VESSEL TRAFFIC MANAGEMENT
AND INFORMATION SERVICES
CONCERTED ACTION

Contract n° WA - 96 - CA 8103

(TECHNISEC)

FINAL REPORT FOR PUBLICATION

IFN
December 2000

TABLE OF CONTENTS

Annexes

Partnership Information

According to the general principles underlying the concept of concerted action, the Commission decided at the very beginning of the project to implement a co-ordination structure able

- to gather the relevant information,
- to organise discussions on the concept and its potentiality for future applications,
- to draw up conclusions.

This structure was essentially composed of

- a Management Committee in charge of the overall responsibility of identifying and organising all activities which would allow to reach the objectives,

- a Technical Secretariat which would be assigned by means of a contract awarded by the Commission to provide the Management Committee with technical and administrative support.

The **Management Committee** was composed, in addition to the competent Commission officers (essentially from DG TREN Unit B4 and at specific occasions from other DG TREN Units or other DGs) of representatives of the thirteen interested EU member States (Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Spain, Sweden, the Netherlands, the United Kingdom) plus Norway.

The following table gives the names and addresses of personalities who were appointed by their respective governments to take part in the debates of the Management Committee.

Names and addresses of Government representatives

Name	First_Name	Organisation	Address	Town	Country
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Sukselainen	Juhani	VTT, Manufacturing Technology	P. O. Box 17053	02044 VTT - ESPOO	Finland
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Willems	C.P.M.	Ministry of Transport Research Centre (AVV)	P.O. Box 1031	3000 BA ROTTERDAM	The Netherlands
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Afonso Covas	José	Laboratorio Nacional Engenharia Civil	Av. do Brasil, 101	1700-066 LISBOA	Portugal
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Pietri	Jean-Marcel	Directeur Général CCI de Dieppe	BP 62	76374 DIEPPE cedex	France
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B.Dir Christiansen	Arno	BMV / W17	Postfach 200 100	53170 BONN	Germany
Symoens	Jean-Pierre	Ministerie van de Vlaasme Gemeenschap	Afdeling Loodswezen, Tavernierkaai, 3	2000 ANTWERPEN	Belgium
Polderman	Kees	Ministry of Transport – DGG	PO Box 20904	2500 EX DEN HAAG	The Netherlands
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Pellizzari	Piero	Italian Coast Guard	Viale Dell'Arte, 16	00144 ROMA	Italy

The **Technical Secretariat** which was granted by the Commission the TECHNISEC contract (n° WA 96 CA 8103) was composed of

- **l'Institut Français de Navigation** (IFN),
- 3, avenue Octave Gréard, 75007 Paris, France,
- Tel. 33 1 44 38 40 43
- Fax 33 1 40 61 93 19
- E.mail : infravav@micronet. Fr acting as project coordinator,
- which appointed the following persons to carry out the project activities :
    - Jean Pruniéras,
    - Ingo Harre,
    - Jean-François Lévy
    - Christiane Ville,
    - Guy Hesser,
    - Shaenour Jina;
    -
- **the Nederlands Instituut voor Navigatie** (NIN),
- Willemskade 21, 3016 DM Rotterdam, the Netherlands
- Tel. 31 10 400 0500
- Fax 31 10 511 5588
- E.mail : nindir@compuserve.com acting as contractor,
- which appointed the following persons to carry out the project activities :
    - Tony Flameling
    - Johan Rutten.

Both Institutes are non profit making organisations aiming at promoting navigation sciences whatever the mode of transport.

Both Institutes are members of the European Group of Institutes of Navigation (EUGIN) and the International Association of Institutes of Navigation (IAIN) and have in that capacity close relationship with brother Institutes within Europe[1] and more generally over the world[2].

[1] EUGIN is now composed of the Institutes of Navigation of the following countries : Austria, France, Germany, Italy, the Nordic countries (Denmark, Finland, Norway, Sweden), the Netherlands, Spain, Switzerland and United Kingdom.
[2] IAIN is composed in addition to the European Institutes grouped within EUGIN, the Institutes of : Argentina, Australia, China, Egypt, Korea, Japan, Poland, Russia, United States.

Executive Summary

The concept of Vessel Traffic Management and Information services was born at the end of the 3rd Framework Programme as a result of a series of three projects :

- Regional Traffic Information Services (RTIS)
- Tools for the Assessment and Improvement of the Existing eel Traffic Services (TAIE)
- APAS : Vessel Traffic and Information Services , a synthesis of both previous projects.

The common objective of all three projects was to extend the findings of the well known COST 301 concerted action on shore based as abbreviated in VTS and recognized by IMO resolution A.518 (14) as "any service implemented by a competent authority designed to improve safety and efficiency of traffic and the protection of the environment".

Recognizing the diversity of actors involved in waterborne traffic management and the possible conflicts between interests at staken the variety of the related information and teh constraints which may hinder information interchanges, the Commission decided in 1998 to implement the VTMIS Concerted Action, a co-ordination structure serving as a platform for free exchanges of views bertween European experts concerned.

The concerted action was assigned the general objective to prepare the way forwards to the development and implementation of information services aiming at enhancing the safety and efficiency of waterborne traffic and the protection of the environment.

The following report intends to provide a comprehensive overview of the activities performed by the concerted action according to its mandate.

It is composed of 5 parts as follows :
i) objectives of the project
ii) means used to achieve the objective
iii) scientific and technical descriptions of the projeci
iv) comparison of initially planned activities and work actually performed
v) conclusions
and a list of publications, conférences and presentations from the project.

Part i) explains that the concerted action adopted a plan of work allowing :
- to clarify the concepts of Vessel Traffic Management (VTM) and Vessel Traffic Management and Information Services (VTMIS)
- to provide the policy makers, the system designers and end users, with comments and examples illustrating the concepts and advices on how to implement enhanced information services
- and finally to address the following specific issues likely to be strongly influenced by the future development of Vessel Traffic Management and Information Services: relationships between traffic and transport management - High speed craft - VTMIS operators qualification and training - Organisation of European SAR and pollution combating services.

Part ii) of the report recalls that the co-ordination structure implemented by the Commission was mainly composed of :
- a Management Committee including in addition to the Commission officers, experts appointed by the 14 EU countries interested in waterborne transport (including Austria) plus Norway,

- a Technical Secretariat that was tasked under the TECHNISEC contract to provide support and assistance to the Management Committee,
- an ad hoc working group comprising under the authority of a EU officer, two members of the Management Committee and two persons from the Technical Secretariat.

The complete list of meetings held in this context is attached to the report.

In addition two workshops were held to deliver presentations on concerted action activities as well as on the most relevant projects carried out under the IVth FP and to get the views of potential end users namely shipowners, shipmasters and pilots.

The proceedings of the workshop held in Amsterdam have been published by the Commission. Those of the conclusive workshop held in Paris will be issued in the same way.

The third part of the report mainly consists in a comprehensive description of the activities performed by the concerted action (June 1996 - November 1999).

It addresses the following issues :

- historical background
- the state of the art
- the VTMIS concept
- preliminary studies
- the conclusive workshop (Paris, 21st October 1999)

With respect to the state of the art, the following documents were issued :
- a glossary of terms
- a literature review (237 pages) split into three headings : research papers, documents of general interest, standards,
- a data base describing the most important VTS established all along the European coast line.

With respect to the VTMIS concept the report draws the attention on :
- the definition of Vessel Traffic Management and Vessel Traffic Management and Information Services
- the guidelines for VTS.

With respect to preliminary studies the report elaborates on the rationale and findings of four studies aiming at providing an insight on :
- how are currently perceived the relationships between Vessel Traffic Management and Transport Management,
- the current status of European organisations in charge of Search and Rescue and Pollution Preparedness and Response,
- provisions currently in force with respect to European VTS and VTMIS operations, qualification and training,
- how to assess navigational risks induced by the presence of fast vessels in areas of high traffic density.

In its fourth part the report is factual in the sense that is compares the efforts actually spent to carry out the VTMIS concerted action activities and what was initially planned. Expressed in monetary terms the cost of the project is around 10% less than anticipated (350,000 Ecus instead of 390,000 Euros in round figures).

The fifth part of the report provides the list of documents that may be considered as the direct product of the research and that are accessible to the public.

1. Objectives of the project

Taking account of previous researches carried out at the initiative of the Commission under the 3rd Framework Programme and earlier, the 4th Framework Programme made provisions for a concerted action [3] with the objective to develop

Research and demonstration of conceptual (legal, procedural and organisational) tools and scenarios to be integrated into VTS to provide "value added services".

The name of that concerted action was abbreviated into Vessel Traffic Management and Information Services, **VTMIS**.

The concerted action was tackled with three types of activities :

- to summarize the knowledge on the state of the art,
- to build concepts and models in co-operation with the actors in this field,
- to prepare reports, concepts and demonstration software.

With this general objective in mind, the concerted action developed a plan of work with the following detailed objectives :

- to clarify the concepts of Vessel Traffic Management (VTM) and Vessel Traffic Management and Information Services (VTMIS)

- to provide the policy makers, the system designers and end users, with comments and examples illustrating the concepts and advices on how to implement enhanced information services

- and finally to address the following specific issues likely to be strongly influenced by the future development of Vessel Traffic Management and Information Services: relationships between traffic and transport management - High speed craft - VTMIS operators qualification and training - Organisation of European SAR and pollution combating services.

[3] Identified under number 6.3.4/29 in the list of tasks composing the Waterborne Transport Programme, part of the 4th Framework Programme.

2. Means used to achieve the objectives

To carry out the programme for work as defined above, the Commission decided to implement a co-ordination structure essentially composed of :

- a Management Committee in charge of the overall responsibility of activities to be carried out within the framework of the concerted action and the establishment when required of relationships with the external world,

- a Technical Secretariat that was tasked by the Commission according to the provision of a specific contract known as the TECHNISEC contract (n° WA-96-CA8103) to provide the Management Committee with appropriate support and assistance. In addition the Technical Secretariat dealt with all administrative matters related to concerted action activities, including the setting up of a web site and the dissemination of results.

It was further recognized that to ensure easy liaison between the Management Committee and the Technical Secretariat there was a need for setting up a small group, the so called ad how working group, which under the authority of the Commission would be tasked with :
- discussing and finalizing synthetic explanatory notes to be integrated to be ...?... of the Management Committee,
- preparing proposals for workshop programmes, draft conclusions and recommendations.

The **Management Committee** was composed, in addition to officers from the Commission responsible for the contract of the Waterborne Programme, of representatives of interested European countries (13 EU countries plus Norway) and of the Technical Secretariat. The Management Committee was co-chaired by an officer from the Commission with respect to all matters having a potential impact on the Commission policy and by the co-ordinator of the TECHNISEC Project with respect to technical matters.

The Management Committee met 13 times from June 1978 until the end of November (i.e. at the rate of approximately three meetings a year). The Management Committee has continuously been well attended. However a majority of countries were represented by only one representative whilst initially provisions had been made for two representatives per country.

The **Technical Secretariat** was composed of two partners, i.e. : the French Institute of Navigation - acting as the co-ordinator - and the Netherlands Institute of Navigation. The latter played a major role in the organisation of a workshop in Amsterdam and it was also tackled with the preparation of minutes of all meetings.

The **ad hoc Working Group** was composed, in addition to one officer from the Commission, of representatives of Germany and of the Netherlands and, depending on the items listed on the agenda, up to three persons from the Technical Secretariat.

The ad hoc Working Group met in principle on the eves of each Management Committee. On one specific occasion a meeting of the ad hoc working group took place in between two consecutive sessions of the Management Committee.

Finally it was felt that the co-ordination structure should allow potential VTMIS end users to discuss and assess the VTMIS concept against their actual needs. To this end, the decision was made, in agreement with the Commission, to hold two **workshops** which took place late in Fall in 1997 and 1999 respectively.

Both workshops were one day events composed of two sessions.

The first session was devoted to questions related to the VTMIS outcomes of activities carried out by the concerted action including explanations on VTMIS concepts and their possible applications as well as results derived from studies.

The second session was reserved to presentations and discussions on stakeholders' viewpoints.

In both cases debates were placed under the authority of Kees Polderman, from the Netherlands, an indisputable personality well aware of all aspects of traffic and transport management.

The list of meetings of the Management Committee and of the ad hoc working groups is given in Annex 22 to the report.

The proceedings of the workshop in Amsterdam have been published by the Commission in 1998 (Ref. ISBN 92-828-3250-3).

The proceedings of the workshop in Paris will be published by the Commission at a later stage.

3.Scientific and technical description of the project

3.0 Introduction

Within the frame of the IVth Framework Programme for Research and Development, the Waterborne Transport Programme made provisions for a concerted action on Vessel Traffic Management and Information Services (VTMIS).

The VTMIS concerted action started in July 1996. A few months later the Commission entrusted a consortium composed of the Dutch and French Institutes of Navigation with the mission to act as the Technical Secretariat of the VTMIS concerted action Management Committee.

The concerted action lasted until the 31st December 1999 thus covering a time span of three years and a half. This report intends to recapitulate and present the outcomes of activities carried out within that period.

From a purely administrative standpoint the report is to be considered as the final deliverable of the TECHNISEC project. However it is clear enough that views expressed in this report are not separable from those of the concerted action Management Committee.

Therefore most of this report findings have been submitted for endorsement to the VTMIS concerted action Management Committee.

Let us stress at this point that all significant "end products" of the VTMIS concerted action are being published in the VTMIS concerted action web site, the address of which is http://www.vtmis.de

Amongst the set of information contained in the web site in its present version the reader may find the Technical Secretariat intermediate report summarizing the activities of the concerted action during the period 1st of December 1996 - 30th of November 1998.

As a matter of fact during the last period of the project, activities carried out by the concerted action, whilst providing new inputs to further investigations, did not lead to substantially modify the conclusions that have been initially drawn up during the first period.

Therefore that part of the information contained in this report inasmuch it is related to the issues considered prior to the 31st of November 1998 do not substantially differ from that contained in the intermediate report.

We felt it necessary not to discard in this report any point of the intermediate report under the argument of possible duplication.

The intention is to avoid any further confusion, to include this report in the web site and to substitute it to the intermediate report. That latter report will be stored in the Commission archives.

In this context this report is divided into five parts as follows :
- Historical background
- The state of the art
- The VTMIS concept
- The bridge programme of preliminary studies

- Conclusive actions and trends.

The report is supported by annexes, listed in the table of contents and attached hereto for easy reference.

3 1 - Historical background

3.1.1 - Generalities

The story of exchange in real time between ships and shore of information on vessel traffic to the benefit of vessel traffic management is a rather long one. Let us mention as an example that the use of shore based radars dates back to the early fifties (1951) when for the first time was set up in Liverpool a radar station to facilitate the boarding of pilots from the cutter[4].

We will here limit ourselves to a brief review of what has happened since 1982. It is indeed from that date onwards that significant research actions on the matter have been initiated and carried out at European level with the support of the EU Commission.

Two periods may be distinguished :

a) 1982 - 1987 : During that period the research action COST 301 was carried out within the frame of the COST mechanism leading to important conclusions, most of them are still fully valid to day,

b) 1992 - 1995 : During that period and based on the recommendations put forward by COST 301, three projects were developed allowing to prepare actions to be performed under the 4th Framework Programme.

3.1.2 - The period 1982 - 1987

Within the framework of the COST mechanism a COST action named COST 301 was initiated with the objective to identify at European level the needs for information services aiming at enhancing the co-operation between ships and shore to the benefit of maritime safety, protection of the environment and the efficiency of maritime traffic.

Action COST 301 concentrated on information services now universally known under the name Vessel Traffic Services (VTS) which interact directly with and in response to the state of maritime traffic inside their areas of coverage.

The work carried out by COST 301 is of paramount importance. For the first time :

- basic definitions such as decision processes, traffic management, traffic images, VTS external and internal functions were set up and agreed upon,
- conceptual tools such as the model of the ship navigation decision process, the VTS model, and the model of involvement of VTS in the decision process were designed and tested.

[4] For more details see the article published by Capt. Terry Hughes in the Journal of Navigation. Vol 51 Number 3, September 1998.

In brief Action COST 301 has had the immense merit to provide a standard methodology to analyse vessel traffic services and their possible impact on vessel traffic management. It may even be said that the general character of the concepts developed and set up in the COST 301 final report, makes it a generic tool for the design and assessment of information services other than those which it initially did address.

3.1.3 - The period 1992 - 1995

As a matter of fact that period started roughly a decade after COST 301 inception. During that decade quite a number of new VTSs were implemented throughout Europe. Most of the VTS competent authorities, took benefit from both the progress of COST 301 action and on-going developments of information and communication technologies. On the other hand, at the same time, it became apparent that the implementation of VTS in the real world had to face with technical and legal limitations.

On technical grounds limitations result from the restricted range of radars by means of which information on positions of non co-operative ships can be acquired and the lack of exchange of digitized information between ships and shore.

On legal and administrative grounds limitations stem from the fact that

a) according to the United Nations Convention on the Law of the Seas (UNCLOS, Montego Bay, 1982) the area of jurisdiction of national administrations on behalf of which VTS are operated only covers territorial waters;
b) the competencies of the same administrations primarily embrace the safety aspects of vessel traffic management;
c) more generally, the impact of vessel traffic management on the economy of transport which is obviously a matter for private industry, is not equally perceived throughout Europe as a possible theme for co-operation between private and public entities.

In this context, the projects that the Commission initiated under the EURET programme in 1992 on the theme of shore based systems aiming at improving vessel traffic management :

a) took fully account of the recommendations of action COST 301;

b) but were also intended to study the needs for and the feasibility of systems allowing for better and/or expanded services provided by European VTS.

Three studies were carried out on this theme.

The TAIE project (Tools for Assessment and Improvement of Existing VTS) essentially considered to which extent new technologies could contribute to the improvement of services provided by the VTS systems.

The RTIS project (Regional Traffic Information System) addressed situations where for geographical and economic reasons, needs for exchange of information on traffic developing in large stretches of coastal and open seas cannot be satisfied by simply increasing the existing VTS infrastructure. As an example the RTIS project considered that part of the Mediterranean area bordered by the Southern European member States.

The APAS VTMIS project aimed at combining the results of the TAIE and RTIS projects with the objective to provide guidance for the preparation of the IVth Framework Programme for Research and Development.

We will not enter in any detailed description of the above mentioned projects, they have already given place to a large number of publications the most important of them are quoted in the bibliography (documents of reference [1], [2], [3]).

The main conclusions of these projects can be briefly summarized as follows :

With respect to the TAIE project

The TAIE project recognized that from the users point of view VTS essentially appear as information providers. As such their mission is mainly to provide decision makers with suitable representations (so-called traffic images) of the traffic as they may result from the acquisition and processing of pertinent data. The traffic images are intended to allow the decision makers to assess the situation of the maritime traffic as it is observed at a given instant or as it may be predicted at a specified future instant.

The project has shown the potential of new technologies for implementing more efficient means to build up, update and transmit (when necessary in real time) traffic images related to the current and short term situations (tactical traffic images) or to the long term situations (strategic traffic images).

In addition the project also addressed some fundamental issues not directly linked with technology and which are still a matter for in-depth consideration. They may be listed as follows :

- the implementation of European data bases on maritime traffic and maritime accidents,
- the assessment of the influence of human factors on the levels of risks,
- the development and enforcement within Europe of harmonized VTS procedures,
- the development and implementation throughout Europe of standardized courseware and training schemes for VTS operators,
- the development of methods such as C/B and multicriteria analysis allowing to measure the impact of VTSs on maritime traffic safety and efficiency and to compare it to capital expenditure and running costs involved.

It should be noted in that latter respect that only one task of the TAIE project focused on the benefits of enhanced resource management that could stem from the implementation of a VTS[5]. A contrario the project essentially addressed safety problems. This highlights the remark made above (in 1.3.b)) on the competencies of the VTS authorities which are currently in charge of VTS operations.

With respect to the RTIS project

The RTIS project started with an attempt :
- to list decision makers potentially involved in vessel traffic management,
- to determine the content and quality of the information they might need to perform their tasks,
- to list the information sources actually holders of the information that users may need,
- to identify cases for storing and processing the information detained by the information holders so as to make that information available to the users if and when required.

[5] That task was task 3.2 Resource planning of the project, see Report on APAS VTMIS, December 1995 [3].

This exercise led to the concept of one or more networks linking information holders and information users through a set of nodes where the information would be concentrated, stored and adequately processed.

In this context a Regional Traffic Information System would appear from the end users point of view as a Value Added Network (VAN) which might have a regional coverage.

Obviously within a given region, VTSs could act as privileged nodes (or centers) where would be made available a significant part of the information related to maritime traffic and in particular real time information acquired by appropriate sensors.

The RTIS project studied the technical feasibility of such a network. It came to the conclusion that by and large the recent development in telecommunication and processing technologies would satisfy the needs for processing and exchanging the relevant information.

In addition the RTIS project addressed other fundamental issues. They may be listed in the form of questions as follows :

- How to get an objective measure of the benefits that could be expected from the implementation of a RTIS ?

- Are these benefits commensurate to the capital expenditure and the running costs of the envisaged network ?

- If so is it likely that an operator (private or public) be prepared to implement services responding to users demand for information allowing for better vessel traffic management with the hope that he would retrieve the funds spent in investment and running expenses by means of fees to be paid by the information users ?

RTIS did not reach any firm conclusions on these points. It was recognized in particular that attempts made to assess benefits to be expected from enhanced information by means of enquiries amongst any population of users, whatever the method (interviews, questionnaires), were disappointing. A possible reason for the failure of such an approach is that as a general rule users who are essentially pragmatic, feel it difficult to imagine what would be the situation resulting from changes in the current practices.

One had to conclude on this point that the validity of new concepts has to be proven by means of demonstrations implemented as far as possible on real sites.

It should be noted also that it is even not certain that the benefits to be expected from new information services can be simply expressed in monetary terms. This leads to think that cost benefit analyses, which by definition take only account of financial aspects, should be completed by multicriteria analyses allowing to take account of other factors that may influence the choice between various options.

With respect to the APAS project

Both the TAIE and RTIS projects terminated at the beginning of 1994. Quite naturally within the frame of the APAS[6] mechanism and with the view to prepare the Waterborne Transport Programme, the Commission asked for a synthesis of the conclusions of the TAIE and RTIS projects.

[6] APAS : ''Actions de Préparation, d'Accompagnement et de Suivi''.

That action gave place to the VTMIS project. It was the first appearance of the acronym VTMIS standing for Vessel Traffic Management and Information Services.

The VTMIS project essentially consisted in two workshops held in Genoa (19th-21st January 1995) and Brussels (2nd-4th October 1995).

At the Genoa workshop thirty presentations were made mainly on topics which had been considered within the TAIE and RTIS projects[7].

At the Brussels workshop :

a) an introductory session was devoted to the keynote address delivered by DG VII, and presentations on the TAIE and RTIS projects, the meaning of the integration of TAIE and RTIS projects and on the views of information providers,

b) a two day demonstration session took place allowing to show the main features of RTIS and TAIE and related projects,

c) a conclusive session was organized where a forum discussed and adopted the workshop final conclusions.

Not surprisingly the APAS project :

- highlighted the strong connections between both the TAIE and RTIS projects,

- led to state that :
  a) in the current state of technologies there were practically no limitations to the implementation of whatever connection between remote sites on land and at sea, nor to information handling on board ships or on land,
  b) but that there were still large uncertainties with regard to the identification of users' needs as well as the users' willingness to pay the services that enhanced information may provide,
  c) institutional, legal, administrative and organizational barriers may have to be removed before the actual implementation of systems globally answering the expectations.

The reader will find attached hereto as annex 1 a copy of the conclusions of the Brussels workshop (2-4 October 1995). The reader is kindly invited to more particularly refer back to point 3 of these conclusions which recommends that new researches should address the following issues :

- the implementation at European level of data bases on marine accidents, marine traffic and cargo flows,
- the needs for information services outside territorial waters in particular with mandatory ship reporting,
- the characteristics of information flows involved in marine traffic management in normal and abnormal situations,
- the definitions of services to be rendered by the European VTMIS network including the remote pilotage service,
- the organisation of the network including the definition of the responsibilities of entities involved, the contractual links between the equipment and information users, either public or private and the network operators, the fees policy,

[7] Information was also given on a) the FARGIS and PORTNET projects carried out by Scandinavian countries, b) the EWTIS, ATLANTIS, EPTO and PROTECT projects initiated by the Commission outside the framework of the EURET programme.

- further developments of cost benefit analyses and cost advantage analyses,
- further assessments of the confidentiality and acceptability of maritime information services,
- further developments in the field of harmonisation of procedures and standardisation of VTMIS equipment,
- further emphasis on the integration of solutions into a European VTMIS network.''

The conclusions of the Brussels workshop, provided the Commission with the necessary scientific input to the preparation of terms of reference for tasks 6.3.4/29, 6.3.4/30 and 6.3.4/32 of the Waterborne Transport Programme.

Under the heading : ''Research and demonstration of conceptual (legal, procedural and organisational) tools and scenarios to be integrated into VTS to provide value added services'', terms of references of task 6.3.4/29 were settled as indicated in annex 2 attached hereto.

Task 6.3.4/29 was due to give place to a concerted action. According to its terms of reference, the VTMIS concerted action was tasked with three types of activities :

- summarize the knowledge on the state of the art,
- build concepts and models in co-operation with the actors in this field,
- prepare reports, concepts and demonstration software.

In 1997 terms of reference of tasks 6.3.4/30 and 32 were further refined. As a result of the third call for tender, a single demonstration project called VTMIS Net was initiated with the objective to cover the objectives of both tasks 6.3.4/30 and 32.

In parallel in 1996 in the context of the Waterborne Telematics Programme, DG XIII selected for funding the Poseïdon project (European Project On Integrated VTS, Sea Environment and Interactive Data On-line Network). That project aimed at carrying the following three tasks of the Telematics Application work programme :

- *Task 3.29 "Vessel Traffic Services Systems"* aiming at the determination of telematic tools for enhancing the compatibility of vessel traffic services (VTS) systems and support new functions, such as remote vessel command competency checks, vessel manoeuvring information and automated vessel identification and tracking.

- *Task 3.30 "Environmental & Traffic Information for Safety (ETIS)"* focusing at the determination of tools and technologies to obtain effective access to environmental and traffic information, relative to situations of potential danger, for accident prevention, SAR and the minimising of detrimental effects.

- *Task 3.31 " Ship - Ship & Ship - Shore Communications Systems (SS&SSCS)"* attempted to support research for determining automated and expert systems for reliable, effective and language independent communication between ships and ship and shore.

This report will from now on essentially concentrate on the VTMIS concerted action.

3.2 - State of the art

3.2.1 - Generalities

At the very beginning of the concerted action it was felt necessary to gather and make easily available a set of information items providing the participants in the concerted action and more generally European research organisations potentially involved in VTMIS related matters with the necessary knowledge on the subject.

In this context previous researches and namely COST 301 action, the TAIE and RTIS projects had fully demonstrated that the preliminary phase of any research has to start with the collection of proper information. This activity generally requires a lot of efforts because of the lack of structured and reliable data.

On these grounds, and following previous recommendations of COST 301 and TAIE it was unanimously felt that three different types of actions should be carried out for the benefit of the VTMIS community :

i) to prepare a list of basic definitions and standardized acronyms relevant to VTMIS and related topics,

ii) to review the relevant literature and to publish a list of documents of interest,

iii) to gather comprehensive information on VTS currently in operation along the European coast line and store that information in a data base.

The results of these activities are summed up below. A final paragraph mentions the needs for updating the information acquired so far and explores ways to comply with such a requirement.

3.2.2 - Basic information and standardized acronyms

Recognizing that at the very inception of any research one should make sure that the concepts on the basis of which the research will develop be expressed in terms commonly understood by all participants, the Management Committee adopted a suggestion already put forward in previous projects[8] to establish a glossary of terms related to vessel traffic management and information services :

The reader will find attached hereto as annex 3 the glossary of terms[9] as it has been agreed upon by the Management Committee at its 8th session.

A few comments may be useful :

- to explain the principles following which the document has been built,
- to justify a number of definitions appearing in the glossary.

[8] In particular in the RINAC project initiated under the IVth FP Waterborne Transport Programme (River-based Information, Navigation And Communication). The project findings are available at DG TREN headquarters.

[9] The glossary of terms as an end-product of the concerted action can also be found in the VTMIS web site.

On the first point, it was felt that the glossary should be kept as much specific as possible. Accordingly, in principle the definitions that the reader will find in the glossary merely cover the theme of VTMIS.

However, a number of definitions related to VTS are included because of the possible involvement of VTS in the future as subsystems of a system providing VTMIS.

It was felt on the other hand that the glossary should mainly address decision makers more interested in the planning of the research and its results than in all its technicalities. Accordingly, the glossary of terms does not include for instance technical terms used by specialists in information and telecommunication technologies. It was finally decided that the document should take account of the most recent data available at the date of publication.

On the second point we will limit ourselves to two comments :

a) the glossary quotes in extenso the definition of Vessel Traffic Management and Vessel Traffic Management and Information Services as they have been approved by the Management Committee at its 4th session,

b) the document takes account of the last version of the IMO resolution on VTS guidelines as put forward by IMO resolution A.857(20) [4] which supersedes the IMO resolution A.578(14) which had constituted the first internationally agreed chart for VTS.

The glossary of terms finally comprises in total 147 items (acronyms, words, expressions) including their definitions.

Since its publication the VTMIS glossary of terms did not call for revision. One can however expect that independently from the need for updating that could be revealed at a further stage, concrete applications of the VTMIS concept could require a number of adjustments to a document which obviously can not be considered as fixed once for all.

3.2.3 - Information on relevant literature

Since the early nineties VTMIS and related topics have been a recurrent themes for research at international European and national levels.

We felt that the information on relevant literature to be made available to all potential participants in researches in the field could be classified into three categories :

- research papers,
- documents having a general impact on research activities,
- standards.

With respect to research papers the idea prevailed to get the pertinent information from the Management Committee members who are closely related to the research carried out at national level.

We took advantage of a procedure previously implemented by Prof. Psaraftis within the frame of the short-sea shipping concerted action (SSS), consisting in circulating questionnaires allowing to identify the name of the author, the title of his contribution, the name of the review where the paper was published, the date of publication.

The enquiry allowed to identify and briefly analyse 237 papers, the complete list of which is attached hereto (see annex 4). It can also be found in a slightly different format on the VTMIS web site.

Documents having a general impact on the research are of various types :

- maritime policy documents issued by the Commission,

- proceedings of events such as VTS symposia and VTMIS workshops (VTS symposium, Rotterdam 1996; Users' requirements workshop, Amsterdam 1997; VTMIS concerted action conclusive workshop, Paris 1999; Conference on Building bridges, Rotterdam 1999; Conference on paving the way for sustainable mobility, Lille 1999),

- recommendations from competent organisations and namely from the International Association of Lighthouse Authorities.

A list of 10 documents of that kind (books, brochures) has been worked out including the dates of publication and references of publishers.

Finally technical standards issued during the period of the concerted action have been identified and referenced as appropriate.

Due to the lack of resources the Technical Secretariat was not able to structure the information as just indicated and to store it in a data base in such a way that it could be retrieved by means of computerized procedures.

For the time being, this situation is felt acceptable. The amount of relevant information items is not yet such that it is manually out of reach. However there will be a need in the future to provide users with the same service as does the data base built up by the concerted action on SSS.

3.2.4 - The European VTS data base

The need for a European VTS data base is obvious. Any study or research on VTS and related issues requires synthetic but comprehensive information on the reasons for which VTS have been implemented, the nature of the service they provide, their area of coverage, their geographical characteristics, the main features of their equipment, the way they are staffed, etc...

A few attempts have been made already to collect data on existing VTS complying with such a need.

The IALA VTS worldguide aims at providing the mariners with information related to VTS operations world-wide. But this document describes only a few tenths of VTSs.

A Japanese publication issued by Prof. Fujii gives information on more than three hundreds VTS world-wide but the descriptions of VTS it provides are limited to some major equipment features.

To fill in the gap resulting from the current lack of data, the concerted action deemed it necessary to devote special efforts to gather a series of data allowing to get an up to date and comprehensive overview of the VTS situation within Europe, considering that the concerted action was offering a remarkable opportunity to assemble the most knowledgeable European experts in the field.

With respect to the method to be followed, given the support provided by administrations involved it was further decided to proceed by means of questionnaires to be individually handled by the members of the Management Committee.

It was felt however that in a first step for practical reasons the exercise should not address all types of equipment which according to the IMO definition[10] and strictly speaking could be considered as VTSs.

Accordingly, centers without radar were excluded from the scope of the enquiries.

This led to exclude for instance simple VHF stations as operated in the maritime sector by port authorities of small ports, or in the inland waterways sector by lock and bridge operators appointed by the inland waterway authority.

In practice such limitations should not cause any inconvenience to those researchers or engineers who are looking for new developments both on operational or technical grounds.

Nevertheless, it should be kept in mind that in a near future needs could be detected for integrating into the same network(s) both large and small VTSs. A review of the latter will then have to be carried out.

For the time being, the enquiries concerning large European VTSs were performed by means of a questionnaire composed of 9 parts as indicated in table I below :

[10] As per in Resolution A.857(20).

Table I

Questionnaire breakdown

Ref. number	Scope	Number of items
1	Identification	14
2	Situation context	24
3	Traffic problems justifying the VTS	15
4	Legal aims of the VTS	4
5	Services provided	11
6	Data collection to build up a traffic image	32
7	Data evaluation	14
8	Data dissemination	16
9	VTS operators	12
	Total	142

The reader will find a copy of the questionnaire attached hereto as annex 5.

The questionnaire was circulated to the concerted action membership. The questionnaire was well received and answered. The data were then entered into a data base which apparently cover a large majority of European VTS and provides therefore a good picture of the existing European VTS infrastructure.

Extracted from the data base, a list of 72 European VTS has been established. It is attached hereto as annex 6.

Potential users of VTS data base may from now on send to the Technical Secretariat request for specific information. To facilitate such exchanges of information, the Technical Secretariat has designed procedures allowing for automatic access to the data base.

To conclude we would like to point out once again that we see a workable European VTS data base as a basic instrument allowing to get clear statements of fact on the structure of the European VTS system and the services they render to users.

Thank to a large majority of participants in the concerted action an efficient tool is now available. It has nevertheless to be completed to cover the full set of significant European VTSs. Above all, attempts will have to be made to make use of the information collected so far[11].

[11] On these grounds the reader may note that the data base provide interesting of information on the favourable impact, as seen by the competent authorities themselves, of VTS on accident risks reduction.

3.2.5 - Updating the information collected so far

Information services intended to support vessel traffic management are obviously rapidly evolving at the same pace as that of Information and Communication Technologies.

The quality of information stored in the documents issued by the concerted action will inevitably decrease as time will elapse.

Since COST 301, experience has shown the difficulties of collecting information providing an adequate picture of the situation.

Experience has even shown that a large proportion of enquiries and namely those making use of questionnaires lead to poor results.

Too many questionnaires have been distributed. More and more often they are not answered at all.

To overcome these difficulties a strong collective motivation has to be created and encouraged.

The VTMIS concerted action, at the moment when its activities are coming to an end, recommends :

i) that a copy of the glossary of terms has to be attached to the proceedings of the conclusive VTMIS workshop, together with the list of European VTSs that are registered in the data base and the proper information on the VTMIS concerted action web site.

ii) the team of experts composing the Technical Secretariat of the future VTMIS Thematic Network be tasked with :

a) implementing at the very beginning of the thematic network activities, a new web site where the interested reader will be reminded of the information acquired so far (in the form of the glossary of terms, the literature review and the European VTS data base),

b) upgrading and updating the above mentioned documents keeping in mind the definite need to maintain and improve the assets of this concerted action.

3.3 - The VTMIS concept

3.3.1 - Generalities

At the very outset of the concerted action the Management Committee, taking account of the conclusions of the workshop in Brussels on the potential benefits of further extensions of Vessel Traffic Services, felt it necessary to develop a conceptual framework and a formalized methodology allowing for a logical organisation of new investigations and providing guidance on the implementation of new information services.

To this end the action plan that was approved by the Management Committee at its 4th session made provisions for :

i) working out definitions of Vessel Traffic Management and Vessel Traffic Management and Information Services,

ii) providing a forum for discussions with users representatives so as to better appraise the users needs,

iii) issuing a policy document on VTMIS to serve as guidelines for the public or private entities willing to promote and operate new information services.

These activities were carried out as planned and as a result :

- definitions of Vessel Traffic Management and Vessel Traffic Management and Information Services were worked out by the Technical Secretariat with some explanatory comments and approved by the Management Committee at its 4th session,

- a workshop user's requirements was held in Amsterdam at the end of 1997 and the corresponding proceedings were published,

- "guidelines" on VTMIS intending to elucidate the general philosophy and aims of the VTMIS concept were prepared and discussed and finally approved by the Management Committee at its 9th session in Lisbon (11th June 1998).

The reader will find attached hereto as annexes 7, 8 respectively and extracted from the VTMIS web site :

* the definitions of Vessel Traffic Management and VTMIS and associated comments as they have been approved by the Management Committee,
* the text of the VTMIS guidelines as approved by the Management Committee.

The proceedings of the Amsterdam workshop are available at DG TREN (Transport and Energy), European Commission headquarters.

In this third part of the report we will comment on the outcomes of the activities listed above. In addition we will strive to explain why the Management Committee felt it necessary to explore in more depth a number of aspects of the Vessel Traffic Management and VTMIS that had led to some misunderstandings within the Community of European VTMIS experts.

Our analysis is accordingly subdivided into three parts :
- Vessel Traffic Management and Vessel Traffic Management and Information Services,
- The user's requirements VTMIS workshop Amsterdam 17th November 1997,
- The VTMIS guidelines.

3.3.2 - Vessel Traffic Management & Vessel Traffic Management & Information Services

VTM and VTMIS definitions as well as their explanatory comments were generally felt straightforward.

It is interesting to note however that the VTMIS definition gave place to criticisms and led sometimes to difficult debates.

Briefly summed up concerns expressed fall into 4 categories :

a) vessel traffic management is not entirely in the province of the VTS national competent authorities,

b) vessel traffic management and their associated VTMIS might aim at benefiting to the transport economy and not only to maritime transport safety,

c) there are no provisions enabling users to be sure of the validity of the information when held by private entities,

d) the definitions of vessel traffic management and information services and associated comments do not allow to get a clear idea of what is physically a system providing Vessel Traffic Management and Information Services.

We must say that the concerted action did not find in these criticisms enough matter to modify the definitions as approved.

On point a) the Management Committee remarked that, in the current situation SAR and pollution combating services are significant examples of entities responsible for maritime traffic management which quite often have no relationship with VTS. May we add that national competent authorities responsible for VTS operations in ports and their approach are not entitled to intervene on maritime traffic control outside the limits of territorial waters.

On point b) the Management Committee clearly stated that Vessel Traffic Management cannot be seen independently from Maritime Transport and even from Intermodal Transport. They noted in addition that from a purely economic point of view interests at stake with respect to Maritime Transport Management, and in particular commercial interests related to transport of cargo, are of at least by one order of magnitude more important than those related to Vessel Traffic Management so that the former has a strong impact on the latter.

On point c) the Management Committee agreed on the fact that the quality of information related to traffic management could differ following that it is hold by public or private actors, but expressed the opinion that precisely the concept of VTMIS should imply private and public partnership, a matter of major importance to be further investigated.

On point d) the Management Committee firmly expressed the opinion that a clear distinction should be made between the **services** that should be rendered to the population of VTMIS potential users and the physical **systems** by means of which the proper information will be made available to them.

In such conditions the Management Committee did not identify any real need for modifying or adjusting the definitions as they had been adopted. On the contrary it was felt that any attempt to do so would lead to endless and inefficient discussions on semantics[12].

More importantly in fact, the discussions reported above have had the merit to draw the Management Committee attention to three points.

i) Firstly, the discussions had highlighted that there exist strong relationships between Transport Management and Vessel Traffic Management, the latter appearing as a component of the former.

The Technical Secretariat was accordingly tasked with a preliminary study aiming at providing a basis for further investigations on this issue.

ii) Secondly, the Management Committee recognised that it would be of interest to collect and process appropriate information on how, SAR and Pollution combating services are currently organised throughout Europe. The Technical Secretariat was instructed to establish draft terms of reference for a preliminary study on the matter keeping in mind that information on these issues is already available at the level of the Commission as well as at international level.

iii) Thirdly, the Management Committee expressed the wish to get some updated information on the requirements for qualification and training of VTS and VTMIS operations. The Technical Secretariat was again instructed to establish draft terms of reference for a preliminary study on the subject.

Part IV of this report will address the Management Committee demand for a more in-depth assessment of the European needs for vessel traffic management and corresponding actions that have been taken so far.

3.3.3 - The workshop in Amsterdam (17th November 1997)

The objectives of the workshop in Amsterdam were
- to gather representatives of various users groups including the administrations,
- to organise a number of presentations on
  - the work performed so far within the concerted action
  - on-going projects initiated under the IVth Framework Programme
- to discuss to which extent the VTMIS approach would answer to users expectations.

The workshop was attended by nearly 100 participants leading to admit that the programme of the event was felt attractive. The conclusions of the workshop in Amsterdam are reported in the document attached hereto in annex 9.

To briefly sum up the outcomes of the lively discussions that took place in Amsterdam let us say that they highlighted the needs for :

- more information on VTMIS objectives and capabilities,
- reduction of the shipmasters workload,
- enhancement of the competitiveness of European fleet and ports.

[12] Incidentally may we add here that in spite of the above mentioned criticisms experience has clearly shown that the community of VTMIS users has been able to "live with" the definitions of Vessel Traffic Management and Vessel Traffic Management and Information Services as they stand during the whole duration of the concerted action.

3.3.1 - More information on VTMIS objectives and capabilities

The European maritime community is quite familiar with Vessel Traffic Services, as defined by IMO resolution A.857(20). They are also, by and large, aware of the equipment by means of which Vessel Traffic Services are provided. They have in mind a fairly accurate picture of a VTS equipment such as radar sensors, radar data processing facilities, VHF, etc.

They know about the role of the authority responsible for VTS operations which in general appears as an emanation of the administration. And finally most of the shipmasters and a number of other types of users have had opportunities to make use of the information displayed by the VTS operators.

However the Amsterdam workshop revealed that in spite of our effort to provide explanations on the concepts of Vessel Traffic Management and Vessel Traffic Management and Information Systems, the audience had difficulties in understanding the meaning of the corresponding acronyms.

Part of the misunderstanding that occurred at that occasion may be attributed to the confusion induced by the letters V, T and S appearing in the new acronym. But, confusion came mainly from the difficulties for some users representatives to identify their possible needs for new information services, not yet implemented.

The Management Committee felt that after all such misunderstandings were to be considered as normal facts, happening in most of real life situations.

The main conclusions that the Management Committee derived from the Amsterdam symposium were twofold :

i) All projects related to Vessel Traffic Management and Information Services must be clearly user oriented.

ii) There is a definite need to enhance the exchange of information between those knowing the potential of advanced technologies and those being in position to use them later on.

With respect to point i) the Management Committee pointed out that establishing close relationship with users will be the only way :

- to assess the benefits that may be expected from the implementation of any new type of VTMIS,

- to assess users' possible willingness to pay, a precondition to the establishment and promotion of private public partnership,

- to clearly identify the constraints linked to the protection of commercial information confidentiality, a matter which until now has not been satisfactorily addressed.

With respect to point ii) it was noted in particular that the lack of information on existing and intended VTMIS has the subsequent consequence that some users think of VTMIS as a kind of super VTS that would in the near future supersede and replace the existing VTS infrastructure.

Such a misinterpretation may in some cases have been encouraged by equipment manufacturers using the VTMIS acronym as an argument for sale.

The Management Committee expressed the opinion that demonstrations such as those which were to take place under the VTMIS-Net project (tasks 6.3.4/30 and 32) of the IVth Framework Programme will enable users to get on the spot a picture of a variety of concrete applications of the VTMIS concepts.

Finally the Management Committee proposed to the Commission to include in the programme of work to be carried out in 1999 provisions for a conclusive workshop to be open to as many users representatives as possible. This proposal was accepted by the Commission. The Technical Secretariat was tasked with the organisation of the event. Information on the venue of the conclusive workshop is given in the last part of this report.

3.3.2 - Reduction of the shipmasters workload

The representatives of shipowners put a strong emphasis on the need for reducing the burden imposed on shipmasters by mandatory multireporting.

As a typical example, the situation was quoted of a ship entering the Channel and bound to Hamburg. That ship has to report in succession to the coastal VTSs located at Ushant, Jobourg, Dover and to various port VTSs from Antwerp to Hamburg.

Mention was made of the fact that at national level, VTS networking has been partly achieved. However gaps are still to be filled in and interconnection between VTSs of adjacent countries is very poor.

The concerted action, taking account of the needs expressed by the representatives of users considered that in all cases where the VTMIS aim at influencing the traffic through a number of centers there is a need for :

- networking the various centers,
- setting up adequate procedures,
- ensuring that the operators have reached the appropriate level of knowledge and skill.

It was therefore felt necessary to prepare the way to a real harmonization of qualification levels of VTS operators throughout Europe together with that of European VTS training programmes and facilities.

The Technical Secretariat was invited to mention those specific concerns in the specifications of the preliminary study (quoted above in §3.2) on VTMIS / VTS operators qualification and training.

3.3.3 - Reduction of costs of ship operations

The representatives of ship owners having stated that the European shipping industry was faced with hard competition said that as a general rule shipowners will welcome initiatives whatever public or private which might generate economies.

Shipowners did not mention possible initiatives intended to improve the efficiency of fleet management but they put emphasis on the promotion of remote pilotage as it had been recommended at the Brussels's workshop.

The concerted action noted the interest of shipowners on remote pilotage. It was decided to gather information from the ports where some forms of remote pilotage have been implemented as for instance in Rotterdam and in Bordeaux.

That information will allow to determine if remote pilotage is really a matter for applications of the VTMIS concept.

More generally the Management Committee expressed the opinion that the economy of maritime transport is undoubtedly a key issue the impact of which on any traffic management measure should not be discarded. On that matter the Management Committee noted with interest later on, that three recommendations put forward in the POSEÏDON project final reports, actually address that aspect. They are :

recommendation 15 on flagging out high risk vessels
recommendation 16 on cost reduction incentives
recommendation 19 on tax incentives.

In conclusion the Management Committee expressed the risk that in the future policy makers be more closely associated to the research world.

3.3.4 - The guidelines on VTMIS

The objective of the guidelines on VTMIS is to provide common grounds for a better understanding of the rationale for VTMIS, what it is and what it is not, the way ahead for future VTMIS implementation.

The document already mentioned as annex 8 was prepared by the representative of the Netherlands at the Management Committee.

That document was welcomed and approved without any change by the Management Committee at its 9th session in Lisbon. It has been integrated into the VTMIS web site.

Briefly summarized the guidelines on VTMIS state :

Firstly that VTMIS is intended to provide independently from the existence of VTS new functionalities such as :

* exchange of information related to vessel movements (e.g. ETA notification to ports, pilots, tugs and terminals)

* regional traffic image outside radar coverage the information contents of which can serve such functions as
  - vessel traffic management
  - port resources management
  - cargo flow management

Secondly that VTMIS is likely to involve many parties such as :
authorities
ports
shipping companies including local shipping agents and shippers/owners.

Thirdly, that the actual implementation of some version of VTMIS depends on the existence of driving forces which might be either an authority or a private service provider able and willing to take the initiative of offering information services at costs, which should be commensurate with the expected benefits.

The guidelines conclude that VTMIS encompass many functions and applications, as well as involved parties including potential driving forces. This would lead to various organizational structures and to the use of adequate hard/softwares, so that the only possible approach towards actual VTMIS implementation is bottom up. In that connection a group of potential users would develop their own information exchange system subject to the following conditions :

- a wide view on and an open eye for the needs of others,
- a fair distribution of costs and benefits for all parties involved,
- a respect for the confidentiality of the information,
- an open architecture of hard and software.

The conclusions of the guidelines on VTMIS are seen by the Management Committee as opening ways to promote the VTMIS concept.

They have the strong feeling that the next step forward could consist in :

- identifying limited groups of information users willing to get information from well identified groups of information holders,

- characterizing the information to be exchanged in terms of contents, quality and information flows,

- proposing appropriate formats and identifying telecommunication facilities to transfer information from information holders to information users,

- studying possible schemes for
    a) valuing and pricing the information requested by the information user
    b) billing the services provided.

The Commission informed the Management Committee that its views on the matter had been shared.

As a result the Vth Framework Programme would encompass a number of actions along the lines of the above conclusions.

3.4 - Preliminary studies

3.4.1 - Generalities

The preceding part of this report has explained the reasons why the concerted action with the objective to prepare grounds for further investigations had given a priority to these so-called preliminary studies on :

- the relationship between Transport Management and Vessel Traffic Management,
- the current situation of European organisations in charge of Search and Rescue and Pollution Combating,
- VTMIS/VTS operators qualification and training.

In addition, the Management Committee

recognizing that traffic of fast ferries is developing very rapidly in European waters and that the question arises as to whether the insertion of fast vessel in a traffic composed of conventional ships is likely to increase the occurrence of risky situations,

noting that under the IVth Framework Programme the Commission initiated a project aiming at studying the problem by means of simulation techniques,

decided to take advantage of the radar facilities currently in operation on both sides of the Dover Straits and of the participation in the concerted action of representatives of the UK and France competent authorities - to acquire factual data on the behaviour of fast vessels in the Dover Straits.

The fourth part of this report provides details on :

- the studies rationale and specific objectives,
- the organisation set up by the Technical Secretariat to answer to the Management Committee requests,
- analyses and comments the findings of the studies as they are presented in a series of four specific reports.

3.4.2 - Relationship between vessel traffic management and transport management

3.4.2.1 - The study rationale

From a general standpoint the fact that there are close relationships between transport management on one hand and vessel traffic management is in itself quite obvious. Vessel traffic in a given area, considered as a phenomenon, is nothing else but the set of movements of vessels in that area. It is generated by transport activities and cannot be dissociated from them.

It is therefore not a discovery that the information on the basis of which vessel traffic is or should be managed be strongly related with that which supports the transport decision process.

It is however a fact that most of the information related to the generation of transport, because of the commercial characteristic of that activity, is considered as confidential. This situation permanently creates conflicts opposing two categories of actors :

- those whose mission is to enhance the level of protection of the citizens against risks inherent to maritime transport,

- those who considering transport as an industry, tend to maximize the profit they can draw from carrying out transport activities.

As a consequence both categories of actors are reluctant to exchange information. One may think that a better knowledge of the interests at stake, and a better appraisal of the role of information in the decision process of both types of actors would be beneficial. On this basis the Management Committee entrusted the Technical Secretariat to review in some details the contributions of projects carried out under the Vth Framework Programme on the theme of information exchanges between waterborne transport actors.

General specifications of such a study were designed and submitted to the Management Committee.

The reader will find attached hereto (annex 10) a copy of the specifications as they were agreed upon by the Management Committee at its Xth session.

3.4.2.2 - Detailed specifications and study arrangements

The Technical Secretariat felt that the most efficient way to tackle the problem set up in the general specifications was to seek for the help of a company :

a) which having been involved in the preparation of the most significant projects related to information services had gained experience in the identification of the needs for information of a large range of actors,

b) and whilst adhering to the VTMIS guidelines principles was willing to contribute on its own to their promotion.

Maritime Safety Rotterdam (M.S.R.) which without doubt was complying with those criteria offered to carry out the study.

The Technical Secretariat with the agreement of the Management Committee decided to award MSR a preliminary study with the objective to identify through the review of IVth Framework Programme relevant projects :

- the main actors involved in vessel traffic management and/or transport management,
- the corresponding flows of information,
- the foreseeable needs for the data collection and processing, and information exchanges.

3.4.2.3 - The final report structure and findings

The report is attached hereto as annex 11.

The report is quite straightforward. We will only draw the readers' attention to the following parts of the report :

Part 5 : Past and present research within EC
Part 6 : Participants
Part 7 : Information
Part 9 : Interconnectivity
Part 11 : Conclusions

3.4.2.3.1 - Past and present research within the EC (Part 5)

Part 5 of the report may be summarized as a review of most significant projects the common objective of which has been to determine to which extent modern information and telecommunication technologies were able to contribute to improve the efficiency of part when not all of waterborne transport activities.

Quite naturally these projects dealt with the following basic aspects of waterborne transport management and monitoring :

- traffic flows and fleet management
- port facilities management
- logistics
- implementation of measures aiming at alleviating the negative impact on safety and environment of the activities concerned.

12 research actions have been reviewed including :

- 9 projects carried out under the 4th Framework Programme (VTMIS-Net, Comfortable, BopCom, Euroborder, Poseïdon, Sealoc, Marnet, Ipsi, Movit),
- one project (Bafegis) which had been planned according to a bilateral agreement linking Sweden and Germany,
- the concerted action on Short Sea Shipping
- the MARIS initiative.

The report :

- briefly summarizes the objectives and scope of each project,
- explains how they can be expressed in terms of functional requirements,
- identifies the needs for improved information services,
- assesses the potential of new technologies with respect to provision of such information services.

3.4.2.3.2 - Participants (Part 6)

Part 6 of the report proposes a synthesis of the relationships between actors involved in Vessel Traffic Management and Transport Management.

Of particular interest we must mention :

i) The table (page 4/40)
It identifies 41 actors (participants) potentially interested in Vessel Traffic Management and/or Transport Management,
and classifies them into two categories following that he/she is the information initiator or receiver. Of course some participants may play both roles of initiator and receiver.

ii) The suggestions to give at a further stage more consideration to the requirements for cargo flow management and more generally to other "matter of concerns" not yet fully identified.

3.4.2.3.3 - Information (Part 7)

Part 7 of the report, from pages 22 to 35 inclusive is mostly composed of two tables. The first table identifies :
- the needs for information in their functional context,
- and for each information item it indicates which organisation actually holds it.

The second table is an attempt to describe the information flows.

Each time this has been possible, that table shows what standard protocols and what type of transmission has been envisaged in projects reviewed as in part 5 of the report[13].

3.4.2.3.4 - Interconnectivity (Part 9)

Part 9 of the report addresses the problem of interconnectivity that a number of the reviewed projects have been faced with. Possible solutions to solve that type of problems have been identified and successfully tested (BOPCOM - VTMIS-Net). However the EUROBORDER project concludes that providing standardisation will require efforts not only from the maritime community, but from all actors involved in the overall chain of transport.

3.4.2.3.5 - Conclusions (Part 11)

In its conclusions the report :

- acknowledges the fact there are strong relationships between Vessel Traffic Management and Transport Management,

- recognizes that quite a number of projects carried out under the Waterborne Programme of the IVth Framework Programme have provided opportunities to a better understanding of :

- the identities of information holders and information users,
- the way communication flows are established and managed,
- solutions that might solve the interconnectivity problems.

The report recognising the need to eliminate as far as possible misunderstandings and confusions finally suggests that further consideration be given to the definition of boundaries between public and private activities, and also between Vessel Traffic Management and Transport Management.

3.4.2.4 - Final comments

[13] Let us mention here that in addition the reader may find in part 8 of the report additional information on the transmission means as they have been listed in the EUROBORDER project.

MSR and the Technical Secretariat kept regularly in touch during the course of the study. Therefore they easily agreed on a first version of the draft final report which in turn was circulated for comments to the membership.

Comments received were in general favourable subject to a number of editorial remarks.

However, one important point of substance was raised[14].

The first version of the draft final report does not make any reference to the INDRIS project relating to the implementation of information services for the benefit of European inland waterway users.

The draft final report has been modified to take account of the observation received by the Technical Secretariat. The observation is indeed all the more justified than the inland waterway authorities have shown considerable interest in the future development of information systems which would not only help the skippers in their navigational activities but would also facilitate their relations with the shippers and more generally with the community of actors involved in transport of goods.

In the mind of the Technical Secretariat the findings of MSR report is a most valuable input to the further development of the VTMIS concept. In particular it provides a firm basis for the design of a future generic information system architecture.

3.4.3 - European organisations in charge of Search and Rescue and Pollution preparedness and response

3.4.3.1 - The study rationale

Search and Rescue services on one hand and Pollution preparedness and response services on the other hand have been both implemented to manage crisis situations generated by maritime accidents.

As such they must be considered as a part of measures implemented to manage waterborne traffic.

Therefore the VTMIS Management Committee felt it that collecting synthetic and updated information on how search and rescue and pollution preparedness and response services are currently organised was implicitly included in the mandate given to the concerted action.

However the Management Committee immediately pointed out that the gravity of consequences of maritime accidents had already incited the International Maritime Organisation to take major initiatives to organise world-wide the efficient implementation of SAR and POL operations.

Organisations of SAR and POL services are therefore governed by stringent international regulations. They take the form of either International Conventions prepared under the aegis of IMO or of IMO resolutions/recommendations or regional agreements linking coastal States belonging to regions faced with particularly severe threats.

As a consequence information on resources and organisations of European SAR and POL services may be split into :

[14] By Cas Willems from AVV.

a) information on dedicated means of whatever kind (aeronautical and naval means - telecommunication facilities) and on points of contact allowing neighbouring countries to communicate,

b) information on the structure of national SAR and POL organisations.

Comprehensive information referred to in a) is made available through procedures specified in IMO regulations and regional agreements.

Information referred to in b) is still scarce. It depends on the culture and administrative practices of each countries and namely of European countries.

The Management Committee considered that there was no need to initiate a research action aiming at completing information referred to in a).

On the opposite it was felt that a limited research action aiming at better understanding the philosophy of SAR and POL services organisation in Europe would permit to assess the potential needs for improving co-operation in the field between EU member States.

On this basis general specifications were drawn up and finally approved by the Management Committee. They are attached hereto as annex 12.

3.4.3.2 - Detailed specifications and study arrangements

To gather updated versions on the organisation of SAR and POL European services, the Technical Secretariat soon recognised that despite its risks of failure, it would have to resort to the questionnaire procedure.

Fortunately enough most of the European administrations responsible for SAR and POL activities were represented in the Management Committee and they kindly offered to co-operate in the enquiry.

In this context the Technical Secretariat decided :

a) to task a team of three experts with the mission to design two questionnaires related to SAR and POL services organisations respectively,

b) and to entrust one of these experts to process the information received from the concerted action membership and to derive conclusions from the enquiry.

The three experts involved in a) were C. de Cena from Top View, J.-F. Lévy a high level civil servant of the French administration and an expert in POL services organisation, and B. de Gouvello a doctor in Economics temporarily recruited by IFN.

C. de Cena was in addition tasked by IFN :

- to process the information as mentioned in b) above and to present his findings in a final report,

- and to deliver a presentation at the conclusive workshop of the VTMIS concerted action.

With the agreement of the Management Committee Top View's rights and obligations were specified. The reader will find attached hereto as annex 13 the detailed specifications.

The work to be jointly carried out by Top View and the other experts was co-ordinated by IFN and gave place, in addition to normal correspondence to a meeting held in Paris on the 27th of August with the objective to finalize the questionnaires.

3.4.3.3 - The outcomes of European SAR-POL services organisation preliminary study

3.4.3.3.1 - The questionnaire approach

Both questionnaires on SAR and POL services were designed with the following objective in mind :

- to identify actors who may be involved in SAR and POL operations amongst whom namely those who are entitled to take decisions,
- to determine how the decision makers responsibilities are split between national and local levels and assess to which extent these responsibilities are decentralized,
- to get information on pre-established plans and procedures to be followed on a routine basis or in case of occurrences of given types of accidents, specially when neighbouring countries are involved,
- to get opinions on the quality of the communication facilities currently in use and on the possible needs for new systems such as AIS.

More incidentally it was also felt desirable to get information on the activities of SAR and POL services expressed for instance in terms of numbers of interventions at sea during a given period.

The experts in charge with the preparation of questionnaires were asked to strictly limit the number of questions composing the SAR and POL questionnaires.

Questionnaires prepared according to those general principles can be found in annex n° 2 to Top View's report.

The reader will notice that SAR and POL questionnaires, although built up in the same spirit, are nevertheless somewhat different.

Such differences are justified by two reasons :

i) rights of intervention that are granted under the provision of the United Convention on Law of the Sea (UNCLOS, Montego Bay, 1982) to coastal States in case they are faced with a threat of pollution, have no equivalent in the domain of Search and Rescue.

ii) The means to be implemented in case of POL and SAR operations are completely different. So are the needs for co-operation between countries belonging to a given region. Detailed regional agreements[15] related to pollution situations are in force within Europe that have no equivalent in the SAR domain.

[15] Such as the Bonn agreement.

3.4.3.3.2 - The final report on SAR and POL organisations

Top View's final report is attached hereto as annex 14.

It is essentially composed of 4 parts.

- Part 1 recalls how the questionnaires have been designed and the response obtained from the VTMIS concerted action membership.

- Parts 2 and 3 present the results of the second phase of the work which consisted in processing the information so collected.

- Part 4 is an attempt to assess the potential of the VTMIS concept with respect to the future SAR and POL organisations.

In our opinion the report clearly states how the study has been carried out and what are its outcomes. We will merely add a few comments :

3.4.3.3.2.1 - On the questionnaire procedure

The response from the membership has been extremely good. A large majority of European authorities in charge of SAR and POL operations undoubtedly appreciated the potential benefit of mutual understanding and co-operation and provided timely and comprehensive answers to the questionnaire.

Portuguese authorities due to unforeseen circumstances did not send their answer in time. However we have decided to make use of the Portuguese information. It will be integrated in the VTMIS website as soon as practicable.

3.4.3.3.2.2 - On the answers overview

On parts 2 and 3. The answers received provide pictures of the organisation currently in force expressed in **comparable** terms.

Data are now available allowing to identify similarities and differences. The report provides a thorough analysis of these data, a short summary of which is as follows.

Amongst the most significant **similarities** one may quote :

With respect to POL organisations :

- the role played by MRCC's (MRSCs) in the reception of messages related to the occurrence of pollution,
- the contribution of a large variety of public and private entities in the detection of pollution and remedial measures,
- the growing participation of oil and shipping industry in POL operations,
- the tendency to differentiate the way responsibilities are attributed following that the pollution, is small, large or major,
- the favourable expectations of the competent administrations with regard to the development of AIS,

With respect to SAR organisations :

- the importance of the role assigned to the MRCCs which are always reported as the first actors receiving the information that an incident occurred and that are always tasked with the co-ordination of the operations at sea,
- subject to the exception of Belgium and Greece, the existence of co-operation agreements with adjacent countries.

However there exist

- subject to the exception of Norway and Sweden, procedures based on the concept of symptomatic event as well as on specific emergency plans,
- the favourable expectations of the competent administrations with respect to the development of AIS.

Amongst the **differences** one may quote :

With respect to both POL and SAR organisations

- the well-known variety of European States geographical configurations, whatever they are expressed in terms of length of the coastline or surface of the areas under the State's jurisdiction

and

- the ways each country is administered at regional and local levels and their impact on the organisation of POL and SAR services at various levels.

With respect to POL organisations

- the attitudes of competent authorities with respect to the interpretation of the rights of intervention as per Art. 221 of UNCLOS,
- the establishment of bilateral agreements between bordering countries.

With respect to SAR organisations

- the variety of additional tasks that bodies responsible of SAR are in charge of,
- the organisation of SAR operations at very short distance from the shore,
- the role of non profit making organisations with respect to the provisions of dedicated means such as lifeboats and other nautical means,
- their views with respect to the future use of digitized communications network.

3.4.3.3.2.3 - On VTMIS concepts potential

The report puts emphasis on the actual application of VTMIS concepts to the timely distribution of data which are needed to manage emergency situations.

In that context the report recalls efforts that have already been deployed to enforce the HAZMAT directive. It puts emphasis on :

- the definite needs for the standardisation of data to be used in emergency situations,
- the setting up of operational procedures to be agreed upon by the competent SAR POL actors including the adoption of relevant standards, a prerequisite to the establishment of interoperable standardised data bases.

3.4.3.4 - Conclusion

The objective of this study was voluntarily limited to identify the main features of SAR and POL organisations as they have actually been set up and implemented by European national competent authorities.

The matter is extremely complex. The outcomes of this study cannot, in any way, be considered as exhaustive.

We think however that the report is likely to help in getting a better understanding of the European situation with regard to how to cope emergency situations occurring at sea. We firmly hope that this will provide decision makers with a few relevant yardsticks. They may appear as particularly welcome at a moment when recent accidents have shown that both safety of life and the environment are still in danger around the European coast line.

3.4.4 - European VTS and VTMIS operators qualification and training

3.4.4.1 - The study rationale

Needs for undertaking a preliminary study on the European VTS and VTMIS operators qualification and training were presented in a note approved by the Management Committee and attached hereto as annex 15.

To briefly summarize that document let us just say that the Management Committee recognised that the impact of any kind of services aiming at enhancing safety and efficiency of vessel traffic and the protection of the environment strongly depends on :

* the setting up of well-defined and harmonised procedures governing the exchange of information between all actors concerned, in particular between shore and vessels,

* and inasmuch as the implementation of such procedures requires the intervention of operators, the harmonisation of the levels of qualification of these operators.

In this connection the Management Committee stated that, until now, efforts have mainly been concentrated on the preparation of standards for qualification and training for Vessel Traffic Services (VTS) operators, - but that the qualification and training of other personnel such as those involved in search and rescue and pollution combating, and a fortiori **more generally** in the operation of other potential vessel traffic management facilities, have not been a matter for a co-ordinated approach.

It was noted in addition that IMO had recently adopted proposals submitted by IALA which had set up a comprehensive framework for a better harmonisation of the VTS operators qualification and training. But some administrations[16] feel necessary to study in more depth the set of criteria on the basis of which VTS operators should identify events[17] requiring their intervention.

Finally the Management Committee entrusted the Technical Secretariat to carry out a study aiming at :

- assessing the current state of the art,
- proposing scenarios for a better co-operation between European training facilities,
- proposing, if needed, a programme for further researches allowing to better define the conditions of VTS/VTMIS operators interventions.

[16] In particular the German administration.
[17] So-called symptomatic events.

3.4.4.2 - Detailed specifications and study arrangements

The discussions that had taken place within the Management Committee had made it clear that navigational situations occurring along the European Coast line vary from one country to another leading to implement in various ways vessel traffic management functionalities such as :

- management of traffic flows within traffic separation schemes,
- management of vessel movements in confined waters such as estuaries, fairways, port basins,
- crisis management (SAR and pollution combating operations).

Provisions made by European States for ensuring that the level of qualification of their VTMIS operators is adequate are also variable depending on the knowledge and skills of personnel prior to their recruitment as VTMIS operators.

In that context the Technical Secretariat felt that a team of at least three experts should be committed to take part in the study.

The team was therefore composed of experts appointed by :
- University of Wismar (Germany),
- MARAN (The Netherlands),
- CETEMAR (Spain).

The team was placed under the overall responsibility of CETEMAR.

The reader will find attached hereto the detailed specifications of the contributions of each partner. Briefly summarised the terms of reference of each contribution were as follows :

- CETEMAR : to report on the situation of VTS in Spain. These VTS are mainly coastal VTS and strongly involved in SAR and POL operations,

- MARAN : to address education and training in the Netherlands with special mention of simulation based training facilities,

- University of Wismar : to report on the most recent analyses carried out at Warnemünde center using the new simulator that has been recently installed and commissioned for the detection of hazardous navigational situations.

3.4.4.3 - The outcomes of the preliminary study on VTMIS operators qualification and training

The reader will find attached hereto (as annex 16) a copy of CETEMAR's final report.

The report is divided in 11 sections. In addition to information related to the evolution of the VTS operators profession, a reference to the VTS guidelines (IMO resolution A.857(20)) and the IALA Model course for VTS operators, and a short description of VTS training in Norway and the UK, the report mainly describes :

- VTS external procedures (section 3)
- VTS Training in Spain (section 5)
- VTS Training in the Netherlands (section 6)
- VTS Training in Germany (section 7)
- Coast Guard and coast guard watch operators (section 9)

Finally section 11 of the report discusses its results and offers conclusions.

3.4.4.3.1 - VTS external procedures (section 3)

The term external procedures is supposed to cover the detection by VTS operators of events the occurrence of which may initiate an intervention of the VTS operators.

Paragraphs 3.1 and 3.2 of section 3 recall that most of the European countries and namely the Netherlands and Spain consider that attempts to assign pre-defined values of such parameters as distances and time to characterize risks of occurrence of collisions or groundings are likely to fail.

Paragraph 3.3 of the same section 3 gives details on the study carried out in Germany with the objective to assess the actual possibility to automatically alert VTS operators in case fixed thresholds for CPA (900 m) and TCPA (10 m) are violated. Experiments carried out in the German Bight area have clearly demonstrated that fixed CPA and TCPA thresholds are not practicable for VTS use.

However Wismar University experts firmly conclude that :

- the definition of appropriate quantified criteria is a prerequisite to the establishment of standardised procedures,
- the identification of such criteria requires further investigation.

In that latter aspect the actual distance between approaching vessels at a certain time should be considered as a candidate parameter for risk assessment in addition to CPA and TCPA.

3.4.4.3.2 - Training in Spain (section 5)

The report provides comprehensive information on :
- the training scheme,
- the contents of the training programme and the conditions under which courses are dispensed.

The main feature of VTS training in Spain is that VTS operators are requested to have a large nautical experience. In this respect the report states that : "The job of VTS operators is considered as being perfectly filled by professional people issued from the Merchant Marine or the Navy and that candidates to VTS specific courses must have officer or captain education received at any of the Nautical Education Centres together with specific professional experience."

These assertions may in our opinion be interpreted as reflecting the fact that the most important Spanish VTSs, are part of the Spanish coastal VTS network the realisation of which has started at the end of the eighties and has by now made remarkable progress.

It can be questioned as to whether the training requirements for Spanish port VTS operators are the same as those in force in coastal VTSs.

3.4.4.3.3 - Training in the Netherlands (section 6)

The report recalls the spectacular development of the VTS infrastructure in the Netherlands and provides detailed information on the activities carried out by the Nautical Traffic Management Training, the Dutch organisation in charge of the co-ordinating entity advising the VTS competent authorities on :

- the requested functional levels and profiles,
- the organisation of professional certificates,
- the training programmes and tools.

Two functional levels are distinguished. Level 2 is the higher including systematic monitoring of the traffic flows and monitoring the compliance with traffic organisation rules and regulations.

The report indicates that two simulation facilities are operated in the Netherlands (at Rotterdam : Marine Safety Rotterdam; at Wageningen : Maritime Research Institute of the Netherlands)[18].

The report addresses the comparison of the training courses distributed by NNVO (Nationale Nautische Verkeersdienst Opleiding) and the model course recommended by IALA.

The comparison makes it clear that both the NNVO and Model courses are based on a common understanding of the VTS functions and therefore have similar objectives. However the comparison clearly reveals that both courses have been designed independently from each other leading to different estimations of times to be spent by the trainees in acquiring the requested knowledge and skills. In particular recommended times to be spent by the trainees on VTS simulator are evaluated respectively 30 hours in the NNVO course and 100 hours in the Model course.

We intend to come back on these discrepancies in the following paragraph.

3.4.4.3.4 - Training in Germany (section 7)

In Germany as in a number of European countries, VTS operators training takes place "on the job". There is no standardised training programme.

However since 1997 considerable efforts have been devoted to the establishment of a comprehensive training programme. As an accompanying measure, a dedicated VTS simulator has been built and is currently operated at the Department of Maritime Studies in Warnemünde.

The report :
i) describes in detail the objectives and contents of the new training programme,
ii) and compares it with the IALA model course.

With respect to point i) the report highlights that in Germany a distinction is made between two categories of personnel :
- officers on the watch,
- and nautical assistants.

[18] Annex II to the report provides information on MSR VTS simulator.

The training programme has been built taking account of the missions of those personnel and of the needs for :
- theoretical and practical basic trainings,
- refresher courses,
- special courses to be delivered to the instructors.

In addition to the list of topics composing the programme for theoretical education, the report provides information on what in our opinion appears as fairly advanced systematic analysis of the tasks to be actually performed on the spot.

Interesting examples are given in addition of criteria allowing to assess the personnel abilities.

Following a thorough comparison of the German training programme and the IALA model course, the authors conclude that the philosophies of both programmes are quite similar.

However a few discrepancies have been detected. They may result from the fact that IALA has built its VTS model course with the objective to cover an hypothetical general situation so that the model course may not take into account some national peculiarities such as for instance the fact that most VTS authorities within Europe require that the candidates to a post of VTS operators do have a large nautical experience.

3.4.4.3.5 - Coast Guard or Coast Guard Watch Operators (section 9)

Under that heading the report addresses qualification and training of operators who as a general rule belong to Search and Rescue and Pollution Combating Services and as such are participating in a number of Vessel Traffic Management operations.

The first paragraphs of the report (9.1 to 9.3.8) mainly recall the evolution of IMO regulations.

Following a number of disasters IMO has considerably extended the field of routeing measures and in particular of Traffic Separation Schemes. Measures have been taken such as the implementation of emergency towing vessels to reduce the risk of accidents or to alleviate their consequences.

New concepts such as improved dynamic routeing, or projects (Bafegis) are under experimentation.

The report points out that all these measures require actions which strongly depend on the existence and quality of an adequate traffic image.

Operators involved in such actions have therefore to become familiar with the exploitation of such images.

The report gives information on the IMO model courses for the functions of :
Maritime Search and Rescue administrator
Maritime Search and Rescue co-ordinator.

The report goes on with specific information on training as practised in various European countries and namely on :
- Spain Coast Guard Training,
- the Netherlands Coast Guard Training.

3.4.4.3.6 - Conclusion

The report of the team which the Technical Secretariat tasked with the preliminary study on VTMIS operators qualification and training contains without doubt a significant amount of useful information.

The contribution of German experts fully answers in particular the question raised by the representative of the German administration sitting at the Management Committee.

However the report confirms the impression that we got at the occasion of the VTMIS conclusive workshop in Paris that all those who have participated in the concerted action feel it somewhat difficult to admit that the VTMIS concept goes far beyond that of VTS. Some confusions are therefore still apparent demonstrating the needs for further explanations and more in depth analyses.

Whatever it may be the report describes in detail efforts put on VTS/VTMIS operators training and qualification in Germany, Spain and the Netherlands providing clear evidence that the matter is actually a prerequisite to the future development of VTS/VTMIS.

More particularly the report identifies two possible themes for further analyses and harmonized actions respectively related to :

a) the existence of some discrepancies between the contents of VTS training courses currently implemented at national level and the recommendations on the matter that have been adopted,

b) the absence of interest of countries where simulation facilities have not been implemented in such facilities established by other countries for their own purposes.

In conclusion the preliminary study on VTMIS/VTS operators qualification and training, draws the attention on the importance of the matter. It demonstrates the needs for further investigations as well as the difficulties of the latter. Materials that have been gathered will have to be used as inputs to any new programme on the theme.

3.4.5 - Fast vessels

3.4.5.1 - The study rationale

The traffic of fast ferries has been continuously growing during the last two decades. At the origin limited to the transport of passengers and cars along short distances, it currently concerns voyages lasting several hours. Projects of fast vessels able to transport goods of high value are in addition under consideration.

Although accidents that have so far involved fast ships are rather rare, the opinion prevails that movements of fast vessels may not be easily predicted neither by masters of other vessels nor a fortiori by yacht skippers. It is felt consequently that risks inherent to the insertion of fast vessels in a conventional traffic should be better analysed and assessed.

Under the IVth Framework Programme the FASS[19] project may be considered as one of the first attempt at European level :
- to assess those risks,

[19] FASS stands for Fast Ships Safety. The FASS project is a project initiated by DG VII. It is now under completion.

- to identify operational procedures likely to reduce navigational risks,
- to determine the types of training facilities allowing fast ship masters to adequately apply these procedures.

A particular feature of the FASS project is to systematically resort to simulation as a tool to assess the risks, the validity of the proposed procedures as well as that of the training facilities.

The FASS project will expectedly provide data on the behaviour of fast vessel masters and the way they interpret the collision regulations. However, it will also show that both fast simulation as well as simulation runs performed by means of full bridge simulations have their own limits.

In particular very few mathematical models of fast ships are currently available.

In this context the Management Committee gave its agreement to the proposal from the Technical Secretariat to take advantage of the availability of modern radar facilities on each side of the Dover Straits, implemented at Dover and Cape Gris-Nez respectively, to collect real data on the behaviour of fast ships navigating in the Dover Straits.

In addition to :
- the collection and processing of radar data during a period of one week,
- and the statistical analysis of these data

the proposal made provisions for presentation of the outcomes of the study to the UK and French administrations responsible for the operation of the surveillance centers of Dover and Gris-Nez.

3.4.5.2 - Detailed specifications and study arrangements

The Channel Navigation Information Service (CNIS) is provided 24 hours a day and at Dover and Gris-Nez VTS centers, the VTS operators are faced with a considerable workload day and night.

Nevertheless both the UK and French administrations considering that the radar detection and processing equipment of both centers is duplicated, felt it possible to authorize qualified operators to make use of these facilities to collect and when possible to process, data related to fast vessels movements during specified periods of time.

IFN proposed to resort to the expertise :
- on the UK side of DERA, the large experience of which in the field is indisputable,
- on the French side of Mr. X. Lefèvre, a private consultant who participated in the definition of specifications for a number of French VTSs including that of Cape Gris-Nez.

A visit was arranged at Cape Gris-Nez surveillance center on the 21st of February to decide in agreement with the representatives of the administration responsible for the operations of both Dover and Cape Gris-Nez VTS :

- on the dates when the surveys would take place on both sides of the Dover Straits (May-June),

- on the list of radar data that should be collected and stored in a data base and further processed.

A model of secondary sheet was designed and the fields of the data base were identified.

Given the agreement of all parties concerned detailed specifications of the preliminary study were drawn up.

It was agreed that the experts would be given access to the radar facilities and processing equipment of Dover and Cape Gris-Nez centers and that the operators would use them when available under the operator supervision.

Two tasks were defined.

The first one was entrusted to DERA to cover the activities to be performed on the UK side of the Dover Straits. Mr. Hadley was in particular tasked with the delicate mission to process the information acquired by the radar currently in operation at Dover Longdare Battery. In addition Mr. Hadley proposed and this was accepted to embark on-board a fast catamaran and to discuss with the officers in command.

The second task was awarded to X. Lefèvre to cover the actions to be taken on the French side.

However the recent installation at Cape Gris-Nez of a new type of processing equipment considerably facilitated the determination of ship's trajectories and of associated parameters such as CPA, TCPAs, etc...

In addition to the tasks arrangements above, the UK and French competent authorities kindly accepted to participate in debriefing sessions.

Two meetings were arranged which took place at Dover on the 28th of July and at Cape Gris-Nez on the 17th September.

It was agreed that :

- the first meeting would consist in reviewing and assessing the draft reports issued by both M. Hadley and X. Lefèvre,

- the second meeting objective would be to agree on the final version of both reports and to draw from the activities carried out in common tentative conclusions and recommendations.

The preliminary study on the behaviour of fast ships findings

The reader will find attached hereto :

- a final report integrating into a single document (annex 17) :
    - the data as they have been collected and processed by both M. Hadley and X. Lefèvre,
    - the conclusions that M. Hadley did derive from the analysis of the behaviour of fast vessels in the Dover Straits and from the discussions in Dover with K. Fisher, the UK member of the Management Committee and the CNIS Dover staff,
- the minutes of the meeting held in Dover on the 28th of July 1999 (annex 18),
- the minutes of the conclusive meeting held in Cape Gris-Nez on the 17th of September 1999 (annex 19).

The report contains (pages 4 to 6) an executive summary which gives an accurate overview of the findings of the preliminary study.

As stated in the report the survey of the traffic of HSC in the Dover Straits covered a period of fair weather and the results cannot be extrapolated to non severe hydro meteorological circumstances. In addition the CNIS radar and associated tracking systems suffer from natural technical limitations. The preliminary study carried out in the Dover Straits cannot pretend to cover all the situations induced by HSC traffic in the area.

Despite these limitations the preliminary study essentially concludes that :

- When fast vessels are involved in flows of traffic composed of conventional ships regular infringements of the COLREGs are observed. However some kind of misunderstanding between HSCs and other vessel traffic, including conventional ferries developed coping with irregularities in applying the COLREGs.

- HSC at least in fair weather are routinely operating outside their approved CPA envelopes and have developed their own code of operations with regard to "avoiding collision situation arising".

It is noteworthy that the same conclusions have been reached at the occasion of the FASS project through :

- interviews of masters in command of either monohulls (navigating in the Mediterranean area between Corsica and Sardinia and Italian/French ports) or catamarans (navigating in the Baltic),
- fast simulation,
- full bridge simulation.

One can therefore think that data related to the behaviour of fast vessels can actually be collected through various means and validated.

The way seems therefore open to assess on a scientific basis navigational risks induced by the development of fast vessel traffic in European waters.

Let us add to these conclusions that the observations made either on-shore at both Channel Navigation Information Services (CNIS) centers or on-board, incidentally showed that the information on update time as it is provided by normal radar equipment and their ARPA facilities, does not fully meet the needs of vessels navigating at a speed exceeding 35 knots.

A recommendation is proposed to further investigate the matter which obviously was outside the limited scope of the study.

Finally let us mention that during the discussions which took place in the meetings held at Dover and Cape Gris-Nez, the question was raised as to whether some modification of the COLREGs should be envisaged in a near future.

As recorded in the minutes of these meetings, the representatives from the UK and French administrations showed little enthusiasm to enter in the process of a COLREGs revision.

The position of the UK and French administrations is quite understandable. A large experience has proven the validity of COLREGs and they have constantly provided irreplaceable guidance to court judgements on collisions. In addition it is a fact that until now, fortunately, the number of accidents involving fast vessels remains very limited.

However we feel that if the growth of fast vessel traffic leads to systematically infringe the COLREGs, then a revision of the rules would become unavoidable. The marine community should be prepared to be faced with such a situation.

Final comments

The outcomes of the preliminary study on fast vessels were jointly presented at the VTMIS concerted action conclusive workshop by M. Hadley and X. Lefèvre.

The presentation was apparently welcomed by the audience. No questions were raised from the floor. No further comments were received from the Management Committee. We consider therefore that the outcomes of the study are approved.

Let us repeat here that the fourth and last VTMIS preliminary study is to be seen as a limited contribution to problems of safety of navigation induced by fast vessels. Only a small area has been observed during a short period. In this area the traffic is subject to the permanent surveillance of a strong and well equipped organisation. During the period the weather was fair.

We are inclined to think that the main lesson to be learnt from the study, is that future research on risks induced by the presence of fast vessels should not ignore the possibilities to acquire real and comprehensive data from existing shore based radar and adequate processing facilities.

3.5 - Conclusive actions and trends

This last part of the report will essentially address the conclusive workshop which was held on the 21st of October in Paris to present to a public of European experts, the findings of the VTMIS concerted action.

In addition a few indications are given on future actions that are currently envisaged on the follow-up of the VTMIS concerted action.

3.5.1 - The VTMIS conclusive workshop

3.5.1.1 - Generalities

The reader will find attached hereto as annex 20 the programme of the VTMIS conclusive workshop held in Paris on the 21st of October 1999. The programme was attended by approximately 80 experts from 13 countries.

The workshop was opened by the representative of the French Ministry of Research and Technology followed by the representative of the Commission.

The workshop was chaired by K. Polderman, Directorate General of Transport, the Netherlands. The programme was essentially composed of four groups of presentations :

- Generalities	3 presentations
- Specific studies	4 presentations
- Most recent projects	4 presentations
- Users' request for future developments	3 presentations
	14 presentations

The workshop ended up by a general discussion and concluded by the adoption of a short set of conclusions which can be found hereafter (§ 5.1.3).

Documents provided by the speakers have been gathered and will be published by the Commission as the proceedings of the workshop.

3.5.1.2 - A short review of the presentations

There is actually no point in developing here detailed comments with respect to those presentations the objective of which was to familiarize the audience with the concerted action activities.

We rather think that emphasis is to be put on presentations related to most recent projects and to the users' request for future developments.

3.5.1.2.1 - Recent projects

All recent projects addressed during the session : POSEÏDON, VTMIS-Net, INDRIS, BOPCOM, BAFEGIS, show the way for future developments of the VTMIS concept.

POSEÏDON and VTMIS-Net have identified a large variety of applications responding to the actual needs for information interchange in the maritime sector. Perhaps the main merit of both projects is that they bring out examples of users needs that are usually expressed through either ordinary enquiries or interviews.

The INDRIS project addresses on the other hand the inland waterway transport. The project takes account of two favourable factors :

a) the needs for shore to ship and ship to ship communications along the European inland waterway network have recently been recognised,

b) co-operation between European countries in the inland waterway sector may be promoted more easily than in the maritime sector. It aims at providing a basis for the development of a set of information services covering all the aspects of vessel traffic management including its relationships with transport management. The project intends to develop standards both for the equipment on board and for communications. Demonstrations will be organised along a number of European fairways (on the rivers Danube, Rhine, Scheldt and Seine), allowing to assess the users' interests in the project.

The presentation related to the BOPCOM project showed the potential of a communication platform allowing to ensure the interconnecting of telecommunication network in the maritime sector. A number of applications of the BOPCOM concept are under development. It is therefore anticipated that it will significantly contribute in a near future to alleviate difficulties resulting from the proliferation of telecommunication standards and protocols.

Finally the presentation on Automatic Information System (AIS) and on Electronic Chart Display and Information System (ECDIS) put an emphasis on the role to be played in a very near future by both those systems, not only on board ships but also on shore. In this latter respect it may be expected that coupled with VTS equipment, AIS and ECDIS will considerably improve the quality of the traffic image both at tactical and strategical levels.

3.5.1.2.2 - Users requirements

Three presentations respectively addressed :
- the administration requests,
- the shipowners requests,
- the port authorities requests and the VTMIS concept.

The first paper was delivered by the representative of the Norwegian administration. The paper presented the Norwegian vision of a global information system currently under implementation in Norway to satisfy the needs for information of the whole Norwegian community of maritime users. The project shows the merits of a co-ordinated approach taking account of the relationships between vessel traffic management and transport management. It is anticipated that such an approach will lead to :
- a commonly agreed system architecture
- standardised communication procedures
- seamless GIS (Geographical Information Service)
- standardised data bases and human machine interfaces.

The paper delivered by the representative of the International Chamber of Shipping addressed the needs for shore based information of the following three categories of actors :
- the shipmasters
- the shipowners
- the ship agents.

All these actors appreciate the services rendered by VTS and are prepared to contribute to future applications of the VTMIS concept. However emphasis was put on conditions to be met, to improve the efficiency of information interchanges between shore and ship. It was stressed in particular that the workload resulting from the exploitation of modern ships is now such that there is an urgent need for reconsidering the requirements for multi reporting and for developing more users friendly communication procedures between ships ad VTS operators.

Finally the president of the European Sea Port Organisation reminded the audience that ports act as major catalysts in transport logistics and economic growth. As such they are interested in systems providing information on movements of transportation vectors (ships, trucks, wagons) or goods. Nevertheless there is no evidence yet that users of such services are ready to pay part if not all of the cost of these services. Problems resulting from the facts :

a) that information concerning ships movements is in a way an element of the port global commercial offer, on one hand
b) and that the confidentiality of commercial information must be protected, on the other hand,

are still pending.

3.5.1.3 - Conclusions

To close down the Paris workshop on VTMIS the chairman submitted to the audience a set of tentative conclusions which could be referred back to at the occasion of further research. After discussion the following conclusions were unanimously agreed.

Workshop conclusions :

1. Vessel Traffic Management : a set of activities strongly linked to each other such as traffic organisation and surveillance, crisis management.

2. Projects and demonstrations carried out throughout the IVth FP RTD show the potential of applications based on IT Technologies. They offer adequate means to respond to public and private demand for information services.

3. Vessel Traffic Management : a component of waterborne transport, more generally of the overall chain of transport. Therefore VTMIS should not be considered in “ splendid ” isolation but in its context.

4. A number of projects, more particularly those related to the inland waterway sector, already recognised the importance of interlinking Vessel Traffic Management and waterborne transport, ex. cargo and fleet management and transport logistics.

3.5.1.4 - Final comments

The last session of the Management Committee took place on the 22nd of October 1999, on the day following the venue of the conclusive workshop.

Under point 5 of the agenda of that meeting, members of the Management Committee were asked to comment on the outcomes of the workshop.

The general impression we got from what was said at this meeting[20] is as follows.

[20] Individual members' interventions are recorded in the minutes of the meeting.

The workshop was well attended and the audience showed its interest both in papers presented and in discussions.

Most of the presentations were of outstanding quality.

There is a definite need for further actions aiming at making the VTMIS concept better understood and in particular avoiding confusion with that of VTS.

There is no other way ahead than to faster co-operation at every level (local, national, European) between all actors involved in Vessel Traffic Management.

3.5.2 - VTMIS follow-up

We think it a general opinion that the VTMIS concerted action findings on one hand and those of related projects carried out under the IVth framework programme, on the other hand, have showed the potential of concrete applications of the VTMIS concept.

It is a fact however that within Europe the development of information services in the field of waterborne transport is slower than it could have been expected.

There are signs that the implementation of such services is currently taking place in non-European countries, increasing the competitiveness of the waterborne transport industry outside Europe and to its prejudice.

The VTMIS concerted action showed that a prerequisite to the promotion within Europe of waterborne traffic management information services is to ensure better co-operation between all actors concerned. For various reasons a number of basic issues have not yet been fully addressed. Bases for public private partnership have not yet been established. Ways to protect the confidentiality of the commercial information are not yet clearly identified.

In brief, further efforts are still necessary to overcome difficulties linked to the usual differences between European countries practices and mentalities.

As far as research is concerned, the Commission intentions related to the Vth Framework programme which will cover the period 2000-2004 are stated in a document named Objectives and RTD priorities, Competitive and Sustainable Growth.

The document describes a number of key actions amongst which key action 2 Sustainable mobility and intermodality which basic aims are :

- to promote transport sustainability from an economic, social and environmental point of view,
- to enhance the efficiency and quality of transport systems or services,
- to improve safety and security and optimising the human roles and performance.

In this context the Commission identified a number of research objectives.

In the category of objectives related to "transport management" a specific objective has been identified under the heading 2.3.1 - Traffic management system :
- to improve traffic flow management,
- to develop a basis for integrated transport management architecture.

According to the usual procedure of call for tenders the Commission circulated a request for proposal on specific tasks.

The reader will find attached hereto as annex 21 the description of task 2.3.1/10 which has been included in the first call for tenders.

This document takes clearly account of the outcomes of the VTMIS concerted action.

It shows the way ahead. A co-ordinating structure (the thematic network) will aim "at a common understanding of how VTMIS/RIS can contribute to facilitate the exchange of information on transport and traffic management based on the integration of both on board and shore based information."

In view of preparing the actual implementation of suitable sets of integrated information services, the main following issues would be addressed :
- identification of common users' requirements,
- identification and/or design of an overall system architecture,
- identification and/or design of standard protocols and procedures,
- identification and assessment of potential schemes for valuing and pricing.

It is expected that the Thematic Network on Waterborne Traffic Management and Information Services will start in Spring 2000.

4. General Conclusion

The overall objective of the Commission at the moment when it decided to resort to the Concerted action mechanism to tackle with Vessel Traffic Management and Information Services was clearly to create a platform allowing the representatives of member State administrations to get a common understanding of a concept, i.e. that of Vessel Traffic Management and Information Service.

The concept was new. It had progressively taken shape as a consequence of projects carried out under the 3rd framework programme making it clear that progresses of information and telecommunication technology would not only have an impact on VTS as identified in the course of the COST 301 concerted action and should be considered within a broader frame.

What can be said looking backwards at what has been done is that the concerted action has covered a rather large range of activities which may be divided in four categories consisting in :

- collecting and processing relevant data
- identifying and justifying concepts and
- opening the way to further investigations and facilitating the actual implementation of adequate information systems,
- disseminating the information.

After a few information on the project historical background (§3.I of the report) activities as classified above are reported in part II to V inclusive under the headings :

State of the art
The VTMIS concept
Preliminary studies
Conclusive actions and trends.

The conclusions of the concerted action were drawn up at the concerted action conclusive workshop. They are included in this report (§ 3.5.1). We will not reproduce nor repeat them at this stage.

However we would like to add to these conclusions two comments of our own.

Firstly let us say that it is our strong feeling that the future developments of the VTMIS concept does not so much depend on technologies. Technology is there and may respond to a large variety of demands. In reality in our mind the real prerequisite to such developments is a closer co-operation between European administrations and industry. One of the objective of the thematic network on VTMIS is precisely to promote such a co-operation leading to expect that time has come for concrete implementations of the VTMIS concept.

Secondly, may we point out that this report necessarily reflects, even if unconsciously, the opinions of the members of the Management Committee.

We hope that these opinions have been faithfully reported.

May we acknowledge at this point here how much outstanding have been the Management Committee contributions to the work carried out in common. We thank all of them for their positive attitudes and constant support. In this context may be specially mentioned the contributions of the Dutch and German delegations who participated with the utmost care in the preparation of basic documents to be submitted to the Management Committee.

The concluding plenary session of the second workshop agreed with the following resolution:

Resolution on :

Integration of the results of the TAIE and RTIS projects

into a European VTMIS network

The workshop held in Brussels (2-4 October 1995) :

1. noted with interest the findings of the TAIE, RTIS and APAS projects and the Scandinavian contribution in the latter, the common objectives of which were on the basis of the results of Action COST 301 :

to further elaborate on the concepts of information services aiming at improving the safety and efficiency of maritime traffic and the protection of the environment,

to design and assess methods by means of which would be made available to potential users multi-layered traffic images together with a comprehensive set of operational and training procedures,

2. was given evidence through a number of demonstrations based on the principles laid down by both projects and developed at the occasion of the VTMIS - APAS, that recent advances in technologies actually insure the feasibility and the interoperability of a very large span of applications,

3. expressed the opinion that further research should be undertaken without delay in particular with regard to :
   - the implementation at European level of data bases on marine accidents, marine traffic and cargo flows,
   - the needs for information services outside the territorial waters and in particular for mandatory ship reporting,
   - the characteristics of information flows involved in marine traffic management in normal and abnormal situations,
   - the definition of services to be rendered by the European VTMIS network including the remote pilotage service,
   - the organisation of the network including the definition of the responsibilities of entities involved, the contractual links between the equipment and information users, either public or private and the network operators, the fees policy,
   - further developments of cost benefit analyses and cost advantage analyses,
   - further assessments of the confidentiality and acceptability of maritime information services,
   - further developments in the field of harmonisation of procedures and standardisation of VTMIS equipment,
   - further emphasis on an integration of part solutions into a European VTMIS network.

4. expressed the wish that a commonly agreed policy on the development of information services be established together with a co-ordinated plan for the implementation of such services over European waters and inland waterways, when required.

   The plan could include the implementation at the scale of several member states of a pilot project to allow the maritime community to better appraise the potentialities of a VTMIS network and to detect the possible needs for refinements and further actions.

These conclusions were amended and then approved by the plenary session of the VTMIS workshop, held in Hilton Brussels, Oct. 4th 1995.

6.3.4/29 Research and demonstration of conceptual (legal, procedural and organisational) tools and scenarios to be integrated into VTS to provide "value added services".

Background/Objectives

Vessel traffic services have the potential of providing more services than just navigational support or assignment of berths. These services could encompass search and rescue, contingency planning, civil protection, monitoring of vessels carrying dangerous goods, port resources planning, information services in ports, environment protection, pollution monitoring, inclusive of detection and monitoring of drift and spread of pollution using waterborne, air and spaceborne surveillance.

The work aims at an assessment of the feasibility to include the above mentioned services into VTS in order to expand it by "value added services" to form a VTMIS system.

Approach

- summarise the knowledge on the state of the art
- build concepts and models in co-operation with the actors in this field
- prepare report, concepts and demonstration software.

Deliverables :	Report/Concepts/Demonstration software
Type of action envisaged :	Concerted Action/Research Study
Timing of action envisaged :	1st call, 36 months
Links to other research tasks :	Telematics TR3.31
Relevant studies or projects in this area :	APAS 1994 Waterborne/1 (VTMIS)

Relevant results considered necessary for the development of the research will be made available for the successful consortia(e).

May 1998

VTMIS Glossary of Terms

This Glossary of Terms is not exhaustive. It was compiled to facilitate communication between persons engaged in the Concerted Action ‘’VTMIS’’or in related R&D actions.

Sources of definitions are given in square brackets, where available.
Last update : 98/05/11

Term	**Definition**
4S Transponder	Ship/ship and ship/shore radio TDMA transponder
Accident	See marine accident
Advice	SMCP message marker, indicating that the following message implies the intention of the sender to influence others by recommendation. The decision whether to follow stays with the recipient [SMCP]
AIS	Automatic Identification System, a term for radio transponders which provide identification and additional data
Allied Services	Services actively involved in the safe and efficient passage of a vessel through a VTS area [IMO 857(20)]
Answer	SMCP message marker, indicating that the following message is the reply to a previous question [SMCP]
ARPA	Automatic Radar Plotting Aid [IMO]
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATD	Actual Time of Departure
Availability	Probability that a system fulfils its objectives
CAM	Collision Avoidance Manoeuvre
Classification	- Location of a target including a detailed description of the type of vessel [COST 301] - Statistically: Assignment of a target to a certain class of vessels according to various criteria, e.g. type, size - Also used for quality control by certain Classification Societies
Classification Societies	Societies which perform quality control of vessels according to commonly agreed ship building rules, partly joined in the IACS (International Association of Classification Societies)
Co-operation with Allied Services, Emergency Services, adjacent VTS	A supporting activity of a VTS involving data exchange and action agreement [IALA VTS Man.]
Co-operative System	- System where two entities co-operate on a manual or automatic basis, e.g. location and possibly identification - Polling system based on special shipborne equipment
Collision	Striking another ship, regardless of whether underway, anchored or moored including underwater wrecks
Competent Authority	Authority made responsible, in whole or in part, by the Government for the safety, including environmental safety, and efficiency of vessel traffic and the protection of the environment [IMO 857(20)]
Concerted Action	Co-ordination of research projects and demonstrations in a particular sector, bringing together EU national administrations and interested parties - to summarize the knowledge on the state of art - to monitor the progress of the research actions - to prepare analyses, reports on certain issues, and recommendations
CPA	Closest point of approach
Crossing Encounter	Encounter of two vessels neither being a head-on nor an overtaking encounter [COLREG Convention]
Dangerous Goods Report (DG)	Report to be sent when an incident takes place involving the loss or likely loss of packaged dangerous goods [IMO 648(16)]

Demonstrator	Activities to make research results visible, to demonstrate technical feasibility, to indicate potential cost, to assess resulting benefits
Detection	To discover the existence of an object. In case of radar systems: detection and location of a target without knowledge of its identity and characteristics
Deviation Report (DR)	Report to be sent when position varies from that predicted from previous reports, when changing reported route, or as decided by the master [IMO 648(16)]
DF	Radio Direction Finder
DGPS	Differential Global Positioning System
Digital Site	Defined geographical area providing common telematics infrastructure and a critical mass of end-users committed to the validation of applications in real life situations
Domain	The area around a ship which the navigator attemps to keep clear of other ships or stationary /drifting objects
DSC Transponder	A radio transponder making use of Digital Selective Calling, which may be a part of a shipborne GMDSS equipment
Duration	Time required to complete an activity
ECDIS	Electronic Chart Display Information System
EDI	Electronic Data Interchange
Effectiveness	- For traffic: cost effective, undelayed - For aids to navigation with reference to shipping: availability under stated conditions in a particular locality to enable mariners safely to proceed along a predetermined track - For aids to navigation and VTS with respect to operation: provision of a service complying with the safety requirements in a given area at minimum costs
Emergency Services	Services which become active in case of an incident or accident (SAR, Pollution Combating, Fire Fighting, Medical Service)
ENC	Electronic Navigation Chart
Encounter	Meeting of two vessels (in COST 301 restricted to the penetration of a ship into the domain of another ship or a fixed maritime structure)
Error Circle (Ellipse)	Circle (Ellipse) which contains a specified statistical amount of all possible measurements [COST 301]
ETA	Estimated time of arrival
ETD	Estimated time of departure
EUROREP	European Vessel Reporting System
EWTIS	The European Waters Traffic Information System project (DG XIII)
Final Report (FR)	Report to be sent on arrival at a destination and when leaving an area covered by a system [IMO 648(16)]
Generic VTS	Hypothetical VTS based on typical operation, providing frame of reference
GIS	Geographic Information System
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GP&C Transponder	Previous name for the 4S transponder (see there)
GPS	Global Positioning System

Harmful Substances Report (HS)	Report to be sent when an incident takes place involving discharge or probable discharge of oil or noxious liquid substances in bulk [IMO 648(16)]
Hazardous Cargoes	Summarizing term for the following goods: - goods classified in the IMDG Code - substances classified in chapt.17 of the IBC and chapt.19 of the IGC Code - oils as defined in MARPOL Annex I - noxious liquid substances as defined in MARPOL Annex II - harmful substances as defined in MARPOL Annex III - radioactive materials specified in the INF Code
Head-on Encounter	An encounter where both ships are on reciprocal or nearly reciprocal courses [COLREG Convention, COST 301]
HMI	Human Machine Interface
IBC Code	International Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
Identification	Acquiring the identity of an unknown object on a known position [IALA]
IGC Code	International Code for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
INF Code	International Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High Level Radioactive Wastes in Flasks on Board Ships
Information	SMCP message marker, indicating that the following message is restricted to observed facts. Consequences are up to the recipient. Also used in a general meaning (involving a content)
Information Broadcast	Broadcast of general information about the traffic and fairway situation by the Information Service of a VTS at fixed times or when deemed necessary
Information Service	A service of a VTS to ensure that essential information becomes available in time for on-board navigational decision making [IMO 857(20)]
Instruction	SMCP message marker, indicating that the following message implies the intention of the sender to influence others by regulation. The recipient has to follow this legally binding message unless he reports contradictory safety reasons [SMCP]
Intention	SMCP message marker, indicating that the following message informs others about immediate navigational actions intended to be taken [SMCP]
LAN	Local Area Network
Lateral Distribution	Distribution of the paths of vessels on a route in a lateral direction
Marine Accident	Any incident to a ship in which the condition of the ship suffers adversely
Marine Pollutants Report (MP)	Report to be sent in case of loss or likely loss overboard of harmful substances in packaged form [IMO 648(16)]
Mark	All-embracing term for lighthouses, buoys, beacons, day marks etc. [COST 301]
MARPOL	International Convention for the Prevention of Pollution from Ships
Master	Captain of a vessel, whom decisions concerning the actual navigation and the manoeuvring of the vessel remain with [IMO 857(20)]
Message Marker	Specified words introducing a message to make clear its status (information, warning, advice, instruction, request, intention, question, answer, SMCP)
Most Probable Position	Best estimate of ship's position from all available data

Navigational Assistance Service	A service of a VTS to assist the on-board navigational decision making and to monitor the effects, especially during difficult circumstances, with messages updated in appropriate intervals [IMO 857(20), IALA VTS Man.]
Net Present Value	The aggregate of future income (benefits) and expenditure (capital investment, running costs) discounted back to the present at a given compound interest rate
Non-co-operative System	Location and possibly identification system not based on special shipborne co-operating equipment
Overtaking Encounter	Encounter where the overtaking ship has a relative bearing between 112,5° and 247,5° measured from the ship considered [COLREG Convention]
Pilotage	A voluntary or compulsory service to provide a master with assistance in manoeuvring his vessel, in communication ship/shore, based on local knowledge
Plot	Indication of the unfiltered (unsmoothed) central position of a detected object regarded as a target
Position Report (PR)	Report to be sent when passing certain positions to ensure effective operation of a system [IMO 648(16)]
Probability	Likelihood of a figure or event based on available statistical information and represented by a number lying between zero and one [COST 301]
Question	SMCP message marker, indicating that the following message is of interrogative character [SMCP]
Racon	Radar responder beacon to mark a position of navigational importance
Radar Transponder	Transponder which is interrogated by radar
Radio Transponder	Transponder which is interrogated or broadcasts by radio
Ramming	jargon, equivalent to collision
Recognition	Location including identity of a vessel
Region	A predetermined coherent area of land or sea which can be considered as a geographical unit, which may consists of sub-regions
Request	SMCP message marker, indicating that the following message is asking for action from others with respect to the ship. The recipient should confirm or answer in the negative [SMCP]
Resource	Means (personnel, equipment) required to carry out an activity
Resource Planning	Advance allocation of resources to satisfy given objectives
Route	Intended or chosen path between two points or ports
RTIS	The Regional Traffic Information System project (DG VII)
Sailing Plan (SP)	Report to be sent before departure from a port within a system or when entering the area covered by a system [IMO 648(16)], normally including ETA or ETD, may be amplified at request of a VTS [IMO 857(20)]
SAR	Search and Rescue [SAR Convention]
Scenario	An hypothetical set of conditions and sequence of events contructed for the purpose of analysing or training a problem
Service Craft	Vessels which provide services other than those specified in ship classes (e.g. tugs, dragders, tenders, naval vessels
Ship Classes	Tankers, Gas Carriers, Bulk Carriers, Ferries, Passenger Vessels, Ro-Ro and Container Vessels, Car Carriers, General Cargo Ships, Supply Vessels, Fishing Vessels, Small Craft, Pleasure Craft
Ship Reporting System	System according to IMO Res. A.648(16) where ships make mandatory or voluntary reports (e.g. AMVER)
Shore Based Pilotage	Remote pilotage provided by a VTS Centre under specified conditions within Navigational Assistance Service
SMCP	Standard Marine Communication Phrases of the IMO, a further development of the Standard Marine Navigational Vocabulary (SMNV)
SMNV	Standard Marine Navigational Vocabulary, see SMCP
SOLAS	Safety of Life at Sea (Convention, IMO)
Status of a Message	Degree of intensity of intended interaction, made clear by introducing message markers
STCW	Standards of Training, Certification and Watchkeeping for seafarers (IMO)

Stranding	Any contact between a ship and the sea bottom
Strategical Level	Level involving general features of the mission of a vessel in terms of sailing plan, destination, cargo (long time period, decisions on route and schedule) [COST 301]
Swept Path	Path limited by the boundaries of the path of one or the superposition of paths of several vessels on a certain route
Symptomatic Event	Event which should initiate a corresponding decision of an operator
Tactical Level	Level involving actual features of the navigation of a vessel (short time period, decisions on position, course and speed) [COST 301]
TAIE	The Tools for the Assessment and Improvement of Existing VTS (Project, DGVII)
TCPA	Time to closest point of approach
TDMA Transponder	Time division multiple access radio transponder, making efficient use of a radio channel based on a common time and fixed time slots
Track	- VTS : successive indication of the filtered (smoothed) central positions of a detected object regarded as a target, possibly including a speed vector and a label - Navigation : chart course [DIN 13312]
Traffic Flow	Number of ships on a path within a predetermined width
Traffic Image	Surface image of vessels and their movements in an area (fairway situation, traffic situation), resulting from data collection
Traffic Organization Service	A service of a VTS to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area [IMO 648(16)]
Traffic Separation Scheme	A fixed space allocation as a passive measure to separate traffic flows [COST 301]
Transponder	Co-operative device capable to transmit autonomously (broadcast) or on interrogation certain data (identification, position, additional data) and possibly also to receive such data
Transverse Distribution	Distribution of the paths of vessels on a route in a transverse direction
UHF	Ultra High Frequency (300 - 3,000 MHz)
Value Added Information Service	Additional information services which result when several sources of information are interlinked in a common network
Vessel Traffic Management	Set of efforts (measures, provisions, services and related functions) which, within a given area and under specified circumstances, intend to minimize risks for safety and the environment, whilst maximizing the efficiency of waterborne transport
Vessel Traffic Management and Information Services	see VTMIS
VHF	Very High Frequency (30 - 300 MHz)
Voyage	A movement of a ship between the harbour of departure and the harbour of destination
VTIS	Vessel Traffic Information System, applied for certain VTS, no internationally standardized term

VTMIS	Vessel Traffic Management and Information Services: intend to respond to public and private demand for facilitating Vessel Traffic Management. They include services distributing in given areas (at regional, national or transnational level) the pertinent information to be used both in real time and in retrieval modes by actors involved. The implementation of or participation in a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services which are or will be implemented in the area, such as VTS, Allied Services and other information services, are interlinked and cooperate according to commonly harmonized procedures.
VTMS	Vessel Traffic Management System, applied for certain VTS, no internationally standardized term
VTS	Vessel Traffic Services, according to IMO Res.A.857(20) ''a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area''
VTS Area	Delineated, formally declared service area of a VTS
VTS Authority	Authority responsible for the management, operations and co-ordination of the VTS, the interaction with participating vessels and the safe and effective provision of the service [IMO 857(20)]
VTS Centre	Centre from which a VTS is operated [IMO 857(20)]
VTS Communication	Link between VTS and VTS Users, can be verbal or non-verbal
VTS Elements	Elements required to perform the VTS tasks: The 3M : Man, machine, method (VTS operators, housing and instrumentation including software, operating procedures) [IALA VTS Man.]
VTS Functions	Fundamental VTS functions to be performed: Data collection, data evaluation, data dissemination [IALA VTS Man.]
VTS Operator	Appropriately qualified person performing one or more tasks contributing to the services of a VTS [IMO 857(20)]
VTS Publication for Users	Promulgation of local rules and regulations, services offered and area concerned by a VTS authority (e.g. World VTS Guide)
VTS Sailing Plan	Plan which is mutually agreed between a VTS Authority and the master of a Vessel concerning the movement of the vessel in a VTS area [IMO 857 (20)]
VTS Services	Services provided by a VTS centre, partly facilities (placed at the disposal of the mariner, optional), partly measures (adherence is mandatory): - Information Service - Navigational Assistance Service - Traffic Organization Service - Co-operation with allied services, emergency services, adjacent VTS [IALA VTS Man.]
VTS Users	Vessels using the VTS and other users (allied services, emergency services, adjacent VTS, other traffic related organizations)
VTSC	Vessel Traffic Services Centre
WAN	Wide Area Network
Warning	SMCP message marker, indicating that the following message implies the intention of the sender to inform others about danger. Consequences are up to the recipient [SMCP]
Way Point	A point where either the traffic flow changes its direction or a point related to the intended track of a vessel
Work Package	A sub-division of a task, the execution of which commences and finishes at specified events
Workshop	Meeting to provide information, demonstration and discussion on a certain topic

VTMIS Literature Survey

The list is structured as follows:

[1. Research Papers] [2. Books/ Brochures/Reports] [3. Standards] [4. EU Policy papers]

Last update: 2000/02/16 - 262 research papers listed

1. Research papers

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Meerwaarde van direct zicht in huidige verkeersbegeleidingssystemen
(Added value of direct visual sight for inland VTS's).
Study, 1996

ANG XIANGLIN
Cost Benefit Analysis Evaluation Method and Model of VTS
Proceedings of VTS 2000 Symposium,
Singapore, 18 - 21 January 2000

ANONYMUS
Conclusions du 8ème Symposium International sur les VTS
(Conclusions of the 8th VTS Symposium), Rotterdam 1996
NAVIGATION n° 175, July 1996

ANONYMUS
Modern trends in vessel traffic
Jrg. 80, nr 11, p. 37, Zeewezen, 1991

ARENDT, F.
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(Discussion of innovative concepts for ship data exchange between Federal VTS and allied services)
Study for the Federal Waterways Authority, 1996, 54 pages

ARENDT, F.
EWTIS - European Water Traffic Information System
Paper published in Ortung und Navigation 1994 / 3

ARENDT, F.
Traffic Management, The Concept of VTS - Logistic Views
Report on the workshop on the user's requirements of Vessel traffic management and information services
European Commission DG VII, ISBN 92-828-3250-3, 1998

BACKSTROM, R.
A National Traffic Information System for the Maritime Community
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(OJ N° L59 of 4.3.1992, p.17)

Council Directive 93/75/EEC, of 13 September 1993
CONCERNING MINIMUM REQUIREMENTS FOR VESSELS BOUND FOR OR LEAVING COMMUNITY PORTS AND CARRYING DANGEROUS OR POLLUTING GOODS
(OJ N° L 247 of 5.10.1993, p.19),
amended by :

- Commission Directive 96/39/EC of 19 June 1996 (OJ N° L 196 of 7.8.1996, p.7)
- Commission Directive 97/34/EC of 6 June 1997 (OJ N° L 158 of 17.6.1997, p.40, corrigendum OJ N° L 162 of 19.6.1997, p.56)
- Council Directive 98/55/EC of 17 July 1998 (OJ N° L 215 of 1.8.1998, p. 65)
- Commission Directive 98/74/EC of 1 October 1998 (OJ N° L 276 of 13.10.1998, p.7)
- LIST OF COMPETENT AUTHORITIES DESIGNATED BY MEMBER STATES to which the information and notifications provided for in Council Directive 93/75/EEC of 13 September 1993 concerning minimum requirements for vessels bound for or leaving Community ports and carrying dangerous or polluting goods, shall be addressed (OJ N° C 65 of 1.3.1997, p.3, and modification of the list in OJ N°C 150 of 16.5.1998, p.3)

Council Directive 94/58/C of 22 November 1994,
ON THE MINIMUM LEVEL OF TRAINING OF SEAFARERS
(OJ N° L 319 of 12.12.1994, p.28),
amended by :
Council Directive 98/35/EC of 25 May 1998 (OJ n° L 172 of 17.6. 98, p.1)
Council Directive 95/21/EC, of 19 June 1995,
CONCERNING THE ENFORCEMENT, in respect of shipping using Community ports and sailing in the waters under the jurisdiction of the Member States, OF INTERNATIONAL STANDARDS for ship safety, pollution prevention and shipboard living and working conditions (port State control)
(OJ N? L 157 of 7.7.1995, p.1),
amended by:

- Council Directive 98/25/EC of 27 April 1998 (OJ N° L 133 of 7.5.1998, p. 19)
- Commission Directive 98/42/EC of 19 June 1998 (OJ N° L 184 of 27.6.1998, p. 40)
- Commission Directive 1999/97/EC of 13 December 1999 (OJ N° L 331 of 23.12.1999, p. 67)

A EUROPEAN VTS DATA BASE Questionnaire

1. VTS Identification

1.1 Name (*in full*) ....

1.2 Locations of the VTS Centres C.1 Name ....
Location ....
Geographical Coordinates Lat ....
Long ....

C.2 Name ....
Location ....
Geographical Coordinates Lat ....
Long ....

(*add other centres information as necessary*)

1.3 Competent authority having implemented and operating the VTS :
name (*in full*) ....

1.4 Contact (person or organization duly authorized to provide the Commission or its delegates with information relating to the VTS) :
name (in full) ....
address : ....
Tel. .... Fax ....
E. mail ....

2. Situation context

2.1 - Area type

2.1.1 Open sea area Length (km) ....
Width (km) ....

2.1.2 Confined waters : Type of the waterway

Approach ☐ Length of the waterway (km).............
Width of the waterway (m) : ....
Depth of the waterway (m) : ....

River ☐ Length of the waterway (km).............
Width of the waterway (m) : ....
Depth of the waterway (m) : ....

Canal ☐ Length of the waterway (km).............
Width of the waterway (m) : ....
Depth of the waterway (m) : ....

2.1.3 Harbour : Surface (km²) : ....
Length of berths (km) : ....

2.2 - Environmental conditions

2.2.1 Tide Swing (m) : ....

2.2.2 Fog causing High ☐

	Medium	☐	
	Low	☐	
	No	☐	problems
2.2.3 Storm causing	High	☐	
	Medium	☐	
	Low	☐	
	No	☐	problems
2.2.4 Ice causing	High	☐	
	Medium	☐	
	Low	☐	
	No	☐	problems

2.3 - Traffic type

2.3.1 Commercial through traffic
Annual nbr. of movements of vessels : ....

2.3.2 Commercial crossing traffic :	High	☐
	Medium	☐
	Low	☐

2.3.3 Commercial arriving/departing traffic
Annual nbr. of movements of seagoing vessels : ....
inlands vessels : ....

2.3.4 Presence of fishing vessels :	High	☐
	Medium	☐
	Low	☐
2.3.5 Presence of pleasure crafts	High	☐
	Medium	☐
	Low	☐

3. Resulting traffic problems justifying the VTS

3.1 - Collisions : Average Nbr/10,000 movements before implementation ....
after implementation ....

3.2 - Groundings/strandings :
Average Nbr/10,000 movements before implementation ....
after implementation ....

3.3 - Delays of vessels due to meteo/hydro difficulties

before implementation	High	☐
	Medium	☐
	Low	☐
after implementation	High	☐
	Medium	☐
	Low	☐

3.4 - Delays due to resource misplanning

before implementation	High	☐
	Medium	☐
	Low	☐
after implementation	High	☐

Medium ☐
Low ☐

3.5 - Damages to objects as berthed vessels or embankment
before implementation High ☐
Medium ☐
Low ☐

after implementation High ☐
Medium ☐
Low ☐

3.6 - Environmental pollution before implementation High ☐
Medium ☐
Low ☐

after implementation High ☐
Medium ☐
Low ☐

4. Legal aims of the VTS

4.1 - Contribution to safety of traffic to avoid collisions Yes ☐ No ☐
grounding/stranding Yes ☐ No ☐

4.2 - Contribution to efficiency of traffic :
by assistance in case of hydro. difficulties Yes ☐ No ☐
meteo. difficulties Yes ☐ No ☐

4.3 - Contribution to efficiency of traffic :
by shore-based co-operation for resource planning Yes ☐ No ☐

4.4 - Contribution to environmental protection
to avoid pollution Yes ☐ No ☐
to limit pollution Yes ☐ No ☐

5. Services provided

5.1 - Information Service : General information by broadcast or on request :
permanently ☐
under certain conditions ☐
not provided ☐

5.2 - Traffic Organization Service : Traffic control permanently ☐
under certain conditions ☐
not provided ☐

5.3 - Navigational Assistance Service :

5.3.1 Restricted Navigational Assistance, not regularly updated, not confirmed begin and end : permanently ☐
under certain conditions ☐
not provided ☐

5.3.2 Full Navigational Assistance, regularly updated, confirmed begin and end, pilot on board permanently ☐
under certain conditions ☐
not provided ☐

5.3.3 Shore based pilotage, as 5.3.2, but as a replacement for a shipborne pilot :

permanently ☐
under certain conditions ☐
not provided ☐

5.4 - Assistance of allied services :

5.4.1. Real time primary shore users : Regular data exchange with interactive allied services Yes ☐ No ☐

5.4.2 Real time secondary shore users :Data provision/exchange with passive allied services Yes ☐ No ☐

5.4.3 Non real time shore users : Data provision for statistics and account settlement Yes ☐ No ☐

5.5 - SAR
Direct task of the VTS ☐
Assistance to SAR ☐
No implication ☐

5.6 - Pollution fighting
Direct task of the VTS ☐
Assistance to combatting service ☐
No implication ☐

5.7 - Fire fighting
Direct task of the VTS ☐
Assistance to fire fighting service ☐
No implication ☐

6. Data collection to build up a traffic image

6.1 - Reports by voice

6.1.1 Reporting mandatory Yes ☐
for which vessels ....

No ☐

6.1.2 Types of report required
SP = Pre-entry rep. ☐
PR = Position rep. ☐
DR = Deviation rep. ☐
FR = Final rep. ☐
DG = Dangerous goods rep. ☐
HS = Harmful subs. rep. ☐
MP = Marine pollutants rep. ☐

6.1.3 Reporting channel
HF Yes ☐ No ☐
VHF Yes ☐ No ☐
Number of simplex channels ....
Number of duplex channels ....

6.1.4 Telephone reports from shorebased sources :
Adjacent VTS : Yes ☐ No ☐
Allied Services Yes ☐ No ☐

6.2 - Reports by data transfer :

6.2.1 Telegrams from vessels Yes ☐ No ☐
shore by vessel's operator Yes ☐ No ☐
agent or the like Yes ☐ No ☐

6.2.2 Fax from	vessels	Yes	☐	No	☐
	shore by vessel's operator	Yes	☐	No	☐
	agent or the like	Yes	☐	No	☐

6.2.3 EDI from	vessels	Yes	☐	No	☐
	shore by vessel's operator	Yes	☐	No	☐
	agent or the like	Yes	☐	No	☐

6.3 - Detection and ranging of objects by non-co-operative sensors

6.3.1 Primary pulse radar	Number of	radar stations	....
		sensors	....
6.3.2 Primary FMCW radar	Number of radar stations		....
		sensors	....
6.3.3 CCTV	Number of TV sensor stations		....
6.3.4 Binocular, visual observation	Number of observing stations		....

6.4 - Detection and ranging of objects by co-operative sensors

6.4.1 Secondary radar	Number of	radar stations	....
		sensors	....
6.4.2 VHF-Direction finder	Number of DF stations		....
6.4.3 Transponders	Number of vessels equipped		....

6.5 - Remote monitoring of the fairway condition

6.5.1 Tide gauge sensors	Yes	☐	No	☐
6.5.2 Visibility sensors	Yes	☐	No	☐
6.5.3 Wind force/direction sensors	Yes	☐	No	☐
6.5.4 Remote monitoring/control of operational state of aids to navigation :	Yes	☐	No	☐

6.6 - Traffic image in the VTS centre(s)

6.6.1 Raw radar display	Number of displays	....
6.6.2 Synthetic radar displays (graphic, plots, tracks)	Number of displays	....
6.6.3 Mixed radar displays (raw radar + synthetic)	Number of displays	....

6.6.4 Ship data presentation on radar displays, number of displays ....
on separate displays, number of displays ....

6.6.5 Ship data bank	own data		☐
	Lloyds data	by disk or the like	☐
	by EDI		☐
	none		☐

6.6.6 ECDIS with superimposed	radar data	☐	
	transponder data	☐	
	ship data	☐	Nbr of displays ....

6.6.7 ECDIS data source

self programmed	☐
ECDIS data provided by disk or the like	☐
by EDI	☐

7. Data evaluation

7.1 - Automatic radar extraction and tracking :

mono tracking	Yes	☐	No	☐
multi tracking	Yes	☐	No	☐

7.2 - Manual evaluation of symptomatic events by operators Yes ☐ No ☐

7.3 - Automatic detection of symptomatic events and alerting

danger of small CPA	Yes	☐	No	☐
crossing the fairway center line	Yes	☐	No	☐
crossing of a line of unsufficient depth	Yes	☐	No	☐
encounter in limited space	Yes	☐	No	☐

others(specify..)

7.4 - Application of expert systems giving guidance in multiple simultaneous situations
Yes ☐ No ☐

7.5 - Preparation of standard messages Yes ☐ No ☐

7.6 - Data storage

Communication		Yes	☐	No	☐
Synthetic traffic image		Yes	☐	No	☐
Raw radar traffic image	permanently	Yes	☐	No	☐
	on demand	Yes	☐	No	☐

8. Data dissemination

8.1 - By voice communication

8.1.1 Channels

HF	Yes	☐	No	☐
VHF	Yes	☐	No	☐

Number of simplex channels ....
Number of duplex channels ....

8.1.2 Language

National	☐
English	☐
Both	☐

8.1.3 Use of Standard Marine Navigational Vobabulary

often	☐
seldom	☐
not at all	☐

8.2 - By data communication

8.2.1 By NAVTEX to vessels	alphanumeric	Yes	☐	No	☐
8.2.2 By fax to vessels	alphanumeric	Yes	☐	No	☐
8.2.3 By EDI to vessels	alphanumeric	Yes	☐	No	☐
	graphic	Yes	☐	No	☐
8.2.4 By transponders to vessels	alphanumeric	Yes	☐	No	☐

graphic Yes ☐ No ☐

8.2.5 By fax to shore based services (adjacent VTS, allied services) :
alphanumeric Yes ☐ No ☐

8.2.6 By EDI to shore based services (adjacent VTS, allied services) :
alphanumeric Yes ☐ No ☐
graphic Yes ☐ No ☐

8.3 - Publication of the VTS in the World VTS Guide Yes ☐ No ☐
In preparation ☐

9. VTS Operators

9.1 - Permanent operators

9.1.1 Number (simultaneous) ....

9.1.2 Qualification Maritime background Yes ☐ No ☐
Specific VTS certificate Yes ☐ No ☐

9.1.3 Special central VTS training including VTS simulator
Yes ☐ No ☐

9.1.4 Local VTS training with dedicated means Yes ☐ No ☐

9.1.5 Local VTS training on the job Yes ☐ No ☐

9.2 - Non permanent operators

9.2.1 Number (simultaneous) ....

9.2.2 Qualification Maritime background Yes ☐ No ☐
Specific VTS certificate Yes ☐ No ☐

9.2.3 Special central VTS training including VTS simulator
Yes ☐ No ☐

9.2.4 Local VTS training with dedicated means Yes ☐ No ☐

9.2.5 Local VTS training on the job Yes ☐ No ☐

List of 72 European VTS

CODE	1,1 Name	COUNTRY	Nbr. VTS/Country
SCHELD	VTS Scheldemond	BELGIUM	1
DROGDE	Drogden VTS	DENMARK	2
GRBELT	Great Belt Trafic	DENMARK	
FORTH	Forth Navigation Service	ENGLAND	6
HARWI	Harwich Harbour	ENGLAND	
LONDON	Port Control Centre London	ENGLAND	
DOVERS	in the Strait of Dover and adjacent waters	ENGLAND	
HUMBER	VTS Humber	ENGLAND	
SOUTHA	Southampton VTS	ENGLAND	
TURKU	Turku VTS	FINLAND	2
HELSI	Helsinki VTS	FINLAND	
JOBOUR	CROSS Jobourg	FRANCE	13
GRINEZ	CROSS Gris Nez	FRANCE	
DUNKE	Port of Dunkirk	FRANCE	
MARS	Marseille	FRANCE	
HAVRE	Havre Port	FRANCE	
NANTES	Port Autonome Nantes Saint Nazaire	FRANCE	
BORD	Bordeaux	FRANCE	
CALAIS	Calais Port	FRANCE	
BOULOG	Boulogne Port	FRANCE	
FOS	Fos Port Control	FRANCE	
CORSEN	CROSS Corsen (Ouessant)	FRANCE	
ROUEN	Port Autonome de Rouen	FRANCE	
SETE	Sete Port	FRANCE	
EMS	VTS Ems	GERMANY	12
CUXHAV	Cuxhaven Elbe (1)	GERMANY	
GBIGHT	VTS German Bight	GERMANY	
BRUNSB	Brunsbuttel Elbe (2)	GERMANY	
HAMBUR	Hamburg Elbe 3	GERMANY	
WARROS	VTS Warnemünde/Rostock	GERMANY	
WESER1	VTS Weser(1)	GERMANY	
TRALUB	VTS Travemünde/Lübeck	GERMANY	
KIELW	VTS Kiel Canal West	GERMANY	
WESER2	VTS Weser(2)	GERMANY	
KIELE	VTS Kiel Canal East	GERMANY	
JADE	VTS Jade	GERMANY	
PIRAE	Pireaus VTS	GREECE	1
LIVORN	Livorno VTS	ITALY	2
GENOA	GENOA VTS	ITALY	

VBSAR1	VTS Amsterdam Rhine Canal (VBS-ARK)I	NETHERLAND	8
WEMEL	SBS Oosterschelde - VTS Eastern-Scheldt	NETHERLAND	
ROTTER	VTMS Rotterdam	NETHERLAND	
DRECHT	VBS/VTS Drechtsteden	NETHERLAND	
IJMOND	VTS Ijmond	NETHERLAND	
WAAL	VBS/VTS Waal	NETHERLAND	
VBSAR2	VTS Amsterdam Rhine Canal (VBS-ARK)I	NETHERLAND	
HELDER	Trafic Center Den Helder	NETHERLAND	
FEDJE	VTS Fedje	NORWAY	3
BREVIK	Brevik Grenland	NORWAY	
HORTEN	HORTEN VTS	NORWAY	
SINES	Sines Port Control	PORTUGAL	2
SETUBAL	Setubal VTS	PORTUGAL	
GIJON	Centro Regional de Coordinación de Salvamento de Gijón	SPAIN	12
BILBA	Centro Regional de Coordinación de Salvamento de Bilbao	SPAIN	
SANTAN	Centro Local de Coordinacion de Salvamento de Santander	SPAIN	
LACORU	Centro Local de Coordinación de Salvamento de A Coruña	SPAIN	
FINIST	Centro Zonal de Coordinación de Salvamento de Finisterre	SPAIN	
VALENC	Centro Regional de Coordinación de Salvamento de Valencia	SPAIN	
ALMERI	Centro Regional de Coordinación de Salvamento de Almeria	SPAIN	
TENERI	Centro Regional de Coordinación de Salvamento de Tenerife	SPAIN	
TARRAG	Centro Local de Coordinación de Salvamento de Tarragona	SPAIN	
BARCEL	Centro Regional de Coordinación de Salvamento de Barcelona	SPAIN	
LASPAL	Centro Regional de Coordinación de Salvamento de Las Palmas	SPAIN	
TARIFA	Centro Zonal de Coordinación de Salvamento de Tarifa	SPAIN	
LULEA	Lulea Trafic	SWEDEN	8
MARSTR	Marstrand Pilotstation	SWEDEN	
LISKIL	Lysekil Pilotstation	SWEDEN	
GOTHEN	Gothenburg Trafic	SWEDEN	
STOCKH	Stockholm Pilotstation	SWEDEN	
MALARN	Malaren (Landsort) Pilotstation	SWEDEN	
OXELOS	Oxelosund Pilotstation	SWEDEN	
FLINT	Flint VTS	SWEDEN	

Vessel Traffic Management and Information Services

The VTMIS Definition

The Concerted Action VTMIS has been working on a definition describing 'VTMIS' with the following result:

> *Vessel Traffic Management: the set of efforts (measures, provisions, services and related functions) which, within a given area and under specified circumstances, intend to minimise risks for safety and the environment, whilst maximising the efficiency of waterborne and connecting modes of transport.*
>
> *Vessel Traffic Management and Information Services intend to respond to public and private demand for facilitating Vessel Traffic Management. Vessel Traffic Management and Information Services include services distributing in given areas (at regional, national or transnational level) the pertinent information to be used both in real time and in retrieval modes by actors involved.*

Comment on the VTMIS Concept

Generalities

From the users' point of view a VTMIS will appear as a 'value-added network' (VAN). Within a region the network would link a number of nodes where functions of collecting, storing and processing information available at local level will be performed.
Depending on the objectives of a given future VTMIS, some of the existing VTS and also new ones might act as nodes of that specific VTMIS.
The following should be borne in mind :

a) The Concerted Action Management Committee has specified that :

> The implementation of or participation in a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services which are or will be implemented in the area, such as VTS, Allied Services and other information services, are interlinked and co-operate according to commonly harmonised procedures.

b) The definition of a VTS (as per IMO Resolution A.857 (20))

> A service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and respond to traffic situations developing in the VTS area.

Information Exchange in VTMIS

A Comment by I. Harre, D, 1994-1998

This 'functional definition' characterises VTMIS on the basis of the exchange of useful information between the actors in the maritime domain. The flow of information could be safety-oriented and/or transport efficiency related. This exchange of information is in line with a number of EU Policies, such as the 'Common Transport Policy', the 'Common Policy on Safe Seas', the 'Trans European Networks' and - beyond Europe - with the G7 MARIS initiative, in particular with its sub-themes SAFEMAR and MARTRANS.

VTMIS (Vessel Traffic Management and Information Services) are characterised by one or both of the following elements :

electronic exchange of information with services of the same kind in the neighbourhood, region or at distant locations ('horizontal information exchange'),

·electronic exchange of information with other maritime services - official or commercial - , e.g. allied or logistical services ('vertical information exchange').

Guidelines on Vessel Traffic Management and Information Services (VTMIS)

A Statement by Marten Koopmans, NL,
Approved by the CA 29 Management Committee in Lisbon, 11th June, 1998

1. Introduction

The acronym VTMIS is a buzzword in the VTS community, not only in Europe but all over the world. Even the shipping sector has heard about it. However, nobody knows what it really is. Are they Vessel Traffic Management and Information Systems or Services ? Do VTMIS have something to do with VTS ? Are they super-de-luxe VTS? If so, what is the difference compared to a "normal" VTS ?
To reduce this confusion these guidelines have been developed by the "Concerted Action on VTMIS". This is a group of representatives from Member States of the European Community, involved in R&D on VTMIS within the European Fourth Framework Programme.
They have already developed a definition on VTMIS. This document will further explain the what, who and how of VTMIS in the form of additional guidelines.

What are VTMIS ?

The concept of VTMIS evolved from the European R&D project COST 301 in the beginning of the nineties. This project looked into possibilities to improve VTS. One of the finding was that more could be done with the information available in the VTS.
In the following European R&D-projects TAIE and in particular RTIS this concept was further developed, resulting in small scale demonstrators in Brussels in 1994.
Next came the European Fourth Frame Programme (4FP). It offered the possibility to look further into VTMIS. Shared costs actions by consortia developed solutions to improve the information exchange within the VTS (COMFORTABLE) as well as additional applications (VASME) and larger scale information exchange with VTS (POSEIDON). Simultaneously similar IT applications were developed for port management (BOPCOM) and cargo flow management (WISDOM). Also inland navigation started to look at VTMIS on the inland waterways (INCARNATION, RINAC and INDRIS).
As part of the structure of the 4FP "concerted action" groups were also set up, including one for VTMIS. These groups was tasked with collecting information for the related shared cost actions, as well as offering guidance and dissemination of their R&D results.
By now VTMIS is not only an acronym used in Europe. Also the US and Canada are using this term to describe similar R&D activities.
Manufacturers have picked up this buzzword and attached it to their VTS systems. Together with the development of VTMIS out of VTS R&D and the similarities in the acronyms this has created the unfortunate impression that VTMIS are a kind of super-de-luxe VTS.

But what are VTMIS ?

The Concerted Action Group has developed the following two step definition for VTM and VTMIS:

> *Vessel Traffic Management: the set of efforts (measures, provisions, services and related functions) which, within a given area and under specified circumstances, intended to minimise risks for safety and the environment, whilst maximising the efficiency of waterborne and connecting modes of transport.*

> *Vessel Traffic Management and Information Services intend to respond to public and private demand for facilitating Vessel Traffic Management. VTMIS include services distributing in given areas (at regional, national or transnational level) the pertinent information to be used both in real time and in retrieval modes by actors involved.*

OK, VTMIS are services, not systems. What kind of services and what systems are involved ? Do they exist already ?
The Concerted Action Group has also drawn up the following explanatory notes:

> *The implementation of or participation in a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services which are or will be implemented in the area, such as VTS, Allied Services and other information services, are interlinked and co-operate according to commonly harmonised procedures.*

Fine, VTMIS do not require VTS, but this is still very vague.
The Concerted Action Group has now developed these guidelines to offer some guidance. These VTMIS-guidelines are not as concise as the VTS-guidelines, which have been developed after years of experience with existing VTS-systems.
VTMIS are not (existing) systems or services. It is a concept, a kind of umbrella, for all activities improving the exchange of information for the services relating to movements of vessels or the cargo. The shortest possible description would be: "VTMIS are improving vessel traffic information".
The ultimate objective of VTMIS is improving the efficiency, including interconnectivity and interoperability with other modes of transport, and the (environmental) safety of shipping.
The deliverable is a vessel traffic image with information on the vessels, cargoes and ETA's, within a given area. This area can be quite large.
This is broader than VTS in two ways:
- Vertically: Within the VTS-area a lot of information exchanges concerning vessel movements take place without involvement of a VTS, e.g. ETA notification to ports, pilots, tugs and terminals
- Horizontally: Between the VTS-areas information on vessel movements (in particular ETD at one port and the ETA at the next port) can form a basis for a regional traffic image outside radar/VHF coverage. This can also be done without the involvement of VTS, e.g. by using information from shipping agents and signalling services. It can become a real-time traffic image with the use of long range transponders.
This traffic image generated by VTMIS can serve many functions, e.g.:

- vessel traffic management, such as :
- - VTS/pilotage
  - compliance monitoring
  - SAR/calamity abatement/salvage
- (port) resource management, such as :
  - towing/line handling
  - berth/terminal planning
- cargo flow management, such as :
  - intermodal connections
  - fleet management
  - JIT information for shipper

The R&D on VTMIS, using the state-of-the-art Information Technology (IT), has shown many applications are technologically possible. So far it has been an unstructured development of all kinds of possible applications.
A policy on what is actually needed has not been developed yet.
The question is "who should implement VTMIS ?" To answer this question we first need to look at .....

2. Who are involved?

Here we see the main problem. There are (too) many parties involved in VTMIS. It transcends national and even regional boundaries. It also requires co-operation between various parties with different, sometimes even opposing, interests and who hardly know each other. They have to start exchanging information, which is partly commercially sensitive. Some of these parties can supply a lot of information, but need little information, so they need to contribute but hardly benefit from VTMIS.
What parties are we talking about ?

Authorities (or their privatised service providers) involved in vessel traffic management, such national maritime authorities, VTS authorities, port authorities, Coast Guards and calamity abatement organisations

Ports (and their independent service providers) involved in port resource management, such as port organisations, pilotage organisations, tug companies, line handlers, signalling services and terminal operators

Shipping companies (and their crews) involved in cargo flow and fleet management, including local shipping agents and shippers/forwarders.

They all want to fulfil their information needs at low costs and/or with little effort for themselves. This can be done by trying, as much as possible, to put the burden on others, only covering their own needs and not making this information available to others. This is understandable, but it results in sub-optimisation, where there could be more benefits for all in an overall optimisation of the information exchange.
Two things are essential to achieve an overall optimisation:

- finding a driving force
- creating win-win situation for all involved

Who could be the driving force ?

For implementing VTMIS within a VTS- or port area the driving force is available, usually the National Maritime Authority, VTS-Authority or Port Authority. They have the jurisdiction and responsibility for efficient and (environmentally) safe vessel traffic in that area.
For implementing regional VTMIS beyond the VTS- or port-area and often beyond national boundaries there is no obvious driving force. This could be a regional body, such as the European Commission or a joint venture of the involved National Maritime Authorities.
However, not only "time is money" but also "information is money".
VTMIS can offer tailor-made information, which has a commercial value to parties involved in shipping, if this information eases or improves the work/performance of these parties. This includes Authorities, who should be willing to pay a commercial information provider for this information instead of compelling the shipping sector to supply this information for free.
So an independent service provider is also an option. Not as a driving force, but more as a catalyst.

Who are suitable service providers ?

In some major ports there are already signalling services, like Dirkzwager in Rotterdam, offering such tailor made information to parties in the port. These companies are expanding to other ports and are also working more and more together. This development could be the basis for an information exchange network between ports.
Also more ports are putting information on arrivals and departures on the Internet. It would only take a few bright young boys to combine this information and sell it tailor-made to various users.
Finally in the liner trade, different shipping agents, working in different ports for the same liner companies exchange vessel and cargo (movement) information on a regular basis. This information could also be sold to other users.

What "win-win" situations can be created ?

Authorities have the means to force parties through legislation to supply them with information, which the Authorities (think they) need. However, this will not be accepted easily by the shipping sector. If it is implemented, it will result in evasive actions, which in turn requires enforcement.
Supply of information will be more readily accepted if this offers some benefits to the shipping sector as information suppliers as well. This could be in the form of resulting services or other information, which the shipping sector needs. In case it is not possible to compensate in kind, payment for the information should be considered.
The same applies to the users of the information. If they cannot offer any information or services in return to the supplier of the information for the information they have received, they should pay for the information.
There creates a balance at each "source" or "drain" of information.

3. How to develop VTMIS?

VTMIS encompass many functions and applications, each with it's own objectives, driving forces, involved parties and people, organisational structures and hard/software, but all using (almost) the same information.
It is impossible to develop one structure with hard/software which can fulfil all the information requirements of all parties involved in a wide area.
A <u>bottom-up</u> approach is needed, where each group can still develop their own information exchange system, but with:

- a wide view on and an open eye for the needs of others
- a fair distribution of costs and benefits for all parties involved
- a respect for the confidentiality of the information
- an open architecture of hard- and software

This requires extensive exchanging and sharing of ideas and intentions for improving the information exchange within a particular area with other parties working with similar information on vessel traffic.
Within a VTS- or port area this discussion on exchange/sharing could take place in a platform where representatives of involved parties get together, initiated and run by the VTS- or Port Authority as a driving force.
Outside a VTS- or port area there are more benefits from VTMIS for vessel traffic management then for port (resource) management. There also seems to be little benefits for cargo flow management.
So National Maritime Authorities (or their subsidiary specialist Authorities and/or privatised service providers) will have the greatest need for information concerning vessel traffic in this wider area.
These Authorities could combine information from existing instruments, such as VTS, port management systems, ship signalling agencies, HAZMAT systems, ship reporting systems and directly from shipping companies and their agents to form an (extrapolated) traffic image. If required additional information could be generated by introducing more of these existing types of instruments. Also new instruments, such as the transponder and Internet, could be used to obtain a more extensive (in range and contents) and real time traffic image.
Again, if the Authorities are willing to pay for this tailor-made information this refining of the raw data could be left to an independent service provider.

4. What are the conclusions?

- VTMIS are Vessel Traffic Management and Information Services

- VTMIS are a concept, a kind of umbrella, for all activities to improve vessel traffic information
- VTMIS are not a super-de-luxe VTS; it does not even require a VTS
- VTMIS deliver a traffic image to be used by Authorities, ports and companies involved in vessels and cargoes
- VTMIS can be used for vessel traffic management, port (resource) management, fleet management and cargo (flow) management
- VTMIS require an Authority or service provider as a driving force or catalyst and a "win-win" objective for all parties concerned

VTMIS can best be developed "bottom-up" but with the needs of others in mind.

VTMIS Workshop in Amsterdam

1. Introduction

In order to elaborate the user requirements for improved VTS and to further complete the VTMIS concept a workshop was held in Amsterdam on 17 November 1997. In this page you will find the workshop programme and the conclusions drawn. The workshop was sponsored by the European Commission, DG VII, hosted by the Netherlands Institute of Navigation (NIN), organised by the secretariat of the Concerted Action 'VTMIS', and presided by Mr. K. POLDERMAN, Ministry of Transport, Public Works and Water Management of the Netherlands.

2. Programme

First Session: Traffic Management, the Concept of VTMIS (Chairman: I. Harre (D))

J. Prunieras (F) : *The VTMIS Concept - Definitions and Basic Issues*

Prof. J. Froese (D) : *Ongoing Projects at European Level*

W. O'Keefe (CDN) : *Canadian Views*

Ivo ten Broeke (NL) : *Inland Waterways*

F. Arendt (D) : *Logistics Views*

Second Session: Information Services Offer (Chairman: Chr. Deutsch (F))

C. Florant (F) : *Ports and Terminal Operators' Views on VTS and Links with Allied Services*

B. Pettersson (S) : *Transponders and Waterborne Transport*

J.L. De Goeij : *Ship Reporting Services*

H. Moyano (ES) : *Internet and the Waterborne Transport*

A. N'Diaye : *A New Approach of the Assessment of River Information Services*

Third Session: Information Services Demand (Chairman: K.-H. Hamer (D))

M. Koopmans (NL) : *Views of the National Maritime Authority*

H. De Meester (ECSA) : *Shipowners' Views*

T. Hughes : *Master Mariners' Views*

N.F. Matthews (IMPA) : *VTMIS and the Pilot*

Prof. Dr. J.A. Covas (PL): *Port of Sines Potential Needs for VTMIS*

C.P. Pellizzari (I) : *Information Needs of SAR Services*

L. Källström (D) : *Intermodality Requirements*

Panel Discussion

3. Results of the Discussions

Although the topic of conclusions was included in the workshop programme, this part of the programme was skipped due to time constraints. The drawing of conclusions was left to the workshop organising committee. The committee chose to adapt the following framework: first to list a number of significant statements made during the workshop, second to deduct from these statements a number of workshop conclusions.

3.1 VTS/VTMIS [1]

From the discussions and some of the stated questions it could be concluded that still a lot of people do not know the difference between VTS and VTMIS. From this the following was advised

- The introduction and widespread distribution of the Glossary of Terms.
- To organise demonstrations in order to educate "users and to make them aware of the VTMIS potential and services offered".

In doing so, this could also clarify the variety of users' requirements.

3.2 VTS/VTMIS [2]

A VTS is compulsory to mariners and is implemented by a competent authority initially to enhance maritime safety. The use of a VTMIS is voluntary to users and can therefore be implemented by information provider[s]. Or to be more precise, a VTMIS needs to have a number of parties willing to share a common set of data. [Providing ground for the question ,,who are the information providers and who are the information users?"].
In short a VTMIS can be considered as an extension of VTS.
It was stated in addition that :
a) There is no VTMIS currently in operation, for VTMIS is a term mainly introduced for research purposes, whatever reference to VTS is made in the discussions on VTMIS. There is currently no way to compare well established and well known services rendered by VTS and those of the hypothetical future VTMIS;

b) To ask the question if there is a need for a VTMIS leads as usual to recognise in general terms that

- a potential user will not require anything new which he does not know,
- a potential user can validate anything new better by experience than by theoretical description.

3.3 VTMIS concept

VTMIS is not a system but a concept, or otherwise expressed, a systematic approach, in which all maritime traffic items [ships, ports, pilots, shipowners, etc.] are part of a management system for the sake of the transportation of goods, with the exchange of information to act as the catalyst.
Considering VTMIS in this way, a VTMIS is, as stated earlier, not an upgraded VTS, not a tool, it is just an approach to make a more efficient use of what already exists.
Finally, the concept of VTMIS has by no means the intention to increase the volume of data in the maritime traffic, but to use the available data and make it better available to everybody who wants it. And in case nobody wants it, there is no good reason for the existence of VTMIS!

3.4 VTMIS [world-wide]

Although the general objectives of the VTMIS concept, safety of navigation, protection of the environment and efficiency of transport reaches beyond Europe, some diversion in the development of VTMIS systems may occur. For example:

- in the various VTMIS EU projects, several solutions are being developed to serve in particular the partly differing needs of the EU countries and waters;
- in Europe the efficiency of transport is more emphasised, compared to the Canadian approach.

3.5 Transponders

The IMO and the IALA differ in their approach to the subject of transponders, or better A.I.S. [Automatic Identification System].The IMO is interested in the system for reasons of tracking, whilst the IALA is more interested in A.I.S. for reasons of identification. This causing a situation that two international organisations have to co-operate in order to seek for an optimal solution.
Further, transponders were initially introduced for VTS operations, but they do have substantial impact on the onboard and on the ship-ship operations.

3.6 'Users pay' principle

The users of services provided by a VTMIS system should pay for these services as follows:

- as a kind of tax in case VTMIS is implemented by a competent authority [for reasons of enhancing maritime safety and traffic efficiency]
- a voluntary fee in case VTMIS is implemented by an information provider [for reasons of offering or selling information].

3.7 The workload on board ships[1]

In relation to the questioned workload aboard ships the following statements are relevant. The services offered by VTMIS should reduce the workload for ships' crews, whilst increasing the safety and efficiency of maritime traffic.
In fact, one of the goals of VTMIS is to reduce the mentioned pressure and in case this is or can not be achieved VTMIS has failed!

3.8 The workload on board ships[2]

Concerning the workload aboard, the unification of information plays an important role, this in order to prevent the repetitive reporting to different authorities, of the same kind of information. The same is valid w.r.t. the availability and application of new techniques. For example:

- the tracking of ships by radar to replace the sequence of positioning reporting as done in the early days,
- ships data exchange between adjacent VTS, to reduce the reporting requirement to only one short ships' report on calling upon the first VTS.

3.9 The workload on board ships[3]

A statement made by the shipowners: "We are not against VTMIS, we even are very much in favour, but we do not want extra work. Our request is to have research carried out and to have systems developed, which are simple to operate by the mariners."

3.10 Shore based Pilotage

According to the shipowners, if VTMIS includes 100% shorebased pilotage, can VTMIS lead to be a bit more flexibility in giving authorisation to captains to enter ports without a pilot on board. Only occasionally, in case that captains are authorised to enter ports without a pilot on board [e.g. for ferries or some other kind of ships calling regularly on the same ports] on-board pilotage is not compulsory and ships can be advised by shore based pilotage. Only occasionally, since pilots are offering two services which in most cases cannot be covered by shore based pilotage:

- local knowledge of the environment [better assessment of the local impact of wind, tide, etc.]
- ability in manoeuvring and mooring ships [ship's crew may not always have the same expertise]

4. Conclusions

4.1 Concerning the workshop itself

The workshop was very well attended by more than 100 participants.

- from the participation of the audience during the sessions and panel discussions,
- from remarks made during the course of the day,
- and from the fact that only a few participants left before the closure of the workshop, the organising committee does agree with the conclusion of the President, Mr. Polderman, that the workshop contributed to achieve a more common understanding about VTMIS.

4.2 Concerning the workload aboard ships

A statement was made by the shipowners' representative : "We are not against VTMIS, we even are very much in favour, but we do not want extra work. Our request is to have research carried out and to have systems developed, which are simple to operate by the mariners."
Taking this request in into account, the answer was given by another statement made at the workshop: "The services offered by a VTMIS should reduce the workload for ship's crews, whilst increasing the safety and efficiency of maritime traffic and in case this is or can not be offered, the concept of VTMIS has failed".

4.3 Concerning the 'Users Pay' principle

Although at the workshop a users pay principle was considered as

- a kind of tax in case VTMIS is implemented by a competent authority [for reasons of enhancing maritime safety and traffic efficiency]
- and a voluntary fee in case VTMIS is implemented by an information provider [for reasons of offering or selling information], as yet, there is in Europe no common understanding.

It is advised to agree in Europe on a common policy, since it is of basic importance for the implementation of a VTMIS.

4.4 Concerning the Concept of VTMIS

- In the maritime world, there still exists confusion about what is the scope of the concept of VTMIS compared to that of an extended VTS system.
- The concept of VTMIS will not necessarily increase the volume of data, but allow a better use of it for the benefit of information providers and users and reduce the burden of reporting.
- In order to have the maritime world better informed and updated, it is advisable to have the Glossary of Terms distributed in the maritime world.
- It is also advised to carry out dedicated small scale demonstration projects and workshops of this kind at regular intervals.

5. The Workshop Report

The papers presented are included in a report entitled

"Report on the workshop on the user's requirements of the vessel traffic management and information services",

issued by the Office for Official Publications of the European Communities, Luxembourg, 1998, ISBN 92-828-3250-3.

For complete information about the transport research publications available and how to order them, please contact:

European Commission, Tel. +32-2-295 4300,
Directorate-General for Transport, DG VII-E Fax +32-2-295 4349
Transport research help desk,
Avenue de Beaulieu 31 - Office 4/83,
B-1160 Brussels.

Technisec project

Bridge programme

Preliminary study on the relationship between vessel traffic management and transport management

Sub-contract

General specifications[21]

The VTMIS concerted action has already clearly recognised that centres such as VTSs normally collect information on ships movements as well as on the status of ships themselves, their crew and cargo. Such information may interest a number of actors participating in ship operations, pilotage, tugs and linesmen organisations, ships agents, stevedores, who most often are independent from the authority responsible for providing the vessel with the services defined in Resolution A.857(20) (Information services, nautical assistance, traffic organisation).

This example leads to think that enhanced exchange of information between entities operating Vessel Traffic Management and Information Services and those who are concerned with Transport Management would have a favourable impact on the economy of Transport.

There is therefore a need for a better identification of the information relevant to Vessel Traffic Management which may have an impact on Transport Management and reciprocally.

It is proposed that the VTMIS concerted action be tasked with a study aiming at :

- identifying information holders and information users,

- detecting cases where the raw information should be processed so as to provide value added services,

- studying the possible typology of links between information holders and users and provide suggestions for the implementation and organisation of appropriate information networks.

Such a study should take account of relevant on-going projects and more particularly of the outcomes of the following on-going projects :

BOPCOM
EUROBORDER
SEALOC
MARNET, IPS, MOVIT
POSEÏDON, BAFEGIS
Concerted Action on Short Sea Shipping
The MARIS initiative.

[21] As agreed by the VTMIS concerted action Management Committee at its Xth session.

MarineSafety international Rotterdam b.v.

INSTITUT FRANÇAIS DE NAVIGATION

Technisec project

Bridge Programme

Preliminary study on the relationship between Vessel Traffic Management & Transport Management

Final Report

17/02/2000

Preliminary study on the relationship between Vessel Traffic Management and Transport Management

Final Report

Purpose of Document

This document constitutes the Final Report of a "Preliminary study on the relationship between vessel traffic management and transport management", Technisec project, Bridge programme within the frame of the European Commission IVth Waterborne RTD programme (DGVII).

Objective

The VTMIS Concerted Action recognised that Vessel Traffic Management is a component of Transport Management and that they may both benefit from the information collected, stored and processed to enhance the efficiency of each of these activities.

This documents aims at providing the following:

- identification of main actors involved in vessel traffic management and/or transport management;
- the flow of information currently exchanged between the information holders and information users;
- the foreseeable needs for the development of information exchange, as well as the need for storing and/or processing data at some focal points;
- ideas on how information flows could be organised in the near future.

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17th February 2000

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Introduction

The VTMIS concerted action has already clearly recognised that centres such as VTSs normally collect information on ships movements as well as on the status of ships themselves, their crew and cargo, sometimes for other purposes such as Port State Control. Such information may interest a number of actors participating in ship operations, pilotage, tugs and linesmen organisations, ships agents, stevedores, who most often are independent from the authority responsible for providing the vessel with the services defined in IMO Resolution A.857(20), i.e. Information Services, Navigational Assistance Services and Traffic Organisation Services.

This example leads one to think that enhanced exchange of information between entities operating Vessel Traffic Management and Information Services and those who are concerned with Transport Management would have a favourable impact on the economy of Transport. There is, therefore, a need for a better identification of the information (including content, quality and security aspects) relevant to Vessel Traffic Management which may have an impact on Transport Management and reciprocally.

Objective

The VTMIS Concerted Action recognised that Vessel Traffic Management is a component of Transport Management and that they may both benefit from the information collected, stored and processed to enhance the efficiency of each of these activities.

This study has the main objectives as stated below:

- identify information holders and users;
- detect cases where the raw information should be processed so as to provide value added services;
- studying the possible typology of links between information holders and users and provide suggestions for the implementation and organisation of appropriate information networks.

This documents aims at providing the following:

- identification of main actors involved in vessel traffic management and/or transport management;
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- the foreseeable needs for the development of information exchange, as well as the need for storing and/or processing data at some focal points;
- ideas on how information flows could be organised in the near future.

Methodology

Considering only European initiated research on VTMIS then the path can be traced back to the COST 301 study which first made mention of the concept of Regional Vessel Traffic Services. Through studies such as RTIS, TAIE, EWTIS and VTMIS-Apas[22] we have been led towards the present day research programme, namely the EC Fourth Framework Programme. At the time of writing the 4th Framework Programme is drawing to a close, and the results of various studies into VTS, VTMIS and Transport Management are becoming known.

[22] The acronym VTMIS standing for Vessel Traffic Management and Information Services was introduced for the first time at the occasion of that project.

With the objectives of this study including the identification of the main actors, the flow of information between them, and the needs for development of information exchange and information flows, the main source of information would logically come from the extensive research carried out to date within the Transport (DG VII) and Telematics Application (DG XIII) Directorates. Short summaries of the objectives of projects considered relevant, along with their link to this study, are given below.

Information has been collated from the web-sites as indicated and/or documents as cited in Chapter 12: References.

Definitions

The following definitions have been put forward by the VTMIS Concerted Action:

Vessel Traffic Management
The set of efforts (measures, provisions, services and related functions) which, within a given area and under specified circumstances, intend to minimise risks for safety and the environment, whilst maximising the efficiency of waterborne and connecting transport.

Vessel Traffic Management and Information Services
Intend to respond to public and private demand for facilitating VTM.

Comment by the DG VII Ad Hoc Committee
VTMIS include services distributing in given areas (at regional, national or trans-national level) the pertinent information to be used both in real time and in retrieval modes by actors involved.

The implementation of, or participation in, a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services which are or will be implemented in the area, such as VTS, Allied Services or other information services, are inter-linked and co-operate according to commonly harmonised procedures.

Past and Present Research within EC

VTMIS-Net

Objectives

VTMIS-Net is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The objectives of VTMIS-Net are to:

- develop a methodology, guidelines and examples for the development of a VTMIS network;
- produce a network and communications system architecture;
- identify tools for enhanced network operations;
- demonstrate the means to monitor the network;
- indicate how further development could lead to an EU wide network.

Relation to VTMIS Bridge Programme

Through various work package reports VTMIS-Net was able to provide the most significant information relating to potential organisations involved in Vessel Traffic Management, the information needs therein and information flows. Reference is made throughout.

More information can be found on VTMIS-Net through the following web-sites:
http://issus.susan.fh-hamburg.de/iss_web/projekte/vtmis-net/
http:/ / www.cordis.lu/ transport/ src/ vtmis.htm

COMFORTABLE

Objective

COMFORTABLE was co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The main objective of COMFORTABLE was to develop tools for VTS operators to help them recognise and assess traffic situations. In this context a support system was developed in order to assist VTS operators in their daily work at a VTS station, possibly within Vessel Traffic Management and Information Services.

A selection of the relevant topics studied includes:

- the development of an advanced traffic assessment tool, based on the further development of EPTO (European Permanent Traffic Observatory);
- the development of tools such as collision risk and precise track motion (utilising transponder technology), and including a tool to assess the added value therewith, SATest;
- ECDIS in VTS;
- Human-Machine Interface considerations for Traffic Situation Displays in various areas;
- the development of MATIAS (MAritime Traffic Image Advanced System), a tool to help predict the operational traffic image of the future, in a larger area not covered by the more traditional sensors such as radar.

Relation to VTMIS Bridge Programme

COMFORTABLE provided extensive input through the work package report “Data Links and Data Bases”. This report provided a framework for the system-level database design of a generic VTS and as such constitutes a reference point for the design and implementation of future VTS and VTMIS systems.

More information can be found on COMFORTABLE through the following web-site:
http://www.cordis.lu/transport/src/comfortrep.htm

BOPCom

Objective

BOPCom is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The main objective of BOPCom is to increase the efficiency of sea transport in Europe through improved port communication, in particular the development of a new telematics concept. The project targets in particular small and medium sized ports with the aim to promote shortsea shipping from the Mediterranean to the Baltic and from the Atlantic to the Arctic.

Relation to VTMIS Bridge Programme

BOPCom illustrated one approach to interconnectivity through tools and services for linking application systems in transport. This is given in Chapter 9.

More information can be found on BOPCom through the following web-sites:
http://www.bopcom.de
http://www.cordis.lu/transport/src/bopcomrep.htm

EUROBORDER

Objective

EUROBORDER is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

EUROBORDER sets out to increase overall port efficiency and competitiveness and to develop ways to increase the integration of ports as service centres for transhipments and distribution within the Trans-European Network. The performance of RoRo and LoLo port terminals will be greatly improved with new ideas on the level of organisation, information and administration. EUROBORDER maps in detail the procedures of the cargo, vehicle and information flow in RoRo and LoLo terminals, and identifies problems and bottlenecks in relation to the requirements of the different actors.

Relation to VTMIS Bridge Programme

Through the provision of the two deliverables “Final Report for Publication” and “Evaluation Results and Feasibility Analysis” EUROBORDER was able to contribute significantly in identifying the shore related activities for both Vessel Traffic Management and Transport Management. Reference is made throughout.

More information can be found on EUROBORDER through the following web-site:
http://www.cordis.lu/transport/src/euroborderrep.htm

POSEIDON

Objective

POSEIDON was co-funded by the European Commission under the 4th Framework Programme, Telematics Application Programme (DG XIII).

POSEIDON had the objective of achieving greater safety and efficiency in maritime transport in Europe. To this end, it sought to establish inter-operable Vessel Traffic Services (VTS) systems by integrating them with advanced communications, information and tracking technologies. Such tools enhance the compatibility of different VTS supporting their effective joint action in traffic control and emergencies or for other new services. Appropriate interface systems were devised during the project and VTS-related tasks fully addressed. The hope was that prompt exploitation of its results could boost industrial VTS products and services keeping the EU to the forefront in this sector.

Relation to VTMIS Bridge Programme

POSEIDON was able to provide information on the generic entity relationship model (GERM) which was taken forward into VTMIS-Net and COMMAN. The GERM, together with “Data Links and Data Bases” (COMFORTABLE), provides a comprehensive overview of the inter-relationships, with respect to information flow, of various participants involved in vessel traffic management.

More information can be found on POSEIDON through the following web-site:
http://hermes.civil.auth.gr/poseidon/poseidon.html

SEALOC

Objective

SEALOC is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

SEALOC’s objective is to provide recommendations for the improvement of safety in maritime transport of dangerous goods in Europe through the implementation of telematics solutions. The SEALOC project will provide recommendations for the improvement of safety in maritime transport of dangerous goods in Europe, with cost effectiveness analysis. To achieve this result, SEALOC will rely on three case studies using the FSA methodology. The main objectives were to:

1. analyse and quantify consequences of one of the best known accidents, the Amoco Cadiz accident, as far as economical and legislative views are concerned;
2. evaluate the safety issues in the Mediterranean Sea in the case of LPG transport;
3. evaluate the safety issues in the North Sea in the case of container transport;
4. assess safety gaps in current operations , rules and procedures;
5. propose recommendations such as information and communication concepts.

Relation to VTMIS Bridge Programme

Of interest is the possible input that may be found as a result of objectives four and five as stated above. Further effort should be placed in establishing the level of relevance with respect to the recommendations proposed for the information and communication concepts.

More information can be found on SEALOC through the following web-site:
http://www.cordis.lu/transport/src/sealoc.htm

MARNET

Objective

The project Inter-Regional Maritime Information Network (MARNET) is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The MARNET project supports the development of a real-time logistics information network for multimodal transport operators in different regions. Its' aim is to enhance the competitiveness of Mediterranean maritime ports in particular.

MARNET general benefits:

- An increased knowledge of procedure and work methods in the maritime transport sector, that will contribute to harmonisation;
- An exhaustive evaluation of the new technologies that make possible the interoperability of diverse technological systems;
- The results of the pilot experience, which will serve to move up the experience curve before full implementation of the systems.

MARNET tangible benefits:

- Simplified access to information;
- Improved customer service;
- Increased competitiveness of the transport service;
- Stable technological base for transition to the use of Electronic commerce and information-based enabling technology for small and medium enterprise;
- Reduction of the clerical work and increased productivity;
- Leveraging the existing technical infrastructure;
- Improved decision-making.

Relation to VTMIS Bridge Programme

The need for data interchange between port communities was found to exist within MARNET. Those needs were grouped together around 12 services, which were the object of information systems developments and pilot operations:

S1-1/...S1-8 EU	Port single desk management
S1-10/11	Dangerous Goods Management
S2-1	Ship tracery
S4-4/...S4-6	Manifest interchange
S6	Commercial information interchange
S7-1/...S7-3	Port consultation
S8-1/...S8-7	Statistics
S9	Exchange interport
S10	Port cargo system for small ports
S11	Manifest Short sea shipping
S12	Interport Data Exchange

Further investigation should be conducted with respect to the identification and comparison of solutions proposed in MARNET and other projects such as VTMIS-Net.

More information can be found on MARNET through the following web-sites:
http://www.euromar-eeig.com/initiat/marnet.htm
http://www.cordis.lu/transport/src/marnetrep.htm

IPSI

Objective

The project Improved Port Ship Interface (IPSI) is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The IPSI project is designed to contribute to the transfer of cargo in Europe from land to sea by making waterborne transport an integral part of the logistics chain through:

- the development of new concepts of flexible and efficient port/ship interfaces;
- the identification of the 'best' methods and equipment for effective transfer of cargo, and information about cargo, with special attention to the need for high efficiency and low investment;
- demonstrating the port/ship interface concept to verify the effectiveness of multimodal cargo exchanges in a "door-to-door" context.

Within IPSI it was stated that since cargo must be moved between ship/barge and land transport systems at least twice, the efficiency of the port/ship interface in the intermodal context of a door-to-door logistic chain is of vital importance.

The challenge of the ports is that they must become more active interfaces in the transport chain. They must become efficient and cost effective logistic hubs where all available modes of transport can be effectively interconnected. This applies to sea, rail, road, and to inland navigation as well. The interconnection of modes of transport must be based on competition and flexibility, i.e. interchanges between the various modes of transport must be possible wherever necessary and applicable.

Relation to VTMIS Bridge Programme

It was concluded that the IPSI terminal concept has been shown to have capabilities that may make it an efficient hub in intermodal chains, particularly when served with IPSI vessels. Furthermore, the cost of vessel and operation combined with the performance of the cargo handling equipment compared to conventional container feedering, clearly makes the IPSI concept a commercially viable alternative for this type of operation.

The IPSI project was focused on the infrastructure needs rather than the information flow between transport modes. There is, therefore, little direct relation to the preliminary study as undertaken.

More information can be found on IPSI through the following web-site:
http://www.cordis.lu/transport/src/ipsirep.htm

MOVIT

Objective

MOVIT is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The overall objective of MOVIT was to achieve a complete VTMIS that could be transported for the purpose of any on-site evaluation of the traffic flow and density under operational conditions. The VTMIS provides basic information to decision-makers regarding:

- identification of traffic problems;
- evaluation of a site for the implementation of sensors;
- definition of operational procedures for VTS;
- demonstration and assessment of system functional designs;
- evaluation of operators' workload.

MOVIT is described as a complete VTMIS in a shelterised version that may be transported to any test site for on-site evaluation of the traffic flow and density under operational conditions. VTS send data to EPTO (see also 5.2 COMFORTABLE above) using a CORBA bus following the MOVIT Communication Standard.

Relation to VTMIS Bridge Programme

The use of the CORBA bus following the MOVIT standard was further utilised within VTMIS-Net. MOVIT provided the foundation on which the system architecture could be built.

More information can be found on MOVIT through the following web-site:
http://movit.e-motive.com/
http://www.cordis.lu/transport/src/movit.htm

BAFEGIS

Objective

BAFEGIS was a bi-lateral German/Swedish test-bed for new technology and methodology to enhance RoRo & ferry safety on the basis of IMO Resolution A.795.

The main contents of the BAFEGIS (Baltic Ferry Guidance and Information System) project was the establishment, the testing and the development of a guidance information system for RoRo passenger ferries in the Baltic. This project was a bilateral German - Swedish test bed to use AIS (Automatic Identification System) for maritime applications in connection with ECDIS (Electronic Chart Display and Information System).

Relation to VTMIS Bridge Programme

A guidance and information system for RoRo passenger ships operating on particular ferry routes in the Baltic Sea, as proposed in BAFEGIS, would make it possible to provide continuous information and advice on such navigational hazards as:

- ♦ drifting and extinguished lightbuoys;
- ♦ obstacles to navigation (wrecks or floating objects);
- ♦ malfunctions in radio-navigation systems;
- ♦ imminent storms and severe weather condition;
- ♦ sea state; or
- ♦ adverse ice conditions;

to the masters of such ships throughout their passage and to influence these masters, through pertinent warnings and recommendations, so as to take appropriate measures for the protection of passengers, crew, vessel, and the marine environment. The

ECDIS database can be kept up-to-date through automatic updating, which can even take place when the ECDIS-carrying vessel is proceeding en route.

A further approach to optimise the professional knowledge of the master is the global AIS (Automatic Identification System) transponder which will support the master by information about other ships in the vicinity when detecting risks of collisions. The technology fulfilling all requirements for ship-to-shore and ship-to-ship transponders is available. The use of ship-to-ship radio transponders makes the following applications possible:

- early identification, location, and tracking of other ships in the vicinity;
- recognition of the type of vessel and, thereby, correct application of the International Regulations for Preventing Collisions at Sea;
- determination of the other vessels' current movement by means of transponder interfaces with course- and speed-sensing equipment.

Within BAFEGIS it was remarked that the increased level of activities by Vessel Traffic Services (VTS) Centres, involving comprehensive communication requirements, have loaded an enormous extra burden upon masters. Consequently, verbal communication should be replaced, wherever feasible, by suitable ways and means of automatic information interchange. The use of transponders is one step into that direction. The European coasts are almost completely covered by mobile radio-communication networks. This means that it would be possible to exchange between ships and the VTS Centre, for example, sailing plans in the form of waypoint lists (complete with timings) and coded navigational advice. The reporting requirement could be reduced correspondingly, and language-related misunderstandings would be precluded. This technology will become even more worthwhile when an interface with an electronic chart display system is made available and navigational information is automatically visualised.

The influence of the transponder with respect to ship-ship, ship-shore and shore-ship communication has been investigated in a number of the aforementioned projects.

BAFEGIS offered a test-bed atmosphere in which the effect of technology such as ECDIS and transponders could be assessed. Extended trials were conducted within VTMIS-Net. Input from the BAFEGIS project was used in this study indirectly through VTMIS-Net.

More information can be found on BAFEGIS through the following web-site:
http://www.maris.int/g8report.htm

INDRIS

Objective

The Inland Demonstrator of River Information Services (INDRIS) is co-funded by the European Commission under the 4th Framework Programme, Waterborne Sector (DG VII).

The underlying aim of the research is to contribute to smooth and safe traffic flows on Europe's inland waterways through the provision of 'open' information systems, based on the same standard, which assist in tactical navigation decision –making.

Relation to VTMIS Bridge Programme

Within the River Information Service (RIS), there are clear common areas of interest between the objectives of RIS and this preliminary study. The three main objectives of RIS are:

- to enhance the safety of inland navigation through the provision of information relevant to immediate navigation decisions so that accidents, such as collisions, contacts or groundings, may be avoided;
- to improve the efficiency of transport and logistics through the exchange of planning information on terminal, port and lock operations and management information on traffic flows;
- to provide general nautical information on the state and use of the fairways, ports, terminals and locks as a service to skippers, and to improve the efficiency of navigation.

RIS relies on the exchange of certain information, which is presented in this study in common with the general information exchange. More specific data is also exchanged / required by the service, which is inherent to the area of navigation, however this is specific to the mode of transport and not covered within this study.

Further use of data from both INDRIS and INCARNATION (the predecessor of INDRIS) should prove vital in more detailed analyses. Within the RIS concept there lies a fundamental link between vessel traffic management and transport management, through, for example, the exchange of planning information on terminal operations.

More information can be found on BAFEGIS through the following web-site:
http://www.indris.com/

Concerted Action on Short Sea Shipping

Objective

The Concerted Action on ShortSea Shipping (SSS-CA) is a major European Commission initiative aimed at the promotion of safe, efficient and pollution-free waterborne transport.

Its' principal aim is to ensure that all relevant research and development work is critically surveyed, and a taxonomy compiled, so that a European-wide vision may take shape on what more needs to be done to develop the shortsea shipping sector in Europe.

Relation to VTMIS Bridge Programme

The Concerted Action on ShortSea Shipping is linked to a number of related Fourth Framework projects. These include BOPCom, EUROBORDER and IPSI. More detailed descriptions of these projects and their relation to this study are given above.

More information can be found on SSS-CA through the following web-sites:
http://www.maritime.deslab.naval.ntua.gr/
http://www.cordis.lu/transport/src/sss-ca.htm

The MARIS Initiative

Objective

The MARIS Initiative is a project emanating from the G7 summit on the information society which aims to demonstrate the potential benefits of the information technologies and telematic applications for a broad range of telematic activities in the marine sector. MARIS will build on existing systems by promoting interoperability and by developing international co-operation to create new services on a global basis.

The European Commission and Canada are responsible for the operational implementation of the MARIS project.

MARIS provides a framework for carrying out the following sub-projects which have been proposed by the different G7 countries:

- Maritime safety and the protection of the marine environment;
- Logistics and multimodal transport;
- Sharing knowledge with regard to the exploitation and protection of marine resources and, in particular, fisheries;
- Intelligent manufacturing through global co-operation.

The key objectives of the pilot projects are to:

- Support international consensus on common principles for applications, access and interoperability of networks;
- Establish groundwork for co-operation among G-7 partners to create a critical mass to address the global Information Society issue;
- Create an opportunity for information exchange leading to further development of the Information Society;
- Identify and select exemplary projects with tangible, understandable, and demonstrable socio-economic and cultural benefits;
- Identify obstacles to implementing applications related to a global Information Society;
- Help create markets for new products and services.

MARIS is an open framework. It therefore aims to integrate interested players from the maritime community world-wide.

In order to be taken into the MARIS framework and to receive the MARIS label for a project, the project needs to fulfil the following conditions:

- Its application area has to be in one or more of the MARIS sub-domains and the project must employ advanced information technologies;
- It should encourage the inter-connection of existing or newly developed information systems;
- It should be aiming at a co-operation on international level.

Relation to VTMIS Bridge Programme

No direct information was sourced through the MARIS initiative, although associated projects were used. In the interest of dissemination it is worth noting the MARIS label scheme and some projects already registered within both INFOLOG/MARTRANS

(Intermodal Logistics and Telematics) and SAFEMAR (which are directly related to the issues within VTMIS.

The following information was accessed through: http://www.maris.int/pmmrtrn.htm

MARIS is an open framework. It therefore aims to integrate interested players from the maritime community world-wide.

Projects included within the MARIS framework are listed below:

COUNTRY	TITLE	SHORT DESCRIPTION
EU	MARTRANS I	Design of a modular and scalable EDI-system and the development of a demonstrator, design of a virtual intermodal transport chain and the development of a demonstrator, development of a multi-media presentation.
EU	COST 330: Teleinformatics Links Between Ports and Their Partners	Review and assessment of strategies for interconnecting sea and inland ports with their partners, in order to better integrate waterborne freight transport operations in a global logistics system. The Action will assess how Information Technologies (IT) can address/improve port trading requirements in a global logistics system.
EU	LOGIN (Logistics Information Network)	User requirements for an intranet for logistics management and intermodal transport including a real life demonstrator.
EU	INTRARTIP	Development of a pre-trade internet technology to match intermodal transport supply and demand.
EU	MARNET	Interconnection of European EDI port communication systems.
Germany	DELCOM (Delivery Communication System); continuation of BOPCOM (Baltic Open Port Communication System)	Development of a system architecture providing inter-connectivity and inter-operability for the planning and control along inter-modal transport chains including the waterborne mode (proposal status).
Germany	Information Network for Global Distribution of Automobiles	Integration of planning procedures and control of intermodal transport into the logistics of procurement and distribution in the automotive industry and in trade (implementation scenario as part of DELCOM).
Canada	Container Cargo Tracking Project	No details available.
Canada	Marine Geomatics	Acquisition, processing and management of data and data products that describe the marine environment.
Canada	Information Seaway	Making the routing of data as transparent to the mariner as the routing of a telephone message is to a user.
Canada/US	...	Development of a standard for a ship safety record which would store information now found on "notice of arrival" reports as well as vessel certificate information, inspection histories, non-compliance records, crew information, maintenance records and similar data.
Japan	Maritime Information Gateway Server and Networking	Infrastructure for advanced information and communication systems which is totally open and highly extensive without being influenced by type of user, hardware or software environment.

Table 1: MARIS framework projects under INFOLOG/MARTRANS

COUNTRY	TITLE	SHORT DESCRIPTION
EU	Feasibility Study	Feasibility of a regional linkage of the national competent authorities of the 5 Member States signatories of a memorandum of understanding in the framework of the implementation of Directive 93/75/EC.
EU	Transponder Performance Standards	Definition of performance of transponders and communication systems in order to include the ship in the information network.
EU	COST 326: Electronic Chart Display and Information System	Implementation of electronic chart display and information systems in order to improve the safety and efficiency of maritime navigation.
EU	BAFEGIS (Baltic Sea Ferry Guidance and Information System)	Tasks: Improvement of safety on board ro/ro passenger ferries, monitoring the journey of ro/ro passenger ferries from the shore, supporting these vessels by means of a nautical-hydrographic forecast information and immediately initiating the required rescue measures in emergencies.
Canada	360 ENC	Not available.
Canada	S-57 ENC	Not available.
Canada		INNAV Vessel Traffic control information, communication, data storage and display of the information.
Canada	AIS (Automatic Information Systems)	Ship-to-shore and ship-to-ship position information, electronic chart-type displays and vessel traffic management functions.

Table 2: MARIS framework projects under SAFEMAR

More information can be found on The MARIS Initiative through the following web-site: http://www.maris.int

Participants

If we now consider the comprehensive list of actors identified below we can try and classify the area in which they operate, either Vessel Traffic Management or Transport Management. We can also determine[23] whether they are likely to be the initiator, receivers, or both, of data:

[23] Determination was made through analysis of documentation included in reference list and 'expert' opinion.

Initiator	Receiver	Participant	Vessel Traffic Management	Transport Management
		Adjacent Ports		
		Allied Services		
		Berth Operators		
		Boundary VTSs		
		Clearing Agents		
		Coast Guard Agencies		
		Competent Authorities		
		Container Depots		
		Customs		
		Customs Agents		
		Emergency Services		
		External Databases (e.g. Lloyd's)		
		Fire Brigades		
		Forwarding Agents		
		Haulier		
		Hydrographic Office		
		Immigration		
		Import/export		
		Linesmen Organisations		
		Marine pollution control units		
		Marine Safety organisation		
		Met Office		
		MRCC		
		Pilot		
		Pilots organisation		
		Port		
		Port Authority		
		Port community system		
		Port Immigration		
		Port service industries		
		Port State Control Authorities		
		Railways consignee		
		Repair yard		
		SAR		
		Shipping line/agent		
		Statistics Office		
		Terminal Operators		
		Tug Operators		
		Vessels		
		VTS		
		Water Police		

Table 3: Participant classification

Vessel Traffic Management

On comparing the various studies concerned with VTMIS there was a general consensus as to who the main participants are:

- Competent Authorities;
- Port Authorities;
- VTS Authorities;
- Waterway Authorities;
- Coast Guard Agencies;
- Port State Control Authorities;
- Customs;
- Immigration;
- Fire Brigades;
- Police;
- Health Organisations;
- Berth Operators;
- Terminal Operators;
- Bridge Operators;
- Lock Operators;
- VTS Systems;
- Pilot Organisations;
- Tug Organisations;
- Linesmen Organisations;
- Supply (e.g. bunkers);
- Ship Agents;
- Ship Owners;
- Stevedores;
- Freight Forwarders.

All of the above participants have, at some stage, the potential to influence vessel traffic movements. Although comprehensive, this list may not be complete because, as put forward within VTMIS-Net, the number of participants could keep expanding as more information becomes available. One of the arguments put forward to potential user groups during user requirement capture was that certain participants may not be aware of the possibilities and influence that certain information may have for them until the information is actually available.

If we place the above participants into a schematic diagram, linking VTM to Transport Management, we see that stevedores and freight forwarders are more inclined to Transport Management, acting in effect as the link-pins.

Included in the WP09 Final Report of COMFORTABLE is a comprehensive listing of data items required in VTS. This used previous studies such as TAIE in order to provide the backbone of the identification of function and process within VTS. Considering the overall possibilities within VTS today the following functions were addressed:

- Perform Traffic Guidance and Control
- Construct and Maintain Traffic Image
- Perform Port Management Support Functions
- Construct and Maintain Environmental and Fleet Data
- Detect Infringements and Enforcement
- Perform Remedial Traffic Functions
- Handle Historical Data Request

When considering Vessel Traffic Management and Information Services it is true to say that VTS is not necessarily a component, although many believe that, where available, it is a natural choice. It is also true to say that not all of the functions listed above are exclusive to VTS.

Due to the strong overlap on information needs the scope of VTMIS, responding to public and private demand for facilitating VTM, has sometimes been expanded far into the field of Transport Management. The conclusions drawn in the statement by

Marten Koopmans “Guidelines on Vessel Traffic Management and Information Services (VTMIS)”, approved by the CA 29 Management Committee in Lisbon on 11th June 1998, hold true but may still need further clarification in order to bring a wider consensus on the meaning of VTMIS, and the limitations that may have to be applied, if any. The conclusions included:

- VTMIS are Vessel Traffic Management and Information Services;
- VTMIS are a concept, a kind of umbrella, for all activities to improve vessel traffic information;
- VTMIS are not a super-de-luxe VTS; it does not even require a VTS;
- VTMIS deliver a traffic image to be used by Authorities, ports and companies involved in vessels and cargoes;
- VTMIS can be used for vessel traffic management, port (resource) management, fleet management and cargo (flow) management;
- VTMIS require an Authority or service provider as a driving force or catalyst and a "win-win" objective for all parties concerned;
- VTMIS can best be developed "bottom-up" but with the needs of others in mind.

The scope of “cargo (flow) management” within a VTMIS may need further clarification and “…..the needs of others in mind”, as stated in the last point, would certainly appear to require more attention.

Following is a general VTS context diagram taken from the COMFORTABLE project. This illustrates the connections as envisaged within VTS, acting as a node for Vessel Traffic Management. It provides a first indication of data flow requirements.

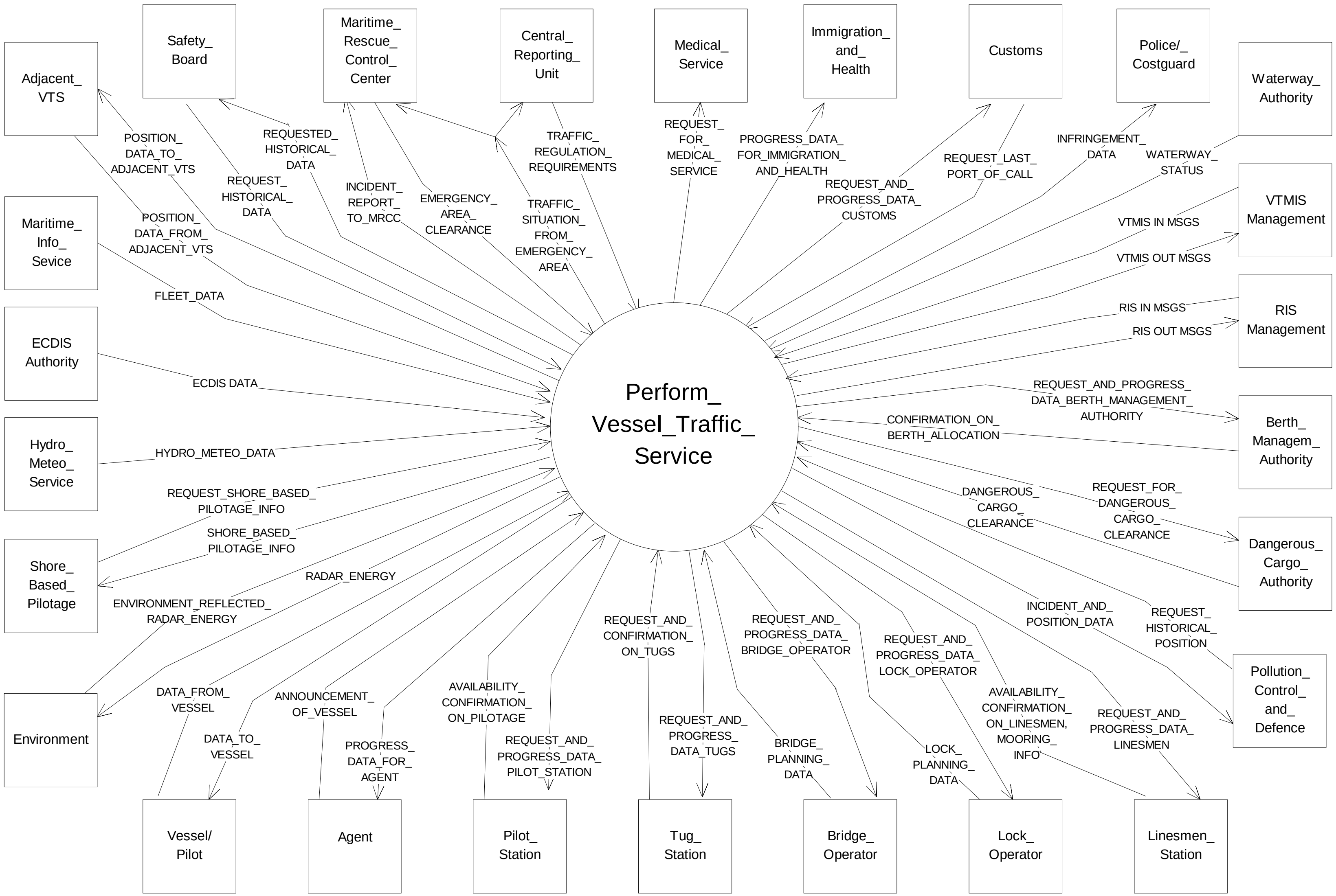

Figure1: DFD 0 – General VTS Context Diagram

Transport Management

The logistics companies find themselves more under the umbrella of Transport Management. Within EUROBORDER the following categories of organisations were considered:

- Government Bodies/ Competent Authorities;
- Customs;
- Labour Unions;
- Terminal Operators;
- Ship Owners;
- Shipping Lines;
- Shipping Agents;
- Stevedores;
- Forwarders;
- Railway Operators;
- Road Transport Operators.

It can be seen from the above that some of the potential participants mentioned are also common to VTM, such as Competent Authorities and Agents, and might, therefore, be considered as the area for attention when considering providing the links between VTM and Transport Management.

EUROBORDER provides considerable input into identifying the information, organisation and administrative requirements, concepts and functionalities in order to integrate ports into the intermodal chain, including the Trans-European Networks.

As stated among the main results of EUROBORDER: "…problems were found arising from the large number of actors involved. These problems were found both in relation to the organisations within the port and to the external actors". Of the terminals analysed the communications relied heavily on paper, facsimile and telephone rather than electronic means of data interchange.

EUROBORDER developed improvement scenarios putting forward suggestions to raise efficiency and competitiveness through:

- Networking on terminal departments;
- Electronic data interchange for communications on a large scale;
- On-line monitoring of movements throughout the terminal;
- Automatic data capture and data handling within the terminal;
- Other organisational changes, e.g. longer opening hours;
- Changes in port terminal layout;
- Changes for the interaction with customs, and;
- Acquisition of new terminal equipment.

The technical considerations put forward are outlined in Chapter 8.

Information

The flows of information currently exchanged between those actors considered either as information holders or information users, given that in many cases an information holder may also be an information user:

The flows of information can be considered in two main lights: holders and users; or initiators and receivers. We also need to remark on the types of information each organisation needs and is able to provide.

Information needs and provision

Although extensive efforts have been made within various research projects, a definitive set of user requirements is still forthcoming, this should be consolidated within the Fifth Framework Programme. The approach adopted within COMFORTABLE, whereby a series of workshops were held in order to involve the end-user from the outset, and thereby gain a qualified response may be an approach to consider.

Vessel Traffic Management

Considering Vessel Traffic Management we can formulate the following example of typical information needs and information able to be provided, as adapted from VTMIS-Net:

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
VTS	VTS	Information Services	Expected Traffic	Vessel(s) Location
	Port Authority	Navigational Assistance Services	Vessel ID	Destination(s)
		Traffic Organisation Services	Vessel ETA/ETD	ETA(s)
		Support to Allied Services	Vessel ATA/ATD	HAZMAT Status
		Rules Enforcement	Vessel Details	Traffic Situation
		Perform Traffic Guidance and Control	Hydro Information	Navigation Assistance
		Perform Port Management Support Functions	Meteo Information	
		Perform Remedial Traffic Management Functions	Environmental Conditions	
		Handle Historical Data Request		
		Construct and Maintain Traffic Image		
		Detect Infringements for Enforcement		
		Construct and Maintain Environmental and Fleet Data		

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Pilots Associations	Pilots	Pilotage	Vessel Identity	Pilot Assignment
			Vessel ETA/ETD	Vessel ETA/ETD
			Vessel ATA/ATD	Vessel ATA/ATD
			Pilotage Requirements	
			Weather Information	
			Tug Status	

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Tug Organisations	Tugs			

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Linesmen Organisations	Linesmen	Mooring	Vessel Identity	
			Vessel ETA/ETD	
			Vessel ATA/ATD	
			Weather Information	
			Tug Status	
			Berth Number	

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
National Competent Authority				

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Other Competent Authorities				

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Search and Rescue	Coastguard	Search and Rescue	Vessel(s) Location	
	Salvage Companies		Traffic Situation	
			Weather	
			Available Resources	
			Type of Incident	
			Cargo Involved	

Table 4: Information requirements – Vessel Traffic Management

Transport Management

A similar representation can be made for those organisations considered earlier to have strong ties to Transport Management, as adapted from VTMIS-Net:

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Port		Statistics	Vessel ETA	Resource Allocation (Stevedores, Dock Allocation, Fuel Supplies, etc.)
		Billing	Vessel Requirements	Emergency Arrangements

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Shipping Line	Ship Agent	Ship Management (shore-link)	Vessel ETA/ETD	Vessel ETA/ETD
Shipping Agent	Ship Broker		Vessel ATA/ATD	Vessel ATA/ATD
	Liner Shipping Company		Cargo Manifest	Cargo Manifest
	Ship Owner		Ships Plan	Ships Plan
	Ship Operator		HAZMAT Manifest	HAZMAT Manifest
	Shipper (Consignor)		Resource Allocation (Berth, Cranes, etc.)	Haulier Appointed
	Compradore (local agent negotiator)			Goods Destination
	Carrier			Passage Plan
	Charterer			

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Berth	Boatmen	Berth Control	Vessel ETA/ETD	Vessel ETA/ETD
	Line Handlers	Crane Control	Vessel ATA/ATD	Vessel ATA/ATD
	Gang	Vehicle Control	Cargo Manifest	Cargo Manifest
		Equipment Control (e.g. Tugs / Straddle Carriers)	Ships Plan	Ships Plan
		Ship Planning	HAZMAT Manifest	HAZMAT Manifest
		Load / Discharge Planning	Goods Release	Goods Arrival / Departure Status
		Equipment Maintenance	Haulier Appointed	Gatepass
			Goods Destination	Load / Discharge Plan

Service / Organisation	*Sample Parties*	*Related Functions*	*Information Needs*	*Information Provided*
Freight Forwarder /	Broker	Customs Clearance	Vessel ETA/ETD	Customs Documents
Clearing Agent	Forwarder	Driver Services	Vessel ATA/ATD	Haulier Instructions
	Importer / Exporter		Cargo Manifest	Standard Shipping Note
			Goods Release	
			Customs Regulation	
			Importer / Exporter Instructions	
			Standard Shipping Note	
			Customs Response Documents	

Service / Organisation	*Sample Parties*	*Related Functions*	*Information Needs*	*Information Provided*
Customs	Customs	Clearance Profiling	Cargo Manifest	Customs Clearance
	Customs Broker		Customs Documents	Customs Response Documents
			Vessel ETA/ETD	Customs Regulations
			Vessel ATA/ATD	
			Passenger Manifest	

Service / Organisation	*Sample Parties*	*Related Functions*	*Information Needs*	*Information Provided*
Other Regulatory Body		Goods Release Profiling	Cargo Manifest	Release Notification
			Customs Documents	Regulations
			Vessel ETA/ETD	
			Vessel ATA/ATD	
			Paperwork (Licences, Certificates, etc.)	

Service / Organisation	*Sample Parties*	*Related Functions*	*Information Needs*	*Information Provided*
Classification	Surveyor		ETA/ETD	
			Ship Status	

Service / Organisation	*Sample Parties*	*Related Functions*	*Information Needs*	*Information Provided*
Services	Bunkerer			

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Cargo	Average Adjusters			
	Tallymen			
	Warehouse Keepers			
	Container Owner			

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
Intermodal	Combined Transport Operator			
	Multimodal Transport Operator			
	Pre-carrier			

Service / Organisation	***Sample Parties***	***Related Functions***	***Information Needs***	***Information Provided***
General	Insurance Company	Payroll		
	Leasing Company	Resource Management		
	P&I Club	Accounts		
		Invoicing (Billing)		
		Resource Scheduling		
		Personnel		

Table 5: Information requirements - Transport Management

Information Flows

From VTMIS-Net we see the following flows identified. A tentative indication has been added of whether the information is applicable to Vessel Traffic Management, Transport Management or both:

Link Ref.	Information Description	Link Type	Participants		Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
			Initiator	Recipient				
1	VTS Track Message	Shore-Shore	VTS	VTS Coastguard Customs LCA NCA MRCC Allied Services Emergency Services	To be developed HDLC TCP/IP	Continuous Automatic		
1a	Vessel Track Message	Ship-Shore	Ship	VTS	AIS	Continuous Automatic		
1b	VTS Track Message	Shore-Ship	VTS	Ship	To be developed	Continuous Automatic		
2	Voyage Related Data - General	Shore-Shore	Shipping Line/Agent VTS of Port of Departure	VTS of Port of Destination Coastguard Port Berth Operator Forwarding Agent Shipping Line/Agent Water Police Pilot LCA NCA Tug Boat Customs MRCC	EDIFACT IALA/IMO AIS HDLC TCP/IP	Single Automatic		
2a	Voyage Related Data - General	Ship-Shore	Ship	VTS of Port of Destination Shipping line/agent	To be developed			
2b	Voyage Related Data - General	Shore-Ship	VTS Port	Ship	To be developed			
3	Arrival Message	Shore-Shore	VTS Berth operator Shipping Line/Agent	VTS Coastguard Berth Operator Customs LCA NCA Port Shipping Line/Agent Forwarding Agent	EDIFACT CORBA TCP/IP	Transaction Single		
3a	Arrival Message	Ship-Shore	Ship	VTS Shipping Line/Agent	VHF			
4	Departure Message	Shore-Shore	VTS Berth Operator Shipping Line/Agent	VTS Coastguard Berth Operator Customs LCA	EDIFACT CORBA	Transaction Single		

Link Ref.	Information Description	Link Type	Participants Initiator	Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
				NCA Port Shipping Line/Agent Forwarding Agent				
4a	Departure Message	Ship-Shore	Ship	VTS	VHF			
5	Request for Pilot Service	Shore-Shore	Shipping Line/Agent VTS	Pilot Co-ordinator	EDIFACT	Transaction		
5a	Request for Pilot Service	Ship-Shore	Ship	VTS Shipping Line/Agent	Telex VHF			
6	Pilot Boarding/ Landing Message	Shore-Shore	VTS Pilot	Pilot Co-ordinator Adjacent Ports	EDIFACT	Transaction		
6a	Pilot Boarding/ Landing Message	Ship-shore	Ship	VTS Port	VHF			
6b	Pilot Boarding/ Landing Message	Shore-Ship	VTS Port		VHF			
7	Ship Information	Shore-Shore	VTS	VTS	EDIFACT	Single Automatic		
7a	Ship Information	Ship-Shore	Ship	VTS	AIS VHF			
8	Inland Waterway Message on Ship Manifest, Dimensions and ETA Inland Water Travel Ship Dimension Message	Shore-Shore	VTS Shipping Line/Agent Pilots	VTS Shipping Line/Agent Berth Operator Customs LCA NCA Port Pilots Forwarding Agent Water Police	EDIFACT CORBA	Single Transaction		
9	Ship's Static Data	Shore-Shore	VTS of Port of Departure Shipping Line Port External Database (e.g. Lloyds)	VTS of Port of Destination External Database e.g. Lloyds Port State Control Coastguard Customs Forwarding Agent Berth Operator LCA NCA Port Marine Safety Organisation Pollution Control Units	EDIFACT CORBA	Single (Automatic) Batch Transaction Continuous		
9a	Ship's Static Data	Ship-Shore	Ship	VTS of Port of Destination	To be developed AIS			
10	**Environmental Data:**							
10.1	Meteorological Data	Shore-Shore	Met Office VTS Weather Station Hydrographic	VTS Shipping Line/Agent Met Office Port	EDIFACT Satellite CORBA	Transaction Single Broadcast		

Link Ref.	Information Description	Link Type	Participants Initiator	Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
			Office	Berth Operator NCA LCA Coastguard Marine Safety Organisation Marine Pollution Units Pilots Tug Operator				
10.1a	Meteorological Data	Ship-Shore	Ship Weather Ship	VTS Met Office Port	EDIFACT Satellite CORBA	Transaction Single Broadcast		
10.1b	Meteorological Data	Shore-Ship	Met Office VTS	Ship	EDIFACT Satellite CORBA	Transaction Single Broadcast		
10.2	Tidal Information	Shore-Ship	Port VTS	Ships Berth Operator Shipping Line/Agent	To be developed	Transaction Single		
11	**SAR:**							
11.1	Distress Message	Ship-Shore	Ship	VTS MRCC Coastguard SAR	DSC Format Satellite	Single (Automatic)		
11.2	SAR Message	Shore-Shore	VTS in Emergency	Boundary VTSs MRCC Coastguard SAR	VTMIS Common Message Format	Single (Automatic)		
11.3	Incident Message	Shore-Shore	Port VTS	VTS NCA LCA Water Police Fire Brigade Coastguard Marine Pollution Control Units Marine Safety Organisation Shipping Line/Agent Institutional Authorities Allied Services (involved)	EDIFACT CORBA	Transaction		
11.3b	Incident Message	Shore-Ship	Port VTS	Ship	EDIFACT CORBA VHF	Transaction		
12	**Dangerous Goods:**							
12.1	Dangerous Goods Message Request	Shore-Shore	Port Shipping Line/Agent Berth Operator VTS	NCA LCA VTS Berth Operator Water Police Forwarding Agent Coastguard Marine Pollution Control Units	EDIFACT CORBA	Single Batch Through		

Link Ref.	Information Description	Link Type	Participants Initiator	Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
12.2	Dangerous Goods Message	Shore-Shore	Port Shipping Line/Agent Berth Operator VTS	NCA LCA VTS Berth Operator Water Police Forwarding Agent Coastguard Marine Pollution Control Units	EDIFACT CORBA	Single Batch Through		
12.2a	Dangerous Goods Message	Ship-Shore	Ship	VTS	AIS VHF	Single Batch Through		
13	**Waste:**							
13.1	Waste Notification	Shore-Shore	Coastguard Marine Pollution Control Units VTS	Port Water Police Customs Berth Operator Marine Pollution Control Units Coastguard NCA / LCA	EDIFACT CORBA	Single		
13.1a	Waste Notification	Ship-Shore	Ship	Port	EDIFACT CORBA	Single		
13.2	Non-compliance to Waste Notification	Shore-Shore	Port Authority	Port State Control	EDIFACT CORBA	Single		
13.3	Notification of Inadequacies / Non-availability of Port Reception Facilities	Shore-Shore	Shipping Agent Competent Authority	Competent Authority	EDIFACT CORBA	Single		
13.3a	Notification of Inadequacies / Non-availability of Port Reception Facilities	Ship-Shore	Ship's Master	Competent Authority (and then onto the Port Authority)	VHF Telex Telephone	Single		
13.4	Non-compliance with Article 7 (disposal of ship-generated waste)	Shore-Shore	Port State Control Authorities	Other Member States	EDIFACT CORBA	Batch		
14	Container Status Information	Shore-Shore	Port Berth Operator Container Depot Repair Yard	Shipping Line/Agent Customs Haulier Importer / Exporter Forwarding Agent Water Police	EDIFACT CORBA	Transaction Single		
15	INTRASTAT	Shore-Shore	Customs Agent Import/Export	Customs	EDIFACT	Batch Single		
16	Maritime Traffic Statistics	Shore-Shore	VTS	NCA LCA VTS Coastguard Port Shipping Line/Agent Customs Pilots Statistics Office	EDIFACT	Single Batch		
17	Freight Booking	Shore-	Forwarding	Shipping	EDIFACT	Single		

Link Ref.	Information Description	Link Type	Participants Initiator	Participants Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
		Shore	Agent Exporter	Line/Agent		Batch Transaction		
18	Port Resources Status	Shore-Shore	VTS Port Pilots Organisation Berth Operator Port Service Industries	VTS Ship Shipping Line/Agent Forwarding Agent Marine Safety Organisation Marine Pollution Control Units Haulier Railways Consignee Coastguard	EDIFACT CORBA	Transaction		
19	Manifest Information	Shore-Shore	Shipping Line/Agent Berth Operator VTS Port Port Community System	VTS Shipping Line/Agent Forwarding Agent Berth Operator Customs Port Port Community System Other Authorities (many of these also act as a relay station for onward distribution) LCA NCA Coastguard	EDIFACT	Transaction Batch Single		
19b	Manifest Information	Shore-Ship	Berth Operator	Ship	To be developed	Batch		
20	**Pollution:**							
20.1	Pollution Report	Shore-Shore	Ship Coastguard Marine Pollution Control Units VTS	VTS Ship Port Marine Pollution Control Units Coastguard NCA LCA	EDIFACT	Single		
20.1a	Pollution Report	Ship-Shore	Ship	VTS Port Marine Pollution Control Units Coastguard NCA LCA	EDIFACT VHF	Single		
20.1b	Pollution Report	Shore-Ship	Coastguard Marine Pollution Control Units VTS	Ship	EDIFACT VHF	Single		
20.2	Counter Pollution Details	Shore-Shore	Marine Safety Organisation	Ports Marine	EDIFACT CORBA	Transaction		

Link Ref.	Information Description	Link Type	Participants Initiator	Participants Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
				Pollution Control				
20.3	Pollution Warning	Shore-Shore	Ship Coastguard Marine Pollution Control Units VTS	Coastguard NCA LCA Ship Marine Safety Organisation Marine Pollution Control Units Water Police Port VTS	EDIFACT	Single Transaction		
20.3a	Pollution Warning	Ship-Shore	Ship	Coastguard NCA LCA Marine Safety Organisation Marine Pollution Control Units Water Police Port VTS	EDIFACT VHF	Single Transaction		
20.3b	Pollution Warning	Shore-ship	Coastguard Marine Pollution Control Units VTS	Ship	EDIFACT VHF	Single Transaction		
20.4	Pollution Information	Shore-Shore	Coastguard Marine Pollution Control Units VTS Port	Coastguard NCA LCA Marine Safety Organisation Marine Pollution Control Units Water Police Port	EDIFACT	Single Transaction		
20.4a	Pollution Information	Ship-Shore	Ship	Coastguard NCA LCA Marine Safety Organisation Marine Pollution Control Units Water Police Port VTS	EDIFACT	Single Transaction		
20.4b	Pollution Information	Shore-Ship	Coastguard Marine Pollution Control Units VTS	Ship	EDIFACT VHF	Single Transaction		
20.5	Pollution Facilities	Shore-Shore	Coastguard Marine Pollution Control Units VTS	VTS Coastguard Marine Safety Organisation Marine Pollution Control Units Port Water Police	EDIFACT	Single Transaction		

Link Ref.	Information Description	Link Type	Participants Initiator	Participants Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
				NCA LCA				
20.5a	Pollution facilities	Ship-shore	Ship	VTS Coastguard Marine Safety Organisation Marine Pollution Control Units Port Water Police NCA LCA	EDIFACT	Single Transaction		
20.5b	Pollution Facilities	Shore-Ship	VTS Coastguard Marine Safety Organisation Marine Pollution Control Units Port Water Police NCA LCA	Ship	EDIFACT VHF	Single Transaction		
20.6	Polluter Identification Message	Shore-Shore	Marine Pollution Control Units VTS	Marine Safety Organisation (National and International) Other Marine Pollution Control Units (National and International)	EDIFACT	Single or Transaction		
21	**Customs:**							
21.1	Customs Declaration	Shore-Shore	Clearance Agent	Customs	EDIFACT	Single Batch Transaction		
21.2	Customs Clearance	Shore-Shore	Customs	Clearing Agent Berth Operator Haulier	EDIFACT	Single Transaction		
22	Immigration and Health Message	Shore-Shore	VTS	Port Immigration Water Police NCA LCA	EDIFACT CORBA	Single Transaction		
22a	Immigration and Health Message	Ship-Shore	Ship	Port Immigration Water Police NCA LCA	EDIFACT CORBA VHF	Single Transaction		
23	Passenger Manifest	Shore-Shore	Shipping Line/Agent VTS	Port Immigration Customs	EDIFACT CORBA	Single Transaction		
23a	Passenger Manifest	Ship-Shore	Ship	Port Immigration Customs	EDIFACT CORBA VHF	Single Transaction		
23b	Passenger Manifest	Shore-Ship	Shipping Line/Agent	Ship	EDIFACT CORBA VHF	Single Transaction		
24	Ship's Navigation Plan	Shore-Shore	Shipping Line/Agent VTS	VTS Port Forwarding Agent Berth Operator Customs	EDIFACT AIS	Single (Automatic)		

Link Ref.	Information Description	Link Type	Participants Initiator	Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
				Water Police Pilot LCA NCA Coastguard				
24a	Ship's Navigation Plan	Ship-Shore	Ship	VTS Port Forwarding Agent Berth Operator Customs Water Police Pilot LCA NCA Coastguard	EDIFACT AIS	Single (Automatic)		
25	Agent's Data	Shore-Shore	Shipping Line/Agent VTS	Port Berth Operator NCA LCA Immigration Customs Coastguard Marine Safety Organisation Marine Pollution Control Units Forwarding Agent Clearing Agent Haulier VTS	EDIFACT CORBA	Single Transaction		
26	Billing Services (charges on PSC, SAR, Aids to Navigation, Anti-pollution Capacity, Salvage)	Shore-Shore	Port Coastguard Marine Safety Organisation Marine Pollution Control Units Forwarding Agent Shipping Line/Agent Water Police Pilot Organisation LCA NCA Tug Operator Customs MRCC	Shipping Line / Agent Importer / Exporter Clearing agent	EDIFACT CORBA	Single Transaction		
27	VTMIS Internal Messages	Shore-Shore	VTMIS	VTMIS	CORBA EDIFACT	Single Batch Transaction		
28	Berth Information	Shore-Shore	Berth Operator Port VTS	Shipping Line/Agent Berth Operator Forwarding Agent Customs Water Police Fire Brigade Pilot Immigration	EDIFACT	Transaction Batch Single		

Link Ref.	Information Description	Link Type	Participants Initiator	Recipient	Standard Protocol	Type of Trans-mission	Vessel Traffic Management	Transport Management
28b	Berth Information	Shore-Ship	Berth Operator Port VTS	Ship	EDIFACT	Transaction Batch Single		
29	Bay Plan	Shore-Shore	Shipping Line Berth Operator	Shipping Line Berth Operator	EDIFACT	Transaction Batch Single		

Table 6: Information flows

Transmission means

EUROBORDER proposes the following supporting technologies for the following functions:

	ITS - Technology/equipment	Used for
	Integrated Terminal Management and Information Systems (**MIS**)	• Management and control of all terminal internal processes • Terminal networking
	Yard Management Software	• Management of storage area
	Electronic Data Interchange (**EDI**) - EDIFACT, Internet	• Electronic booking • Electronic status reports • Electronic invoicing • Electronic sending of documents (e.g. manifests)
	On Board Units (**OBU**s), GSM	• Communication with external vehicles (forwarder/transport operator), with internal vehicles and cranes (terminal operator)
	Radio Frequency **Tags** and Transponders	• Automatic identification of ITU and vehicles throughout the terminal
	Smart Cards	• Automatic identification of drivers for authorisation of entrance
	Optical Character Reading (**OCR**)	• Automatic identification of containers (via container number) at land and sea side gate
	Video cameras, **video stored pictures**	• Damage control
	Variable Message Signs (**VMS**)	• Guidance of external vehicles
	DGPS - Differential Global Positioning System	• To position internal vehicles (and consequently ITUs)
	Simulation/optimisation model for port terminals	• Using computer software to test major strategic decisions

Table 7: Transmission means – Transport Management

Within VTM many transmission means are in use for shore-shore, ship-shore and shore-ship. These are outlined to a certain degree within Chapter 7.2 “Information Flows”.

Interconnectivity

BOPCom provides one possible solution to the challenge of interconnectivity. “Based on an innovative concept for communication called “Interconnectivity Management” (IM), related IM tools were developed for linking application systems so that they can interact automatically.” Applications implemented in BOPCom include:

- Cargo Booking;
- Hinterland Transport;
- Dangerous Cargo Management;
- Transport Order;
- Transhipment;
- Vessel Movement and Berth Allocation.

More recently the results were applied to the VTMIS-Net demonstrator project for some of the partners in the North Sea - Channel Demonstrator, providing the means for several ports to exchange VESDEP (VESsel DEParture) type information, including ETA and ATD, using Internet technology.

The various tools include:

OSIS *Open System Interconnection Software*
The OSIS Tool enables any systems exchanging ASCII or EBCDIC files (e.g. EDIFACT messages) to be linked up.

MEGA *Message Gateway*
The MeGa Tool enables the convenient linking of ASCII files (e.g. EDIFACT messages) and database structures.

CODABA *Communications Database*
CoDaBa is a generic database structure that can be used for storing any information to be exchanged in the port and transport business. The user can implement CoDaBa with any kind of relational database management system (RDBMS).

APVIS *Application Viewers*
ApVis are tools for directly accessing the Communications database CoDaBa. They can be used for on-line data entry and retrieval by communication partners who do not have an application system supporting the communication.

The VESDEP message utilised the data dictionary provided overleaf.

Message type:				
Data Element	**Type**	**Unit**	**Example**	**Description**
Message Type	M	an..35	DEPARTURE	Type of message
Message ID	M	N	10001	Identifier for this message
Initiator ID	M	N	5	Identifier of initiator
Initiator	M	an..20	WILHELMSHAVEN	Message initiator at area of departure
Recipient ID	C	N	1	Identifier of recipient
Recipient	M	an..20	LEHAVRE	Message recipient
Time stamp	M	n14	19990430103800	UTC when the message was generated
UTC Time Zone	M	n..2	2	Difference local time minus UTC
Vessel ID	M	an..6	CY5T	Call sign
		n..9	987654321	Lloyds register number / IMO number
		n..9	123456789	MMSI number
Vessel ID Type	M	An	1	Identifies what is used as Vessel ID
Vessel name	C	an..35	Titanic	Vessel Name
Acknowledgement	M	n1	0	1 = yes = request a return message; 0 = no
Port of Departure	M	an..5	DEBRE	UN LOC Code
Port of Destination	M	an..5	FRLEH	UN LOC Code
ATD	M	n14	19990430103530	UTC for actual time at point of departure
Longitude at ATD	C	N	-22562	1/10 000 minute East = pos., West = neg.
Latitude at ATD	C	N	44823	1/10 000 minute North = pos., South = neg.
Course over ground	C	N	157	1/10 degree steps
Speed over ground	C	N	56	1/10 knot steps
Actual draught	C	N	62	1/10 m Max 25,5 m
Dangerous goods ID	C	N1	1	1 = yes = dangerous goods onboard; 0 = no
Waste ID	C	N1	0	1 = yes = waste onboard; 0 = no
ETA	C	N12	199905020930	Estimated time of arrival
ETA time reference	C	N14	19990430103800	UTC when the ETA was calculated
UTC Time Zone for ETA	C	n..2	2	Difference local time for ETA minus UTC
Longitude at ETA	C	N	-22562	1/10 000 minute; East = pos., West = neg.
Latitude at ETA	C	N	44823	1/10 000 minute; North = pos., South = neg.
ETA provider	C	an..20	Captain	Free Text

Table 8: Data Dictionary used in VTMIS-Net VESDEP message[24]

[24] The origin of this Data Dictionary lies within the MOVIT project.

Of particular interest from the EUROBORDER study is the ranking applied to various organisations with respect to their influence on each other. Ranking was determined in order of active influence, reactivity and total behaviour. The following overall ranking was determined:

1	Customs
2	Large Shipper
3	European Union
4	Labour Unions
5	Railways
6	Large shipping line/agent
7	Large forwarder
8	National ministries
9	Port owners

10	Local authority
11	Port authority
12	Large road haulier
13	Terminal operator
14	Small shipping line/agent
15	Stevedoring company
16	Small forwarder
17	Small road haulier

Table 9: Influence ranking within Transport Management

It was concluded that: "..the terminal operators and port authorities are in a very difficult situation if they want to improve their performance and become more competitive. They have too little influencing power themselves, but have to adapt to large customers and adhere to regulations. …..on the information level a lot of other organisations are involved. The development here is proceeding very slowly, with the port having to create interfaces to a lot of different information systems. The ports have to wait for further standardisation, or develop solutions with which they are independent from other organisations."

In suggesting solutions the report goes on to add: "One possibility for improvements to take place is on the total transport chain, then including the port. This requires high co-ordination and co-operation between all actors….Interoperable systems or interfaces between the single systems still have to be developed."

Future Considerations

The User Requirements capture conducted in VTMIS-Net identified certain areas for consideration, as identified below:

- Direct data entry into an automated system, thereby increasing efficiency;
- Licensed and controlled access to data in standard report formats should be used within a network for consistency, security and ease of transmission;
- Information on both the national and international level needs to automated/speeded up;
- Easier and direct access to accurate information on ETAs, berths, pilotage, hazardous cargoes and weather should be provided;
- Automatic hand-over of vessel information from port of departure to port of arrival, including ATD and ETA;
- Integrated rescue organisation network;
- Co-ordination of VTMIS information exchange locally, nationally and at a European level.

Many of the above items have been addressed within the demonstrations held in VTMIS-Net, although concerns regarding consistency, security and ease of transmission have not been fully covered.

Due to emerging technological evolution it was determined within EUROBORDER that legislation must be updated rapidly. Major concerns were raised with respect to EDI, tags, smart card solutions and automatic data capture and handling. Concerns raised within the requirements capture conducted within VTMIS-Net also held true for EUROBORDER: “With regard to the EDI legislation, there are some legal issues to be solved. These are related to the authentication, uniqueness of documents, storage of data, reliability, liability and insurance.” Electronic commerce and signatures has also raised some legal issues.

It cannot be said that every actor requires the same level of content, accuracy and/or up-date rate, and likewise it cannot be said that every piece of information requires the same security, reliability and/or accessibility considerations.

Within Vessel Traffic Management we may have to consider what level of traffic guidance is to be provided. If a conventional VTS were to perform the majority of Vessel Traffic Management, and that VTS only provided Information Services, then the information needs would vary greatly from a VTS providing Navigational Assistance Services and Traffic Organisation Services. If we were to consider a port with many intermodal possibilities, including extensive rail and road connections, then the link between Vessel Traffic Management and Transport Management may need to be integrated more closely, in order to provide enhanced efficiency, implying at least the same level of safety, within that port.

EUROBORDER concluded that: “The introduction of sophisticated internal information systems in relation with the computerisation of the port terminal and the use of EDI constitute one factor that improves daily terminal operations not only for the port terminal itself but also for its customers (transport company, shipping company, end customer).”

Conclusions

Both Transport Management and Vessel Traffic Management have their information holders and information users. Of course, some information is exclusive to either Transport Management or Vessel Traffic Management, however a large proportion of the information is held and used in both sectors. The key then, may be to determine which actors are best suited to gather and distribute the information.

It can be that two different actors are holders of the same information, although the source of that information may be different. Who, therefore, can be said to have the better information, in terms of quality? Traditionally users of information have been able to rely on various sources for information and they already have well established links with holders of information that supply the level of service (accuracy, timeliness, reliability etc.) that they require. If we are to consider information flow between Transport Management and Vessel Traffic Management then it may be sufficient to ensure that the systems holding the information are able to “talk” to each other through set protocols, or solutions such as those provided in BOPCom.

Two considerations that have to be borne in mind are:

- Public or Private: The definition of VTMIS as supplied calls for an intention to respond to public and private demand for facilitating Vessel Traffic Management, but it must be remembered that what is public in one country may be private in another, and vice versa;
- Where does Vessel Traffic Management stop and Transport Management begin? Maybe the VTM boundary should be drawn when the vessel is alongside, although EUROBORDER places the Port Authority, the traditional providers of VTM in their environment, in only eleventh place in the Transport Management influence matrix. Limitation may be needed with respect to which actors can be classed within Vessel

Traffic Management and which within Transport Management. The information needs may be common although the defined actors, functions and responsibility attached are different.

The following statements from EUROBORDER may be used to summarise the wide-spread consensus for the way forward both in Transport Management and Vessel Traffic Management: "One possibility for improvements to take place is on the total transport chain, then including the port. This requires high co-ordination and co-operation between all actors….Interoperable systems or interfaces between the single systems still have to be developed."…… "The ports have to wait for further standardisation, or develop solutions with which they are independent from other organisations." A consequence of ports and others developing their solutions, given the expense of current systems, is that achieving any standards may only occur at the next system upgrade, unless they have been able to successfully 'future proof' their current systems.[25]

The call for further standardisation is strong and a meeting of minds between Transport Management and Vessel Traffic Management actors should be sought in order to determine where further integration is desired, and who is able, and willing, to provide what to whom, within the limitations of an operational and organisational structure.

References

Aristotle University of Thessaloniki (AUTh) et al., "Evaluation Results and Feasibility Analysis", EUROBORDER, EC 4th FWP (DG VII), 1998.

Defence and Evaluation Research Agency (DERA) et al., "Network and Communication Architecture", VTMIS-NET, EC 4th FWP (DG VII), 1998.

Institute of Ship Operation, Sea Transport and Simulation (ISSUS) et al., "Generic Entity Relationship Model", POSEIDON, EC 4th FWP (DG XIII), 1997.

Institute of Shipping Economics and Logistics (ISL) et al., Promotional Literature, BOPCom, EC 4th FWP (DG VII), 1998.

Koopmans M, "Guidelines on Vessel Traffic Management and Information Services (VTMIS)", approved by the CA 29 Management Committee in Lisbon on 11th June 1998.

MarineSafety Int. Rotterdam (MSR) et al., "Data Links and Data Bases", COMFORTABLE, EC 4th FWP (DG VII), 1998.

Transport Research Institute (TFK) et al., "Final Report for Publication", EUROBORDER, EC 4th FWP (DG VII), 1998.

Additional Information

In addition to the web links provided in the text, the following sites are of interest:

Concerted Action on VTMIS:
http://www.vtmis.de or http://www.cordis.lu/transport/src/technise.htm

EC Transport RTD Programme: Waterborne Transport Research Projects:
http://www.cordis.lu/transport/src/water.htm

[25] Comment by Mike Hadley (DERA)

Technisec project

Bridge programme

Preliminary study on the organisation of

European Search and Rescue and Pollution combating services

Sub-contract

Annex I

Preliminary study - General terms of reference

All coastal States within the European Union have a clear perception of measures to be implemented, to cope with their obligations as they result from the international conventions established under the aegis of the International Maritime Organisation (such as the SOLAS Convention, the SAR Convention, the MARPOL Convention and the STCW Convention).

Large efforts have been spent to implement efficient structures and means to rescue people in danger, detect and combat marine pollution. Provisions have been made to share and exert responsibilities in case of accidents occurring in the open sea.

Experience shows that :

- the organisations which have legitimately been set up by European countries to comply with their obligations largely differ from one country to another,

- due to the complexity of these organisations resulting in particular from the diversity of means involved (nautical and aeronautical means, coupled with telematics facilities), in cases of accidents implying multinational co-operation, the lack of mutual understanding of the role of competent authorities may hinder the success of remedial operations.

In this context the VTMIS concerted action management committee has decided to undertake a preliminary study with the following objectives :

- to gather proper information on the structures of organisations which throughout Europe are responsible for search and rescue operations, pollution detection and combating, provision of aids to navigation,

- to identify, where any, the requirements for co-operation between operational centres owned by different countries to optimise the use of resources.

The Technical Secretariat within the frame of the Technisec project has been entrusted to take appropriate steps to help the management committee in gathering and processing as appropriate at a further stage the relevant information related to both the above issues.

Technisec project

Bridge programme

Preliminary study on the organisation of

European Search and Rescue and Pollution combating services

Sub-contract

Annex II

Detailed terms of reference for TOP VIEW contribution to the study

The contribution of TOP VIEW to the preliminary study on organisation of search and rescue and pollution combating services will address countries participating in the VTMIS concerted action, i.e. 14 maritime States, members of the European Union, plus Norway.

TOP VIEW contribution will consist in :

i) drafting questionnaires to be circulated to the members of the Management Committee who will be responsible for collecting the information and sending it back to TOP VIEW through IFN,
ii) interviewing the Italian competent authorities in Rome,
iii) processing the answers so as to establish a data base,
iv) extracting from the data base a draft picture of the most important feature of the current situation, to be finalised by IFN for final submission,
v) preparing a draft final report to be finalised by IFN for final submission,
vi) taking part in the VTMIS conclusive workshop in Paris on the 21st of October and delivering on that occasion a presentation on the matter.

Ad i) The general structure of questionnaires will be set up and finalised in agreement with IFN. To this reference is made to TOP VIEW and IFN messages dated 24.02 and 12.03 respectively.

The questionnaires will be submitted to the Management Committee for approval prior to its distribution.

The questionnaire should be drawn up in such a way that it could also be used for the interviews to be conducted by TOP VIEW in Rome and also by IFN in other places.

Ad ii) Interviews to be conducted by TOP VIEW in Rome and by IFN in other places will be based on the questionnaires. As far as possible contacts will be made with high ranked officers so as to collect in addition views on the general policy of national governments concerned on the future development/implementation of measures aiming at improving the safety of navigation and the protection of the environment.

Ad iii) In establishing the data base consideration will be given on processes allowing to retrieve the data from the data base and to answer to queries involving multiple entries.

Ad v) ad vi) The structure and contents of the final report and presentation at the conclusive workshop are specified in article 7 Deliverables of the contract.

Technisec Project

DG VII - Concerted Action Task 29

(Contract n. WA–96–CA 8103)

A survey on European SAR and Pollution Combating Organisations

- FINAL REPORT -

Ver 1.2 – 10/04/2000

Prepared by:

IFN (F) **- Top View** (I)

doc.: IFN/10.04.00/W95W7.0/1.2/E

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IFN – Paris</td><td><u>Version / Date of publication:</u>
Ver 1.2 – 10/04/2000</td></tr>
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Summary:

This documents is the final report relating to the activity carried out by IFN, with the collaboration of *TOP VIEW System Engineering* as subcontractor, under the Technisec contract with the European Commission – DG VII.

The work has been aimed at undertaking a preliminary study on SAR/POL organisations in Europe with the following objectives:

- To gather proper information on the structures of organisations which throughout Europe are responsible for search and rescue operations, pollution detection and combating, provision of aids to navigation,
- To identify, where any, the requirements for co-operation between operational centres owned by different countries to optimise the use of resources.

The information gathering has been mainly based on a "POL Questionnaire" and a "SAR Questionnaire" issued to the competent officers in all the participating countries, with the collaboration of the national representatives participating in the VTMIS T.29 management committee, aiming in particular at:

- Updating the present knowledge on the subject at European level and gathering the experience of the last years.
- Picking up possible issues preventing or reducing the effect of SAR/POL operations, particularly those where international co-ordination and harmonisation are needed.
- Assessing the potential interest of VTMIS networks to support/improve SAR/POL data exchange, especially in emergency situations.

Number of pages:	**426**
Number of figures:	**2**
Number of tables:	**12**
Number of annexes:	**4**

List of contents

Annexes

General abbreviations

AdmMun	Municipal Administration
AdmProv	Provincial Administration
AIS	Automatic Identification System (transponder, IMO compliant)
AutEnv	Competent Authority for Environment
comm.	communication(s)
CVD	Civil Defence competent authority
det.	Detailed
DisPlan	Disaster Plan/Emergency Plan/Contingency Plan
Emg.cy	Emergency
EU	European Union
FireBri	Fire Brigade
GMDSS	*Global Maritime Distress and Safety System*
implem.	Implementation
ITU	*International Telecommunication Union*
MinDef	Ministry of Defence
MinEnv	Ministry of Environment
MinFor	Ministry of Foreign Affairs
MinInt	Ministry of Interiors
MinTra	Ministry of Transport
Munic. Adm.	Municipal Administration
NCA	National Competent Authority (broadly intended)
org.	Organisation (public or private)
OPRC	*IMO Convention on pollution preparedness, response and co-operation* (OPRC 1990)
OSC	On Scene Commander
P_Auth	Port Authority
POL	Pollution Combating
Prov. Adm.	Provincial Administration
PSTN	Public Switched Telephone Network
publ.	Publication
Q. / quest.	Questionnaire
RC	Response Commander
RegEnvCen	Regional Environment Centres
RegPOLCen	Regional Pollution Combating Centres
RTIS	Regional Traffic Information Service
RIS	River Information Service
SAR	Search & Rescue
SRS	Ship Reporting System
TSS	Traffic Separation Scheme(s)
VAN	Value-Added-Network
VTM	Vessel Traffic Management
VTMIS	Vessel Traffic Management Information Service
VTS	Vessel Traffic Service
WAN	Wide Area Network

Special "by country" abbreviations

The abbreviations listed below are used within the summary tables in this report and also in the Annexes. They give also an overall view of the specific national organisations involved in POL and SAR for each country.

(Be1): MFC = *Ministry of the Flemish Community*-Dept. of Infrastructures and the Environment Waterways and Marine Affairs administration, Pilotage and VTS.

(Be2): FDE = *Federal Dept. For Environment*.

(Be3): *Management Unit of North Sea and Scheldt Estuary*, mathem. Model of marine ecosystem is at Royal Belgian Inst. For Natural Sciences.

(Fi1): FEI= *Finnish Environment Institute*, depending on the Finnish Ministry of the Environment.

(Fi2): Other governmental Bodies: Board of Navigation, Coast Guard, Defence Forces.

(Fi3): FFG= *Finnish Frontier Guard* part of the Ministry of Interiors.

(Fi4): FMA= *Finnish Maritime Administration*.

(Fr1a): CROSS= *Centre regionaux operationnel de surveillance et de sauvetage..*

(Fr1): Navy, Customs, Maritime Affairs, Gendarmerie.

(Fr2a): The *Préfet Maritime* ("PrèfMar") are three in total in France, supported by *CROSS* as specialised body. PrèfMar are Admirals in charge of a naval command and also in charge of a general responsibility for "State's action at sea". For the latter duties they do not report to the Minister of Defence, but to the Prime Minister or to any Minister, according to the matter involved.

(Fr2b): The *Prefét de Departement* is a high commissioner of administrative department. The co-ordination with *Préfet Maritime* is ruled by a "Sea Polmar Plan" and a "Land Polmar Plan".

(Fr3): *Ministère de l'Equipement et des Transport.*

(Fr4a): CAAM= *Centre Administratif des Affaires Maritimes*.

(Fr4b): CEDRE= *Centre de documentation et d'Expérimentation de Recherche sur les pollutions accidentelles des eaux*.

(Fr5): CEPPOL= *Commission d'Etudes Pratiques de lutte anti-pollution*.

(Fr6): Regarding Governmental Committee to the sea and Secretarial general to the sea.

(Fr7): Regarding the organisation of the State actions at sea.

(Ge1): ELG= *National Spill Response Team*, with representatives of the Federal Government and of the five Federal Coastal States.

(Ge2): MOT= *Federal Ministry of Transport, Housing and Building*.

(Ge3): WSA= *Water and Shipping Authority* of the Federal Ministry of Transport (MOT).

(Ge4): FCS= *Federal Coastal State(s)*.

(Ge5): DGzRS= *German Sea Rescue Service* (*Deutsche Gesellschaft zur Rettung Schiffbrüchiger*), is a private non-profit organisation.

(Ge6): ZMK= the *National Reporting Centre* in Cuxhaven.

(Gr1): MEPD= *Marine Environm. Protection Division* of the Ministry of Mercantile marine.

(IT1): ICG = *Italian Coast Guard= Comando Generale delle Capitanerie di Porto.*

(NL1): NCG= *Netherlands Coast Guard* (Centre in Ijmuiden).

(NL2): NSD= *North Sea Directorate* (/responsible for pollution combating on the North Sea), a directorate from Rijkswaterstaat/ Ministry of Transport Public Works and Water Management.

(NL3): DG-RWS= *Directoraat-Generaal Rijkswaterstaat*.

(NL4): NCC= *National Co-ordination Centre*.

(NL5): CNDPT = *Chairman of the National Disaster Policy Team*, as the representative of the Netherlands Minister of Transport, Public Works and Water Management, supported by the NCG (Coast Guard Centre in Ijmuiden).

(NL6): KNRM= Royal Netherlands Lifeboat Institution.

(No1): RMJ = *Royal Ministry of Justice*, Rescue and Emergency Planning Department.

(No2): SFT= *Statens Forurensningstilsyn* => Norwegian Pollution Control Authority - Dept. for Control & Emergency Response.

(No3): NMD= *Norwegian Maritime Directorate*

(SP1): DGMM= *Merchant Marine General Directorate*, from the Transport Dept. in the Ministry of Economic Development. The operational structures are SASEMAR-*National Maritime SAR Organisation* and EPPE-*National Organisation of Port Authorities*, see Spain's questionnaire for a complete description of the structure.

(SP2): SASEMAR= National Maritime Safe & Rescue Organisation in Spain.

(SP3): EPPE= *National Organisation of Port Authorities* in Spain.

(SP2): CIC= *Integrated Service Coordination Centre*, part of the SASEMAR structure.

(Sw1): SwCG= *Swedish Coast Guard*, depending on the Ministry of Defence.

(Sw2): SMA= *Swedish Maritime Administration*, under the general responsibility for organisation of the *Ministry of Industry, Employment and Communications.*

(UK1): MCA= *Maritime & Coastguard Agency.*

(UK2): HMCG= *Her Majesty Coast Guard*, part of the MCA.

(**UK3): DETR**= *Department of the Environment, Transport and the Regions*

A SURVEY ON EUROPEAN SAR AND POLLUTION COMBATING ORGANISATIONS

Introduction

This paper reports the results of a survey regarding the organisation of the national competent bodies responsible for SAR and Pollution combating operations in the European States.
The work has been carried out within the TECHNISEC project of DG VII as a preliminary study on the subject, in view of the main findings to be further investigated within the 5th R&D Framework Program.
The following aspects are described:

- The relevant international Agreements and Resolutions,
- The results of the survey, carried out with questionnaires,
- The relevance of the VTMIS concepts with respect a European VTMIS network specialised for SAR & POL activities,
- The main issues regarding the reciprocal interoperability of the various national information systems.

Rationale for the study

All coastal States within the European Union have a clear perception of measures to be implemented to cope with the obligations resulting from the international conventions established under the aegis of the International Maritime Organisation (such as the SOLAS Convention, the SAR Convention, the MARPOL Convention and the STCW Convention).
Large efforts have been spent to implement efficient structures and means to rescue people in danger, detect and combat marine pollution. Provisions have been made to share and exert responsibilities in case of accidents occurring in the open sea.
Experience shows that:

- The organisations which have legitimately been set up by European countries to comply with their obligations largely differ from one country to another,
- Due to the complexity of these organisations, resulting in particular from the diversity of means involved (nautical and aeronautical means, coupled with telematics facilities), in case of accidents implying multinational co-operation, the lack of mutual understanding of the role of competent authorities may hinder the success of remedial operations.

In this context the *VTMIS Concerted Action Management Committee* has decided, at the meeting held on 7th April 1999, to undertake a preliminary study on SAR/POL organisations in Europe with the following objectives:

- To gather proper information on the structures of organisations which throughout Europe are responsible for search and rescue operations, pollution detection and combating, provision of aids to navigation,
- To identify, where any, the requirements for co-operation between operational centres owned by different countries to optimise the use of resources.

Methodology

It was agreed that the information gathering procedure would include the preparation and distribution of questionnaires (provided in annexes), focusing on *organisational* aspects, because sufficient data about *means* were already available within IMO and/or DG VII.
The activity has been carry out with the essential collaboration of the national representatives participating in the VTMIS management committee, aiming in particular at:

- Updating the present knowledge on the subject at European level and gathering the experience of the last years.
- Picking up possible issues preventing or reducing the effect of SAR/POL operations, particularly those where international co-ordination and harmonisation are needed.
- Assessing the potential interest of VTMIS networks to support/improve SAR/POL data exchange, especially in emergency situations.

International framework for POL and SAR

This section is intended as a very short recall of the main international agreements and Conventions relevant to pollution combating (POL) and Search and Rescue (SAR).
Two additional related tables are provided in annex, extracted from the IMO Web site, with the full list of the IMO Conventions (file <List_all_IMO_Conventions.htm>) and the implementation status by all European States, plus Norway (file <IMO_Conv_status_EU-States.xls>.

International Agreements specific for POL

A number of International Conventions deal with marine pollution preparedness, response and co-operation, either at a world-wide level or at a regional level of validity:

- Worldwide: The *IMO Convention on pollution preparedness, response and co-operation* (OPRC 1990) the extension of which to other substances is on the agenda of IMO.

  This Convention was adopted by a Diplomatic Conference convened by the IMO in November 1990 and entered into force in May 1995. It deals with preparing for and responding to oil pollution incidents, not only from ships but also from offshore oil exploration and production platforms, sea ports and oil handling facilities.
  The various articles of the OPRC Convention cover:
  -the preparation of oil pollution emergency plans by the involved operators;
  -oil pollution reporting procedures and the actions to be taken on receipt of such a report;
  -the establishment of national and regional systems for preparedness and response;
  -international co-operation in pollution response;
  -research and development and technical co-operation.

- At regional level for the EU Member States (from North to South):
  - the Helsinki Convention,
  - the Copenhagen Agreement,
  - the Bonn Agreement,
  - the Lisbon Agreement (not in force),
  - the Barcelona Convention.

  Regular meetings of these Conventions take place and many publications were issued.

- A number of bilateral agreements, dealing either with pollution only or also with other aspects (for instance bilateral co-operation in POL & SAR operations).

- The EU Council decision establishing a *Community Information System* (CIS), currently under revision, under which such a system with extensive information was created. It is assumed that, under this document, centres where staff and equipment are available will be published for all EU Member States.

Other relevant international agreements for POL

A number of other International Conventions deal with topics linked in some way with preparedness and response to pollution.

- The *United Nations Convention on the Law of the Sea* (UNCLOS, Montego Bay) whose part XII deals with protection of the environment and in particular as regards shipping ;
- The *IMO Convention on Intervention* (1969/73) which empowers coastal States to take measures when a pollution or a threat thereof endangers their coastline or related interests ;
- Conventions dealing with civil liability and compensation ;
- The *International Convention for the Prevention of Pollution from Ships*, 1973, as modified by the Protocol of 1978 (MARPOL 73/78), dealing mainly with measures to prevent pollution accidents and discharges.
  It imposes on ships on which an incident might result in a pollution or a threat thereof to report to the nearest coastal State. It also requests ships to carry a “ *shipboard pollution emergency plan* ”. Several amendments have been adopted, some of which have yet to enter into force. Regulations covering the various sources of ship-generated pollution are contained in five annexes. These prescriptions are reproduced in the OPRC Convention but with less detail than MARPOL and the various resolutions issued by IMO for its implementation.

International agreements for SAR

The basic agreement in force is the IMO *"International Convention on Maritime Search and Rescue*", approved in Hamburg April 1979 and entered into force in 1985, defining all the relevant provisions as regards:

- organisation of the national competent Body in centres and sub-centres,
- co-operation between States,
- means and operating procedures,
- implementation of a Ship Reporting System, including standard format for messages (*sailing plan*, *position report*, *final report*).

Amendments to the above Convention are provided by the document prepared by the *Maritime Safety Committee* (MSC 69/22/Add. 1, Annex 3, May 1997), put forward for adoption by the 69th MSC session in May 1998 and expected to enter into force on 01/01/2000.

Ship Reporting Systems

A number of international Conventions and Resolutions address Ship Reporting Systems, defining the conditions where the ship's reporting is either mandatory or recommended. The SOLAS Convention, concerning many provisions and systems, covers among others:

- the introduction of the GMDSS system (*Global Maritime Distress and Safety System*),
- the respective procedures to deal with distress situations.

Other agreements are aimed, for prevention sake, at anticipating the ship reporting during the regular navigation phase, in order to have already basic recorded data about the ship, her voyage and her cargo.
Among this latter type of agreements we remember:

- SAR Convention (Hamburg, 1979): the above-mentioned SAR Convention makes reference (Chapter 5 in the amended version) to a Ship Reporting System and to Ship reporting Procedures, including standard formats for the relevant messages. The reporting procedure for ships is nevertheless not mandatory in normal circumstances.
- IMO Resolution A.648(16), adopted on 19 October 1989: *General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for reporting Incidents involving Dangerous Goods, Harmful Substances and/or Marine Pollutants*. It defines both the general principles and the standard formats for the following messages:
  - Sailing Plan
  - Position report
  - Deviation report
  - Final report
  - Dangerous Goods report
  - Harmful substances report
  - Marine pollutants report
  - Any other report.

  The reporting procedure for ships, according to §3 of the Resolution, is mandatory only for incidents involving Harmful Substances and/or Marine Pollutants.

- HAZMAT EU Directive (1993): *The minimum requirements for vessels bound for or leaving Community ports and carrying dangerous or polluting goods* (93/75/EEC - Brussels, 13/09/1993).
  This well-known EU Directive, aiming at overcoming the limitations of the former agreements with respect the anticipation of data, enforces any ship willing to enter or leaving a European port to report about her cargo and her sailing plan before leaving the port of departure. The report can be done either on paper or using an electronic media.

The C.I.S. - Community Information System

DG VII is working on the implementation of a European data bank dedicated to pollution combating, flagged *C.I.S.* - "*Community information system for the control and reduction of the pollution caused by the spillage of hydrocarbons and other harmful substances at sea*".
It covers such items as the prediction models, data bases etc. in use within the European Union and refer to " national country profiles " which should include :

- description of the national organisation,
- a detailed country map,
- localisation of the centres of expertise,
- location of stockpiles, ships and aircraft (vessels and aircraft ; storage disposal ; stockpiles),
- inventory of the main means (strike teams, mechanical recovery equipment ; application system ; shoreline clean-up ; cleanup material ; cargo/bunker transfer),
- offer conditions, where applicable.

The C.I.S. should also contain the operational contact points of the Member States and Commission and would describe the role of the Commission (DG XI) in case of an emergency.

SAR and POL Questionnaires used for the survey

The questionnaires used to carry out the survey, respectively named "SAR questionnaire" and "POL questionnaire", attached as Annex 1 and Annex 2, have been designed with a common structure, covering the following items:

- The competent authorities, the actors
- Organisation of SAR/POL services
- International co-operation
- Plans & Procedures
- Communications
- Results (former experience within the country)
- Public opinion, trends for privatisation.

The final aspect of those two Questionnaire is the result of the decisional process developed within the Task 29 Management Committee, where, at the session held on the 10th of June, the technical secretariat circulated for comments two draft questionnaires. Members of the Management Committee made the point that all States represented at the Management Committee had already sent comprehensive information to IMO (with respect to SAR) and to the Commission, namely to DG VII with respect to SAR and to DG XI with respect to POL.
The technical secretariat was therefore urged to avoid the questionnaires related to POL and SAR organisations being redundant with previous actions and to prepare and circulate completely new questionnaires taking account of the remarks from the Management Committee.
The two resulting questionnaires related to SAR and POL organisations have been prepared after having reviewed the relevant documentation available at IMO and within the Commission.
Both questionnaires are solely concentrate on organisational issues. They leave apart in particular questions related to either the specific types of means which may be involved in SAR and POL operations or the addresses of points of contact and their telecommunication facilities. That latter information is in fact available either at IMO or at the Commission levels.

The questionnaires were distributed, starting end of August 1999, in all the EU countries plus Norway through the respective representatives in the management committee of DG VII for the Concerted Action Task 29.

Overall results of the survey

In this Chapter, the main common results of the survey carried out through the POL and SAR questionnaires are summarised, making out some general considerations.

Coverage of the answers obtained

Out of a total of fourteen States enquired, leading to a total of **28** expected answers, a total of **24** answers have been gathered, i.e. **12** POL questionnaires and **12** SAR questionnaires (Portugal provided only the SAR answers).
The table below, together with Figure 1, shows the coverage obtained.

Figure1: Table 1 - Questionnaires received back until 10.02.2000

STATE	POL	SAR
Belgium	X	X
Denmark		
Finland	X	X
France	X	X
Germany	X	X
Greece	X	X
Ireland		

STATE	POL	SAR
Italy	X	X
Netherlands	X	X
Norway	X	X
Portugal	X	X
Spain	X	X
Sweden	X	X
United Kingdom	X	X

Coastline and area covered by the participating countries

The coastline interested by the answering countries is around **50.000** km, not including 18.550 km of fjords and bights for Norway. The total jurisdictional surface is around **12.900.000** square km. The specific data are provided within the SAR summary table.

Organisations in charge for POL and SAR at the national level

This aspect is referenced to in both questionnaires, respectively:
- **(POL)** - Question **III-1**: Which central governmental authority(ies) have a role in the general organisation of the preparedness and response ?
- **(SAR) - General supervision: II-1**: Under which authorities the general organisation of SAR services is placed in your country ?
- **(SAR) - Organisation: II-2**: Which are the entities responsible for SAR services at national, regional or local levels ?

The gathered situation is summarised in Table 2.

Figure1: Figure 1 - Participating countries and collected questionnaires

Table 2 - Organisations in charge for POL and SAR at national level, policy & co-ordination (questions **III-1** POL and **II-1 / II-2** SAR)

STATE	POL	SAR	STATE	POL	SAR
Belgium	Ministry of Defence & MFC - Ministry of the Flemish Community[(1)]	MFC - Ministry of the Flemish Community	**Italy**	Ministry of Transport[(9)] & Coast Guard (MRCC)	Ministry of Transport[(9)] & Coast Guard (MRCC)
Denmark			**Netherland**	CNDPT, Chairman of the National Disaster Policy Team[(10)]& Coast Guard	Ministry of Transport & Coast Guard[(11)]
Finland	Ministry of Environment & Environment Institute-FEI[(2)]	Ministry of Interiors & FFG - Finnish Frontier Guard[(3)]	**Norway**	Ministry of Env. & SFT - Norwegian Pollution Control Authority[(12)]	RMJ-Royal Ministry of Justice[(13)] Rescue and Emg.cy Planning Deptm.
France	The Secretariat general to the sea, a Prime Minister's officer	Ministry of Transport & the Prèfet Maritime[(4)]	**Portugal**	SAM – Marine Authority System	Ministry of Defence
Germany	Federal Ministry of Transport & WSA-Water & Shipping Authority[(5)]	The Federal Ministry of Transport, & DGzRS[(6)]	**Spain**	DGMM-Merchant Marine General Directorate [(14)] & SASEMAR	DGMM-Merchant Marine General Directorate & SASEMAR
Greece	MEPD-*Marine Environm. Protection Division* of the MinMM[(7)]	Ministry of Merchant Marine[(8)] & MRCC Piraeus	**Sweden**	Ministry of Defence & the Coast Guard [(15)]	Ministry of Industry & Swedish Maritime Admin. - SMA[(16)]
Ireland			**United Kingdom**	MCA - Maritime & the Coastguard Agency[(17)]	DETR-Deptm. of Envir.,Transport and the Regions & MCA[(18)]

Legend (these abbreviations are also included in §0):

(1) MFC = *Ministry of the Flemish Community*, Dept. of Infrastructures and the Environment Waterways and Marine Affairs Administration.

(2) FEI = *Finnish Environment Institute*, the Authority for the Environment, depending on the Finnish Ministry of the Environment.

(3) FFG = *Finnish Frontier Guard* part of the Ministry of Interiors (this is derived from the Finnish POL questionnaire, because the SAR questionnaire is missing).

(4) PrèfMar = *Préfet Maritime* (they are 3 in total), supported by *CROSS-Centre Regionaux Opérationnels de Surveillance et de Sauvage* as specialised body. PrèfMar are Admirals in charge of a naval command and also in charge of a general responsibility for "State's action at sea". For the latter duties they do not report to the Minister of Defence, but to the Prime Minister or to any Minister, according to the matter involved.

(5) WSA= *Water and Shipping Authority* of the *Federal Ministry of Transport, Building and Housing.*

(6) DGzRS= *German Sea Rescue Service* (*Deutsche Gesellschaft zur Rettung Schiffbrüchiger*), is a private non-profit organisation.

(7) *Ministry of Foreign Affairs* (MinFA), supported by the Marine Environment Protection Division (MEPD) of the Ministry of Mercantile Marine as specialised body. "Greece has not yet

ratified the IMO International Convention 1969/73, thus any action of enforcing measures according to article 221 of UNCLOS falls in the framework of responsibility of the Ministry of Foreign Affairs and is considered ad hoc".

(8) *Ministry of Merchant Marine* (MinMM), supported by the MRCC in Piraeus.

(9) *Ministry of Transport and Navigation* (MinTra), the former Ministry of Merchant Marine, supported by the MRCC in Rome.

(10) CNDPT = *Chairman of the National Disaster Policy Team*, as the representative of the Netherlands Minister of Transport, Public Works and Water Management, supported by the CGC - Coast Guard Centre in Ijmuiden.

(11) DNCG = *Director of the Netherlands Coast Guard at MRCC* (Ministry of Defence / Royal Dutch Navy). The Ministry of Transport, Public Works & Water Management is responsible for national SAR policy. The DNCG is responsible for the SAR-organisation and operations.

(12) SFT= *Norwegian Pollution Control Authority.*

(13) RMJ = *Royal Ministry of Justice - Rescue and Emergency Planning Dept*., supported by the MRCC. In situations where people are in danger of life or health, the Main Rescue Centrals in Sola and Bod handle all available resources.

(14) DGMM= *Merchant Marine General Directorate*, from the Transport Dept. in the Ministry of Economic Development. The operational structures are <u>SASEMAR</u>-*National Maritime SAR Organisation* and <u>EPPE</u>-*National Organisation of Port Authorities*, see Spain's questionnaire for a complete description of the structure.

(15) SwCG = *Swedish Coast Guard*, under the Ministry of Defence.

(16) SMA = *Swedish Maritime Administration*, under the general responsibility for organisation of the *Ministry of Industry, Employment and Communications*. SMA has the main SAR resp., i.e. to operate MRCC/MRSC. SwCG should maintain a high preparedness for SAR oper. at sea.

(17) MCA= *Maritime & Coastguard Agency* , HMCG= *Her Majesty's Coast Guard*, is part of MCA.

(18) DETR= Department of the Environment, Transport and the Regions. MCA is part of DETR.

<u>Conclusions</u>:

Looking at the countries where <u>both</u> POL and SAR answers are available, the following remarks can be done:

- The top level Ministries involved in SAR and POL, responsible for national policy and overall co-ordination, are different among countries, but the operational structure in most cases follows the MRCC/MRSC schema, as from the relevant IMO SAR Resolution. **Norway** and **Spain** provided description of a comprehensive multi-level organisation, involving also other type of actors, described in block diagram within their questionnaire.
- <u>Five</u> countries have the <u>same Body</u> in charge of both tasks, with a common structure and common operation centres, in particular the national headquarters (i.e. the "MRCC" relating to the SAR terminology).
- As regards the other countries with different Bodies in charge for POL and SAR, the picture is of a tight collaboration between the operational structures, yet separate, of those two Bodies where the SAR MRCCs are often involved in the emergency POL operations.
- The <u>oil industry</u> expertise is used in both operations and training. The participation of other <u>private organisations</u> is generally limited. An exception is represented by **Germany**, where the SAR operations are performed by the *German Sea Rescue Service* (DGzRS)[(Ge1)], a private non-profit organisation.

Communications and Interest for AIS

Under "*Communications*" an interesting aspect is mentioned by Finland (POL), concerning the fact that *"wireless real-time video transmissions from surveillance aircrafts is too much expensive, so it could be an area of further technical investigation".*

AIS (Identification & position system) is generally considered interesting, because of the potential benefits that an automatic identification and tracking system can bring both during the prevention routine phase and in the intervention phase. The table below summarises the results relating with the interest toward AIS, covered by questions VI-2 POL and IV-4 SAR.

Figure1: Table 3 - Interest for AIS

STATE	POL	SAR
Belgium	Yes	Yes
Denmark		
Finland	Yes	
France	probably	probably
Germany	Yes	Yes
Greece	Yes	Yes
Ireland		

STATE	POL	SAR
Italy	Yes	Yes
Netherlands	Yes	Yes
Norway	No	No answer
Portugal	No answer	No answer
Spain	In the future	In the future
Sweden	Yes	Yes
United Kingdom	Yes	In the future

Conclusions regarding the POL questionnaires

The summary conclusions about the POL Organisations are reported here below, accompanied by the original questions, highlighted in dark-blue colour.
In very few cases a summary table is also included. This is done when a panoramic view of the relevant situation is considered particularly useful.
We will make reference to the relevant POL table provided as Annex, where the results are reported on a by-country basis. Regarding that table, the following aspects, undertaken to solve practical/esthetical issues, must be taken in account:

- In same cases the table corresponding to one single original question has been splitted into a number of sub-lines[26]. That has been done, as a post-processing work, with the sake of not losing the detail of the various answers received.
- As the quantity and the level of information are very variable either within the same questionnaire or among different questionnaires, it has proven difficult to show them always in the same way. In particular, long statements have been "squeezed" in order to fit them into the table.

I - The " actors "

Q. I-1: When there is a pollution incident which authority(ies) would receive the first information ? In particular, which authority should receive the ship report required by the MARPOL Convention ?

Figure1: *Table 4 - Authority receiving the ship report at first*

(Notes are referring to the "by country abbreviations" described at §0)

POL	Belgium	Finland	France	Germany	Greece	Italy
I-1	Ministry of the Flemish Community(Be1)	MRCC at Turku or one of 2 MSRC in Kelsinki, Vaasa	One of 5 MRCCs (named "CROSS"(Fr2a)) *or one of 2 MRSC (1 Atlantic,1 Medit.)*	**ZMK** - the National Reporting Centre in Cuxhaven	Port Auth, MEPD(Gr1), MRCC in Pireus	MRCC-MRSC of Coast Guard(IT1)

Netherl.	Norway	Portugal	Spain	Sweden	United Kingdom
Netherlands CoastGuard Centre(NL1)	Pollution Control Authority (SFT)(No2) - Dept. Control & Emergency Response, via coastal radio stations	SAM-Marine Authority System: local Agency; Harbour Master	SASEMAR(SP1) should be the first authority informed on any accident	Coast Guard via nearest coastal Radio Station	Her Majesty's Coast Guard (**HMCG**), part of the **MCA** - Maritime & Coastguard Agency

The summary of the respective answers by country is given in Annex within the POL Table, in EXCEL format.

Remarks:

i) Some interviewees have mentioned that the authority in charge with the reception of the information is also tasked with the transmission of the information to other bodies such as the competent authority for the Environment. The questionnaire does not permit to assess to which extent such a practice is applied in all the other countries.[27]

ii) The situation, with respect whether or not a MRCC is to be considered as an authority, seems quite different among countries. The French answer presupposes that a MRCC is an authority, whilst Italy has identified a MRCC as a branch of the administration to which it belongs and UK has considered that a MRCC is not an authority in itself.

[26] All sub-lines added to the original segmentation of the questionnaire are marked with " * ".
[27] In some countries, the authority to which the first information is sent seems dependent on the type of the message itself: for instance a ship report, a local oil spill report, POLREP messages.

Q. I-2: Do these authorities, or others (please describe) have other means than a report such as traffic surveillance to be aware of a threat ?

Conclusions :

i) Several types of means have been identified: patrol vessels, surveillance aircrafts, remote sensing aircrafts & radio listening, a VTS/radar/semaphore of the network, a line ship or line aircraft (national or foreign), a State Party.

ii) Emphasis has been put in general on The Navy, the Customs and in case of the NL on the North Sea Directorate referred as NL2 in appendix 0.1.

iii) Mention has also been made of the collaboration of civil partners like liner ships and airline aircrafts.

iv) France has noted that patrol vessels are managed by four different public bodies. However details have not been provided by all countries.

Q. I-3: If a transfer operation at sea is envisaged, who does authorise the operation ? Who would take care of the ship in which the cargo should be transferred ?

Q. I-4: When oil or other harmful substances are in the water, which authority does co-ordinate the response ?

Q. I-5: Which authority(ies) would provide the various types of equipment and personnel (aerial surveillance ; dispersants and dispersing means, booms, skimming devices, accompanying personnel, expertise ...).

Conclusions :

i) A number of different bodies are involved in the various countries, spanning from local authorities to national authorities.

ii) A difference is made in the answers between "big" incidents and "small" incidents, depending either on the amount of pollution and on the surface of the area involved, especially when extending beyond the area of jurisdiction of a single local authority.

iii) The type and level of involved bodies is spread among Ministry of Environment, Ministry of Transport, National Response Team, Harbourmasters.

iv) In some countries in case of high risk situations (i.e. of a considerable spillage or marine pollution) a "Spill Response Team" is established at national level to convene and to co-ordinate the response actions.

v) In federal States, like Germany, serious marine pollutions are jointly managed by representatives of the Federal Government and of the Federal Coastal States (Lander).

Q. I-6: Same questions as I-4 and I-5 above when the pollutant has reached the shore.

Conclusions :

i) The importance of oil spills has generally been ranked in three levels[28] (small pollutions, medium pollutions and major pollutions).

ii) In most countries different bodies are involved at each level.

iii) At the first level of intervention the Municipal Administration (*Mun. Adm.*) and possibly the Fire Brigades are involved in most countries, sometimes under the general co-ordination of the national competent authority (NCA).

Q. I-7: What is the role of the oil and shipping industry in the process described above ? In the direction of operations ? in the provision of means ?Table 5 recapitulates part of

[28] This was not suggested by the questionnaire in itself

the information provided in response to this questions, giving in the left column a figure for the total number of "X" filled in the questionnaire on each line.

Q. I-8: Which authority(ies) is(are) responsible with the processing of wastes recovered during an operation ? Were specific difficulties met in such a process ?

Figure1: Table 5 - Role of the oil and shipping industry

Role if oil/shipping industry in:	**I-7**		**nr. of X**
	I-7.a	- participation in operations	**8**
	I-7.b	- provision of means	**5**
	I-7.c	- advisory role	**5**

Conclusions :

i) The participation of oil and shipping industry in operations is common practice.
ii) The provision of means by the oil and shipping industry is performed in 5 countries.
iii) The "advisory role" is performed in 5 countries.
iv) An interesting reference is mentioned by the Netherlands to the "*Oil Spill Response Centre*" in Southampton as a substantial contribution of oil/shipping industry: "*In case of major spills, the oil and shipping industries are expected to take counter pollution measures (in compliance with OPRC). Most oil companies are joined in the "Oil Spill Response Limited". Means for clean-up operations are available at the "**Oil Spill Service Centre**" in Southampton. Since NSD[29] is responsible for any clean-up operation at sea and ashore, combat strategies as well as provision of means from oil/shipping industries should be applied under the authority of the NSD."*
v) For waste processing (Q. I-8) a difference with respect the responsible body is sometime mentioned relating to wastes collected at sea and wastes collected in ports or seashore.

Q. I-9: What is the relationship between State (central or regional levels) and other local communities (towns, regions etc.) .

Conclusions : The answers here are not homogeneous, probably due to the generality of the question. In four cases the answer is to be found in the **Disaster Plan**, which is provided in copy only by Belgium ("*North Sea Disaster Plan*").

A full answer, provided by **NL**, is quoted here below as a significant example:

"All response at sea (e.g. SAR operations, disaster response, law enforcement, etc.) are co-ordinated by the **CGC**. Depending on the situation, both an *Operational Team* and a *Policy Team* are established representing all ministries involved, and in this situation as a precaution the *National Co-ordination Centre* (NCC) will always be informed by the CGC (*Coast Guard Centre in Ijmuiden*). If areas outside the control zone of the CGC are affected (e.g. in case of a gas-cloud drifting ashore), local/regional authorities, or in case of major incidents the CGC will co-ordinate the response there."

Q. I-10: Do some of the entities described above have another role in other actions that pollution response (e.g. SAR operations) ?

Conclusions: A part from **Finland**, **Germany**, **Portugal**, **Sweden**, all the other organisations involved in POL are also directly involved in SAR operations. In any case the POL structures are always involved also in SAR operations, that take the higher priority.

[29] NSD = North Sea Directorate.

Q. I-11: Are there private entities other than the oil and shipping industry which play a role in preparedness or in response to a pollution incident ? If yes, please describe them and explain their role.
Conclusions: Several types of organisations are mentioned: Research Centres, Tank cleaning companies, Private marine environment protection enterprises, Tugs, Port Services, Dredger Co, Salvage Co & special beach cleaning.

Q. I-12: Are there research bodies and training centres dealing with marine pollution preparedness and response ? If yes, describe them and, in particular, specify whether they are specialised in this topic or not. Specify also their relationship with the authorities and with the industry.
Conclusions: Research bodies and training centres are mentioned in all countries, mostly as public institutions. In some case also private industry is mentioned, especially supporting training activities.

II - The right of intervention

Article 221 of the Law of the Sea Convention (Montego Bay 1982), adopted later than the IMO Intervention Convention 1969/73, provides that:
" *Nothing shall prejudice the right of States pursuant to international law both customary and conventional to take and enforce measures beyond the territorial sea proportionate to the actual or threatened damage to protect their coastline or related interests, including fishing, from pollution or threat of pollution following upon a maritime casualty or acts relating to such casualty, which may be reasonably expected to result in major harmful consequences* ". Could you describe :

Q. II-1: The authority(ies) in charge of taking and enforcing such measures in your country and the legislation which empowers them to do so .

Conclusions : Table 6 recapitulates the answers received regarding this question. The reader will note the coherence of information with Table 4.

Figure1: *Table 6 - Authorities in charge for the enforcement actions*

Figure2: ***(II-1.a: authority in charge for enforcement.* II-1.b**: relevant (national) legislation.* II-1-c**: operational body/authority).***

POL	Belgium	Finland	France	Germany	Greece	Italy
II-1.a	MFC - Ministry of the Flemish Community	FEI - Authority for Environment (AutEnv)	*Prèfet Maritime*	Water and Shipping Auth. (WSA) of the Federal MinTra (MOT), according to the national law	Ministry of Foreign Affairs (details in the quest.)	Coast Guard
*II-1.b**	Defined by the Provincial Admin. (*AdmProv*)	Act on Prevention of POL from ships 16/03/1979	Art. 16 of the n°76-599 act of 7th July 1976, complying with IMO Intervention Convention	Act on Federal Competence in Maritime Matters (Seeaufgaben Gesetz) § 3-3d	IMO Convention 1969/73 not yet ratified by GR => ad hoc decisions (follow. UNCLOS Art. 221)	Law n. 979/1982
*II-1.c**	Sea Rescue Service, Nautical Director		*Naval Operating Centre* of the Navy			Coast Guard

POL	Portugal	Netherlands	Norway	Spain	Sweden	U. K.
II-1.a	SAM – Marine Authority System	(MinTra) Chairman of the *National Disaster Policy Team*	Norwegian Maritime Directorate - (NMD)[)(No3)]	it is depending on the circumstances	Swedish Maritime Administration + SwCG	MCA - Maritime & Coastguard Agency
*II-1.b**	Decree no. 265/93	National law "Wet BON" (combating disasters in the North Sea)	Laws in 1975 and 1998, *Pollution Control Act*		*Swedish Water Pollution Act*	Merchant Shipping Act 1995 (section 137)
*II-1.c**		*(no answer, from Q.I-9 it should be CGC + NCC)*				

Q. II-2: The type of measures which can be decided in that respect (e.g. emergency towing, request to sail to a given place, interdiction of certain actions, authorisation needed for lightening operations etc.).

This includes all measures generally undertaken by the competent authority, including:

- Directions to Salvors, shipping companies, Masters of vessels, port authorities:
  - emergency towing, request to sail,
  - interdiction of certain actions (… of departure, … of loading etc.)
  - authorisation for lightening operations
  - agreed passage plans (mentioned by the UK answers)
- Taking over the command of the vessels.

Conclusions:

i) The type of actions that are normally undertaken is quite similar in all countries.

ii) The actions generally follow the relevant **Contingency Plan**. Any relation with the "*Disaster Plan*" mentioned at Q. I-9 is not always well stated, but it should be the same.

iii) In some case it is clearly stated that the extreme measures with respect the involved ship(s) are taken only in very serious cases, and always within the limits defined by the national Constitution and "*bearing the proportional and subsidiary principle in mind*".

II-3: Some occurrences in which such measures were taken and the follow-up of them, including litigation if any .

Conclusions: The answers are not homogeneous, going from general to very detailed. A very comprehensive list of casualties is provided by some country.

Q. II-4: The means of intervention available to the authority(ies) such as public or private teams, public or private tugs. If such means are privately owned, describe the legal means by which the authority may get control on them, such as pre-established contract, legal powers etc.

Conclusions: All types of means are generally reported: own means, public means from other bodies and private (contracted) means.

III - The organisation

Q. III-1: Which central governmental authority(ies) have a role in the general organisation of the preparedness and response ?

Q. III-2: Same question as regards the budget for the various means involved.

Q. III-3: Same question as regards the relationship with the bodies (shipping companies and their insurers, International Fund etc.) liable for compensation.

Q. III-4: Are there laws, by-laws, governmental instructions ... which describe the national organisation in your country ? If yes, please give the detailed references of the publications in which they may be found.

Figure1: Table 7 - Organisations in charge of POL

POL	Belgium	Finland	France	Germany	Greece	Italy
III-1 - Authority in charge for general POL organisation	Ministry Defence & MFC-*Ministry of the Flemish Community*(Be1)	Environment Authority - **FEI**- *Finnish Environment Institute*(Fi1)	*The Secretariat General to the sea*, a Prime Minister officer	On behalf of **MOT**-*Federal Min. of Transport*(Ge2), **WSA** - *Water and Shipping Authority*(Ge3) has the leading role in the general organisation of preparedness and response	*Marine Environm. Protection Division* **MEPD**(Gr1) of the Ministry of Mercantile marine	Ministry of Transport
III-2 - Authority in charge for **budget** of POL means	III-1 + Ministry Interiors, Min. Environment	FEI	MinDef, MinTra, MinEnv	MinTra + 5 Federal Coastal State (**FCS**)(Ge4)	MEPD	Ministry of Transport/ Environment/ Interiors, **CVD**
III-3 - Authority in charge for **relat. ships & compensations** of other Bodies	III-1 + Ministry Interiors, Min. Environment	FEI	*Prèfet Maritime* + a special financial team activated on purpose to claim costs	MOT is representing ELG-*National Spill Response Team*(Ge1) in internat. questions relating foreign shipowners, insurers etc.	MEPD	Ministry of Transport, Ministry of Environment
III-4 - Laws, by-laws describing POL organisations	*Provincial Disaster Plan*	Finnish Envir. Legislation, MinEnv-General Managem. Div.	Décret n°95-1232 of 22/11/1995 (Fr6), Décret n°78-272 of 9/03/1978 (Fr7), + other	MOT & the 5 FCS have an administrative agreement as the basis of the National Organisation for POL Combating	L.743/77, decree 55/98, L.2252/94 (OPRC)	L979/82, decree 662/94, L84/94, L647/96
III-4.1 - Indications as where they can be found	*(copy provided on paper)*	ISBN 951-47-4790-9	"*Droit de la Mer - Aspects genereaux*" n°102-1, Oct. 1990	Internal Governmental instructions (not published)		

POL	Netherlands	Norway	Portugal	Spain	Sweden	U. K.
III-1 - Authority in charge for **general** POL organis.	CGC, the individual Ministries are responsible for organisation of preparedness & response (including means, strategies, plans etc.).	Ministry of Environment & **SFT**	“Not available”	Ministry of Foment	Ministry of Defence	**MCA**
III-2 - Authority in charge for **budget** of POL means	Individual Ministries	Ministry of Environment	“Not available”	Ministry of Finance	Ministry of Defence	Central Government
III-3 - Authority in charge for **relat.ships & compensations** of other Bodies	Liability of shipping/oil companies is insured up to a certain level according to internat. standards		“Not available”	Ministry of Finance	Chancellor of Justice	MCA, *Shipping Policy* deal with policy issues
III-4 - Laws, by-laws describing POL organis.	Yes, “*Rampenplan voor de Noordzee*” (Contingency plan for the North Sea)	The *Pollution Control Act* (one copy is provided)	“Not available”		*Swedish Rescue Services Act* + respective governmental instruction	*National Contingency Plan*
III-4.1 - Indications as where they can be found		www.sft.no		At SASEMAR , or any Port Authority or the Merchant Marine Directorate		

Remarks :
For the top level responsibility different types of Ministries are involved: Ministry of Defence, Ministry of Environment, Ministry of Interiors, Ministry of Transport.

IV - International co-operation

Whenever your country is Party to co-operation agreements other than the ones listed in Annex I, please give their names and descriptions.

Conclusions :

The following bilateral Agreements are reported:

- Finland: Finnish-Soviet, Finnish-Estonian.
- France: MANCHPLAN: Anglo/French SAR and counter pollution agreement.
- Germany: with the Netherlands and with Denmark.
- Greece: with Italy for Ionian Sea.
- Netherlands: Bi-lateral agreement with Germany.
- Sweden: Arctic Council among Arctic countries for Emergency, Prevention, Preparedness & Response.
- U.K.: MANCHPLAN: Anglo/French SAR and counter pollution agreement. NORBRITPLAN: English/Norwegian pollution agreement for the offshore industry.

V - Plans and procedures

Q. V-1: Are there pre-established plans, at national, regional or other level for the response to a pollution incident ?

Q. V-2: Are there specific procedures, i.e. sets of pre-defined actions, when a pollution incident is known or for parts of the response to such an incident ?

Conclusions :

i) Pre-established Plans at national-regional-local level exist in any countries.

ii) A set of pre-defined actions to POL events exist in most countries.

VI - Communications

Q. VI-1: Are these difficulties between shore-based stations/centres, and air and marine craft involved in POL operations ? If yes, please give details.

Q. VI-2: Would you see advantages in developing AIS applications for POL ? If yes, please give details.

Conclusions:

i) An interesting aspect is mentioned by Finland, concerning the fact that *"wireless real-time video transmissions from surveillance aircrafts is too much expensive, so it could be an area of further technical investigation"*.

ii) AIS is generally considered very interesting because of the potential benefits that an automatic identification and tracking system can bring both during the prevention routine phase and in the intervention phase.

Additional comments:

Regarding AIS, the following sentences are directly quoted from the questionnaires:

(BE) "Manual IS (Ship Identification) is developed in VTS. AIS will have its benefits. VTS reporting is in place in Belgian waters, AMVER is implemented on board most vessels controlled by Belgian interests."

(FI) "Together with radar satellite detection and taped maritime situation picture with AIS identified targets provides a new testimony tool against offenders of antipollution regulations. AIS helps also following, how oil recovery vessels and surveillance planes are situated, when operationally needed. For tactical manouvering on the scene, they have already an integrated navigation and steering system with target documentation, but AIS may help also in that."

(IT) "AIS would make it easier to know at any time the position of each craft in the scene of the incident, both for prevention and for response purposes."

(NL) "Yes, especially for pollution prevention purposes."

(No) "In Norway the communication strategy is to use several well-known comm. methods in parallel, creating a redundant comm. system (Inmarsat, VHF, analog cellphone, digital cellphone). Hence, the creation of an Advanced Information System has not been identified as a key factor for successful emergency response in Norway."

(SW) "AIS will be of value for avoiding accidents; is also an efficient tool for ships identification and would be a great help when trying to find ships having made an illegal discharge."

(UK) "If information on the details on cargo and/or bunkers could be ascertained, positive identification of a vessel would be beneficial when tracking a would be polluter."

Q. VI-3: Are there any provisions applicable to national ships related to ship reporting systems in addition to international conventions or IMO resolutions?

Positive answers are provided by:

- **France**, **Germany**: referring to the Act „*Traffic Regulations for Navigable Waters*",
- **Italy**: ship reporting system, only for Italian ships >1600 ton, every 24 hours in the Mediterranean, 48 hours outside the straits.
- **Norway**, referring to the *Pollution Control Act*.
- **Spain**, where a national provision related to a "blue box " device (like the aircraft black box) is mentioned, as well as specific initiatives of regional authorities to control their fishing fleet through an automated GPS-based position reporting system.
- **U.K.**: referring to the mandatory reporting system for all ships in the Dover Straits.

VII - Results

Q. VII-1: Are there data on the activities of the services engaged in preparedness and response action ?

Q. VII-1.1: Are they available and if yes how and under which format ?

Q. VII-2: How many operations were carried out in the last calendar year ?

Q. VII-3: Which was the last significant incident in your country ?

Conclusions:

i) Public data on POL activities are not always available.

ii) The number of operations in the last year span from a few units to more than a thousand for Italy (1.262) and U.K. (1.700). That is probably due not only to the heavy influence of the coastal extension of the latter two countries, but also to the type of pollution accidents that have been reported.

iii) The provided lists of significant events are quite detailed. In some cases have been summarised in order to fit the table (see Annexes).

iv) The following e_mail addresses have been provided:

- Belgium: www.mumm.ac.be
- Finland: www.vyh.fi/eng/intcoop/regional/response/prevent.htm

VIII - Miscellaneous

VIII-1: Which major steps and occurrences land-marked the history of services engaged in pollution preparedness and response operations during the last 25 years ?

Detailed lists are provided in the questionnaires by Belgium, Finland, Greece, Italy, Netherlands, Portugal and Sweden (see Annexes).

VIII-2: Could you describe public opinion sensitivity, for instance by the number of publications in the media, either on specific occurrences or in general ?

The sensitivity of the public opinion is generally reported as high and remarkably increased in the last decade.

VIII-3: Are there plans to increase the role of private entities in the action ?

A positive answer is given by Greece, Italy, the Netherlands, and Spain (limited to the ports of Barcelona and Bilbao).

²IX - POL contact persons

The table below contains the addresses as provided by the contact persons that gave their collaboration in filling in the POL questionnaire. The reader will note that most of them are the respective national representatives within the DG VII C.A. T29 Committee.

Figure1: Table 8 - Contact persons for the POL questionnaires

Belgium	**Cdt. Jean-Pierre Symoens**, Ministry of the Flemish Community - Environment & Infrastructure Dept. - Waterways and Marine Affairs Adm. - Pilotage Division - Tavernierkaai 3 - 2000 Antwerpen - tel. +32 3 - 222 08 64 - fax 222 08 36 JeanPierre.Symoens@lin.vlaanderen.be ; **Mr. Willem Van Poucke** Willem.VanPoucke@lin.vlaanderen.be
Finland	**Mr. Kalervo Jolma** Kalervo.Jolma@vyh.fi
France	**Adm. Guy de Chauliac** – Secrétariat général de la mer, 16 blvd Raspail, 75007 Paris, Tel. 33 1 42 84 08 19, fax. 33 1 42 84 07 90 – Guy.de-Chauliac@sgmer.premier-ministre.gouv.fr **Ing. Jean-Francois Lévy** – LevyJF@dps.equipement.gouv.fr
Germany	**Mr. Menzel** - Head of Division - Federal Ministry of Transport, Building and Housing, Germany - Environmental Protection, Hydrology, Water Management Division (EW 24) - fax: ++49 228 300 4009
Greece	**Com. (H.C.G.) Lazaros Aichmalotidis**, Lazaich@yen.gr
Italy	**Com. P. Pellizzari**, **Com. Aulicino** - Telecomm & Electronics Office at Coast Guard Headquarters - Rome, tel. +39 06-5908.4527 - fax 5908.4578 Lucamena@hotmail.com
Netherlands	**M.Sc (Mar. Tech) Marten G. Koopmans**, Ministry of Transport, Public Works and Water Management - Directorate-General for Freight Transport - Directorate Transport Safety **-** Nieuwe Uitleg 1 - P.O. Box 20904 - 2500 EX - The Hague - tel. +31 70 351 15 68 - fax 351 15 48 - Marten.Koopmans@dgg.minvenw.nl
Norway	**Mr. Bjørn Erik Krosness** (Acting Head of Section), Navigation Safety Section - Norwegian Coast Directorate, Postboks 8158 Dep. 0033 OSLO
Portugal	**J. M. A. Covas**, Head, Harbours and Beaches Division, Laboratório Nacional de Engenharia Civil, Av. do Brasil, 10 - 1700-066 LISBOA – PORTUGAL - Tel.: (351 21) 8443445, Fax: (351 21) 8443016 (new fax number) or (351 21) 8443019, e-mail: acovas@lnec.pt
Spain	**Mr. Pablo de Castro**, Director Tecnico, ENYCA S.A.(Grupo Mondragòn), Avda. La Cerrada 37, 39600-MALIANO - ph. 34942261096, fax 34942260506, PDCastro@enyca.es , http://www.enyca.es
Sweden	**Commodore Thomas Fago,** SwCG-Head of the Response dept., fax ++46-455 10521 - Kcl@coastguard.se
United Kingdom	**Mr. W. R. Smith**, Senior Operations Mngr - Director. of Maritime Operations and HM Coastguard - Maritime and Coastguard Agency --- Bay 1/07, Spring Place, 105 Commercial Road, Southampton SO15 1EG - UK, Tel: +44 (0)23 8032 9416 - Fax : +44 (0)23 8032 9488 -- Bill_Smith@mcga.gov.uk **Mr. Howard Wright**, Marine Surveyor - Navigation Safety (MCGA) - Southampton - fax ++44 (0)23 8032 9488 -- HWright@mcga.gov.uk

Conclusions regarding the SAR questionnaires

The summary conclusions about the SAR Organisations are reported here below, preceded by the original questions, written in dark-blue colour.
We will make reference to the relevant SAR table provided in Annex, where the results are reported on a by-country basis. Regarding that table, the following aspects, undertaken to solve practical/esthetical issues, must be taken in account:

- In same cases the table corresponding to one single original question has been splitted into a number of sub-lines[30]. That has been done, as a post-processing work, with the sake of not losing the detail of the various answers received.
- As the quantity and the level of information are very variable either within the same questionnaire or among different questionnaires, it has proven difficult to show them always in the same way. In particular, long statements have been "squeezed" in order to fit them into the table.

0 - Geographical data of the coastline (km and square km)

The respective data are shown in the table below.

	Belgium	Finland	France	Germ.	Greece	Italy	Netherl.	Norway	Portug.	Spain	Sweden	U. K.
km	61	1.400	5.500	3.661	16.700	8.000	330	2.650(*)	2.148(°)	8.800	*no answer*	20.000
sq.km	2.711	84.400	119.400	57.000	516.154	*no answer*	57.065	450.055	5.646.350	2.500.000	*no answer*	3.429.904

(*): For Norway, the total figure is 21.200 with fjords and bights.
(°): For Portugal, Azores and Madeira are included.

I - The " SAR " actors

Q. I-1: When an incident might give rise to a SAR operation, who are the actors (either public or private ones) who might have to :

Q. I-1a: receive the information that an incident occurred ? In particular, which authority(ies) should receive the ship report required by the SAR Convention and relevant IMO resolutions.

Q. I-1b: (*) provide and operate the means ? (*) Such as Navy, Air Force, non-profit organisations....

Q. I-1c co-ordinate the means to be used ?

Q. I-1d: other ? If yes, please precise.

Conclusions :

i) (Q. I-1a) The MRCC is always reported as the first actor receiving the information that an incident occurred.

ii) (Q. I-1.c): The co-ordination is always performed by the MRCC (central) or by the nearest MRSC.

iii) (Q. I-1b) Regarding who is providing the operational means, the situation is different among the countries: from a single/a few actor(s) in most cases, up to 11 bodies for France. All the different organisations mentioned in the questionnaires are listed here below in alphabetical order:

- Air Force
- Any ship at sea in the vicinity, according to chapter V of the SOLAS Convention;
- Civil Defence

[30] All sub-lines added to the original segmentation of the questionnaire are marked with "*".

- Coast Guard
- Civilian Helicopter Companies,
- Continental Shelf Operating Companies,
- Customs
- Fire brigades
- Governmental Air Ambulance Service,
- Health Service and Ambulance Service,
- Life boats
- Merchant Marine, Maritime Affairs, National Coastal Administration
- Navy
- Police
- Radio Medical Service
- Red Cross
- Regional Emergency Alarm centres
- Shipowners
- Satellite Earth-station
- Tugs
- Volunteer Society for Sea Rescue

Q. I-2: How would you evaluate the relative importance of :
I-2a the Armies ? -- I-2b the police ? -- I-2c firemen -- I-2d non-profit organisations I-2e other important actors(*).
(*) Please use a 4 level scale : **1**= non significant, **2**= significant, **3**= important, **4**= very important.
The respective figures are shown in the table below, obtained summing up for each category the scores collected through all the questionnaires.

Figure1: Table 9 - Relative importance of participating bodies

I-2a	Armies	29,0
I-2b	Police	21,5
I-2c	Firemen	24,5
I-2d	non-profit Organisations	25,0
I-2e	other important actors(°)	12

(°): Including Customs and Civil ships/Aircrafts in the vicinity.

II - Implementation of SAR services

General supervision

Q. II-1 - (*) Under which authorities the general organisation of SAR services is placed in your country ?
(*) We are concerned here with authorities in charge of planning, budgeting, providing personnel etc. When the authority is a ministry and thus may be subject to change overtime, just indicate "the ministry in charge of a given type of activity", e;g. the ministry in charge of merchant marine, the ministry in charge of defence.

SAR Organisation

Q. II-2 - (°) Which are the entities responsible for SAR services at national, regional or local levels ?
(°) Depending on your country's organisation, one of the mentioned levels might be irrelevant.
Conclusions:
The respective answers are reported, for each country, within Table 10 and Table 11. The reader will notice that:

- Regarding **Q. II-1,** the general policy and supervision are performed by different types of Ministries. The Ministry of Transports (or of Merchant Marine) is mentioned in 7 countries out of 11.
- Regarding **Q. II-2**, the national level of co-ordination, not surprisingly, is quite homogeneous because in most cases the MRCC, or an equivalent body, is in charge of.

Figure1: Table 10 - Implementation of SAR services ***(part A)***

		Belgium	Finland	France	Germany	Greece	Italy
II-1	**General supervision**	MFC - Ministry of the Flemish Community	Ministry of Interiors + FFG - *Finnish Frontier Guard*	Ministry of Transports	Federal Ministry of Transport, Building and Housing	Ministry of Merchant Marine	Ministry of Transport and Navigation
II-2.a*	Organisation at national level	SAR Service of the MFC	FFG headquarters + National SAR Committee	3 *Preféts Maritime*, reporting to the Prime Ministry	DGzRS	MRCC	MRCC Rome operations' centre (Coast Guard Headquarters)
II-2.b*	Organisation at regional level		MRCC (Archipelago Coast Guard District in Turku) + 2 MSRCs (Helsinki, Vaasa)		DGzRS	MRSC (5)	MRSC (13)
II-2.c*	Organisation at local level					Harbour Master	Harbour Masters

Figure1: Table 11 - Implementation of SAR services ***(part B)***

		Netherlands	Norway	Portugal	Spain	Sweden	United Kingdom
II-1	**General supervision**	Min. of Transport, Public Works & Water Management (responsible for national SAR policy)	The RMJ - *Royal Ministry of Justice* (Rescue and Emergency Planning Deptm.)	Ministry of Defense	DGMM - *Merchant Marine General Directorate*	Ministry of Industry, Employment & Communications + Swedish Maritime Admin. (SMA)	Department of the Environment, Transport and the Regions (DETR)
II-2.a*	Organisation (and operations) at national level	DNCG - *Director of the Netherlands Coast Guard at MRCC* (Ministry of Defence / Royal Dutch Navy)	MRCC *(see the questionnaire for a detailed description)*	Chief of the Navy General Staff	MRCC = SASEMAR**(SP1)**	Maritime Traffic Deptm., Maritime SAR-service, by the *National SAR co-ordinating Committee*, the *National Boating Safety Council,* MRCC Goteborg	Her Majesty's Coastguard as part of the Maritime and Coastguard Agency (MCA)
II-2.b*	Organisation at regional level			MRCC (Lisboa, Delgada, Funchal)	SASEMAR**(SP1)**->Zonal MRCC (CZCS), Regional MRCC (CRCS)	Regional SAR co-ordinating Committees, MRSC in Stockolm and Gotland	
II-2.c*	Organisation at local level			Harbour Masters	SASEMAR(SP1)->Local MRCC (CLCS), CIC-Integrated Service Co-ord. Centre, CEI-Integrated Emergency Centre, CE-Seasonal Centre	(same as for regional level)	

Q. II-3 - (#) Which are the specialised executing bodies at national, regional or local levels ? (#) They are the bodies in charge of MRCC and MRSC functions. Depending on your country's organisation one of the mentioned levels might be irrelevant.

Conclusions: This question was probably not enough clear in the questionnaire, because most answers point to the MRCC itself as the specialised executing body, rather than to the Bodies in charge of MRCC and MRSC functions. The current situation seems anyway to be well described in the answers to Q. II-2.a: *Organisation and operations at national level*.

Q. II-4 - (*) Which is the relationship between the various territorial levels of SAR organisation and:

(**Q. II-4.a**) - The State (at national or decentralised level)

(**Q. II-4.b**) - Other local authorities.

(*) Please give details on provisions made in case of large SAR operations to welcome on shore people that have been rescued and when necessary been brought to hospitals.

Conclusions: In the most common situation the co-operation between different organisations is co-ordinated by dedicated Committees, like the following:

-*Regional SAR Committees* chaired by the commander of the Coast Guard (Finland).

-Co-ordinate Council of Major Disasters (Greece).

-Regional Emergency Alarm Centres (Ministry of Interiors) in combination with Regional Medical Centres (Netherlands).

But other situations exist, where:

-The Police is stated as "central" for the State relationships (Sweden, UK).

-Non-profit organisations e.g. red cross, fire brigades etc. have local arrangements on the operational side.

Missions

Q. II-5 - What are the specific duties of the bodies referred to in II-3

Q. II-6 - (*) Do these bodies have other duties than implementing SAR services ?

(*) such as pollution response

Conclusions: A variety of specific duties are mentioned, as listed here below. The most common duties are those related with the POL surveillance, in accordance with Table 2 .

- POL surveillance
- Port State Control, port clearances
- Police, border control, border checks
- Fire fighting at sea
- Navigation surveillance & VTS
- Fishing surveillance
- Fleet management
- Pilotage
- VHF distress communication
- Medical support & evacuation.

Surveillance of waters close to shore

Q. II-7 - Is there a stretch of seawater close to the shore within which the bodies in charge with SAR operations are not responsible for such a mission ? If yes by whom is it carried out within such area and how ? (*).

(*) for instance by a local authority with or without own means.

Conclusions: The answer is positive for three countries, relating to Local Beach Rescue Unit, Majors and other local Authorities with their means. Also seasonal local units are mentioned during summertime.

International co-operation

Q. II-8 - Are there co-operation agreements with adjacent countries for SAR services ?

Conclusions: The answer is positive for all countries but **Belgium** and **Greece**. In some case, like **Norway**, a list of the additional agreements is provided.

Q. II-9 - (*) Does such co-operation with adjacent countries produce concrete actions ?

(*) such as pooling of facilities, establishment of common procedures, conduct of joint training exercises, regular checks of inter-State communication channels, liaison visits by rescue co-ordination centre personnel and the exchange of search and rescue information (as point 3.1.8 of the 1979 SAR Convention suggests)

Conclusions: The answer is positive for all countries, mentioning common training actions & common drills regularly performed with adjacent countries.

III - Plans and Procedures

Definitions

symptomatic incident : an incident which might reveal the need for a SAR action and is mentioned in a pre-established classification.

Procedure : implementation of a set of pre-determined actions when a symptomatic incident occurs.

Procedures

Q. III-1 - Does the conduct of SAR operations follow **procedures** (in the above meaning) ? If not, according to which methods SAR operations are carried out ?

Conclusions: The answer is positive for all countries but **Norway** and **Sweden**. The fact is mentioned that IAMSAR Manuals are adhered to.

Q. III-2 - Does the implementation of such **procedures** follow plans ? If yes, please give details.

Conclusions: The implementation of the above referenced procedures does follow plans. "Rescue Plans", "Regional SAR Disaster Plans", "National Plans" are mentioned, probably with the same practical meaning. In some cases a reference is made where, depending on the importance of the situation, the co-ordination is increasingly assumed at local-regional-national level.

Q. III-3 - (*) Do you consider that the **procedures** or other methods (and possibly plans for their implementation) should be improved in your country ?

(*) such as improving details, simplification, widening.

Conclusions: The most concise answer is probably "Learning lessons, Refining procedures". In other cases more specific aspects are addressed, like:

-(Greece) improvements by establishing HI-TEC equipments: Electronic charts, etc.

-(Italy): tighter co-operation and more precise procedures with the authority in charge of air rescue.

IV - Communications

Q. IV-1 - Are communications between entities in charge of SAR services on land exclusively using public networks ? If not give details on the entities which are linked by specialised digital links.

Conclusions:

-7 answers report use of public networks, in one case including a "Defense network".

-4 answers report (also) use of a dedicated network, in addition to the above.

-2 answers are missing on this subject.

Q. IV-2 - Are there plans to expand specialised digital links ?
Conclusions: affirmative answer is given by **Finland**, **Germany**, **Greece**, **Italy**.

Q. IV-3 - Are there any difficulties for the communication between the various shore-based stations/ centres and air and marine craft involved in SAR operations ? If yes, please give details.
Conclusions: no relevant difficulties are declared.

Q. IV-4 - Would you see advantages in developing AIS applications for SAR ? If yes, please give details.
Conclusions:

i) As already summarised at §0, there is a general interest towards the opportunities brought by the implementation of AIS transponders an board of both SAR means and commercial ships. Expected advantages to be gained by developing AIS applications for SAR are related with the possibility:

-*to enhance and automate position plotting, improving the quality of the overall picture of the situation at sea maintained at the MRCC and the MRSCs, both for prevention (collision avoidance) and for response actions (searching time reduced to zero) purposes*.

-*to reduce verbal communication and to lower the probability of mishaps and misinterpretation due to verbal communication, all for the benefit of an upgraded efficiency of SAR missions*.

ii) **France** reports that 75% of SAR cases handled by French MRCCs are in relation with leisure crafts or leisure activities, which are not expected to be fitted with AIS.

iii) **Norway** reports that due to the communication strategy to use several well-known telecomm means in parallel, AIS is not considered a key factor for a successful emergency response.

Q. IV-5 - Are there any provisions applicable to national ships related to ship reporting systems in addition to international conventions or IMO resolutions?
Conclusions: affirmative answers are given by **Belgium**, **Finland**, **Greece**, **Italy**, **Sweden**, **UK**. These should be overlapped with those obtained from the POL questionnaire[31], where affirmative answers are given by France, Germany, Italy, Spain, Sweden.

V - Results

Q: V-1 - What is the total number of operations carried out in the last year of reference ?
Conclusions: The small table below reports the figures provided for year 1998.

BE	FI	FR	DE	GR	IT	NL	NO	PT	SP	SW	UK
238	1.276	7.685	2.442	1.083	10.251	450	1.505	115	3.500	==	11.553

Q. V-1a - Did you observe an increase or decrease of this total number in the last 10 years ? If yes, what was the proportion ?
Conclusions: the situations reported are various, with either an increase or a decrease in the overall number of operations.

[31] The reader should take in account that SAR and POL questionnaires were not always filled in by the same national organisation or person.

Q. V 1b - (*) Did a particular type of intervention increase in the last ten years ? If yes, please give details.
(*) Give specific precision for pleasure navigation activities
Conclusions: from a few answers it seems that the number of operations relating with pleasure crafts has always increased. For example, in **France** it has doubled in the last ten years.

Q. V-2 - Are there any data on the use of means implemented during SAR operations ? How can they be available ? Under which conditions and format ?
Conclusions: affirmative answers are given by **Belgium**, **Finland**, **France**, **Greece**, **Netherlands**, **United Kingdom**. The specific format is, though, only given by **UK** (MS Access or ASCII flat file).

VI - Miscellaneous

History - Q. VI.1 - What were the main steps and major events which marked the history of SAR services in the last 25 years ?
Conclusions: a part from specific casualty events, detailed in the questionnaires, common statements are those referring to:
- The ratification and implementation of the IMO SAR Convention, further to which the National SAR Plans have been adopted.
- The advent of VHF radio, Satellite Communications, GMDSS.
- The rise of the Offshore Oil and gas industry.
- The Channel Navigation Information Service in the Channel and Mandatory reporting of ships in the Dover Straits.

Public opinion sensitivity
Q. VI.2 -: Is the number of papers published in the media stable, increasing or decreasing ?
Conclusions: only a few answers are given here.
-in **Belgium** and **Finland** the number of published papers is stable,
-in **Greece**, **Italy**, **Portugal** it is increasing, especially in summertime (GR, IT).

Q. VI-3 - Do citizens contribute in a significant way to the funding of non-profit organisations ?
Conclusions: the answer is affirmative for **Finland**, **France** (where the citizens' contribution is remarkably up to 50%), **Germany**, **Netherlands** and **UK**.
Q. VI-3.a - Do such organisations carry out campaigns to increase public sensitivity ? if yes what are they ?
Conclusions: advertising/publicity, press appeals, Lifeboat Charity Days, fund raising campaigns are reported only by **Netherlands** and **UK**.

Q. VI-4 - Is there one single "easy to remember" phone number which would allow a citizen to alert SAR services operators when needed ?
Conclusions: short numbers are used in most countries; only **Belgium** and **Finland** report one single phone number made of 8 - 10 digits.

Privatisation - Q. VI-5 - Are there plans to increase the role of the private sector in SAR services ? If yes, please give details on the way it would be carried out.
Conclusions: in general, there are not plans to increase the role of the private sector, with exception of **Belgium** ("privatising Pilotage") and **Finland** ("give more formal status to the Finnish Life Boat Association").

Additional data

Q. VI-6 - (*) Are there national synthetic documents including information on ship reporting systems that the authors of this questionnaire might consult to get a deeper insight in the question ? If yes how are they available ? Under which conditions and format ?

(*) e.g. Internet sites.

Conclusions: in a number of countries Web sites for SAR data are already in operation. In other countries are planned. The following Web addresses are provided:

-Germany: for SAR information: www.is-bremen.de/dgzrs (not usable for ship reporting).

-Italy: e-mail to the Italian Coast Guard Headquarters: cogecap3@flashnet.it.

-Norway: www.kystdir.no (Norwegian National Coastal Administration); www.odin.dep.no (Official governmental information); www.mil.no (Armies).

Q. VI-7 - What are the important features of SAR services in your country which did not appear in the answers to this questionnaire ?

Conclusions: a suggestion is given by **Germany**, in order to include "Medical first aid and transportation, fire fighting and technical assistance.

Some information of this type can be found in the answers to question **II-6**: Other Duties.

VII - SAR contact persons

The table below contains the complete addresses as provided by the contact persons that gave their collaboration in filling in the SAR questionnaire. Most of them are the respective national representatives within the DG VII Concerted Action Task 29 Committee. Please refer to the same POL table for the names in common with the POL questionnaires.

Figure1: Table 12 - Contact persons for the SAR questionnaires

Belgium	*(same as for POL questionnaire)*
Finland	**Rear Adm. Jaakko Smolander**, Deputy chief of the Finnish Frontier Guard - FFG Headquarters, Box 3, FIN-00131 Kelsinki. FINLAND - ph. ++358 20 - 410.6511, fax 410.6755 -- **Mr. Henrik Warnhjelm**, RVLE Henrik.Warnhjelm@RVLE.rvl.mailnet.fi
France	**Adm. Guy de Chauliac** – Secrétariat général de la mer, 16 blvd Raspail, 75007 Paris, Tel. 33 1 42 84 08 19, fax. 33 1 42 84 07 90 – Guy.de-Chauliac@sgmer.premier-ministre.gouv.fr
Germany	*(same as for POL questionnaire)*
Greece	*(same as for POL questionnaire)*
Italy	*(same as for POL questionnaire)*
Netherlands	*(same as for POL questionnaire)*
Norway	*(same as for POL questionnaire)*
Portugal	*(same as for POL questionnaire)*
Spain	*(same as for POL questionnaire)*
Sweden	Swedish Maritime Administration, Maritime Traffic Deptm., SE-60178 NORRKOPING, Sweden, ph. +46-11-191000, fax +46-11-123109, Sjotrafik@Sjofartsverket.se , www.Sjofartsverket.se
United Kingdom	*(same as for POL questionnaire)*

The potential interest of VTMIS networks

Following the above-described scenario, and given our scope of work, we will now focus on:

- The potential interest of the VTMIS concepts with respect to the data exchange needs of SAR and POL organisations in Europe.
- The possible issues preventing or reducing the effect of SAR/POL operations, particularly those where international co-ordination and harmonisation are needed.

It's worth recalling that the generic national SAR structure as described by the IMO Convention, with its national Maritime Rescue Co-ordination Centre and sub-Centres (MRCC, MRSC), is in itself a good example of a VTMIS network, although specialised for a specific task.
In fact, comparing with the guidelines given by Task 29 C.A. most VTMIS requisites, as marked in the table below, are satisfied and, not surprisingly, the table of all possible VTMIS services has a relevant part dedicated to SAR, Environment monitoring, Pollution fighting, Civil Protection and HAZMAT.

• VTMIS are Vessel Traffic Management and Information Services	
• VTMIS are a concept, a kind of umbrella, for all activities to improve vessel traffic information	
• VTMIS are not a super-de-luxe VTS; it does not even require a VTS	
• VTMIS deliver a traffic image to be used by Authorities, ports and companies involved in vessels and cargoes	
• VTMIS can be used for vessel traffic management, port (resource) management, fleet management and cargo (flow) management	
• VTMIS require an Authority or service provider as a driving force or catalyst and a "win-win" objective for all parties concerned	
• VTMIS can best be developed "bottom-up" but with the needs of others in mind	n.a.

Information needs of SAR/POL Competent Authorities

SAR/POL Competent Authorities are, in normal conditions, hardly interested in routine port operations, pilotage or berth booking of any ship.
But when an emergency occurs part of the data routinely managed by the Port Information Systems, or possibly by a number of "regional VTMIS", becomes essential for the SAR/POL authority to optimise and speed-up the preparation of the remedial actions.
Those data regard:

i. vessel's state, type, state of the equipments etc.;
ii. type, amount, position on board (i.e. the bay-plan for container vessels) of hazardous cargo, if any;
iii. state and availability of assisting vessels, tugs and other means;
iv. state and availability of specialised technicians and other interested people;
v. information about other vessels possibly crossing the area of the accident.

The well-known problem is that those data should be reached in the very short timeslot available to prepare the remedial actions.
In particular, as regards cargo and ship's data, ship's records relating with the variations of the cargo will be left in each port of call. Therefore the last port of call must be

addressed in order to reach the most updated information. Guarantee of completeness and reliability of the data is also a desirable attribute.

Information are typically spread

The above-listed data are generally owned by different sources, typically distributed over an international maritime area.

- Detailed cargo and ship's data will likely be located at the MRSC/MRCC Database(s), or, with respect the last port of call, at:
  - the Harbour Master's Office,
  - the Port Authority,
  - the ship's Agent,
  - the Shipowner headquarters.
- Information about the type and the state of the equipments on board could reside also at the Port State Control organisation(s), or at the interested Registers.
- Data concerning the means available from assisting organisations, if not directly stored in the Database of the involved SAR/POL NCA, could be archived in the information systems of the assisting organisations, or in different ports.
- Data regarding other vessels possibly in the area of interest can reside in many different places, depending on the last port of departure.

HAZMAT, VTMIS and the European Index for Ship movements

The world-wide spread of "Ship & Cargo Data" in absence of a ship reporting system to the destination ports is one of the reasons why the HAZMAT directive has been conceived and enforced in Europe. In this way the spread is "at least" confined within the European ports and can be tackled a bit easier with the adoption of EU harmonised procedures.
At the time of the HAZMAT preparation a European (VTMIS) network to be used for SAR/POL prevention and remedial operations had already been considered as an effective and suitable tool for the practical exploitation of the Directive at European level. Since then, a number of projects and studies (PROTECT, EWTIS, MATISSE, APAS-VTMIS, VTMIS-Net and possibly others) have been concerned with the feasibility of a Inter-port European Network of ship movements for tracking Hazardous Materials.
The principle of operation is very simple: during "normal" situation the Network Database is just fed with those data, that are kept secret. In this way the sensitiveness of the commercial data is protected. Only in case of an accident the data relating to the involved ship(s) are made available to the Competent Authorities.
Different solutions can be implemented with respect the communication/Database mechanism, passing through different levels of "concentration" of the ship movements records.
For example, the NCA of the State where the last port of call is located can just be involved in the data exchange chain as a simple "repeater", or can already possess all the necessary data in force of a "national concentration policy" of all the HAZMAT declarations received. The latter scheme of operation has already been implemented in some States, like in **Italy**.

Conclusions about the VTMIS SAR/POL CA relationship

Following the above-described scenario, we can observe that the relevance of VTMIS concepts to contribute to the SAR/POL operations relies on the following aspects:

- Information are dramatically urgent during emergency situations: the time response is fundamental.

- Information are geographically distributed and owned by different actors.
- Detailed cargo data are commercially critical and in many cases the cargo manifest and the Bay-plan are long files of data which is not convenient to move from the original source in normal situations. Therefore, in case of an emergency, the cargo data are likely to be obtained starting from the first European port that was called by the involved ship.

An integration among existing and future national VTMIS network dedicated to SAR/POL can, in force of its broader coverage, help in:

- Collecting the main relevant data and/or keeping track of all the locations where those data are kept and how they can be reached.
- Automatically "routing" the request for information up to the right places with a minimum delay.
- Providing common applications for e.g. simulation, position forecast algorithms, which in turn can improve the standardisation/integration of:
  - The operational procedures,
  - The related training.

Other "general purpose" VTMIS networks, covering different regions but integrated each other, can help in the "routing" process and can provide the means to reach missing data. The current technologies for Internet/Intranet and for Wide Area Networks (maybe in this case it could be named "GAN-Global Area Network") luckily offer good tools for reliable and not expensive solutions.

Functional aspects: procedures and messages

Generally speaking, when different actors need to share information, different functional situations and habits are to be matched. The reciprocal constraints can be different depending on the type and on the role of the involved parties.
As usual in the maritime field, the main issues are mostly of *organisational* type. Those related to *critical* information that commercial operators do not like to be disclosed for the possible benefit of their competitors are also to be included. The system will have therefore to assure robustness, privacy and protection of commercially sensitive data.
In addition to that, a number of operational procedures should be agreed among the competent SAR/POL actors (then also tested and trained), defining appropriate ways for co-operation and co-ordination.
Those procedures include the agreement concerning the adoption of standard messages to be used in different situations as regards, for example:

- query/response message for ship's data,
- query/response message for cargo data,
- acknowledgement message.

Functional aspects: Databases

From the point of view of the data exchange links a European VTMIS for SAR/POL, could rely on the following "domains" of actors:

- A domain grouping all the equivalent SAR/POL CA within Europe,
- A domain grouping all the equivalent SAR/POL CA outside Europe,
- A domain grouping all the other external operators (public and private) within Europe,
- A domain grouping all the other external operators (public and private) outside Europe.

The first domain can be directly served by the European VTMIS dedicated to SAR/POL. The second domain could be reached with world-wide links among SAR/POL networks.

The remaining two domains could be reached through existing and future Port Community Systems and "general purpose" VTMIS, i.e. those covering commercial operations among different actors of different ports.
In technical terms, the first domain can be considered formed by "peer-to-peer" links among systems working at the same hierarchical level. Those systems performing similar tasks and hopefully having a similar way to manage the basic information about ships' positions, cargo, routes, means etc.
Regarding the data exchange capability with the other "external" domains, every node in the SAR/POL VTMIS must be interoperable with their respective networks, at both local (Port Community Systems) or regional (VTMIS) level.
In consequence of that one basic condition must be satisfied:

The respective Databases should be consistent each other, i.e. the description of the various items of information should be based on the same language, the same codification, the same geographical references, the same formats, etc. In other words, a standardised Database is needed.

A very similar approach has been pursued by the **INDRIS** project (4^{th} F. P. - DG VII) for the **RIS**-*River Information System*, whose principle of operation is close to that of a VTMIS for the inland navigation, with additional functionalities covering aids to voyage planning, lock/berth booking, commercial operations and other features.

Conclusions

The present report has described the results of the survey about the current situation of SAR and POL Competent Organisations in Europe.
The relevant legal framework for SAR and Pollution combating actions, and the agreements for Ship Reporting Systems (SRS) have been refreshed.
The potential interest of VTMIS networks to support and possibly improve SAR/POL operations has been shortly analysed, looking at the typical information needs and considering the possible functional solutions provided by the VTMIS.
Starting from the current European situation as collected with the present survey, that goal seems to be not too far.

List of the Annexes

Annex 1

Summary Tables of POL and SAR answers

(These tables are provided as electronic file in EXCEL format,
see file Annex 14_1.xls)

Annex 2

Original POL and SAR questionnaires with IFN accompanying letter

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75007 PARIS

Tel : ++33 (0)1 44 38 40 43
ou : ++33 (0)1 44 38 41 44
Fax : ++33(0)1 40 61 93 19
E-Mail : infranav@micronet.fr

N°d'identification intracommunataire : FR 95 385 019 153

Paris, le 31 August 1999

To all members of the VTMIS management Committee

Subject : **VTMIS concerted action - Bridge programme of preliminary studies SAR and POL organisations**
Encl. : **2 questionnaires**

Dear colleague,

You certainly remember that at the VTMIS Concerted Action Management Committee held on 7th April 1999 the decision was made to review the organisations of SAR and POL services implemented by the countries participating in the concerted action.
It was agreed that the procedure according to which the proper information would be collected would include the preparation and distribution of questionnaires.
At the session of the Management Committee held on the 10th of June, the technical secretariat circulated for comments two draft questionnaires.
Members of the Management Committee made the point that all States represented at the Management Committee had already sent comprehensive information to IMO (with respect to SAR) and to the Commission (DG VII with respect to SAR, DG XI with respect to POL).
Therefore the technical secretariat was urged to avoid the questionnaires related to POL and SAR organisations being redundant with previous actions.
The technical secretariat announced that it would prepare and circulate **completely new** questionnaires taking account of the remarks from the Management Committee.
You will find attached hereto the two new questionnaires related to SAR and POL organisations that we have prepared after having reviewed the documentation on SAR and POL available at IMO and within the Commission.
Both questionnaires are now solely concentrate on **organisational** issues. They leave apart in particular questions related to either the specific types of means which may be involved in SAR and POL operations or the addresses of points of contact and their telecommunication facilities. That latter information is available either at IMO or at the Commission levels.
A slight difficulty arose from the fact that with respect to POL organisations the Commission had implemented some years ago a "community information system (CIS)". The Commission's intention is to create a revised CIS with a new format. However the corresponding decision has not yet been made. Therefore it may happen that some of our questions will have to be answered once again when the final decision to develop a new

CIS will have been arrived at. The date when the final decision will be taken is not yet known.
Given the short time span which is now available before the end of the VTMIS concerted action (31st of December 1999) we have to ask you to send us your answers to both our questionnaires by the 30th of September at the latest.
Obviously in your capacity as an appointed member of the Management Committee you might not be the very person who is officially entitled to answer the questionnaires. In such a case we trust that together with the colleague of yours when any which belongs to your country delegation you will be able to send the questionnaire to the competent person and to get the answer back from him/her.
We will then process the data we will have received. The results of that second phase of the study will be analyzed and commented in a report that each of you will receive one month later together with a request for observations. The report will be adjusted according to your observations and will be presented in the final report on the preliminary review of European SAR and POL organisations.
It goes without saying that within the framework of the VTMIS bridge programme of preliminary studies, the most that we expect is to collect objective data allowing to identify as the case would be problems of common interest.
You contribution to that effort will be gratefully welcome.
Thanking you very much in advance for your co-operation.
With kind regards,

J. Pruniéras,
VTMIS Technical Secretariat.

Pollution preparedness and response (POL)

QUESTIONNAIRE

Preliminary remarks : 1 A number of international instruments, such as agreements or conventions, deal with the topic of pollution preparedness and response. They appear in Annex I to this questionnaire. Any reference to Conventions in this questionnaire corresponds to those in Annex I.

2 The European Union established many years ago a " community information system ". This is currently under revision as, at the time when this questionnaire is prepared, a new Council decision is being discussed. When this decision is adopted, there will be a new " community information system " which will i.e. include a description of each member State organisation. The draft content of the " country profile " in this new system is presented in Annex II. The present questionnaire might in some points duplicate what will appear in the system. It should however give interesting views in particular as it is presented in an " operational " more than administrative way.

DEFINITION (adapted from the OPRC Convention) *" pollution incident " means an occurrence or series of occurrences having the same origin which result or may result in a discharge of oil or other harmful substances and which pose or may pose a threat to the marine environment, or to the coastline or related interests of one or more States and which requires emergency action or other immediate response.*

QUESTIONNAIRE

Notes : 1 Where the answer to a question is different depending on whether the incident is on a ship, an offshore platform or other source, please give separate answers.

2 If the answer is different for a major pollution event (disaster such as the Amoco Cadiz or the Exxon Valdez or Ixtoc I) or for a less important pollution (for instance a few beaches polluted), please give as many answers as are necessary to give a complete view of the situation in your country. Same remark if the answer is not the same for pollution by oil and pollution by other harmful substances.

I The " actors "

I-1 When there is a pollution incident which authority(ies) would receive the first information ? In particular, which authority should receive the ship report required by the MARPOL Convention ?
I-2 Do these authorities, or others (please describe) have other means than a report such as traffic surveillance to be aware of a threat ?
I-3 If a transfer operation at sea is envisaged, who does authorise the operation ? Who would take care of the ship in which the cargo should be transferred ?
I-4 When oil or other harmful substances are in the water, which authority does co-ordinate the response ?
I-5 Which authority(ies) would provide the various types of equipment and personnel (aerial surveillance ; dispersants and dispersing means, booms, skimming devices, accompanying personnel, expertise ...).
I-6 Same questions as 4 and 5 above when the pollutant has reached the shore.
I-7 What is the role of the oil and shipping industry in the process described above ? In the direction of operations ? in the provision of means ?
I-8 Which authority(ies) is(are) responsible with the processing of wastes recovered during an operation ? Were specific difficulties met in such a process ?

I-9 What is the relationship between State (central or regional levels) and other local communities (towns, regions etc.)
I-10 Do some of the entities described above have another role in other actions that pollution response (e.g. SAR operations) ?
I-11 Are there private entities other than the oil and shipping industry which play a role in preparedness or in response to a pollution incident ? If yes, please describe them and explain their role.
I-12 Are there research bodies and training centres dealing with marine pollution preparedness and response ? If yes, describe them and, in particular, specify whether they are specialised in this topic or not. Specify also their relationship with the authorities and with the industry.

II The right of intervention

Article 221 of the Law of the Sea Convention (Montego Bay 1982), adopted later than the IMO Intervention Convention 1969/73, provides that " Nothing shall prejudice the right of States pursuant to international law both customary and conventional to take and enforce measures beyond the territorial sea proportionate to the actual or threatened damage to protect their coastline or related interests, including fishing, from pollution or threat of pollution following upon a maritime casualty or acts relating to such casualty, which may be reasonably expected to result in major harmful consequences ". Could you describe :
II-1 The authority(ies) in charge of taking and enforcing such measures in your country and the legislation which empowers them to do so ;
II-2 The type of measures which can be decided in that respect (e.g. emergency towing, request to sail to a given place, interdiction of certain actions, authorisation needed for lightening operations etc.)
II-3 Some occurrences in which such measures were taken and the follow-up of them, including litigation if any ;
II-4 The means of intervention available to the authority(ies) such as public or private teams, public or private tugs. If such means are privately owned, describe the legal means by which the authority may get control on them, such as pre-established contract, legal powers etc.

III The organisation

III-1 Which central governmental authority(ies) have a role in the general organisation of the preparedness and response ?
III-2 Same question as regards the budget for the various means involved.
III-3 Same question as regards the relationship with the bodies (shipping companies and their insurers, International Fund etc.) liable for compensation.
III-4 Are there laws, bye-laws, governmental instructions ... which describe the national organisation in your country ? If yes, please give the detailed references of the publications in which they may be found.

IV International co-operation

Whenever your country is Party to other co-operation agreements than the ones listed in Annex I, please give their names and descriptions.

V Plans and procedures

V-1 Are there pre-established plans, at national, regional or other level for the response to a pollution incident ?

V-2 Are there specific procedures, i.e. sets of pre-defined actions, when a pollution incident is known or for parts of the response to such an incident ?

VI Communications

V-1 Are these difficulties between shore-based stations/centres, and air and marine craft involved in POL operations ? If yes, please give details.
V-2 Would you see advantages in developing AIS applications for POL? If yes, please give details.
V-3 Are there any provisions applicable to national ships related to ship reporting systems in addition to international conventions or IMO resolutions?

VII Results

VII-1 Are there data on the activities of the services engaged in preparedness and response action ? Are they available and if yes how and under which format ?
VII-2 How many operations were carried out in the last calendar year ?
VII-3 Which was the last significant incident in your country ?

VIII Miscellaneous

VIII-1 Which major steps and occurrences land-marked the history of services engaged in pollution preparedness and response operations during the last 25 years ?
VIII-2 Could you describe public opinion sensitivity, for instance by the number of publications in the media, either on specific occurrences or in general ?
VIII-3 Are there plans to increase the role of private entities in the action ?

ANNEX I (to the POL questionnaire)

EXISTING CONVENTIONS AND OTHER INTERNATIONAL DOCUMENTS

Specific agreements for pollution

A number of international Conventions deal with marine pollution preparedness, response and co-operation. Such are

- world-wide : the IMO Convention on pollution preparedness, response and co-operation (OPRC 1990) the extension of which to other substances is on the agenda of IMO.
- at regional level for the EU Member States : from North to South : the Helsinki Convention, the Copenhagen Agreement, the Bonn Agreement, the Lisbon Agreement (not in force), the Barcelona Convention. Regular meetings of these Conventions take place and many publications were issued.
- a number of bilateral agreements, dealing either with pollution only or also with other aspects (for instance bilateral co-operation in SAR operations)
- the EU Council decision establishing a Community information system, currently under revision, under which such a system with extensive information was created. It is assumed that, under this document, centres where staff and equipment are available are published for all EU Member States

Other agreements relevant to the topic

A number of international Conventions deal with topics linked with preparedness and response to pollution.

- the United Nations Convention on the Law of the Sea (UNCLOS, Montego Bay) whose part XII deals with protection of the environment and in particular as regards shipping ;
- the IMO Convention on Intervention (1969/73) which empowers coastal States to take measures when a pollution or a threat thereof endangers their coastline or related interests ;
- Conventions dealing with civil liability and compensation
- MARPOL 73/78, which deals mainly with measures to prevent pollution accidents and discharges, imposes on ships on which an incident might result in a pollution or a threat thereof to report to the nearest coastal State. It also requests ships to carry a “ shipboard pollution emergency plan ”. These prescriptions are reproduced in the OPRC Convention but with less details than MARPOL and the various resolutions issued by IMO for its implementation.

ANNEX II (to the POL questionnaire)

The COMMUNITY INFORMATION SYSTEM (C.I.S.)

The “ Community information system for the control and reduction of the pollution caused by the spillage of hydrocarbons and other harmful substances at sea ” should describe its aim and scope and should cover such items as the prediction models , data bases etc. in use within the European Union and refer to “ national country profiles ” which should include :

- the national organisation
- a country map

- the centres of expertise
- location of stockpiles, ships and aircraft (vessels and aircraft ; storage disposal ; stockpiles)
- inventory of the main means (strike teams, mechanical recovery equipment ; application system ; shoreline clean-up ; cleanup material ; cargo/bunker transfer)
- offer conditions

The C.I.S. should also contain the operational contact points of the Member States and Commission and would describe the role of the Commission (DG XI) in case of an emergency.

Search and Rescue (SAR)
QUESTIONNAIRE

For all questions with a star (*), there is a precision given in the annex.

0 Geographical data on the coastline

0-1 (*) What is the length of the coastline in your country ?
0-2 (*) What is the surface of the Search and Rescue region (SRR) under your country's responsibility ?

I The " SAR " actors

When an incident might give rise to a SAR operation,
I-1 Who are the actors (either public or private ones) who might have to :
I-1a receive the information that an incident occurred ? In particular, which authority(ies) should receive the ship report required by the SAR Convention and relevant IMO resolutions.
I-1b (*) provide and operate the means ?
I-1c co-ordinate the means to be used ?
I-1d other ? If yes, please precise.

I-2 (*) How would you evaluate the relative importance of :
I-2a the Armies ?
I-2b the police ?
I-2c firemen
I-2d non-profit organisations
I-2e other important actors

II Implementation of SAR services

general supervision
II-1 (*) Under which authorities the general organisation of SAR services is placed in your country ?
organisation
II-2 (*) Which are the entities responsible for SAR services at national, regional or local levels ?
II-3 (*) Which are the specialised executing bodies at national, regional or local levels ?
II-4 (*) Which is the relationship between the various territorial levels of SAR organisation and
-the State (at national or decentralised level)
-other local authorities
missions
II-5 What are the specific duties of the bodies referred to in II-3
II-6 (*) Do these bodies have other duties than implementing SAR services ?
surveillance of waters close to shore
II-7 Is there a stretch of seawater close to the shore within which the bodies in charge with SAR operations are not responsible for such a mission ? If yes by whom is it carried out within such area and how ? (*)
international co-operation
II-8 Are there co-operation agreements with adjacent countries for SAR services ?

II-9 (*) Does such co-operation with adjacent countries produce concrete actions ?

III Plans and Procedures

Definitions
symptomatic incident : an incident which might reveal the need for a SAR action and is mentioned in a pre-established classification. **Procedure** : implementation of a set of pre-determined actions when a symptomatic incident occurs.

Procedures
III-1 Does the conduct of SAR operations follow **procedures** (in the above meaning) ? If not, according to which methods SAR operations are carried out ?
III-2 Does the implementation of such **procedures** follow plans ? If yes, please give details..
III-3 (*) Do you consider that the **procedures** or other methods (and possibly plans for their implementation) should be improved in your country ?

IV Communications

IV-1 Are communications between entities in charge of SAR services on land exclusively using public networks ? If not give details on the entities which are linked by specialised digital links.
IV-2 Are there plans to expand specialised digital links ?
IV-3 Are there any difficulties for the communication between the various shorebased stations/centers and air and marine craft involved in SAR operations ? If yes, please give details..
IV-4 Would you see advantages in developing AIS applications for SAR ? If yes, please give details.
IV-5 Are there any provisions applicable to national ships related to ship reporting systems in addition to international conventions or IMO resolutions ?

V Results

V-1 What is the total number of operations carried out in the last year of reference ?
V-1a Did you observe an increase or decrease of this total number in the last 10 years ? If yes, what was the proportion ?
V 1b (*) Did a particular type of intervention increase in the last ten years ? If yes, please give details.
V-2 Are there data on the use of means implemented during SAR operations ? How can they be available ? Under which conditions and format ?

VI Miscellaneous

history
VI-1 What were the main steps and major events which marked the history of SAR services in the last 25 years ?
public opinion sensitivity
VI-2 Is the number of papers published in the media stable, increasing or decreasing ?
VI-3 Do citizens contribute in a significant way to the funding of non-profit organisations ?

Do such organisations carry out campaigns to increase public sensitivity ? if yes what are they ?
VI-4 Is there one single easy to remember phone number which would allow a citizen to alert SAR services operators when needed ?

privatisation

VI-5 Are there plans to increase the role of the private sector in SAR services ? If yes, please give details on the way it would be carried out.

additional data

VI-6 (*)Are there national synthetic documents including information on ship reporting systems that the authors of this questionnaire might consult to get a deeper insight in the question ? If yes how are they available ? Under which conditions and format ?
VI-7 What are the important features of SAR services in your country which did not appear in the answers to this questionnaire ?

ANNEX (to the SAR questionnaire)
INDICATIONS ON HOW TO FILL IN THIS QUESTIONNAIRE

0-1 The information requested here is usually available from official sources in your country(e.g. the Hydrographer).
0-2 It is the SRR area notified for your country through the IMO. Give the figure in square nautical miles.
I-1.c Such as Navy, Air Force, non-profit organisations....
I-2 Please use a 4 level scale: 1= non significant, 2= significant, 3= important, 4= very important.
II-1 We are concerned here with authorities in charge of planning, budgeting, providing personnel etc. When the authority is a ministry and thus may be subject to change overtime, just indicate “the ministry in charge of a given type of activity”, e;g. the ministry in charge of merchant marine, the ministry in charge of defence.
II-2 Depending on your country’s organisation, one of the mentioned levels might be irrelevant.
II-3 They are the bodies in charge of MRCC and MRSC functions. Depending on your country’s organisation one of the mentioned levels might be irrelevant.
II-4 Please give details on provisions made in case of large SAR operations to welcome on shore people that have been rescued and when necessary been brought to hospitals.
II-6 Such as pollution response.
II-7 For instance local authority with or without own means.
II-9 Such as pooling of facilities, establishment of common procedures, conduct of joint training exercises, regular checks of inter-State communication channels, liaison visits by rescue co-ordination centre personnel and the exchange of search and rescue information (as point 3.1.8 of the 1979 SAR Convention suggests).
III-3 Such as improving details, simplification, widening.
VI-1b Give specific precision for pleasure navigation activities.
VI-6 e.g. Internet sites.

Annex 3

IMO tables extracted from the IMO Internet Web site with the status of IMO Conventions

(Two tables are provided in electronic format, extracted from the IMO Web site, with the full list of the IMO Conventions (file <List_all_IMO_Conventions.htm>) and the implementation status by all European States, plus Norway (file <IMO_Conv_status_EU-States.xls>)

SUMMARY OF STATUS OF CONVENTIONS
as at 30 June 1999

Convention	Entry into force date	No. of Contracting States	% world tonnage*
IMO Convention	17-Mar-58	157	98.59
1991 amendments	-	45	65.71
1993 amendments	-	78	79.55
SOLAS 1974	25-May-80	139	98.46
SOLAS Protocol 1978	01-May-81	92	92.85
SOLAS Protocol 1988	03-Feb-00	34	53.96
Stockholm Agreement 1996	01-Apr-97	8	9.53
LL 1966	21-Jul-68	143	98.45
LL Protocol 1988	03-Feb-00	33	53.92
TONNAGE 1969	18-Jul-82	124	98.13
COLREG 1972	15-Jul-77	133	96.67
CSC 1972	06-Sep-77	66	61.25
1993 amendments	-	5	3.01
SFV Protocol 1993	-	5	5.99
STCW 1978	28-Apr-84	133	98.11
STCW-F 1995	-	2	3.17
SAR 1979	22-Jun-85	63	46.85
STP 1971	02-Jan-74	17	22.38
SPACE STP 1973	02-Jun-77	16	20.78
INMARSAT C 1976	16-Jul-79	86	92.98
INMARSAT OA 1976	16-Jul-79	86	92.98
1994 amendments	-	32	26.62
1998 amendments	-	19	25.70
FAL 1965	05-Mar-67	83	54.81
MARPOL 73/78 (Annex I/II)	02-Oct-83	108	94.07
MARPOL 73/78 (Annex III)	01-Jul-92	91	79.62
MARPOL 73/78 (Annex IV)	-	75	43.11
MARPOL 73/78 (Annex V)	31-Dec-88	94	86.46
MARPOL Protocol 1997 (Annex VI)	-	2	4.83
LC 1972	30-Aug-75	77	67.12
1978 amendments	-	20	21.90
LC Protocol 1996	-	6	6.04
INTERVENTION 1969	06-May-75	73	68.75
INTERVENTION Protocol 1973	30-Mar-83	42	44.91
CLC 1969	19-Jun-75	75	41.00
CLC Protocol 1976	08-Apr-81	54	63.55
CLC Protocol 1992	30-May-96	46	75.53

FUND 1971	16-Oct-78	50	33.16
FUND Protocol 1976	22-Nov-94	34	52.96
FUND Protocol 1992	30-May-96	44	72.10
NUCLEAR 1971	15-Jul-75	14	22.77
PAL 1974	28-Apr-87	26	33.96
PAL Protocol 1976	30-Apr-89	20	33.68
PAL Protocol 1990	-	3	0.77
LLMC 1976	01-Dec-86	33	43.12
LLMC Protocol 1996	-	2	2.85
SUA 1988	01-Mar-92	41	43.71
SUA Protocol 1988	01-Mar-92	37	43.12
SALVAGE 1989	14-Jul-96	30	28.94
OPRC 1990	13-May-95	45	48.74
HNS Convention 1996	-	0	
** Source: Lloyd's Register of Shipping/World Fleet Statistics as at 31 December 1998*			

	IMO Convention 48	IMO amendments 91	IMO amendments 93	SOLAS Convention 74	SOLAS Protocol 78	SOLAS Protocol 88	Stockholm Agreement 96	LOAD LINES Convention 66	LOAD LINES Protocol 88	TONNAGE Convention 69	COLREG Convention 72	CSC Convention 72	CSC amendments 93	SFV Protocol 93	STCW Convention 78	STCW-F Convention 95	SAR Convention 79	STP Agreement 71	STP Protocol 73	INMARSAT Convention 76	INMARSAT OA 76	INMARSAT amendments 94	INMARSAT amendments 98	FACILITATION Convention 65	MARPOL 73/78 (Annex I/II)
Austria	x			x	x			x		x	x	x			x									x	x
Belgium	x	x	x	x	x			x		x	x	x			x		x			x	x	x	x	x	x
Denmark	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x			x	x	x	x	x	x
Finland	x	x	x	x	x		x	x		x	x	x			x		x			x	x	x	x	x	x
France	x	x	x	x	x	x		x	x	x	x	x			x		x	x	x	x	x	x		x	x
Germany	x		x	x	x	x	x	x	x	x	x	x			x		x			x	x	x		x	x
Greece	x	x	x	x	x	x		x	x	x	x	x			x		x	x	x	x	x			x	x
Ireland	x		x	x	x		x	x		x	x				x		x							x	x
Italy	x			x	x	x		x	x	x	x	x			x		x			x	x			x	x
Luxembourg	x			x	x	x		x	x	x	x	x			x		x							x	x
Netherlands	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x			x	x	x		x	x
Norway	x	x		x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x
Portugal	x			x	x			x		x	x	x			x		x			x	x	x		x	x
Spain	x	x	x	x	x	x		x	x	x	x	x			x		x			x	x			x	x
Sweden	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x
United Kingdom	x	x	x	x	x		x	x		x	x	x			x		x	x	x	x	x	x	x	x	x

	MARPOL 73/78 (Annex III)	MARPOL 73/78 (Annex IV)	MARPOL 73/78 (Annex V)	MARPOL Protocol 97 (Annex VI)	London Convention 72	London Convention Protocol 96	INTERVENTION Convention 69	INTERVENTION Protocol 73	CLC Convention 69	CLC Protocol 76	CLC Protocol 92	FUND Convention 71	FUND Protocol 76	FUND Protocol 92	NUCLEAR Convention 71	PAL Convention 74	PAL Protocol 76	PAL Protocol 90	LLMC Convention 76	LLMC Protocol 96	SUA Convention 88	SUA Protocol 88	SALVAGE Convention 89	OPRC Convention 90	HNS Convention 96
Austria	x	x	x																		x	x			
Belgium	x	x	x		x		x	x	x	x	x	x	x	x	x	x	x		x						
Denmark	x	x	x		x	x	x	x	d	x	x	d	x	x	x				x		x	x	x	x	
Finland	x	x	x		x		x	x	d	x	x	d	x	x	x				x		x			x	
France	x	x	x		x		x	x	d	x	x	d	x	x	x				x		x	x		x	
Germany	x	x	x		x	x	x	x	d	x	x	d	x	x	x				x		x	x		x	
Greece	x	x	x		x				d	x	x	d	x	x		x	x		x		x	x	x	x	
Ireland	x		x		x		x	x	d	d	x	d	d	x		x	x		x				x		
Italy	x	x	x		x		x	x	x	x		x	x		x						x	x	x	x	
Luxembourg	x	x	x		x				x	x						x	x								
Netherlands	x		x		x		x	x	d	x	x	d	x	x	x				x		x	x	x	x	
Norway	x		x	x	x		x	x	d	x	x	d	x	x	x				x		x	x	x	x	
Portugal	x	x	x		x		x	x	x	x		x	x								x	x			
Spain	x	x	x		x	x	x	x	d	x	x	d	x	x	x	x	x	x	x		x	x		x	
Sweden	x	x	x	x	x		x	x	d	x	x	d	x	x	x				x		x	x	x	x	
United Kingdom	x	x	x		x	x	x	x	d	d	x	d	d	x		x	x		x	x	x	x	x	x	

Annex 4

Electronic files of the questionnaires received (when available)
(The POL and SAR questionnaires, as filled in by the respective national contact persons, are provided in electronic format, if available as such,
see file Annex 14.4.doc)

Annex 15

VTMIS concerted action

Note by the Secretariat

A proposal for additional activities

Date : 30th December 1998

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VTMIS procedures and operators training

Whatever the objectives and configuration of future Vessel Traffic Management Information Services, inasmuch as the objectives of traffic management are to influence in some way the behaviour of ships involved in given traffic flows there will be a need for assessing navigation situations and accordingly to provide the various actors involved with the proper information.

The efficiency of any VTMIS is therefore closely linked to the existence of harmonised definitions of both

- a) adequate set of procedures by means of which the proper information is transmitted from the information holders to the information users,

- and as soon as procedures are not fully automated, b) the levels of qualification of operators who will be made responsible for the transmission and use of that information.

Summing up, in all cases, where the services VTMIS aim at influencing the traffic through a number of centres via qualified operators there is a need for :

- networking the various centres,
- setting up adequate procedures,
- ensuring that the operators have reached the appropriate level and skill.

As a first approach to the problem, one may consider as typical the situation of European VTS which at the moment suffer from the following shortcomings :

- The interconnection of VTSs is far from complete even if in some countries VTSs are fully interconnected;

- The navigational situations deserving the implementation at regional or even local level, in response to symptomatic events, of well defined procedures have not yet been fully identified;

- And consequently, the procedures to be followed by the VTS operators to cope with those situations as well as the training processes enabling future operations to recognise the occurrence of symptomatic events and to act according specified procedures have been precisely settled.

It may be added that as a consequence :

- the workload imposed on shipmasters due to the mandatory multireporting together with measures related to dangerous goods management has not been reduced,

- on the other hand various training tools and training centres have been implemented throughout Europe leading to a certain proliferation of dedicated facilities,

- and finally that the level of qualification of VTS operators varies from one country to another confusing the end users of the system.

It is proposed that the VTMIS concerted action be tasked with a study aiming at :

- assessing the current state of the art, taking account of the work carried out under projects either already carried out such as TAIE and RTIS or currently under development in MASSTER, MARCOM, METHAR, SAFECO, COMFORTABLE, POSEÏDON together with the outcomes of the work programme of the IALA VTS Committee,

- proposing a set of scenarios following which European training facilities could be set up and harmonised,

- preparing detailed framework for investigations addressing :

  * the identification of parameters characterising hazardous navigational situations that might entail the VTS to provide navigational assistance service or traffic organisation services
  * the development of corresponding appropriate procedures
  * the contents of coursewares composing an efficient training programme for novices as well as for refreshers
  * preparing a set of scenarios allowing to assess the relevance of procedures and related training tools.

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TECHNISEC Project

FINAL REPORT ON QUALIFICATION AND TRAINING OF VTMIS OPERATORS

FINAL REPORT ON QUALIFICATION AND TRAINING OF VTMIS OPERATORS

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FINAL REPORT ON QUALIFICATION AND TRAINING
OF VTMIS OPERATORS

DOCUMENT HISTORY:

Issue	Date	Initials	Short Description of Changes
1.1	30.06.1999	RGB, C.G., K.B.	First issue
1.2	27.10.1999	RGB, C.G., K.B.	Reviewer comments.
1.3	17.11.1999	RGB, C.G., K.B.	Reviewer comments.
1.4	10.12.1999	RGB, C.G., K.B.	Reviewer comments.
1.5	20.12.1999	RGB, C.G., K.B.	Reviewer comments.
1.6	14.01.2000	RGB, C.G., K.B.	Reviewer comments.
1.7	03.02.2000	RGB, C.G., K.B	Reviewer comments

FINAL REPORT ON QUALIFICATION AND TRAINING OF VTMIS OPERATORS

Content

TECHNISEC PROJECT – Report on Qualification and Training of VTMIS operators

1 SUMMARY

This report discusses the training of VTMIS operators. It became apparent that VTMIS-operators do not exist, although in Europe some VTMIS projects have been carried out. If VTM[32] is considered in Europe, it is clear that VTM is present in ports and rivers. There is also a case for VTM at sea. This VTM at sea is oriented to the prevention of oil pollution and the enforcement of Rules that are being agreed in International Conventions and in the IMO.

The IALA VTS committee is considering the training of VTS operators. The VTS committee has published a model course for VTS operators. In fact this is mainly but not exclusively a training for VTM in ports. Many of the activities in a VTM and by a VTM operator are covered by the training objectives of a VTS operator.

VTM operators carry out their responsibilities regarding vessel traffic. They need to collect specifc report style information in order to know the identity and position of vessels before they are able to interact. Information that is derived from the Traffic Images can be provided automatically to third party users. There is no need here to have a special operator to carry out such tasks.

This report, therefore, concentrates on training for VTS operators and discusses how this training can also be used for VTM in rivers and at sea.

There are some different opinions with respect to the procedures that are used by VTS operators to handle collision avoidance. For different reasons, in most European countries, no specific procedures are in use. However, if VTS operation should be harmonised in the future in order to use all the potential of VTS more effectively, then standardisation of procedures should be discussed as one of the most relevant items. This would also comply with Mr. W. O'Neil's (International Maritime Organisation Secretary General) call for VTS/VTMIS rules similar to Air Traffic Control [MGN 99].

In Germany proposals have been developed to base collision avoidance procedures on risk criteria. This report will discuss these proposals and a framework for further investigations and development of the concept used is suggested.

[32] VTM is Vessel Traffic Management

2 Introduction

2.1 Navigation Through The Report

This report is organised as follows:

The first chapter explains the different parts of the report and also summarizes some results from the TAIE project.
The second chapter discusses the external procedures of a VTS.
Chapter 3 provides an overview of the development of VTS and VTS operators. It also gives an overview of the VTS model course as developed by the IALA VTS committee. This overview is used for a comparison with the VTS training in Spain, the Netherlands, Germany, Norway and the UK.
Chapter 4 discusses VTS training in Spain
Chapter 5 in the Netherlands
Chapter 6 in Germany and the situation in Norway and
the UK is discussed in Chapter 7.
The Coast Guard as an entity and VTM tasks that are carried out by the Coast Guard is discussed in Chapter 8.
In Chapter 9 the VTS training for the users of VTS, deck officers, is discussed.
In Chapter 10 the results are discussed and recommendations are given.

2.2 Certain Results from the TAIE Project

TAIE EURET and RTIS EURET were two projects that were carried out under the EURET programme. That was a rather small programme prior to the fourth framework programme. The approach used in these projects may be considered as a continuation of the findings in COST 301. This pioneer project contributed much to VTS development and, at the same time, the subject of Regional VTS (in the Mediterranean) was also discussed. Some NW European countries opposed the idea of Regional VTS, notably the Netherlands, fearing those sea regions would be treated as port VTS with a very expensive and unnecessary coverage of radar and other infrastructures. These differences in opinion were visible in the two projects: R(egional) T(raffic) I(nformation) S(ervice) and T(ools) for the A(ssessment) of the I(ncrease) of E(fficiency) of VTS. However both projects worked closely together and showed that a fundamental change in appreciation of VTS and RTIS was pending.

TAIE had a number of work packages that are interesting for the present subject. Firstly, Prof. Lemburg of ISSUS was work package leader for a new communication course for VTS operators. This course was intended to be implemented for the radar simulator of ISSUS [1].

Secondly Dr. Coles of Opeform reviewed the VTS training in some European countries to date. This review is still valid for many aspects mentioned. The VTS model course for VTS operators of IALA may now open the way for a more general harmonised approach of VTS operator training. In Annex 1 a summary table is reproduced containing many aspects of VTS training in France, the UK, Germany and the Netherlands [2].

2.3 CAMs and VTS Procedures

TAIE also studied the aspects of Allocation of Space and the Systematic Use of Navigation Plans. The intention was clear: the studies should lead to VTS external procedures, implemented by a VTS operator, to thwart the threat of collision. Earlier attempts were already recorded during COST 301. In WG 2 of COST 301 a literature survey was carried out on the major parameters in a CAM[33] and how these parameters could be used by a VTS operator [3, 4] for reducing the risk of collision. The Tactical Decision Distance (TDD) was defined as the distance between two vessels where the burdened vessel can be expected to implement a CAM. In association with a TDD a Minimum Decision Distance (MDD) was defined. This distance is the minimum value of TDD where a safe CAM can be carried out. A safe CAM is carried out when the Tactical Separation Standard (TSS or DCPA) satisfies a minimum value. The minimum value of TSS is called MSS (Minimum Separation Standard). In case a VTS operator discovers that, despite the co-ordination of navigation plans at on the level of Traffic Organisation Service level, a potential encounter of two ships is imminent, he informs both vessels and lets them agree on the CAM and safe TSS and TDD. This is the first role of the VTS-operator. His or her second role is to verify that the CAM is made in good time. He uses the TDD and the MDD as criteria. If the burdened vessel is not carrying out the manoeuvre properly then the VTS operator should inform the vessel of the need for action beforeit becomes close to its MDD. The third role of the operator could be that of verifying that a CAM is sufficient to give a TSS that is greater than the MSS. The VTS operator should inform the vessel that the CAM would not lead to the required TSS. The final role of the VTS operator is to inform both ships involved in the emergency situation if, for any reason, it appears that the MHSS (Minimum Hydrodynamic Separation Standard) is likely to be breached. It is to be kept in mind that the responsibility for obeying the COLREGs remains with the masters of the vessels [5].

Benedict and Roper [6,7] studied the operational problems and the intended functions of a VTS system. They revised the definition of Strategic Planning, as compared to the one suggested in COST 301. They also rejected the results of COST 301 as a possible basis for the development of tools for collision avoidance. An important role is seen for the VTS generated Navigation Plan. Such a plan contains a list of way points of a route and is prepared or approved by a VTS center. This plan also contains information about times when vessels need to occupy a certain navigable space and which orders (course and speed) are necessary to keep to the planning. Ships navigation plans provide the basis for the VTS center's plan of navigation. The use of the navigation plans

[33] Collision Avoidance Manoeuvre

and their evaluation and, if necessary, amendment before they are sent back to the vessel is one of the proposals in [8].

The basis for these ideas are:

- VTS operators are sometimes overtaxed. Under such conditions data processing may not be up to scratch.

- VTS operators have to carry out a lot of routine activities. This leads sometimes to insufficient monitoring of dangerous situations.

- If the VTS operator detects a dangerous situation, he uses his own internal mental model to remedy the situation, but this is sometimes too late. In [8] the general recommendation was included that VTS operators should not influence the traffic more than necessary. This absence of positive operational guidelines leads to problems of limiting responsibilities and to uncertainty of VTS operators when needing to perform actions that affect the traffic flow.

- VTS operators don't have tools to detect dangerous situations in time.

The operational problems that exist and that need to be addressed are, according to [7],:

- Streamlining of operational procedures in order to improve VTS efficiency.
- Relief of the mental pressure on VTS operators by providing them more tools and automatic data processing.
- Shift the scope of VTS towards more Traffic Organisation Services to cope with the optimisation of the traffic flow.

In order to solve these problems the following break down is made:

- Data acquisition of traffic flow parameters.
- Prediction of the future state of the traffic, based on simulation.
- Evaluation of present and future traffic situations to determine present and future risk.
- Planning and decision making on a tactical and strategic level.

Tactical evaluation of traffic deals with current observed situation with a non-acceptable risk of collision. The evaluation can be done in two ways:

(a) VTS operator monitoring and the application of a mental initiator for operator action.

(b) More complex computer based evaluation where the results are presented to the operator.

Strategic evaluation deals with expected situations and tries to avoid these by a suitable strategy. The evaluation criteria used here are more abstract and are oriented to acceptable or non acceptable situations

The report shows that visualisation of traffic may help the VTS operator. A "passage window" was proposed that provide the relevant parameters for a CAM. The use of safety areas and expectation areas[34] was also recommended. Although there is a large number of models for collision risk assessment most of them are not suitable for VTS. This conflict solver should generate recommendations to the VTS operator of how problems may be solved. This is an important novelty since current VTS systems only warn about conflict situations. The solution of the problems is left to the masters of the vessels based on good seamanship. When this fails, the VTS operator may provide information or even instructions on how to avoid the collision. However, when the vessels seem to be uncertain about what to do, or it does not comply with COLREGs, the VTS operator should suggest or even instruct manoeuvres to avoid collision.

The question about which procedures should be used by VTS operators if they have new tools at their disposal could not be solved in TAIE.

2.4 General conclusions of the TAIE project

In [9] the conclusions of the project, one of them reads:

- The experts who were asked to assess the results of the VTS training work packages in TAIE concluded that harmonised VTS courseware with emphasis on communications is now quite advanced. It requires co-operative efforts in order to finalise and to implement it in all European countries that have VTS. The same courseware should be integrated with basic mariner training in order to stress the importance of clear communications.

This final report also contains two recommendations:

- An association of VTS training centres is established to develop courseware for the training of VTS operators. A small European agency might co-ordinate the activities and perhaps support small-scale implementation of VTS courses. Experts from IALA and educational centres might assess the software that is developed for the courses. The major emphasis should be on harmonisation of verbal communication procedures, since this would probably contribute greatly to the safety of waters covered by VTS.

[34] These are an expression of an area with risk of collision and all possible positions of a vessel for a certain time interval in the future.

- Verbal communication in a VTS area should be part of the training of mariners to stress the importance of the proper use of VTS communication by the users of VTS.

3 VTS External Procedures

3.1 External CAM Procedures in the Netherlands

The Netherlands does not use external procedures using some kind of risk assessment of Collision Avoidance in VTS areas. Under Chapter 1 an approach has been mentioned, as studied under COST 301, to use conceptual distances to describe the interaction of VTS operators in situations where vessels involved in a potential encounter, may be under risk of collision. Some simulator trials have been carried out as a result of this study, but these trials did not provide VTS authorities with sufficient material to consider similar procedures in real VTS.

The general consensus is that the risk of collision is based in the first place on the geometry of the encounter situation. A second, but perhaps more important factor according to many experts, is the level of simultaneous knowledge of the intentions of both vessels in such an encounter. It is normally taken that when a vessel knows the intentions of the other vessel with or without the assistance of the VTS-operator, small DCPAs[35] are not, by definition, threatening and do not pose a high risk.

A VTS operator can contribute to both factors, but since the last mentioned factor is the most important, he will attempt to provide information in such a way that both navigators feel confident about the development of the encounter. He is also capable of requesting that both navigators keep in contact with each other and make agreements on the way the encounter will develop. The VTS operator can closely monitor the CAM, if a CAM is necessary. Under normal conditions instructions from a VTS operator in order to achieve a certain result will not be necessary.

If the mental model is valid, where the risk of collision is dependent on the geometrical configuration, and on the confidence or otherwise of both navigators, then the risk of collision is considerably reduced when certainty exists regarding an encounter.

The other possibility is that a VTS-operator simulates the evolution of the traffic on the basis of sailing plans. These sailing plans can be amended to minimise encounters, and hence the risk of collision. The procedure mentioned is a part of the Traffic Organisation Services and is probably not very popular with the shipping industry. Minimising encounters can only be achieved by reducing the

[35] These DCPAs should be "seaman-like" and should be selected in relation to the fairway characteristics and the speeds of both vessels. The uncertainty component in the DCPA should however be removed.

speed of many vessels. Many masters will also not be very pleased by the fact that a VTS authority changes the sailing plans for no apparent and clear reason.[36]

The use of the normal phases as required by COLREGs (approach phase to observe other vessel, phase to implement CAM), where risk of collision exists, is valid in open seas where no contact between vessels is made. In those cases, the confidence for the navigators involved is based on the observation of the behaviour of the other vessel. The timely execution of a CAM of the burdened vessel with such an intensity that there is no doubt on the privileged vessel as to the intentions of the other vessel, contributes to safety.

Traffic situations, causing collisions, in Dutch VTS areas are not frequently encountered and the few collisions that have resulted after intervention of the VTS operator did not cause a change of any external procedure.

The competent authorities believe that the training of VTS operators is currently adequate in order to master these encounter situations when they arise.

3.2 External Procedures in Spain

3.2.1 Introduction

VTS communication procedures to be carried out by the Naval Command and Port Authorities in Spain have been designed to enable VTS operators to control shipping traffic together with port operations as covered by current legislation. In this way the VTS is able to co-ordinate the information and monitor the operations under improved conditions of safety and efficiency.

3.2.2 Procedures Used

The ships that are birthed, anchored or under way within the limits of the port or in nearby waters, must establish communication with the VTS center and offer the following information:

Name and code.
Position at the moment of communication, in geographic co-ordinates or route and distance from a landmark on the coast.
Estimated Time of Arrival (ETA).
Requirements.
Any other information required by the VTS centre related to ship specifics - cargo, crew and operations to be carried out.

[36] Not unlike the red traffic light on a crossing with no other traffic than your own car in the midst of the night.

The communication to be made by the different ship types vary according to VTS centre and ship characteristics. For example, in the case of a port VTS the following cases apply:

- Ships that need a pilot:
  - When incoming - communicate with the VTS two hours before ETA at port boundaries or the position the pilot should come on board.
    - Establish fresh connection when ETA varies by over 15 minutes.
    - VTS must inform the pilots and tugs of ETA 40 minutes before arrival.
  - When outgoing - communicate with the VTS two hours before departure and contact the pilots to require the service. VTS will inform the tugs and berthing personnel of the expected departure of the ship.

- Long-distance fishing ships and those that are out of port for a time equal to, or more than, 24 hours:
  - When incoming - contact the VTS one hour before ETA at port limits or when 8 nautical miles from the entrance.
  - Outgoing - communicate to the VTS the intention of leaving port and initiate the manoeuvre.

- Sport and leisure craft:
  - Based in port - there is no obligation to communicate with the VTS centre. However, it is recommended that when planning to spend more than 24 hours outside to let them know and to contact when returning.
  - When they are near to port or inside, maintain listening to VHF, channel 16 or the VTS working channel.

- Port Service ships and craft:
  - This group includes those ships and craft that provide the following services:
    - Towing.
    - Collection of solid or liquid residue.
    - Supply of fuel, lubricating oils, water and provisions.
    - Embark and disembark personnel.
    - Dredging, cable laying, buoys, bathymetry or submarine cables.
    - Interior traffic passengers.
    - Rescue.
    - Berthing.
    - Pilots.

All ships must inform the VTS centre as soon as they make way on initiating or terminating the service that originated the movement to or from its base.

3.2.3 Information to the Ships

The VTS has a function as co-ordinator of safety for shipping traffic and port operations. As such the centre must provide the information and services required by the ships:

- Forecast of berth and commencement of the operations involved.
- Forecast of the time the pilot should embark.
- Liaison and communication with pilots, tugs and berthing personnel of the ETA.
- Instructions and procedures in case of waiting for a berth or delay in the time of arrival of the pilot.
- Notification of quay and berth position, or the geographic co-ordinates in the case of anchorage.
- Monitoring shipping within the operational radius assigned to the VTS centre.
- Aid by radar and information on shipping whenever petitioned or when advisable for safety reasons.
- Liaison with Yacht Clubs to cover the craft using their equipment.
- Weather information in accordance with the established timetable/procedure. This information will be provided on petition for special cases.
- Information concerning quays, tides and depths in the port.
- Any information relating to shipping traffic and operations to be carried out by the ship, except those pertaining to the agent or consignee.

The information provided to the ships, owners, consignees and authorities may solve generalised or specific problems and therefore the services offered by the VTS centres are always profitable both from a financial and safety related viewpoint.

3.3 Operational Procedures for Collision Avoidance in VTS

3.3.1 Operational Procedures Presently Declared in German VTS Rules

With respect to standardisation and harmonisation of VTS procedures it can be stated that, safety relevant measures - collision and grounding avoidance - are important items for both the subjects. Apart from these items communication procedures may also be standardised for reasons of minimising the necessity of long speeches and also to minimise the probability of communication problems (such as misunderstandings).

Contrary to other countries Germany attempts to describe VTS interactions within the national rules for VTS operation. This is to avoid dangerous traffic situations as much as possible and provide VTS operators with a framework of how and when to intervene in defined traffic situations [Str 98]. As a result of the survey of VTS procedures the following tables give an overview of these, together with the criteria and thresholds currently used to contribute to collision avoidance in German VTS areas. According to the German approach on shore-based collision avoidance, procedures are divided into measures for two-dimensional traffic and measures to avoid dangerous encounters in linear fairways.

<table>
<tr><td colspan="2" align="center">Traffic Organisation Service and German interpretation
- Excerpt from VTS-Operator rules -</td></tr>
<tr><td colspan="2" align="center">Avoidance of collisions - two dimensional traffic in open sea – areas</td></tr>
<tr><td align="center">Criteria for
VTS-intervention</td><td align="center">Communication procedure</td></tr>
<tr><td align="center">automatic collision warning
or
constant compass bearing
between approaching vessels is occured
<u>and</u>
8 min > TCPA > 4 min</td><td>Operator has to <u>inform</u> the involved vessels about:
? Vessel type and length of the other vessel
? distance and direction of constant bearing
? time to closest approach
<u>Question</u> regarding the intended manoeuvre to avoid the collision
<u>Information</u> about the other vessel's intended manoeuvre.</td></tr>
<tr><td align="center">as above but

TCPA < 4 min</td><td>In case the danger of collision of the certain encounter is still occuring, the VTS operator has to <u>inform</u> the concerning vessels about:
? distance and direction of constant bearing to the other vessel involved in the situation and
? time to closest approach
Furthermore the VTS operator has to <u>instruct</u> the vessels:
? to perform a manoeuvre to avoid the expected collision with the vessel at a
? distance of ... nautical miles and with true bearing of ... degrees.</td></tr>
</table>

Table 1: German VTS-Procedures for shore-based collision avoidance in open sea areas

Avoidance of collisions - Linear traffic in fairway areas	
Criteria for VTS-intervention	**Communication procedure**
Danger of collision has to be assumed if: ? an overtaking vessel endangers passing traffic ? a vessel lands or puts out when other vessels pass the fairway ? a vessel is crossing or turning into the fairway with passing traffic ? a vessel uses the left side of the fairway when there is oncoming traffic	A VTS operator should provide: ? Information to passing traffic about vessels crossing, entering or leaving the fairway ? Instructions for mooring. Crossing vessels to give the right of way to passing traffic. If necessary mooring is to be prohibited and/or passing times specified for certain way points - distances should be established. In case a vessel uses the left zone of a fairway, a VTS operator should provide: ? Information to the oncoming traffic ? Instructions to certain vessels, not to start a voyage, to pay attention to the established zones with encounter and overtakinng prohibitions and if necessary specify passing times. In case a vessel uses the opposite fairway side during an overtaking manoeuvre, a VTS operator should provide: ? Information to the oncoming traffic about position and direction of the vessel ? Instructions to the overtaking vessel to pay attention to the oncoming traffic and the right-hand rule

Table 2: German VTS-Procedures for shore-based collision avoidance in linear fairways

It should be stated here that other safety related subjects - such as grounding avoidance for example - are not defined, or at least not in such a detailed manner, as for collision avoidance in the German rules for VTS operation.

3.3.2 Experiences of the practical use of "standard procedures" and reasons

Besides some problems with the communication procedures as already mentioned (e.g. which vessel should be called first, when should VTS intervene in linear fairways, and so on), there are other reasons why the described "standard" procedures for the "open sea" VTS areas could only seldom be used [Sze 94].

According to research carried out under the COMFORTABLE project [Reg 99] and [Reg 98], one main reason for this is the link of the operator action to the implemented automatic collision warnings. These warnings are triggered if fixed thresholds for CPA (900 m) and TCPA (10 min) are violated. These thresholds seem to be established more or less arbitrarily and do not take into consideration things like traffic behaviour within the area to be monitored or the occurrence of different environmental conditions and different sizes of ships potentially involved in an encounter situation.

In consequence this leads to a high alarm rate on an average. Sometimes the operator has to handle more than three or four alarm situations simultaneously, which often forces the operator to deviate from the standard procedure defined in the rules. The following figures taken from [BB 98] gives an impression of the alarms to be handled by VTS operators in the German Bight VTS.

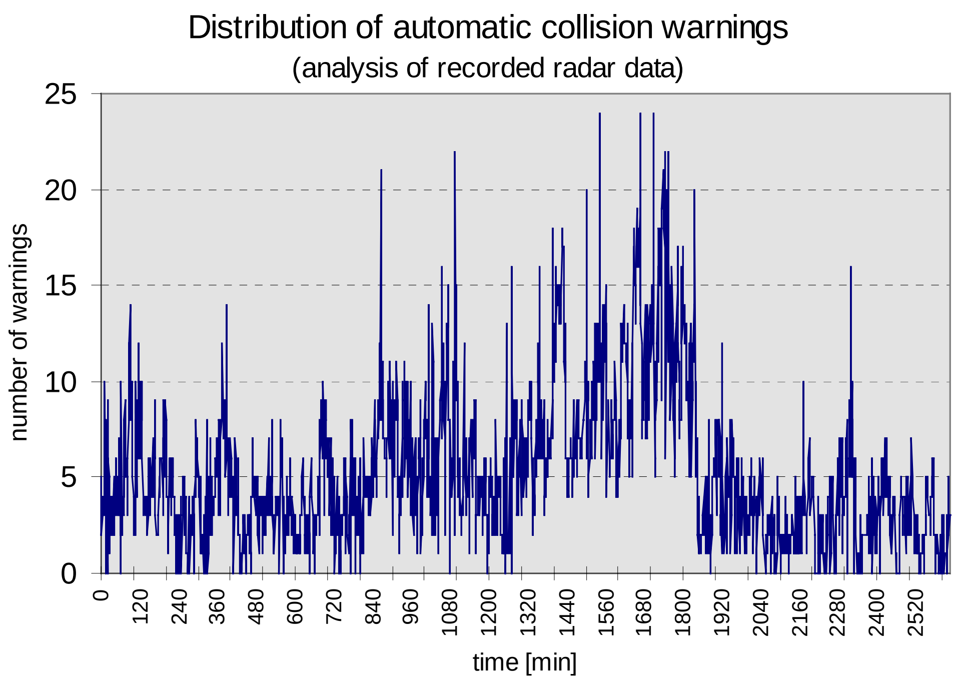


Figure 1: Sample of the high level of collision warning frequency.

Figure 1 gives an example of the permanently excessive number of automatic collision warnings, whereas the following figure gives an image of the spatial distribution of triggered warnings inside the area to be monitored.

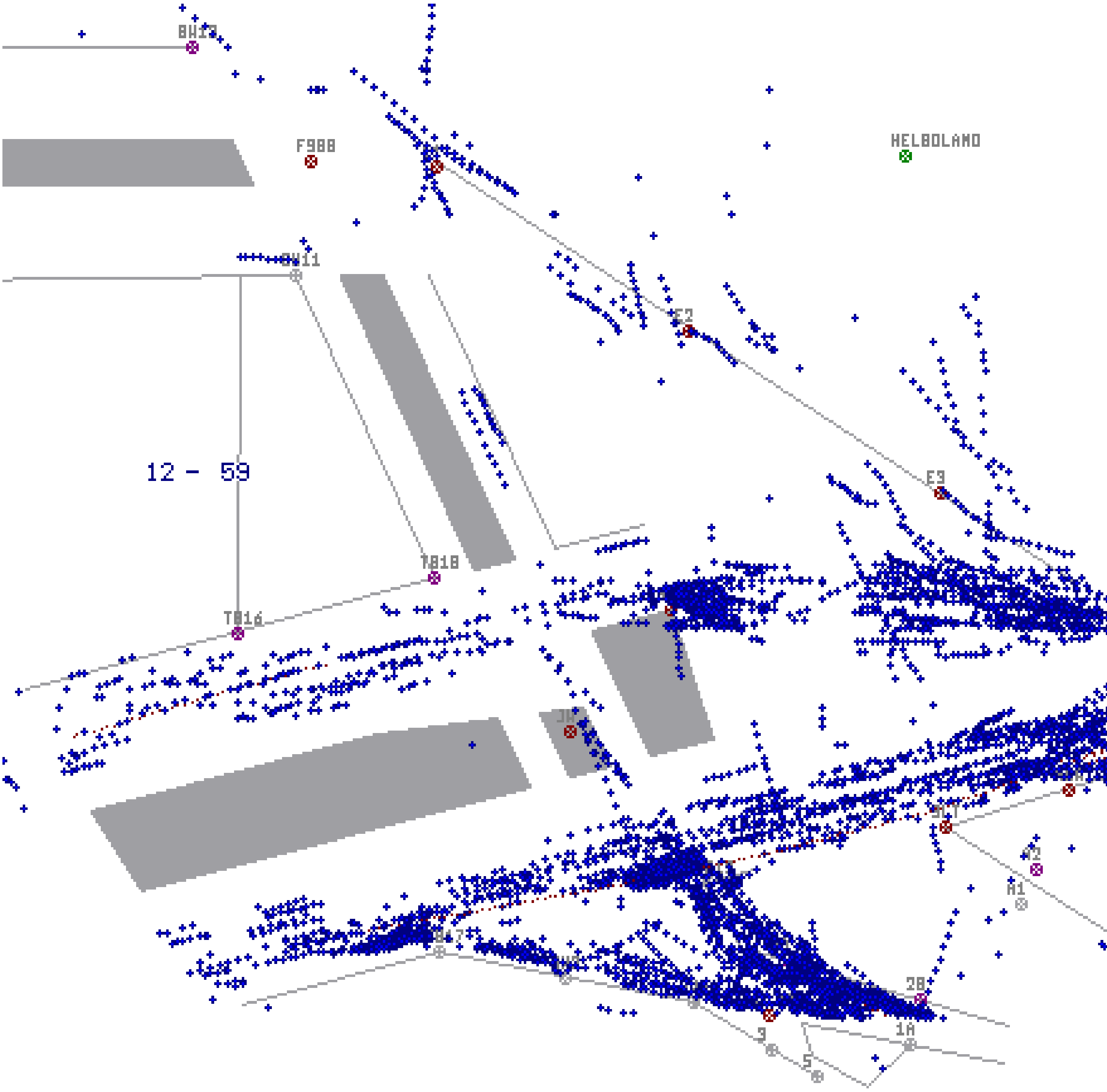


Figure 2. Example of the spatial distribution of automatic CPA/TCPA warnings given by the system automatically for a 24 hour period in the German Bight VTS area.

An analysis of collisions that really happened in the German Bight has shown that there were more than two collision warnings that the operator on duty had to handle at the time of the accident, as the following example shows.

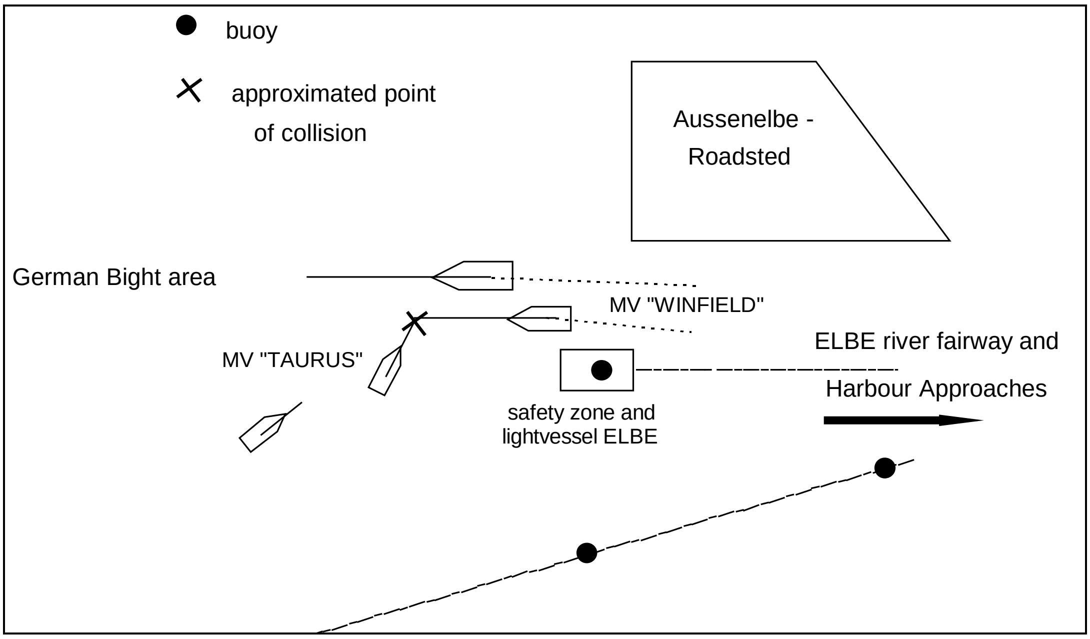


Figure 3: Principle sketch of the sea accident (reconstructed course of the accident according to available descriptions; false to scale).

The above is a drawing of the accident that took place in the German Bight VTS area near the lightvessel "ELBE". The figure below shows the correspondig alarmrate at the time the accident happened.

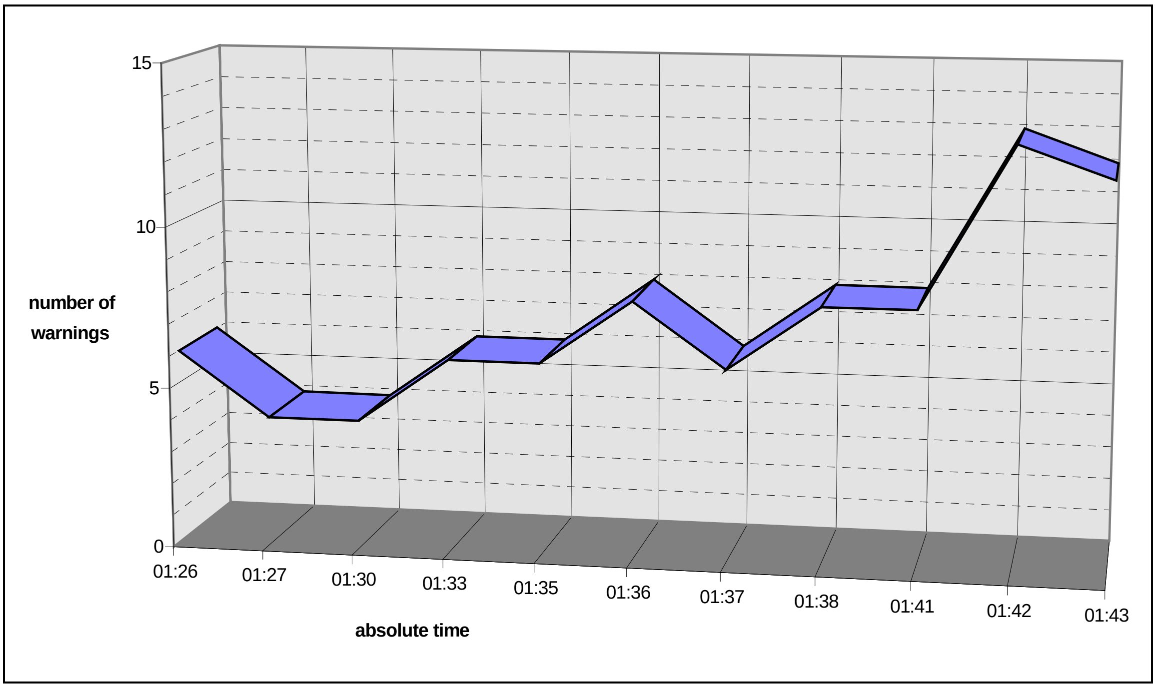


Figure 4: Absolute number of automatic collision warnings in the VTS center during the approach of MV “B” and MV “A”.

3.3.3 Requirements For The Development Of Standard Procedures

As further research [Bal 99] has shown, it is a very complicated matter to establish suitable thresholds for warnings. It is also complicated to establish safety related VTS interventions to avoid danger. One main reason for this is the lack of approved, quantified safety standards for collision avoidance and for shore based traffic monitoring by VTS. This deficiency restricts the intended effect of VTS to ensure and to improve the safety of sea traffic.

Finally the "International Rules for Preventing Collisions at Sea" (COLREGs) valid for both actors, the onboard officer on duty and the VTS operator on shore, do not contain any quantified values such as for the "safe passing distance" or action "in ample time" which are the only basis for harmonised situation assessment. These values should be quantified, defined and made legally binding so that they may be used for the ARPA-based collision warnings on board, as well as for the automatic collision warnings in the VTS center.

According to [Nic 97] the approach to determining how to implement the appropriate limits can be discussed ad infinitum. However, there is no doubt about the fact that standardisation and harmonisation cannot be reached if the criteria and the limits for the relevant actions are missing. On the other hand it will be expected that the availability of such limits will then open the way to further development of VTS from "only" avoiding dangerous situations when they already exist, to "also" co-ordinate the traffic flows. As stated by Mr. William O'Neil. Secretary General to the International Maritime Organisation (IMO), who calls for VTS / VTMIS similar to air traffic control [MGN 99], such ideas are presently under discussion by the IMO.

The following main conclusions are derived from the survey of German VTS-procedures for collision avoidance and the survey of parts of relevant European projects. They must be taken into account as the main emphasis for the development of standardised VTS procedures:

- Taking into consideration the high number of possible encounter situations that require outside intervention, VTS should be standardised by means of more or less pre-defined measures and communication standards. This could also give positive inputs for training courses. Procedures as defined at present are not sufficiently suitable for every kind of dangerous encounter situation. The criteria used (e.g. alarms in open sea areas based on fixed CPA and TCPA thresholds) are not practicable for VTS use. Furthermore, current criteria in German VTS, such as e.g. the CPA limit (as synonymous for the safe passing distance) and the TCPA limit, are not obligatory for the mariners on board.

- Quantified criteria are not only fundamentally necessary for harmonisation and standardisation of VTS and VTMIS they will also be urgently needed for evaluation of training and simulator exercises. Especially the question of an interaction in ample time that is a wide field for discussion if there are no quantified values. So presently it is open to each teacher to define what "in ample time" means.

- Standardisation and harmonisation of shore-based collision avoidance should particularly follow IMO-VTS Resolutions and the International Rules for Preventing Collisions at Sea. If there are national approaches different to these international regulations (as e.g. being more specific), they should be published if they are potentially suitable to being introduced in other regions.

- An early intervention by VTS in the case of a risk of collision is not critical and may not be appropriate or even practicable. This is the case for dense traffic, high workload of the VTS operator or of the navigation officers on board the vessels, for example. Critical interventions are those that come too late. Therefore quantified criteria are needed to determine appropriate action limits, to adjust the technical supporting systems (warnings and alarms) and to create a thorough basis to generate training and performance standards.

- The exact number of VTS procedures as subject to potential standardisation must be determined by more detailed research under further studies. However, with respect to ATC and training courses of ATC personnel there are some parallels (e.g. traffic control to avoid collisions). Some subjects may be used partially (as e.g. assessment of real traffic situations and of training scenarios). Of course there are a lot of subjects which are not relevant for VTS and VTS training at all (e.g. measures to avoid collisions by means of a change in altitude).

A first rough review of relevant paragraphs of the "Procedures for Air Navigation Services - Rules of the Air and Air Traffic Services" (PANS-RAC), for example, Part III: "*Area Control Service*" especially chapter 8.2 to 8.4, show that in ATC there are very detailed procedures available which are based on well quantified and accepted limits.

Of course there are differences in philosophy and intentions and further areas, but at an administration level comparable to the IMO there were standards defined that are much more detailed than presently available for maritime VTS. Especially with respect to the introduction of more and more VTMIS functions it would seem to be sensible and useful to investigate whether it is possible to apply similar rules and regulations. For example which of the PANS-RAC and its methods are applicable, partially applicable or not at all applicable to VTS and VTMIS.

3.3.4 A risk model as a potential approach for the development of standard procedures and harmonisation of VTS measures

Taking into account the statements included in the introductory first chapter of this report and using a model for situation assessment based on the COLREGS, it seems possible to standardise and to harmonise VTS measures for collision avoidance by defining VTS interactions in accordance to the standard message types: 'Information', 'Warning'/'Advice' and 'Instruction' provided by the IMO.

In [Bal 99] the following model was suggested as a potential base for harmonisation and standardisation of VTS interaction to avoid collisions. The criteria and parameters used are situation dependent limit values that have to be determined according to local rules and specific hydrographic conditions:

VTS interaction for collision avoidance	**Criteria for risk assessment**
Information (e.g. about the development of a potential dangerous encounter situation)	CPA < C_A and RNG > R_A
Warning / Advice (e.g. about a real risk of collision and the relevant actions according to the COLREGS)	CPA < C_A and R_M < RNG ≤ R_A
Instruction (e.g. to initiate or fail a certain action)	CPA < C_A and R_C ≤ RNG ≤ R_M

Framework for harmonisation of VTS interaction for collision avoidance

According to different scenario studies instead of TCPA limits RNG criteria are used in this model. RNG stands for the actual distance between approaching vessels at a certain time and represents also the TCPA because it is based on the relative velocity of approach between the vessels. R_A, R_M and R_C are the corresponding limits for a particular necessary VTS interaction as defined in the latest IMO, VTS Guidelines.

One approach to quantify a situation's dependent limit value, is described in [BHB 98]. The model suggested is a framework and must be further developed.

Therefore, as one way to investigate these problems, apart from a more detailed analysis of and arguments for, the need for standardised procedures, an approach containing the following two main parts is suggested:

1. Definition of safety standards / limits as a basis for standardisation and harmonisation of VTS procedures, and
2. Development / modification of existing or missing procedures.

These two main subjects could be investigated by a potential framework or research study including, among other matters:

- Research into the possibility of standardising VTS procedures taking other transport industries as potential models.

- Perform a critical comparison of the IMO/IALA standards and recommendations for VTS and the COLREGS against the rules of other means of transport, including the rules of the Air, and determine the pros and cons of each.

- Specification of VTS actions and their objectives, together with definition and quantification of limits by means of simulator and scenario studies.

- Testing the procedures and limit values within the framework of a, or a series of, experimental simulator studies with VTS operators.

Based on such research, the specific content of certain VTS respective of VTMIS training courses, may then be reviewed. Obviously the VTMIS functions could then also be defined clearly and in more detail.

The representative of the German Government has already raised the problem mentioned in this chapter with the IALA VTS Committee.

4 VTS and VTS operators

4.1 Introduction

Not long after World War II it became clear that the limitations of the use of ship borne radar reduces the full utilisation of ports capacities under impaired visibility conditions. The general opinion of experts was that shore based radar could provide traffic images in order to keep flows of ships running smoothly in port areas. In the fifties a number of shore based radar chains were installed in European main ports. (Liverpool in1948 and Rotterdam in 1956).

It is interesting to note that these systems were primarily intended to increase efficiency of traffic flows. Attention was paid to the study of accidents at sea and the way in which this number of accidents could be reduced. This has also lead to studies of the effect of shore based radar chains on accidents in port areas. It was discovered (not surprisingly) that in addition to the increase in operational hours and consequently a better utilisation of port capacity, the number of accidents was reduced.

In the seventies more pressure came from the environmentalists. Large disasters in the seventies (Tory Canyon, Amoco Cadiz, Metula and many others) affected public awareness of the necessity of protecting the environment. Fear that such disasters may also happen in port approaches and port areas forced policy makers to reconsider the concepts of the port radar chains and the co-operation between pilots and radar chain operators.

Slowly there was a movement towards what we now call a VTS. A Vessel Traffic Service was defined and the matter was discussed at IMCO. The number of VTS has rapidly increased over the last decade.

Information technology has played an increasingly important role in the eighties and attempts were made to connect local VTSes with one another to obtain advanced information. Although the capabilities were available to achieve this goal, many port organisations were not yet able to cope with all difficulties involved in the implementation of new technologies in such a traditional environment as the shipping industry. This was also partly due to the financial problems of many ports because of the increasing number of tasks they have to carry out.

In the beginning of the eighties the then European Community considered a European wide study on VTS to promote the use of this technology along its coastline and to harmonise many procedures in relation to its use. This study was called COST 301 and the funds to carry it out became available in 1983. The study was concluded in 1987 and its impacts were quite considerable. The results could be described under five headings.

Firstly, the study leads to a coherent description of the concepts and definitions to be used when one desires to have an effective discussion on VTS.

Secondly, the use of risk analysis and simulation as a tool for the decision-makers to determine the nature and scope of a VTS in terms of accident reduction and improvement of efficiency was started.

Thirdly, COST 301 provided a survey of all methods of surveillance and the way that technology can help to promote the exchange of information between ships, between ship and shore and between shores (VTS).

Fourth, the results of COST 301 were important in the field of certification and training of VTS operators. COST 301 started to develop converging ideas in this area and the VTS committee of IALA has taken over this type of work.

Fifth, an interesting phenomenon was the origin of what was called a Regional VTS. Traffic problems and competitiveness in Mediterranean ports enabled a group working on VTS for the Mediterranean.

It was also necessary to address the useful role of the IALA VTS committee. Although progress would appear slow in the initial phases of the existence of the committee, it gained international recognition and has proposed some useful conventions on VTS and VTS operator recruitment to the IMO.

Summarising: VTS developed from a shore based radar system to enhance navigation under impaired visibility conditions, to a modern system with multiple sensors with the objective to enhance safety as well as expediency of maritime traffic. The protection of the environment is also one of the major objectives of VTS especially in off shore waters.

4.2 The Evolution Of Shore Based Radar Operators To VTS Operators

A description of the development of the genesis and the training of VTS operators can be made when one considers the developments that are reported in various VTS symposia. Although some confusion arises as to who organised the first VTS symposium, it is generally accepted that this was held in London in 1973. The proceedings were called "Marine Traffic Engineering" and the Conference was organised jointly by the Royal Institute of Naval Architects and the Royal Institute of Navigation. Subjects discussed included "Traffic Flows", "Collision Avoidance", "Traffic Regulation" and "Future Developments". No section was devoted to training of operators of such systems and only one paper [12] discussed the training of shore based staff of marine traffic systems.

The second symposium, held in 1976 in The Hague, contained a section on "Education and Training of Personnel Involved in Traffic Management" [13].

VTS was addressed under the following headings:
- Port Traffic Guidance System (Genoa)
- Vessel Traffic Management System (Rotterdam)
- Navigation Service (London)

- Maritime Traffic Control System (Le Havre)
- Vessel Traffic System (Rotterdam VTMS called by Sperry)
- Traffic Guidance Systems (Hochschule fur Nautik, Bremen)
- Maritime Traffic Control (IMPA/EMPA)
- Marine Traffic Systems (Port of Manchester)
- Marine Traffic Systems (UWIST, Cardiff)
- Marine Traffic Guidance Systems (Hull Nautical College)
- Traffic Control Systems (Mr Hinsch, later chairman of IALA VTS committee)

It is clear that in a lot of places vessel traffic was drawing attention and many experts discussed the scope of these systems and the operators that operate or control them. An interesting observation was made in the "Final Assessment" of the 1978 Liverpool Conference on Marine Traffic Service [14]. Observation 10 contains the following:

> "To standardise the phraseology concerning traffic movement it was agreed that Marine Traffic Services should be replaced by Vessel Traffic Services“. Indeed the logo of the Bremen Conference in 1981 contains "Vessel Traffic Services“.

Another interesting and important subject in the 1978 conference was discussed by Captain Weeks: "Safety in Maritime Communications". Many others followed this paper on this subject. It is the most important subject in the Model Courses for VTS operator to be developed later by the IALA VTS-committee. In 1984, again, Captain Weeks presented a paper called "SEASPEAK for VTS“ [15]. The most important principles of the use of VHF were:

- Rigid adherence to internationally agreed communication procedures.
- Use of very simple and easily comprehensible message forms and message content.

These principles are still totally valid and are the core of the communication parts of the Model Course for VTS operators to be developed.

In 1988 the Sixth International Symposium on Vessel Traffic Services was held in Gothenburg. The then Chairman of the IALA VTS committee, Mr. Kop, gave an overview of the work of the VTS IALA Committee [16]. This committee made the following recommendations regarding VTS operators:

- The authority should establish appropriate qualifications and training requirements for VTS operators.
- VTS authorities should ensure that VTS operators have the qualifications and have received specialised training appropriate to their tasks within the VTS and meet language requirements in particular with regard to VTS operators authorised to issue traffic instructions or to give navigational assistance.

In an addendum to the paper, Mr. Kop says that the IALA VTS committee is preparing guidelines with respect to recruitment, qualifications and training of VTS operators. In the Gothenburg conference also a paper was presented that discusses the results of two years training with a VTS simulator in the Netherlands[37].

In 1992 the seventh International Symposium on Vessel Traffic Services was held in Vancouver. A training paper was presented by the Canadian Coast Guard, generally considered together with the Netherlands as the pioneering countries on VTS-operator training [17]. A paper by the Warsash Maritime Centre [18] shows that the training Institutes in the UK are ready for providing VTS operator training, according to the standards then in preparation by IALA VTS Committee. However, training institutes are only one part of the equation. VTS authorities should also be willing to send recruits to those establishments. In 1992 for the first time transponders and ECDIS technology [19] were discussed as being of importance for VTS centers.

In 1996 the eighth International Symposium on Vessel Traffic Services was held in Rotterdam. The ninth will be organised in 2000 in Singapore. The training session of this symposium contained a number of papers. Among them is a paper on harmonisation of VTS communication training [20], and a paper regarding the continuous re-evaluation of the training of VTS operators in Canada [21]. A paper regarding the future training of VTS operators in Germany is also included [22].

This symposium also displays various papers on VTMIS. Among them are M. Jean Prunieras' paper on VTMIS [23]. Mr. C. Glansdorp indicated directions of research for Regional Management Services and Regional Management Information Services based on Traffic Images [24]. Mr. Polderman [25] discussed progress since 1984 in Marseilles and also discussed the used of traffic images in conjunction with various reports coming from ships.

4.3 Summary

The notion “VTS“ and "VTS operator" has evolved over the last 25 years. It started out as a collection of notions on a local scale, intended to be used for individual ports and their needs. It is now a well defined issue, based on an internationally agreed standard definition of its main objectives and a description of its main tasks. The operator of this system is known: standards for recruitment and qualification have been developed. A model course is available to be used in all training aspects. VTS simulators are developed to provide realistic exercises. The international community, and especially the European Community, has started a voyage to explore VTS co-operation and sharing available data, to review measures for pollution control and to provide information to MRCC.

All this is used for safety and efficiency tasks of the competent authorities, in ports, in inland waters and at sea. New studies are also underway to investigate how information can be stored and retrieved that can be used by other parties, if they so wish. The next VTS symposium will no doubt indicate

[37] In chapter 5 more information is given on the first VTS simulator.

current evolution of Vessel Traffic Management and the use of traffic information by other parties.

5 VTS Training in Spain

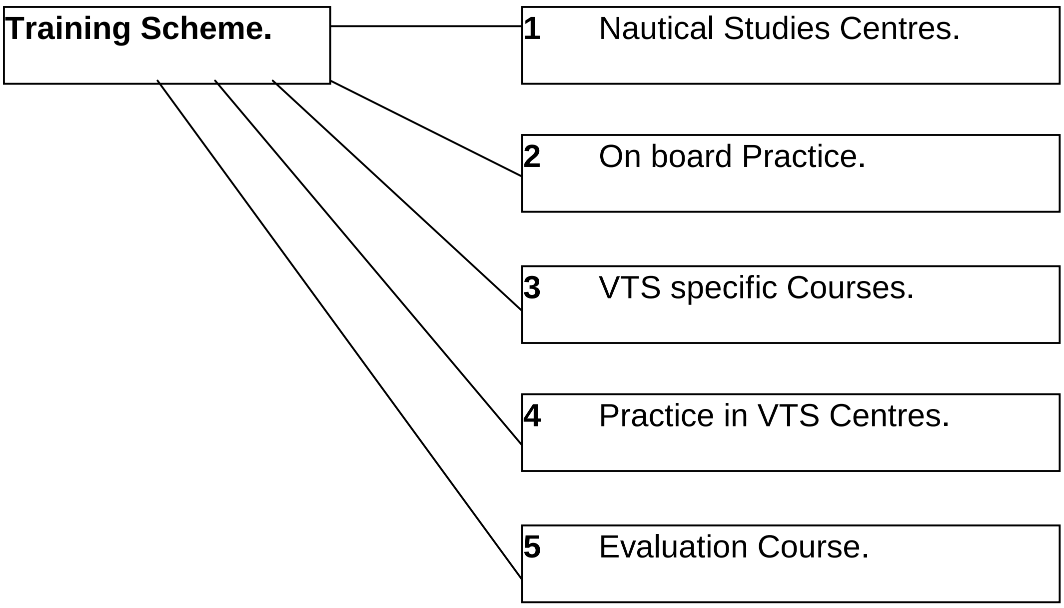
5.1 Training Scheme

The choice and training of personnel to take over the jobs of VTS operators will be based on the development of the scheme proposed in the draft of 9th June 1999 that might constitute the central point of the final proposal.

The education and training of VTS operators in Spain has traditionally been based on the following suppositions:

- The job of the VTS operator can be perfectly filled by the professional people in the Merchant Marine.
- Education and training programmes may be planned based on the knowledge already had by Captains and Officers in the Merchant Marine.
- Programme content of Nautical Faculties have been changed (Plan 1995) and certain specific subjects have been included that are needed by VTS operators.

Taking into account that personnel prepared to operate in the VTS have certain common characteristics with VTMIS operators, a system of integrated education is proposed for both. The training and education of personnel who may be destined to VTS, include the following phases:



The proposed training scheme is an integral plan that intends to provide the most appropriate people for all the jobs that are needed to efficiently run the VTS.

It must be remembered that the circumstances surrounding the working environment of the operators will, at times, be extremely tense. At such times a wrong decision might well unleash a disaster of unknown dimensions. For this reason we insist that the profiles of the operators and their training programmes must be chosen with great care.

Operator functions currently depend on the type of VTS and the geographical position of this. It is therefore necessary to carry out a study into the functions that the VTS or VTMIS should be doing. In general, all VTS should cover the following items, using unified procedures and with personnel that has undergone standard training:

- Control and monitoring of all ships carrying dangerous goods within European Union waters.
- Control of anchorage and port areas - monitoring manoeuvres related to the movement (arrival/departure) of all the ships.
- Control and monitoring of contaminating waste from ships passing through each nation's waters.
- Co-ordination of salvage and rescue tasks of ships and people.
- Co-ordination of research work derived from shipping accidents.
- Advice on the most appropriate routes for high traffic density areas.
- To make known the weather conditions in the area.

The latest IMO resolution, A.857 (20), paragraph 2.1.2 specifies the following: „A clear distinction may need to be made between a Port or Harbour VTS and a Coastal VTS. A Port VTS is mainly concerned with vessel traffic to and from a port or harbour/s, while a Coastal VTS is mainly concerned with vessel traffic passing through the area. A VTS could also be a combination of both types. The type and level of service/s rendered could differ between both types of VTS; in a Port or Harbour VTS a Navigational Assistance Service and/or a Traffic Organisation Service is usually provided for, while in a Coastal VTS usually only an Information Service is rendered".

Keeping this in mind, the education and training programme must be approached very carefully and we believe this has been done with our Integrated Training Plan.

Once the Vessel Traffic Service functions have been specified it is possible to evaluate its needs and to place the foundation for developing such an integrated training programme that may be standard for all VTS. However, it must be kept in mind that the impact produced by the introduction of new standards may have an initial, detrimental effect on the final cost of the training.

The programme we have proposed is to be carried out following the philosophy that once a need is known it is possible to prepare the solution. It is therefore important to find out what the operator needs are - otherwise the programme would start the race well behind such needs and would therefore be obsolete even before being implemented.

The programme should be developed in accordance with priorities in order to fulfil the final aim, which is to provide well-prepared operators who will carry out their functions with efficiency, capable of solving any problems that may arise during their watch duty.

5.2 Timing of the Integrated Education and Training Programme

In order to dispose of VTS Operators that are capable of carrying out their job a sufficient amount of time should be given to the course depending on the initial approach and the philosophy applied to it.

Taking the Spanish example, we shall establish a timetable providing a whole range of different possibilities. This will serve to prepare the final model that will show the permanent optimum timelines.

1. Nautical Studies Centres.
- Five periods of four months in the Centre.
2. On board Practice.
- Ninety days. At the end of this period a paper should be presented summarising the experience.
3. VTS specific Courses.
- One week. (Should be increased to two weeks).
4. Practice in VTS Centres.
- One week. (Should be increased to two weeks).
5. Course Evaluation.
- One week.

These six parts that make up the Integrated Education and Training Programme will be further developed in order to obtain a standard course that may be implemented in all countries.

5.3 Development of the Integrated Education and Training Programme

The structure and development of the first phase is a difficult step to take because of the connotations implied in reference to the particular studies offered by each country that often differ one from another.

Apart from the actual training of future operators, the evolution of the Plan also includes the guidelines needed to standardise/unify the courses and procedures and instructions for keeping staff working in Vessel Traffic Services up to date.

5.3.1 Nautical Studies Centres

The studies currently offered in the Nautical Studies Centres are under revision and improvements. In the Barcelona Nautical Faculty such improvements were made and introduced into the 1995-1996 academic year. Its contents as referring to personnel aspiring to the post of VTS operator include the following certificates:

- Certificate of marine navigation.
- Graduation in nautical science and maritime transport.

With respect to professional certificates there are:

- Pilot - second class.
- Pilot - first class.
- Master of the Merchant Marine.

The Certificate course content is distributed among six four-month courses. The first five are theory given at the Barcelona premises, and the sixth is practice on board. Subjects taught include the following:

- Techniques of graphic representation.
- Naval medicine.
- Maritime law.
- Physics.
- Statistics.
- Mathematics.
- Chemistry.
- Spherical Trigonometry.
- Maritime communications.
- Navigation - dead reckoning and coastal.
- Ship systems.
- Computer science.
- Maritime safety.
- Electro-technical.
- Maritime finance.

- Naval construction.
- Theory of the ship.
- Manoeuvres.
- Stevedoring.
- Meteorology.

The graduation course is distributed into four, four-month courses. The first three are theory and the fourth practice on board. Subjects include the following:

- Naval automation.
- Maritime transport planning.
- Radio-electrical and navigational aid systems.
- Special maritime transport.
- Weather forecast and analysis.
- Environmental impact and pollution prevention.
- Organisation of the shipping company.
- Ship dynamics.
- Technical English.
- Marine propulsion.

Further, the student must carry out a number of credits for free-choice subjects that are optional during the lifetime of both courses - Certificate and Graduate.

5.3.2 On board Practice

Practice on board ships takes place during two periods. One on finishing the certificate course and the other after the graduate course. Therefore, the student who also presents the free choice work will obtain the corresponding diploma for the course. With a certain number of days and having presented a project, the certificate or graduate may obtain the diploma of pilot or officer - second class.

5.3.3 VTS specific Course

Anybody wanting to access a job in a Vessel Traffic Service may come from other areas that are not necessarily the Merchant Marine. For example, the Navy, when dealing with technical personnel with a high level of education in specific areas such as communications, radar or navigation. Such people would therefore be prepared to receive the same training course specifically for VTS operators.

Once the studies in the Nautical Training Centres and the practice on board have concluded, the Captains (graduates) and the Officers (Certified) will be ready to access a specific course for Vessel Traffic Services in order to take on operator tasks.

We shall look at the training of Spanish operators in general and we shall provide conclusions that will offer criteria for improving their training.

The theoretical training received by students coming from existing training centres in Spain that are distributed over the whole country, have sufficient basic knowledge so that, with additional training, they may be able to take on any job within the Vessel Traffic Services. However, all candidates for receiving a VTS course have to take a selection examination and if the qualification obtained is higher than the set level they are accepted for the course.

Such programmes have provided, right from the start of planning the VTS network in Spain, a fully prepared human resource that is essential for developing the whole organisation of safety in this country in an appropriate way.

To fill VTS operator jobs, a public advertisement is made with the condition that the candidate must have officer or captain education received at any of the Nautical Education Centres together with specific professional experience. This is the first stage of selection where the candidates have their curriculum vitae studied closely. Using an evaluation table, years at sea in different levels of responsibility are given a mark and then the additional training received.

Once the curriculum vitae that comply with the requirements have been chosen, a second selection process is applied where psychological criteria are evaluated using a series of tests and written papers to evaluate the capacity of visual retention, memory, mental calculation or decision making capacity.

The written papers are also meant to evaluate the candidate's knowledge of languages in relation to translation of texts, understanding as well as written and spoken fluency for message transmission purposes.

The content of a standard course programme together with the number of hours assigned to each subject is as follows:

- Communications (5 hours). The contents include:
    - Introduction al GMDSS.
    - Selective digital call.
    - Inmarsat A/C.
    - Practice.
- The national rescue plan - maritime rescue co-ordination centres (4 hours). Content includes:

    - Functions.
    - Classes.
    - Internal organisation.
    - Own means.
    - Co-operating organisations.
    - Search systems.
- VTS. Concept. Equipment and Facilities. (12.5 hours). Content includes:
    - Concept.
    - Equipment and installations.
    - Port traffic management.
    - Separation Device Traffic Management.
    - Practice.
- National and international regulations (3 hours).
    - Law of State Ports and the Merchant Marine.
    - Maritime Search and Rescue.
    - International Legislation and the legal position of the operator.
- Dangerous Goods: (2 hours).
    - IMDG code.
    - Computer applications of the IMDG code.
- Pollution Combat (2 hours).
    - Contention and recuperation.
    - Treatment of residues.
    - Contingency plans.
- English: (6 hours). We cannot make too much emphasis on the importance of being able to fluently handle the English language. This is used by all seafarers, no matter what their origin, in order to make themselves understood.
    - SAR terminology.
    - Standard Marine Communications Phrases.
    - Combat pollution texts.
    - Internet maritime resources in English.
- COLREGS (2 hours).

At the end of the training course a 30-minute exam is held to evaluate the capacity level of the person who followed it.

5.3.4 Practice in VTS Centres

All courses must be made up of two parts: a theoretical one and a practical part. During the first part all the subjects needed by the candidate for carrying out their functions and solving any situation that may arise during their working day are imparted. During the second part the theory is put into practice in order to gain the experience needed to successfully manage the incidences that are a normal part of an operation, whether this is traffic management or search and rescue.

In Spain, all the students who take VTS operator courses in the Integrated Nautical Studies Centre in Gijón (Veranes) must carry out practice time at existing VTS centres and on simulators in order to gain sufficient knowledge of how they work, and to handle real data in delicate situations.

The time spent exercising on manipulation of waypoints and controlling echoes on the screen provides a rehearsal of knowledge for all students (remembering that most of them come from officer levels of the Merchant Marine). This acquisition of a greater proficiency is fundamental for the guidance of maritime traffic in the VTS centres.

This practice may consist in one or several days in the Search and Rescue Centre where the students are shown real operations being carried out at that very moment. After this the student must put the theory learnt into practice by helping the staff on duty and controlling the traffic on the centre's consoles. Everything related to communications is experienced in a real way under the supervision of the teachers. Lastly, they carry out an exercise with a helicopter, rescue tug and launch in order to search for and rescue those shipwrecked.

5.3.5 Evaluation Course

The final phase of the integrated education and training programme will constitute a course wherein the operators will be evaluated.

- Phase A: The function of this part of the course is that of evaluating the skills acquired by the student and to apply the selection criteria for placing each person within the VTS system.
- Phase B: The function of this phase is to determine each operator's skills when faced with emergency situations. To show organisation and command skills.
- Phase C: This last phase will contain a series of specific points covering situations that arise in the different types of VTS and that determine the operators' qualification.

Evaluation Course.

A:
- Individual Profile of the operator candidate.
- Evaluation of training course.

B:
- Decision making capacity evaluation.

C:
- In-depth knowledge and application of the steering rules, particularly in those cases and problems that may derive from applying Rule 10.

The integrated plan of education and training includes refresher courses for operators that have been working for some time in a VTS. This is in order to maintain their skills up to date and in top condition.

5.3.6 Spanish Training For VTS Compared With The IMO Model Course.

The courses offered in Spain for VTS operators do not strictly follow the model defined by the IMO. The fundamental reason being that in Spain, the VTS operator has already undergone specific training in the Nautical Faculty. The level demanded in order to access VTS operator training courses is to be in possession of a Master Marina or Officer's certificate for the Merchant Marine. The IMO course has been prepared for people with lower qualifications enabling them to reach VTS operator level with only one course but with fuller content.

5.4 VTS Guidelines and Model Courses

5.4.1 Introduction

The model course V-103/1, Vessel Traffic Services Operator, Basic Training appeared on 19 March 1999. The model course is built according the templates in use for the model courses that are associated with the STWC convention of IMO [26]

The contents are for a large part based on the training courses for VTS operators as being developed in the Netherlands by the foundation NNVO of the Ministry of Transport and Public Works. Canadian material is also used for the compilation of the course. This is not surprising since the Dutch and the Canadians played a pioneering role in VTS training.

The approach to the chapter is done dividing it into two parts that offer a global view of the course. The first part covers the subjects covered by the course and adds some paragraphs to aid understanding of the material covered by the subject. The second part briefly describes some of the points dealt with in the subjects.

5.4.2 Model course

Course content is divided up into 8 main subjects with a certain number of variables in accordance with the importance of the subject in question.

1. Legislation:
   - Law of Ports and the Merchant Marine.
   - Environmental Maritime Rescue.
   - The legal position of the Controller.
   - International Maritime Organisation.
   - Shipping Regime in Sea Spaces.

1. Communications:
   - Introduction to GMDSS.
     - Concept.
     - Areas.
     - Maintenance.
     - Application.
   - Digital Selective Call.
   - Introduction to satellite systems.
     - INMARSAT.
   - Radio beacons.
     - COSPAS-SARSAT.
   - Radar responder.
   - Global system of radiowarnings.
     - NAVTEX.
   - Radio telex.

1. Spanish Search and Rescue Plan (I cannot understand how in the IALA model course template something is written on Spanish plans. This is wrong and should not appear here.

2. Search and Rescue Co-ordination Centres:
   - Functions of Search and Rescue Co-ordination Centres.
   - IMOSAR Manual.
   - Shipping emergencies:
     - Accidents.
     - Incidents.
     - Pollution.

1. Dangerous goods:
   - IMDG code.

1. Shipping Traffic Services:
   - RIPA Rule 10.
   - General considerations on Shipping Traffic Services.
   - Specific Procedures.
   - Radar & VTS.

1. English:
   - SAR Terminology.
   - Standard phrases for the Shipping Traffic Services.
   - Pollution Combat,

5.4.3 Shipping Traffic Services.

The suggestions made, for example in Spain, regarding the subjects of training for VTS operators, are complemented hereafter by several points. These points may have greater relevance in respect to consequences derived from inappropriate action and on what points special attention should be paid during the training periods of operators.

IMO is the only international organisation with recognised competence for establishing and recommending rules and measures on an international level related to the organisation of shipping traffic.

Rule 10 applies to the Traffic Separation Schemes approved by the IMO and no ship is exempt of these obligations.

It is extremely important to be aware of this rule and to apply it because the possible variables in its application can have very serious legal consequences for the ship and its crew. Therefore the VTS-o perator must be totally confident in his/her actions in this matter.

5.4.4 General Considerations on Vessel Traffic Services

The organisation of the Vessel Traffic Services are studied taking into account the requirements of the area where this is implanted. This implies an analysis of the following factors:

- Local geographic conditions.
- Value of the parameters related to the weather variables in the area.
- Number and class of ships navigating these waters.
- Commercial factors.

- Other activities carried out and that may affect the characteristics of the services offered.

The services offered by the Vessel Traffic Services are based on:

- The communications systems.
- Radar and visual control.
- Data acquisition about incidents and their later analysis and evaluation.

The analysis and study of the basic services increases VTS-operator knowledge and makes sure that the information is transmitted quickly and reliably 24 hours a day.

The information prepared in the Centres and offered to ships helps their crews to take appropriate decisions in unfavourable circumstances.

The operator is introduced to advisory and aid to navigation techniques in order to provide this service to the users being well aware of the significance when providing information, making suggestions or giving directions to shipping. The nuance introduced here is very important in those cases where the intervention of the Law becomes necessary.

5.4.5 Specific procedures

Operational procedures must be defined in order to offer solutions to all the operations that may arise in the Vessel Traffic Service. The procedures may have a routine or an emergency character. Both types must be the result of international legal requirements.

An essential component in the procedures are the communications and within these the voice systems. It is important that the VTS-operator is confident with these and the use of English will increase the VTS-operator ability.

An important part of the knowledge that a VTS-operator should have is that related to the functions carried out in the Rescue Co-ordination Centres (RCC). For Spanish operators this is a complementary subject to the education received in the Nautical Training Centres, which is where all the VTS -operator students come from.

The functions of the RCC are carried out according to the development of procedures that may be divided into:

- Routine. Those procedures that cover all routine watch-duty operations and for which standard methods and communications are used and that may be sensitive to automation processes.
- Emergency. Those procedures that solve specific problems and where in some cases, apart from the methods proprietary to each country, manuals

edited by the International Maritime Organisation are used and that are known by all users; in this case ships and operators.

In Spain, the RCC are divided into different types in accordance with the area they are responsible for:

- 1 Nation-wide Rescue Co-ordination Centre
- 2 Zonal Rescue Co-ordination Centres
- 8 Regional Rescue Co-ordination Centres
- 11 Local Rescue Co-ordination Centres

That makes a total of 24 centres whose basic functions would be:

- Control and prevent maritime accidents.
- Control maritime traffic.
- Co-ordinate and direct maritime rescue operations.
- Co-ordinate and direct marine pollution control operations.
- Broadcast maritime safety notices and weather bulletins for shipping.
- Inform and assist Maritime Authorities.

The tasks carried out in all of them are very similar and the Operator does not need to have different training. When assigned to a Centre he or she receives complementary training on the spot referring to any particular characteristics and modus operandi in the centre.

5.4.6 Routine.

Routine procedures, that should be included in Operator training, intend to provide a working tool that alleviates accumulated tension in risk situations and directs the information flow toward the users automatically. Aided by the available equipment, the Operator must know how to prepare the information for dissemination in bulletins or messages that must be generated by routine procedures. The contents of the messages should at least have the following:

Information on the weather:

- Visibility, sea condition and wind parameters.
- Information on local, national and international forecasts, depending on the areas covered by the centre.
- Schedule or timetable for transmitting bulletins.

Information on the traffic:

- Any information related to possible danger to shipping must be transmitted immediately.
- Offender ships.
- Concentration of fishing vessels.
- Yacht races.
- Ships with limited manoeuvring capacity.

One of the functions of the Operator is to try and prevent dangerous or risk situations with ships. Therefore they must have available all detailed information about the area in order to be able to transmit details about the traffic situation at each moment. Making up a traffic image is a very complex job that has many repetitive tasks that are easily incorporated into automatic systems.

Information for shipping:
A routine service for information or suggestions to users to make sure they follow certain rules in their decisions. Advice is offered by Operators who have had extensive nautical education and training and who have experienced similar situations on board ship. For example, they may suggest;

- Changes to course and speed under certain circumstances.
- Position with respect to the coast and anchorage points,...

The Operator must reduce routine communications to in order to assist in solving a situation. He must not give an order as to any particular manoeuvre since this is not his job. However, should the ship ask for support and advice when the circumstances she finds herself in involve imminent danger for ship, cargo or crew integrity, the operator may offer firm advice to the captain telling him what he should do.

In other cases routine operations are information bulletins that are made up with the participation of the operator and transmitted by the centre at specific times.

5.4.7 Emergencies

Particular procedures imply careful treatment of special, or very specific, cases. Over the duration of the course the operator is prepared so that he or she can solve a problem that may be considered an emergency situation because of its specific characteristics. One such hypothetical case could be the following:
A ship has broken down and is being towed. A fire has broken out or it has suffered a collision that in any case has left it in a precarious condition for navigation.

The procedure to be followed may be divided into several phases for each of which the operator must show the knowledge he has acquired and his capacity for taking decisions. This procedure will be developed in order to solve the emergency situation, noting the information that is needed for this and explaining operator behaviour.

First phase.

The emergency is reported.

Current communication systems automatically provide information about on board emergencies. The Global Maritime Distress Safety System provides for certain equipment to be installed on board and they provide the means to automatically transmit alerts.

Operator action.

Operator knowledge is related to the messages or alerts that may come in automatically and whether he knows how to use the radio-telephonic equipment or other equipment in order to acknowledge receipt of such messages.

Second phase.

Information treatment.

The quantity of messages exchanged between the ship in danger and the RCC may reach gigantic proportions and it is easy to fall into an overload status.

Operator behaviour.

He should inform the director of the centre by means of a summary of the events and ask for a meeting of the centre's emergency team.

The operator must co-ordinate communications between the ship and the center where the emergency team has met.

He must keep an eye on the ships' situation and in relation to other traffic in the vicinity.

The Centre's Team.

The emergency will be co-ordinated by a team that has been chosen for such occasions, and this will be the decision making team on what help the ship needs. In this case it needs airborne resources to get the victims off, support ships that are in the area and tugs to tow it.

Third phase.

Set-up the resources available in the vicinity. Helicopter for picking up any injured people. A tug or rescue ship for towing. Nearby ships to be on stand-by should their help be needed.

Operator behaviour.

His functions are the co-ordination of the communications between the ship and centre, the tug and the helicopter and passing the information to the emergency team. He will need to keep an eye on the ship's situation at all times together with that of the tug and the nearby support ships. It may be necessary to re-route traffic entering the affected zone.

Centre team.
The whole team will take any decisions with respect of how and in what way to carry out the rescue of victims and the towing operation.

Fourth phase.

Look after those involved in the emergency. Tug and stricken ship.

Operator behaviour.
The operators must co-ordinate communications between the rescue resources and shore teams - doctors, hospitals and so on wherever the injured persons will be attended to.
They must control the position of ship, tug and support vessels. They must guide the damaged ship on a safe course toward port.

Centre's team.
They will be in charge of advice to the rescue resources and the ship's captain of how to proceed in order to save the victims.

Fifth phase.

End of the emergency.

Operator behaviour.
They must initiate all necessary procedures in order to terminate the emergency and to continue with routine operations.

Centre's team.
When the damaged ship's situation has been evaluated the meeting of the team will be closed.

5.5 Conclusions

The ideas noted at the beginning of the chapter are justified by what we have said since then, and we would therefore insist that courses designed for training VTS operators follow two paths:

(a) Training procedures followed in Spain where the candidates already have knowledge from their studies in nautical education and training centres. This, to our mind, facilitates the understanding of any difficulties arising during their VTS service and the aid they offer to provide a quick, efficient solution.

(b) Procedures followed in other countries where candidates come from very differing areas of know-how. Therefore the initial training must start from scratch in nautical subjects and progressively increase the level over the course until VTS operator level is reached.

Another logical justification is that the VTS operator who is trained in Spain is capable of facing problems related to pollution control, search and rescue because they have had practical training in the "school at sea" which is the best simulator for understanding the consequences derived from malpractice.

6 VTS training in the Netherlands

6.1 Introduction

VTS is a rather common phenomenon in the Netherlands. In 1956 a shore radar system in the port of Rotterdam was initiated. This system, contrary to the general belief, was meant to aid vessels in difficult visibility conditions from the roads to a berth in the city. In those difficult post war years a continuous flow of goods to the port was highly essential. The visibility conditions were very much impaired by the exhaust gases of the oil and chemical industry. The COST 301 project could be seen as breakthrough in drafting the concepts of vessel traffic management. The VTS committee that was already in existence and initiated by IALA started to implement part of these achievements in a recommendation that was finally also adopted by IMO. (The first VTS guidelines were approved on November 20^{th,} 1985).

The Ministry of Transport (and in particular the Directorate-General of Shipping and Maritime Affairs: DGSM) initiated a co-operation of different interested parties and started a VTS training programme in the early eighties. It was considered that training of VTS personnel using a simulator could have benefits related to a more central approach and hence being more cost –effective than some form of on the job training. A simulator was designed and built and in September 1986 the Minister of Transport officially commissioned the first VTS simulator on the premises of MARIN. The ministry also started to look to all potential participants and a training organisation as a more or less independent organisation. The organisation was called NNVO: Nationale Nautische Verkeersdienst Opleiding (National Nautical Traffic Management Training).

In its present form the NNVO should be seen as a co-operation of the following entities:

- Rijkswaterstaat (responsible as the competent authority for VTS on inland waters, as well as partner in the Scheldt VTS together with the Flemish authorities)
- DGG (Directorate-General for Freight Transport. This DGG incorporated the former DGSM. DGG oversees VTS activities in the Netherlands and represents the Netherlands in IMO and IALA)[38].
- Port Authority of Rotterdam
- Port Authority of Amsterdam
- Port Services of Scheveningen[39]

[38] DGG is also responsible for the Dutch part of VTS Ems. This VTS is operated by the German Authorities and can be considered as a part of the German Bight VTS
[39] Scheveningen is a bathing resort on the North Sea coast and is a part of the Hague. Scheveningen is an important fishing port and contains a number of liner services.

- Zeeland seaports[40]
- Groningen seaports[41]
- The Netherlands Royal Navy (the Royal Navy is responsible for VTS in the naval base of den Helder. This port accommodates practically only naval activities, apart from minor fishing and supply activities).

These authorities employ 440 VTS operators. These operators provide information but they are also empowered to give instructions to shipping. This is based on the Vessel Traffic Management law in the Netherlands. The training for VTS operators has a more or less solidfoundation in the Guidelines for VTS. These guidelines request the competent authority to provide training for their VTS operators. The Vessel Traffic Management law includes an article that provides the possibility to make rules regarding qualification and training of VTS-operators. The NNVO has contributed to these rules and now manages the execution of the training, until the time that it is remodelled.

6.2 Organisation of the training

The objective of the NNVO is to contribute to the evolution of vessel traffic in a standard way, nationally as well as internationally. This objective can be achieved by a common approach to the training of VTS-operators. Basic training is centralised but specific local or regional elements could be added to this basic course. The following groups of interested persons can be determined:

- candidates coming from outside any of the co-operating organisations
- candidates coming from the co-operating organisations
- candidates for additional training
- candidates for refresher courses.

The organisation should cope with these groups and provide adequate training programmes.

As already mentioned, VTS operators have the power to give instructions to vessels that come under their coverage. This power requires an official examination as a prerequisite. The aforementioned law requires this as well as an examination at the end of any refresher course. The examination contains a theoretical and a practical part. The practical part is executed using a simulator. The law defines that the minister is competent to require minimum standards on the simulators used for examination. If an investigating committee confirms that these minimum standards are being satisfied, such a simulator could then be used for this examination. MSR[42] and MSCN[43] both

[40] Zeeland seaports include the port of Flushing as well as the port of Terneuzen. The river Scheldt is the main entrance for the ports of Antwerp and Ghendt as important Flemish ports.
[41] The Groningen seaports consist of the port of Delfzijl as well as the new developed Eemhaven
[42] MSR: Marine Safety International Rotterdam is simulator facility in Rotterdam. It is part of a larger US based company Flight Safety International. The port of Rotterdam also has interests in the company.

have approved VTS simulators and both companies have basic courses for VTS operators in accordance with the NNVO guidelines.

Some participants have smaller equipment for local or regional additions, notably Groningen Seaports and the Port Authority of Amsterdam.

The NNVO consists of a steering group overseeing all activities of VTS training. The steering group consists of one representative of all partners. In some cases the harbourmasters are the representatives and they also act as a QA board.

A working group, consisting of representatives of the partners, is responsible for the annual planning on the basis of their needs. The planning is affected by the availability of the VTS simulators and the VTS managers of MSR and MSCN are involved in the planning.

The Minister of Transport appoints members for the Examination Commissions on a regional and country wide level. The NNVO provides assistance in the activities of these commissions. Training is co-ordinated by the NNVO. Each partner provides pro rata VTS (simulator) instructors and other teaching personnel. The partners make teachers available for theoretical subjects.

6.3 Functional levels and profiles

Two functional levels are distinguished within the VTS. These levels can be characterised as follows:

- Level 1:
  This level is meant for a person charged with the operational management of those responsible for the safe and efficient evolution of vessel traffic in his designated sector(s).
- Level 2:
  This level is meant for a person responsible for the evolution of vessel traffic in his designated sector. The main tasks are monitoring of the traffic and the provision of information to these vessels through communication.

In some regions in the Netherlands these functions are combined. Normally these regions have smaller VTS.

The functional profile appropriate to level 1 may be described as follows:

- Management of VTS activities
- Checking the execution of VTS-operators tasks
- Use of the resources available in the centre
- Approval, on behalf of the VTS authority, of requests for special transport and all other traffic activities needing approval. In some instances, requests may also be refused.

[43] MSCN: this is the MSCN facility of MARIN (Maritime Research Institute of the Netherlands). The VTS facility is based in Wageningen.

- Provision of instructions
- Co-operation in the drafting of navigation pans (passage plans)
- Drafting of nautical and weather bulletins that are regularly broadcast
- Collection, assessment and distribution of traffic information
- Provision of information to related organisations such as pilots, coast guard etc.
- Monitoring of the compliance with rules and regulations of traffic participants
- Drafting of reports of infringements of traffic rules to the competent authorities
- Monitoring the appropriate use of the states' fairways.
- Reports informing on the inadequacy of fairways if this is apparent or becomes apparent to the competent authority's management
- Reports informing on the inadequacy of services rendered by other resources to the competent authority's management
- Taking correcting measures when traffic congestion becomes apparent
- Co-ordination of available resources with other service providers
- Assistance in the case of calamities.

The functional profile appropriate to level 2 may be described as follows:
- The provision of traffic related, as well as meteorological and other relevant information, to the traffic participants as well as the provision of navigational assistance. Means to be used are: VHF, TOR, NAVTEX.
- Collection, assessment and distribution of traffic related information
- Communication with vessels in the area
- Systematic monitoring of the traffic flows in the area
- Monitoring of compliance with rules and regulations of traffic participants
- Drafting of reports to the competent authorities of infringements of traffic rules
- Monitoring the appropriate use of the states' fairways.
- Taking correcting measures when traffic congestion becomes apparent
- Assistance in the case of calamities

The NNVO is particularly concerned with training related to level 2.

6.4 Methodology and modularity

NNVO training is modular. Subjects are grouped into one module that is seen as a unit in the training programme. Each module has its own presentation and assessment. The modules are sometimes used for differentiation to different groups in time and location and the use of modules provide a large degree of flexibility. Candidates who already have knowledge of any of the modules are not required to follow the courses in that module.

The following modules are determined:
- Communications
- Nautical knowledge
- Traffic Management
- Equipment

- Topography and geography
- Law, rules and regulations
- General

Modules exist for the national level and for regional as well as local levels. The following codification applies:
- N-module for all candidates
- R-module for regional candidates
- D- module for candidates of a special service (such as Inland VTS)
- L- module for candidates of a specific VTS-centre.

In the following tables a detailed overview is given:

6.5 Communications

Model course V103/1 IALA	NNVO Course
Eq 1 VHF 1 VHF 2	Module NCO/01 **5.6.1 Introduction** -Communications -Communication lines radio traffic in shipping
Lang. 3	Module NCO/2 **5.6.2. English or German** -Speaking skills
	Module NCO/3 **English or German** -Standard Vocabulary
	Module DCO/02 **5.6.3. French** -Shipping terms
VHF 2	NCO/04 **Regulations** -International Dialogues -National Dialogues -Rules and Regulations
	NCO/05 **5.6.4. Communications technology** -General principles
VHF3	NCO/06 **5.6.5. Radio/telephony Procedures** -normal traffic -maritime distress and safety traffic - special traffic
	NCO/07 **5.6.6. Training** -discipline -normal traffic

	-maritime distress and safety traffic - special traffic

Table 4: Overview of Modules for Communications.

6.6 Nautical Knowledge

Model course V103/1 IALA	**NNVO Course**
	NNK/01[a] **5.8.1. Ship Types Inland Navigation** -General description
	NNK/01b **5.8.2. Construction and Equipment of Inland Vessels** -General -Specific for each type
	NNK/01c **5.8.3. Ship's Documents of Inland Vessels** -General -Specific for each type
	NNK/01d **5.8.4. Manoeuvring of Inland Vessels** -unrestricted waters -rivers -canals -harbour basins
	NNK/01e **5.8.5. Wind and current effects on Inland Vessels** -General -Specific for each type
	NNK/01f **5.8.6. Course and Speed Inland Vessels** -unrestricted waters -rivers -canals
NK. 5	NNK/02[a] **5.8.7. Ship Types Sea Going Trade** -General description
NK. 5	NNK/02b **5.8.8. Construction and Equipment of Sea Going Vessels** -General -Specific for each type
	NNK/02c **5.8.9. Ship's Documents of Sea Going**

	Vessels -General -Specific for each type
	NNK/02d **Manoeuvring of Sea Going Vessels** -General -Specific
	NNK/02e **Wind and current effects on Seagoing Vessels** -General -Specific
NK. 1	NNK/02f **Course and Speed on Seagoing Vessels** **-**Unrestricted waters -Rivers -Canals
	NNK/03 **Meteorology** -General -Specific for traffic services -Special weather reports for vessel traffic
	NNK/04 **Hydrology** -General -Specific

Table 5: Overview of Modules for Nautical Knowledge

6.7 Traffic management

Model course V103/1 IALA	**NNVO Course**
Tr. Man. 4	NVD/01 **5.10.1. VTS Guidelines**
Tr. Man. 5	NVD/02 **5.10.2. Traffic Management** -Tasks and scope of control -International co-operation
Tr. Man. 2	RVD/01 **5.10.3. Internal organisation** -Hierarchy -Responsibility
VHF 3	RVD/02 **5.10.4. External organisation** -Co-operation with other services -work agreements -emergency procedures
	NVD/05 **5.10.5. Local Organisation** -Local work agreements -Local procedures

Table 6: Overview of Modules for Traffic Management

6.8

Equipment

Model course V103/1 IALA	NNVO Course
NK. 4	NAP/01 **5.12.1. On Board Navigational Equipment** -Navigational Aids -Communications Equipment -Other
Eq. 1	NAP/02 **5.12.2. Shore Based Equipment** -Navigation -Communication -Other
Eq.3	NAP/03 **5.12.3. Information Processing Equipment** -Theoretical considerations -Use of systems
Eq. 3	NAP/04 **5.12.4. Shore based radar** -Theory -Use of systems
	RAP/01 **5.12.5. Regional/Local Equipment** -Theory -Use of systems

Table 7: Overview of Modules for Equipment

6.9

Topography/Geography

Model course V103/1 IALA	NNVO Course
	NTG/01 **5.14.1. Knowledge of VTS areas** -International -National -Regional
NK.1	NTG/02 **5.14.2. Nautical and Geographical Publications** -General -Specific
NK. 3	NTG/03 **5.14.3. Buoyage systems**
	RTG/01 **5.14.4. Regional Knowledge of VTS areas** -Conspicuous points -Tides -Dimensions and distances -Waterfront companies
	LTG/01 **5.14.5. Regional Knowledge of VTS areas** -Conspicuous points -Tides -Dimensions and distances -Waterfront companies

Table 8: Overview of Modules for Topography/Geography

6.10

Shipping Law, Rules and Regulations

Model course V103/1 IALA	NNVO Course
	NWR/01 **5.16.1. General Introduction Law**
	NWR/02 **5.16.2. Shipping Law**
	NWR/03 **5.16.3. Special Law/Local Byelaws**
	NWR/04 **5.16.4. Authority/Scope of competence**
	NWR/05 **5.16.5. Log keeping**
	NWR/06 **5.16.6. Applicability**
NK. 2	NWR/07 **5.16.7. Colregs**
	NWR/08 **Inland Shipping Rules**
	NWR/09 **5.16.8. Shipping Rules Territorial Sea**
	DWR/01 **5.16.9. Rhine Shipping Rules**
	DWR/02 **5.16.10. Dangerous Goods IMO**
	DWR/03 **5.16.11. Dangerous Goods ADNR**
	DWR/04 **5.16.12. Dangerous Goods Local Rules**
	RWR/01 **5.16.13. Regional Rules**
NK. 6	LWR/01 **5.16.14. Port Rules and regulations**
	RWR/02 **5.16.15. Practical Applications**

Table 9: Overview of modules for Shipping Law, Rules and Regulations

6.11 Other

Model course V103/1 IALA	NNVO Course
	NOA/01 **5.18.1. Who is Who in the Netherlands?** **-**Authorities -Agencies -Corporations -Services -Organisations
	NOA/02 **5.18.2. Management** **-**management -planning organisational techniques
PA 1	NOA/03 **5.18.3. Public Relations** **-**Publicity -Relations with press

Table 10: Overview of Modules for Other

6.12

Comparison of VTS-operator Training Programme with IALA Model Course

6.12.1 Criteria

A detailed comparison of the contents of the NNVO training programme with the IMO model course is not possible without the contents of the courses. A more general comparison is carried out using the following parameters:

- Modules and main headings
- Number of hours

In the tables 1 through 7 the equivalent modules that are used in the Model Course are given[44]. The NNVO modules do not feature a classification in professional levels.
The following abbreviations are used for the different groups in the Model Course:

Language- Lang.
Traffic Management- Tr. Man
Equipment- Eq.
Nautical Knowledge- NK
Communication Co-ordination- CC
VHF radio-VHF
Personal Attributes- PA
Emergency Situation- Emer.

The main Learning Objectives of the Model course are compared: these objectives are numbered 1, 2 etc (f. e NK3= third learning objective of the modules on Nautical Knowledge).

6.12.2 Results

The modules are compared in the Tables 1 through 7. The impression is that the model course is slightly more systematic and that the subjects in the NNVO course are more disperse. This is quite understandable since the NNVO is a "living" course where the experience of the VTS instructors is used to improve the course contents. It seems that a bit more emphasis in the NNVO course is given to the law, rules and regulations. In the IALA Model Course some of the notions that are introduced in the VTS research, notably COST 301 and other European projects, play a more dominant role. Again, this is not surprising since the basics for the NNVO course were developed in the period when the first VTS simulator was introduced [11, 12, 13]. Furthermore the results of training of VTS-operators were an important subject in COST 301 and the notions developed in that project play a large role in the IALA VTS subcommittee that discussed training.

Inland navigation plays an important role in the Netherlands and the agency responsible for the safety of inland navigation has introduced VTS along Dutch rivers and canals where high volumes of shipping pass the junctions of rivers

[44] For a description of the IALA model course see Chapter 3

and canals. It is logical that in an all round training this subject is discussed. These subjects are not found in the Model Course.

The part covering communications and messaging in both courses is difficult to compare. A lot of items of the Model Course are hidden under different subjects of the NNVO course.

The total studying time of a NNVO course is 250 hours. Each candidate should spend 30 hours in simulation exercises with 30 hours debriefing. He should be stationed in a VTS station for a week and examination will take two days. When the candidate is successful he has the general knowledge needed to hold the post of a VTS-operator, but he would need to follow supplementary courses for the locality where he will carry out his duties. The IALA Model Course requires 309 hours and about 100 hours for simulation training. Remarks are made in the Model Course that the duration depends on the training schedule and deviations of the recommended duration are possible. Another important factor is the entrance level.

6.13 Additional Remarks

In some sectors of the Rotterdam VTS, pilots use the VHF channels for that area. This is the case in Pilot Maas where a pilot is at an observation post in the Pilot Boarding Area. The pilot provides shore-based pilotage for these vessels until the time that another pilot has boarded the vessel. Sometimes this pilot has a role to play as VTS-operator and some of them are given additional training in this respect. They can then provide information to vessels in their area without needing a VTS-operator. The pilots need to have the same certificate as the VTS-operators to do this. The NNVO provides examiners organised by the Training Department of the Pilotage Organisation. However, these pilots as acting VTS operators do not have the competence to give instructions to the traffic. Shipping Traffic Law expressly denies this authority to the pilots. Instructions can only be given using the competence of the VTS-supervisor.

The Netherlands has two VTS simulators for training. One is located in MSCN and the VTS-simulator of 1986 was replaced by a new one in 1998. The second simulator is found in the facilities of MSI Rotterdam and was commissioned in 1993. The competent authority requires that VTS-training should be carried out with an approved simulator. The ministry of Transport and Public Works provides a list of minimum requirements and if these requirements are met, the Organisation managing the VTS courses gives its Approval.

7 VTS Training in Germany

7.1 Introduction

The VTMIS-CA committee defines VTMIS in two steps as follows:

Vessel Traffic Management
This entails a set of measures, provisions, services and related functions that, within a given area and under specified circumstances, are meant to minimise risks for shipping, enhancing safety and protection of the environment, whilst maximising the efficiency of waterborne and connecting modes of transport.

Vessel Traffic Management and Information Services
These services are meant to respond to public and private demand for facilitating the control of shipping traffic. Vessel Traffic Management and Information Services include those that are provided in given areas (at regional, national or transnational level). The pertinent information is to be used, both in real time and in retrieval mode, by the actors involved in the shipping industry. The implementation of or participation in a VTMIS in a given area does not presuppose the existence of any specific type of equipment as long as it is adequate for the tasks to be performed. However it implies that all services that are or will be implemented in the area, such as VTS, Allied Services and other information services, should be interlinked and co-operate according to commonly approved procedures.

For this reason the present state of VTS operator training and procedures presently in use in German VTS areas shall be summarised to prepare a framework for further investigations possibly under the 5th Framework programme.

The aim of this contribution is to review and to summarise the present state of the training of German VTS personnel together with that of deck officers and pilots. Furthermore, operational procedures shall be discussed with respect to potential harmonisation and standardisation.

Therefore a survey of the training programme and the relevant legal rules for VTS operation in Germany will be performed. An example of operational procedures presently used will be given and the way they are implemented and its potential for standardisation and harmonisation will be described. The VTS operator training will be roughly compared with the training of the German Air Traffic Control personnel in order to show up any differences and common features.

7.2

Main Objectives And Characteristics Of VTS Operator Training Courses In Germany

7.2.1 Current Training of German VTS Personnel

Presently, vocational training of future VTS operators takes place in the VTS centres as local, on the job, training. Senior VTS operators and the staff of the local administration carry out the teaching at the future working positions. The training program takes about half a year. During his training, the trainee visits several departments of the Waterways Authorities and of other organisations. At the end of the training, the trainee has to pass an oral test under supervision of the local Waterway Administration.

A standardised national training curriculum is still pending. The systematic training for the analysis and evaluation of traffic situations, the decision finding process and emergency procedures is carried out only in theory. A realistic practical training, covering all the operational procedures, is presently not possible.

With the rapid development of technology in the field of radar engineering and information processing, VTS became more and more highly sophisticated in its technical and functional systems. The role of VTS in interaction with the vessel traffic and in direct response to the traffic situations, make VTS a crucial element in the management of shipping as well as for increasing vessel safety. We should be aware that well trained VTS operators may not only directly influence the safety and efficiency of traffic flow, but it may also have a positive effect on the ships staff acceptance of VTS operations. This in turn would increase the quality of ship participation in such VTS operations. Such considerations show why there is a need for better training for personnel involved in this system. The use of a simulator can play an important role in improved training but it is only a pedagogical instrument for carrying out highly qualified training and should never be the motive for the training itself.

7.2.2 VTS Training Objectives And Plan For A New Training Program

7.2.2.1 General

Since a simulator is 'only' a technical means for training, a successful simulation programme requires appropriate training units (theoretical lessons and training scenarios). Last but not least, the instructor should be a specialist in VTS in order to evaluate the training results. To guarantee all these elements, the Federal Ministry of Transport established a working group, consisting of specialists from different parts of the Waterways and Shipping Directorate, from Aids to Navigation R & D Centre and from the Department of Maritime Studies Warnemünde. It has been working since 1997, defining organisation, contents and objectives of future VTS training. Some of the results of this work are presented hereafter.

7.2.2.2 Training Organisation - Criteria for Recruitment and Forms of Education

In German VTS, there are two positions with different training requirements, the officer on watch (OOW) and the nautical assistant (NA).

The following criteria for recruitment have been defined for *OOW's*:

- New employment takes place from the pool of nautical staff; licence: Master High Seas (min. 2 years seafaring experience)
- Qualification: Polytechnic
- Aptitude test before entering the course
- Restricted Operator's Certificate (ROC) or General Operator's Certificate (GOC)
- Must speak maritime English fluently
- Good Health certificate issued by the relevant public health department

The following criteria for recruitment have been defined for *NA's*:

- New employment takes place from the pool of nautical staff; licence: Coastal Shipping Master (min. 2 years seagoing experience)
- Qualification: technical college
- Aptitude test before entering the course
- Restricted Operator's Certificate (ROC) or General Operator's Certificate (GOC)
- Basic knowledge of maritime English
- Good Health certificate issued by the relevant public health department

The following courses are planned for training and education of the German VTS staff:

A: Basic Training:

Basic Training serves to impart a general knowledge of VTS. This course is performed separately for OOW and NA.

A.1 Segment 'Basic Course' (Part of Basic Training):

- General part of the **Basic Training**
- Will be held at the MSCW as central training site
- This course will be fully pedagogically guided by lecturers from Maritime University, the Waterways Administrations and experienced instructors from the VTS centres themselves

Theoretical subjects will provide basic knowledge for the practical training, ensuring a common uniform knowledge base for all trainees. The duration of the 'Basic Course' is planned for 500 hrs. (50% theoretical lessons, 50% practical simulator training).

A.2 Segment 'Area Course' (Part of Basic Training):

- Area-specific part of **Basic Training**

- A distributed training in the future home VTS centre of the trainee
- Experienced instructors will partly teach this course from the VTS centres.

Training on the job (mainly an introduction into the operational procedures) takes place under supervision and instruction of an OOW. The duration of this course depends on the specific demands of the area, but not more then 250 hours. At the end of the Basic Course there is a validation of the qualification according to operational demands. Each trainee gets a certificate of participation with the remarks 'participated with 'success'', or, 'participated' (if the educational objectives are not met). The Participation is issued by the Department of Maritime Studies Rostock-Warnemünde. At the end of the entire Basic Training the progress is assessed. The suitability of the trainee for OOW or NA is issued.

B: Further Training

'Further training' means cyclical training or training performed according to need. This aims towards the alignment of a qualification profile to an existing or changing demand profile.

B.1 Cyclical training ('refresher training')
This concentrates mainly on the consolidation of knowledge and skills. In particular of those elements in the qualification profile expected to 'fade' due to infrequent use (e.g. emergency procedures). Each VTS operator shall take place in refresher training at least every two years; the courses will last one week.

B.2 Training by need
This refers to an alignment of the qualification profile with a new or changed demand profile (e.g. when new technology is installed or when operational procedures are changed). After passing a course of further training the trainee receives a certificate of participation.

C: VTS Instructor Course

As mentioned above, instructors (senior OOW's from the VTS centres) will play an important role in the training process. Such an instructor has practical experience and he is able to illustrate a specific subject by giving examples from his own personal experience. This competence can be obtained only by VTS personnel and can only be transferred by VTS personnel. In instruction and training it is essential that the instructor 'speaks the same language'. This influences training results and also increases motivation.

To prepare the future VTS instructors for their tasks in training, we have developed an internal instructor-training course. This course is directed towards two main aims:

- To familiarise the instructor with structure, functionality and technical means of the VTS simulator so that he is able to use it as a pedagogical instrument,

- To found a common methodological and pedagogical understanding of the training process and to increase teaching skills.

7.2.2.3 Contents and Objectives of VTS Operator Training

The working group on VTS training defined topics of theoretical education as well as training objectives for practical training. The following were defined for *theoretical education*.

General Topics Of Theoretical Education:

A: Legal Regulations (Law Of Waterway And Administration)

A.1 Administrative Organisation and Administrative Procedure

A.2 Shipping- and river police duties of VTS centre

A.3 Shipping- and Waterways Law

A.4 Operational Rules

A.5 Pilotage

A.6 Sea Accident Analysis

A.7 Search and Rescue

A.8 Dangerous Goods Transport and Protection of the Marine Environment

A.9 Ship Safety

A.10 Competence in an accident and disasters

B: Vessel Traffic Systems And Operation

B.1 Vessel Traffic Systems

B.2 Area Knowledge

B.3 Elements and Terms

B.4 VTS Services and Tasks

B.5 Accident Management and Actions in Special Situations

B.6 Documentation and Evidence

C: Technical Systems

C.1 Radar

C.2 Telematics

C.3 Navigational equipment

C.4 Data processing

C.5 Communication Systems

C.6 Recording

D: General Nautical Procedure

D.1 Ship Dynamics (Refresher)

D.2 Strength and Stability

D.3 Application of Shipping Rules by VTS

D.4 Hydrometeorology

D.5 Hydrography

E: Communication

E.1 General Communications Procedures

E.2 VHF and GMDSS Procedures

E.3 Standardised Communications

E.4 Service Specific Communications

Area-specific topics of theoretical education:

A: Legal Regulations (Law Of Waterway- And Administration)

A.1 Internal Organisation

A.3 Shipping- and Waterway Law

A.4 Operational Rules and Procedures

A.5 Pilotage

B: Vessel Traffic Systems And Operation

B.2 Area Knowledge

B.5 Accident Management and Actions in Special Situations

B.6 Documentation and Evidence

C: Technical Systems (In The Local Centre)

C.1 Radar

C.2 Telematics

C.4 Data processing

C.5 Communication Systems

C.6 Recording

D: General Nautical Procedure

D.3 Application of Shipping Rules by VTS

D.4 Hydro/meteorology

D.5 Hydrography

7.2.3 Structure Of Operator Activities And Training Objectives - The Fundamental Basis For The Development Of The VTS Operator Training Programme

For the definition of training objectives after a long period of analysing the activities of VTS operators in different centres ([Deh 96] and [FöB 97]), a 'Structure of Activities' was defined. For each topic of this structure (shown below), a detailed specification of learning objectives was developed. The system of learning objectives then formed the basis for the development of all further training units / scenarios and the detailed description of the training programme objectives [Deh 97].

1. GAIN TRAFFIC SITUATION IMAGE
    - 1.1 Collect fairway data
    - 1.2 Collect environmental data
    - 1.3 Collect traffic data
        - 1.3.1 Collect ship data
        - 1.3.2 Identify ships
        - 1.3.3 Observe traffic
    - 1.4 Construct situation image

2. EVALUATE SITUATION IMAGE
    - 2.1 Evaluate fairway data
    - 2.2 Evaluate environmental data
    - 2.3 Evaluate traffic data
    - 2.4 Check interactions environment-fairway
    - 2.5 Check interactions fairway-traffic
    - 2.6 Check interactions environment-traffic

3. DECISION FINDING
    - 3.1 Decide on...
        - 3.1.1 ...regulatory measures as shipping police
        - 3.1.2 ...regulatory measures as river police
    - 3.2 Decide on priorities

4. PERFORM REGULATORY MEASURES
    - 4.1. Perform regulatory measures as shipping police
        - 4.1.1 Provide traffic information
            - 4.1.1.1 Provide regular situation report
            - 4.1.1.2 Provide individual traffic information
        - 4.1.2 Provide navigational assistance
            - 4.1.2.1. Provide regular navigational assistance
            - 4.1.2.2 Provide navigational assistance until radar pilot arrives

4.1.3 Issue traffic regulations

4.1.3.1 Issue instructions

4.1.3.2 Issue approvals

4.1.3.3 Issue exemptions

4.1.4 Control flow of traffic (at Kiel Canal)

4.2 Perform regulatory measures as river police

4.3 Initiate repressive measures

5. PERFORM OTHER MEASURES

5.1 Perform measures to react on unusual situations / emergencies

5.1.1 Perform measures to react to danger to live

5.1.2 Perform other measures to react to accidents, environmental pollution and catastrophes

5.2 Perform measures to react on technical faults and failures

6. PROVIDE DOCUMENTATION / RECORDS

6.1 Provide regular records of watch

Based on this structure of activities the training and task objectives were defined in detail. One example is given in the following table:

<table>
<tr><td>Training Id.
OOW 1.3.2
NA 1.3.2</td><td>Identification of vessels</td></tr>
<tr><td colspan="2">Training objective:
The trainee acquainted with the different methods of vessel's identification</td></tr>
<tr><td colspan="2">Task objectives:
The trainee ...
(a) is able to perform the identification of a vessel by means of:
- the relative and absolute position data included in regular ship reports
- VHF-bearings
- the fairway position displayed in the REV-table
(b) is able to recognise violations of the reporting compulsory and initiate measures for identification
(c) is able to critically assess the reliability of a performed identification and in case of doubts to get additional information by:
- further requests from the reporting vessel or vessels in the vicinity of the vessel to be identified
- the evaluation of the radar echo's size or course and velocity of the vessel
- a comparison with data available in the REV-table
- means of VHF-bearing
- means of optical observation or CCTV-display
(d) assign the correct category to the identified vessel and correlate label and the ship data set</td></tr>
<tr><td colspan="2">Notices:
kind and extension of the mentioned activities depend on the technical equipment available in a certain VTS centre</td></tr>
</table>

Table 12: Example of the description of training objectives as fundamental basis for the development of a training programme

During the process of developing a VTS training programme it is clear that without having a clear description of activities, with a detailed definition of the aims of a specific activity, it is impossible to fill any of the previously drafted frameworks for the VTS operator training programme.

Furthermore it must be taken into account that at the time of development of the draft for a training programme, the model courses of the IALA-recommendation V-103 was not yet available. Now it can be seen that the methodology used complies well with the given structure and that the contents are sometimes described in much more detail than in the recommended model courses. In fact it would appear that the division in theoretical and operational training objectives used for the development of the German training course is more practical. As an example, the German course description clearly states "the trainee must be able to ...", which is missing in the IALA model course descriptions. This is probably more helpful. On the other hand, the IALA model courses do describe much better the "personal attributes" in respect to the attitudes of the trainee (teamwork, interpersonal skills) than considered in the German training objectives.

Finally the IALA model courses provides the possibility of teaching trainees without previous nautical knowledge. The German concept does not take into account such training courses at present. However, the level of nautical knowledge that is required of such trainees, as laid out in the model courses, seems to be much too low.

With respect to the development of a VTMIS operator-training programme it can be stated that it is necessary to clearly define what is the aim of VTMIS and by what perator activity this aim may or should be reached.

7.3 Comparison of VTS-operator Training Programme with IALA Model Course

7.3.1 General remarks

As already stated in the previous chapter concerning the VTS training in the Netherlands a detailed comparison of the contents of the training programme with the IALA model course is not possible without the contents of the courses.

The IALA model courses are laid down as a framework that is understood to be as free as possible. The introduction of the Model course contains the explanation that neither the number of hours nor the subjects are expected to be fully kept:

"*It is not the intention of the model course to present instructors with a rigid teaching package which they are expected to follow blindly. ... For teaching purposes the subjects may be grouped and re-arranged where that is considered an advantage.*"

and at other places:

"*The recommended hours given in the syllabuses are intended to be used as approximate guidelines for planning purposes. The hours should be adjusted as necessary to suit local circumstances ...*"

Therefore a more general comparison is performed for the German VTS training regarding the general structure of the recommended training and certification standards.

7.3.2 Correspondence and Differences

The structure of the German VTS training complies with the IALA Recommendations in principle:

- Basic training,
- Fundamentals of VTS,
- Award of a VTS Operator Certification,
- On-the- job training and

- Award of an endorsement in the VTS Certification log

As recommended in Germany there is also basic training. The fundamentals of VTS are included in this basic course. The central basic course is followed by the "Area-Specific Course" which is equivalent to on-the-job training. The VTS operator certification is intended but still under discussion by the authorities.

As can be seen from the previous chapter the content and length of the special courses are only slightly different to IALA recommendations. Although the German basic course is presently described in 5 modules, the content covers approximately 90% of the model courses. Existing differences are more related to local conditions.

There are no separate "Language" and "Traffic Management" modules, but their content forms a part of other modules, especially under Communications. Furthermore, one of the entrance requirements is "must speak maritime English fluently" so that it is not necessary at present to provide a special module for language training.

Items of "Traffic Management" are of course included in the contents of "Vessel Traffic Systems and Operation". However, except for collision avoidance rules and measures, "Traffic Management" is more related to national rules and conditions. For example, the items of "VTS Sailing Plans" (Model course - Part C, Module 2, Traffic Management), which are very significant in the North American VTS, are not yet included in much detail. This is because of impending, necessary modifications to existing VTS rules. "Adjustment and Termination of VTS Sailing plans" are important tasks of VTS operators on the Canadian coast and its inland waterways, but in Germany, there is only an equivalent subject for the Kiel Canal VTS centers at this time.

The "Equipment" module is represented as "Technical Systems".

"Nautical Knowledge" is presented as "General Nautical Procedure" but does not contains as many items as the IALA model recommends. This is particularly due to German recruitment criteria, which at present, and still at least for the next decade, demands the licence of Master for foreign-going vessels, which again requires a minimum of 2 years seafaring experience. On the other hand the IALA model courses take into account the training of personnel without nautical knowledge which is not the case in Germany.

The modules of "Communications Co-ordination" and "Radio" are parts of the German "Communications" course.

"Personal Attributes" is the only module that is presently not considered in the training programme at all. Nevertheless, this module is still under discussion even at IALA. For this special item, experience is missing in Germany and probably also in most of the other maritime countries.

Finally, the special IALA module, "Emergency Situations" is not represented in the German training programme until now due to different special alarm and catastrophe manuals available in the VTS centers along the German coast. Handling of emergency situations is therefore a major subject for "on-the-job" training.

At the moment, the total studying time planned for a VTS operator programme in Germany is 750 hours. Simulation exercises will be certainly be included. However, a specific number of hours is still to be decided on. The final number will be oriented according to the recommended number of exercises / simulation hours (201) but will more importantly depend on the previous knowledge of the trainees themselves. After completion of the basic course a certificate will also be issued similar to the IALA recommendations.

Although at present pilots perform the navigational assistance service in Germany, they are not covered by the VTS training programme. Pilot associations therefore carry out their own training courses. A lot of discussion is currently on the table about how to incorporate both these parties.

8 VTS Training in Norway and the UK

8.1 VTS Training in Norway

VTS training is now under development on the basis of the IALA model course. The development of the programme is a joint effort of the Norwegian National Coastal Administration and, in particular, the Coast Directorate and Kongsberg Norcontrol Systems. The latter is one of the suppliers of VTS systems in Norway. The first course is expected to run in February 2000 and will be held in the VTS centre in Horten. Some adaptations (more consoles) will be made for the training of more VTS-operators at the same time. The course will be in the same building as the VTS Center, but in separate facilities with the same traffic image as the VTS.

VTS systems are in place in Horten, Brevik, Fedje, and a new one is envisaged in Kvitsoy, a small island near Stavanger. This VTS is thought to commence operations in 2001 whereas the Horten VTS is commissioned for the beginning of 1999. The number of VTS operators at this moment is about 40 and the new ones were trained on a customised course held in the Oslofjord VTS. Older VTS operators make the most of their jobs by using their personal knowledge and experience with some outside guidance on communications and communication procedures.

A national centre for HAZMAT reports is also located in Horten. The relevant national authorities can retrieve data directly and the VTS–operators are not directly involved in this process. No refresher courses are presently available. Whether or not refresher courses will be available in the near future for VTS operators is not yet clear. Discussion on this subject has not yet produced a decision. The entrance level for candidates is rather high, as can be seen from the following requirements:

1. Deck officers certificate class. 2 and theoretical education to obtain deck officers certificate class 1 or similar after earlier arrangements or
2. Relevant high school or relevant training within the authority or
3. Other maritime certificates such as radio officer, preferably with experience on foreign-going ships.

Applicants with qualifications in accordance with 1 will be preferred. In practice it is deck officers with quite high qualifications that are employed. Equivalent requirements are made for candidates coming from the Royal Norwegian Navy. It is thought that many subjects of the model course will already have been mastered by the candidates and that time can be saved as compared to the time recommendation of the model course.

Norway contributed to the conference in Cape Breton, Canada in spring 1999, initiated by IALA, where the details of the model course were discussed among VTS instructors and other interested parties.

The Norwegian SAR operations are carried out from two MRCCs. One in Stavanger (South) and one in Boedoe (North). VTS operators report any ship in distress to one of these co-ordination centers. They commit the resources needed for any SAR actions. In some cases the VTS operator may be asked to act as the on-scene commander, when such an arrangement will have beneficial effects for the operation.

Oil pollution as observed by, or reported to a VTS operator is also reported to the national Pollution Control Authority. This authority will take any necessary measures. VTS-operators play no further role in this except when clean-up operations affect the smooth flow of traffic. Traffic arrangements are then made by the VTS-operator and vessels informed.

Some experts see FARGIS as some sort of VTMIS. At present they do not have an active role, as it isn't an operational system. It is expected for VTS operators to become involved in VTMIS eventually.

8.2 VTS Training in the UK

Up till now no official VTS-operator training, according to some sort of shipping law, takes place in the UK. Teachers and trainers have attended the IALA VTS committee meetings to detail the IALA model course.

The present situation is that, for example, WMC provides a one-week training course for VTS-operators. They use the new Sindel VTS-simulator recently commissioned in Warsash. These operators are sent by port authorities that are responsible for VTS operations in British ports. VTS-operators are sometimes recruited from seafarers (mates) but also other shore segments provide VTS-operators. This one-week course includes some elements on human factors, standard maritime phrases, VHF communications and COLREGS. Some port authorities are becoming concerned over the present situation. They are aware of the IALA model course, but they are not able to implement a full course according to the guidelines contained in it. Budgets to do that are not available. Even so, they want international recognition. This however cannot be provided by IALA. Recognition should be included in national law and port bylaws.

Two hundred VTS-operators are working in the UK that means a steady flow of 10 new VTS-operators per year.

The aftermath of the Sea Empress disaster includes many recommendations. One of them is a recommendation of integral port personnel training. The training establishments expect that the situation in the UK will soon change and that VTS training according to the IALA model course can be initiated.

9 Coast Guard and Coast Guard Watch Operators

9.1 Introduction

This report is concerned with the training of operators who are related to Vessel Traffic Management. The first six chapters discuss the VTS operator. This is an operator of a well-established phenomenon. Since the beginning of the eighties VTS was duly established with the blessing of the most important international organisations. The recruitment, training and certification of VTS-operator were, in theory at least, taken care of by the VTS-operator guidelines. Since then, the IALA VTS committee have published their Model Course for VTS-operators. This is a strong recommendation for harmonisation of the job of VTS-operator whilst maintaining sufficient flexibility to adapt the course to regional or local conditions. Eventually the time will come in Europe when no significant, fundamental discussion on VTS and VTS-operators will be necessary. However, the approach to some fundamental aspects of the way that VTS-operator should deal with symptomatic events is not yet concluded, as this report proves.

New challenges are on the horizon. First of all, the phenomenon of Inland VTS is already here. Inland VTS were already established 25 years ago in the Netherlands. The competent authorities for port and inland waters were positioned in the same ministry and that fact has contributed to a more general approach for port VTS, as well as for Inland VTS. Even this fact was not able to prevent that the routines in port VTS and Inland VTS eventually diverge and this was also the case among different inland VTS. Five years ago the Rijkswaterstaat took the initiative to harmonise inland VTS and guidelines were drafted in close harmony with the IMO Guidelines. A first draft was completed in 1996 [14] which is presently being discussed in international forums, such as the UN in Geneva and the Rhine commission in Strasbourg. The PIANC, as the authoritative body for inland navigation, has started a workgroup to review these guidelines.

A large European project oriented to Traffic Management in Inland Waters started in 1998: "River Information Services“[45]. This can be seen as an enhanced VTS with regional and international aspects. The development of technology enables more (traffic) information to be provided on board the vessel (AIS, Inland ECDIS, met info) whilst the direct interaction of VTS-operators may be reduced when the system is in operation. A large number of vessels are equipped with such new equipment. The regional character of RIS might also reduce the number of manned VTS centers. The role of the VTS-operator is slowly changing to a Traffic Flow -operator, where Traffic Organisation Services are dominant. At the same time, RIS can perform more functions.

[45] INDRIS, Inland Demonstrator for River Information Services

Traffic flow operators need to have traffic images to monitor the flows of traffic. Regional Traffic Images are constructed on AIS with VHF communications. AIS equipment will be the same as the equipment on seagoing vessels to harmonise traffic in ports with a lot of seagoing as well as inland traffic.

The consortium that carries out the research and the planned demonstrators consists of partners closely related to the Ministries of Transport in the Netherlands, Austria, Belgium (Flanders as well as Walloon) and France. Germany is involved in a number of projects that are related to INDRIS. The project publishes preliminary guidelines, RIS guidelines [27] that are constructed on the basis of the VTS Guidelines.

The PIANC working group also considers these Guidelines and contact has been made with the IALA VTS committee to consider close working relationships to harmonise them.

A second challenge is a close scrutiny of the Vessel Traffic Management tasks at sea. The first question is which Management Tasks are being carried out or could be carried out and what type of operator is carrying out these tasks? In the next section these questions will be discussed.

9.2 VTMIS and Traffic Management at Sea

Before commencement of the EEC Fourth Framework Programme and after the conclusion of the EURET research programme, there was a void. The then DG VII Transport decided to combine the TAIE and RTIS consortia into a new one. This consortium was called VTMIS-APAS. It was expected that the efforts of these consortia would lead to the beginning of a harmonised approach for VTMIS.

It should be noted that TAIE was centred on VTS. This would mean that many aspects in TAIE were regarded in the context of the VTS Guidelines and the work of the IALA VTS committee. This committee had, however, no influence on the activities in TAIE. Traffic Management in the context of TAIE is therefore considered as Vessel Traffic Management. This was seen in TAIE as a task for Administration and the local competent authorities were designated these tasks, with an eye open for the use of the information by allied services.

The RTIS project did not classify the management of services as being private or public. It was recognised that if such a service would be implemented in, for example, the Mediterranean, a lot of problems regarding the nature of RTIS would need to be solved.

Mr. J. Prunieras [28] provided a paper in the closing workshop of the project in Brussels on the integration of Vessel Traffic Management Information Systems. The definition of VTMIS is not apparent from that paper. In a later stage the

VTMIS concerted action as part of the Fourth Framework Research Programme provided one.

Mr. C. Glansdorp [29] suggested, on a more practical level, a potential implementation of a VTMIS. This is based on the concept of regional and local traffic images held by the competent authorities. These traffic images form the basis of any action, in response to symptomatic events generated by vessel traffic, taken by competent authorities.

The ideas behind the integration of VTMIS in [28] are that the public authorities and private enterprise should co-operate. Public authorities are responsible for safety issues of Vessel Traffic, taking into account that these authorities also create conditions for the economic development of maritime transport and a proper use of the limited resources. Private industry is interested in the optimisation of resources involved in whatever side from the shore it is considered. Areas of interest are fleet management, use of port infrastructure and management of allied services.

The ideas behind the concept of VTMIS in [29] are that information is exchanged between the competent authorities in order to improve the execution of their tasks. When the authorities have a complete picture of the Vessel Traffic in the form of Traffic Images (nothing more or less as one of the presentation layers of a database, central or distributed), they can use this information to base their actions on. Furthermore, they can use filters to provide designated information of these Traffic Images to private industry on request. The advantages are twofold: the competent authorities as agencies of the European Administrations concerned enhance the activities of private industry regarding the development of maritime transport. The optimisation of their resources is a second and a more operational advantage.

Where VTMIS, according to Mr. Prunieras, is some kind of co-operation between public and private entities, that uses information exchange systems on Traffic Management. Users of the information have no guarantee regarding the accuracy or reliability of the information. Not every commercial user has the obligation to provide information according to law. Only masters have the responsibility to provide relevant and accurate details to the authorities in the reporting schemes.

VTMIS, according to Mr. Glansdorp, is based on information about users of the system that they have to provide according to law to the competent authorities. This information is used to carry out the Traffic Management tasks of these competent authorities (in ports, at sea). If information that is in possession of these authorities assists industry, it should be made available, provided that all interested industrial partners can use the same information. An authority cannot allow competitive edges to be provided to only one specific commercial user.

VTMIS as a network of a conglomerate of information holders and information providers, may not provide an ideal platform for industry information exchange. Representatives of "Industry“ did not invent VTMIS. The Industry has found other ways to exchange information. This became clear in one of the first phases of VTMIS-net, where user requirements were investigated. The response of industrial partners to VTMIS-net was disappointing.

If VTMIS is going to develop along these lines, the exchange of information will have to be done automatically. No VTMIS operators are required. The quality of information may be high or low and the information that is exchanged will not be based on information that users should report to official competent authorities. These authorities work with information that should be accurate. Consequently, the quality of information is variable.

VTMIS as a necessary information network to provide all the competent authorities with information on the movement of vessels - and all issues that are connected with movement of vessels - is based on mandatory reports complying with the principles of reporting as being devised by the IMO. The information leads to accurate Traffic Images on the basis of which such competent authorities can carry out their tasks efficiently. Some of this information is useful for industrial participants and could be made public at the request of the industry.

RIS, the VTMIS of inland navigation, is mainly working along these lines. Information that is supplied by the users is primarily meant for competent authorities to ensure a safe and efficient traffic flow and that the infrastructure is maintained with no harm to the environment. These properties may give inland water transportation the competitive edge in some West European countries, as compared to other transport modalities. A part of the telematic infrastructure of RIS may also be used for transport management, without any responsibility of the competent authority.

These thoughts point in the direction of a more complete traffic image over all navigable waters of importance. The traffic images of a port and inland waterways should not be seen in isolation but as a coherent entity, where all European competent authorities work together. The traffic image of the sea is, however, still missing. The EUROREP directive was a first indication that the knowledge of vessel movements may help the SAR authorities and also for anti pollution purposes.

Apparently the connecting sea areas in the European sphere of interest were seen as important bodies of water. The question of enforcement of internationally agreed rules and allocation of space, the protection of the coastal states against pollution of vessels is becoming more and more important.

It seems to be logical that an investigation starts with a consideration of the roles of the Coast Guard. The principles on which Coast Guards are based in European Countries vary. The main role for many Coast Guards is SAR and in some cases also Pollution Control. It is not the intention to discuss this role in great detail but these Coast Guards are very well positioned to carry out other tasks. Normally Coast guards have watch officers who co-ordinate SAR actions around the clock. Do they have (Vessel) Traffic Management Tasks?

9.3 Other Vessel Traffic Management tasks

9.3.1 Introduction

The general principle of navigation on the high seas is that each vessel has the right of innocent passage. This, in global terms, mean that a transit of a vessel, outside the territorial waters of a Coastal State, should occur not subjected by any restriction of this State. However, when traffic flows started to increase in straits and other small or narrow sea areas, the right of innocent passage in these straits and areas was questioned as a result of a large number of accidents. The safety level was considered as unsatisfactory and in the late sixties professional organisations attempted to devise schemes to reduce the potential risks related to collisions. The first Traffic Separation Scheme was implemented in the Dover Straits.

Increased traffic flows were not the only causes for such measures. Other uses of the sea, such as fishing, exploration and exploitation of marine resources from the sea and the seabed, also lead to an increased need for some kind of management.

If an international agreement is reached to share the use of the sea, there is also a need to manage the different uses. IMO plays an important role and has made a large number of internationally accepted routing measures.

Enforcement of the rules is left to the States that have signed the agreements. In some countries Coast Guards have been tasked with the enforcement measures and to take action against infringements through the Flag States of the guilty vessels.

In such cases the Coast Guards can be seen as traffic management organisations at sea. In extreme cases, Coastal States are prepared to monitor traffic flows using shore based radar equipment. A good example is the CNIS. This organisation monitors the behaviour of vessels in the area of the Dover TSS. Information to vessels is provided as how to use the TSS properly and to alert shipping for rogues[46]. Rogues are reported to the Flag State if they are identified and it is expected that the National Governments will take appropriate action. Such monitoring of traffic outside territorial waters is only done at a few other places in Europe; The CROSS Centres of France are an example as well as the VTS in the Gibraltar Straits with its centre in Tarifa and that just off Finisterre which centre is in Gijón.

9.3.2 Traffic Separation Schemes and other IMO routing measures

[46] A guilty party infringing the rules.

The objectives for ship's routing at sea is to improve the safety of navigation in converging areas and in areas where traffic density is great, or where the freedom of movement is inhibited by restricted sea room as well as limited depths. Unfavourable weather conditions are also a reason to consider routing measures. The precise objectives of a routing measure depend on the nature of the risk implied by the conditions that it may alleviate. These conditions may be one, several or all of the following:

- Separation of opposing traffic flows to reduce head on encounters
- Avoid collisions between crossing vessels and those in an established traffic lane
- Simplify the traffic pattern in converging areas
- Organisation of safe traffic flows across or along areas with concentrated offshore exploration and exploitation
- Organisation of traffic in and around areas where the navigation of certain classes of vessels carrying dangerous or hazardous goods is undesirable
- Reduction of the probability of grounding in areas where water depths are critical and uncertain.
- Organisation of traffic near or through fishing areas.

Examples are: TSS which consists of separation zones or separation lines and traffic lanes as well as established direction of traffic, the round-about, inshore traffic zone, recommended routes, recommended tracks, deep water routes, precautionary areas, areas to be avoided.

It is to be noted that the routing measures which are implemented are generally static measures promulgated by the Governments concerned in Notices to Mariners and in the charts they issue through their Hydrographic Offices.

The behaviour of vessels close to or in a TSS is described in Rule 10 of the COLREGS.

9.3.3 Lord Donaldson's recommendations

The reason to initiate an Inquiry into the prevention of pollution from merchant Shipping was the wreck of the Braer. The Braer grounded on Jan 5th, 1993 onto the rocks of Garth Ness in the Shetlands. The vessel was laden with about 85,000 tons of Gulfaks, a light brand of oil. The public indignation in Great Britain led to an inquiry by Judge Donaldson. The aims of the study were to look into the future and to make recommendations regarding the protection of the UK coastline and to indicate what assistance could be enlisted.

Lord Donaldson's report [30] includes a large number of issues that have a bearing on the prevention of pollution on the coasts. The report ends with a large number of recommendations. Those relating to routing at sea, which may be seen as some kind of Vessel Traffic Management, are discussed hereafter.

"Routing measures including advice are essential for safety in busy waters such as the Dover Straits, but they are also valuable in protecting environmentally sensitive areas. The main problems are lack of knowledge: with a few exceptions, the UK Government does not know either precisely where ships go within their waters, or to the extent to which routing advice is followed. Masters, owners and insurers may not appreciate the importance of routing advice and probably do not know which areas are both environmentally sensitive and at risk. The first step is to improve the knowledge of these measures".

It seems that this recommendation should have more general acceptance by other European Governments. Special PR departments in the Ministries of Transport might take on implementation of improved information.

"The Department of Transport should consider the scope for routine checks on the routes taken by vessels into and out of a particular port".

The meaning of this recommendation is that PSC inspectors check the routes followed by a vessel and compare them with the advice that had been given. It is recommended that, especially for big oil ports, a confirmation is always given to a competent authority of the route followed (Coast Guard for example).

To implement this recommendation immediately, problems arise when trying to follow the tracks of these vessels. The introduction of AIS will improve the situation in areas under VHF coverage, when all European Coast Guards are being equipped with electronic and GIS infrastructure to track vessels. WARIS, that can be seen as AIS connected to a medium distance communications system, might solve problems in the MARPOL areas of each European member state.

"The UK government should press IMO to ensure that all vessels with large bunker capacity are subject to the same routing and reporting requirements and recommendations as laden tankers".

There might be a problem with cruise ships. Some cruises are organised to visit locations that are environmentally sensitive so that the passengers may enjoy the scenery and wildlife. Exemptions for these vessels if they satisfy special requirements may be a solution. If the preceding recommendation is acceptable for European Member States, this one will also be acceptable. As a practical measure the bunker capacity limit could be fixed at 1000 m^3.

A recommendation regarding protection of sensitive areas is the MEHRA (Marine Environmental High Risk Area). Routing measures are being issued or required to be followed by masters without explaining why he should do so. Any new measure should inform masters of areas of great sensitivity. The identification and publishing of these areas will provide the ship's master additional information relevant to set-up passage planning. It is hoped that, in addition, ship owners and operators in their own self-interests will regard a MEHRA as an area where their ships should stay clear.

The criteria for a MEHRA to be established should be based on shipping patterns and the environmental importance of the area. The maritime considerations include:

- Number, type and size of vessels passing and the nature of their cargoes,
- The distance of the usual shipping lanes from the shore
- Any circumstances giving rise to an increased risk of collision such as a significant amount of traffic going across the normal flow.
- Hydrographic conditions relevant to safe navigation, such as the lack of anchorage
- Prevailing meteorological and tidal characteristics

The environmental considerations include:

- Existence of wildlife feeding or breeding sites of international significance
- The presence of biological communities of either flora or fauna or both of particular interest or rarity: (Designation as Special Protection Area under the EC Birds Directive or an Area of Special Conservation under the Habitats Directive will normally be regarded as evidence of this).
- The existence of commercially exploitable biological resources and mariculture sites
- The extent to which the area provides a public recreational amenity.

The following recommendation is related to the MEHRAs.
"The UK Government should establish MEHRAs: a few small areas of high sensitivity, which are also at risk from shipping:

(a) The Department of the Environment, with its Northern Irish, Scottish and Welsh counterparts and their statutory advisers, should work jointly with the department of Transport to identify MEHRAs on the criteria we suggested,
(b) The UK Government should urge IMO and the EC to adopt and promote MEHRAs, but should not wait for international agreement before promulgating UK MEHRAs.
(c) The Department of Transport should monitor MEHRAs to see whether master’s behaviour has changed
(d) If further steps are needed, the UK Government should consider options with IMO. Possibilities include compulsory "Areas to Be Avoided“, compulsory routes and protected headlands

- The UK Government should consider with IMO, the EC and other interested parties how best to publicise and monitor MEHRAs.“

If the recommendation is generalised this recommendation might be valid for each European member state. Part c is then a task for a Coast Guard as well as d. With the introduction of AIS in the near future this would not be very difficult.

"The UK Government should seek to ensure through IMO and the EC that any new routing system is enforced through special reporting conditions, similar to those in a similar recommendation. Repeated breach of the conditions should lead to a ban on loading and unloading.“

This sanction requires co-operation between the Coast Guard of the country affected and the PSC of the Port State in the port where the vessel calls to unload or load.

Summary.

The recommendations of the Donaldson's Inquiry indicate that from the viewpoint of pollution, extra routing measures are necessary and therefore Vessel Traffic Management Measures at Sea should be considered and implemented: a MEHRA may be one of the new measures. The Coast Guards will play a role when these measures are implemented and they need to have equipment to carry out this task. AIS and WARIS and their infrastructures will be part of that equipment.

9.3.4 The "Braer“ And Improved Dynamic Routing

On 5th January 1993 the Braer was wrecked on the rocks of Garth Ness near Sumburgh Head on the Shetland Islands. The weather was extremely bad and the engine of the vessel developed a failure due to contaminated fuel supply. Although the position of the vessel was about 11 nautical miles South West of Sumburgh Head, the drift of the vessel as a result of the South Westerly storm was nearly 2 knots and six hours later the Braer hit the rocks. The hull was punctured and the weather did not improve. In a short time it was clear that the Braer had become a wreck and that a considerable part of the cargo, if not all, was or would soon be spilt. Amplifying factors were that tug assistance was provided too late, their response being rather slow. The weather did not improve for a long time making all salvage efforts futile.

The weather in the case of the "Braer“ was very bad. In such cases masters of vessels carrying dangerous goods need to report their sailing plan to a Coast Guard under a MAREP reporting scheme. This sailing plan can be assessed given the weather conditions. Let us assume that all vessels carrying dangerous goods will have AIS-transponders and that their position is known in a regional traffic image in a Coast Guard center. The Coast Guard and the master should agree on a recommended route for this case. This route takes into account the risk of a failure on board the vessel, the weather conditions and the availability of an Emergency Towing Vehicle as well as the distance of the ETV from the most threatened part of the coast.

A simple arithmetic expression can be used to determine the minimum distance to land and the course to steer can be shaped according this minimum distance and the port of departure and destination. The Coast Guard operator can regularly check the progress being made by the vessel.

The procedure suggested here is much more flexible and less costly then implementing a full VTS system around the Shetlands that was demanded by some inhabitants of the islands shortly after the "Braer“ disaster. The regional traffic image provides all the information and the weather conditions can be estimated form the weather forecasts. The costs for the tanker owners are reduced since only in those cases where bad weather occurs are some deviations in the interests of the Coastal State made. This process should be seen as dynamic routing and may reduce the number of MEHRAS and ABTAs if these areas were based on the fear of considerable pollution.

Dynamic routing is not possible in areas with high traffic density, such as the Southern part of the North Sea and the Atlantic Approaches to Northwest Europe. Most of the TSSs will not be effected, since many are based on considerations of traffic density. However in remote areas in Europe with sensitive coasts, dynamic routing seems to be possible, if the Coast Guard are given pro active routing activities.

9.3.5 The Coast Guard and the MARPOL Convention

Lest us assume that the Coast Guard possesses a regional traffic image of the total MARPOL sea area of interest. Let us also assume that the oil spill programme could work on top of the traffic image and that the traffic image could be constructed in a fast time mode. If a spill is reported on the coast or a large spill floating to the Coast, the Coast Guard operator (or the Pollution Control officer in charge) could find areas, in function of time, where ships could have spilt the oil. A “back-tracking“ simulation such as this, takes into account the state of the sea over the past few hours. It should now be possible to find a reduced number of ships that were in the area, at the time, that may have caused the pollution. In a comparable case, the Dutch Coast Guard, without a traffic image, found 572 vessels suspected of a spill in 1989. This was based on voyage records provided by the ports and a long time after the occurrence of the spill. Furthermore, this information could have been available at about the same time that the oil spills were observed.

Another useful feature is that all logbooks of patrol vessels, Coast Guard vessels and planes, as well as VTS centers, are in electronic form and can be investigated remotely by authorised persons. This is a helpful feature to reduce the number of suspected vessels.

In 1989 these facilities were not available and not being used by either the Vessel Traffic Managers or the Coast Guard. However, if a regional traffic image would have been available and the possibility to overlay an oil spread programme the chances were large that they could have identified the guilty party, or at least have a small number of candidates. If an event like this occurs, it would be very helpful to compare electronically different logs and try to find indications regarding a potential culprit.

Many pollution cases are not the result of calamitous spills, but the result of tank washing and other prohibited activities according to the MARPOL convention. The slicks resulting from these spills are frequently small and very often, they will disappear before they reach land. The Coast Guard planes are able to observe many of these slicks, but only in a few, rare cases the severity of the spill requires cleaning operations. For smaller slicks that are detected some days after the actual spill, it is very unlikely that an oil spread programme could offer indications as to the possible culprit. The method that is discussed here will probably not provide results. Larger spills detected shortly after release has a much larger chance that the culprit may be caught by the method discussed here.

On the other hand, the costs of the method are small. Most of the time a regional traffic image is available for other reasons. Most Coast Guards or pollution combat centers have oil spread programmes. If these programmes (the software constructing the regional traffic image and the development and progress of the oil stain) are linked in time, results may be obtained. With modular software this would not be a large and expensive task. There is no reason why this method should not be used.

9.3.6 The "Amoco Cadiz“ and Emergency Towing Vessels

The disaster with the Amoco Cadiz is widely known and there is no need to repeat the findings. An interesting subject is the availability of salvage tugs to assist vessels that are in trouble. These vessels are stationed at crucial points to provide assistance when vessels are in distress. France stationed, among others, a large tug in Brest as a result of the Amoco Cadiz. Other countries decided to station tugs at different ports.

ETVs have two interconnected problems. The first one is the determination of the conditions where ETVs may intervene. This depends on the interpretation of the intervention convention, giving the Coastal State power to intervene if their coast is threatened. Secondly, when the number of expected interventions is small, a C/B analysis often indicates that an ETV should not be used. This leaves the decision-makers with a difficult problem. If no protection is offered and a calamity occurs, the decision-makers are at fault. If a lot of money is spent and no visible results are obtained, the decision-makers are again at fault, since they waste money. If the decision-makers extend the powers of intervention to the utmost, the major shipping countries may have problems, since their vessels are forced to accept towing assistance.

The problem is not an easy one. Large disasters, such as the Amoco Cadiz in the area where a large tug is stationed are so infrequent that these tugs may not provide benefits commensurate with the costs. Other considerations are that the response times of tugs are generally long. It often takes more than 12 hours before the ETV arrives at the scene of the disaster.

Here a specialist Traffic Management Task is forthcoming related to how the ETV is used in an operational sense. In what way is the location of an ETV connected to dynamic routing? Coast Guard operators with Traffic Management tasks should be able to solve these problems. A regional traffic image and the actual and future positions of vessels may introduce a more dynamic way of allocating ETVs. The traffic image may be used to make risk profiles of vessels and locate the ETV in such a way that the risks are minimised. Risks, in this context, are those related to the loss of life at sea (the perception of risk by the general public is very much dependent on the size of the loss of life such as in the Titanic and Estonia) and the size of massive oil spills. The potential environmental consequences are also very important.

The regional traffic image and the routes to be followed may enable the Coast guard operator to determine a sailing plan for the ETV. This plan would normally not be implemented in good or rather good weather conditions. Drift speeds of stricken vessels are normally so slow in these conditions that normal intervention times may be sufficient. However, in gales and storms intervention times should be reduced since drift speeds are higher. Tugs should then be nearer to the potential localities of risk. Storms of hurricane force worsen the situation, since in those conditions the tug cannot operate safely and sometimes it has to cease its operations in order to safeguard its own safety and seek shelter.

In localities with less dense traffic where on a regular basis large oil or chemical tankers call at ports, dynamic positioning of a tug near the approach may be possible in weather conditions where an engine break down may have disastrous consequences. In many other cases where, on the basis of evidence provided by PSC-inspectors and other ship condition databases, a healthy mistrust in the behaviour of a tanker may exist, dynamic positioning of ETVs may be applied.

9.3.7 Ferry Disasters and BAFEGIS Experiences

The numbers of casualties of the "Herald of Free Enterprise“ and "Estonia“ are well known. A massive loss of life occurred, putting the ferry industry in a very bad light and as a result a large number of measures were taken by the international safety community. Bad operational procedures were revealed regarding internal safety and measures were taken to remedy the situation.

The loss of life was tremendous and one wonders if close monitoring of these vessels by an Authority may help identify any problems on board and when there is a need for aid to be provided immediately. The risks may be categorised under two headings: internal safety of the vessel and traffic safety.

The first aspect is associated with the seaworthiness of the vessel. It is known that for the operation of high speed craft special maximum weather conditions apply. If the actual or expected weather conditions are worse than permitted, such a vessel should not set out to sea. The risk of foundering can be avoided in this way.

The second aspect is that any collision or grounding may result in heavy loss of life. Ferry operations may be improved when they are monitored from a central place (a Coast Guard or VTS Center) in relation to the weather conditions and the presence of other vessels. Slow vessels may be provided with information that a ferry or fast passenger catamaran is on its way and its route. Navigators of smaller vessels are properly informed. AIS will play a large role. This will improve the communications between ships but also provides on line information to the Center.

Close monitoring of ferries can be done by a regional traffic image in a Coast Guard Center where wind and waves can be indicated to the Master, so that appropriate decisions on the operation of ferries can be taken. The monitoring of the regional traffic image also provides information to the ferry, as well as to other ships, about the traffic picture in the area.

Measures such as special monitoring of ferries in a regional traffic image may help to avoid any incident that may affect the safety of the vessel and that of the passengers on board.

First experiences regarding the second aspect were obtained during the bilateral project for a Baltic Ferry Guidance and Information System – BAFEGIS [31]. After the "ESTONIA" disaster Swedish and German government, authorities and industrial partners decided to start an experimental system in accordance with IMO-Resolution A.795 (19) and which was also related to VTMIS matters. Using transponder and ECDIS technology a guidance and information system were introduced and tested. The participating vessels got additional meteorological information (direction and force of current and wind) via the VTS center, with special focus on relevant way points of the planned ferry routes. Furthermore the vessels received additional position and movement information from the participating ferries by means of AIS transponders.

The VTS centers involved received an additional ECDIS based traffic image where radar and AIS information were displayed. By means of the ship-to-shore AIS transponder data exchange one further possibility for identification was given for shore based traffic monitoring and traffic management. Therefore additional and GPS based ETA data were available for space allocation within the Warnmünde fairway.

Under the VTMIS-project the BAFEGIS system was extended for permanent traffic control of the whole route of a ferry crossing the Baltic Sea. This could be monitored continuously by the VTS center.

During the tests, the shore side traffic management related matters were taken over by the VTS operators, who were trained on special courses in handling the special equipment and perform the additional tasks.

9.3.8 Summary of Traffic Management Tasks

Most of the Traffic Management Tasks at sea have something to do with monitoring of vessels in coastal or MARPOL areas, with special emphasis on MEHRAS or ABTA’s. In some cases, dynamic routing of specific vessels and the allocation of an ETV can also be seen as Traffic Management tasks. Most of these activities are based on a regional traffic image. This can be constructed when all vessels are equipped with AIS. Outside the areas of VHF communication, other methods may be used, such as AIS with INMARSAT-C. Some specialist companies are currently investigating the practical application of this method. The Coast Guard is not carrying out most of these tasks although exceptions are the CNIS[47] and CROSS-centres in the UK and France.

These tasks seem to be very similar to some tasks of a VTS-operator. These activities seem more to be strategical than tactical and have a character of Traffic Organisation Services. There is a need to have a look at Coast Guard-operator courses and see whether the training of this type of work is included.

9.3.9 IMO Coast Guard Model Courses

In the first instance IMO has made model courses for the following functions:
- Maritime Search and Rescue Administrator
- Maritime Search and Rescue Co-ordinator

The Government of Norway contributes these two model courses to the work of IMO. The scope of the first model course is to provide an introduction to the organisation and operation of a maritime search and rescue service. The model course covers:
- The administrative organisation and responsibilities of a SAR service.
- The international provisions governing search and rescue
- Maritime terrestrial and satellite radio communications and fixed communications
- An overview of meteorological and navigational aspects affecting SAR operations
- The design, equipment and operation of rescue co-ordination centres
- Resources used in search and rescue
- SAR training
- Public relations

This course contains only a few subjects that are also of importance for Vessel Traffic Management operators.

The scope of the second model course is to assist maritime training institutes in organising and introducing new courses as well as updating and supplementing existing training material.

The subjects:
- communications
- meteorology
- navigation
- ship reporting systems

bear some resemblance with the contents of VTS-operator training model course.

[47] The CNIS has only limited responsibilities

The conclusion is that the model courses are not sufficient for any Traffic Management tasks at sea.

9.4 Roles of some European Coast Guards

9.4.1 Spain Coast Guard Training

9.4.1.1 Introduction

The education and training of the Coast Guard in Spain is slightly different to that of other countries, due to the fact that several departments and ministries are involved in controlling Spanish maritime waters.

Until a few years ago, the highest authority covering Spanish territorial waters was the Naval Command which, by means of their regional headquarters distributed along the whole coast, controlled everything that could possibly float and looked after the search and rescue operations. Changes made in the structure and functions of the Navy, led to the creation of special bodies dedicated to carrying out the work relating to maritime traffic (shipping). The functions carried out in other countries by their Coast Guard, in Spain is carried out by:

- The sea branch of the civil guard (Guardia Civil).
- Customs control launches.
- The Merchant Marine Government Office through their organism "SASEMAR"[48].

Each has their own means to carry out their functions and in consequence the training of their personnel varies from one to the other and is not standard.

9.4.1.2 Education and Training Courses

The training courses for personnel who carry out coast guard type operations vary and their content is not standard.

SASEMAR personnel come from the Higher Nautical Training Centers and we may therefore look up the course contents under "Nautical Studies Centers“ under chapter four.

Customs personnel also come from the Higher Nautical Training Centers as well as Technical Training Centers and Nautical-Fishing Training Centers. Although specific subjects and know-how may be different according to level, the basic subjects are very similar.

[48] Spanish Agency for Maritime Search and Rescue and Pollution Control

Lastly, the sea branch of the Civil Guard are members of a military entity who have carried out nautical training that provides them with proficiency for handling the launches they use in their daily work.

9.4.2 Netherlands Coast Guard Training

9.4.2.1 Introduction

The Netherlands Coast Guard was commissioned in 1987. It was a co-operation between 8 agencies of six Ministries. Among these agencies were the Directorate-General Shipping and Maritime Affairs and the Directorate for the North Sea. Both agencies within the Department of Transport and the Royal Netherlands Navy as a part of the Ministry of Defence.

The objectives of the Coast Guard were to carry out the existing legislative tasks of the Administration in the Netherlands part of the North Sea more efficiently with fewer means. It was decided to commission a Coast Guard Centre in Ymuiden. This centre contained the central reporting and information desk and co-ordinates the operational means, such as vessels and helicopters at sea. In case of incidents and accidents at sea the centre was in charge of limiting their consequences.

In the Netherlands, the Coast Guard has some smaller traffic management tasks. There is a special branch for enforcing the international and Dutch law on the Netherlands Continental Shelf. Apart from that the Coast guard co-ordinates Vessel Traffic Services on a temporary basis when special operations, such as pipe laying operations are carried out. The Coast guard controls an Emergency Response Vessel on the Dutch Continental Shelf. This vessel sets out to sea when the weather deteriorates and takes a position where interventions can be easily made.

9.4.2.2 Two branches of the Coast Guard

The Coast Guard is divided in two branches: a safety service branch and an enforcement branch.
The tasks of the safety service branch include:
(b) GMDSS traffic
(c) SAR co-ordination
(d) Disaster and calamity abatement
(e) Vessel Traffic Management
(f) Marine marking
(g) Vessel traffic research

The tasks of the enforcement branch include:
(h) Policing

(i) Enforcement of environmental regulations, such as riles based on the MARPOL conventions
(j) Enforcement of the fishing rules
(k) Enforcement of Vessel Traffic Management and Routing measures, such as IMO routing conventions (TSSs and Deep draught Routes) as well as COLREGS
(l) Enforcement of the rules regarding the SOLAS convention
(m) Customs and Excise control
(n) Border surveillance

The Coast Guard area consists of the Netherlands territorial seas and the Netherlands part of the North Sea Continental Shelf. The Inland Sea (Yssel lake) as well as the large former and present sea arms of the South West part of the Netherlands delta is also part of the area under control for the safety services branch.

In summary:
The Coast Guard Centre contains the following elements:
(o) Operational control of all means placed to be provided for the Coast guard tasks
(p) Central reporting and information room
The Coast Guard is tasked with the co-ordination and procession of GMDSS traffic.
(q) National Maritime and Aeronautical Rescue Centre
The Coast Guard Centre co-ordinates all activities related to SAR
(r) National Nautical Information Centre
The Coast Guard Centre is tasked with the collection recording, processing and distribution of relevant information for the smooth execution of her tasks

The director will use the resources at his disposal according to the following prioritisation of the tasks:
-(1) SAR
-(2) Calamity abatement
-(3) Enforcement and investigation of criminal offences
-(4) Incident management
-(5) Other enforcement tasks
-(6) Remaining tasks

9.4.2.3 Training of Coast Guard Operators

The Netherlands Coast Guard trains its own personnel. The number of Coast Guard operators is 21 with 7 supervisors. Recruitment is not specific, but candidates with a maritime background and a MARCOM certificate have priority.
The standard training package contains the following subjects:
- English
- Communication, including GMDSS, telex and fax.
- Typing
- Aeronautical knowledge

- Nautical knowledge
- ADAS operation[49]
- Means to be used in the Coast Guard and SAR operations
- Exercises
- The use of NEREUS. This is a system that allows Coast Guard operators to retrieve dangerous cargo information of vessels if this knowledge is relevant for the success of the operation.

This training scheme generally takes 6 months. Additional to the successful completion of this training is on-the-job training of approximately 4 months before the Coast Guard operator is ready for the job.

A part of the ADAS training is scheduled in the training centre of HM Coast Guard, Highcliff, Christchurch UK. The reason is that the Netherlands Coast Guard is using an adapted version of the same logging and recording system as being used by the HM Coast Guard. The same establishment also provides training courses for the Coast Guard supervisors.

Traffic Management tasks are part of the daily operations carried out by the Coast Guard. The Coast Guard Centre has no regional traffic image at its disposal.

When AIS technology is introduced on vessels in 2004, the Coast Guard may have shore infrastructure to monitor traffic along the Dutch Coast within VHF range. Plans for a regional traffic image for the Coast Guard as a response to the introduction of AIS is in a very early stage.

The Dutch Ministry of Transport and Public Works is presently working on WARIS. This can best be described as an AIS system that uses long distance communication methods. The Ministry didn't publish any future plans of the use of WARIS.

[49] ADAS is a continuous logging system where all events are inputted.

10 VTS Training for Merchant Marine Officers

10.1 Training in the Netherlands

During the last two decades some experts and professional have advocated that in the training of Merchant Marine Deck Officers more emphasis is placed on the procedures in a VTS area. This should be a part of the training.

The NNVO has requested the Nautical Colleges to include VTS in their curricula. At a later stage they have requested to change the terms of the first mate's certificate examination so that this subject is properly integrated.

The VTS-committee of the Dutch Harbour Master Association also requested that more attention be paid to this part of the training. This was based on a number of reports from VTS that mariners have insufficient knowledge of procedures in VTS covered areas. Changing curricula in Dutch Nautical Colleges cannot solve the problem. It should be done on an international scale.

10.2 Training in Spain

The premises that form the basis for choosing personnel to cover VTS operator needs in Spain are related to the know-how received in the nautical training institutes. Therefore, all future VTS operators must be Merchant Marine Officers (Masters and Deck Officers).

The considerations addressed by this chapter are directly related to chapter four. Therefore we shall not repeat concepts dealt with there but would rather develop a series of points that lead us toward a definite shape for the integrated training of VTS operators.

10.2.1 Initial training.

Using the supposition that all VTS operators in Spain must come from the Merchant Marine, meaning that they possess an officers or captains certificate, we shall differentiate between console operators who are in charge of a watch duty, and center managers or directors. We understand they should severally receive different levels and contents of training.

The data and training programmes described under Chapter 4 are provided in a generalised manner for all VTS operators. After this initial training the students are capable of taking on operator functions at a VTS center.

The operator with a captains' certificate (essential requirement for any candidate to managing a VTS centre), must spend a period of time that is not less than three years, covering all the posts and functions in the center and carrying out all the watch duty positions. During that time they may access refresher courses to complement their initial training.

10.2.2 Review Of VTS Training For Shipmasters And Officers

The main objectives and characteristics of training courses for VTS operators (deck officers and pilots) are being reviewed because of the technical advances being made in order to maintain the programmes and contents up to date.

- First of all because the curricula for the Nautical Training Institutions have varied their contents.
- Secondly because shipping traffic conditions have changed in specific areas.
- Thirdly because it is necessary to consider all the procedures related to the new GMDSS, and new technology appearing daily in order to improve VTS equipment.
- Lastly, the number of VTS in Spain has increased considerably, practically covering the whole of the country's coastline, and needing more staff.

The proposal of maintaining on-going training by means of seminars and refresher courses will provide a pool of qualified personnel capable of directing a VTS centre.

10.2.2.1 Advanced Training Courses.

Search and rescue operations should be completely under the control of the operators since they are highly complex operations and imply a large number of areas to be monitored. VTS centers aid and co-ordinate search and rescue operations and their personnel should be able to control all facets of the operations involved. Therefore, this course includes some basic notions. Keeping in mind personnel who are candidates to managing the VTS center, an advanced course should have the following contents:

- National Plan for Rescue.
- International Search and Rescue Systems
- Knowledge related to:
  - Means available for the rescue of human lives.
  - Means available to be used in an emergency.
  - Use of outside resources available through agreements among the different organisations/entities in possession of resources useful for search and rescue and pollution control.
  - Ruling related to maritime traffic control.
  - Requirements for the protection of the marine environment.
- Provision of an appropriate education of all personnel integrated into the different organisms dealing with safety and pollution matters.
- Increase knowledge in matters related to computers, communications and in general all skills that may be considered a priority requirement in the development and function of the VTS centre.

10.2.2.2 Refresher Courses

Refresher courses, or complementary training that is addressed to personnel with sufficient sea knowledge and experience in VTS operations, that will provide the student with solutions to complex situations.

Content may be theoretical or practical on technical specifics of the VTS function, and may include the following subjects:

- Novelties in equipment handling.
- Introduction to new working procedures.
- Use of computer applications addressing automation processes.
- Simulation of high density traffic navigation.
- Handling large quantities of information

In general, the courses should insist on certain fundamental points related to ship movements and that are very useful when faced with a console for following the evolution of shipping traffic. For example:

- Proficiency in appreciating changes in route and speed of the echoes on screen.
- Differentiate between an echo that is connected to the traffic and when it is interference due to factors outside of the navigation situation.

10.2.2.3 Need for Officers and Shipmasters.

With respect to Spain, the main philosophy applied to Chapter 10 "VTS Training for Merchant Marine Officers“ has been considered keeping in mind the needs of students of the Nautical Faculties when aspiring to the posts of VTS operator, particularly when they need to have an Officers' certificate at least.

The problems arising between Shipmasters and VTS operators on arrival of a vessel in a port, may become quite serious until such time as the procedures to be followed for communications and messages are made standard.

The guidelines published by the IMO are insufficient and deal with the subject in a very superficial way. This lack of firmness in the resolutions relating to the procedures used results in inefficiency. For example, in Spain the messages exchanged between VTS and ships cover several different factors for implementation. (See External Procedures in Spain).

10.3 Training in Germany

The training course content for navigating officers is different at each of the 10 maritime training facilities in Germany. All the maritime departments fulfil the standards defined in the latest convention on standards of training and certification of watch keeping officers STCW 95.

However at the Department of Maritime Studies in Warnemünde there is a course called "Maritime Traffic Safety" in which VTS matters are taught in detail. Simulator exercises for navigation in coastal waters and harbour approaches includes communication with VTS centres as e.g. the compulsory reporting at defined reporting points in the given simulator area.

Pilots carry out their own training programmes that include radar advice from VTS centers on shore. There are special courses for VHF-communication in cases of bad visibility. However, a structured training programme is currently being prepared which will also include a wide range of VTS related matters. The aim of German VTS pilots is to perform special Vessel Traffic Services and to keep permanent watch in the VTS centers in Germany.

11 Discussion

If VTMIS operators are defined as operators in competent authorities who manage Vessel Traffic, then the following types of operators can be envisaged as capable of such responsibilities:
-(I) VTS-operator
-(II) RIS-operator (traffic flow)
-(III) A Coast Guard Vessel Traffic operator

11.1 VTS-operator

VTS operator training framework in principle exists. The VTS Guidelines [32] and the Guidelines for VTS-operator Training [33] provide a solid framework and the IALA VTS committee recently has published a Model Course as a programme for syllabus and training content overview. If this model course is taken as a foundation in each member state, there is no doubt that appropriate training can be provided. However, definition of more detailed procedures and scenarios, which could be different even in EU countries, may or should be developed in the future. In principle, VTS and VTS-operator training are now so mature that the only thing left seems to be full-fledged implementation.

However, only a few member states are capable of providing the recommended training immediately. The Netherlands has a system that has existed for over a decade: a basic course for VTS-operators and two approved VTS-simulators. It may be expected that Norway will implement the Model Course, and VTS training based on it, in 2000. In the UK discussions are ongoing as a result of the Sea Empress accident and it is expected that new initiatives be taken in the UK. Training courses for VTS operators (deck officers and pilots) are in existence and currently being reviewed in Spain.

A recommendation of the TAIE final report in 1994 suggested that a central European office be founded to provide harmonised courseware for VTS operator training. In 1999 this recommendation has been implemented, since the IALA VTS committee provides a framework for training in the model course.

Germany has started centralised VTS operator training and will implement basic courses in 2000 using an up-to-date VTS-simulator.

Missing elements are still the minimum requirements for a VTS-simulator. These minimum requirements might be taken from Dutch law, where in an appendix to the Shipping Traffic Law they are provided. There should also be a set of scenarios similar to those developed under the MASSTER-project [33] for ship handling and engine operation, where procedures and harmonised actions for training scenarios are defined.

Quality Control of VTS training might also be a subject that deserves discussion and European decision making. Other participants in navigational safety, such as pilots, are in the process of designing quality control measures. These measures may introduce a regular quality of piloting once the EMPA has accepted these quality standards. It would be wise that VTS competent authorities in Europe, through IALA, discuss the necessity of Quality control. Auditing of these standards in European VTS by auditing squads send by the Commission, may be one way of ensuring quality and uniform (communication) procedures. Uniform European VTS will highly contribute to safety in VTS covered areas.

The development of VTS over the last 15 years has resulted in a comprehensive framework for training of VTS-operators and an understanding of VTS by various users. It is hoped that all maritime member states will not need another 15 years for implementation.

11.2 RIS-operator

RIS is an attempt to start an inland RTIS. Although RIS has more facets, we will concentrate here on the Vessel Traffic Management tasks of a RIS. Inland VTS is providing information to vessels when they are navigating in an inland waters environment. An important part of the information is given to vessels that want to join the main traffic on rivers when they leave side canals or locks. Traffic information is provided on the basis of a local or tactical traffic image. This image is built on radar technology. In the Low Countries these vessels are not always able to view the river since high dikes may obstruct their view. Information on the traffic on the river in both directions is then provided by the VTS-operator to the skippers of the vessels.

In RIS (also in RINAC) ideas are developed that a lot of the information that is provided by the VTS-operators is shown on the bridge of the vessel. The use of AIS as an essential element should be mentioned first. Inland vessels will be provided with AIS and Inland ECDIS charts so that the skipper knows the position of own ship and other AIS vessels. Information that is presently provided by a VTS-operator verbally is now provided by other means. The identification of the vessels facilitates communication between them regarding safety issues and again intervention by a VTS-operator is not required. Navigation assistance services as provided by VTS-operators are not required. AIS include accurate DGPS and consequently the position of a vessel is sufficiently known for navigation purposes.

General information on the waterways can be provided by FIS (Fairway Information Service). Such a service provides information on among other, water levels, water currents and possible closures of waterways. (Such a service could also take care of Inland ECDIS updates).

The provision of safety information on the bridge of an inland vessel includes general information, traffic information and navigational assistance. One task of a VTS that is Traffic Organisation Services is not yet catered for and in many areas there is no need for them. However the number of vessels using the delta of the Rhine is large. Traffic counts indicate that about 150,000 ships use the lower Rhine or an important part of it. It is expected that that number will increase when the road infrastructure is no longer capable of absorbing more freight and forwarders will look to other modes of transport- among them the inland navigation mode. In that case traffic organisation services will become more and more important.

In that case it can be envisaged that there will be a RIS operator who monitors the traffic flow in a large area and takes measures when vessel traffic creates bottlenecks. The VTS-operator needs to have a regional traffic image or strategic traffic image for this purpose. This traffic image is based on AIS technology with links from vessels to a shore station. The quality of this image is dependent on the coverage of AIS on ships. A Strategic Traffic Image based on AIS will not be complete if not all vessels are equipped with AIS. Radar coverage of parts or the entire RIS area should then supplement the information in the Strategic Traffic Image. A RIS operator can be seen as a VTS-operator but the emphasis of his activities will be more oriented to traffic flow management and enforcement rather than to Vessel Traffic Management in its present form.

This overview of the (future) RIS and the RIS operator as developed from a number of VTS is rather simple. RIS is not yet implemented. Demonstrators are in the planning stage and an evaluation of users opinions will be made. A crucial item is the presence of AIS on board of the vesselsand this can only be guaranteed if the member states (probably through the Rhine and Danube Commissions) are willing to make AIS installation a requirement. The decision to make AIS mandatory will not be easy as many skippers will resist such a demand on costs grounds. When RIS is not used in large parts of the main rivers, skippers can only apply the device in smaller areas. This will neither promote the interest in buying AIS-equipment voluntarily, nor the desire to make AIS a mandatory requirement by the safety authorities.

Therefore a major problem will be, as mentioned before, that all river users will not have AIS. Pleasure craft and very small other vessels will not qualify for AIS. Those vessels can only be detected by radar. Radar on board can detect small vessels but this equipment is direct line-of-sight equipment and vessels without AIS and covered by dikes are not likely to be seen on a PPI. Using shore-based radar pictures on board can solve this problem. However the link of the vessel to the shore-based radar equipment needs to be suitable to accommodate the data flow, if shore-based radar images are sent.

These problems should be solved before the present VTS stations are replaced by a RIS station with a regional traffic image for a whole region. The RIS-operator is a kind of VTS-operator with emphasis on Traffic Organisation Services (Traffic Flow Management may be a better description). The future of the RIS operator will depend on the success of the demonstrators of RIS and the evaluation of the most essential parts of the RIS by the responsible agencies in the co-operating member states.

11.2.1 The Coast Guard operator

Coast Guard Services are provided in EU in different ways. Some countries have a Coast guard covering all elements from SAR to emergency handling like oil spill combat and policing the sea area. In other countries these tasks are distributed and given to several affiliated organisations and institutions. The main part of Coast Guard service operators or watch officers is the co-ordination of Search and Rescue. This task is mainly performed by around the clock watch on the safety and distress communication channels. In many cases a Strategic Traffic Image can assist the watch operator in optimising search patterns and tasking the appropriate resources.

In some countries these watch officers have other tasks too. Among these tasks are Vessel Traffic Management tasks. Examples of these are the organisation of mobile Vessel Traffic Services when special operations at sea are carried out. In some countries Coast Guard is involved in policing the sea area adjacent to the coast where the coastal state has responsibilities for the EEZ. In other countries the Coast Guard[50] carries out the tasking of an ETV. Recent accidents[51] have caused a reconsideration of Vessel Traffic Management tasks at sea. An important contribution for the UK is provided by the Donaldson report. Other member states consider whether introduction of ETVs can reduce the pollution as a result of accidents. Cost/Benefit analyses show that the costs of commissioning and maintaining ETVs are high and that the effective range of these vessels is small in case of big vessels used for this purpose only other measures might supplement or replace big ETVs by smaller multipurpose ships and to support the traffic by dynamic routing.

Regarding the use of ETVs further research work is recommended:

- to estimate the optimal number and size of towing capability of ETVs (they should be able to do other tasks such as fire fighting or oil pollution combat
- to determine the optimal location of ETVs and operational procedures for Coast Guard / VTS operator to guide these vessels
- agreements between EU countries for mutual use of such vessels.

The suggested dynamic routing sends vessels carrying dangerous goods farther away from the coasts if weather conditions are bad. This dynamic routing requires some form of reporting and the increase of the powers to intervene by the coastal state in case of threat to the coastal state. Certainly it is only acceptable at low cost for shipping and when it is done in **all** European Countries. The solution of using dynamic routing doesn't require much new equipment, but will certainly not fully replace ETVs. AIS will become mandatory in a few years. It is required that Traffic Images can be made in a Coast Guard centre or in a MRCC. ECDIS technology is available[52] and the AIS technology is rather mature. The costs of setting up a Traffic Image might require some

[50] Or affiliated organisations such as MCPU in the UK.
[51] Among them are: Brear, Estonia, Sea Empress, Pallas and the collision between the Ever Decent and the Norwegian Dream
[52] ECDIS technology is available, but ENCs are not available for many sea areas as yet. This situation will only slowly improve.

investment, but maintenance costs are low. It seems more cost-effective than the acquisition and maintenance of ETVs. It is certain that when such schemes need to be implemented large discussions in IMO are required.
These Vessel Traffic Management tasks can be carried out using reporting schemes and/or the use of AIS. A Strategic Traffic Image is required. In principle only the vessels carrying dangerous goods should have these reporting duties. When large vessels with large fuel tanks are also considered as a vessel carrying dangerous goods for the purpose of oil pollution combating a Strategic Traffic Image will contain nearly all large vessels over 10,000 GT. The role of the Coast Guard of co-ordination of SAR makes a Strategic Traffic Image desirable for assisting merchant vessels in distress. Although this part is important, most co-ordination is required for incidents and accidents with small vessels, such as leisure craft and small fishing vessels. Many countries will hesitate to provide budgets for a Strategic Traffic Image to assist the Coast Guard for this reason. For small vessels an AIS based Strategic Traffic Image is useful when the Coast Guard watch officer decides that a merchant ship might provide assistance before a lifeboat or helicopter arrives on the scene. This will not frequently be the case. However, when these Strategic Traffic Images are also useful for counter pollution purposes the balance can tip over.

New technology such as AIS as well as advancements in the ECDIS and communication technology can be used for some Vessel Traffic Management tasks at sea that are designed to minimise loss of life at sea and/or avoid large calamitous pollution resulting from ships.

There is a need to a uniform approach, initiated by the Commission. Some of the measures should be discussed in IMO, since they can be considered as part of the routing measures that are discussed and proposed by IMO.

Many of the Coast Guards in the member states of Europe are able to implement these measures without many problems, since their Coast Guards are well equipped for their tasks and can be made ready without large financial and training problems.

Training of the sea Traffic Management Tasks for Coast Guard operators can be carried out to determine what part of the VTS-operator Model Course can be applied to the training of Coast Guard operators. It is believed that a large part of the Coast Guard watch officer training and VTS-operator training overlaps and that the drafting of appropriate parts can be carried out without problems.

11.2.2 Conclusions

This study well allows for drawing the following conclusions:

- There is no need to see a VTMIS-operator as a new function for a new system. Vessel Traffic Management is already carried out on different locations: at sea in approaches and in ports and in inland waters.

A Coast Guard watch officer or operator can be tasked with Vessel Traffic Management in coastal waters or at sea. This task will always be subordinate to SAR services and the saving of life at sea. Part of Vessel Traffic Management can be seen as measures to thwart the threat of pollution on the coast and coastal seas[53]. Implementation of dynamic routing measures for specific vessels can be a part of the counter pollution measures but these measures are part of Vessel Traffic Management.

A VTS-operator is an operator tasked with Vessel Traffic Management in approaches and ports. Inland waters also belong to the area where VTS-operators are active. In some cases VTS-operators are working in International Straits. Their scope of power is limited due to international law. VTS-operators have well defined functions, agreed on international level.

A RIS-operator is a special case of a VTS-operator in inland waters. Such an operator's main task is Vessel Traffic organisation and monitoring. This is due to the characteristics of RIS where Vessel Traffic Information that normally is provided to vessels by VTS-operators is provided by electronic means. This is also possible owing to the special nature of inland navigation that is distinctly different from Vessel Traffic consisting of seagoing vessels. A more strategic task remains in some densely populated inland fairways, such as the lower Rhine and the Scheldt. Traffic flow monitoring and, if necessary, implementing dynamic measures to cope with the safety and efficiency of the traffic flows is the major task. Enforcement of these measures can also be seen as part of the monitoring process. A RIS-operator is a VTS-operator specialised in a particular task.

- The framework for VTS-operator training has reached a mature stage, based on international agreement. The IALA VTS committee was instrumental in providing that framework. Presently, only a few European countries have organisations in place that can provide the training for VTS-operator in accordance with the framework of the Model Course. More detailed definition of external procedures in VTS, standardised response actions and the collection of existing or generation of new scenarios for simulator training, should be developed as part of such courses.

- Vessel Traffic Management at sea is under debate by some European Countries. ETVs are stationed in some countries. Dynamic routing as an additional or replacing measure is not yet proposed by anyone European Country, but many Maritime Safety Agencies are considering measures. Legal problems such as the interpretation of the intervention convention need to be solved. Without doubt, dynamic routing of tankers is more cost-effective than an ETV alone. Investigations are necessary to guide and to co-ordinate the operation of these vessels and to prepare strategic concepts for response measures in case of emergencies.

- Many European Coast Guards are able to provide Vessel Traffic Management at sea, as long as the priority of the main SAR task is not

[53] In fact the MARPOL zone appointed to each Coastal State

jeopardised. Training for these tasks can be incorporated in the training schemes of Coast Guard watch officers or Coast Guard-operators. This operation is not very difficult since parts of the Model Course for VTS-operators can be used.

- If there is a need for RIS-operators in inland navigation as a result of the evaluation of the INDRIS operators these RIS operators can be properly trained. Again the Model Course should provide guidance. The subject of Traffic Flow Monitoring and Traffic Flow Management can be easily added.

11.2.3 Recommendations

This project also leads to a number of recommendations. Among these recommendations are:

- The quality of VTS-operator should be maintained. This quality includes the use of standard maritime phrases that are easily understood by mariners of all nationalities. This quality assurance can be implemented by a central European agency that carries out check spots and audits at all VTS of the member states. Such an agency reports any deficiency of the code of practice to the competent authority and the Commission and recommends measures to achieve improvements. This will be a large contribution to the safety of navigation in European waters.
- Clearer definitions and descriptions of the tasks and procedures within VTS operations should be developed as both to enhance or standardise elements of these procedures and to form a basis for the quality assurance and examination.
- Examination is not yet a part of the Model Course. It is recommended that this QA agency also provide a framework for proper examination of the basic course as well as refresher courses. An example of this is provided by the Netherlands NNVO.
- It is recommended that the feasibility of a European system for examination with exchange of trainers/VTS simulator instructors and examiners is investigated and the form of an agency that is tasked with examination.
- It is recommended that the Commission urges its member states to (re)consider Vessel Traffic Management at sea and which measures should be implemented to provide for clean and green European seas.
- It is recommended that the use of Strategic Traffic Images to provide assistance in SAR tasks is promoted by internationally accepted AIS and ECDIS technology. Moreover the concepts for emergency response measures should be generally investigated and revised on an European level whereby new technologies for decision making should be taken into account.

11.2.4 Training the Educators

Studies carried out show up different technical aspects of the education and training of personnel destined to operate VTS services, but nothing has been said about the teachers and educators.

It has been taken for granted that the teacher is prepared to carry out their mission even though there is no founded reason to support this supposition. There is no center where specific training is provided for teachers.

We believe that the operator's job is sufficiently important with a high enough responsibility to demand that the people teaching the courses must have received specific education/training first of all in the subject matters involved and secondly in teaching methods and planning.

11.3 Harmonisation and Standardisation of Procedures

11.3.1 Conclusions

The present situation according to the implementation of standardised and/or harmonised VTS procedures in Germany is characterised by a relative low level. There are only fewer procedures that are detailed declared in the official rules for VTS operations. First approaches to standardised procedures concern VTS interactions to contribute to collision avoidance and to standardise the content and the course of standard messages to be given by VTS operators (as e.g. hourly traffic information). Although procedures are need as one basis for training, their definition is mostly left out and was declared as training content. This means that in Germany the rules describe more the aims of VTS operator actions and leaves the specific action to the operator. Within the training courses operators should learn different appropriate methods for carrying out a suitable action to intervene successfully in specific traffic situations.

However, from the German point of view, comprehensive described procedures, that are a necessary foundation for standardised training and education, also require a clear and detailed description of relevant parameters and especially criteria that should initiate a certain operator action. The great variety of possible traffic situations, of the environmental conditions (weather, tide, current) and the regional differences between several VTS areas (linear fairways, channel fairways, fairway bounds, VTS areas with two dimensional traffic and TSS) leads currently to the very general description of the VTS operational procedures. Beside these facts also the differences of the technical equipment in the VTS centers prevent a detailed determination of what a VTS operator has to perform in special traffic situations.

Finally the lack of quantified criteria for "the safety and efficiency of traffic" as mentioned in the IMO-VTS-Resolution, generally valid and to be used by VTS operators and ship officers, is a stumbling block for the introduction of procedures and their standardisation and harmonisation. In consequence it is difficult to describe training aims as well as assessment and evaluation criteria for VTS training exercises.

As described above in relation to air traffic control, there are some rules containing quantified limits (e.g. horizontal and vertical separation standards) that seems to be suitable for application in vessel traffic. Therefore further investigations into the other transport modes, especially the air traffic should be performed to identify if it is possible to use similar regulations and apply them to VTS.

At present more detailed procedures are mostly described referring to concrete situations and environmental parameters (such as passage prohibitions of certain ships in specific fairway positions) and so they are not valid generally.

11.3.2 Recommendations

Under this project it is only possible to take a timid step toward reaching the final aimd of drafting a framework for a VTM operator training programme. The development of VTMIS is still in progress, a lot of technical equipment will influence the building up of such advanced systems presently and in the future. So the activities a VTM operator has to perform can presently not be described completely. However, it is necessary to attempt this in order to develop a corresponding training programme for such personnel.

In order to develop harmonised training programmes for VTM operators it will be suggested to include within the 5th Framework Programme of the EU the following matters for research studies:

1. to describe the connection between operational procedures and training in order to clearly define the requirements for harmonised procedures
2. to complete the exemplary inventory of existing procedures already harmonised on a national level,
3. to investigate the possibilities of harmonisation with respect to experience in other transport modes
4. and therefore study the other transport means and their rules and regulations to identify the relevant items that can also be used for the creation of harmonised operational procedures in VTM,
5. to compare training contents that are already internationally harmonised on the basis of IALA recommendation V.103 with requirements to modify/extend the existing training content so that they then comply with requirements for harmonised procedures

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Annex I: VTS in different countries

	France Coastal VTS (C.R.O.S.S.)	**France** Port VTS	**Germany** VTS	**Netherlands** VTS	**United Kingdom** VTS
1. Description of VTS	The 5 Centres Regionals Operationnels de Suveillance et de Sauvetage have 4 major functions: ¡- surveillance of traffic and aid to navigation ¡- reception and centraliation of distress signals & coordination of search and rescue ¡- collection of information on pollution ¡- police maritime fishing	Extension of Harbour Master duties, including those of IMO A.578(14) , such as:- ¡-Traffic Management ¡-Information management ¡-Disaster / Emergency manage- ment cf contingency plan	Part of German Waterway Administration, VTS acts as:- ¡-shipping police ¡- traffic management for safety and efficiency ¡-pollution control Hamburg and Bremen operate their own VTS.	VTS recognised by national law; exercises functions of IMO 578(14) and, in some cases pilots give shore-based radar assistance to shipping from VTS centre.	1) Port VTS since 1948 (Liverpool) as extension of Harbour Master duties for safe and efficient running ofport. 2) The Channel Navigation Information Service (CNIS) is a form of coastal VTS for the Dover Strait
2. Legal basis for VTS	Decree of 9 March 1978 giving	For independent ports, the	VTS is not mentioned in any law	VTS is covered under National	There is no national law to

	Maritime Prefectures administrat- ive powers of civil police at sea and coordination of the actions of the State at sea CROSS centres come under the Interministerial Commission for the Sea, part of the Ministry for the Sea	Maritime Ports Code gives the Port Director authority (article R 113.9); Book III of the Code gives the same authority to the Head of other ports. The existing duties of Port Officers under Book III of the Maritime code cover the functions of VTS operator.	but the legal basis for traffic control is found in several national & international laws. The German waterways are under control of the Ministry of Transport. The ports of Hamburg and Bremen operate their own VTS. The basic document for VTS management is VV-WSV 2408	Shipping Law which resulted from a Joint Venture of Authorities. VTS come under the authority of the Ministry of Transport.	regulate VTS. VTS come under the byelaws of the respective Port Authorities (eg: the Harwich Haven Authority VTS comes under the Harwich Harbour Act of 1974). The CNIS is an operational arm of the Department of Transport and is run by H.M. Coastguard
3. Types of operator post	Traffic watch: chief of watch operator Operations watch	Port Officer (OP =officier de port) Deputy Port Officer (OP adjoint) Auxuiliary Deputy Port Officer Radio/radar Officer*	Head of VTS centre Nautiker vom Dienst Assistent (+ pilots for shore-based advice)	Function 1: in charge of operat- ions, give instructions and information to shipping: Central VTS manager	Officer of the Watch Assistant

	chief of watch operator 24-hour Duty Officer on call	(*maritime traffic controller at Le Havre)		VTS Manager (as for Central but limited to part of VTS area) Function 2: only give information VTS Official Pilots may give advice to ships	
4. Recruitment /entry requirements	Traffic watch: ¡- chief of watch Merchant navy officer or national navy reserve doing national service ¡-operator national navy military servic e Operations watch	OP & OPAdjoint recruited by exam open to mariners with seagoing license from merchant /national navy and >10 years sea experience OPA auxiliaire usually former mariners preparing for OP / OPA exam	TheWaterway Authority is responsible for recruitment and selection. All members of the nautical part of VTS centres mus have sailed on ships and have a basic knowledge of sea-manship before applying. VTS head and NvD	Central VTS Manager Higher nautical diploma, NNVO Training course + >5years experience at Function level 2 VTS Manager Higher/Medium nautical diploma & NNVO training course + >5years at Function 2	Officer of the Watch : Master Mariner Class 1 Assistant: Various backgrounds, but preference to those with seagoing experience

	watch officer navy radio/radar officer operator quartermaster or AB radio	 radio / radar operator usually recruited locally by port from radio officers of merchant or national navy	Master Deep Sea license VHF license fluent English seagoing experience ¡-usually from Merchant Navy some from government Waterway Authority vessels Assistent at least AB ticket VHF licence English seagoing experience ¡-the real basic qualification varies from AB, shipmechanic, radio operator to Master license for coaster or fishing vessel	 VTS Official Medium/lower nautical diploma NNVO training course + >5years in a nautical function* *seagoing experience is required for operators in centres in contact with vessels at sea	
5. Training	Minimal on-the-job training.	There is no harmonised,	There is no mention of training	In 1985 the Dutch authorities	Port VTS

	Since 1988 a PC-based communications training simulator has been available at Corsen for watch officers This involves a simplified radar simulator and learning phrases appropriate for a range of scenarios (infringements, collision-course, etc).	national training scheme. The DPNM (government port & maritime directorate) commissioned a feasibility study in 1987. This led to a modular curriculum based on COST 301 7.2, IALA guidelines and task analysis, but this was never implemented. Training is therefore on-the-job at present.	in the document VV-WSV 2408 <u>NvD training</u> lasts about 6 months, is on-the-job and may be more or less structured, according to the VTS May involve periods in various relevant organisations. Is backed up by literature, booklets on communications practice, etc; There is an oral exam at the end given by a Waterway Authority Mentor	set up a national VTS education and training programme under a joint-venture organisation (National Nautical VTS training/ education Organisation or NNVO) Since 1986 a purpose-built training simulator exists devloped for the government (DGSM = Directorate-General of Shipping & Maritime Affairs). A second simulator owned by MSR will open in January 1994	Depends on the port. Always involves on-the job training which can vary in length from 1 week to 12 weeks or more. Some ports (eg:Harwich, Southampton) use a simulator at Warsash; some ports (eg: Sullom Voe, Harwich, Southamp -ton) operators take refresher courses (*see Table X for more info)
Training (continued)			<u>Assitent training</u> On-the-job. Most were employed	The NNVO programme was based on IALA, Cost 301 Task 7.20	<u>CNIS</u> All Coastguard personnel are

			on government vessels so have knowledge of the local area and Waterway Authority structure	and task analysis and offers one of the most comprehensive training courses in the world. The NNVO provides compulsory basic, refresher and team training courses on a modular structure *(for details, consult Dijkhuisen & Regelink, 1990)* There is also a regional training course (RNVO) which varies according to the Authority. This is carried out partly on a simulator (eg: Wageningen or from 1994 MSR Rotterdam)	given an introductory 12-month familiarisation course related to all VTS matters, including radar observation courses. There is a 2-week in-house refresher course every 5 years In 1992 a new VTS simulator opened at the Southampton Institute, Warsash campus
6. Future Developement	The existing communications	The backgound of recruits is	The present survey has led to	Netherlands VTS authorities	A future shortage of Master

	training module could be updated and implemented systematically. Secondment is too short to warrant more investment, say officials	excellent, according to a recent survey, but training is not sufficient, especially in comunications, legal aspects, port affairs. Numbers are at the lower limit of that compatible with the VTS mandate. As a modular training course exists, only cost need be an obstacle to its implementation.	recommendations, including: ¡- establish VTS legal basis in a single document; ¡-develop concrete criteria for recruitment & selection ¡- carry out collective training ¡-separate national & local training needs ¡-develop more dynamic training	are reorganising themselves. NNVO is now a sub-department of DGSM, which is now mostly a policy-making department. Rotterdam PA, the Royal Navy the Coastguard and the Rijkswaterstaat have taken over performance of VTS operations From 1994 Rotterdam PA will train its operators (RNVO) on the MSR simulator.	Mariners Class 1 will mean a change in recruitment and so in training. In the short term, mariners with lower qualifications will be taken. VTS could also merge with pilotage. But in the long term recruitment could start at age 18 with a specialised, long training.

Annex II: VTS simulator of the Maritime Research Institute of the Netherlands

Capability Statement
VTS Simulator MSCN

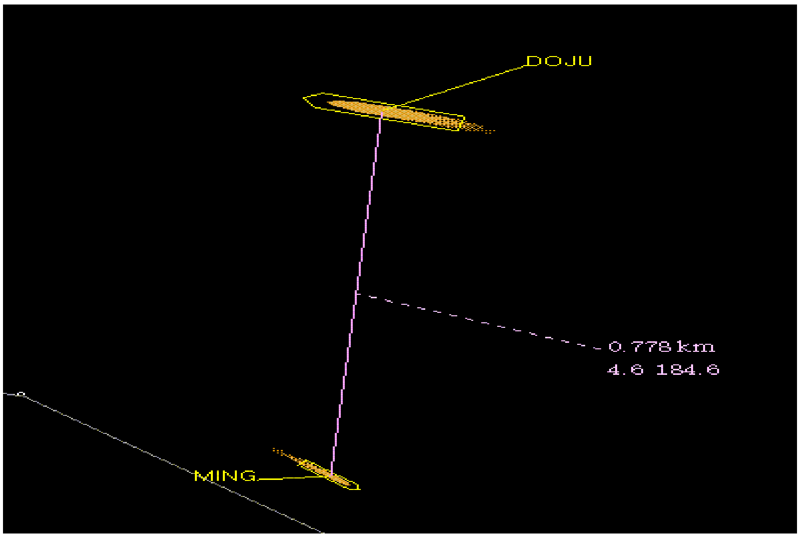
Version: 28 October 1999

Illustration front page: *Westerschelde, Flushing VTS area*

Introduction

The VTS (Vessel Traffic Services) simulator, built in 1998, is used for training sessions of all Dutch (inland and sea) VTS operators as well as Dutch pilots. The simulator fully complies and even exceeds the international standards set by IMO and is certified by the Dutch Ministry of Transport.
In order to allow for a realistic environment, geographical maps and current data may be entered into the preparation system. A comprehensive database of possible ships allows instructors to use ships that often sail in a particular region. Training sessions are based on prepared scenarios which are fully interactive. The radar and communication equipment is similar to the equipment the trainee will encounter in reality.

Below a brief summarisation of the simulator features and its capabilities is given.

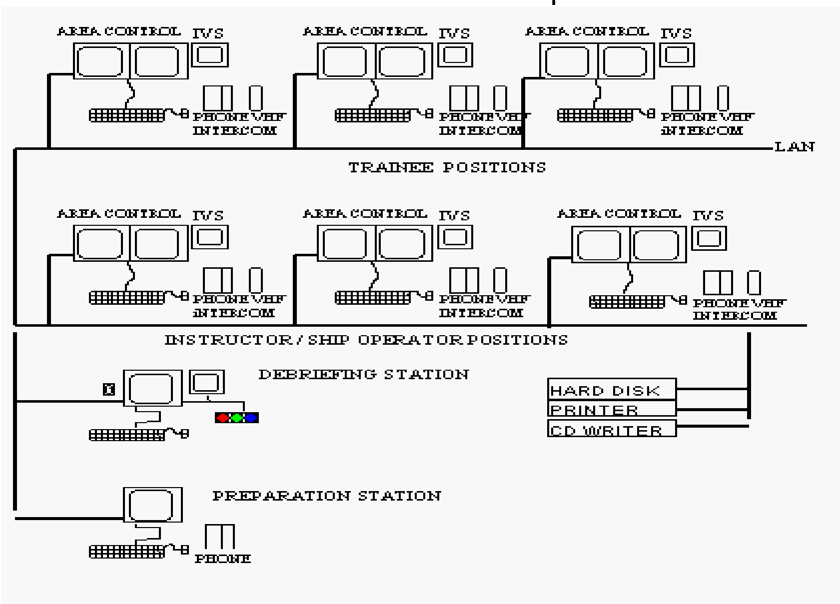


Manoeuvring at close quarters

NOTE: Other simulators at MSCN such as the Bridge Simulators and the Fast-Time Simulation Programme SHIPMA are described in separate brochures. These brochures are available on request.

Overview VTS simulator system

The MSCN VTS simulator is designed to train personnel in handling shore-based ship radio communication services as well as using radar and communication equipment by means of a computer simulation system. The simulator consists of three stations for the instructors/ship-operators, three stations for trainees, a debriefing station and a run preparation station. The stations for instructor/ ship-operators and trainees are equipped with all essential radar and communication means required to fulfil the training objectives.



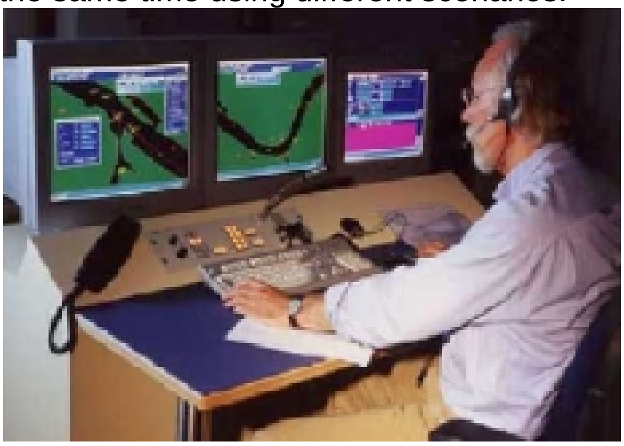
Instructor Segment

From his position the instructor can direct all ships that play a role in a particular scenario. Because the scenarios are not fixed, the instructor is able to interact with a trainee. The instructor position is equipped with 2 radar screens showing the trainee's position, through which he can oversee the same simulation exercise area as the trainee can, but only the instructor has the possibility to change certain settings. E.g. the instructor is able to change the target labelling or can simulate a sudden deletion of a target when it enters a blind radar sector. The means of communication of the instructor position are similar to the trainee's position but also here only the instructor can simulate various types of radio disturbances. Every position (trainee/instructor) is equipped with VHF Radio, intercom and telephone. The instructor and trainee positions are also equipped with a third screen being the IPS screen. This IPS (Information Processing System) will be discussed in chapter 5

Instructors position

Trainee segment

The trainee has the same operating screens and radio equipment available as the instructor but is limited in changing the exercise settings himself. It is possible to train three trainees at the same time using different scenarios.



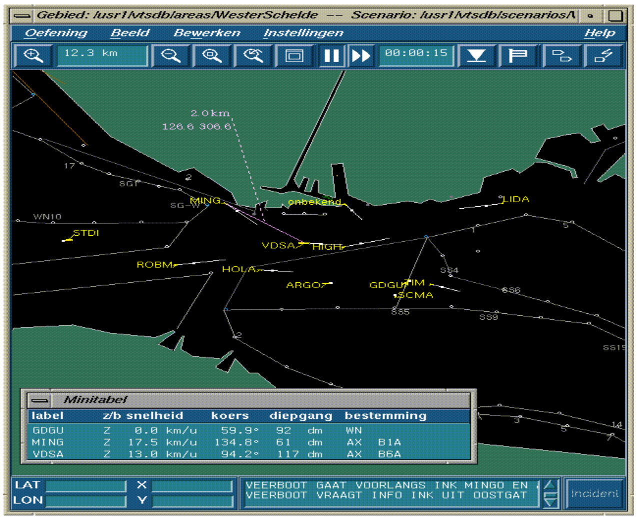
Trainee position with radar and IPS screens

IPS (information PROCESSING system)

Both instructor and trainee can use the IPS screen displaying all relevant information, like ETA/ETD, draft , pilot on board and dangerous cargo. The instructor can change the displayed information during the simulation run and also trigger failures in the IPS system.

PREPARATION Station

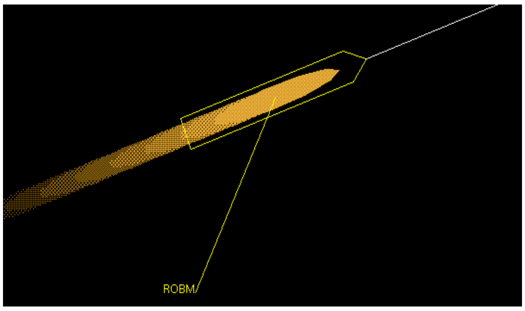
The preparation station is used to prepare an exercise. Its layout is identical to the instructor's position. An extra feature is the scenario editor enabling the preparator to edit text, which automatically runs simultaneously with the exercise at the bottom of the instructor screen. This text is used as a guide for the instructor during the simulator run.



Exercise preparation - Westerschelde, Flushing VTS area

High-level Modelling

To enhance the level of realism with regard to the mathematical ship models of this VTS simulator, data of MARIN's ships towing tank models have been used. Radar target appearances are made with great care in order to reach the highest level of realism.



Synthetic radar appearance of a target with label and afterglow.

DEBRIEFing station

Each run can be debriefed by using a powerful debriefing tool. The instructor is able to “open” each specific run of a trainee with the help of a file browser. During a debriefing session each run can be played again at normal speed or one can jump to a certain moment in time, including sound which is also logged. The debriefing sessions are held in a classroom equipped with a “beamer” enabling all trainees to learn from each others’ actions.

Training and training area SET-UP

During in a course where VTS simulation is combined with theory lessons, a full training crew can have as much as 22 members consisting of 18 VTS operators (trainees), 3 ship operators and 1 senior instructor. During the training strong emphasise will be laid on communication procedures. The simulator has a flexible and modular set-up. The inclusion of synthetic radar allows for training operators of simple shore based stand-alone units and operating complex and sophisticated systems. MARIN’s in-house software designers can easily implement any training area within a short time frame. As a result of this particular modular simulator set-up and all in-house know-how a training can be fully adapted to the client’s wishes. On request the simulator training can be extended with other modules such as Laws and Regulations, Maritime English, Nautical Knowledge and Management Information System Training.

Annex III: ATC and VTS operator training - a first approach to common and different features

The Air Navigation Services Academy

The DFS Air Navigation Services Academy in Langen is the training centre for air navigation services personnel working in operations. State-of-the-art technology and many years of experience guarantee excellence in ab-initio and qualification training.

The Air Navigation Services Academy is not only open to DFS personnel. Both national and international aviation organisations and airlines can book training programmes for different services in the field of air navigation. The courses offered are specially tailored to meet specific requirements.

Air Traffic Control - Operators

For without air traffic controllers, nothing would be possible in national and international air transport. In Germany alone, they controlled more than 2.2 million aircraft movements in 1997. They are in permanent contact with the pilots, in English and by means of radiotelephony. There are tower controllers and centre controllers:

- The tower controller

By means of visual contact, tower controllers control aircraft on runways and taxiways as well as in the direct vicinity of an airport.

- The centre controller

Air traffic controllers in approach and area control work without direct visual contact with the pilots. Same as in vessel traffic the radar is the main technical aids for traffic control and monitoring. Air traffic controllers of the speciality areas "area control" and "approach control" are called centre controllers.

Air traffic controllers in approach control the climb phase of aircraft after take-off until they are handed over to area control. Area controllers then accept these flights "enroute" and guide them on the requested level and flight route to their destination airport. The approach to an airport until transfer to the tower is again controlled by approach control. People interested in one of the jobs may become acquainted with the major differences between tower and centre controllers, both during training and in the later job, when they are visit one of the units of the DFS.

Training characteristics

General remarks

Tower and centre controllers are trained at the Air Navigation Services Academy of DFS Deutsche Flugsicherung in Langen, near Frankfurt/Main. The training of air traffic controllers is tailored to their later work as tower or centre controllers and is subdivided into a theoretical and a practical phase.

Duration of ATC operator training

Speciality area	Tower controller	Centre controller
Theoretical training at the Academy	approx. 12 months	approx. 15 months
Practical training at a DFS unit	approx. 8-15 months	approx. 12-18 months

Table 2: Training duration of ATC operators in Germany

Completion of the training

Theoretical training is accompanied by simulation exercises and practical placements. After completion of the theoretical training at the DFS Air Navigation Services Academy, the training phase is continued as on-the-job training at a DFS unit. During this phase, the acquired knowledge is applied and deepened at a "real" controller working position. Experienced colleagues always assist the prospective controllers.

- Examination
  The air traffic controller training is completed with practical examinations at the working position.
- Training content
  Theoretical training comprises, among others:
  - air traffic control,
  - navigation,
  - air law,
  - aeronautical meteorology,
  - aeronautical English,
  - aeronautics,
  - flight simulation,
  - emergency and failure procedures,
  - as well as radiotelephony procedures.

Specialty area	Tower controller	Centre controller
Possible locations of employment	All international airports in the Federal Republic of Germany: Berlin (Tegel, Tempelhof, Schönefeld), Bremen, Düsseldorf, Dresden, Erfurt, Frankfurt/Main, Hamburg, Hannover, Köln/Bonn, Leipzig, München, Münster-Osnabrück, Nürnberg, Saarbrücken, Stuttgart	all Control centres in: Bremen, Karlsruhe, Langen near Frankfurt/Main, München, Düsseldorf, Berlin

Working position	In the control tower: contact with the pilots by means of radiotelephony, direct visual contact with the traffic on runways, taxiways and in the direct vicinity of the airport	In the control centre: contact with the pilots by means of radiotelephony and radar
Team size	2-4 colleagues	Up to 12 colleagues

Table 3: Speciality areas of ATC operators trainees to finalise their training course

Qualification requirements

In contrary to VTS operator training in Germany, which requires nautical knowledge represented by the holding of a masters license, the education and training of air traffic operators is neither restricted to persons with special occupations or professions nor any professional experience.
The prospective air traffic controller shall have

- "Abitur" or an equivalent qualification that allows a general or restricted university entrance
- due to the international character of this occupation a good command of English, both oral and written
- applicants shall be between 19 and 25 years of age.
- good natural ability to visualise things in three dimensions, an excellent memory and enjoy working with technology.

Medical fitness

A visual acuity of 5/5 (1.0 = 100%) in each eye separately is required. If these values can only be obtained with correcting lenses (glasses, contact lenses), the optimum correction must not exceed ± 5 dioptres.

Applicants shall not have any acute, chronic or progressive pathological condition of their eyes or adnexae; colour perception and hearing must be unimpaired.

Selection procedure

In contrary to the recruitment of staff for the VTS operator education strong examination tests are used in the field of air traffic control. With the help of a selection procedure specifically developed for this job, the suitability of applicants is tested beforehand. The tests will be performed in co-operation with the German Aerospace Centre (DLR).

Training facilities at the Air Navigation Services Academy

Simulator facilities

The Air Navigation Services Academy has different kind of simulation facilities at its disposal. Beside two different kinds of simulators basing on PC-networks there are a Tower-Simulator and a Full Mission ATC Simulator.

The full mission ATC simulator consists of 8 complete controller work places. In most cases 2 trainees will be teached at one work place meaning one trainee as controller and the second as co-ordinator. It is possible to link this ATC-Simulator with the LUFTHANSA Flight Simulator.

The PC network-based simulators will mainly used for self studying. There are simulation work places equipped with facilities for communication and basic flight data processing functions. These work places allow to run special exercises automatically and to practise special operator tasks. The other simulator based on network PC's can be used to train essential courses of flight data processing.

Instructorless training facilities

Beside the simulator facilities for ab-initio and further training the academy is supported by state-of-the-art tools. Computer Based Training (CBT) is an essential component of the DFS ab-initio and further training programmes. At each DFS unit, CBT learning stations are available with a comprehensive offer of self-teaching programs.

At the Air Navigation Services Academy, there is a modern self-teaching centre which is equipped with 17 networked PCs of state-of-the-art technology. This so-called CBT studio offers more than 70 CBT programs for ab-initio and further training of DFS employees. The programs range from air navigation services-related domains, office programs and working techniques to PC-based language training. A considerable part of the air traffic controllers' training is provided with the help DFS-developed CBT programs.

Training methodology

The basic methodology of ATC operator training may be described as a "step-by-step-approach". According to this each learning process is divided into phases and these phases are further divided into learning steps. One learning step is defined as "period of instruction" of a limited duration (approx. 5-8 simulation exercises normally) for one well defined training subject. Each learning step has a specific set of learning objectives.

According to the methodology of the academy the training is structured in the following setting up phases:

1. familiarisation
   basic introduction to procedures, phraseology, structure of air traffic areas, place of work and its handling and configuration a.s.o.
2. basic procedures and skills

modular training of single methods and procedures as e.g. identification, vectoring, clearances etc.

3. advanced procedures and skills

The trainees have to apply skills learned in phase 2 to complex situation and have to decide about the use of suitable procedures

4. unusual situations

Trainees have to react to unexpected situations while normal handling is required to other complex situations simultaneously.

5. consolidation

Trainees will be build up for examination by exercises that become more and more complex and complicate.

6. validation

   means a practical examination

7. remedial training

on request, serves for individual and aim orientated reduction of some lacks, which are recognised by the trainee during the forgoing phases

The learning objectives will be described by:

- performance (What is expected from the trainee? mostly defined by a "performance verb")
- standard (reference, in most cases relevant rules / regulations) and
- conditions under which the trainee should produce a certain performance

As can be seen the description of the learning objectives is similar to the definitions used during the MASSTER project.

The instructors at the Air Navigation Services Academy distinguish between different categories of learning objectives:

- knowledge-based learning objectives
- learning objectives on basis of operational skills
- cognitive learning objectives
- mental learning objectives

In order to phrase learning objectives a top down approach with the following structure is used:

1. learning objective of the whole training resp. one concrete training phase (description of an overall objective as e.g. trainee is able to permanently use separation standards)
2. learning objective of a concrete learning step (description of the objective for a session of 5 – 8 exercises as e.g. trainee is able to apply the wake turbulence standard)
3. learning objectives of a specific task resp. exercise (most detailed level of the description regarding specific actions by means of specific procedures with special technical equipment and certain performance criteria, as e.g. trainee applies the 6 nm wake turbulence separation for the conditions of x, y during the phase z)

The teaching personnel confirms that the complete and detailed measuring of learning objectives and its application on tasks and exercises is one of the most difficult and toilsome works during the development of a certain training programme.

With respect to the development of a training programme for VTMIS operators the ATC methodology confirms the already above mentioned conclusion. Also with respect to the ATC methodology it must be concluded that it is not meaningful to create a framework or even such a training programme within the TECHNISEC project. At first a clear definition is necessary what a VTMIS operator has to do to reach which specific aim and which actions he has to perform before one can start to define training objectives on basis of which a training programme may be developed.

Annex IV: The VTS Simulator at the Maritime Simulation Centre in Warnemünde – Example of a VTS training facility

Functional requirements and general structure

A high functional and structural flexibility was the general aim when specifying thec requirements. This philosophy is based on the fact, that there is no standardised VTS Centre in Germany. Therefore, a one-on-one copy of any centre was not meaningful. The requirements were instead:

- to simulate the functionality of real working places
- to keep the man-machine-interface as flexible as possible
- to keep full flexibility concerning the configuration of the training places (free selection of different composition watch teams)
- to provide a complex training facility for all VTS standard and emergency operations

The VTS Simulator is one of the 3 simulators at the MSCW. It can be operated as standalone system or linked with the shiphandling simulator, thus allowing a really dynamic co-operation between ship and VTS centre. Future VTS-operators will find optimum conditions to train their tasks in the dialogue with the 'bridge team'.

The VTS-System consists of different segments:

- instructor segment
- trainee segment (including a segment for instructorless training)
- briefing and debriefing segment

Instructor segment

The instructor-segment provides all facilities for exercise preparation, and control. It is equipped with 3 instructor consoles with the exercise control display (based on an ECDIS presentation). A special application allows to watch any situation display at the trainee segment to supervise the tasks the trainee is performing. Additionally, CCTV displays are available for the supervision of the trainee segment.

Since communication is absolutely crucial for VTS operation, each instructor console is equipped with a communication unit (for speaking and listening), allowing an individual selection of required listening/speaking channels. Simplex/Duplex effects and radio range effects can be simulated. In order to minimise the probably high workload due to communication, prepared audio samples can be played automatically.

The following functionalities are available to the instructor:

- controls to configure the training stations as different types of operator stations with specific functionality and specific MMI
- controls to set / control the traffic situation, environment conditions, technical malfunctions, a.s.o.
- facilities to control the simulation run and to set marks and comments (including a mobile unit allowing control when moving freely into the trainee area)
- common databases for generating and displaying training scenarios
- full VHF communication system (GMDSS A1 standard)
- CCTV supervision control
- multimedia recording and replay system
- software aids for individual acquisition and evaluation of the training results
-

The instructor area is separated from the trainee area by a glass wall, allowing direct supervision of the trainees.

Trainee segment

The trainee segment consists of 9 training stations (the so called 'VTS basic units'), which are mobile standard consoles with 2 monitors, VHF unit and telephone. The stations can be configured to form specific working places.

Additionally, 2 dedicated stations for instructor training (see chapter below) are available.

In principle, each station can access to all relevant data. At the monitor the radar picture, radar synthetics, ECDIS information, way-time-graphs, ship data and hydrometeorological data can be displayed and edited. Different tables are available to show details of the actual traffic situation.

As mentioned above, any training station can be configured to realise specific functionality for the applications:

- officer on watch (OOW)
- nautical assistant (NA)
- radar pilot
- instructor
- briefing/debriefing

The flexible configuration of the training stations allows a training in different working positions and compositions of the watch. The stations can be arranged to build up to three VTS centres with their relevant working places. The VTS centres can act in parallel or within the same environment, allowing configurations as e.g.:

- 3 parallel exercises (3 VTS centres within different areas, each exercises has its ‘own world’)
- One exercise with 3 adjacent VTS centres within the same environment (e.g. adjacent centres Deutsche Bucht, Cuxhaven and Brunsbüttel).

Since each working place can be configured to realise any required functionality, in case of failure of one working place the training process can take place without disturbances. Also, there is the possibility to access additional instructor stations (e.g. in cases when the instructor workload is extremely high).

Although the training stations are high-tech workplaces, main interest is focused on the human and not on the technical aspect. Emphasis was placed on ergonomic aspects, which also includes the room light and -acoustics.

Briefing / debriefing area

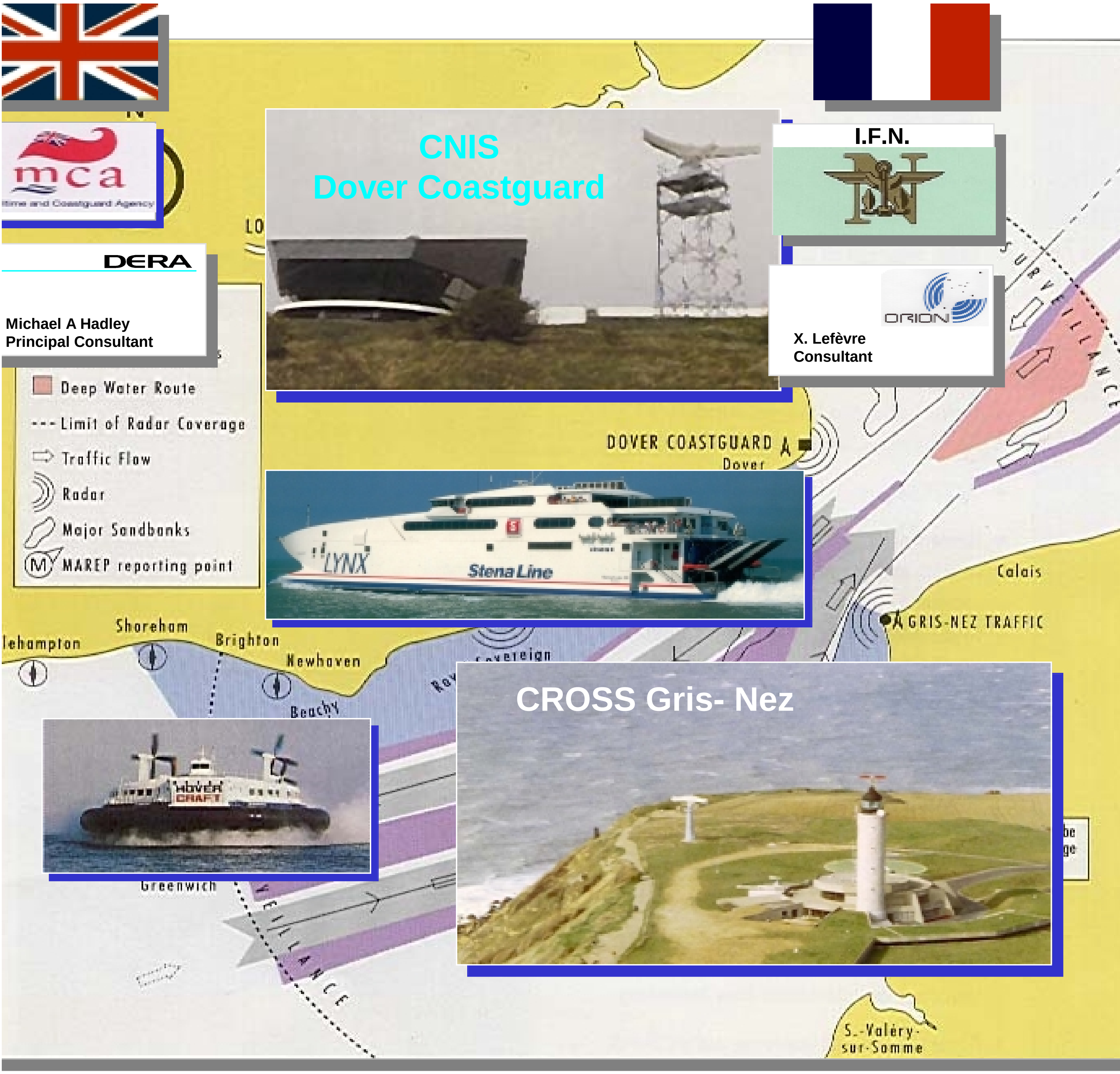
Briefing and debriefing are important elements of any simulator exercise. Since any exercise is recorded (including exercise geometry, VHF communication and selected actions of the trainees) for debriefing purposes a recorded exercise can be retrieved from the database and replayed at this station. A large screen projection system is available at the debriefing area, as well as a complete audio system. The replay can run in real-time, slow motion or quick motion forward and reverse with various speed. Jumps to marks are possible. Any of the recorded events can be picked out, reviewed and analyzed in detail.

Instructorless training (ILT)

Although Computer Based Training is state-of-the-art today, for the training of VTS operators we are on 'new ground'. For this kind of training we have two separate training stations, allowing the trainee to access a pre-programmed scenario on the monitor screen. The usual VTS functionality is fully available. On a second screen, a MMI with multiple choice questions is presented; the answers are assessed by a special scoring system. Additionally, the presentation of graphic-, audio- and video files out of the ILT application is possible. If required, all VTS basic units can be configured to ILT working places.

Annex 17

A Preliminary Study on the Risk Resulting from the Development of Fast Craft



Final Report, October 1999

Contents

Annex 17

Executive summary

As part of the technical support for the 4th Waterborne RTD programme's concerted action activities in the area of Vessel Traffic Management and Information Services (VTMIS), the DERA (Maritime Navigation Systems) was tasked to investigate the movement of High Speed Craft (HSC) in the Dover Strait. The EU contract called for a study aimed at assessing risks that may result from the development of Fast Vessel Traffic in congested areas. Given the density of vessel traffic in the Dover Straits and the presence of a significant number of high-speed craft, this was the area chosen for the study. The DERA's remit was to :

- Use the facilities of the Channel Navigation Information System (CNIS) to collect radar data related to encounters involving at least one HSC
- Process those data, so as to identify manoeuvres performed by vessels involved in those situations
- Entering raw and processed data into a database.
- Deriving from the observations, analysis of those navigational situations that may be recognised as generating navigational risk.
- Providing inputs to a provisional synthetic assessment of navigational risk induced by HSCs.

The data derived from the study, gathered from CNIS data over three separate days, in fair weather, is to be presented at a VTMIS workshop, in Paris, in October 1999.

The Dover Straits was chosen because it is both busy and has a significant population of HSC. It also represented an opportunity for co-operation between two member states, the substance of which may be subject to further discussion. There was no question that the study was based on any thoughts of a poor local HSC safety record. The unblemished nature of the safety record can be attributed in large part to the excellence of the HSC crews, their training and equipment.

It was established that there are both 'in house' rulings governing the interaction between HSC and other vessel traffic and deconfliction plans, aimed at avoiding HSC on HSC encounters but, on the Dover – Calais route, avoiding ferry on ferry encounters. These rulings, which result from the Channel Operators Navigation Committee, and plans do not appear to be available to the general mariner. The study showed that specified separation distances, between HSC and other vessel traffic, were routinely infringed in fair weather. On a relatively short exposure, it is appears that an informal understanding about the interaction between ferries (of all types) and 'through traffic' exists that is not in accordance with the International Regulations for the Prevention of Collision at Sea. Specific applications of this informal understanding apply to HSC, whereby they will alter course when the stand on vessel and will also alter course to port, if this is considered to be the best course of action for them. However, a crucial question, given the manoeuvrability of HSC and the confines of the Dover Straits, is the range at which a risk of collision may be deemed to exist. Local and 'through traffic' are equally involved in this set of informal understandings.

Several caveats about the data have been made, ranging from the almost uniformly fair weather conditions, through the natural limitations of the CNIS radars and associated tracking system to the lack of access to any associated communications.

The records covered 40 interactions between at least one HSC and other vessel traffic. Of these 50% involved a hovercraft and 50% a fast catamaran. In 35% of the interactions there was believed to be the potential for an 'incident'.

The opportunity was taken, thanks to a kind offer from Hoverspeed, to see HSC and other vessel traffic interaction ' in the flesh'. This provided a valuable perspective and 'reality check'. It was from this visit that it was discovered that ARPA is considered inaccurate for HSC use, as well as a clearer picture of the company rules concerning the operation of HSC.

A similar survey was performed on the french side at the same period as the survey conducted at Dover. Appendix 5 to this report shows the results obtained by Xavier Lefèvre who was committed by the French Institute of Navigation to carry out that specific task.

With the reported inaccuracy of ARPA in HSC, the use of radar 'tracking' is being used safely to assess potential collision situations and to determine the HSC's response to them. The efficacy of this method relies on the capability and concentration of the operator. As already stated, the operators (Master and First Officer) are well trained and highly motivated but it is at least a cause for speculation as to whether some of the recorded interactions, showing too close CPAs, may have resulted from mis-appreciation of a radar picture being used 'by eye'.

The principle conclusions, regarding vessel traffic interaction are :

- The regular infringement of the COLREGS is at least an unsatisfactory situation and has the potential to result in a collision. The subject is understood to be keenly felt by those involved in the operation of HSC in the Dover area and is believed, by them, to call for some change to the existing regulations.

- Although for understandable reasons, both HSC and other vessel traffic are not operating entirely within the COLREGS.

- Some vessel traffic using the TSS improperly apply Rule 10 of the COLREGS, allocating to themselves stand on privileges to which they are not entitled.

- An understanding between HSC and other vessel traffic, including the conventional ferries on similar routes, appears to have developed that copes with irregularities in applying the COLREGS.

- In fair weather, HSC are routinely operating outside their approved CPA envelopes and have developed their own code of operations, with regard to avoiding collision situation arising.

- HSC (and ferry traffic in general) are operating in accordance with navigation rules that are not generally available to other vessel traffic.

The report's recommendations are :

- Consideration should be given to making the 'In house' data, used by HSC, more widely available.

- Although probably appreciated by regular users of the TSS, knowledge of the approved CPAs of HSC on other vessel traffic may avoid unnecessary anxiety to those using the Dover Straits for the first time.

- There is a need to further educate vessel traffic in the Dover Straits about the implications of Rule 10 .

- Consideration is needed of the informal 'rules' established by practice in the Dover Straits and their relationship with the existing rules.

- To gain a wider perspective, there is a need to review the interaction of HSC, with each other and other vessel traffic, over a greater range of weather conditions. It would also be of assistance to have access to HSC true course and speed, as well as course and speed over the ground. To avoid post processing, this might be done by fitting AIS.

- To fully understand the interaction between any vessels it is necessary to be aware of any communications between them. Any further study should, therefore, include access to such communication.

- From the above, it is apparent that the co-operation of those operating HSC (both HC and CAT) will be important to any further study and it is recommended that their willingness to participate be established at an early stage.

Introduction

Tasking

- As part of the technical support for the 4th Waterborne RTD programme's concerted action activities in the area of Vessel Traffic Management and Information Services (VTMIS), the DERA (Maritime Navigation Systems) was tasked to investigate the movement of High Speed Craft (HSC) in the Dover Strait. The tasking was placed on DERA by the Institut Français de Navigation (IFN) in accordance with their contract with the Commission of the European Union (No, R96/66 SAV B6 – 716101 SN 001252).

- The EU contract called for a study aimed at assessing risks that may result from the development of Fast Vessel Traffic in congested areas. Given the density of vessel traffic in the Dover Straits and the presence of a significant number of high-speed craft, this was the area chosen for the study. The DERA's remit was to :

    - Use the facilities of the Channel Navigation Information System (CNIS) to collect radar data related to encounters involving at least one HSC
    - Process those data, so as to identify manoeuvres performed by vessels involved in those situations
    - Entering raw and processed data into a database.
    - Deriving from the observations, analysis of those navigational situations that may be recognised as generating navigational risk.
    - Providing inputs to a provisional synthetic assessment of navigational risk induced by HSCs.

- It was agreed with the Maritime and Coastguard Agency (MCA) and the IFN that the use of the CNIS to gather the base data would take place during the week commencing 14 June 1999. Although not constrained to, the principle areas of interest allocated for DERA study were areas 2 and 3, as shown on Figure 1 - 1. Data gathering, using the French facilities at Cap Gris-Nez were planned to take place simultaneously.

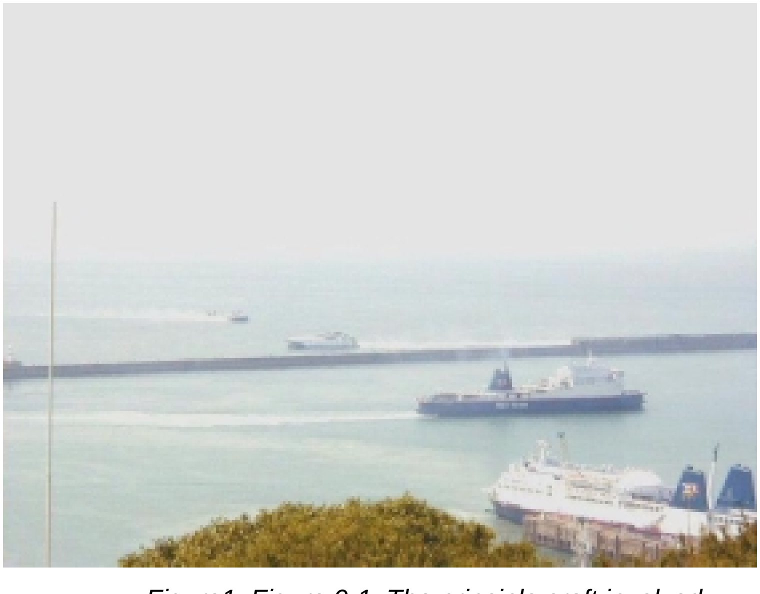


Figure1: Figure 0-1 The principle craft involved.

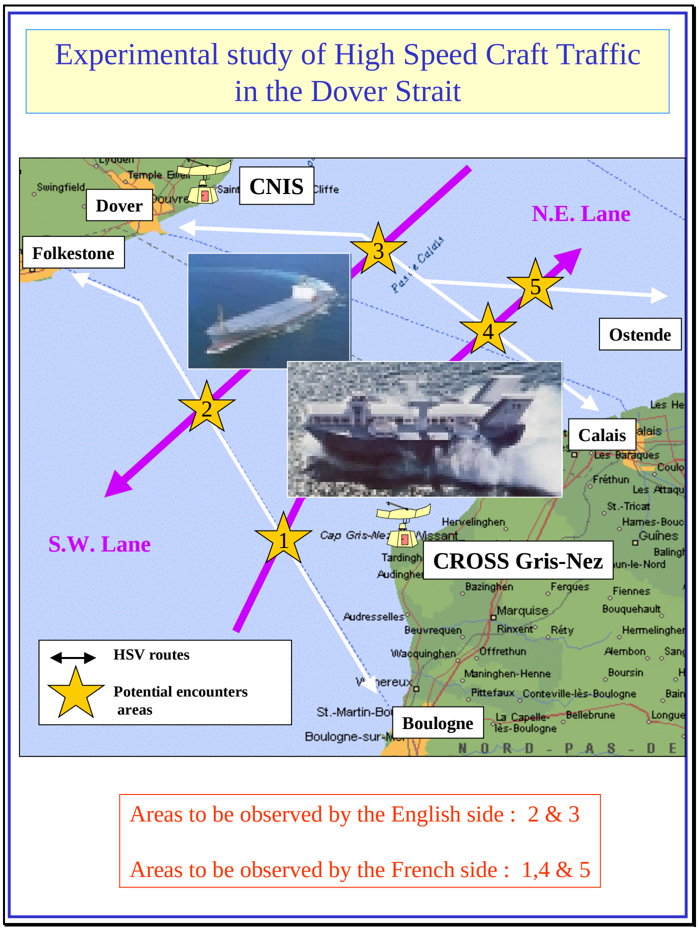


Figure1: Figure 1-2 Designated study watch areas

- The data required to be recorded for each incident observed is shown at Appendix 1. It was anticipated that data on a minimum of 30 encounters would be gathered.

- The data derived is to be available by the beginning of October 1999 and a joint presentation of findings is planned for a Workshop, concluding the activities of the concerted action on VTMIS, to be held in Paris on 21 October 1999.

- The area of study was strictly limited to the Dover Straits, within which Hoverspeed are the principle operators of HSC. It would be wrong, and is not the intention of this report, to draw too generic conclusions based on one area of operations and one company, the help of which was much appreciated.

Data Gathering

Activities at CNIS

- In order to avoid any interruption with the normal use of the CNIS Operations Room, it had been agreed that the data gathering would take place using a system console in the Operations Manager's office. (Figure 2 - 1)

Figure1: Figure 0-1 CNIS Console used during the study

- For internal administrative reasons, data gathering began at 1100 on Monday 14 June 1999. By 2000 on Thursday 17 June 1999 40 instances of interaction involving at least one HSC had been recorded, in the required format. The data was taken from recordings of three separate days (4, 14 and 15 June 1999). In addition interviews were held with Captain E Meare (an MCA Nautical Surveyor based at Dover), Mr E Musson (Operations Manager at CNIS) and Captain R Gammie (Senior Captain - Seacats for Hoverspeed at Dover). Thanks to Captain Gammie, it was possible to see the problems faced by HSC in the Dover Straits at first hand, by making a crossing between Dover and Calais in a SeaCat (CAT). This took place on Friday 18 June 1999.

- The recording of data using the CNIS system was not straightforward because, although designed to record and replay the up to 10 days of historic data retained on the system before it is archived, it does not appear to have been envisaged that use of other system functions would be required simultaneously. This resulted in a cumbersome process of using the replay function, which was password protected, identifying incidents, establishing a definable starting point, taking the appropriate measurements, which entailed exiting the replay function, logging back into the replay function, moving the sequence forward, stopping the replay, exiting to take the next measurements ….. This sequence of events was then repeated for each set of readings taken during the recording. In addition, accessing the database for the required ship data, where this was available, required the use of a separate system. At its extreme, the gathering and recording of run 19 took well over 3.5 hours. It should be noted that plans for a replacement for CNIS are under consideration and the resulting system can be expected to deal effectively with any similar, future surveys.

- The HSC were readily identified by the length of their velocity vectors; CATs generally operate at 35 – 38 knots and Hovercraft (HC) at 45 – 50 knots. Three HSC routes were involved (see Figure 1-1), Dover Calais, Dover – Ostende and Folkestone – Boulogne.

- Although CNIS will respond promptly to investigate any complaint about interaction between vessel traffic in its area of responsibility it has no remit to detect such situations and pursue them autonomously.

- The inception of a mandatory reporting scheme in the Dover Straits from 1 July should improve the knowledge immediately available to CNIS about vessels involved in any incidents.

- The CNIS is known to track accurately, although hysterisis in the system, as in all other similar systems, does mean that it is slow to keep up with a manoeuvring target. This is exacerbated at high speed. However, in this instance, it is believed that the use of the system in replay, when the target jumps at approximately minute intervals, is responsible for the apparently jerky motion.

Ferry Operations

Routing

- Both conventional and HSC ferries operate in the Dover Straits. CATs operate on the Dover – Ostende and Folkestone – Boulogne routes and CATS, HC and conventional ferries operate on the Dover – Calais route; the conventional ferries generally operate at 18 – 21 knots.

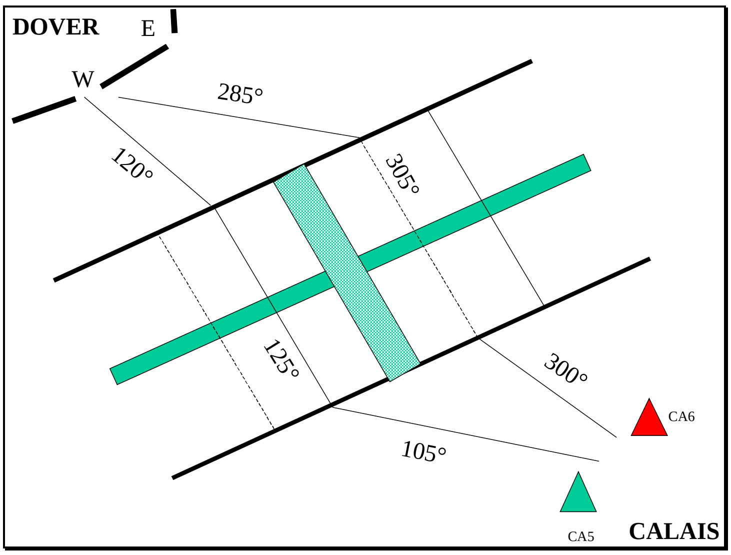


Figure1: Figure 3-1 Dover – Calais Ferry Separation Scheme with CAT route superimposed

- Because of the density of ferry traffic generally and because of the particular need to avoid head on encounters between HSC procedures regarding routing have been established by the ferry companies and are laid down in their instructions to masters; for Hoverspeed, this was in their Craft Routing Manual. These routes are not mandatory and allowance is made for the needs of weather routing. However, where no other considerations apply, these routes are expected to be followed. Details of these routes are not generally available, although the fact of them is known to CNIS. These matters are discussed at meetings of the Channel Operators Navigation Committee, at which all involved in cross-Channel activities are represented. It was from this forum that the voluntary ferry separation scheme arose.

- Due to the particularly heavy ferry traffic between Dover and Calais, all the ferry companies operating this route have agreed on a ferry traffic separation scheme, which is also aimed at avoiding head on encounters between all Southeast and Northwest ferries. (See Figure 3 - 1). The separation zone is 0.25 nm either side of a line drawn from Langdon Battery to the Coquelles belfry in Calais. The lanes are 1.5 nm wide and the tracks shown, which came from the Hoverspeed CAT Operating Manual, are 0.6 nm from the separation zone. All HSC at Dover generally use the Western entrance to the harbour. Thus, one effect of this ferry separation scheme is that the HSC arriving at Dover from Calais have to cross the path of the conventional ferries leaving from Dover's Eastern entrance. Similarly the HSC departing for and arriving from Ostende have to cross the path of both incoming and outgoing conventional ferries.

The operating instructions for HSC include restrictions on how close they may pass to other vessels. These are 1 nautical mile (nm) ahead and 0.5 nm astern / abeam.

Communications

- All HSC monitor VHF Channel 33. Each HSC makes regular reports along its particular route, so that other HSC are aware of their position, and the channel is available for inter HSC communication, should this be necessary.

- Other, conventional ferries have been known to use this frequency to communicate with HSC but this is not the norm.

- Although contrary to the guidance given in the MCA's Marine Guidance Note (MGN) 27, it is known that VHF is sometimes used to 'co-ordinate' the manoeuvres of vessels in close quarters situations. The use of such communications is not monitored and the impact on the interactions reported on, if any, is not known.

Training

- As reported by the MCA and observed during the HSC crossing on 18 June 1999, the training of HSC personnel is of a high order. Masters and First Officers are not only qualified for the craft in which they are currently working but are also certified for the individual routes that they are operating on. This is the Type Rating system, part of the IMO HSC Code, for which certificates in the UK are authorised by the MCA.

- It was in initially reported by the MCA and subsequently endorsed by Hoverspeed that their HSC staff are above average, in terms of performance, well motivated and that retention is high.

HSC Operations in practice

Right of way

- HSC move considerably faster than the majority of other traffic in the Dover Straits. The observed speed advantage ranged from over 40 knots (HC on fishing vessels and yachts) to 15 – 20 knots (CATs on relatively high speed conventional vessel traffic and ferries). There is a belief by the operators / officers of HSC that their speed is consistently underestimated by other traffic; this view was endorsed during discussions with CNIS and MCA staff. On the other hand officers in HSC are perceived to anticipate the movements of other vessels well in advance. This has led to an acceptance on the part of the HSC that it is to their advantage to get out of the way of other, slower vessels. In doing this, they would seek to take early action to avoid a close quarters situation developing, even when according to the International Regulations for the Prevention of Collision at Sea (COLREGS), they are the stand on vessel. Thus, an early alteration of course to port is made if, in their view, this is the best course of action. A consideration, in such circumstances, is the relative confines of the Dover Straits and the traffic density.

- Given their speed advantage and high manoeuvrability, it is assessed that, for an HSC, a stand on situation would only exist within 3 – 4 nm. For a cross-Channel CAT approaching a vessel in the TSS, at 90 degrees, this equates to approximately 6 minutes.

- There is an understanding on the part of the operators of / officers in HSC that vessel traffic in the NE and SW lanes assume that they have right of way. Whilst this may not be the case in all such vessels, CNIS and the MCA are aware of instances where this lack of knowledge of Rule 10 has been true. The HSC officers reported regular instances of ship's officers claiming to have right of way because their ship was in a TSS. Observations during the data gathering phase corroborated the HSC view, as there were no instances of conventional 'through traffic' altering for HSC, other than those instances traceable to anti-collision manoeuvres involving third parties.

- Alterations of course to port and action by HSC that were 'stand on' vessels were regularly observed during the data gathering phase and are recorded in the data sheets at Appendix 2. This confirms the expressed operating practice of the HSC.

- The bridge of an HSC is well manned. The helm, radar and engineering consoles are manned (nominally by the Master, First Officer and Chief Engineer respectively but these responsibilities can be delegated.) Because of the propulsion arrangements, the task of conning an HSC is complex and requires special training. The Master is easily able to see one of two side by side radar displays and can have access to both. The First Officer has access to both radar displays, enabling two separate range scales to be monitored simultaneously.

Figure1: Figure 0-1 Bridge of the Seacat Atlantic II

- Figure 4-1 shows the bridge of a Hoverspeed Seacat with the helm and radar positions manned. In this instance the CAT's First Officer is at the helm with the Master standing behind him. Another of the company's First Officers is at the radar display, being checked for blind pilotage by the company's Senior Captain - Seacats, prior to route clearance certification. Finally an officer visiting from a Supercat (on the Dover – Ostende route) is undertaking a familiarisation visit. The screen, forward of the radar display is there to enhance the use of blind pilotage.

Radar and ARPA

- It was recognised, some time ago, that the original specification for radar equipment was inadequate, in technical respects, for HSC. This led to the adoption by IMO of new standards. Although revised standards for radar equipment have been adopted for both normal speed and high speed craft, IMO has, so far, only adopted a radar plotting standard for normal speed craft. These allow for the recognition of vessels with speeds up to 70 knots and for a closing speed (on own ship) of 100 knots. It is understood that technical difficulties remain that make a similar specification for HSC currently impracticable. Thus current radar plotting standards do not meet the requirements for HSC and, therefore, cannot be applied to them. This also means that no Automatic Radar Plotting Aid (ARPA), suitable for use in HSC, is currently available.

- The relevant standards are :

  IMO MSC.64(67):1996 – Annex4 – Performance Standards for radar equipment.

  A820:1995 – Performance standards for navigation radar equipment for high speed craft. (Associated IEC standard IEC60936-2)

  IMO823:1995 Performance standards for automatic radar plotting aids. (Associated IEC standard IEC60872-1)

- The IEC standard (IEC60936-2) is still relatively new and, to date, it is understood that only two such equipments have received Type Approval in the UK.

Other manoeuvring considerations

- The passage of HSC in the Dover Straits has to contend with streams of through traffic in the North East (NE) and South West (SW) lanes of the Traffic Separation Scheme (TSS), fishing vessels, fishing floats and recreational vessels of various types. Average traffic levels used by CNIS are 400 ship movements per day, comprising :

Southwest lane	125
Northeast lane	125
Crossing traffic	250

  These numbers do no include the up to 30 Fishing vessels and 40 – 50 sailing and other recreational craft during peak times.

- The density of traffic has led to fishing vessels steaming protectively around their pots. Overall, this can lead to complex situations, often feeding one into another. This has resulted in the HSC developing a procedure whereby one officer (generally the Master) is at the helm and another (generally the First Officer) is at the radar. The officer manning the radar continuously assesses the shipping situation and maintains a flow of information to the officer at the helm. Having determined that, at the high speeds at which they operate, ARPA (even those using the newer high antennae rotation speeds) cannot be relied on to provide accurate information, all tracking of other shipping is carried out in relative motion. This places considerable importance on the judgement of the operator.

- Particularly with regard to vessel traffic in the NE and SW lanes, the procedure is to identify a gap between two vessels, adjust course to close the stern of the lead vessel and at quite a late stage adjust course to pass close astern of the lead vessel and as far ahead as possible from the following vessel. In doing this Closest Points of Approach (CPA) of less than 2 cables astern were observed and the norm appeared to be 4 cables. In the fine weather and clear visibility which attended the duration of the data gathering phase at Dover this looked close on the radar but, 'on the ground', proved safe and unalarming.

- It was stated by Hoverspeed that, in fog, HSC would never get as close to other vessels as the approved CPA limits.

- HSC as well as being fast and manoeuvrable can also stop quickly. CATs can, and do, stop in 2 – 3 cables from full ahead. HC can do just as well and if the pressure is removed or lost from their air cushion effectively stop dead in the water. This is, however, only an extreme measure, if used deliberately, as it inevitably results in structural damage to the craft and almost certain injury to passengers and crew.

- The effect of weather on HSC, especially HC, is pronounced. The drift angles produced can be large (20º - 30º). This can mislead visual observers and makes the problems associated with the use of radar more acute. Each of the HSC routes has a weather routing envelope in which to operate.

- Due to the problems that collision with a fishing float can cause an HSC and also the ingestion of its line into a CAT's water jets, HSC are liable to manoeuvre at very short notice to avoid them. The reason for such a manoeuvre is unlikely to be immediately apparent to an observer, especially one using only radar.

Wake

- In the deeper water of the Dover Straits, wash from HSC is not considered to be a problem and it was observed that passing 3 cables off a small vessel tending fishing pots at 35 knots seemed to cause no concern to the occupants. However, the effect in shallower water has led to restrictions in and near all ports serviced by the HSC. There may also be restrictions on the direction and speed of approach / departure.

- On several occasions during the data gathering phase double tracking of CATs, generally those on the Dover – Ostende route, was observed. This was believed to be caused by the tracking of both the vessel and its distinctively high wake and also due to the prevailing high pressure and generally low sea state.

Figure1: Figure 0-2 Wake of Atlantic II

Figure 4-3 SuperCAT building up speed on leaving Dover

Analysis of observations

Reservations

- When reading the records of observation of high speed craft interactions the following need to be borne in mind:

  The CNIS radar does not see all contacts of interest to the HSC. These can include small recreational / fishing craft, fishing floats and floating debris.

  There was no access to nor is there any record of any inter-ship communication at CNIS.

  The CNIS system was checked as performing within its specification in March 1999 and was designed to cope with the speeds of current HSC (see Appendix 3). However, the variable courses and speeds, particularly the speeds, recorded for HSC during data gathering cannot all be attributed to frequent alterations of course and speed. Although changes of speed are particularly effective for HSC, because of the almost instantaneous reaction, Hoverspeed confirmed that the records taken did not reflect normal HSC operation.   As previously stated this is attributed to the use of the system in 'replay'.

  The COLREGS are based on the relative headings between vessels and this cannot be accurately determined by radar. This is especially true when considering HSC in high winds or during turns at speed. With regard to data gathered from the CNIS system, in some cases the judgement about aspect was straightforward but in others it may be open to debate.

  The hysterisis of any radar system means that turns may be well developed before they become apparent to the radar observer.

  The records taken were selected on the basis of the perceived incidents that occurred and, by chance the split is 50% HC and 50% CAT. However, the limited practical experience was only with a CAT, although the Master involved had considerable experience with HC and their operations were discussed.
- An extract of the performance specification of the CNIS system is at Appendix 3.

Categorisation of records

- An initial breakdown of the records taken from the CNIS system is at Appendix 4.

Analysis

- Despite the instructions given to HSC in their operating instructions about CPA distances, it is clear that the distances (1 nm ahead and 0.5 nm astern / abeam) are regularly reduced. This is sometimes forced on HSC as they negotiate their way between the streams of traffic in the SW and NE lanes of the TSS and is not of itself dangerous. It would appear that the working CPAs used are 0.8 nm ahead and 0.2 – 0.3 nm astern / abeam. Thanks to Hoverspeed it was possible to see such CPAs in practice and confirm that the 'working' distances specified both looked and felt safe. It is only where these 'working' CPAs have been infringed that it is assessed that there was an opportunity for an incident to occur.

- Although it was physically observed that CPAs of 0.2 - 0.3 nm appeared to cause no concern to quite small, open boats there was one recorded instance (Run31) where a CPA of <0.3 nm may have caused a small vessel to stop.

- It is necessary to take into account the fact that each day observed was in good weather, particularly the latter two. There is, therefore, no record of how CPAs may be modified in poor weather.

- The instructions to HSC, about CPA, call for a relative distance of at least 1.5 nm ahead / astern of vessels in the same lane for there to be an allowable opportunity for an HSC to pass between them. The effect of the working distances used means that the required gap is reduced to 1 nm. This gap is frequently not available and gaps of as little as 0.6 – 0.7 nm have been used (Run 2 / 3 / 37 / 40). Despite passing within 0.2 nm of the lead vessel's stern this still means that CPAs ahead of the trailing vessel of less than 0.5 nm ensue. This is considered potentially hazardous.

- The safe operations of HSC implicitly rely on traffic in the lanes of the TSS maintaining their course and speed, regardless of which is the stand on vessel, and the working practices that have developed with both the conventional ferries and the local fishermen. Although the high manoeuvrability of the HSC make this a practical proposition it is clear that the existing regulations of the COLREGS are being broken. Although this has not led to an 'incident' the potential for one is apparent.

- HSC do alter course / speed when the stand on vessel and will alter course to port (Run 5), if that seems to be the best course of action, when manoeuvring in an anti-collision situation.

- Given their manoeuvrability, the HSC 'yardstick' of considering that a risk of collision exists only when the other vessel is within 3-4 nm seems safe, especially when the separation between traffic in the two lanes of the TSS may be considerably less.

- Instances occurred where it appeared that :

    - HSC chose to pass close ahead of a vessel rather than use a sizeable gap astern (Run 13 / 22 / 24 / 34)
    - HSC adhered to a company navigation plan, rather than make maximum use of a gap in vessel traffic in the TSS (Run 33).
    - The HSC timetable may have been a factor in the choice of passing manoeuvre (Run 1 / 24).
    - HSC may have been 'unsighted' of small vessels due to masking by other vessel traffic (Run 19).
    - HSC manoeuvred unnecessarily (Run 4)
    - HSC can find themselves in a dynamic manoeuvring situation with little time to react to other than the nearest interaction (Run 12 / 19).

Annex 17

Conclusions

Overall

- HSC have been operating in the Dover Straits for over 30 years. With only one recorded 'incident', which had nothing to do with interaction with other vessel traffic. It involved a total power failure causing an HC to collide with the Dover Harbour detached mole in a Force 8 gale in 1985. With regard to vessel interaction, the track record of HSC in these waters is, therefore, safe. Coupled with this, CNIS report that they have received no complaints against HSC. Thus there appears to be no reason for great concern at the interaction between these craft and other vessel traffic in the area.

- The data gathered, solely in fair weather, would, however, indicate that uncomfortably close CPAs do occur sufficiently frequently for this to be a cause for further study.

Radar

- The radar picture available to HSC is of high quality and has been proven to show extremely small targets, far smaller than a jet ski, in favourable conditions. High confidence is, therefore, placed in its use, including in reduced visibility.

- With the inapplicability of ARPA in HSC, the use of radar 'tracking' is being used safely to assess potential collision situations and to determine the HSC's response to them. The efficacy of this method relies on the capability and concentration of the operator. As already stated, the operators (Master and First Officer) are well trained and highly motivated but it is at least a cause for speculation as to whether some of the recorded interactions, showing too close CPAs, may have resulted from mis-appreciation of a radar picture being used 'by eye'.

Figure1: Figure 0-1 Radar display of an HSC

- Time did not permit the observation of interactions in poor weather / conditions of high radar clutter.

Manoeuvring / COLREGS

- Although not borne out in practice, the regular infringement of the COLREGS is at least an unsatisfactory situation and has the potential to result in a collision. The subject is understood to be keenly felt by those involved in the operation of HSC in the Dover area and is believed, by them, to call for some change to the existing regulations.

- Although for understandable reasons, both HSC and other vessel traffic are not operating entirely within the COLREGS. The HSC manoeuvred when the stand on vessel in 50% of the observed interactions.

Some vessel traffic using the TSS improperly apply Rule 10 of the COLREGS, allocating to themselves stand on privileges to which they are not entitled.

An understanding between HSC and other vessel traffic, including the conventional ferries on similar routes, appears to have developed that copes with irregularities in applying the COLREGS.

- HSC are occasionally operating outside their approved CPA envelopes and have developed their own code of operations, with regard to avoiding collision situation arising.

- HSC (and ferry traffic in general) are operating in accordance with navigation rules that are not generally available to other vessel traffic.

Recommendations

Administrative

'In house' data, used by HSC, should be more widely available to those using the Dover Straits and consideration should be given to placing HSC routing data on the relevant charts.

Although probably appreciated by regular users of the TSS, knowledge of the approved CPAs of HSC on other vessel traffic may avoid unnecessary anxiety to those using the Dover Straits for the first time.

COLREGS

- There is a need to further educate vessel traffic in the Dover Straits about the implications of Rule 10.

- Consideration is needed of the informal 'rules' established by practice in the Dover Straits and their relationship with the existing rules.

Communications

- There may be benefit, where this is practicable, in both conventional ferries and CNIS monitoring VHF Channel 33.

CNIS

- If the opportunity presents itself, use should be made of suitably equipped high speed craft to validate the performance of CNIS against HSC.

Further research

- This study was a precursor to a possible deeper assessment of vessel traffic interaction involving HSC. To gain a wider perspective, there is a need to review the interaction of HSC, with each other and other vessel traffic, over a greater range of weather conditions. It would also be of assistance to have access to HSC true course and speed, as well as course and speed over the ground. To avoid post processing, this might be done by fitting AIS.

- To fully understand the interaction between any vessels it is necessary to be aware of any communications between them. Any further study should, therefore, include access to such communication.

- From the above, it is apparent that the co-operation of those operating HSC (both HC and CAT) will be important to any further study and it is recommended that their willingness to participate be established at an early stage.

Acknowledgements

MCA

- The gathering of the data used in this report could not have been achieved without the permission of the MCA to use the CNIS system and the active co-operation of the CNIS staff. Special thanks are due to Mr E Musson (Operations Manager at CNIS) for the use of the CNIS facilities in his office and his patient instruction about how to use it.

Hoverspeed

- The ability to see a Seacat operating at first hand provided a valuable input to the study. The courtesy and co-operation of Captain R Gammie (Senior Captain - Seacats at Hoverspeed) and the Master and crew of Atlantic II are gratefully acknowledged.

Figure1: Figure 0-1 Hovercraft in Dover Harbour

List of abbreviations

AHD	Ahead
AIS	*Universal* Automatic Identification System
ALC	Course alteration
ARPA	Automatic Radar Plotting Aid
AST	Astern
CAT	Catamaran
CNIS	Channel Navigation Information System
CRO	Crossing
COLREGS	International Regulations for Preventing Collision at Sea (1972), as amended
CPA	Closest Point of Approach
DCPA	Distance at Closest Point of Approach
DERA	Defence Evaluation and Research Agency
EU	European Union
GW	Give Way
HC	Hovercraft
HON	Head On
HSC	High Speed Craft
HSV	High Speed Vessel
IFN	Institut Français de Navigation
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MOS	Speed modification
NE	North East
nm	nautical mile
OTH	Other vessel
OVE	Overtaking
RTD	Research and Technology Development
SO	Stand On
SW	South West
TCPA	Time to Closest Point of Approach
TSS	Traffic Separation Scheme
TWO	Modification of course and speed
UK	United Kingdom

VHF	Very High Frequency
VTMIS	Vessel Traffic Management and Information Services
VTS	Vessel Traffic Services

Appendix 1 – Initial recorded interaction data format

RECORDING SHEET N° :

DATE

Meteo

Visibitity

Sea

Wind Speed
Direction

HSV data (given for the French side, reverse departure and arrival for the English side)

NAME of the High Speed Vessel **Type**

Port of departure

Boulogne	Calais	Ostende

Port of arrival

Folkestone	Dover

Schedule time of departure

Collision Avoidance Manœuvres observed

	1	2	3	4
HSV manœuvres				
Target number				
Other Ship manœuvres				
Target number				
Both of them				
Starting time for recording				
Ending time for recording				

Remarks

1	
2	Simple or Multiple Encounter
3	Other informations
4	

Name of the replay file

Name Media

Collision Avoidance Manoeuvres DATA BASE

1	2			N

Date					
Time (start of the manœuvre)					
Visibility					
Sea					
Wind speed					
Wind direction					
Area					
Name of the HSV					
Type					
Target number					
Initial Course					
Initial Speed					
Name of the other ship (if known)					
Type of the other ship (if known)					
Target number					
Initial Course					
Initial Speed					
Ship manoeuvring					
"Colreg" type of ship manoeuvring					
Type of the encounter					
DCPA before the manœuvre					
Type of CPA before manœuvre					
Anticipation distance (Initial separation)					
TCA at this distance					
Type of the manœuvre					
Course alteration					
Speed modification					
New DCPA					
New TCA					
Duration of the manœuvre					
Effective DCPA					
Type of effective CPA					
OBSERVATIONS Multiple Encounters (list of targets numbers involved)					
Other remarks (free text)					

List of Codes

Visibility	1	Fog – Objects visible 0 to 10000m
	2	Poor – Objects visible 1000m to 2 nm
	3	Fair – Objects visible 2 nm to 5 nm
	4	Good – Objects visible over 5 nm
Sea	State	Mean maximum height of sea waves in feet
	0	0
	1	0 – 1
	2	1 – 2
	3	2 – 4
	4	4 – 8
	5	8 – 13
	6	13 – 20
	7	20 – 30
	8	30 – 45
	9	Over 45
Wind speed		Beaufort Scale
Wind direction		N, NE, E, SE, S, SW, W, NW
Area		1, 2, 3, 4, 5

Ship manoeuvring	HSV	High speed vessel
	OTH	Other Vessel
"Colreg" type of ship manoeuvring	GW	Give Way Vessel
	SO	Stand On Vessel
Type of the encounter	CRO	Crossing
	HON	Head On
	OVE	Overtaking
Type of CPA before manœuvre	AHE	Manoeuvring ship crosses Ahead the other ship
	AST	Manoeuvring ship crosses Astern the other ship
Type of the manœuvre	ALC	Course alteration
	MOS	Speed modification
	TWO	Modification of course and speed
Type of effective CPA	AHE	Manoeuvring ship crosses Ahead the other ship
	AST	Manoeuvring ship crosses Astern the other ship

Appendix 2 – Database Summary

Collision Avoidance Manoeuvres DATA BASE													
	1	2	2	3	4	5	6	7	7	8	8	8	8
Date	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99	4/6/99
Time (start of the manœuvre)	7:40	8:35	8:35	9:25	10:02	1448	1456	1519	1519	1558	1558	1558	1558
Visibility	4	2	2	2	3	4	4	4	4	4	4	4	4
Sea	4	2	2	2	3	3	3	3	3	3	3	3	3
Wind speed	6	5	5	5	5	3	5	3	3	3	3	3	3
Wind direction	240	210	210	210	215	225	225	225	225	225	225	225	225
Area	3	3	3	3	3	4	3	3	3	3	3	3	3
Name of the HSV	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Type	CAT	HC	HC	HC	HC	CAT	CAT	CAT	CAT	HC	HC	HC	HC
Target number	062	397	397	624	690	387	387	497	497	666	666	666	666
Initial Course	301	110	397	101	308	324	309	312	312	108	108	108	108
Initial Speed	31.5	37.1		39	35	30.3	28.6	28.8	28.8	38.5	38.5	38.5	38.5
Name of the other ship (if known)	Sea Beirut	Unknown	Theano K	SYAM	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Dora Baltea	Magnolia
Type of the other ship (if known)	Car carrier	Unknown	Bulker	General Cargo	Unknown	Ferry	Ferry	Ferry	CAT	Ferry	Ferry	Car carrier	Tanker
Target number	303	567	682	676	116	357	405	490	547	533	551	203	508
Initial Course	228	229	228	227	229	132	124	123	123	305	298	217	231
Initial Speed	11.0	12.3	12.2	10.6	13.3	21.9	18.8	19.4	28.3	19.7	18.8	10.9	7.8
Ship manoeuvring	HSV	HSV	HSV	HSC	HSV	Both	HSV	HSV	HSV	HSV	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	SO	SO	SO	SO	GW	GW	SO	GW	GW	GW	GW	GW
Type of the encounter	Crossing	CRO	CRO	CRO	CRO	HON	HON	HON	HON	CRO	CRO	CRO	CRO
DCPA before the manœuvre	0.07	0.78	1.59	0.02	0.32	0.72	0.12	0.29	0.34	0.49	0.14	0.36	0.51
Type of CPA before manœuvre	Steady	AHE	AHE	STEADY	AHE	AST	AST/PORT	AHE	AST	AST	AST	AST	AHD
Anticipation distance (Initial separation)	4.84	6.04	7.25	4.09	3.62	5.71	4.46	4.27	7.93	3.73	5.17	5.57	4.83
TCA at this distance	9.6	8.1	9.6	5.3	6.2	6.5	5.7	5.3	8.3	3.8	5.4	7.7	6.7
Type of the manœuvre	TWO	ALC	ALC	TWO	TWO	TWO	ALC	TWO	TWO	TWO	TWO	TWO	TWO
Course alteration	10	13	13	8	20	15 (Ferry 26)	8	18	18	0	11	20	20
Speed modification	6	3.7	3.7	2	5.2	Negligible	Negligible	2	2	3.7	2	1.6	1.6
New DCPA													
New TCA													
Duration of the manœuvre	5	4	4		6	3	5	5	5	2	4	7	5
Effective DCPA	0.37	0.16	0.32	0.16	0.19	0.53	0.36	0.24	0.24	0.7	0.73	0.49	0.5
Type of effective CPA	AST	AST	AHE	AST	AST	AST/PORT	PORT	STBD	PORT	PORT	PORT	AHD	AHD

Collision Avoidance Manoeuvres DATA BASE													
Title	Run number												
	9	9	10	11	12	12	13	14	15	15	16	16	16
Date	6/14/99	6/14/99	6/14/99	6/4/99	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99	14/6/1999	14/6/1999	14/6/1999
Time (start of the manœuvre)	0603	0603	0704	0713	0732	0732	0912	0925	1004	1004	1110	1110	1110
Visibility	4	4	4	4	3	3	3	3	3	3	4	4	4
Sea	2	2	2	2	2	2	1	1	1	1	2	2	2
Wind speed	4	4	4	4	3	3	3	3	3	3	3	3	3
Wind direction	350	350	000	000	005	005	020	020	20	20	025	025	025
Area	3	3	3	1	3	3	2	3	3	3	4	4	4
Name of the HSV	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Type	HC	HC	HC	CAT	CAT	CAT	CAT	HC	HC	HC	HC	HC	HC
Target number	571	571	473	534	304	304	744	397	50	50	243	243	243
Initial Course	108	108	114	149	314	314	322	107	102	102	291	291	291
Initial Speed	45.3	45.3	49.7	18.4	32.3	32.3	30.7	46.7	48.6	48.6	48.9	48.9	48.9
Name of the other ship (if known)	Unknown	Sagitta	Unknown	Unknown	Unknown	Unknown	Emerald	Nathalie	Linnea	Unknown	Unknown	Unknown	Unknown
Type of the other ship (if known)	Unknown	General cargo	Ferry	Unknown	Unknown	Ferry	General Cargo	Tanker	Tanker	Unknown	Ferry	CAT	Unknown
Target number	679	120	998	325	504	348	812	702	532	894	796	276	857
Initial Course	228	226	306	230	226	308	232	231	229	039	304	138	303
Initial Speed	11.1	13.1	19.1	22.3	7.9	20	10.3	16.2	11.2	0.9	21.4	26	17.6
Ship manoeuvring	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	None	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	GW	GW	GW	GW	GW	GW	SO	GW	HC was GW	GW	GW	GW
Type of the encounter	CRO	CRO	CRO	CRO	CRO	CRO/OT	CRO	CRO	CRO	CRO	OVE	CRO	OVE
DCPA before the manœuvre	0.1	1.37	0.39	1.01		1.96	0.58	0.21	0.51	0.18	0.32	1.33	1.21
Type of CPA before manœuvre	AST	AHE	AHD	AST	AST	AHD	AST	AHD	AST	AHD	STBD/AH	AST	PORT/AHD
Anticipation distance (Initial separation)	5.09	6.91	9.86	6.59			5.82	5.43	5.18	1.19	3.85	7.75	1.48
TCA at this distance	5.9	7.7	8.6	14.7		17.6	10.7	5.7	5.5	1.5	8.1	6.3	1.6
Type of the manœuvre	ALC	ALC	ALC	TWO	TWO	TWO	ALC	ALC	TWO	MOS	ALC	ALC	ALC
Course alteration	10	0	19	40	68	35	35	12	5	Nil	+5 to -6	+5 to -6	+5 to -6
Speed modification	3	1	Negligible	19	3.9	8	Negligible	Negligible	3.2	4.6	Negligible	Negligible	Negligible
New DCPA													
New TCA													
Duration of the manœuvre	4	8	7	5	3	3	5	6	6		8	4	5
Effective DCPA	0.46	0.8	0.56	0.26	0.49	0.82	0.85	0.16	0.38	0.19	0.19	0.8	1.07
Type of effective CPA	AST	AHE	AHD	AST	STBD	AHD	AHD	AST	AST	AHD	AST	AST	PORT/AHD

Collision Avoidance Manoeuvres DATA BASE												
Title	Run number											
	17	17	18	18	19	19	19	20	21	22	23	24
Date	14/6/1999	14/6/1999	14/6/1999	14/6/1999	14/6/1999	14/6/1999	14/6/1999	6/14/99	6/14/99	6/14/99	6/14/99	6/14/99
Time (start of the manœuvre)	1241	1241	1240	1240	1310	1310	1310	1315	1336	1355	1420	1451
Visibility	4	4	4	4	4	4	4	4	4	4	4	4
Sea	2	2	2	2	2	2	2	2	2	2	2	2
Wind speed	4	4	4	4	4	4	4	4	4	4	4	3
Wind direction	030	030	030	030	030	030	030	030	030	030	030	030
Area	4	4	2	2	4&3	4&3	4&3	3	3	2	3	3
Name of the HSV	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Type	HC	HC	CAT	CAT	HC	HC	HC	CAT	HC	CAT	CAT	HC
Target number	999	999	752	752	675	675	675	874	339	871	120	713
Initial Course	290	290	313	313	295	295	295	083	098	160	261	300
Initial Speed	46.2	46.2	30.2	30.2	48.1	48.1	48.1	28.2	44.1	35.4	31.6	48
Name of the other ship (if known)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Green Freezer	Port Hedland Maru	ANTO	Salantai
Type of the other ship (if known)	Ferry	Ferry	Unknown	Unknown	Ferry	Unknown	Ferry	Unknown	Reefer	Bulk Cargo	General cargo	General cargo
Target number	774	148	309	179	943	017	323	241	538	75	668	171
Initial Course	307	122	226	225	334	030	300	237	233	229	223	231
Initial Speed	22.4	18.9	10.4	5.1	20.5	12.4	21.2	18	12.2	11.6	6.4	6.7
Ship manoeuvring	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	GW	GW	GW	GW	GW	GW	SO	SO	SO	GW	GW
Type of the encounter	OVE	CRO/HON	CRO	CRO	OVE	OVE	OVE	CRO	CRO	CRO	OVE	CRO
DCPA before the manœuvre	1.08	0.8	0.82	1.18	0.84	0.97	0.6	0.62	0.19	1.1	0.24	0.24
Type of CPA before manœuvre	AST	AST/PORT	AHD	AHD	AST	AHD	STBD	AHD	AHD	AHD	AHD	AHD
Anticipation distance (Initial separation)	2.78	11.6	6.64	4.87	4.1	5.95	5.94	9.74	4.23	2.43	3.53	4.51
TCA at this distance	6	10.7	12.6	9.2	6.9	6.9	13.1	12.9	4.7	3.9	7.9	5.9
Type of the manœuvre	TWO	TWO	ALC	ALC	ALC	ALC	ALC	ALC	TWO	TWO	ALC	ALC
Course alteration	HC 7	HC 7	17	3	15	14	17	4	6	+7	5	10
Speed modification	3.5	3.5	Negligible	Negligible	Negligible	Negligible	Negligible	Nil	4	-5	Negligible	Negligible
New DCPA												
New TCA												
Duration of the manœuvre	6	3	4	ID		2	4	11	4	5	10	6
Effective DCPA	0.41	0.56	0.82	ID	0.23	0.74	0.29	0.64	0.42	1.05	0.56	0.92
Type of effective CPA	STBD	AST/PORT	AHD	AHD	AST	AHD	PORT	AHD	AST	AHD	AHD	AHD

Collision Avoidance Manoeuvres DATA BASE (continued)													
Title	Run number												
	25	25	26	27	28	28	28	29	29	29	29	30	30
Date	6/14/99	6/14/99	6/14/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99
Time (start of the manœuvre)	1627	1627	2026	0644	0716	0716	0716	0730	0730	0730	0730	0811	0811
Visibility	4	4	4	4	4	4	4	4	4	4	4	4	4
Sea	1	1	1	2	2	2	2	2	2	2	2	2	2
Wind speed	1	1	1	1	1	1	1	1	1	1	1	1	1
Wind direction	210	210	210	090	90	90	90	090	090	090	090	090	090
Area	3	3	3	3	3	3	3	3	3	3	3	3 / 4	3 / 4
Name of the HSV	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Type	HC	HC	CAT	CAT	HC	HC	HC	CAT	CAT	CAT	CAT	HC	HC
Target number	829	829	54	946	411	411	411	542	542	542	542	427	427
Initial Course	111	111	291	085	294	294	294	306	306	306	306	106	106
Initial Speed	50.7	50.7	36.1	28.9	52.8	52.8	52.8	34.1	34.1	34.1	34.1	54.6	54.6
Name of the other ship (if known)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Kumasi	Tundra Queen	Chembulk	Unknown	United Trader	Unknown
Type of the other ship (if known)	Ferry	Ferry	Unknown	Unknown	Unknown	Unknown	Ferry	Container	Reefer	Tanker	Ferry	Chemical Tanker	Unknown
Target number	27	265	914	519	580	688	590	710	743	0.29	206	302	15
Initial Course	308	309	082	231	223	229	126	231	227	226	323	042	279
Initial Speed	20.3	19.7	7.6	14.3	18.8	12.8	18.6	17	21.2	16.8	18.8	10.3	7
Ship manoeuvring	HSV	HSV	BOTH	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	SO	-	SO	GW	GW	GW	GW	GW	GW	SO	GW	GW
Type of the encounter	CRO	CRO	CRO	CRO	CRO	CRO	CRO	CRO	CRO	OVE	CRO	CRO	HON
DCPA before the manœuvre	0.39	0.5	0.99	0.04	1.67	2	0.61	0.71	0.24	2.72	3.88	0.22	0.51
Type of CPA before manœuvre	AST	AHD	AHD	STEADY	AHD	AHD	AHD	AHD	AHD	AST	PORT	AHD	PORT
Anticipation distance (Initial separation)	5.08	8.46	4.85	8.01	4.24	5.52	7.12	2.59 (But see note)	3.34	3.34 (But see note)	4.31	3.72	6.58
TCA at this distance	4.3	7.3	6.6	11.6	4.7	6.3	6.1	4.4	5.5	3.3	6.6	4.4	6.4
Type of the manœuvre	TWO	ALC	ALC (Both)	ALC	TWO	TWO	TWO	TWO	TWO	TWO	TWO	ALC	ALC
Course alteration	10	10		10	5	7	13	36	36	36	36	17	17
Speed modification	4.3	4.3	3.7	Negligible	3	3	3	2	2	2	2	Negligible	Negligible
New DCPA													
New TCA													
Duration of the manœuvre	2	2	8	4	4	4	8	3	3	3	3	5	7
Effective DCPA	0.39	0.85	0.44	0.28	0.7	0.8	0.18	2.04	2.13	0.9	1	0.93	0.55
Type of effective CPA	AST	AHD/STBD	AST	AST	AHD	AHD	AST	AHD	AHD	AST	AHD	AHD	STBD

Collision Avoidance Manoeuvres DATA BASE										
Title	Run number									
	31	31	32	33	34	35	35	36	36	36
Date	0915	0915	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99
Time (start of the manœuvre)	4	4	0922	0951	1002	1027	1027	1118	1118	1118
Visibility	2	2	4	4	4	4	4	4	4	4
Sea	2	2	2	2	2	2	2	2	2	2
Wind speed	090	090	2	2	3	3	3	3	3	3
Wind direction	3	3	090	090	090	090	090	090	090	090
Area	Unknown	Unknown	2	3	3	2	2	3	3	3
Name of the HSV	HC	HC	Unknown	Unknown	Unknown	CAT	CAT	Unknown	Unknown	Unknown
Type	4.8	4.8	CAT	CAT	CAT	Unknown	Unknown	CAT	CAT	CAT
Target number	293	293	508	064	286	690	690	616	616	616
Initial Course	48.2	48.2	308	079	302	171	171	304	304	304
Initial Speed			30.1	30.6	38.7	30.6	30.6	30.1	30.1	30.1
Name of the other ship (if known)	Unknown	Unknown	Unknown	Rendsburg	Laptev Sea	Unknown	Unknown	Yong Da	Unknown	Unknown
Type of the other ship (if known)	Unknown	Ferry	Unknown	General cargo	Tanker	Unknown	Unknown	Tanker	?Fishing vessel?	Unknown
Target number	237	457	994	41	738	507	788	189	564	824
Initial Course	286	125	242	237	227	232	234	220	085	229
Initial Speed	6.6	18.4	9.8	14.8	16.5	13.7	12	11.6	5.1	12.5
Ship manoeuvring	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	SO	GW	GW	GW	SO	SO	GW	SO	SO
Type of the encounter	OVE	CRO	CRO	CRO	CRO	CRO	CRO	CRO	CRO	CRO
DCPA before the manœuvre	0.44	0.21	0.36	0.22	0.18	0.86	2.62	1.24	1.43	2.12
Type of CPA before manœuvre	STBD	AST	AHD	AHD	AST	AHD	AHD	AHD	AHD	AST
Anticipation distance (Initial separation)	3.48	6.44	4.64	14.3	4.44	3.81	4.27	7.58	9	7.51
TCA at this distance	5	5.8	10		7	8.3	7.4	14.4	15.6	14.7
Type of the manœuvre	TWO	TWO	TWO	TWO	TWO	ALC	ALC	ALC	ALC	ALC
Course alteration	5	5	17	47	+17 -23	24	24	32	50	50
Speed modification	6	6	3	3	-2.4	Negligible	Negligible	Negligible	Negligible	Negligible
New DCPA										
New TCA										
Duration of the manœuvre	6	6	1	2	8	5	5	4	7	8
Effective DCPA	0.5	0.22	0.44	1.41	0.39	0.49	1.26	1.92	0.23	0.39
Type of effective CPA	STBD	STBD/AST	AHD	AHD	AHD	AST	AHD	AHD	PORT	PORT

Collision Avoidance Manoeuvres DATA BASE									
Title	Run Number								
	37	37	37	37	38	39	39	40	40
Date	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99	6/15/99
Time (start of the manœuvre)	1204	1204	1204	1204	1240	1317	1317	1803	1803
Visibility	4	4	4	4	4	4	4	4	4
Sea	2	2	2	2	2	2	2	1	1
Wind speed	3	3	3	3	3	3	3	2	2
Wind direction	090	090	090	090	090	090	090	090	090
Area	3	3	3	3	2	3	3	3	3
Name of the HSV	Unknown	Unknown	Unknown	Unknown	Unkmown	Unknown	Unknown	Unknown	Unknown
Type	HC	HC	HC	HC	CAT	HC	HC	HC	HC
Target number	868	868	868	868	120	468	468	391	391
Initial Course	104	104	104	104	313	108	108	108	108
Initial Speed	48.6	48.6	48.6	48.6	30.5	50.3	50.3	62	62
Name of the other ship (if known)	YONG DA	Unknown	Unknown	ARIANTA	Oxana Trader	Unknown	Unknown	Unknown	Unknown
Type of the other ship (if known)	Tanker	Unknown	Unknown	Tanker	General Cargo	Ferry	HC	Unknown	Unknown
Target number	189	900	63	840	601	753	473	558	647
Initial Course	221	238	243	33.8	229	310	296	232	231
Initial Speed	11.2	3	2.9	11.7	10	19.7	45.6	10.5	19.4
Ship manoeuvring	HSC	HSV	HSV	HSC	HSV	HSV	BOTH	HSV	HSV
"Colreg" type of ship manoeuvring	N/A	SO	GW	GW	GW	GW	GW	SO	SO
Type of the encounter	CRO	CRO	CRO	CRO	CRO	CRO	HON	CRO	CRO
DCPA before the manœuvre	1.23	0	o.34	0.21	0.04	0.41	0.45	0.46	0.11
Type of CPA before manœuvre	AST	STEADY	AST	AHD	AHD/STDY	AST	PORT	AHD	AHD
Anticipation distance (Initial separation)	6.69	3.18	4.28	3.94	4.69	8.02	14	2.91	4.64
TCA at this distance	7.23	3.8	5	4.2	9	7	8.8	2.5	3.7
Type of the manœuvre	TWO	TWO	TWO	TWO	ALC	ALC	TWO	TWO	ALC
Course alteration	+14 & -15	14	+14, -14	+14, -14	22	11	18 (Track 473 -17 and +14)	4	4
Speed modification	6	6	6	6	Negligible	Negligible	+4.4	2	Negligible
New DCPA									
New TCA									
Duration of the manœuvre	8.6	5	7	5	3	3	6	3	6
Effective DCPA	0.72	0.48	0.18	0.35	0.41	0.42	0.59	0.31	0.21
Type of effective CPA	AST	AHD	AHD	AST	AST	AST	PORT	AHD	AST

Note. The data contained in this Appendix represents a condensation of that taken for each 'Run'. Full details can be obtained from Mike Hadley. His e-mail address is mhadley@dera.gov.uk. The full set of record sheets runs to well over 200 pages.

Appendix 3 – Extract of the performance specification for CNIS

Reference : CNIS Functional Specification Issue 3.1, as amended by the CNIS User Working Group.

Radar Measurement Accuracy

It shall be possible for an operator to measure the position of a target relative to the radar origin or to any other selected reference point, to an accuracy of :

Range :- ± 1.5% or 70 m (whichever is the greater) of the maximum range scale in use.

Bearing :- ± 0.25° for a target at the maximum distance (from the origin or reference) which is visible on the display.

Radar Tracking

The system is to acquire a target, on a steady course and speed and giving a strong radar return, and within 3 minutes have access to tracking data which has an accuracy of :

Speed :- ± 1 kt or 10% (whichever is the greater)

Course :- ± 5°

Within 5 minutes of acquisition, the speed and course of the target shall be available to the following accuracy's :

Speed :- ± 0.8 kt, based on a moving average of 5 successive data points.

Course :- ± 1°

The system shall be capable of accurately following the motions of vessels with true speeds of up to 70 knots, providing they are giving a strong radar return.

The tracking system shall be capable of tracking aircraft, which have a speed of up to 120 knots, providing they are giving a strong radar return.

Overall System Accuracy

Based on a range accuracy of 100m (rms) and a bearing accuracy of 0.2° the minimum performance requirement (1SD) of the CNIS ADP system (radar and trackers) is to be :

Range of target (nm)	0-5	5-10	10-15	15-20	20-25
Maximum total positional error (metres)	100	119	139	163	190

Annex 17

Radar Performance Guidelines

With environmental conditions of zero precipitation, not less than sea state 4 and with a fluctuation of radar cross sectional area (RCSA) swerling 3, it should be possible to observe at least a 50% 'paint' on the maintainer's display of targets at or below corresponding ranges from the radar sensor, as described below :

Representative Vessel	RCSA	Range
Small Fishing Boat	10 sq m	9.5 nm
Pilot Vessel	50 sq m	14.0 nm
Coaster	100 sq m	17.0 nm
Small Gas carrier	500 sq m	24.0 nm

CPA / TCPA

There are no specified requirements for the accuracy of CPA / TCPA measured by the system but the results should fall within the criteria for an IMO Type Approved ARPA (Scenario 1) i.e. ± 0.5 nm and ± 1 minute.

VHF D/F

The specific requirements for the accuracy of VHF D/F bearings measured by the system are contained in paragraph 1206.2 of the HMCG Technical Manual. This states that the quoted accuracy for operational D/F systems is ± 5°. However, it then qualifies this with the statement that most systems can do better than this and that the accepted working accuracy is ± 3°.

Appendix 4 – Tabulated breakdown of records taken from CNIS

Run No. & Type	HSC	HSC manoeuvring as the give way vessel	HSC manoeuvring as the stand on vessel	Infringement of distance rules	Manoeuvre by other vessel	Time of manoeuvre before CPA	CPA Distance nm	CPA Relative to other vessel	Potential incident
1 S	CAT	✔		✔		3	0.37	Astern	
2 M	HC		✔	✔		6	0.16 0.32	Astern Ahead	✔
3 M	HC		✔	✔		3	0.16 0.5	Astern Ahead	✔
4 S	HC		✔			3	0.19	Astern	
5 S	CAT	✔				2	0.53	Port	
6 S	CAT	✔		✔	✔	5	0.36	Port	
7 M	CAT		✔	✔	✔	2	0.24 0.4	Starboard Port	
8 M	HC		✔	✔	✔	2	0.5 0.5 0.7 0.73	Ahead Ahead Port Port	✔
9 M	HC	✔		✔		4	0.46 0.82	Astern Ahead	
10 S	HC	✔		✔	✔	7	0.56	Ahead	✔
11 S	CAT	✔		✔		4	0.26	Astern	
12 M	CAT	✔			✔	4	0.5	Astern	
13 S	CAT	✔		✔		5	0.85	Ahead	

Run No. & Type	HSC	HSC manoeuvring as the give way vessel	HSC manoeuvring as the stand on vessel	Infringement of distance rules	Manoeuvre by other vessel	Time of manoeuvre before CPA	CPA Distance nm	CPA Relative to other vessel	Potential incident
14 S	HC		✔			5	0.16	Astern	✔
15 M	HC	✔		✔		3	0.38 0.19	Astern Ahead	 ✔
16 M	HC	✔		✔		8	0.19 0.8	Astern Astern	✔
17 M	HC	✔		✔	✔	6	0.41 0.56	Starboard Astern	
18 S	CAT	✔		✔		3	0.82	Ahead	
19 M	HC	✔		✔	✔	7	0.23 0.74 0.29 0.1 1.29	Astern Ahead Port Ahead Ahead	 ✔
20 S	CAT		✔	✔		3	0.64 0.84	Ahead Astern	✔
21 S	HC						0.42	Astern	
22 S	CAT		✔			3	1.05	Ahead	
23 M	CAT	✔	✔	✔	✔	8	0.56 0.31 1.69 2.12 0.98	Ahead Port Ahead Ahead Astern	✔

Run No. & Type	HSC	HSC manoeuvring as the give way vessel	HSC manoeuvring as the stand on vessel	Infringement of distance rules	Manoeuvre by other vessel	Time of manoeuvre before CPA	CPA Distance nm	CPA Relative to other vessel	Potential incident
24 S	HC	✔		✔		7	0.93	Ahead	
25 S	HC	✔	✔	✔		2	0.39 0.85	Astern Starboard	
26 S	CAT		✔	✔	✔		0.44	Astern	✔
27 S	CAT		✔	✔		6	0.28	Astern	
28 M	HC		✔	✔		7	0.18	Astern	✔
29 M	CAT	✔	✔			6	0.99 0.91	Ahead Astern	
30 M	HC	✔		✔		5	0.93 0.55	Ahead Starboard	
31 M	HC	✔	✔	✔		4	0.5 0.22	Starboard Astern	
32 S	CAT	✔		✔		2	0.44	Ahead	✔
33 S	CAT	✔	✔			4	1.45 1.41	Ahead Ahead	
34 S	CAT	✔		✔	✔	3	0.39	Ahead	✔

Run No. & Type	HSC	HSC manoeuvring as the give way vessel	HSC manoeuvring as the stand on vessel	Infringement of distance rules	Manoeuvre by other vessel	Time of manoeuvre before CPA	CPA Distance nm	CPA Relative to other vessel	Potential incident
35 M	CAT		✔			7	0.5 1.26	Astern Ahead	
36 M	CAT	✔	✔	✔		7	1.92 0.23 0.39	Ahead Port Port	 ✔
37 M	HC	✔	✔	✔	✔	5	0.72 0.48 0.18 0.35	Astern Ahead Ahead Astern	 ✔
38 S	CAT	✔		✔		4	0.41	Astern	
39 M	HC	✔		✔	✔	3	0.42 0.59	Astern Astern	
40 M	HC		✔	✔		2	0.31 0.21	Ahead Astern	✔

E Appendix 5 – Results of the survey carried out by Xavier Lefèvre at Cap Gris Nez (14th –18th of June 1999)

1. Introduction

The basic principle consisted to collect data including :

A) INITIALISATION OF A RECORDING SHEET FOR EACH IDENTIFIED HIGH SPEED CRAFT

That has been done from the time-tables edited by Companies operating HSC; this form recorded (see model in appendix 1) :

Date

Name and type of the vessel (Catamaran, Hovercraft)

Port of departure

Hour of departure

Current meteorological conditions (Wind, Sea, Visibility)

B) OBSERVATION OF THE WHOLE TRIP OF THIS HIGH SPEED CRAFT

During this trip, two kinds of events have to be detected:

Collision avoidance manoeuvre done by this HSC

Collision avoidance manoeuvre done by a normal speed vessel to avoid this HSC

Every event will be registered in the sheet form with indications of relevant hours (beginning, end of the manoeuvre) in order to extract them later on from the SOFRELOG data storage system.

Data processing will consisted, from the SOFRELOG replay function, to record the different parameters of collision avoidance manoeuvres such as :

- ❑ Anticipation distance (initial separation)
- ❑ DCPA, TCA before manoeuvring
- ❑ Value of course and/or speed alteration
- ❑ Duration of the collision avoidance manoeuvre
- ❑ Real DCPA obtained

Each collision avoidance manoeuvre has been recorded in a data base (see appendix 2).

Characteristics parameters are specified in the five following figures.

Figure n°1 : Detection of a risk of collision

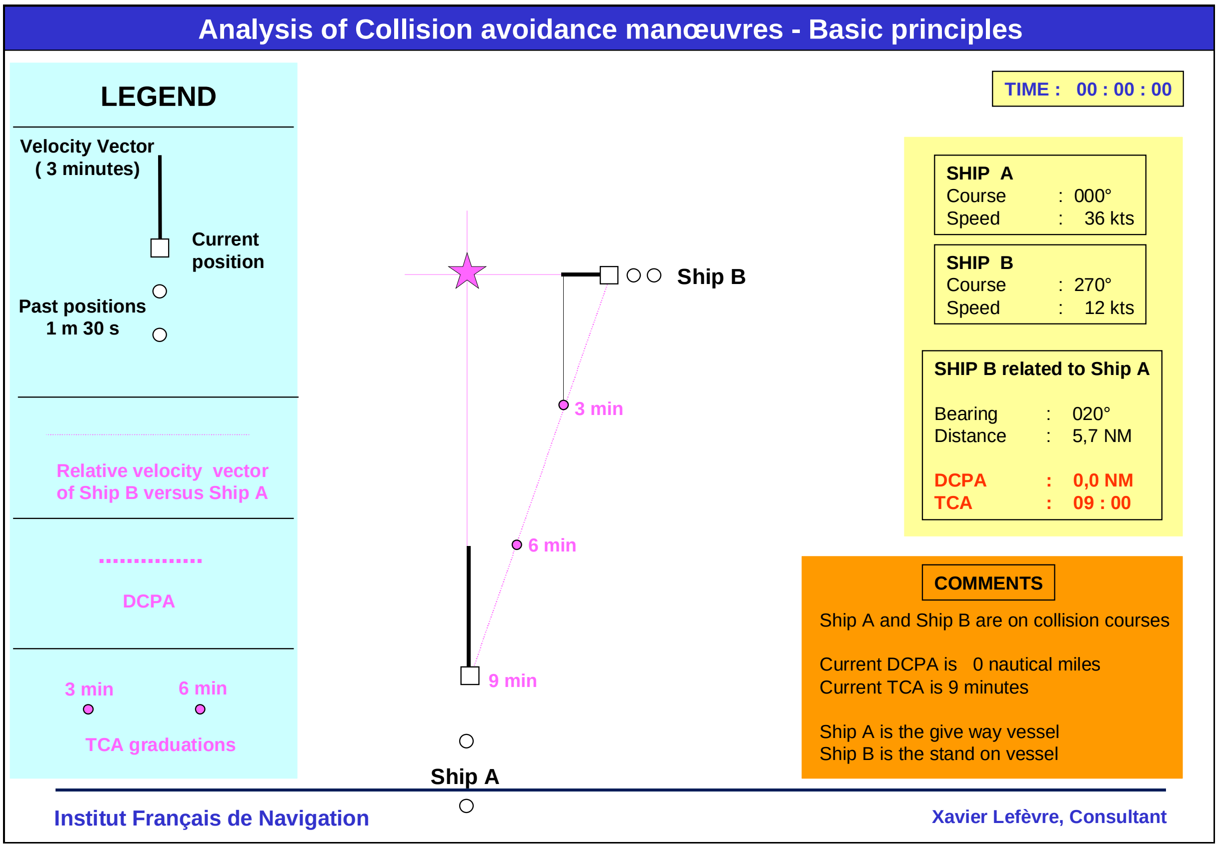


Figure n°2 : The give way vessel initialises a collision avoidance manœuvre

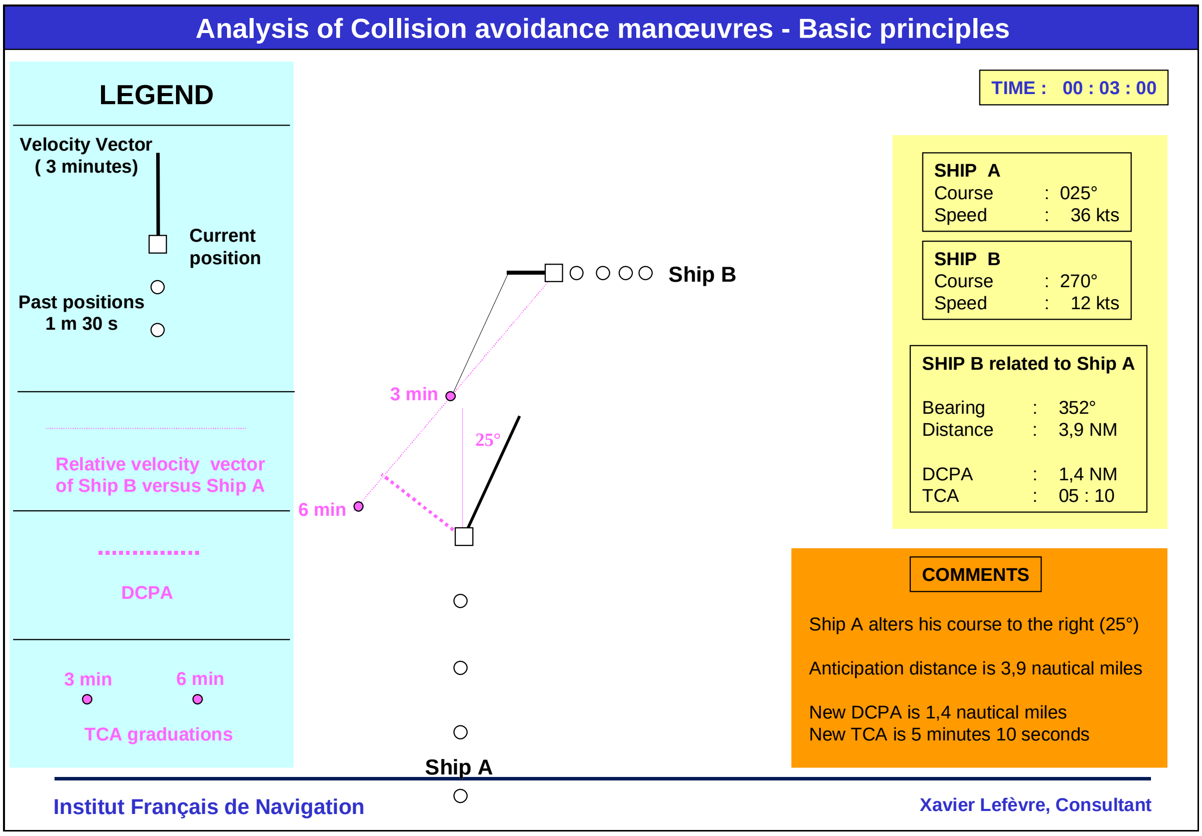


Figure n°3 : The give way vessel resumes initial course

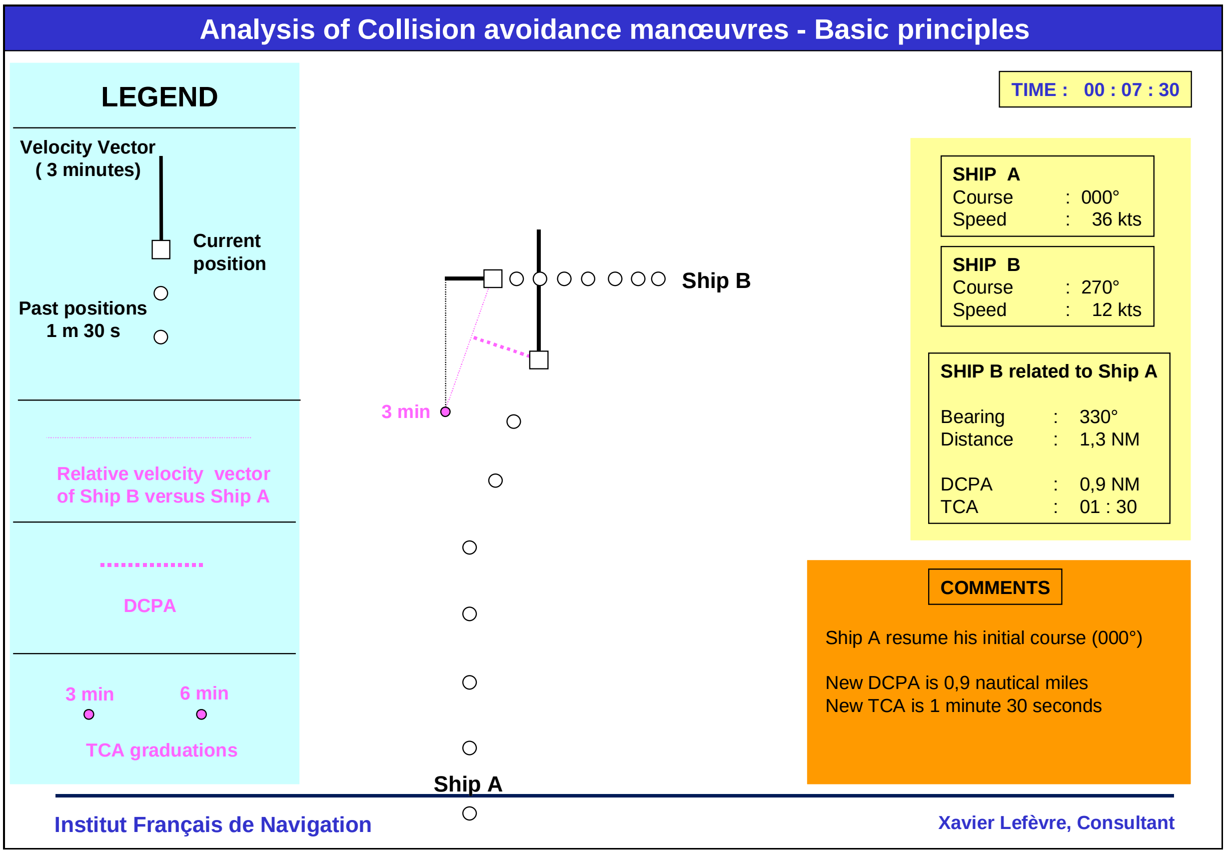


Figure n°4 : Effective Closest Point of Approach

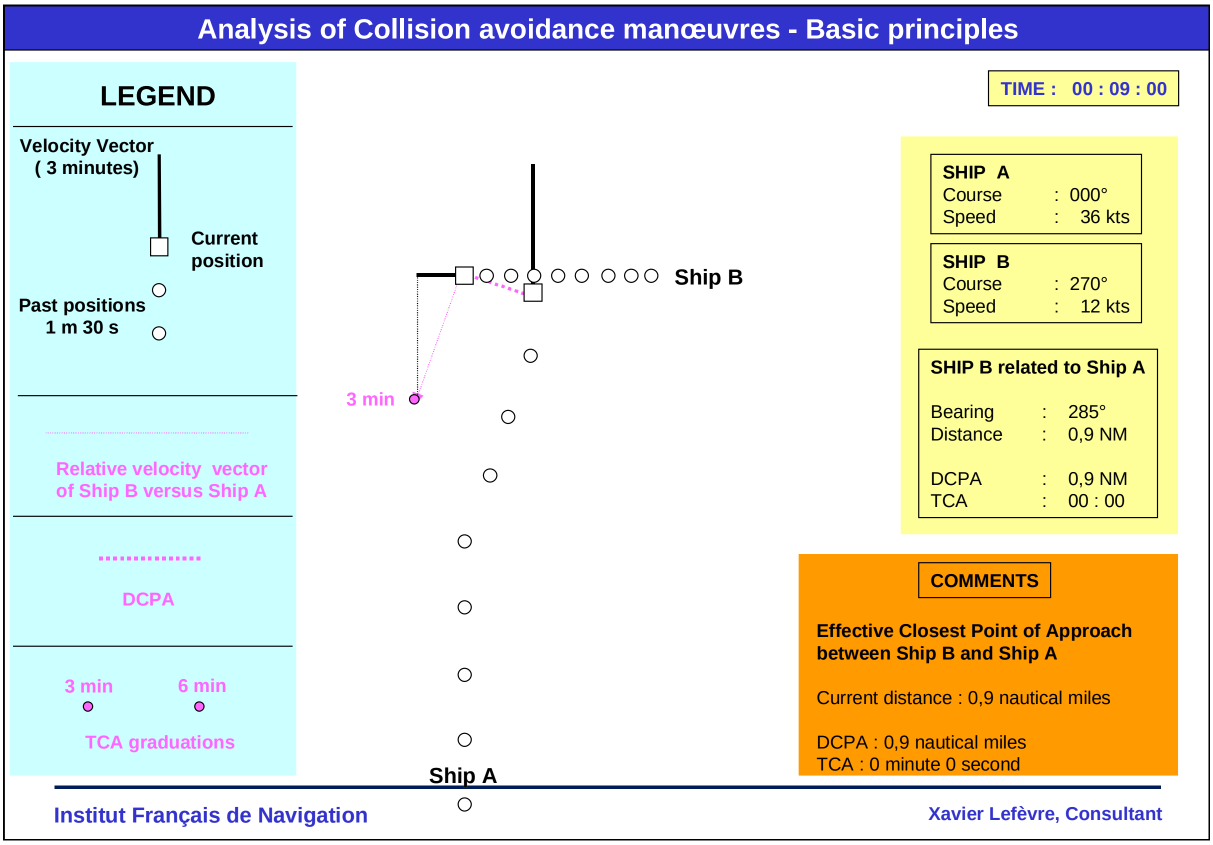
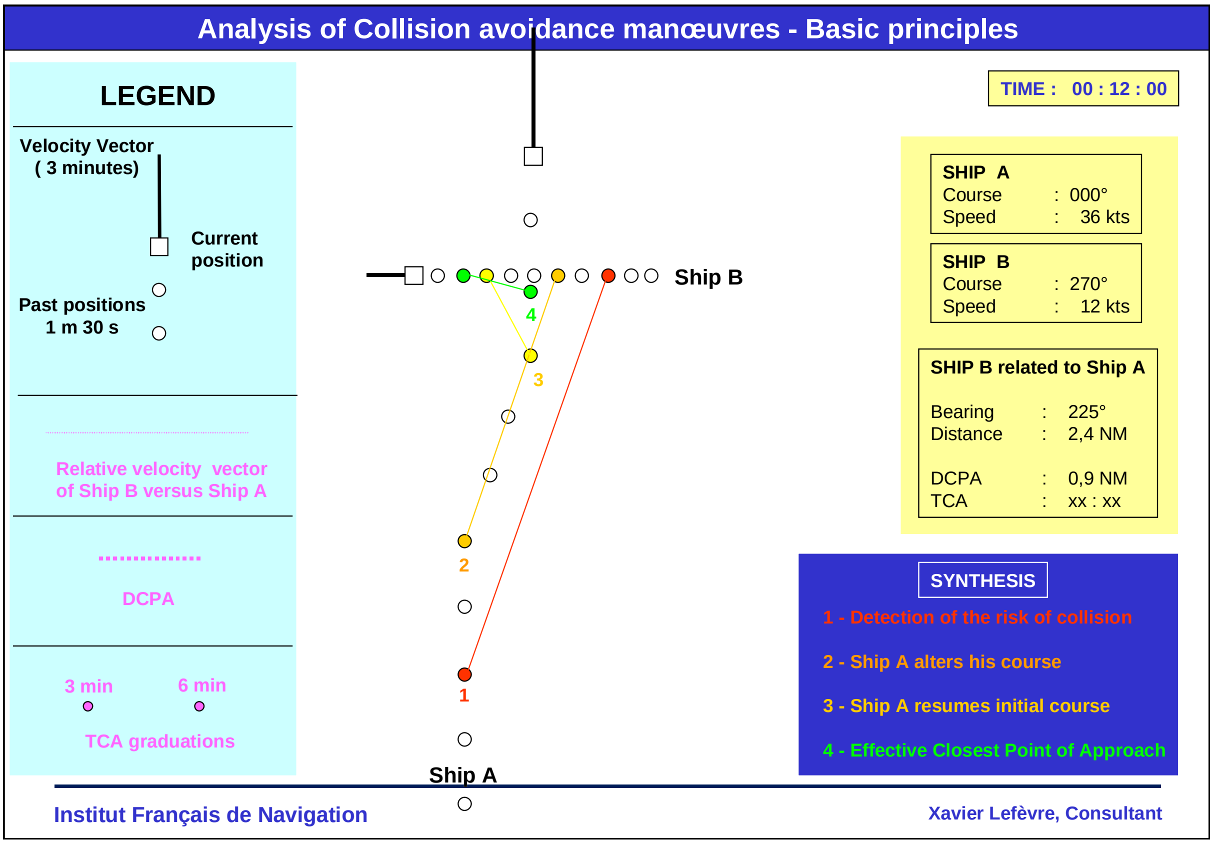


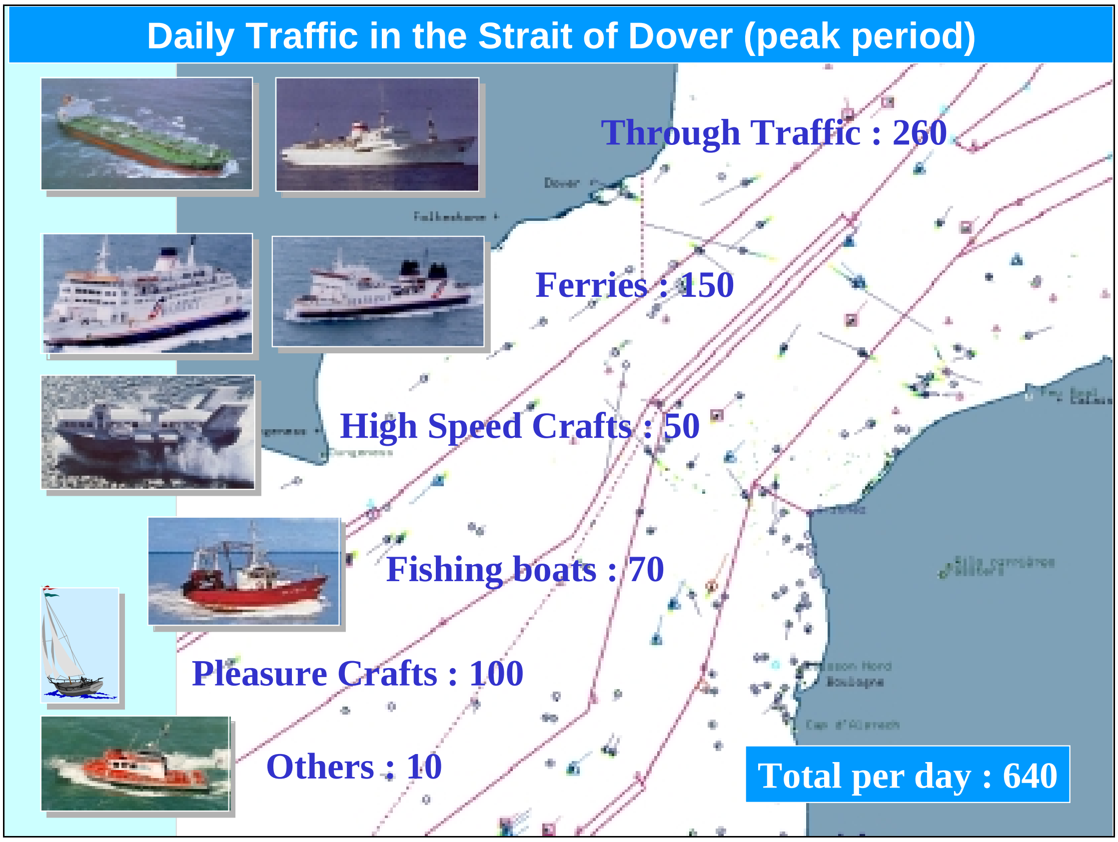
Figure n° 5 : Synthesis

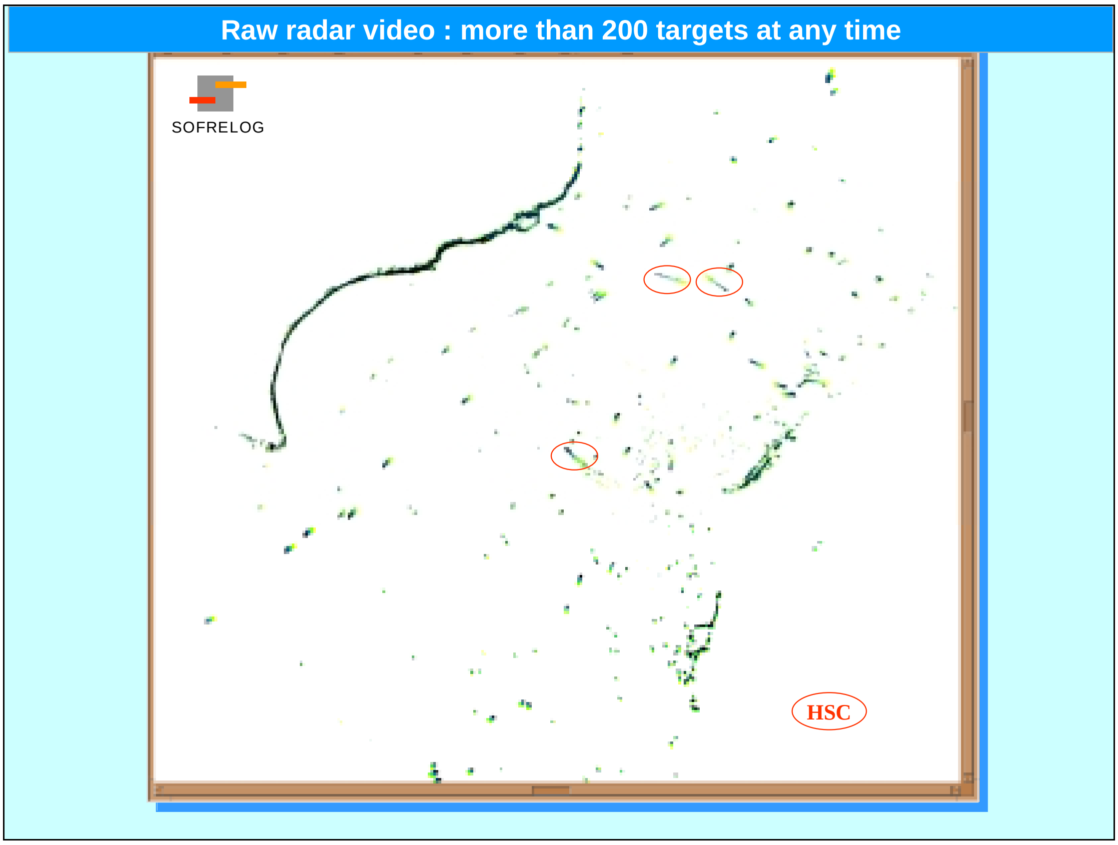


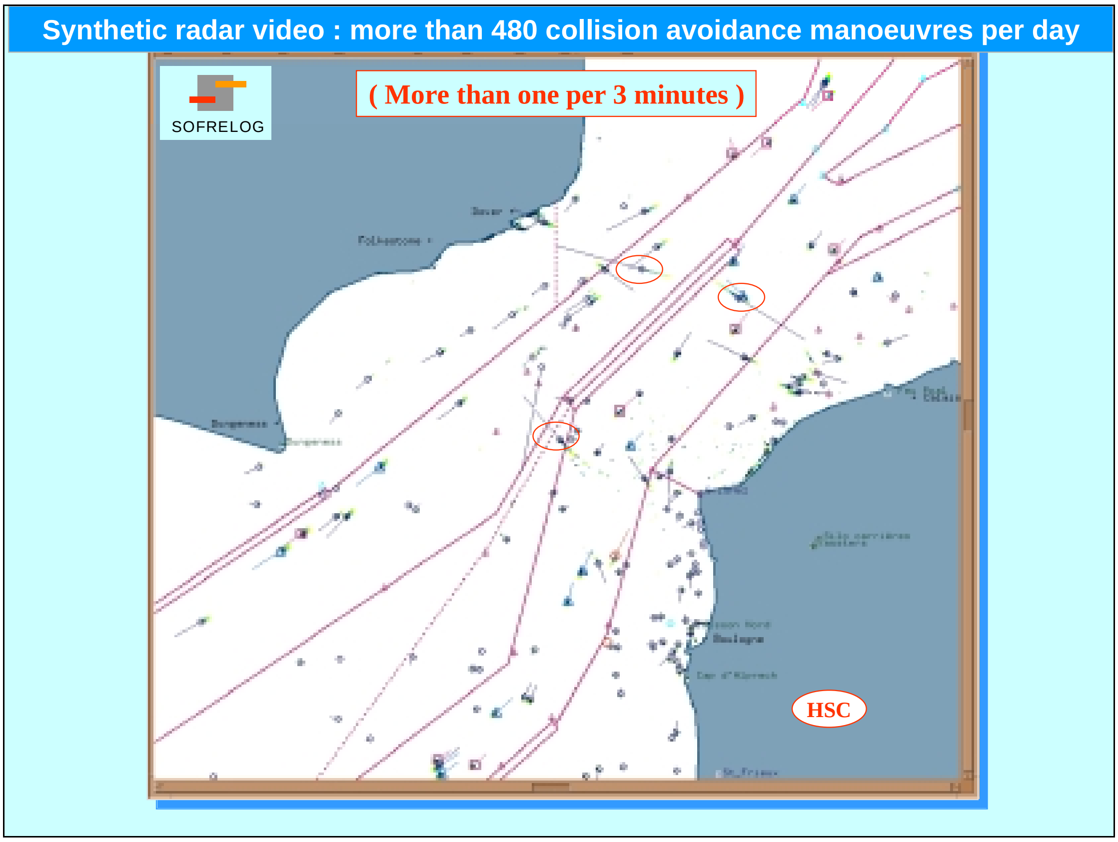
2. Traffic density in the Strait of Dover

The three following figures show that :

- About 640 ships of various types sail daily in the Strait of Dover (in peak periods); among them, 50 vessels are High Speed Crafts
- At any time, more than 200 targets are displayed on the radar screens of CROSS Gris Nez
- More than 480 collision avoidance manœuvres occur per day (more than one per 3 minutes)


Daily Traffic in the Strait of Dover (peak period)
Through Traffic : 260
Ferries : 150
High Speed Crafts : 50
Fishing boats : 70
Pleasure Crafts : 100
Others : 10
Total per day : 640


Raw radar video : more than 200 targets at any time
SOFRELOG
HSC

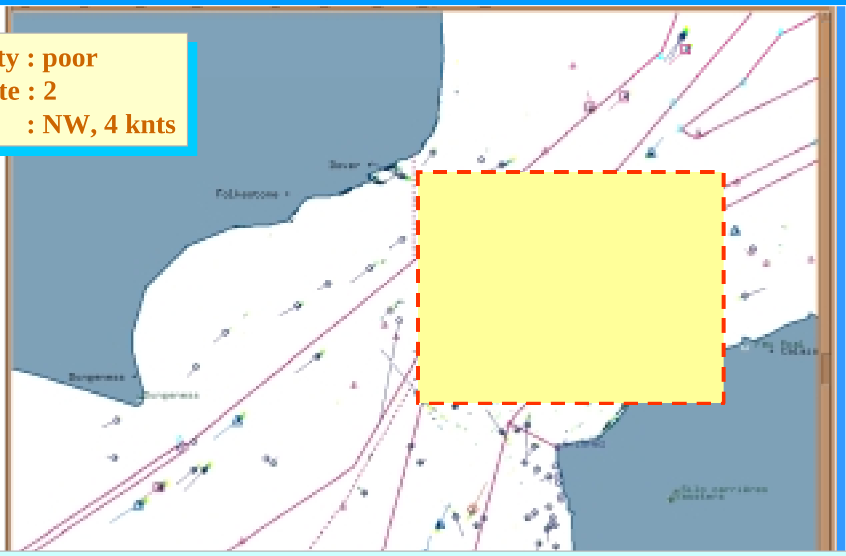


3. Four examples of Collision avoidance manoeuvres

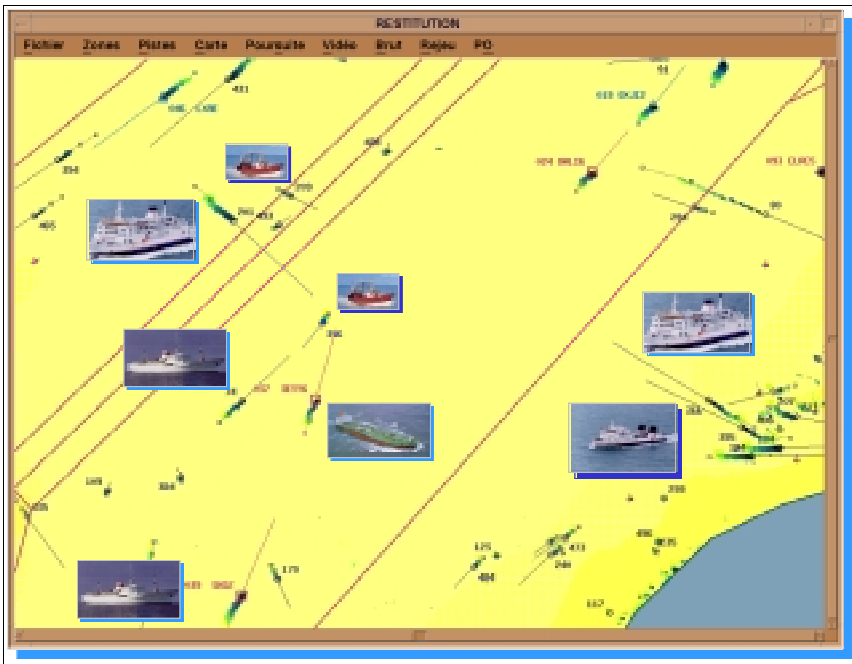
- **Example 1** : 8 collision avoidance manœuvres inside a 20 minutes period with no HSC involved
- **Example 2** : Head On and Overtaking encounters for the Seacat Calais-Dover
- **Example 3** : The Seacat Boulogne-Folkestone anticipates her crossing of the N.E. Lane
- **Example 4** : Head On encounter between a Ferry and an Hovercraft, then crossing encounter between the Ferry and a bulk carrier in the S.W. Lane

Example n° 1 : Multiple encounters in the North East Lane

Visibility : poor
Sea State : 2
Wind : NW, 4 knts



One ferry Dover-Calais will alter course and/or speed three times, firstly to avoid a deep draught vessel, secondly to avoid a general cargo and finally to avoid another cargo.At the same time, a rogue fishing boat was involved in these encounters. A few minutes later, the general cargo and the deep draught vessel will alter course to avoid two ferries Calais-Dover and another fishing boat will alter course for the NE bound vessels.



DATE
16/06/1999

TIME
09 : 38 : 00

The ferry 201 is on a collision course with the deep draught vessel 037
The target 396 is a rogue fishing boat

DATE
16/06/1999

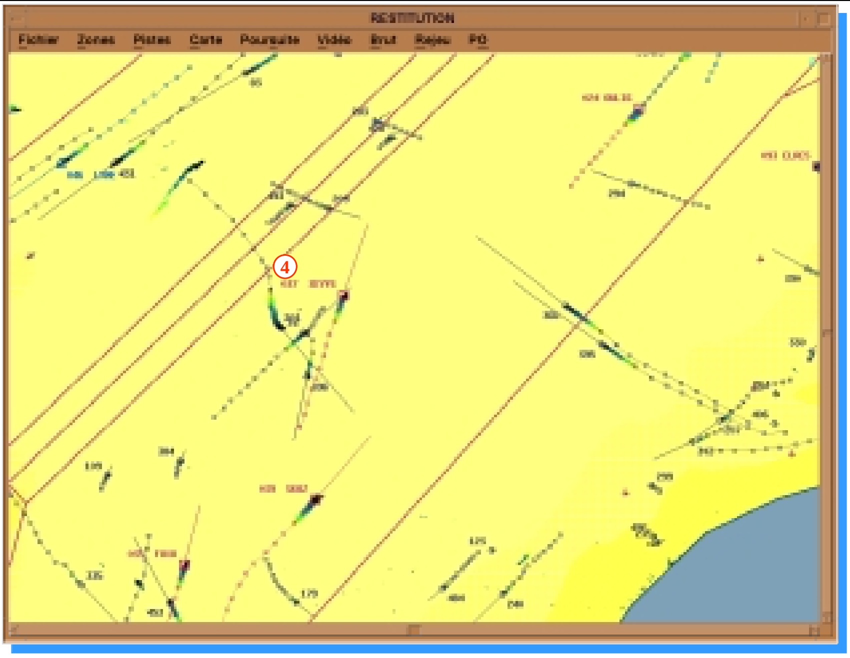
TIME
09 : 40 : 00

Ferry 201 alters course to the right to avoid vessel 037; so doing, Ferry 201 decrease DCPA with cargo 74; the rogue fishing boat is really disturbing

DATE
16/06/1999

TIME
09 : 43 : 00

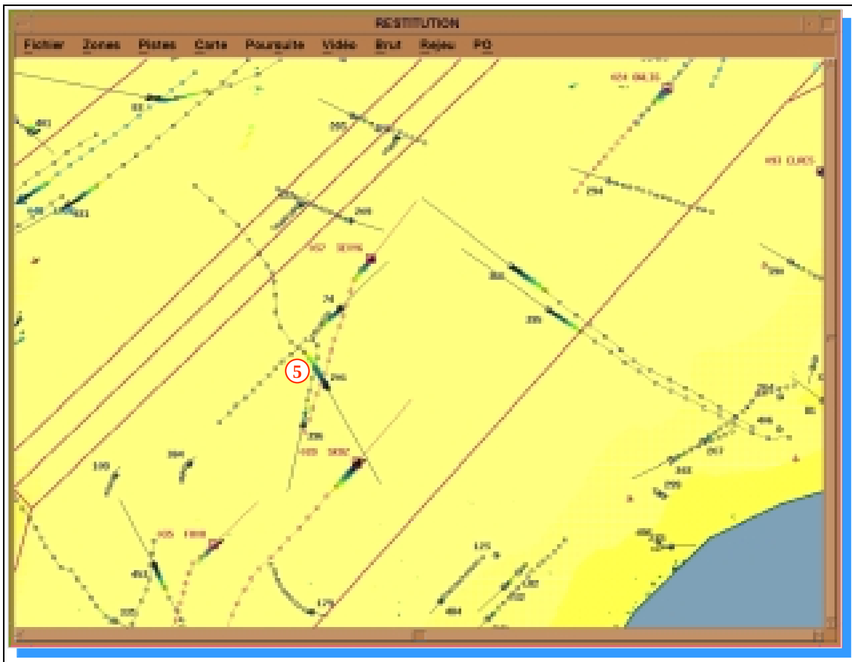
Ferry 201 reduces speed (50%) to pass astern vessel 037 and cargo 74
The fishing boat alters course to the left and increases speed



DATE
16/06/1999

TIME
09 : 46 : 00

Ferry 201, after a new alteration of course to the right resumes initial course and speed; so doing, Ferry 201 meets a collision course with cargo 039
The rogue fishing boat is no more involved in encounters



DATE
16/06/1999

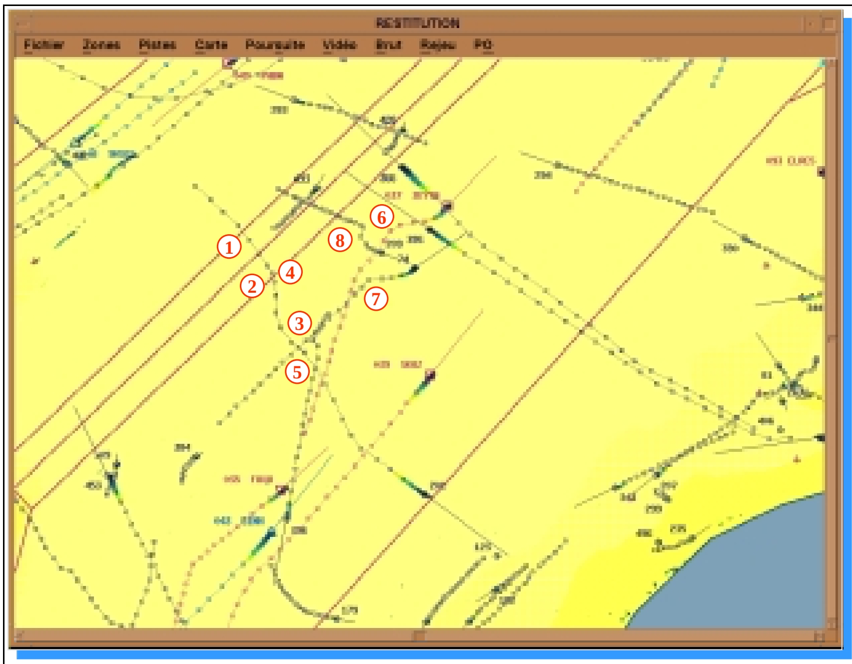
TIME
09 : 50 : 00

Ferry 201 alters course to the right again to avoid cargo 039
Deep draught vessel 037 altered course and is now on a collision course with ferry 366
Cargo 74 is on collision course with ferry 395

DATE
16/06/1999

TIME
09 : 54 : 00

Ferry 201 pass astern cargo 039
Vessel 037 and cargo 74 alter course to the right to avoid ferries 366 and 395
The fishing boat 209 alters course (60°, right) to avoid targets 037 and 74



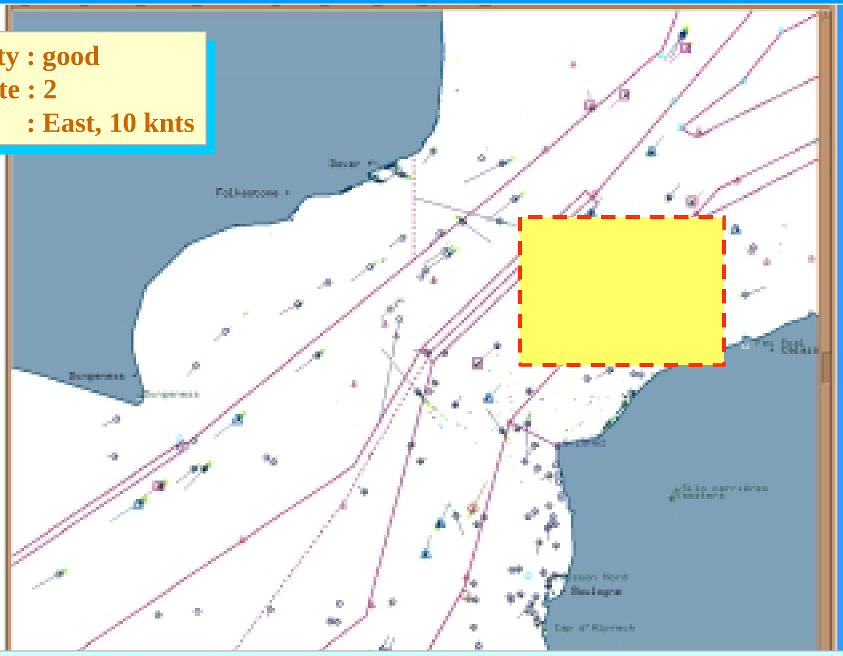
DATE
16/06/1999

TIME
09 : 58 : 00

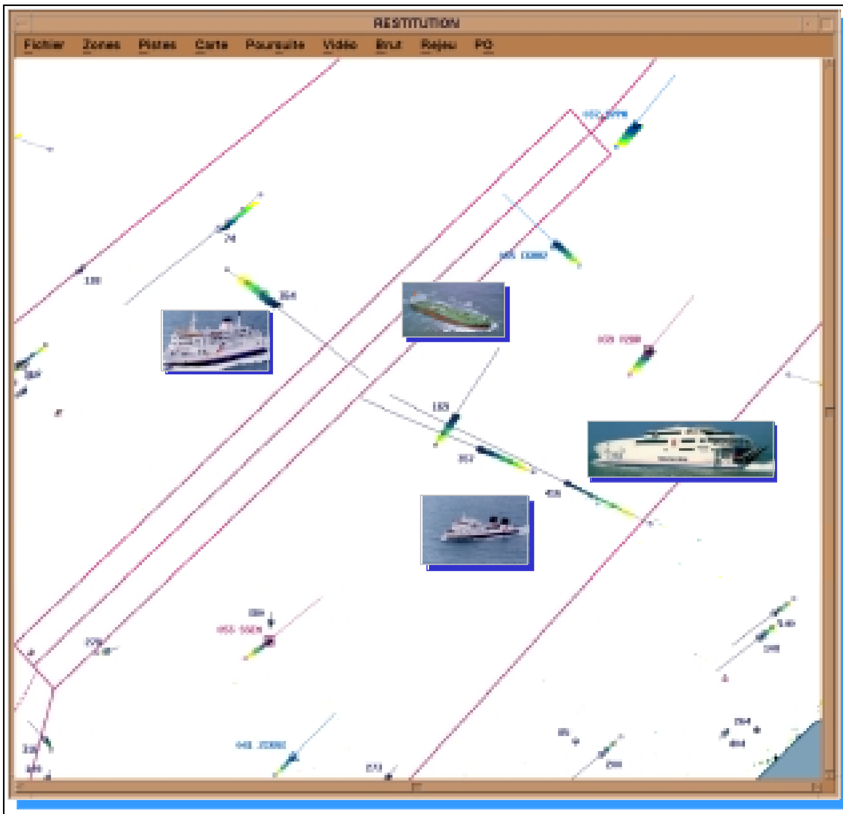
The situation is now clear, but tracks are witnesses !…
8 collision avoidance manoeuvres inside a 20 minutes period

Example n° 2 : Head On and Overtaking encounters for SEACAT Calais-Dover

Visibility : good
Sea State : 2
Wind : East, 10 knts



The SEACAT Calais -Dover is in Head On encounter with a ferry Dover-Calais
An other ferry Calais Dover, overtaken by SEACAT will alter course to the right to pass Portside the ferry Dover-Calais; SEACAT will make a large turn

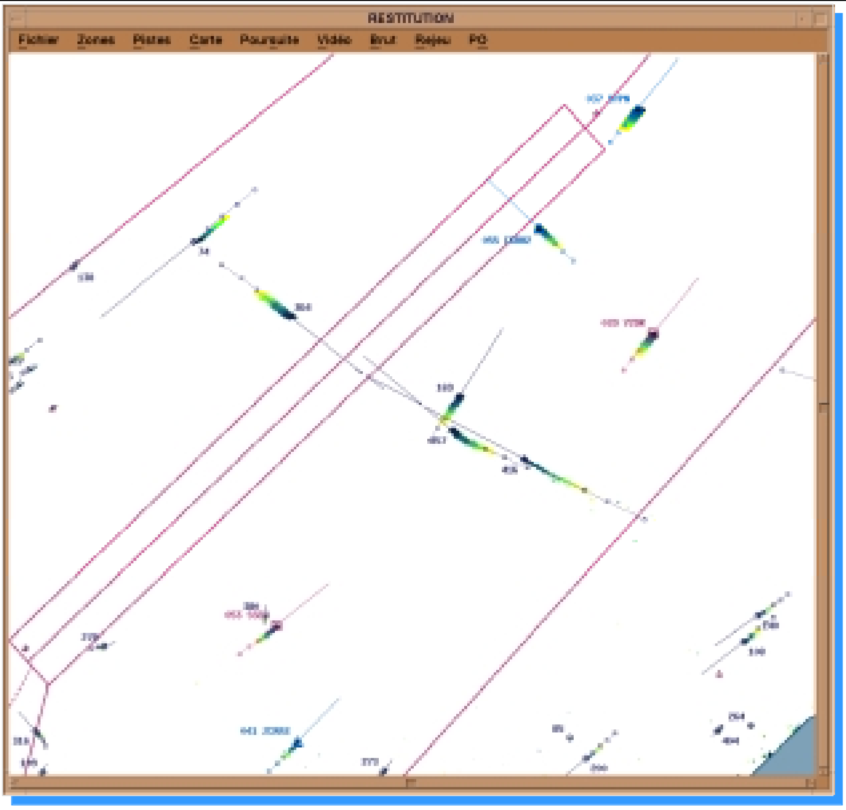


DATE
18/06/1999

TIME
09 : 45 : 00

SEACAT n° 416 is on Head On collision course with Ferry 364.

Maintaining current course, Ferry 357 will pass Starboard Ferry 364

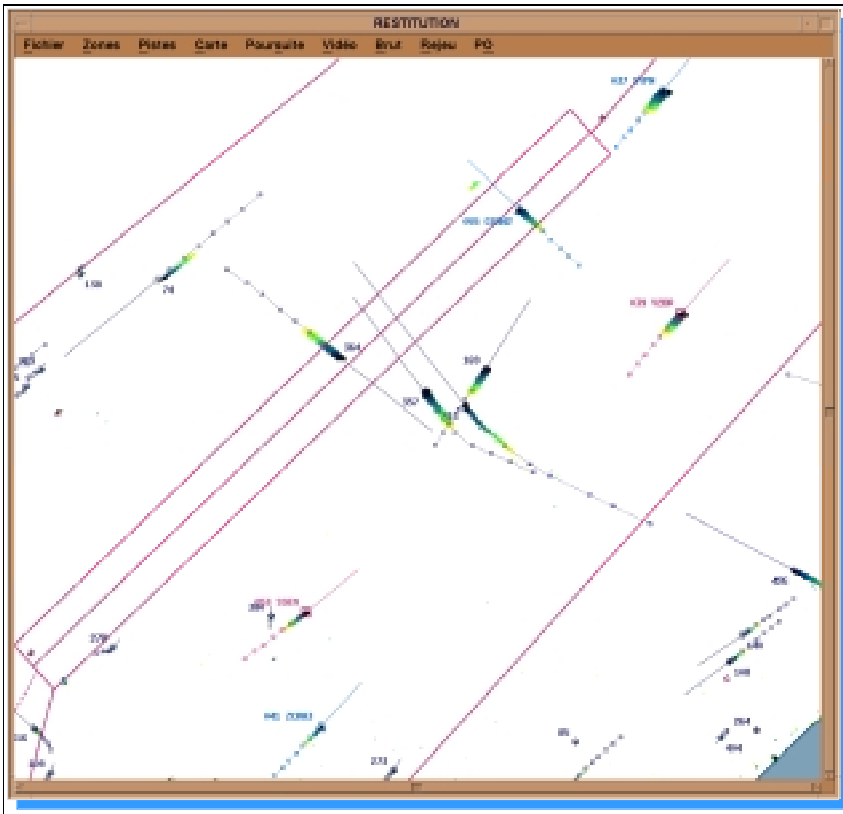


DATE
18/06/1999

TIME
09 : 46 : 00

Ferry 357 alters course to pass Portside Ferry 364.

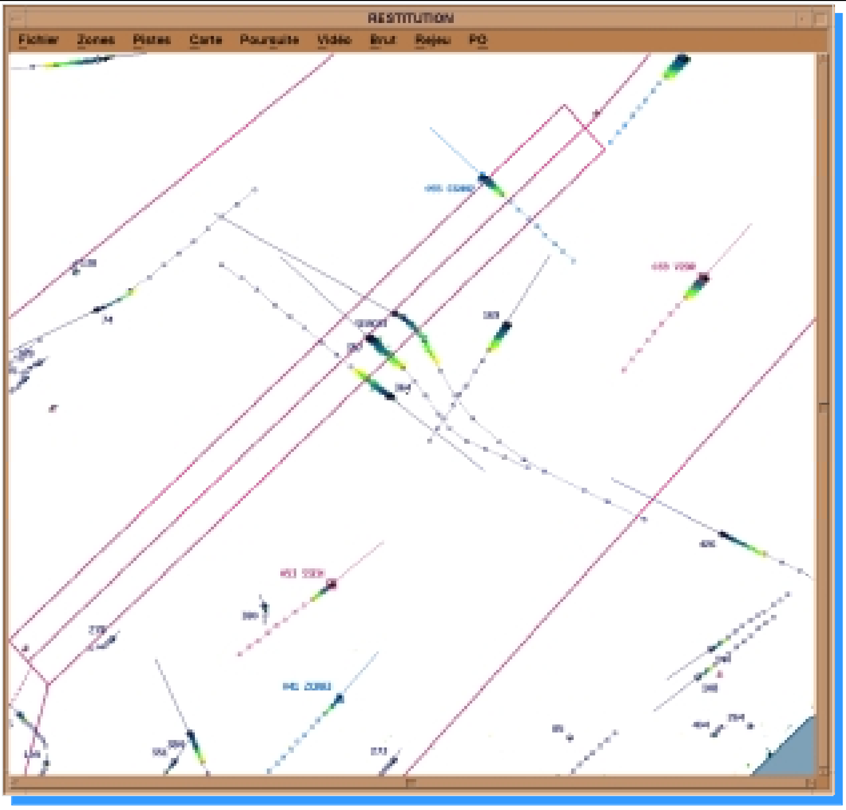
So doing, Ferry 357 and SEACAT 416 are on Overtaking collision course



DATE
18/06/1999

TIME
09 : 50 : 00

SEACAT 416 altered course to the right to avoid Ferries 357 and 364



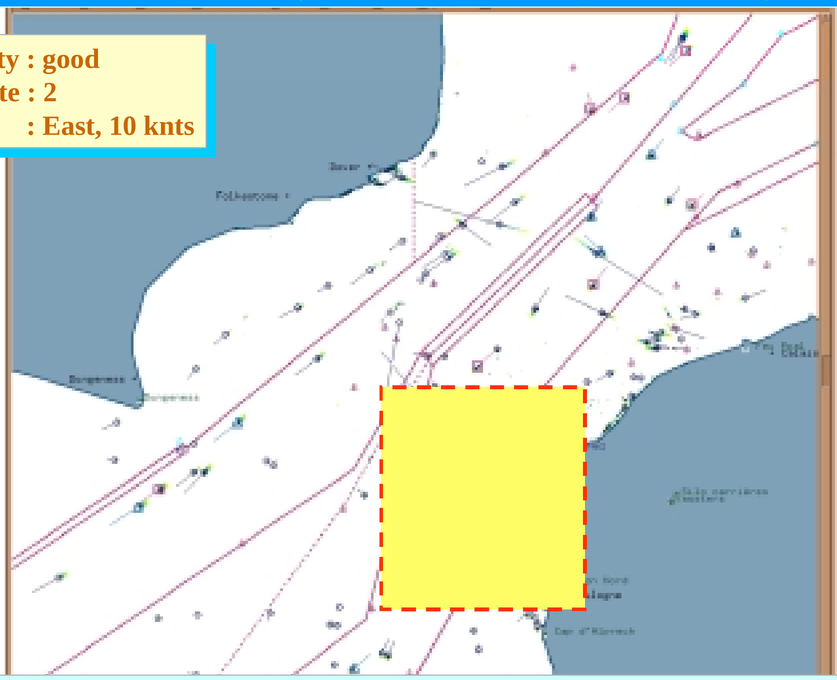
DATE
18/06/1999

TIME
09 : 54 : 00

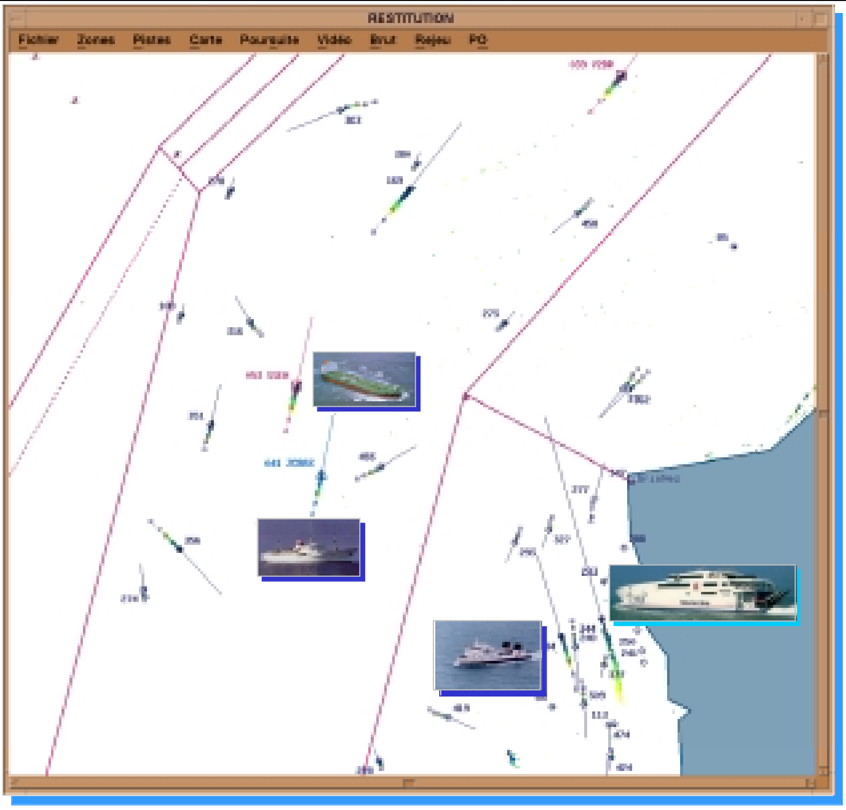
The situation
is now clear

Example n° 3 : SEACAT Boulogne-Folkestone anticipates crossing of N.E. Lane

Visibility : good
Sea State : 2
Wind : East, 10 knts



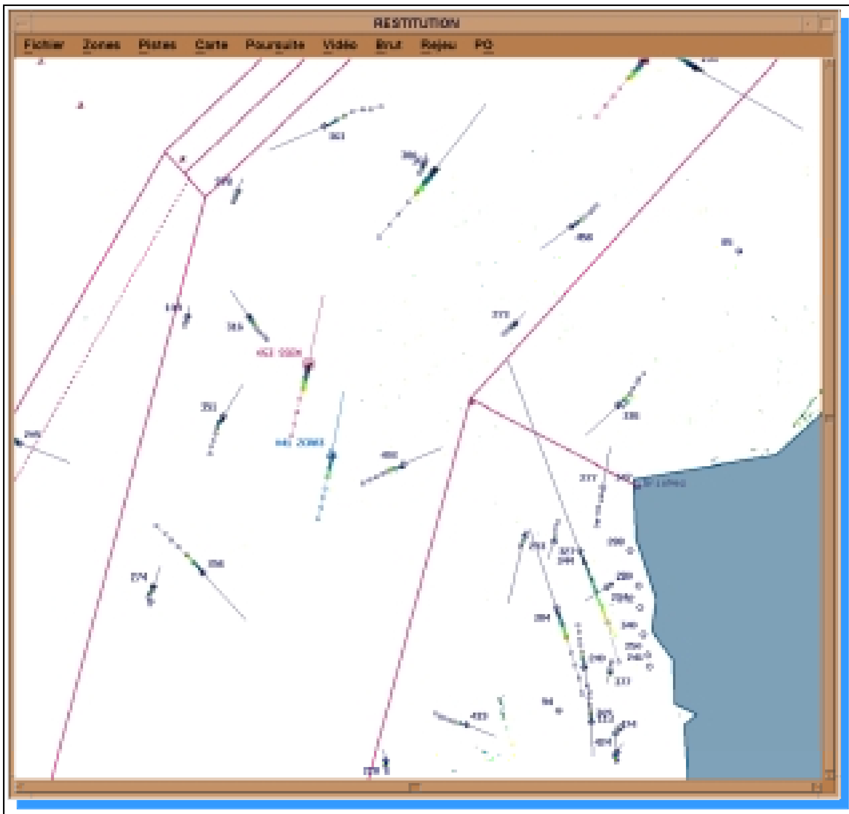
The SEACAT Boulogne - Folkestone will anticipate the crossing of the N.E. Lane with a large left turn to pass astern a deep draught vessel and a general cargo



DATE
18/06/1999

TIME
09 : 10 : 00

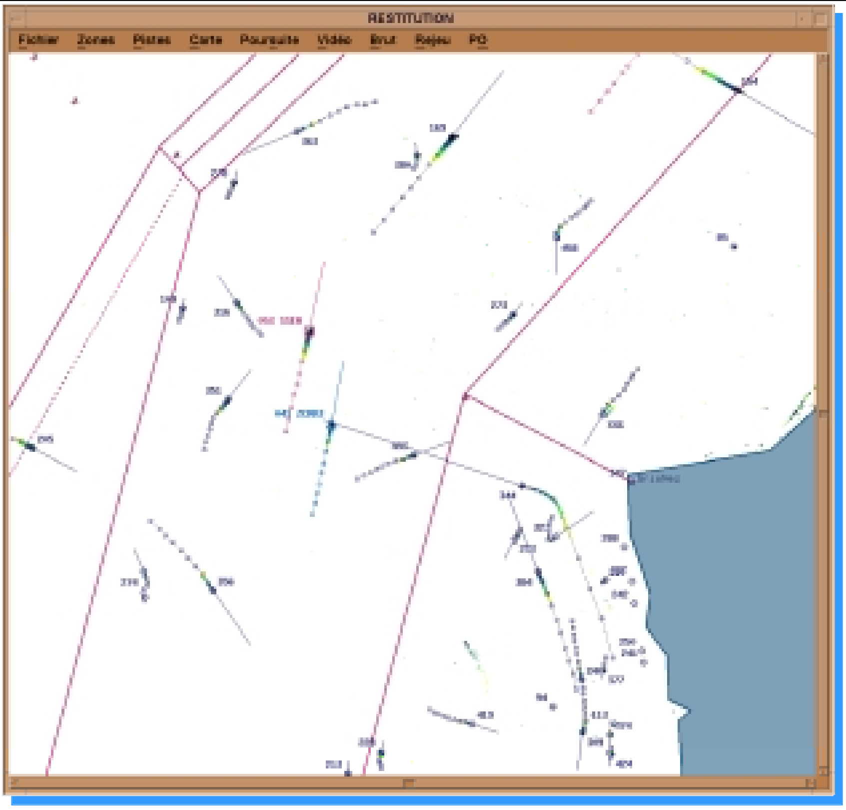
SEACAT 344 leaves Boulogne with usual course to cross the N.E Lane



DATE
18/06/1999

TIME
09 : 12 : 00

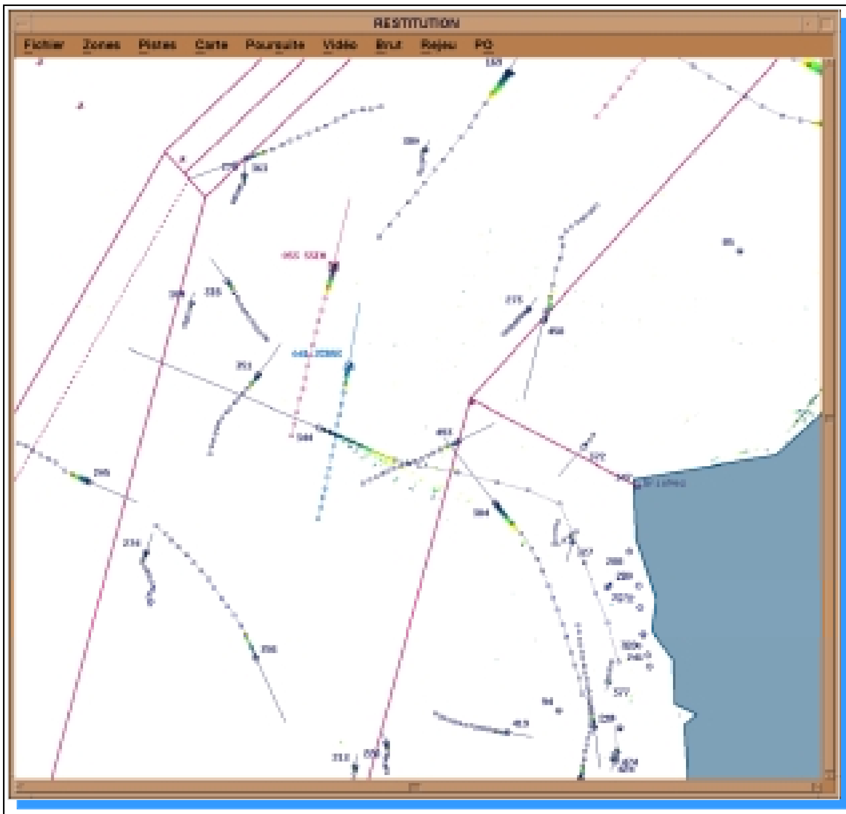
Maintaining current course, SEACAT 344 will disturb
deep draught vessel 053 an general cargo 041



DATE
18/06/1999

TIME
09 : 15 : 00

SEACAT 344 alters course to the left to pass astern vessel 053 and cargo 041



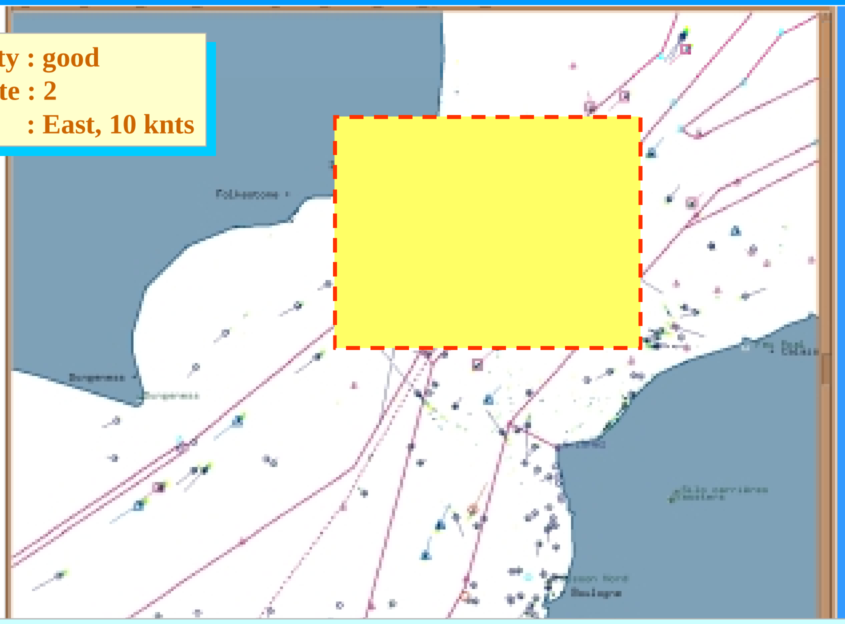
DATE
18/06/1999

TIME
09 : 21 : 00

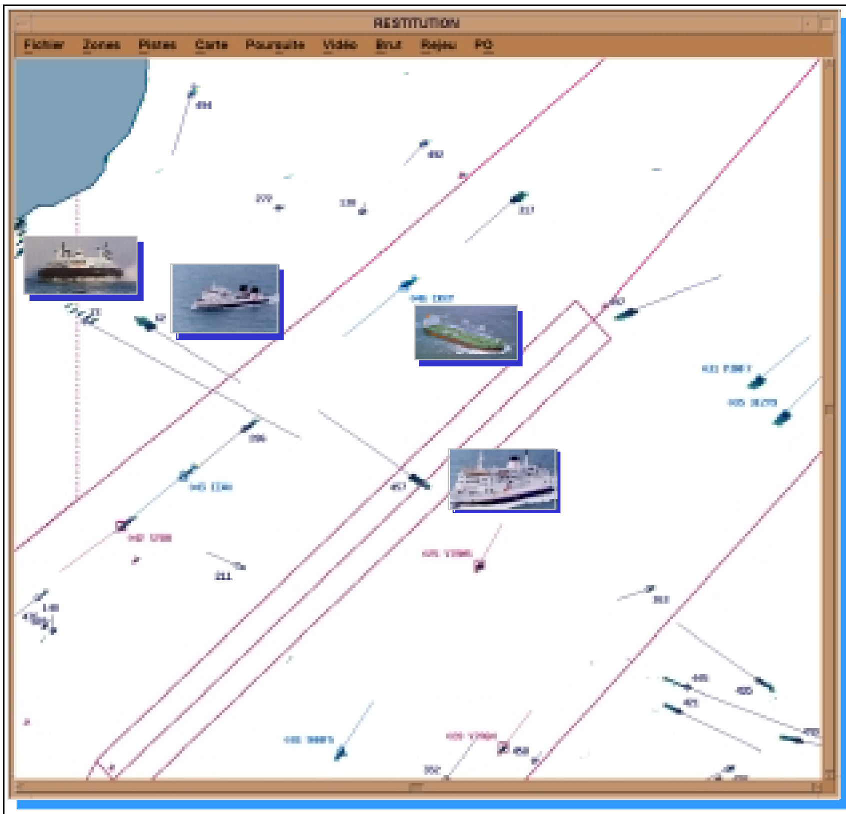
The situation is now clear

Example n° 4 : Head On encounter with an Hovercraft, then crossing encounter

Visibility : good
Sea State : 2
Wind : East, 10 knts



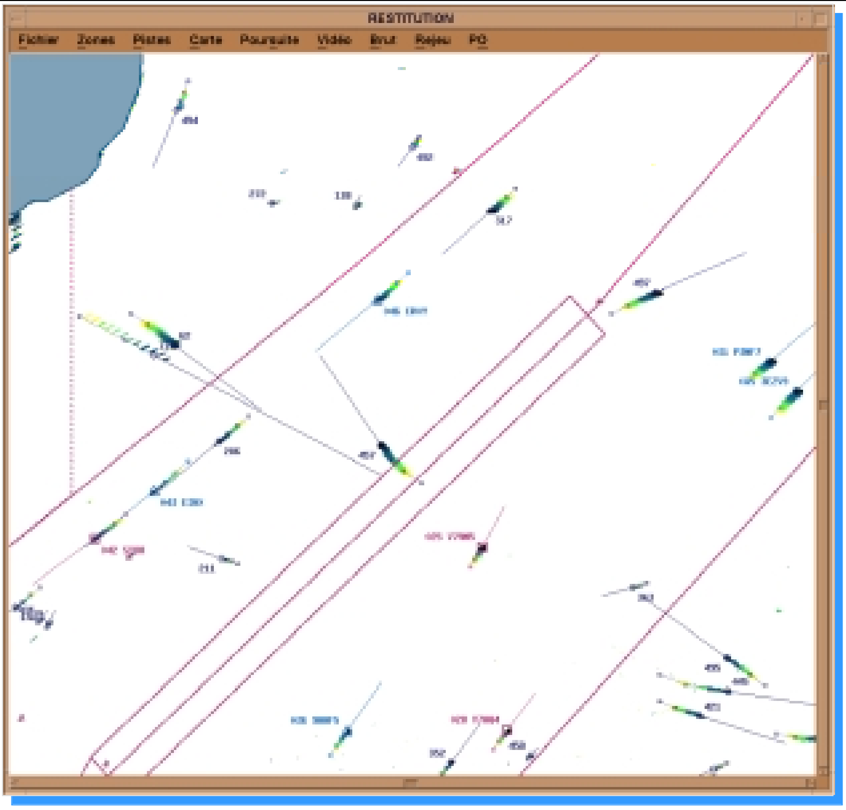
One ferry Calais-Dover is on Head On encounter with a Ferry Dover-Calais
and one Hovercraft Dover-Calais.
The ferry will alter course to the right; so doing, the ferry will be on crossing encounter with a bulk carrier in the S.W. Lane; The ferry will alter course again.



DATE
18/06/1999

TIME
08 : 14 : 00

Ferry 457 is on
a Head On collision
course with Ferry 62



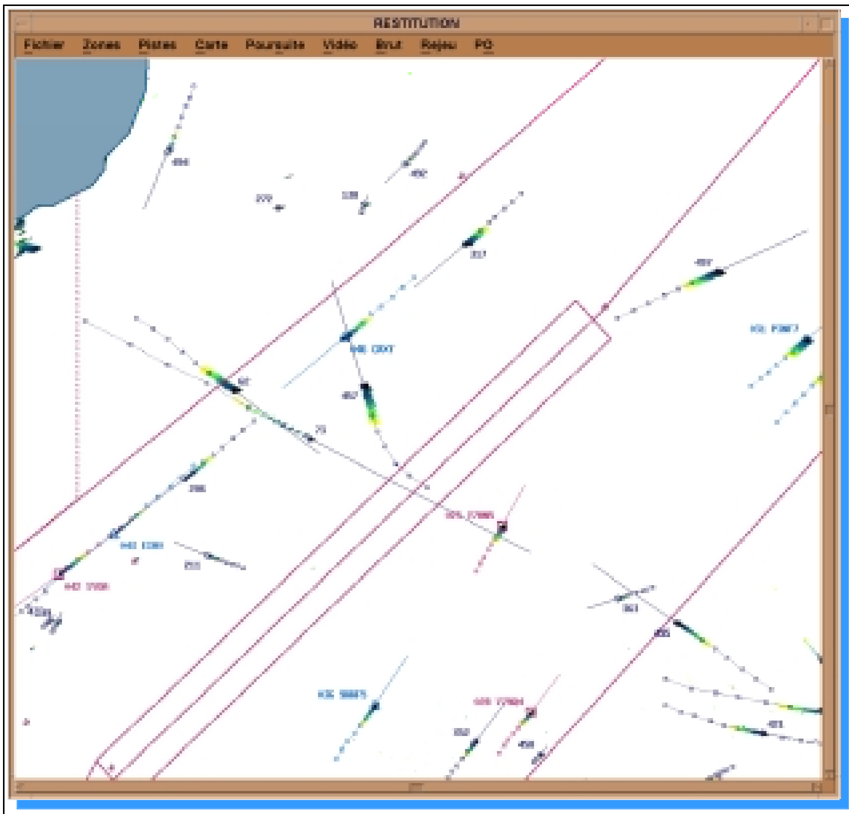
DATE
18/06/1999

TIME
08 : 15 : 00

Ferries 457 and 62
alter course to the right
to get a portside
passage.

Hovercraft 73 alters
course (5°, right)
to overtake Ferry 62

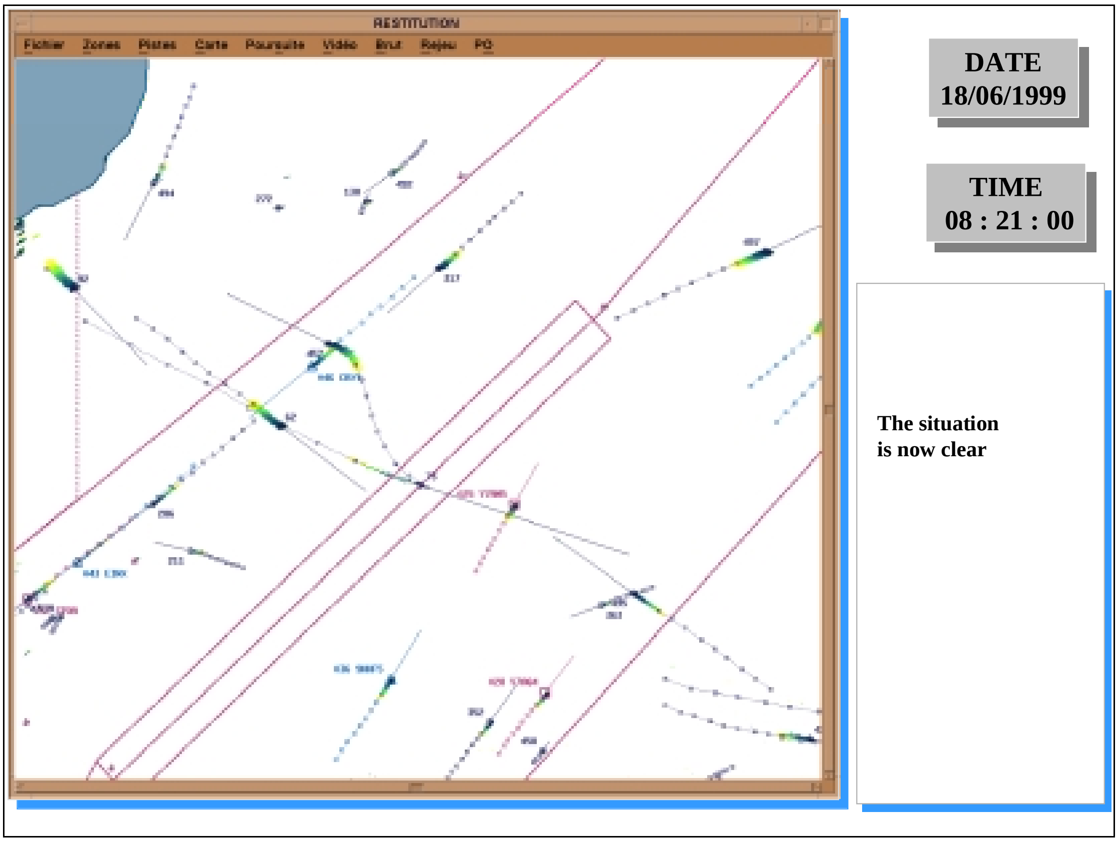
Ferry 457 is now
on a crossing collision
course
with bulk carrier 046



DATE
18/06/1999

TIME
08 : 17 : 00

Ferry 457 altered
course to the right
again
to pass astern
bulk carrier 046



4. Draft results

The main draft results issued from the surveys are the following :

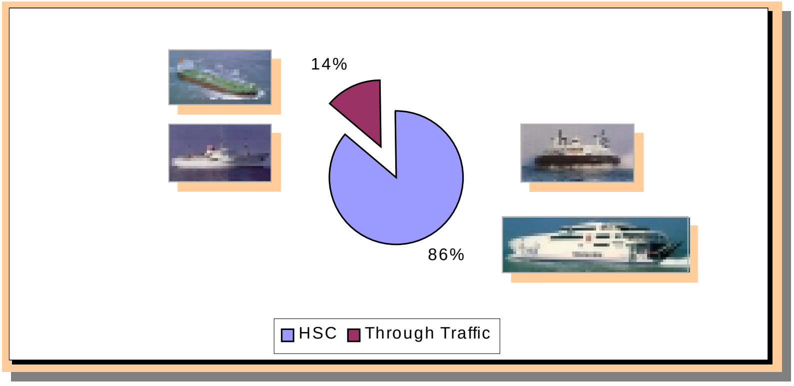
1. Out of 100 encounters involving one HSC, 86 of Collision Avoidance Manœuvres (CAM) were carried out by HSC (14 by “normal speed” vessels)

2. Out of 100 crossing of the Strait of Dover by HSC :
   - 57 did not have to manœuvre for collision avoidance purpose
   - 18 had to manœuvre to avoid Ferries
   - 25 had to manœuvre to avoid Through Traffic in the N.E. and S.W. lanes

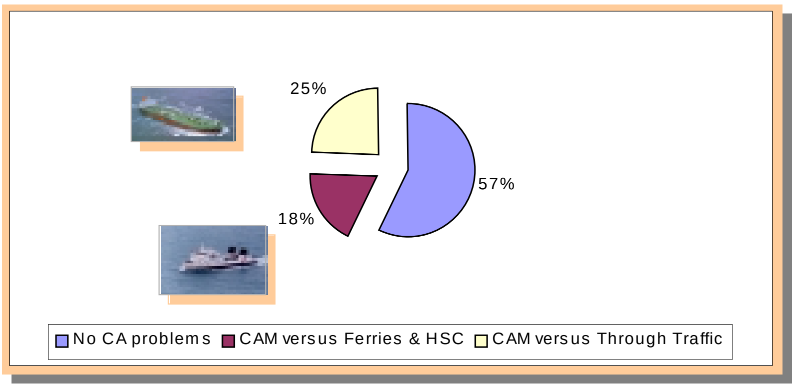
3 Out of 100 Collision Avoidance Manœuvres :
   - 55 have been done by Hovercrafts
   - 45 have been done by Catamarans

4 Out of 100 Collision Avoidance Manœuvres done by the through traffic versus one HSC :
   - 89 were to avoid a Catamaran
   - 11 were to avoid an Hovercraft

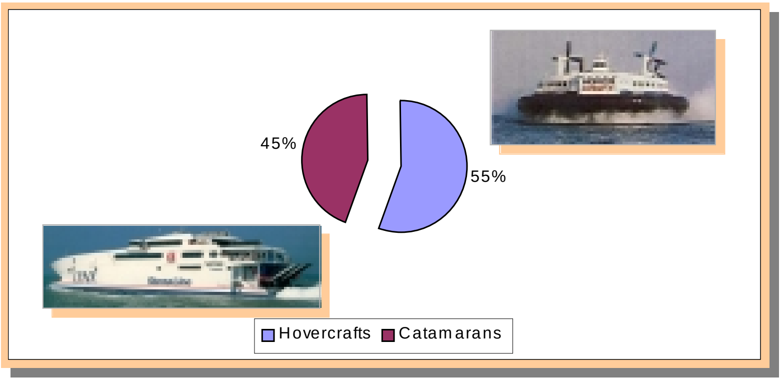
1 -Collision Avoidance manœuvre involving One High Speed Craft



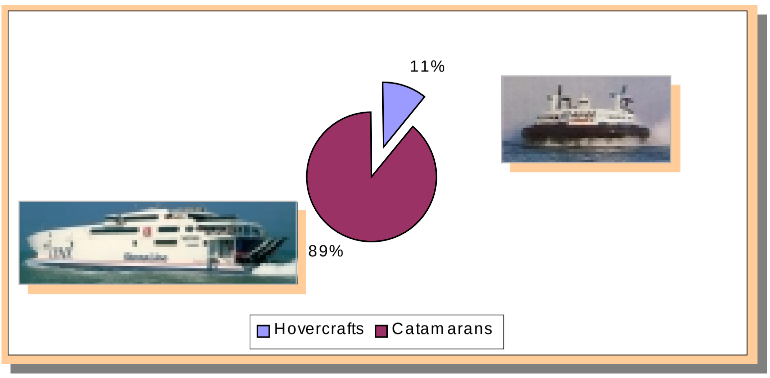
2 -Historical account of High Speed Craft crossings



3 -Distribution of Collision Avoidance manœuvres by type of High Speed Craft



4 -Collision Avoidance manœuvres made by Through Traffic to avoid the two types of HSC



5. Acknowledgements

This survey could not have been achieved without the permission of the DAMGM to use the SOFRELOG system. Special thanks are due to Bruno CELERIER (Director of the CROSS Gris Nez) for his welcoming and his participation to this survey.

6. Database Summary

(see the following table)

Collision Avoidance Manœuvres DATA BASE	

DATA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Date	25/2	15/6	16/6	16/6	17/6	18/6	18/6	18/6	18/6	18/6
Time (start of the manœuvre)	1312	O916	O709	O917	O615	O721	O727	O814	O915	O945
Visibility	1	4	3	3	4	4	4	4	4	4
Sea	2	2	1	1	1	2	2	2	2	2
Wind speed	3	1	2	2	2	3	3	3	3	3
Wind direction	315	90	90	90	90	90	90	90	90	90
Area	3	3	2	1	4	3	2	3	1	
Name of the HSV	U	U	SEACAT	SEACAT	U	U	SEACAT	U	SEACAT	SEACAT
Type	HC	HC	CAT	CAT	HC	HC	CAT	HC	OVE	CAT
Target number	334	369	415	373	199	379	471	73	344	416
Initial Course	299	289	146	305	109	103	280	118	345	297
Initial Speed	38	48	29	29	42	46	31	48	34	32
Name of the other ship (if known)	U	U	U	U	U	U	EIWX	U	SSEM	U
Type of the other ship (if known)	FER	FER	CARGO	FISH	FER	HC	CARGO	FER	TANK	FER
Target number	336	271	135	383	468	?	43	62	O53	364
Initial Course	122	125	230	183	306	284	219	221	O12	128
Initial Speed	20,5	18,4	22	13,4	21	42	9	22	12	19
Ship manoeuvring	HSV	HSV	OTH	HSV	HSV	HSV	HSV	HSV	HSV	HSV
"Colreg" type of ship manoeuvring	GW	GW	GW	GW	GW	GW	GW	GW	GW	GW
Type of the encounter	HON	HON	CRO	CRO	HON	HON	CRO	OVE	OVE	HON
DCPA before the manœuvre	0,05	0,03	0,1	0,2	0,12	0,12	0,7	0,1	0,9	0
Type of CPA before manœuvre	PORT	STBD	AHD	CRO	STBD	PORT	AHD	PORT	AHD	PORT
Anticipation distance (Initial separation)	5,0	3,7	5,7	1	3	3,2	2	1,1	4	4
TCA just before the manœuvre	5	3	8	2	6	2	3	3	11	5
Type of the manœuvre	ALC	ALC	ALC	ALC	ALC	ALC	ALC	ALC	ALC	ALC
Value of the Course alteration	7	5	30	10	8	-7	-10	5	-54	15
Value of the Speed modification	0	0	0	0	0	0	0	0	0	0

New DCPA	0,54	0,2P	0,3	0,5	0,5	0,3	1,5	0,3	2,7	1,2
New TCA	00:00	2	7	1	2	2	2	2	6	3
Duration of the manœuvre	00:00	2	5	2	2	1	2	1	2	2
Effective DCPA	0,25	0,2	0,4	0,5	0,2	0,3	1,5	0,3	2,7	1,2
Type of effective CPA	PORT	PORT	AST	AST	PORT	STBD	AHD	PORT	AST	PORT
OBSERVATIONS Multiple Encounters (list of targets numbers involved)								Multiple		Multiple
Other remarks (free text)	XL0	XL1	XL2	XL6	XL8	XL13	XL13	XL13	XL14	XL14

HSC manœuvres in the Dover Straits

Results of the survey

Draft minutes of the meeting held at Dover on the 28th of July.

The meeting was kindly hosted by the MCA's officers at Dover and held in the conference room of the CNIS centre.

A list of attendees is attached hereto as annex I. The draft agenda is attached hereto as annex II.

Item 1. Opening of the meeting

As an opening of the meeting J. Pruniéras recalled that :

a) a concerted action on the theme of Vessel Traffic Management and Information System was initiated by the EU in 1996 as a component of the IVth Framework Programme for Research and Development.

The Dutch and French Institutes of Navigation have been tasked since 1997 with the technical secretariat of the concerted action.

b) The VTMIS concerted action management committee decided by the end of 1998 to carry out a preliminary study on the potential risks resulting from the insertion of HSCs into a conventional traffic.

c) The French Institute of Navigation given the time and budgetary constraints, has proposed to the Management Committee to restrict the study for the time being to :

i) a survey of the situation in the Dover Straits likely to provide significant data on a mixed traffic involving HSC in a particularly busy area,

ii) the collection of preliminary views on that particular situation as it is currently seen by the UK and French authorities.

Items 2 and 3. Introduction of participants and approval of the agenda - The participants briefly introduced themselves and the draft agenda was approved.

4. Objectives of the survey - J. Pruniéras explained that it was decided to collect and process radar data on traffic situations involving HSCs by using the radar and processing facilities at both Dover and Gris-Nez centres. With the support of CNIS and CROSS staffs and equipment that work was carried out at Dover under the responsibility of Mike Hadley, DERA and on the French side by Xavier Lefèvre (a private consultant).

The objective of the meeting is therefore :

to get an overview of the data collected so far, to agree on the outline of the document which would be presented under the aegis of the EU Commission (DG VII) at a workshop to be held in Paris on the 21st of October.

5. Mike Hadley reported that he has collected radar data related to 40 crossings of the Dover Straits involving various types of HSCs. The data are recorded in 40 data sheets allowing to analyse in detail interaction between at least one HSC and other vessels traffic. He circulated a draft report describing how data were collected and submitting a number of conclusions.

The report is composed of 8 parts as follows :

1 - Introduction
2 - Data gathering
3 - Ferry operations
4 - HSC operations in practice
5 - Analysis of observations
6 - Conclusions
7 - Recommendations
8 - Acknowledgements.

M. Hadley mentioned at the occasion of a trip onboard a hovercraft he got from the officers on the bridge interesting information on the current "in house" practices.

Xavier Lefèvre reported that due to constraints induced by the normal use of the Gris-Nez radar facilities, he had to limit the number of fully surveyed and registered crossings to 15.

However he was able to process data so as to graphically display vessel trajectories related to typical encounter situations involving HSCs. X. Lefèvre showed on the screen the results of that process together with a few statistics related to the distribution of collision avoidance manoeuvres.

6. It was agreed that Mike's report should be taken as the basis of a single final report presenting the outcomes of **the data collection phase** of the preliminary study.

Participants were invited to let know their remarks to M. Hadley by the 10th of August at the latest. Mike Hadley will then prepare and send a refined version of his own contribution to IFN by the 20th of August. To this version M. Hadley will attach as an annex one single table synthesising the main data of interest extracted from the data sheets.

On reception of M. Hadley's revised version of his report :

i) X. Lefèvre and IFN will insert in it, as a new paragraph 5 of the report, the trajectories displays and statistics worked out by X. Lefèvre.

ii) IFN will transfer the information contained in the data sheet into the VTMIS web site.

7. The report on the data collection phase of the study will be circulated to both the UK and French administrations for observations and comments. IFN will organise a meeting sometimes around mid-September to finalise the views of administrations concerned.

It was agreed that :

i) views from the UK and French administrations will be sought in particular on the tentative conclusions as they appear in Mike Hadley's report. This could entail a few adjustments of these conclusions.

ii) the presentation to be made at the VTMIS final workshop would remain at technical level. It would be out the scope of the workshop to prejudge of whatever position European administrations could adopt.

Participants took the opportunity offered by the meeting to exchange views on a number of issues related to HSCs and their role in the traffic in the Dover Straits.

i) It was mentioned that a number of ARPA or other radar based equipment facilities are not always able to accurately track HSCs. K. Fischer observed that IMO has issued new ARPA optional standards completed by new IEC norms.

ii) Emphasis was put on the fact that in the Dover Straits fast ships quite often do not strictly comply with the provisions of COLREG. Even if no accident attributable to that fact is to be deplored, the situation can be considered as a matter of concern.

Participants expressed the opinion that such circumstances are not a case for designing and implementing new rules at international level. They agreed in addition on the point that the Dover Straits should not be considered as a special area where particular rules would be made applicable.

It was recognised however that there are potential needs for better transparency which could lead to improve the information to mariners.

Emphasis was put on the point that given the large variety of possible configurations such information cannot be expressed in quantified terms. The convenience of disclosing ''in house'' rules as they are set up by some shipping companies was felt questionable.

In addition the remark was made that the expression High Speed Craft introduces some confusion in the sense that manoeuvrability rather than speed is the main factor influencing HSCs behaviour. Vessels such as large container ships may proceed at speed around 28 knots and behave quite differently from HSCs'.

8. Miscellaneous

J. Pruniéras expressed the appreciation of the French delegation for the warm hospitality of MCA and the CNIS officers and the nice arrangements they made.

He also thanked DERA for the enjoyable lunch. Participants will receive in due course an invitation for the meeting to be held around mid-September at either Gris-Nez or Dover where representatives of the UK and French administrations will be officially invited.

9. Conclusion of the meeting

As a conclusion to the meeting participants had the opportunity to visit the operators room at Dover.

Preliminary study on the risks resulting from the development of fast craft

A survey of the Dover Straits

Conclusive meeting

Cape Gris-Nez, 17th September 1999

2 enclosures : Agenda
Note on Human Factors

The meeting was kindly hosted by the French Administration des Affaires Maritimes at CROSS Gris-Nez.
The list of attendees was as follows :

- M. Babkine, Chef du bureau NM1 (Direction des Affaires Maritimes et des Gens de Mer),
- M. Hadley, DERA
- X. Lefèvre, Consultant
- M. Milligan, Deputy District Controller, Dover MRCC
- J. Pruniéras, IFN.

Apologies were received from : B. Célerier, Chef du CROSS Gris-Nez
K. Fisher, Head of Navigation Safety MSA

1. The meeting was opened at 12h00

2. The draft agenda a copy of which is attached hereto was approved

3. The draft minutes of the meeting held at Dover, 28th of July were approved

4. Actions taken so far were summed up by M. Hadley and X. Lefèvre

5. The draft final report from DERA and X. Lefèvre had been circulated prior to the meeting. It was decided that X. Lefèvre and IFN will take in charge the edition of the report to be submitted to the EU Commission

6. The conclusions and recommendations appearing in the report from DERA were reviewed. A few amendments were discussed and agreed upon. They will be taken care of in the final version of the report.

The administration representatives said that :

- from a general standpoint the outcomes of the survey do not show a compelling need for modifying the present COLREGS,
- and more specifically that they had no objection against further investigating the needs for including in notices to mariners related to the navigation in the Dover Straits information on the behaviour of fast vessels.

They agreed on the suggestion from M. Milligan to further explore the influence of human factors on the behaviour of officers in charge of fast ships navigation in the light of the outcomes of a recent study carried out by N. Svatek and summed up in the attached document.

They suggested to refer back to the IMO HSC definition to clearly identify which ships the definition actually concerns.

They were favourable to evoke the problem of HSC at further meetings of AFATG.

They made the point that views they were expressing do not commit their administrations to which obviously any final decision belongs.

7. J. Pruniéras confirmed that at the VTMIS conclusive workshop the presentation to be delivered by M. Hadley and X. Lefèvre will exclusively report on the outcomes of the survey. No mention will be made of the opinions of the administrations on the matter as expressed in 5 above.

M. Hadley and X. Lefèvre agreed on the planning of their own interventions given that the presentation should not last more than 20 minutes.

8. The meeting was closed at 4.45 p.m.

Preliminary study on the risks resulting

from the development of fast crafts

A survey of the Dover Straits

Conclusive meeting

Cape Gris-Nez starting at 11h30 (local time)

Draft agenda

1. Opening of the meeting
2. Approval of the agenda
3. Approval of the minutes of the meeting held at Dover 28th of July
4. Brief review of actions taken so far
5. Status of DERA's report including X. Lefevre's contribution
6. Presentation of the DERA's report conclusions and discussion
7. Further actions including the presentation of DERA's report at the VTMIS conclusive workshop 21st of October 1999
8. Miscellaneous
9. Closure of the meeting.

1. It is part of the human condition to entertain risky or hazardous thoughts at times but left unchecked, hazardous attitudes can quickly translate into hazardous behaviour.

2. Difficult situations can be exarcebated (if not actually caused by) hazardous attitudes. A hazardous attitude can quickly block communication, interfere with judgement and undermine the decision making process.

3. In general terms, there are five identifiable types of hazardous attitudes found most prevalent by researchers working through the aviation accident literature. Whilst any one of us can adopt a hazardous thought pattern, or an "attitude" at any time, for whatever reason, be it stress, fatigue, complacency etc. for some it is an habitual form of behaviour.

4. No matter whether it is a frequent or infrequent line of thinking, it is important to recognise the symptoms and learn the antidotes. These attitudes are both disruptive and unsafe.

INVULNERABILITY - "IT WON'T HAPPEN TO ME"
antidote *"Don't risk it, could happen to me"*

IMPULSIVENESS - "DO SOMETHING ! NOW ! QUICK !
antidote *"Slow down, don't rush, think and ask others"*

RESIGNATION - "WHAT'S THE USE, THERE'S NO POINT"...
antidote *"What are the alternatives available, talk to others"*

ANTI-AUTHORITY - "NOBODY'S TELLING ME WHAT TO DO AND WHAT NOT TO DO"
antidote *"Follow the rules, they're usually right, argue later"*

MACHO - "I can handle it, just watch me"
antidote *"Solo is unsafe. The crew is a team".*

Nicole Svatek
(Human.Factors.Consultant@Virgin.Airlines)

Conclusive VTMIS Workshop

Paris, 21 October 1999

Opening Speech	François Jacq, French Ministry of Research and Technology
Views of the EU Commission	Astrid Schlewing, DG VII
The Concerted Action General Findings	Jean Pruniéras, IFN, Concerted Action Technical Secretariat

Specific Studies

Preliminary studies on the relationship between Traffic management and transport management	H. Regelink & D. Jarvis, MSR, the Netherlands
Technisec : VTMIS-operator training and procedures	C. Glansdorp, the Netherlands, J. Carbajosa, R. Gonzales, Spain K. Benedict, M. Baldauf, Germany
European SAR and Pollution Combating Organisations	C. de Cena, Top View, Italy
High Speed Craft Traffic Survey in the Strait of Dover	M. Hadley, DERA, UK X. Lefèvre, IFN, France

Most Recent projects

VTMIS-Net and POSEÏDON	J. Froese, ISSUS, Germany
INDRIS : Inland Navigation Demonstrator of River Information Services	I. ten Broeke, DGG, the Netherlands
BOPCOM and VTMIS – Interconnectivity for the Maritim Community	Dipl.-Math.F. Arendt, ISL, Germany
AIS and ECDIS in the BAFEGIS Project	I. Harre, STN Atlas E., Germany

Users' requests for future developments

Administrational Requests	Cdr. S. Ording, Coast Directorate, Norway
Shipowners' Requests	P.T. Kidman, ICS
Port Authorities and the VTMIS Concept	J.M. Pietri, ESPO

DISCUSSION and CONCLUSIONS
under the Chairmanship of K. Polderman, DGG, the Netherlands.

2.3.1/10 Thematic Network on Waterborne Traffic Management and Information Services

1. Problem description

FP4 provided an initial platform in order to support the development of concepts for Vessel Traffic Management and Information Services (VTMIS) as well as for River Information Services (RIS). Traditional Vessel Traffic Services (VTS) concepts, both for maritime and inland navigation, were focused on traffic management with an emphasis on safe navigation. Both, VTMIS and RIS aim at the improvement of navigational safety, the integration of information related to transport logistic activities as well as at the optimised control and use of resources, cargo flows and infrastructure through the provision of added value services and the integration of new technologies. Consequently, VTMIS and RIS, are important elements in ensuring enhanced efficiency, safety including human aspects, as well as environmental sustainability, and are therefore strongly supporting the objectives of the Common Transport Policy.

2. Description of task

The thematic network should aim at a common understanding of how VTMIS/RIS can contribute to facilitate the exchange of information on transport and traffic management based on the integration of both onboard and shore-based information. A technical secretariat will have to carry out the administrative support for the Thematic Network. The technical secretariat of thematic network should reflect the multi-disciplinary requirements and complexity of the subject and, where appropriate, requirements for integrative studies, within the defined framework, should be indicated.

The work should aim at a further development of a co-ordinated approach to the VTMIS and RIS concept, including the characterisation of the information to be exchanged in terms of content, quality and information flows and the identification of common user requirements and standards for the integration and validation of new technologies and added value services, which will encompass harmonised data exchange, links and procedures. Important aspects to be considered are prediction of ETAs, improvement of traffic images through enhancement tools, e.g. ECDIS, shore-based pilotage, and automatic identification systems as well as the role of EDI networks in providing reliable and real-time communication between different traffic management and information systems.

Important aspects of the successful development of VTMIS/RIS are user awareness and operator acceptance. Therefore, it will be important to identify groups of information users who wish to obtain information from well-identified information holder/provider and to identify their information requirements. From a financial viewpoint, potential schemes for valuing and pricing the information requested should be assessed.

VT(MI)S and RIS operator acceptance, training and instructions are becoming more and more important in the context of evolving concepts. The thematic network should therefore identify education and training requirements and develop common criteria for training schemes and scenarios for VTMIS/RIS operators as well as for assessment.

3. Expected results

- Clustering of public authorities, other key stakeholders, research projects
- Identification of (common) user information requirements

- Identification of added value services
- Harmonisation of data structure, exchange, and procedures within VTMIS and RIS, Assessment of further harmonisation needs between the two service types
- Identification and exploitation of synergies between traffic management systems and freight information systems
- Framework for the operational integration of safety and commercially-oriented information in order to provide traffic and transport management services which serve both, public and commercial interests
- Recommendations on the financial aspects of implementation
- Identification of education and training requirements for VTMIS and RIS operators; Development of common criteria for training schemes and of assessment criteria

4. Type of Contract

Thematic Network

5. Timing

1 Call, 36 months

6. References

- Work programme 2.3.1, 2.3.2, 2.2.3, 2.2.5
- 1. Preparing for enlargement, 3. TEN and transport policy/ 14,20,22,39/I.D3,II.1.D3
- Task 2.3.1/7

7. Links

Concerted Action on Vessel Traffic Management and Information Services (VTMIS) and Inland Navigation, Incarnation, Comfortable, Indris, Poseïdon, Echo, Bopcom, Prosit, Marnet, COST 326, 330

8. Third Countries

Active participation where appropriate