

CASE STUDY MDA BlueHawk™ Maritime Domain Awareness



MDA BlueHawk™ and RADARSAT-2 Used to Identify the Source of an Oil Discharge in the South China Sea

The Challenge

Maritime Domain Awareness refers to the understanding of everything associated with a nation's maritime domain that could impact security, safety, the economy, or the environment. With water covering about 70% of the planet, Maritime Domain Awareness is one of the most important activities undertaken by national and international agencies. As the amount of global maritime traffic increases, these organizations are under increasing pressure to address issues such as trafficking of illegal goods by sea, illegal fishing, piracy, tracking of foreign vessels, sovereignty protection, and bilge dumping. These activities have huge economic and political costs, and in the case of detecting the source of illegal bilge dumping, have traditionally been very difficult to identify and prosecute the offenders.

The Solution

In July 2013, the MDA BlueHawk™ Maritime Domain Awareness solution, using RADARSAT-2 satellite radar imagery, was used to identify a vessel that had discharged a large quantity of oil into the South China Sea as it departed from the Hong Kong/Macau region of China. The MDA BlueHawk™ web-based service provides an unclassified multi-sensor Maritime Domain Awareness picture to maritime security organizations worldwide. Fusing vessel, oil slick and other information derived from space-based radar (from RADARSAT-2 and other sensors), AIS vessel tracking and other maritime information, MDA BlueHawk™ monitors vast maritime regions.

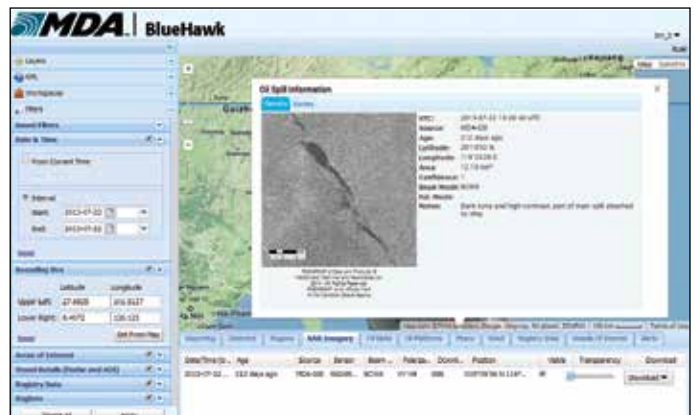
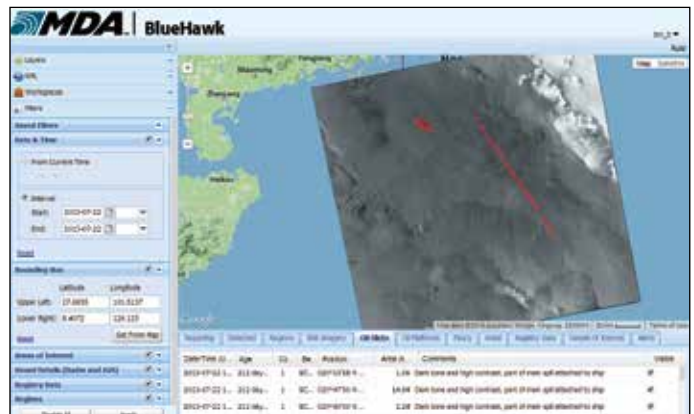


Figure 1: The MDA BlueHawk™ system provides a comprehensive view of the maritime environment. The RADARSAT-2 SAR scenes are overlaid with other data sources, including the oil spill analysis and ship detections.

Situational Analysis

On July 22, 2013 a RADARSAT-2 ScanSAR Wide satellite radar scene captured at 10:28 UTC was analyzed by MDA's team of highly-trained analysts, and an oil slick of approximately 300 km in length was identified in the South China Sea between Hong Kong and the Philippines. Using operator-validated ship detection algorithms on the satellite image, a vessel of approximately 150 m in length was located at the end of the oil spill. Referencing data from space-based Automatic Identification System (AIS) receivers, no AIS messages were received from the vessel's location at the time of the oil spill that could be correlated to the vessel that was identified by MDA operators from the radar scene. Using MDA BlueHawk™, the full scene was then analyzed for all AIS information from all vessels in the broader area, with one key AIS message captured at 14:19 UTC, almost six hours after the time of the spill detection, at a location about 100 km south by south-east of the end of the oil slick. This AIS message included vessel identification information.

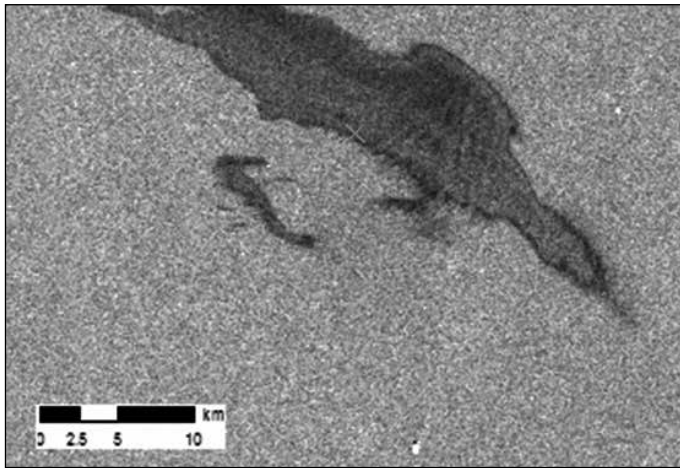


Figure 2: A second oil slick of interest, more than 30 km long and almost 10 km wide, was identified by operator-validated automated detection algorithms in MDA BlueHawk™, from the same RADARSAT-2 image. While identified at the same time as the larger bilge dumping incident, it is likely from another source.

MDA BlueHawk™ provided the International Maritime Organization registration information for the identified ship, a tanker registered as 147 m in length. This vessel was identified as heading away from the area of the oil slick based on the AIS course over ground and speed information. Using predictive algorithms based on that AIS information, the estimated previous track of the vessel was calculated, placing the vessel precisely at

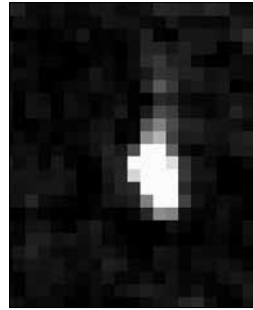


Figure 3: An image chip from a RADARSAT-2 image identifies a ship of ~150 m in length. It was identified at the end of a huge slick in the South China Sea.

the end of the 300 kilometer-long oil slick at the estimated time of the spill. As part of the analysis, all other AIS targets in the area for two hours on either side of the timing of the oil slick were evaluated, including predicted vessel tracks for each ship in the area. No AIS interference was identified within the region of the oil slick, and no other vessels could be reasonably identified as being responsible for the slick, as no vessel had an AIS path that crossed that specific area on a similar course. In evaluating the oil slick's structure,

it was noted that there were gaps in the oil slick that are assumed to be due to wind effects and not intermittent oil discharge. The weather patterns in the area (rain cells, strong winds), and the appearance of streaks in the radar image are very likely due to Langmuir circulation or atmospheric rolls. The spacing is consistent with the spatial scales for these types of atmospheric patterns.

Once the probable target had been identified, its AIS information was further analyzed. Two previous AIS signals were identified on July 12th at 16:26 UTC and July 13th at 13:05 UTC, as the vessel headed north from the waters near the Philippines, toward the major ports of Hong Kong and Macau. No further AIS signals were received from this vessel until July 22nd, just after the oil slick appeared. At that time, regular AIS signals from the vessel reappeared, with additional recordings on July 23rd at 14:19 UTC southwest of Manila, and then reported regularly from the 24th through the 27th where it appears to have been moored off the coast in Tarjun Village, South Kalimantan, Indonesia near an oil refinery. When plotted within the MDA BlueHawk™ system, the in-coming and out-going paths of the vessel make it clear that this ship was very likely the source of the oil slick.

In reviewing all the details of the scenario, it appears that the vessel was headed north, and disabled its AIS tracking system about a day before arriving at port. It spent close to 10 days in port, and then headed back out along a very similar route. Less than two hundred kilometers from its port of origin it dumped its bilge, causing a 300 kilometre long oil slick. Once it had completed the discharge and traveled about another 100 km, it reactivated its AIS system and continued south past the Philippines.

The Benefit

By bringing together multiple sources of maritime information, MDA BlueHawk™ allows for the detection and identification of polluters in a nation's EEZ, and provides information required to prosecute the offending vessel.

Successful Prosecution

This approach for the detection, identification and prosecution of polluting vessels using satellite information has been validated through the successful prosecution of Maersk Tankers Singapore Pte Ltd, after their vessel, the Maersk Kiera, was found guilty of polluting in an area off England's Cornwall coast.

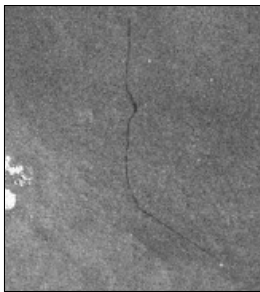


Figure 4: The Maersk Kiera off the Cornwall coast with a trail of oil close to 20 km long.

In February 2012, the Maersk Kiera was en route nine from Liverpool, nine miles off Land's End (well within the United Kingdom EEZ) when it left a trail of oil residue 30 km long. The crew of the ship had been washing its tanks, which had contained palm oil, which left residue in the water when the scene was captured by satellite-based radar. The image showed the ship with the trail of pollution behind it.

Maersk Tankers Singapore Pte Ltd was fined £15,000 by the Truro Magistrates' Court after pleading guilty to allowing one of its ships to pollute the sea. The Maritime and Coastguard Agency (MCA) said it was a "landmark case", and a spokesperson for the MCA offered that "It's the first time satellite imagery has been used in the UK that has led to a successful prosecution. This sends out a powerful message about prevention and enforcement."

About MDA BlueHawk™

MDA BlueHawk™ provides an unclassified multi-sensor Maritime Domain Awareness picture for global areas of interest to maritime security organizations worldwide. MDA BlueHawk™ delivers essential information that is critical to mission success, answering:

- Where are the vessels in my area of interest?
- Which vessels don't want to be seen?
- Which vessels are potential threats?
- Where exactly are there any oil slicks?
- What else is happening in my area of interest?

Fusing space-based radar with vessel tracking and other maritime information, MDA BlueHawk™ delivers a best-in-class Maritime Domain Awareness picture of vast maritime regions, rapidly detecting potential threats as far from shore as possible.



Figure 5: MDA BlueHawk™ fuses satellite data with other maritime data sources to provide complete Maritime Domain Awareness.

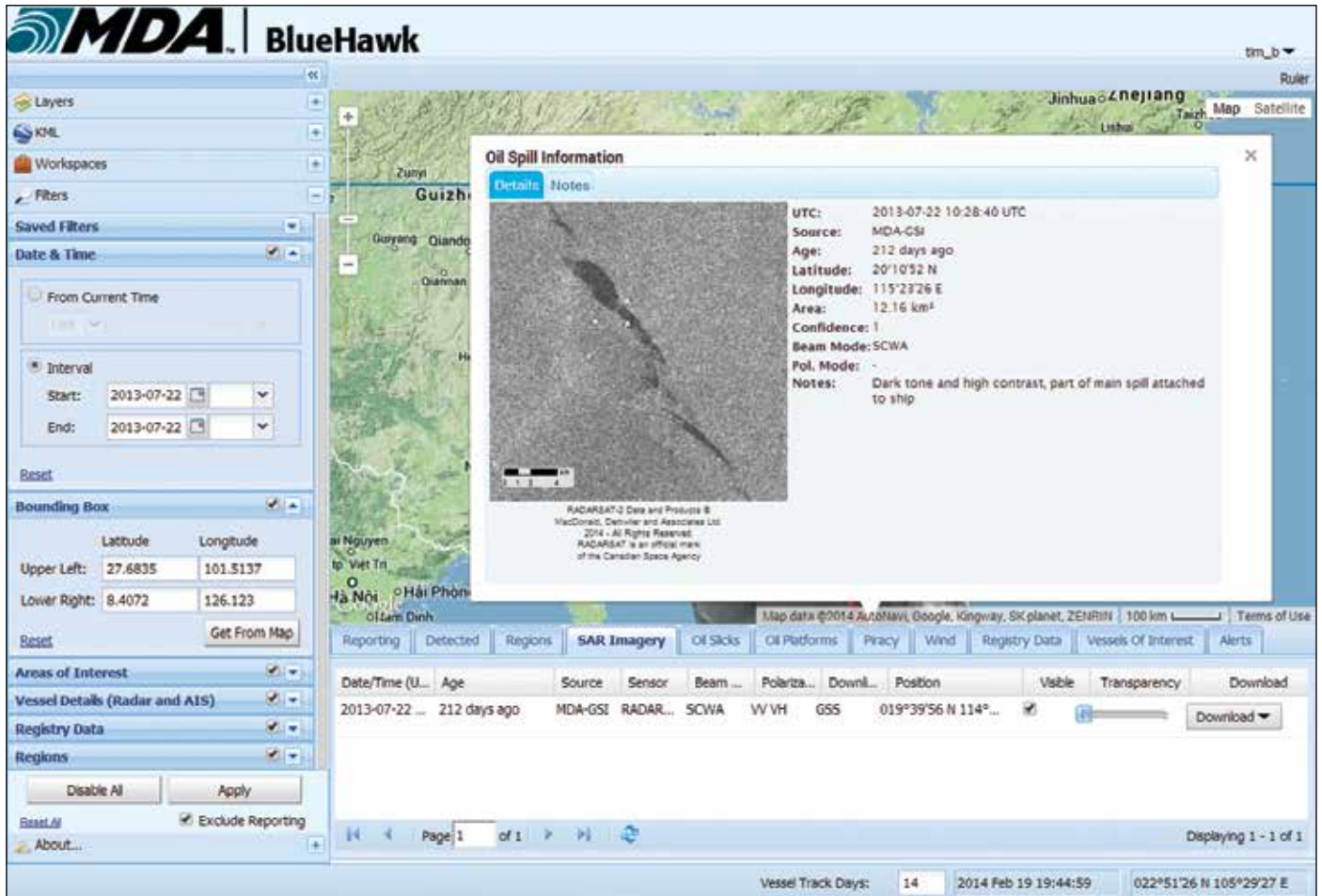
MDA BlueHawk™ is available as an internet-based service accessible through any web-browser, as a direct data feed into customer systems, or as an enterprise-class system installed at customer locations.

MDA is currently contracted to the U.S. National Fish and Wildlife Foundation to provide satellite-based detection of illegal bilge dumping, including the delivery of the MDA BlueHawk™ service.

About RADARSAT-2

RADARSAT-2 is one of the most technologically advanced commercial Synthetic Aperture Radar (SAR) satellites in the world, offers unparalleled imaging flexibility and capacity, increased information content with high-resolution, dual polarization and full polarimetric imaging options and a highly responsive programming and delivery ground segment.

RADARSAT-2 offers the capacity, coverage, and imaging features that deliver superior results for oil spill detection, vessel detection, and ice monitoring, making it the premier commercial satellite for global maritime surveillance.



The MDA BlueHawk™ Maritime Domain Awareness system provides a comprehensive view of the maritime environment anywhere in the world, in near real-time. RADARSAT-2 Synthetic Aperture Radar (SAR) scenes are overlaid on interactive map screens with information from other data sources, and the MDA BlueHawk™ oil spill analysis and ship detections.

About MDA

MDA built and operates the RADARSAT-2 satellite mission and is the global distributor for RADARSAT-1 and -2 image products into key industrial markets. MDA provides advanced information solutions that capture and process vast amounts of data, produce essential information, and improve the decision making and operational performance of business and government organizations worldwide. Focused on markets and customers with strong repeat business potential, MDA delivers a broad spectrum of information solutions, ranging from complex operational systems, to tailored information services, to electronic information products. The Company's common shares trade on the Toronto Stock Exchange under the symbol TSX:MDA.

For more information on MDA BlueHawk™ please contact us at:

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¹ <http://www.bbc.co.uk/NEWS/UK-ENGLAND-CORNWALL-24400845>