broader sense is also known as consequence management or incident response.

The control and repair of psychological damage to personnel is not discussed in this paragraph, but in the context of sustainability in Chapter 8.[228]

7.11.1 Damage control and repair on board ships and aircraft

Ships under way[229]

A typical feature of the situation on board ships that are under way is that a high degree of self-sufficiency is required. Incidents such as fire, leakage and injury must in principle be dealt with by the crew themselves. On board a ship under normal circumstances, a specifically designated part of the crew is responsible for the initial response in incidents such as fire and accidents: the **standing at-sea firefighting party** and the **first-aid team**.[230] In high-risk situations or activities, the commanding officer will raise the degree of readiness by standing up special duties (for example, special sea duty or flying stations; see box at paragraph 7.4.3) or by making specific preparations for a possible hazardous situation (for example, if the onboard helicopter has got into difficulties and has to make an emergency land-on). If it turns out that employment of the firefighting party, the first-aid teams and the special duties is not sufficient to bring the incident under control, then the ship will go into emergency stations. Most of the crew is assigned a role in emergency stations, the core of which is made up of the **firefighting and damage control (FF/DC) teams**, which can relieve each other when dealing with the calamity. In emergency stations, repair teams are also posted and the first-aid teams are augmented.

228 See Chapter 8, paragraph 8.5.2 (Psychological care).
229 For detailed regulations for damage control on board Dutch and Belgian naval ships that are under way, see Dutch/Belgian ACZSK DOPS NLMF STC 164.1 / ACOT-SPS-OPSNAV-NMSQ-200 Damage Control.
230 The medical response service provides the first-aid in the medical support chain (Role 0). See Chapter 8, paragraph 8.5.1.2 (Levels of medical care).

In the event of an increased threat level, the ship will switch from the normal four or three section watch to a higher level of readiness (two section watch). This normally means that half the crew are at post to perform their assigned task and self-defence. In this situation, half the damage control organisation is also at post, including half of the FF/DC teams. In the event of an incident, scale-up can take one of two forms: either to emergency stations (in the event of accident, fire or damage) or to battle stations (in the event of an acute threat). During battle stations the entire crew is ready for action: one part to perform the combat tasks and the other part for damage control and repair, mainly divided into FF/DC teams, repair teams and the medical response service. The configuration may differ for specific forms of threat or hazard; for example, reconnaissance and decontamination teams for hazard management in a CBRN or TIM incident (see paragraph 7.9.8).

Because crews have to be self-sufficient while under way, the employment of each crew member is vital to bring a calamity under control. Everyone must be able to take the right initial action, for example on discovery of a fire, a leak or a casualty. Furthermore, everyone must be able to perform the tasks in the follow-up actions in the firefighting party, in an FF/DC team or in the treatment of casualties. Damage control and first-aid treatment are thus among the basic skills of all naval personnel.

Firefighting on board

Ships in harbour
Ships in harbour will have less need for self-sufficiency and there will normally be an opportunity to seek refuge on the quayside in the event of a calamity.

Under normal circumstances, a small part of the crew will be on duty (harbour detail) for surveillance, security and initial emergency response. If an incident cannot be brought under control with the employment of duty personnel, assistance will be requested from the onshore emergency services (fire service, ambulance).[231]

If there is an increased threat, more onboard crew members will be on duty for extra security and defence (see paragraph 7.8.2.2). If the threat level necessitates a high security alert state, the ship will switch to independent damage control by implementing four, three or two section watch.

Ships at anchor
Ships at anchor are like those under way in that they are in principle left to their own resources. In these cases, the organisation of damage control is identical to that of ships under way (standing firefighting party with FF/DC-teams as back-up). In cases where the assistance of local emergency services (such as fire boats and fire service) can be called upon, these can take over part of the FF/DC task. If, however, there is an increased threat and a security alert state is in force, the ship will want to keep the responsibility for damage control itself, for example by switching to two section watch.

231 Other procedures may apply in the home port (Den Helder, Zeebrugge), for example that ships are completely shut down and closed outside working hours and monitored by centralised surveillance.

Aircraft, helicopters and small craft
Small units that are operating independently away from a mother ship, such as helicopters and landing craft, have only limited, sometime extremely limited, capabilities for damage control. In the event of damage, breakdown or injury, the response will be confined to initial response actions, such as activating fire extinguishers or giving first aid. Further actions will require the support of the mother ship. Aircraft and helicopters will obviously want to turn back, if they still can, to the mother ship, to another ship with spare deck or to an airbase.

Damage to an aircraft, helicopter or vessel may be so substantial that the vessel sinks or that the aircraft has to make an emergency landing, either ditching in the sea or crashing on land. Search and rescue (SAR) operations will be needed in these cases; if an air crew has come down in enemy territory, a personnel recovery (PR) operation might have to be mounted.

7.11.2 Damage control and repair in team operations
Maritime team actions are usually conducted outside the object (ship or base) itself. If an incident occurs, the main emphasis will be on treatment of casualties. This will obviously be the case in the event of an accident: the first response is always to stabilise casualties, and then evacuate them to a safe location where further medical treatment can be given.

In the event of an attack or fire contact, action will also need to be taken to prevent further injury or damage. This means: leave the danger area as quickly as possible (**dash**) and seek cover (**down**), move under cover to a safe and favourable position (**crawl**) to get a view of the area (**observe**) and the attackers (**sight**) in order to be able to give (**suppression**) counter-fire (**fire**). In the meantime, start giving first aid to and evacuating casualties.

Medical evacuation in amphibious operations

Maritime team actions may take place on land, for example in an amphibious or a humanitarian assistance operation, or on board another ship, for example in a boarding. The limited freedom of movement on board an unfamiliar ship is then a disadvantage in escaping from and suppressing the attackers and in treating casualties. Direct support will be needed from the mother ship, both in the form of fire support and (accelerated) evacuation of casualties.

7.11.3 Damage control and repair of data

Damage can also occur in the information domain, either accidental or deliberate. There is said to be damage if the exclusivity, availability or integrity of information is damaged. This is no different in maritime operations than in those in the other domains, such as land and air.

Damage to exclusivity means that confidential data has (potentially) fallen into the wrong hands (compromise). Damage control consists of fixing the data leak, for example by switching to alternative encryption. Repair of confidentiality is in effect no longer possible: the compromised data must be regarded as lost. Instead, alternatives will need to be sought wherever possible, for example alternative operation plans, tactics, and so on. The compromise of data can have extremely serious repercussions; every case involving a (suspected) breach of confidentiality must therefore be reported as quickly as possible to the security authorities.[232]

232 For the Netherlands, see Aanwijzing SG A/963 *Melden van voorvallen* [Reporting incidents]. For Belgium, see ACOT-SPS-DOCREP-ONXQ-001 *Notificatie van ernstige gebeurtenissen* [Notification of serious incidents].

Data might become unavailable as a result of physical damage, for example a power cut or damage to data carriers (computer systems, papers). Repair is effected by removing the physical cause or by switching to systems that are still available (redundancy, copy). The unavailability of essential data could also, however, be the result of software errors (deliberate or otherwise). This can be repaired by restoring back-up files. At the same time, the cause of the data loss must be investigated in order to avoid any repetition of the problem.

Data could also become corrupt. This could happen during storage or transport (data connections) and could be the result of software errors (which perform incorrect actions or calculations) or hardware faults (damaged disks, for example). Here too, repair is possible by using different hardware or restoring earlier back-ups.

Damage control for digital information is largely supported by security software that monitors access to and integrity of the systems, blocks harmful actions and detects, isolates and removes malicious software. This works in the same way as antivirus and security software designed for personal digital devices.

8. MARITIME SUSTAINABILITY

8.1 Introduction

Maritime operations are defined as the pursuit of objectives in the maritime domain through the use of military power. This military power is made up of three elements: means, ways and will. The available military power must be sustained throughout all stages of the operation and increased if necessary. In the first instance, this is achieved by protecting the means (materiel, personnel and information) and the morale against damage resulting from hazards, interference and threats. This is the joint function 'force protection', as described in Chapter 7. Secondly, the opportunities and moral support for the operation need to be maintained and expanded. This is the province of the joint function 'manoeuvre' that is described in Chapter 10. At the same time, however, the available means and the morale must also be sustained, by replenishment, care and maintenance, until the mission has been completed successfully. This is achieved with the joint function 'sustainability', which is examined in this chapter.

Sustainability is the ability to maintain the required military means as long as is necessary to achieve the mission objectives. Military means are made up of personnel, materiel and information. This chapter will only look at how personnel and materiel are maintained, as the task of maintaining (and expanding) the required information falls to the joint function 'intelligence', as described in Chapter 6.

Sustainability consists largely of logistics.[233] namely operational logistics for materiel and personnel made up of the following six functional areas:

- Medical services, comprising preventive health care, advice for the commander, short-term medical intervention and a medical evacuation chain.
- Supply: the procurement, storage, shipment, distribution and removal of materiel and supplies, including food and medical equipment.
- Maintenance and repair of materiel.
- Logistic movement and transport of personnel and materiel.
- Infrastructure: the acquisition or construction, maintenance, management and removal or demolition of required infrastructure.
- Logistic services, such as billeting, food supply, laundry, postal services and refuse disposal.

Sustainability is, however, more than logistics and services. It also includes watch and shift systems in order to maintain continuous operations, deployment and rotation of operational reserves and the roulement of units.

Sustainability is not only a function and a principle of military operation; it also has a direct correlation with other principles. Sustainability is thus a precondition for flexibility; it ensures that options for action remain open. At the same time, flexibility is an important logistic principle; flexible support offers more possibilities for maintaining military power. Sustainability also helps to maintain morale by providing medical, psychological and material support. Other principles in turn support sustainability. Economy of effort, for example, contributes significantly to the ability to sustain the operation.

233 For the capstone doctrine relating to logistics and sustainability, see AJP-4 Allied Joint Logistic Doctrine.

There is also a direct correlation between sustainability and protection. Firstly, certain forms of support contribute to prevention; the best example of this is medical support, where vaccinations help to prevent loss of personnel through illness. Secondly, there is an overlap between the two functions, for example where redundancy is concerned.[234]

Maritime operations take place in the maritime domain, mainly with units specially suited to that environment: ships, submarines, maritime aircraft, amphibious troops and specialist teams such as boarding and diving teams. Both the features of the maritime domain and the characteristics of these units result in capabilities and restrictions in terms of maintaining personnel and materiel.

This chapter starts by describing the characteristics of maritime sustainability and goes on to explain the forms of maritime logistic support. After a brief look at the coordination of maritime logistic support, the chapter will continue with a description of the different functional areas of maritime logistics, looking in turn at personnel support including medical and psychological care, supply, maintenance and repair of materiel, movement and transport and logistic services. Lastly, relief and rotation of personnel and units will be examined.

8.2 Characteristics of maritime sustainability

Sustainability in maritime operations is, just as in any other form of military operation, dependent on the four planning factors: distance, destination, demand and duration (the four Ds). Maritime sustainability also depends on the specific characteristics of the maritime domain, two of which have a defining influence on the planning factors. The first is the vast expanse of the maritime domain, which often involves long distances and a great deal of travelling time. This characteristic particularly affects the distance factor. The second characteristic is that the maritime domain is not a natural environment for humans; seawater is not drinkable, food is difficult to come by and movement in the domain (for any length of time) is only possible with the aid of means such as ships and aircraft. This characteristic is important for the demand factor.

The following section will examine how each planning factor impacts on the ability to maintain the materiel and personnel required for maritime operations. The ensuing characteristics of maritime sustainability will be discussed at the end of the paragraph.

234 See Chapter 7, paragraph 7.4.3 (Protective measures).

Distance
The ‘distance’ factor affects sustainability in two ways. Firstly, the length of time for which forces need to be able to operate independently and without support will determine the arrangements for their organic sustainability. In addition, the distance and travelling time affect the way the support chain is set up, especially the inter-theatre distance (between the home base and the area of operations) and the intra-theatre distances (between local support sites and the units in the area of operations).

The maritime domain is vast: maritime operations are characterised by great distances and long travelling time. Naval ships therefore need to be able to operate independently for long uninterrupted periods of time. They must thus carry sufficient supplies, be able to maintain their own materiel and be able to provide food and any necessary medical treatment for their crew. Furthermore, the crew must be composed in such a way - qualitatively and quantitatively - that continuous operation is possible without giving rise to fatigue or demotivation.

Maritime operations generally take place a long way from the (national) home base. This generates a need not only for local support, but also for strategic transport.

Maritime operating areas are normally vast. The great distances and long travelling time within these areas of operation have implications for sustainability. The long travelling times are thus at odds with the target times that apply to medical support (see paragraph 8.5.1), which might mean that ships have to be equipped with extra medical facilities before deployment.

Furthermore, ships will not usually rely on one port or airbase for their onshore support, but will use different facilities in or near the area of operations.

This means that the support chain will not usually consist of one main supply route (MSR), but of a network of routes and ship chandlers which are often used on a one-off basis.

Destination
The ‘destination’ factor relates to both the area in which the operation is taking place and the unit for which the support is intended.

Local conditions in the maritime area of operations not only affect consumption and wear and tear, for example as a result of cold, heat and salt corrosion. Specific health risks may also arise, necessitating preventive measures and impacting on the planning for the medical support chain. The availability of local facilities such as ports and airbases (host nation support, HNS) and whether or not surrounding nations are proving helpful will also be instrumental in determining the possibilities for logistic support of the maritime operation.

The end destination and any intervening transshipment points play an important role in the supply process. Whether or not goods can be handled or received in a particular form or packaging will determine how they are transported. In maritime operations, most units (naval ships as well as troops in the field) are not able to work with containers; instead, pallets or even smaller forms of packaging are used.

Demand

The ‘demand’ factor affects both the supplies and facilities that units require and the scale and frequency of supply and support. Many requirements, such as food and consumable items, are usually fairly easy to predict. Others can fluctuate greatly under the influence of the circumstances and the course of the mission. Examples of the latter are fuel, spare parts, ammunition and medical support. Demand planning is usually done by determining logistic risks: the likelihood that something will be needed and the repercussions if it is not (readily) available. Time also plays a role; the longer an activity or operation lasts, the greater the demand for (strategic) supply and support. In that sense, there is a close correlation between the factors of demand and duration.

Although naval ships are able to operate for lengthy periods without supply or support, there will nonetheless be demands over the course of time. Fuel is one of the most critical of these, given that other essential facilities depend upon it (propulsion, electricity, drinking water). Furthermore, demand for (fresh) food may arise relatively quickly. The maritime domain does, however, offer the advantage that this type of shortfall can often be met through local civil channels. Freedom of navigation in the maritime domain allows a ship to use replenishment at sea or to seek a (safe) port for the purpose of loading new supplies.

Maritime operations are often multinational in nature; maritime task groups will then consist of units of differing type and nationality. Efficient support of these different units is only possible if equipment, methods and procedures are as interchangeable as possible and in keeping with each other. Standardisation of equipment, methods and procedures results in simpler and faster supply and replacement and thus has a positive effect on maritime sustainability.[235]

In the maritime domain, demand also affects the way actions are supported from the sea, such as amphibious and humanitarian assistance operations. In these operations, it is always a question of how big the logistic footprint on land can or should be. At one end of the scale, the choice could be to keep the footprint to a minimum by providing as much support as possible direct from the ships. This is fast and flexible, but carries a risk of critical shortfalls. At the other end of the scale is the option of setting up an extensive support site on land. This takes time and requires more security, but it delivers more robust support. This will be discussed further in paragraph 8.3.2.1.

A special facet of sustainability that also falls under the demand factor is the use of **redundancy**. The (immediate) requirement for spare parts and corrective maintenance can be limited by running essential systems with high levels of redundancy. Failure of or damage to a system or its parts will then have no or only limited implications for the operation. On board naval ships, therefore, many essential facilities are duplicated or triplicated (such as propulsion (twin propellors, two rudders), electricity supply (generator, cabling) and computer system (networks)).

235 See also ‘Standardisation – the silent power of NATO’ in Chapter 3 paragraph 3.4.1 (Anticipation).

Duration
The 'duration' factor is not only important in estimating and planning the demand, as indicated above. In longer deployments, this factor also determines the extent of the requirement for roulement: the relief and rotation of teams, crews, units or even entire task groups. Paragraph 8.11 will examine this in more detail.

Characteristics of maritime sustainability
As illustrated in the foregoing description of the use of planning factors in maritime operations, typical features of maritime sustainability are:

- a high degree of self-sufficiency and thus a limited degree of logistic dependence;
- reduced vulnerability by ensuring redundancy in essential systems;
- multinational standardisation of equipment, methods and procedures;
- use of civil sources for supply, particularly for fuel and food;
- a logistic chain that usually comprises not just one fixed route, but a network of routes and support sites;
- use of small packaging units for supply items.

8.3 Forms of maritime logistic support

Maritime actions not only involve ships, submarines, helicopters and aircraft, but also troops and teams. These personnel and assets are deployed in different ways for operating at sea and from the sea, and this has implications for the way in which sustainability can best be supported.[236]

The following paragraphs discuss the different forms of maritime logistic support. First, paragraph 8.3.1 will look at logistic support for operations at sea, and this will be followed by a description in paragraph 8.3.2 of the sea-based logistic support for units operating on land.

8.3.1 Logistic support for operations at sea
Naval ships are characterised by a high degree of self-sufficiency. They have their own supplies and provisions on board that allow them to continue to operate for long periods. Supplies are finite, however, and the levels of facilities and maintenance are not without their limits. At certain times, therefore, supplies will have to be replenished and, in cases where a ship's own provisions will not suffice, external assistance will be required. This would be the case, for example, in the event of damage to or failure of main or critical systems, or if personnel have sustained serious injury. The required support can be obtained in two ways: from other ships (afloat support) or from land (ashore support).

Paragraphs 8.3.1.1 and 8.3.1.2 will examine both these forms of logistic support for naval ships at sea. Paragraph 8.3.1.3 will then look at the logistic support in team-based maritime operations such as boardings.

236 For more details, see ALP-4.1 Multinational Maritime Force Logistics.

8.3.1.1 Afloat support

Afloat support is provided between ships as well as by specially equipped logistic ships.

- Mutual support takes place mainly for spare parts. This could be a case of important logistic synergy; if different units are using the same equipment and goods, they can use each other's supplies and thus be less dependent on shore-based support. Mutual afloat support is not confined to spare parts, however: it might also involve specific expertise or a facility that is not available on some ships but is on others (often larger ships). A good example of this is dental treatment.

  Mutual support may also take a more centralised form, as in the case of units which have lower sustainability, such as MCM vessels and fast patrol boats (FPBs). In task groups consisting of this type of unit, a larger ship will usually function as the staff ship, which will then provide the extra (logistic) support for the task group units.

- Support by logistic ships provides a significant expansion of sustainability, particularly when it involves supply ships that are suitable for replenishment at sea (RAS). Firstly, a supply ship, mother ship or support ship functions as an extra warehouse and supply centre. Furthermore, the supply and facility levels are normally higher than those of the other ships (for example, more extensive medical facilities). Secondly, a supply ship can function as a link between the ships at sea and the ashore support; it can bring up new supplies, enabling other ships to remain at sea for longer. A shuttle service such as this is particularly important for supplies with a high rate of consumption or limited storage life, such as fuel and food.

8.3.1.2 Ashore support

Ashore support is land-based logistic support of maritime units, both to replenish supplies and to supply goods and services that the maritime units no longer have.

In its simple and commonly used form, ashore support consists of replenishment and maintenance assistance during (short-term) port visits. The ship then deals mainly with civil suppliers and companies, which provide in-country resources (ICR). A consul or civil ships chandler usually acts as an intermediary between the ship and local supplier.[237] Only in cases of immediate operational need and if they cannot be obtained locally will goods be send from the home base. This usually concerns vital spare parts.

In its extended form, ashore support comprises an entire **advanced logistic support site** (ALSS), with multiple smaller **forward logistic sites** (FLS). There is usually host nation support (HNS)[238] involving agreements that are made with the countries hosting the ALSS and FLS. Because of the usually vast size of maritime operating areas, there is generally more than one FLS, spread over sea- and airports near the area of operations. This extended form of ashore support is used in longer-term maritime operations taking place a long way from (national) home bases, as these will have a greater requirement for support that is not available locally, such as ammunition, specific parts, maintenance expertise and relief of personnel. An ALSS can also be equipped with specific support such as medical facilities. Because maritime operations usually take place in a multinational context, support sites such as an ALSS and FLS are often used by more than one country.

237 For Belgian maritime units, the NATO Support Agency (NSPA) acts as the permanent ships chandler abroad.
238 For details about host nation support, see AJP-4.5 Allied Joint Host Nation Support Doctrine & Procedures.

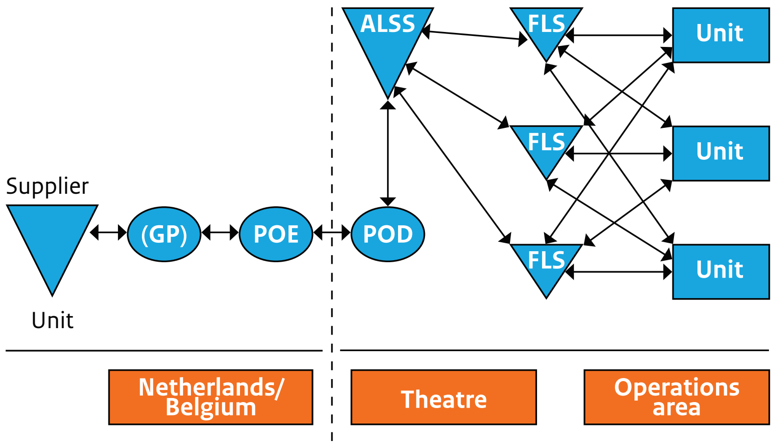


Diagram showing the maritime logistic support chain

The illustration shows a diagram of ashore support. The required support (means or personnel) are assembled in the home nation at a point of embarkation (POE), such as a seaport (SPOE) or an airbase (APOE), if necessary making use of a groupage point (GP). From the POE, the assembled support goes by aircraft or ship with civil scheduled services, civil charters or strategic military transport to a seaport of debarkation (SPOD) or an airport of debarkation (APOD) in or near the area of operations. The ALSS provides temporary storage/billeting and arranges onward dispatch to the appropriate FLS (or direct to the unit concerned).

Transport from the ALSS/FLS to the unit concerned could take place in the following ways:

- over land, for example if the ship is in a harbour;
- by sea, for example with other ships, small vessels or on a supply ship;
- by helicopter (vertical onboard delivery, VOD);[239]
- by airdrop (in the case of goods).

The support that can be delivered in this way is referred to as passengers, mail, cargo (PMC). The cargo of the PMC refers to goods that can be carried by aircraft, so not bulk goods such as fuel or hazardous goods such as large-bore ammunition.

The support chain is not a one-way process, however. All steps have a return flow from the area of operations to the home base, for example for returning or wounded personnel. Furthermore, the chain can also be used for other purposes, such as the accompanied transport of detainees suspected of piracy or smuggling.

It is not always necessary to set up every element of a logistic chain. Depending on the duration and scope of the operation and on the support available locally, an (extended) FLS or a combination of an FLS with other shore-based facilities, such as a communication or command centre, may suffice. One example of this is the Dutch mobile forward support facility (MFSF).[240]

239 Such transport can also be take place by aircraft to an aircraft carrier; this is known as carrier onboard delivery (COD).
240 See the description of the MFSF in the box entitled 'Command facilities of the Dutch and Belgian navies' in Chapter 5 paragraph 5.10 (Maritime headquarters and command facilities).

8.3.1.3 Logistic support in team-based operations at sea

Maritime operations at sea not only involve ships, but also teams that come from ships or that are operating independently. These include boarding parties, vessel protection detachments (VPD) and teams providing (emergency) incident response and assistance on board other vessels.[241]

Teams that operate from a naval ship are supported by that 'mother ship'. This does not normally pose any problems, as the ship remains in the immediate vicinity of the vessel in question throughout the boarding or the response action. Special circumstances could obviously arise, such as a boarding that is going to be extremely time-consuming (thus necessitating relief of personnel) or situations involving multiple casualties. Ideally, therefore, the naval ship in question should have recourse to support from other units (afloat support).

There are also situations in which teams operate independently on board another ship, for instance in the case of independent teams embarked on board merchant ships (autonomous VPD or AVPD). These teams can of course make use of facilities on the merchant ship (such as billeting and catering) but will need to be self-sufficient in other aspects of sustainability. Examples of this are supplies of ammunition, medical support and watch relief. An AVPD is thus larger in terms of personnel and materiel than a VPD operating from and under the supervision of a naval ship. Replenishment and relief of an AVPD occurs once the ship has reached the destination port. Strategic transport is required for this; a further option is to make use of forward supplies.

8.3.2 Sea-based logistic support for operations on land

Maritime operations not only take place at sea, but can also extend from sea to land. In many cases, this means that personnel and materiel are employed for operations ashore. To guarantee the sustainability of this landed military power, support needs to be available; this is in principle provided by or through naval ships present in the area, which make up the afloat support.

Sea-based logistic support occurs in the following situations:

- amphibious operations, whether they represent combat actions or are part of maritime assistance such as a humanitarian assistance operation or an NEO;
- maritime special operations;
- riverine operations;
- in support of land operations.

The form and scale of this logistic support can vary widely in these situations, although it is normally based on the same model, namely that of combat service support (CSS). Paragraph 8.3.2.1 sets out the application of this model in amphibious operations. Paragraph 8.3.2.2 will examine the use of this model in two other forms of activities performed from the sea, namely maritime special operations and riverine operations. Paragraph 8.3.2.3 will then discuss the logistic support that maritime units can provide for land-based operations.

241 See Chapter 9, paragraph 9.2.6 (Boarding parties, security detachments and emergency response teams).

8.3.2.1 *Logistic support for amphibious operations*

Combat service support (CSS) for amphibious operations[242] is based on the following principles:

- Support for light infantry operating in dispersed formation, so for small, highly mobile units and teams with limited independent sustainability ('man-portable' supplies, normally sufficient for 48 hours);
- Little or no local infrastructure present or available (port facilities, airports, roads);
- No in-country resources or HNS.

Amphibious logistic support thus differs from other forms of CSS because of the small footprint, the high degree of independence and mobility and the possibility of rapid scale-up or -down.

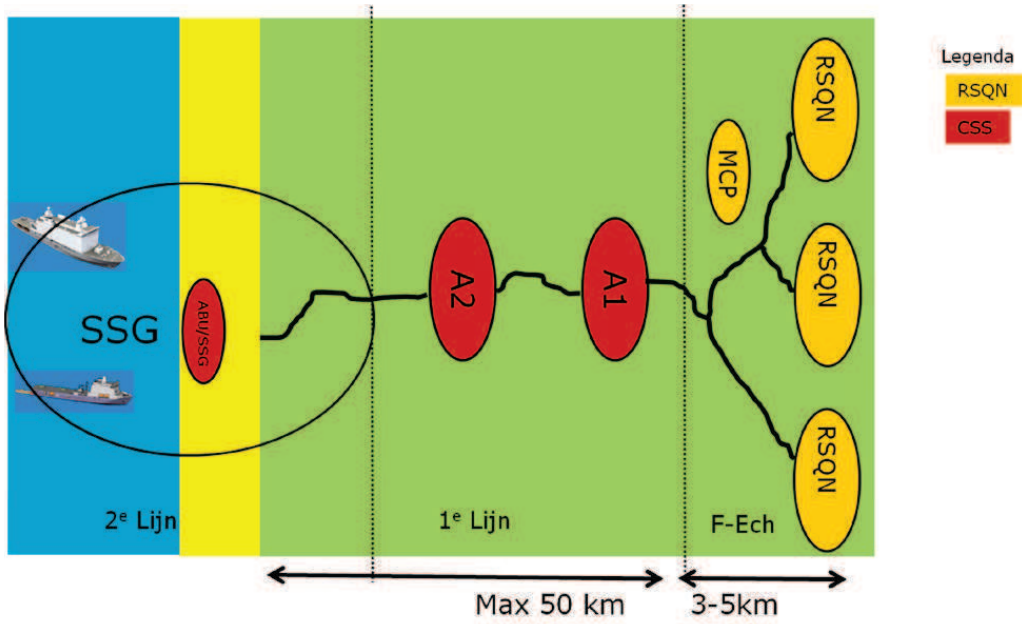
Logistic support of amphibious operations is organised in 'echelons' and is based on three support levels.

- First-line support comprises the logistic means and services needed for five-day sustainability. This first line consists of two echelons:
  - o F Echelon (fighting echelon), the front line of primary combat forces;
  - o A Echelon, the first line of supply and support immediately behind the F Echelon.

242 For details, see Dutch ACZSK DOST/MATLOG 305 *Operationele logistieke processen* [Operational logistic processes], Chapter 11000 (Amphibious operation).

- Second-line support delivers the logistic means and services needed for 25-day sustainability. The second line is also referred to as the sea-based support group (SSG) and consists of:
  - o C Echelon (CSS group), the link between the forward echelons on land (F and A) and the ships;
  - o The ships that make up the afloat support; this can vary from an entire amphibious task group to a single naval ship.

- Third-line support comprises the entire support chain behind the afloat and ashore support (see paragraph 8.3.1). This third line is needed to sustain an amphibious operation for longer than 30 days.



Generic chain of sea-based logistic support (CSS).

The unique -and often the most critical- aspect of an amphibious operation is the transport between ships and the coast. Transport assets are scarce and the passage is accompanied by many threats and hazards, certainly in combat conditions. The nature and intensity of the operation, the circumstances and the threat will determine the level of support that needs to be delivered to the shore. There are three generic methods for establishing this logistic footprint ashore.

- **Shore-based**. A full combat service support area (CSSA) is set up on land. The CSSA will in principle hold all supplies and facilities associated with first- and second-line support. This method requires a great deal of time and cargo space. In combat conditions, further assets will be needed for the protection of both the transports and the CSSA itself. Furthermore, this method is less flexible for adapting to changing circumstances; (forced) relocation of the CSSA will cost more time and effort. The main advantage of shore-based support is the robust support that can be delivered to forward deployed troops.

- **Partial Offload**. This is an interim form, in which only first-line support is brought ashore, possibly augmented with essential second-line elements. This method requires less time, cargo space and protection, but that is at the expense of the (immediately) available support.

- **Sea Based**. The starting point in this method is a minimal footprint; as much support as possible will be provided directly from the ships. This method is only feasible if sufficient fast and safe transport assets are available, maintaining a direct link between the ships and the F and A echelons. This method is fast and flexible, but carries a risk of critical shortfalls.

The choice of method is largely determined by the circumstances, the threat, the available means and the type of operation (amphibious assault, amphibious raid, NEO or humanitarian assistance operation). The choice also depends on the way in which the operation is conducted: via a beachhead or as a ship-to-objective manoeuvre.[243]

243 See Chapter 11, paragraph 11.3.1 (Amphibious operations).

8.3.2.2 Logistic support for other maritime operations launched from the sea

Amphibious operations are not the only form of maritime operation launched from the sea in which sea-based support is necessary to maintain military power. There are two other forms in which this is necessary, namely in maritime special operations and riverine operations.

Logistic support for maritime special operations

Special operations[244] are military activities that are carried out by special operations forces (SOF) using unconventional techniques and methods. Typical features of special operations are that they are usually small scale and are normally conducted in (potentially) hostile terrain. These characteristics also determine the sustainability of special operations forces and the logistic and medical support. SOF are highly self-sufficient. CSS for special operations consists primarily of any supplies needed (ammunition, food), transport assets for insertion and extraction and capabilities for medical evacuation. It must be possible to deliver all these forms of support covertly.

In maritime special operations, this support is generally provided by maritime units. This could be an amphibious task group or a riverine task force, but it could also be limited to a single ship such as a frigate or a supply ship.

Logistic support for riverine operations

Riverine operations[245] are military operations in which rivers, river deltas, lakes and other inland waterways are used as a space for manoeuvre. Support for the sustainability of riverine operations is very similar to that for the inland part of amphibious operations. The main supply route (MSR) does not run overland, however, but is made up of the surface of rivers, lakes and canals, and it is along this ‘wet’ MSR that logistic support and services run via the different echelons (F, A and C). If the riverine task force is operating from a main operating base (MOB), then the C echelon (the CSS group) will normally be located in this MOB. Further second-line support can be provided from sea-based or land-based support sites.

8.3.2.3 Sea-based logistic support for land operations

Support of military sustainability in maritime operations does not necessarily relate purely to those conducted at sea or from the sea. Maritime forces can also provide support for land-based operations by other forces. This will often be indirect logistic support, such as the provision of sealift (see paragraph 8.8), although naval ships can also deliver direct support in terms of supply and service.

244 For details of maritime special operations, see Chapter 11 paragraph 11.3.3 (Maritime special operations).

245 For details of riverine operations, see Chapter 11 paragraph 11.3.4 (Riverine operations).

Maritime support of land operations is also known as **sea basing**, with maritime units functioning as a floating compound and support site (sea base) for the land operation. Sea basing is not limited to logistic support, however; a sea base can also provide other functionalities and forms of support for land operations, such as C2, fire support and air defence. The main advantage of a sea base is that there is less dependence on the circumstances on land to deliver support. Furthermore, a sea base offers greater security, as maritime forces provide their own force protection. As in amphibious operations, however, transport to and from the shore is a critical factor, and sea basing stands or falls with the availability of sufficient vessels and helicopters.

Maritime units could be used as a sea base for a land operation in the following situations:
- if the area in question is poorly accessible from land;
- if there is insufficient time or space to set up a base on land;
- if there are insufficient HNS possibilities in the immediate vicinity of the area of operations.

Sea basing is particularly useful for the initial phase of a land operation, if the necessary land facilities have not yet been set up. It is also ideal for humanitarian assistance operations in coastal areas, for example after a tsunami or a hurricane.

As far as the logistic element is concerned, sea basing can exist at different levels. A sea base could be confined to second-line support with organic supplies and facilities; in effect, a type of afloat support. In a more extensive form, a sea base could also function as a transshipment point, where supplies coming from the ashore support or (direct) from the home base are sorted for distribution to forces on land. The scale of logistic support that can be provided with sea basing is limited, however. Sea basing alone is not usually enough to support large groups of land forces, certainly not if they are operating a long way inland.

8.4 Coordination of maritime logistic support

The logistic support of maritime operations covers different functional areas: supply, maintenance, transport, medical treatment and services. Together, these areas form a complex whole of means, personnel and information. In multinational operations, this complexity is further increased by the fact that logistic support usually goes through national channels. Maritime sustainability therefore requires the appropriate coordination, in the first place to optimise the match of the various forms of support with the demand and, in the second place, to ensure the most efficient use of national means and facilities.

Logistic officials and staff sections in principle look after the coordination of all logistic support, although the coordination of medical support is looked after by specific medical officials and staff sections.[246]

246 For more details about tasks and responsibilties in maritime logistic and medical support, see ALP-4.1 Multinational Maritime Force Logistics, Chapter 2 (Afloat support) and 3 (Ashore support).

The need for coordination of logistic support increases with the scale of the operation. In a short-term operation by a small number of units, coordination between the logistic and medical services of the units themselves will normally suffice, led by the logistic section (N4) and the medical section (NMed) of the staff of a task group. In larger operations of longer duration, on the other hand, more staff capacity will be needed to manage the coordination, certainly if there is ashore support provided by an ALSS and FLS.

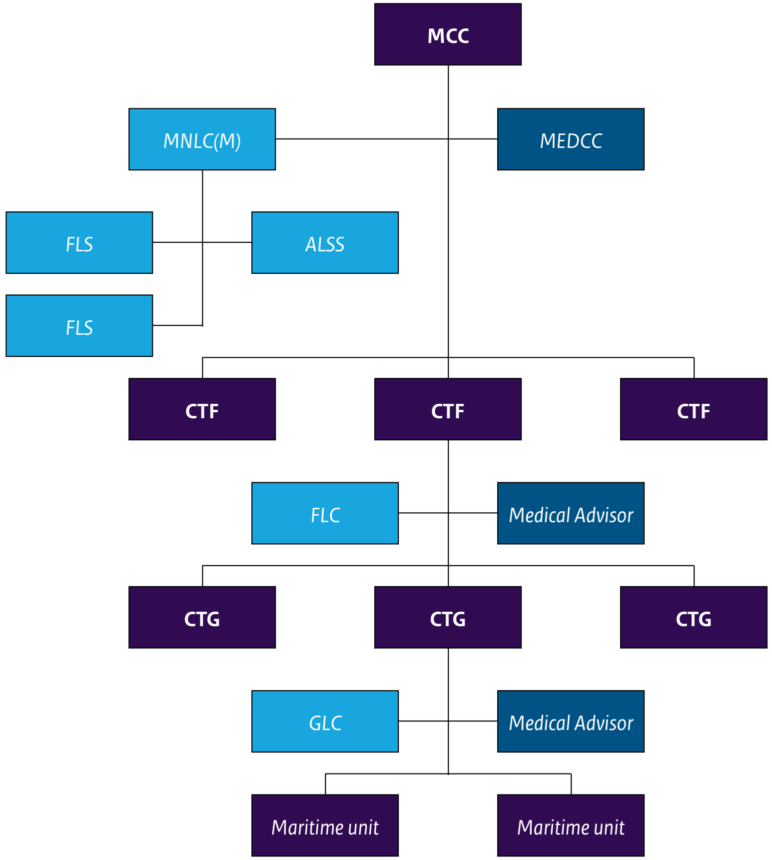
Logistic coordination

The generic model for coordination of maritime logistic support has the following elements:[247]

- A joint logistic support group (JLSG) at joint force commander (JFC) level.
- A multinational logistic centre (MNLC) at the level of the component commanders. The MNLC of the maritime component is called the multinational logistic centre (maritime) (MNLC(M)) and forms part of the maritime component commander's staff.
- A force logistic coordinator (FLC) with the staff of every task force (TF).
- A group logistic coordinator (GLC) with the staff of every task group (TG).

In this model, the MNLC(M) is responsible for managing the ALSS and the various FLS (see figure).

247 For further details of the levels (MCC, TF, TG), see figure in Chapter 5 paragraph 5.6 (Organising the maritime component).



Example of the organisation of logistic and medical support within the maritime component

Medical coordination

Medical support is coordinated through the medical advisors of the commanders at the different levels. In larger operations, this advisory function may be extended to a medical coordination cell (MEDCC).

8.4.1 *Information management in maritime logistic support*

To maintain sustainability and to be able to respond adequately to disruptions and shortfalls, good situational awareness[248] is needed, along with a proper understanding of the commander's plans and intentions. This is provided partly by logistic and medical information systems and by various forms of reporting. Because information systems are often nationally based, multinational operations in particular place great emphasis on the reporting system. In maritime operations, reports are usually made by means of messages in the form of instructions, requirements or status reports.[249]

As well as the logistic instructions contained in the OPLAN and the OPGEN,[250] the more specific maritime logistic instructions can be found in, for example, the Operational Tasking Logistic (the FLC or the GLC's OPTASK LOG) and the Operational Tasking Replenishment at Sea (OPTASK RAS).

Examples of messages indicating requirements are:
- LOGREQ (logistic requirement): mainly used to indicate the required support during port visits.
- EMREQ (emergency requirement): mainly used to request afloat support for units.
- OPSTAT RASREQ (replenishment-at-sea requirement): to indicate the expected requirement during RAS (e.g., type and amount of fuel).

248 See Chapter 6, paragraph 6.5 (Data relating to own and friendly forces and units).
249 For more details, see ALP-4.1 Multinational Maritime Force Logistics, Chapter 4 (Logistic Reporting).
250 See Chapter 5, paragraph 5.5.1 (Planning and issuance of orders).

Examples of status reports are:
- OPSTAT DAMAGE for reporting damage to materiel and injuries to personnel.
- OPSTAT DEFECT for reporting defective materiel.
- Periodic reports such as LOGSITREP (logistic situation report), LOGASSESSREP (logistic assessment report), MEDSITREP and MEDASSESSREP.

8.5 Personnel support

Maintaining the personnel element of military power means ensuring that there are sufficient personnel available, that they are properly trained, that they are kitted out and fed and that there are facilities for medical and psychological care. Personnel sustainability therefore comprises:
- recruitment, education, training and exercising of personnel;
- provision of accommodation, nourishment and facilities for personal care, sport and relaxation;
- provision of opportunities for maintaining contact with the home front and for other social activities (e.g., post and internet);
- provision of health care, both medical and psychological;
- provision of rest periods and relief.

The starting point in military operations is the availability of sufficient numbers of qualified personnel. In principle, therefore, the recruitment, education and training of personnel does not form part of sustainability on deployment.[251] The provision of accommodation, nourishment, contact with

251 This falls under the strategic function of anticipation. See Chapter 3, paragraph 3.4.1 (Anticipation).

the home front, relaxation, rest and relief belongs to the logistic functional areas of supply, infrastructure, logistic services and roulement (see paragraphs 8.6, 8.9, 8.10 and 8.11). The advantage of a naval ship is that these facilities can all be found on board.

This paragraph looks at maintaining and if necessary restoring the physical and psychological condition of personnel: medical care (paragraph 8.5.1) and psychological care (paragraph 8.5.2). Attention will focus only on the planning and implementation of the support given during deployment in or near the area of operations. The following elements of personnel support will not, therefore, be discussed in this paragraph:

- aftercare for personnel and former personnel (retired, veterans) following an operation or deployment;
- support for the home front (partners, children, family members and other relatives) before, during and after the operation or deployment.

This does not mean, however, that these two elements of personnel support are not important for the sustainability of personnel in the operation. On the contrary: both aftercare and support for the home front are essential for maintaining morale (one of the principles of military operations).

8.5.1 Operational health care

The aim of military operational health care is to preserve combat power, thus guaranteeing the sustainability of units in all circumstances in an operation. It is a core aspect in maintaining the physical, mental and social wellbeing of the most important military factor, the personnel.

The military health care system is based on national principles, outlines and system requirements, using civil quality standards in the planning, with due regard for the specific conditions in which the armed forces sometimes have to operate.[252] The system focuses primarily on health care for military personnel, but offers scope, if necessary and opportune, for life-saving treatment and humanitarian assistance to be given to civilian casualties with acute, life-threatening conditions.

The military health care system is based on four pillars:

- **Preventive health care**. Optimal protection against disease and disorders prior to deployment.[253]
- **Curative health care**. Effective treatment of disease.
- **Traumatology**. Effective treatment of injuries.
- **Aftercare**. Good medical care for military personnel after deployment.

252 For the Netherlands, see Directive SG V/26 *Grondslagen, hoofdlijnen en systeemeisen militaire gezondheidszorg* [Principles, outlines and system requirements for military health care]. For Belgium, see ACOT-SPS-DOCREP-ONXQ-001N *Gebruiksconcept van de operationele medische steunfaciliteit* [Use of the operational medical support facility]. See also AJP-4.10 Allied Joint Medical Support Doctrine.
253 Preventive health care falls under the military function of force protection. See Chapter 7 paragraph 7.4.3 (Protective measures) 'Interception' and paragraph 7.9.8 (Maritime CBRN defence) 'Individual protection'.

Although there are international and allied agreements relating to medical treatment, differences in national medical legislation may result in differences in the care provided. The main points at issue are thus what medical personnel are authorised to do and the medical treatments that can be given by personnel that are not medically qualified.

8.5.1.1 Time limits

To optimise the chances of cure, survival and recovery, the health system uses medical time limits within which it must be possible to provide medical assistance. These limits form the basis for the size and composition of the organisation, the available materiel and the education and training of personnel. These limits are used as a starting point for medical evacuation, treatment and nursing. They do not serve as an absolute requirement, but as a level that needs to be approached as closely as possible. A health care system (medical evacuation chain) is deployed for all operational military activities. In principle, adequate surgical treatment must be available within one hour – the 'golden hour' - of the injury being sustained. If local conditions make this impossible, casualties with serious injuries must be treated as quickly as is practically possible, ideally in line with three important time limits (known as the 10-1-2 rule):

- **10 minutes**. Catastrophic bleeding must be stemmed and the airway secured within 10 minutes.

- **1 hour**. Medical evacuation transport with qualified medical personnel must be at the location of the seriously injured casualty within one hour; personnel must be able to stabilise bleeds, secure a free airway, ensure intravascular access and administer pain relief.

- **2 hours**. Surgical intervention at a medical treatment facility appropriate for the injury must be possible within two hours of the injury being sustained.

- **AMV within 15 minutes**. The 15-minute rule has been added to Dutch military health care, which means that professional treatment will be started within 15 minutes of the incident being reported. The minimum level of treating professional is that of general military nurse (AMV in Dutch).

- **4 hours**. Non-acute and non-severe trauma patients must receive advanced treatment by specialist medical personnel within four hours.

- **24 hours**. For non-urgent curative treatment, professional medical assistance must be available within 24 hours.

- **48 hours**. A patient must be given dental treatment within 48 hours.

- **72 hours**. It must be possible to evacuate a patient needing additional specialist treatment to a more specialised medical facility within 72 hours.

8.5.1.2 *Levels of medical care*

An operational health care system will be rolled out on the basis of the type of operation, distance, available evacuation equipment and expected intensity. Medical care is echeloned into successive **roles**[254] representing a scale-up of medical treatment options.

- **Role 0**: Medical care (first aid) that an individual can give to himself or others and treatment by non-medical personnel with supplementary medical training. Role 0 support occurs prior to the start of the medical chain.

  On board ships, the first-aid teams function as Role 0. They will stabilise the casualty and arrange any medical transport within the ship to a first-aid post or the sick bay.

  In Dutch marine corps units, each rifle group has one member designated as combat life saver (CLS). He must be able to guarantee treatment supplementary to basic first aid within 10 minutes. A medic may also be assigned to a marine corps unit to act in situations where a unit or team is deployed beyond the range of a medical chain and where it is either undesirable or impossible to have medical personnel in the team. This is the case, for example, in special operations.

- **Role 1**: This is first-line medical support from a sick bay on board a ship or from a basic medical unit or a medical evacuation team in a Dutch marine corps unit. Triage, stabilisation and medical transport are the primary tasks. In addition, a Role 1 also advises the commanding officer on occupational hazards and to hygiene and preventive health care.

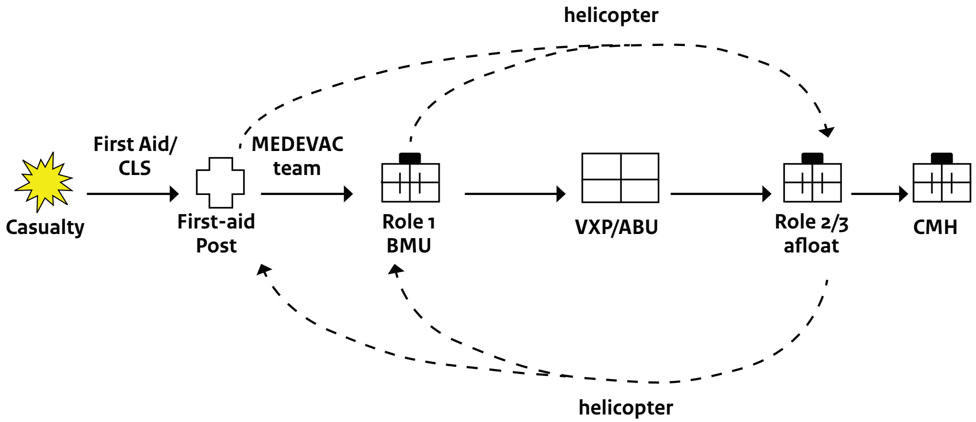
Role 1 facility on board: the sick bay

254 In AJP 4.10(B) paragraph 1102 the normative descriptions specific to the maritime environment are set out in five levels, where level 1 is an addition to the defined roles: *'Nationally mandated minimum medical requirements for that platform to provide primary care, triage, first aid, pre-hospital emergency care and evacuation. This will encompass minimum IMO standards and comply with relevant STANAGS'*.

- **Role 2**: This is where initial life-, limb- and eyesight-saving surgical intervention takes place, including the necessary support (such as post-operative care, nursing, laboratory, radiology, sterilisation and blood replacement products).

- **Role 3**: This involves primary surgical interventions, and the installation has additional facilities for diagnosis and treatment, including extensive nursing care.

- **Role 4**: This is in principle the end hospital in the medical chain, and it offers the entire spectrum of medical support. In most countries, role 4 treatment is provided by a military hospital and other elements of the national health care service. In the Netherlands, the Central Military Hospital (CMH) serves as the national Role 4; in Belgium, that is the '*Koningin Astrid*' Military Hospital (MHKA).



Example of an operational health care system in amphibious operations

8.5.1.3 Evacuation of casualties

Medical intake of a casualty usually means that transport is needed to a facility (role) where the necessary treatment can be given. This transport is called **medical evacuation** (MEDEVAC) and takes one of three main forms:

- Forward MEDEVAC from the point of injury to the initial reception point;
- Tactical MEDEVAC within the area of operations, for example between ships or between ship and land;
- Strategic MEDEVAC to a facility outside the area of operations.

MEDEVAC is not simply the transportation of casualties. In order to maximise the chances of cure, survival and recovery, treatment and nursing should be continued to the fullest possible extent during the transport (continuum of care). MEDEVAC requires specific medical equipment and personnel and is performed under medical responsibility.[255]

In the maritime domain, MEDEVAC is mainly performed by helicopter. Evacuation by boat is also possible, but is laborious, slow and often hampered by weather conditions, particularly wind and waves. If the weather is too bad for helicopters to operate, it is usually also too dangerous for small boats.

Initial medical care on board a ship (first-aid team)

255 Besides MEDEVAC, there is also casualty evacuation (CASEVAC). CASEVAC is the evacuation of casualties in unforeseen circumstances, using any available means of transport. Unlike MEDEVAC, little or no medical treatment is provided during CASEVAC.

8.5.1.4 Triage

Casualties are prioritised on the basis of need for medical treatment. **Triage** is the technique used to determine the initial treatment priority and to prioritise further evacuation so that as many casualties as possible can be given the treatment they need as soon as possible.

In the event of low casualty numbers, the 'P' system is used, indicating the urgency with which treatment and/or evacuation is required. The distinctions are as follows:

- P1 – urgent (acute danger to life);
- P2 – priority (risk to vital functions);
- P3 – delayed (all other injuries).

In a mass casualty situation (MASCAL), the 'T' system is used, designed to deliver the treatment needed for the survival of the largest number of casualties. The categories are as follows:

- T1 – immediate treatment (casualties with impaired vital functions who can be treated with a quick procedure that requires few personnel and little equipment);
- T2 – delayed treatment (casualties without impaired vital functions who need a time-consuming surgical procedure for which some delay is acceptable);
- T3 – minimal treatment (casualties without impaired vital functions for whom no surgical procedure is necessary);
- T4 – expectant treatment (casualties with impaired vital functions who can only survive with lengthy and intensive treatment. They will be treated if the means become available).

8.5.1.5 Impact of the maritime environment on medical support

Maritime operations take place on, in, above and from the sea. The natural features of the maritime environment and the methods of operating on the sea (ships) and under water (submarines and divers) have an impact on the way in which and the extent to which medical support can be provided.

Firstly, the great distances in the maritime domain mean that any necessary treatment (such as intensive care) is not always available quickly enough. On the one hand, this means that ships have to be largely self-sufficient in terms of treatment. On the other, it means that there are always limits to the care available. The minimum treatment capacity that must be available is therefore always a result of a balance of risk when planning the deployment (see paragraph 8.5.1.6). During the mission, a commander has to weigh the risks of each activity against the (im)possibility of timely and adequate medical care. Generally speaking, maritime forces find themselves in large areas of operations and thus have to operate at great distances from other participating and supporting units and from any shore-based support. This gives rise to major challenges when it comes to observing the time limits referred to in paragraph 8.5.1.1. The time factor is particularly important and the maximum time limit within which casualties must be able to access surgical treatment (role 2/3) will not be viable in many cases. Even if Role 2 capacity is available in the area of operations, there is no guarantee that it will be near enough for MEDEVAC helicopters to be able to provide the right treatment. It is partly for this reason that the concept of the Advanced Resuscitation Team (ART) was developed to stabilise casualties with catastrophic bleeding and airway obstruction.

The ART can be carried on board units that normally ‘only’ have a Role 1 capacity (sick bay). The casualty will obviously still need to be evacuated to a higher level as quickly as possible to receive further treatment. This exception to the normal rule can only be realised with permission from the highest operational and medical national authority. An ART is not a replacement for a Role 2 or 3 facility, but simply a means of overcoming longer evacuation times.

Secondly, subsurface activities with submarines and divers mean that there is often a need for specialist hyperbaric medical support.

Furthermore, on board a ship there are many people in a relatively small area. In the event of an incident, therefore, casualty numbers could rise quickly and overload the limited medical capacity. This can put huge pressure on a narrowly defined evacuation chain, which means that effective and skilled triage is vital. A shipwreck will carry the risk of hypothermia and drowning. An incident on board thus quickly leads to a huge demand for medical support. At the same time, there is an increased risk that medical personnel themselves will be injured or killed.

The configuration of the rooms on board a ship also has repercussions for the types of injury. Most rooms are relatively small and have no direct access to the open air. This means that in the event of an incident, there is an increased risk of burns, smoke inhalation and blast injuries (internal injuries caused by pressure waves). The relatively small rooms and steep steps on board a ship also hamper the transportation of casualties.

8.5.1.6 Medical plan

Prior to deployment, medical planners will conduct a health care analysis. This is a form of operational risk management,[256] in which health risks will be assessed (potential hazards and threats) and measures to manage these risks will be specified. This will then be used as a basis to determine which and how many medical capabilities should make up the health care system in and near the area of operations.

A medical capability is the ability to perform certain medical procedures that is gained by combining personnel, materiel and methods. Examples of capabilities are surgery or intensive care. They can be combined to form a module, examples of which are an OR module (complete operating room, including the required medical personnel and equipment) or a nursing module. Medical capabilities and modules are used to set up a health care system that will suffice for the expected actions, anticipated threats and hazards and expected losses. Medical capabilities also include a medical C2 element responsible for advising the commander on medical issues, for medical planning, for coordinating patient transfers and for medical reports.

How the health care system is set up is further determined by factors such as the form and size of the patient population (military personnel), the available HNS and any availability of medical facilities in partner nations.

256 Zie Hoofdstuk 7 paragraaf 7.4 (Risicomanagement).

Given the impact of the availability of organic medical units on the execution of an operation, the doctor will play a key role as the commander's advisor. The medical planner will also play a key role in formulating the medical plan. It is essential that both are involved from the first planning meeting so that they can offer the operational commander as many options as possible rather than limitations.

8.5.1.7 Medical evacuation chains in maritime operations

Evacuation chain in operations at sea

As indicated, evacuation at sea will take place to a sea-based Role 2 or Role 3 facility. Role 3 is preferable, but these are normally in very short supply. If there is no Role 3, or if the available Role 3 unit is overloaded, casualties will be evacuated to a primary casualty receiving ship (PCRS). The landing platform docks (LPDs) HNLMS Johan de Witt and HNLMS Rotterdam, the joint support ship HNLMS Karel Doorman and the support ship BNS Godetia can all perform this role if the right medical personnel are available. If a similar and acceptable medical treatment facility is within range on land (for example in a partner nation or on the basis of HNS), this will be the preferred option for evacuation. Strategic airlift will then ensure that the casualty (if stable) is evacuated to the Netherlands or Belgium at the earliest opportunity.

Evacuation chain in operations from the sea

In operations launched from the sea, casualties will in principle be evacuated back to the ships at sea. This can be done by means of what may be scarce assets such as landing craft or MEDEVAC helicopters. As Role 1 and medical evacuation groups, basic medical units may also form part of the various echelons.

Depending on the type of operation, the favoured option may be to establish a Role 2 on land, for example in an operation of longer duration. If a similar and acceptable land-based medical treatment facility is within range, this will be the preferred option for evacuation. The rest of the chain is as described above.

8.5.2 Psychological care

Life-threatening or other traumatic events can impact on an individual's mental wellbeing. The effects may be temporary, but they could also, depending on the individual and the events, result in long-term psychological damage, such as post-traumatic stress disorder (PTSD).

To minimise losses resulting from psychological problems, the self-restorative abilities of personnel must be supported.[257] Some of this support and counselling is offered by colleague networks in accordance with the trauma risk management model (TRiM). The starting point for TRiM is personal mental resilience, which enables most people to cope with traumatic events. It is also important that they are given enough space in their direct social environment to process the incident. It is the task of immediate superiors and commanding officers to give their personnel the required rest, space and time to develop this self-healing capability. Commanding officers can seek the necessary advice[258] from the doctor, the personnel officer, the chaplain and the colleague network of the unit in question.

257 See Dutch ACZSK DPERS GPZ 435 *Zorgdocument* [Personnel care document].
258 In Dutch units, this normally takes the form of a recommendation by the Social Medical Team (SMT). See Dutch Directive SG A/982 *Richtlijn SMT* [SMT Guidelines].

He may, for example, ask for an opinion on whether the traumatic event is cause for a compulsory TRiM interview. If the event relates to a calamity, help can be enlisted from the Special Psycho-social Rapid Intervention Team (SPRINT),[259] which is in principle able to reach a unit within 48 hours to provide support and counselling.

Immediately after the deployment of a unit ends, psychological support is given in the form of adaptation interview.[260] This adaptation is designed to close the mission and prepare personnel for their return to the home situation. These interviews also offer military personnel and the organisation an opportunity to consider whether further counselling or support would be necessary or desirable. Adaptation is also a form of recognition of and appreciation for individual performance. In maritime operations, adaptation usually takes place during the return voyage, with an adaptation team (made up of interview moderators) travelling on board for a while. During the interviews, personnel look back on the mission and forward to the homecoming. They also receive information about coping with stress and an explanation of what the care disciplines can offer.

8.6 Supply

Supply is the functional area within logistics tasked with the procurement, storage, shipment, distribution and removal of materiel and supplies, including food and medical equipment. Supply ensures that forces have the right means to perform their activities and to maintain personnel and equipment. It is closely related to the functional area of movement and transportation (see paragraph 8.8), as transportation is needed to get the required materiel and supplies to the right place.

Supply ensures that sufficient stocks are available, that they are maintained at the required level and that any shortages are rectified as quickly as possible. The supply process thus starts by determining the stocks. The level of stocks depends on consumption, the possibility of storing stocks (volume/weight, perishability) and the possibility of interim replenishment (how long does the unit need to make them last). Supply also involves the replenishment of stocks, and the methods for doing so are based on two principles:

- **Push**. Goods are delivered in previously agreed quantities and at previously agreed times. This method is mainly used for goods for which consumption is easy to predict, such as fuel and food. It needs little in the way of communication, and transportation can be planned easily. The disadvantage is the limited flexibility, which means that abnormal usage results in surplus stocks or indeed shortages.

- **Pull**. Goods are delivered on request. This method is efficient as unnecessary stockpiling is avoided. It is, however, vulnerable to disruption, particularly in respect of transportation. Good communication is also essential.

259 In the Belgian armed forces, this role is performed by the Mental Operationality Counsellor (RMO).
260 See Dutch CHOD Directive A-125 *Adaptatie* [Adaptation].

A combination of the two methods is also possible. A full overview of stocks, requirements and deviations from the norm allows a quick response to (changing) demands, and this can even be done without a specific request. It is conditional on a full overview, which can only be achieved with the use of computerised information systems, such as enterprise resource planning (ERP), that enable tracking and tracing of all goods.

Apart from getting the right quantities at the right time, it is also important to get the right goods. To avoid any misunderstandings, unique article numbers are used wherever possible. NATO developed the military NATO stock number (NSN) for this, but increasing use is being made of civil coding and identification systems such as European Article Numbering (EAN, the barcode).

Another factor involved in supply is the packaging. The form of packaging is not only determined by the properties of the goods to be delivered (liquid, solid, flammable, fragile), but also by whether or not it is possible to transport and transship the goods in the desired quantities (materiel handling). The supply chain must be able to repackage the required stocks and deliver them in a form acceptable to the (end) user. Special requirements and alternative methods may apply, such as conditioned transport (refrigeration) and specific packaging (for example blood products).

Supply articles are categorised into **classes of supply**, and NATO uses the following categories:[261]

- Class I: food products and products for personal care.[262]
- Class II: items belonging to the unit's equipment, such as spare parts, clothing, weapons and tools, as well as medicines and vehicles.
- Class III: petroleum, oils and lubricants (POL).
- Class IV: goods that do not belong to the unit's standard issue equipment, such as construction and engineering materials and disaster relief goods.
- Class V: ammunition, explosives and chemical agents.

Maritime supply

The main feature of maritime supply is that the ship functions as a floating warehouse. A naval ship carries its own stocks, enabling it to operate independently and to look after and maintain the personnel and the equipment on board. As the need arises, these stocks should also support operations and activities mounted from these ships, such as amphibious and special operations, boardings, evacuations and humanitarian assistance operations. A second feature of these stocks is the huge diversity of goods. They range from liquids in large amounts (fuel, drinking water), hazardous substances (from paint to heavyweight torpedoes), perishable goods (food, blood) and small, fragile spare parts (computer prints) to goods that require special handling (cryptographic materials, morphine). Lastly, maritime supply involves some unique methods for delivering goods to the user: those of replenishment at sea (RAS).

261 Some NATO nations use different supply classes. For details of these, see APP-19 Classes of Supply of NATO Land Forces.
262 In the Dutch navy, these are referred to as 'toko items' (the 'toko' is the onboard shop).

8.6.1 Norms for supply in maritime operations

This paragraph looks at the norms and logistic details for each class of supply articles as applicable to Dutch and Belgian naval ships.

Class I – Food and personal care items

A naval ship has food stores, including refrigeration and freezer space and drinking water tanks. Amphibious assault ships have a 45-day food supply, frigates and submarines have a 30-day supply, and smaller types of ship normally have stocks to last for a maximum of 14 days. After about a week, the first shortages of fresh food will start to occur: mainly milk, milk products and perishable vegetables. After about two weeks, the ship will have switched almost entirely to storable products, such as preserves and deep-frozen food items. The supply of drinking water must be maintained by using the ship's own equipment to produce drinking water from seawater.

Replenishment of food usually occurs during a port visit, by purchasing locally from civilian suppliers, but it may also occur at sea from a supply ship. The same applies to drinking water.

Class II – Equipment and spare parts

A unit has various stores on board for spare parts and other onboard supplies. By way of illustration: a frigate has about 20,000 different articles in stock. The stock of spare parts needs to be sufficient for 90 days of repair and maintenance of technical systems. The stock of general consumables must be enough to last a large ship 180 days (90 days for submarines). Replenishment occurs by way of afloat or ashore support.

Smaller units have more limited onboard stocks, which need to be sufficient for 14 days of maintenance and consumption. For replenishment, they have to rely on afloat support (for example from a support or staff ship), an onshore support facility (such as the Dutch MFSF) or other ashore support.

Class III – Petroleum, oils and lubricants (POL)

The same norms apply to lubricants as to spare parts (stocks for 90 and 14 days). Lubricants are stored on board in tanks or vats.

Fuel is the most critical supply article. This does not only apply to marine fuel (F-76)[263] but also to aviation fuel (F-44). With full tanks, the supply of marine fuel on board frigates and minehunters is sufficient for 10–14 days. Usually, however, it is not advisable to let the supply drop below 50%, as the risk of running out of fuel as a result of unforeseen circumstances is then unacceptably high. Fuel is not only needed for propulsion, but also for the entire onboard energy supply. Frigates and minehunters will therefore refuel at least once a week, and ideally every four days. This occurs either by means of supply ships or during port visits.

263 To enable the exchange of fuels and lubricants, standards have been agreed within NATO (of which F-76 is the most common marine fuel). See STANAG 1135 Interchangeability of Fuels, Lubricants and Associated Products.

Amphibious assault ships and submarines can last longer with their supply of marine fuel. In regular deployment – an amphibious operation – the stock on board an amphibious assault ship is enough for 45 days (15 days of transit, 30 days of operating). A submarine can patrol for 30 days before the critical limit of 10% is reached. In other deployments – for example, if high speeds need to be maintained for longer periods – earlier replenishment will be required. Amphibious assault ships can refuel from a supply ship, but submarines have to put into port.

Amphibious operations also require vehicle fuel. This is not normally a critical item, as it can be produced on board by mixing additives with marine fuel.

Class IV: Extra equipment
All naval ships, with the exception of submarines, can carry extra materiel. This is certainly not a problem for amphibious and supply ships; they can also carry materiel for other units. Frigates have less space for extra materiel and small ships have very little extra capacity.

Items in this class are often mission-specific packages for a particular mission or operating area. These packages contain extra articles that cannot be efficiently carried on board as standard. One example is the disaster relief package carried on ships that serve as the guard ship in the Caribbean, as there is every likelihood that these ships will be required to provide initial disaster relief for islands hit by hurricanes. Mission-specific packages are normally taken from the home port, but they could, if local circumstances require, be taken to the area of operations via ashore and/or afloat support.

ShelterBoxes being prepared for helicopter[264]

264 A ShelterBox contains survival items for ten people following a disaster. Its contents include a tent, mosquito nets, a burner, pots and pans, tools and toys. See www.shelterbox.org.

Class V - Ammunition
Ships have their own stores for the various types of explosive materials: ammunition for small-bore weapons, gun ammunition, ammunition for mortars, mine-destruction charges and flares. There is also storage for torpedoes, and guided missiles are normally kept in the launchers.

Ammunition consumption depends heavily on the deployment and the course of the operation. Replenishment of heavy weapons (guided missiles, torpedoes) is usually only possible in a (naval) port that has the necessary facilities. Replenishment of other types of ammunition may take place in port or at sea from a supply ship.

Supply ships usually have cargo space for torpedoes and guided missiles and can thus provide (strategic) transport for these types of ammunition between ports.

8.6.2 Replenishment at sea

Replenishment at sea (RAS) is the transfer of personnel and/or supplies when at sea. RAS can be used to replenish supplies under way, thus enabling ships to stay in the area of operations for longer with less dependence on (local) ports.

RAS can be performed in different ways:[265]

- **Refuelling**: fuel is pumped through a hose suspended from a tensioned abeam rig stretched between the two ships or through a fuel hose towed by a supply ship (astern rig). In many cases, the rig can also be used to pump drinking water to the receiving ship.

- **Solids**: the transfer of pallets or freight sacks with food, goods or ammunition by means of a tensioned abeam rig.

- **Light Freight**: the transfer of personnel and small goods (such as post bags or loose items) using a lighter version of a tensioned abeam rig.

- **Vertical replenishment** (VERTREP); by suspending pallets or freight sacks from a helicopter (underslung load).

- **Boat transfer**: the transfer of goods or personnel by means of small craft such as an RHIB.

Only supply ships are equipped with special rigs for the transfer of fuel and heavy solids. They can usually supply more than one ship simultaneously with these rigs (one ship on each side, with several rigs per receiving ship if necessary), with a VERTREP taking place at the same time.

265 As well as instructions for RAS, ATP-16 (Replenishment at Sea) also contains details of RAS capabilities of supply ships from various countries, including those from a number of non-NATO-nations.

Replenishment at sea (fuel transfer)

Other types of ship will usually only have a rig for light freight and personnel or at least the capability to receive such a rig. Smaller craft, such as MCM vessels, are not able to receive the tensioned abeam rigs from supply ships. They can, however, take on fuel and goods by mooring alongside a supply or support ship, circumstances permitting. Submarines do not have any capacity for RAS, other than by helicopter or small boat (RHIB).

In the case of afloat support from a supply ship, a return flow is also possible. This capability is mainly used to send back packaging materials (empty boxes, empty pallets) or to transfer refuse that cannot be dumped at sea (such as plastic waste).[266] The supply ship will then take these return articles back to port.

RAS can also be used to resupply the supply vessels themselves while at sea. This is called consolidation (CONSOL) and is usually performed for refuelling only. Shuttle tankers bring new fuel supplies from port to the supply ships at sea.

RAS is not without risk. Firstly, there are safety risks, as personnel have to work with heavy equipment on open and moving decks, even in unfavourable weather conditions. RAS is also a risk in terms of security and defence. During RAS, the ships involved are much less manoeuvrable, and thus represent an easier target for an attack. Furthermore, the use of certain sensors is restricted to prevent interference with the operation of the rigs, thus reducing the capability for early detection of a possible attack.


Replenishment at sea (solids)

266 See Chapter 2 paragraph 2.5.4 (International Convention for the prevention of pollution from ships, MARPOL).

8.7 Maintenance and repair

Maintenance and repair encompass all activities designed to keep materiel in the required condition (maintenance) or to restore it to that condition after damage (repair). Maintenance and repair ensure that the means available to a commander are fit for purpose.

8.7.1 Maintenance

There are three forms of maintenance:

- **Preventive maintenance** is performed systematically in order to reduce the risk of defects.
- **Modificative maintenance** is that in which materiel is modified to enhance performance or to reduce the risk of defects.
- **Corrective maintenance** is performed after a fault or defect has occurred for the purpose of removing that fault or defect.

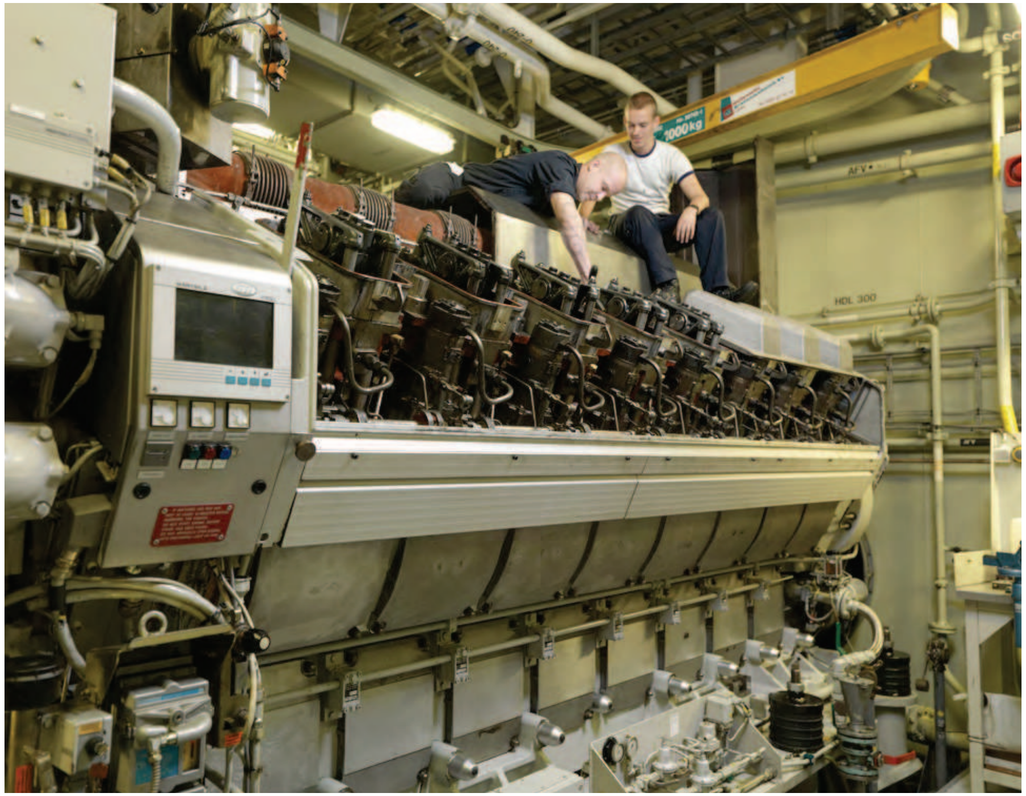
Within the three forms, there is a further distinction between the levels of maintenance:

- **Organic level maintenance** (OLM) is basic maintenance that should be performed regularly and that takes little time. OLM can be performed by the operator/user himself or by the unit's technical personnel. Examples are cleaning, lubricating and minor repairs.

- **Intermediate level maintenance** (ILM) is a more complex form of maintenance, usually requiring specialist equipment, expertise and/or facilities. If necessary, ILM can also be carried out in or near the area of operations, if maintenance equipment, spare parts and maintenance personnel are made available (temporarily). An onboard helicopter flight support team, for example, could carry out certain forms of ILM itself for a helicopter. It is also possible to replace a defective gas turbine on a ship in a foreign port, but that can only be done if specialist maintenance personnel are made available.

- **Depot level maintenance** (DLM) is major maintenance that can only be performed by specialist workshops such as a shipyard, which means that the equipment or unit in question is not deployable. Major maintenance is carried out at lengthy intervals (years) and is usually long term (months). DLM time planning partly determines a unit's rotation model or relief timetable (see paragraph 8.11).

The only maintenance performed during deployment and operations is preventive and corrective, usually only at organic but occasionally also at intermediate level. Corrective maintenance at intermediate level is carried out as incidental maintenance. Preventive ILM and all forms of DLM are carried out during planned maintenance periods.



Maintenance work on a ship's diesel engine

Naval ships are equipped with a huge variety of means and devices, many of which are technically complex (such as sensors, weapon systems and helicopters). Because naval ships need to be able to operate independently for prolonged periods, they need to be able to perform the expected maintenance independently too. This maintenance applies not only to the ship itself and its equipment, but also to the means that operate from the ship, such as landing craft, helicopters and the vehicles used by amphibious troops.

The crew of a naval ship therefore always includes maintenance personnel with a technical, weapons engineering, electrotechnology or aviation technology background. Many naval ships also have ship's divers, who are able to perform maintenance tasks under water.

8.7.2 Battle damage repair

As well as repairs in the form of corrective maintenance, repair may also be necessary because damage has been incurred by accident or by combat action. This is battle damage repair (BDR): emergency repairs to materiel to prevent further damage and to restore the function of damaged equipment, if necessary temporarily.

On board naval ships, BDR is part of the damage control that is performed by the FF/DC teams and the repair teams during emergency stations or battle stations.[267] The purpose of BDR is to:

- preserve and where possible repair the watertight integrity and stability of the ship (by repairing leaks and pumping out water);
- fight fires and prevent the spread of fire and smoke;
- repair damaged installations and equipment (provisionally).

267 See Chapter 7, paragraph 7.11 (Damage control and repair).

8.8 Movement and transportation

8.8.1 General

The logistic functional area of movement and transportation concerns the transportation of military units, materiel and personnel.[268] Logistic movements take place for the benefit of:

- **deployment** - the movement of military forces from the home base to the area of operations;[269]
- **sustainment** - the preservation of military power by the transportation of supplies and personnel, by the implementation of rotations and relief and by the evacuation of casualties;
- **redeployment** - the movement of military forces from the area of operations to the home base on completion of an operation.

The logistic movement of a military unit is not the same as the physical movement of that unit in the context of manoeuvre. In the case of a logistic movement, the unit's materiel and personnel are transported to another location, but the unit is not in an operationally ready state during that transit period. Actual operations are only possible once the unit has arrived in the area of operations (**reception**), has been reassembled (**staging**), moved to the end destination (**onward movement**) and integrated with the other units already in the area (**integration**).[270]

268 For details, see AJP-4.4 Allied Joint Movement and Transportation Doctrine.
269 For details, see AJP-3.13 Allied Joint Doctrine for the Deployment of Forces.
270 RSOI = reception, staging, onward movement and integration. RSOM = reception, staging and onward movement. RSOM is the logistic part of RSOI.

In the case of a physical movement in the context of manoeuvre, the military unit is ready for action during transit and the movement forms part of that action. Movements of units in maritime operations, including those over great distances, are usually manoeuvres and not logistic movements. A number of examples are listed below by way of illustration.

- Forward deployment of an amphibious task group with embarked landing force is a (strategic) manoeuvre.
- Although the landing of a landing force during an amphibious operation closely resembles a complex logistic operation, it is not a logistic movement but a tactical manoeuvre.
- Movement of a naval ship or craft by (civil) transport ship to or from the area of operations is a (strategic) logistic movement.
- Execution by helicopter of a tactical MEDEVAC is a (tactical) logistic movement.

The difference between logistic movement and manoeuvre also manifests itself in maritime operations in the cargo of amphibious and logistic ships. If these ships are used for a logistic movement, all available space will be used for the cargo ('strategic cargo'). If the ships are part of an amphibious task group and have (elements of) an embarked landing force on board, they will not usually be fully laden ('tactical cargo').

This is because forces must be ready to deploy: the units, vehicles and goods that need to disembark first are at the 'front'. Because the task is subject to change, the order of disembarkation could also change; space is therefore needed to be able to shift the cargo while under way.

Strategic cargo on the helicopter deck of an LPD

Levels of logistic movements

There are three levels of logistic movement:

- **Strategic movement**. Movement from the home base to the area of operations and vice versa.[271]
- **Movement at operational level**. Movement within or near to the area of operations as part of the military campaign.
- **Tactical movement**. Movement within the area of operations.

271 For Dutch instructions relating to strategic movements, see CHOD Directive A-401 *Strategische verplaatsingen*.

Logistic movements at operational level do not normally occur in maritime operations; such movements usually fall under maritime manoeuvre at operational or tactical level. One example of this is the movement of an amphibious task group to another part of the area of operations.

Methods of logistic movement

Movements take place over water, through the air and across land:

- **Sealift** is the movement by ship at sea, and is ideal for moving large quantities and heavy materiel.[272] Freedom of navigation also means that sealift is not dependent on cooperation from other nations. A sealift may be conducted by military ships (for example, logistic or amphibious assault ships), civil scheduled services or hired or commandeered civil transport ships (ships taken up from trade, STUFT).

- **Airlift** is movement by aircraft or helicopter. An airlift can cover great distances in a short space of time, but it is less suitable for transporting large quantities or heavy materiel. The possibilities for an airlift could be hampered by overflight restrictions above other states. Airlift can be carried out by military transport aircraft (or helicopters), civil scheduled services or hired civil aircraft and helicopters.

- **Inland surface transport** is movement in the interior. Transport may occur by road, by rail or by inland waterway.

272 In a strategic transport for a deployment for land operations, 90% of materiel is normally moved to the area of operations by sealift. The other 10% and the personnel arrive by airlift.

8.8.2 Logistic movements for maritime operations

Logistic movements take place in the context of deployment, sustainment or redeployment. The following section shows which logistic movements take place in maritime operations for each of these three situations.

Logistic movements for maritime deployment

Maritime deployment does not usually involve strategic logistic movement or subsequent reception, staging and onward movement (RSOM). Maritime forces conduct transit to the area of operations themselves. The duration of the transit allows the execution of any necessary mission-specific preparation of the unit, including integration of embarked units.

There is only said to be a logistic movement in the context of deployment if a maritime unit is not transported independently, but in another way. This is the case, for example, for:

- Movement of naval ships or craft by sealift to the area of operations. In this case, there will often be a more or less simultaneous airlift of personnel of the transported unit.
- Deployment of an autonomous VPD (AVPD) to the merchant ship to be protected (usually in a safe departure port near the area of operations).
- Transportation of relief crews if rotation involves the ship remaining in the area of operations and the crew being replaced.

Logistic movements for maritime sustainment

The following forms of logistic movement take place for the sustainment of maritime capability during an operation.

- Strategic transport of supplies (for example, fuel, ammunition and spare parts) to the area of operations. Such transport may also take place prior to or in preparation for maritime deployment (pre-positioning of stocks).
- Strategic transport of passengers, mail and cargo (PMC) between home base and ALSS/FLS. This also includes strategic MEDEVAC.
- Tactical transport of PMC between ALSS/FLS and units at sea, transport of PMC between units at sea and transport of PMC between ships at sea and troops deployed on land. This also includes tactical MEDEVAC.

Logistic movements for maritime redeployment

As in deployment, redeployment does not usually involve strategic logistic movements. Only when a unit is returning by sealift, in the redeployment of an AVPD from the arrival port and on the return of a relieved crew is there said to be a logistic movement.

8.8.3 Maritime logistic movements for other forms of operation

A logistic movement in the maritime domain may also be performed for other forms of military action, such as land or air operations. Examples of these are:

- Strategic sealift of military materiel (such as tanks, vehicles, aircraft and helicopters), stocks and personnel.
- Tactical transport (both sealift and airlift) of military equipment and personnel from the sea to positions on land, for example from a sea base to staging areas, assembly areas or forward mounting bases[273] and back.
- Tactical transport by means of inland waterways, for example in the context of riverine operations.
- Tactical MEDEVAC from land to the medical facilities of a sea base.

8.9 Infrastructure

The logistic functional area of infrastructure concerns all static buildings, facilities and other permanent installations needed to support military power. In military operations, it concerns all (more or less) permanent structures and facilities that are needed in or near the area of operations to support the operation (field infrastructure), such as those required for C2, communication, transport, storage, accommodation, catering and security.

273 For examples, see Annex A of AJP-3.13 Allied Joint Doctrine for the Deployment of Forces.

Depending on the duration and the level of facilities, infrastructure is divided into five levels.[274]

- Level 1 is the minimum level for highly mobile operations, involving the use of organic equipment such as individual tents, canteens, etc.

- Level 2 is an extra level to enable longer stays in the field for operations of short duration. This level provides additional but easily transportable equipment such as group tents, mobile sanitary installations and mobile energy supply.

- Level 3 is a limited level for longer, more static operations. This level makes provisions for use of facilities in containers, which means that sea or road transport is required for supply and removal.

- Levels 4 and 5 are extensive and (semi-)permanent levels for static operations, for which compounds are established using prefab elements or existing infrastructure.

Infrastructure in operations at sea

In maritime operations at sea, there is in principle no need for infrastructure in the area of operations, as ships themselves function as mobile infrastructure. Only when support sites are established on land is use made of infrastructure.

274 For more details, see Dutch CHOD Directive A-409 *Operationele infrastructuur voor verblijf te velde* [Operational infrastructure in the field].

This would be the case for the following:

- A temporary mobile command and support facility for smaller ships, such as the Dutch Mobile Forward Support Facility (MFSF).
- Facilities for ashore support, such as an ALSS or an FLS. Existing civil or military infrastructure is usually used for this in the context of HNS, for example in a sea- or airport.

Infrastructure in operations from the sea
In maritime operations launched from the sea, there is a need for infrastructure when troops are conducting operations on land. For highly mobile actions in amphibious and special operations, this is normally confined to level-1 and -2 facilities. Also for operations in the context of maritime assistance, such as an NEO or humanitarian assistance operation, no higher than level-2 facilities will be required. This is because the naval ships located at the point from which the operation was launched can be used as the higher facilities level (sea base).

8.10 Logistic services

The purpose of logistic services is to maintain and improve the physical condition and morale of personnel. Together with rotation and relief (see paragraph 8.11) and medical and psychological care (see paragraph 8.5), logistic services ensure that personnel remain ready for action and motivated.

Logistic services encompass the following provisions and facilities:

- energy supplies (electricity, heating, air conditioning);
- drinking water installations;
- food supplies;
- sanitary facilities (showers, toilets);
- waste disposal;
- billeting (accommodation);

Logistic services on board: accommodation and food

- welfare (such as post, telephone and internet);
- financial services;
- laundry;
- recovery, identification, preparation and repatriation of the deceased.

The level of logistic services available is directly related to the level of available infrastructure (see paragraph 8.9). In maritime operations, this means that virtually all possible logistic services are available on board naval ships.
In maritime operations launched from the sea, such as amphibious and humanitarian assistance operations, the level of logistic services on land is low (levels 1 and 2), as the troops on land can always rely on the high service level on board the ships. One example of this is the 'dry out', in which amphibious troops return briefly to the amphibious assault ship to make use of the logistic services (shower, clean clothes, fresh food, etc).

8.11 Roulement and relief

Personnel and materiel cannot be deployed for ever without a break. Personnel need rest and materiel needs maintenance. To be able to sustain activities and operations over long periods, there is a need for roulement: the relief and rotation of teams, crews, units or even entire task groups.

Relief and rotation occur at different levels in maritime operations. On board a ship, the crew is divided into sections (divisions) that relieve each other, thus enabling a continuum that can be sustained for weeks or even months.[275] Relief also occurs at tactical level, when a unit puts into port for supply or maintenance and the tasks and position in the operation are taken over by another unit. Lastly, at operational level units rotate, with one unit leaving the operation and another taking its place. There are two options in the rotation of naval ships: rotation of crew only (the ship itself stays in the area of operations) or rotation of the entire ship. The first option is quick, but only advisable if the state of maintenance of the ship allows or if there are local possibilities for conducting the required maintenance. For the second option, the transit time between home base and area of operations needs to be taken into account.

The timetable for relief or rotation is determined by various factors:

- The assignment of onboard personnel to watch sections (divisions) and teams depends primarily on the anticipated amount of work and the required degree of readiness. The most common setups are based on four, three or two sections.

- Relief of units at tactical level is mainly determined by the need for supply and maintenance; the total number of available units within the operation is obviously another key factor. Relief of tasks can thus range from a few days to several weeks.

- Rotation of units and task groups at operational level is mainly driven by the need for depot level maintenance for the ships. Personnel welfare considerations such as maximum deployment period and recuperation may also play a role here. The rotation of units or crews is usually based on a three- or four-stage system. In the case of the former, one unit is deployed, the second is preparing for deployment ('work up') and the third is undergoing maintenance.[276] In the latter, one unit is deployed, the second is redeploying and recuperating post-deployment, the third is undergoing maintenance and the fourth is in work up.

275 See box 'Degrees of readiness, watch systems and special duties on board naval ships' in Chapter 7 paragraph 7.4.3 (Protective measures).

276 In the Netherlands, the deployment norm for personnel is based on the three-stage system. See CHOD Directive A-106, *Uitzendnorm 1:2* [Deployment norm].

9. MARITIME STRIKING POWER

9.1 Introduction

Maritime operations are defined as the pursuit of objectives in the maritime domain through the use of military power. This is done by exerting influence on other actors and on the environment in order to change the actors' behaviour or the state of the environment to such an extent that the achievement of the objectives is brought closer. This change in the behaviour or state of an actor or system is known as an effect. Exerting influence thus means realising effects: the creation of desired effects and the countering of undesired (side) effects.

The collection of means and methods at a commander's disposal to create effects is referred to as **striking power**. Although the essence of military action is made up of the ability to use (all-out) force, striking power consists of more than the fire power of weapon systems or the fighting power of units and troops. Striking power also encompasses other means and methods with which physical effects can be delivered. Examples are the ability to stop and arrest criminals and insurgents, the capacity to intercept contraband or smuggled goods and the means to provide disaster relief or to dispose of mines and explosives.

There are also forms of striking power that are not aimed at physical but cognitive effects. A cognitive effect is a change of an actor's mindset, outlook or perception that will result in a change of behaviour. Cognitive effects are created by using information as a 'weapon'. This can be done with physical striking power, for example by physically destroying elements of the C2 structure or communication systems, or by a physical presence in combination with threatening or reassuring language. Cognitive effects can also be delivered by the direct use of information, for example by psychological operations, by public information or by electronic or digital manipulation of data and information systems.

The purpose of striking power is to influence other actors or the environment, by creating both physical and cognitive effects. It is not only designed to defeat an opponent physically or to undermine his morale; it is also used to demoralise potentially hostile actors, to support friendly actors and to enlist the support of (as yet) non-committed actors. In some cases, striking power serves to influence the environment. This always involves physical effects in connection with the removal or indeed creation of obstructions. Examples in maritime operations are laying or clearing sea mines and clearing obstacles on a landing beach.

Striking power is both a sword and a shield. The defensive use of striking power in maritime operations - the shield - is discussed in Chapter 7 (Maritime force protection).[277] The description of the offensive use of striking power - the sword - is divided into two chapters. This chapter gives an overview of the different forms of offensive striking power that can be used in maritime operations. The ways in which this offensive striking power is used in maritime operations are examined in Chapter 10 (Manoeuvre).

As already stated, striking power is the collection of means and methods with which physical and cognitive effects can be created. Physical effects in the maritime domain are created by physical means (effectors): naval platforms (ships, aircraft), teams (troops) and unmanned systems. This chapter thus begins with a description of this physical maritime striking power. Cognitive effects are created by using physical means and/or particular methods in the information domain. The chapter continues with a description of maritime striking power in the information domain, and closes with a description of two special forms of striking power: that in the electromagnetic spectrum and that in the acoustic spectrum. These two forms are described separately, as they can be used to create both physical and cognitive effects.

277 See Chapter 7, paragraph 7.9 (Maritime defence).

9.2 Physical maritime striking power

The physical striking power in maritime operations is made up of units, troops and unmanned systems. Maritime units are manned military objects located on, in or above the sea or on or above land:

- ships;
- submarines;
- aircraft and helicopters;
- coastal batteries.

These four types of maritime unit will be discussed in paragraphs 9.2.1 to 9.2.4.

Maritime troops are teams of personnel that are deployed in the water, on board other ships and installations or on land, such as:

- amphibious manoeuvre units and special operations forces;
- boarding parties, security detachments and emergency response teams;
- diving teams.

Paragraphs 9.2.5 to 9.2.7 will examine these three types of maritime troops in further detail.

Together with units and troops, unmanned systems also form part of physical striking power in the maritime domain. These systems include:

- sea mines;
- unmanned aerial vehicles (UAVs);
- unmanned surface vehicles (USVs);
- unmanned underwater vehicles (UUVs).

Paragraphs 9.2.8 and 9.2.9 will look at the maritime use of these four types of unmanned system in more detail.

9.2.1 Ships

Naval ships come in all sorts of shapes and sizes.[278] and the level and form of striking power they possess thus vary enormously. They do, however, have one important feature in common: versatility.[279] Most naval ships carry various types of effector with them. As well as their own weapon systems, they can also deliver other forms of physical striking power, such as boarding parties and facilities for providing humanitarian assistance or disaster relief. Many ships can also serve as a base of operations for assault boats, SOF, helicopters or unmanned systems. Broadly speaking, there are four categories of naval vessels:

- cruisers, destroyers, frigates, assault ships and patrol ships;
- aircraft carriers and amphibious assault ships;
- supporting ships;
- landing craft, assault boats and transport craft.

Cruisers, destroyers, frigates, assault ships and patrol ships

The backbone of the surface fleet is made up of versatile naval ships such as cruisers, destroyers and frigates. These types of ship are fast and manoeuvrable, and are designed to be able to engage enemy submarines, aircraft and surface ships. They are equipped for that purpose with a wide range of weapons, such as surface-to-air missiles (SAM) and surface-to-surface missiles (SSM), gun systems, machine guns, torpedoes and depth charges.

278 NATO uses standard abbreviations to designate ship types, such as FF for a frigate and SSK for a submarine. A list of these abbreviations and their definitions can be found in APP-20 Standard Ship Designator System.
279 See Chapter 3, paragraph 3.6.4 (Characteristics of maritime operations: Versatility).

These types of ship usually have one or more helicopters that can be employed against submarines and/or surface ships. In some cases, these ships are equipped with weapon systems, such as guns and land attack missiles, that can be used to attack land-based targets or to intercept ballistic missiles. As well as being ideal for combat tasks, these types of ship are also suited to other tasks such as maritime security operations (MSO, e.g. law enforcement) and maritime assistance (e.g. presence and disaster relief).

The Dutch air defence and command (LC) frigates and the Dutch and Belgian multipurpose (M) frigates belong to this category of versatile naval ships.

Besides the general purpose cruisers, destroyers and frigates, there are also naval ships with a more specialised task, such as assault and patrol ships. Fast patrol boats (FPB) and fast attack craft (FAC)[280] are smaller, often extremely fast naval vessels that are specially equipped to attack other ships. They are not usually equipped with an onboard helicopter. Patrol ships are vessels that are ideally suited to conducting MSO and gathering intelligence, but which are not equipped for combat operations against other naval ships, submarines or aircraft. Patrol ships do in most cases have a helicopter.

The Netherlands' Holland-class ocean-going patrol vessels belong to this category.

280 FPB and FAC are general terms for assault ships which, according to APP-20, are classed as types PG and PT (patrol combatants) and variants thereof (such as PGG, PGM and PTG).

Dutch LC-frigate

Belgian M-frigate

Dutch ocean-going
patrol vessel

Aircraft carriers and amphibious assault ships
This category includes large and extremely large naval ships that function as a home base for other forms of striking power, such as aircraft, helicopters, landing craft and amphibious manoeuvre units.

Aircraft carriers are floating airfields. In effect, they consist of a large hangar below a flight deck that covers virtually the entire upper surface of the ship. The physical striking power of an aircraft carrier comprises the many different types of aircraft and helicopters carried by the ship. That striking power has a long range and can be highly diverse: for example, fighter, patrol and radar aircraft, and transport and attack helicopters. Aircraft carriers also have command facilities.

Amphibious assault ships are vessels that are specially equipped to function as a base camp for amphibious troops. They have means for setting these troops ashore or picking them up, such as transport and attack helicopters, landing craft and assault boats. They also have facilities for C2 and logistic and medical support for the amphibious troops.

The Dutch LPDs HNLMS Johan de Witt and HNLMS Rotterdam belong to the amphibious assault ship category.

LPD HNLMS Rotterdam (with a FRISC in the foreground)

There are also ships that are a combination of an aircraft carrier and an amphibious assault ship. These have a hangar and a large flight deck as well as facilities for landing craft (such as a dock).

Supporting ships
Supporting ships have a specific task that is usually linked to one of the other joint functions: C2, intelligence, force protection or sustainability. These ships are not equipped for combat operations against other ships and aircraft but are, alongside their specific main task, also highly useful for MSO and maritime assistance.

- **Logistic ships** are designed for logistic tasks such as (strategic) transport, supply and medical support. Some of these ships are also equipped for RAS,[281] via rigs as well as via helicopters or boats.

  The Netherlands' joint support ship, HNLMS Karel Doorman, belongs to this category.

- **Mine countermeasures** units provide protection against the threat of sea mines. They are equipped with special sensors and devices to detect and dispose of sea mines and other forms of explosive (such as UXO). These ships have very limited capacities for other tasks.

  The Dutch and Belgian Tripartite minehunters belong to this category.

Tripartite minehunters HNLMS Vlaardingen and BNS Lobelia

281 See Chapter 8, paragraph 8.6.2 (Replenishment at sea).

- **Survey vessels and intelligence ships** are designed to gather data on hydrography, oceanography and meteorology or for the purposes of intelligence. They are equipped with highly specialised sensors and devices and are not usually armed.

  The Dutch hydrographic survey vessels HNLMS Luymes and HNLMS Snellius and the Belgian survey vessel BNS Belgica belong to this category.

Survey vessel HNLMS Snellius

- **Support ships** are designed to provide C2, logistic and technical support and/or transportation of other maritime units or troops.[282]

The following Dutch and Belgian ships belong to this category:
- the Belgian support ship BNS Godetia;
- the Dutch torpedo training ship HNLMS Mercuur;
- the Dutch support ship HNLMS Pelikaan, stationed in the Caribbean;
- the Dutch diver support vessels.

Other navies have many other types of ship in the support ship category, for example mine layers, seagoing tugboats, salvage vessels and hospital ships.

HNLMS Mercuur

BNS Godetia

HNLMS Pelikaan

282 Another common term for ships in this category is tender (e.g., submarine tender).

Landing craft, assault boats and transport craft

These types of vessel provide transport and/or protection for (amphibious) troops, and normally operate from a larger ship such as an amphibious assault ship. A common feature is that they have limited sustainability and are lightly armed. There is a wide diversity of vessel type in this category, including:

- landing craft and hovercrafts that can set vehicles and troops ashore, such as the Dutch landing craft utility (LCU) and the landing craft vehicle/ personnel (LCVP);
- assault boats and armed vessels suitable for riverine operations, such as the Dutch FRISCs (fast raiding intercept and special forces craft);
- transport craft for boarding parties and SOF, such as the Dutch and Belgian RHIBs (rigid hull inflatable boats) and FRISCs.

LCU

LCVP

9.2.2 *Submarines*

Operating under water is one of the few ways to stay hidden in the maritime domain. Submarines derive their strength from this; they are difficult to detect and can thus remain unseen for longer. This enables them to bring their striking power to bear in places where other units run much greater risk, such as in the immediate vicinity of units and areas of an adversary. Submarines can thus make full use of the element of surprise. The (possible) presence of a submarine therefore sends a strong and threatening signal to an opponent.

A submarine's striking power normally consists of heavy weapon systems, such as ballistic missiles, guided missiles, heavyweight torpedoes or sea mines. These weapon systems enable a submarine to engage land-based targets, ships or other submarines. Submarines can also serve as a home base for maritime SOF, frogmen or divers and can assist in the gathering of intelligence.

There are different types of submarine:

- an SSBN (submarine, ballistic missile, nuclear) is a nuclear-propelled submarine equipped with strategic ballistic missiles to attack land-based targets;

- an SSGN (submarine, attack, guided missile, nuclear) is a nuclear-propelled submarine equipped with guided missiles that can be employed against ships or land-based targets;

- an SSN (nuclear powered attack submarine) is a nuclear-propelled submarine equipped with heavyweight torpedoes;

- an SSK (long-range patrol submarine) is the equivalent of an SSN, but smaller and with a different method of propulsion, for example diesel-electric;

- an SSC (coastal submarine) is a smaller version of an SSK, designed for use in coastal waters.

The main difference between the various types of submarine is the method of propulsion. Nuclear-propelled submarines have the advantage of being able to stay under water for longer: up to months at a time. They can also reach high speeds under water (more than 30 knots) and can maintain that high speed for long periods. Submarines with diesel-electric propulsion do not have these advantages. They sail on batteries under water; at fixed times, therefore, these submarines must surface or use a snorkel to recharge the batteries with the diesel engines. There are other submarines with diesel-electric propulsion which also use fuel cells (air independent propulsion, AIP), allowing them to stay under water for longer or to maintain high speeds under water for longer periods.

Walrus-class submarine

The Netherlands' Walrus-class submarines are of the SSK type. They are diesel-electric-propelled submarines with a large action radius, whose small size allows them to operate in coastal waters. They are equipped with heavyweight torpedoes and with devices for receiving electromagnetic and acoustic signals (ESM, passive sonar). They can also serve as a base of operations for SOF and as mine layers.

9.2.3 *Aircraft and helicopters*

Airpower makes a significant contribution to striking power in maritime operations too. Aircraft and helicopters have the advantage of being able to travel great distances quickly and can thus cover huge areas. Maritime operations involve the use of aircraft and helicopters that operate from ships as well as those that are land based. There are also aircraft that can operate from the water surface: flying boats and seaplanes.

Aircraft and helicopters that operate from ships are usually adapted for use at sea. The space on board a ship is always (considerably) smaller than at an airport. Furthermore, a ship's flight deck is a moving, rocking surface rather than a fixed one. Airborne assets must therefore be fitted with folding wings, rotors and tail fins, a tailhook for catching arresting wires and/or a harpoon deck-lock for securing to the deck. Ships that have a helicopter deck are not always able to operate with all types of helicopter. The size and/or weight-bearing capacity of the deck may not be sufficient for larger helicopter types to land or take off.[283]

283 For an overview of capacities of ships with a helicopter deck (NATO and non-NATO nations), see APP-2 Helicopter operations from ships other than aircraft carriers (HOSTAC).

Despite these (technical) restrictions, operating with ship-based aircraft and helicopters has major advantages as opposed to their land-based counterparts. Operations are not dependent on the availability of airports in the vicinity of the area of operations or on the cooperation of nations in which those airports are located. Furthermore, no time is lost on (long) transits between the airport and the area of operations.

The following types of aircraft and helicopters may be elements of maritime striking power:

- **Combat aircraft**. These operate from aircraft carriers or from land, for the purpose of:
  - o counter-air operations: to achieve a desired or necessary degree of control of the air;
  - o air contribution to maritime operations: the contribution to antisurface warfare (ASUW) against ships;
  - o air contribution to land operations: employment against land-based targets such as air interdiction (AI) and close air support (CAS).

For this, combat aircraft use guided missiles (air-to-air and/or air-to-surface), bombs and guns. Combat aircraft may also be employed for ISR tasks such as (photo) reconnaissance.

The Dutch and Belgian F-16 fighter aircraft belong to this category.

Dutch F-16

- **Patrol aircraft**. Maritime patrol aircraft (MPA)[284] are large aircraft that operate from land. These aircraft, their sensors and their crews are specialised for missions in the maritime domain. MPAs have a long range and can thus be active within an area for prolonged periods, often several hours. They are employed for:
  - o antisurface warfare (ASUW);
  - o antisubmarine warfare (ASW);
  - o ISR tasks (surveillance and reconnaissance), both above sea and above land.

  Maritime patrol aircraft often have various sensors, such as radar, sonar buoys, MAD,[285] ESM and photographic equipment. Maritime patrol aircraft may be equipped with torpedoes (against submarines), guided missiles (against ships), mines and bombs.

284 In some cases these aircraft are referred to as MPRA (maritime patrol and reconnaissance aircraft).
285 Magnetic anomaly detector. See box 'Using the earth's magnetic field', Chapter 1, paragraph 1.2.3.2.

- **Maritime helicopters**. These are medium or light helicopters suitable for operating from ships. They can be used to perform the same tasks as an MPA – ISR, ASUW and ASW – although they have a shorter range and lower endurance than an MPA, in most cases no more than a few hours. Most maritime helicopters are also suited to transport tasks, for example for a boarding or emergency response team.

  The Dutch and Belgian NH-90 NFH maritime helicopters belong to this category.

NH-90 maritime helicopter

- **Attack helicopters**. This category consists of helicopters that are equipped to perform air interdiction (AI) and close air support (CAS) against land-based targets. In maritime operations, their combat power is used mainly in amphibious operations.

  The Dutch AH-64 Apache attack helicopters belong to this category.

Apache attack helicopter

- **Transport helicopters**. Although these types of helicopter do not themselves have any direct striking power, they form an essential element of maritime striking power, particularly in amphibious operations, boardings and humanitarian assistance operations. Transport helicopters make it possible to transfer (combat) forces directly and quickly between the ship and the intended object (ship-to-objective manoeuvre, STOM).[286] Transport helicopters are also vitally important for sustainability (logistic and medical support).

  Dutch and Belgian transport helicopters of the types NH90 TNFH/TTH and Dutch medium helicopter of the type CH-47 (Chinook) belong to this category. Because of their size and weight, the latter can only operate from the LPD HNLMS Johan de Witt and the JSS HNLMS Karel Doorman (or from foreign ships of similar or larger size).

286 See Chapter 11, paragraph 11.3.1 (Amphibious operations).

The above-mentioned categories of aircraft and helicopters make a direct contribution to physical maritime striking power. There are also other types of aircraft and helicopter that perform supporting tasks for maritime operations, mainly in relation to C2, sustainability, intelligence gathering and picture compilation. Some examples of these are:

- Airborne early warning (AEW) aircraft and helicopters, such as the E-3 Sentry and the E-2 Hawkeye aircraft;
- Tanker aircraft, such as the Dutch KDC-10 tanker/transport aircraft;
- EW aircraft, such as the US EA-6 Prowler and the EA-18 Growler aircraft;
- Transport aircraft, such as the Dutch and Belgian C-130 Hercules and the Dutch KDC-10.

9.2.4 *Coastal batteries*

On land too, there are units that contribute to physical maritime striking power: the coastal batteries. Coastal batteries could be either static (a building) or mobile (a truck-mounted launcher). The physical striking power of coastal batteries is made up of torpedoes or guns (usually in permanent positions) or of guided missiles or unguided rockets (usually mobile units). In addition, permanent coastal batteries may also operate controlled naval minefields.

9.2.5 *Amphibious manoeuvre units and special operations forces*

Physical maritime striking power consists not only of ships, submarines and aircraft. In various forms of maritime operation, striking power is mainly made up of troops and teams, the largest example of which are amphibious manoeuvre units and maritime SOF. They comprise combat forces specially equipped to deliver striking power from the sea in order to thus exert influence at sea or on land.

Amphibious manoeuvre units

Amphibious manoeuvre units are ideal for conducting the various forms of amphibious operation,[287] such as an assault or raid. These units are supported in their actions by amphibious combat support units, such as those with mortars or anti-aircraft guns. Amphibious combat service support units ensure sustainability.

Depending on their size and mission, amphibious manoeuvre units and their supporting units may be organised differently. The organisation usually takes the traditional form of battalions and companies, but there are also other forms, such as the marine expeditionary unit or the marine combat group (MCG). The different forms are often related to the assignment of aircraft and helicopters (air assault units) and/or landing craft (surface assault units). In amphibious operations, the amphibious manoeuvre units make up the landing force (LF), which forms part of the amphibious task force.[288]

Besides these combat tasks, amphibious manoeuvre units are also highly suited to other operations conducted from the sea, such as evacuations (NEO) and humanitarian assistance operations.

The Netherlands Marine Corps' marine combat groups belong to the amphibious manoeuvre units and are divided into raiding squadrons and raiding platoons.

287 See Chapter 11, paragraph 11.3.1 (Amphibious operations).
288 See Chapter 5, paragraph 5.8.1 (C2 in amphibious operations).

Amphibious manoeuvre units in action

Maritime special operations forces

Special operations forces (SOF) are specialised, often small units that are employed for covert infiltrations, special reconnaissance and direct action.[289] Characteristic of maritime SOF is that they perform these tasks in and from the maritime domain. They have the ability to move, usually unseen, under water, over water and through the air to and from their objective and execute their mission. The particular specialism of maritime SOF is that of the frogmen.

Apart from their use in combat tasks, maritime SOF also form the specialist striking power in MSO, examples of which are hostage release operations (HROs), opposed boardings and (maritime) counterterrorism operations. Lastly, SOF are also employed for special military assistance, for example in the role of military advisor.

The troops of the Netherlands Maritime Special Operations Forces (NLMARSOF) of the Marine Corps belong to the category of SOF, as does the Boat Group of the Belgian Special Operations Forces (BE SOF).

Maritime special operations forces

289 See Chapter 11, paragraph 11.3.3 (Maritime special operations).

9.2.6 Boarding parties, security detachments and emergency response teams

Whereas amphibious troops and SOF focus on delivering striking power for combat operations, there are also maritime troops and teams which deliver striking power for law enforcement and for humanitarian assistance and disaster relief. These teams may come from the ship's crew, possibly augmented by extra personnel, or they may be assembled specifically for the mission. This form of maritime striking power encompasses the following:

- **Boarding parties**. These are teams designed to board other ships to perform an inspection in the context of a blockade, an embargo or an anti-smuggling or counter-piracy operation. Depending on the nature of the boarding and the expected threat, a boarding party will consist of naval personnel, marines or a combination of the two. In the case of opposed boardings, maritime SOF will normally form part of the boarding party. Boarding parties operate from a (large) surface ship such as a frigate, a patrol ship or a supply ship, which provides combat support (such as fire support) and combat service support (mainly logistic and medical support).

  If a boarding results in the need to seize the vessel in question as prize[290] or for further inspection, members of the boarding party could then function as part of the prize crew.

- **Security detachments**. A vessel protection detachment (VPD) is a team tasked with protecting a civil ship against a criminal threat such as piracy. A VPD is normally armed with small-bore weapons such as light machine guns. Snipers may also be included in a VPD.

  A VPD may operate autonomously (AVPD), or it could, just like a boarding party, operate under the protection and with the support of a naval ship. Because of sustainability (relief, medical care), an AVPD is larger than a VPD that is supported by a naval ship.

VPD protecting a merchant ship against piracy

290 See box 'Contraband and prize capture of goods and ships' in Chapter 2 paragraph 2.7.1.3.

- **Emergency response teams**. A naval ship is at all times able to provide aid and relief in the event of an emergency. This could be an emergency at sea, for instance a ship in distress, or an emergency situation on land, such as a natural disaster, major accident or evacuation. In such cases, an emergency response team is assembled from the crew to provide initial assistance. The size of the team and the amount of assistance a naval ship can provide will obviously depend on the type of ship, the size of the crew and the available onboard facilities.

  An emergency response team could also be one that is specially assembled, often provided with extra equipment, and assigned to the ship for a specific emergency response mission. This will be the case if there is sufficient time and space to embark the extra personnel and equipment and if the expected scale of the operation requires, for example after a major earthquake or hurricane or in the event of a large-scale evacuation.

9.2.7 Diving teams

Just like a submarine, groups of individuals can also make full use of the advantages of operating under water. These are the frogmen and the divers. Frogmen represent the offensive striking power; they thus belong to the maritime special operations forces (MARSOF, see paragraph 9.2.5). The work of divers is supportive in nature and consists of detecting and disposing of sea mines, explosives and other subsurface obstacles. Because of their expertise, they also serve as specialists in maritime units for surface EOD and IEDD.

Divers

Diving teams are usually assembled for a specific task or a particular specialism:

- mine clearance: these are the diving teams on MCM ships that can clear sea mines and UXO to a depth of 55 metres;
- very shallow water mine countermeasures (VSWMCM): clearance of sea mines, obstacles and explosives in water less than 10 metres in depth.[291]
- salvage and construction: salvage work, clearance of obstacles and subsurface repairs.[292]
- deep diving: diving activities at great depths (up to 81 metres).

291 See Chapter 11, paragraph 11.2.4.2 (Mine countermeasures), VSWMCM element.
292 Most naval ships have one or more ships divers in the crew. They have sustainability-related tasks, such as identifying defects on the subsurface parts of the ship and performing repairs underwater. See Chapter 8, paragraph 8.7 (Maintenance and repair).

Diving teams can operate from any type of ship, but they usually work from a specially equipped (dive support) vessel or from a site on land. Besides being used for activities in their specialist field, diving teams may also be employed for other tasks for which their expertise is required, such as harbour protection[293] and EOD.[294]

In the armed forces of many countries, there is a close correlation between individuals operating under water in the navy (divers, frogmen) and those in the army (engineers, commandos):

- In the Netherlands, the various specialisms in the diving field are brought together in the joint Defence Diving Group (DDG), which is part of the navy. The only exceptions are the divers responsible for EOD: as the Maritime EOD company (*MAREODCie*), they are incorporated in the Defence Explosive Ordnance Disposal Service (*EODD*), which is part of the army.

- In Belgium, the diver-deminers are merged in one joint organisational element, namely the Explosive Ordnance Disposal Service (*DOVO*), which is part of the army.

9.2.8 Sea mines

The sea mine is a relatively simple but extremely powerful form of maritime striking power. The detonation of one sea mine is usually sufficient to sink a ship or at least to disable it long term. Sea mines pose a grave danger to shipping. The mere suspicion that mines have been laid can bring shipping to a halt in the area in question, even if not a single mine has been found. Furthermore, the removal of any (suspicion of a) mine risk is time-consuming: (potential) mine-risk areas need to be searched, safe routes need to be designated and detected mines must be cleared safely.

There are many different types of sea mine, with different methods of detonation.[295] They can be laid by aircraft, ships and submarines. It does not always require special equipment; merchant ships, fishing boats or other craft could also be used for laying mines.

The Dutch and Belgian navies do not have sea mines.

9.2.9 Unmanned systems

Apart from manned units, troops and sea mines, physical striking power could also consist of **unmanned systems** that are able to move and perform tasks independently or by remote control. Because these systems are unmanned, often more difficult to detect and less costly than ships or aircraft, greater risks can be taken with them. This enables activities to be undertaken within the safe distance that would normally apply, thus much closer to hazards or to enemy units.

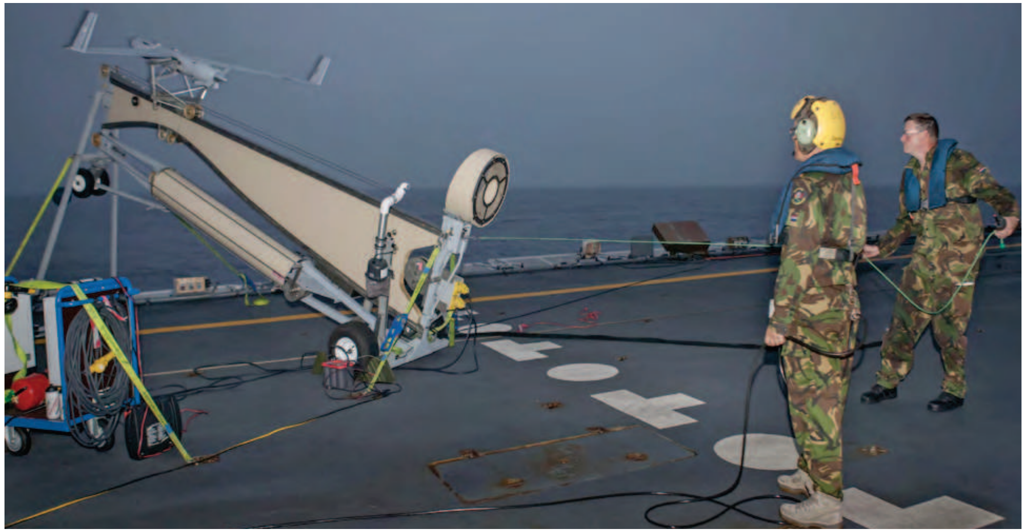
Unmanned systems are usually designed for a specific domain (under water, on the water, in the air or on land) and for a specific task (intelligence gathering, picture compilation, destruction).

293 See box on harbour protection in Chapter 12, paragraph 12.5 (Countering violent crime and terrorism in the maritime domain).
294 See Chapter 13, paragraph 13.5.4 (Maritime assistance: explosive ordnance disposal).
295 For more details about the various types of sea mine, see Chapter 7 paragraph 7.9.6 (Defence against sea mines).

Unmanned Aerial Vehicles

Unmanned aerial vehicles (UAVs) combine the possibility of operating close to hazards and threats with the advantages of airpower: high speed and long range. Maritime operations involve the use of UAVs that operate from ships as well as those that are land-based. To be able to operate from ships, UAVs need special launch and recovery installations.[296] In the maritime domain, UAVs are mainly used in a supporting role, namely that of ISR.

The short-range tactical UAV (SRTUAV) of the Dutch Joint ISTAR Command (JISTARC) is a UAV and is suitable for use by any (naval) ship with sufficient free space on deck.[297]



Scan Eagle UAV being launched from the helicopter deck

296 Instead of UAV, therefore, this is also sometimes referred to as an unmanned aerial system (UAS). A UAS comprises not only the UAV, but also the necessary support, such as a ground control station (GCS), launch and recovery installation, operators, etc.
297 Although usually the flight deck or helicopter deck is used for a UAV, it is not essential.

Unmanned Underwater Vehicles

Unmanned underwater vehicles (UUVs) encompass all forms of autonomous or remotely operated underwater robots and mini submarines. They usually have a specific task. Although they are limited, the range and endurance of UUVs are in most cases still greater than those of divers. They are employed mainly in high-risk environments, whether because of major hazards (mines, explosives) or a major threat (close to opposing units). UUVs are also ideal for operating in conditions that are unfavourable for divers, such as strong currents, poor visibility or low temperatures. UUVs are mainly employed for the purpose of intelligence gathering or protection.

Examples of UUVs used by the Dutch and Belgian navies are:

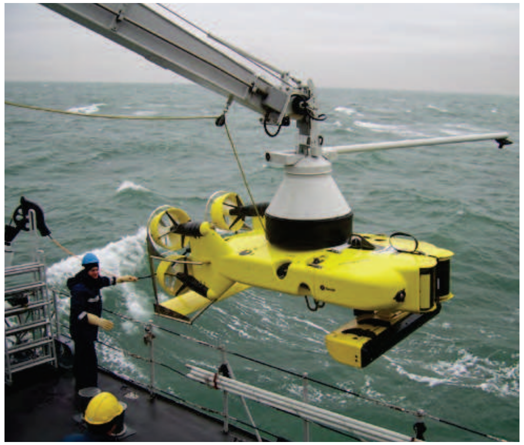
- REMUS (Remote Environmental Measuring Units) is a torpedo-shaped underwater robot fitted with high-quality sonar equipment that enables areas underwater to be searched rapidly and systematically.
  REMUS is an autonomously free-floating system; once programmed, it will perform the task itself.[298] REMUS is used by diving teams specialised in VSWMCM, EOD and harbour protection.

298 Because REMUS is an autonomous system, it is also referred to as an AUV (autonomous underwater vehicle) rather than a UUV.

REMUS

- ROV (remotely operated vehicle) is a remote-controlled underwater robot fitted with sonar and cameras with which areas and objects underwater can be searched. The ROV is used by diving teams operating from minehunters and diving support vessels.

- SPVDS (self-propelled variable depth sonar) is a remote controlled sonar used on MCM ships. The SPVDS can move virtually freely in the water column, but remains attached to the ship by a cable. In contrast to the hull-mounted sonar, the SPVDS is less dependent on the acoustic profile under water. Furthermore, the SPVDS makes it possible to compile the subsurface picture at greater distances from the ship and in deeper water.



SPVDS

- The Seafox is a wire-guided torpedo-shaped UUV for use in the clearance of sea mines. The Seafox I (Inspection) version is used to identify objects detected by sonar and is re-usable. The Seafox C (combat) can only be used once. It is fitted with an explosive charge that can be used to destroy objects under water.

Seafox I

Unmanned Surface Vehicles

As well as over water (UAV) and under water (UUV), unmanned systems can also be used on the water surface. Although these unmanned surface vehicles (USVs) have lower speeds and a shorter range than UAVs, they do have the capacity for a larger payload and normally have greater endurance. USVs can also be equipped with sonar devices, so that they can contribute to the situational awareness under water. They can also be fitted with sweeping devices so that they can be employed for mine countermeasures.

9.3 Maritime striking power in the information domain

As indicated in the introduction to this chapter, striking power is the collection of means and methods with which physical and cognitive effects can be created. Cognitive effects are created by using information as a 'weapon', to change actors' opinions, outlooks and perceptions and thus their behaviour. Cognitive effects can be created with the use of physical striking power, for example through the physical destruction of elements of C2 or communications. They can also be created by means of certain methods - **information activities** - that involve the use of (dis)information.

These information activities are:
- Presence, posture and profile;
- Cyber warfare;
- Deception;
- Psychological operations (PsyOps);
- Key leader engagement (KLE);
- Civil-military cooperation (CIMIC);
- Public affairs (PA).

Information activities also include offensive elements of EW and acoustic warfare, which are described in paragraph 9.4.

Information Operations (InfoOps) and Strategic Communication (StratCom)

NATO doctrine regards **information operations** as a separate joint function. Information operations do not form a separate category of military operations, but a (staff) function that coordinates all activities in the information domain. NATO doctrine for information operations[299] makes a distinction between defensive and offensive information activities. The purpose of the defensive activities is to protect friendly data and information management, such as INFOSEC and OPSEC (see Chapter 7). Offensive information activities involve the use of information as a 'weapon', for example by means of deception, use of the media and cyber warfare. These offensive activities are described in this chapter.

Another concept in NATO doctrine is that of **strategic communication** (StratCom). Like InfoOps, StratCom is a coordination mechanism, but at the political strategic and military strategic level. The purpose of StratCom is to achieve consistency and coherence in word and deed between political and diplomatic statements, public information and military information activities. StratCom therefore falls under the comprehensive approach: the coordinated use of instruments of power. In this approach, InfoOps forms a military subset of StratCom.

Information activities do not only target the adversary. There are three target audiences in the information domain: opponent(s), friendly parties and other actors (neutrals, third parties, those who are uncommitted). The cognitive effect that needs to be created varies per target audience. The purpose of

299 See AJP-3.10 Allied Joint Doctrine for Information Operations.

information is to bring about a situation in which opponents cease their detrimental behaviour, friends and sympathisers are informed and motivated and neutral actors are persuaded to lend their passive or active cooperation.

The following paragraphs set out the information activities on the basis of target audience, means and use in maritime operations.

9.3.1 Presence, posture and profile

The presence of military forces and the behaviour of those forces and of their individual members all send a message, and this can influence other actors.

Presence has a broad application in maritime operations as a means of exerting influence at strategic and operational level. Freedom of navigation allows the presence of maritime forces wherever a political message is deemed necessary, without violating the territorial integrity of other states (naval diplomacy). A presence can be evidence of resolve. Examples of this are the presence of the Netherlands Guard Ship in the Caribbean and NATO's standing maritime groups. Maritime presence can also be used to deter opponents and to reassure friendly parties. In such cases, the presence of maritime forces serves to endorse political and diplomatic statements (threats, declarations of support). At operational level, the presence of maritime forces can be used to fix opposing troops.[300]

300 See also Chapter 3 paragraph 3.4 (Strategic functions of maritime operations), in particular the functions of anticipation, prevention and coercion (paragraphs 3.4.1 to 3.4.3).

Posture and profile have a direct influence on other actors' perception. They must be in keeping with the aim and target audience of the activity. A rigid and robust posture -sabre rattling- is, for example, designed to serve as a deterrent for potential opponents. In a dialogue with local seafarers, on the other hand, an approachable posture will be required. It will in some cases be all about the detail, such as the choice between wearing a helmet or a beret, or the choice of words in a conversation on the maritime VHF radio.

The influence of presence, posture and profile can be huge, also in a negative sense. Improper or unprofessional behaviour on the part of individual military personnel can have negative repercussions at strategic level, as it will impact on public support for the operation. It is therefore vitally important that the posture and profile of units and individuals correspond to the broader context and the core message of the operation or campaign.[301] At least equally important is the awareness of cultural and religious differences, so that inadvertent negative (side) effects can be prevented.

9.3.2 Cyber warfare

Cyber warfare (or computer network operations, CNO) is the military use of digital data and systems. It has three sub-areas: computer network exploitation (CNE) for intelligence gathering,[302] computer network defence (CND) for protection[303] and computer network attack (CNA) as a weapon.

301 See Chapter 10, paragraph 10.4.2 (Maritime manoeuvre at operational level – campaign themes).
302 See Chapter 6, paragraph 6.7.3 (Sources and collection methods).
303 See box on Cyber security in Chapter 7 at paragraph 7.8.3 (Information protection in maritime operations).

Computer network attack (CNA) is an attack on digital data and digital systems by hacking, by means of a virus or malicious software (malware) or by overloading (denial of service). A cyber attack is directed at the availability and integrity of data and systems. By damaging availability, the aim is to cause the failure of digital systems or to deny access to data. By damaging the integrity of digital data and software, the aim is to cause unexpected or unpredictable behaviour in systems and thus confusion in the user. The user can also be deceived with erroneous data.

Cyber attacks differ from other military means in a number of ways. A cyber attack can only be launched once, for instance, as afterwards the capacity of the 'cyber weapon' will be known and the weakness in the affected system will have been addressed. Furthermore, the effectiveness of a cyber attack is unpredictable, as the adversary might already have taken countermeasures. A cyber attack also takes a very long time to prepare and requires a high degree of secrecy.

Military cyber attacks will normally be directed at specific systems of an opponent, as attacks on widely used (usually civil) systems could carry a high risk of collateral damage.

Military cyber attacks are not typical of maritime operations, although there are in theory many possible applications for cyber attacks in this domain. This is because maritime opponents also make frequent use digital processes: not only in their networks and C2 systems, but also communications devices, operating systems of sensors and weapons, operating systems for energy supply and propulsion (platform automation) and logistic support systems.

9.3.3 Deception

Deception is the creation of an erroneous representation of reality by the targeted dissemination of misleading information or the deliberate emission of a false signal. The aim is to induce the opponent to react in a manner that is prejudicial to his interests, without his awareness of what is happening. This will only be successful if the opponent does not recognise the misleading information as such, but regards it as reliable, accurate and relevant.

Deception is a recognised and, if well executed, effective and profitable military method, also referred to as a 'ruse'. Deception makes it possible to surprise the opponent and helps to establish (enhanced) protection. Deceiving an adversary is no simple task, however; it requires thorough preparation, a high level of secrecy and an understanding of how the opponent thinks. There is a direct correlation between operations security (OPSEC)[304] and deception. OPSEC denies the opponent access to accurate information about dispositions, capabilities and intentions. Deception fills that information gap with targeted, misleading information.

304 See Chapter 7, paragraph 7.8.3.2 (Operations security).

The creation of a credible but deliberately inaccurate representation of reality usually requires various forms of information or signals. For them to succeed, they must be properly coordinated with each other. Deception involves the use of more than one form of information activity, such as behaviour, PsyOps and electronic, acoustic and cyber warfare.

Deception can be used at different levels of operation, also in maritime operations. At the operational level, a creative approach to dispositions and ships activities can help to conceal the true intentions of the joint campaign or the operation. An amphibious demonstration is a good example of this.[305] At tactical level, opponents can be wrong-footed by zigzag courses, misleading combinations of active sensors or navigation lights and the use of decoys. At technical level, deception mainly occurs through the use of techniques such as jamming, spoofing, camouflage, blackouts and silent operating. The power of good deception, however, lies in a credible combination of different activities at different levels.[306]

305 See Chapter 11, paragraph 11.3.1 (Amphibious operations).
306 For further details on the maritime use of deception, see ATP-31 NATO Above Water Warfare Manual, Chapter 10, Section 1, Operational Deception (OPDEC) (classified).

9.3.4 Psychological operations (PsyOps)

Psychological operations are activities used to spread messages that are directed at a particular target audience. Depending on the target audience, the effect that these messages are designed to create may be:

- to weaken the will of the opponent or of potentially hostile target audiences;
- to boost public support among target audiences that are favourably disposed;
- to obtain support and cooperation from target audiences which are (still) taking a wait-and-see approach.

PsyOps involve the use of three methods of communication to convey the message:

- **Visual**: through the use of text and images. This can be done by means of leaflets, posters, comic strips and periodicals, or by printing text or images on useful or desirable objects (toys, first-aid equipment, vests, torches).
- **Audio**: through the use of radio broadcasts and loud hailers.
- **Audio-visual**: through the use of television, video or internet.

Communication methods need to meet a few conditions in order to be effective:

- The message must be specific to the target audience. This means that a good understanding of the target audience is essential: culture, language, motivations, philosophies and sensitivities. The skills of the target audience are also important; for example, the distribution of leaflets with text among a largely illiterate population is pointless.

- The message needs to be truthful, but must not compromise the applicable OPSEC.
- The source of the message must be clear.[307]

Because of these conditions, PsyOps material (folders, printed objects, videos) is developed and produced by a specialist team. This PsyOps support element (PSE) is then assigned to a staff at operational or tactical level. The material is usually distributed by the military unit itself.

Although PsyOps do involve the use of the electromagnetic and the acoustic spectrum, these forms of PsyOps are not classified as electronic or acoustic warfare. This is because PsyOps are a form of communication. The issue of warnings for security and defence, such as the verbal “Stop or I’ll shoot”, or the warning-off calls by radio communications, is thus also a form of PsyOps.

Maritime PsyOps - visual warning to pirates

307 This is referred to as ‘white PsyOps’. NATO nations have a policy that does not allow the use of PsyOps without source reference (‘grey PsyOps’) or those with a deliberately false source reference (‘black PsyOps’).

Psychological operations are primarily useful in forms of military operation that are conducted in the direct vicinity of or among the target audiences concerned. This means that in conventional maritime combat operations at sea there are only limited opportunities to use PsyOps. However, in amphibious operations and in other forms of maritime operation, such as law enforcement and humanitarian assistance operations, PsyOps are an important method for creating cognitive effects. The visual PsyOps methods (leaflets, printed objects, internet messages) can be particularly effective ways of reaching sympathetic or uncommitted target audiences, such as local fishermen and merchant seamen, in counter-drug-trafficking and counter-piracy operations.

9.3.5 Key Leader Engagement (KLE)

As the name suggests, **key leader engagement** (KLE) entails the involvement of influential individuals in the integrated mission. Key leaders are people who, because of their position, status, power and/or influence, must be regarded as capable of affecting the situation in the area of operations. Examples of key leaders are local authorities, leaders of local professional, ethnic or religious groups and influential businessmen. The purpose of KLE is to induce these local leaders to use their influence for the benefit of the mission and the objectives of the military operation.

Key leader engagement is diplomacy at local level, based on personal contact. In principle, therefore, it is an activity that the military commander himself will perform in his role as a diplomat. KLE could be regarded as ‘PsyOps on a personal level’. It is also important to be aware that KLE is not without its pitfalls. Local influential figures may exhibit behaviour that is undesirable or at odds with our own principles, such as corruption or dubious business practices. Caution would then be advised to ensure that the gains in influence on the one hand do not result in the loss of support from other parties on the other.

KLE is an activity that is only effective in military operations conducted near to or among the target audiences. In maritime operations, therefore, the main usefulness of KLE is as an instrument in humanitarian assistance and in law enforcement, such as anti-smuggling and counter-piracy operations. Influential key leaders are not usually found at sea, but on land. Examples of maritime key leaders are port authorities, local military authorities, police and coastguard leaders, pilots, shipowners, representatives from the fishing industry and elders from fishing villages.

9.3.6 Civil-military cooperation (CIMIC)

Civil-military cooperation (CIMIC) is the coordination and cooperation between military forces and local civil actors in support of the military operation. The purpose of CIMIC is to establish and maintain cooperation with civil authorities, organisations and the local population to such a level that enables the military commander to fulfil his mission.

The cooperation thus achieved is designed to remove any obstacles to the military operation, minimise any inconvenience caused by military activities and establish unity of effort with civil actors. CIMIC revolves, as it were, around ‘good neighbourliness’ and supports the comprehensive approach.

CIMIC has three main tasks:

- **Civil-military liaison**: identifying and maintaining contacts among all relevant civil actors in the area of operations (authorities, organisations, businesses).
- **Support to the force**: obtaining the necessary support for the military operation (capabilities, means and people), eliminating disruptions (for the military operation as well as for the local community) and gaining public support.
- **Support to civil actors and their environment**: providing support for local civil actors, depending on the mandate for the operation.

The key task for CIMIC depends on the situation, the military mission and the type of military activity that is required. Although CIMIC performs a largely coordinating function, it may lead to the implementation of specific CIMIC projects. CIMIC projects are normally implemented by the military units themselves, but in some cases CIMIC uses civilian expertise, for example by employing reservists as CIMIC specialists. If more CIMIC personnel are assigned to the military organisation, they will usually be brought together in a CIMIC support element (CSE).

CIMIC is closely related to key leader engagement, psychological operations and public affairs. A commander can use KLE to identify and discuss opportunities for successful CIMIC. CIMIC projects can also be used to support PsyOps activities. Lastly, CIMIC success can be used to reinforce the message conveyed by PsyOps and public affairs.

CIMIC is extremely important in maritime operations, primarily because they are normally conducted in the global commons of the seas amid other civil users such as merchant ships, fishing vessels and pleasure craft. Secondly, many forms of maritime operation involve collaboration with local authorities and organisations, such as ports, shipowners, police and so on. One specific form of maritime CIMIC is the Naval Cooperation and Guidance for Shipping (NCAGS)[308] organisation, which coordinates support for and cooperation with civil shipping.

9.3.7 Public affairs

The aim of **public affairs** (PA)[309] is to influence the perception of a military operation. The main purpose is usually to foster understanding for the military operation among the general public. By disseminating information, public affairs activities help to gain public support. Furthermore, information serves to prevent erroneous or inaccurate reporting and to correct it where necessary. Finally, PA activities also serve to counter enemy propaganda.

It is highly important that public information in different places within the organisation is coherent. Press conferences in capital cities must thus convey a message that is consistent with the information issued during a meeting with local representatives or an 'open house' during a port visit. This consistency is achieved by using master messages, themes and lines to take (LTT). Master messages contain the main points of view as formulated in the communications strategy for the particular deployment or operation. These master messages only change in the event of major changes in the mission, political stance or approach. Themes are generally-worded messages emphasising specific aspects of an operation, such as 'personal security' or 'local cooperation'. Lines to take are substantive points about particular topics to which attention needs to be drawn, such as the nature of the mission or the reasons for a specific operation or activity. Master messages, themes and LTT give friendly personnel something to go on in their discussions with the public and the media.

PA activities are conducted by means of:

- Direct public information, where there is direct contact with the public, for instance during open days, shows and trade fairs and through personal contact (telephone, email) with interested parties;
- Indirect public information through statements on (friendly) websites and through social media platforms via internet;
- Press information through contacts with journalists.

Direct public information

Direct public information generally focuses on creating goodwill. It is often an effective way of encouraging cooperation on the part of the local population and local authorities. In maritime operations, direct public information actions usually take place during port visits, by - if the security situation allows - opening the ships to visitors and inviting the local authorities on board. These direct public information activities usually provide a natural starting point for engaging in dialogue with the local news media and via internet.

308 See Chapter 3 paragraph 3.5.5. (Cooperation with civil shipping).
309 Other terms for public affairs are: external communication, public relations (PR) or public information (PI).

Indirect public information

In the case of indirect public information, communication takes place via remote means of communication with the target audience, using means such as websites and social media to inform both the general public and the independent news media.

Official websites, blogs and functional social media accounts are used in the same regulated way as press information. Statements through these channels are made by or with the knowledge of public affairs officers and are consistent with the master messages and themes of the deployment or operation.

Informal blogs and non-function-related statements via social media are distinct from other information activities. These outlets make personal accounts of defence employees visible to the public. This personal slant means that blogs and social media are influential methods. The use of social media does carry risks, however, both from the point of view of (information) security and in respect of perception and public image. General guidelines have therefore been formulated for the use of social media by defence employees as private individuals.[310] These guidelines may be tightened up during actual military deployment, for example on the grounds of OPSEC or in the context of a Black Hole procedure.[311]

310 For Dutch defence personnel, the applicable document is Directive SG A/973 *Richtlijnen voor het gebruik van sociale media door defensiemedewerkers* [Guidelines for the use of social media by defence employees].
311 See Chapter 7, paragraph 7.8.3.1 (Information security).

Press information

Press information encompasses the official statements about the military operation. It is disseminated mainly via the independent news media by means of press conferences, written press releases and interviews with individual commanders, specialists, experts or official spokespersons. Media publications can have a huge impact. Unlike most other information activities, press information on military operations is thus always under the tight control of the political and strategic levels. In principle, therefore, press information is the preserve of specially appointed public affairs officers (PAOs). Ideally, any contact between other military personnel (such as commanding officers) and journalists or other media representatives will be supervised by a PAO.
This does not mean, however, that other military personnel are forbidden to have any contact with the press. Such contact may even be desirable, but it is only effective if the personnel involved have been briefed (media awareness), are up to speed on the line to take and are aware of the risks in terms of operational information (OPSEC)).[312] The official spokespersons should be informed as early as possible of any (possible) contact with the media.

When using press information as a means of striking power in the information domain, commanders must be constantly aware that they only have limited control over the result. It is not the commander or the spokesperson who decides what is to be written or broadcast, but the media representatives.

312 See Chapter 7, paragraph 7.8.3.2 (Operations security (OPSEC)).

Dealing with journalists during maritime operations is essentially no different from issuing press information in other forms of military operation. Although an encounter with a journalist or camera crew is less likely at sea, embedded media may embark on board a naval ship. Given that it is difficult to get away from each other on board a ship, the entire crew must be briefed on how to deal with the media; they should be made aware of the possible risks, but also of the opportunities such dealings may offer.

9.4 Maritime striking power in the electromagnetic and acoustic spectra

As well as the physical striking power and that in the information domain, there are another two special forms. These are the striking power in the electromagnetic spectrum (electronic warfare) and that in the acoustic spectrum (acoustic warfare). These two forms are special in that they can be used to create both physical and cognitive effects.

9.4.1 Electronic warfare

Military use of the electromagnetic spectrum is known as **electronic warfare** (EW), which is made up of three sub-areas:[313]

- Electronic warfare support measures (ESM) are means enabling the use of received electromagnetic signals for the benefit of situational awareness;[314]
- Electronic protective measures (EPM) are designed to offer protection against the adverse effects of (enemy) EW;[315]
- Electronic countermeasures (ECM) are designed to deny another actor effective use of (parts of) the electromagnetic spectrum.

313 The capstone NATO doctrine for EW is set out in AJP-3.6, Allied Joint Doctrine for Electronic Warfare. The maritime application of EW is described further in ATP-1 Volume 1 and in ATP-31 (both classified).
314 See Chapter 6 paragraph 6.8.1.2 (Data collection for picture compilation).
315 See Chapter 7, paragraph 7.9.9 (Defence against electronic warfare).

Electronic countermeasures form the offensive element of EW. They use electromagnetic energy as a weapon with which both physical and cognitive effects can be created. Physical effects occur, for example, in electronic neutralisation, in which the use of directed energy results in damage to electronic equipment. Cognitive effects are created by jamming or deception of electronic equipment. **Jamming** is used to render radar, radios, navigational equipment and IEDs temporarily unusable. Deception is achieved by, for example, generating false radar echoes or by **spoofing** (transmitting false information over voice radio).

ECM equipment can usually be found on board larger naval ships (such as destroyers and frigates) and on board special EW aircraft. In the Dutch and Belgian navies, the large units (frigates, LPDs and the JSS) have equipment for passive ECM (deception by means of decoys and chaff). The Dutch LC frigates also have equipment for active ECM (jammers).

9.4.2 *Acoustic warfare*

Military use of the acoustic spectrum is known as **acoustic warfare**.[316] which, just as EW and cyber warfare, has three sub-areas:

- for picture compilation and intelligence (acoustic warfare support measures, AWSM),[317]
- for protection (acoustic protective measures, APM)[318] and
- as a weapon (acoustic countermeasures, ACM).

Unlike EW, which only occurs in the air and in space, acoustic warfare can also occur under water.

Acoustic countermeasures (ACM) form the offensive element of AW. ACM are designed to deny other actors effective use of (parts of) the acoustic spectrum, and they too can be used to create both physical and cognitive effects. The physical effect of sound involves overloading or causing damage to the human ear, both in the air and under water (for example, anti-sabotage charges against divers). The cognitive effect of sound as a subsurface weapon is created by jamming or deception of sonar equipment. This is done mainly by generating false echoes, for example with the aid of torpedo decoys or by means of bubble targets. The cognitive effect of the use of sound in the air is achieved mainly by creating fear and confusion, for instance by flying a fighter aircraft low, fast and with a great deal of noise over a particular object in a show of force.

316 The maritime application of acoustic warfare is described further in ATP-1 Volume 1 and in ATP-28 (both classified).
317 Such as the use of passive sonar; see Chapter 6 paragraph 6.8.1.2 (Data collection for picture compilation).
318 Such as management of acoustic signatures; see Chapter 7 paragraph 7.8.3.2 (OPSEC), under Signature management.

10. MARITIME MANOEUVRE

10.1 Introduction

Maritime operations are defined as the pursuit of objectives in the maritime domain through the use of military power. The joint function 'manoeuvre' forms the core of this effort. **Manoeuvre** is the creation and exploitation of the ways and will to use means as efficiently and effectively as possible for the realisation of the objectives. The other joint functions serve as enablers for manoeuvre; without C2, intelligence, sustainability, force protection and striking power, manoeuvre would be difficult.

Manoeuvre is more than the movement of combat power (ships, tanks, aircraft, troops) in the physical domains. It also encompasses the use of striking power in the information domain (both physically and cognitively) in order to influence other actors' perceptions. Manoeuvre means that a commander needs to be able to keep several plates spinning at the same time.

The realisation of the objectives by means of (maritime) manoeuvre is not something that occurs in isolation. First of all, maritime manoeuvres must be in keeping with the joint and multinational military manoeuvre of the campaign or the operation. Furthermore, the totality of military manoeuvres must fit within the comprehensive approach: the coordinated use of instruments of power.[319]

319 See Chapter 3, paragraph 3.2.2 (Instruments of power).

This chapter discusses the use of manoeuvre in maritime operations. It starts by explaining the principles of military manoeuvre and their application in maritime manoeuvre. It will then examine the extent to which the characteristics of maritime operations set out in Chapter 3 – mobility, access, influence, sustained reach and versatility – affect manoeuvre in those operations. The chapter will continue with an explanation of maritime manoeuvre at the different levels of operation and examine the ways in which the various activities are coordinated at the maritime manoeuvre levels. After a brief rundown of the restrictions that could affect freedom of action, the rules of engagement (ROE) will be discussed.

10.2 Principles of manoeuvre

The successful fulfilment of the joint function of manoeuvre depends on circumstances such as the opponent, the mission and the environment. Nonetheless, there are a number of fixed principles upon which the manoeuvre function is based. These are:
- the direct and indirect approach;
- the manoeuvrist approach;
- freedom of movement;
- force protection.

10.2.1 Direct and indirect approach
Military capabilities can be used in two different ways to influence other actors. The first is the **direct approach**, in which friendly capabilities are directed against the other actor's centre of gravity. The advantage of this approach is the good chance of quick success. The disadvantage is the high risk, as the direct approach usually means that a war of attrition needs to

be waged against the other actor's strengths. The direct approach is thus only useful if friendly forces are clearly superior to those of the opponent and at the same time the risks are limited. The second way of using military capabilities is in the **indirect approach**, in which attempts are made to avoid the adversary's strengths and to focus friendly capabilities on influencing critical vulnerabilities. The advantage of the indirect approach is that the desired result can be achieved with minimum effort. The disadvantage is that these results take longer to achieve in some cases, as the ultimate result is not a direct effect of the selected approach, but an indirect effect (second or higher order effect).

In some cases, it may not be possible to change an opponent's perception to such an extent that it breaks his will to act. Particularly in the case of ideologically motivated actors, such as religious or ethnic groups, a different method will be needed to create the desired effect. This can be done via the indirect approach by denying external support to the adversary and striving to gain maximum (local) support for the operation. An opponent is after all dependent on other actors for his sustainability or his force protection; alienating him from those actors will remove his means and/or ways of operating. This form of indirect approach is therefore used in many counterinsurgency operations and in operations against crime and terrorism.

The use of manoeuvre does not automatically mean a choice for the indirect approach. Manoeuvre means a choice for a direct or an indirect approach or a combination of the two, depending on the objectives, the strengths and weaknesses of the other actors and the risks. It also most certainly means that it will be possible to change the approach at a later stage.

Asymmetry

In today's warfighting, asymmetry usually has negative connotations. This is because the term is predominantly associated with irregular -or asymmetric- threats. Asymmetry thus indicates that regular forces are vulnerable to this type of threat and have difficulty finding an appropriate response.[320]

Since the biblical struggle of David against Goliath, however, asymmetry has been seen as an accepted and often profitable (military) method. Asymmetry is based on the avoidance of enemy strengths and the exploitation of enemy weaknesses, thus allowing maximum effect to be created with the minimum of effort. The right use of asymmetry will enable a weaker party to succeed against a (much) stronger party. Many existing forms of (maritime) military striking power therefore make use of asymmetry. Examples are the submarine, the sea mine and the use of SOF. >

320 See box on irregular, hybrid and asymmetric threats in Chapter 7 at paragraph 7.9 (Maritime defence).

Asymmetric operations also have a disadvantage, albeit in the long term. As soon as an asymmetric method has proved its worth, countermeasures will have been developed, as in, for example, the case of submarines and airpower. When they were introduced, they represented a formidable threat against which there was initially no defence. They have now been in existence for so long that means and ways have been developed to counter these threats.

There are two ways in which an unfavourable asymmetric situation can be turned around. The first is to apply superior symmetry, by adopting the methods of the other party but with better execution. Examples of this would be the employment of submarine against submarine and the use of small, fast (assault) boats against pirates and smugglers. The second way is to create a favourable asymmetry by exploiting the weaknesses of an opponent. The use of aircraft and helicopters against submarines is a good example of this method.

10.2.2 *Manoeuvrist approach*

The basic principle of the **manoeuvrist approach** is to break the enemy's will and his willingness to continue to fight by shaping his perception of reality and by destroying the cohesion in his actions. The emphasis in this approach lies on the mental component, not on physical destruction. Important features of this approach are initiative, tempo, mobility and momentum which in combination will result in surprise, disruption and shock on the part of the opponent.

The manoeuvrist approach is predominantly based on breaking the enemy's C2 cycle. The situation must unfold so quickly or so unexpectedly that the enemy is unable to produce an adequate response in time. In the original form of the manoeuvrist approach, on the battlefields and in sea battles, this confusing situation was created by rapid movements, physical mobility and camouflage. Nowadays, the use of tempo, mobility and deception in the information domain also belong under the manoeuvrist approach. Examples here are the use of the media and of cyber and electronic warfare to influence the enemy's perceptions.

The ability to use initiative, tempo and mobility effectively, however, requires good coordination and synchronisation of all activities. Moreover, friendly C2 must allow for flexibility and initiative. The widest possible use of mission command[321] supports the manoeuvrist approach.

10.2.3 *Freedom of movement*

Freedom of movement is essential for the ability to influence the situation. It provides room for flexibility and makes it possible to take the initiative and make use of surprise. Freedom of movement is necessary in all domains, not only in the physical space at sea, on land, in the air and in outer space; there must also be sufficient freedom of action in the information domain and in the electromagnetic and acoustic spectra.

321 See Chapter 5, paragraph 5.4 (Methods of command and control).

Unlimited freedom of movement in all domains is virtually unattainable and freedom of action is usually restricted. On the one hand, opponents will obviously try to limit that freedom of movement as much as possible; on the other, political considerations (mandates, ROE), legal stipulations (international humanitarian law (IHL), criminal law, human rights) and ethical principles may present restrictions for friendly operations (see paragraph 10.6). The aim is thus always to gain the freedom of movement necessary to ensure that as many options as possible remain open, without jeopardising the execution of the mission. In many cases, therefore, obtaining and preserving the required freedom of movement in the different domains, such as sea control, control of the air and information superiority, are important decisive conditions.

Sea control and sea denial

The extent to which maritime forces are able to execute their mission is largely determined by the degree of freedom they have to use the maritime domain. This is referred to as control of the sea and is not, despite the name, confined to the sea surface, but also includes the situation under water and in the air. There are three forms of control of the sea.

- **Command of the sea** is absolute control of the sea, whereby friendly forces can make unrestricted use of the sea while opponents are completely unable to do so. This form of control of the sea is comparable to the way in which land forces can keep possession of land. It is also similar to absolute control of the air - air supremacy - which is also a necessary condition for command of the sea. Command of the sea is in effect only possible if all maritime means of an adversary have been neutralised. Given that the advent of the aeroplane, the submarine and the sea mine has made this virtually impossible, this level of control of the sea no longer occurs in practice.

- **Sea control** is control of the sea that is defined in time and location. There is said to be sea control if friendly forces can use a specific section of the sea for a certain period for their own purposes and can restrict or deny that use by an opponent. Depending on the desired level of sea control, a certain degree of control of the air is always required. Sea control is always a balance between desired freedom of action and acceptable risk. As the risks increase – for example in the littoral area or in the event of an irregular or terrorist threat – the desired level of sea control will be more difficult to attain.

- **Sea denial** is the complete or partial denial of the use of an area of the sea to an opponent when friendly forces are not able or do not wish to gain sea control of that area. Sea denial is relatively easy to effect with the use of sea mines, submarines or (mobile) coastal batteries. >

Level of control of the sea				
Friendly forces			**Opponent**	
Command of the sea (absolute control)	Sea control (defined by time and location)	Sea denial (ability to deny the control to the opponent)	Sea control (defined by time and location)	Command of the sea (absolute control)

Levels of control of the sea

The three forms of control of the sea can be regarded as points on a scale where control by one party shifts to control by the other (see table). In practice, the aim in most forms of maritime operation will be to gain sea control, and the level of control will depend on the mission. Sea control is never a goal in itself, but always a means of enabling effective maritime operations. Sea control, although limited in time and location, will provide the necessary freedom to achieve the force's objectives.

In other domains too, obtaining and maintaining a degree of superiority is often a prerequisite for the friendly operation. This is the case in all environments where full control or occupation is normally impossible: the sea, the air, outer space, the information domain (including cyberspace) and the electromagnetic and acoustic spectra. Control of the air and information superiority are examples of equivalents of sea control. Although it is possible to occupy and control land, situations could nonetheless arise on land in which effective operations depend on gaining a certain degree of control of the environment. This is the case, for example, in counterinsurgency operations.

10.2.4 Protection

As set out in Chapter 7, military power needs to be protected in two ways. Firstly, force protection is designed to protect friendly military power against all forms of threat to the force, in other words any threat to friendly military means or will. In addition, any threat to the mission – the ways or the public support – must be averted.

Manoeuvre is closely related to both forms of protection and thus plays an important role in force protection, particularly in security and defence. After all, prevention offers the best protection, and offensive manoeuvre – "attack is the best defence" – makes it possible to avert or evade threats to the force. Equally important, however, is the role of manoeuvre in countering threats to the mission, as manoeuvre serves to gain, maintain and increase (public) support, freedom of action and ways in which to exert influence. Both manoeuvre roles ensure adherence to the principle of protection.

Protection can also be a task, however. In that case, manoeuvre is also made up of security and defence tasks as described in Chapter 7, but then for the benefit of the object to be protected. In maritime operations, examples could be shipping, maritime infrastructure or the maritime flank of a land-based operation.

Protection, manoeuvre and striking power are thus closely associated with each other. Military striking power can be both a sword and a shield: the shield in a defensive action, the sword in an offensive action. Manoeuvre is always a combination of the two; on the one hand, the protection necessary to counter threats and, on the other, the risk that is undertaken when exploiting opportunities. Manoeuvre is thus a combination and weighing up of both forms of striking power - defensive and offensive - in order to achieve the (military) objectives.

10.3 Characteristics of maritime manoeuvre

Maritime manoeuvre is the creation and exploitation of ways and will to use the available maritime means as efficiently and effectively as possible for the realisation of the objectives. Maritime manoeuvre takes place in the maritime domain. The characteristics of the maritime domain and those of the maritime forces will determine the way in which the principles of manoeuvre can be applied in maritime operations. The following paragraphs describe the implications of the characteristics of maritime operations (mobility, access, influence, sustained reach and versatility)[322] for maritime manoeuvre.

10.3.1 The role of mobility and access in maritime manoeuvre

Freedom of navigation and overflight over two thirds of the earth's surface means that maritime forces have worldwide mobility; they have access to most areas and the freedom of movement to get there and stay there. This freedom of movement forms the basis for maritime manoeuvre, at all levels of operation. Mobility and access make it possible to deploy maritime forces wherever they will have the greatest effect.

Physical freedom of movement in the maritime domain is not guaranteed at all times and in all places, however. In cases where there is a capable opponent, the required freedom of movement will have to be fought for (sea control). The vastness of the sea and the constantly limited resources mean that in those cases, the desired degree of sea control can usually only be won and maintained in a limited part of the sea.

Physical freedom of movement at sea can also be limited by natural environmental features such as straits and shallows. These could restrict the possibilities for effective manoeuvre in littoral operations in particular, especially for the larger ships. The natural features of and human activity in littoral areas also restrict the freedom of movement in the electromagnetic and acoustic spectra. In principle, therefore, the defender of a coast or a strait has a more favourable position than the attacker, and this has two major implications for maritime manoeuvre:
- operating near an enemy coast requires more and often different means for the necessary situational awareness, protection and sea control;
- amphibious operations usually start from a relatively weak position (an uphill struggle).

322 See Chapter 3, paragraph 3.6 (Characteristics of maritime operations).

10.3.2 The role of influence in maritime manoeuvre

The ability to exert influence is an important element in maritime manoeuvre. The influence that maritime forces can exert on the various actors is largely derived from physical presence, supplemented by other information activities such as public affairs. The mobility and access offered by the maritime domain make it possible to exert influence, if necessary a long way from the home nation. The influence of maritime presence is useful at all levels of operation, both at sea and from the sea.

At strategic level, the presence of maritime forces is designed to support diplomatic efforts, mainly for the benefit of prevention, deterrence and compellence. At operational level, the main function of the influence of a maritime presence is to fix the opponent. Fixing at sea is effected through the presence of ships or by the potential presence of submarines or sea mines. Forces on land are fixed from the sea by the constant presence of an amphibious force or a carrier battle group or carrier strike group (a maritime task group around an aircraft carrier with embarked combat aircraft).

Fixing by means of maritime presence can also be effected ‘from land’; the presence of warships in safe harbours or at anchor sites will force a maritime adversary to take protective measures in case those ships suddenly put to sea. Ships that extend such influence by means of this latent threat are known as a **fleet in being**.

At tactical level, the influence of presence serves mainly to persuade an opponent to take certain actions or indeed to refrain from doing so. Positioning therefore always plays a role in the use of deception, for example in the form of decoy groups or by feigning the presence of ships, submarines or sea mines.

The influence extended by a maritime presence stems largely from the fact that military combat at sea is of high intensity, as combat power at sea is made up of ships, submarines and aircraft. The physical neutralisation of these units requires powerful weaponry: guided missiles, torpedoes and sea mines. The mere (suspected) presence of ships, submarines and aircraft equipped with heavy weapon systems, such as guided missiles and torpedoes, thus represents a threat to an opponent.

10.3.3 The role of the size of the domain in maritime manoeuvre

The world seas are vast. At the strategic level of maritime operations, the vastness of the maritime domain means that no single state or actor has sufficient assets to maintain a constant presence everywhere at sea. Choices must thus be made, interests and risks weighed up and priorities set. The same applies to the operational and tactical levels of maritime operations. Maritime operating areas can be enormous and the number of available assets is always limited. It is not only the sea surface in the area of operations that is vast; coastlines too can cover huge distances (thousands of kilometres). This is of particular importance for enforcing embargoes and tackling smuggling and piracy, for which entire coastlines need to be kept under surveillance and sealed off.

The often (extreme) vastness of the maritime area of operations has the following implications for maritime manoeuvre:

- **Choice between dispersal and concentration of means**. A huge area and a limited number of assets mean that a commander will always be faced with the choice of dispersing his units or concentrating them. Much will depend on the type and extent of the threat, the level of protection available and also, of course, the nature and purpose of the operation. Generally speaking, dispersal is only useful in a low-level threat, if there is sufficient protection against threats or in covert operations. Concentration will obviously be the preferred option in offensive actions (concentration of power), but it may also be favoured in the defence. While physical dispersal of forces could offer a degree of protection, it reduces the possibility of providing mutual support. That protective support (layered defence) is a specific advantage of concentration.

  Even if dispersal is chosen, the commander may still decide to concentrate his assets temporarily. This usually takes the form of a **focused operation**: a temporary operation by several units in a limited area to achieve a specific objective.

- **Choice between static and dynamic operation**. Static operations mean that units (ships, submarines, aircraft, troops) operate within a geographically fixed area or object, usually divided per unit into relatively small boxes or sectors. Dynamic or moving operations mean that (groups of) units can move more or less freely within the area of operations in order to perform their task.

  Static operations are based on a passive approach: one waits for the prey or the attack. In most cases, they are thus defensive in nature and are mainly used for protection. In static operations, the size of the area to be protected depends on the available assets. To exploit the advantage of the concentration of means, static operations usually only take place in areas of limited size. Examples are the defence of an amphibious objective area (AOA), a strait or a harbour. The protection of a (merchant) ship by a vessel protection detachment (VPD) is also a form of static operation.

  Dynamic operations are based on a more offensive approach: one takes the initiative and seeks out the opponent. Dynamic operations do not necessarily mean a choice for dispersal; they can also involve concentration by operating in (small) groups. Examples are the surface action groups (SAG) in ASUW and the search and attack units (SAU) in ASW.

  There are also forms in which the two are combined. The classic example is the convoy, which is in effect static protection around a moving object. Convoying (escorting) combines the advantages of static operations (protection, concentration of assets) with those of dynamic operations (offensive actions and initiative).

Choices in maritime manoeuvre: convoy or patrol?

Successful manoeuvre relies on making the right choices. In some cases, however, the best choice is not always clear, even with the benefit of hindsight. One example of such a choice is the way in which maritime forces have been protecting merchant shipping in the Gulf of Aden against Somali pirates.

Primarily -and correctly from a doctrine perspective- the principle of concentration was applied. In consultation with international merchant shipping and the International Maritime Organisation (IMO), a fixed route was established through the Gulf of Aden: the Internationally Recommended Transit Corridor (IRTC). Maximum concentration of shipping on this route meant that the available maritime forces could be deployed efficiently, as they no longer had to keep the entire breadth of the Gulf of Aden free from pirates, but could in principle confine themselves to the IRTC. Furthermore, naval ships were thus operating closer to the merchant vessels, which meant that they would be able to intervene faster in the event of an attack. These two advantages were deemed to outweigh the obvious disadvantage of concentration, namely that it was easier for the pirates to find their prey.

However, maritime forces from the various countries involved had different ideas about how to protect merchant shipping in the IRTC.

- Maritime forces from nations that were part of coalitions (EU, NATO and the Combined Maritime Forces, CMF) proceeded to patrol the IRTC. They did so by dividing the IRTC into boxes of 60 x 20 nautical miles and stationing a naval ship in each box. The ships and helicopters in these static patrol boxes were supported by regular flights by maritime patrol aircraft over the entire length of the IRTC.

- Maritime forces from nations which participated in a national capacity in the protection of merchant shipping (including China, Russia, Japan and South Korea) opted for dynamic protection, escorting individual ships in their transit along the IRTC. In some cases, these escorts were supported by maritime patrol aircraft.

Based on the practical experience of the maritime operations in the Gulf of Aden, it proved impossible to determine which of the two operating methods was the most effective. This was mainly because the two methods complemented each other, as they were being conducted in the same area, namely the IRTC. On the one hand, the presence of naval ships that were escorting the convoys had a positive effect on security in the patrol box concerned. The convoys in turn benefited from the extra security provided by the naval ships in these boxes. The comparison of the two methods was further complicated by the fact that a third form of protective operation was being conducted at the same time. Various shipping companies and countries (including the Netherlands) were also providing static protection of merchant vessels on an incidental basis by employing security teams.

10.3.4 The role of versatility in maritime manoeuvre

Maritime forces are characterised by their versatility: they are able to perform a wide diversity of tasks and can switch quickly between them. This versatility creates flexibility, providing a maritime commander with different employment options as well as the opportunity to adapt the employment to changing circumstances.

There are, however, limits to the versatility of certain maritime forces, particularly in combat operations. For instance, some types of ship are designed or equipped for particular tasks, such as amphibious operations, MCM or logistic support. Specialist ships such as these have few, if any, means for other tasks such as ASW or ASUW. Furthermore, some units do not have means for self-defence at the highest end of the force spectrum, such as air defence equipment, and these units will, if the case arises, need to be protected by others. The provision of this protection, fire support or air support for vulnerable units is also known as **cover**.

A maritime commander needs to have a clear understanding of the capabilities and limitations of his assigned units. He will know, therefore, not only what the various employment options are, but also when certain units are at risk and thus when other units or means are needed to reduce those risks.

10.4 Maritime manoeuvre and the levels of operation

10.4.1 Strategic maritime manoeuvre

Maritime manoeuvre at strategic level is the deployment of maritime military means to serve the interests and strategic objectives of a state or coalition. Strategic maritime manoeuvre thus centres on assembling and deploying groups of maritime units (ships, aircraft, marine corps units) to fulfil one or more of the seven strategic functions: anticipation, prevention, coercion, protection, intervention, stabilisation and normalisation.[323] The strategic level specifies the objectives, mandate, composition, deployment period and area of operations for the maritime part of the military means.

Strategic maritime manoeuvre is not the same as maritime military strategy or naval strategy. Maritime military strategy is the specification of ambition, size and capacity of the (national) maritime force.[324] Strategic maritime manoeuvre is the specification of where, when and for what purpose (parts of) that maritime force should be deployed when necessary.

Maritime units are scarce resources. Strategic maritime manoeuvre thus revolves around making choices and setting priorities, examples of which are:

- whether or not to forward deploy maritime units or troops (pre-positioning), such as the Dutch maritime presence in the Caribbean;

323 See Chapter 3, paragraph 3.3 (Strategic functions).
324 See Chapter 3, paragraph 3.2.5 (Defence policy and military strategy).

- whether or not to assign naval ships to participate in the permanent naval task groups of a multinational alliance, such as the Standing NATO Maritime Group (SNMG) and the Standing NATO Mine Countermeasures Group (SNMCMG);

- whether or not to participate with maritime units in a (multi)national military operation, and whether or not to change the form, duration or mandate of that participation.

10.4.2 Maritime manoeuvre at operational level

The operational level of military operations concerns the planning, direction and execution of campaigns: the entirety of operations conducted within a certain time or in a particular area to assist in the realisation of the strategic objective(s). Campaigns each have a campaign theme, and within that theme, the various operations and activities will usually take place in a certain framework indicating which function or effect is predominant in a particular phase of the campaign.

Maritime manoeuvre at operational level concerns determining the nature of the maritime contribution to the military campaign. This means that the maritime contribution should be in keeping with the applicable campaign theme and contribute to the functions and effects of the framework and/or the phase of the campaign.

Campaign themes and types of operation

The strategic choice of form and mandate for the military campaign means that the military action has a particular campaign theme:

- **Combat**: combat operations against a military opponent or other actor using (large-scale) force.
- **Security**: security operations and law enforcement, such as counter-insurgency, counter-piracy and counter-illicit-trafficking.
- **Peace support**: peace support operations such as the separation of belligerents and monitoring observance of ceasefires.
- **Peacetime military engagement**: military operations in support of diplomacy or local civil authorities.

Campaign themes indicate the nature of the campaign and the operation. The prevailing campaign theme also gives military personnel the mindset in respect of the character and intensity of the military operation, thus endorsing the selection and maintenance of the aim of the operation. The fact that a campaign is conducted under the flag of one of the four themes does not mean, however, that activities more associated with another theme cannot be conducted. A campaign theme merely indicates which form of operating is **predominant**.

The campaign theme also determines the form of maritime operations within the campaign. There is a direct correlation in maritime operations between the campaign theme and the type of activity and means associated with it. Maritime operations can thus be divided relatively clearly into:

- maritime combat operations
- maritime security operations
- maritime assistance

These three types of maritime operation will be discussed in detail in Chapters 11 to 13. There is no separate group of maritime operations for peace support; relevant maritime peace support activities are included in the most appropriate of the three specified groups. Enforcement of a maritime blockade is thus a combat operation, maintaining an embargo is classed as a security operation and maritime capacity building (SSD/SSR) of local coastguard and navy falls under the heading of maritime assistance.

Frameworks and phasing

Campaigns can vary enormously in terms of scale, ranging from major campaigns that cover entire theatres to small-scale campaigns for a smaller task in a small area. A campaign is made up of a coordinated series of operations conducted simultaneously or successively. The operational level must provide the operational design (the planning) and also supervise and if necessary adjust the implementation, in other words the operational management.[325]

A campaign's operation plan usually consists of several **lines of operation**, which in turn comprise a number of **decisive conditions** that must be met in order to achieve the objectives. The execution of the operation plan -the operations and activities within the various lines of operation- is usually divided into phases. As soon as certain decisive conditions have been met, the way is clear to start on the next phase.

Each phase usually has its own focus or main effort, although many campaigns and operations have the same pattern of phases. This pattern of changing focus per phase is called an operational level framework. There are various forms of such frameworks, such as:

- **find, fix and strike**: a functional framework that is often used in combat operations;
- **shape, decide and sustain**: a framework of the main effects that need to be created successively at operational level. This effects framework is often used in expeditionary operations and interventions;
- **clear, hold, build**: a refinement of the effects framework that is mainly used in the phases of a counterinsurgency or law enforcement operation.

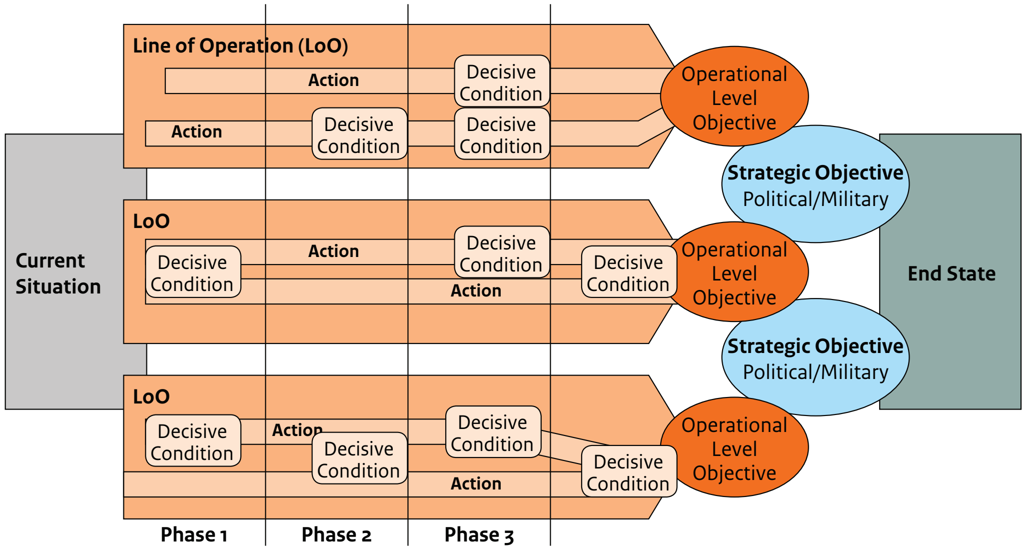


Diagram of an operation plan with lines of operation and decisive conditions

325 For details of planning at operational level, see AJP-5 Allied Joint Doctrine for Operational-Level Planning.

These frameworks can be translated into the maritime contribution to a campaign. In an intervention involving an amphibious operation, the following maritime activities could, for example, belong to the effects framework phases:

- **Shape**: gaining the required degree of sea control and control of the air in the area of operations, particularly in the amphibious objective area (AOA). Examples of additional activities are mine clearance in the AOA, conducting deception operations and intelligence gathering. Maritime activities in this phase are called precursor or advance force operations.
- **Decide**: conducting the amphibious operation itself or occupying or capturing the target positions on land. At the same time, sea control and control of the air should be maintained or extended.
- **Sustain**: sea-based support for the ongoing operation on land, including logistic and fire support.

Another example is a counter-piracy operation according to the counterinsurgency framework:

- **Clear**: rigorous ousting of pirates from the area of operations by means of offensive action and – if not already the case – obtaining the desired degree of freedom of movement to do so (sea control, control of the air, information superiority).
- **Hold**: further undermining operational capabilities of and support for piracy, while further improving and extending the protection of merchant shipping.
- **Build**: assisting with the reconstruction and effective employment of local security services (police, coastguard, navy) so that they can ultimately take on counter-piracy efforts themselves.

Choices in maritime manoeuvre at operational level

The use of maritime manoeuvre at operational level also revolves around choices. Examples of maritime choices within a campaign or operation are:

- The use of an amphibious task group as an afloat threat to fix opposing land forces or employment of this group for an actual landing.
- The choice for (continued) operation from a sea base[326] or for moving the required support (combat support and/or combat service support) to land. This choice will depend mainly on the required flexibility and on the threat level, both at sea and on land.
- The choice for an offensive approach (hunting an opponent) or for a defensive approach (escorting, convoying).

10.4.3 Tactical maritime manoeuvre

Tactical maritime manoeuvre is the effective employment of striking power of the units within the maritime and amphibious task groups of the operation's maritime component. It is about the allocation of tasks and the employment of forces, which must be in keeping with the relevant campaign theme, with the phase of the operation and with the applicable parameters (such as the ROE).

Tactical manoeuvre is by definition dependent on local circumstances. Much thus depends on choices that are based on a smart response to the local threat and local situation. Tactical manoeuvre is usually a balance between the level of protection, the ability to obtain maximum situational awareness and the exploitation of opportunities to achieve the objectives.

326 See Chapter 8, paragraph 8.3.2.3 (Sea-based logistic support for land operations).

In most cases, it is also about choosing between dispersal and concentration, between static and dynamic operations, between overt or covert operations and between time and security. Examples are:

- choosing whether to avoid, deceive or indeed to engage a threat (such as a conventional submarine);
- choosing a particular landing zone (beach, helicopter landing zone);
- choosing whether to wait for an opponent at a strait or go after him in open water;
- choosing whether to assign more or fewer units to protect specialist or amphibious units;
- choosing offensive action (dispatching a surface action group (SAG) or a search and attack unit (SAU)) or defensive action (defending from within the group or from the geographically fixed boxes);
- choosing the time for a focused or special operation, for example depending on available intelligence or on meteorological or climatological conditions (new moon, spring tide, monsoon).

10.5 Coordination

Manoeuvre is the creation and exploitation of ways and will to use the available maritime means as efficiently and effectively as possible for the realisation of the objectives. Successful manoeuvre rarely consists of a single action, however. Success usually stems from a combination of means and actions at the right time and in the right place. Furthermore, success is always related to the other levels of operation.

Tactical successes must be in keeping with the objectives of the operational and strategic levels. Military victories must also be in keeping with the comprehensive approach. Successful manoeuvre thus requires coordination, both of joint and multinational military activities and between military activities and activities by other instruments of power and by other actors. At first sight, procedures for coordination and synchronisation would appear to be at odds with a number of principles of military operations, such as initiative, surprise, simplicity and flexibility. The purpose of coordination is, however, to ensure that seemingly appropriate activities will not have to be paid for later, in other words to ensure, for example, that there is no collateral damage or that a tactical victory does not lead to a strategic defeat. The coordination procedures themselves must obviously comply with the principles of military operations. The processes must be simple to perform, flexible and must allow room for initiative and the exploitation of surprise.

Manoeuvre is coordinated in different ways and at different levels. Chapter 5 (Command and control) looked at various forms of coordination, such as that of the employment of aircraft, submarines and (maritime) SOF. Chapter 9 showed that coordination of information activities takes place through StratCom (strategic level) and InfoOps (operational and tactical level). The following paragraphs will examine two overarching mechanisms necessary to steer manoeuvre in the right direction:

- the targeting process;
- synchronisation.

Targeting: two meanings

The word 'targeting' could lead to confusion, as it has two different meanings:

1. Selection and prioritisation of targets and target audiences and determining, executing and evaluating associated actions. This is a coordinated (staff) process that takes place mainly at operational and tactical level as part of C2.

2. The acquisition (or attempt to acquire) sufficient target data in order to employ a weapon effectively (fire control solution, target designation or target acquisition). This is part of the picture compilation process for offensive tactical maritime activities such as a surface action or a maritime strike.[327]

This publication makes a distinction between these two meanings:
- In the case of the first meaning (staff process): '**the targeting process**'.
- In the case of the second meaning (fire control solution): '**targeting**'.

Targeting in the sense of target designation also has a defensive counterpart, namely ensuring that the enemy does not get a fire control solution. This defensive activity is known as counter-targeting.[328]

327 See Chapter 11, paragraph 11.2.2 (ASUW) and paragraph 11.3.2 (Maritime strike operations).
328 See Chapter 7, paragraph 7.9.1 (Principles of maritime defence).

10.5.1 *The targeting process*

The targeting process is the selection and prioritisation of targets and target audiences and determining, executing and evaluating associated actions.[329] This process is made up of the following steps:

- **Target development:**
  - o determining which effects are needed to realise the objectives;
  - o determining which activities are needed to create these effects;
  - o selecting targets and target audiences for these activities, weighing up the pros and cons and setting priorities;

- **Engagement**: planning and implementing the required activities to create the desired effects;

- **Assessment**: using achieved results to adjust effects, actions, targets and priorities.

The targeting process is also part of C2. The C2 cycle is therefore reflected in the steps: analysis, planning, execution and assessment.[330]

The targeting process must ensure that all activities, physical as well as information activities, meet the following criteria:

- **Relevant and acceptable**. The activities and the desired effects must be politically acceptable, be compatible with the objectives of the operational and strategic levels and conform to the applicable ROE.

329 For details, see AJP-3.9 Allied Joint Doctrine for Joint Targeting.
330 See Chapter 5, paragraph 5.5 (C2 as a process).

- **Efficient**. Assets are scarce and expensive, certainly the heavy weapons that are used in maritime combat operations (torpedoes, guided missiles). Target accuracy and hit probability must, therefore, be as high as possible.

- **Effective**. The chosen method must create the desired effect with the lowest possible risk of inadvertent and undesirable (side) effects (such as collateral damage).

- **Legitimate**. Method, means and effect must all conform to legal requirements stipulated in, amongst others, international humanitarian law, the law of armed conflicts at sea, criminal law and criminal procedure.

The analysis and planning in the targeting process generate a number of products. The Joint Prioritised Target List (JPTL) is a coordinated list of approved targets, target audiences, effects and methods. In many cases, there is also a Restricted Target List (RTL) and a No-strike List (NSL). The RTL contains targets that meet the requirements, but which are for the moment prohibited, for whatever reason. The NSL contains prohibited targets or target audiences, for instance because they have international legal protection. However, the inclusion of a target on the RTL or NSL will never affect the right of self-defence in the event of an attack by or from one of these targets or target audiences.

Deliberate targeting process
The targets, target audiences, effects or methods on the different target lists are generated by the **deliberate targeting process**, in which as many potential targets, target audiences and effects as possible are identified before the operation or mission. This mainly concerns targets and target audiences about which the position and/or behaviour are known and for which the method and/or the time of action have already been incorporated into the planning. Action against these targets or target audiences thus occurs at a pre-planned point in time (scheduled targets) or if a pre-planned situation arises (on-call targets).

Dynamic targeting process
There are also, however, targets and target audiences which are expected to be present in the area of operations but for which there is insufficient target information to undertake action. These are called anticipated targets. In the maritime domain, this applies to, for example, most of the physical targets (ships, submarines, aircraft); these targets are mobile and the position and timing of action cannot usually be determined in advance. Furthermore, new targets or target audiences may arise during the operation, for example if they are new to the area of operations or if there has been a change in positions, behaviour or desired effects. These are the unanticipated targets. Action against these (un)anticipated targets is undertaken by means of the **dynamic targeting process**. As soon as the situation demands action or if sufficient target information is available, means are assigned and methods and priorities set.

Time sensitive targets
Time-sensitive targets (TSTs) represent a special category of target. They are targets and/or target audiences which either pose a significant threat or are of great importance to the operation but which offer few possibilities for action. A target is designated as a TST by the JFC, often on the basis of political and military strategic guidelines. The targeting process for TSTs is usually channelled through specially established (staff) elements. Time-sensitive targets may be identified in the deliberate targeting process, while the action to be taken is determined with the aid of the dynamic targeting process.

10.5.1.1 Joint targeting process
The 'target development' and 'assessment' steps occur mainly at operational level. The JFC thus specifies the contents of the various target lists, taking into account the input and recommendations of the component commanders. For each component, he will also compile a Prioritised Target List (PTL) derived from the JPTL. In addition, he will decide which targets to designate as time-sensitive targets and set out the necessary engagement criteria.

10.5.1.2 Maritime targeting process
At tactical level, the component commanders (such as the MCC) are tasked with the engagement: the planning and execution of activities designed to create the desired effects derived from the PTL. Within the maritime component, this means that the MCC and his CTFs and CTGs translate the PTL into the OPGENs, the various OPTASKs, FRAGOs and other instructions. For weapon employment, this usually takes the form of target/threat priorities, weapon release criteria, identification/classification criteria, salvo sizes and instructions for target reporting units (TRU).

For the various information activities, this translation takes shape through, for example, the specification of lines to take, themes to avoid, plans for deception and instructions for specific PsyOps, KLE and CIMIC.

The (maritime) PTL also influences the employment of ISR assets. Most of the physical maritime targets (ships, submarines, aircraft, troops) are mobile; they will first need to be localised and identified before any action can be undertaken. The priorities set by the PTL will largely determine which areas are to be searched and which objects sought. The PTL is thus a joint factor in determining the target areas of interest (TAI),[331] which in turn guide the employment of ISR assets and units.

The MCC may suggest targets, target audiences and/or effects for consideration in the joint targeting process for inclusion on the JPTL. This proposal of new or modified targets, effects and priorities is called a target nomination list (TNL).

10.5.2 Synchronisation
Successful manoeuvre usually stems from the right combination of means and actions at the right time and in the right place in order to thus create the right effects. Where the targeting process is mainly focused on the 'what' and the 'how' (the effects, methods and means), synchronisation is intended to optimise the 'when' and the 'where'.

331 See also Chapter 6, paragraph 6.7.4 (The intelligence process).

Synchronisation in time and place is directly related to the principles of concentration, economy of effort and unity of effort. Synchronisation ensures that activities are performed in the right order, and it helps to prevent duplication and interference. Lastly, synchronisation makes it possible to create synergy between activities.

A special area of attention is the synchronisation of activities in the physical domains (sea, land and air) with those in the information domain. This is particularly important to ensure that the physical activities do not send out a signal that differs from that of the information activities.

Synchronisation forms an integral part of the C2 process, particularly during the planning and execution.[332] The correct tool for making the time- and location-related synchronisation visible for the commander and his staff is the synchronisation matrix.[333] in which the activities by the various units over time are set against place and operation or plan lines. This makes it relatively easy to identify any conflicting or mutually reinforcing actions.

Synchronisation is important at all levels of operation. At the maritime tactical level, it is particularly important for amphibious operations, in which a large number of interdependent activities are rolled out in a relatively small area in a short space of time, often from a relatively weak position.

332 See Chapter 5, paragraph 5.5 (C2 as a process).
333 For an example of a synchronisation matrix, see the Dutch *Handboek Maritiem Operationeel Planningsproces* (MOPP).

10.6 Restrictions and Rules of Engagement

A commander never has full freedom of action. His freedom of movement and action is always limited by various factors. Firstly, natural phenomena may produce restrictions through the state of the sea, the weather and the terrain, for example because of water depth, sea state, storms, and so on.[334] The actions of opponents and other actors may also restrict the freedom of movement, if, for example, they represent a threat or cause any other type of interference. A force's actions may also be limited, however, by its own government or organisation because of:

- political and diplomatic considerations and parameters, such as a mandate;
- legal stipulations, for example maritime law, IHL, criminal law or human rights;
- ethical principles;
- operational considerations, for example for safety reasons or to prevent mutual interference.

There are various methods for creating clarity for a commander in relation to the powers and restrictions that apply to his actions. The most important of these are the rules of engagement (ROE), which are examined in more detail in the following paragraphs.

334 See Chapter 1 (Natural features of the maritime domain).

The other methods usually relate to operational considerations and are in some cases a further refinement of the ROE. Examples of these are:

- measures to prevent interference,[335] such as airspace control measures, waterspace management and the joint restricted frequency list;
- restrictions resulting from the targeting process, such as the RTL and the NSL (see paragraph 10.5.1).

10.6.1 Rules of Engagement

Rules of Engagement (ROE) are the official parameters within which a commander performs his activities. ROE specify the limitations and freedoms that apply to a commander and his subordinates in the performance of their assigned tasks. They define specific circumstances, conditions and methods. They are always worded in terms of a restriction ("action X is prohibited") or as a freedom ("action Y is authorised", "the use of Z is unrestricted").

ROE do not only relate to the use of force, but to every action that could potentially be seen as provocation. They may therefore contain stipulations regarding entry of certain areas, maximum distance to which certain objects may be approached and the use of certain means or methods (such as fire control radar, search lights or boarding parties).

335 See Chapter 7, paragraph 7.7 (Prevention of mutual interference).

ROE are not a means of assigning specific tasks; they merely indicate the restrictions and freedoms that must be observed by military personnel. They were after all designed to ensure that political leaders would be able to control the use of the military instrument of power. ROE represent an addition to the inherent right of self-defence and they may never restrict the exercising of that right.[336]

ROE are determined by the political strategic level and issued by the military strategic level. This is usually done on a national basis, but in allied operations (e.g., led by NATO or the EU), the preferred option is for common ROE. In this case, individual nations may add national **caveats** (conditions or restrictions) to the common ROE. A commander of a multinational operation or task group must be well aware of caveats or of differences in national ROE to avoid issuing orders that are at odds with the ROE of the unit in question. A multinational operation will, therefore, normally involve the designation of a national **red card holder**, who is authorised to prohibit or to stop an operational action by a friendly participant in a multinational operation ("show the red card"). The national contingent commander (CONTCO), the senior national representative (SNR) or the commanding officer of the national unit itself will usually serve as the red card holder.

The Netherlands and Belgium use NATO's Compendium of ROE[337] as a basis for the formulation of (national) ROE.

336 See also Chapter 7 paragraph 7.10 (Use of force in security and defence).
337 MC 362/1 NATO Rules of Engagement

Although the ROE themselves provide a commander with a clear set of restrictions and freedoms, some uncertainty could arise in their application. To avoid any misunderstanding, a commander should therefore have an understanding of the political background to the ROE. This is ensured by the inclusion of a political policy indicator (PPI) and a political policy statement (PPS):

- The **political policy indicator** is a one-letter code (X, Y or Z) which indicates whether political leaders:
  - o wish to limit the involvement in an operation (X = de-escalation),
  - o wish to maintain the current situation (Y = maintain status quo), or
  - o accept the risk of escalation (Z = risk of escalation is acceptable).

- The **political policy statement** is a brief summary of the policy objectives, allowing the commander to place the ROE in the context of the mission.

ROE are often implemented in stages, which means that commanders at strategic, operational and tactical levels can further limit the ROE for their subordinate commanders. They can never expand the ROE on their own initiative, however. A unit commander may thus not always have at his own level all the ROE that apply to that operation. Authorisation for the use of particular ROE may, for example, be at a higher level. If a commander does not himself have particular ROE but expects a need for them, he must request those ROE from the higher level. If necessary, that commander will then request the necessary ROE from his higher level.

ROE are authorised, implemented, cancelled and requested via a structured procedure, by means of the following messages:
- ROE Request (ROEREQ);
- ROE Authorisation/Denial (ROEAUTH);
- ROE Implementation/Cancellation (ROEIMPL).

ROE apply to all military activities within an operation, but could be implemented differently for each phase. This ensures that the ROE are properly in keeping with the campaign theme and the phases of the operational framework (see paragraph 10.4.2).

ROE, force instruction card and applicable law
ROE apply to the level at which they have been implemented by means of an ROEIMPL. If ROE are applied down to individual level, individual military personnel must have a sufficiently clear understanding of the ROE that apply to them and of the correlation with the right of self-defence. This is ensured by the issue of an ROE instruction card on the use of force, which gives a translation of the ROE for the level of individual service personnel. An aide-memoire will also be issued if necessary, containing the ROE applicable at the level of subordinate commanders.

ROE and instruction cards must at all times remain within the parameters of applicable law, such as international humanitarian law, the law of armed conflicts at sea and criminal law. In the formulation and implementation of ROE and instruction cards, therefore, account must be taken of these legal requirements. This does not mean, however, that every action performed in accordance with the ROE automatically complies with the principles for the use of force. Every commanding officer and each individual serviceman must constantly consider whether the use of force, even if it is permitted by the ROE, meets the criteria of military necessity, proportionality, discrimination and the prevention of unnecessary suffering. To put it in legal terms:

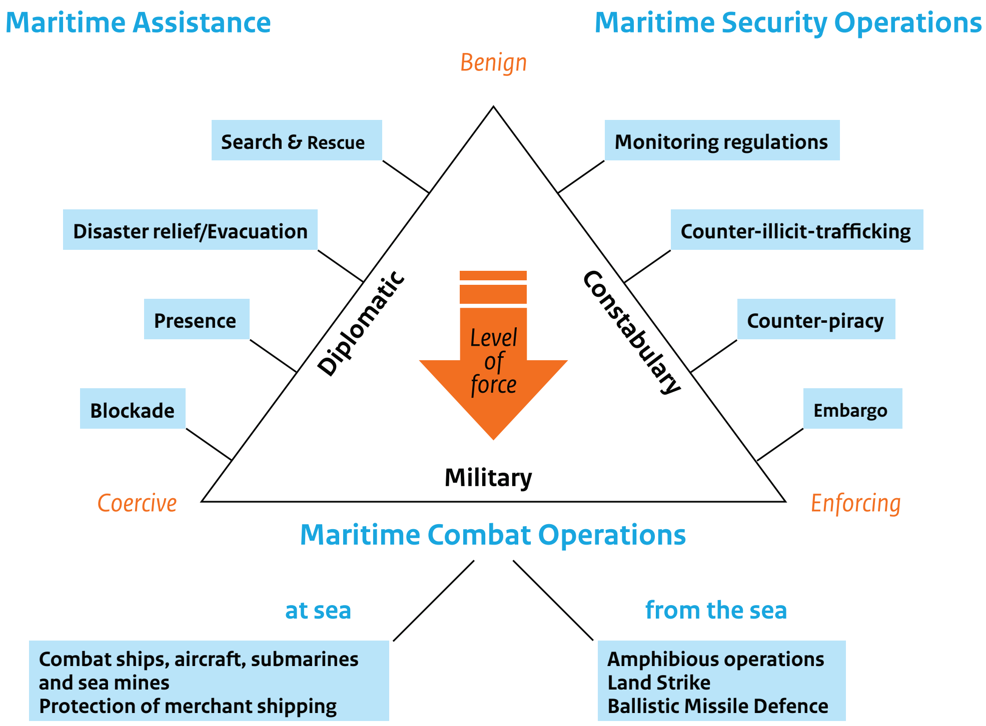
- ROE may never serve as an independent ground for exculpation;
- If the use of force complies with the criteria, ROE could, on the other hand, constitute grounds for exemption from criminal liability.[338]

Specific maritime ROE

ROE apply not only to specific, time- and place-defined military operations. There are also ROE that apply even if there is no specific military deployment. This applies particularly to maritime forces who, thanks to the freedom of navigation, may find themselves outside their own national territory without being involved in military deployment in an operation or mission. This would be the case, for example, during transits and exercises in international waters. In these cases, Dutch and Belgian maritime forces are subject to the ABNL ROE, which have been implemented by both the Dutch and Belgian Chiefs of Defence.

338 For the Netherlands: article 38, second paragraph, of the Military Penal Code. For Belgium: article 70 of the Criminal Code.

PART 3 TYPES OF MARITIME OPERATIONS



11. MARITIME COMBAT OPERATIONS

11.1 Introduction

Combat operations are the essence of the military organisation: the threat and use of force, on a large scale if necessary, to safeguard interests and realise objectives. Combat operations consist of defensive and offensive activities at tactical level directed against a military opponent or other actor using (large-scale) force. Characteristic of combat operations is the employment of heavy weapon systems (guided missiles, torpedoes, guns, bombs and mines) and of the combat power of troops.

Maritime combat operations take two different forms:
- **At sea**, friendly naval and air forces engage with and defend themselves and others against hostile naval and air forces.
- **From the sea**, maritime forces deliver striking power to create effects on and above land to support the battle at sea, in the air or on land.

Both forms are inextricably linked. In virtually all cases, combat operations at sea are needed to be able to conduct combat operations from the sea, as maritime striking power can only be delivered from the sea if that power is sufficiently protected at sea and has sufficient freedom of movement there. Examples would be protecting an amphibious task group and gaining and maintaining sea control in and around the AOA. Combat operations at sea often go hand in hand with combat operations from the sea. One example of this is the neutralisation of a coastal battery that is standing in the way of the necessary freedom of movement at sea.

This chapter sets out the various forms of maritime combat operation. It will first examine the combat operations at sea, in the form of the various warfares: antisubmarine warfare (ASW), antisurface warfare (ASUW), anti-air warfare (AAW) and naval mine warfare (NMW). The various forms of combat operation from the sea will then be discussed: amphibious operations, maritime strike operations, maritime special operations and riverine operations. The chapter will close with a paragraph about applying the methodology of these combat operations to other forms of maritime operation.

11.2 Maritime combat operations at sea

In maritime combat operations at sea, friendly naval and air forces engage with and defend themselves and others against hostile naval and air forces. The aim of combat operations at sea is to destroy, neutralise of render unusable or useless the enemy's warfighting assets under water, on the surface or over the sea. This is effected by means of physical striking power (such as armed force) and by information activities (such as deception and EW).

Maritime combat at sea is played out simultaneously in three different parts of the maritime domain: in, on and over the water. Because of the specific circumstances, characteristics and means in each of these areas, these combat operations are divided into the following maritime warfares:
- antisubmarine warfare (ASW)
- antisurface warfare (ASUW)
- anti-air warfare (AAW)
- naval mine warfare (NMW)

All four warfares are supported by electronic and acoustic warfare,[339] for the purpose of offensive and defensive activities as well as for the purpose of situational awareness (ISR, picture compilation).

There is a strong interdependence between the various warfares; they usually take place simultaneously, which means that results in one area could have direct implications for the others. Failure to take timely action against enemy surface ships (ASUW), for example, could mean that these ships are able to get close enough to employ their guided missiles, resulting in a critical problem for the air defence (AAW).

In the following paragraphs, the warfares are described in terms of purpose, means, offensive and defensive execution, details about picture compilation and other characteristic elements and methods. The defensive activities of the warfares will only be mentioned briefly here, as they are described in more detail in Chapter 7, paragraph 7.9 (Maritime defence).

339 See Chapter 9, paragraph 9.4 (Maritime striking power in the electromagnetic and acoustic spectra).

11.2.1 *Antisubmarine warfare*

Antisubmarine warfare (ASW)[340] is designed to deny the opponent effective use of his submarines and unmanned underwater vehicles (UUVs). This concerns the tactical level, so in other words, submarines and UUVs that are at sea. If enemy submarines and UUVs can be prevented from leaving port at strategic level, for example by neutralising them in the harbour by means of an air strike or by blocking the harbour with a minefield, there would be no further need for ASW at sea.

Submarines can be used to gather intelligence, to attack enemy ships, submarines or land-based targets and to serve as an operating base for maritime SOF. This use can be denied in three different ways (or in a combination thereof):

- **Evade**. Ships and submarines can evade an enemy submarine by keeping out of range of its sensors or weapons. For this, there must be some degree of certainty about the position of the enemy submarine. Furthermore, the ships must be capable of greater speed than the submarine (there needs to be a speed advantage). If this is not the case, the distance to the submarine must be sufficient to ensure that it does not have time to close the gap. Evasion can also be effected by operating in areas that are particularly unfavourable for submarines, such as shallow water.

340 For more details about antisubmarine warfare, see Dutch MDP *Onderzeebootbestrijding*, NATO ATP-1 Volume 1 Chapter 9 Anti-Submarine Warfare, and NATO ATP-28 Allied Anti-Submarine Warfare Manual (all classified).

- **Deter**. An enemy submarine can be prevented from executing its task by causing maximum frustration and confusion, exerting pressure and wearing it down. This is done by means of deception, through denial of information and by means of threats. A threat does not necessarily have to be accompanied by an attack. A submarine's strength lies mainly in the element of surprise: a submarine will do its utmost to remain undetected. If units are using sensors that make a submarine aware that it can be detected at long distance (such as radar and active sonar), this will have a deterrent effect.

- **Destroy**[341] by means of an attack with torpedoes and/or depth charges or by a sea mine.

Apart from sea mines, a submarine can only be threatened by torpedoes and depth charges. The range of these weapons is limited and is usually shorter than that of the weapons carried by a submarine (guided missiles and torpedoes). This means that the weapon carrier needs to be close to the submarine – within the stand-off distance - in order to employ its weapons, which makes surface ships vulnerable and thus less suitable for ASW. Friendly submarines, maritime patrol aircraft and maritime helicopters are most suitable for ASW, as friendly submarines have the advantage of being in the same medium and therefore have similar sensor and weapon ranges (symmetry). Airborne assets can exploit their favourable asymmetry in ASW, as most submarines have no anti-aircraft capability.

341 Unlike the situation with surface ships, there is no difference between neutralising and destroying when it comes to submarines. Inflicting such a level of damage that there is said to be 'mission kill' or 'disabling damage' means that a submarine has to have sustained structural damage. In the case of a submarine, this will normally lead to sinking and thus destruction.

Sonar is the main sensor in ASW, for detection and identification as well as for weapon employment, so use of the acoustic spectrum (acoustic warfare) also plays a major part in ASW. Other means are also vital for effective ASW, however. Radar is used to detect periscopes, snorkels and radio masts, for example, and ESM and ECM equipment is needed to intercept or jam radio and radar transmissions from submarines. ASW is thus also dependent on use of the electromagnetic spectrum (electronic warfare). A typical sensor that is only used in ASW is the magnetic anomaly detector (MAD).[342]

Offensive antisubmarine warfare

Offensive ASW involves preventing enemy submarines and UUVs from entering a particular area or driving submarines and UUVs out of such an area. The emphasis here is on deterrence and, if necessary, destruction. If offensive ASW is conducted in preparation for forthcoming maritime operations (shaping), these are said to be **precursor operations**. Offensive ASW can also be conducted by laying and maintaining barriers around an area or in a passage or strait, in what is known as a **barrier operation**.

342 See box 'Using the earth's magnetic field', Chapter 1, paragraph 1.2.3.2.

Defensive antisubmarine warfare

Defensive ASW involves the protection of friendly units against operations by enemy submarines and UUVs. This defence can take a static or a dynamic form. The static form will be required if a particular area needs to be protected, for example an AOA, a static sea base or an anchor site near a harbour. The emphasis here lies on deterrence and destruction. The dynamic form of defensive ASW is used if a group of ships (a task group or a convoy) needs protection under way (ASW escort). The most common form of this is a defensive screen of airborne assets, friendly submarines and ships. In an ASW escort, evading detected submarines is also an option, as well as repelling or destroying them.[343]

Close ASW action

As soon as an enemy submarine has been located and needs to be repelled or destroyed, this will be done by a few specially designated units. These units (usually aircraft, helicopters and ships) will combine to form a search and attack unit (SAU). The actions that they perform in the immediate vicinity of the submarine in order to repel or destroy it are known as **close ASW action**.

343 For more details, see Chapter 7, paragraph 7.9.2 (Defence against submarines and torpedoes).

11.2.2 *Antisurface warfare*

Antisurface warfare (ASUW)[344] is designed to deny the opponent effective use of his surface ships. This concerns the tactical level, thus enemy ships that are at sea; if enemy ships can be prevented from leaving port at strategic level, for example by neutralising them in the harbour by means of an air strike or by blocking the harbour with a minefield, there would be no further need for ASUW at sea. ASUW is not necessarily directed solely against enemy warships; other ships playing a part in enemy operations can also represent targets for ASUW. Examples of this are merchant ships that are executing a strategic transport or attempting to breach a blockade.

The diversity of surface ships is huge,[345] as is that of the tasks for which they can be employed, the ways in which they can defend themselves and other ships and the ways in which they can pose a threat. The methods that can be used to deny the adversary effective use of his surface ships thus depend on the nature, type and employment method of those ships.

344 For more details about antisurface warfare, see Dutch MDP *Oppervlakteoorlogvoering*, NATO ATP-1 Volume 1 Chapter 8 (ASUW), and NATO ATP-31 NATO Above Water Warfare Manual (all classified).
345 See Chapter 9, paragraph 9.2.1 (Ships).

An opponent can be denied effective use of his surface ships in three different ways (or in a combination thereof):

- **Evasion**. Enemy surface ships can be evaded by manoeuvring and/or implementing measures to avoid detection (by deception or counter-surveillance).

- **Deterrence**. Enemy surface ships can be prevented from performing their task by physically harassing them and by confronting them with a serious threat. What form that threat should take depends on the weaknesses and the defensive means of the enemy ships.

- **Neutralisation or destruction**. There are several methods for neutralising or destroying surface ships:
  - o Air strike or air attack by combat aircraft armed with missiles, bombs and/or guns;
  - o Attack with missiles launched from maritime patrol aircraft, helicopters, ships, submarines or coastal batteries;
  - o Attack with torpedoes launched from submarines, aircraft, ships or coastal batteries;
  - o Attack by gun systems from ships or coastal batteries;
  - o Attack by maritime SOF;
  - o Use of sea mines.

Surface action

There is no clear distinction in ASUW between offensive and defensive activities. The deterrence, neutralisation and/or destruction of enemy surface ships occur in offensive form (for the purpose of realising the objectives) or in defensive form (to defend friendly forces against a surface threat).[346] Apart from the employment of SOF or the use of sea mines, action against enemy surface ships is undertaken in the same way, namely by means of a **surface action**. This is conducted in accordance with a generic pattern of successive activities and decisions.

- **Picture compilation and target designation**. Picture compilation for ASUW is a continuous activity designed to generate the best possible situational awareness in relation to an opponent's surface ships (recognised surface picture, RSP). This picture is compiled by employing all available means for the detection, localisation, recognition and identification of surface ships. Radar and ESM are the main means, supplemented by optical, thermal and acoustic sensors. Because visual and radar detection between ships is limited to the horizon, observation from the air and from space is essential for ASUW. As soon as the positions and identity of an opponent's ships have been sufficiently well established, target designation will take place: specification of the method of attack and the necessary means.

346 For more details, see Chapter 7, paragraph 7.9.4 (Defence against surface ships).

- **Long-range engagement**. This is an attack on surface ships a long way from friendly units. An attack such as this is mounted against ships that may pose a threat even at long distance (thus for which a long stand-off distance applies), such as enemy aircraft carriers or warships armed with surface-to-surface missiles (SSM). A long-range engagement can be performed by:
  - combat aircraft;
  - submarines (torpedo attack);
  - guided missiles launched from ships, aircraft, helicopters, submarines or coastal batteries;

  Which combination of weapon carriers and weapons is the most suitable will depend on the defensive capacity of the target ship and that ship's counterattack capabilities. If a ship has good air defence and is equipped with aircraft or SSM, the preferred option will be a torpedo attack by submarine or an attack with guided missiles from aircraft or submarines. If the target ship has SSM but only (range-)limited air defence, preference will be for an attack by combat aircraft or by guided missiles (air-to-surface missiles, ASM) launched from helicopters. If friendly guided missiles have a longer range than those of the opponent (range advantage), an attack with friendly SSMs would also be a good option. All kinds of attack require the support of electronic and acoustic warfare for maximum disruption, deception and saturation of the enemy's defensive capacities.

  Characteristic of an attack with combat aircraft or SSM is (a need for) the use of a **target reporting unit** (TRU). This is a unit that observes enemy ships on its sensors (and thus usually needs to be close to those ships). The TRU's task is to transmit precise and current target data in order to maximise the accuracy and effectiveness of the attack. After the attack, the TRU provides data for damage assessment. The execution of a coordinated attack with the aid of a TRU is referred to as **third party targeting** (TPT). If a TRU transmits target data on targets outside sensor range of the firing units, this is said to be **over-the-horizon targeting** (OTHT). No TRU is required in a torpedo attack by a friendly submarine; the submarine will be close to the target and will in principle gather its own data for the attack and the subsequent assessment.

- **Short-range engagement**. This is an attack on surface ships within sensor and weapon range of friendly units. Such an attack is used against ships which can only pose a threat at close range, so for which a short stand-off distance applies. These in effect include all ships that do not have SSM, such as patrol, amphibious, support or merchant ships. A short-range engagement is conducted with guided missiles, torpedoes or gun systems, the choice being determined by the enemy's defensive capabilities.

  A short-range engagement may take the form of an independent surface action, but it could also be a (necessary) follow-up to a previously conducted long-range engagement.

A surface action is usually conducted by a specially assigned group of units, a surface action group (SAG). If the action is performed entirely by helicopters, this is said to be a helicopter action group (HAG).

Enemy surface ships will defend themselves against attack. For an attack to succeed, this defence will need to be disrupted, deceived or overwhelmed. This is done through the coordinated use of surprise, deception and concentration of means. Saturation is achieved by concentrating the attack in terms of time and place. This can be done by directing a limited number of heavy weapons at the target simultaneously, or by subjecting the enemy to an overwhelming number of small-scale attacks. An example of the latter is the swarm tactic, whereby a swarm of lightly armed small vessels attack at the same time.

11.2.3 Anti-Air Warfare

Anti-Air Warfare (AAW)[347] is the maritime element of counter-air operations.[348] **Counter-air** is that part of the joint air operation that is designed to gain and maintain the degree of control of the air necessary to create freedom of movement and contribute to force protection.

Counter-air consists of offensive and defensive activities:

- **Offensive counter-air** (OCA) entails all offensive activities designed to counter an enemy air threat. This includes, for example, attacks on aircraft on the ground and land-based launch installations, aerial combat and the suppression of enemy air defence.

- **Defensive counter-air** (DCA) or air defence (AD) is the defence of friendly units and interests against a physical threat from the air, including ballistic missile defence (BMD).

In the maritime domain, OCA activities are mainly conducted in the context of ASUW and ASW, as an air threat at sea – insofar as it does not originate on land – comes from ships and submarines. The prevention of an air threat coming from these weapon carriers thus requires offensive ASUW and ASW actions. The use of friendly combat air patrol (CAP) aircraft to engage enemy aircraft and guided missiles over the sea is the only aspect of OCA that forms part of maritime anti-air warfare.

347 For more details about anti-air warfare, see Dutch MDP *Luchtverdediging*, NATO ATP-1 Volume 1 Chapter 7 Anti-Air Warfare, and NATO ATP-31 Allied Above Water Warfare Manual (all classified).
348 For more details, see AJP-3.3 Allied Joint Doctrine for Air and Space Operations.

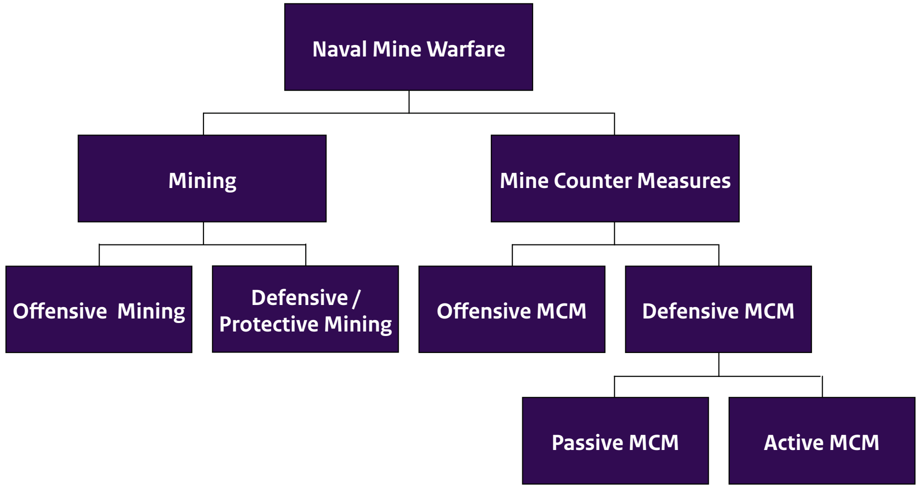
For the rest, AAW represents the maritime element of DCA, namely the defence of ships or an area against a physical threat from the air. This maritime air defence in principle forms an integral part of the air defence of the entire area of operations and of the joint force.[349] AAW can also contribute to the air defence of land-based units. It is thus the only one of the principal warfares (AAW, ASUW and ASW) that falls under combat operations at sea as well as those launched from the sea.

Anti-air warfare is conducted with combat aircraft and ships using weapon systems such as guided missiles (air-to-air and surface-to-air) and gun systems. Radar is the primary sensor for AAW: naval ships usually have several different radar systems (for warning, target designation and missile guidance) or sophisticated radar systems that can combine these functions. Some units are even designed to function as radar stations for AAW, such as the AEW aircraft and helicopters. Because of the emphasis on radar, EW also plays an important part in AAW. The detection and identification of radar signals with the aid of ESM equipment, for example, is vital for the compilation of the recognised air picture (RAP). At the same time, ECM devices such as jammers and decoys are used for disruption and deception of the enemy's radar picture.

349 For more details, see Chapter 7, paragraph 7.9.3 (Maritime air defence).

11.2.4 *Naval Mine Warfare*

Naval Mine Warfare[350] (NMW) involves both the use of sea mines by friendly forces (mining, mine laying) and protection against the use of sea mines by an adversary (mine countermeasures, MCM).



The different activities in naval mine warfare

11.2.4.1 *Mining*

The purpose of a sea mine is to destroy a passing ship or submarine. Mining -or the threat thereof- can be used to create the following effects:

- to prevent, deter or delay the passage of ships and submarines through an area;

350 For more details about naval mine warfare, see ATP-1 Volume 1 Chapter 13 Mine Warfare, and ATP-6 Volume 1 Naval Mine Warfare Principles (both classified).

- to force an opponent to perform what are often time-consuming and extensive activities to detect and clear any mines that have or might have been laid.

These effects are normally used in the pursuit of objectives at strategic level, for example to disrupt or block commercial traffic or to ensure that enemy maritime forces cannot pose a threat. The effects of laying sea mines, or of threatening to do so, can, however, also be used for objectives at operational or tactical level. Examples here would be sealing off a strait or defending an area of operations.

Sea mines can be employed in either a defensive or offensive role.

- A defensive (or protective) minefield will be located in or near national waters or in waters where the desired level of sea control has been achieved. A minefield such as this serves to protect friendly forces, ports or coastlines.

- An offensive minefield is laid in waters controlled by an adversary with the aim of reducing or obstructing shipping.

One disadvantage of most sea mines is that they cannot distinguish between friendly ships and those of other actors. For the sake of the protection of friendly forces, therefore, it is vital that they are made aware of the position and particulars of friendly minefields. This is done by notification via the Allied Worldwide Navigational Information System (AWNIS).[351]

351 See Chapter 7 paragraph 7.7.2 (Prevention of physical interference in the air, on water and on land).

11.2.4.2 Mine countermeasures

The purpose of mine countermeasures (MCM) is to gain and maintain physical freedom of movement for own and friendly ships and submarines by minimising the risk of damage or loss caused by enemy sea mines.

The best way to counter a mine threat is to prevent the opponent from laying them in the first place. This requires offensive actions such as rendering mine stocks unusable, attacking mine layers or laying minefields. Offensive MCM is thus conducted with other forms of combat operation, such as ASUW or maritime strike operations.

If mines have or are suspected to have been laid, protective activities will be required to counter the risk they pose. These protective measures are known as defensive MCM and consist of passive and active measures:

- **Passive MCM** consists of measures designed to evade the mine threat (for instance, by routing traffic around the mine threat area) and measures to prevent the detonation of sea mines (for example, by minimising ships' signatures and making use of high water levels.[352]

- **Active MCM** is the removal of (suspected) mine threats by detecting sea mines and disabling them by destruction or dismantling.

352 For more details, see Chapter 7, paragraph 7.9.6 (Defence against sea mines).

Active MCM is the work of specialist units such as MCM vessels and diving teams. Because these units are in short supply and their work is extremely time-intensive, active MCM is only conducted if it cannot be avoided. This is usually the case if the mine threat is real and there is no way of evading it. Examples would be a strait, the approach to a harbour or an amphibious objective area (AOA).

Active MCM

The use of MCM units in active MCM can take three forms:

- **Exploratory MCM** relates to investigative employment for the purpose of establishing the presence or absence of sea mines within an area where mines could have been laid (the mine threat area, MTA). This takes the form of reconnaissance of a route or a particular sector within the MTA.

- **Reconnaissance MCM** takes place if mines have actually been discovered. This type of employment is exploratory in nature and serves to establish the size of the mine danger area (MDA) and, if necessary, to specify a safe(r) alternative route.

- **Clearance MCM** relates to the clearance of a route or an area. Clearance is a high-risk and time-consuming process, and thus only takes place if the threat level is high (e.g. if mines have already been discovered) and passage is essential (e.g. in a strait or harbour approach) and there is no other way of reducing the risk (e.g. by taking a different route).

It is rarely possible to give a guarantee in any form of active MCM that a searched or cleared area is actually free of sea mines. The presence or absence of mines can never be established with absolute certainty; there will always be a residual risk to shipping. Active MCM is risk management; the aim is to reduce the residual risk to an acceptable level.

There are three different methods for active MCM, two of which are used by MCM units: hunting and sweeping. These two methods can be used in water depths of between 10 and 200 metres. The detection and clearance of sea mines, explosives and other obstacles in water less than 10 metres deep are performed by diving teams and UUVs. Given the limited water depth, this third method is called Very Shallow Water MCM (VSWMCM).

Minehunting and minesweeping

- Minehunting is performed by using special sonar equipment to search the water column and the seabed for mine-like objects and to further identify them. This can be done with the MCM unit's own sonar (ship or helicopter) or with the sonar of a UUV (such as the SPVDS). If a mine-like object is identified as a sea mine, clearance can go ahead. Divers or UUVs will usually place and detonate an explosive charge near the mine. The advantage of minehunting is that the MCM unit itself can in principle remain at a safe distance from a potential mine. The disadvantages are dependence on good conditions for the sonar and the slow rate of progress if there are many mine-like objects in the area (for example, in the case of a rocky or debris-strewn sea floor). Minehunting may be less effective on sandy floors, as mines may be buried by drifting sand and are thus invisible to sonar.
- Minesweeping is the clearance of sea mines by dragging a sweep. This sweep is designed to detonate any sea mines that are present or to cut them from their moorings. It detonates the mines by simulating ships' signatures with the aid of sound sources (acoustic sweep), strong electromagnetic fields (magnetic sweep) or by creating pressure differences. Cutting is done by means of a mechanical sweep for the purpose of clearing moored mines. Minesweeping is usually conducted with a combination of sweeps, depending on the expected mine threat. The main disadvantage of minesweeping is the high risk; the sweep is dragged by a vessel that must first sail over the possible sea mines itself. To avoid exposing friendly MCM vessels to this risk, USVs and drones are generally used to drag the sweep. Helicopters can also be used for the purpose.

It is only rarely the case that conditions in the area of operations are optimal for one of the two methods. Hunting and sweeping are complementary methods, and this is particularly true in areas where (temporary) sandshifting occurs; if bottom mines are covered with sand, sweeping is the only option. Once the sand has cleared, they can be hunted as well as swept. Because of the lower risk, minehunting is in principle the preferred method. Only if the residual risk is unacceptably high after hunting will minesweeping be undertaken.

Very Shallow Water Mine Countermeasures
For safety reasons, in view of the high risk of running aground and damage to the ship, most types of naval ship do not in principle operate in areas where the water is less than ten metres in depth. Situations do arise, however, in which vessels, usually smaller ones, need to navigate shallow water, for example in amphibious operations and when operating on rivers and internal waters (riverine operations, see paragraph 11.3.4). MCM vessels cannot be employed if the water depth is less than ten metres; the risks are too high because of the close proximity to potential sea mines. Instead, active MCM in these shallow waters (VSWMCM) is conducted by diving teams and UUVs, specialised in the detection and clearance not only of sea mines, but also of other obstacles and explosives. To do this, they use Maritime Search[353] techniques. VSWMCM in effect represent the transition between MCM at sea and countermeasures for mines and explosives on land. The divers and UUVs are also able to perform these activities in water deeper than ten metres, and can operate from any suitable vessel (including submarines) or from land.

Determining factors in active MCM: time and surprise
Active MCM can be conducted in two different situations. Firstly, it may be needed in response to a threat that has been expressed or a mine that has been discovered in an existing area of operations or in an actively used shipping lane.

Secondly, active MCM may be required to obtain the desired degree of freedom of movement for a new operation or activity (precursor operations, advance force operations). In the case of the latter, two factors determine the planning for and execution of active MCM. Time is the first determining factor. The systematic searching of a (potential) mine danger area, the creation of safe routes and clearance of detected mines and explosives is extremely time-consuming. Depending on the size of the area and the circumstances, this can vary from a few days to several months. Active MCM thus needs to be commenced (long) before the start of the operation itself in order to reduce the (residual) risk in the intended area or on the intended routes to an acceptable level.

This leads to the second determining factor: surprise. It is difficult for ships to hide at sea. The arrival of MCM units in a particular area may alert an opponent to an imminent maritime operation and thus negate any surprise effect that might be required. In such cases, VSWMCM teams will also be used for MCM in water deeper than ten metres; because they have to be able to operate near to an enemy coast, these teams are able to perform their activities covertly.

353 See box about Maritime search in Chapter 6, paragraph 6.8.2 (Picture compilation by teams).

11.3 Maritime combat operations launched from the sea

In maritime operations launched from the sea, maritime striking power is used to create effects on and over land (power projection) to support the battle at sea, in the air or on land.

Combat operations launched from the sea are generally offensive in nature. The mission objective can, however, be either offensive or defensive. Neutralisation of an enemy coastal battery could, for example, take place in preparation for an amphibious operation (shaping for an offensive operation on land), or it could be necessary to avert a threat to friendly shipping (protection of the operation at sea).

A combat operation from the sea is seldom conducted as an independent operation. Only actions against strategic targets in a harbour or on land can exist in their own right. Most other combat operations from the sea form part of a broader campaign or operation.

Combat operations launched from the sea begin at and are supported from the sea. This requires the correct execution of the various warfares (ASW, ASUW, AAW and NMW), as maritime striking power can only be projected on land if a favourable situation is created at sea: sufficient protection and the required degree of freedom of movement.

The following combat operations are launched from the sea:

- amphibious operations;
- maritime strike operations;
- maritime special operations;
- riverine operations.

There is also an overlap in the air between combat operations at sea and from the sea, as AAW does not stop at the boundary between land and water. The contribution of AAW to air defence (AD) and to ballistic missile defence (BMD) over land is thus also a form of combat operation from the sea.

11.3.1 Amphibious operations

An **amphibious operation** is a military operation launched from the sea by a naval and landing force (LF) embarked in ships or craft, with the principal purpose of projecting the landing force ashore tactically into an environment ranging from permissive to hostile.[354]

Types of amphibious operation

There are four types of amphibious operation, which differ in terms of purpose and nature:

- An **amphibious assault** involves establishing a force on a hostile or potentially hostile shore for a prolonged period. The operation may be confined to the initially occupied terrain, although an amphibious assault usually forms the initial entry for follow-up operations further inland with the support of follow-on forces.

354 For more details about amphibious operations, see the Dutch Field Manual for Amphibious Operations (LAO) and NATO ATP-8 Volume 1 Doctrine for Amphibious Operations.

- An **amphibious withdrawal** involves the extraction of friendly forces in naval ships from a hostile or potentially hostile shore. This may be the landing force itself, if the withdrawal is a planned preparation for redeployment elsewhere, although it could also be an extraction of combat forces (not necessarily just the actual landing force), for example under pressure from enemy actions.

- An **amphibious raid** is a swift incursion into or a temporary occupation of an objective, followed by a planned withdrawal. A raid is limited in terms of time, space and necessary means.

- An **amphibious demonstration** is conducted for the purpose of deceiving the enemy by a show of force, without revealing the true intentions. The aim is to delude the enemy into a course of action that is prejudicial to his interests, without his awareness of what is happening. Combat contact with the enemy is in principle avoided in an amphibious demonstration.

These four types of amphibious operation are combat operations. An amphibious operation could, however, also be conducted in the context of an MSO or of military assistance, for instance in an action against a base of operations for illicit trafficking, to evacuate civilians (NEO) or to provide humanitarian assistance or disaster relief on land. This **amphibious support to other operations** usually bears strong resemblance to an amphibious raid and will be discussed in Chapters 12 and 13.

Amphibious operation

Critical factors in amphibious operations

Amphibious operations, particularly the amphibious assault, require maximum maritime striking power. A large number of activities take place within a small area and within a short space of time, both in and on the sea and on land, as well as in the air. A number of factors are crucial for the success of an amphibious operation. Firstly, at the core of every amphibious operation lies a complex logistical problem, namely the coordinated and synchronised movement of the landing force via the water and through the air to and/ or from the target area on land. Secondly, from a land-based situation in which there is little or no freedom of movement and no striking power exists, sufficient freedom of movement needs to be created and enough striking power projected ashore to be able to accomplish the mission. The often unfavourable conditions of the hostile environment mean that the build-up of striking power on land usually starts from a relatively weak position and is thus an uphill struggle. Thirdly, it is not only the units at sea that need protection during the operation; that protection must also be extended to the target areas on land. Especially during the movement and the build-up of striking power on land, there will thus be a need for air defence and joint fires, both from the air, in the form of close air support (CAS), and from the sea, as naval fire support (NFS).[355] [356]

These critical factors mean that an amphibious operation is in principle conducted by a specially assembled amphibious task force (ATF). This ATF is made up not only of amphibious assault ships with their landing craft and transport helicopters and their embarked LF of amphibious manoeuvre units, combat support units and combat service support units. An ATF also consists of ships, submarines, helicopters and aircraft which provide protection for the task force as a whole and which can also deliver the required fire support (CAS, NFS) or clear mines and obstacles (MCM, VSWMCM). The critical factors and the diversity of units and tasks also place demands on the way in which amphibious operations are organised and on their C2.[357]

355 Formerly known as naval gunfire support (NGS). In some cases, the term naval surface fire support (NSFS) is used but this is not an accepted term in NATO doctrine, however.
356 For the technical doctrine and procedures for NFS, see ATP-4 Allied Naval Fire Support.
357 See Chapter 5, paragraph 5.8.1 (C2 in amphibious operations).

Phases of an amphibious operation
Amphibious operations are made up of a number of phases. Although they are not always clearly separated and do not always take place in the same sequence, the following phases are always identifiable.

- **Planning**. This phase involves the start of the planning process for an amphibious operation. After the mission analysis, the commanders involved (CATF, CLF) will formulate their initial plan for the operation. This plan contains a number of important decisions which form the basis for further planning. The planning for the amphibious operation (and any adjustment) does not stop when the next phase starts, but continues during subsequent phases.

- **Embarkation**. The (extra) units required for the amphibious operation are embarked, with their personnel, materiel and support, on board the assigned ships. The arrangement of the load should be based as far as possible on the expected sequence of debarkation in the action phase.

- **Rehearsal**. During this phase, the planned execution of the action phase will be tested for feasibility: timetable, readiness of the units, familiarity with the plans and instructions and the functioning of communications. The actual execution of the landing may also be rehearsed in this phase (a rehearsal landing).

- **Movement**. This phase involves the movement of units in the amphibious task force (ATF) from the point of embarkation or from a forward deployed position (pre-positioned) to the amphibious objective area (AOA). The phase ends with the arrival of the full ATF at their positions within the AOA.

- **Shaping**. In order to optimise the chances of success for the action phase, the AOA is prepared in three different ways:

  - o **Supporting operations** are supporting activities performed by units that are not part of the ATF. They include, for example, gathering intelligence, deceiving the enemy and obtaining and keeping the necessary degree of sea control, control of the air and information superiority. Supporting operations are in effect separate from the phasing and take place continuously before, during and after the actual amphibious operation.

  - o **Advance force operations** are preparatory activities conducted in the intended AOA by forward units from the ATF, augmented if necessary by other units. The purpose of these operations is to minimise critical threats and hazards and to acquire detailed data and intelligence for the planning process. Advance force operations include MCM (including VSWMCM), rapid environmental assessment (REA)[358] as well as reconnaissance, infiltrations and offensive actions by maritime SOF. Advance force operations turn into pre-landing operations when the entire ATF has arrived in the AOA.

  - o **Pre-landing operations** are a continuation of advance force operations following the arrival of the ATF in the AOA. These operations provide continued detailed preparation of the objective area just before the action phase. Because the entire ATF will now be present, and thus the force's intentions will in principle be clear to the enemy, pre-landing operations are more overt in nature than the normally covert advance force operations.

- **Action**. The amphibious operation itself takes place in this phase: the demonstration, the raid, the assault or the withdrawal. The action phase starts with the arrival of the ATF in the AOA and ends when the objectives of the operation have been achieved or if the execution of the mission has become impossible, for example if circumstances have changed drastically.

The amphibious operation is complete once the objectives have been achieved (or have become unattainable). For an amphibious demonstration, raid or withdrawal, this **termination** can be recognised fairly clearly. A demonstration is terminated either when the desired effect (deception of the enemy) has been realised or at a previously established point in time. A raid and a withdrawal will be terminated as soon as all own and friendly forces are back on board. In an amphibious assault, the moment of termination depends on the purpose of the assault. There are several possible options:

- The entire LF reboards the ship, whereby the ATF becomes available once again for a subsequent amphibious operation.

358 See Chapter 6, paragraph 6.6.4 (Rapid environmental assessment).

- The LF remains on land and forms (the core of) a land component (CLF becomes LCC).
- The LF remains on land and is assigned to another component, for example an existing LCC.

Combinations are of course also possible, for example where part of the LF remains on land and part reboards the ship for other operations.

Beachhead versus ship-to-objective manoeuvre
In the conventional execution of an amphibious operation, the emphasis lies on capturing and setting up a beachhead on the shore. Only when sufficient mass in terms of physical striking power has been assembled in this beachhead can action be projected inland to achieve the actual objectives of the operation. This method is logical and in line with important principles of military operations, in particular the principles of 'concentration' and 'sustainment'. The disadvantage of this method, particularly in a sizeable amphibious assault, is the loss of tempo and momentum. This is because the build-up of physical striking power in the beachhead takes time (the 'operational pause'). This conventional method is thus at odds with the characteristics of the manoeuvrist approach,[359] namely to surprise and disrupt the enemy through initiative, tempo, mobility and momentum.

359 See Chapter 10, paragraph 10.2.2 (Manoeuvrist approach).

There is another way to execute the action phase of an amphibious operation that is more in keeping with the manoeuvrist approach: the **ship-to-objective manoeuvre** (STOM).[360] As the name suggests, STOM is based on the idea that the beachhead can be omitted if sufficient physical striking power can be delivered straight from the ships to the objective. This means that the operational pause needed for building up the beachhead can be avoided and maximum use can be made of tempo and surprise. STOM does, however, require different assets and capacities because of the greater emphasis on airlift (helicopters and VSTOL[361] aircraft) and on faster transport over water (for example, fast assault boats and hovercrafts). On the other hand, because of the speed of action and the effect of surprise, STOM offers more flexibility and can achieve the same objectives with less physical striking power.

Using STOM, the action phase can be started at a greater distance from the coast. A major advantage is that the amphibious assault ships are then less vulnerable to threats from the shore. Furthermore, less time and effort is required for (preparatory) protective measures such as mine clearance of areas and routes.

360 US doctrine refers to the manoeuvrist approach in amphibious operations as 'operational manoeuvre from the sea' (OMFTS).
361 VSTOL = vertical and short take-off and landing. Examples of VSTOL aircraft are (Sea) Harrier jump jets and V-22 Osprey transport aircraft.

11.3.2 Maritime strike operations

Maritime strike operations[362] are air attacks and bombardments launched from the sea against targets ashore. This form of combat operation from the sea is also referred to as strike warfare or a maritime air strike. It is the maritime equivalent of strategic attack and air interdiction, as carried out by air forces against land-based targets.[363] The purpose of a maritime strike is to destroy, disable, render unusable or useless land-based enemy fighting power and supporting means. This also includes maritime targets in harbours, such as warships, submarines and ammunition depots (e.g., storage sites for sea mines).

Maritime strike operations are conducted with one or more of the following forms of offensive physical striking power:
- combat aircraft from aircraft carriers;
- attack helicopters from ships;
- guided missiles, such as cruise missiles, launched from ships or submarines;
- ships' gun systems.

The effects of a maritime strike do not have to be physical in nature, however. The employment of combat aircraft could, for instance, focus purely on the creation of cognitive effects. Examples are radar jamming (EW) or the distribution of leaflets (PsyOps).

362 For further details about maritime strike operations, see ATP-1 Volume 1.
363 See AJP-3.3 Allied Joint Doctrine for Air and Space Operations.

The following forms of (air) attack are not included among maritime strike operations:
- Attacks launched from the sea against strategic land-based targets, using nuclear weapons such as (intercontinental) ballistic missiles launched from submarines.
- Air attacks against ships at sea (sea strike). These are part of ASUW (see paragraph 11.2.2).
- Joint fires for friendly troops on land, such as close air support (CAS) and naval fire support (NFS).

Maritime strike operations are conducted for the purpose of:
- Creating effects that will lead directly or indirectly to the realisation of objectives at operational and strategic level. Examples are sinking submarines in the harbour and destroying fuel stocks.
- Creating tactical effects to support a maritime operation. Examples are neutralising a (mobile) coastal battery or rendering a shore radar installation inactive.

Where, when and with what means a maritime strike is to take place is in principle determined in the targeting process.[364] In the event of strike taking place, the maritime component commander (MCC) should coordinate the action with the air component commander (ACC), in particular the airspace control authority (ACA).[365] as there is a risk of interference because the means used in maritime strike operations (aircraft, guided missiles, grenades) use the airspace to get from the sea to their land-based target.

364 See Chapter 10, paragraph 10.5.1 (The targeting process).
365 See Chapter 5 paragraph 5.8.3 (C2 in the deployment of (unmanned) aircraft and helicopters).

If low-flying missiles such as cruise missiles are employed, maximum deconfliction must be ensured between the flight path and (friendly) shipping.

11.3.3 Maritime special operations

Special operations[366] are military activities that are carried out by specially designated, organised, selected, trained and equipped troops - special operations forces (SOF) – who use unconventional techniques and methods. Special operations are generally small scale, are usually conducted in (potentially) hostile territory, carry a high political or military risk and normally serve a strategic purpose. The high political or military risk may mean that these activities need to be clandestine or covert.[367] Special operations are thus coupled with a high level of secrecy (OPSEC) and have their own chain of command in a separate Special Operations Component Command (SOCC).

The activities performed by SOF are highly diverse in nature, but they always fall within one of the following three main tasks:

- **Special reconnaissance** (SR): the acquisition of specific, often time-critical and strategically important information in a hostile or politically sensitive environment.

- **Direct action** (DA): the capture or destruction of specific material, the liberation, detention, capture or elimination of specific high-value individuals (HVI), the personnel recovery (PR)[368] of friendly troops that have become isolated or the terminal guidance of guided weapons.

- **Military assistance** (MA): the support and influencing of favourably disposed actors through on-the-job mentoring (advice, training and supervision).

Special operations in the context of (maritime) combat operations always fall under the heading of special reconnaissance (SR) or direct action (DA). Activities classed as military assistance (MA) are not generally regarded as combat operations and are therefore described in Chapter 13 paragraph 13.2 (Maritime assistance to diplomacy).

Maritime special operations are special operations that take place at sea or from the sea. Generally speaking, they are conducted by maritime special operations forces (MARSOF). MARSOF units operate from ships or submarines and make their way from the sea to their target by boat, helicopter or parachute. MARSOF's particular specialism is their frogmen, who can reach their objective under water, for instance by swimming or by using underwater scooters. These units are also specialised in operating on or in maritime objects, such as ships and maritime infrastructure.

366 For more details about (maritime) special operations, see AJP-3.5 Allied Doctrine for Special Operations.
367 **Clandestine** (or discreet) = in such a way that secrecy and concealment are assured. **Covert** = in such a way that the identity of the executor remains concealed or can be plausibly denied.

368 Formerly also referred to as combat search and rescue (CSAR). For more details, see the NATO Bi-SC Joint Operational Guidelines 11/01 Joint Personnel Recovery.

Maritime special operations can be conducted as independent operations, for example to create a strategic effect. They can also be conducted in support or as part of another (maritime) operation, for example advance force operations for an amphibious operation.

11.3.4 *Riverine operations*

Riverine operations[369] are military operations in which rivers, river deltas, lakes and other inland waterways are used as manoeuvre space. Whereas internal waters form an obstacle for a land operation, riverine operations are able to use these water surfaces as a route to project influence on land. Particularly in areas where routes for overland transport are limited in number or in poor condition, rivers, lakes and waterways represent a good alternative, as long as they are navigable. Examples of such areas are river deltas, swamps, mangrove forests and tropical rainforests (jungle). But even in urban areas -many towns are situated alongside a river- internal waters can provide (extra) room for manoeuvre.

From a maritime point of view, riverine operations mainly involve the use of internal waters that are directly linked to the sea. They can also, however, take place on lakes, canals and other navigable inland waterways which are not accessible from the sea. Methods for overcoming water obstacles, such as bridging and river crossing, do not form part of riverine operations, but fall under land operations.

Riverine operations

Riverine operations may be conducted:
- as independent military operations;
- as part of a land operation;
- as part of a maritime operation.

Within a maritime operation, riverine operations generally form part of an amphibious operation. when rivers serve as an extension of the maritime domain in the land domain. They can also serve as one of the transport routes for the STOM (see paragraph 11.3.1).

369 For further details about riverine operations, see ATP-8 Volume 1 Chapter 11, Riverine Operations.

Characteristics of riverine operations
Rivers and internal waters have specific characteristics:

- rivers and internal waters are usually shallow, which means that there may be strong and variable currents;
- there is a high risk of obstacles (sandbanks, dams, fallen trees, low bridges);
- there is a high risk of ambushes, as vegetation or buildings obscure fields of vision and fire.

These circumstances mean in the first instance that a great deal of information will be required. To be able to operate on internal waters, specific environmental information is needed, as is the case in amphibious operations; not only in relation to water depths, obstacles and clearance height of bridges, but also about the river banks and their (direct) environment.

Secondly, these specific characteristics impose demands on the means for riverine operations. To be suitable for operations on internal waters, vessels must be of limited size (small draught, limited height), capable of high speed (to escape an ambush), be resilient (high risk of ambush or holing) and have sufficient firepower (to suppress threats).

The conditions on rivers and internal waters offer opportunities, however, such as the possibility of operating under water (divers, UUVs) and the possibility of exploiting water currents (for covert operations, for example).

Riverine operations are normally conducted by a riverine task force which has (amphibious) vehicles as well as boats. Helicopters can also be assigned to the task force if necessary. A riverine task force needs to have a high level of logistic self-sufficiency.

In riverine operations of shorter duration and smaller scale, for example as part of an amphibious operation, a riverine action group (RAG) is generally used. This RAG is a (temporary) formation taken from the ATF's group of landing craft (boat company or boat group).[370]

11.4 Combat operations as a basis for other maritime operations

As already set out at the beginning of this chapter, combat operations – the threat and use of force, if necessary on a large scale – form the core of the military organisation. The way in which naval forces conduct maritime combat operations also forms the basis for the way in which they conduct other types of operation: maritime security operations (see Chapter 12) and maritime assistance (see Chapter 13). The application of one methodology as a basis for all types of operation has the following advantages:

- **Simplicity**. The use of one methodology as a basis for all types of operation enhances clarity and prevents confusion. This is particularly important for C2 and for the creation of situational awareness (intelligence and picture compilation).

370 Similar to the surface action group (SAG) in ASUW, which is a temporary formation assembled from the maritime or amphibious task force. See paragraph 11.2.2.

- **Flexibility.** For the purposes of protection and defence in particular, it is important that a rapid transition is possible to the use of heavier means if the situation demands (escalation dominance, see box).

The C2, picture compilation, protection and other relevant methods in other types of maritime operation too will, therefore, resemble those in combat operations as closely as possible. In operations to counter drug trafficking by sea, for example, C2 and picture compilation will be virtually identical to those in AAW and ASUW. Another example is a maritime assistance operation launched from the sea, such as an NEO or disaster relief following a natural disaster. In terms of techniques and procedures, the execution of these operations often bear strong resemblance to that of an amphibious operation, in particular an amphibious raid.

Escalation dominance: the 'Lido II' tanker incident

During the Balkan wars in the 1990s, NATO imposed an economic and arms embargo on the belligerents. The maritime part of this embargo was enforced with Operation Sharp Guard: ships from the NATO Standing Naval Forces were stationed in the Adriatic Sea to deny merchant ships access to the ports of Serbia-Montenegro.

On 1 May 1994, after being discovered by the US cruiser USS Philippine Sea, the oil tanker 'Lido II', sailing under the Maltese flag, tried to escape detention by making for the coast of Montenegro at full speed. At the same time, the tanker was transmitting distress signals because of an alleged leak in the engine room. The Dutch frigate HNLMS Van Kinsbergen received orders to board the vessel in order to take control of the ship. At that moment, several Serbian fast patrol boats equipped with guided missiles left their home port to, they claimed, render technical assistance to the oil tanker. These Serbian fast patrol boats arrived at the position of the oil tanker at the same time as HNLMS Van Kinsbergen and the British frigate HMS Chatham. An ominous situation arose, in which a Serbian fast patrol boat tried to ram the British frigate and several Tornado fighter jets were scrambled from Italy in a show of force. In the meantime, the boarding party had been able to board the ship. The team observed that the engine room had been flooded deliberately and that seven Yugoslavian stowaways were on board. Several hours later, the Yugoslavian units withdrew and the tanker, whose main engine had failed, was taken by an Italian tug, under the supervision of HNLMS Van Kinsbergen, to the Italian port of Brindisi and handed over to the Italian coastguard.

The Lido II incident shows first of all that in maritime operations too, an apparently orderly and routine situation can suddenly turn into a combat situation with an acute threat of high-intensity force. The incident also illustrates the use of escalation dominance. The dominance of collaborating ships and aircraft provided a sufficient deterrent to the Serbian forces, which meant that the embargo was enforced without any actual use of heavy weapons.

12. MARITIME SECURITY OPERATIONS

12.1 Introduction

Maritime security operations (MSO) are designed to protect interests in the maritime domain against breaches of the (international) rule of law. MSO consist of all activities targeting civil actors who violate agreements regarding the use of the sea, such as international treaties and UN Security Council resolutions. The purpose of MSO is law enforcement; national maritime forces function here as a national or international police force.

MSO comprise both defensive and offensive activities that take place at the tactical level. Offensive operations are conducted to prevent the various forms of disruption of the rule of law. Defensive activities serve mainly to protect interests in the maritime domain (shipping, infrastructure) against violent crime (such as piracy) and terrorism.

A typical activity in most forms of MSO is the boarding, in which a team of military personnel boards another ship in order to search it and, if necessary, detain ship, cargo, crew or passengers. This does not usually involve the use of force, but that does not mean that force does not play a role in MSO. Warding off an attack by pirates, conducting an opposed boarding or ending a hostage situation can all be high-intensity operations. Instead of using heavy weapon systems, there is a preference for machine guns and light arms and the employment of SOF.

This chapter discusses the methodology in maritime security operations, starting with a summary of the various legal grounds for MSO. This will be followed by an explanation of the two types of security operation, namely maritime interdiction operations and operations conducted to counter violent crime and terrorism. The chapter will then examine the forms of boardings and their execution, going on to look at how they are followed up if goods are seized or individuals are arrested. Lastly, the chapter will focus on situations in which MSO run concurrently with other maritime operations (maritime combat operations and maritime assistance).

12.2 Legal grounds for maritime security operations

Law enforcement is the countering of breaches of the rule of law. In the maritime domain, the rule of law is defined by the various agreements and treaties discussed in Chapter 2:

- the United Nations Convention of the Law of the Sea (UNCLOS) of 1982;
- international agreements on countering drug-trafficking, terrorism and illegal immigration (for example, the SUA Convention and the Caribbean Regional Maritime Agreement);
- the San Remo Manual on International Law Applicable to Armed Conflicts at Sea;
- UN Security Council resolutions.

There is said to be a breach of the rule of law if there are activities that are defined in these agreements as crimes, namely:

- piracy;
- slave trading;
- unauthorized broadcasting;
- sailing a ship without nationality (stateless: a ship that is not displaying a flag).
- smuggling of drugs, arms, money, and of people (illegal immigration, human trafficking);
- terrorism and violent extremism;
- breaching a blockade imposed in accordance with the rules of the San Remo Manual;
- violating an embargo imposed by the UN Security Council.

People-smuggling

Maritime security operations focus on countering these unlawful acts, in principle those that occur in international waters or in a state's own territorial waters.

MSO may, however, also be conducted in places where another state has jurisdiction, such as in the territorial waters of another state or on board a ship of another flag state. This is only possible, however, if such action has been authorised by a treaty, in a resolution, on legal grounds or in a mutual agreement. Examples are:

- maintaining a blockade under the San Remo Manual in the territorial waters of an opponent;
- boarding a ship to check for drug-smuggling, if authorised to do so by the ship's flag state.

The enforcement of law and order in a state's own territorial waters and its own EEZ is said to be both an MSO and maritime assistance, as national law enforcement always takes place under the control of the civil authorities. There is a distinction between the criminal law enforcement task and the monitoring task (upholding administrative law).[371] The enforcement of criminal law falls under maritime security operations, whereas the monitoring of compliance with other regulations, such as those relating to fishing, the environment and traffic, falls under maritime assistance. This maritime monitoring is therefore described in Chapter 13.[372]

371 For more details, see Dutch AWB 27-10 *Handboek Maritieme Rechtshandhaving* [Maritime Law Enforcement Handbook].
372 See Chapter 13, paragraph 13.5.3 (Maritime monitoring).

12.3 Types of maritime security operation

The crimes against which action is taken can be divided into two categories. Firstly, there are those that directly disrupt the rule of law or threaten security in the maritime domain, namely maritime terrorism and the usually violent forms of crime such as piracy. Secondly, there are crimes which do not directly threaten security at sea but which do represent a threat to security on land, such as the violation of a blockade or embargo and the trafficking of goods and people.

There are important differences in the methods used against the two forms of criminal activity. The countering of illicit trafficking and the prevention of violation of blockades and embargoes rely mainly on interdiction of the transport. Counter-piracy (CP) and maritime counter-terrorism (CT) require defensive as well as offensive activities to protect shipping and maritime infrastructure. The following paragraphs will look more closely at these two types of MSO. Paragraph 12.4 will first discuss maritime interdiction operations (MIO), after which paragraph 12.5 will examine how violent crime and terrorism are tackled in the maritime domain.

12.4 Maritime interdiction operations

A **maritime interdiction operation** (MIO) is one that is conducted to enforce prohibition on the maritime movement of specified persons or materials within a defined geographical area.[373] An operation such as this occurs in the following situations:

- enforcement of a blockade in accordance with the rules of the San Remo Manual;
- enforcement of an embargo in accordance with a UN Security Council resolution;
- countering illicit trafficking of goods such as drugs or weapons;
- countering illegal immigration, human trafficking or slave trading.

A maritime interdiction operation is not only conducted to prevent goods or people from entering a particular country; the purpose of an MIO may also be to prevent certain goods or people from leaving a particular country by sea.

For an MIO to be conducted successfully, the legal basis for the operation must first of all be clear. This legal basis must enable maritime forces to take action against suspect ships or aircraft and if necessary institute a search on board. It must also be clear which goods or persons are (contraband, wanted individuals) or are not being targeted by the operation; this should be clear from the mandate and the rules of engagement.

373 For further details about MIO, see ATP-71 Allied Maritime Interdiction Operations.

Because an MIO is based on preventing the transportation of goods or people, the essence of these operations is to trace these goods or people. In many cases, this means that a search will need to be conducted on board the ship in question. The execution of boardings is thus an essential element of almost every MIO. The prevention of sea transport is not, however, confined to shipping; the obstruction of air transport may also be part of an MIO. This is normally effected by passing information about suspect flight movements to the authorities on land. Suspect aircraft may also be forced by friendly aircraft to divert to an airport where an inspection can be performed.

The core of a maritime interdiction operation is made up of the following activities.

- **Intelligence and picture compilation**. Picture compilation in an MIO focuses on the detection, localisation, recognition and identification of all shipping and air traffic in the area in question. The aim is to find (potential) offenders or traffickers among other, innocent shipping and air traffic. This requires continuous employment of the maximum number of assets, such as ships, submarines, aircraft and UAVs for ISR activities. Civil means such as AIS[374] can also be extremely useful in clarifying the required RMP and in identifying suspect ships.

374 See box on AIS and LRIT in Chapter 6, paragraph 6.3.2.2.

The activities against which an MIO is directed are not usually performed overtly, but covertly. Intelligence gathering and the compilation of the RMP therefore focus on finding indicators of possible offences, such as deviations in the normal pattern of life (PoL). Account should also be taken of inventive and unorthodox methods, such as attaching contraband to the underside of a ship, dragging contraband under water or the use of 'caches' (temporary storage sites) on the sea floor. Intelligence relating to potential offenders, their methods and their plans is therefore crucial for the effective execution of an MIO. Submarines also play an important part, as they can gather information unseen.

The exchange of data and intelligence is extremely important in MIO. The results of each query and every search must be shared immediately with other units and organisations involved, thereby not only preventing duplication of effort, but also ensuring speedier identification of PoL deviations.[375]

- **Query**. If circumstances are such that it is deemed necessary, ships and aircraft will be queried. The purpose of this query process is to obtain further information or to verify data derived in other ways in order to remove or confirm any suspicion. As a rule, ships are interrogated in English via the maritime VHF radio. In some cases, communication cannot be established in this way and other means are required, such as the use of interpreters or the employment of an RHIB to make direct contact. Generally speaking, the query process is conducted without restricting the

375 This MIO method, in which intelligence forms the basis for the operation, bears a strong resemblance to what are referred to as intelligence-led operations, as used by the Dutch police and the Royal Netherlands Marechaussee in their crime-fighting activities.

movement of the ships in question. In some situations, however, it may be necessary to order the ship to reduce speed or to stop. The interrogation of aircraft takes place via aeronautical VHF. The result of the query process could be that the ship or aircraft involved is no longer suspect and can proceed on its way. The interrogation may, however, give cause for a boarding or a diversion, whereby the ship or aircraft is sent to a different destination or via a different route.

- **Boarding**. In a boarding, a boarding party from the naval ship embarks on board the suspect vessel to conduct further investigations. Depending on the nature of the operation, this investigation may be confined to an inspection of the ship's papers, crew, cargo and/or passengers. The investigation may also necessitate a meticulous search of the entire ship and/or cargo. Paragraph 12.6 looks further at the execution of various forms of boarding.

Boarding a suspect vessel

If the boarding does not generate any further suspicions or evidence, the vessel will be cleared to proceed. If the boarding does not remove suspicion or if it reveals evidence of a crime, a decision may be made to proceed to a diversion and/or other follow-up actions, such as seizure of ship and cargo or the arrest of individuals.

- **Diversion**. A diversion means that the ship or aircraft in question will be forced to select a route or destination other than the one that was originally intended. There are various forms of diversion. Firstly, the ship or aircraft could make its way to the original destination, but via a different route. Secondly, a ship or aircraft could be denied entry and sent back to its departure (air)port. Thirdly, a ship or aircraft may be ordered to choose another destination. The latter could simply be a different but permitted (air)port, or it could be a specific (air)port for the purpose of undergoing a (further) inspection. The decision to proceed to a diversion may follow a query, but in the case of a ship it could also be taken after a boarding, perhaps to continue the investigation in a more secure environment or to proceed to follow-up actions. Diversion of aircraft is only possible if friendly aircraft are available to escort and supervise the diversion.

Any decision to proceed to a boarding or a diversion or to take any necessary follow-up actions if a crime is known to have been committed will usually be taken by a tactical-level commander (CTG, CTF or MCC). He may also delegate the authority for such decisions to a maritime interdiction operation commander (MIOC).

Boarding of a merchant ship to enforce an embargo

The aforementioned activities make up the core of each maritime interdiction operation. In virtually all cases, there will also be other activities that are more dependent on the purpose of the operation and on local conditions. These usually involve various information activities, such as PsyOps and information campaigns designed to make users of the maritime domain aware of the purpose of the operation and its possible implications for those users. In a counter-illicit-trafficking MIO, additional activities may be conducted to gain the cooperation of local users of the sea, particularly in relation to intelligence and picture compilation.

Counter-illicit-trafficking operations in the Caribbean

Since the 1990s, the Dutch armed forces have been actively involved in counter-illicit-trafficking operations in the Caribbean. The purpose of these operations is to counter the illicit trafficking in, for example, narcotics (particularly cocaine), weapons, humans and money from countries in South America to the United States and Europe. Originally established as a national US operation, counter-illicit-trafficking in the Caribbean has now grown into a cooperative of a number of countries, both in the region itself and outside it. The operation also takes the form of the comprehensive approach, in which different government services (interagency: military, police, coastguard, customs) contribute to the operation and collaborate closely.

At the forefront of the operation in the Caribbean is the US Joint Interagency Task Force South (JIATFS), with its headquarters in Key West (Florida). From his HQ at the Parera naval base (Curaçao), the Netherlands Flag Officer in the Caribbean (*CZMCARIB*) acts as the JIATFS subordinate commander (CTG 4.4). In that capacity, he determines the contribution of maritime capacities from the Kingdom of the Netherlands to the operation. Examples of those capacities are the Netherlands CARIB guard ship and the patrol aircraft of the Dutch Caribbean Coastguard. *CZMCARIB* (as CTG-4.4) can, if necessary for a particular action or intercept, also call upon partners' capacities. One example of this would be the US Coast Guard's Law Enforcement Detachments (LEDET), which operate from Dutch naval ships as boarding parties during counter-drugs operations. >

Just as in any other MIO, the exchange of information and intelligence is also vitally important in counter illicit (maritime) trafficking in the Caribbean. The power of the JIATFS collaboration thus lies not only in the cooperation in the actual execution, but also in an enhanced situational awareness of drug trafficking in the region.

The implementation of the Caribbean Regional Maritime Agreement[376] brought about a significant improvement in the opportunities for counter-drugs operation in the Caribbean, as most states that are party to the treaty have granted each other the right of visit on board ships sailing under their flag. Furthermore, the treaty makes it possible to detain and board stateless ships suspected of drug trafficking. It also contains agreements relating to the authorisation of enforcement operations within the territorial waters of the signatory states.

Since the start of the collaboration within JIATFS, Dutch and Belgian forces have regularly achieved impressive results in these counter-drug-trafficking operations, in some cases intercepting more than a thousand kilos of cocaine.

Intercepting a drugs shipment in the Caribbean

376 See Chapter 2, paragraph 2.6.1 (Counter-drug-trafficking agreements).

12.5 Countering violent crime and terrorism in the maritime domain

Terrorism, violent extremism and violent forms of crime such as piracy not only disrupt the international rule of law, but they also pose a direct threat to the safety of users of the maritime domain. Unlike an MIO, therefore, operations against these types of crime and terrorism require protective measures.

An important characteristic of violent crime and terrorism is the covert and surprise nature of the action. Pirates and terrorists have the greatest chance of success if they are able to approach their target unseen and strike in a surprise attack. That target could be a ship, or it could be an installation at sea (e.g. an oil platform) or a port installation. The aim of piracy is to attack a ship and its crew to steal goods or to hijack the ship and/or crew for ransom. Such attacks are usually mounted using small, fast boats. A terrorist act can be committed by many different methods, depending on its purpose. As well as the use of small, fast boats for a raid and hijack or for an attack, possible methods also include the use of (small) aircraft, the use of mines and IEDs, an underwater attack by swimmers or divers and the use of disguise and deception.

The countering of violent crime and terrorism in the maritime domain encompasses the following actions and activities, which usually take place simultaneously and which reinforce each other:

- **Reducing the vulnerability of shipping and maritime infrastructure**. In the first instance, users of the sea such as shipping, drilling installations and port services need to take their own precautions to prevent attack. Shipping can do so by avoiding high-risk areas and by taking self-protection measures[377] such as good watchkeeping, sailing at high speed and putting up barriers on deck. Maritime forces can help with this self-protection by exchanging information on criminal and terrorist activities (shipping alerts) and by giving advice (also, for example, in relation to CBRN or IEDs).

- **Protection of maritime infrastructure**. If the existing security and protection of maritime infrastructure is deemed inadequate, maritime forces may be employed to provide active protection for that infrastructure (drilling platforms, subsea cables, port installations). This protection usually takes the form of an armed security detachment, augmented if necessary with vessels for patrolling the immediate vicinity. Further help can be given by specialist teams for underwater reconnaissance and EOD. Protection of maritime infrastructure is normally a national military task, but it can also be performed in a multinational context, for instance to support local authorities or in the absence of a legitimate government.

377 Self-protection measures against piracy for merchant ships are covered in the publication 'Best Management Practices (BMP)', published by the Baltic and International Maritime Council (BIMCO), an international association of shipping organisations. See www.bimco.org.

Harbour protection

One of the guaranteed capacities provided by the Royal Netherlands Navy for the third main task of the Defence organisation is two composite units for harbour protection. These composite units are made up of divers from the Defence Diving Group (DDG), supported by maritime personnel from the Defence Explosive Ordnance Disposal Service (EODD). Each unit comprises a staff element, diving specialists, UUV specialists (including the REMUS),[378] sonar specialists, surveillance teams, bomb disposal experts and technical and logistic support. Each composite unit contains a total of 32 people. As a rule, the unit operates from a diving support vessel.

Each unit is capable of protecting static objects at the waterside or in the water (infrastructure, ships) against dynamic threats (such as small boats, assault divers and swimmers) and static threats (such as obstructions, mines and IEDs) in and on the water.

Although these harbour protection units in principle perform this task on a national basis, they can also be deployed for similar tasks abroad.

- **Protection of shipping in high-risk areas**. If shipping cannot avoid high-risk areas (in a strait, for example) or if adequate self-protection measures are not feasible (perhaps because of low maximum speed), maritime forces may be employed to provide active protection.

378 See Chapter 9, paragraph 9.2.9 (Unmanned systems).

This protection can take different forms, varying from purely reactive to more active defence in depth:[379]

- o **Vessel protection detachment** (VPD). A VPD is a military, armed supplement to the self-protection measures of the civilian ship. It serves to deter potential attackers and to defend the ship by force if necessary.[380]

- o **Escort**. In the case of an escort, one or more naval ships will be assigned to an individual ship or group or ships to provide protection against attacks. This generally means that the naval ship will stay close to the ship it is protecting. Escorts are not always conducted by naval ships, however; they can also be performed by armed aircraft or helicopters.

- o **Convoys**. In a convoy, ships sail together in (regulated) groups in order to reduce the risk of (surprise) attack. A convoy may be independent (group transit), in which case maritime forces provide protection from a distance (for example in a safe area or a corridor). A convoy may also be escorted, if it has been assigned with protective units.

- o **Creation of safe areas or routes** (corridors). This is a more proactive method of protection, in which maritime forces move freely within (parts of) the area in order to intercept potential attackers. This defence in depth will thus take place further away from the protected shipping.

Escorting civil shipping

- **Preventing attacks** Active countermeasures mean removing the ways, means and will to perform violent actions. To ensure that these activities cannot be played out in the maritime domain, it is not only at sea that measures are required, but in many cases on land too.

  Active countermeasures at sea in effect mean establishing sea denial, thus denying the opponent effective use of the sea. This method shows significant similarities to a maritime interdiction operation (MIO), because of the emphasis on intelligence and picture compilation and the use of boardings to confirm or disprove suspicion of involvement in criminal or terrorist activities. As in MIO, this active countering results in the seizure or destruction of goods and/or the arrest of individuals.

379 See Chapter 7, paragraph 7.9.1 (Principles of maritime defence).
380 A VPD is a military security detachment. Subject to authorisation by the flag state, shipowners may instead contract in private armed security personnel. A private team such as this is usually referred to as a private security team (PST) or a private armed security team (PAST).

Active countermeasures on land focuse on support points, bases of operations, command and communications centres, stores and other support facilities and personnel. In the first instance, this action is obviously the responsibility of the nation in question, but military action may be needed to support the local authorities or if there is no legitimate local government. The physical effects in such operations can be created by means of amphibious operations, special operations, a (limited) maritime strike operation or a land operation. This is usually accompanied by the creation of cognitive effects by means of PsyOps, KLE and other forms of information activities.

- **Ending hijacks and hostage situations**. An attack by pirates or terrorists may succeed in spite of all the protective measures. If any such attack leads to the hijacking of a ship and/or the taking of hostages, military action may be required to end this situation. Conducting an intervention such as this, or a **hostage release operation** (HRO), is the province of (maritime) special operations forces. In the maritime domain, this type of special operation usually takes the form of an opposed boarding (see paragraph 12.6).

Within the Netherlands armed forces, the execution of this type of intervention outside the Kingdom is allocated to different units.[381] For operations in the maritime domain, this task is assigned to the Netherlands Maritime Special Operations Forces (NLMARSOF) of the Marine Corps. HROs in situations involving Dutch interests in foreign territory are assigned to the Commando Corps (KCT) of the Royal Netherlands Army.

Deployment of NLMARSOF to end a hijack

In Belgium, the execution of HROs is assigned to the *Commissariaat Generaal Special Unit* (CGSU) of the Federal Police or to the Land Component's Special Forces Group (SFG). Both can operate in national territory as well as abroad.

381 The deployment of the military for HROs within the Kingdom of the Netherlands is a form of (special) military assistance. For this, see Chapter 13, paragraph 13.5.1 (Maritime assistance in criminal law enforcement).

Although the aforementioned activities are vital for the control of (the consequences of) violent crime and terrorism in the maritime domain, they do not generally lead to a lasting solution to the problem. A comprehensive approach is needed to tackle the underlying causes of piracy, terrorism and other forms of violent crime.

12.6 Boarding

A **boarding** is the exercising of the right of visit of a civilian ship, which is conducted by a boarding party.[382] Although the execution of boardings is a maritime specialisation, it does not necessarily have to be a specifically military activity in all cases. Boardings can also be conducted by or with personnel from other organisations tasked with maritime law enforcement, such as coastguard, border control and police officers.

Not every situation in which a (boarding) team boards another ship can be classed as a boarding. It is only said to be a boarding if there are legal grounds for investigating and if **flagstate consent** has been given (in situations in which it is required).[383] The absence of legal grounds or flagstate consent does not mean, however, that the ship cannot be boarded, just that no formal investigation can be conducted during the visit. In such cases, the approach and possible boarding of another ship is referred to as an **approach and assist visit** (AAV) or a **consensual visit**.

382 For details and procedures, see Dutch *Handboek Boardingoperaties* [Boarding Operations Handbook] and NATO ATP-71 Maritime Interdiction Operations.
383 In some countries, permission from the master of the ship will suffice for the execution of a boarding (master's consent). Both Belgium and the Netherlands will only accept official flagstate consent as permission for boarding.

In visits such as these, a ship can only be boarded by invitation of the master. An AAV or consensual visit is often used to gather information (for maritime situational awareness, MSA) and to engender goodwill among local seafarers. A small boat (RHIB or FRISC) will normally be used, with several members of the boarding party on board.[384]

12.6.1 *Types of boarding*

A boarding requires the cooperation of the ship in question, and the attitude of this ship towards the arrival of the boarding party will largely determine the way in which the boarding is conducted. Depending on the expected degree of cooperation, the types of boarding are defined as follows:

- **Unopposed boarding**: a boarding in which the master of the ship follows instructions from the naval ship and in which no passive or active resistance is apparent or expected.[385]

- **Non-cooperative boarding**: a boarding in which the ship refuses to cooperate but in which no active or armed resistance is expected. The resistance is of a passive nature, for instance refusal to answer questions, refusal to follow instructions or the presence of passive measures on board that obstruct or hamper the boarding or searching of the vessel.[386]

384 These actions are referred to collectively as VBSS (visit, board, search and seizure), although this American term does not have NATO-wide recognition.
385 Other terms that are sometimes used to refer to an unopposed boarding are 'compliant boarding' or 'cooperative boarding'.
386 Another term that is sometimes used to refer to a non-cooperative boarding is 'non-compliant boarding'.

- **Opposed boarding**: a boarding in which the master deliberately refuses to cooperate, in which active or armed resistance is expected or in which measures are in place that are clearly intended to pose a danger to or to injure members of the boarding party.

Boarding parties from naval ships are usually capable of conducting unopposed and non-cooperative boardings. An opposed boarding can only be conducted by or with the help of SOF, who will first have to seize and secure the ship by means of a takedown operation before the boarding party can board for the inspection.

12.6.2 *The boarding party*

A boarding is conducted by a boarding party[387] , which normally consists of a specially trained section of the ship's crew which conducts boardings as a sub-task. A boarding party can also consist of specially assigned specialists who perform boardings as their main task.[388] Combinations of the two are also possible, with a boarding party comprising specialists as well as crew members.

A boarding party consists of three (sub)teams:

- **Bridge team**, made up of the boarding officer and a signals operator, augmented if necessary with an interpreter, a technical specialist (engineer) or other specialists.
- **Security team**.
- **Search team**.

The size and composition of the (ship's) boarding party may vary, depending on the circumstances and the mission. A boarding party for an unopposed boarding of a small vessel, for example, may (and should) be smaller. For a boarding of a large ship whose cargo needs to be inspected, a larger team will be required to be able to perform the inspection within a reasonable space of time. The composition may also be different or supplemented in specific operations. In counter-piracy operations, for example, Dutch naval ships use an enhanced boarding element (EBE). These marines operate as a (reinforced) security team and provide the security on board larger ships.

A boarding requires more than just a boarding party. Other means and personnel on board the naval ship are also directly involved in a boarding:

- The commanding officer of the naval ship retains overall command. He will decide whether to give the go-ahead and can also decide to abort the boarding at any time.
- Boats (RHIB/FRISC) or onboard helicopter(s) provide the transport for the boarding party and its equipment, and will also evacuate any casualties if necessary.
- A fire support element with small-calibre weapons will provide any necessary fire support and cover from the naval ship. Fire support can also be delivered from a helicopter or from an RHIB or FRISC. Snipers are also included in the fire support element in many cases.

387 In the Dutch and Belgian navies, a boarding party is called a boarding team.
388 This is the case in the Caribbean, for example, when operations are conducted with a law enforcement detachment (LEDET) from the US Coast Guard.


Fire support for a boarding

All those involved in a boarding will help to create the best possible situational awareness by observing from their position and by sharing information. Every effort must be made to keep sight of all sides of the target ship, by means of the correct positioning of the naval ship, the RHIBs/FRISCs and the helicopter(s). Account must, however, be taken in that positioning process of the necessary stand-off distance in respect of any weapons on board the suspect ship.

12.6.3 *Phased execution of a boarding*

Every boarding follows the same fixed pattern of activities:

- **Orders and preparation of the team**. The decision to proceed with a boarding will depend on the query, observed behaviour or any intelligence relating to the target ship. As soon as the order to board has been received, preparations will begin. These preparations will depend on the circumstances and mission, such as the nature and characteristics of the target ship, the type of boarding, the composition and size of the boarding party, means of transport (boat or helicopter), expected risks and measures to deal with them (operational risk management).

- **Preparation of the target ship for boarding**. At the same time as the team's own preparations, the target ship must also be prepared to receive the boarding party. This preparation will differ according to the type of boarding:

  - o In an unopposed boarding, the target ship will be asked to stop or to proceed very slowly. Arrangements will be made for preparing positions at which the boarding party can board (pilot ladder, landing or hovering spot for helicopter), for assembling crew and passengers and for having the necessary documents ready for inspection.

  - o In a non-cooperative boarding, steps will first need to be taken to persuade the ship to cooperate. If necessary, force will be used in the form of warning shots across the bow, non-disabling fire on non-vital parts of the ship (such as mast, funnel or cargo), or ultimately disabling fire on vital parts of the ship (propulsion, rudder, buoyancy). As soon as cooperation has been obtained, instructions for an unopposed boarding apply.

- o In an opposed boarding, there is no question of preparing the target ship. A different activity will be performed, usually by surprise, namely a **takedown operation** to take control of the ship. As soon as that takeover has succeeded, insertion of the rest of the boarding party will proceed.

- **Inserting the security team and securing the target ship**. Once the preparations on board both ships have been completed for an unopposed or non-cooperative boarding, the actual boarding will start with the insertion of the security team. They will ensure that the situation on board the target ship is safe enough for the rest of the boarding party.

Security team

- **Inserting the bridge team and search teams**. As soon as the target ship has been secured (after a takedown or by the security team), it will be boarded by the bridge team first, followed by the search team.

- **Inspection and search**. As soon as the entire boarding party is on board, the inspection itself will commence. The form and duration of the inspection depends entirely on the nature of the boarding and the objective of the operation. In some cases, it may be confined to the inspection of ship and cargo documentation and crew members' passports. If, however, there is any suspicion of trafficking or breach of an embargo, it may be necessary to perform a thorough search of the entire ship, including the cargo, to check for contraband. This can result in a lengthy inspection, during which interim relief will be required for the boarding party's subteams.

  The boarding party will use maritime search[389] techniques. On the one hand, this is because goods (drugs, weapons) or indications (forged documents) have often been deliberately concealed and are difficult to find. On the other hand, it ensures that all goods or indications will be preserved as evidence for criminal proceedings.

389 See box about Maritime search in Chapter 6, paragraph 6.8.2 (Picture compilation by teams).

- **Decision on the results and possible follow-up actions**. Once the inspection has been completed, a decision will be made regarding the results:

  o **Clearance of the vessel**. This brings the boarding to an end and the boarding party will return to its own ship in reverse order.

  o **Seizure of goods or detention of persons, followed by clearance of the vessel**. In this situation, the seized goods and/or detained persons will first need to be transferred to the naval ship. Withdrawal will then follow as for a cleared vessel.

  o **Seizure of the entire ship**. This changes the whole nature of the boarding; the boarding party's purpose is no longer to inspect, but to run the vessel into a roadstead or harbour. This usually means that part of the boarding party (usually the search team) will be relieved by technical and nautical specialists needed to (help) sail the ship. The seizure (and thus the boarding) will end when the ship is transferred to the appropriate authorities and the ship's personnel have re-embarked their own ship.

12.7 Follow-up actions to maritime security operations

A maritime security operation often results in the seizure of goods or the arrest of individuals. While this signifies completion of the military part of the action, completion of the law enforcement element has yet to follow. Depending on the legal basis, the following forms of follow-up action are possible:

- Besides the capture of enemy ships in a maritime blockade, there is also the possibility of taking neutral ships and/or goods as 'prize'. The prize capture is concluded by adjudication of the goods as prize.[390]
- In a maritime embargo, completion depends mainly on stipulations in the resolution that formed the legal basis for the embargo. Seized goods are generally declared forfeit. In some cases, the perpetrators will also face criminal prosecution.
- In counter-illicit-trafficking of goods such as drugs and weapons, the seized goods are usually destroyed and the traffickers prosecuted.
- In the case of violent crime, piracy and terrorism, the seized goods and equipment initially serve as evidence; in most cases, it will then be destroyed or declared forfeit. The perpetrators will face criminal proceedings.
- In the case of slave trading and human trafficking, the perpetrators will usually face criminal prosecution.

390 See box 'Contraband and prize capture of goods and ships' in Chapter 2 paragraph 2.7.1.3.

The success of the follow-up actions depends heavily on the correct and legitimate execution of the maritime operation. This applies particularly to actions designed to guarantee a fair and impartial legal procedure, such as the detention of suspects and the gathering and securing of evidence.

If an MSO results in criminal prosecution of the perpetrators, the crew of the naval ship, particularly the members of the boarding party, may be called up at a later date to appear as witnesses in the trial.

12.8 Concurrence with other maritime operations

In some cases, MSO take place simultaneously with other maritime operations, such as combat operations or maritime assistance.

In effect, they are only conducted at the same time as combat operations in the enforcement of a maritime blockade. A blockade is after all a method of warfare that occurs at the same time as maritime combat operations directed at the enemy.

Concurrence with the various forms of maritime assistance can occur in a number of ways. Paragraph 12.2 indicated that maritime law enforcement in national territorial waters is both an MSO and a form of maritime assistance to the competent authorities (in this case, the Public Prosecution Service). In many cases, there is concurrence with humanitarian assistance, for example for victims of piracy and human trafficking

Lastly, as part of the comprehensive approach, operations to counter violent crime and terrorism will normally coincide with other activities that fall under maritime assistance. One example of this is providing support and advice to local maritime security organisations such as the navy and the coastguard, and instructing and training their personnel (maritime capacity building in the context of security sector development).

13. MARITIME ASSISTANCE

13.1 Introduction

Maritime assistance is the collective term for operations and activities in which military power is put to use in the maritime domain to support diplomatic efforts or to support civil authorities.

- Maritime assistance to diplomacy occurs mainly in the context of the strategic functions of 'prevention' and 'coercion', and consists of military support of the diplomatic and economic instruments of power. Military power in the maritime domain is used to exert influence on other actors, mainly by means of presence.

- Maritime assistance to civil authorities occurs in the context of the strategic functions of 'stabilisation' and 'normalisation', and consists of military support for civil tasks such as humanitarian assistance, disaster relief and the enforcement of law and order. Military power will be deployed if civil authorities and organisations can no longer or not yet perform their tasks themselves ('safety net') or if specific military capacities are required ('structural partner').

The use of force is not usually involved in maritime assistance, but it may be required in some situations for the purposes of security and protection.

This chapter starts with a description of the various forms of maritime assistance to diplomacy, looking at showing the flag, naval diplomacy, maritime capacity building and maritime evacuation of civilians. The various forms of maritime assistance to civil authorities, including the role of coastguard organisations, will then be discussed. Firstly, assistance in response to an emergency, both at sea and from the sea, will be examined, followed by a look at the various forms of support, such as help in the enforcement of criminal law and public order and assistance in maritime monitoring. The chapter will close with a description of the various forms of support using specific maritime capacities and expertise.

13.2 Maritime assistance to diplomacy

Maritime assistance to diplomacy involves military activities in the maritime domain through which influence can be exerted on other actors. This influence serves to protect interests and achieve strategic objectives, and is largely based on presence and a show of power. Military activities endorse diplomacy by demonstrating resolve: on the one hand to reassure and support friendly actors and, on the other, to send a warning signal to potential adversaries.

Maritime assistance to diplomacy comprises the following activities:

- Showing the flag
- Naval diplomacy
- Maritime capacity building
- Maritime evacuation of civilians

13.2.1 Showing the flag

Showing the flag is a maritime presence for the purpose of establishing and maintaining friendly relations with other nations. The simplest way to show the flag is a routine visit by a naval ship to a foreign port. In more elaborate forms of showing the flag, the maritime presence will have another purpose, such as supporting state visits and trade missions. In many cases, it will be combined with maritime cooperation through joint exercises prior to and/or following on from the visit.

Showing the flag

13.2.2 Naval diplomacy

Naval diplomacy involves the use of the presence of maritime forces to endorse diplomatic statements. The aim of naval diplomacy is to prevent harm to national interests and to help force a change in behaviour on the part of other actors.

A much-used form of preventive naval diplomacy is the permanent maritime presence, whereby the presence of maritime forces serves to send out a warning signal to potential adversaries. Examples of this permanent maritime presence are the Netherlands Guard Ship in the Caribbean and NATO's standing maritime groups (SNMG and SNMCMG). Conducting maritime exercises, ideally together with military partners, is also part of preventive naval diplomacy. Both permanent and incidental maritime presence are also used for the targeted collection of data and intelligence.

Naval diplomacy may also have a more coercive character. This is the case, for example, where military presence is used to challenge an excessive legal claim of a coastal state by deliberately entering the disputed area in what is called a freedom of navigation operation. Naval diplomacy also represents a preparatory step for maritime power projection: the influencing of the situation on land by threatening to employ or actually employing offensive military capabilities.

Naval diplomacy is largely based on the physical presence of maritime forces. Although any naval ship is in principle suitable for this purpose, it is the type and number of ships that help to determine the importance of the presence. An aircraft carrier and an amphibious assault ship with embarked marine corps units make quite an impression, especially if they are accompanied by destroyers and frigates. The (potential) presence of a single submarine also sends a powerful political-military message.

13.2.3 Maritime capacity building

Maritime capacity building is the reinforcement of local maritime security services so that they will be able to cope with security problems independently. The need for maritime capacity building usually arises when local security services are not available or are unable to perform their task properly. Such situations are the maritime form of **security sector development** (SSD). Maritime capacity building may also take place if security services have to be re-established following a conflict or a transfer of power (**security sector reform**, SSR).[391]

Maritime capacity building centres on supporting, advising and training maritime security services such as the navy, coastguard and (harbour) police. Attention usually focuses on maritime capacities for law enforcement and protection, such as the ability to monitor and secure maritime borders and counter-piracy and counter-terrorism capabilities. Capacity building is not just about transferring means and practical skills, but extends to setting up an efficient and responsible organisation, guaranteeing democratic control and strengthening support and authority.

391 As well as the terms SSD and SSR, military capacity building is also referred to as security force assistance (SFA).

In most cases, maritime capacity building takes place in conjunction with other forms of assistance and reconstruction. One example of this is assistance in (re)building judicial systems, such as the legislature, the legal apparatus and the prison system, as criminal prosecution is an essential element of effective (maritime) law enforcement.

Maritime capacity building can take place either long term or on an incidental basis. Long-term assistance usually takes the form of a military mission, in which trainers and military advisors (often SOF)[392] are employed for a prolonged period. Incidental assistance is short term and usually takes place within the parameters of another operation or exercise. A ship visiting port

392 This belongs to the third task – military assistance (MA) – for (maritime) special operations forces; see Chapter 11 paragraph 11.3.3 (Maritime special operations).

Training as part of maritime capacity building

to replenish supplies during an operation, for example, could at the same time provide training for and conduct exercises with local maritime security services.

Maritime capacity building is easy to combine with other forms of maritime assistance, such as showing the flag and naval diplomacy. A good example of this is the Africa Partnership Station (APS) (see box).

Africa Partnership Station

The Africa Partnership Station (APS) is a unique combination of showing the flag, naval diplomacy and maritime capacity building. APS is a US initiative led by US Naval Forces Africa Command (USNAVAF). The idea behind it is that good governance of the maritime domain contributes to the stability, economic prosperity and security of countries in the region. The aim of APS is to further this governance by enhancing maritime situational awareness, maritime security structures and maritime infrastructure. To do so, maritime forces are deployed to educate, train and hold exercises for local organisations such as the coastguard, SAR organisations and fisheries inspectorates. This deployment is accompanied by showing the flag and by assistance to humanitarian organisations.

APS focuses on finding African solutions to global problems, based on long-term friendly relations. Since it began in 2007, APS has grown from a few port visit exchanges and briefings to a fully-fledged education and training programme, both at sea and on land.

Although the Africa Partnership Station is a US initiative, navies of other non-African countries also participate. The Africa Campaigns conducted regularly by units of the Belgian Naval Component, for example, are embedded in the APS programme. In addition, HNLMS Johan de Witt and HNLMS Rotterdam executed the APS programme for two months in various West African countries in 2009 and 2013 respectively.

Africa Partnership Station: handover of hydrographic sloops donated by the Netherlands to Senegal

13.2.4 Maritime evacuation of civilians

If the safety of a state's citizens abroad is compromised and the local authorities are no longer able to provide sufficient protection, it may become necessary to evacuate this designated civilian population. If the local situation deteriorates to such an extent that evacuation via civil and commercial channels is no longer possible, it may have to be conducted by and with the protection of military means. A military evacuation of designated civilians from a high-risk situation to a safe place is referred to as a **non-combatant evacuation operation** (NEO).[393]

An NEO is usually a national operation conducted at the initiative of the Ministry for Foreign Affairs. It is led by the head of the local diplomatic mission, such as the ambassador, the chargé d'affaires or a consul, who also decides who is eligible for evacuation as an entitled person (EP). If more countries decide to evacuate their citizens, the different national evacuations may be combined. It has been agreed within the EU, for example, that in the event of an evacuation, one country will take the lead and look after all European citizens (lead state concept).

An NEO usually involves the following steps:

- Notifying and assembling people who need to be evacuated. Notification is the task of the diplomatic mission. People are assembled at one or more previously designated sites (a reception centre or an evacuation point).

- The screening, selection and registration of entitled persons and, if necessary, provision of logistic and medical support. This is usually done in one central location, the evacuation control centre (ECC).

- Transportation of entitled persons and their possessions to a safe place. This transportation may be conducted straight from the ECC, or it could proceed via an embarkation site, for example to an air- or seaport.

393 For details, see AJP-3.4.2 Allied Joint Doctrine for Non-combatant Evacuation Operations.

Military support for an NEO is made up of security for the evacuation sites and routes, transport assets, provision of logistic, medical and other forms of support (e.g., communications). In terms of execution, this means that the military part of an NEO consists of the rapid deployment of a force, securing of the required locations (reception centres, ECC and embarkation sites), provision of transport and support, followed by withdrawal once the evacuation has been completed. It is extremely important that the planning for and the execution of these military activities are closely coordinated and synchronised with the local diplomatic mission.

An NEO is by definition a logistic operation that has to be conducted under pressure of time and in often chaotic circumstances, and success depends on precision, security and speed. Account must be taken, however, of the civil nature of the operation, which will involve the transportation of and care for elderly people, pregnant women, children and possibly even pets.

The evacuation itself can take place over land, by air, by sea or by a combination of these. It is said to be a maritime NEO if the evacuation is (partly) conducted with the aid of naval ships and marine corps units. A maritime NEO has several important advantages, especially if the evacuees are located near a coast or a river. Firstly, naval ships can generally reach the vicinity of the area in question without hindrance and remain there as a floating safe refuge. Furthermore, naval ships are self-sufficient and are in principle not dependent on local support. Lastly, boats launched from naval ships can evacuate people by way of rivers and internal waters.

In terms of planning and execution, the maritime part of an NEO is very similar to an amphibious raid and amphibious withdrawal).[394] This does not mean, however, that only amphibious units can conduct an NEO; in principle, any naval ship is suitable for the purpose. Larger units are obviously more suitable, as they have more facilities for transport, security, support and care.

Unlike an evacuation that is conducted purely over land or by air, it may be decided in a maritime NEO to set up an evacuation control centre not on land but on board the ship. Practice has shown that it is more efficient to evacuate all potential evacuees straight to the ship, after an initial safety check (for weapons, for example). Once on board, further selection, registration, reception and medical treatment will take place. This arrangement does, however, carry the risk that there may be people on board who are not classed as entitled persons and will thus have to disembark, although this risk is considered lower than the risk of possible errors made in the course of registration/selection in a chaotic situation on land.

394 See Chapter 11, paragraph 11.3.1 (Amphibious operations).

13.3 Maritime assistance to civil authorities

13.3.1 Forms of maritime assistance to civil authorities

Maritime assistance to civil authorities consists of military activities in the maritime domain for the purpose of conducting or supporting civil authority tasks. Military deployment for these tasks will generally take place if:

- civil capacities are non-existent or inadequate, for example in the areas of humanitarian assistance, disaster relief or law enforcement, or
- specific military capabilities are required, for example for EOD, diving activities or hydrographic surveys.

In virtually all forms of maritime assistance to civil authorities, military activities are performed under civil responsibility. The civil authorities concerned request the assistance, control its execution and can decide at any point that the military contribution is no longer required.

Maritime assistance to civil authorities takes place in and from the maritime domain. This means that help and support can be provided in the global commons of the high seas, within the territory of another state or in a state's own national territory.[395] The use of maritime capacity to assist civil authorities thus has both a national and an international component.

Maritime assistance to civil authorities takes the form of emergency response or support:

- **Emergency response** focuses on rescuing and assisting people (human safety). In the maritime domain, this emergency response consists of the provision of emergency assistance at sea (search and rescue, SAR) and the provision of emergency assistance from the sea to victims on land (humanitarian assistance and disaster relief, HADR). Paragraph 13.4 looks in more detail at these two forms of emergency response.

- **Support** consists of tasks performed by the military on behalf of a local civil authority, such as:
  - criminal enforcement of the rule of law;
  - enforcement of public order;
  - maritime monitoring (upholding administrative laws);
  - providing support and services with specific military capabilities or expertise.

  These tasks relate to security as well as to safety. Paragraph 13.5 looks in more detail at these different forms of maritime support to civil authorities.

395 For Belgium, the Netherlands and the Caribbean part of the Kingdom of the Netherlands, the various forms of military assistance and support are set out in a number of national laws and regulations. See footnote in Chapter 3, paragraph 3.4.7 (Normalisation).

13.3.2 *Coastguard tasks*

Various forms of maritime assistance to civil authorities are also classed as ‘coastguard tasks’. Many countries have a civil coastguard organisation, responsible for performing public duties in the maritime domain. These tasks are normally divided into service tasks and law enforcement tasks.

The **service tasks** performed by the coastguard consist of:

- monitoring and handling maritime distress, urgency and safety radio traffic;
- maritime emergency response, search and rescue (SAR);
- disaster relief and incident management;
- vessel traffic services.

Also included in the coastguard’s service tasks are specialist tasks such as buoyage of waterways, maritime traffic research and EOD.

The coastguard’s **law enforcement task** consists broadly of two types of law enforcement:[396]

- *Criminal investigation* refers to investigations conducted in connection with criminal offences such as terrorism, violent crime or trafficking of arms, drugs and people.
- *Monitoring and control* relates to the enforcement of administrative law, such as customs legislation, environmental legislation, shipping legislation, legislation on ships’ equipment, fisheries legislation and mining legislation.

The Netherlands and Belgium also have coastguard organisations set up for the execution of these public tasks in the maritime domain (see box). In principle, these coastguard organisations only perform their tasks within their areas of responsibility.[397] In some countries, the coastguard is also tasked with law enforcement on the high seas, examples being the Dutch Caribbean Coastguard and the US Coast Guard.
If military forces perform tasks for a local coastguard organisation, this is classed as maritime assistance to civil authorities.

The coastguard in the Netherlands, Belgium and the Caribbean

The coastguard is a civil organisation responsible for various service and law enforcement tasks in the maritime domain. Coastguard organisations such as this exist in the Netherlands, Belgium and the Dutch Caribbean, namely the Netherlands Coastguard, Belgian Coastguard and the Dutch Caribbean Coastguard. Because there are differences in the way the three coastguard organisations are set up, managed and equipped, a brief description of each of them is given below.

- **Netherlands Coastguard** is an independent civil organisation that performs tasks in the North Sea for the various government departments. The Ministry for Infrastructure and the Environment is the coordinating ministry for the coastguard, while the Ministry of Defence manages the executing part of the coastguard. The day-to-day management rests with the Director Coastguard, an officer of the Royal Netherlands Navy. >

396 For details, see Dutch ABW 27-10 *Handboek Maritieme Rechtshandhaving* [Handbook on Maritime Law Enforcement] and ABW 27-9 *Handboek Maritime Rechtshandhaving in het Caribisch Gebied* [Handbook on Maritime Law Enforcement in the Caribbean].

397 See Chapter 2, paragraph 2.4.4 (Law enforcement), paragraph 2.5.2 (International Convention on Search and Rescue), and others.

He has a permanently manned Coastguard Centre located in the same building as the MHQ ABNL in Den Helder. The Coastguard Centre serves as a central reporting, information and coordination centre and is also the National Maritime and Aeronautical Rescue Coordination Centre (RCC). Netherlands Coastguard has four ships and two patrol aircraft with which to perform its tasks. It can also call upon units belonging to the various ministries, such as naval ships, Royal Netherlands Marechaussee patrol vessels and maritime helicopters of the Ministry of Defence, the specialist vessels of the Department of Public Works and the patrol boats and helicopters of the National Police.

- The **Belgian Coastguard** is made up of the Coastguard Centre, which is responsible for ensuring efficient cooperation between the maritime activities of the 17 different government services at Flemish and federal level. The Centre consists of two services: the Maritime Rescue and Coordination Centre (MRCC) in Ostend and the Maritime Security Information Centre Belgium (MIK) in Zeebrugge. The MRCC is the first point of contact for ships in distress and it also coordinates rescue actions. The MIK has operators from the navy, the maritime and river police and customs officials working together to ensure that the law is also respected at sea. The Belgian Coastguard does not have its own assets, but it can use those of its government partners united in the coastguard structure.

- The **Dutch Caribbean Coastguard** is an alliance between the four countries of the Kingdom of the Netherlands, namely Aruba, Curaçao, St. Maarten and the Netherlands including the BES islands (Bonaire, St. Eustatius and Saba). It performs coastguard tasks for the various ministries of the Kingdom's four countries. The Minister of Defence is charged, on behalf of the Council of Ministers, with the management of the Dutch Caribbean Coastguard. The day-to-day management rests with the Flag Officer Caribbean (CZMCARIB) in his capacity as Director of the Dutch Caribbean Coastguard. At his disposal is the Coastguard Centre, which is based at Parera naval base on Curaçao and which is also home to the Rescue Coordination Centre (RCC Curaçao). The Dutch Caribbean Coastguard performs its tasks with three cutters (seagoing patrol ships), twelve Super RHIBs, five Boston Whalers, two maritime patrol aircraft and two helicopters. The seaborne units operate from the support facilities on Curaçao, Aruba, Bonaire and St Maarten, while the airborne assets are stationed at the Hato support facility at Curaçao airport. In addition, the organisation has a shore radar that covers the territorial waters of Aruba, Curaçao and Bonaire. As well as its own units, the Dutch Caribbean Coastguard also makes frequent use of CZMCARIB units such as the support ship HNLMS Pelikaan and the guard ship.

The cutters and a patrol aircraft belonging to the Dutch Caribbean Coastguard

The Netherlands Coastguard's two patrol aircraft

13.4 Emergency response at sea and from the sea

13.4.1 Emergency response at sea

Search and Rescue

As set out in Chapter 2, every seafarer has an obligation to do whatever he can to render assistance to persons in distress at sea, and international agreements have been made to guide this assistance.[398] Maritime units will also render assistance where necessary in the rescue of persons in distress. A search and rescue (SAR) action is always conducted in consultation with or by order of the Rescue Coordination Centre (RCC) responsible for the area in question. In many cases, naval ships will take on the role of on-scene commander (OSC).[399]

In the Netherlands, Belgium and the Caribbean, naval and air forces make a structural contribution to emergency response at sea by keeping ships and helicopters available for SAR on call.

Most SAR actions involve assistance to people who have got into difficulties as a result of an accident (such as a collision), adverse weather or technical problems. There are cases of assistance to persons in distress where the situation is more complicated, however, such as those involving boat refugees, human trafficking or illegal immigration. In these cases too, the saving of lives is obviously paramount, but after that the naval ship may have limited capacity for getting the distressed persons ashore. The solution will then need to be sought through diplomatic channels, often in consultation

398 See Chapter 2, paragraph 2.5.2 (International Convention on Maritime Search and Rescue)
399 For details on how SAR is conducted, see the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual and ATP-10 Search and Rescue.

with international organisations such as the International Organisation for Migration (IOM) and the Office of the United Nations High Commissioner for Refugees (UNHCR).

Another special form of emergency response at sea is that rendered to those on board ships that have fallen victim to piracy or hijacking. Naval ships that are involved in operations against violent crime and terrorism are often first on the scene and will help ship and crew on their way so that they can reach a safe harbour under their own steam.

Submarine Escape and Rescue

A special form of emergency response at sea is that involved in rescuing the crew of a submarine that has got into difficulties. A SAR action such as this requires specific capabilities, particularly those needed to rescue people from a sunken submarine in a submarine escape and rescue (SMER) operation. SMER is one of the few areas of military operation in which efforts are being made on a global scale to achieve standardisation and interoperability.[400]

Salvage

Besides the rescue of persons in distress, emergency response at sea may also refer to the help needed to salvage ships. As a rule, military assistance in salvage and towing only occurs if there is a need to avert a greater calamity (such as an environmental disaster or the obstruction of a shipping lane) and it is not possible to wait for the arrival of civil salvage vessels.[401]

400 See ATP-57 The Submarine Search and Rescue Manual

401 Guidelines for assistance from Dutch and Belgian naval ships in salvage operations are contained in ACZSK DOPS 124/EDIR ACOT-SPS-OPSNAV-NMSC-200/NCCM *Navigatie*, paragraph 3300 and Annex A (*Verklaring van afstand*/Waiver of claims).

13.4.2 Emergency response from the sea

As a result of a conflict or of a man-made or natural disaster, large groups of people can end up in an emergency situation. If local authorities and non-governmental humanitarian organisations are not yet or no longer able to cope with such an emergency situation, military deployment may be necessary to alleviate the worst of the suffering. This military deployment is known as **humanitarian assistance and disaster relief** (HADR). HADR is made up of all sorts of assistance designed to alleviate human suffering, such as:

- reception of refugees;
- provision of basic necessities (water, food, shelter);
- saving lives and providing urgent medical treatment;
- providing protection.

Military deployment for the provision of HADR is generally of limited duration: it will end as soon as civil authorities and humanitarian organisations are (again) able to cope with the relief effort themselves.

Although HADR relates to a situation on land, there is an important role for maritime forces to play. They are able to provide independent assistance in coastal regions, certainly if those areas have become difficult to reach in other ways. Naval ships have their own capacity for producing drinking water and are equipped with (mobile) means for transport, communication, firefighting, energy supplies and medical treatment. Amphibious assault ships and marine corps units in particular can be extremely useful, although any naval ship is in principle able to function as a sea base for the provision of HADR to people on land.[402]

402 For more details about techniques and procedures for emergency response from the sea, see ATP-3.4.1.2 Multinational Maritime Support of Humanitarian Operations.

HADR from the sea

In the Dutch Caribbean, Dutch maritime units also make a structural contribution to the provision of humanitarian assistance. During the hurricane season, which runs from June to November, ships and marine corps units are on call to provide HADR, both on the Kingdom's islands and in other countries in the region.

13.5 Maritime support to civil authorities

13.5.1 Criminal enforcement of the rule of law

Criminal enforcement of the rule of law involves supporting the police and judicial authorities in criminal investigations. Enforcement of criminal law in the maritime domain by maritime forces in principle falls under the heading of maritime security operations. If this enforcement takes place in national waters, however, it is also said to be maritime assistance. It is conducted in the same way as described in Chapter 12, by, for example, intelligence collection and by the boarding and if necessary seizure of ships.

Maritime assistance in national law enforcement takes place on an incidental as well as a structural basis. On an incidental basis, naval ships and marine corps units can, by order of a criminal investigator, take action against maritime crime, for example by conducting boardings and HROs on (complex) maritime objects such as passenger ships and oil rigs. In both the Netherlands and Belgium, the structural contribution consists of the on-call availability of a ready duty ship (RDS). In the Netherlands, the structural contribution to this task also includes the two composite units for harbour protection[403] and the collection, where possible, of relevant data relating to suspect shipping.[404]

403 See box on harbour protection in Chapter 12, paragraph 12.5 (Countering violent crime and terrorism in the maritime domain).
404 These are mainly data about ships for which the coastguard has issued a "watchlist alert" because they are of interest to law enforcement agencies or controlling organisations.

13.5.2 *Enforcement of public order*

This task involves the provision of support to local authorities to restore and maintain law and order. Although this does not strictly speaking fall under maritime operations, this form of support may occur in various forms of maritime operations. In a disaster relief operation, for example, it may (also) be necessary to implement measures to prevent looting and theft. In such cases, part of the ship's crew or the marine corps unit will be given the task of maintaining law and order. In principle, they will do so under the direction of the local authorities (e.g., the local police).

13.5.3 *Maritime monitoring*

Maritime monitoring is the provision of support to civil authorities and organisations for the enforcement of administrative law, for example to prevent contraventions of customs, fiscal, public health, fishing, mining, environmental and traffic regulations. The execution of this task takes one of two forms. Firstly, each maritime unit serves as the eyes and ears of the authorities; they are obliged to document and report any observed or suspected contravention of the regulations. Follow-up actions (such as the imposition of fines) will then be taken by the relevant authorities, often through the intermediary of the coastguard. Maritime units may also be employed as a platform for conducting inspections. This method usually bears a strong resemblance to the execution of a boarding, albeit that the boarding party is generally smaller and consists partly or mainly of supervisory officials from the relevant inspecting body.

Although maritime monitoring is in principle a national task, it may also be conducted in an international setting. In such cases, monitoring is confined to observing and reporting possible contraventions to the local or international requesting authority.

13.5.4 *Support and services with specific military capabilities or expertise*

In some cases, civil authorities need specific capabilities or expertise that can only be provided by the military. These include specific military capabilities intended for maritime operations.

Maritime explosive ordnance disposal

Explosive ordnance disposal (EOD) is a specialist skill that in most countries is reserved for the military. In the Netherlands and Belgium, this task is performed by the Defence Explosive Ordnance Disposal Service (*EODD*) and the Explosive Ordnance Disposal Service (*DOVO*), respectively. These joint organisational elements also incorporate expertise for EOD in the maritime domain: in the Netherlands, this is in the form of the Maritime EOD Company (*MAREODCie*). Because of their maritime expertise, these specialists are employed in all situations where explosives are found in the water, for example internal waters, rivers, canals and lakes. They are also employed in cases where subsurface explosives such as sea mines and torpedoes are found on land.

Maritime assistance in EOD in Albania

Dutch and Belgian MCM vessels also have mine clearance diving teams, which can dispose not only of sea mines, but also of **unexploded explosive ordnance** (UXO) that has been left in the sea (see box).

Disposal of unexploded explosive ordnance at sea

UXO that has been left behind poses a danger not only to shipping but also to other activities at sea, such as fishing, mining and thus also military operations. This UXO could have remained in the sea following a past conflict because it missed its target or failed to detonate. It may also have been deliberately dumped in the sea in (former) ammunition dumping grounds or it could have fallen into the water by accident (spilled load). This mainly concerns (the remains of):

- sea mines;
- dropped munitions (e.g., aerial bombs);
- rockets, guided missiles and torpedoes;
- gun and mortar ammunition.

Because most abandoned munitions are located on the seabed (or in its uppermost layers), they pose a danger for activities near the seabed and in shallow water. When operating with submarines and conducting MCM, amphibious or riverine operations, therefore, it is vital to have an idea of the possible presence of UXO in the area of operations.

UXO is dangerous for all users of the sea and it must therefore be cleared as quickly as possible after detection. This EOD is a coastguard task that is performed by the military. Both the Dutch and Belgian navies have ships and EOD teams on permanent standby to clear UXO on the Belgian and Dutch sectors of the continental shelf. Regular participation also takes place in operations by other countries, to clear UXO left in their waters following past conflicts, for example in the Baltic Sea.

Diving assistance

With their range of specialist diving skills,[405] the military can provide various forms of assistance to civil authorities and organisations, some examples being:

- Assistance to the police and justice authorities in underwater searches, for example for missing persons or for criminal evidence (such as weapons).
- Assistance to the coastguard in searching for persons lost at sea, for example in sunken ships or crashed aircraft, and in clearing subsurface obstacles.
- Assisting the fire service in the rescue of persons or vehicles from the water.
- Assisting civil authorities and waterway managers in the clearance of subsurface obstacles.
- Assisting investigative organisations in investigations of diving accidents and incidents (diving-related assistance).

Both in the Netherlands and in Belgium, diving teams are permanently available for these tasks. Furthermore, this diving assistance can also be provided abroad, for instance to clear obstacles in harbours and help in the search for missing persons as part of a disaster relief operation following an earthquake.

Diving assistance

Diving medical assistance

Because of the many diving activities, both the Dutch and Belgian navies have extensive facilities and expertise in the field of diving medicine. The Diving Medical Centre (DMC) in Den Helder and the Centre for Diving and Hyperbaric Medicine in Zeebrugge have pressure and decompression tanks and diving medical personnel. Both centres have on-call availability for the treatment of casualties of diving accidents and other accidents involving overpressure.

405 See Chapter 9, paragraph 9.2.7 (Diving teams).

Charting the waters

Unlike the situation in Belgium, where the hydrographic task is in the hands of a civil organisation (Flemish Hydrography), in the Netherlands, the task of charting the waters of the Kingdom (in the Netherlands as well as in the Caribbean) is assigned to the Hydrographic Service, part of the Royal Netherlands Navy. In the Netherlands, therefore, this task is a form of maritime assistance to civil authorities.

The hydrographic task can also be performed to assist foreign civil authorities; for example, re-charting channels and harbours as part of a disaster relief operation following an earthquake or tsunami, in order to establish quickly whether they can be used for the supply of relief goods. Another example is assistance in charting parts of the sea, navigable waters and rivers on which there is no data or on which the information is obsolete or unreliable.

Hydrographic surveys in the port of Monrovia (Liberia) in the context of the Africa Partnership Station in 2009

Assistance of maritime engineer and transport capacity

For the purpose of conducting amphibious operations, maritime forces have specific engineer and transport capacity that is specially suited to use on the boundary between land and water. Examples of these are landing craft and the beach armoured recovery vehicle (BARV). These assets can be employed to assist in rescue and salvage tasks at poorly accessible or poorly navigable sites such as beaches, sand flats and islands.

Beach armoured recovery vehicles

KEY WORD INDEX

D

T

ABBREVIATIONS

A

AAV	Approach and Assist Visit
AAW	Anti-Air Warfare
AAWC	Anti-Air Warfare Commander
ABNL	Admiral Benelux
ACINT	Acoustic Intelligence
ACA	Airspace Control Authority
ACC	Air Component Commander
ACM	(1) Airspace Control Measures
	(2) Acoustic Countermeasures
ACO	Airspace Control Order
ACZSK	Royal Netherlands Navy Directive
ADC	Air Defence Commander
ADIV	(Belgian) General Intelligence and Security Service
AEW	Airborne Early Warning
AI	Air Interdiction
AIP	Air Independent Propulsion
AIS	Automatic Identification System
AJP	Allied Joint Publication
ALSS	Advanced Logistic Support Site
AML	Additional Military Layer
AOA	Amphibious Objective Area
APS	Africa Partnership Station
ART	Advanced Resuscitation Team

ASEAN	Association of Southeast Asian Nations
ASIAP	Active Sonar Interference Avoidance Plan
ASMD	Anti-Ship Missile Defence
ASW	Antisubmarine Warfare
ASWC	Antisubmarine Warfare Commander
ASUW	Antisurface Warfare
ASUWC	Antisurface Warfare Commander
ATO	Air Tasking Order
ATP	Allied Tactical Publication
AVPD	Autonomous Vessel Protection Detachment
AWNIS	Allied Worldwide Navigational Information System
AWSM	Acoustic Warfare Support Measures

B

BARV	Beach Armoured Recovery Vehicle
BDA	Battle Damage Assessment
BDR	Battle Damage Repair
BMD	Ballistic Missile Defence

C

C2	Command & Control
CAOC	Combined Air Operations Centre
CAP	Combat Air Patrol
CAS	Close Air Support
CASP	Coordinated Air/Sea Procedures
CATF	Commander Amphibious Task Force
CBRN	Chemical, Biological, Radiological and Nuclear
CCIR	Commander's Critical Information Requirement
CCIRM	Collection Coordination and Intelligence Requirements Management
CCOI	Critical Contact of Interest
CDA	Collateral Damage Assessment
CHOD	Chief of Defence
CI	Counter-intelligence
C-IED	Counter-IED
CIMIC	Civil-Military Cooperation
CIS	Communication & Information System
CLF	Commander Landing Force
CLS	Combat Life Saver
CMS	Combat Management System
CNA	Computer Network Attack
CND	Computer Network Defence
CNE	Computer Network Exploitation
CNO	Computer Network Operations

COI	Contact of Interest
COLPRO	Collective Protection
COLREGS	Convention on International Regulations for Preventing Collisions at Sea
COMINT	Communications Intelligence
COMPLAN	Communications Plan
COMPUSEC	Computer Security
CONTCO	Contingent Commander
COP	Common Operational Picture
CRC	Control and Reporting Centre
CSS	Combat Service Support
CSSA	Combat Service Support Area
CTF	Task Force Commander
CTG	Task Group Commander
CZMCARIB	Netherlands Flag Officer in the Caribbean

D

DCA	Defensive Counter-Air
DDG	(Netherlands) Defence Diving Group
DLM	Depot Level Maintenance
DOVO	(Belgian) Explosive Ordnance Disposal Service

E

ECC	Evacuation Control Centre
ECDIS	Electronic Chart Display and Information System
ECM	Electronic Countermeasures
EEFI	Essential Element of Friendly Information
EEZ	Exclusive Economic Zone
ELINT	Electronic Intelligence
EMCON	Emission Control
EOD	Explosive Ordnance Disposal
EODD	(Netherlands) Explosive Ordnance Disposal Service
EPM	Electronic Protective Measures
ESM	Electronic Warfare Support Measures
EU	European Union
EW	Electronic Warfare
EWC	Electronic Warfare Coordinator
EXTAC	Experimental Tactic

F

FAC	Fast Attack Craft
FF/DC	Firefighting and Damage Control
FFIR	Friendly Forces Information Requirement
FIR	Flight Information Region
FLC	Force Logistic Coordinator
FLS	Forward Logistic Site
FPB	Fast Patrol Boat
FRAGO	Fragmentary Order
FRISC	Fast Raiding Intercept and Special Forces Craft
FRONTEX	*Frontières Exterieures* (European agency)
FSCM	Fire Support Coordination Measures

G

GLC	Group Logistic Coordinator

H	
HADR	Humanitarian Assistance and Disaster Relief
HAG	Helicopter Action Group
HF	High Frequency (radio)
HNS	Host Nation Support
HNLMS	His/Her Netherlands Majesty's Ship
HRO	Hostage Release Operation
HUMINT	Human Intelligence
HVI	High Value Individual
HVU	High Value Unit
I	
I&W	Indication and Warning
ICAO	International Civil Aviation Organization
ICP	Intelligence Collection Plan
ICR	In-Country Resources
IDCRIT	Identification Criteria
IED	Improvised Explosive Device
IEDD	IED Disposal
IFF	Identification Friend or Foe
IHL	International Humanitarian Law
ILM	Intermediate Level Maintenance
IMINT	Imagery Intelligence
IMO	International Maritime Organization
InfoOps	Information Operations
INFOSEC	Information Security
IPE	(1) Intelligence Preparation of the Environment (2) Individual Protective Equipment
IPROM	Internal Protection Measure
IRTC	Internationally Recommended Transit Corridor
ISAR	Inverse Synthetic Aperture Radar
ISPS	International Ship and Port Facility Security Code
ISR	Intelligence, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
J	
JFC	Joint Force Commander
JIATFS	Joint Interagency Task Force South
JISTARC	(Netherlands) Joint ISTAR Command
JOR	Joint Operations Room
JPTL	Joint Prioritised Target List
JRFL	Joint Restricted Frequency List
JSS	Joint Support Ship
K	
KCT	(Netherlands) Army Commando Corps
KLE	Key Leader Engagement

L

LCC	Land Component Commander
LEDET	(US Coast Guard) Law Enforcement Detachment
LF	(1) Landing Force
	(2) Low Frequency (radio)
LPD	Landing Platform Dock
LRAD	Long-Range Acoustic Device
LRIT	Long-Range Identification and Tracking
LTT	Lines-to-Take

M

MAD	Magnetic Anomaly Detector
MAOC-N	Maritime Analysis and Operations Centre-Narcotics
MAREODCie	(Netherlands) Maritime EOD Company
MARPOL	International Convention for the Prevention of Pollution from Ships
MARSOF	Maritime Special Operations Forces
MCC	Maritime Component Commander
MCCIS	Maritime Command and Control Information System
MCG	Marine Combat Group
MCM	Mine Countermeasures
MCP	Main Command Post
MDA	Mine Danger Area
MEDEVAC	Medical Evacuation
MEU	Mission Essential Unit
MF	Medium Frequency (radio)
MFSF	Mobile Forward Support Facility
MHQ ABNL	Maritime Headquarters Admiral Benelux
MIK	Maritime Security Information Centre
MINT	Maritime Intelligence Team
MIO	Maritime Interdiction Operation
MIVD	(Netherlands) Military Intelligence and Security Service
MLA	(Netherlands) Military Aviation Authority
MPA	Maritime Patrol Aircraft
MSA	Maritime Situational Awareness
MSO	Maritime Security Operations
MSR	Main Supply Route
MTA	Mine Threat Area

N

NAI	Named Area of Interest
NATO	North Atlantic Treaty Organization
NCAGS	Naval Cooperation and Guidance for Shipping
NDD	Netherlands Defence Doctrine
NEDB	NATO Emitter Database
NEO	Non-combatant Evacuation Operation
NFS	Naval Fire Support
NGO	Non-Governmental Organisation
NIPOC	National Intelligence Point of Contact
NIST	National Intelligence Support Team
NLMARFOR	Netherlands Maritime Force

NMW	Naval Mine Warfare
NMWMSC	(ABNL) Naval Mine Warfare Mission Support Centre
NOTAM	Notice to Airmen
NQS	Noise Quiet State
NSC	NATO Shipping Centre
NSL	No-Strike List
NSO	NATO Standardization Organisation
NSWAN	NATO Secure Wide Area Network
NtM	Notice to Mariners
NVG	Night Vision Goggles

O

OCA	Offensive Counter-Air
OLM	Organic Level Maintenance
OPCOM	Operational Command
OPCON	Operational Control
OPGEN	Operational General Matters
OPLAN	Operation Plan
OPORD	Operation Order
OPSEC	Operations Security
OPTASK	Operational Tasking
ORM	Operational Risk Management
OSC	On-Scene Commander
OSINT	Open-Source Intelligence
OTC	Officer in Tactical Command
OTHT	Over-the-Horizon Targeting

P

PA	Public Affairs
PCRS	Primary Casualty Receiving Ship
PI	(1) Protective Interests
	(2) Public Information
PIR	Priority Intelligence Requirement
PMC	Passengers, Mail, Cargo
PMI	Prevention of Mutual Interference
POD	Port of Debarkation
POE	Port of Embarkation
PoL	Pattern of Life
POL	Petroleum, Oils and Lubricants
PPI	Political Policy Indicator
PPS	Political Policy Statement
PR	Personnel Recovery
PsyOps	Psychological Operations
PTL	Prioritised Target list

R

RADFREQPLAN	Radar Frequency Plan
RADHAZ	Radar and Radio Radiation Hazard
RAG	Riverine Action Group
RAP	Recognised Air Picture
RAS	Replenishment at Sea
RCC	Rescue Coordination Centre
RCS	Radar Cross Section

RDS	Ready Duty Ship
REA	Rapid Environmental Assessment
REMUS	Remote Environmental Measuring UnitS (type of UUV)
REP	Recognised Environmental Picture
RFI	Request for Information
RHIB	Rigid Hull Inflatable Boat
RI&E	Risk Identification and Evaluation
RMP	Recognised Maritime Picture
ROE	Rules of Engagement
RPG	Rocket-Propelled Grenade
RSOM	Reception, Staging and Onward Movement
RSP	Recognised Surface Picture
RTL	Restricted Target List

S

SACEUR	Supreme Allied Commander Europe
SATCOM	Satellite Communication system
SAG	Surface Action Group
SAM	Surface-to-Air Missile
SAR	Search and Rescue
SAU	Search and Attack Unit
SBAD	Surface-Based Air Defence
SCC	(NATO) Surveillance Coordination Centre
SCP	Shipping Cooperation Point
SEWACO	Sensor, weapon and command system
SFG	(Belgian) Special Forces Group
SHF	Super High Frequency (radio)
SIGINT	Signals Intelligence
SLOC	Sea Lines of Communication
SMER	Submarine Escape and Rescue
SNMG	Standing NATO Maritime Group
SNMCMG	Standing NATO Mine Countermeasures Group
SNR	Senior National Representative
SOCC	Special Operations Component Command
SOF	Special Operations Forces
SOLAS	International Convention for the Safety of Life at Sea
SOP	Standing Operating Procedure
SPVDS	Self-Propelled Variable Depth Sonar
SRR	Search and Rescue Region
SSD	Security Sector Development
SSG	Sea-based Support Group
SSM	Surface-to-Surface Missile
SSR	Security Sector Reform
SSSB	Ship-Shore-Ship Buffer
STANAG	NATO Standardization Agreement
STOM	Ship-to-Objective Manoeuvre
StratCom	Strategic Communication
STUFT	Ship Taken Up From Trade
SUA	International Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation
SUBOPAUTH	Submarine Operating Authority

T

TACOM	Tactical Command
TACON	Tactical Control
TAI	Target Area of Interest
TCM	Torpedo countermeasure
TDA	(1) Tactical Decision Aid
	(2) Torpedo Danger Area
TDS	Tactical Data System
TEE	Tactical Exploitation of the Environment
TEWA	Threat Evaluation and Weapon Assignment
TF	Task Force
TG	Task Group
TIM	Toxic Industrial Material
TNL	Target Nomination List
TPT	Third Party Targeting
TRA	Temporary Reserved Airspace
TRiM	Trauma Risk Management
TRU	Target Reporting Unit
TSS	Traffic Separation Scheme
TST	Time-Sensitive Target

U

UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UHF	Ultra High Frequency (radio)
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
USV	Unmanned Surface Vehicle
UUV	Unmanned Underwater Vehicle
UXO	Unexploded Explosive Ordnance

V

VDS	Variable Depth Sonar
VERTREP	Vertical Replenishment
VHF	Very High Frequency (radio)
VLF	Very Low Frequency (radio)
VOCI	Vessel of Collection Interest
VOD	Vertical Onboard Delivery
VPD	Vessel Protection Detachment
VRMTC	Virtual Regional Maritime Traffic Centre
VSWMCM	Very Shallow Water Mine Countermeasures
VTS	Vessel Traffic Services

W

WCO	Weapon Control Order
WSM	Waterspace Management