SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Systems (1)

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RESULTS OF A FEASIBILITY STUDY INTO THE SPACE-BASED DETECTION OF AIS SIGNALS ON AN OPERATIONAL BASIS

Abstract

An important system in the field of global maritime surveillance is the Automatic Identification System (AIS), which is responsible for communicating ship- and voyage-related data of surface vessels. Many entities use land-based AIS for monitoring and guidance of maritime traffic, which requires ships to be equipped with an AIS transceiver that transmits relevant data about this vessel in the VHF frequency range.

In order to perceive the maritime traffic situation beyond the land-based AIS range, introduction of a space-based AIS system is proposed, which primary figure-of-merit consists of the probability of detection of a ship's AIS message in case the satellite receives a multitude of AIS messages. Because of mutual overlap and interference of the AIS signals, which will not occur at land-based receivers, the challenge is to filter out and decode individual AIS messages.

In Europe, several activities have been initiated by ESA and EC to validate AIS receivers, design first operational missions and to develop complete space-based AIS constellations. A consortium led by OHB has been responsible for the development of a full-fledged European space-based AIS system.

This paper will give a presentation of the preliminary results from an ESA-TIA feasibility study. It will start with a summary of user requirements, which were obtained by interviewing relevant users, including coast guards, port authorities, and national customs, and which were consequently consolidated and approved by EMSA.

Based on these requirements, two general scenarios have been considered in evaluating the feasibility of the European space-based AIS system. In scenario 1, only the areas with low and medium traffic will be considered, enabling the use of simple technology. Scenario 2 also considers the high traffic zones, which consequently requires the application of more complex technology.

Next, a short overview of available technologies relevant to space-based AIS will be presented, which will include antennas, space-based receivers and digital processing algorithms.

For every scenario, a trade-off of the available technologies has been made leading to a baseline spacecraft. These spacecraft have to be deployed in a constellation in order to meet the user requirements. By simulating a constellation in a dedicated AIS simulator, its detection performance can be evaluated. The preliminary simulation results of the selected constellations will be presented and will be accompanied by a thorough discussion.

As a final note, the First Space Node will be shortly treated, which is planned to go into Phase-B in the second half of 2010