MEĐUNARODNI SUSTAV SIGURNOSTI PLOVIDBE

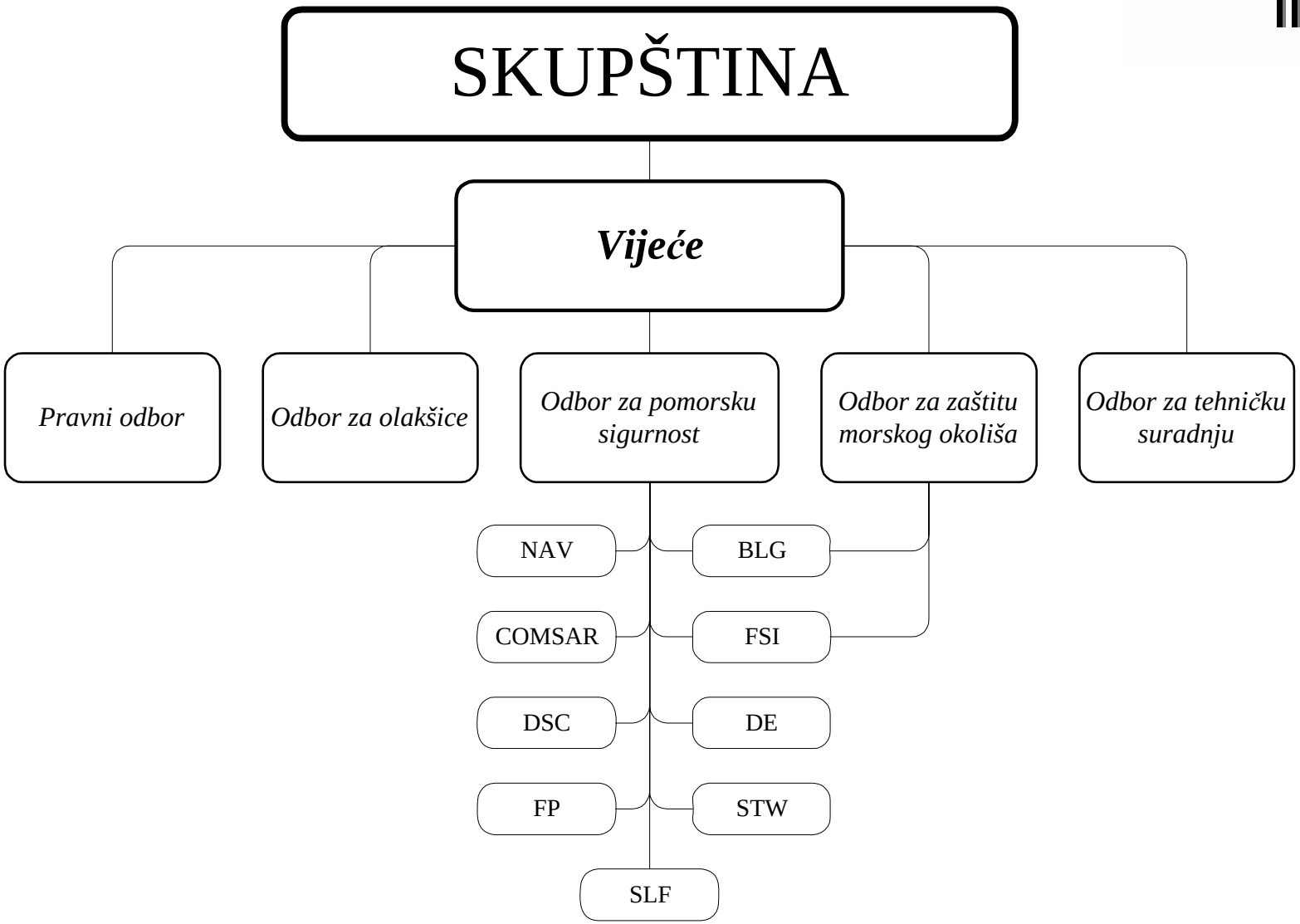
- **Međunarodna razina**
  - međunarodne organizacije
    - službene i neslužbene
  - međunarodne konvencije i preporuke

- **Državna razina**
  - uprava i pridružene ustanove
    - zakoni i podzakonski propisi

- **Razina primjene**
  - svakodnevna praksa
    - preporuke strukovnih udruženja

IMO

IMO

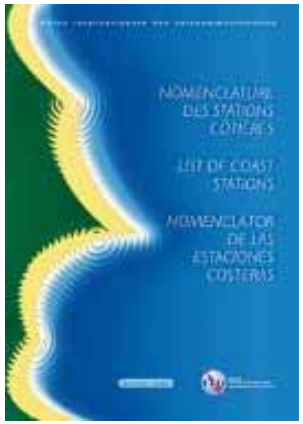

SKUPŠTINA
Vijeće
Pravni odbor
Odbor za olakšice
Odbor za pomorsku sigurnost
Odbor za zaštitu morskog okoliša
Odbor za tehničku suradnju
NAV
BLG
COMSAR
FSI
DSC
DE
FP
STW
SLF

ITU

- Plenipotentne konferencije
  - Vijeće,
  - Svjetske konferencije o međunarodnim telekomunikacijama
- Svjetske/regionalne konferencije (skupštine) o radiokomunikacijama
- Svjetska skupština za standardizaciju
- Svjetske/regionalne konferencije o razvoju telekomunikacija
- Tajništvo
  - Odjel za razvoj telekomunikacija
    - *Telecommunication Development Sector ITUD*,
  - Odjel za standardizaciju telekomunikacija
    - *Telecommunication Standardization Sector ITU-T*
  - Odjel za radiokomunikacije
    - *Radiocommunication Sector ITUR*

ITU

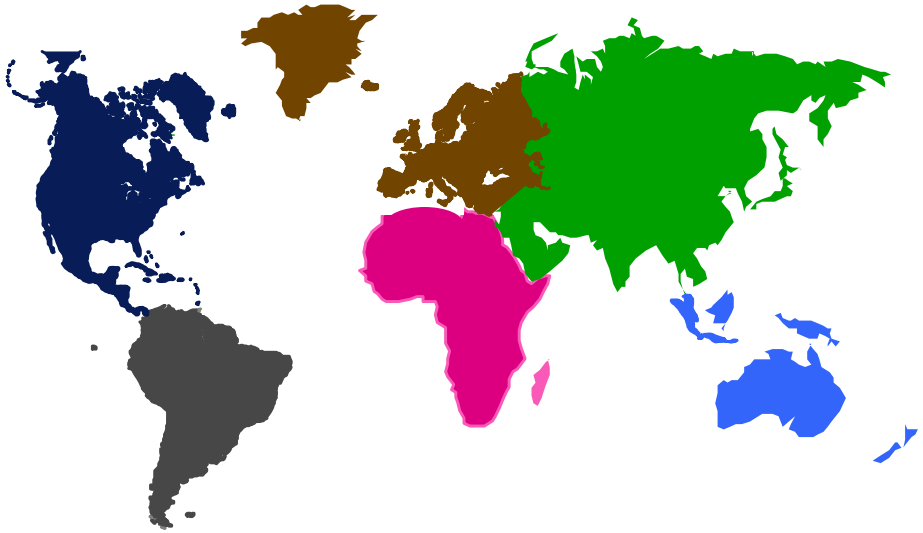
- Osnovni dokumenti
  - Radio pravilnik (Radio regulations)
- Izvedeni dokumenti
  - Manual for use by Maritime Mobile and Maritime Mobile Satellite Services
  - List IV List of Coast Stations
  - List V List of Ship Stations
  - List VI List of Radiodetermination and Special Service Stations
  - List VII A List of Call Signs and Numerical Identities



WMO

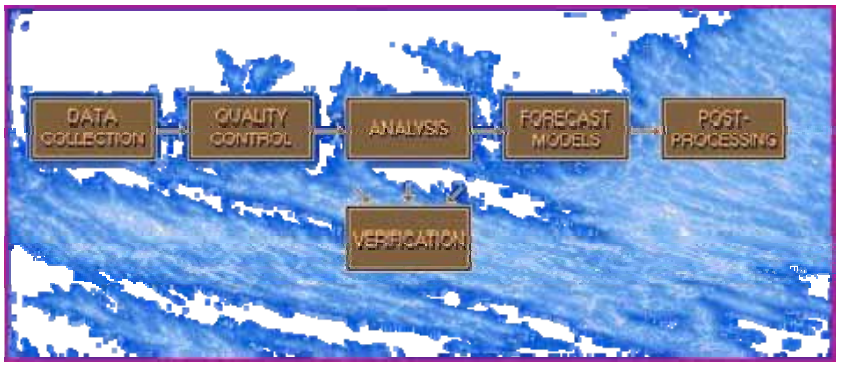
- Svjetski meteorološki kongres

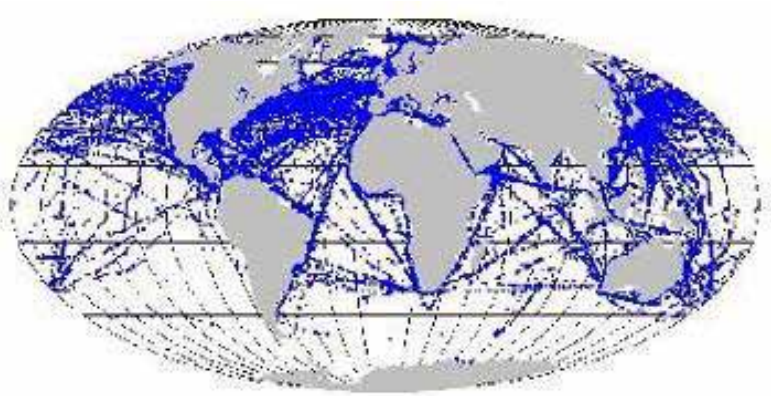
- Izvršni odbor
- Regionalne meteorološke udruge
  - Afrika, Azija, Južna Amerika, Sjeverna Amerika, Središnja America i Karibi, Jugozapadni Pacifik i Europa
- Tehnički odbori (8)
  - Technical Commission for Oceanography and Marine Meteorology (JCOMM)
- Tajništvo

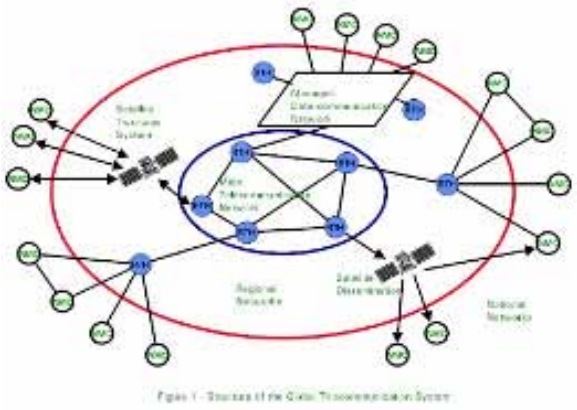


WMO

- World Weather Watch – WWW
  - Global DataPprocessing and Forecasting System – GDPFS
    - World Meteorological Centres (WMCs) - 3
    - Regional Specialized Meteorological Centres (RSMCs) – 25
      - *RSMCs Tropical cyclone forecasting 6*
    - National Meteorological Centres (NMCs),
  - Global Observing System (GOS)
    - površinsko motrenje
    - visinsko motrenje
    - pomorsko motrenje (VOS)
    - zrakoplovno motrenje
    - satelitsko motrenje
  - Global Telecommunication System (GTS)



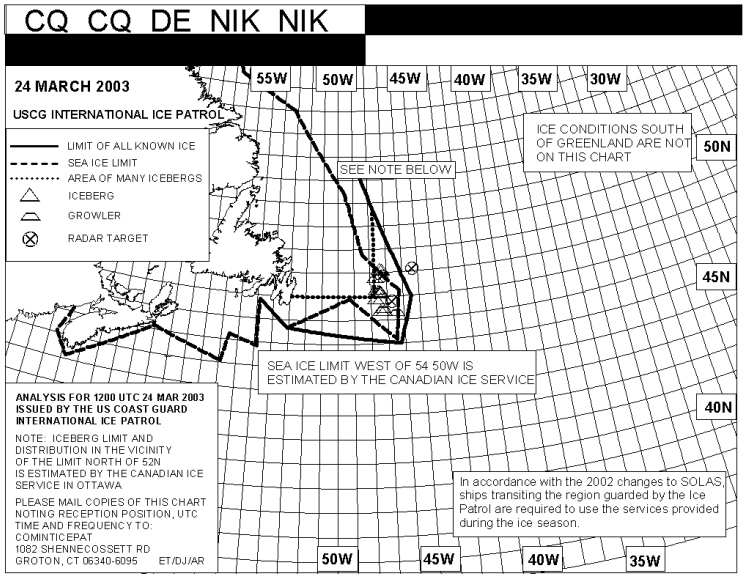


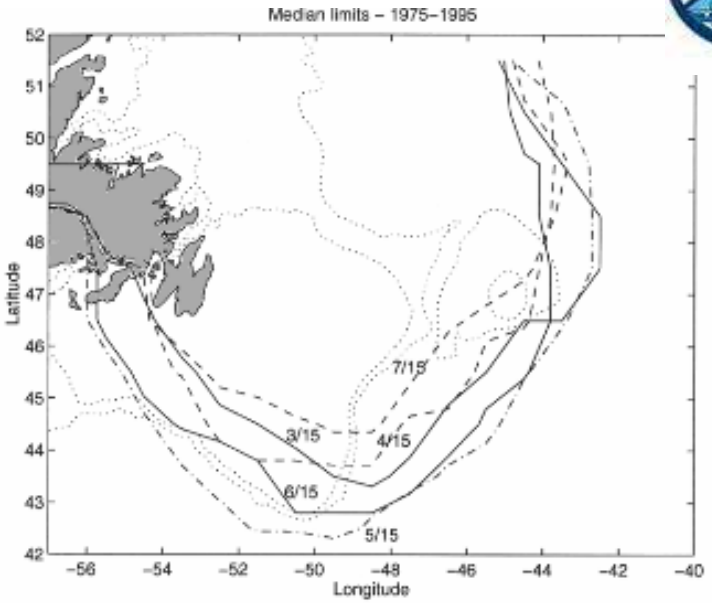


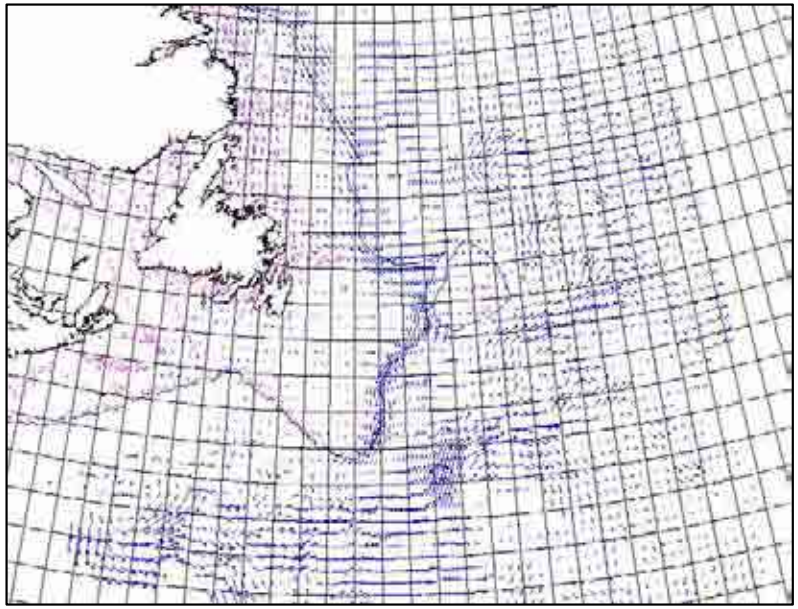
IHO & IALA

- International Hydrographic Organization
  - udruga nacionalnih hidrografskih ureda
  - osnovana1925, Monaco
  - zadaće:
    - izrada INT karata, suradnja i razvoj hidrografije, standardizacija ENC i ECDIS sustava (S57)
- International Association of Lighthouse Authorities
  - udruga ustanova za održavanje plovnih putova i srodnih gospodarskih subjekata
  - osnovana 1957.
  - odbori:
    - Electronic Navigation
    - Aids to Navigation Management
    - Engineering, Environmental and Preservation
    - Vessel Traffic Services
    - Pilotage Authority Forum
    - Legal Advisory Panel

Međunarodna služba nadzora leda



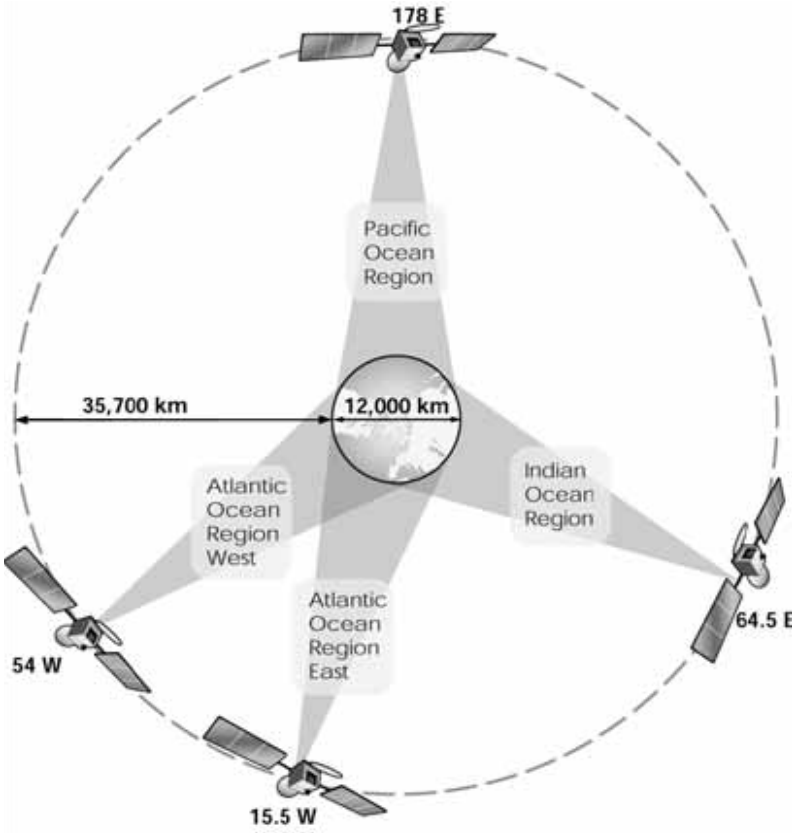


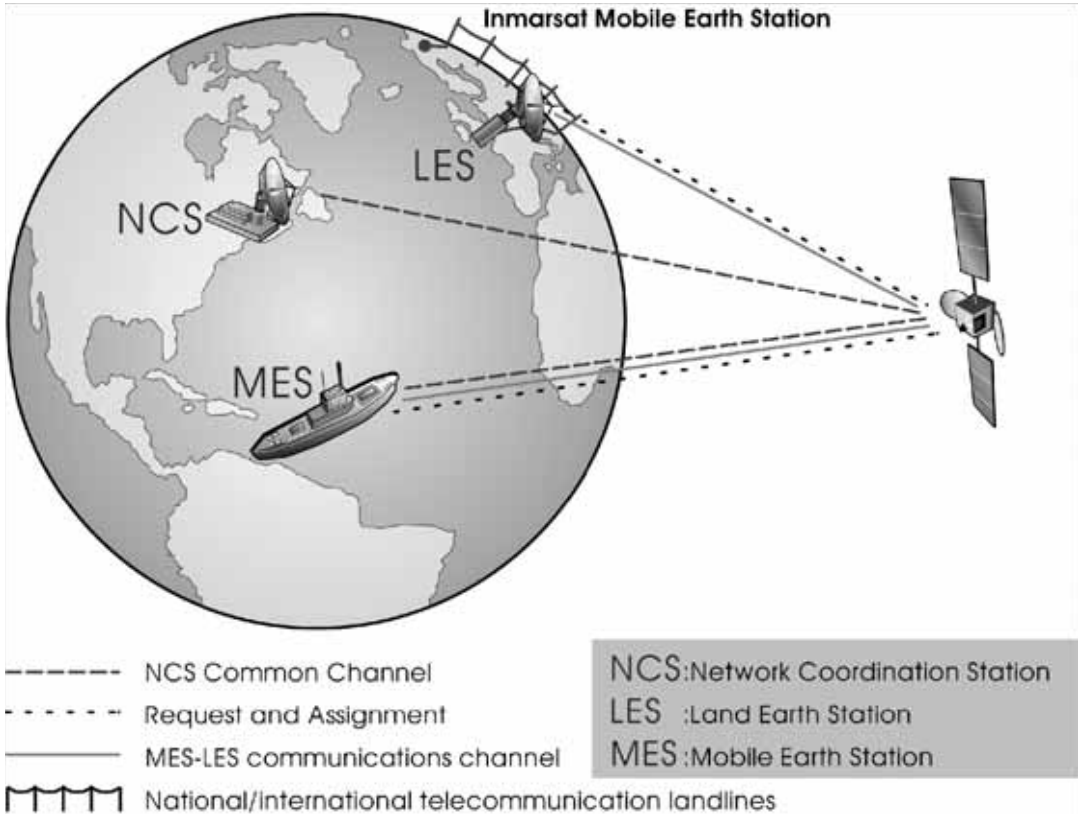


IMSO

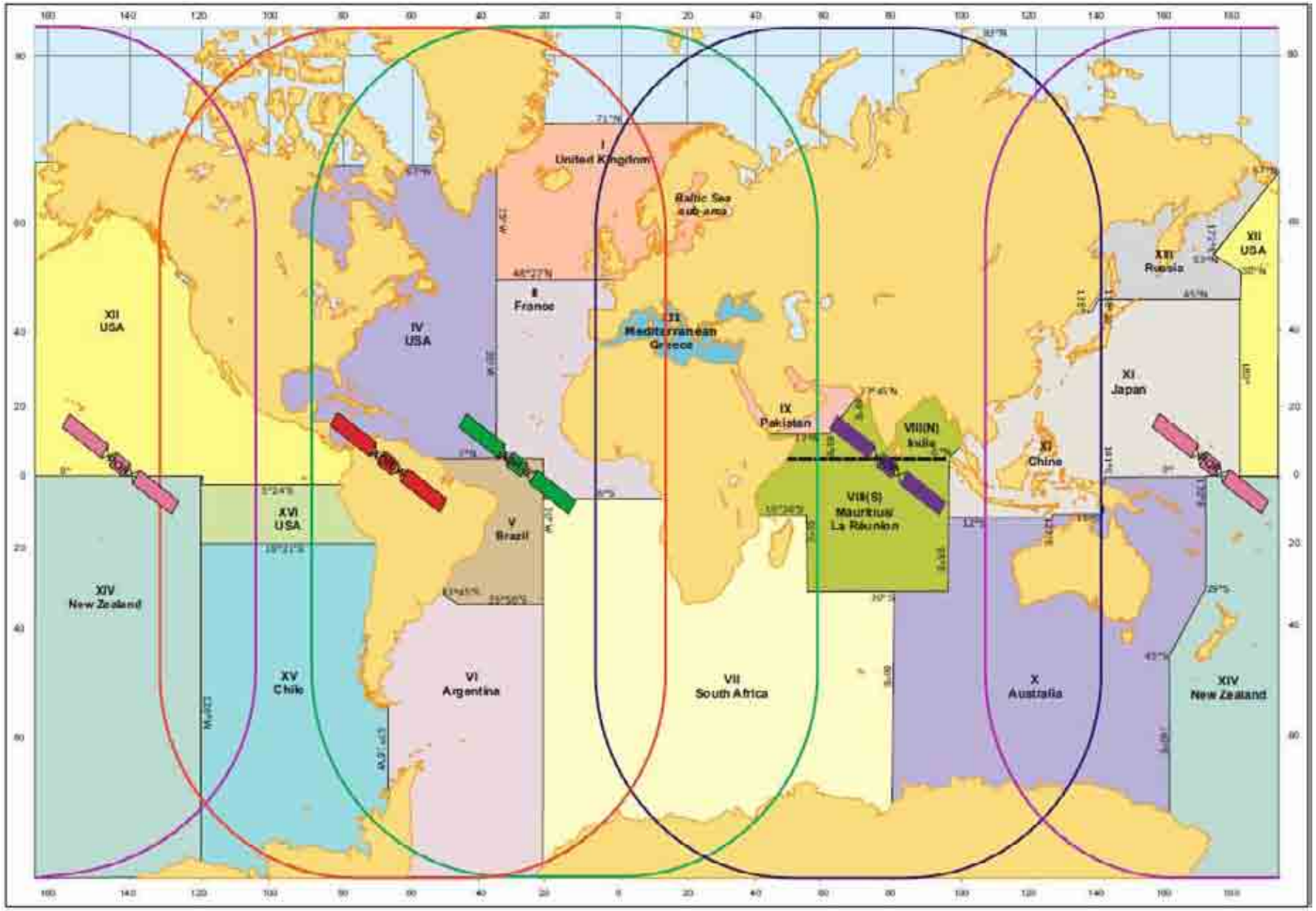
- Convention on the International Maritime Satellite Organization, 1976
- Convention on the International Mobile Satellite Organization (IMSO), 1998
- Zadaće:
  - GMDSS (IMO)
  - distress alerting
    - search and rescue coordinating communications
    - maritime safety information (MSI) broadcasts
    - general communications
  - aeronautical safety AMS(R)S services (ICAO)
- Public Services Agreement (PSA) <> INMARSAT

INMARSAT

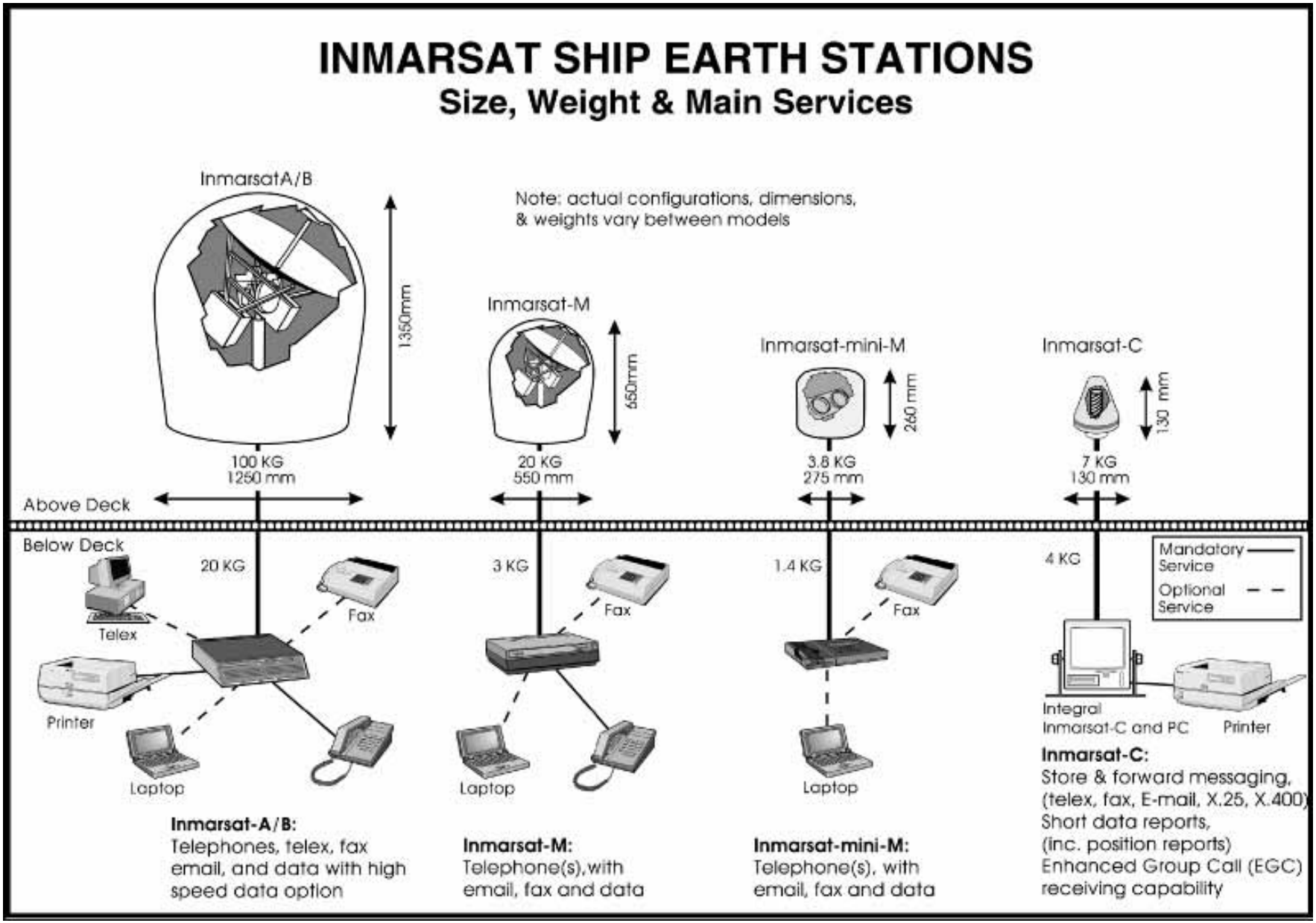

178 E
Pacific Ocean Region
35,700 km
12,000 km
Atlantic Ocean Region West
Indian Ocean Region
Atlantic Ocean Region East
54 W
64.5 E
15.5 W


Inmarsat Mobile Earth Station
LES
NCS
MES
NCS Common Channel
Request and Assignment
MES-LES communications channel
National/International telecommunication landlines
NCS:Network Coordination Station
LES :Land Earth Station
MES :Mobile Earth Station

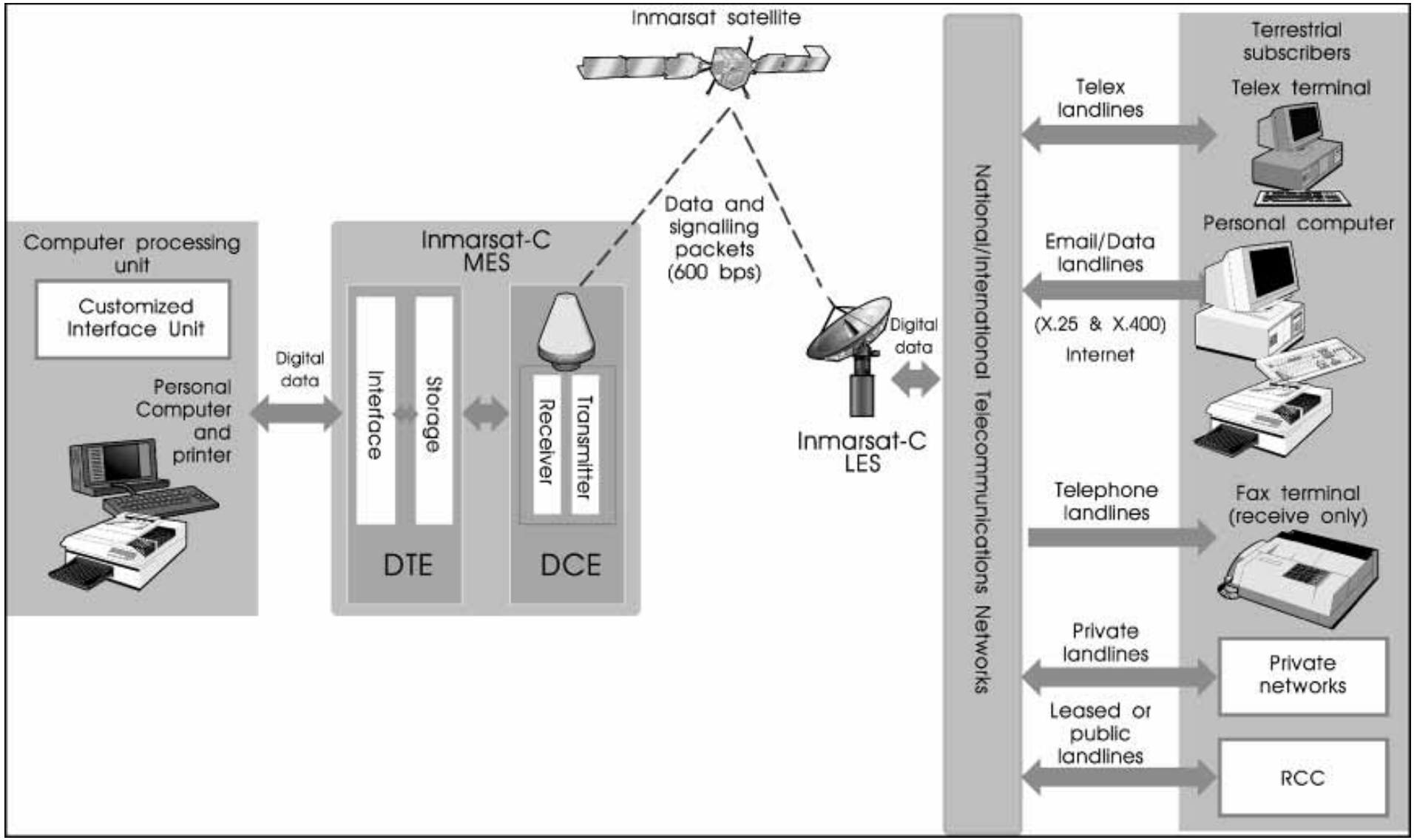
INMARSAT


I
United Kingdom
Baltic Sea
sub-area
II
France
III
Mediterranean
Greece
IV
USA
XII
USA
XVI
USA
V
Brazil
VI
Argentina
XV
Chile
XIV
New Zealand
VII
South Africa
IX
Pakistan
VIII(N)
India
VIII(S)
Mauritius
La Réunion
XI
China
XI
Japan
XII
Russia
XII
USA
X
Australia
XIV
New Zealand

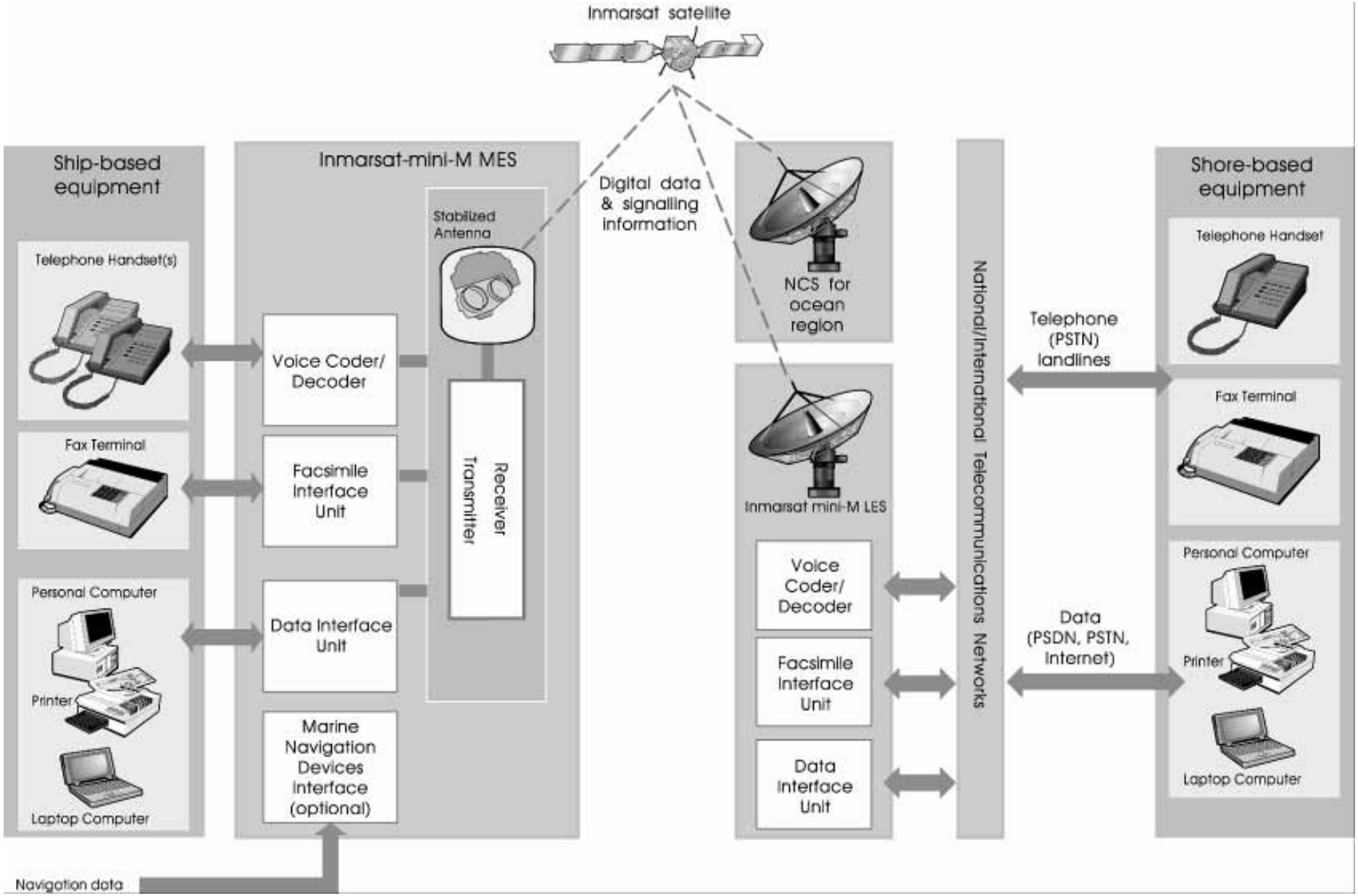
INMARSAT


INMARSAT SHIP EARTH STATIONS
Size, Weight & Main Services
InmarsatA/B
1350mm
Note: actual configurations, dimensions,
& weights vary between models
Inmarsat-M
650mm
Inmarsat-mini-M
260 mm
Inmarsat-C
130 mm
100 KG
1250 mm
20 KG
550 mm
3.8 KG
275 mm
7 KG
130 mm
Above Deck
Below Deck
20 KG
3 KG
1.4 KG
4 KG
Mandatory Service
Optional Service
Telex
Fax
Printer
Laptop
Integral
Inmarsat-C and PC
Printer
Inmarsat-A/B:
Telephones, telex, fax
email, and data with high
speed data option
Inmarsat-M:
Telephone(s),with
email, fax and data
Inmarsat-mini-M:
Telephone(s), with
email, fax and data
Inmarsat-C:
Store & forward messaging,
(telex, fax, E-mail, X.25, X.400)
Short data reports,
(inc. position reports)
Enhanced Group Call (EGC)
receiving capability

INMARSAT


Inmarsat satellite
Data and signalling packets (600 bps)
Computer processing unit
Customized Interface Unit
Personal Computer and printer
Digital data
Inmarsat-C MES
Interface
Storage
Receiver
Transmitter
DTE
DCE
Digital data
Inmarsat-C LES
National/International Telecommunications Networks
Terrestrial subscribers
Telex landlines
Telex terminal
Email/Data landlines
(X.25 & X.400)
Internet
Personal computer
Telephone landlines
Fax terminal (receive only)
Private landlines
Private networks
Leased or public landlines
RCC

INMARSAT


Inmarsat satellite
Ship-based equipment
Telephone Handset(s)
Fax Terminal
Personal Computer
Printer
Laptop Computer
Inmarsat-mini-M MES
Stabilized Antenna
Voice Coder/ Decoder
Facsimile Interface Unit
Data Interface Unit
Receiver Transmitter
Marine Navigation Devices Interface (optional)
Navigation data
Digital data & signalling information
NCS for ocean region
Inmarsat mini-M LES
Voice Coder/ Decoder
Facsimile Interface Unit
Data Interface Unit
National/International Telecommunications Networks
Telephone (PSTN) landlines
Data (PSDN, PSTN, Internet)
Shore-based equipment
Telephone Handset
Fax Terminal
Personal Computer
Printer
Laptop Computer

Međunarodna pravila

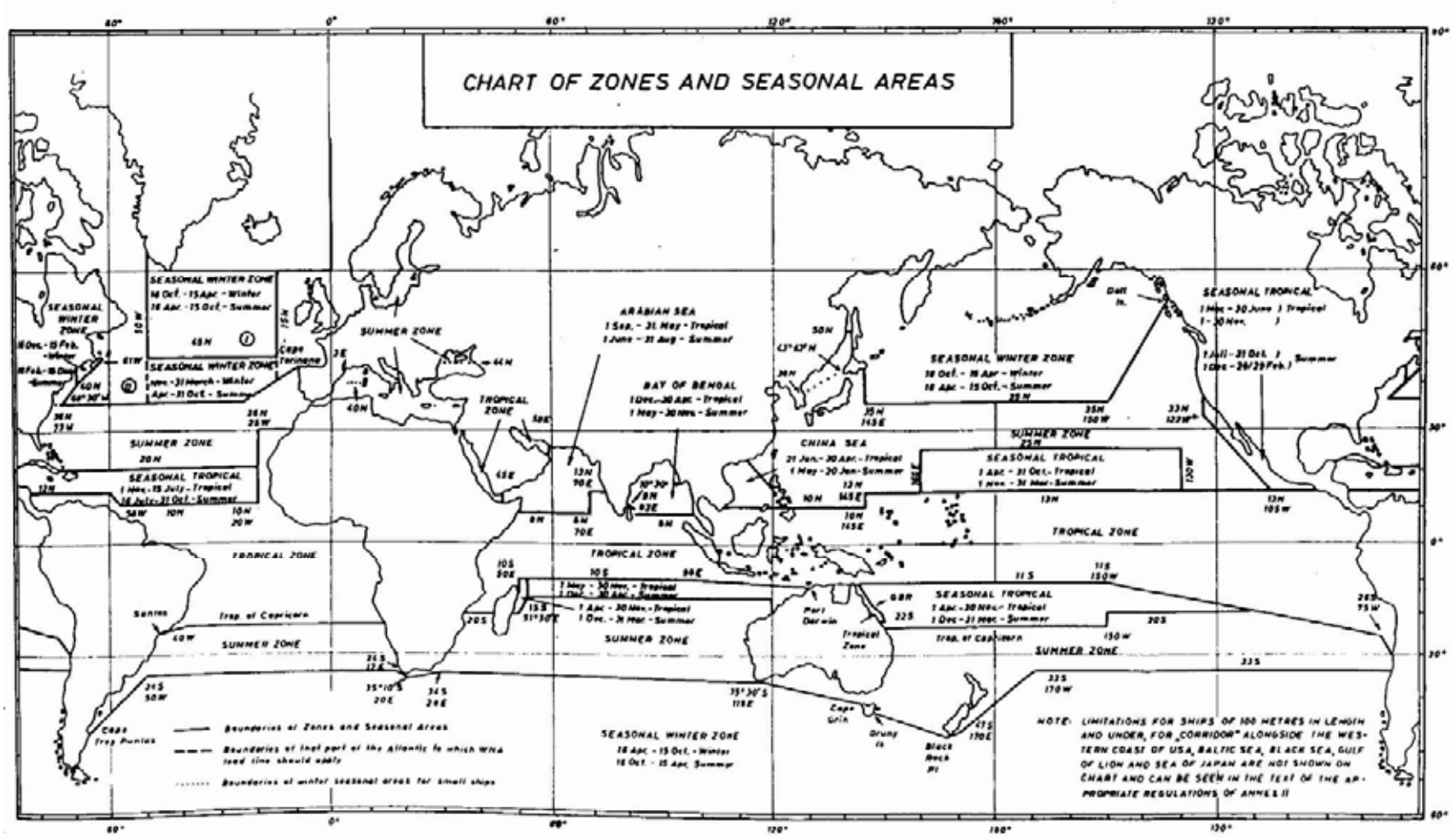
- Konvencija OUN o pravu mora
  - (United Nations Convention on the Law of the Sea), 1982
- Međunarodna konvencija o zaštiti ljudskih života na moru
  - (International Convention on the Safety of Life at Sea SOLAS), 1974
- Međunarodna konvencija o sprečavanju onečišćenja mora s brodova
  - (International Convention on the Prevention of Pollution from Ships MARPOL), 1973/78
- Međunarodna konvencija o teretnim linijama
  - (International Convention on Load Lines), 1966
- Međunarodna konvencija o baždarenju
  - (International Convention on Tonnage Measurement of Ships), 1969
- Konvencija o međunarodnim pravilima o izbjegavanju sudara na moru,
  - (Convention on International Rules for prevention of collisions at sea COLREG), 1972

Međunarodna pravila

- Uvjeti ispuštanja tekućih štetnih tvari u more prema MARPOL 73/78

	Skupina A	Skupina B	Skupina C	Skupina D
Uvjeti ispuštanja izvan posebnih područja				
Geografsko područje	Najmanje 12 milja od najbližeg kopna			
Dubina mora	Najmanje 25 m			nije određeno
Brzina broda	Najmanje 7 čv. (4 čv. za plovila bez poriva)			
Najveća količina iz svakog tanka	0	1 m^3 1/3000 kapaciteta tanka	3 m^3 1/1000 kapaciteta tanka	neograničeno
Najveća koncentracija	≈0	manje od 1 ppm u brazdi	manje od 10 ppm u brazdi	manje od 10% produkta
Uvjeti ispuštanja u posebnim područjima				
Geografsko područje	Najmanje 12 milja od najbližeg kopna			Isto kao i izvan posebnih područja
Dubina mora	Najmanje 25 m			
Brzina broda	Najmanje 7 čv. (4 čv. za plovila bez poriva)			
Najveća količina iz svakog tanka	0	0	1 m^3 ili 1/3000 kapaciteta tanka	
Najveća koncentracija	≈0	≈0	manje od 1 ppm u brazdi	

Međunarodna pravila



Nacionalni propisi

- **Pomorski zakonik**
- **Zakon** o postupnom isključenju iz plovidbe tankera bez dvostruke oplate
- **Odluka** hrvatskog Sabora o proširenju jurisdikcije Republike Hrvatske na Jadranskom moru
- **Odluka o dopuni Odluke** o proširenju jurisdikcije Republike Hrvatske na Jadranskom moru
- **Pravilnik** o obavljanju podvodnih aktivnosti
- **Pravilnik** o pomorskom peljarenju
- **Pravilnik** o izbjegavanju sudara na moru
- **Pravilnik** o oznakama na plovnim putovima u unutrašnjim morskim vodama i teritorijalnom moru Republike Hrvatske
- **Pravilnik** o uvjetima za obavljanje arheološkog istraživanja spomenika kulture na morskom dnu ili morskom podzemlju unutarnjih morskih voda i teritorijalnog mora Republike Hrvatske
- **Pravilnik** o uvjetima za obavljanje istraživanja u posebno zaštićenim dijelovima prirode na morskom dnu ili morskom podzemlju unutrašnjih morskih voda i teritorijalnog mora Republike Hrvatske

Nacionalni propisi

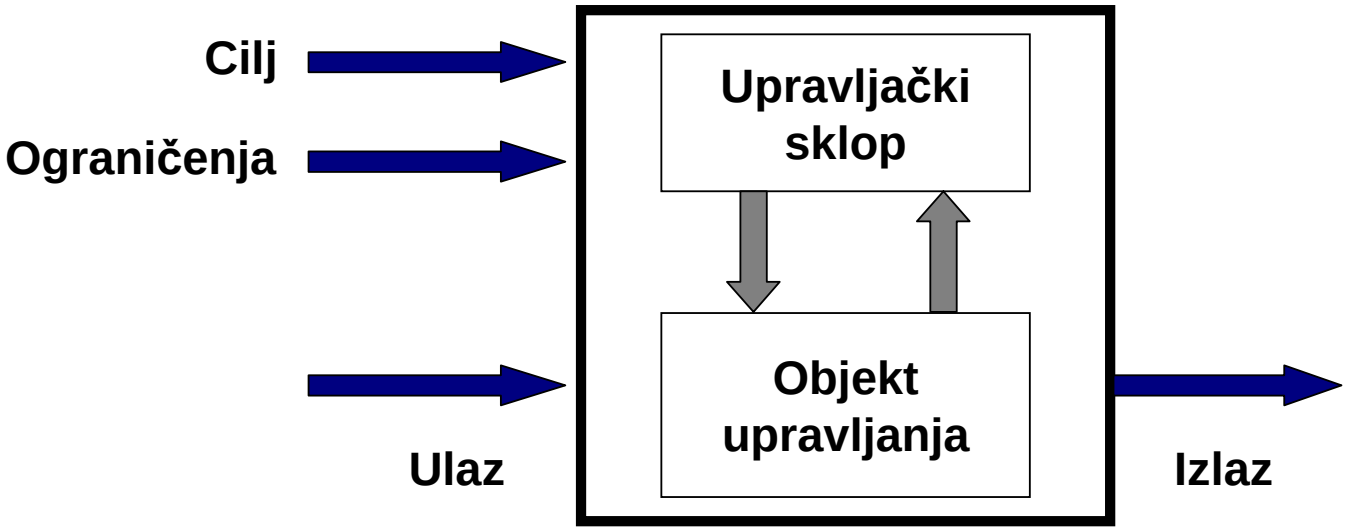
- **Pravilnik** o uvjetima pod kojima strane pravne i fizičke osobe smiju obavljati istraživanja, ispitivanja, fotografiranja i mjerenja mora, morskog dna i/ili morsko podzemlja unutrašnjih morskih voda i teritorijalnog mora Republike Hrvatske
- **Pravilnik** o obavljanju inspekcijskog nadzora sigurnosti plovidbe
- **Pravilnik** o uvjetima i načinu održavanja straže, te obavljanju drugih poslova na brodu kojima se osigurava sigurna plovidba i zaštita mora od onečišćenja
- **Uredba** o pristupu, prolasku i boravku stranih ratnih i znanstvenoistraživačkih brodova u unutrašnjim morskim vodama i teritorijalnom moru Republike Hrvatske
- **Naredba** o kategorijama plovidbe pomorskih brodova
- **Naredba** o plovidbi teritorijalnim morem i unutrašnjim morskim vodama Republike Hrvatske
- **Naredba** o plovidbi u prolazu u šibensku luku, u Pašmanskom tjesnacu, u prolazu Mali Ždrelac i Vela Vrata, rijekama Neretvom i Zrmanjom, te o zabrani plovidbe Pelješkim, Koločepskim, Unijskim kanalom i kanalom Krušija, dijelovima Srednjega kanala, Murterskoga mora i Žirjanskoga kanala
- **Naredba** o ustanovljavanju zabranjenih zona u hrvatskim unutrašnjim morskim vodama

Brod

- Osnovna svrha:
  - kretanje po morskoj površini (ili ispod nje ili neposredno iznad nje) od ishodišta do odredišta u nekom konačnom vremenu
- Pomorsko putovanje:
  - skup djelatnosti kojima se u konačnom vremenskom periodu brod vodi na siguran način od ishodišta do odredišta.
- Cilj putovanja broda
  - prijevozna funkcija
    - *(npr. trgovački brodovi)*
  - obavljanje neke djelatnosti na moru
    - *(npr. ratni, ribarski ili istraživački brodovi).*
- Elementarno stanje broda
  - položaj u prostoru i vremenu,
  - stanje njegovih podsustava

Brod

- Osnovni podsustavi:
  - navigacijski podsustav,
  - porivni podsustav,
  - podsustav upravljanja kretanjem,
  - podsustav napajanja energijom i osiguravanja boravka i rada na brodu, te
  - podsustav namijenjen provedbi temeljnog cilja broda



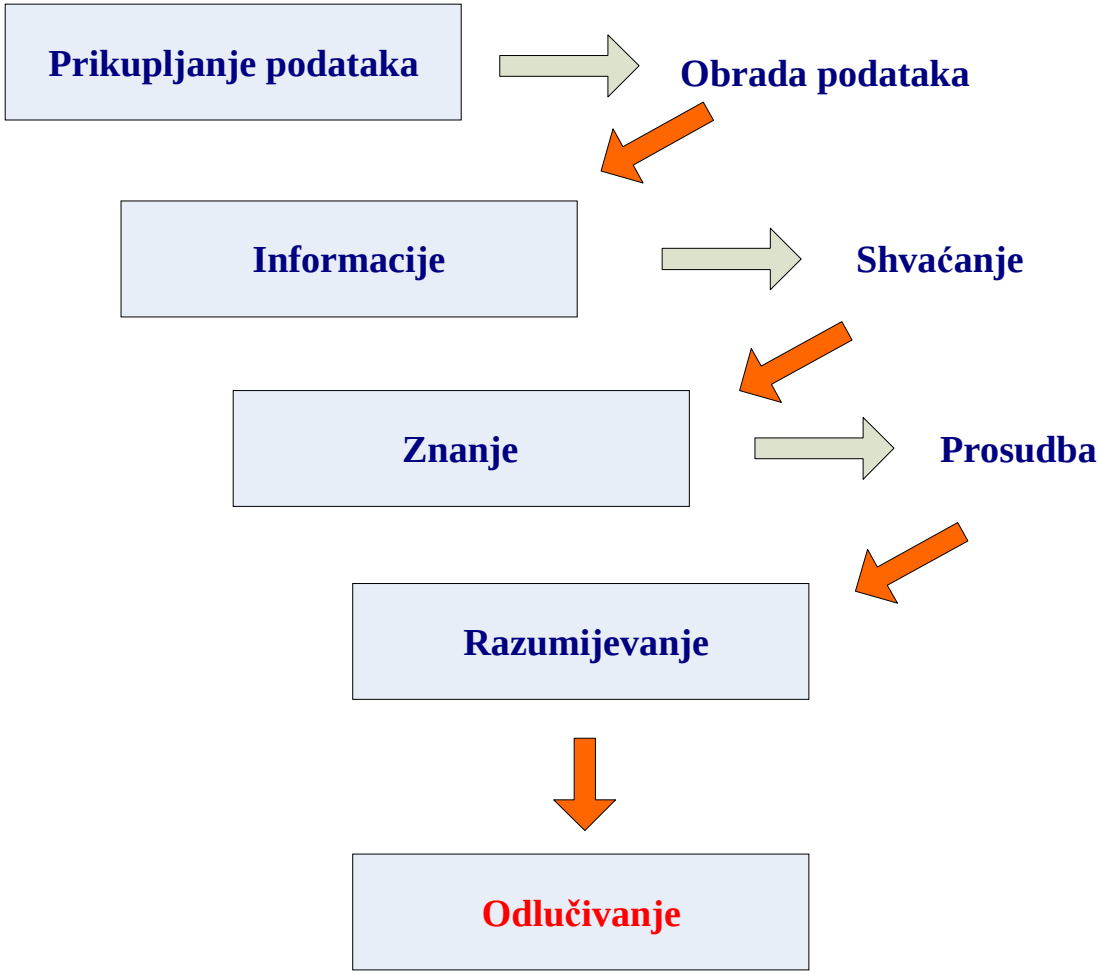
Plovni put

Waterway Risk Model					
Vessel Conditions	**Traffic Conditions**	**Navigational Conditions**	**Waterway Conditions**	**Immediate Consequences**	**Subsequent Consequences**
Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Injuries	Health and Safety
Deep Draft Mariner Proficiency	Volume of Recreational Traffic	Currents	Dimensions	Petroleum Discharge	Environmental
Shallow Draft Mariner Proficiency	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Material Release	Aquatic Resources
Recreational Boater Proficiency	Congestion	Obstructions	Configuration	Mobility	Economic

Pomorska plovidba

- Osnovno obilježje:
  - iskorištavanje svojstava nekog morskog područja, njegovog podmorja ili prostora neposredno iznad površine mora
- Pomorska plovidba:
  - skup djelatnosti radi iskorištavanja mora i priobalja.
- Cilj
  - djelotvorno kretanje morskim područjem ili
  - djelotvoran rad u nekom morskom području
  - uz uvjet zadovoljavajuće razine sigurnosti ljudi, imovine i okoliša
- Elementarno stanje
  - određeni prostorni raspored svih brodova u zadatom području.

Donošenje odluka



Odluka	Trajanje provedbe
Strateška odluka	
Taktička odluka	
Izvedbena odluka	

PLANIRANJE POMORSKOG PUTOVANJA

- Upravljanje putovanjem je:
  - slijed odluka
  - donesenih na temelju dostupnih podataka i
  - njihovih provedbi kojima se na siguran način ostvaruje cilj putovanja.
- Planiranje putovanja je:
  - slijed radnji
  - kojima se unaprijed donosi niz odluka o načinu provedbe putovanja
  - imajući u vidu nepouzdanost raspoloživih podataka.
- Planiranje i upravljanje putovanjem:
  - obavlja zapovjednik broda ili
  - neka druga osoba na temelju ovlaštenja zapovjednika i pod njegovim nadzorom u skladu s obvezujućim propisima i dobrom pomoračkom praksom.

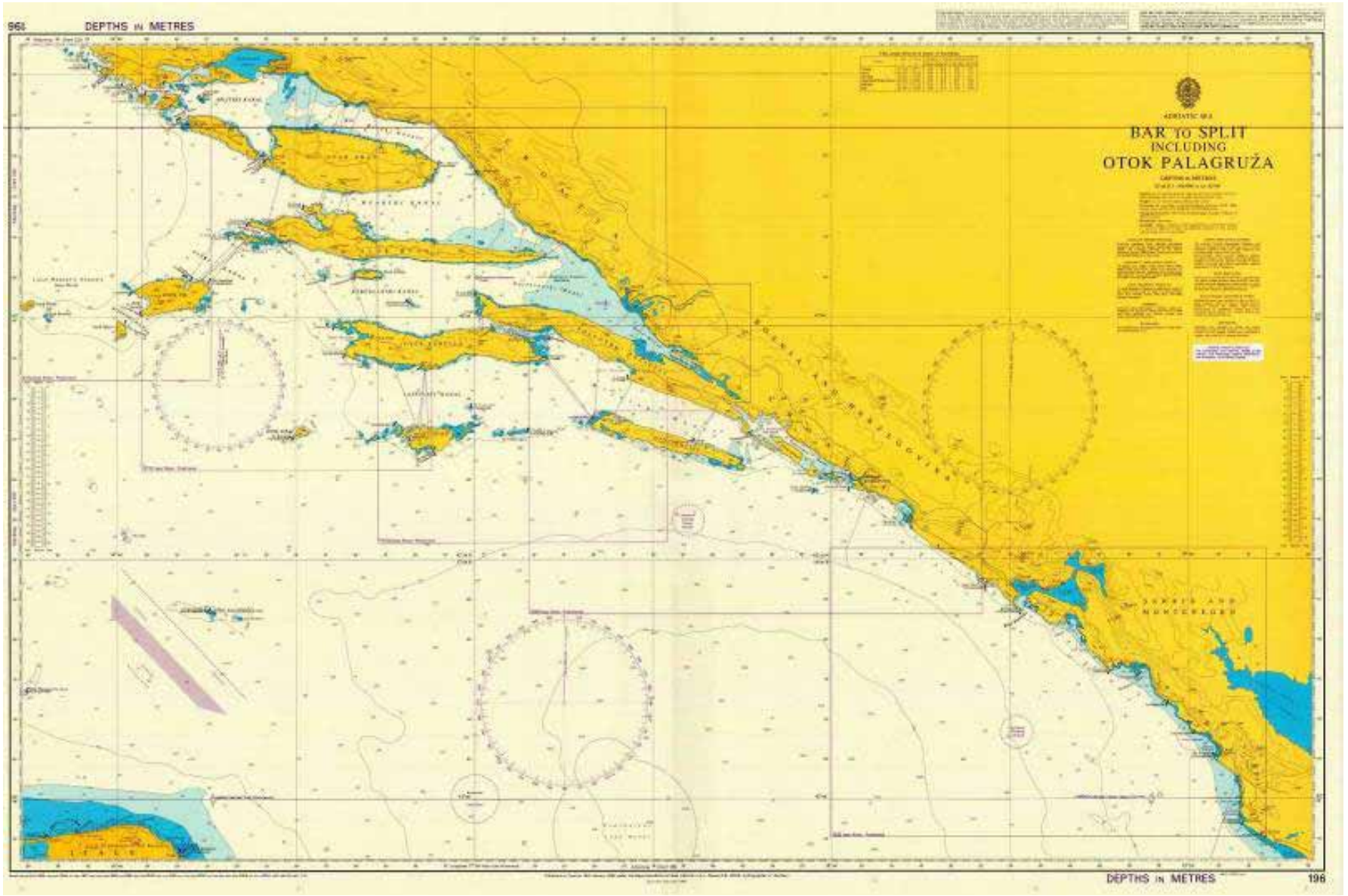
PLANIRANJE POMORSKE PLOVIDBE

- Upravljanje plovidbom je:
  - slijed odluka i njihovih provedbi
  - kojima se omogućuje sigurna plovidba svim brodovima
  - u određenom području.
- Planiranje plovidbe je:
  - slijed radnji kojima se određuju mjere i postupci
  - koji će se uvesti na određenom području
  - s ciljem uspostavljanja i održavanja sustava pomorskog
  - zadovoljavajućeg stupnja sigurnosti plovidbe i zaštite okoliša.
- Planiranje plovidbe (te primjena mjera i postupaka) za određeno područje:
  - obveza je obalne države
  - uz pridržavanje međunarodno prihvaćenih pravila i postupaka.

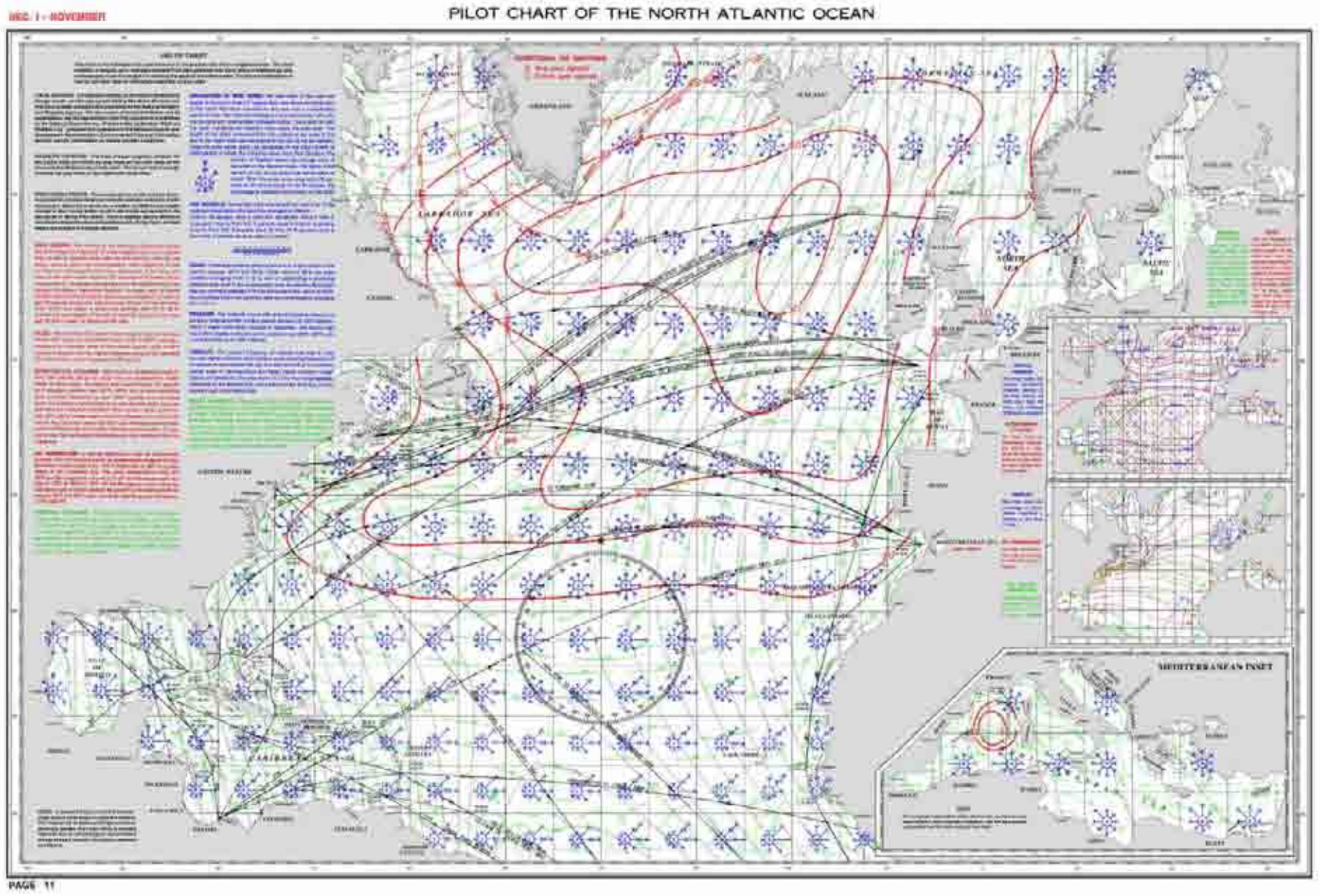
INFORMACIJSKA PODRŠKA

- Pomorske karte
  - papirnate
    - navigacijske,
      - *generalne karte (1 : 500.000 do 1 : 5.000.000),*
      - *kursne karte (1 : 100.000 do 1 : 500.000),*
      - *obalne karte (1 : 50.000 do 1 : 100.000) i*
      - *planovi (do 1 : 50.000).*
    - informativne i
    - pomoćne.
  - elektronske karte
    - ENC
    - raster
- Katalog pomorskih karata
- Oceanske rute svijeta
  - (Ocean Passages for the World)
- Peljari
  - (Sailing Directions)
- Popis svjetionika
  - (List of Lights and Fog Signals)
- Tablice morskih mijena
  - (Tide Tables)
- Atlasi morskih struja
  - (Tidal Stream Atlases)
- Podaci o pomorskim rutama
  - (Ships' Routeing)
- Podaci o klimi
  - (Climatology Atlas)
- Tablice udaljenosti
  - (Distance tables)

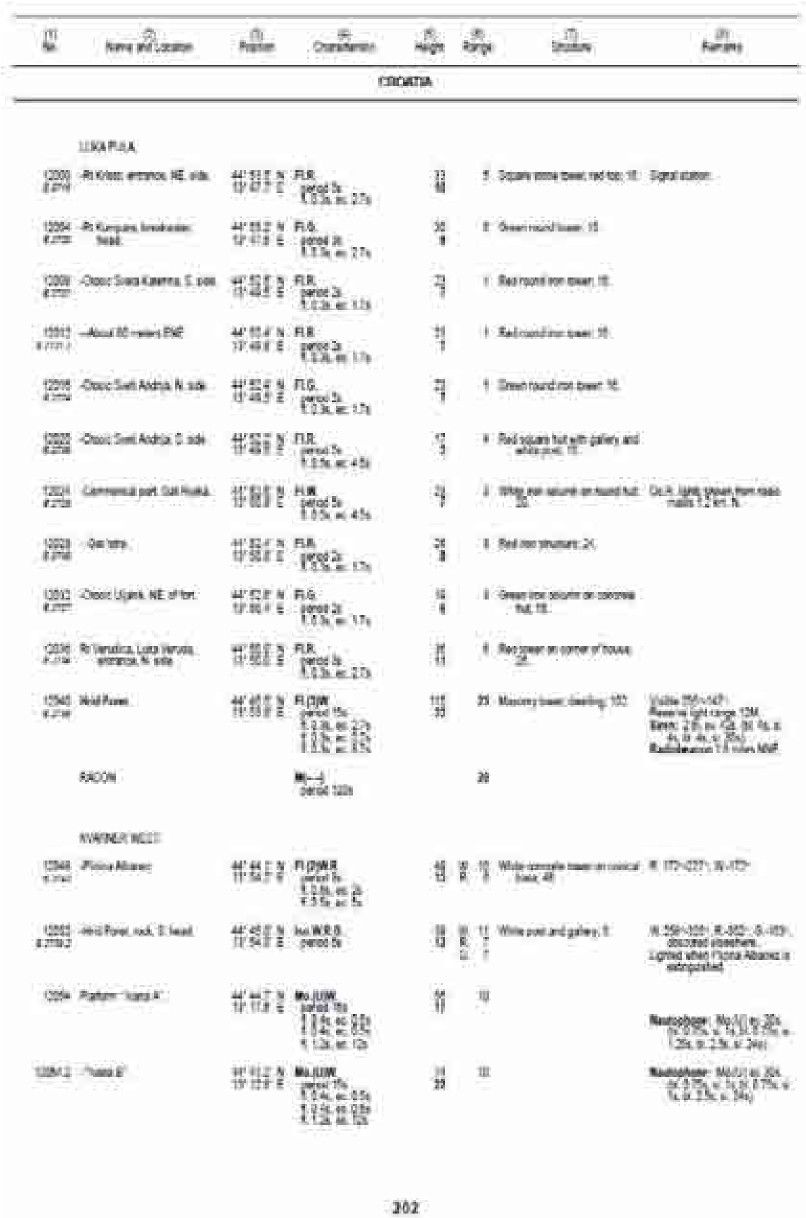
INFORMACIJSKA PODRŠKA



INFORMACIJSKA PODRŠKA



INFORMACIJSKA PODRŠKA



11.33 Vinodolski Kanal (45°11'N., 14°40'E.) is an extension of Velebitski Kanal and leads between the E side of Otok Krk and the mainland. The channel, 9 miles long, extends NW from the vicinity of Novi Vinodolski to the S end of Tihi Kanal.

The Adriatic Highway follows the mainland coast, close inland, along the E side of the channel and is conspicuous in places.

Rt Silo (45°08'N., 14°40'E.), marked by a light, is located on the W side of the channel and is fringed by shoals. This point is the termination of a narrow and low tongue of land which projects from the E side of Otok Krk. Plic Konjska, with a depth of 4.4m, lies about 0.3 mile SE of the point.

Zaliv Soline, a nearly land-locked small bay, lies 1.5 miles WNW of Rt Silo and is entered through a narrow channel. Although there are depths of 10 to 13m over a width of 100m in the entrance, the bay has depths of only 2 to 4m and is used mostly by small craft.

Tihi Kanal (45°13'N., 14°37'E.), 3 miles long, connects the NW end of Vinodolski Kanal to Rijecki Zaliv. The channel is deep and tortuous and leads between the mainland and the NE end of Otok Krk. Otocic Sveti Marko, barren and light-colored, lies close off the N extremity of Otok Krk and divides the N part of the fairway into two passages. The main passage leads NE of the island and is 0.2 mile wide. During strong gales, the current in this channel may attain a rate of 3 knots. The passage leading SW of the island is suitable only for small craft. A light is shown from the NE side of Otocic Sveti Marko.

A road bridge spans the two passages of Tihi Kanal at the S end of Otocic Sveti Marko. The W passage has a vertical clearance of 50m and the E passage, under the center span, has a vertical clearance of 60m.

Southbound vessels using Tihi Kanal are generally given the right of way. Approval to transit Tihi Kanal must be obtained from the Rijeka port authority.

Kvarner and Approaches

11.34 Otok Susak (44°31'N., 14°18'E.), the S and outer island in the approaches to Kvarner, is bold and mostly flat. Its extremities are fronted by shallow banks. A light is shown from a prominent structure, 12m high, surmounting the summit which rises near the center of the island. The village of Susak, with a prominent belfry, is situated in a cove at the NE side of the island.

Otok Unije (44°38'N., 14°15'E.), a long and irregular shaped island, lies with Rt Vnetak, its SW extremity, located 7 miles NNW of Otok Susak. The island consists of a chain of partly wooded hills and the summit, 132m high, stands in the SE part. The shores are rocky in places and indented, especially along the E side. A reef, marked by a beacon, extends up to 0.3 mile S from Rt Arbit, the S extremity of the island. Rt Lokunji, the N extremity of the island, is marked by a light. The village of Unije, with a prominent church, stands at the head of a small bay near the center of the W side of the island. It is fronted by a small craft harbor used by local ferries. Vessels can anchor in the bay, in depths of 20 to 25m, mud, about 0.6 mile offshore. Local knowledge is advised.

Otoceci Srakane, consisting of two narrow islets, extends up to 3.7 miles SE of the SE extremity of Otok Unije. These islets are partly wooded and steep-to. Hrid Silo lies close SE of the SE islet. A light is shown from a prominent structure, 10m high, standing on this rock.

11.35 Unijski Kanal (44°37'N., 14°20'E.) leads between Otok Unije and Otoceci Srakane, at the W side, and Otok Losinj, at the E side. This passage is partially landlocked and affords good shelter for a large number of vessels. It is reported to be a refuge for fishing vessels. Anchorage can be taken nearly anywhere, according to draft and shelter required, but the bottom close to the shore of Otok Losinj is reported to be rocky. The currents in the channel are tidal and are affected by the winds. The flood current is reported to sometimes attain a rate up to 2.5 knots.

Hrid Galiola (44°44'N., 14°11'E.), a low and rocky islet, lies on a reef 5 miles WNW of the N extremity of Otok Unije. A light is shown from a conspicuous structure, 19m high, standing on this islet at the E side of the entrance to Kvarner.

Hrid Galiola Light

11.36 Otocic Zeca (44°46'N., 14°19'E.), a light-colored islet, lies at the E side of the channel 1.5 miles off the W coast of Otok Cres. The summit of the islet, 65m high, rises near its S end and is surmounted by a pyramid topped with a globe and a staff. A light is shown from a tower, 8m high, standing at the SW side of the island.

Rt Pernat (44°57'N., 14°19'E.), a conspicuous and steep-to point, is located on the W coast of Otok Cres 10 miles N of Otocic Zeca. Brdo Helm, 482m high, rises 5.5 miles SSE of the point and is prominent.

Hrid Zaglav, marked by a light, is located at the E side of the channel. This rock lies on a shoal about 0.6 mile offshore 2 miles SSW of Rt Pernat.

11.37 Rt Crna Punta (44°57'N., 14°09'E.) is located on the W side of Kvarner 7.2 miles W of Rt Pernat. This point is dark colored, steep-to, and thickly wooded. It rises to Vrh Brdo which stands 1.5 miles NNW and is surmounted by a stone pyramid. A light is shown from a prominent structure, 7m high, standing on the point and a stone monument is situated 0.3 mile NW of the light.

The coast to the S of Rt Crna Punta is described beginning in paragraph 11.44.

Vrh Ucka (45°17'N., 14°12'E.), double-peaked, rises 3 miles inland 20 miles N of Rt Crna Punta. This mountain is 1,401m

INFORMACIJSKA PODRŠKA

CROATIA

General

Croatia is located in southeastern Europe, bordering the Adriatic Sea between Bosnia and Herzegovina and Slovenia.

The climate is Mediterranean, and more predominately, continental, with hot summers and cold winters. Mild winters with dry summers prevail along the coast.

The terrain is geographically diverse. There are flat plains along the Hungarian border, low mountains, and highlands near the Adriatic coast. The W coast is fringed by off-lying islands.

Buoyage System

The IALA Buoyage System (Region A) is in effect. See Chart No. 1 for further IALA Buoyage System information.

Currency

The official unit of currency is the kuna, consisting of 100 lipa.

Firing Areas

P-1 (SW of Rt Marlera)—Area bound by line joining the following positions:
- a. 44°48'N, 14°00'E.
- b. 44°42'N, 14°14'E.
- c. 44°22'N, 14°06'E.
- d. 44°39'N, 13°40'E.

P-2 (SW of Otok Losinj)—Area bound by line joining the following positions:
- a. 44°34'N, 14°22'E.
- b. 44°29'N, 14°34'E.
- c. 44°17'N, 14°22'E.
- d. 44°24'N, 14°15'E.

P-3 (SW of Otok Premuda)—Area bound by line joining the following positions:
- a. 44°22'N, 14°35'E.
- b. 44°12'N, 14°50'E.
- c. 44°04'N, 14°35'E.
- d. 44°15'N, 14°24'E.

P-4 (SW of Otok Vis)—Area bound by line joining the following positions:
- a. 44°18'N, 15°02'E.
- b. 44°10'N, 15°10'E.
- c. 44°11'N, 15°02'E.

shipbuilding, petroleum and refining, food and beverage products, paper, and rolled steel iron products.

Languages

Serbo-Croatian is the official language, which is spoken by 96 per cent of the population.

Navigational Information

The maritime territorial claims of Croatia are, as follows:

Territorial Sea	12 miles. Requires advance permission or notification for innocent passage of warships in the territorial sea.
Continental Shelf	Depth of 200m or the Limit of Exploitation.

Pilotage

Pilotage is compulsory for all foreign vessels exceeding 500 grt. Pilotage is also compulsory for vessels carrying hazardous cargo proceeding between Croatian ports and while in Croatian waters. Certain vessels under 500 grt may be subject to pilotage should the Harbormaster's office consider this necessary.

The harbor authorities may be contacted 24 hours on VHF channel 9. The pilot associations may be contacted 24 hours on VHF channel 12.

Coastal pilotage is compulsory for all vessels carrying dangerous liquid chemicals or bulk flammable liquid gas. Vessels bound for ports open to international traffic should use coastal pilotage. Coastal pilotage should be requested 6 hours in advance.

Prohibited Areas

The following prohibited areas have been established in Croatian waters:

1. A sea belt, 100m wide, along the N shore of Poluotok Lustica peninsula, between Spiljice and Donji Krasici and between Rose and Rt Dobrec.
2. A sea belt, 300m wide, along the N shore of Mala More from Uvala Vodice to Rt Meded, delimited by the following shore points: 42°59.4'N, 17°28.5'E and 42°56.4'N, 17°32.8'E.
3. The sea area in the Stonski Kanal, within a line joining Rt Blaca and Zaronja.
4. In two areas within 300m of that part of the coast of Otok Lastovo from 42°45.3'N, 16°48.6'E, on the shore, to 42°45.8'N, 16°49.4'E, on the shore, including the area within 300m of the coast of Otok Mrcara; and within 300m of that part of the coast of Otok Lastovo from 42°43.8'N, 16°50.2'E, on the shore, to 42°44.0'N, 16°52.1'E, on the shore.
5. A sea belt, 300m wide, along the shore of Poluotok Prevlaka peninsula, delimited by the following points on the shore:
   - a. 42°24.5'N, 18°30.6'E.
   - b. 42°24.3'N, 18°30.7'E.
6. A sea belt in front of Sava Kovacevic ship repair yard of Tivat, delimited by the following positions:
   - a. 42°25.9'N, 18°41.8'E.
   - b. 42°25.8'N, 18°41.4'E.
   - c. 42°26.2'N, 18°41.3'E.
   - d. 42°26.4'N, 18°41.5'E.
7. A sea belt, 300m wide, offshore of Otok Palagruza.
8. A sea belt, 300m wide, along the S coast Otok Brac from Rt Zastup to Uvala Farska, delimited by the following points:
   - a. 43°17.9'N, 16°27.5'E.
   - b. 43°16.3'N, 16°33.4'E.
9. A sea area in the bay of Luka Budava, SW of a line, the outermost points of which on the shore are marked by two pyramidal structures.
10. A sea area, 500m wide, offshore of Otok Goli.
11. The sea area around Brionski Otoci, delimited by a line joining the following positions:
    - a. 44°56.8'N, 13°42.6'E.
    - b. 44°54.9'N, 13°42.8'E.
    - c. 44°53.1'N, 13°45.1'E.
    - d. 44°53.9'N, 13°46.7'E.
    - e. 44°54.5'N, 13°47.2'E.
    - f. 44°55.5'N, 13°46.8'E.
    - g. 44°56.9'N, 13°44.7'E.

The following navigation prohibited areas have been established in Croatian waters:

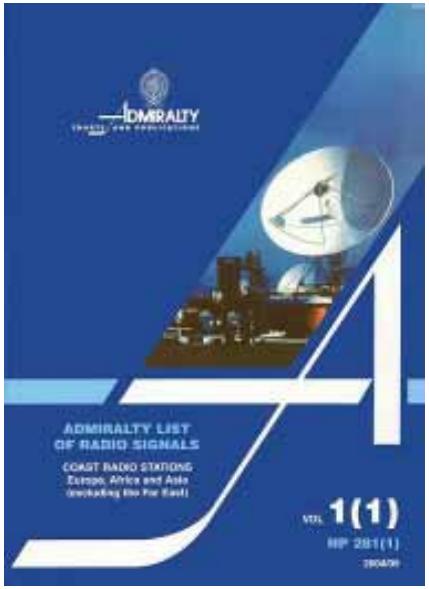
1. Within 300m of three sections of the coast of Otok Vis:
   - a. Between 43°03.5'N, 16°03.8'E, on the shore, and 43°02.8'N, 16°03.8'E, on the shore, in the vicinity of Rt Barjak and including Otocici Barjak.
   - b. Between 43°00.6'N, 16°04.6'E, on the shore, and 43°00.4'N, 16°05.0'E, on the shore, in the vicinity of Rt Stupiste.
   - c. Between 43°02.4'N, 16°14.4'E, on the shore, and 43°03.9'N, 16°15.7'E, on the shore.
2. Uvala Stupica Mala and the channel between Rt Rasohe and Otocic Mazirina.
3. A sea area, 300m wide, surrounding Rt Zecevo.
4. Uvala Zagracina (44°08.2'N., 14°53.8'E.), Uvala Dumboka (44°07.2'N., 14°16.0'E.), and Uvala Bokasin (44°06.6'N., 14°56.7'E.), on the NE coast of Dugi Otok.
5. Within a 300m radius of Marinca Rat.
6. Within a radius of 300m of Rt Grui, Goli Rat, Rt Razmjic, and from position 42°45.2'N, 17°32.1'E.
7. Through Novsko Zdrilo.

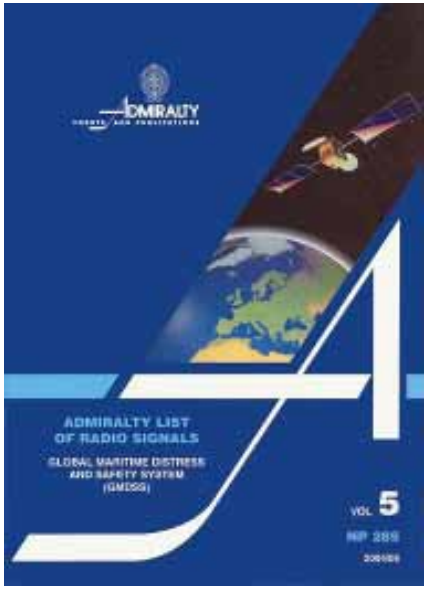
Prohibited areas for vessels greater than 500 grt, and for vessels carrying dangerous substances, or which have not been certified gas-free, have been established in the following areas:

1. In Pasmanski Kanal S of Rt Podvara (44°03'N., 15°18'E.)
2. In Kolocepski Kanal between Otok Kolocep (42°40'N., 18°01'E.) and Veliki Vratnik (42°45'N., 17°47'E.)
3. In Peljeski Kanal between Rt Rasnjic (42°55'N., 17°12'E.) and Rt Osicac (43°01'N., 17°01'E.)
4. In the channels between Otok Kornat and Dugi Otok on the W, and Otok Pasman and Otok Ugljan on the E, from Otok Zirje (43°39'N., 15°40'E.) to Otok Molat (44°15'N., 14°49'E.)

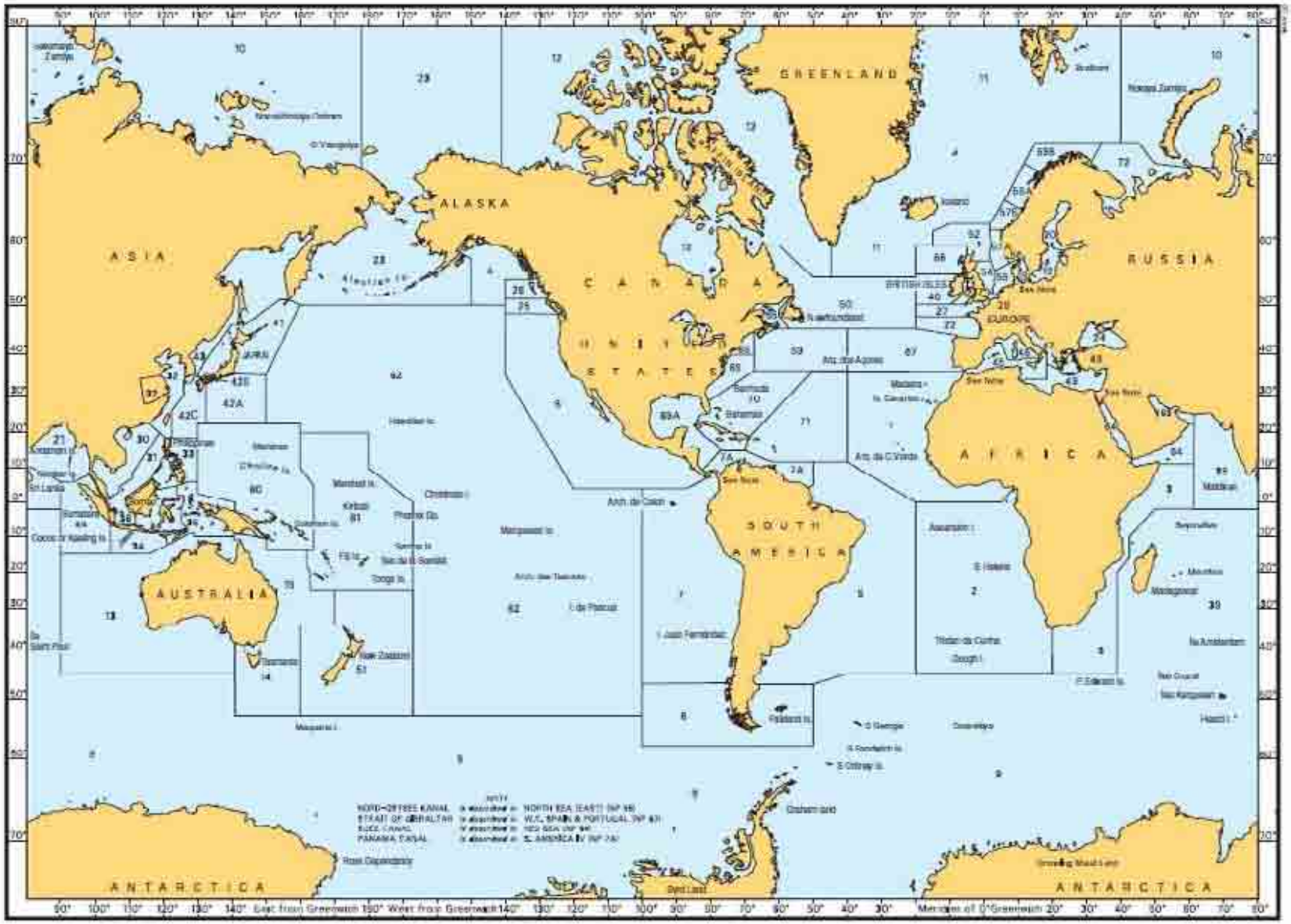
INFORMACIJSKA PODRŠKA

- Admiralty List of Radio Signals
  - NP281
    - Coast Radio Stations
  - NP282
    - Radio Aids to Navigation, Satellite Navigation Systems, Legal Time, Radio Time Signals and Electronic Position Fixing Systems
  - NP283
    - Maritime Safety Information Services
  - NP284
    - Meteorological Observation Stations
  - NP285
    - Global Maritime Distress and Safety System (GMDSS)
  - NP286
    - Pilot Services, Vessel Traffic Services and Port Operations





INFORMACIJSKA PODRŠKA



Pomorska radijska služba

- Podjela po dometu:
  - služba kratkog dometa
    - (VHF 156174 MHz)
  - služba srednjeg dometa
    - (MF 16054000 kHz)
  - služba dugog dometa
    - (HF 400027500 kHz).
- Vrste usluga
    - opće komunikacije
      - *izravno (uključivanjem u neku od javnih mreža)*
      - *neizravno*
    - posebne službe
- Obalne postaje otvorene za javnu komunikaciju
  - dvosmjerna komunikacija
    - poruke sigurnosti
    - druge poruke
  - jednosmjerne komunikacije

- Obalne postaje namjenske službe:
  - navigacijska podrška
    - GNSS
    - sustavi ograničenog dometa
  - posebne službe:
    - radijske goniometarske stanice,
    - radijski i radarski obilježivači,
    - oceanske postaje-brodovi,
    - goniometarske kalibracijske postaje,
    - signal točnog vremena,
    - signali standardnih frekvencija
    - ursigrami
    - meteorološki izvještaji i navigacijska upozorenja,
    - usluge medicinske pomoći brodovima na otvorenom moru

KOMUNIKACIJSKA PODRŠKA

- Svjetski sustav izvještavanja brodova u plovidbi
  - Worldwide Navigational Warning Service - WWNWS
- struktura koordinacijskih tijela
  - NAVAREA koordinator (16)
    - informacijski sustav
    - komunikacijski sustav (<700M)
  - koordinator NAVAREA potpodručja
  - nacionalni koordinatori
- izvori informacija
  - hidrografski uredi
  - centri za koordinaciju traganja i spašavanja
  - pomorski hidrometeorološki uredi
  - Međunarodna služba nadzora leda

KOMUNIKACIJSKA PODRŠKA

- Svjetski sustav izvještavanja brodova u plovidbi
  - vrste poruka po području
    - NAVAREA poruke
    - obalne poruke
    - lokalne poruke
  - dužnosti NAVAREA koordinator
    - procjena značaja poruke
    - editiranje poruke
    - dostava NAVAREA poruka
      - *drugim koordinatorima*
      - *nacionalnim koordinatorima*
    - predaja NAVAREA Warning Bulletins (tjedno)
    - poništavanje NAVAREA poruka
    - dostava poruka na zahtjev

KOMUNIKACIJSKA PODRŠKA

- Vrste i oznake obavijesti i upozorenja WWNWS
  - A navigacijska upozorenja
  - B meteorološka upozorenja
  - C izvještaji o ledu
  - D upozorenja o traganju i spašavanju
  - E meteorološke prognoze
  - F peljarske obavijesti
  - G obavijesti o DECCA sustavu
  - H obavijesti o LORRANC sustavu
  - I obavijesti o OMEGA sustavu
  - J obavijesti o diferencijalnom OMEGA sustavu
  - K obavijesti o drugim elektronskim navigacijskim pomagalima
  - L dodatak za A
  - V,W,X,Y posebne Službe
  - Z nema obavijesti

NAVTEX

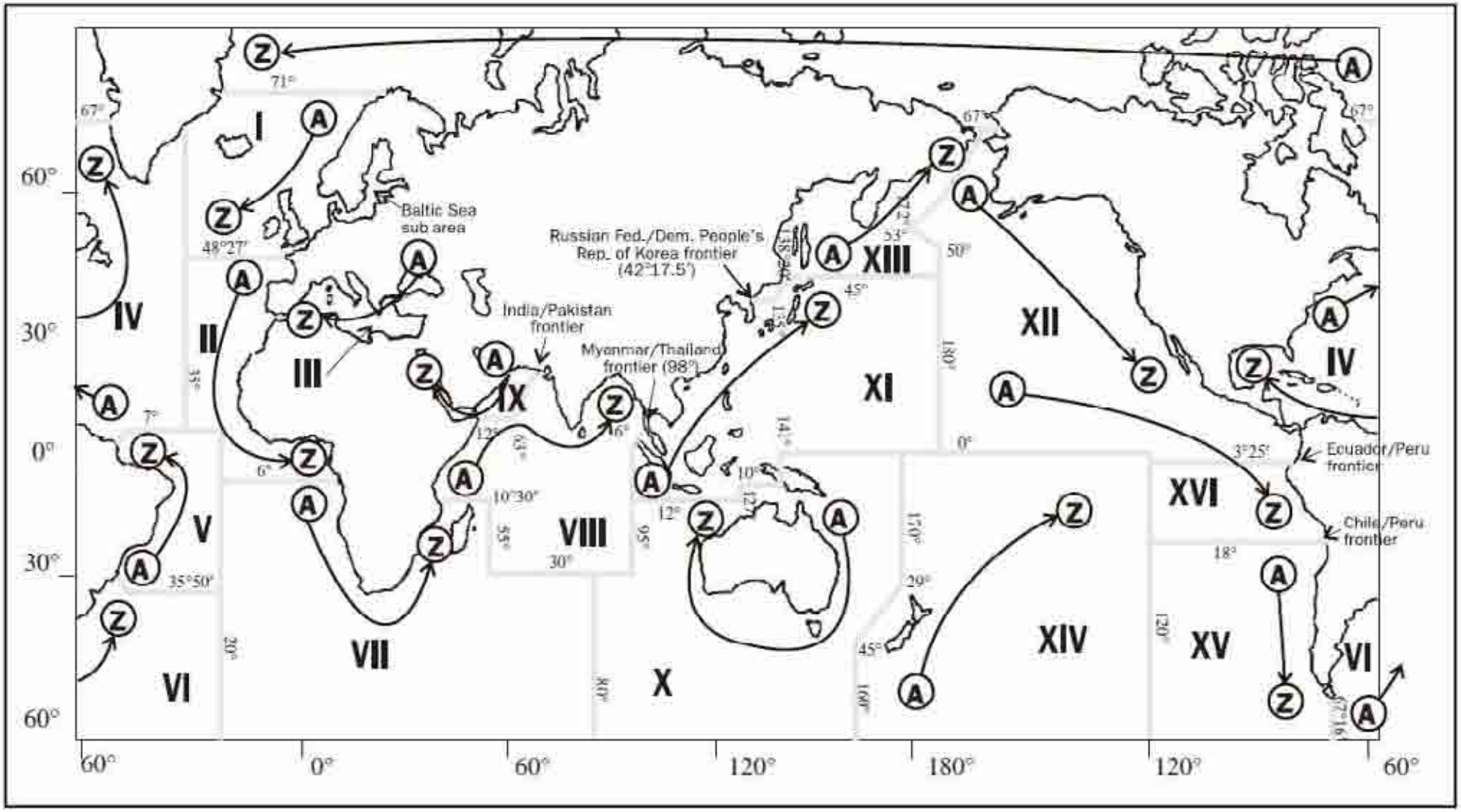

I
United Kingdom
Baltic Sea
sub-area
II
France
III
Mediterranean
Greece
IV
USA
XII
USA
XII
USA
XII
Russia
XI
Japan
IX
Pakistan
VIII(N)
India
X
China
VIII(S)
Mauritius/
La Réunion
XVI
USA
V
Brasil
XIV
New Zealand
XV
Chile
VI
Argentina
VII
South Africa
X
Australia
XIV
New Zealand

NAVTEX

- Frekvencije
  - 518 kHz (490 kHz, 4209.5 kHz)
- Vrste poruka
  - ROUTINE
  - IMPORTANT
  - VITAL
- Predaja
  - posebne stanice
  - prema posebnom vremenskom rasporedu (domet > 400 M)
- Uređaj
  - prijemnik
    - mikroprocesor
    - memorijski (najmanje 30 poruka)
    - održavanje poruka najmanje 6072 sata
  - jedinica za tiskanje
    - poruke sa postotkom greške manjim od 4%

- Poruka
  - zaglavlje
  - ZCZC
  - oznaka vrste poruke
  - oznaka broja poruke (0199)
  - vrijeme i datum
  - tekst poruke
  - oznaka kraja poruke
  - NNNN

NAVTEX


I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
XVI
Baltic Sea sub area
India/Pakistan frontier
Myanmar/Thailand frontier (98°)
Russian Fed./Dem. People's Rep. of Korea frontier (42°17.5')
Ecuador/Peru frontier
Chile/Peru frontier
60°
30°
0°
30°
60°
60°
0°
60°
120°
180°
120°
60°

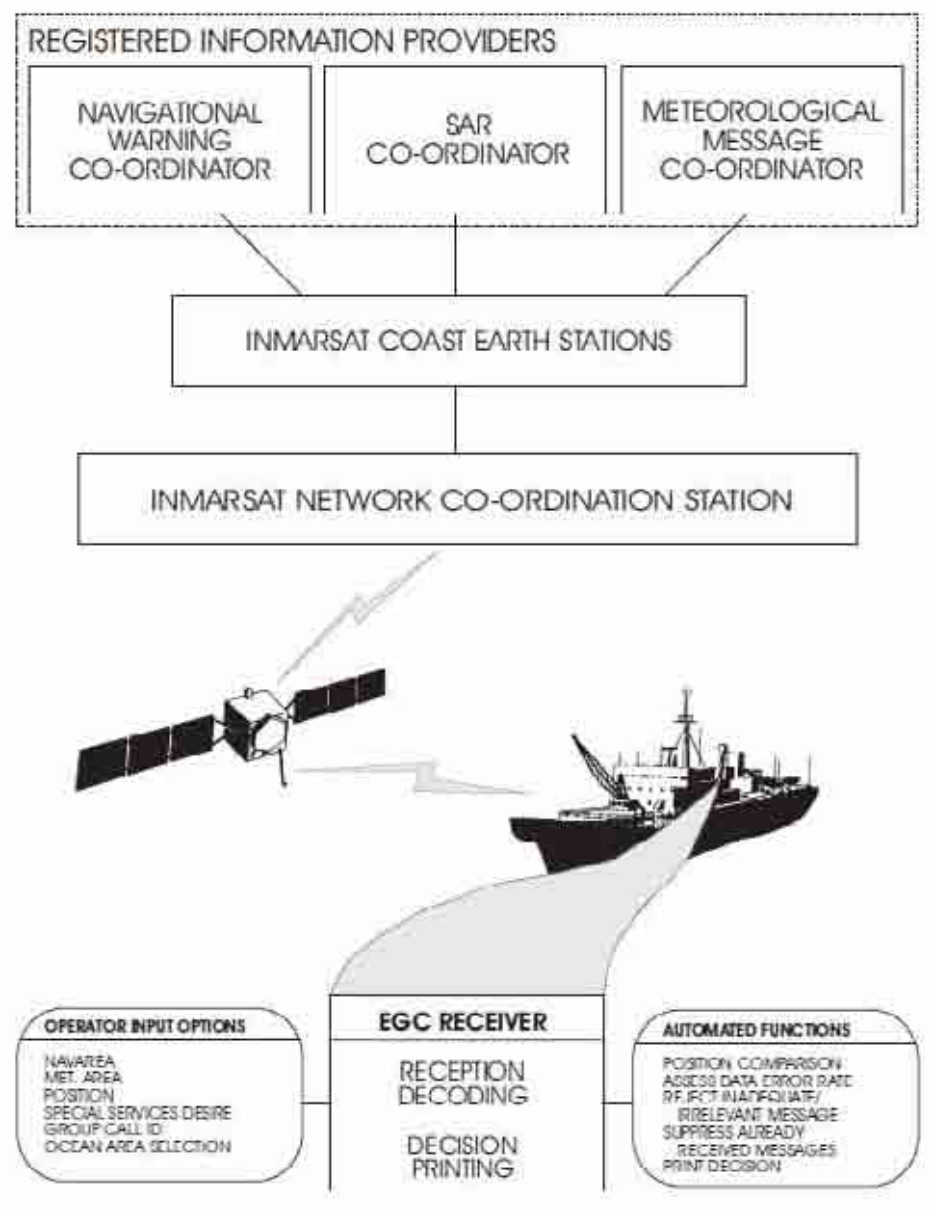
NAVTEX

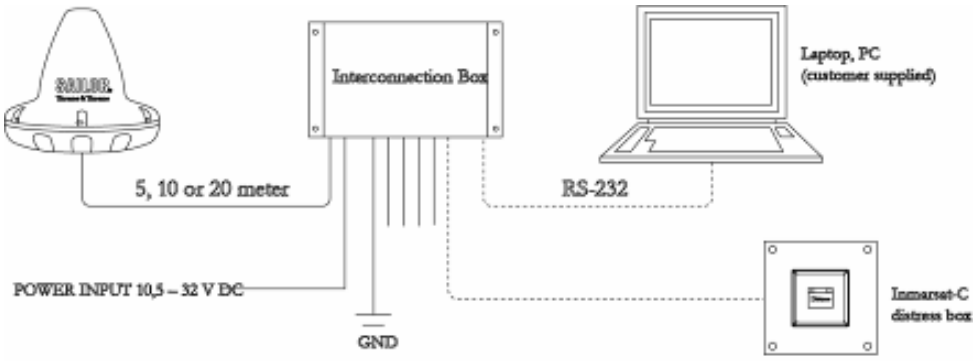
NAV/MET Area	Country	NAVTEX Coast Station	Position	Range (NM)	III Character	Transmission times (UTC)	Language	Status of implementation [Date of operation]
		Madeira (Porto Santo)	N.I.	N.I.	P	0230,0630,1030,1430,1830,2230		Planned
	Spain	Coruña	43 21N 08 27W	400	D	0030,0430,0830,1230,1630,2030	English & Spanish (trial)	Operational
		Tarifa	36 01N 05 34W	400	G	0100,0500,0900,1300,1700,2100		
		Las Palmas	28 10N 15 25W	400	I	0120,0520,0920,1320,1720,2120		
III	Bulgaria	Varna	43 04N 27 46E	350	J	0130,0530(weather forecast), 0930, 1330,1730(weather forecast), 2130	English	Operational
	Croatia	Split (Hvar Is)	43 30N 16 29E	85	Q	0240,0640,1040,1440,1840,2240	English	Operational
	Cyprus	Cypradio	35 03N 33 17E	200	M	0200,0600,1000,1400,1800,2200	English	Operational
	Egypt	Alexandria	31 12N 29 52E	350	N	0210,0610,1010,1410,1810,2210	English	
	France	Cross La Garde	43 06N 05 50E	350	W	0340,0740,1340,1540,1940,2340	English	Operational
	Greece	Iraklion	35 20N 25 07E	280	H	0110,0510,0910,1310,1710,2110	English & Greek	Operational
		Kerkyra	39 37N 19 55E	280	K	0140,0540,0940,1340,1740,2140		
		Limnos	39 52N 25 04E	280	L	0150,0550,0950,1350,1750,2150		
	Israel	Haifa	32 49N 35 00E	200	P	0020,0420,0820,1220,1620,2020	English	Operational
	Italy	Roma	41 37N 12 29E	320	R	0250,0650,1050,1450,1850,2250	English & Italian	Planned[N.I.]
		Augusta	37 14N 15 14E	320	S	0300,0700,1100,1500,1900,2300		
		Cagliari	39 13N 09 14E	320	T	0310,0710,1110,1510,1910,2310		
		Trieste	45 40N 13 46E	320	U	0320,0720,1120,1520,1920,2320		
	Malta	Malta	35 49N 14 32E	400	O	0220,0620,1020,1420,1820,2220	English	Operational
	Russian Federation	Novorossiysk	44 42N 37 44E	300	A	0300,0700,1100,1500,1900, 2300	English	Operational
	Spain	Cabo de la Nao	38 43N 00 09E	300	X	0350,0750,1150,1550,1950,2350	English & Spanish	Operational
	Turkey	Istanbul	41 04N 28 57E	300	D	0030,0430,0830,1230,1630,2030	English	Operational
		Samsun	41 17N 36 20E	300	E	0040,0440,0840,1240,1640,2040		
		Antalya	36 53N 30 42E	300	F	0050,0450,0850,1250,1650,2050		
		Izmir	38 22N 26 36E	300	I	0120,0520,0920,1320,1720,2120		
	Ukraine	Mariupol	47 06N 37 33E	280	B	0100,0500(weather forecast), 0900(ice report), 1300, 1700 (weather forecast), 2100	English	Operational
		Odessa	46 29N 30 44E	280	C	0230,0630,1030(weather forecast), 1430, 1830(weather forecast, ice report), 2230		
IV	Bermuda (UK)	Bermuda	32 23N 64 41W	280	B	0010,0410,0810,1210,1610,2010	English	Operational
	Canada	Riviere-au-Renard	50 11N 66 07W	300	C	0020,0420,0820,1220,1620,2020	English	Operational
					D	0035,0435,0835,1235,1635,2035		
		Wiarton	44 20N 81 10W	300	H	0110,0510,0910,1310,1710,2110		

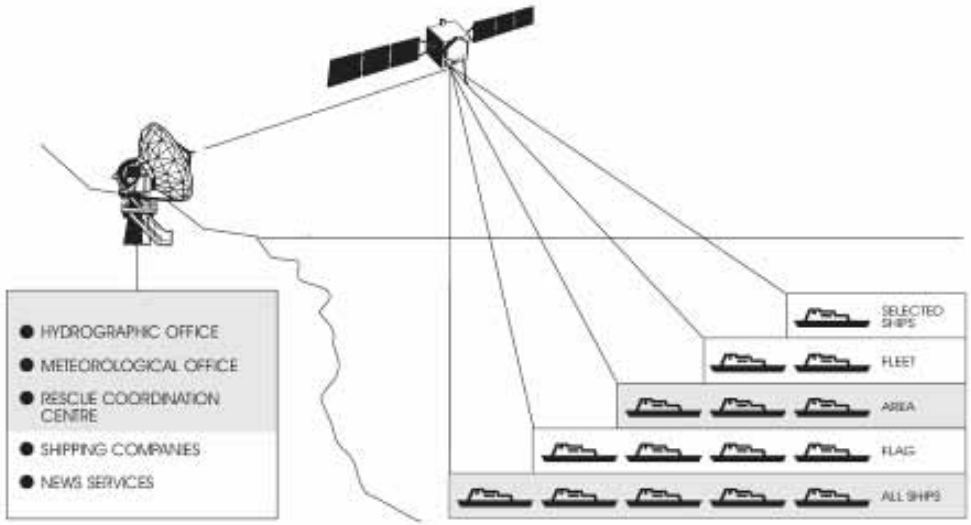
EGC SafetyNet

- slijed upućivanja poruke
  - nadležna ustanova
  - CES (Coast Earth Station)
  - nadležni NCS
  - satelit
- prioritet poruke
  - *Routine Safety Urgency Distress*
- vrsta poruke
  - Navigational warning services:
    - Coastal warnings;
    - NAVAREA warnings.
  - Meteorological services:
    - Met warnings or forecasts to coastal area;
    - Met warnings to circular area;
    - Met warnings or forecasts to METAREA.
  - SAR services:
    - General (all ships) call;
    - Shoretoship distress alerts to circular area;
    - Urgency and Safety traffic;
    - SAR coordination to rectangular area;
    - SAR coordination to circular area.
  - Piracy countermeasures messages:
    - Nav warnings to rectangular area
- adresa primaoca
  - pravokutna koordinate donjeg desnog ugla, $\Delta\varphi$ i $\Delta\lambda$
  - kružna koordinate središta i radijusom (M)
  - NAVAREA broj NAVAREA područja
  - obalna područja broj NAVAREA područja i slovo obalnog područja
- broj ponavljanja
  - konačna
  - beskonačna
- prijem poruke
  - prikaz nakon usporedbe:
    - s vlastitim položajem
      - *poznati položaj*
      - *nepoznati položaj*
    - s prethodno primljenim porukama (255)
  - prikaz ako poruka nema grešaka

EGC SafetyNet







EGC SafetyNet – Weather bulletin

NAV/MET AREA	Issuing Country	LES	Broadcast Schedule (UTC)	Ocean Region Satellite
I	United Kingdom	Goonhilly	0930, 2130	AOR-E
II	France	Aussaguel	0900, 2100	AOR-E/AOR-W
III	Greece	Thermopylae	1000, 2200	AOR-E
IV	United States	Southbury	0430, 1030, 1630, 2230	AOR-W
V	Brazil	Tangua	0730, 1930	AOR-E
VI	Argentina	Southbury	0230, 1730	AOR-W
VII	South Africa	Burum	0940, 1940	AOR-E/IOR
VIII	India	Arvi	0900, 1800 (N of 0°)	IOR
	Mauritius/La Reunion	Aussaguel	0130, 1330 (S of 0°) 00003, 06003, 12003, 18003 (S of 0°)	IOR
IX	Pakistan	Perth	0700	IOR
X	Australia	Perth	1030, 2330	IOR
			1100, 2300 02104, 06454, 13004, 19504 (Bass Strait) 0815, 2015 (Northern Territory)	POR
			0800, 2000 (Western Australia)	IOR
XI	China	Beijing	0330, 1015, 1530, 2215	IOR
	Japan8	Yamaguchi	0230, 0830, 1430, 2030 (N of 0°) 0815, 2015 (S of 0°)	POR
XII	United States	Southbury/Santa Paula	0545, 1145, 1745, 2345	AOR-W/POR
XIII	Russian Federation	Eik	0930, 2130	POR
XIV	New Zealand	Albany (Auckland)	0930, 2130 0130, 1330 (NZ coast only) 0330, 1530	POR
XV	Chile	Southbury	1845	AOR-W
XVI	United States	Southbury	0515, 1115, 1715, 2315	AOR-W

EGC SafetyNet – Navigation bulletin

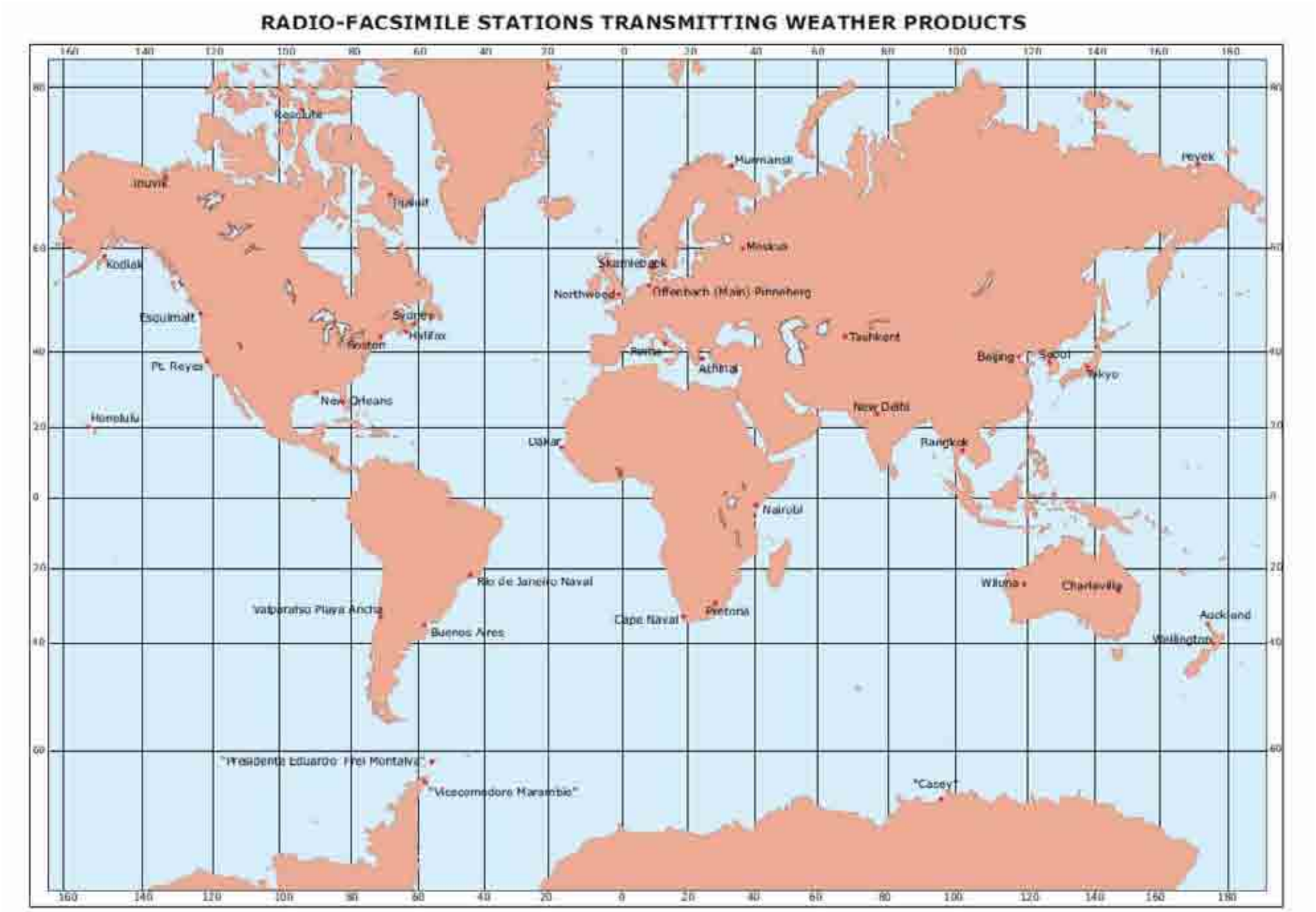
NAV/MET AREA	Coordinator	LES	Broadcast Schedule (UTC)	Ocean Region Satellite
I	United Kingdom	Goonhilly	1730 & as appropriate	AOR-E
II	France	Aussaguel	1630	AOR-E
III	Spain	Thermopylae	1200, 2400 & on receipt	AOR-E
IV	United States	Southbury	1000, 2200	AOR-W
	French Antilles (C1)		0900, 2100	
V	Brazil	Tangua	0400, 1230	AOR-E
	French Guiana (A1)	Southbury	0900, 2100	
VI	Argentina	Southbury	0200, 1400	AOR-W
VII	South Africa	Burum	1940	AOR-E/IOR
	La Reunion (D1)	Aussaguel	0040, 1240	IOR
	Mayotte (V1)		0330, 1530	
	Kerguelen (K1)		0140, 1340	
VIII	India	Arvi	1000	IOR
	La Reunion (D1)	Aussaguel	0040, 1240	IOR
	Mayotte (V1)		0330, 1530	
IX	Pakistan	Perth	0800	IOR
X	Australia	Perth	0700, 1900 & on receipt	IOR/POR2
	New Caledonia (N1)	Southbury	0140, 1340	POR
XI	Japan	Beijing/Yamaguchi	0005, 0805, 1205	IOR/POR
XII	United States	Southbury/Santa Paula	1030, 2230	AOR-W/POR
XIII	Russian Federation	Eik	0930, 2130	POR
XIV	New Zealand	Albany (Auckland)	On receipt & every 12 hrs.	POR
	New Caledonia (N1)	Southbury	0140, 1340	POR
	Wallis and Futuna (D1)		0030, 1230	
	French Polynesia (R1)		0250, 1450	
XV	Chile	Southbury	0210, 1410, 2210	AOR-W
XVI	Peru	Southbury	0519, 1119, 1719, 2319	AOR-W

HF NBDP & Faximile MSI

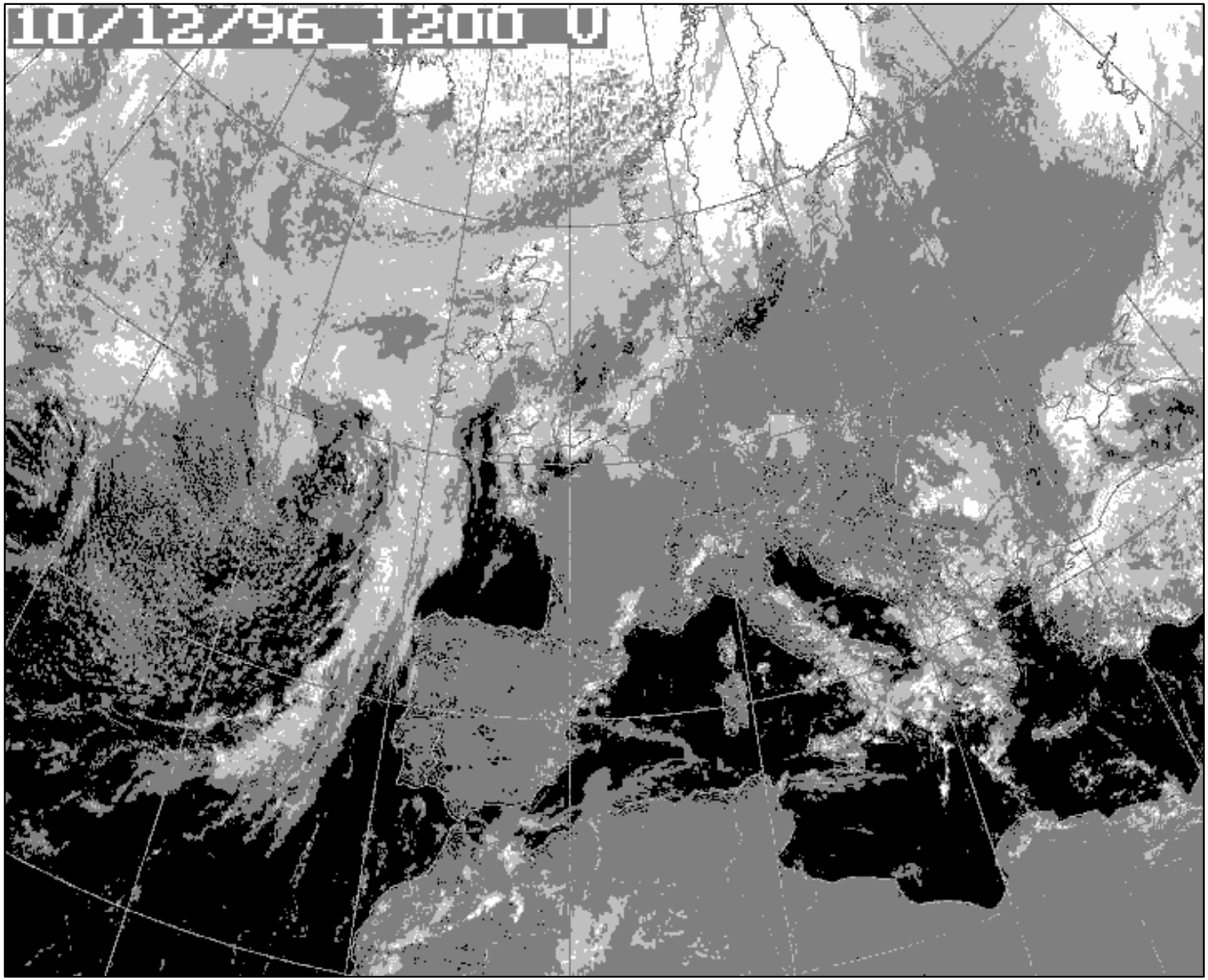
- Narrow Band Direct Printing RadioTelegraphy
  - telex uređaj u FEC modu
    - 4210.0 kHz, 6314.0 kHz, 8416.5 kHz, 12579.0 kHz,
    - 16806.0 kHz, 19680.5 kHz, 22376.0 kHz 26100.5 kHz
  - porukama prethodi DCS poziv

- Faximile
  - izvedba
    - namjenski prijemnik s jedinicom za ispis
    - radioprijemnik, modem i računalo
  - mjerilo 1:10.000.000 do 1:20.000.000
  - vrste slika
    - površinska analiza
    - temperature zraka i mora
    - stanje valova i vjetrova
    - visinska analiza (500 mb)
    - površinske i visinske prognoze (24, 36, 48 i 72 sata)
    - satelitske slike
    - upozorenja i obavijesti

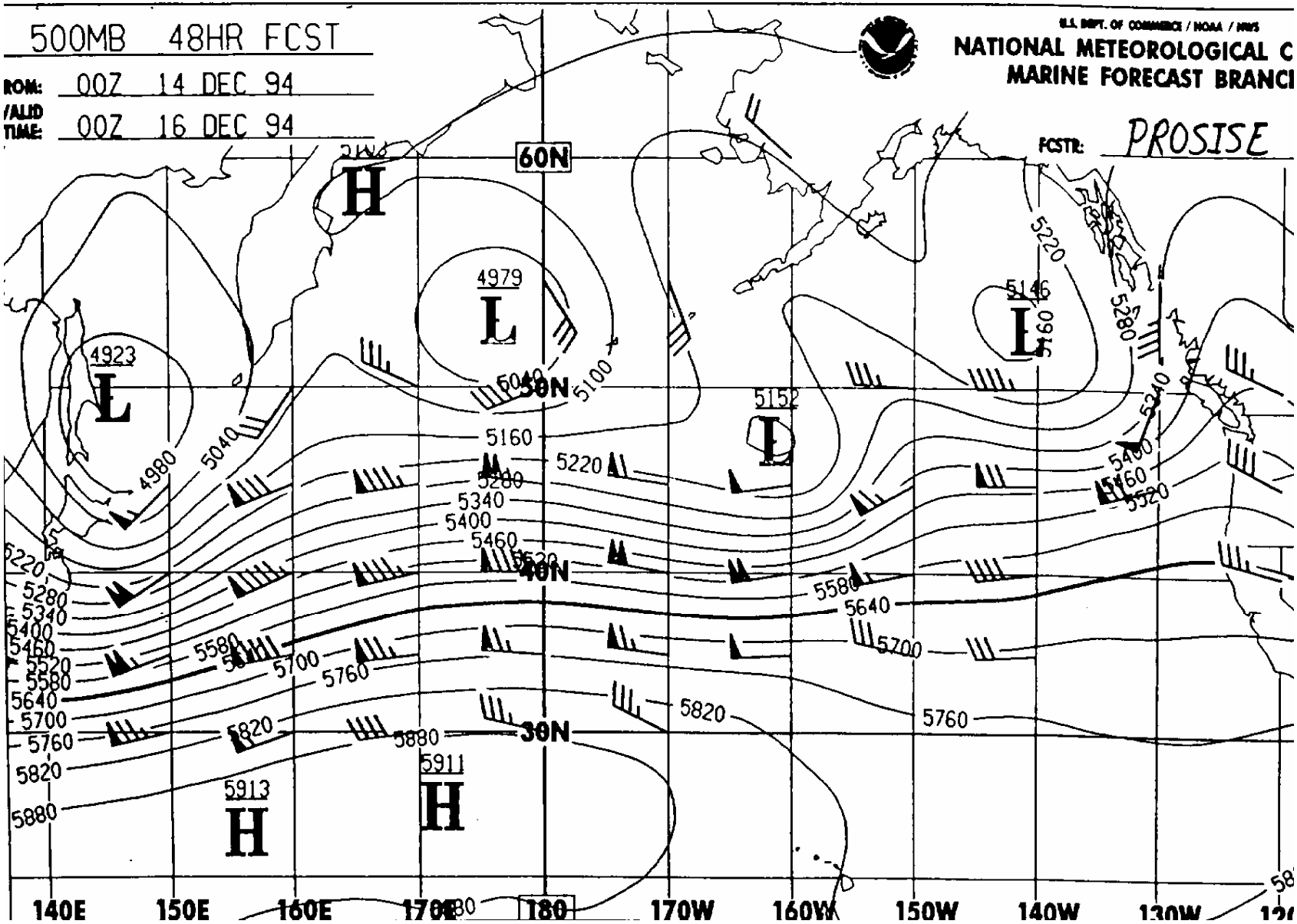
Radiofaksimil



Radiofaksimil



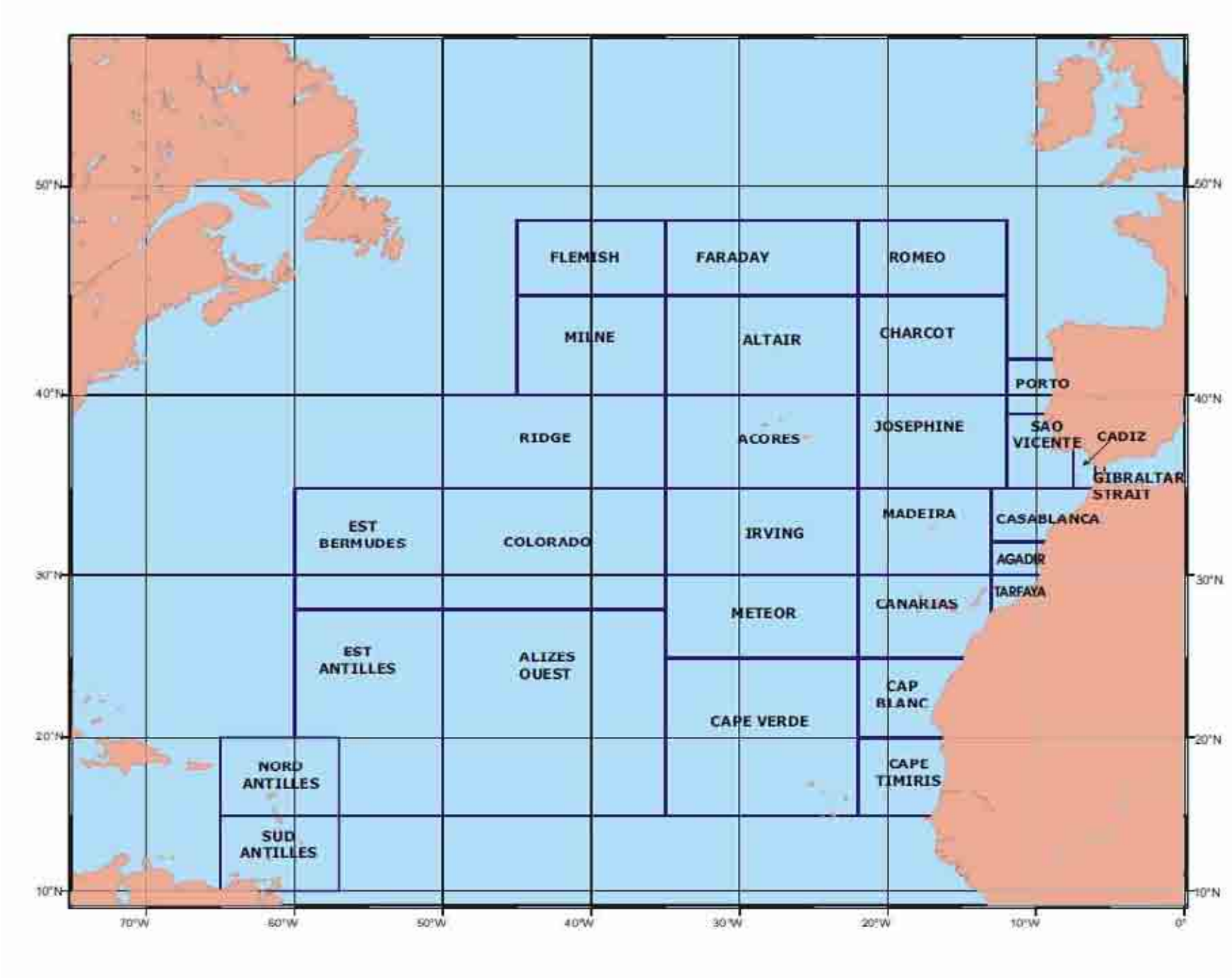
Radiofaksimil



KOMUNIKACIJSKA PODRŠKA

- Meteorološka upozorenja
  - I. upozorenje
    - *no storm warning*, *gale warning* za vjetar snage 89, *storm warning* za vjetar snage 10 ili više te *hurricane / typhoon / tropical cyclone warning* za tropske ciklone,
    - dan i vrijeme, vrst i stupanj poremećaja, tlak u središtu (mb), koordinate središta,smjer i brzinu kretanja poremećaja,
    - smjer i brzinu vjetra,
    - podatke o vjetrovnim valovima i valovima mrtvog mora,
  - II. situacija:
    - dan i vrijeme,
    - osnovni podaci o baričkim sustavima (vrst sustava, tlak, pozicija i brzina kretanja),
    - vjetar, valovi i vidljivost,
  - III. prognoza:
    - vrijeme trajanja (1224h),
    - naziv ili granice područja,
    - vjetar, vidljivost, valovi, led i dr.,
    - izgledi razvoja vremena,
  - IV. šifrirana sinoptička analiza i prognoza,
  - V. šifrirana meteorološka izvješća odabranih brodskih postaja,
  - VI. šifrirana meteorološka izvješča odabranih kopnenih postaja.

KOMUNIKACIJSKA PODRŠKA



KOMUNIKACIJSKA PODRŠKA

WOAU05 APRF 282125
40:3:1:31:10:11:00 IDW21100
SECURITE HIGH SEAS WEATHER WARNING FOR METAREA 10

ISSUED BY THE AUSTRALIAN BUREAU OF METEOROLOGY, PERTH
AT 2125UTC 28 MARCH 2007

Gale Warning FOR THE WESTERN AREA
Please be aware, wind gusts can be a further 40 percent stronger than the averages given here, and maximum waves may be up to twice the height.

SITUATION AT 1800UTC
A series of cold fronts south of 40 South.

AREA AFFECTED
South of 40S080E 37S095E 45S120E 37S129E, expected to be south of a line 50S085E 35S090E 35S100E 35S125E 40S129E by 290600UTC and south of 50S090E 37S105E 47S129E by 291800UTC.

FORECAST
NW/SW winds 30/40 knots. Rough to very rough seas. Heavy swell.

WEATHER PERTH

FQMQ54 LFPW 282045
Weather bulletin on METAREA 3, METEOFRANCE, Toulouse, Wednesday 28 March 2007 at 21 UTC.
Wind speed in BEAUFORT SCALE
Sea : Total significant Please be aware, wind gusts can be a further 40 percent stronger than the averages given here, and maximum waves may be up to twice the significant height.

Part 1 : WARNING : Nr 120.

Part 2 : General synopsis, Wednesday 28 at 12 UTC Low 1007 hPa south of Balearic islands, expected 1007 hPa just north of Alger at 29/12 UTC then moving southward and filling. Low 1008 hPa over north of Tunisia, moving to Tyrrhenian sea.

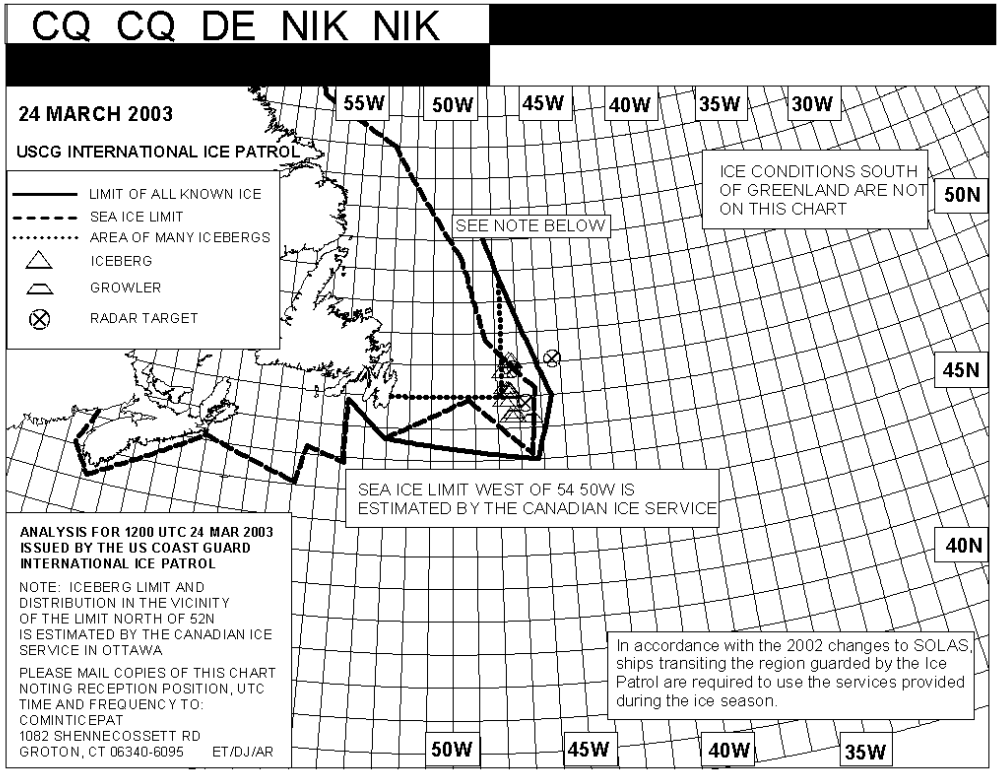
Part 3 : Forecasts to Friday 30 at 00 UTC
EAST OF CABRERA : Southerly 4 or 5 decreasing soon 3 or 4, then becoming North 3 or 4 later, locally 5 at end. Moderate. Rain and thundery showers.
BALEARES : Northeast increasing imminent 7 or 8 then decreasing gradually 3 or 4 afternoon and backing Southwest 3 or 4 at end. Rough decreasing at end. Rain and thundery showers.
……
LION : Northeast 4 or 5 backing North or Northwest on morning, then increasing 6 at end. Moderate. Rain in south.
ALBORAN : West 6 or 7 decreasing soon 5 or 6 then 4 or 5 at end. Moderate in west, rough in east. Showers.

Part 4 : Outlook for next 36 hours : Northwesterly moderate or fresh flow from gulf of Lion to Tunisia and in Tyrrhenian sea, becoming a Westerly moderate or fresh flow over the whole basin, locally strong in Tyrrhenian sea.
NNNN

KOMUNIKACIJSKA PODRŠKA

SUBJ: INTERNATIONAL ICE PATROL (IIP) BULLETIN
SECURITE

1. 25 MAR 1200 UTC ESTIMATED LIMIT OF ALL KNOWN ICE:FROM 4650N 5450W TO 4530N 5330W TO 4500N 4615W TO 4800N 4600WTO 5200N 4830W THEN NORTHWARD. ICE LIMIT NORTH OF 52N ISOBTAINED FROM CANADIAN ICE SERVICE. SEA ICE LIMIT WEST OF5450W IS ESTIMATED BY THE CANADIAN ICE SERVICE.
2. RADAR TARGET OUTSIDE ICE LIMIT: 4804N 4514W.
3. SEA ICE LIMIT: FROM 4520N 6535W TO 4410N 6635W TO4315N 6545W TO 4515N 6050W TO 4345N 5705W TO 4515N 5620W TO4520N 5500W TO 4650N 5450W TO 4540N 5300W TO 4650N 4930W TO4515N 4630W TO 4735N 4615W TO 4915N 4900W TO 5120N 4950W TO5455N 5320W.
4. MANY ICEBERGS ARE NORTH OF 4700N AND WEST OF 4745W.
5. IN ACCORDANCE WITH THE 2002 CHANGES TO SOLAS, SHIPSTRANSITING THE REGION GUARDED BY THE ICE PATROL ARE REQUIRED TO USE THE SERVICES PROVIDED DURING THE ICESEASON.
6. USE EXTREME CAUTION WHEN NEAR THE GRAND BANKS AS ICE MAYBE PRESENT. REPORT POSITION AND TIME OF ANY ICE ENCOUNTEREDTO COMINTICEPAT VIA CG COMMUNICATIONS STATION NMF, NMN,INMARSAT CODE 42, OR ANY CANADIAN COAST GUARD RADIO STATION.MAKE UNCLASSIFIED SEA SURFACE TEMPERATURE AND WEATHERREPORTS TO COMINTICEPAT EVERY SIX HOURS WITHIN LATITUDES 40NAND 52N AND LONGITUDES 39W AND 57W.
7. ICEBERG CHART FACSIMILE BROADCASTS ARE AT 1600Z AND 1810ZON FREQUENCIES 6340.5, 9110.0 AND 12750.0 KHZ.
8. RELEASED BY CDR R.L. DESH, COMINTICEPAT.BT



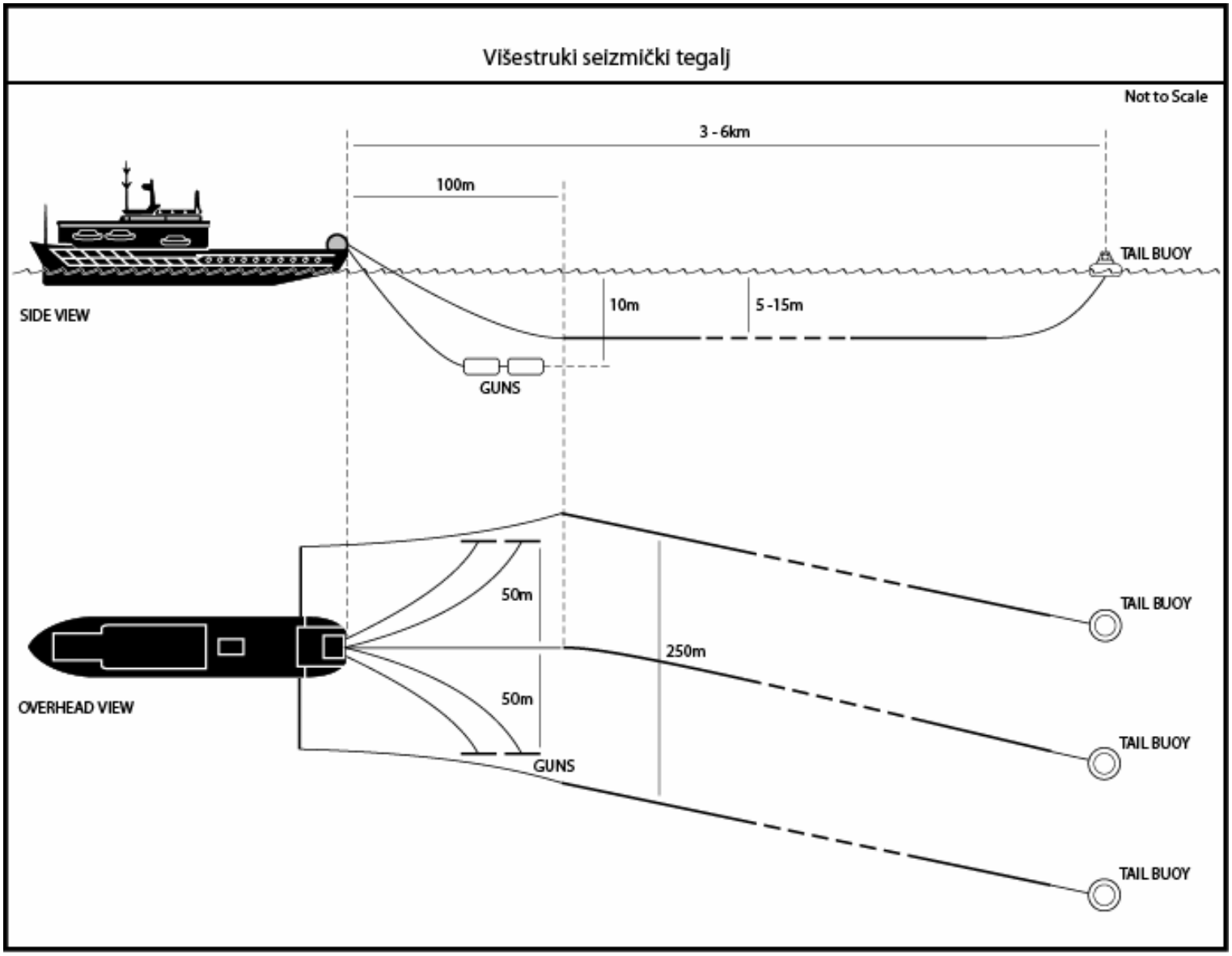
KOMUNIKACIJSKA PODRŠKA

- Navigacijska upozorenja
  - nezgode ili neispravnosti pomorskih svjetala, znakova za maglu i plutača uz plovne putove;
  - prisutnost opasnih podrtina na ili u blizini plovnih putova te njihove oznake;
  - uspostavljanje značajnih novih pomagala za navigaciju ili značajne izmjene na postojećima;
  - prisutnost velikih teglja koji teško i sporo manevriraju;
  - pojava plutajućih mina;
  - područja gdje se obavlja traganje i spašavanje ili čišćenje zagađenja (koja treba izbjegavati);
  - zahtjevi izvješća o susretanju i uočavanju zrakoplova i brodova koji kasne na odredište, a po izravnom zahtjevu centara za koordinaciju traganja i spašavanja;
  - položaji novootkrivenih podvodnih grebena, pličina ili podvodnih podrtina koje mogu biti opasnost po sigurnost brodova u plovidbi ili njihove oznake;

KOMUNIKACIJSKA PODRŠKA

- Navigacijska upozorenja
  - neočekivane i neplanirane promjene plovnih putova ili zabrane plovidbe nekim područjem;
  - polaganje kablova ili cjevovoda, tegljenje podvodnih objekata u istraživačke svrhe, korištenje daljinski ili ručno upravljanih podvodnih plovila ili druge podvodne djelatnosti koje mogu predstavljati opasnost okolnoj plovidbi;
  - uspostavljanje *offshore* objekata u blizini ili na plovnim putovima;
  - značajne neispravnosti radionavigacijskih službi;
  - obavijesti koje mogu utjecati na sigurnost plovidbe na većem području kao što su vojne vježbe, vježbe gađanja, svemirske operacije i drugo; u upozorenje treba biti uključen stupanj opasnosti, a samo upozorenje treba biti predano najmanje pet dana prije najavljenih operacija;
  - sve druge obavijesti koje na bilo koji način mogu utjecati na sigurnost plovidbe u nekom području,
  - obavijesti o ispravcima pomorskih karata.

KOMUNIKACIJSKA PODRŠKA



KOMUNIKACIJSKA PODRŠKA

Navigacijska upozorenja – primjeri

navarea three
041/95 - adriatic sea
capsized boat 6 metres long blue hull semisubmerged adrift in 41 37 n 018 45 e at 112000z jan95.
cancel this message on 16 jan95.
nnnn

navarea three
079/95 - ligurian sea
man overboard in 43 53 n 008 13 e at 262200z jan95
cancel this message on 01 feb95.
nnnn

navarea two
032/95 - satellite
1 - satellite 30320-48 (oscar-32) returned to service effective 221250z jan.
2 - the following satellites are in service : 30200-16 (oscar-20), 30230-12 (oscar-23), 30250-25 (0scar-25), 30310-60 (0scar-31), 30320-48 (oscar-32), 30490-39 (nova-2).
nnnn

NAVIGACIJSKA PODRŠKA

- Teorija navigacijskih grešaka
  - podjela grešaka
    - razlika između izmjerene i stvarne vrijednosti (error)
    - sistematske greške
      - *jednake u veličini i predznaku za sva opažanja*
      - *ispravljaju se korekcijama*
    - grube pogreške
      - *pogrešno čitanje*
  - slučajne greške
    - slijede normalni zakon (Gausov zakon)

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}}$$

    - srednja vrijednost greške

$$\mu = \frac{1}{n}\sum_{i=1}^{n} X_i$$

    - standardna devijacija

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(X_i - \mu)}$$

    - standardna devijacija uzorka

$$\sigma_u = \frac{\sigma}{\sqrt{n}}$$

NAVIGACIJSKA PODRŠKA

- Navigacijska točnost
  - osnovne pretpostavke
    - samo slučajne greške
    - greške slijede normalnu razdiobu
    - greške dvaju linija položaja su nezavisne
    - linije položaja su pravci
  - točnost opažanja
    - vizualna opažanja d/100
    - radarska opažanja d/75
    - RDF azimut d/50
    - radarska udaljenost R/100
    - astronomska opažanja 1.5 Nm

NAVIGACIJSKA PODRŠKA

- Najvjerojatniji položaj
  - *Most probable position*
- vjerojatna kružna greška
  - *Circular probable error – CEP*

$$P = 1 - e^{-\frac{R^2}{2\sigma^2}}$$

- krug položaja

$$R_{95} = \frac{k\sqrt{\sigma_1^2 + \sigma_2^2}}{\sin\alpha}$$

- R_{95} radijus kruga položaja
  - *k 1.8 ukoliko je 70°<α<110° a 0.5<σ1/σ2<1, inače 2.0*
- vjerojatna eliptična greška

$$\sigma_x^2 = \frac{1}{2\sin^2\alpha}\left(\sigma_1^2 + \sigma_2^2 + \sqrt{(\sigma_1^2 + \sigma_2^2)^2 - 4\sin^2\alpha\,\sigma_1^2\sigma_2^2}\right)$$

$$\sigma_y^2 = \frac{1}{2\sin^2\alpha}\left(\sigma_1^2 + \sigma_2^2 - \sqrt{(\sigma_1^2 + \sigma_2^2)^2 - 4\sin^2\alpha\,\sigma_1^2\sigma_2^2}\right)$$

NAVIGACIJSKA PODRŠKA

- Metoda najmanjih kvadrata
  - $\Sigma (Y - Yc)^2 = \min$
    - $\partial(\Sigma d^2)/\partial x = 0$
    - $\partial(\Sigma d^2)/\partial y = 0$
    - A X = B
    - AT A X = AT B
    - X = [AT A]1 AT B
  - pravac koji zadovoljava uvjet min D^2 do zadatih točaka
    - $\Sigma (Y - a - bX)^2 = \min$
    - $2 \Sigma (Y - a - bX) X = 0$
  - točka koja zadovoljava uvjet min D^2 do zadatih pravaca
    - jednadžba udaljenosti točke od pravca
    - $d = X \cos \alpha + Y \sin \alpha - p$
  - rješenja sustava
    - $X \Sigma(\cos^2\alpha) + Y \Sigma(\sin \alpha \cos \alpha) = \Sigma(p \cos \alpha)$
    - $X \Sigma(\sin \alpha \cos \alpha) + Y \Sigma(\sin^2\alpha) = \Sigma(p \sin \alpha)$

NAVIGACIJSKA PODRŠKA

- Razina navigacijske podrške određena je potrebama korisnika odnosno njegovom djelatnošću:
  - plovidba otvorenim morem,
  - plovidba obalnim područjima,
  - plovidbi kroz plovne prolaze, kanale, plovne rijeke te na prilaznim lučkim putovima,
  - manevriranje tijekom pristajanja i isplovljenja iz luka,
  - hidrografske i oceanografske djelatnosti, i
  - geodetska istraživanja i iskorištavanje mora i podmorja.
- Osnovna obilježja navigacijskih sustava
  - pokrivenost
    - područje prijema
  - točnost
    - standardna devijacija
  - raspoloživost
    - vrijeme u kojem se jamči korištenje uz zadatu točnost

NAVIGACIJSKA PODRŠKA

Namjena	Područje pokrivenosti	Točnost	Raspoloživost
Plovidba otvorenim morem	globalno	1.4 3.7 km	0.95 0.99
Plovidba obalnim područjima	obalna područja	100 460 m	0.990 0.997
Plovidba navigacijski opasnim područjima Područje nadzora VTS sustava	prilazni putovi	20 m 10 m	0.990 0.997 0.995 0.999
Manevriranje tijekom pristajanja i isplovljenja iz luka	lučka područja	8 m	1.0
Hidrografske i oceanografske potrebe	globalno, regionalno	0.25 5 m	0.95
Geodetska istraživanja i iskorištavanje mora i podmorja	lokalno, regionalno	1 5 m	0.95

NAVIGACIJSKA PODRŠKA

Odnos zahtijevane točnosti i najvećeg vremenskog razmaka između uzastopno određenih položaja broda

Udaljenost do navigacijski opasnog objekta (M)	**Zahtijevana točnost (M)**	**Točnost navigacijskog sustava (M)**				
		0.1	**0.25**	**0.50**	**1.0**	**2.0**
		Najveće dopušteno vrijeme od posljednjeg položaja (min)				
10	0.4	12	9			
20	0.8	28	27	22		
30	1.2	48	47	44	27	
40	1.6	72	71	68	56	
50	2.0	100	99	97	87	0
60	2.4	132	131	129	120	73
70	2.8	168	167	165	157	118
80	3.2	208	207	206	198	162
90	3.6	252	251	250	242	210
100	4.0	300	300	298	291	260

NAVIGACIJSKA PODRŠKA

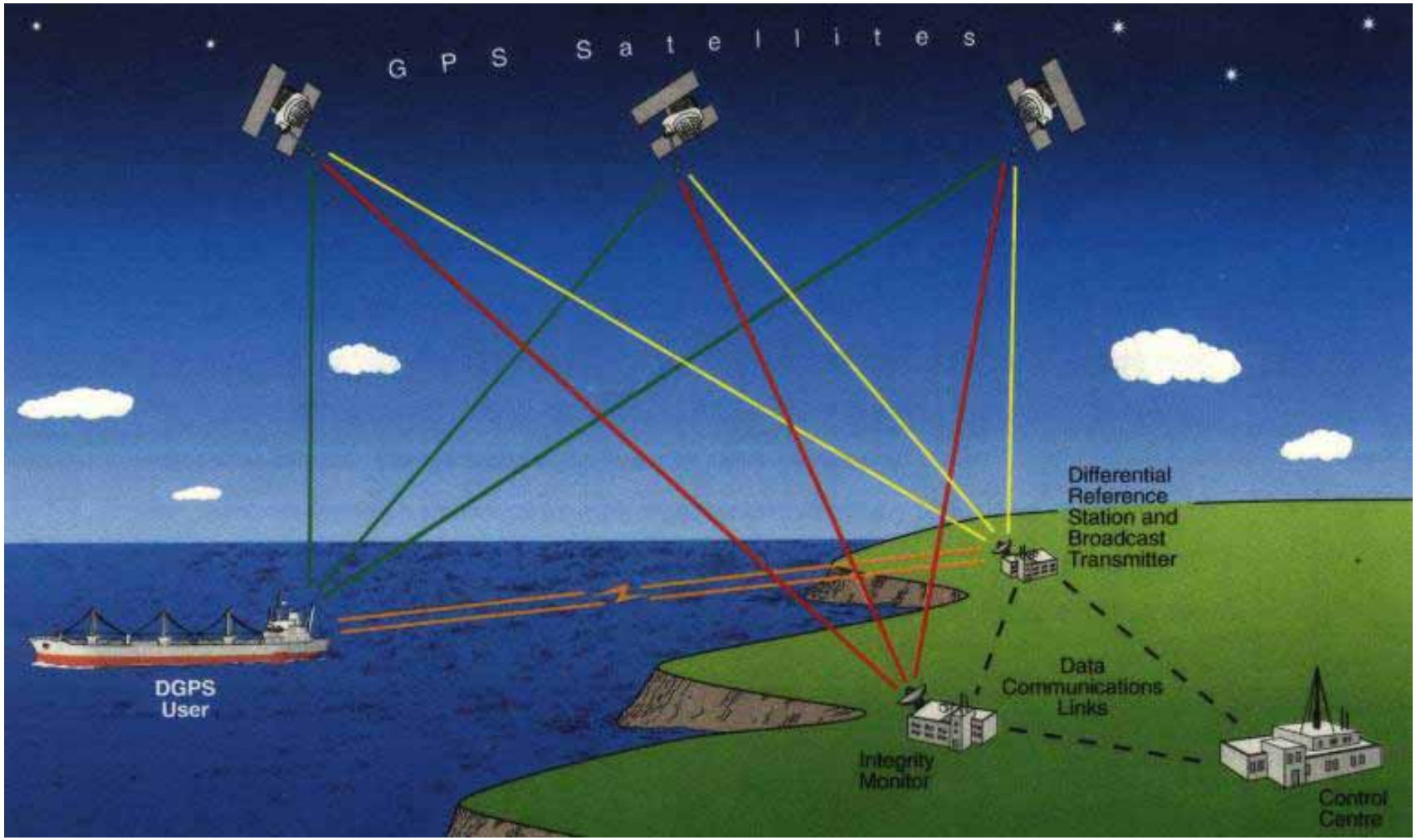
NAVIGACIJSKI SUSTAV	GPS GLONASS	TRANSIT TSIKADA	OMEGA ALPHA	LORANC TCHAIKA
Način rada	mjerenje razlike vremena	mjerenje pomaka frekvencije	mjerenje faznog pomaka	mjerenje razlike vremena
Domet stanice			11.000 km 12.000 km	900 – 2.200 1.500 – 1.800
Pokrivenost (M km²)	globalno globalno	globalno globalno	140 globalno	75 20
Pouzdanost	vrlo visoka	99%	≈97%	95%
Točnost (RMS)	100 60	40 m 80 120 m	3.600 m 2.300 – 7.600	460 m 100 700 m

NAVIGACIJSKA PODRŠKA

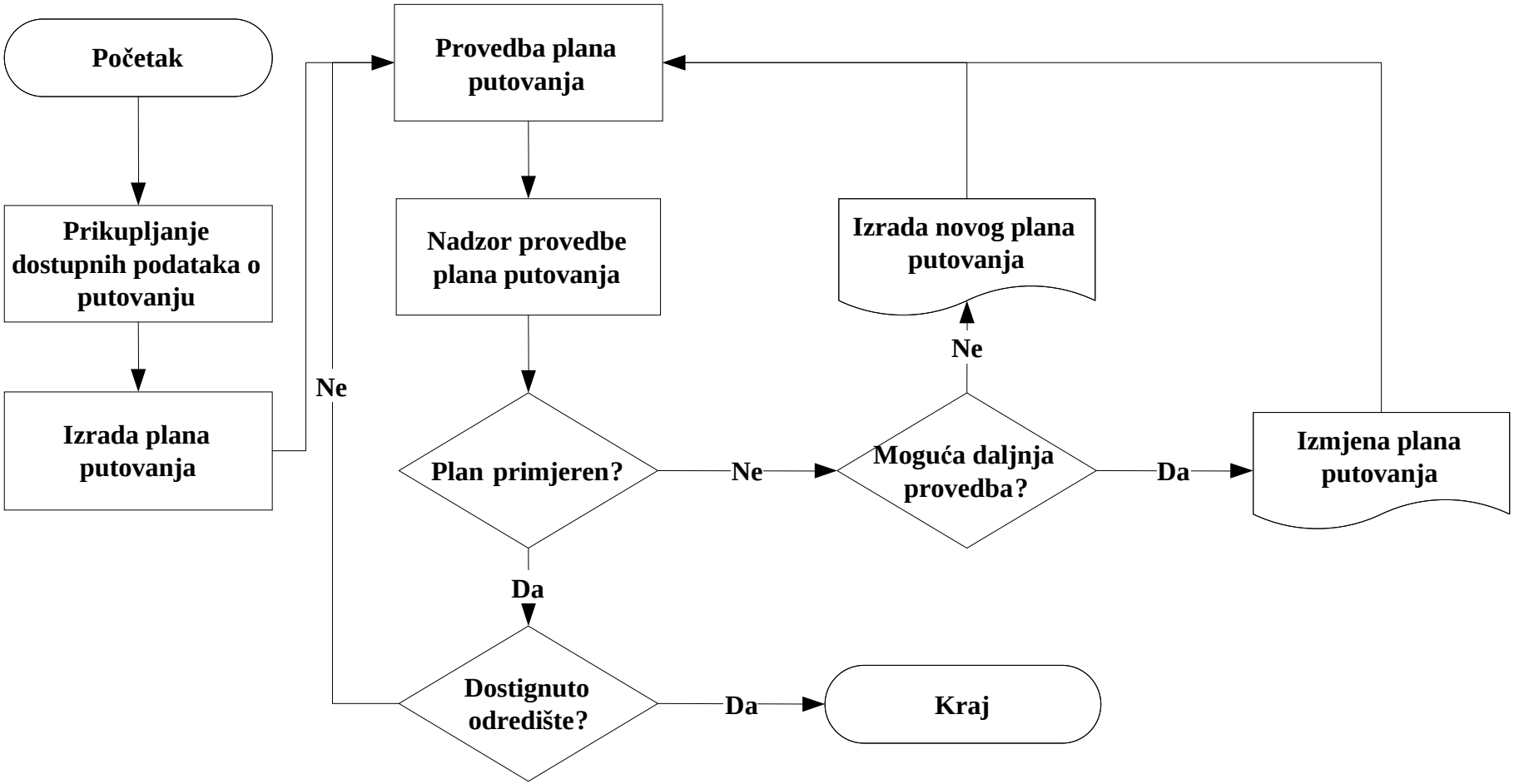
Parametar	**Zahtjevi**
Točnost sustava na mjestu prijemne antene: zemljopisna točnost ponavljajuća točnost	 ≤ 10 m (95 %) ≤ 14 m (95 %)
Obavještavanje o neispravnosti sustava: - vrijeme do davanja alarma - prag vrijednosti	 ≤ 10 s ≤ 25 m
Raspoloživost sustava prag vrijednosti	99,8 % (30 dana) prekid rada < 3 s
Pouzdanost	≥ 99,97 % (1 godini)
Pokrivenost	globalno
Učestalost određivanja pozicije	najmanje jednom svake 2 s
Kapacitet rada	neograničeno

Najmanji uvjeti za globalne navigacijske satelitske sustave u pomorstvu
IMO Rezolucija A.860(20), Maritime Policy for a future Global Navigation Satellite System (GNSS),

NAVIGACIJSKA PODRŠKA



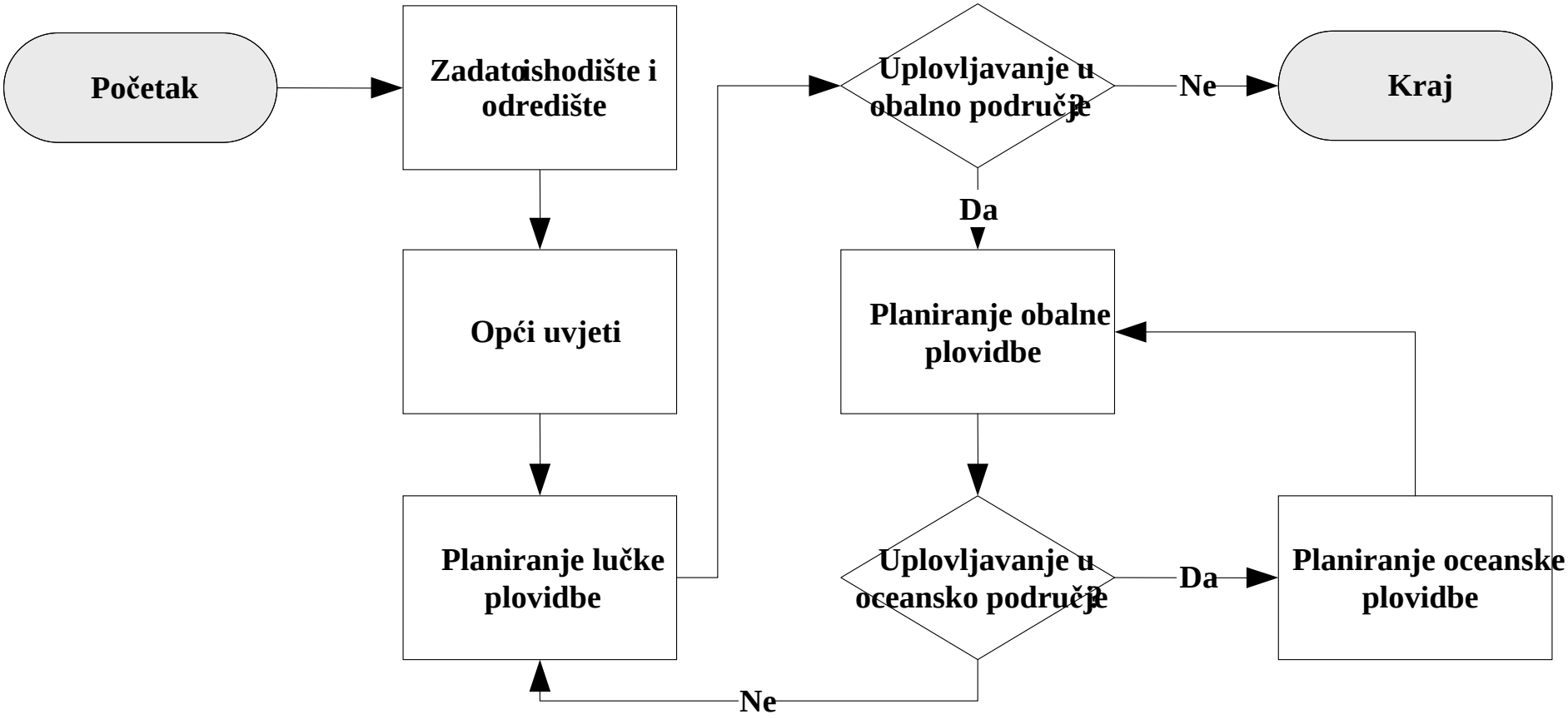
PLAN PUTOVANJA



Plan putovanja - Sadržaj plana putovanja

- kursovi preko dna te kursovi ispravljeni za zanos
- najveće dopušteno odstupanje od planiranog kursa plovidbe
- učestalost ucrtavanja položaja broda i preporučeni način određivanja položaja,
- mjesta i način promjene kursa broda i dr.
- dostupna navigacijska upozorenja i obavijesti, vremenska izvješća, upozorenja i prognoze,
- gaz broda,
- najmanji dopušteni iznos dubine mora ispod kobilice,
- vremena nastupa i visine voda,
- područja obvezne uporabe dubinomjera,
- najmanja dopuštena udaljenost mimoilaženja
- obveza pozivanja dodatnih motritelja najveća dopuštena brzina broda u pojedinim područjima
- područja u kojima je nužna dodatna opskrba energijom kormilarskog uređaja
- položaje broda s kojega su obvezna javljanja i komunikacijski kanali
- mjesta i način prihvata peljara, sidrenja, poziva zapovjednika ili obavještavanje stroja
- važna obilježja navigacijskih pomagala
  - posebice radarskih i radijskih obilježivača i goniometarskih postaja
- alternativni plovidbeni putovi,
- obvezne navigacijske radnje
  - npr. priibava faximil slike
- područja i vremena ispuštanja / zabrane ispuštanja zauljenih voda,

Plan putovanja



Plan putovanja

- Opći uvjeti:
  - sigurnosni uvjeti:
    - uvjeti navedeni u Upisnom listu,
    - uvjeti brodskih svjedodžbi,
    - uvjeti navedeni u Međunarodnoj konvenciji o teretnim vodenim linijama 1966.,
    - područja vojnih vježbi,
    - područja piratskih napada,
    - mogućnost nadopune gorivom,
  - ugovorni uvjeti
    - uvjeti iz ugovora o prijevozu,
    - uvjeti osiguranja,
    - upute brodara ili unajmitelja,
    - …

Postupak izrade čimbenici

Opći uvjeti okoline	Podaci o brodu i teretu	Čimbenici kretanja	Navigacijska podrška
Zemljopisni uvjeti	Veličina i gaz broda	Vjetar	Opći uvjeti
Prometni uvjeti	Poriv broda	Morske struje	Navigacijski sustavi
Objekti sigurnosti plovidbe	Obilježja tereta	Valovi	Druga navigacijska pomagala
Ugovorna i druga ograničenja	Konstrukcijska obilježja broda	Dubina mora	
Sigurnosni uvjeti	Manevarska svojstva		
Meteorološki i oceanografski uvjeti			

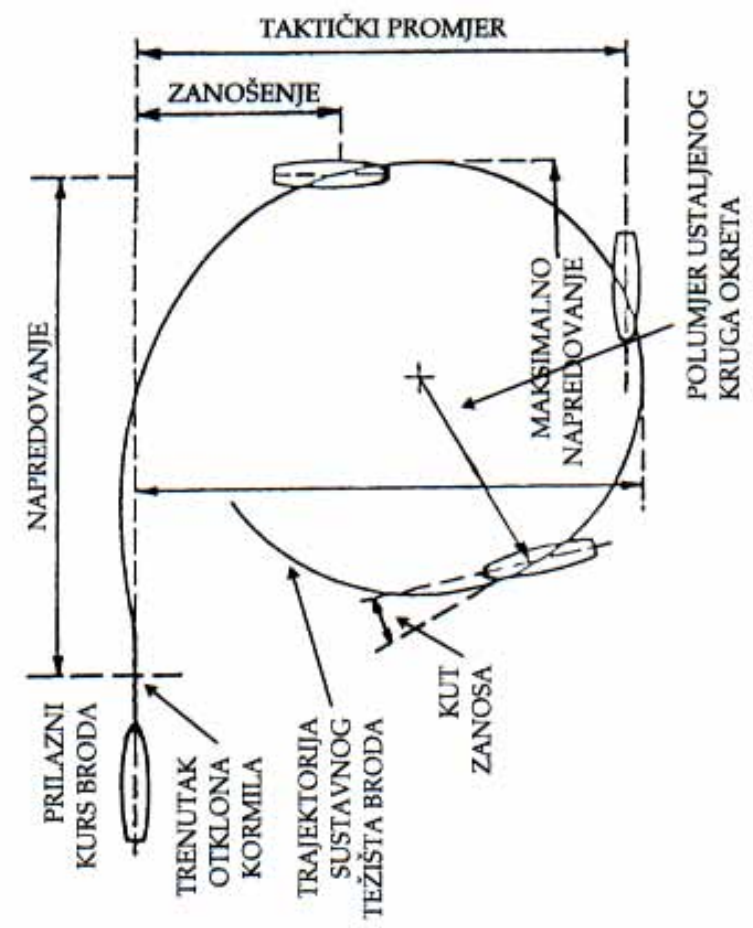
Maritimna svojstva broda

- Opća obilježja
  - dužina, širina, gaz, nosivost, tonaža, koeficijenti oblika
- Tehnološka svojstva
  - poriv broda, obilježja tereta, konstrukcijska obilježja broda
- Dinamička svojstva
  - najveća, putna, manevarska brzina
- Manevarska svojstva
- Promjena dinamičkih svojstava
  - dodatni zagažaj, promjena upravljivosti
- Čimbenici okoline
  - vjetar, valovi, morske struje, dubina mora
- Navigacijski uvjeti
  - osnovna i dopunska pomagala, mjere sigurnosti

Manevarska svojstva

- Upravljivost
  - svojstvo zaustavljanja broda i
  - svojstvo okretanja broda.

- Krug okreta
  - napredovanje
    - (Advance)
  - najveće napredovanje
    - (Maximal advance)
  - taktički promjer
    - (Tactical diameter)
  - zanošenje ili bočni pomak
    - (Transfer)
  - najveće zanošenje
    - (Maximal Transfer)
  - kut zanosa
    - (Drift angle)
  - polumjer ustaljenog kruga okreta
    - (Steady turn radius)



Bruto tonaža	$\log G = 2.65 \lambda \ 1.70 \pm 0.08$
Brzina plovidbe	$\log V = 0.25 \lambda + 0.52 \pm 0.06$
Zaustavni put u nuždi	$\log D = 1.46 \lambda + 0.01 \pm 0.18$
Napredovanje (35°)	$\log Da = 1.03 \lambda + 0.43 \pm 0.01$
Bočni pomak (35°)	$\log Dt = 1.01 \lambda + 0.17 \pm 0.14$

Manevarska svojstva

PILOT CARD

Ship's name _____ Date _____

Call sign _____ Deadweight _____ tonnes Year built _____

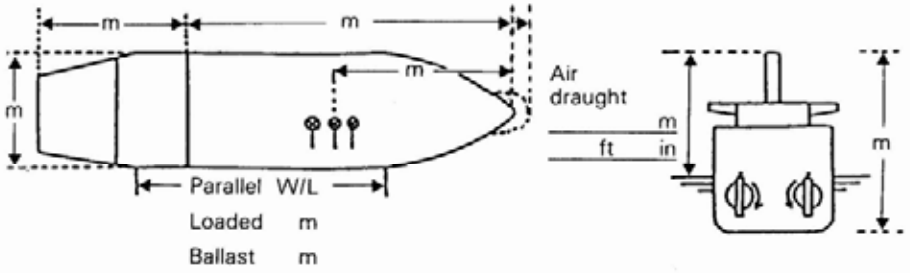
Draught aft _____m/____ft ____in, Forward _____m/____ft ____in, Displacement _____tonnes

SHIP'S PARTICULARS

Length overall _____m, Anchor chain: Port _____shackles, Starboard _____shackles,

Breadth _____m Stern _____shackles

Bulbous bow Yes/No (1 shackle = _____m/_____fathoms)



Type of engine _____ Maximum power _____kW (_____HP)

Manoeuvring engine order	Rpm/pitch	Speed (knots)	
		Loaded	Ballast
Full ahead			
Half ahead			
Slow ahead			
Dead slow ahead			
Dead slow astern		Time limit astern _____min	
Slow astern		Full ahead to full astern _____s	
Half astern		Max. no. of consec. starts _____	
Full astern		Minimum RPM _____ _____knots	
		Astern power _____% ahead	

STEERING PARTICULARS

Type of rudder _____ Maximum angle _____ °

Hard-over to hard-over _____s

Rudder angle for neutral effect _____ °

Thruster: Bow _____ kW (_____ HP) Stern _____ kW (_____ HP)

CHECKED IF ABOARD AND READY

Anchors ☐

Whistle ☐

Radar ☐ 3 cm ☐ 10 cm

ARPA ☐

Speed log ☐ Doppler: Yes/No

Water speed ☐

Ground speed ☐

Dual-axis ☐

Engine telegraphs ☐

Steering gear ☐

Number of power units operating ☐

Indicators:

Rudder ☐

Rpm/pitch ☐

Rate of turn ☐

Compass system ☐

Constant gyro error ± _____°

VHF ☐

Elec. pos. fix. system ☐

Type _____

OTHER INFORMATION:

Manevarska svojstva

WHEELHOUSE POSTER

Ship's name _____, Call sign _____, Gross tonnage _____, Net tonnage _____

Max. displacement _____tonnes, and Deadweight _____tonnes, and Block coefficient _____ at summer full load draught

Draught at which the manoeuvring data were obtained

Loaded	Ballast
Trial/Estimated	Trial/Estimated
____m forward	____m forward
____m aft	____m aft

STEERING PARTICULARS

Type of rudder(s) _____

Maximum rudder angle _____°

Time hard-over to hard-over

with one power unit _____ s

with two power units _____ s

Minimum speed to maintain course propeller stopped _____ knots

Rudder angle for neutral effect _____°

ANCHOR CHAIN

	No. of shackles	Max. rate of heaving (min/shackle)
Port		
Starboard		
Stern		

(1 shackle = _____m/_____fathoms)

PROPULSION PARTICULARS

Type of engine _____, ____kW (____HP), Type of propeller _____

Engine order	Rpm/pitch setting	Speed (knots), Loaded	Speed (knots), Ballast
Full sea speed			
Full ahead			
Half ahead			
Slow ahead			
Dead slow ahead			
Dead slow astern		Critical revolutions ____rpm Minimum rpm ____ ____knots	
Slow astern		Time limit astern ____min Time limit at min. revs. ____min	
Half astern		Emergency full ahead to full astern ____s Stop to full astern ____s	
Full astern		Astern power ____% ahead Max. no. of consecutive starts ____	

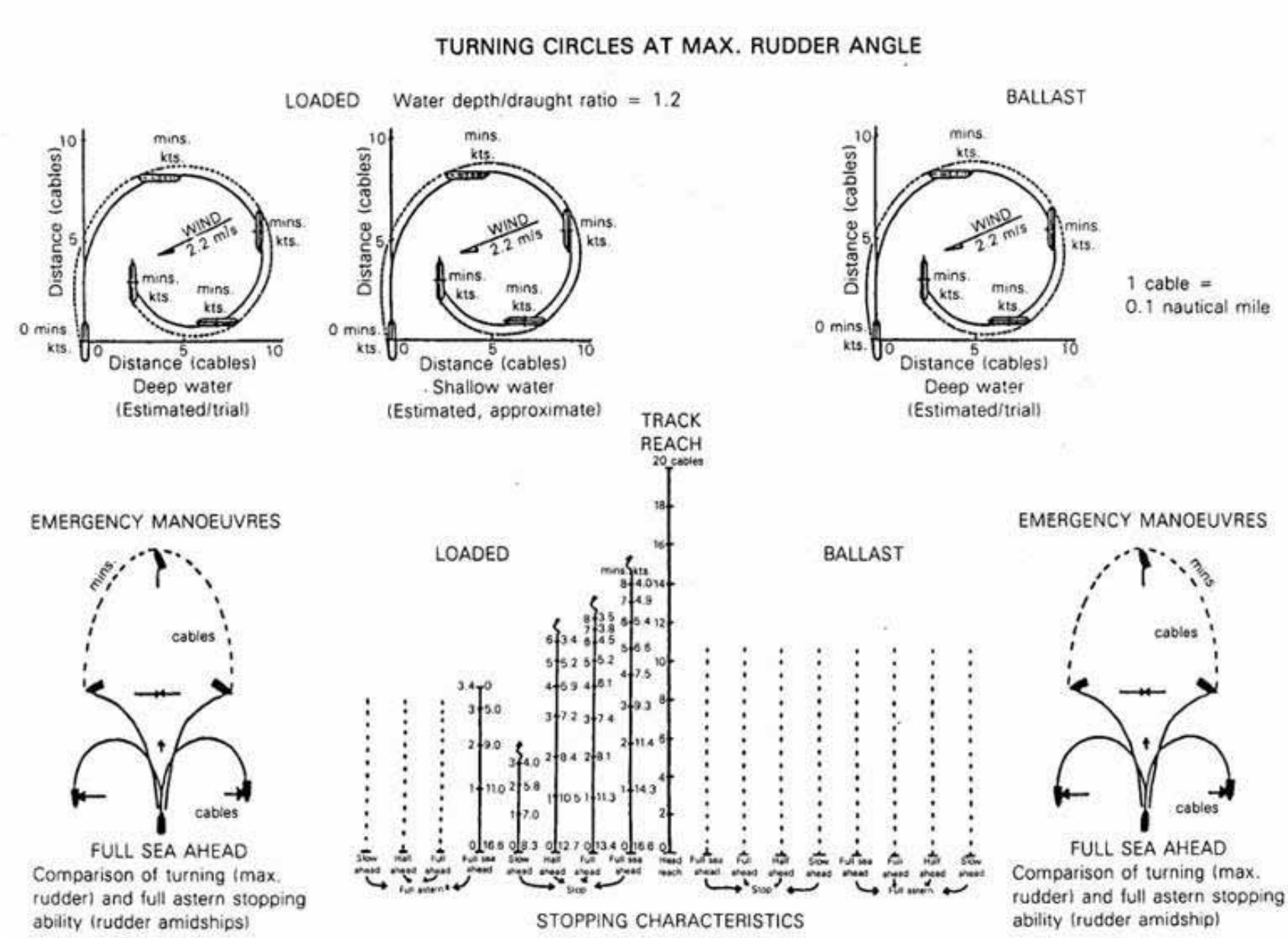
THRUSTER EFFECT at trial conditions

Thruster	kW (HP)	Time delay for full thrust	Turning rate at zero speed	Time delay to reverse full thrust	Not effective above speed
Bow		s	°/min	min s	knots
Stern		s	°/min	min s	knots
Combined		s	°/min	min s	knots

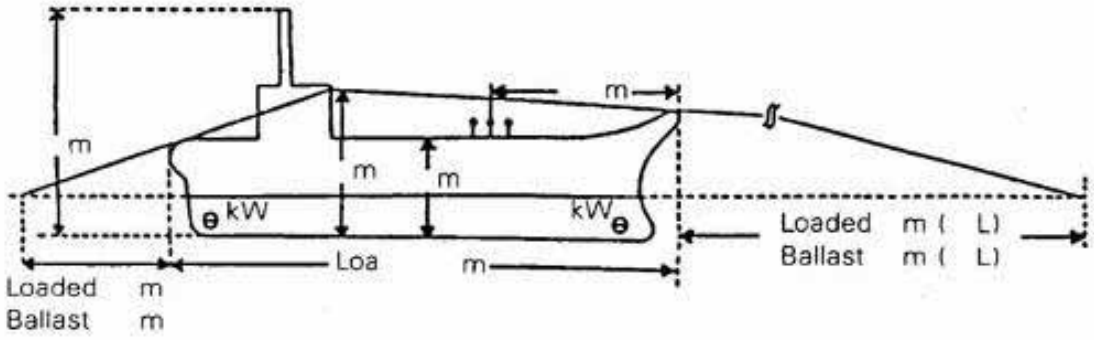
DRAUGHT INCREASE (LOADED)

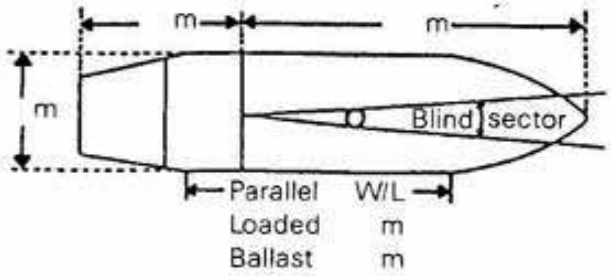
Estimated Squat Effect			Heel Effect	
Under keel clearance	Ship's speed (knots)	Max. bow squat estimated (m)	Heel angle (degree)	Draft increase (m)
m			2	
			4	
			8	
m			12	
			16	

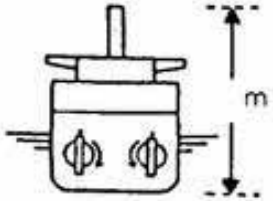
Manevarska svojstva



Manevarska svojstva







MAN OVERBOARD
RESCUE MANOEUVRE

SEQUENCE OF ACTIONS TO BE TAKEN:

- TO CAST A LIFEBUOY
- TO GIVE THE HELM ORDER
- TO SOUND THE ALARM
- TO KEEP THE LOOK-OUT

Insert a recommended turn

Prepared by _____

Date _____

PERFORMANCE MAY DIFFER FROM THIS RECORD DUE TO ENVIRONMENTAL, HULL AND LOADING CONDITIONS

Čimbenici okoline

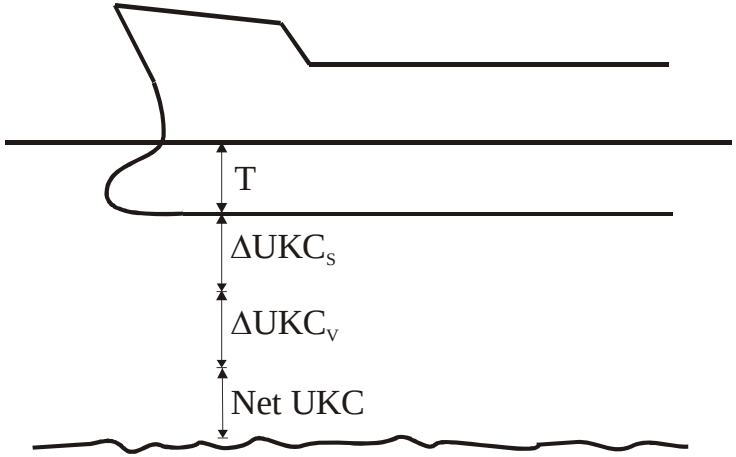
- Vjetar
  - $Fw=½ \cdot Cw \cdot \rho z \cdot v^2 \cdot A$

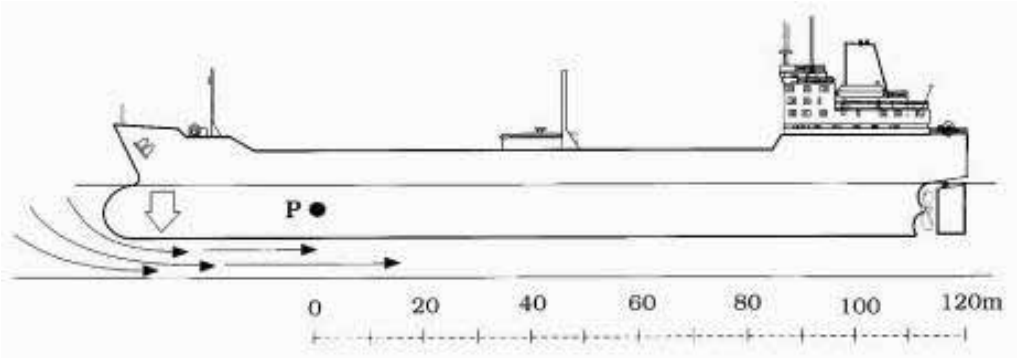
Brzina bočnog vjetra (čv)	Sila vjetra (t)
10	7
15	16
20	28
25	44
30	64
35	87
40	113
45	143
50	177
55	214
60	255
65	301

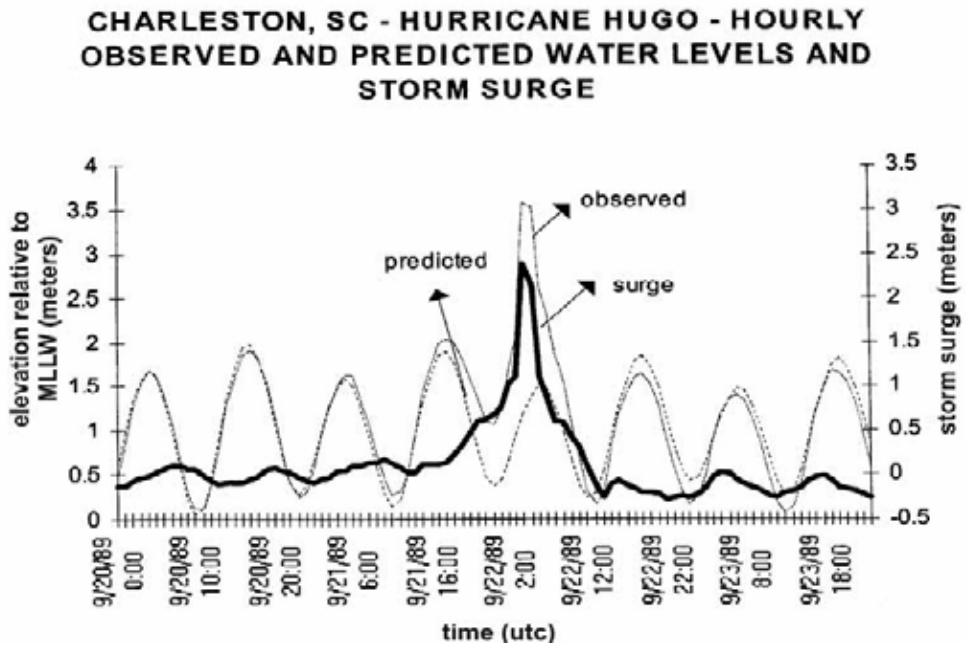
Dužina 161 m Gaz 6.4 m

Čimbenici okoline

- Dubina mora
  - DSmin = T + Net UKC + ΔUKCv + ΔUKCs
    - Net UKC neto dubina ispod kobilice:
      - *za mekana (muljevita) dna > 0,3 – 0,5 m,*
      - *za pjeskovita > 0,5 m,*
      - *za tvrda (stjenovita) dna > 1,0 m.*
    - ΔUKCv poniranje i uzdizanje broda na valovima;
    - ΔUKCs dodatni zagažaj i promjena trima.
- Utjecaj tlaka i vjetra
- Dodatni zagažaj (squat)
  - $D = V\ 0,,17\ \sqrt{\Delta}$
  - $\Delta T = (Cb \times V^2) / 100$

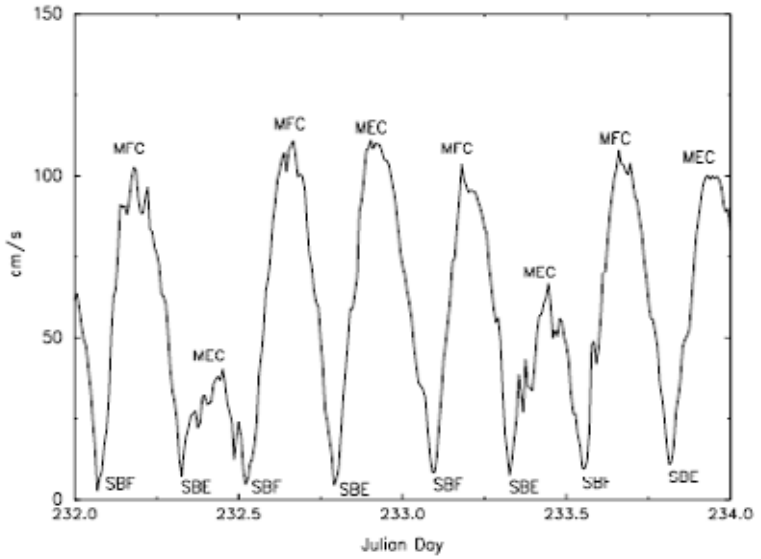


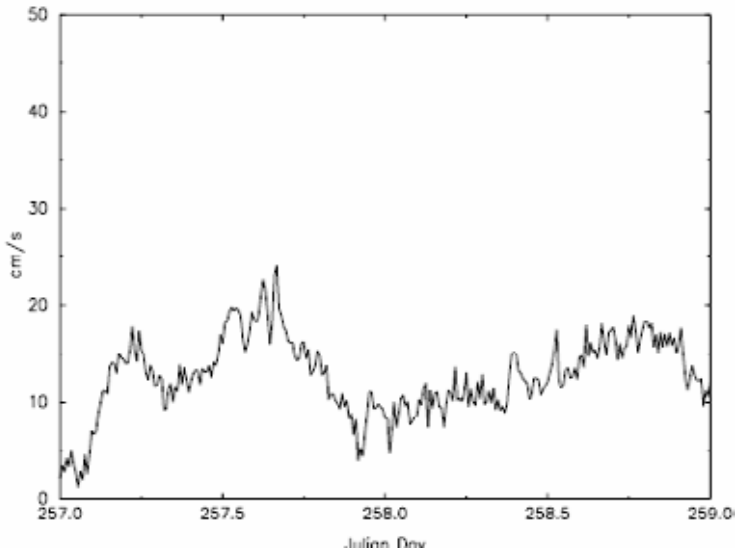




Čimbenici okoline

- Morske struje
  - Fc=½ • Cc • ρv • v² • A
    - Cc = 1,0 do 1,5 za D>>T
    - Cc = 2,0 za D=2T
    - Cc = 3,0 za D=1,5T
    - Cc = 6,0 za D=T
    - Cc = 0,2 do 0,6 za α=0°
  - struje morskih mijena
    - reverzibilne struje
    - kružne struje



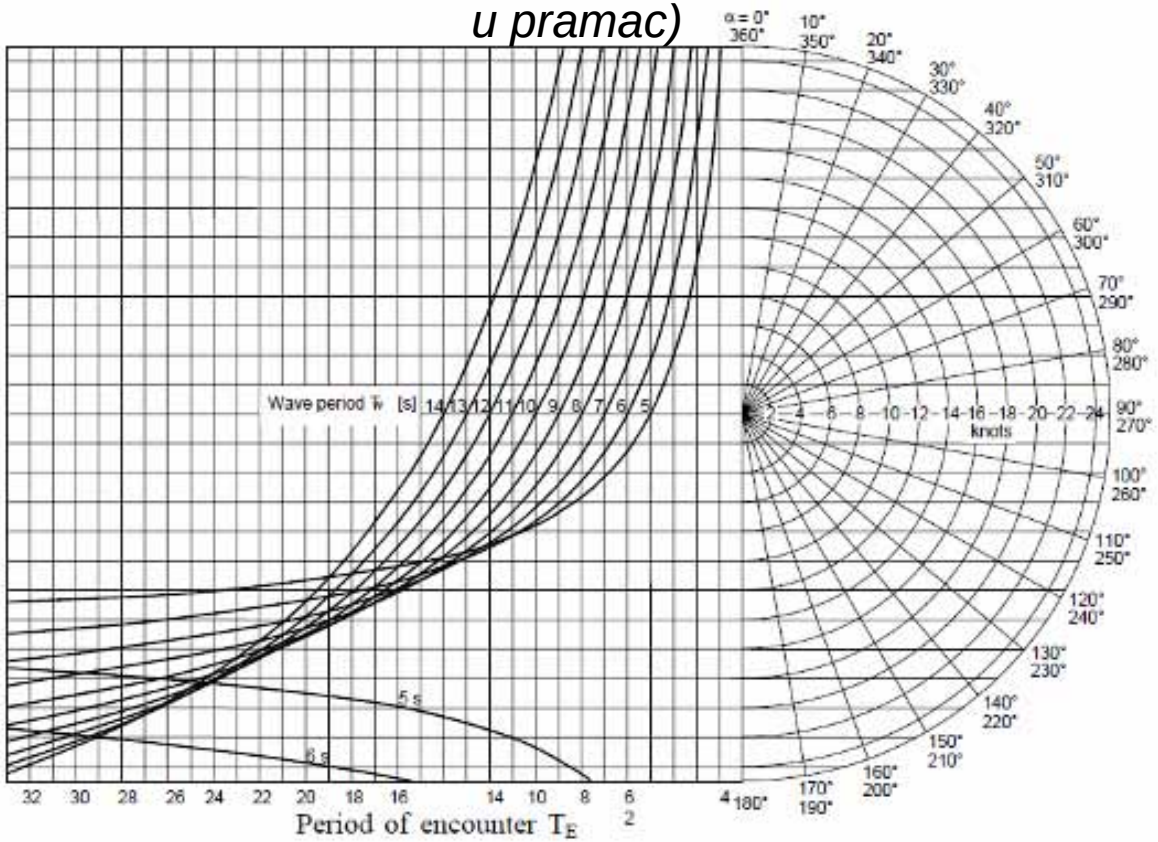


Čimbenici okoline

- Valovi
  - odnos valnog perioda (Tw) i duljine vala (λ):
  - period (T_E) susretanja (poniranja):
    - *V brzina broda u čvorovima,*
    - *α kut nailaska valova (α=0 za valove u pramac)*

$$\lambda = 1.56 \cdot T_W^2 \text{ [m] or } T_W = 0.8\sqrt{\lambda} \text{ [s]}$$

$$T_E = \frac{3T_W^2}{3T_W + V\cos(\alpha)} \text{ [s]}$$

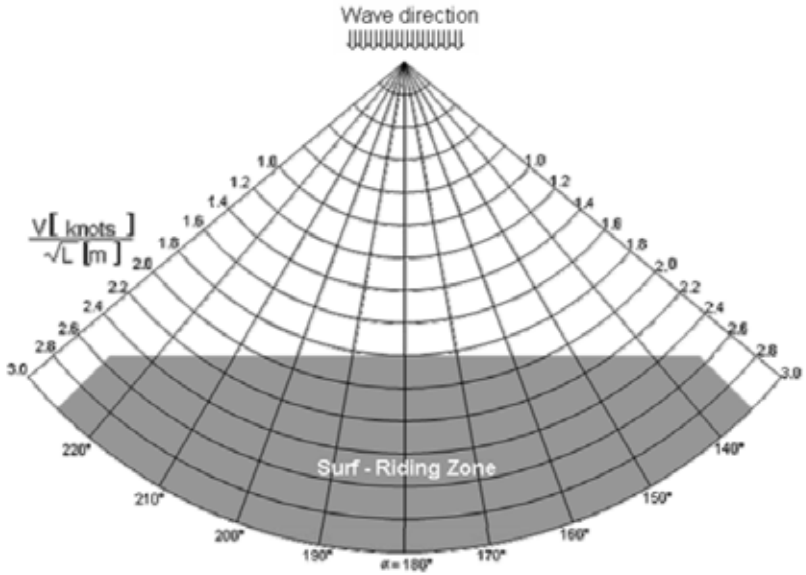


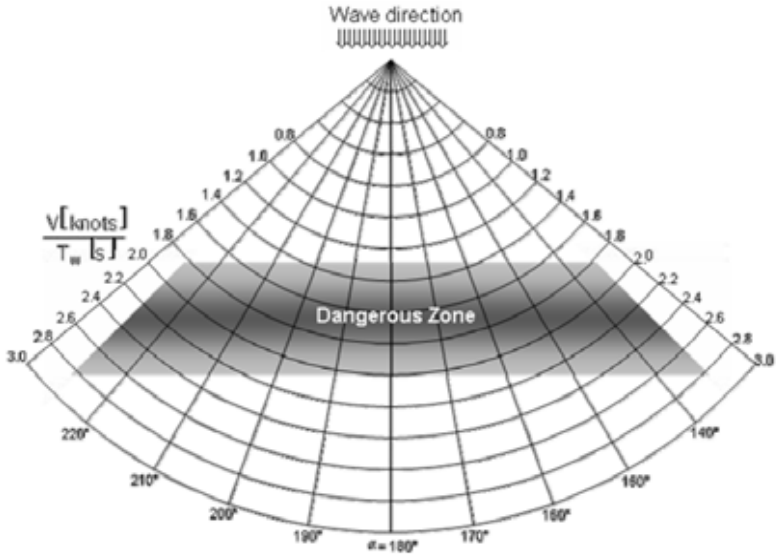
Čimbenici okoline

- Valovi - opasnosti u plovidbi
  - valovi u krmu
    - *surfriding*
    - *gubitak stabilnost*
      - brijeg vala (0,6 L < λ < 2,3L) na sredini broda
  - ljuljanje
    - sinkronizacija prirodnog perioda valjanja (T_R) s periodom nailaska valova (T_E)
  - parametarsko ljuljanje
    - uzrok: promjene stabilnosti pri položaju broda na brijegu i dolu vala
    - uvjet nastanka: $T_R : T_E = 1 : 1$ ili $2 : 1$
  - udarci trupa u vodu
    - *slamming*
  - ukrcaj vode na palubu
    - *shipping a green water*

Čimbenici okoline

- Valovi - opasnosti u plovidbi
  - surfriding
    - uvjet:
      - $135° > \alpha > 225°$
      - $Vb > 1.8\ \sqrt{L} / \cos(180° - \alpha)$
  - uzastopni udarci pramcem
    - uvjet:
      - $\lambda > 0{,}8L$ *i*
      - $Hs > 0{,}04L$





Plovidba obalnim morem izbor plovnog puta

- Vanjski faktori
  - raspoloživi načini određivanja položaja broda i njihova pouzdanost
  - pouzdanost podataka prikazanih na pomorskoj karti
  - poznavanje obilježja lokalnih morskih struja
  - očekivana vidljivost i stanje vjetra i mora
  - postojanje pličina, podrtina i drugih navigacijskih prepreka i njihova označenost
  - poznavanje morskih mijena
  - vremena i trajanja sumraka
  - smještaj i obilježja mjera usmjerene plovidbe
  - preporučeni plovidbeni pravci za brodove dubokog gaza
  - preporučeni plovidbeni pravci u nautičkim peljarima
  - mogućnost izmjene plovidbenog puta
  - postojanje luka zakloništa
  - postojanje sustava nadzora plovidbe
  - očekivana gustoća prometa, posebice ribarskih brodova u plovidbi ili u ribolovu
  - mogućnosti pribavljanja vremenskih prognoza i navigacijskih upozorenja
  - primijenjene mjere zaštite mora i priobalja (posebno osjetljiva područja)
  - postojanje područja vojnih djelovanja na moru
  - postojanje opasnosti od oružanih napada na brod u plovidbi
  - postojanje objekata za iskorištavanje podmorja odnosno sigurnosnih područja

Plovidba obalnim morem izbor plovnog puta

- Unutrašnji faktori
  - raspoloživa navigacijska pomagala, posebice njihova točnost i učestalost određivanja položaja broda u plovidbi,
  - broj i obilježja sredstava za određivanje kursa i brzine preko dna,
  - raspoloživa sredstva za komunikaciju,
  - veličina i gaz broda,
  - maritimna obilježja broda,
  - priroda i obilježja tereta,
  - pouzdanost porivnog stroja i kormilarskog uređaja,
  - odnos raspoložive porivne snage i očekivane brzine morskih struja te prevladavajućeg utjecaja valova i vjetra,
  - broj i sposobnosti posade broda,
  - mogućnost potrebe ispuštanja zauljenih voda i primijenjenih mjera zaštite mora i okoliša od onečišćenja, te
  - zahtjevi unajmitelja i osiguravatelja.

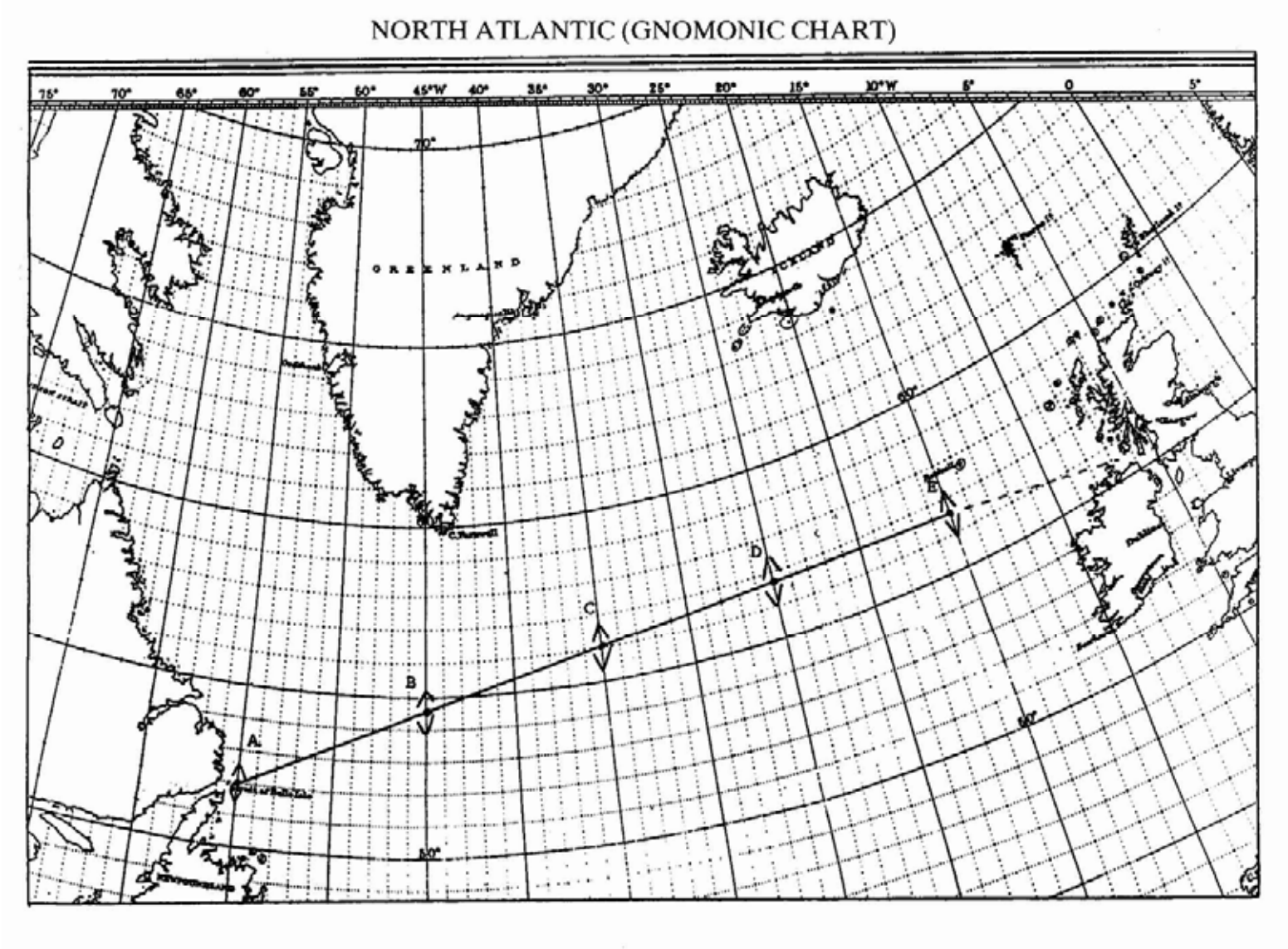
Oceanska plovidba izbor plovnog puta

- Vanjski faktori
  - udaljenost između ishodišta i odredišta,
  - oceanske morske struje,
  - vjerojatnost pojave olujnih vjetrova, tropskog ciklona, magle ili smanjene vidljivosti,
  - granice leda i vjerojatnost nailaska na samostalne ledene brjegove,
  - raspoloživost i pouzdanost dugoročnih vremenskih prognoza,
  - preporučen plovidbeni put
  - položaj i veličina područja zabranjenih za plovidbu,
  - položaj područja dopuštene plovidbe prema Međunarodnoj konvenciji o teretnim vodenim linijama, 1966, i
  - raspoloživi navigacijski sustavi u području plovidbe.

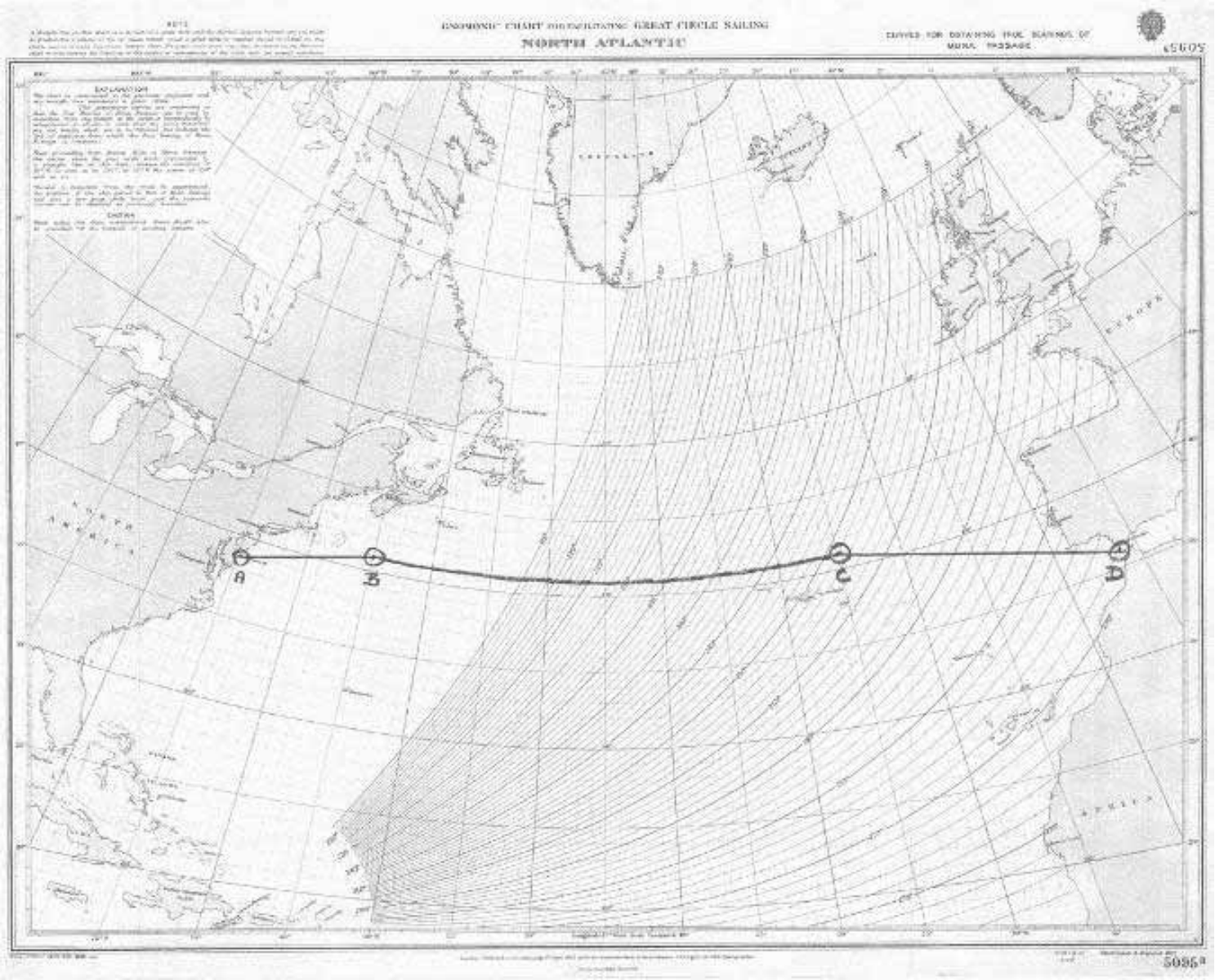
Oceanska plovidba izbor plovnog puta

- Unutrašnji faktori
  - raspoloživa navigacijska pomagala,
  - stabilnost i čvrstoća broda,
  - priroda i obilježja tereta,
  - očekivani gubitak brzine zbog utjecaja valova i vjetra,
  - maritimna svojstva broda pri djelovanju valova i vjetra,
  - pouzdanost porivnih strojeva i kormilarskog uređaja,
  - ograničenja područja plovidbe navedena u brodskim svjedodžbama,
  - položaj posebnih područja i posebno osjetljivih područja
  - raspoloživa količina goriva odnosno
  - potreba opskrbe gorivom i ostalim potrepštinama tijekom putovanja,
  - uvjeti i posebni zahtjevi unajmitelja / osiguravatelja.

Oceanska plovidba izbor plovnog puta



Oceanska plovidba izbor plovnog puta



Plan putovanja

- Praćenje kretanja broda:
  - provjera položaja broda s obzirom na:
    - vremenski razmak između uzastopnih utvrđivanja položaja
    - osnovne i dopunske načine određivanja položaja
    - identifikaciju referentnih objekata
    - stupanj pouzdanosti osnovnog i dopunskog načina određivanja položaja
  - provjera kursa preko dna,
  - provjera brzine broda preko dna i
  - provjera dubine mora ispod kobilice s obzirom na:
    - utjecaj vjetra, valova i tlaka zraka
    - povećanje gaza zbog valjanja i posrtanja
- Oblik Plana putovanja:
  - knjiga plana putovanja,
  - tablice plana putovanja,
  - pomorske karte.

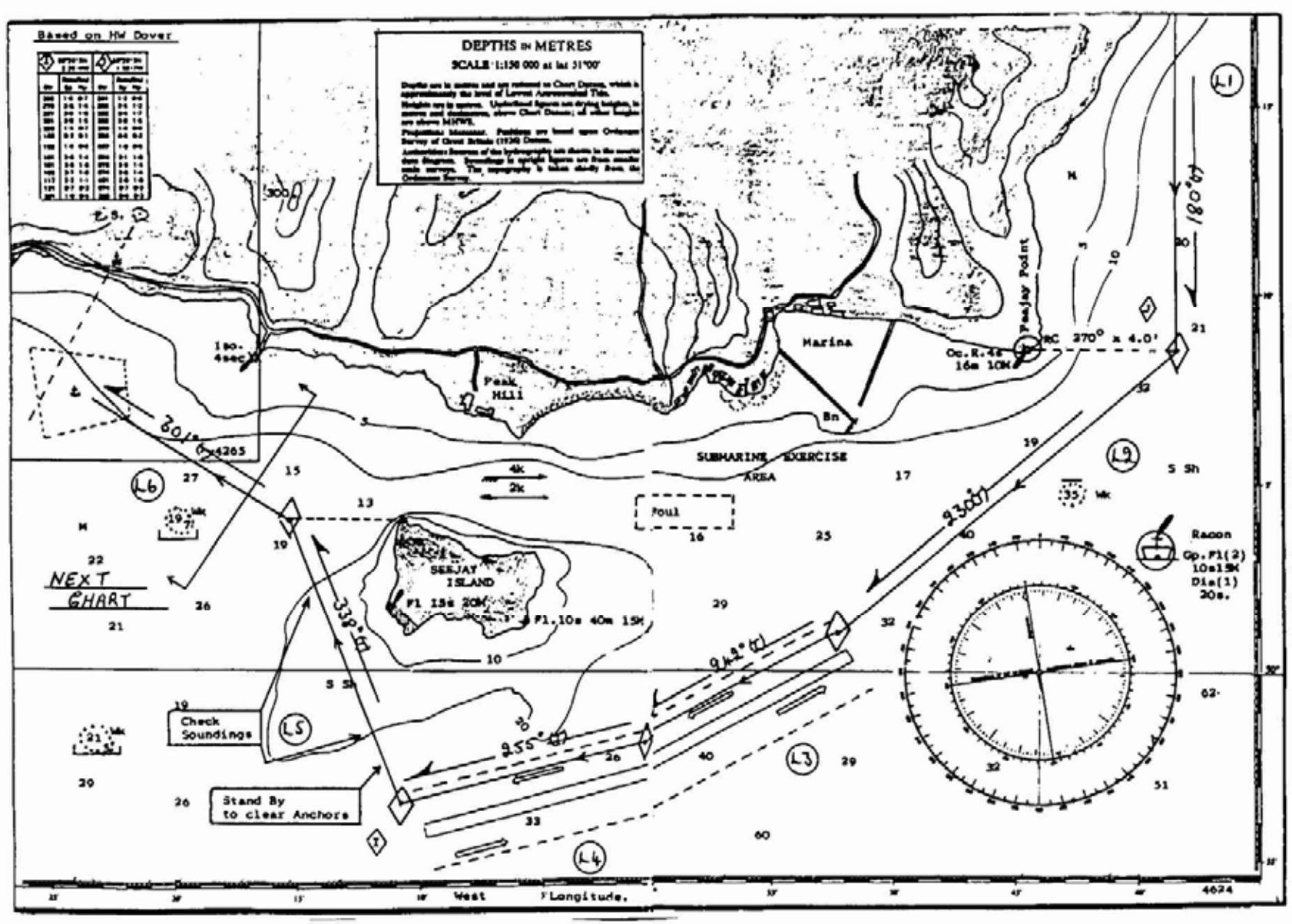
Plan putovanja

LIVERPOOL TO HALIFAX (Canada) *Route North about Ireland* (*Great Circle*)

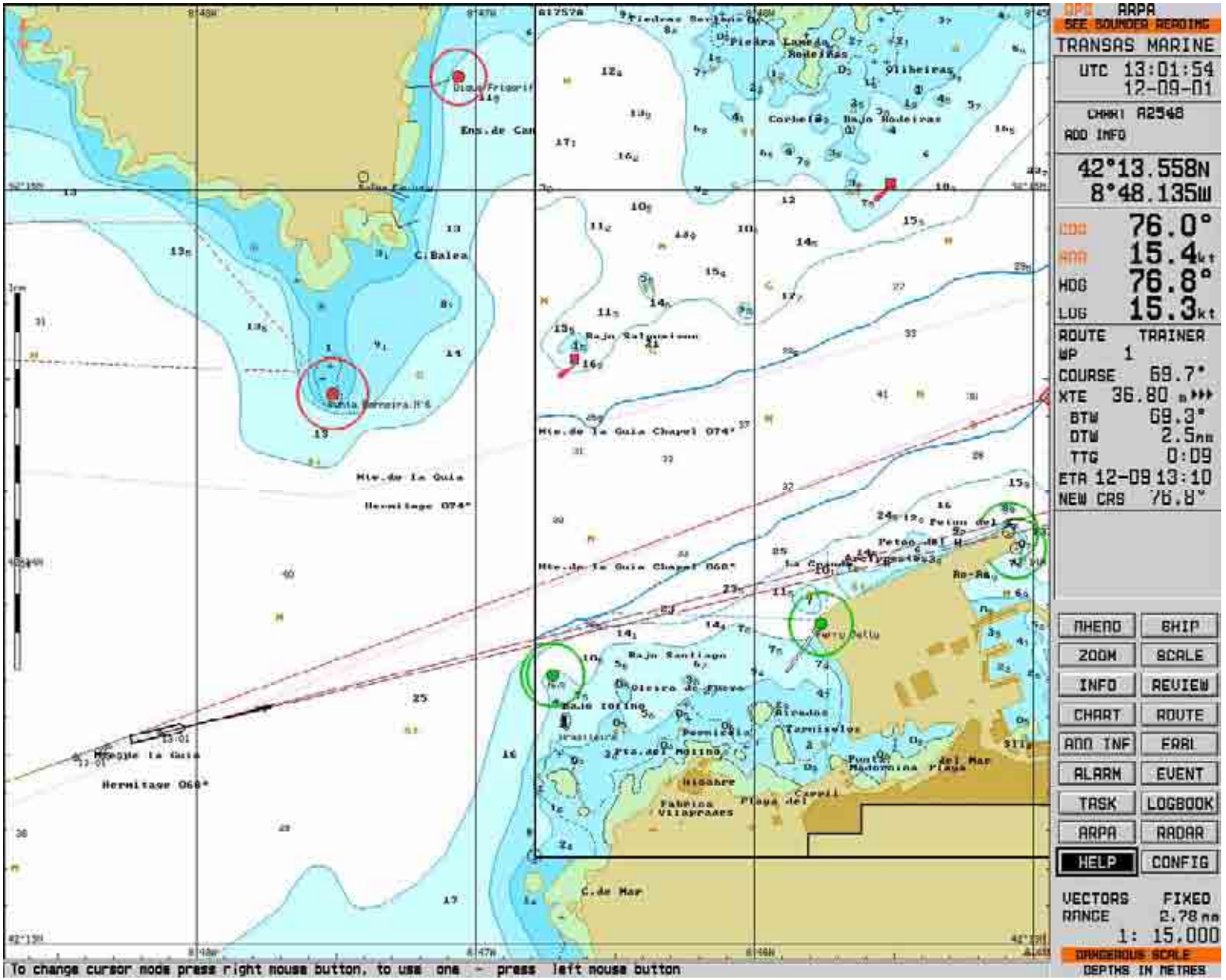
Name *From*	*To*	*Bearing × Distance*	*Tr. Course*	*Steam Time at 15.0kts*	*Distance*	*Dist to Go*
Berth (Pilotage)	Bar Pilot Stat'n	—	Various to Masters Orders	0.5 hrs	6.5	2436
Bar Station	Chicken Rk.Lt.	054° × 5.0'	295°	4.3 hrs	64.0	2372
Chicken Rk.Lt.	Mew Island Lt.	256° × 4.5'	341°	3.0 hrs	45.0	2327
Mew Island Lt.	Altacarry Hd. Lt.	225° × 8.8'	333°	3.0 hrs	45.0	2282
Altacarry Hd.Lt.	Inishtrahull Lt.	180° × 4.0'	277°	2.9 hrs	44.0	2238
Inishtrahull Lt.	Cape Race	000° × 12.0'	269° Int.Co.	118.6 hrs	1780.0	458
Cape Race	Egg Island	000° × 9.4'	254°	28.7 hrs	430.0	28
Egg Island	Chebucto Head	270° × 3.0'	270°	1.8 hrs	27.0	1
Chebucto Hd.	Pilot Station	—	315°	0.1 hrs	1.0	0
Pilots Station	Berth* (To be advised)	—	Various to Masters Orders	1.0 hrs	*	
Total Distance					2442.5'	
Steaming Time	(excluding Halifax Pilot)			162.8 hrs = 6 days 18.8 hrs		
				Provisional ETA = XXXXXX		

Clocks to be retarded 4 hours from BST.

Plan putovanja



Plan putovanja



Plan putovanja - izvedba

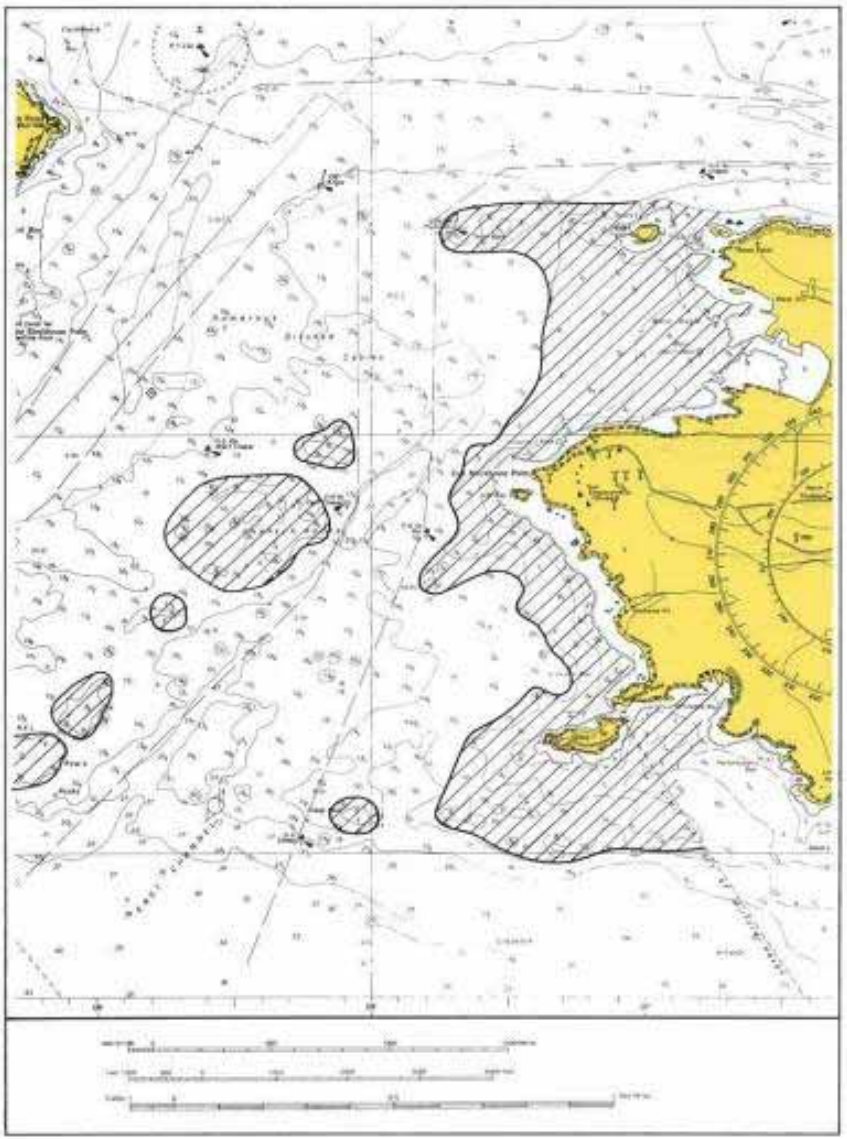


Figure 1 NO-GO AREAS

Assuming ship on maximum draught 9·1 metres

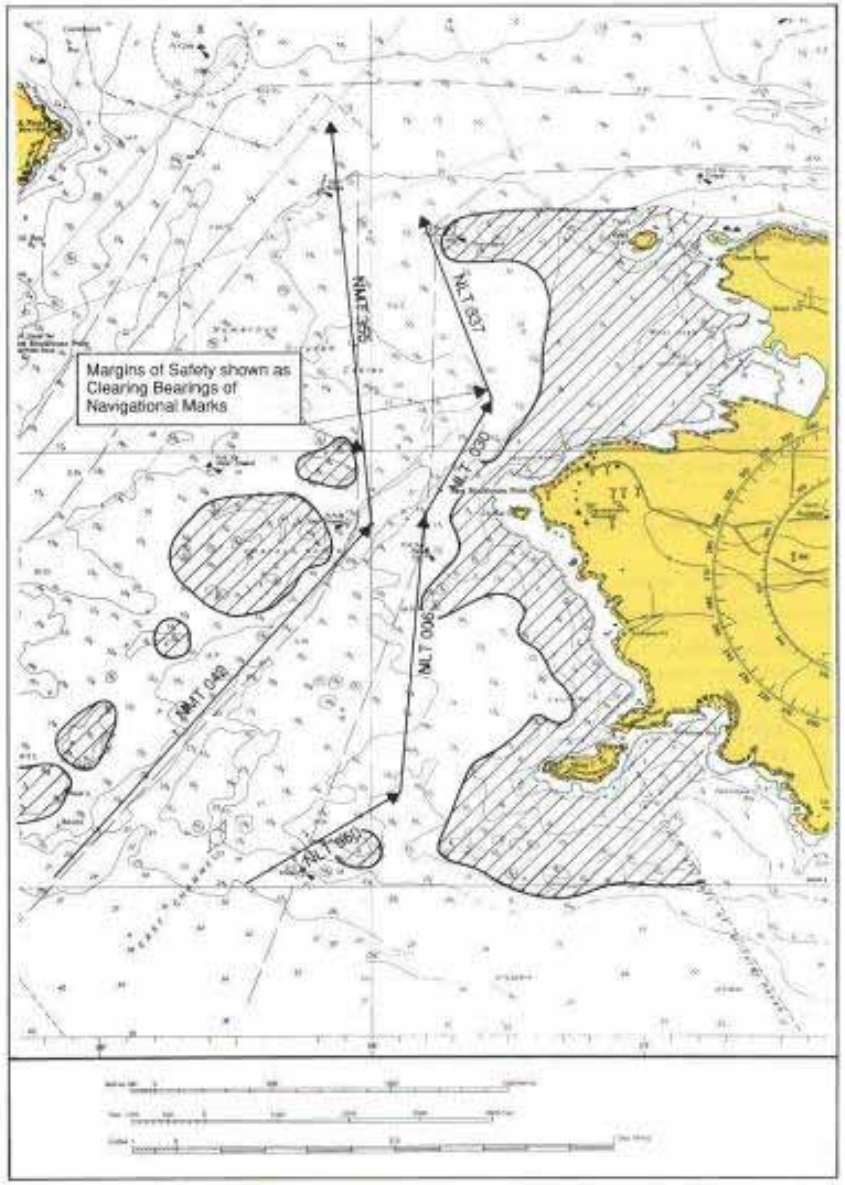


Figure 2 MARGINS OF SAFETY

Plan putovanja - izvedba

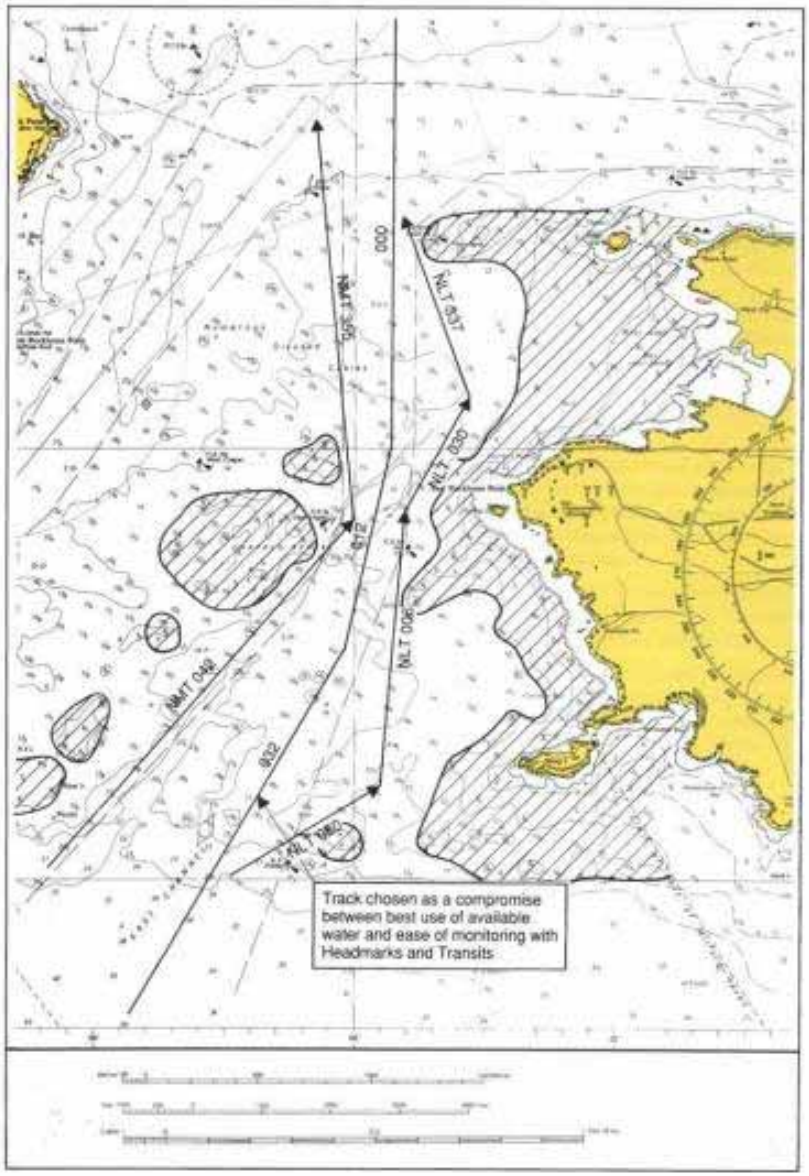


Figure 3 CHARTED TRACKS

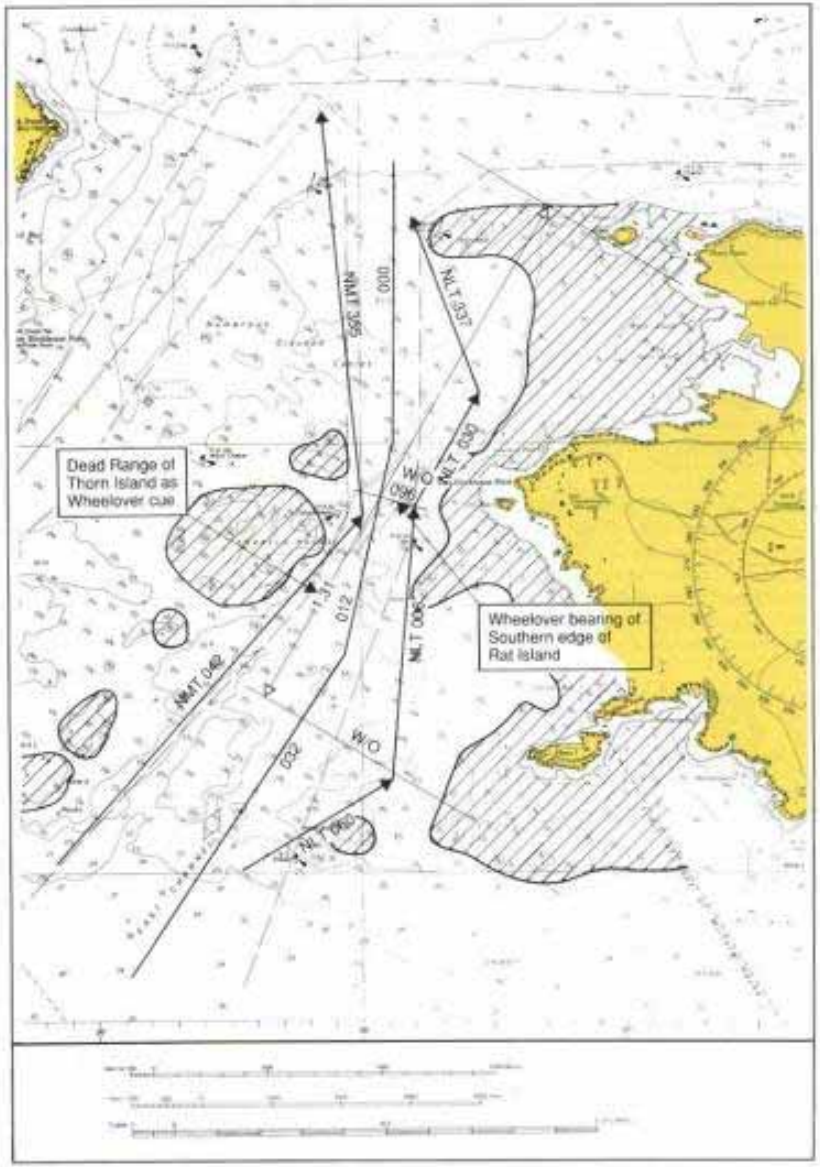


Figure 4 COURSE ALTERATIONS AND WHEEL OVER POSITIONS

Plan putovanja - izvedba

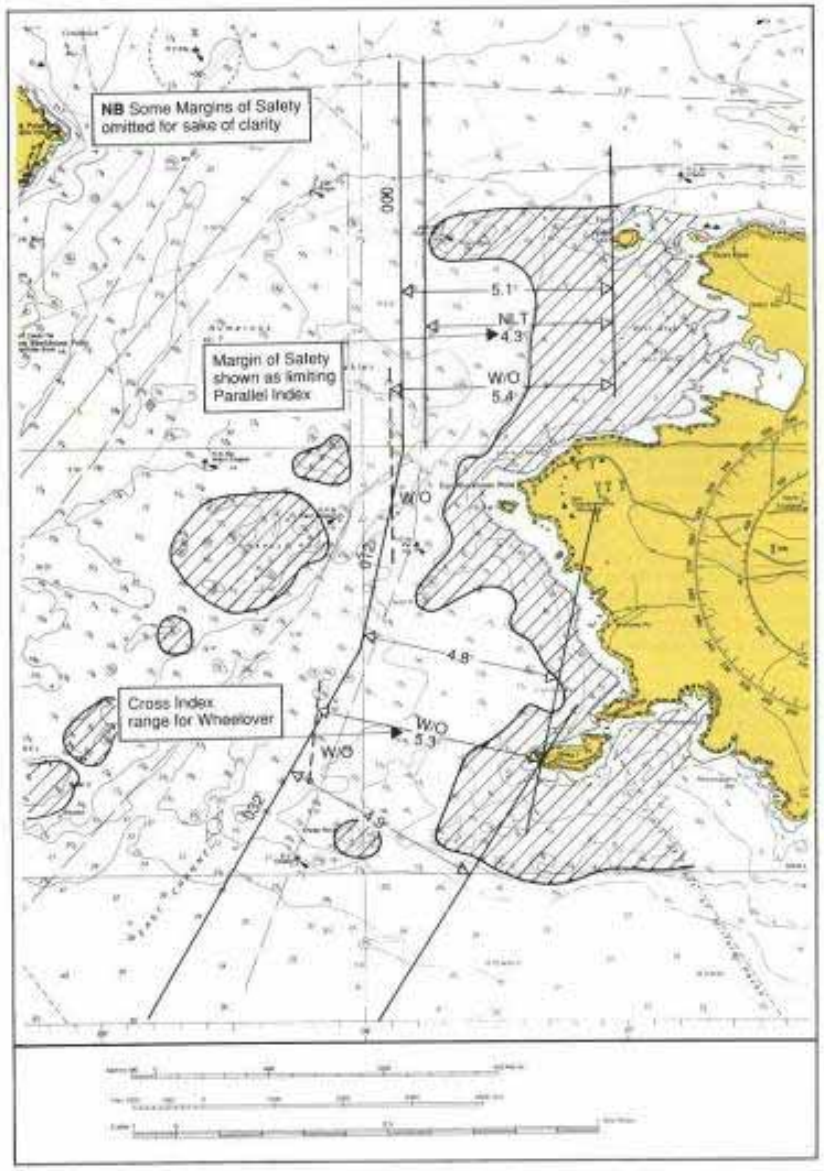


Figure 5 PARALLEL INDEXING

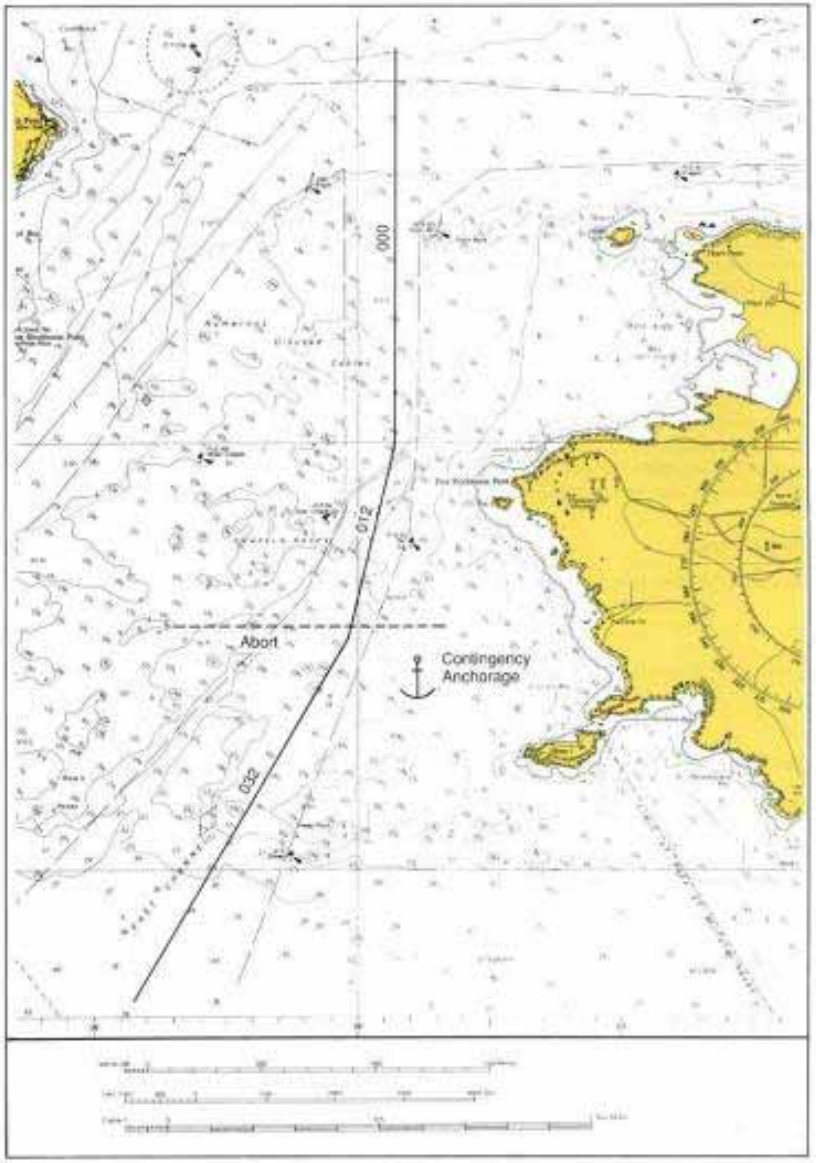


Figure 6 ABORTS AND CONTINGENCIES

Plan putovanja - izvedba

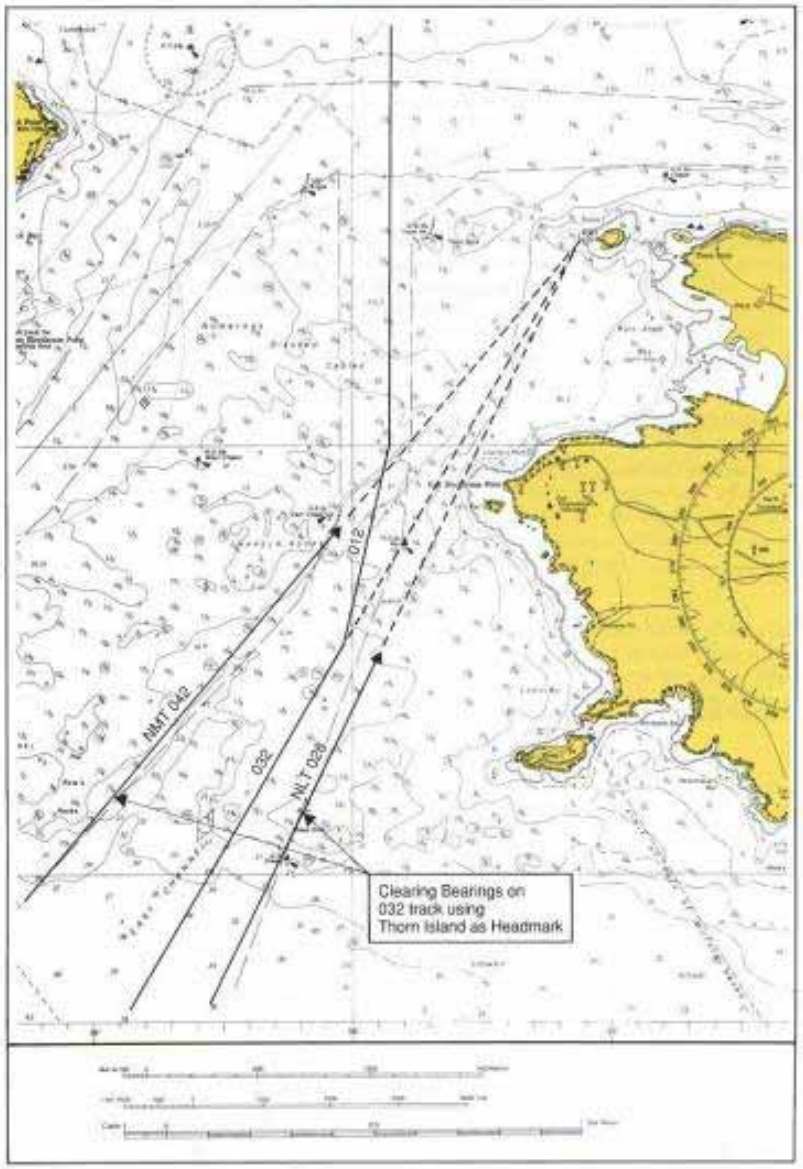
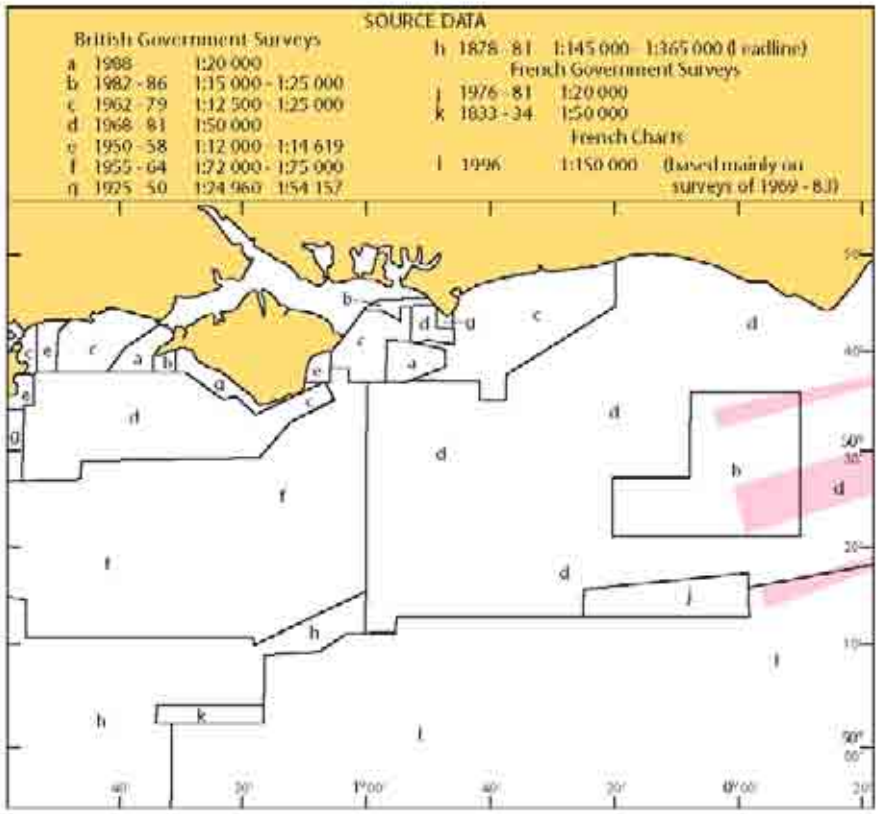


Figure 9 CLEARING BEARINGS

Planiranje putovanja u posebnim uvjetima

- Posebne okolnosti
  - područja leda
  - područja visokih geografskih širina,
  - neistražena područja
  - područja za koja se pomorske karte i priručnici temelje na starim podacima.
- Namjenske plovne jedinice
  - brodovi polagači kablova ili cjevovoda,
  - istraživački brodovi,
  - brodovi za istraživanje nafte i plina,
  - brodovi za prijevoz teških tereta,
  - brodovi koji prevoze terete visoko složene na palubi ili su takvih veličina i oblika da ih je teško osigurati,
  - veliki putnički brodovi na kružnim putovanjima.

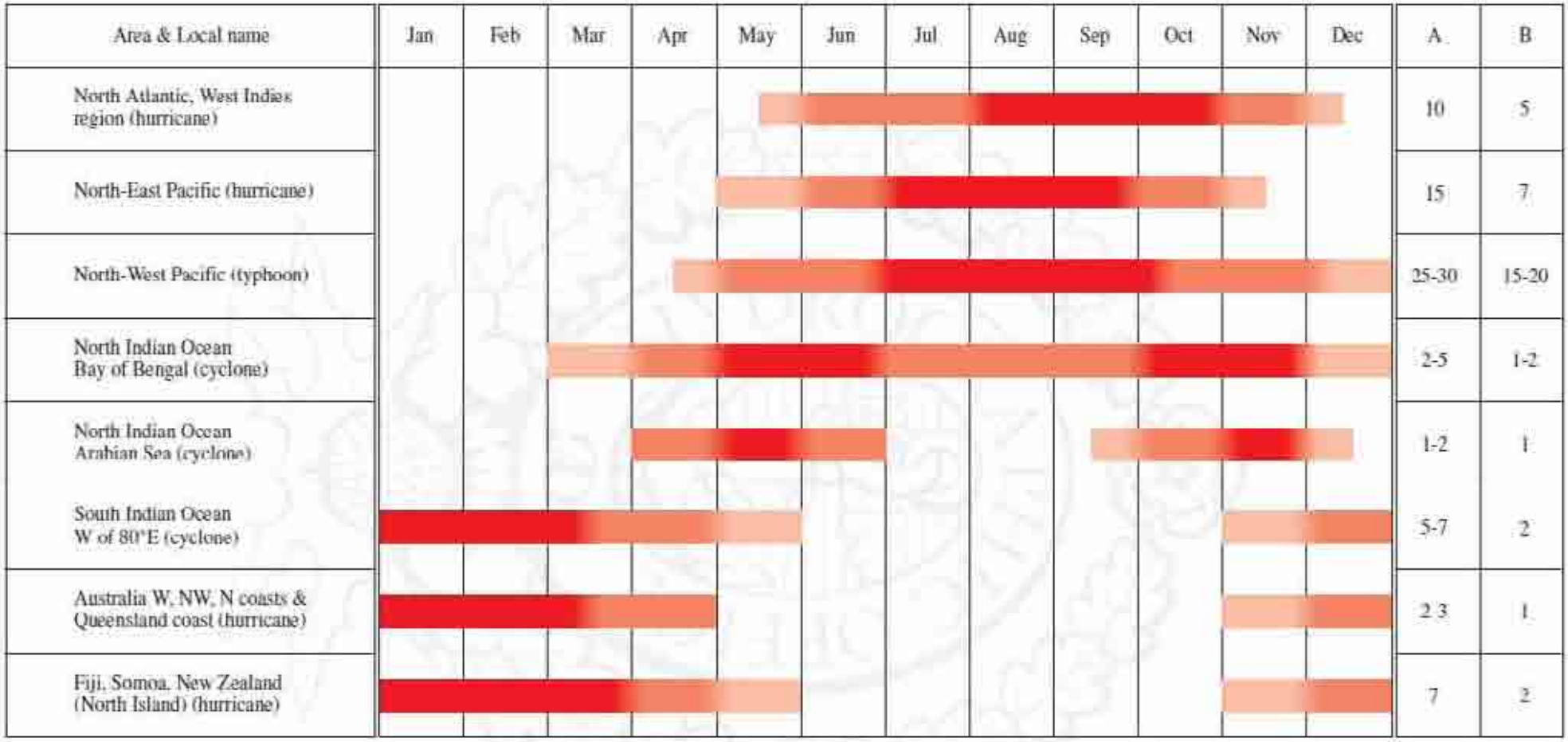
Planiranje putovanja u posebnim uvjetima



CATEGORY OF ZONES OF CONFIDENCE
(ZOC TABLE)

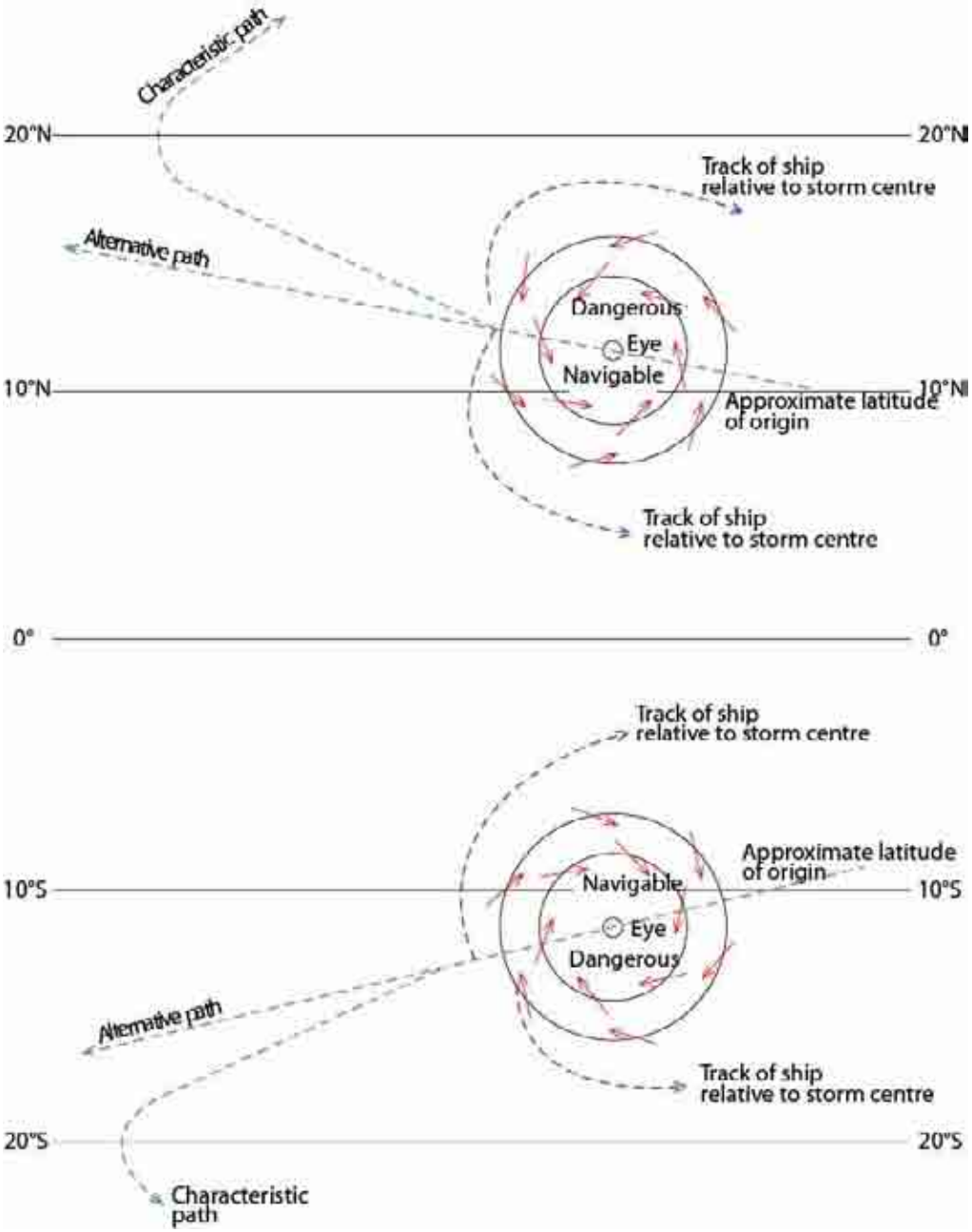
1	2	3		4
ZOC	Position Accuracy	Depth Accuracy		Seafloor Coverage
A1	± 5m	= 0.5m + 1%depth		Full seafloor coverage. All significant features detected and depths measured.
		Depth (m)	Accuracy (m)	
		10	± 0.6	
		30	± 0.8	
		100	± 1.5	
		1000	± 10.5	
A2	± 20m	= 1.0m + 2%depth		Full seafloor coverage. All significant features detected and depths measured.
		Depth (m)	Accuracy (m)	
		10	± 1.2	
		30	± 1.6	
		100	± 3.0	
		1000	± 21.0	
B	± 50m	= 1.0m + 2%depth		Full seafloor coverage not achieved;: uncharted features, hazardous to surface navigation are not expected, but may exist.
		Depth (m)	Accuracy (m)	
		10	± 1.2	
		30	± 1.6	
		100	± 3.0	
		1000	± 21.0	
C	± 500m	= 2.0m + 5%depth		Full seafloor coverage not achieved; depth anomalies may be expected.
		Depth (m)	Accuracy (m)	
		10	± 2.5	
		30	± 3.5	
		100	± 7.0	
		1000	± 52.0	
D	Worse than ZOC C. Full seafloor coverage not achieved; large depth anomalies may be expected.			
U	Unassessed			

UPRAVLJANJE BRODOM U IZVANREDNIM OKOLNOSTIMA

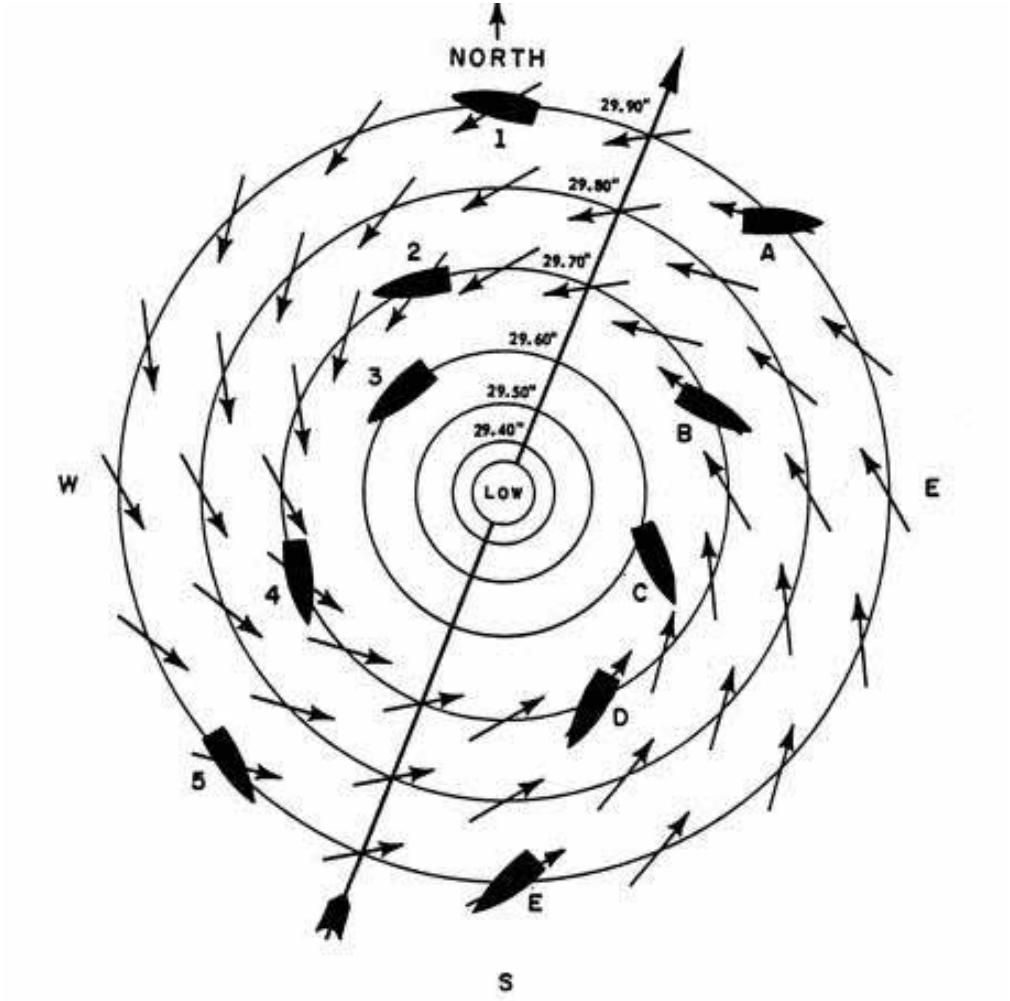


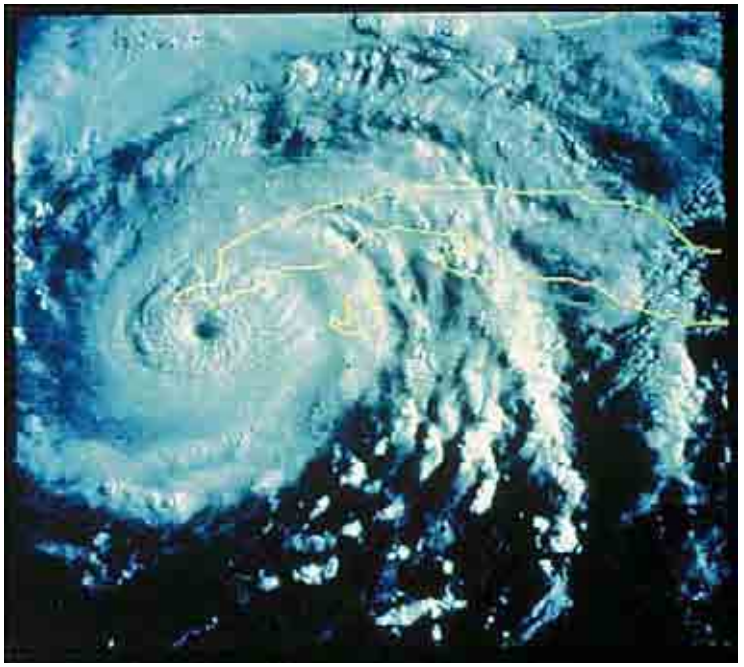
Column A: Approximate average frequency of tropical storms each year
Column B: Approximate average frequency of tropical storms each year which develop Force 12 winds or stronger

UPRAVLJANJE BRODOM U IZVANREDNIM OKOLNOSTIMA



UPRAVLJANJE BRODOM U IZVANREDNIM OKOLNOSTIMA





UPRAVLJANJE BRODOM U IZVANREDNIM OKOLNOSTIMA

```
WTXS31 PGTW 272100
MSGID/GENADMIN/NAVPACMETOCCEN PEARL HARBOR HI/JTWC//
SUBJ/TROPICAL CYCLONE WARNING//
RMKS/
1. TROPICAL CYCLONE 20S (KARA) WARNING NR 006
   01 ACTIVE TROPICAL CYCLONE IN SOUTHIO
   MAX SUSTAINED WINDS BASED ON ONEMINUTE AVERAGE

   WARNING POSITION:
   271800Z  NEAR 19.8S 120.4E
     MOVEMENT PAST SIX HOURS  120 DEGREES AT 14 KTS
     POSITION ACCURATE TO WITHIN 060 NM
     POSITION BASED ON CENTER LOCATED BY A COMBINATION OF
     SATELLITE AND RADAR
   PRESENT WIND DISTRIBUTION:
   MAX SUSTAINED WINDS  035 KT, GUSTS 045 KT
   DISSIPATING AS A SIGNIFICANT TROPICAL CYCLONE OVER WATER
   REPEAT POSIT: 19.8S 120.4E

   FORECASTS:
   12 HRS, VALID AT:
   280600Z  20.4S 121.9E
   MAX SUSTAINED WINDS  030 KT, GUSTS 040 KT
   DISSIPATED AS A SIGNIFICANT TROPICAL CYCLONE OVER LAND

REMARKS:
272100Z POSITION NEAR 20.0S 120.8E.
TROPICAL CYCLONE (TC) 20S (KARA), LOCATED APPROXIMATELY 105 NM
      EASTNORTHEAST OF PORT HEDLAND, AUSTRALIA, HAS TRACKED
      EASTSOUTHEASTWARD AT 14 KNOTS OVER THE PAST SIX HOURS. THE SYSTEM HAS
      WEAKENED RAPIDLY OVER THE PAST 12 HOURS AND, BASED ON RECENT RADAR
      IMAGERY, HAS MOVED OVER LAND NEAR WALLAL DOWNS. CURRENT INTENSITY IS
      BASED ON DVORAK ESTIMATES OF T2.5 AND RECENT ANIMATED SATELLITE
      IMAGERY WHICH SHOWS VERY WEAK BANDING AND A BURST OF DEEP CONVECTION
      SOUTH OF THE CENTER.TC 20S IS FORECAST TO TRACK EASTSOUTHEASTWARD AND
      TO REMAIN OVER LAND WITHIN A HOSTILE ENVIRONMENT OF HIGH VERTICAL
      WIND SHEAR. THIS FORECAST IS BASED ON PERSISTENCE AND A CONSENSUS OF
      THE AVAILABLE DYNAMIC AIDS THROUGH TAU 12. THIS IS THE FINAL WARNING
      ON THIS SYSTEM BY THE JOINT TYPHOON WARNING CENTER (NAVPACMETOCCEN).
      THE SYSTEM WILL BE CLOSELY MONITORED FOR SIGNS OF REGENERATION.//
NNNN
```

OPTIMIZACIJA POMORSKOG PUTOVANJA

- Planiranje plovidbe s obzirom na vrijeme
  - (Weather Routing)
- Klimatološko planiranje plovidbe
  - (Climatological Routing)
- Meteorološko planiranje plovidbe
  - (Meteorouting)

Limiti ubrzanja i ljuljanja (NORDFORSK, 1987.)

Opis	rms vertikalnog ubrzanja	rms bočnog ubrzanja	rms ljuljanja
Laki fizički rad	0,20 *g*	0,10 *g*	6,0°
Težak fizički rad	0,15 *g*	0,07 *g*	4,0°
Intelektualni rad	0,10 *g*	0,05 *g*	3,0°
Putnički brod	0,05 *g*	0,04 *g*	2,5°
Krstarenje	0,02 *g*	0,03 *g*	2,0°

OPTIMIZACIJA POMORSKOG PUTOVANJA

- Funkcija cilja:
  - plovidbeni put najmanje udaljenosti
    - (*Least Distance Route*)
  - plovidbeni put s najmanjim vremenom plovidbe
    - (*Minimum Time Route*)
  - plovidbeni put s najmanjim potroškom goriva
    - (*Minimum Fuel Route*)
  - plovidbeni put koji omogućava najmanje troškove
    - (*Minimum Cost Route*)

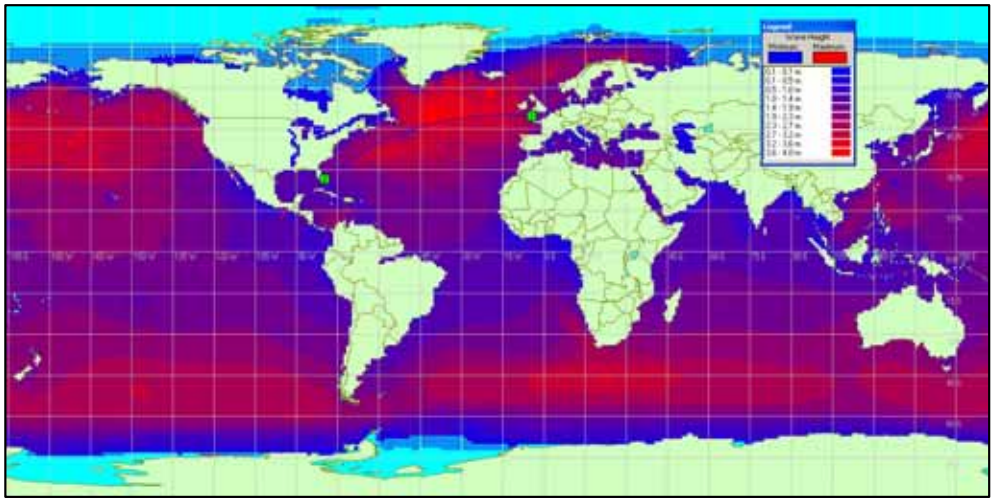
- Ograničenja
  - broda
    - Σ poriva = Σ otpora
  - okruženja

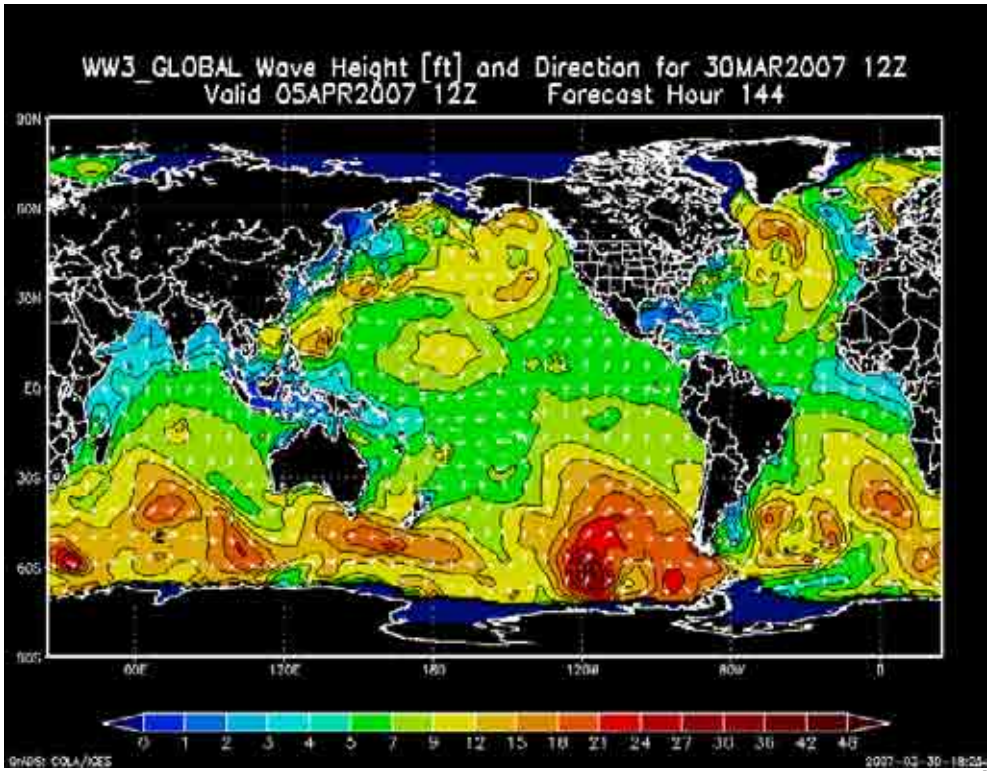
- Gubitak brzine uzroci
  - dodatni otpor vjetra
  - povećani otpor promjene položaja
  - dodatni otpor odbijanja valova
  - povećani otpor zbog zanašanja i zaošijanja (rad kormila)
  - gubitak učinkovitosti poriva (promjene tlakova)

- Prevelika brzina posljedice
  - zalijevanje palube
  - udaranje pramca
  - prevelika ubrzanja
  - bježanje vijka
  - bježanje s kursa
  - nemogućnost rada (polijetanje zrakoplova)

OPTIMIZACIJA POMORSKOG PUTOVANJA

- Okruženje
  - vremenska podjela:
    - statički, kratkoročni i dugoročni podaci
  - zadaće hidrometeorološke raščlambe:
    - brzina i smjer vjetra
    - visina, period i smjer primarnog i sekundarnog valovlja
    - brzina i smjer sezonskih morskih struja
  - procjena vremenskog razvoja:
    - sinoptička prognoza
    - klimatološka procjena
    - mješovite i/ili modificirane metode

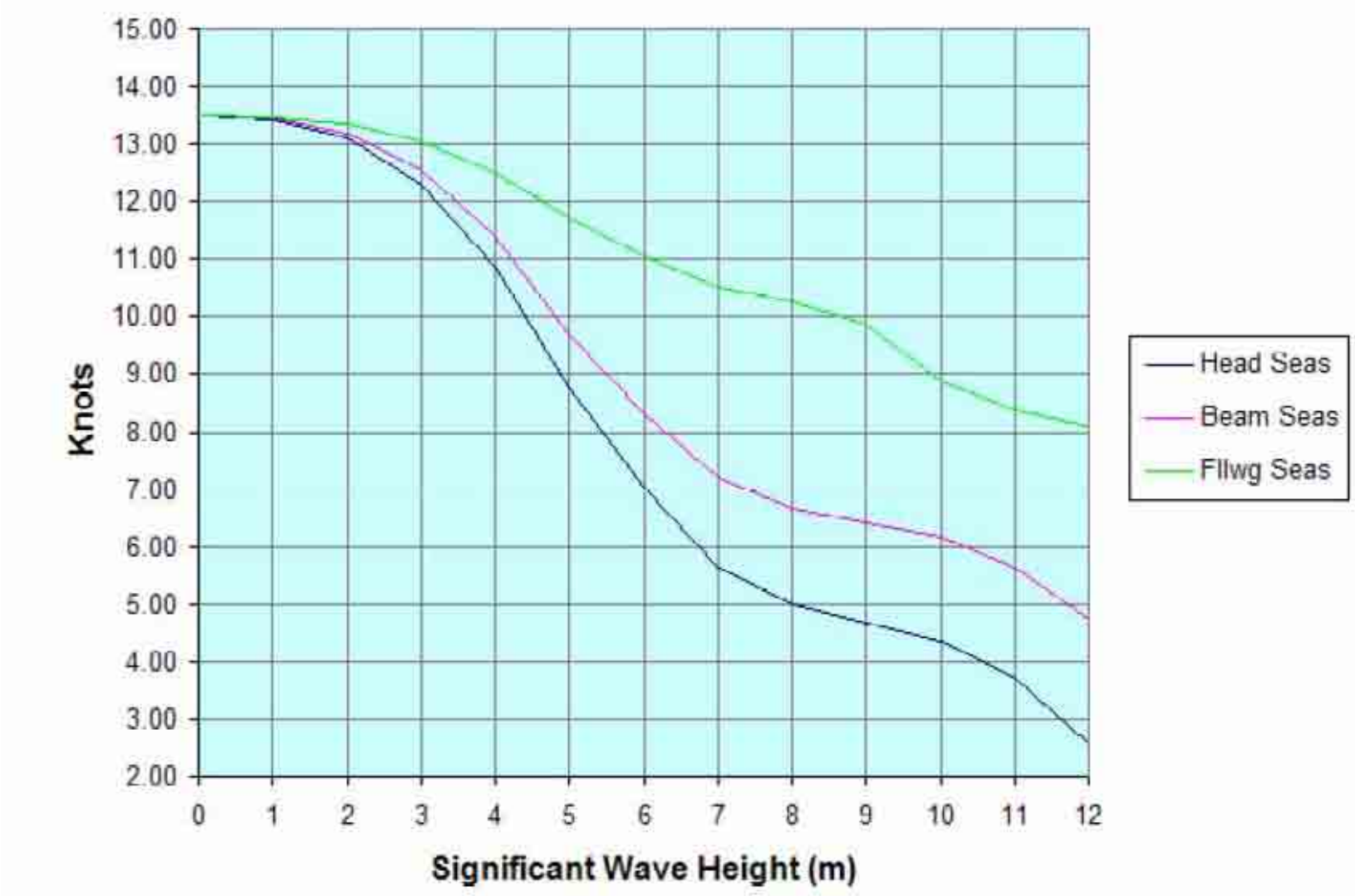




OPTIMIZACIJA POMORSKOG PUTOVANJA

- Maritimna svojstva
  - jednostavni modeli
    - krivulje gubitka brzine po stanju mora
    - Jamesove krivulje
    - polarni dijagrami pomorstvenosti
  - deterministčkih modeli:
    - matematički opis oblika podvodnog i nadvodnog dijela broda,
    - podatke o snazi stroja i obilježjima djelovanja porivnog vijka,
    - podatke o statičkoj i dinamičkoj stabilnosti broda, uključujući i model dinamičkog trima broda,
    - podatke o dokovanju broda i vrsti odnosno kakvoći zaštitnih premaza trupa protiv obrastanja,
    - modele upravljivosti broda, i
    - regresijske studije i provjere na temelju ispitivanja i brodskih bilješki.

OPTIMIZACIJA POMORSKOG PUTOVANJA



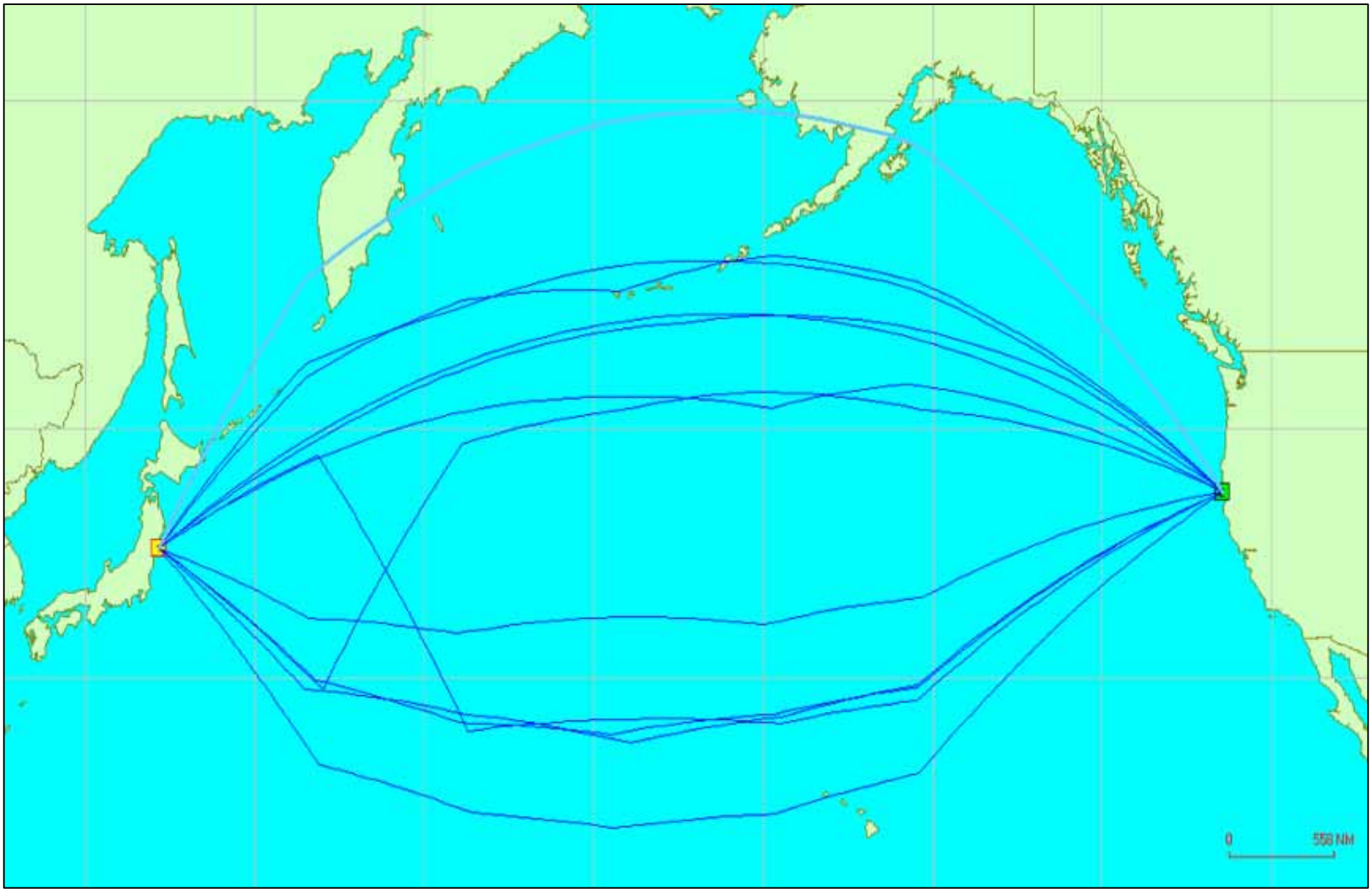
OPTIMIZACIJA POMORSKOG PUTOVANJA

- Maritimna svojstva – minimalni uvjeti za optimizaciju
  - vrsta broda
  - brzina broda u mirnoj vodi,
  - vrsta i količina tereta i količina balasta,
  - gaz broda,
  - stabilnost broda,
  - namjera pranja tankova, te
  - druga ograničenja (osiguranje broda i/ili tereta)
- Algoritmi izračuna optimalnog plovidbenog puta
  - račun varijacija
  - algoritmi dinamičkog programiranja
  - metode izokrona

OPTIMIZACIJA POMORSKOG PUTOVANJA

- BRODSKI SUSTAV *ORION – OceanRoute*
  - ↓ Prognoza površinskog tlaka
    - *National Meteorological Centre*
  - ↓ Raščlamba podataka o vjetru
    - *Fleet Numerical Oceanographic Centre*
  - ↓ Tlak > vjetar 10dnevna prognoza
  - ↓ Inicijalna spektralna energija valova
    - WAVAD globalni model spektralne energije, vlasništvo *OceanRoutes Inc*.
  - ↓ 10dnevna prognoza valovlja
  - ↓ Proširena prognoza vremena i valovlja
  - ↓ Optimizacija putovanja
  - ↓ Procjena optimizacije putovanja od dežurnog meteorologa
  - ↓ Sažimanje i prijenos podataka
  - ↓ Prihvat, prikaz i naknadna obrada podataka na brodu

OPTIMIZACIJA POMORSKOG PUTOVANJA



OPTIMIZACIJA POMORSKOG PUTOVANJA

- Postupak
  - početna preporuka plovidbenog puta
    - (*Initial route recommendation*)
  - preporuka o prilagodbi trenutka isplovljenja
    - (*Adjustment of departure time*)
  - izmjena plovidbenog puta
    - (*Diversion*)
  - izmjena brzine plovidbe
    - (*Adjustment of Speed of Advance*)
  - slobodne izmjene plovidbenog puta
    - (*Evasion*)
  - vremenske upute
    - (*Weather Advisory*)

OCEAN ROUTES
World Wide Ship Weather Routing

MESSAGE TRAFFIC

VESSEL : SARAJEVO EXPRESS
VOYAGE : CADIZ to NEW YORK
OPERATOR : CROATIA LINE

CONDITION : LOADED
DATE : APR 94 - MAY 94
REFERENCE : 19406

INITIAL RECOMMENDATION:

22-APR-94_11:01 GMT REF/TLXL0422002

TO: VAPORES SUARDIAZ - CADIZ - SPAIN//76035//

THE FOLLOWING WEATHER FORECAST AND ROUTE RECOMMENDATION BASED ON ETD CADIZ APRIL 23RD 0100Z AND ASSUMED CALM SEA SPEED OF 17.0 KNOTS. PLEASE CONFIRM YOUR INTENDED CALM SEA SPEED AND ANY REQUIRED ETA.

FOR 24 HOUR ASSISTANCE PLEASE CALL OCEANROUTES, SANFRANCISCO, USA AT 408-733-7914.

1/ ADMINISTRATIVE REQUESTS: PLEASE ADVISE ACTUAL DATE/TIME (GMT) AND POSITION AT FULLANAY. AFTER ARRIVAL, PLEASE ADVISE DATE/TIME (GMT) AND POSITION AT END OF SEA PASSAGE. WE WILL OBTAIN YOUR POSITION FROM YOUR WMO 085.

2/ RECOMMENDATION: AS CONDITIONS PERMIT, PARALLEL SAILING UNTIL 40W, THEN AL AMBROSE.

APPROXIMATE DISTANCE 3255 NM CADIZ TO AMBROSE PILOT.

3/ REASON FOR ROUTE SELECTION: AVOID HEAVIEST W-LIES OVER THE EASTERN AND CENTRAL OCEAN. ALSO PASS SOUTH OF ICEBERG AREA AND MINIMIZE EXPOSURE TO THE GULF STREAM CURRENT CORE.

4/ ANALYSIS/SHORT RANGE FORECAST:
22/1200Z/WD 23/1200Z/WD 24/1200Z/WD 25/1200Z/WD
LON 47W15W/985 52N11W/982 57N15W/985 57N20W/988
LON ---------- 43N53W/1007 50N46W/993 49N47W/990

5/ EXPECTED CONDITIONS ALONG RECOMMENDED ROUTE:

DURATION	WIND/(DIR/BF)	SEAS	SWELLS
UNTIL 23/18Z	SW/5-6	2-3M	W-NW/2-3M
23/18Z-24/12Z	W-NW/4-5	1-2M	NW/4-5M
24/12Z-25/00Z	VAR/3	NIL	N/4-5M
25/00Z-26/00Z	S/4-6	1-2M	N/4M THEN 3M
26/00Z-26/12Z	SSW/6-7	3-4M	N/3M THEN W/3M

6/ OCEANOGRAPHIC INFO:
THE INTERNATIONAL ICE PATROL ESTIMATED THE LIMIT OF ALL KNOWN ICEBERGS AT 21/1200Z TO EXTEND FROM THE NEWFOUNDLAND COAST NEAR 4748N 5800W TO 4335N 5800W TO 4035N 4800W TO 4330N 3930W TO 4000N 3930W TO 5130N 4100W TO 5700N 5605W THEN EASTWARD.

THE LINE DESCRIBED BY THE FOLLOWING SEQUENCE OF POINTS REPRESENTS THE WEST OR NORTH WALL OF THE GULF STREAM WITH THE MAXIMUM CURRENT 03 TO 15 MILES EAST OR SOUTH OF THIS LINE:

25.0/80.3 27.0/80.0 30.0/80.3 30.0/77.5 37.8/73.0 38.2/70.5
37.8/68.0 37.0/67.0 38.0/67.3 38.8/65.0 38.3/62.8 39.3/64.0
40.7/64.0 40.7/61.0 39.3/60.2 39.1/58.9 40.7/57.3 40.5/55.0

B/RSOS.

FROM MASTER:

23-APR-94 08:12 GMT VIA WAR F/T+2307032 PW: WB
HOP3 2302002
VSL FULLANAY 2302002 POSITION 3633N 00620W.
INTENDED CALM SEA SPEED 17 KNOTS.
B/ROB 1227/.

FROM MASTER:

23-APR-94 08:17 GMT VIA WAR F/T+2307052 PW: WB
HOP3 2302002
IFO - 1227.0
DIESEL - 152.0
VSL FULLANAY 2302002 POSITION 3633N 00620W.
INTENDED CALM SEA SPEED 17 KNOTS.
B/ROB 1227/152 MT.
FOLLOWING YOUR RECOMMENDATION
1256352 SAEX X

FROM OCEANROUTES:

24-APR-94_04:57 GMT REF/TLXL0424010
MARIGAT 1256352

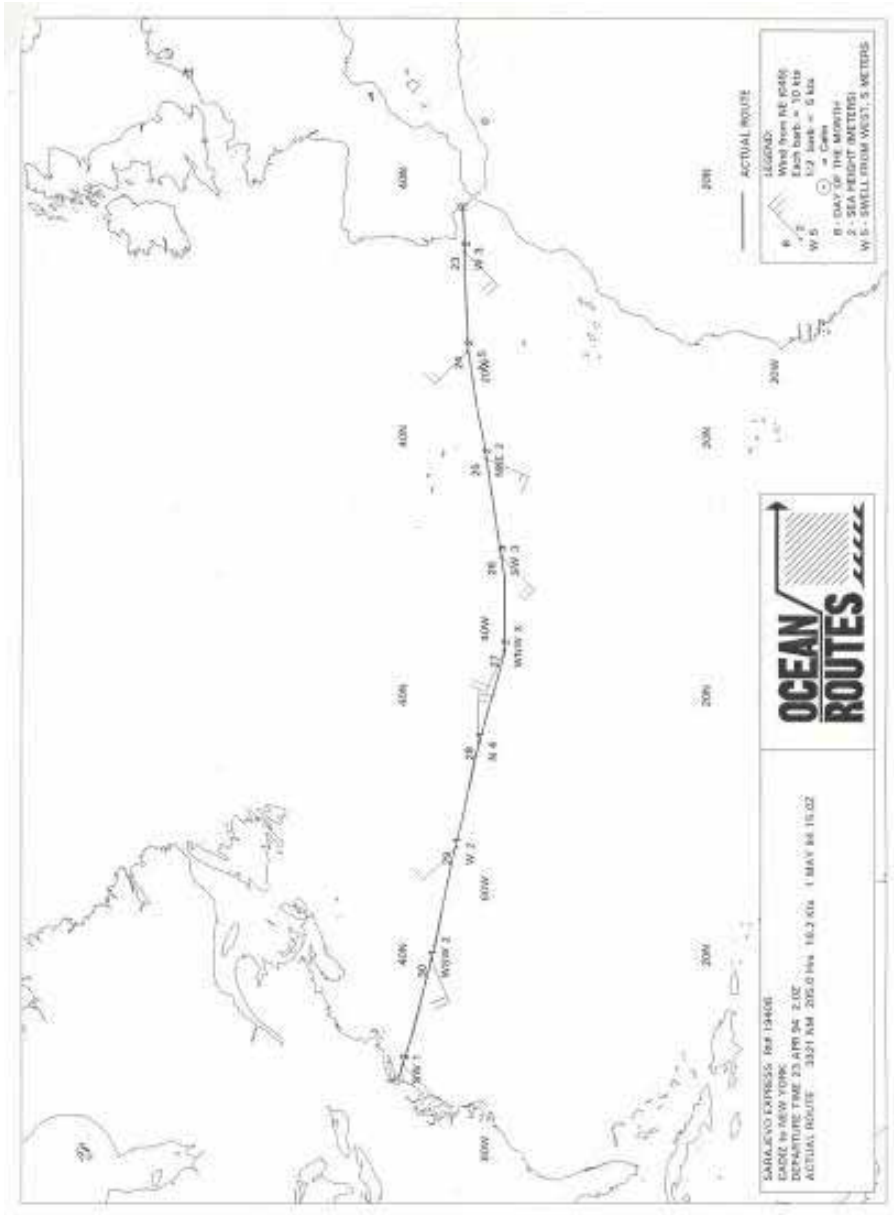
1. RECOMMENDATION: RL/34N35W, RL/34N41W, RL/AMBROSE LIGHT.

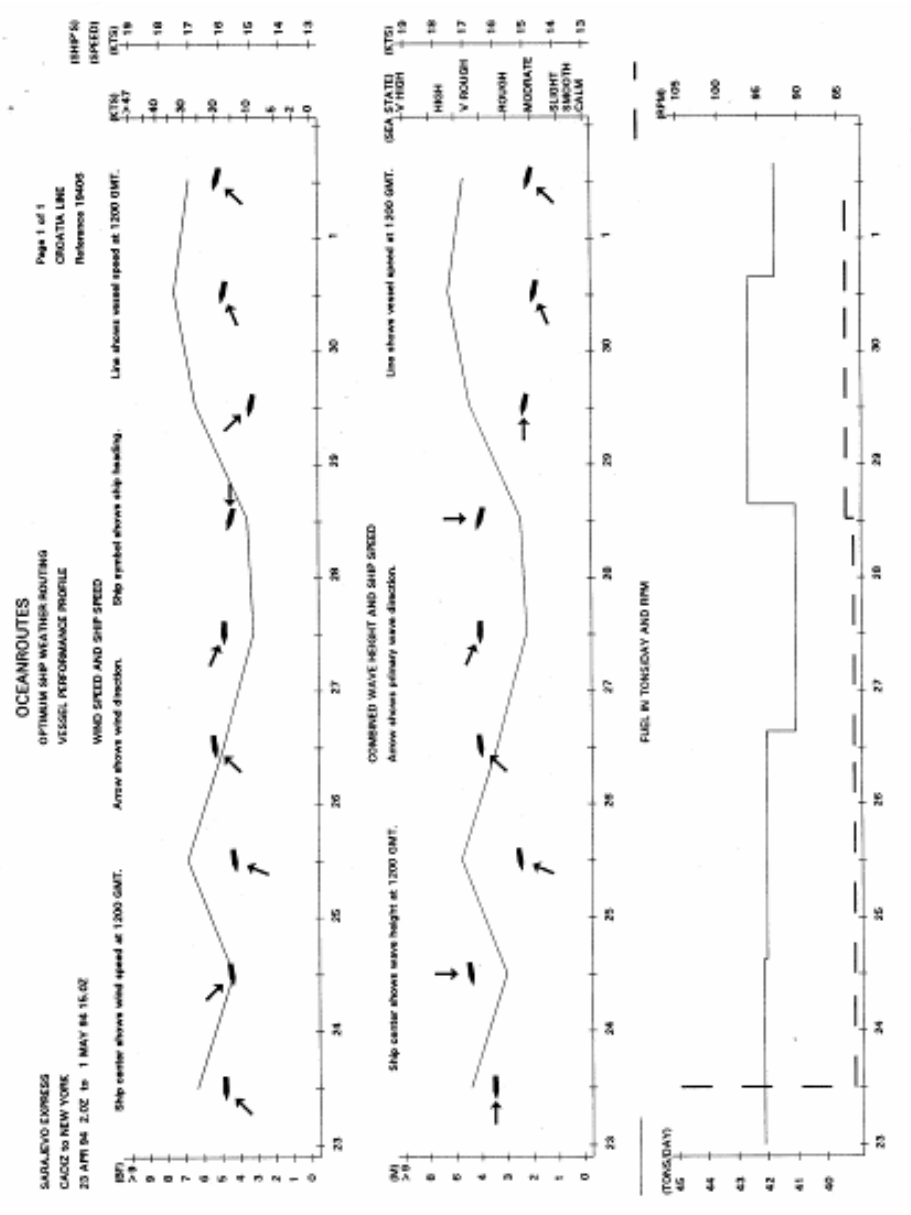
2. REASON FOR RECOMMENDED ROUTE: ROUTE OPENS DISTANCE FROM A SERIES OF MIDOCEAN LOW LATITUDE GALES FORECAST NEAR 41N NEXT 4-6 DAYS. AND NOTING THE CARGO CONDITION FOR THIS VOYAGE WE EXPECT SW OR LARGER SEA/SWELL NORTH OF 35N FROM THE 26TH-28TH MIDOCEAN.

3. SHORT RANGE FORECAST:
24/1200Z/WD 25/1200Z/WD 26/1200Z/WD 27/1200Z/WD
HIGH 33N20W/021 33N17W/026 33N08W/026 THEN/WW
LOW 42N45W/023 52N31W/976 55N27W/984 63N59W/992
LOW NEW 42N58W/007 42N42W/995 45N37W/988

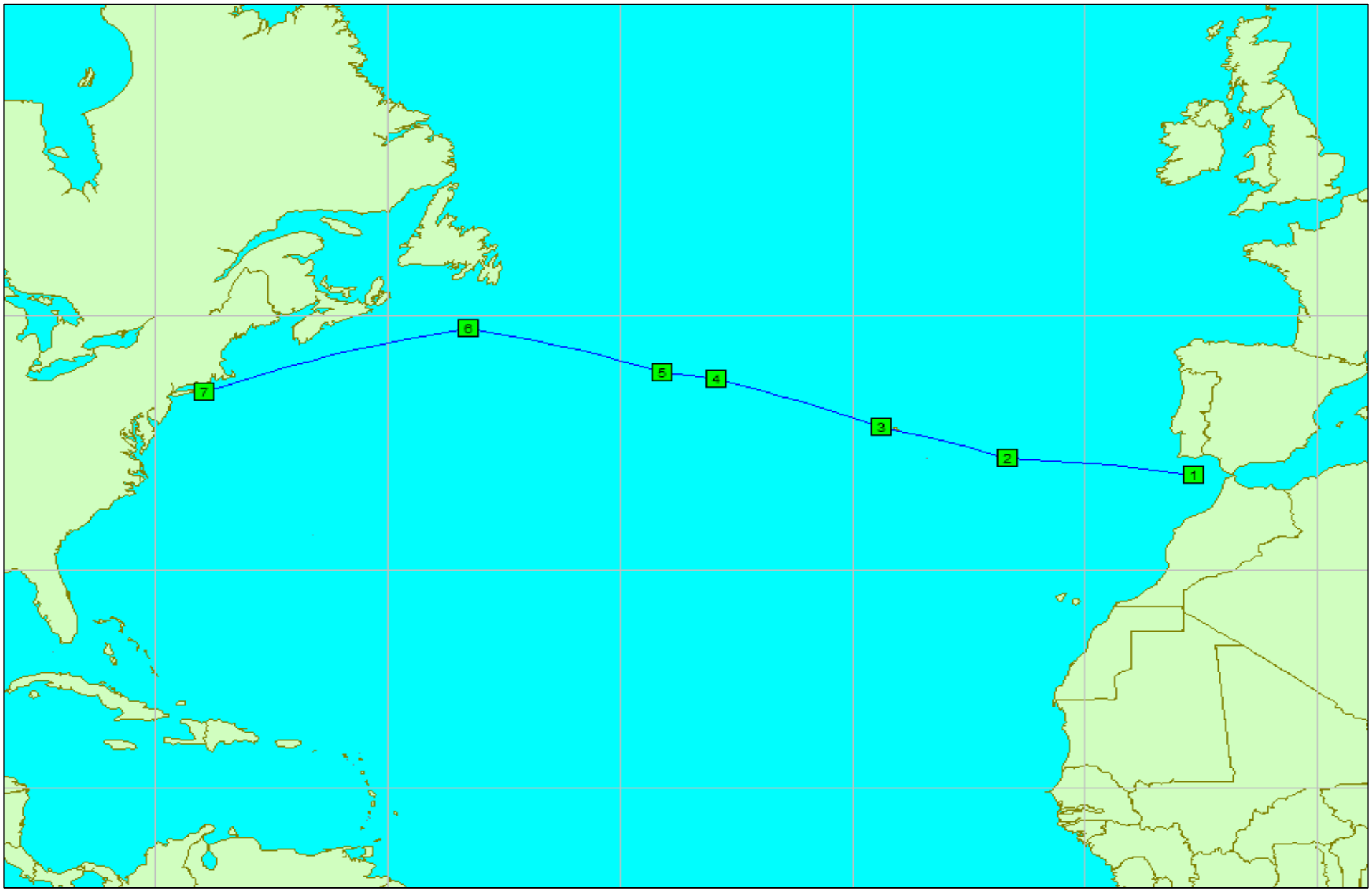
4. EXPECTED CONDITIONS ALONG RECOMMENDED ROUTE:

OPTIMIZACIJA POMORSKOG PUTOVANJA



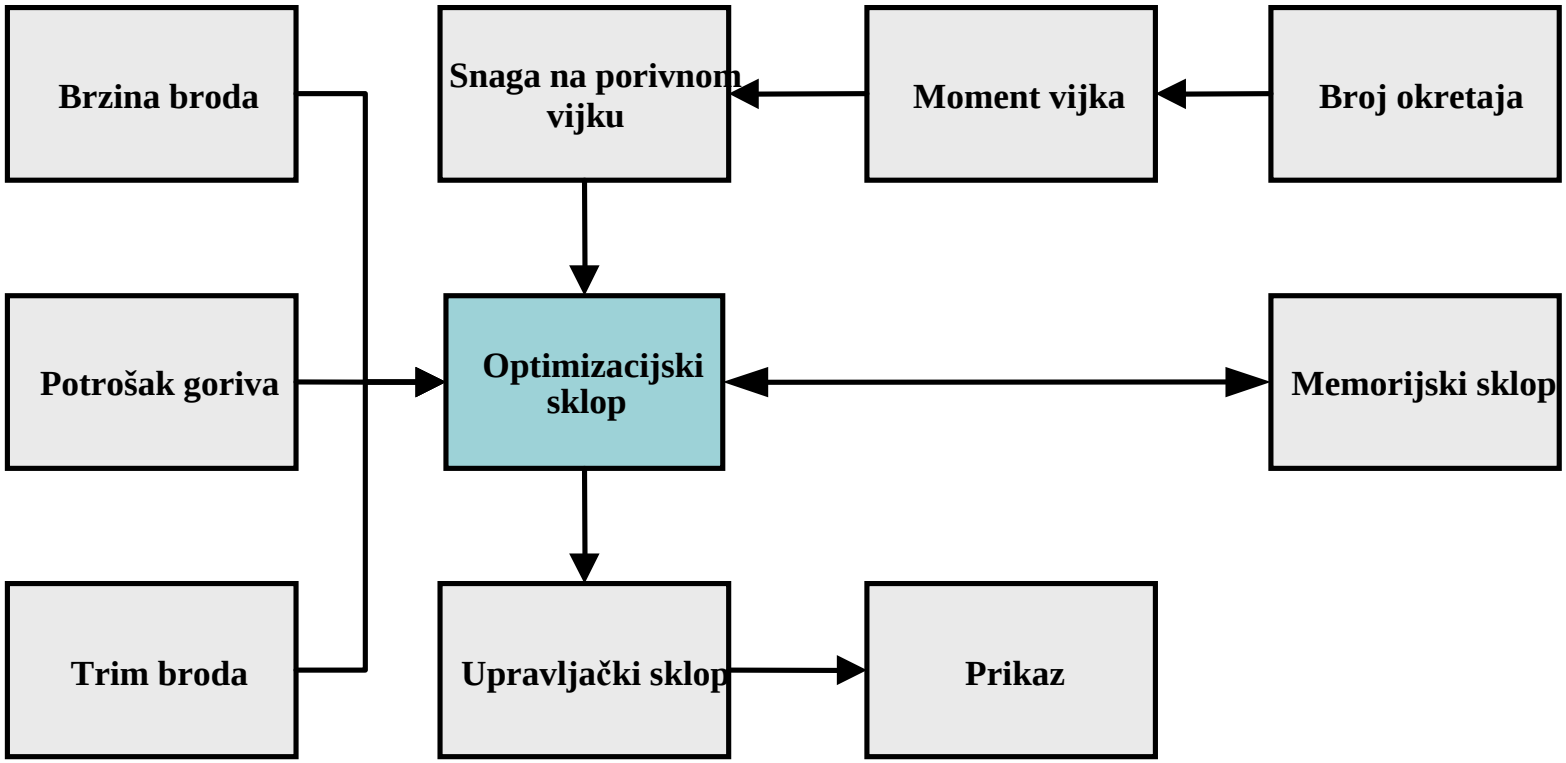


Optimizirana putanja



OPTIMIZACIJA POTROŠKA GORIVA

- Funkcija cilja – optimizacija potroška goriva
  - po jedinici snage
  - po brzini
  - po prijeđenom putu



OPTIMIZACIJA POSLOVANJA

- Funkcija cilja – optimizacija brzine

- Troškovi putovanja
  - troškovi goriva (Tg)
  - troškovi u stajanju (Ts)
  - fiksni troškovi (Tf)

$$Tg = c * 24 * e * q * \Delta^{2/3} * V^{3}$$

- Kriterij optimalnosti
  - najmanji ukupni dnevni troškovi
  - najveća dobit
    - E = M ΣT
      - *M ukupni prihod na putovanju*
      - *ΣT ukupni troškovi*
  - najveći stupanj rentabilnosti
    - R = (M ΣT) / D
      - *D trajanje putovanja*

OPTIMIZACIJA POSLOVANJA

Voyage data

Distance = 12000.00 Nm

At sea = 34.01 days
In port = 11.00 days

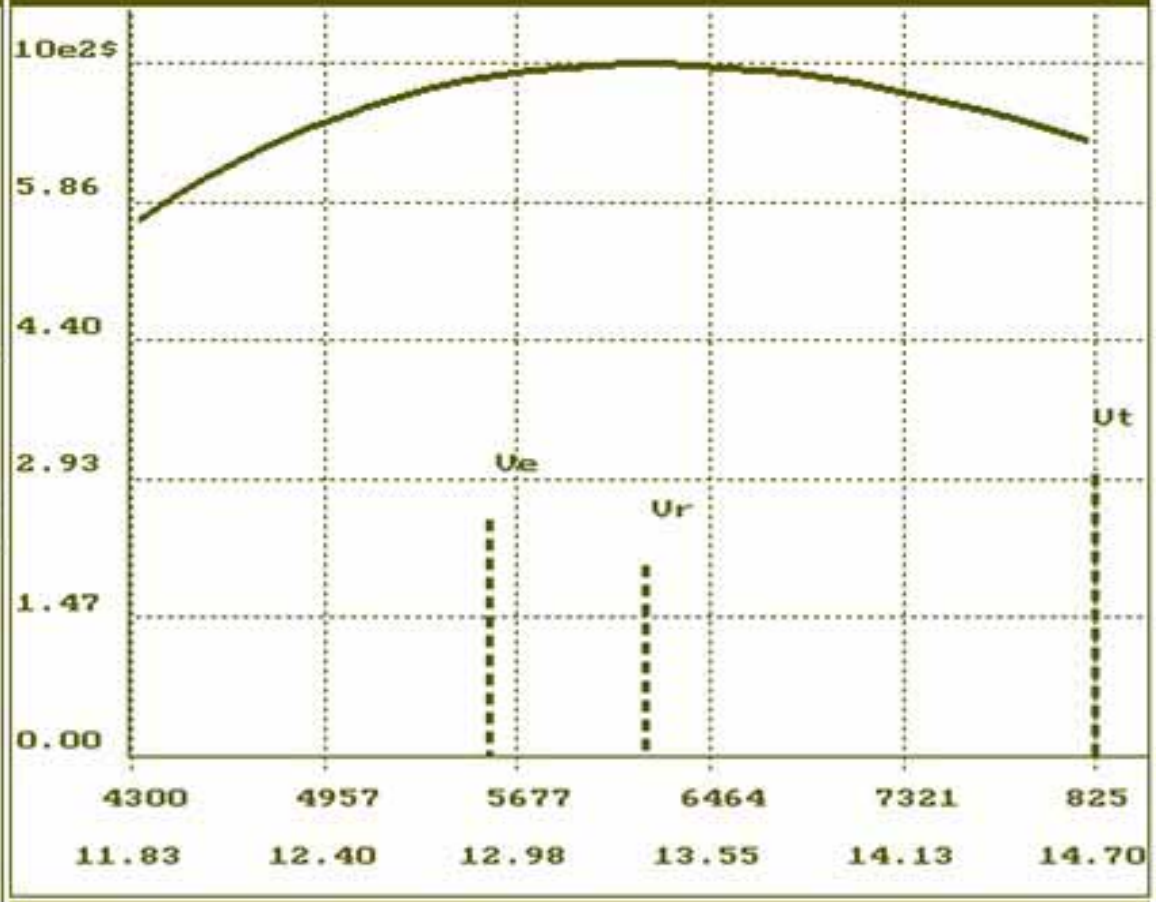
Freight = 600000.00 USD

Income:
Voyage = 27711.16 USD
Daily = 615.62 USD

Service parameters:
Speed = 14.70 kn
Power = 8250.00 kW

Optimum parameters:
Speed = 13.36 kn
Power = 6191.00 kW

Graph



MSG

Press U, T, F, E, S, R, P, D, M or V

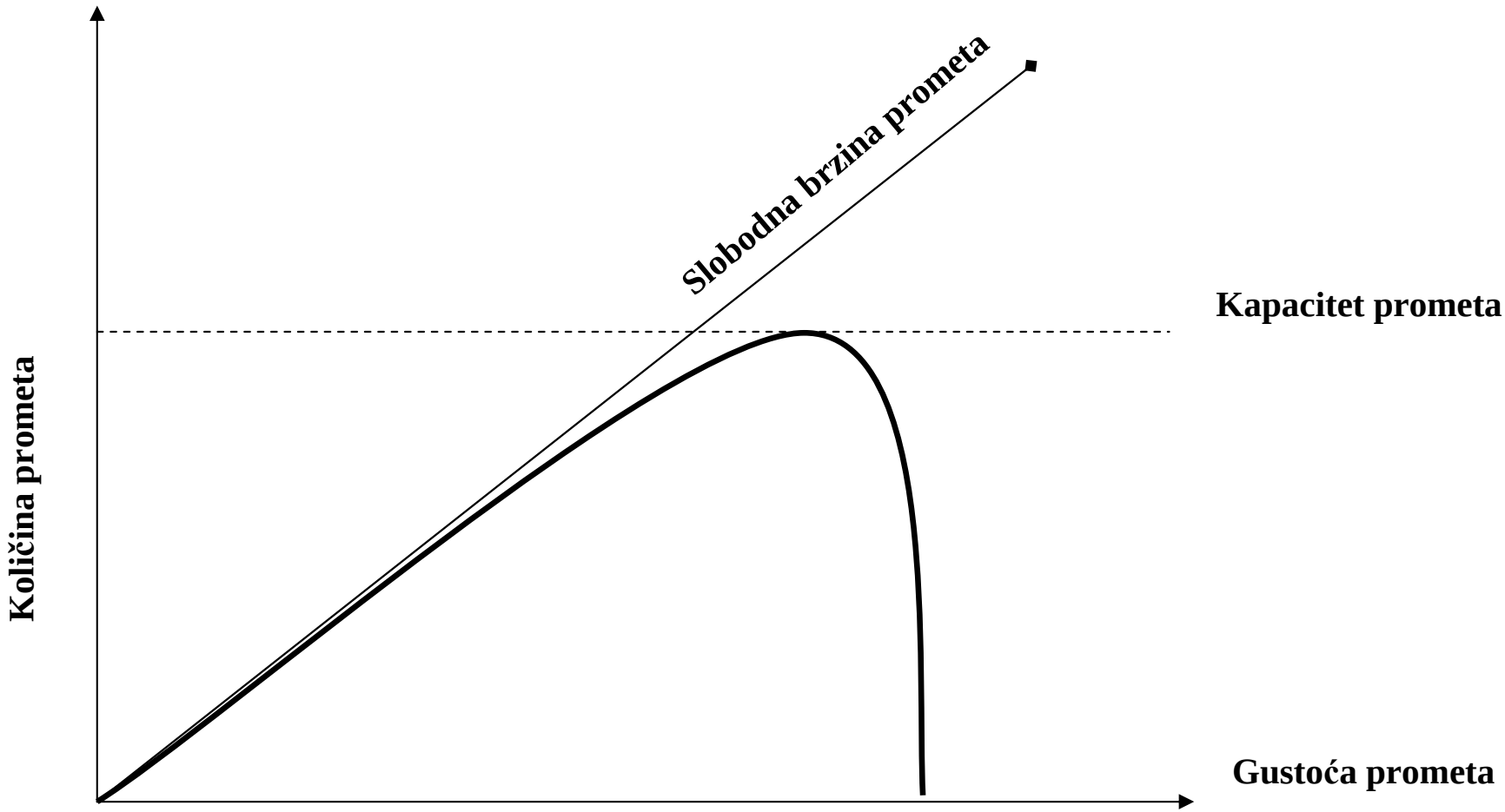
PROMETNI TIJEK

- Gustoća prometa $\delta = \frac{n}{A}$
- Brzina prometnog tijeka $Vt = \frac{\sum V_i}{n} \qquad i = 1..n$
- Količina prometa $q = \delta \cdot V \cdot W$
- Razdioba pristizanja brodova $P_n(t) = \frac{(q \cdot t)^n}{n!} e^{-q \bullet t}$
- Vrijeme između dva broda $f(t) = q \cdot e^{-q \bullet t}$

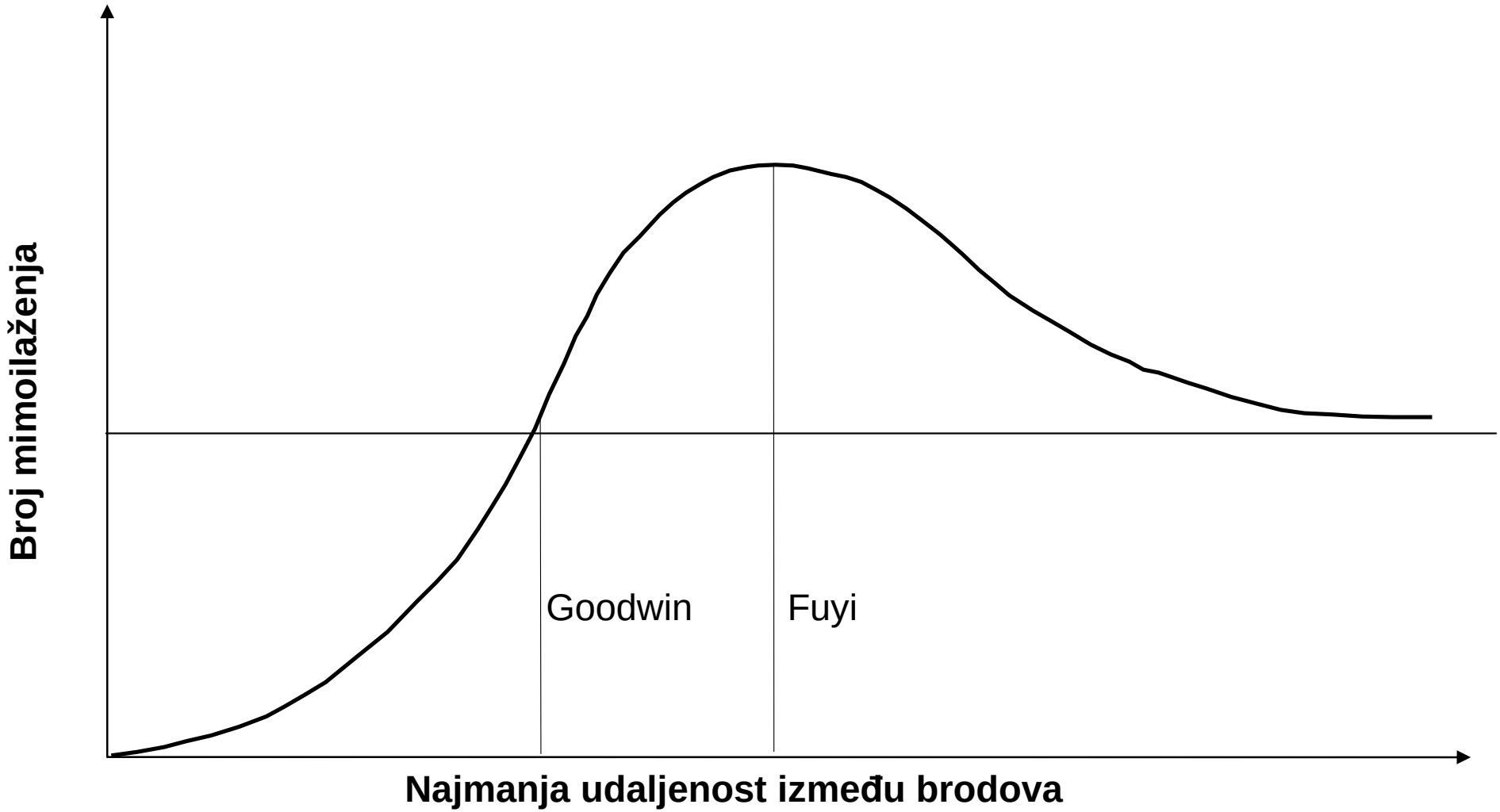
PROMETNI TIJEK

- Kapacitet prometa

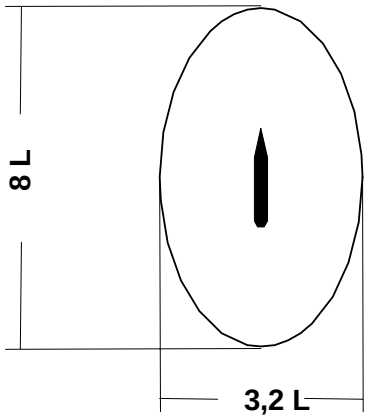
$$C = c \cdot W \cdot V \cdot \delta_{\max}$$



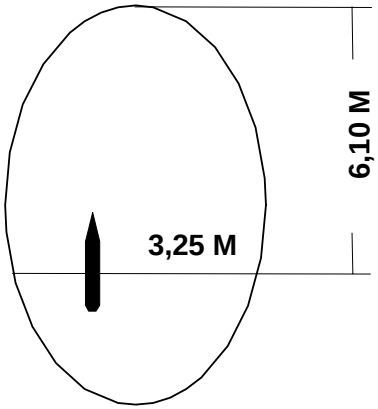
Teorija domene



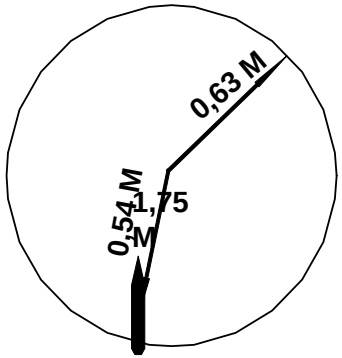
Teorija domene



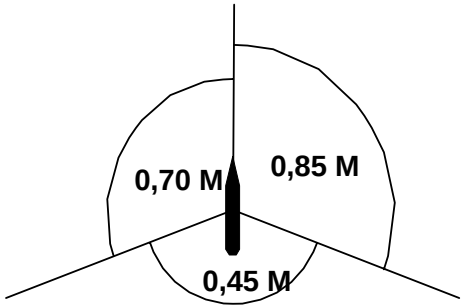
Fuyi



Coldwell



Davis



Goodwin

	Sektor I	Sektor II	Sektor III
Istraživanje I	0.5	0.5	0.4
Istraživanje II	0.9	0.9	0.8
Istraživanje III	0.7	0.6	0.5

Vrsta plovidbe	Sektor I	Sektor II	Sektor III
Dover Strait	0.8	0.8	0.1
Gibraltar Strait	1.5	1.4	0.6
otvoreno more	2.4	2.4	0.9
južno Sjeverno more	0.9	0.7	0.5

Otkrivanje opasnih blizina

- Broj sudara

$$N = \delta \bullet Vr \bullet c$$

- Srednja relativna brzina

$$Vr = \frac{2 \bullet \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} (Vi^2 + Vj^2 - 2 \bullet Vi \bullet Vj \bullet \cos(Ki - Kj))}{n(n-1)}$$

- Prosječni broj sudara
  - S – promjer ograničenog područja

$$Nc = \frac{\delta^2 \bullet S \bullet Vr \bullet c}{2}$$

- Funkcija udaljenosti

$$D(t) = \sqrt{D_{CPA}^2 + Vr^2 (t - t_{CPA})^2}$$

Otkrivanje opasnih blizina

- Tau

$$\tau = \frac{r}{r'}$$

- RDRR

$$RDRR > \frac{R - R_d}{R'}$$

- RDRR+
  - δ "popravka" radijusa domene,
  - Θ "popravka" vremena djelovanja

$$RDRR + = \frac{R - (D + \delta)}{R'} - \theta$$

- Turner

$$Rw = a\, D_{CPA}^2 + b\, t_{CPA}^2$$

- Judson

$$N_c = \frac{m_1 d + m_2 Vr}{R}$$

- PAD
- Z

$$z(t) = \frac{Vr^2}{(1 + D_{CPA}^2)^2 \bullet (1 + D^2(t))}$$

USMJERAVANJE PROMETNOG TIJEKA

Ciljevi usmjeravanja plovidbe

Poboljšanje sigurnosti plovidbe u područjima konvergencije plovidbenih pravaca, u područjima gdje je velika gustoća prometa ili u područjima gdje je sloboda kretanja brodova smanjena ograničenim manevarskim prostorom, postojanjem navigacijskih pomagala, ograničenom dubinom ili nepovoljnim meteorološkim uvjetima

Ciljevi usmjeravanja plovidbe

- Odvajanje nasuprotnih prometnih tijekova
- Smanjivanje opasnosti od sudara pri presijecanju osnovnog smjera
- Pojednostavljenje plovidbenog tijeka u područjima konvergencije
- Sigurna plovidba u područjima istraživanja ili iskorištavanje podmorja;
- Uspostavljanje prometnog tijeka u i oko područja gdje je plovidba opasna ili nepoželjna
- Smanjivanje opasnosti od nasukavanja
- Vođenje prometa izvan ribolovnih područja

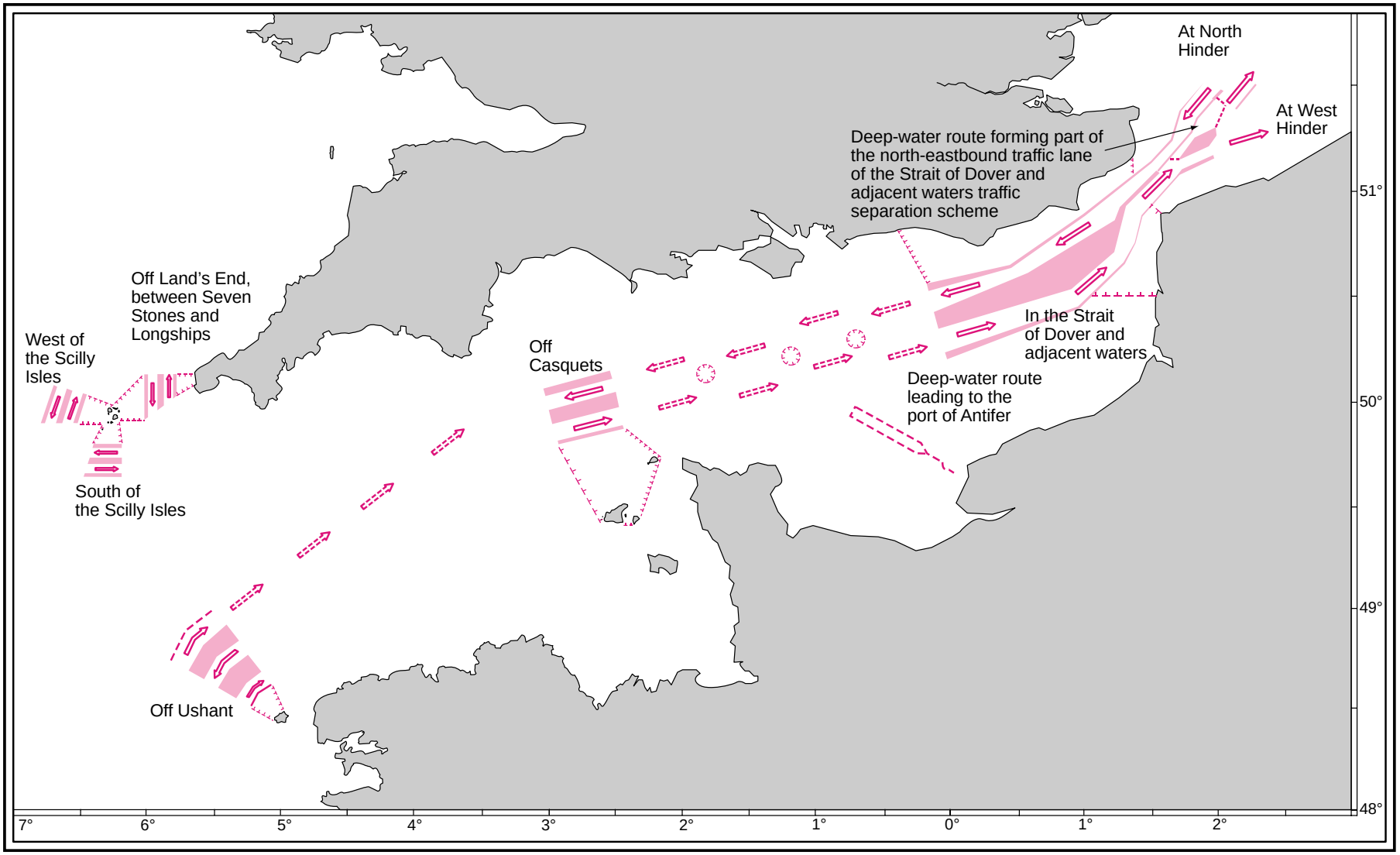
Plovidba u sustavima usmjerene plovidbe

- Sustav usmjerene plovidbe (*Routeing system*)
  - svaki sustav koji se sastoji od jednog ili više sustava odijeljene plovidbe kao osnovne mjere te drugih propisanih mjera kojima je cilj smanjivanje opasnosti od nezgoda.
- Sustav odijeljenog prometa (*Traffic separation scheme*)
- Područje priobalnog prometa (*Inshore traffic zone*)
- Područje povećana opreza (*Precautionary area*)
- Kružni tok (*Roundabout*)
- Dvosmjerni plovidbeni pravac (*Twoway route*)
- Preporučeni plovidbeni pravac (*Recommended route*)
- Plovidbeni pravac za brodove duboka gaza (*Deep water route*)
- Područja koja treba izbjegavati (*Area to be avoided*)

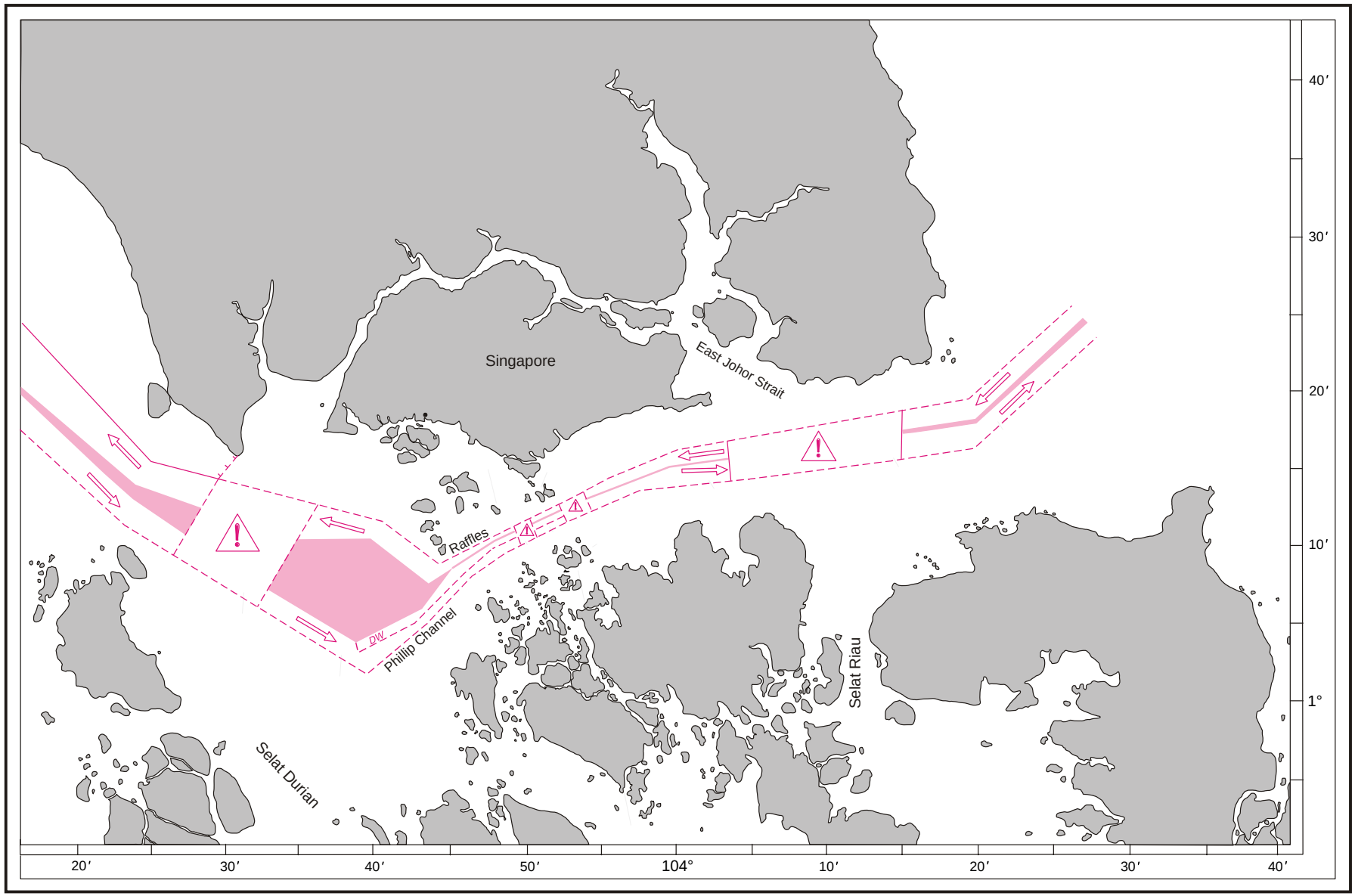
Uspostavljanje sustava usmjerene plovidbe

- Uvjeti za uspostavljanje novih sustava
  - plovidbeni smjerovi trebaju odgovarati postojećim smjerovima plovidbenog tijeka
  - sustav treba obuhvaćati što manje promjena smjera plovidbe
  - oblik i dužina u blizini područja istraživanja ili iskorištavanja podmorja mogu se razlikovati od uobičajenih ukoliko se time postiže veži stupanj sigurnosti plovidbe
  - broj područja u kojima se susreće više plovidbenih pravaca kao i područja u kojima se plovidbeni smjerovi presijecaju treba biti što manji
  - plovidbeni smjerovi moraju biti tako položeni da u omogućavaju najbolju iskorištenost obalnih navigacijskih pomagala
  - stupanj hidrografskih istraživanja na području sustava i na prilaznim područjima u pogledu postojećih dubina i navigacijskih opasnosti mora biti zadovoljavajući i na raspolaganju nadležnim službama zaduženim za izradu pomorskih karata

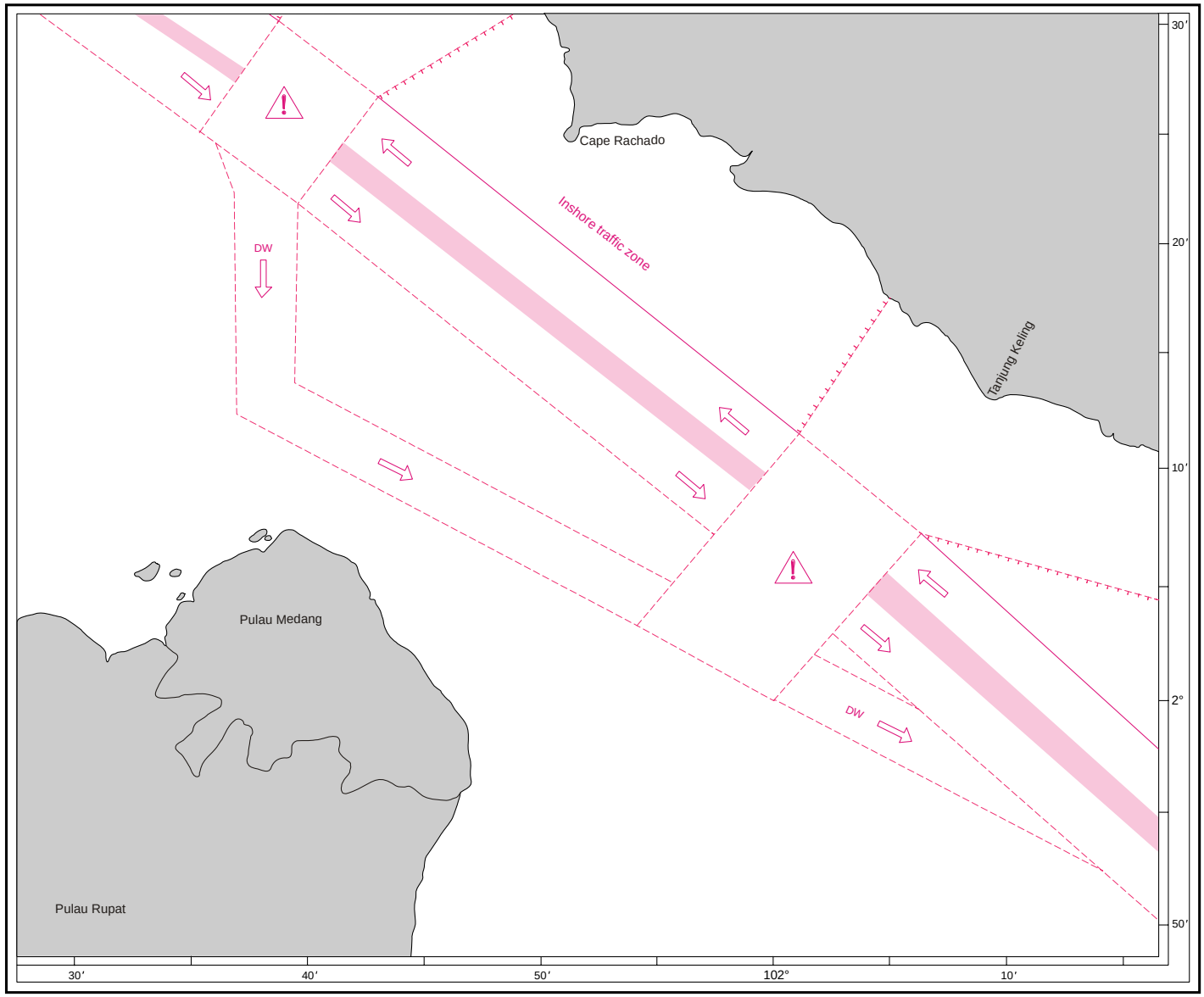
Plovidba u sustavima usmjerene plovidbe



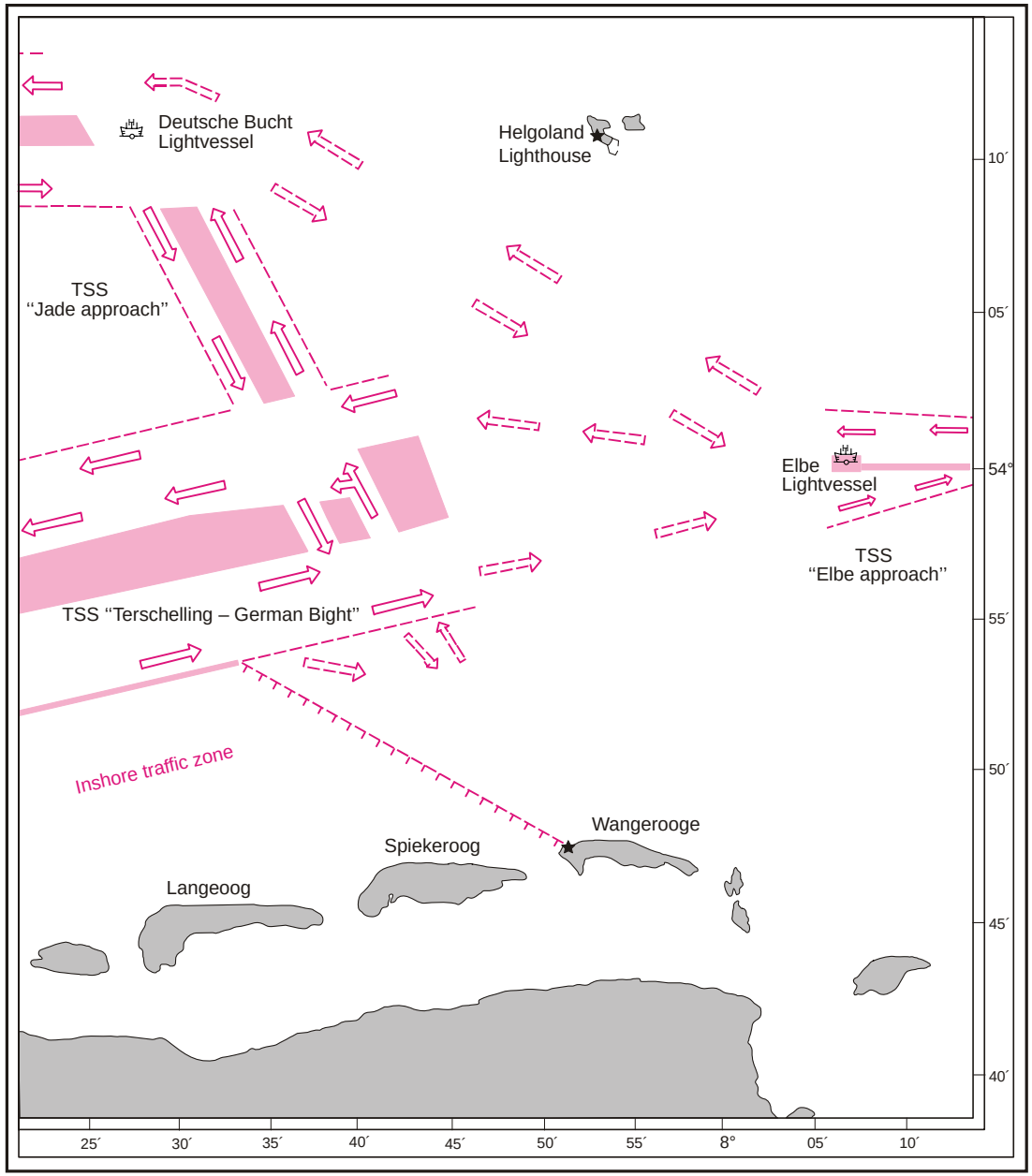
Plovidba u sustavima usmjerene plovidbe



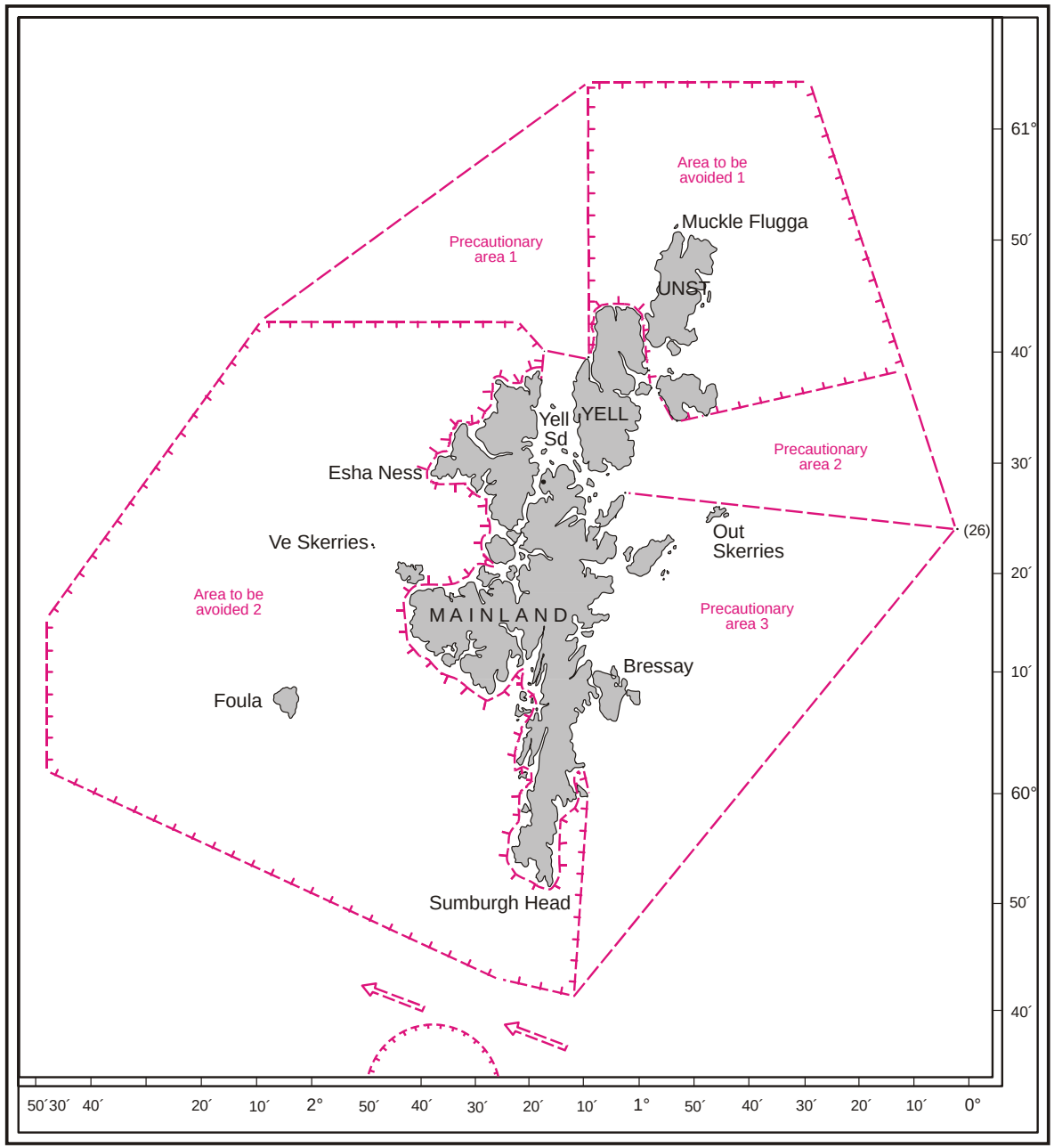
Plovidba u sustavima usmjerene plovidbe



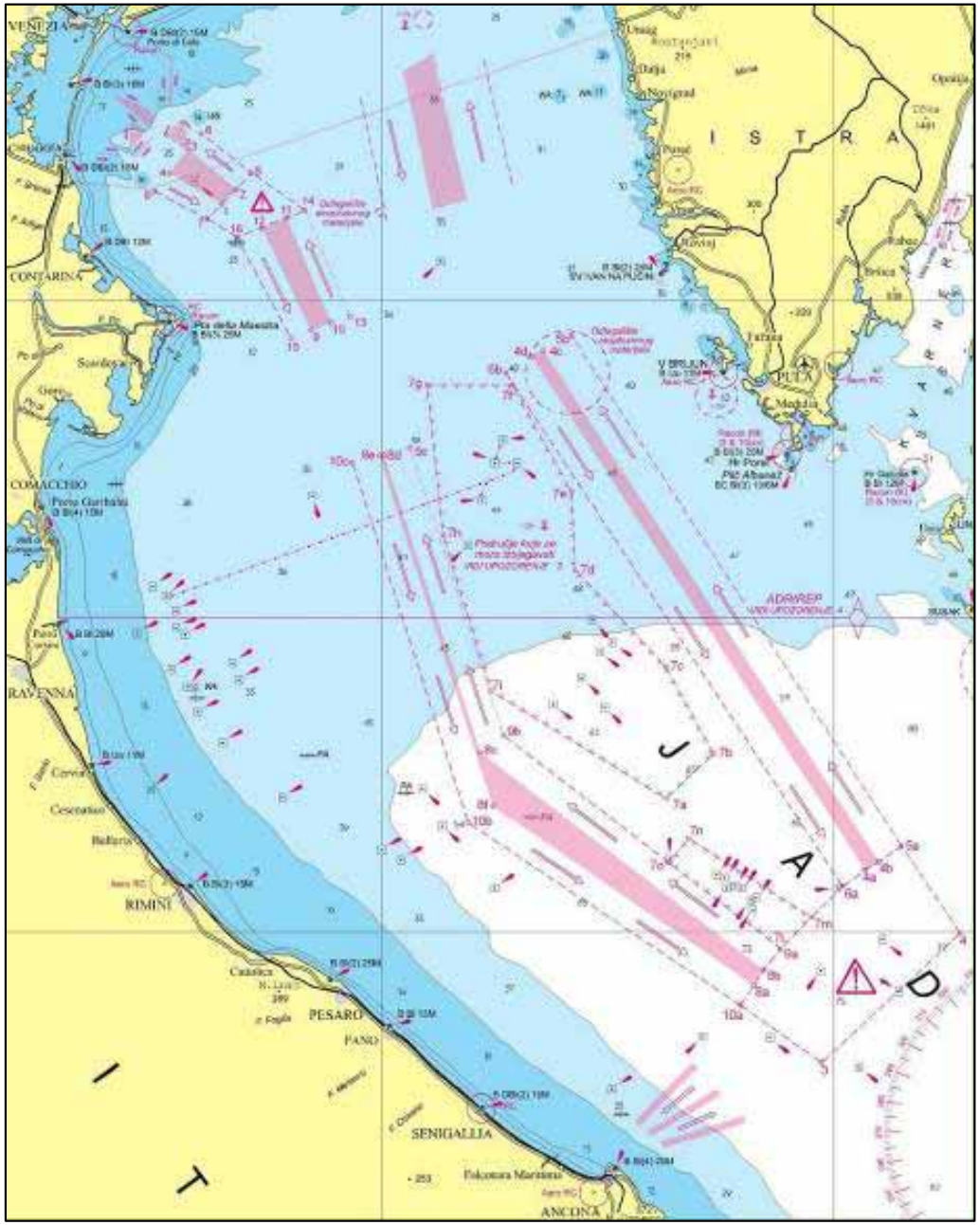
Plovidba u sustavima usmjerene plovidbe



Plovidba u sustavima usmjerene plovidbe

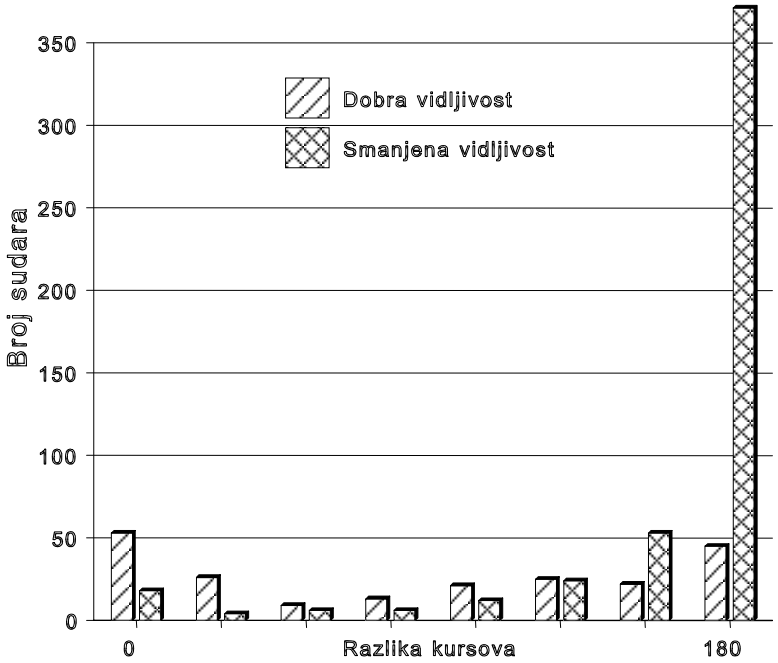


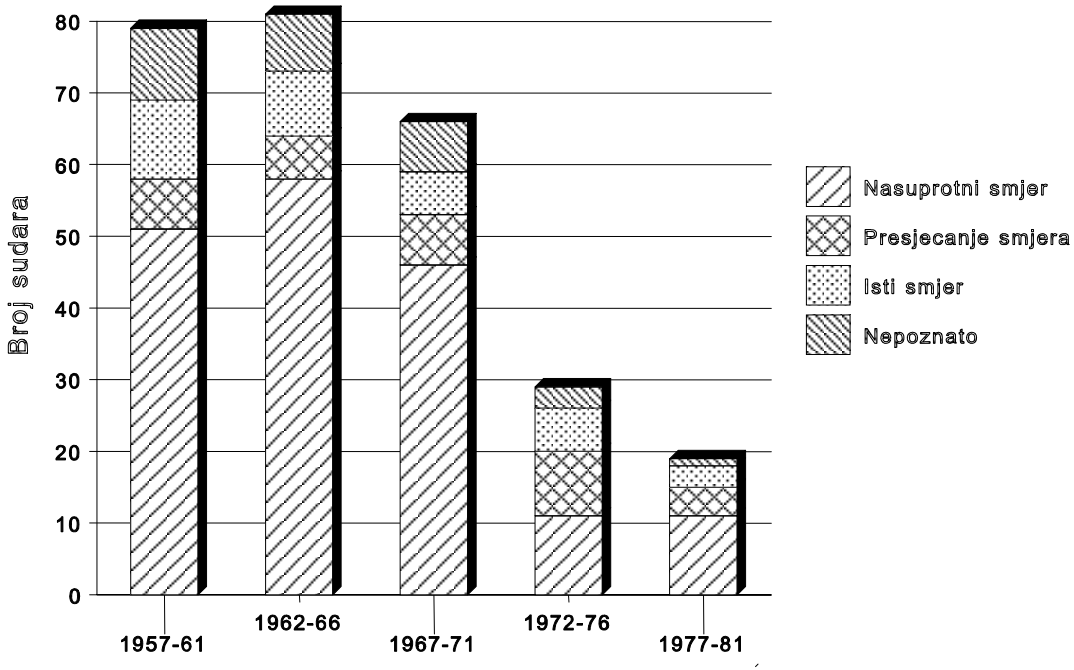
Plovidba u sustavima usmjerene plovidbe



Sustav usmjerene plovidbe "Sjeverni Jadran" s izmjenama i dopunama usvojenima na sjednici MSCa 2006. godine

Uspješnost primjene mjera usmjerene plovidbe





NADZOR POMORSKOG PROMETA

- 1948,
  - Mersey Port Authority (Liverpool, radar)
- 1951,
  - Long Beach (Radar and VHF)
- 1982,
  - COST 301
- 1980s,
  - Port of London Authority (POLARIS)
- 1993,
  - IALA VTS Committee VTS Guidelines.
- 1995,
  - IMO Guidelines for Vessel Traffic Services
- 2004
  - SOLAS

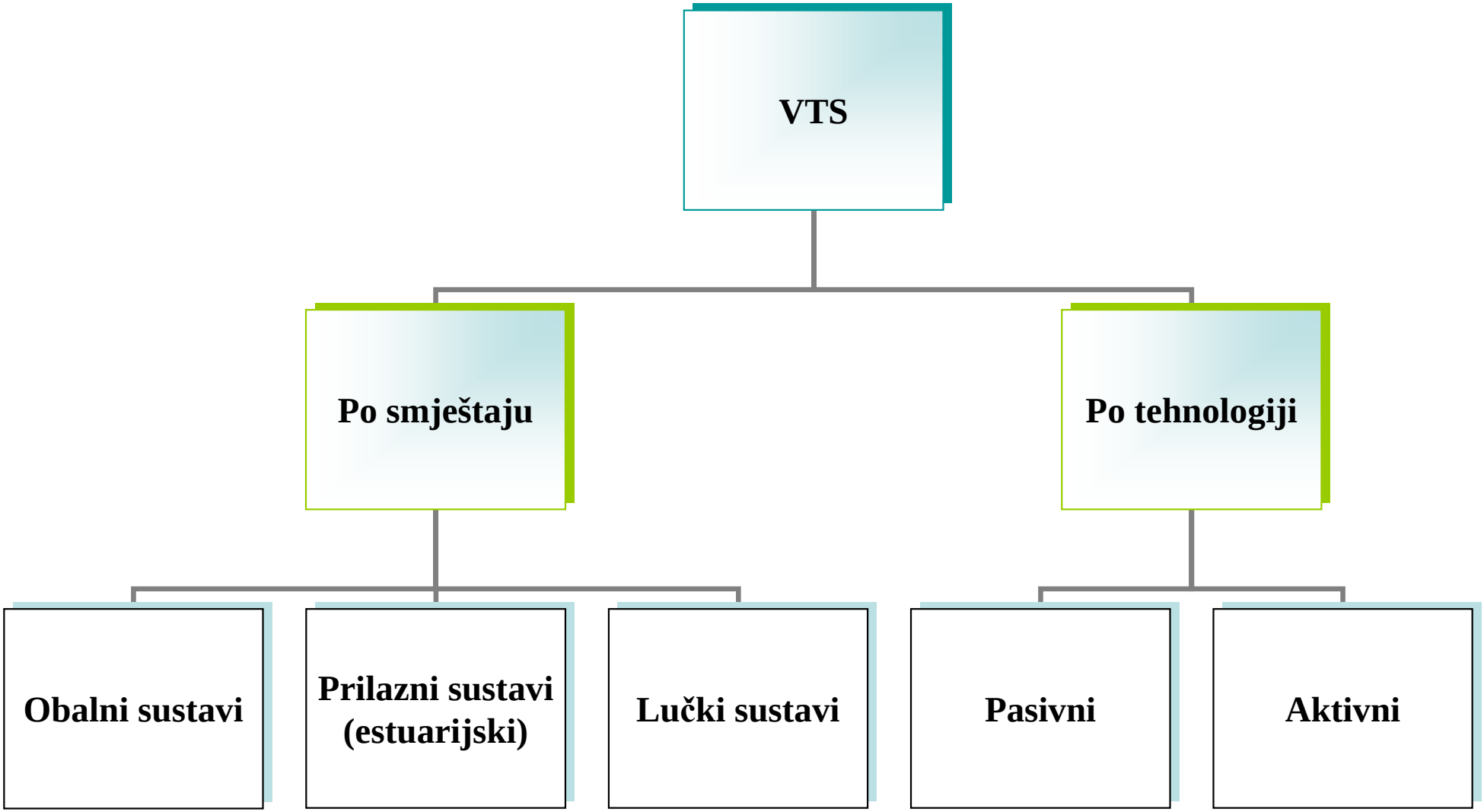
NADZOR POMORSKOG PROMETA

- Služba nadzora plovidbe jest *svaki sustav (Služba) uspostavljen od strane nadležnih vlasti sa namjerom da unaprijedi sigurnost i učinkovitost pomorskog prometa te zaštitu okoliša*.
    - Vessel Traffic Service (VTS)
- Postupci
  - temeljni (*primary procedures*),
  - pružanje pomoći (*remedial*) i
  - naredbodavne postupci (*enforcement*).
- Podjela po području djelovanja:
  - sustavi na unutrašnjim plovnim putovima,
  - lučki sustavi u lukama s razvedenim pristupnim putovima,
  - lučki sustavi u lukama bez pristupnih plovnih putova i kanala,
  - obalni sustavi sa skromnim terminalnim prometom, i
  - obalno/lučki sustavi sa značajnim tranzitnim i terminalnim prometom.

Uspostavljanje VTS službe

- Procjena
  - Inception
- Prikladnost i osnovni nacrt
  - Feasibility and Design
- Prosudba rizika
  - Risk Assessment
- Procjena troškova i koristi
  - Cost/Benefit
- Izrada i primjena
  - Implementation
- Procjena zadovoljavanja ciljeva
  - Evaluation

Vrste VTS sustava



Funkcionalni slijed djelatnosti

- Radne funkcije
  - promatranje
    - *(*Observation*)*
  - prepoznavanje
    - *(*Identification*)*
  - vođenje
    - *(*Guidance*)*
  - usmjeravanje
    - *(*Routing*)*
  - upravljanje
    - *(*VTMIS management*)*
  - uzbunjivanje
    - *(*Alerting*)*
  - bilježenje
    - *(*Recording and replay*)*
  - nadzor
    - *(*Control and monitoring*)*

Načela i tehnologija nadzora pomorskog prometa

- Prikupljanje podataka:
  - korištenjem vlastite opreme o stanju na plovnim putovima
  - održavanjem stalne radiostraže
  - prikupljanjem izvještaja o od brodova o njihovom položaju, stanju trupa, strojeva i opreme ili štetnim ili opasnim tvarima

- Obrada podataka u cilju:
  - praćenja kretanja brodova u pogledu ispunjavanja zahtjeva međunarodnih, nacionalnih i lokalnih propisa
  - interpretacije ukupne prometne situacije i njezina razvoja
  - praćenja hidrometeoroloških uvjeta i navigacijskih pomagala na plovnim putovima
  - koordinacije tijeka podataka te daljnje dostave izvještaja
  - naknadne statističke obrade

Načela i tehnologija nadzora pomorskog prometa

- Informacijska služba uključuje:
  - dostavu podataka o kretanju prometa, stanju vidljivost ili namjerama drugih brodova radi obavještavanja brodova koji sudjeluju u sustavu samo slušanjem radioizvještaja
  - dostavu podataka važnih za sigurnost plovidbe
  - distribuciju podataka o stanju prometa na određenom području (namjeravana kretanja, mimoilaženja, itd)
  - upozoravanje brodova o stvarnim ili potencijalnim plovidbenim opasnostima (onesposobljeni brodovi, skupine ribarskih brodova u nekom području, brodovi uposleni na obavljanju složenih poslova) te izvještavanjem o alternativnim postupcima ili plovidbenim pravcima

- Služba navigacijske pomoći obuhvaća pomoć brodovima po zahtjevu ili prema potrebi u otežanim navigacijskim ili meteorološkim okolnostima odnosno u slučaju kvara ili drugog nedostataka

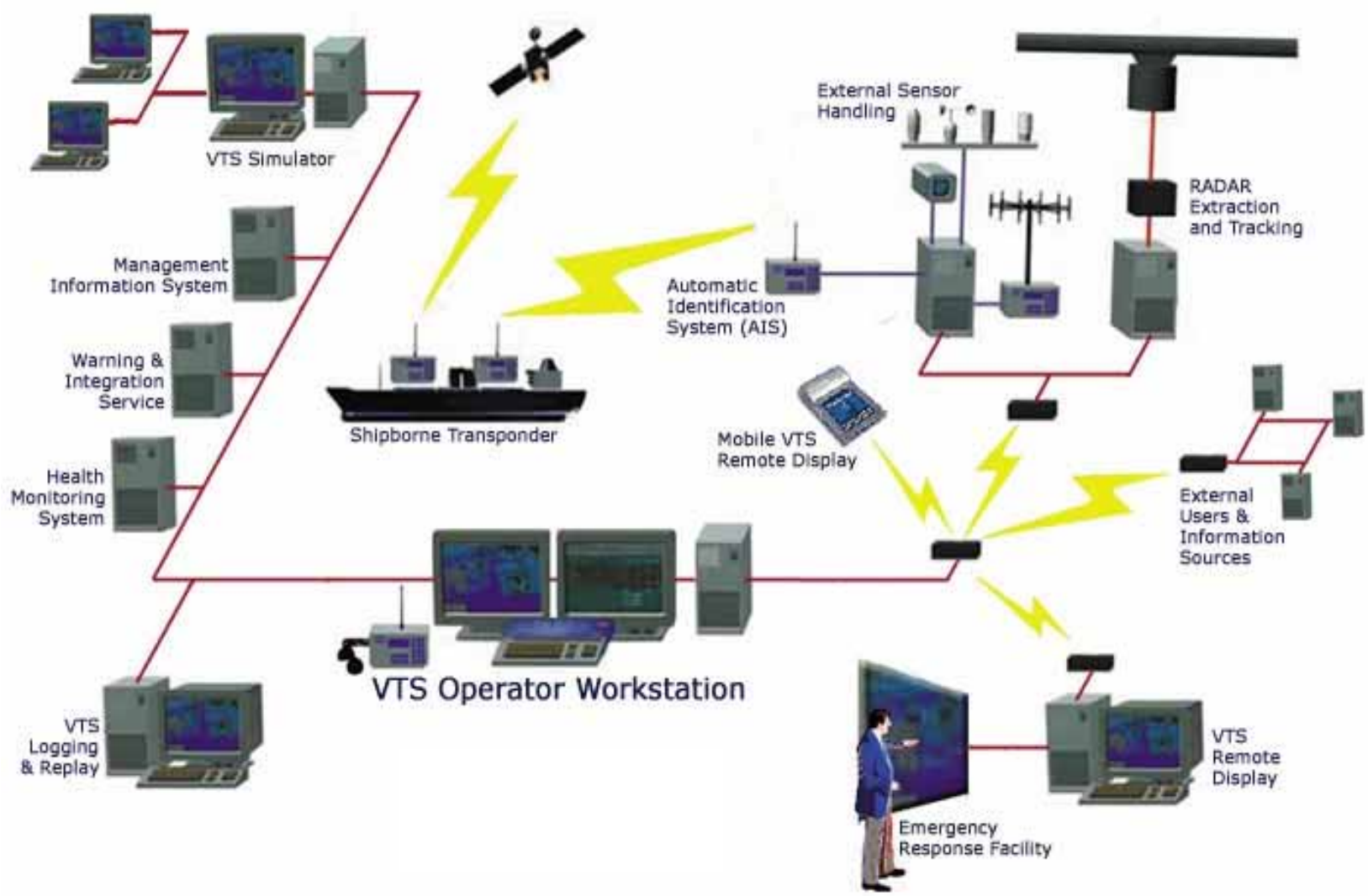
Načela i tehnologija nadzora pomorskog prometa

- Služba organizacije prometa obuhvaća
  - planiranje kretanja sa ciljem da se izbjegne nastanak opasnih situacija i osigura siguran i efikasan promet u području nadzora;
  - izdavanje dozvola za uključivanje u promet, izvještavanje u posebnim situacijama ili uvjetima te određivanje redoslijeda kretanja
  - utvrđivanje redoslijeda kretanja kroz područja od posebnog interesa
    - npr. plovni putovi u kojima je uspostavljen jednosmjeran promet
  - uspostavljanje plovidbenih putova te ograničenja brzina na pojedinim dijelovima plovidbenog puta
  - određivanje sidrišta
  - davanje savjeta i uputa
    - zaustavljanja odnosno upućivanja brodova ili slično

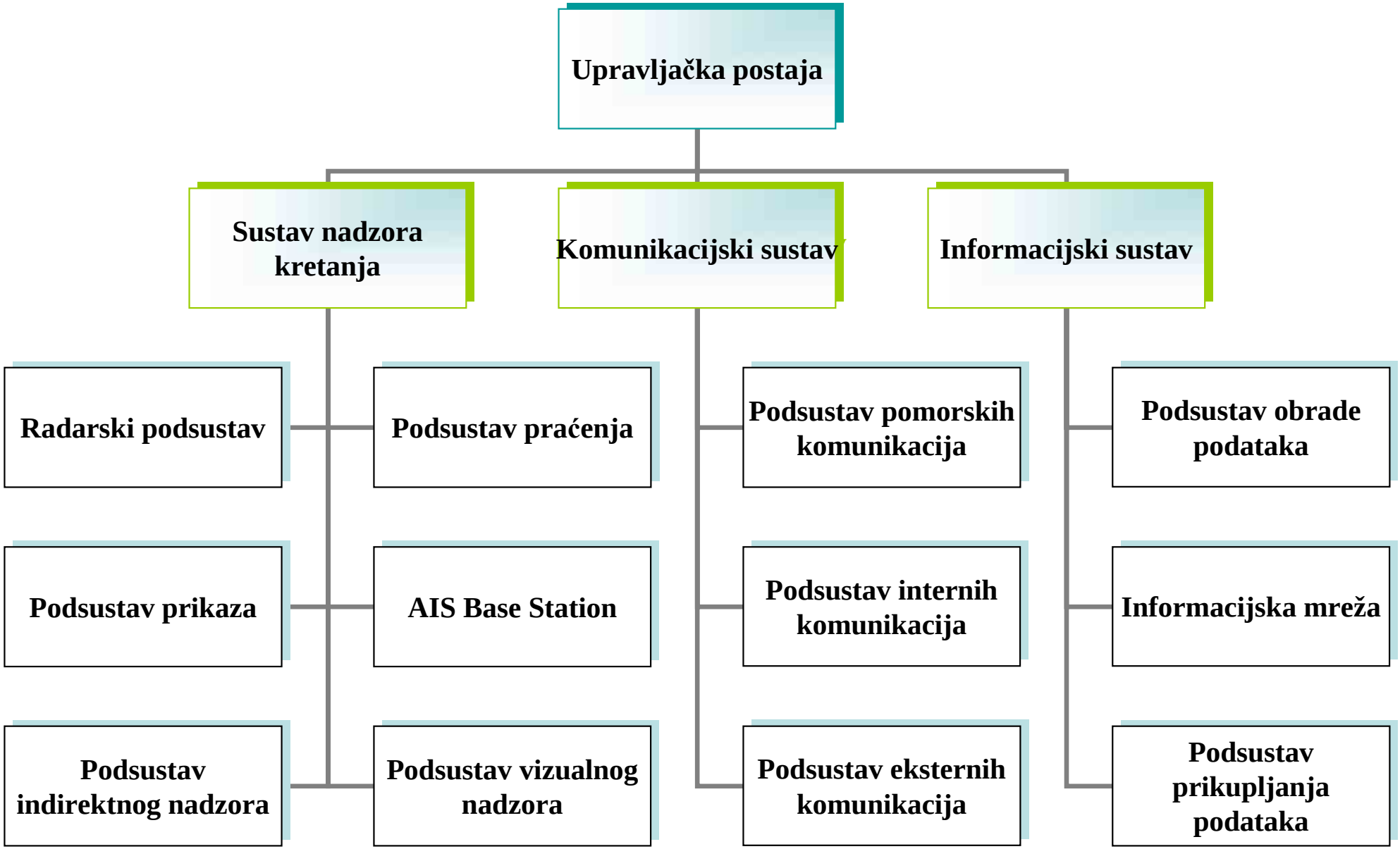
Načela i tehnologija nadzora pomorskog prometa

- Podrška drugim pridruženim djelatnostima:
  - koordinacija tijeka informacija i distribucija značajnih informacija drugim učesnicima u sustavu ili zainteresiranim organizacijama
  - podrška drugim pridruženim aktivnostima VTS službe kao što su peljarenje, razne lučke službe, zaštita od zagaćivanja te koordinacija operacija traganja i spašavanja
  - prosljeđivanje poziva odnosno zahtjeva pri spašavanjima i postupcima u nuždi te ukoliko je pogodno i sudjelovanje u takvim operacija

VTS sastav


VTS Simulator
Management Information System
Warning & Integration Service
Health Monitoring System
Shipborne Transponder
External Sensor Handling
RADAR Extraction and Tracking
Automatic Identification System (AIS)
Mobile VTS Remote Display
External Users & Information Sources
VTS Operator Workstation
VTS Logging & Replay
VTS Remote Display
Emergency Response Facility

VTS sastav


Upravljačka postaja
Sustav nadzora kretanja
Komunikacijski sustav
Informacijski sustav
Radarski podsustav
Podsustav praćenja
Podsustav pomorskih komunikacija
Podsustav obrade podataka
Podsustav prikaza
AIS Base Station
Podsustav internih komunikacija
Informacijska mreža
Podsustav indirektnog nadzora
Podsustav vizualnog nadzora
Podsustav eksternih komunikacija
Podsustav prikupljanja podataka

Tehnologijske sastavnice

- Sustavi nadzora kretanja
  - Radari(OTH,BD,3D), AIS, VHF DF, CCTV, IR

- Komunikacijski sustavi
  - interni, eksterni
- Sustavi prikupljanja podataka o okolini
  - vjetar, valovi, vidljivost, tlak, oborine, temperatura
- Informacijski sustavi
  - otvoreni, zatvoreni, interaktivni

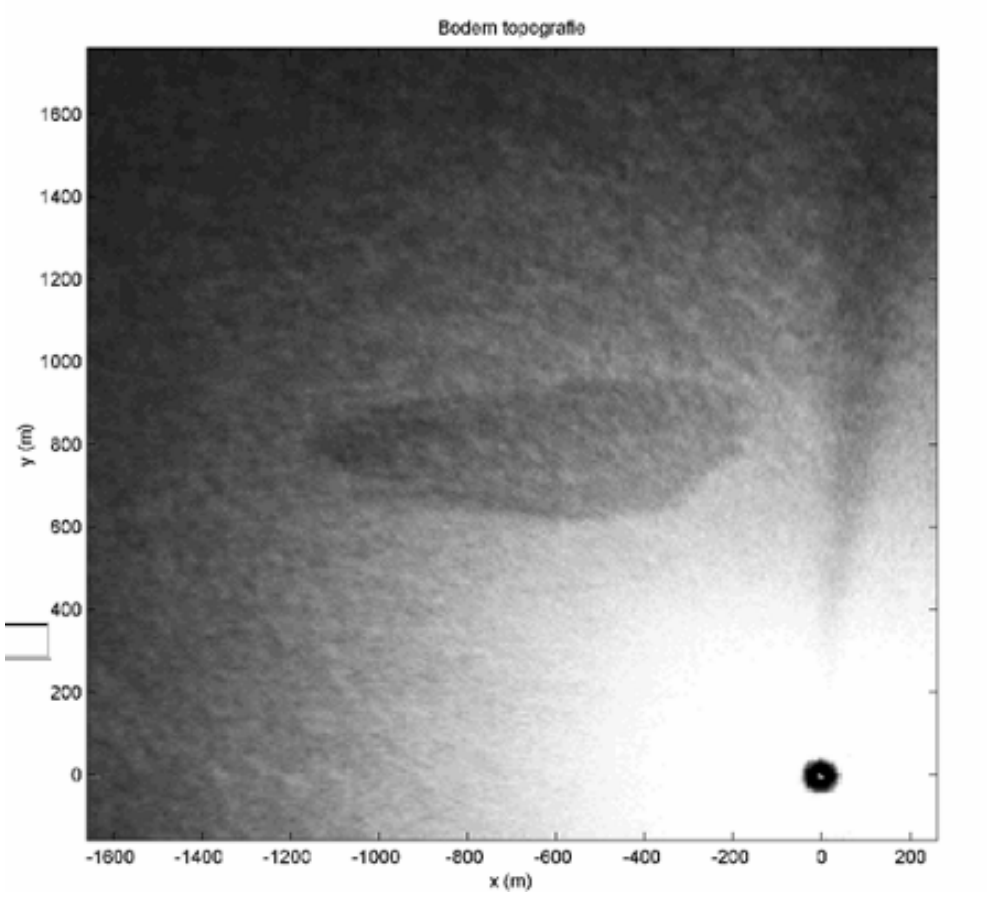
Radarski sustavi

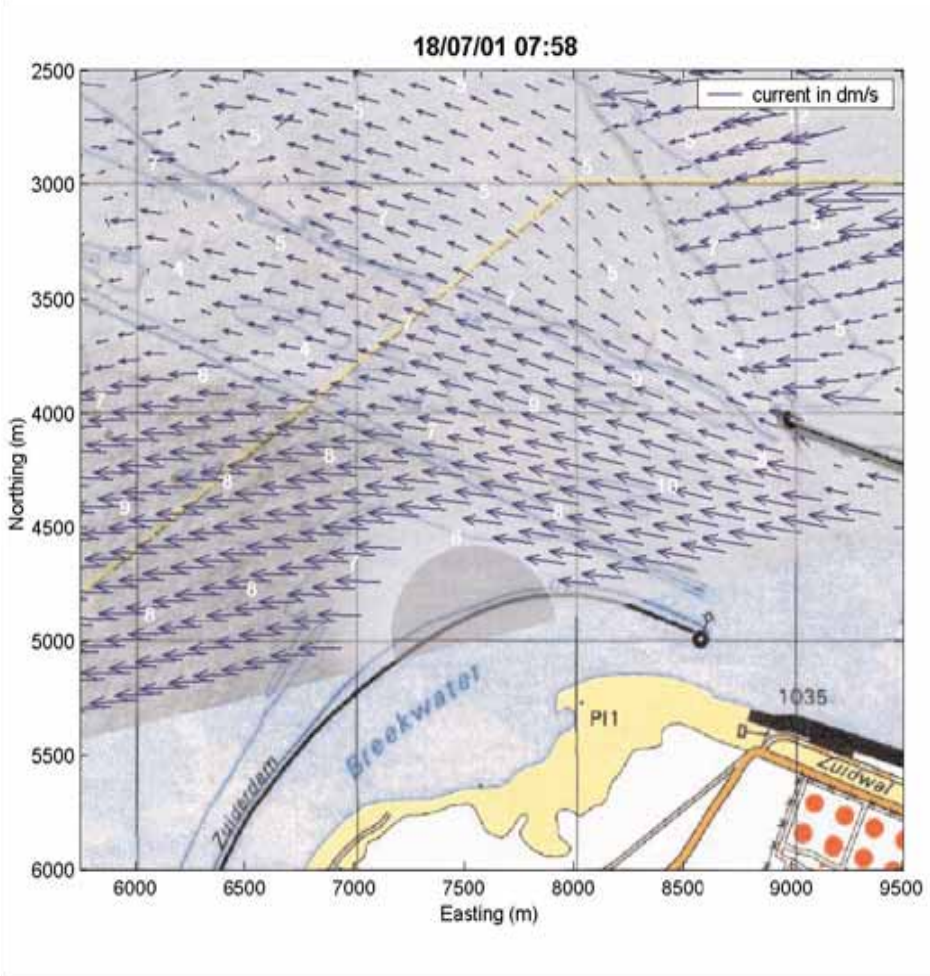
- dvofrekventni rad svake nadzorne postaje (S i X područje);
- daljinsko (iz nadležnog VTS centra) i lokalno uključivanje i isključivanje;
- pouzdan i neprekinuti rad pri brzini vjetra do 120 km/h te podnašanje udara vjetra (izvan rada) brzine do 180 km/h;
- otkrivanje oktahedralnog radarskog reflektora promjera 1 m smještenog na visini 6 m iznad površine mora na udaljenosti od 8 nautičkih milja pri vidljivosti od 0.5 nautičkih milja, padalinama u iznosu od 10 mm/h i stanju mora 1;
- razlikovanje dvaju metalnih brodova duljine 25 m u istom azimutu međusobno udaljenih 50 m na udaljenosti od 6 M pri padalinama do 25 mm/h
  - (azimutalna rezolucija);
- izmjera udaljenosti do objekta s točnošću najmanje ±30 m na udaljenosti od 6 M
  - (radijalna rezolucija);
- prikaz dva odvojena metalna broda duljine 25 m na udaljenosti od 6 M kada se razlikuju po azimutu za 75 m pri padalinama do 25 mm/h
  - (kutna rezolucija);
- prikaz dva odvojena metalna broda duljine 25 m na udaljenosti od 6 M kada se razlikuju po azimutu za 200 m pri padalinama od 25 do 80 mm/h
  - (kutna rezolucija);

Radarski sustavi

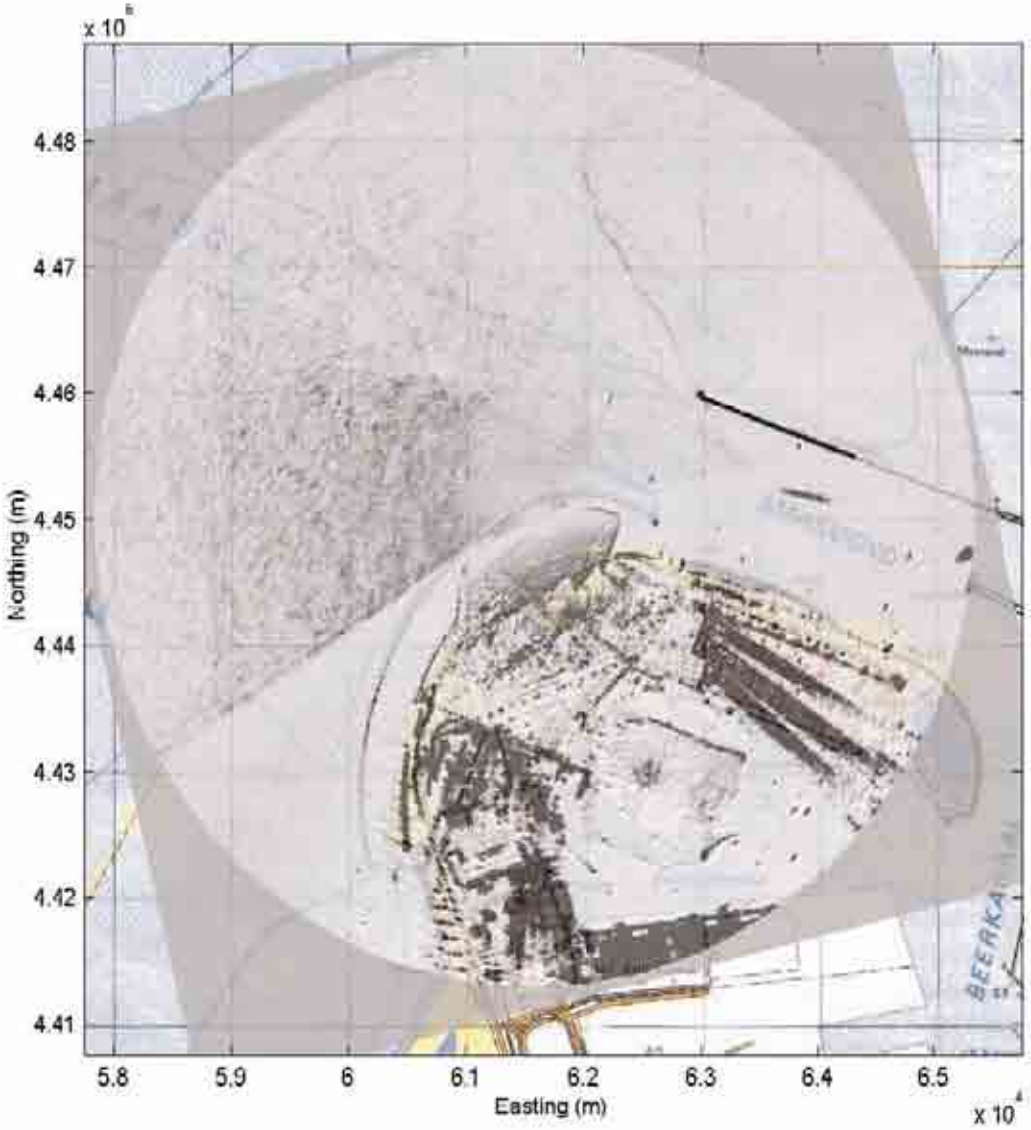
- Podsustav za autonomno praćenje (*Tracking Sub-System*)
  - automatski i ručni prihvat ciljeva
  - mogućnost praćenja najmanje 200 ciljeva istovremeno pri čemu u slučaju najvećeg broja prihvaćenih ciljeva ne smije biti primjetnog kašnjenja podsustava za obradu podataka;
  - osigurano dodjeljivanje najmanje dvije mnemoničke ili neke druge oznake duljine najmanje devet znakova
  - omogućeno preuzimanja i predaje izvornih i sintetičkih podataka
  - autonomni izračun najmanje slijedećih podataka: kurs, brzinu, DCPA i tCPA za izabrani par brodova;
  - mogućnost postavljanja pobudnih stanja
- Podsustav prikaza (*Display Sub-System*)
  - ergonomski uvjeti rada;
  - prikaz sintetički proizvedenih objekata i oznaka
    - (npr. navigacijske oznake, sheme odvojenog prometa, preporučene plovidbene putove, itd.);
  - prikaz sintetičkih podataka, izvornog radarskog prikaza ili oboje;
  - prikaz smjerova dobivenih VHF goniometrom.

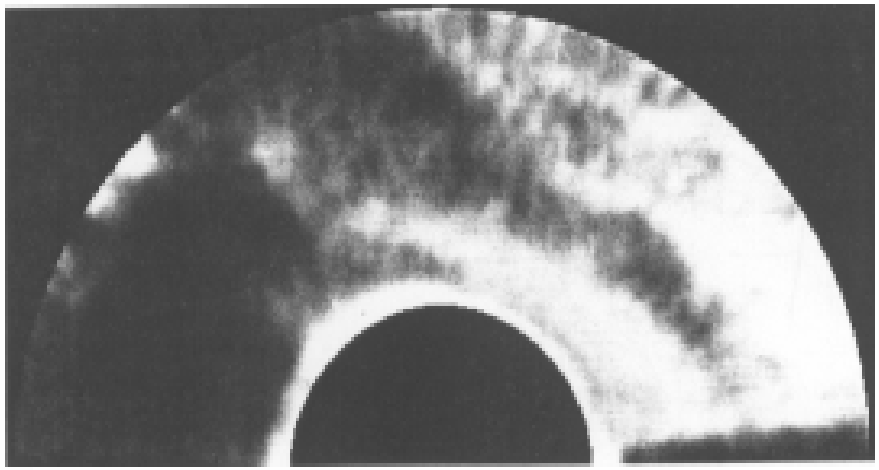
Radar

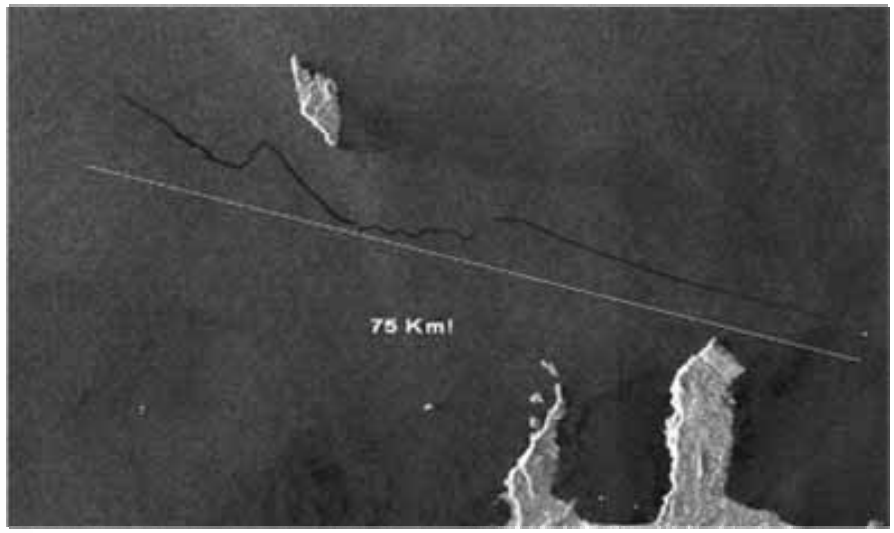

Bodem topografie
y (m)
x (m)
1600
1400
1200
1000
800
600
400
200
0
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
200


18/07/01 07:58
current in dm/s
Northing (m)
Easting (m)
2500
3000
3500
4000
4500
5000
5500
6000
6000
6500
7000
7500
8000
8500
9000
9500
Zuiderdam
Breakwater
PI1
1035
Zuidwal

Radar

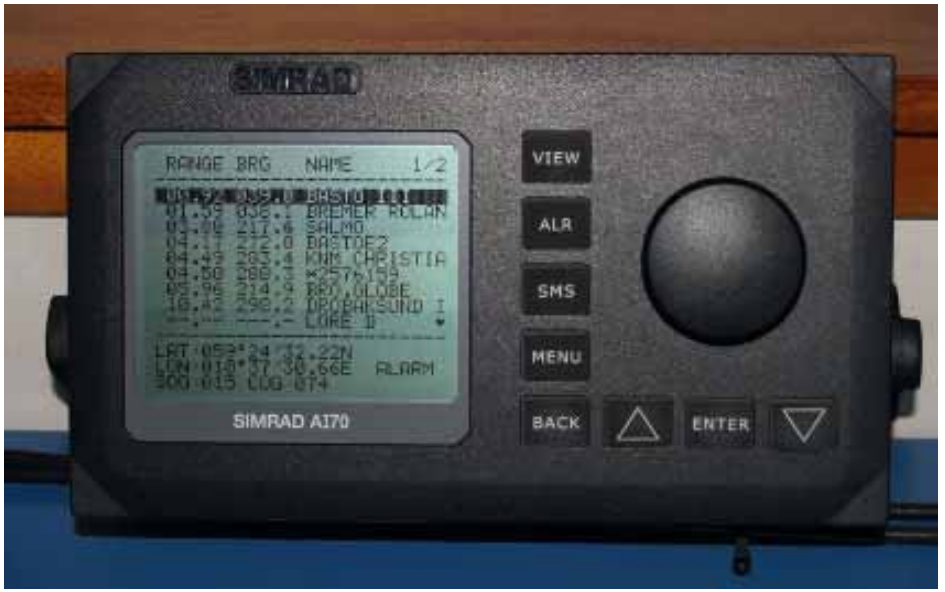

x 10^6
4.48
4.47
4.46
4.45
4.44
4.43
4.42
4.41
Northing (m)
5.8
5.9
6
6.1
6.2
6.3
6.4
6.5
Easting (m)
x 10^4




75 Kml

AIS

- "AIS shall
  - 1. provide automatically to appropriate equipped shore stations, other ships and aircraft information, including ship's identity, type, position, course, speed, navigational status and other safety-related information;
  - 2. receive automatically such information from similarly fitted ships;
  - 3. monitor and track ships; and
  - 4. exchange data with shore-based facilities."
    - (SOLAS, poglavlje V, Pravilo 19)

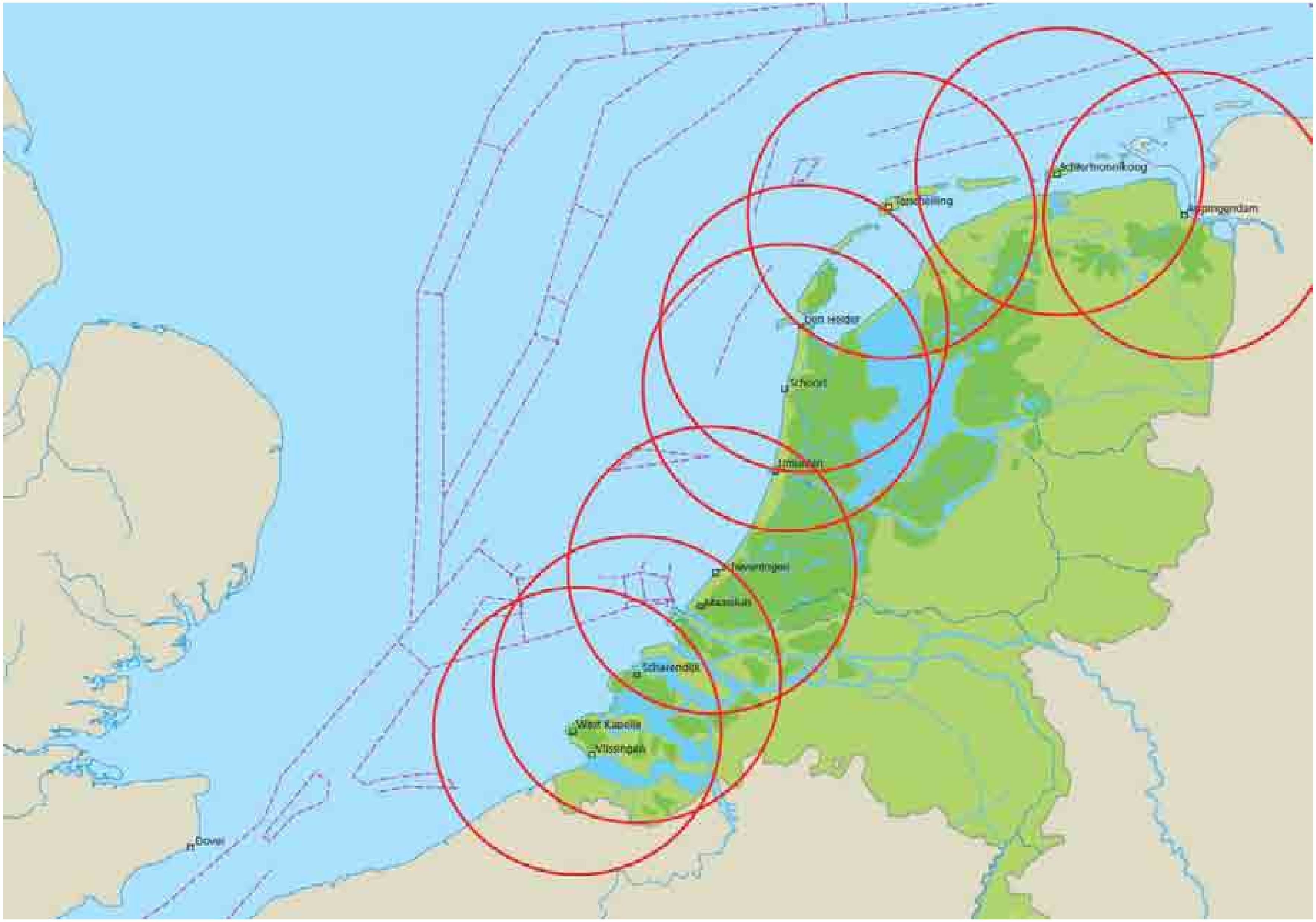


CLASS A AIS INFORMATION[9]

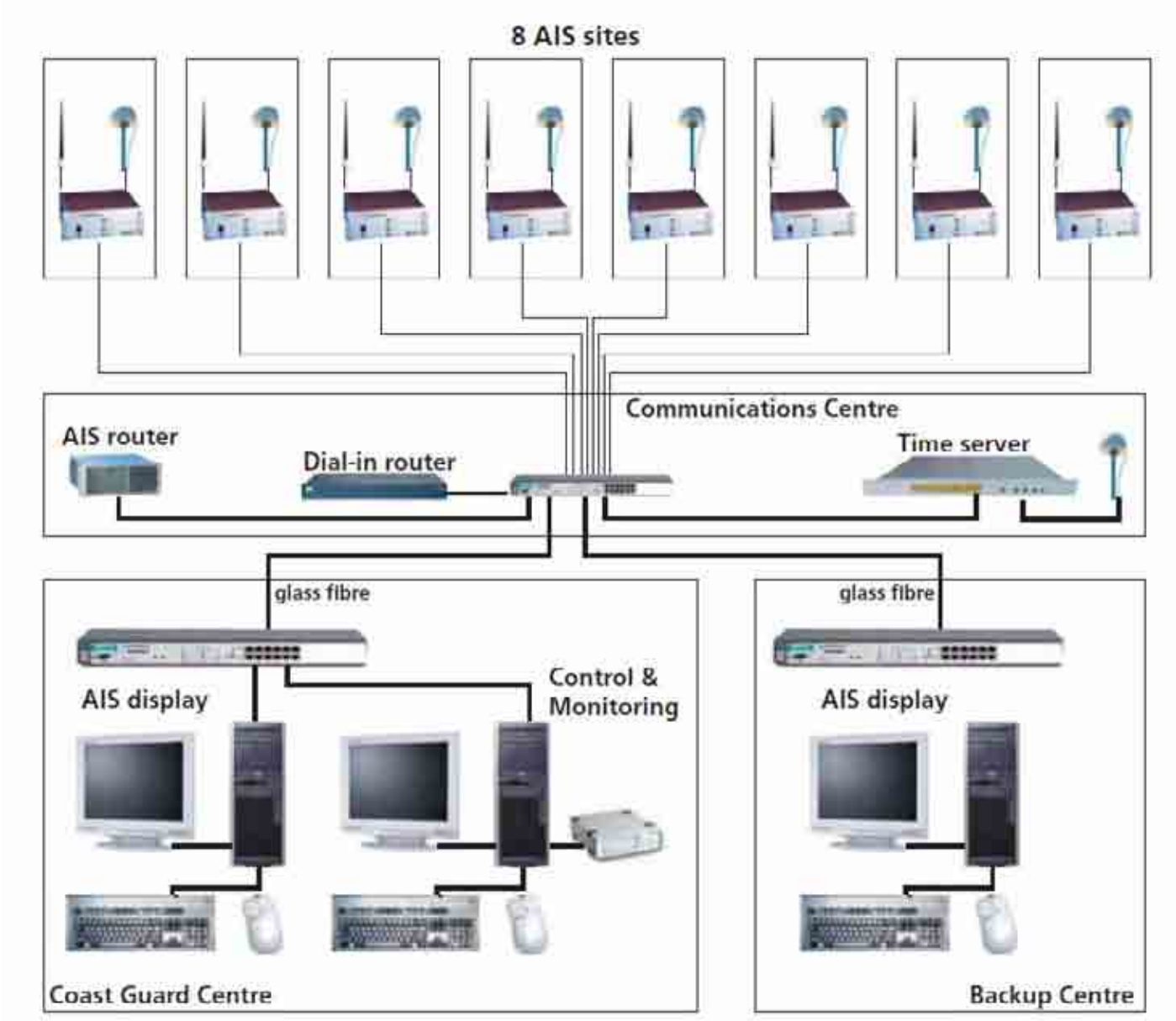
STATIC	DYNAMIC	VOYAGE RELATED
IMO Number	Vessel's Position*	Vessel's Draft
Call Sign & Name	Time (in UTC)	Hazardous Cargo (type)**
Length and Beam	Course over Ground (COG)	Destination and ETA#
Vessel type	Speed over Ground (SOG)	
Location of position fixing antenna	Heading	
	Navigational Status##	
	Rate of Turn	

* With accuracy indication and integrity status
\# At master's discretion
** As required by competent authority
e.g. anchored, not under command, fishing; manual input.

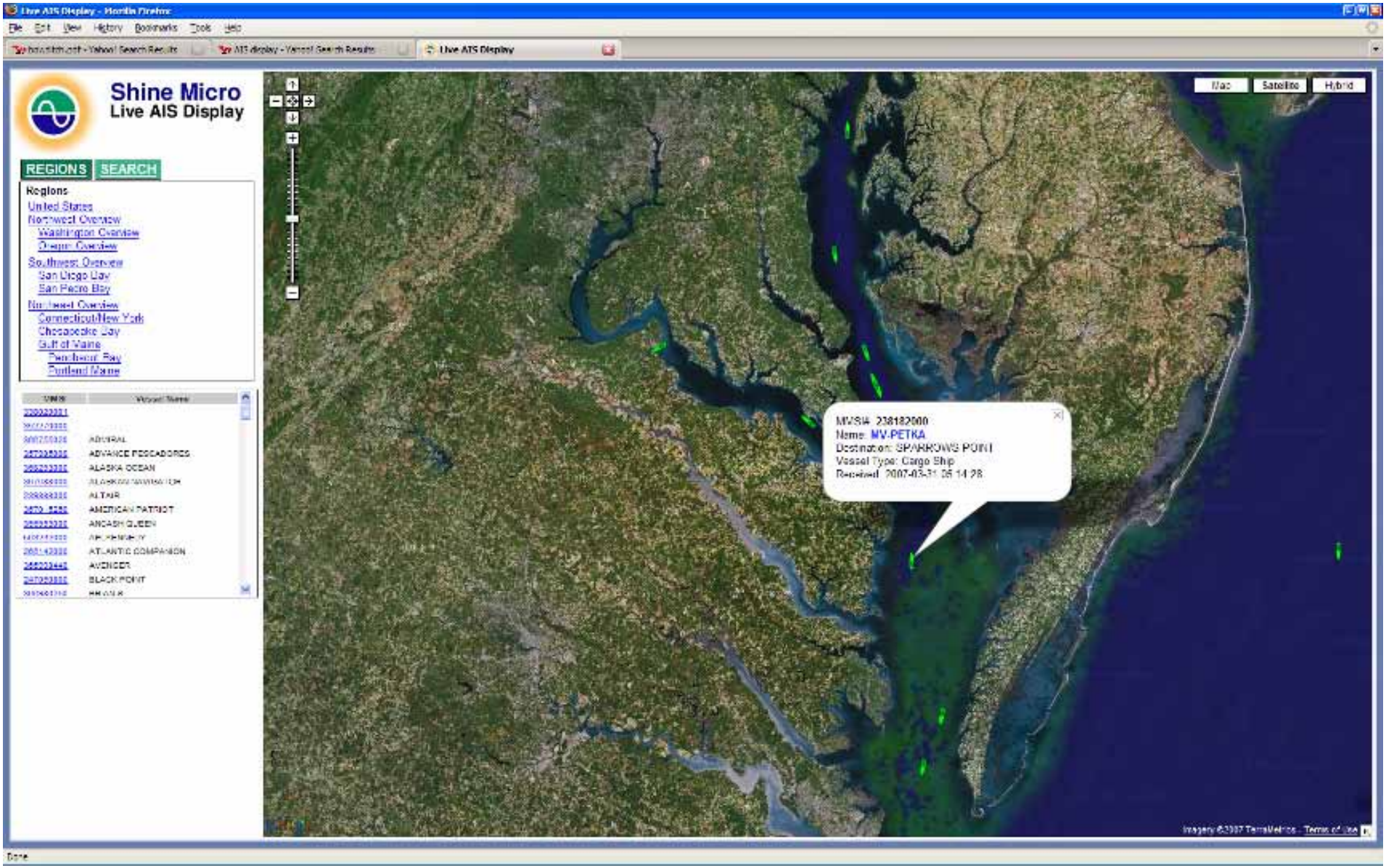
AIS


Terschelling
Schiermonnikoog
Den Helder
Schoorl
Scharendijk
West Kapelle
Vlissingen
Dover

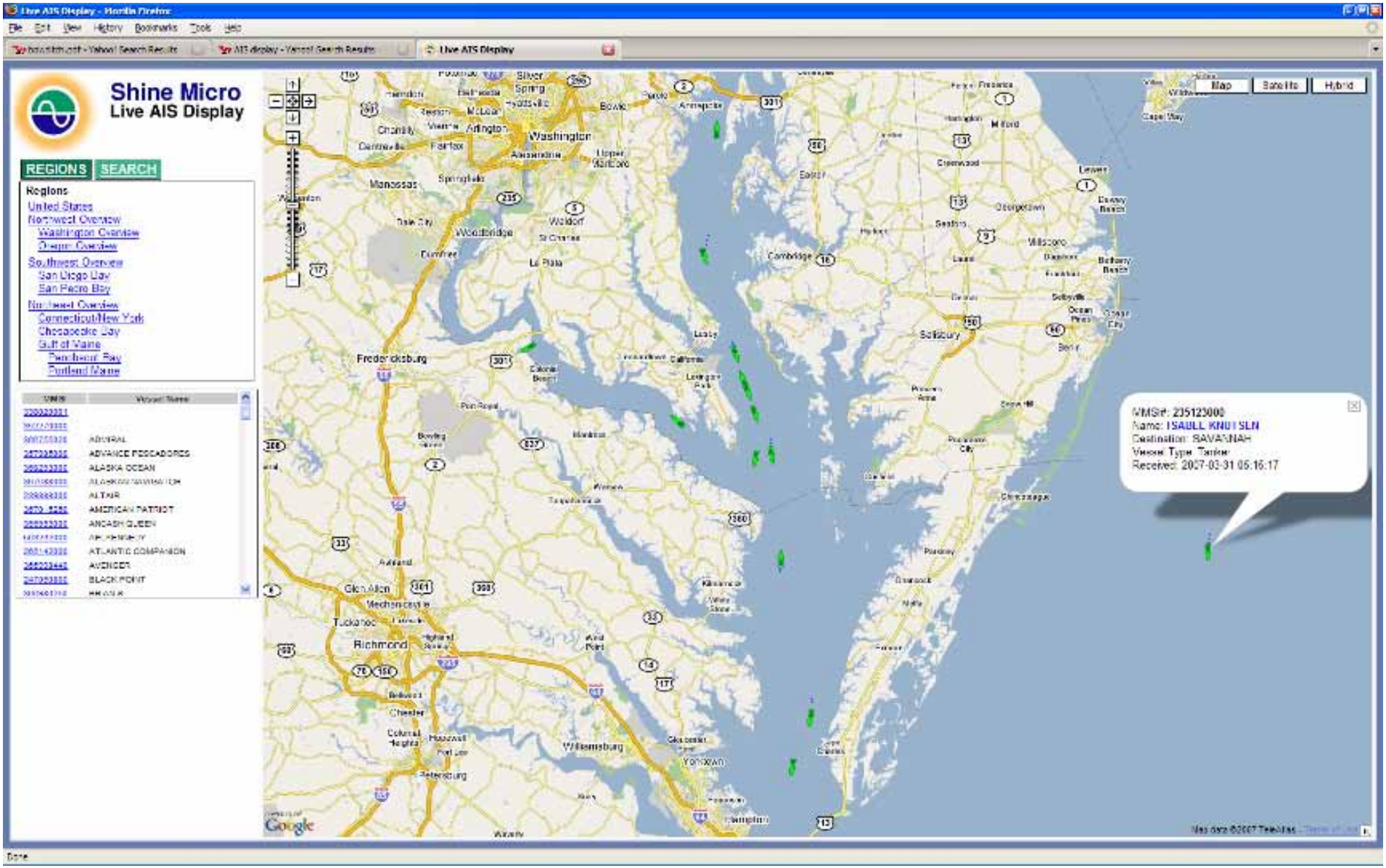
AIS


8 AIS sites
Communications Centre
AIS router
Dial-in router
Time server
glass fibre
AIS display
Control &
Monitoring
Coast Guard Centre
glass fibre
AIS display
Backup Centre

AIS

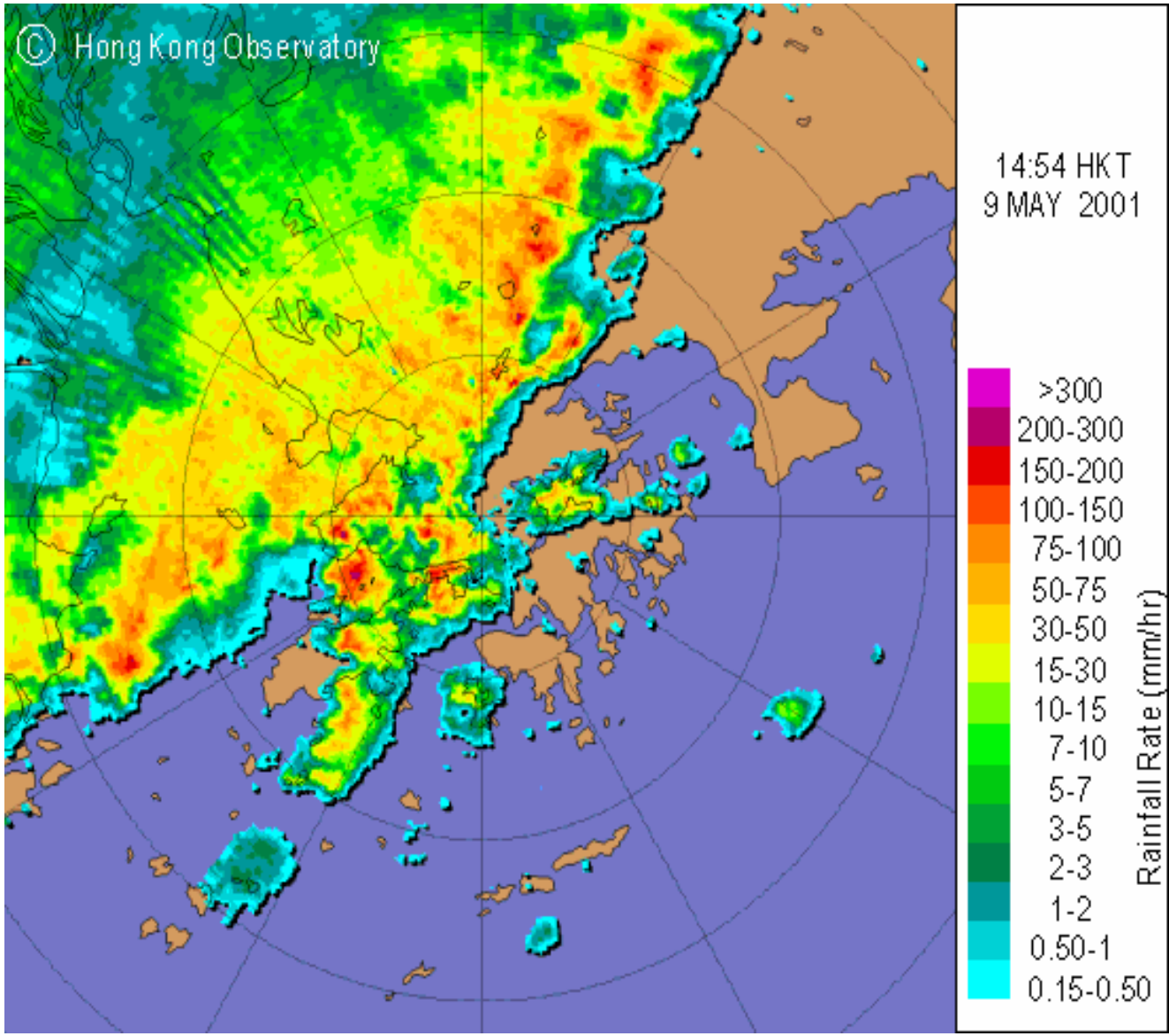

Live AIS Display - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Live AIS Display
Shine Micro
Live AIS Display
REGIONS
SEARCH
Regions
United States
Northwest Overview
Washington Overview
Oregon Overview
Southwest Overview
San Diego Bay
San Pedro Bay
Northeast Overview
Connecticut/New York
Chesapeake Bay
Gulf of Maine
Penobscot Bay
Portland Maine
Map
Satellite
Hybrid
MMSI: 238182000
Name: MV-PETKA
Destination: SPARROWS POINT
Vessel Type: Cargo Ship
Received: 2007-03-31 05:14:28
ADMIRAL
ADVANCE PESCADORES
ALASKA OCEAN
ALTAIR
AMERICAN PATRIOT
ANCASH QUEEN
ATLANTIC COMPANION
AVENGER
BLACK POINT
Done

AIS

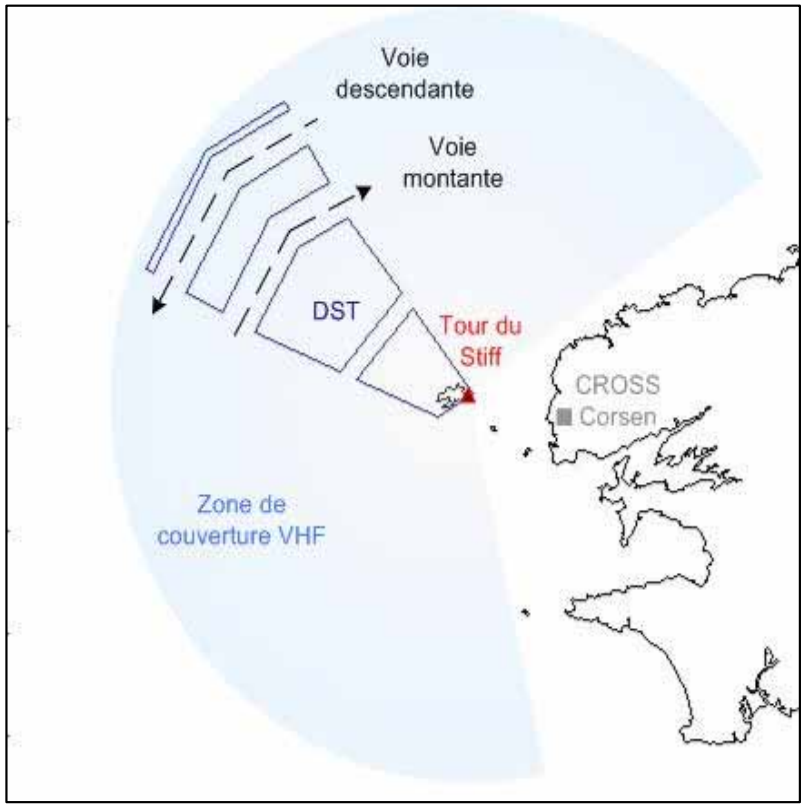

Shine Micro
Live AIS Display
REGIONS
SEARCH
Regions
United States
Northwest Overview
Washington Overview
Oregon Overview
Southwest Overview
San Diego Bay
San Pedro Bay
Northeast Overview
Connecticut/New York
Chesapeake Bay
Gulf of Maine
Penobscot Bay
Portland Maine
Map
Satellite
Hybrid
MMSI: 235123000
Name: ISABEL KNUTSEN
Destination: SAVANNAH
Vessel Type: Tanker
Received: 2007-03-31 05:16:17
Washington
Arlington
Alexandria
Fredericksburg
Richmond
Williamsburg
Salisbury
Cambridge
Google

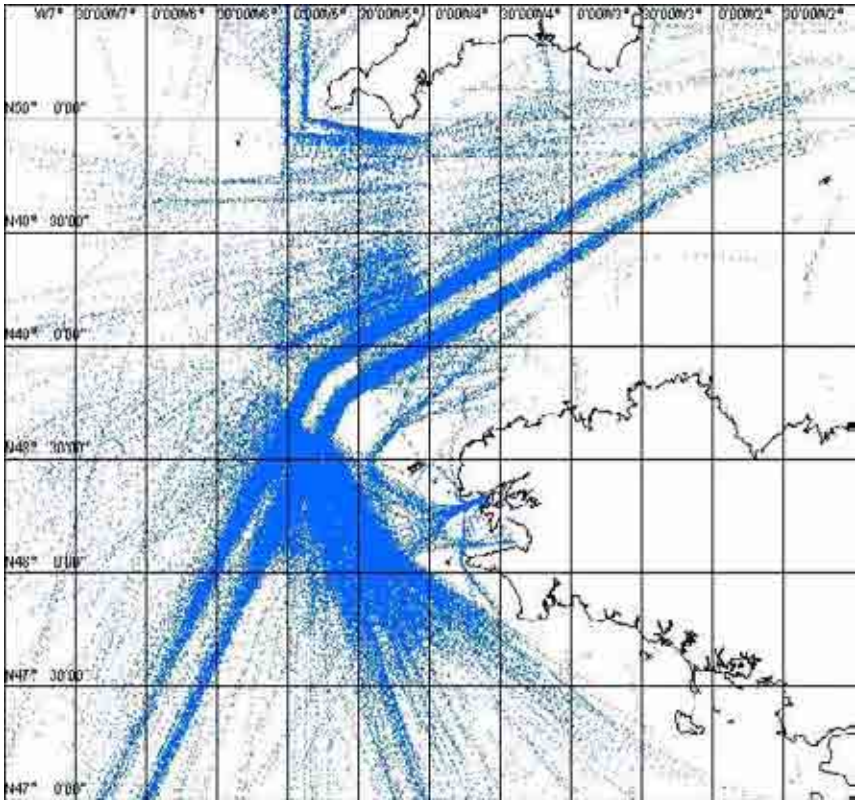
IR

IR

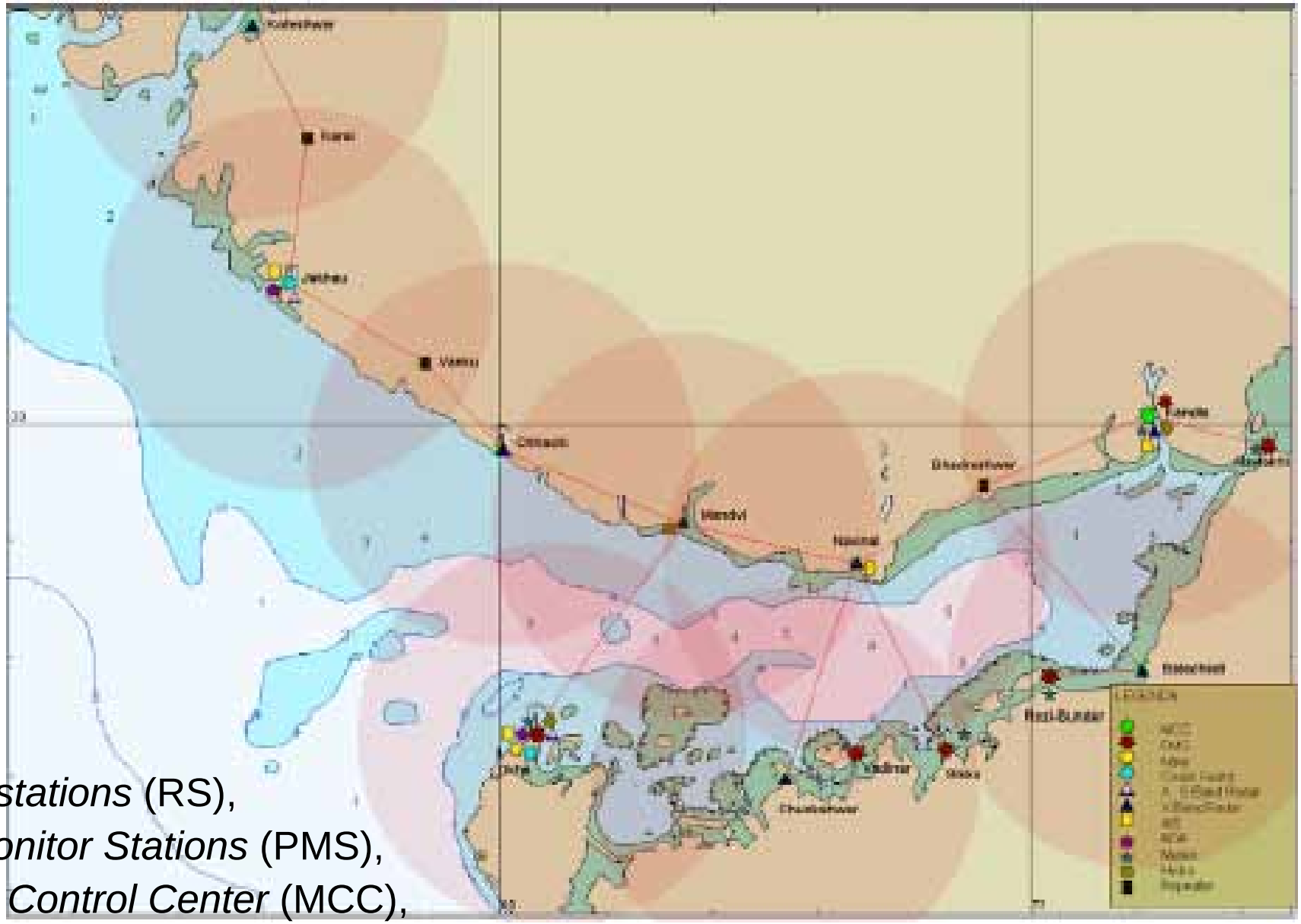

© Hong Kong Observatory
14:54 HKT
9 MAY 2001
>300
200-300
150-200
100-150
75-100
50-75
30-50
15-30
10-15
7-10
5-7
3-5
2-3
1-2
0.50-1
0.15-0.50
Rainfall Rate (mm/hr)

Obalni VTS – Uschant, Francuska



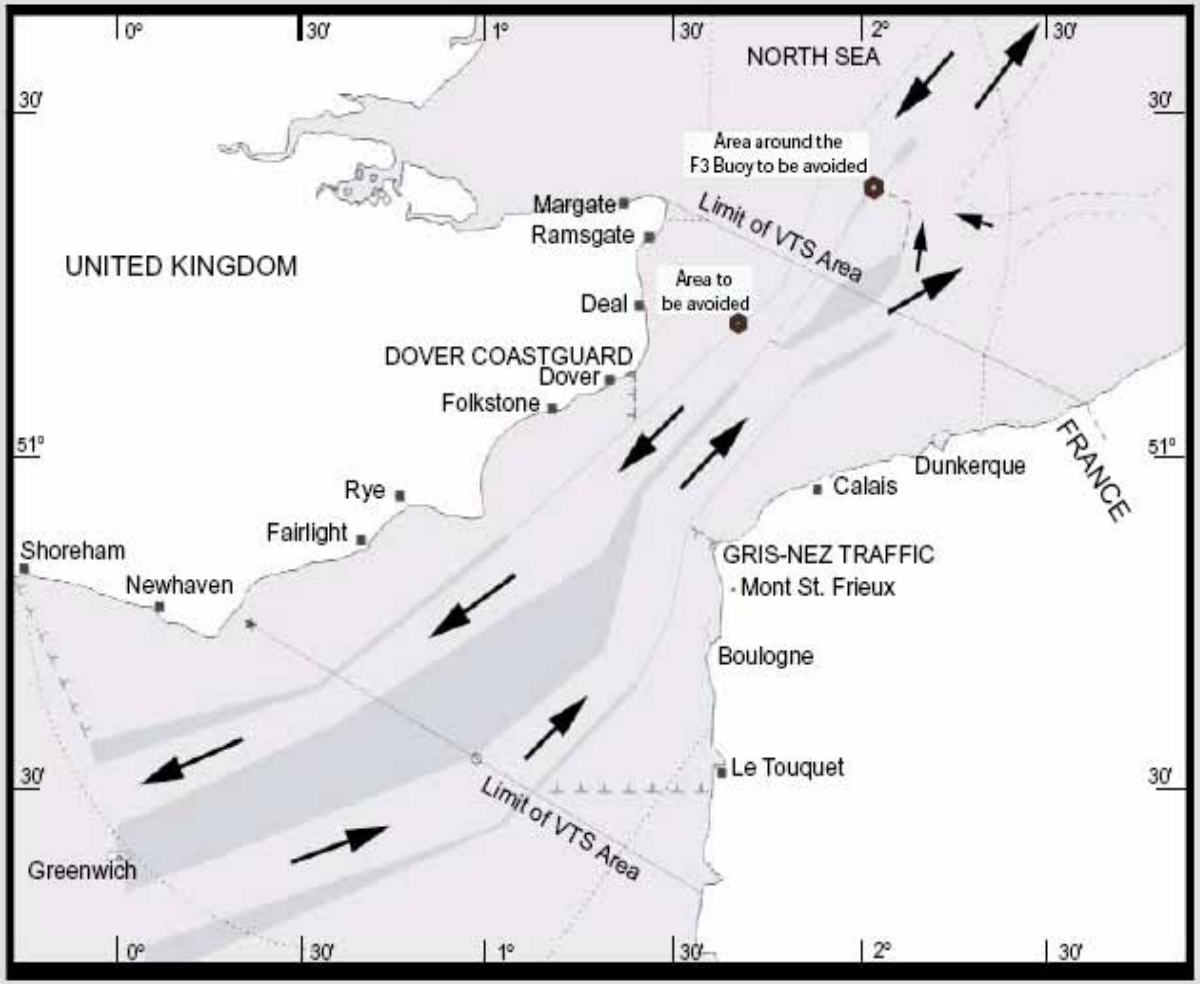


VTS – Kunch, Indija



9 *Radar stations* (RS),
6 *Port Monitor Stations* (PMS),
1 *Master Control Center* (MCC),
15 MW veza (7 GHz) 3 ponavljača i 5 OFC veza.

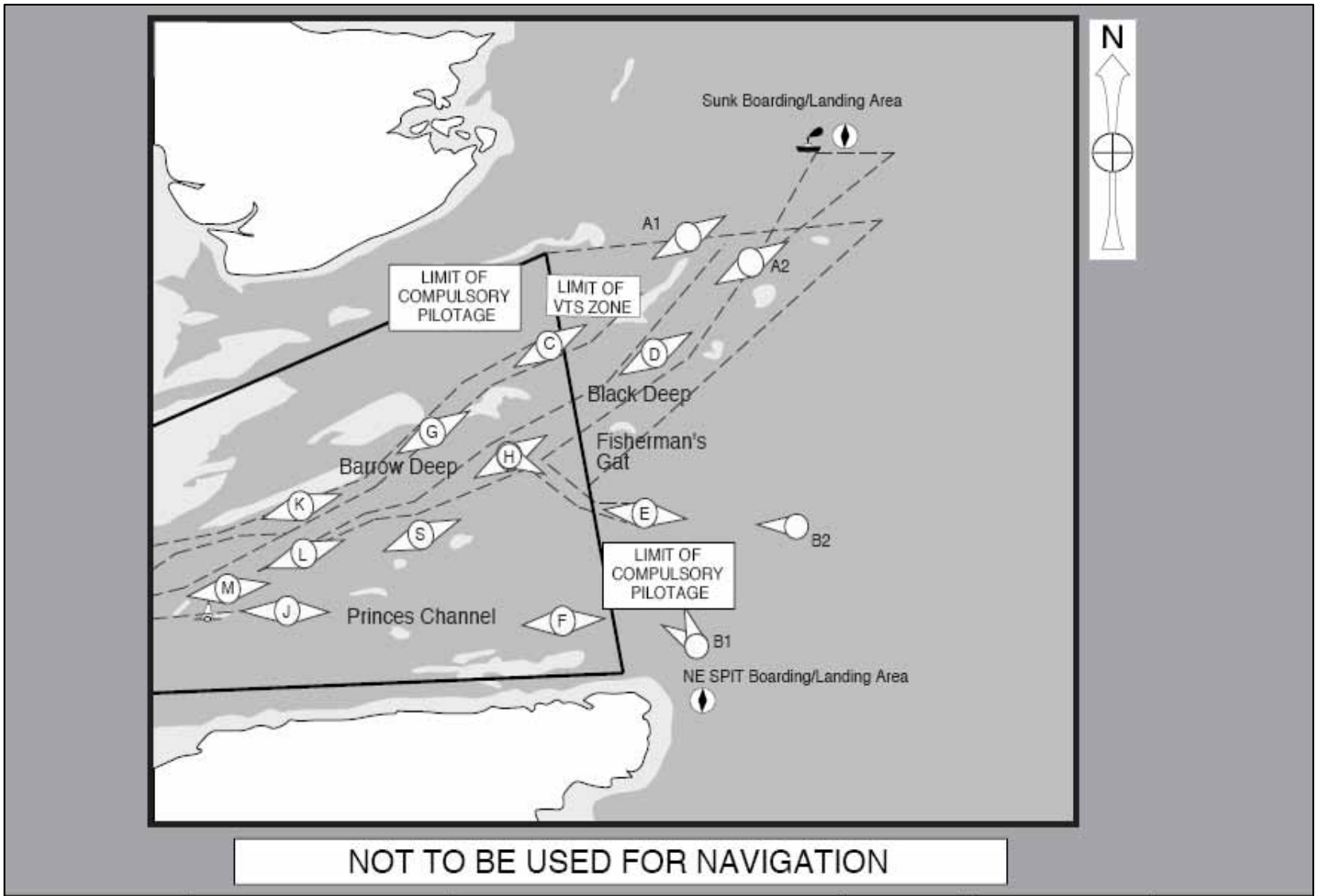
VTS Dover



NOT TO BE USED FOR NAVIGATION

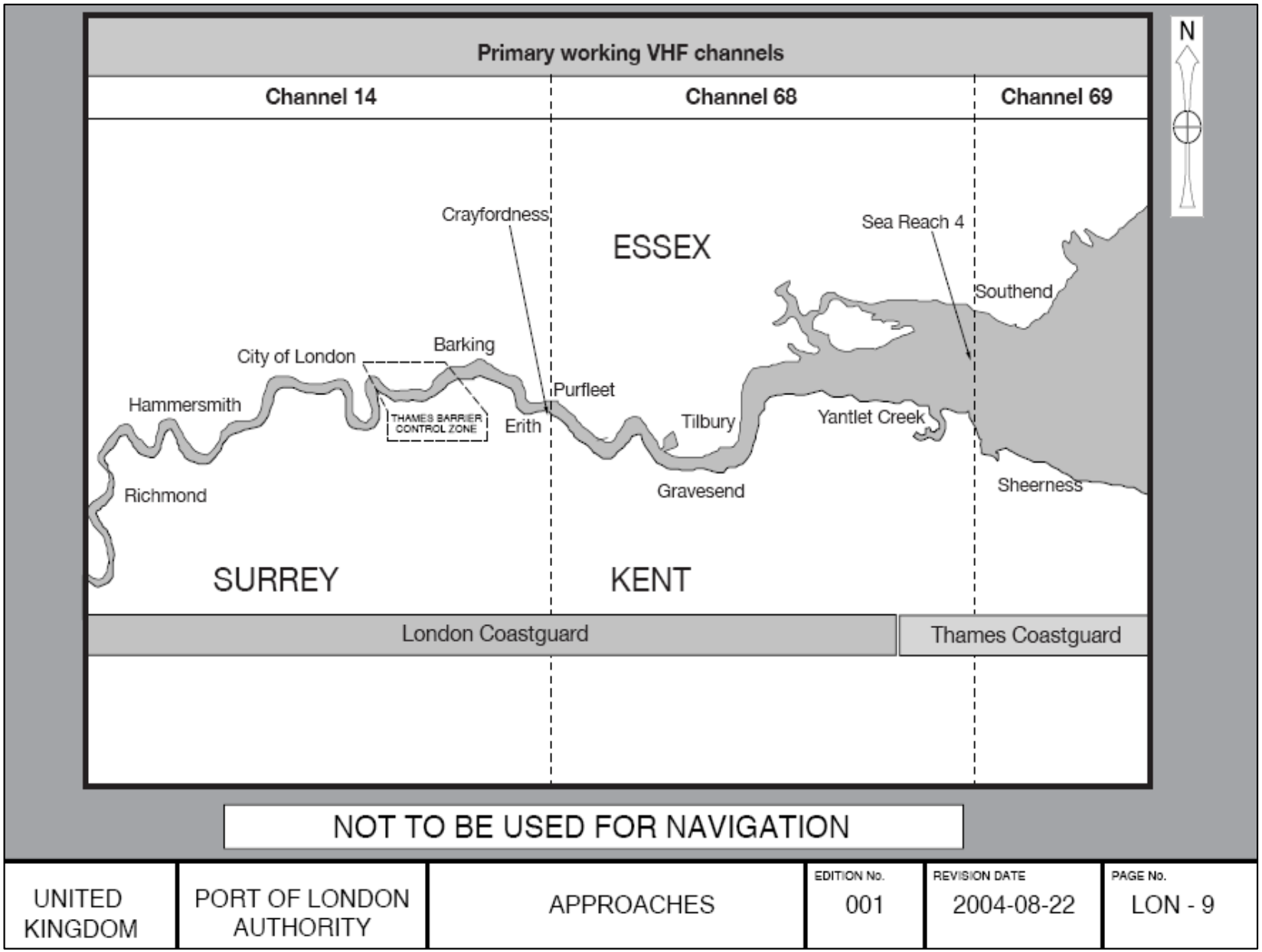
UNITED KINGDOM	DOVER	VTS AREA	EDITION No. 001	REVISION DATE 10-13-03	PAGE No. DOV 2

VTS London

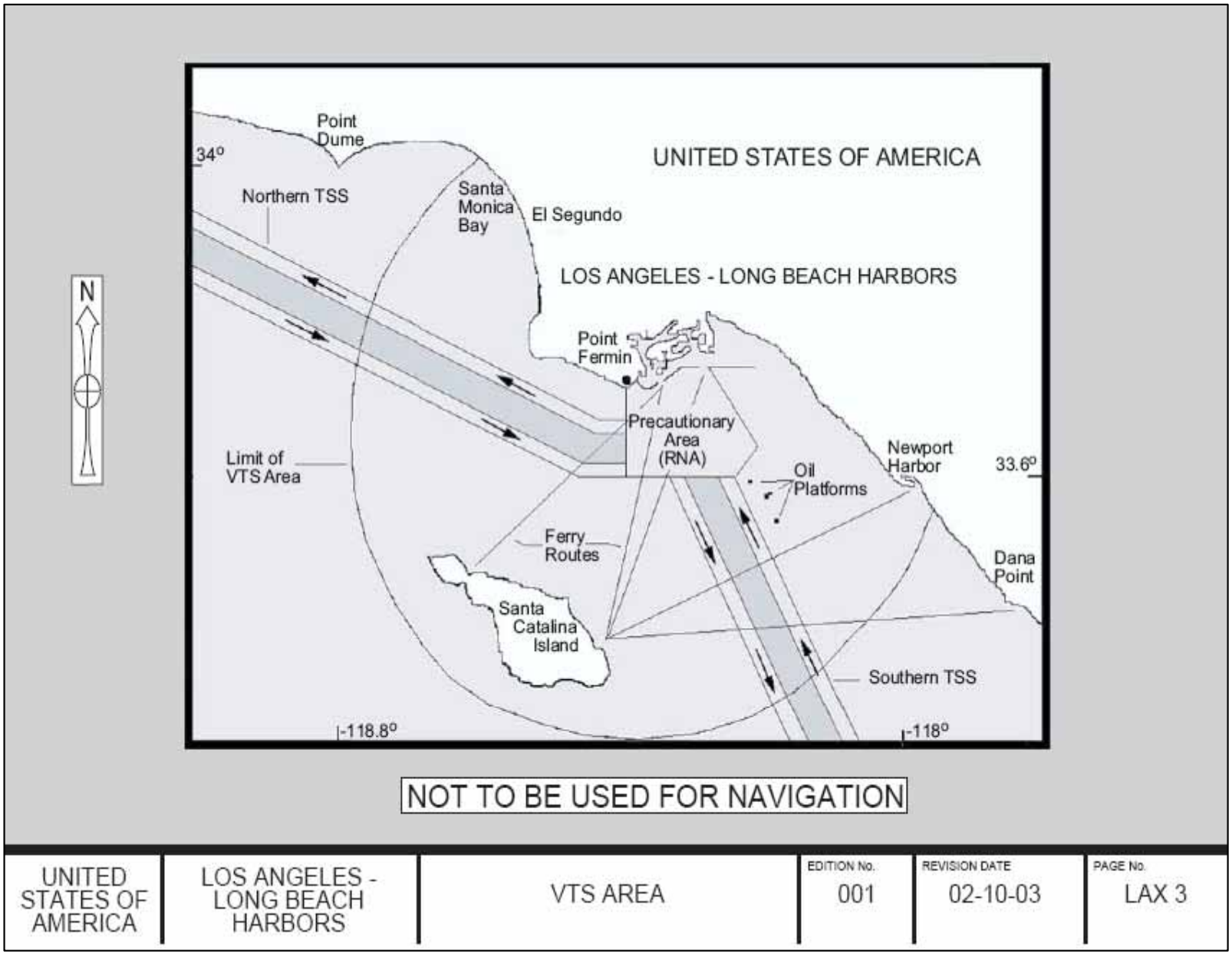


UNITED KINGDOM	PORT OF LONDON AUTHORITY	APPROACHES	EDITION No. 001	REVISION DATE 2003-10-20	PAGE No. LON - 7

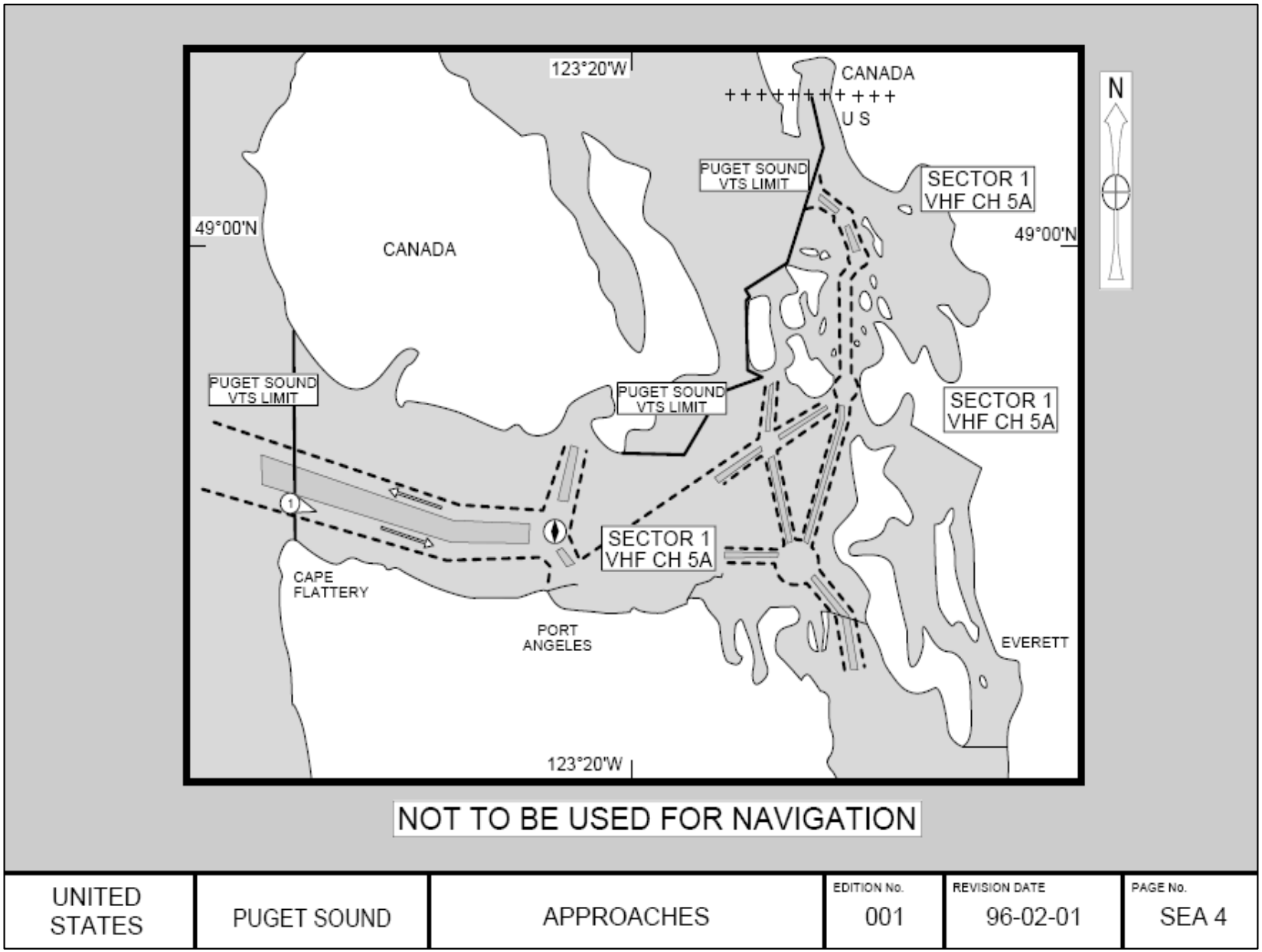
VTS London


Primary working VHF channels
Channel 14
Channel 68
Channel 69
N
Crayfordness
ESSEX
Sea Reach 4
Southend
City of London
Barking
Hammersmith
THAMES BARRIER CONTROL ZONE
Erith
Purfleet
Tilbury
Yantlet Creek
Richmond
Gravesend
Sheerness
SURREY
KENT
London Coastguard
Thames Coastguard
NOT TO BE USED FOR NAVIGATION
UNITED KINGDOM
PORT OF LONDON AUTHORITY
APPROACHES
EDITION No.
001
REVISION DATE
2004-08-22
PAGE No.
LON - 9

VTS Los Angeles



VTS Puget Sound



UNITED STATES	PUGET SOUND	APPROACHES	EDITION No. 001	REVISION DATE 96-02-01	PAGE No. SEA 4

VTS postupci – upravljanje prometom

- Raspodjela prostora (*Space Division*)
  - prethodno određivanje namjene pojedinih morskih površina
  - *statička i dinamička dodjela*
- Raspodjela vremena (*Time Division*)
  - sustav dopuštenja i obveze javljanja:
    - dopuštenje uplovljavanja/prelaska
      - *(*Entry Clearance*);*
    - dopuštenje sidrenja ili dopuštenje plutanja
      - *(*Permission to Anchor, Permission to Wait*);*
    - dopuštenje isplovljenja iz luke ili napuštanja sidrišta ili promjene sidrišta ili mjesta sidrenja
      - *(*Permission to Sail*).*
  - sustav ograničenja brzine plovidbe
    - statičko i dinamičko ograničenje
- Raspodjela udaljenosti (*Distance Division*)
  - utvrđivanje najmanje udaljenosti između brodova koji plove istim smjerom
  - utvrđivanje redoslijeda pristupa na plovni put ili isplovljenja sa sidrišta

VTS Westcoast interior

Interni postupci

- Redovni postupci
  - Routine procedures
  - Bilježenje
  - Osoblje
  - Održavanje opreme
  - Suradnja s pridruženim službama
  - Odnosi s javnošću
  - Sigurnosna zaštita
  - Uvježbavanje
  - Primopredaja straže
  - Primopredaja brodova
  - Održavanje publikacija
- Postupci u nuždi
  - Emergency Procedures
  - Pad sustava (System Failure)
    - prekid internih komunikacija
    - prekid eksternih komunikacija
    - prestanak rada izvora podataka
    - prekid rada informacijskog sustava
  - Unutrašnji poremećaji
    - požar, evakuacija, zdravstvene ugroze, sigurnosne prijetnje

Eksterni postupci

- Redovni postupci
  - Routine procedures
  - PreArrival Information
  - Entering VTS Area
  - Vessels Transiting VTS Area
  - Vessels at Anchor
  - Vessels at Berth
  - Vessels Departing the VTS Area
  - Transition between Adjacent VTS Areas
  - Adverse environmental conditions

Eksterni postupci

- Postupci u nuždi
  - Emergency Procedures
  - Collision, Capsize, Sinking, Grounding, Fire, Man Overboard
  - Pollution
  - Places of Refuge
  - Medical Emergency
  - Vessel Not Under Command (NUC)
  - Security incident
  - Protest Action
  - Natural Disaster

VTS postupci

GERMANY	TRAFFIC GERMAN BIGHT	AREA PROCEDURES	EDITION No. 002	REVISION DATE 2005-05-07	PAGE No. HGL 1

VHF PROCEDURES

German Bight Traffic is divided into two sectors:

West VHF CH 79
East VHF CH 80
(See HGL 2)

All vessels in area German Bight Traffic must maintain permanent watch on appropriate VHF Channel and/or VHF CH 16

Permission to change frequency or to end VHF watch should be obtained from German Bight Traffic

REPORTS

Pre-entry reports (Sailing Plan)

All vessels: - more than 50m in length including pushed or towed composite
- carrying dangerous goods in bulk (gas / chemicals / petroleum / petroleum products)

Must report:
1. When approaching German Bight through TSS "German Bight Western Approach" or TSS "Terschelling-German Bight" and passing light buoy "GW 7" or passing light buoy "TG 13"
2. When approaching German Bight from North or West and crossing latitude 54°20'N crossing longitude through light buoy "GW 7"
3. Before leaving a port within the VTS area
4. When approaching VTS Ems from North or East crossing latitude 54°00'N crossing longitude through light buoy "GW 7"

TO: German Bight Traffic (1, 2 or 3 above)
Ems Traffic (4 above)
GIVING: IMO SRS ITEMS: Alpha Delta Golf India Oscar Papa (full particulars, including gas free or not) Quebec Tango Uniform
VIA: for 1, 2 or 3 above VHF CH 79 or 80
for 4 above VHF CH 18

Position Reports

ALL VESSELS (as above)
WHEN: at reporting points (waypoints) shown on HGL 2
TO: German Bight Traffic
GIVING: IMO SRS ITEMS: Alpha Bravo Delta Foxtrot
VIA: VHF CH 80

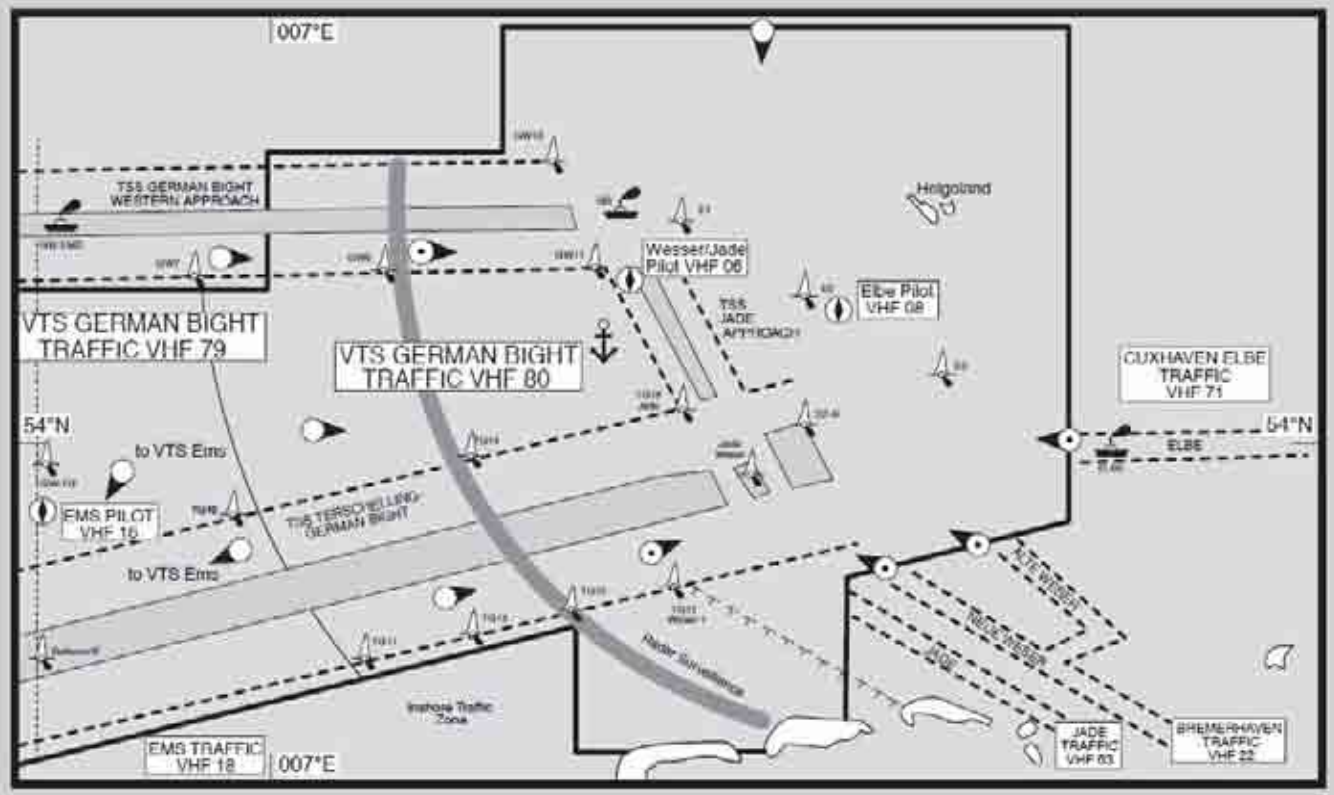
Deviation Report

ALL VESSELS (as above)
WHEN: any change in details given in pre-entry report
TO: German Bight Traffic
GIVING: IMO SRS ITEMS: changed by deviation (anchoring, change of destination)
VIA: VHF CH 80

Incident Report

ALL VESSELS (as above)
WHEN: all vessels shall immediately report an incident impairing safety or the environment
TO: German Bight Traffic
GIVING: full details of incident
VIA: VHF CH 80 / 79

VTS postupci



NOT TO BE USED FOR NAVIGATION

GERMANY	GERMAN BIGHT TRAFFIC	VTS GERMAN BIGHT	EDITION No. 002	REVISION DATE 2005-05-07	PAGE No. HGL 2

VTS postupci

GERMANY	TRAFFIC GERMAN BIGHT	AREA PROCEDURES	EDITION No. 002	REVISION DATE 2005-05-07	PAGE No. HGL 3

SERVICES OFFERED

Information Service
Situation reports (SITREP) are broadcast at fixed times, and reports to individual ships are broadcast on demand. Requests for individual reports are to be made on the appropriate VHF Channel to German Bight Traffic

Time of SITREP: Every hour + 00 min on VHF CH 79 and 80 in German and English
Content of SITREP:
1. Information relevant to making a safe passage through the VTS area
2. The general fairway and traffic situation (weather, casualties, dredging, pilot information)

Safety Report
Time of Safety Report: Every 15 minutes on VHF CH 80, pre-announced on VHF CH 16, in German and English
Content of Safety Report
1. Vessels with restricted manoeuvrability in "TSS JADE Approach"
2. Other special circumstances

Navigational Assistance Service
VTS German Bight Traffic gives navigational assistance, on request, in visibility of less than 4000 metres, for ships for whom pilotage is mandatory. This service is given between light vessel GERMAN BIGHT (GB) and light buoy "3" / "JADE 2"
This service is also rendered by instruction of the VTS Centre

Language:	German, or, on request, in English
Content:	Regular own ship position information, and information concerning other traffic
REQUEST:	Call German Bight Traffic
GIVING:	IMO SRS Items: Alpha Delta for identification
VIA:	VHF CH 80

Traffic Organization Service
Prevention of accidents, control of traffic flow by information, warning, advice or instruction

GERMAN BIGHT PILOTAGE

Pilotage is COMPULSORY for the following classes of ships:
1. Tankers of more than 150m length or more than 23m beam if not gas free or fully inerted when bound to/from Rivers Ems, Jade, Weser or Elbe
2. Bulk carriers more than 220m in length or more than 32m beam when bound to/from River Elbe
3. Bulk carriers more than 250m in length or more than 40m beam or more than 13.5m draught to/from Rivers Jade or Weser
4. All other vessels more than 350m in length or more than 45m beam to/from Rivers Jade, Weser or Elbe

24 hours before arrival

TO:	PILOT STATION WHERE BOUND
GIVING:	IMO SRS ITEMS: Alpha Hotel (ETA at light vessel "GB" or light buoy "GW/TG") India Oscar Uniform X-ray (state whether an approved helicopter landing area or marked winching area is available on board)
VIA:	Telephone, Telefax, FAX or email (or via Agent)

6 hours before arrival

TO:	PILOT STATION WHERE BOUND
GIVING:	IMO SRS ITEMS: Alpha Hotel
VIA:	RADIOTELEGRAM or RT via DAN

2 hours before arrival at River Elbe Pilot or 3 hours before arrival at River Ems, Jade or Weser

TO:	PILOT STATION WHERE BOUND
GIVING:	IMO SRS ITEMS: Alpha Hotel
VIA:	Ems VHF CH 09, Jade & Weser VHF CH 06, Elbe VHF CH 08.

Pilot boarding place, German Bight

See diagram on page HG2. For German Bight Helipilot or Ems Helipilot listen on VHF CH 16 (Working channel VHF 09 or 72) 30 minutes before arrival at boarding place.