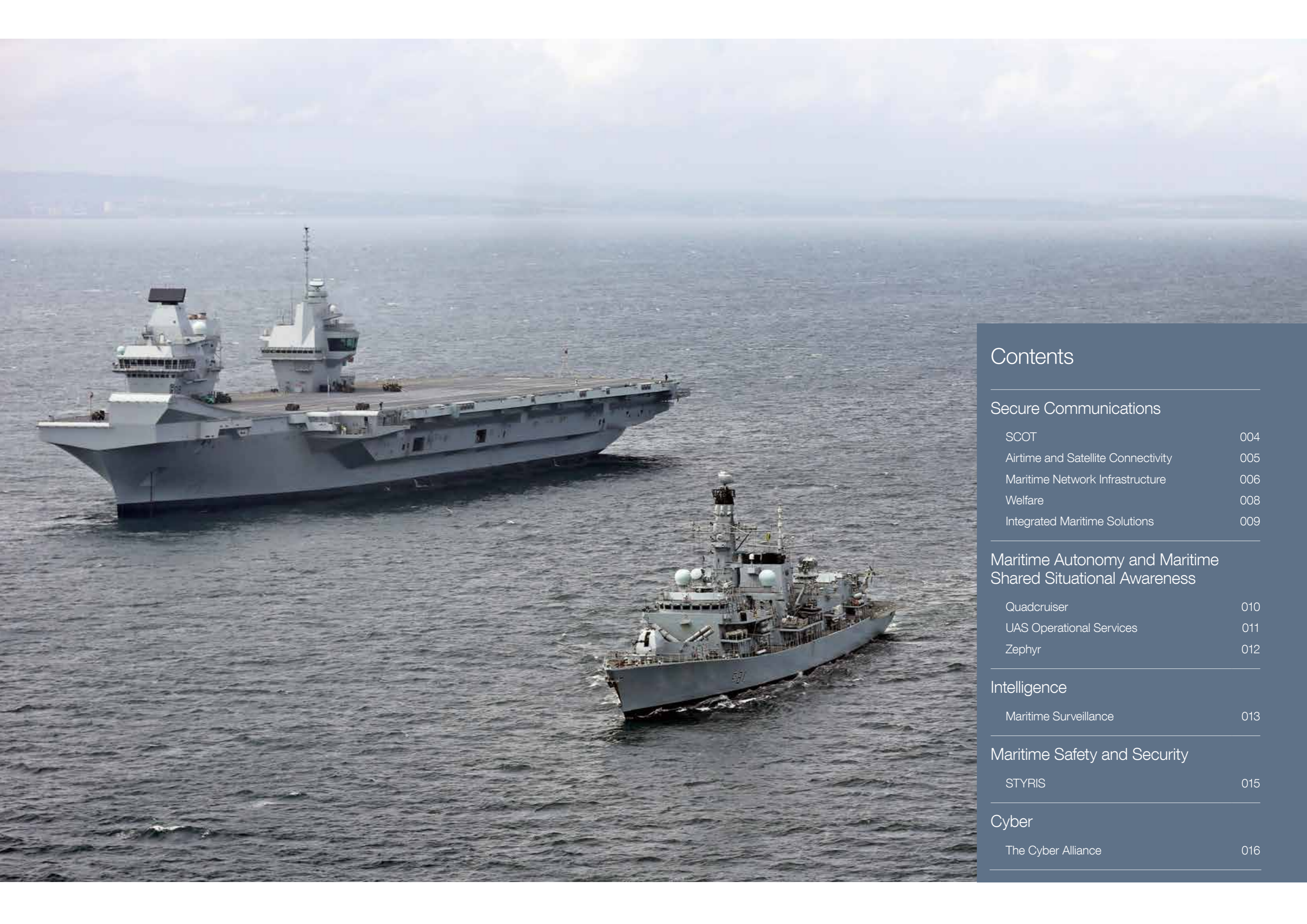


DEFENCE AND SPACE

Maritime Overview



AIRBUS



Contents

Secure Communications

SCOT	004
Airtime and Satellite Connectivity	005
Maritime Network Infrastructure	006
Welfare	008
Integrated Maritime Solutions	009

Maritime Autonomy and Maritime Shared Situational Awareness

Quadcruiser	010
UAS Operational Services	011
Zephyr	012

Intelligence

Maritime Surveillance	013
-----------------------	-----

Maritime Safety and Security

STYRIS	015
--------	-----

Cyber

The Cyber Alliance	016
--------------------	-----

Secure Communications

Our Mission

Connect and Inform people anytime, anywhere... with Secure and Resilient Communications

Your operational success is what drives us. We focus on delivering the right solutions to meet your operational needs for today and tomorrow. You can rely on our proven experience and expertise in managing everything from network operations to in-field support services and training. We focus on the people we work with and for.

anti-piracy operations and peace keeping missions' far away from home waters. Airbus provides robust, secure communications services to navies of the world.

Communication whilst on the move and in the middle of the ocean is a tricky one, but we've been delivering it for our customers for over 40 years.

These services meet the requirements of multi-national maritime operations, including:

- Multiband connectivity
- Bandwidth managed services
- Voice, data, broadband
- Welfare communication services
- Command and Control (C2) and situational awareness
- High data rates to submarine vessels
- Mastering interoperability of NATO STANAG and US MAC 1 compliant networks, services and infrastructure.

To be effective and safe in theatres of operation, ships of all size and classes need to be visible on the communications net. Navies are now supporting large coalition forces,



8

MilSatCom Satellites in operation, dedicated to governments & military customers



18

Armed forces worldwide use our SatComs (incl. NATO and European Defence Agency)



24/7

MilSatCom Satellites in operation, dedicated to governments & military customers



40

Years of experience in delivering SatCom Services



200

Fixed & deployed stations delivered to the French Armed Forces as part of the Concept Network



500

Ground Terminals delivered within the scope of SATCOM BW



25,000

Welfare end-users served around the world



300,000

UK MoD users connected (Secured LAN Services)

SCOT terminals enable mission critical communications for navies anytime, anywhere.



SCOT Mission



Key Features

- Highest levels of availability in the most adverse environmental conditions
- Maintains exceptional pointing accuracy without recourse to ship's positional reference systems
- Able to withstand shock, vibration and harsh operating environments up to sea-state 8
- Range of solid state and TWT (Travelling Wave Tube) amplifier options up to 2kW
- Multi-channel capability
- Designed and tested from the outset as 'mission critical'
- Advanced 3-axis, fully balanced, fully stabilised antenna system designed for dynamic and severe platform motion
- Exceptional strength
- Low PIM (Passive Inter Modulation) versions available
- High reliability 'solid state' and ability to respond to high stress (jamming)

SCOT Patrol



Key Features

- Highest levels of availability in the most adverse environmental conditions
- Able to withstand shock, vibration and harsh operating environments up to sea-state 7
- Reduced magnetic footprint
- Lightweight – Above decks assembly is manufactured from carbon fibre
- Advanced 3-axis, fully balanced, fully stabilised antenna system
- designed for dynamic and severe platform motion
- Maintains exceptional pointing accuracy without recourse to ship's positional reference systems
- Minimal susceptibility and impact on other communications, sensors and weapon systems
- Particularly suitable for use in mine counter measure vessels
- Exceptional strength

Airtime and Satellite Connectivity

Airbus provides managed satellite services using both military and commercial satellite bandwidth, Airbus can provide all MilSatCom capability or specific services which

include bandwidth only, bandwidth with anchoring and backhaul or many other various combinations of packaged services, products and systems.

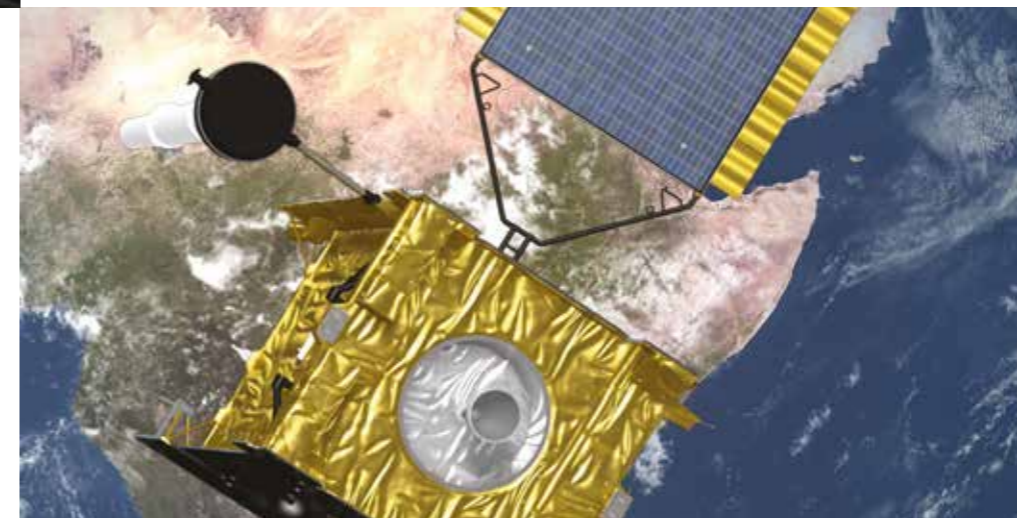
SCOT (Satellite Communications Onboard Terminal)

For 40 years, Airbus Defence and Space's SCOT family of naval MilSatCom terminals has led the world in providing reliable, high capacity, long-range communication to warships in the toughest conditions. SCOT terminals enable mission critical communications for navies anytime, anywhere.

In excess of 300 SCOT terminals have been fitted to over 40 vessel classes. SCOT terminals and sub-systems have been supplied to the navies of Canada, USA, UK, Germany, Spain, Portugal, Italy, Turkey, UAE, Brazil, Netherlands, Singapore and Australia.

SCOT Terminals are available under 2 product families:

- SCOTMission – High performance, military specification
- SCOTPatrol – Lightweight for smaller vessels
- We provide a range of X, Ka dual-band terminals ranging from 80cms to 2.2M



Airbus provides autonomous high-speed high throughput IP communication capability of UHF, C, X, Ku and Ka band satellite capabilities and associated services.

- Providing global coverage
- Very high-speed IP all-satellite communications network
- One-stop shop 24/7
- Assistance, engineering
- QoS commitment

Maritime Network Infrastructure

Maritime Network Evolution

Maritime Network Evolution (MNE), delivers a modern BLOS IP based communication architecture to the Royal Navy's surface Fleet. MNE fully supports the long term UK Maritime Strategy, exploiting all Information Exchange Requirements (IERs) for:

- Carrier Enabled Power Projection (CEPP)
- Joint Expeditionary Force (Maritime) JEF(M) and,
- Any Naval UK operational tasking

MNE will significantly update the communications networks of 20 Royal Navy warships, including:

- Queen Elizabeth Class Carriers,
- In-service Type 23 and Type 45 vessels
- Future surface fleet vessels including Type 26 and Type31e

The four year upgrade programme sees the first ship fit early 2018 with HMS Queen Elizabeth planned fit in early 2019. The MoD also have a costed option for a further 9 vessels.

The solution creates an Internet Protocol backbone for the future Maritime Technical Architecture which, together with the existing Airbus SCOT Mission Military X Band Terminal and Skynet Constellation, will create a true 'Network on the Sea'.

The new SCOT Next Generation Terminal, and the Skynet 6 Satellite, will help ensure the Royal Navy continues with their world leading Beyond Line of Sight Maritime communications capability for decades to come.

Operational Benefits:

- Embrace MoD Strategy for "Almost Everything over IP"
- Support MoD Strategy towards Global Connect and New Style of IT
- Deliver multiple integrated Bearer of Opportunity selection to the User
- Retain key military features such as Multi-Level Secure Voice
- Eliminates equipment obsolescence
- Multiple innovative enhancement



Operational Benefits:

Since 2012 Airbus has provided the RIFAN solution to the French Navy and delivered the following benefits:

- Deployed task force Ship-to-shore, ship-to-ship end-to-end secure connectivity
- Federation of data flows per classification level and routing through WANs
- Ashore network Operating centre and Security Operation Centre providing fleet Hypervision
- Crew focused on core operational activities
- On board Overall Picture of On-Board equipment from unique workstation (Hypervision)

Maritime Network Evolution (MNE), delivers a modern BLOS IP based communication architecture to the Royal Navy's surface Fleet.

The RIFAN and RIFAN 2 system

Airbus in partnership with Naval Group and Rhode & Schwarz, has set up the Intranet Network of Aero-Naval Forces (RIFAN) to interconnect platforms of the French Navy.

The goal of RIFAN Stage 2 is to integrate, deploy and maintain a network of secure communications between the various French Navy

vessels and the forces on the ground. RIFAN step 2 thus ensures the stability of voice (UHF / V) and data (HD / IP and SNR) information exchanges in the most critical situations, anywhere in the world.

Network management and security can be done through centralized Network Management Capacity (CMR) and also Local Management

Capacity (CGL). Flow transfers, optimized by the COMCEPT / TELCOMARSAT, SYRACUSE and INMARSAT / BGAN satellite facilities.

The RIFAN 2 "IP" connection infrastructure ensures coverage of all information exchanged, from the unprotected level to the NATO Secret level.

Welfare



The Maritime Welfare (MW) Service is a fixed and mobile voice, text, email and Internet service for Naval crew when at sea. It provides those services already available to land based troops to the sea environment.

Our services include X, C and Ku-band VSAT solutions and the whole range of Inmarsat, Iridium, Thuraya and UHF maritime solutions. Our value-added services and applications further reduce complexity, optimise communications and save your time and money.

Key Features

- Provides welfare services for ship's crew enabling continuous contact with friends and family, and cultural and information services
- Fixed phone-voice service
- Mobile telephony voice and text service through closed user group
- Personal email
- Wi-Fi connection for personal tablets, laptops and smartphones

Airbus currently provides Maritime Welfare Services to:

- MilSatCom Ships
- Non-MilSatCom Ships
- Submarines

“For many the critical difference delivered by the increased bandwidth was that it enabled video calls to be made home so as to enjoy face to face communications with loved ones, or even watching children open presents.”

Commanding Officer, HM Warship, South Atlantic

Fleet Welfare Multimedia (LARUS)

The ability to access the internet and social media sites on-demand is taken for granted today. But naval service places considerable constraints on such access, which may have a detrimental impact on recruitment and retention. The Airbus LARUS system addresses such constraints and enables the ship's company to access social and multimedia content either live or on-demand, using personal devices at the bunk space. LARUS is bearer agnostic and can utilise MilSatCom, ComSatCom, cellular and ship alongside facilities. LARUS is disseminated below decks through a networked infrastructure, which can be tailored to the security requirements of the customer.

Key Benefits:

- Integration of all welfare services into an Airbus coherent Maritime Network Ability to use multiple Bearers Of Opportunity (BOO) – bearer agnostic
- Designed specifically to allow future media enhancement services as required
- Use of Bring Your Own Devices (BYOD)

Key Features:

Promotes on-board multimedia experience by providing:

- Video calling
- TV and Radio
- Video on demand
- Data services



Integrated Maritime Solutions

FREMM (Frégate Européenne Multi-Mission / Multi-Mission European Frigate) is an example showing how the maritime capabilities of Airbus are brought together to provide coherent and integrated 'whole-ship' solutions fleet-wide.

FREMM includes the following Airbus supplied services and products:

- Mobile Voice Comms (PMR) subsystem
- Self-Powered Telephone subsystem
- CCTV subsystem

- Secured IP (RIFAN2)
- LTE subsystem
- UHF LOS subsystem
- Telcomarsat/Astel services
- ComSatCom and MilSatCom terminals
- Maritime welfare services



PMR Over IP Naval Solutions

Proven secure voice and data radio communications customized for Naval applications.

- On-board local and remote management adapted to the FREMM needs
 - FREMM needs customization (Detailed MIB development)
 - Interface with the Central communication system (SNMP)

- Access network infrastructure adapted to end users
 - Radio access media to on board mobile radio terminals
 - Line connected media interface to on phone Fixed voice over IP subsystem
 - Analog Gateway interface
 - Line connected media interface to telephone system (IP to ISDN interface)
 - End user equipment (rugged

handheld, Flying desk headset, fire rescue, Marine gateway, etc.)

• Mains features

- Group communications (CMD, AERO, SEC ...)
- Private communications
- Encrypted communications
- Voice Communications Priority management
- Direct mode communications

Maritime Autonomy and Maritime Shared Situational Awareness

Airbus DS Airborne Solutions is a subsidiary of Airbus Defence and Space – your partner for development, production, operation, certification, training and logistics.

We have been in the UAV business since 1977 by carrying out development, certification, training, logistics and maintenance for the German Armed Forces, including on foreign deployments. We will also gladly be of service as your partner by collaborating with your government authorities and security forces to adapt our unmanned reconnaissance systems to meet your needs or to provide you with a reconnaissance capability for tactical or MALE (Medium Altitude, Long Endurance) systems.

In close collaboration with procurement authorities and local suppliers we are able to set up a complete logistics chain to ensure full logistics support while respecting the partner nation's budget. Local industrial capabilities are assessed and considered to initiate a transfer of technology and production.

Furthermore ADAS is able to provide Training and Licensing for maintenance- and service personnel, air vehicle operators and payload operators

Airbus DS Airborne Solutions provides UAS and related services - including data collection, analysis and distribution, pre- and post-flight checks, and maintenance.



Quadcruiser QC11

QuadCruiser QC11 combines the benefits of a vertical take-off & landing drone with a fixed-wing aircraft achieving quick deployment without a runway or catapult and an extraordinary flight duration. Its fully automatic flight modes and a simple graphical control station mean it is easy to operate, and being less than the 25kg weight limit means it can fly in most countries around the world.

The drone is designed for a wide range of commercial applications such as cargo delivery, infrastructure inspection, surveillance, video filming, and geo-spatial data collection. Its modular mission system is able to accommodate a wide range of payloads with open interfaces and a large payload bay.

Performance and Specification

- Take-off weight: 25kg
- Wing span: 3.5m
- Endurance: up to 8 hours cruise flight
- 4 or 8 electric motors for vertical take-off
- 1 pusher electric motor for efficient cruise flight

UAS Operational Services

Since the beginning of the service in Afghanistan, more than 3000 missions with at least 38,000 flight hours were carried out in this program successfully with an availability of above 95%.



©Copyright: Bundeswehr/Heyn

Key Features

Cloud connected drone

- Connects seamlessly with Airbus' digital service platform
- Command and control from anywhere via 4G / Internet
- Video and imagery content distribution to mobile and desktop apps
- Airbus' secure platform means operators can allow their end-users to re-task the drone in flight via mobile app without compromising safety

Imaging and surveillance capabilities

- HD EO camera with 30x optical zoom
- 60mm IR lens can detect people at 2000m
- Video and snapshot modes, with live-streaming and on-board recording / download
- Motion Detection and Object Tracking

Cargo delivery

- Capable to deliver up to 5kg of payload over long distances
- Its large payload bay can accommodate bulky packages
- Its reliable beyond-line-of-sight operations make it suitable for both commercial cargo, medical and humanitarian supplies.

In response to the urgent need in Afghanistan, Airbus DS Airborne Solutions GmbH (ADAS) provides since 2010 UAS Operational Services for SAA TEG (System for imaging reconnaissance deep in the area of operations). Since November 1st, 2016, Airbus DS Airborne Solutions also operates a fleet of UAVs for the German Bundeswehr in Mali. In an extremely short time

Airbus DS Airborne Solutions supplies Unmanned Aerial Vehicle Systems (UAS) for long-range reconnaissance in Afghanistan and Mali and manages the entire logistical support and the maintenance for the system in the theatre of operations with its own staff. On the industrial side, a monthly number of flight hours and availability are guaranteed.

Upon demand ADAS prepares, taxis and starts the UAV and hands over the aircraft to the German AirForce, who is responsible for the further deployment of the unmanned aerial reconnaissance system in operational missions. The training of Air Force staff falls to Airbus DS Airborne Solutions again.

Maritime Shared Situational Awareness



Designed for both military and commercial purposes, Zephyr provides groundbreaking capabilities in long range, persistent surveillance and communications.

Zephyr

Zephyr is a High Altitude Pseudo-Satellite (HAPS) that complements satellites and conventional UAVs to provide powerful new capability:

- Runs exclusively on solar power
- Over 30 continuous days of flight – longer than any other High Altitude UAV

- Flies above the weather and above commercial air traffic
- Autonomous, high reliability platform
- Low vibration and structural loads to Low vibration and structural loads to allow high efficiency, lightweight payloads

Zephyr delivers a truly unique, real-time pseudo satellite capability to provide wide area persistent presence at low through-life cost. Running exclusively on solar power, Zephyr flies at about 65,000 ft, above the weather and other air traffic.

Intelligence

Maritime Surveillance

Based on a constellation combining radar and optical satellites, Airbus Defence and Space provides the most comprehensive/efficient answer for maritime monitoring services by building the meaningful solution for wide coverage, fine detail, intensive monitoring, reliable and successful new collections, premium reactivity and interpretation response.

Unique on the industry, this reactive observation capacity, allow Airbus Defence and Space to activate and combine the appropriate satellites when needed to:

Detect more ships

- Radar can see whatever the weather conditions are
- Optical Sensors can detect smaller, wooden and fiber boats
- Large spectrum of available resolutions allow to refine any analysis from detection to classification and identification

On a wider theater

- Huge daily collection thanks to SPOT6/7 (100.000 sq.km in a single pass) and TerraSAR-X (400.000 sq.km in a single acquisition)wider acquisition modes

- Multisensor tasking strategy to make the best use of available collection capacity (Dedicating individual sensors to a sub part of the area to widen the monitored area)

More Frequently

- Enable a situation understanding several times a day by leveraging all sensors to afford daily and even intra-daily revisit
- Different satellite pass along the day (radar satellites passing at 6AM or 6PM, optical ones in the frame of 10 -11 AM)

Airbus Defence and Space supports shipping and insurance companies, OGM firms, National Authorities private security forces and environmental protection agencies with timely and accurate information to ensure the safety and efficiency of maritime activities around the globe.



Zephyr Potential Solutions



Military Surveillance

- Electronic Intelligence
- Maritime Surveillance
- Border Surveillance
- Missile Detection
- Electro-optical and Infrared Sensors



Civil Remote Sensing

- GEO Intelligence
- Agriculture
- Site Planning & Constr.
- Mining
- Fire Detection
- Fire Management



Military Communications

- Tactical COMS (VHF,UHF, S Band, LTE)
- In-theatre Internet Coverage
- Theatre Backhaul



Internet Connectivity

- Backhaul
- Mobile Connectivity (Long term evolution)

Maritime security is of utmost importance today with more than 90% of the world's trade goods and more than 70% of global crude oil transported by sea. As shipping traffic grows, the pressure on the security of the world's oceans is increasing.

Maritime activities are also expanding into the Arctic regions with growing traffic in the ice-infested waters of the Northeast and

Northwest Passage, and oil and gas platforms set up to exploit the huge reservoirs of resources in the Arctic. These activities rely on detailed and timely ice information to support safe and effective operations.

All these activities increase the pressure on the marine environment and the demand for reactive imagery, early-warning capabilities and reliable monitoring services to:

- Better know activity on an area (EZZ & more)
- Detect patterns of illegal behaviours at sea: illegal fishing, narco-traffic, immigration, maritime pollution, piracy)
- Trap catching in act traffickers
- Support Defence missions: intelligence, operations at sea

Best in class satellites mobilized

Not only one satellite imagery provider can bring so much to answer all maritime surveillance need. Whatever you want to detect, monitor or track, Airbus Defence and Space can trigger the appropriate satellite or combine all the Armada/fleet to provide you with the meaningful solution.

SPOT 6 & 7 Twins

Key features for Maritime Surveillance activity	Benefit
60 km swath & Over-The-Top Agility	Ideal for wide area surveillance Acquisitions of 100,000 sq.km in a single pass of contiguous segments
1.5m products	Easy identification of big ships (cargos, tankers, ferry boats) Easy detection of medium to small ships (fishing boats, go fasts, speed boats, sailing boats and small wooden / rubber / fiber boats, tug boats, skifs, mother ships, dhows...)
Daily Revisit	To allow rapid access to target, Intensive monitoring or very large areas completed in a flash
Stereo capacity	To enable speed assessment and direction

Pléiades Constellation

Key features for Maritime Surveillance activity	Benefit
20 km swath & Over-The-Top Agility	Best coverage capacity in a single pass in this class of resolution: Up to 100 x 150 sq.km
0.5m products	Ideal for identification of small boats such as fishing boats, go fasts, speed boats, sailing boats and small wooden / rubber / fiber boats, tug boats, skifs, mother ships, dhows...
Daily Revisit	1, Rapid access to target – 2, Intensive monitoring – 3, Very large areas completed in a flash
Stereo capacity	Enabling speed assessment and direction

TerraSAR-X

Key features for Maritime Surveillance activity	Benefit
Wide Scan SAR Mode	Up to 400,000 sq.km within a single acquisition anywhere and independently of weather conditions.
0.25m to 40m resolution products	at 40m resolution and with a 270 km swath, Wide Scan SAR images are the best tradeoff between coverage and resolution the industry can offer today and suits perfectly to: <ul style="list-style-type: none"> - monitor ship traffic & maritime assets - detect oil spills - detect and track ice on northern routes - the new Staring SPOTLight mode at the unprecedented resolution of 0.25m reveals crucial details for IMINT and GEOINT applications and allows to go beyond detection, to classification and even ship identification.
X band	Reliable Detection and Tracking of Sea Ice
Revisit	The future TerraSAR-X / PAZ constellation (Q4 2017) will allow increase revisit rate and will bring AIS sensor on board, enabling to discriminate reporting vs. Non reporting boats on the spot

Maritime Safety and Security

STYRIS®

The Maritime Surveillance centre of competence of Airbus Defence and Space is the only reference the three key maritime business segments Vessel Traffic Services (VTS), Coastal Surveillance Systems (CSS) and Critical Infrastructure Protection (CIP) for surveillance of Oil and Gas, Offshore and Shore based assets.

Thanks to 30 years of experience, over 250 maritime safety and security systems are in operation for fully satisfied Customers including

Port Authorities, Coastguards and Navies worldwide.

Understanding the coastal surveillance mission and maritime environment to meet the challenges, STYRIS is the surveillance system, integrating all sensors and providing the common operational picture.

Main challenges

- Border Integrity Maritime Domain Awareness enforcement
- Safety of Maritime Operations

- Detection of illicit activities
- Maritime Security
- Search And Rescue (SAR)
- Maritime Logistic Operation Support

Environment Protection By applying a User Centric Design approach and the involvement of customers as key partners at every stage of the product development is one of the main added values STYRIS® provides, making it a true User leading edge product.



Case Study

Major Container & Oil Terminal in Malaysia equipped successfully with a Critical infrastructure protection System.

Key features of STYRIS system deployed are:

- Improved Swimmer detection & recognition and identification
- Surface and subsurface Recognized Maritime Picture STYRIS black cockpit concept

Customers can benefit from C2 system integrating all assets: Deployment and integration of sensor sites (e.g. radar, EO and SONAR); Installation, commissioning of complete STYRIS system (including latest advanced features) in Control Centre(s) and remote operator locations; Comprehensive training program for operators and technical staff. **'A system designed by the User for the User'**



The risks and threats of cyber incidents are growing geometrically, even in countries with significant cyber defence resources

The Cyber Alliance

The Digital revolution has brought about a significant level of change in the way the Maritime market works over a very short period of time. Huge benefits have been achieved in efficiency and cost savings, but also unfortunately new threats to the Maritime community have emerged along with digitalization.

The maritime industry itself is beginning to experience more and more attacks, which are vastly under-reported and is considered vulnerable as not well prepared.

Shipping operates worldwide and many nations do not have their own incident reporting mechanisms, or know where to report. In fact, most countries simply have no reporting

Centre for any cyber incidents in the maritime industry or in international waters.

It is recognized by all that there is a lack of data on cyber crime available, for ship owners and operators, ports, Insurers, flag states and classification societies, to be able to assess the level of threats and risks, mitigate attacks, improve overall safety, and be able to take remedial action.

Airbus in partnership with CSO Alliance is about to upgrade and deploy an anonymous maritime crime-reporting portal including a cyber incident reporting facility. This initiative is supported by Class, Insurers and P&I, Shipowners and managers, Flag states and the IMO.

What is provided?

Main features of the portal:

- A single globally accepted place to report incidents, supported by the entire maritime industry
- A mechanism to enable Secure and anonymous reporting
- A European system meeting very high privacy and confidentiality requirements
- A voluntary reporting system, and if sufficient support can be achieved at the IMO, become voluntary with MSC guidance
- Applications and tools, such as a malware analysis function, allowing users to download suspect files and get an answer on what they are dealing with; or find appropriate support, training and self assessment of cyber readiness tools, to determine their level of vulnerability
- News, and alerts on new threats and malware
- A library of best practice and process documentation
- As the reports will be anonymous there will also be a way, for those interested or affected by an incident, to contact providers of relevant assistance to assess risk, degree of vulnerability or even get assistance to prevent problems or address the consequences of a cyber-attack and ensure lessons are learned

How can anonymity be guaranteed?

It is proposed to split the reported information to servers in different countries using an anonymising reporting Centre. This enables heavily encrypted data of the crime report +ID of who reported the incident, to be split and distributed between 3 servers in different legal entities in 3 different jurisdictions and with different legal and privacy systems. The original data including

ID of who reported the incident is then destroyed on receipt, but after the data is split.

Airbus therefore does not know the source or ID of the originator. CSO Alliance does not know what the content of the incident was only that there was an incident and a generic type, but will be able to provide useful statistics and trends, and the combined incident and ID has been erased after transmission in Iceland.



AIRBUS

© AIRBUS 2018 - All rights reserved. Airbus, its logo and the product names are registered trademarks.
Ref 12137mn / May - 2018.

www.airbus.com



[@AirbusDefence](https://twitter.com/AirbusDefence)

