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White Paper

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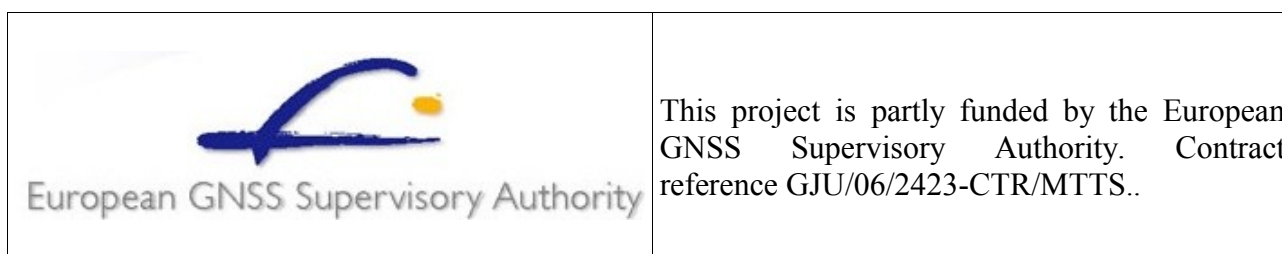


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1 Introduction

1.1 Purpose

This document is the white paper of the MTTS project. This document is written by ARGOS BV, with input from PilotFish, West Consulting, and Ursa Minor.

2 Driving factors

In Europe more than more than 10 million leisure boat owners regularly take their vessels offshore. The combination of dense shipping transports and the complex environmental conditions in these areas leads to an increasing number of (near) accidents. Very little information is known about such accidents or alert situations, because for the leisure boat tourist, especially for craft less than 13.7 metres hardly any regulations exist compared to the professional market where safety regulations are mandatory.

Although studies and other activities have been carried out which potentially should have led to a coherent European policy there is still no common legislative policy applicable.

The level of risk to which leisure vessels and their owners are exposed is related to how often adverse events occur (frequency) and their severity (consequences). Different kinds of risk maybe encountered as a function of the area of impact, circumstances leading to the risk, the consequences. The SSPA Research Report No. 131, 2005, although looking at small fishing vessels on a global view identifies a number of critical issues that contribute to hazards. They include adverse weather (storms, poor visibility due to rain/fog), complicated traffic situations and errors in navigation

The lack of information and the general unawareness of potential risks is attributed as major factor to fatal and near fatal accidents and calamities.

To manage risk, measures must be applied to either reduce the likelihood of an adverse event or its consequences, or both. Rules and standards to control the navigation of vessels are widely used to manage risk, notably but not exclusively to reduce the frequency of an event. The regulation concerned may seek to influence all the criteria listed above or a specific issue, e.g., to protect the environment. Risk control external to the vessel is also used; the provision of search and rescue (SAR) services is an essential element of a coordinated risk management strategy, particularly for recreational vessels.

Although guidelines require planning of voyages there remains the problem of providing localized accurate information on metro logical and sea conditions. The provision of a SAR service can do much to limit the deleterious effects of an incident once it has occurred, i.e., reduce the severity of incident by providing timely and adequate response but can in itself not reduce the 'frequency' of incidents occurring.

Challenges to legislation are the monitoring, compliance costs and acceptance. The MTTS projects challenge is to demonstrate the benefits that can be gained from using MTTS and thus achieve acceptance by defacto.

3 Problem development

3.1 *Need for better information*

Recreational vessels are typically not equipped to receive all information sources at sea such as NAVTEX messages and weather forecasts. Most vessels that travel on open seas will be equipped with a marifone which can receive regional local weather forecasts and other (distress) information when in the neighbourhood of a coastal station, but further away from the coast this may be insufficient. The MTTTS project can provide several kinds of information to these vessels: localized weather forecasts, severe weather warnings, information on distress calls in the neighbourhood and other information typically distributed by MSI (marine safety information) messages, such as warnings about missing buoys or lost containers. The MTTTS system can also provide a solution for smaller recreational vessels in inland waters, where the offshore solutions (marifone, navtex) are either not available or too expensive.

Marine Rescue Control Centres (RCC) have a strong need for actual information during alert situations. This information ranges from all the details about the vessel sending out the alert, to information about the environmental conditions at the location of the vessel, now and in the near future. MTTTS can provide better information by delivering up-to-date information at all times, and by delivering localized information about the environment.

3.2 *Ability to register prior to leaving*

There is a severe lack of information on the movement of individual recreational vessels. Contrary to professional vessels (e.g. container ships) there is no single point where the ship movements are tracked. Recreational vessels do not have a parent company which keeps track of their location, and they do not carry transponders to keep track of their location in busy areas such as the shipping lanes in the North Sea and English Channel. An important means of improving the safety situation of recreational vessels would be to enable them to register their journeys with a central system. Such a system could keep track of basic information such as the departure time and harbour, arrival harbour and estimated time of arrival, the number of people on board and basic information about the vessel and available equipment.

3.3 *Informing Coastguard of problems*

The lack of information on board of recreational vessels due to a lack of professional equipment also means that there may be a problem informing the RCC of any incidents. Vessels with a marifone can typically call for help when in range of other ships or a coastguard station. Smaller vessels in inland waters or smaller seas may be relying on a mobile phone to call for help, with may cause problems when out of reach of a phone network.

When an incident does occur, time and communication means may not allow for a detailed description of the problems. Basic information about the ship and its crew still has to be passed to the coastguard, which may cost precious time or fail completely. Such information should become available to the coastguard by other means such as a voyage registration system, whenever possible.

3.4 *Reducing false alerts*

The rate of false alert coming in to coastguard stations is exceedingly high. Approximately 80% of all alerts do not concern a real incident, but simple problems like an automatic warning system going off. In the case of an EPIRB (automatic beacon) this could be caused by the device falling overboard or even cleaning of the vessel. The Coastguard has no effective means of communicating with the vessel to confirm the alert. In case of an alert, a process should automatically start to verify all available information about the vessel and its location, to help the coastguard decide if the alert is likely real or false. An automatic decision system is unlikely to be accepted due to the risk of false negatives (real alerts judged as false), however it should be possible to provide significant extra information to the coastguard automatically. Such information could consist of

- The current location of the vessel
- The vessels “home” harbour location, with contact information
- If the vessel has a marifone: contact information
- Basic characteristics of the vessel
- If registered: information about the current journey of the vessel including the number of people on board.
- Shipping information (water depth, chart) at the location of the alert
- Current environmental conditions at the location of the alert

Based on such information the coastguard could quickly answer straightforward questions like “Is the vessel in a harbour?”, “Could the vessel be grounded?”, “Is there bad weather at the location of the vessel?”. Using the contact information, the vessel or harbour may be contacted directly to confirm the validity of the alert. With the introduction of the Galileo constellation, additional means become available to contact the vessel in distress. Upon receiving an alert through Galileo, the RCC can automatically send a return message to the vessel asking for a confirmation of the alert. In case the alert was false (e.g. the EPIRB fell overboard) the vessel crew can immediately abort the false alert, before the RCC starts a SAR operation.

3.5 *Improving efficiency*

In the chain of information passing which occurs when a vessel sends out a distress signal, there are currently many steps through a variety of communication channels. Standardisation of the information, automation of processes and accurate analysis of the incident and recommendations for course(s) of action will significantly improve efficiency and increase the likelihood of a successful rescue.

3.6 *Reducing number of incidents*

By providing especially smaller recreational vessels with sufficient accurate, localized and up-to-date information on environmental conditions and relevant safety issues (containers, missing buoys, other ships in distress), the number of incidents could be reduced significantly. To actually make such information available, a system is required which is affordable for leisure vessel owners, easy to install and operate on a small vessel (low electric power capacity). The system should have sufficient means to communicate with the shore in all common situations, using either cell-phone connections, wireless networks or radio transmissions. The upcoming Galileo constellation would offer an excellent communication solution which is “always available”, although limited in bandwidth for the transmission of weather information.

4 MTTs solution

4.1 Introduction

The MTTs system seeks to address the problems described in chapter 3. Using experience gained in the Environmental Distress Demonstrator (EDD)¹ Stakeholders were established and a thorough evaluation of their requirements.

The MTTs system offers several location-based services usable by the leisure vessel market, commercial shipping services as well as the coastguard (RCC). The system focuses on delivering information that is otherwise not (readily) available to the vessels for voyage planning for instance and to the RCC for situational awareness and vessel status.

A prerequisite was the use and demonstration of the capabilities of Galileo/SAR. The basic concept illustrated below, therefore the system is designed to make use of all available communication channels, notably including the future Galileo constellation with return-link capability for 2-way communication between a vessel and the RCC.

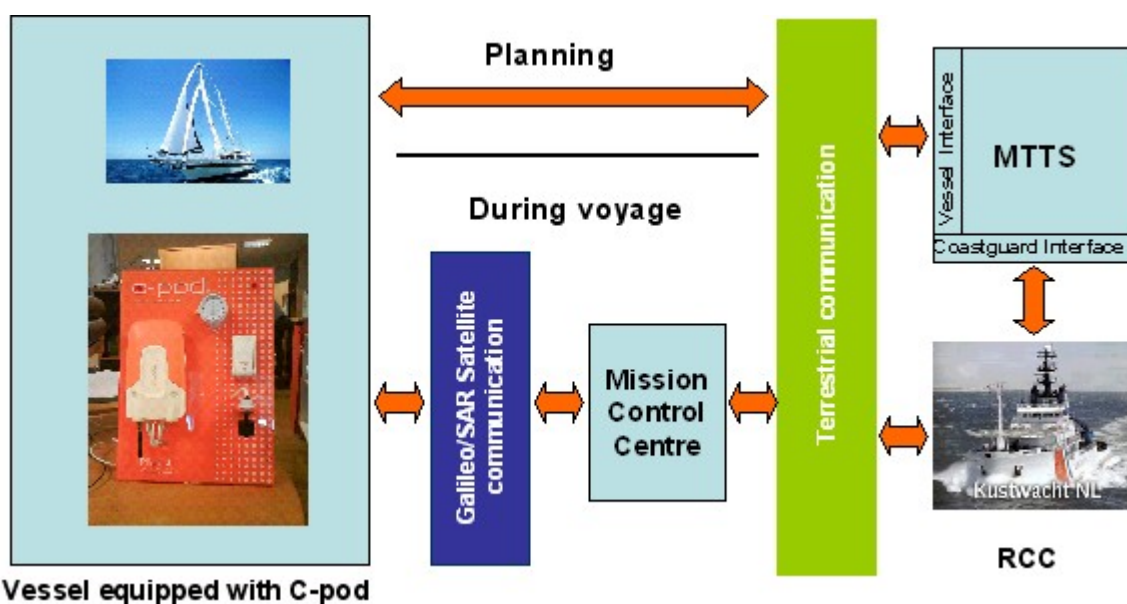


Figure 1: Schematic overview of the MTTs concept

¹ EDD is a Dutch nationally supported project led by Ursa Minor with partners ARGOS and West Consulting

4.2 *MTTS Key Features*

4.2.1 Environmental information

MTTS integrates a service providing environmental data (weather, waves and currents) relevant for marine safety. The service delivers up-to-date environmental data up to 5 days ahead, based on state-of-the-art numerical models. These include

1. Wave data from a global wave model, covering all oceans and the larger seas
2. Surface current data from a global tidal model, combined with a global wind-driven current model.
3. Weather data from a global weather model, or from a high-resolution weather model for regions such as the North Sea area.

Weather data can be provided as charts (delivered on demand, centred on the vessel location) or as regional averages (e.g. for weather regions used in MSI messages such as “Humber”, “Dogger”). Appropriate warnings can be delivered when dangerous weather thresholds are exceeded.

The same weather data is also provided to the RCC. The data is made available in the form of charts, which can be provided for a whole region or in detail centred around a vessel location.

4.2.2 Safety information

MTTS collects marine safety information (MSI) messages from several sources on the internet, and keeps them in a centralized database. Safety information messages can be added by the RCC, for example recent distress calls by other vessels. The MSI information can be delivered to the vessel on demand, in combination with up-to-date weather forecasts for the current location.

The MSI information can also be provided to the RCC when a distress call is entered. The system automatically selects all MSI messages relevant for the location of a distress call, and makes them available to the RCC.

4.2.3 Alert analysis

MTTS will perform an automated analysis of incoming alerts. During this analysis, the system will attempt to collect all relevant information for the alert. Information is presented to the RCC as it becomes available. The system can send questions to ask the vessel for missing information (prioritized by the level of importance of the missing information and the severity of the alert). If the vessel answers these questions, the system will present the additional information, and update the alert analysis if required. The alert analysis is intended to help the RCC decide if an alert is fake or not, and to automatically provide additional information when an alert is real.

The system can provide additional information such as the following:

- Contact information for the vessel.
- An automated confirmation (using a return-link communication channel) of the alert, was it real or false?
- A comparison of ship information (depth, type of ship) with local conditions (water depth, weather, waves).
- Information about the number of crew on board.
- Information on wounded people, casualties, medical assistance required?
- Information about the state of the ship (drifting, grounded, fire, capsized, sinking).

4.3 MTTs Demonstrator Implementation

MTTS is developed on open standards and technologies with the objective of being able to provide the services globally. The resulting system based on a secure network features two user interface services and two fully automated support services. One for the Vessel owner used primarily for voyage planning and the other for the RCC for responding to alerts arising from emergency incidents where the vessels either automatically or manual issue a distress message.

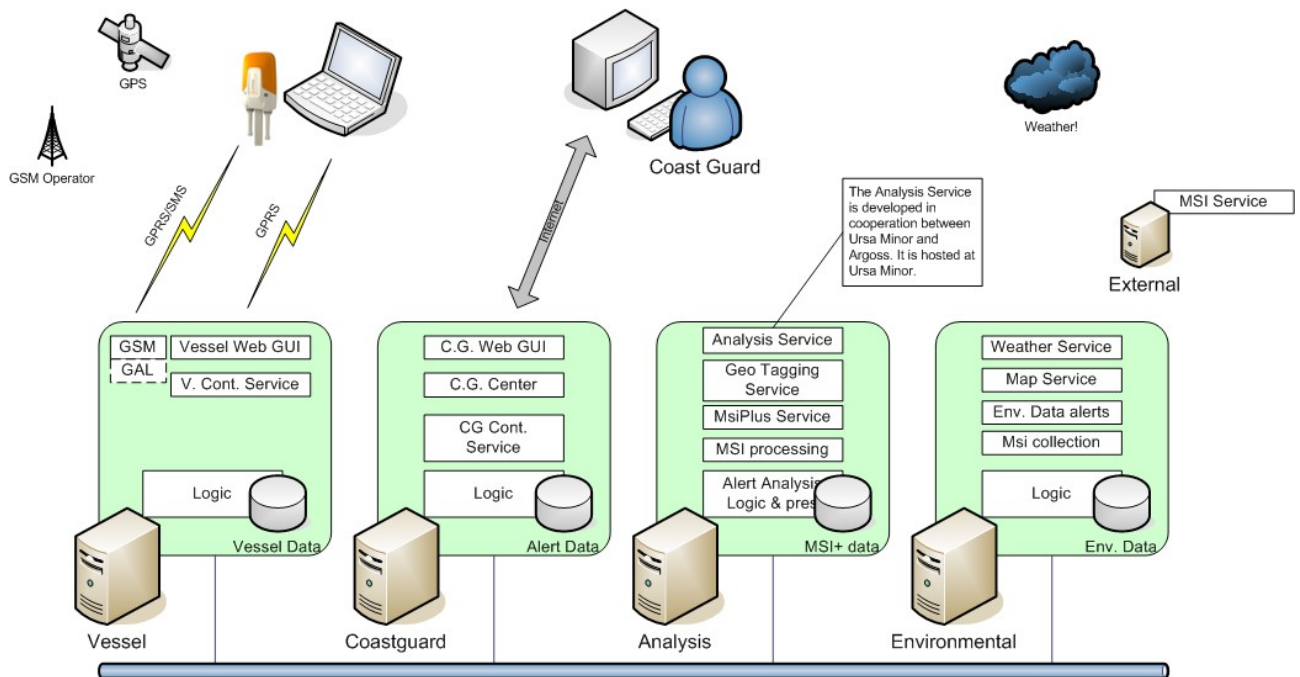


Figure 2: MTTs Demonstrator Physical Architecture. Web services are utilised to allow the running of different parts of MTTs at remote partner sites.

5 Benefits

MTTS has a number benefits for marine safety. These are achieved by collecting relevant information (either for the RCC or for the vessel) in a single system, and making them readily available. The information is localized, which makes it directly applicable to a vessel in distress. The system makes use of the most recent technologies, both in the field of communication and aggregation of services into one common system.

1. Environmental information (weather) and safety information (MSI) readily available for vessel owners, also in recreational market. This increases marine safety, reducing the number of incidents.
2. Environmental information readily available and up-to-date for Rescue Control Centres, localized for the vessel in distress.
3. Location-based information is generated automatically based on position information from GPS or Galileo.
4. Centralized storage of vessel and voyage information for leisure vessels.
5. Vessel and auxiliary information automatically collected and available to RCC.
6. Confirmation of distress signals via 2-way communication (Galileo) to reduce false-alert rate.
7. Modular system design using web services allows for easy integration of extra information sources and services (e.g. drift prediction module).
8. C-Pod interface provides a ready-made product to deliver information on-board leisure vessels, including alarm and tracking services.

6 Future developments

MTTS is a demonstration R&D project that has successfully demonstrated benefits of integrating several applications into a coherent service aimed at reducing the risks of incidents occurring and providing support to RCCs for effectively performing rescues.

Galileo is also still in its development phase with a planned operational phase starting in 2013. Also the use of extra capacity in the Galileo Services (return-link) has yet to be decided.

So how can we proceed ? Clearly there are other terrestrial and global satellite based communication capabilities that can be used in preparation of the availability of Galileo.

The market potetial is being explored and feedback from potential user groups will be part of future work of the consortium which could lead to a partial commercialisation of the system.

Other environmental conditions can be integrated to include tidal, current and wind information which will allow better planning, an improved understanding of coastal conditions and increased accuracy of local based services particularly for the RCCs which would be able to more accurately pinpoint the probable location of a vessel in distress.

Experience already has been gained in the EDD project.

Finally it is necessary to go to trials to investigate the benefits. This will require equipping a representative group of vessels and the adoption of the MTTS concept by RCCs for evaluation.

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