The Vessel Detection System

VMS and VDS

All European Union vessels above 15 metres in length are fitted with a Vessel Monitoring System (VMS). Similar systems are operational or being brought into operation in other fishing areas and by other fishing nations. The system relies on satellite navigation and communication technologies. A “blue box” installed on board the vessel transmits the GPS-derived vessel position by satellite to the Fisheries Monitoring Centre (FMC) in the flag state which then communicates the information to the state or regional fisheries body in whose waters the vessel is fishing. The period between transmissions varies but is normally between one and two hours. The vessel can also be “polled” by the FMC. This allows the authorities to determine the position of all vessels fitted with VMS within a certain area at a certain time. The system enables the fishermen to demonstrate their compliance with regulations on days at sea, closed areas or closed seasons.

This automated technology has transformed fisheries control. It requires little effort from both fishermen and authorities. However some fishermen claim that the system penalizes those who obey the rules. It cannot monitor those whose system is switched off or malfunctioning and cannot identify vessels from non-EU countries that do not have VMS. For this reason the EU Fisheries Council of December 2002 asked Member States to carry out pilot projects to assess the use of remote sensing for control. Commission Regulation (EC) No 1461/2003 of 18 August 2003 states that the aim of the proposed Vessel Detection System (VDS) is to (a) determine the number of fishing vessels and their position in a given area; (b) cross-check the positions of the fishing vessels detected by VDS with position reports from VMS, and (c) signal the possible presence of fishing vessels from which no position reports have been received through VMS. Council Regulation 1966/2006 of 21 December 2006 now foresees operational use of satellites in contexts where cost-effectiveness can be proven, starting in January 2009.

Synthetic Aperture Radar Imagery

The Vessel Detection System relies on polar-orbiting satellites carrying Synthetic Aperture Radar (SAR) instruments which can detect vessels at sea under most conditions – day and night and through cloud. At present there are two main satellites carrying such instruments – the European Space Agency’s Envisat and the Canadian Radarsat-1. A number of others will be launched in the near future. Each of these is able to provide an image of any point on the earth every two to three days – more as we move away from the equator. The sensor can operate in a number of modes – from wide area and low detail to smaller area and higher detail.
Results of Pilot Studies

Pilot studies of VDS – mostly in real-time - have been carried out in European and international waters - the Baltic, the Barents Sea, the North Sea, the English Channel, the Bay of Biscay, the Azores, the Mediterranean, the North East and North West Atlantic. There are a number of steps in the process: (1) image acquisition, (2) SAR processing (converting raw signal into array of pixels), (3) vessel detection, (4) matching with VMS signals. Times of less than half an hour have been achieved for the whole processing chain.

The studies indicate that the system can detect nearly all vessels subject to VMS under most weather conditions. Swaths of 300km in open ocean and 50-100 km in coastal regions have been found to offer the best compromise between resolution and coverage. Matching VDS with VMS without ambiguity is possible if the VMS signal is within ten minutes of the satellite overpass. However, the system works best if all the VMS-equipped vessels within the image frame are “polled”.

Near Rockall Radarsat-1 Standard Mode 7, 12 May 2004, 18:54 UTC

In 2004 the real-time fisheries satellite monitoring targeted a “closed area” near Rockall which is out-of-bounds for fishing to allow haddock stocks to recover. Scottish fishermen alleged Russian fishermen were violating this rule but the Scottish authorities did not regularly monitor this area and therefore had no evidence. On 12 May, 2004, JRC found that 4 vessels were fishing inside the box confirming the suspicions of the Scottish fishermen. The Scottish authorities immediately sent out a surveillance aircraft. The yellow outline in the figure indicates the haddock box, the black outline the image borders. The ships are those seen in the image.

Operational systems

VDS technology has reached maturity. Vessel positions in all European waters can be sent to FMCs in useful time. The delivery time depends on the capacities of the ground stations. While it is possible to obtain an image delivery time of 6 minutes in N. Europe, there is still no ground station in the Mediterranean that can deliver an image in less than 3 hours. A minimum of 30 hours is still required to order an image. The VDS process is nearly automatic and the modifications required at the FMCs are minimal. The main cost item is the cost of the images. This price is linked to the annual volume of purchases. The costs to the authorities amount to € 700-1500 per image. But it is expected that the price will go down in the near future when more satellites become available.

The system is not designed to replace aircraft patrols but to complement them. The overview provided by VDS deters non-compliance and provides a baseline capability for identifying instances of non-compliance. The aircraft, with its closing-in capability, is used only when needed to collect evidence of illegal activity.

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