SURPASS: SURFACE PICTURE ASSESSMENT
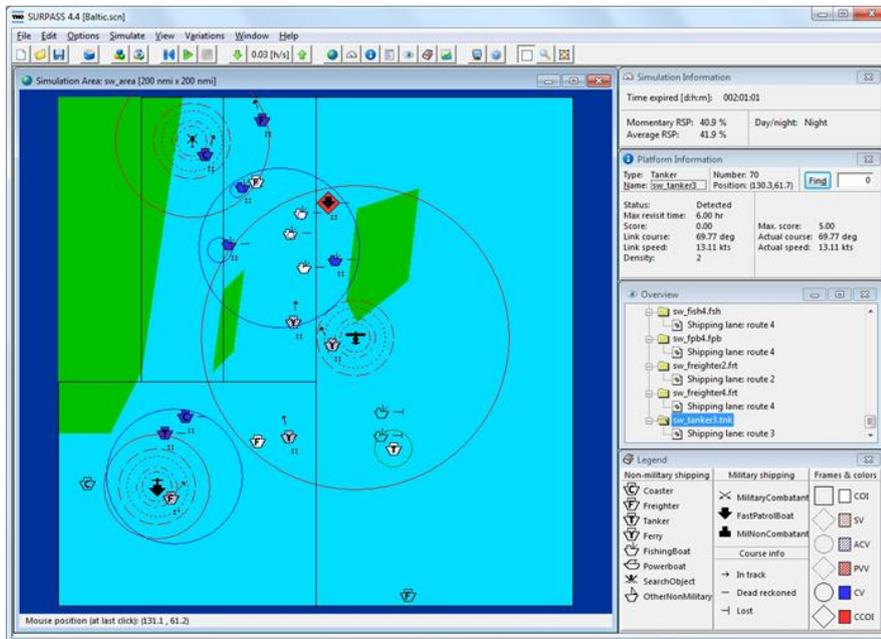

The simulation model SURPASS provides insight into the resources and the tactics required for establishing and maintaining a recognised surface picture.

BACKGROUND

The tasks of the Royal Netherlands Navy (RNLN) can be divided into combat, security and support operations. Combat operations involve tasks of a military nature, such as protection of convoys, ballistic missile defence and anti-submarine warfare. Security operations comprise tasks with a legal nature, such as combating drug trafficking, maintaining an embargo and fisheries controls. Support operations involve tasks such as search and rescue and providing disaster relief.

Since the 90s of the last century, the importance of security and support operations has increased for the RNLN. Especially in security operations, but also in a supporting task like search and rescue, detailed and up-to-date information about the existing shipping in an area is essential. This requires a good process of surface picture compilation. TNO's simulation model SURPASS (SURface Picture ASSessment) is a tool that enables simulation and visualization of the whole process of maritime surface surveillance.

AIM

The aim of surface surveillance is to establish and maintain a Recognised Surface Picture (RSP). The general objective of SURPASS is to provide insight into the means required for picture compilation (the types and number of units, the types and ranges of sensors), and the way to deploy these means (tactics). The main assets considered in SURPASS are frigates, helicopters, Maritime Patrol Aircraft (MPA) and Unmanned Aerial Vehicles (UAVs) along with their sensors, including radar, visual means, infra-red systems, ESM, and passive sonobuoys.

SURPASS can be used (1) as an analysis tool: for research into new platforms (such as the NH90 helicopter) and for research into new operational tactics (such as Network Enabled Capability); and (2) as a training tool: for educational purposes.

SURPASS assists in answering typical questions such as: (a) How large an area can a task force adequately cover? (b) What is the operational contribution of the different assets and

sensors? (c) How can the assets of a task force best deploy their embarked assets? (d) How should an asset use its sensors to best contribute to the development and maintenance of the surface picture?

FUNCTIONALITY OVERVIEW

SURPASS provides the necessary tools to analyse surface surveillance and supports all kinds of operations such as embargo enforcement, search and rescue, fishing inspection, surface warfare, and counterdrug operations. The most important Measure Of Effectiveness (MOE) in SURPASS is the quality of the surface picture over a prolonged period of time. Other MOEs are the positive identification fraction, SAR effectiveness and risk. SURPASS supports all phases of surface surveillance, namely detection, localization, recognition, identification, and tracking. DETECTION is the search and discovery of new contacts or ships. The LOCALIZATION process involves determining the contact's position, course and speed. RECOGNITION means establishing the characteristics of the ship, like its type or its individuality. IDENTIFICATION is the process of assigning a standard identity (or a Maritime Interdiction Force identity) to a ship based on the identification criteria (IDCRITS) specified by the user. At times, proper identification may involve the boarding of potential embargo violating vessels to look for forbidden cargo. TRACKING is the process of following the contact once detected. SURPASS can model all the above activities. In the eventuality

that a contact can no longer be tracked, SURPASS maintains an Area of Probability or a Furthest- On Circle for the contact in question, for potential use at a later stage.

SCENARIO

SURPASS provides a scenario editor allowing the user to define the area of operation, the shipping lanes, the shipping and the surveillance units operating there. This area may contain various obstacles such as islands, oil platforms and shallow areas, which may hinder the surveillance units' sensors and movement. The model distinguishes different shipping classes such as military combatants, tankers, coasters, fishing-boats, and powerboats. The behaviour of each class is controlled via parameters such as: followed shipping lane; minimum, median and maximum speed; maximum course change; mean times between speed and course changes. All these parameters allow the user to test the surveillance units for different scenarios and sets of tasks. The surveillance units are defined by parameters such as speed and availability, and by their sensor suite. Each sensor is characterised by the ranges at which it can detect and recognise the different types of shipping. The parameters are derived from empirical data or from detailed system level models. They vary according to the time of day, the altitude, and the prevailing environmental conditions.

TACTICS

SURPASS gives ample consideration to the tactics of the surveillance units so that the benefits and drawbacks of alternative tactics can be investigated. The model helps in finding the best trade-off between the amount of effort required for maintaining the available information by revisiting dead-reckoned tracks, and the amount of effort needed for searching for new contacts. Each surveillance unit can be assigned its own tactical rules. For instance, a surveillance unit can use different scheduling rules dealing with possible weapon threats by applying so-called stand-off ranges. In this way, a balance can be found between the quality of the surface picture and the amount of risk.

APPRECIATION AND INTENTION

SURPASS proves it is a valid and worthy simulation model with on-going potential. The intention is to make the tool also applicable for counter-piracy operations. SURPASS has already been used in several studies for the RNLN and in a number of international collaborative projects. For example, the Norwegian Forsvarets forskningsinstitutt (FFI) used SURPASS to evaluate their Nansen-class frigates in the role of anti-surface warfare. The Danish Defence Acquisition and Logistics Organisation (DALO) used SURPASS to compare the performance of a number of prospective helicopters in crisis response and coast guard operations. The Netherlands Defence Academy (NLDA) uses SURPASS in their Operational Analysis education programme for upcoming officers. By means of simulation and visualization students can see the effects of executing their own tactics in a virtual world.
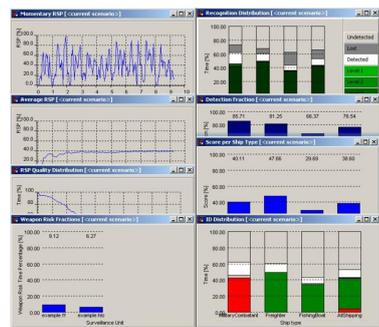
Example output of SURPASS

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