Airbus for Safer Oceans

Maritime Surveillance Services

Maritime Domain Awareness Solutions

OGS 2022 - Nouméa





Intelligence - Maritime Overview

UK Maritime Surveillance Service

Technical Overview

Capability Enhancements

Service Key Facts & Key Takeaways





Vessel Traffic System Coastal Traffic System





STYRIS® VTS and CSS

From multi-sensor data fusion to Recognised Maritime Picture (RMP)



DEFENCE AND SPACE

Earth Observation Constellations

Large commercial satellite constellation with **wide range** of modes, resolutions, swathes and revisit frequencies. **Partnerships** ensure **diversity**, including non-imagery data (HawkEye).

OPTICAL CONSTELLATION



NEXT

Zephyr

CO3D

RADAR CONSTELLATION

[Airbus Amber]

TerraSAR-X Neo

SIGNAL INTELLIGENCE

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Situational Awareness for Safer Oceans



Activity awareness from coastline to deep sea.

Assistance to **coastguards and naval forces for defence missions.**

Identification of illegal activities for law enforcement at sea (drug trafficking, vessel hijacking, illegal fishing and more).

Securing and optimising personnel and fleet management.

Increasing Search & Rescue operation effectiveness.

The experience of our analysts is augmented with the latest in machine learning, artificial intelligence and automated analytics to rapidly process a variety of data sources

[Airbus Amber]

Intelligence Maritime Strategy



Maritime Surveillance Service



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Royal Navy Maritime Surveillance Service

Vessel detection, recognition & reporting

Radar imaging with **AIS data**

VDR's delivered for areas of interest & classification of 'dark' vessels

Generated from Sentinel & Airbus **Radar** constellation through our **fully automated processing** chain

Processing performed on Airbus UK premises secure server

Exported in .kmz and .txt formats.

Customised vessel colour coding

Email notification with analytics



- Vessel Detection Reports
- Launch / Land Site Analysis
- Add-on Service of Global AOI's

SAR & AIS Vessel Detection Report (VDR) Benefits

Fully Automated 24/7 Operational Service

Reliable Performance

In terms of detection rate and false alarm rejection

Less than 1h

Average service delivery from image acquisition to VDR product Possibility to use station in Singapore for the Pacific

SAR Correlated with AIS

Identified vessels from SAR correlated with live AIS ExactEarth data feed

Superior

Airbus SAR multi-frequency ship detection algorithm

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Vessel Detection Report – VDR TSX acquisition – 12th June 2021



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Stream of vessels with no AIS heading to/from Rostov/Mariupol

Technical Overview



Imagery – Airbus Radar constellation Acquisition Modes



Imagery tasking process (1/2)

Acquisition cycle of 2 consecutive weeks with 2 images acquired per day Areas of interest provided by JMSC to Airbus typically 10 days before the first day of acquisitions

Airbus prepares a tasking plan (.kml) with few options for JMSC

JMSC selects the plan

Airbus tasks the satellite(s)



Imagery tasking process (2/2)

Tasking plan for weeks 45 and 46 (17th November to 30th November)





VDR SAR/AIS output (.kmz) (1/3)



AIS correlation window +-15m respect to image acquisition

VDR SAR/AIS output (.kmz) (2/3)



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VDR SAR/AIS output (.kmz) (3/3)





Example of automated email with VDR analytics

To	do_not_reply@airbus.com Maritime Surveillance Service - TSX_20210704_063333 VDR	
TSX_2021 2 MB	0704_063333_colour_OUTPUT.kmz TSX_20210704_063333.txt 45 KB	

*** This message was automatically generated by the Airbus DMPS System ***

Dear Customer,



The Vessel Detection Report for the TSX ScanSAR image acquired on 20210704 at 063333 UTC has been uploaded on the SFTP link and attached to this email for your reference. 24 vessels in total have been detected, 9 with correlated AIS.

Kind Regards, Airbus UK Maritime Team

If you wish to contact us about this email or any other matter please contact ukintelligencemaritime ops@airbus.com

Attachment File 1: TSX_20210704_063333_colour_OUTPUT.kmz

Attachment File 2: TSX_20210704_063333.txt



GLRT vs. CFAR SAR Vessel Detection Algorithms (1/2)





Intensity



GLRT vs. CFAR SAR Vessel Detection Algorithms (2/2)



Intensity

Since 2016 Airbus has been developing a Generalized Likelihood Ratio Test Algorithm for ship detection (GLRT)

- a SAR multi-frequency ship detection algorithm
- compared against & outperformed the standard CFAR algorithm in operational environment

Radio Frequency Detection

HawkEye360 RF data use cases:

- Monitor Large EEZs
- Geolocate Vessels that:
 - Spoof or turn off their AIS
 - Are not equipped with AIS
- Validate AIS Messages
 - Independent Geolocation
- Operations in GPS denied environments



> Frequency Range from 144 MHz to 15 GHz



Offer and analytics:

- Today HawkEye360 constellation has reached 15 satellites
- Aim is to reach 20 clusters of three satellites by 2025
- Up 7 revisits/day over most regions
- Expected Latency ~7h (RFgeo), target is 15'
- Analytics assigning AIS to RF data
- Analytics assigning dark vessels' flags to RF data

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Capabilities Enhancement



Capabilities Enhancement



Key Facts & Key Takeaways





VDRs Delivered

- **2021** 726 UK EEZ + 5 Add on Global AOIs
- **2022** 321 UK EEZ + 86 Add on Global AOIs

Average Stats

- 16 vessels identified per VDR
- Currently **53%** Dark targets
- Last 3 months, median end to end time (from image acquisition) is **48 minutes**, median processing time **28 minutes**
- Minimum E2E is 22 minutes!

Service developed with and used by the UK Navy to provide surveillance in overseas water. Every part of the service has been created working with them, fixing issues and satisfying needs. Excellent feedback from the customer.



Key Takeaways

- Automatic generation of VDR from SAR and AIS data
- Use of a superior SAR multi-frequency ship detection algorithm
- Reliable performance in terms of detection rate and false alarm rejection
- Operational Service available 24/7
- Scalable, affordable, pricing model based on tokens (like a pay as you go phone)



Time for questions and discussion !





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