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March/April 2014

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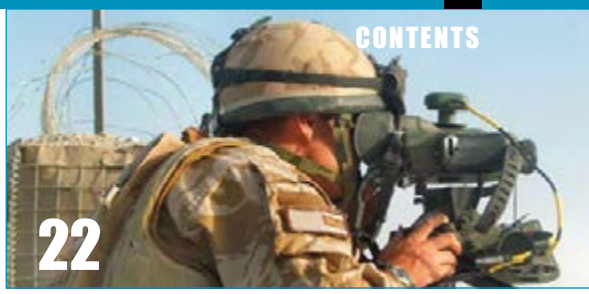

Cover story: C4ISR systems are increasingly being utilised for events/border security. *(Image: istockphoto)*

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Solving the mystery

As this edition of *Digital Battlespace* goes to press, the uncertainty surrounding the disappearance of Malaysian Airlines flight MH370 is ongoing. One can only hope that by the time you read this column, the tragic incident will have been explained, providing families of passengers and crew with some kind of explanation as to what occurred in the skies above the Asia-Pacific region.

As harsh as it may sound, it is terrible events like this that provide us with critical lessons learned, allowing those concerned and other interested parties to update TTPs, CONOPs and where necessary, equipment. This is what happened following the 9/11 terrorist attacks in New York City and Washington, DC, with effects on homeland security in the US and all around the world.

The after-action review of the MH370 episode, whenever it is finally resolved, will reflect a number of important lessons learned for the C4ISR community.

First, we routinely read about fast-developing radar systems, civilian or military, and it is astonishing to see that this kind of technology literally 'lost' a Boeing 777-200ER halfway between Malaysia and Vietnam. *DB* sources in Malaysia highlighted issues regarding the efficiency of the Malaysian air defence system, but as yet these claims remain uncorroborated.

Second, it comes as a surprise that beacons and transponders carried on board an airliner can be turned off manually, whether intentionally or not by an official crew member, or anybody else for that matter. Expect to see international legislation passed in the near future to ensure a permanently transmitting beacon/transponder is fitted to all commercial aircraft.

No matter what happened to the aircraft, the multinational search and rescue efforts have been most impressive, with many countries now pitching in with assets to take responsibility for multiple and massive search boxes.

The search, which effectively covers an enormous triangle between Kazakhstan, the South China Sea and Western Australia, has been likened to looking for a needle in a haystack. But as I write, Australian PM Tony Abbott announced the sighting (via satellite imagery) of possible aircraft debris in the Indian Ocean, some 2,400km off the West Coast of Perth.

Whether this turns out to be MH370 or not, the benefits of GEOINT are plain for all to see. Australia this month purchased eight P-8A Poseidon maritime surveillance aircraft as part of a A$4 billion (US$3.6 billion) deal. It is expected that this capability will be further enhanced with the acquisition of Northrop Grumman's MQ-4C Triton UAV, which will replace the AP-3C Orion – the platform which identified the possible debris of MH370.

Such procurement will only enhance Australia's maritime surveillance capabilities. It is a shame that Triton, which is yet to go operational with the USN, is not on-station to assist in the search. Its mission payload radius of 2,000nm would have been handy.

Elsewhere, it would be remiss of me to ignore the latest revelations emanating from the former NSA contractor Edward Snowden. This time, the agency is accused of monitoring '100%' of phonecalls in an undisclosed foreign country.

Dubbed 'Mystic', the voice interception programme has been running since 2009 and allows 'retrospective retrieval' of all calls originating from the country. No doubt, recognition technology will pick up keywords, actions and routine, but it would be interesting to see how much tangible intelligence is acted upon following such a huge dredging process.

Andrew White, Editor

RESPONSE

Digital Battlespace's editorial team is always happy to receive comments on its articles and to hear readers' views on the issues raised in the magazine. Contact details can be found on p1.

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- Soldier mod
- Urban terrain awareness
- European comms
- Generic vehicle architectures

EMS critical to evolving operations, says USN...

The EA-18G is described as a 'critical' system in the future EW battlespace. *(Photo: US DoD)*

Control of the electromagnetic spectrum (EMS) will be critical as operations move away from the permissive environment of the past 12 years, VAdm David Buss, US Commander Naval Air Forces, has stated.

Speaking to *Digital Battlespace* on 12 February, Buss said it was 'no surprise' that potential adversaries around the world had capabilities to deny US forces portions of the EMS.

'We're operating very diligently with systems we have online today and the systems we will develop and field tomorrow to bring back capabilities to dominate locally the EMS,' he said.

It is widely acknowledged that China and North Korea possess mature jamming systems. Additionally, the latter is understood to have a high-altitude EMP capability which could neutralise critical infrastructure in a city or military base.

However, Buss described 'very exciting times for naval aviation' and admitted that the USN had just started to scratch the surface with regards to dominating the EMS.

He added that platforms such as the EA-18G EW aircraft would prove critical in generating the effects needed in the future. Referring to the Next Generation Jammer programme, Buss described a 'whole new set of possibilities in terms of global dominance of EMS'.

He continued: 'We are just getting going with that, and we also need to think differently about how we use cyber and our tactical assets in the future. We are looking around the globe at potential adversaries and those who will try to keep us out, preventing us from operating or dominating the battlespace in the future.'

Above and beyond platforms, Buss said concept of operations would also be critical in the 'high-end domain'.

'In the less permissive environment, we are focusing on naval aviation in developing the types of skills we used to have in the air-to-air arena and in the anti-submarine warfare domain back in the Cold War,' he added.

Buss also highlighted 'sensing, understanding and knowledge' of the battlespace: 'It's about ISR assets and how we think about shreds of information and fusing that intelligence picture which allows us to the greatest extent to understand and sense what's going on in the battlespace.'

Noting the E-2D Advanced Hawkeye and its generation of effects, as well as maximisation of weapons and sensors of other aircraft operating in the battlespace, he concluded: 'We need the right protocols and data links, no matter what platform it is, to share… and fuse information into a coherent picture. Only this will mark our success in the high-end battlespace in the future.'

By Andrew White, San Diego

... while AOC warns of 'uncontrollable' cyber realm

The future of EW in Asia-Pacific is going to evolve past the traditional threats and into an uncontrollable, networked cyber realm, a senior EW expert has warned.

Jurgen Opfer, VP of the Association of Old Crows Australia, informed *Digital Battlespace* how the contested Asian domain electromagnetic threats are evolving to include disruption of communications systems, counterfeit chip propagation, violation of cyber capabilities and navigation systems, and missile proliferation.

'EW used to be ESM – electronic countermeasures, radar jamming and electronic counter-countermeasures to defeat the jamming,' he said. 'That was the simple view.

'As you expand technology in the military sense, you have to consider that it accounts for things like communications systems, which are now all electronic – it is no longer two tin cans connected by a piece of string.'

He said that as well as communications systems, navigation systems are now totally electronic and therefore an EW concern: 'I'm not just talking about GPS, and in turn GPS jamming, but also inertial navigation systems in aircraft and so on, which can be tampered with by cyber attacks.

'So it is now the case that cyber is an aspect of EW,' he continued. 'It becomes much more than the EMS. And where do most electronic systems come from these days? The answer is China. So that is where the cyber threat comes into it.'

The threat from China is an obvious one in the region, with the two local manufacturers NORINCO and CPMIEC reportedly accounting for 24% of the $65 billion international missile market, according to Opfer.

'The countries that are potentially in conflict with China include Japan, Taiwan, possibly South Korea, and of course the US,' he concluded.

By Beth Stevenson, Singapore

UK GEOINT remains crucial post-Afghanistan

GEOINT has proven vital to ISAF troops operating in Afghanistan. *(Photo: Crown Copyright)*

A senior British officer has predicted that UK forces will rely upon geo intelligence (GEOINT) capability more than ever as focus is shifted from Afghanistan to other operational theatres.

Gen Sir Richard Barrons, Cdr of Joint Forces Command, told the Defence Geospatial Intelligence conference in London in January that the UK military mission has revolved around counter-terrorism since 1989, but future theatres will occur in different environments and personnel will face new threats.

'We have focused on Afghanistan… and some of this we need to carry forward into the future,' he explained. 'The role of GEOINT in support of homeland security, defence and resilience are the core functions going ahead.'

Key areas of interest for UK operations include counter-narcotics, for which he said GEOINT can do a lot more to make this mission easier, as well as the proliferation of ballistic missiles and offensive cyber capability.

More nations will have ballistic missiles, and their effective range is expected to increase. 'It is inevitable that nations will have those weapons that can reach Europe and the UK in particular,' Barrons noted.

'In Africa, UN peacekeepers are conducting a range of operations in environments where we are dealing with humanitarian drama at scale, instability at scale and terrorism. There is clearly a role for GEOINT, and the things we have learned to do in more recent campaigns, to be applied more profitably in support of those operations. And I am a fan of the way nations may choose in the future to apply that sort of capability in support of the UN.'

Barrons also referred to unrest across the Middle East. Although it was predicted by the West, the way it has played out was not necessarily as planned, and will be a learning curve for UK and allied personnel.

'The fundamental difference for the UK and many of our partners and allies is in that mix of instabilities in the Gulf, there are risks to national interests and security in a way that you could not have asserted in some of the campaigns of the last 20 and 10 years.

'The stakes are much higher and it looks to be more complicated and enduring. It isn't just that the world is changing, but the character of conflict continues to change. Terrorism has not gone away, but it has changed.'

By Beth Stevenson, London

Airborne Technologies unveils WiFi ISR payload

Airborne Technologies has launched a self-sufficient reconnaissance pod with wireless installation that provides an instant ISR capability for a variety aircraft.

The Self-Contained Aerial Reconnaissance Pod (SCAR-Pod), introduced at the Singapore Airshow in February, was originally designed for the Pilatus PC-9 single-engine turbo-prop training aircraft, but can be integrated onto 'any other platform, fixed or rotary wing', according to Helmut Gaschler, international sales manager for the company. 'The mounting points on the SCAR-Pod can be modified to fit on any other hard points on the aircraft as well,' he told *Digital Battlespace*.

Gaschler said that due to the SCAR-Pod's wireless data connection into the cabin, it is ready for immediate use, which means that installation takes less than 30 minutes. Depending on the size of the gimbal, the pod is available in two versions for 10in and 15in EO/IR cameras.

As it is wireless and fits to points already installed on the aircraft, the platform itself does not need to undergo any modifications in order to receive the SCAR-Pod, and the lug suspensions enable use on every aircraft with NATO hard points, while no external cabling is required.

The plug-and-play system can hold an EO/IR gimbal, downlink, uplink, moving map, augmented reality system and COMINT/SIGINT equipment, while the battery pack offers ten hours of operation and is easily changed.

By Beth Stevenson, London

News bytes

Sniper ATP-SE achieves IOC with USAF
18 March 2014

Boeing signs RAAF Wedgetail support extension
17 March 2014

NGC describes aspirations for E-2D contracts
3 March 2014

Thales announces optronic payload support contract
27 February 2014

Boeing P-8A Poseidon enters full-rate production
26 February 2014

Austria orders Selex ES air defence radar
26 February 2014

Australia secures Poseidon maritime surveillance aircraft deal
24 February 2014

SOFLE to enhance USMC access to global SOF network
21 February 2014

PCAS prepares for live weapons drop
21 February 2014

Airbus expands encryption device offerings
19 February 2014

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Active seekers

Against a background of intensive procurement activity in the sector, **Tom Withington** examines the aircraft and sensors currently deployed or offered for the AEW&C role.

Rarely has the global airborne early warning and control (AEW&C) market been so active, with several nations around the world considering the acquisition of new platforms or upgrading their existing aircraft.

According to Washington, DC-based consultancy Avascent, the market will see a healthy demand for AEW&C in the coming years, with projections estimating growth from $1.2 billion per annum in 2014 to $1.9 billion in 2020.

Sebastian Sobolev, Avascent's managing analyst for international markets, believes that militaries which are modernising from relatively low baselines, like Malaysia and Thailand, are investing in smaller solutions like Saab's Erieye-based platforms. He expects most demand for AEW&C to arise in Asia, with these customers dominating accessible markets (ie excluding China and Russia) and constituting two thirds of spending in the sector by 2020.

'The fastest growth, however, will come from the Middle East. The UAE has an outstanding requirement for an AEW&C platform and we project that Saudi Arabia will have a similar requirement in the future,' Sobolev predicted.

HELICOPTER OPTION

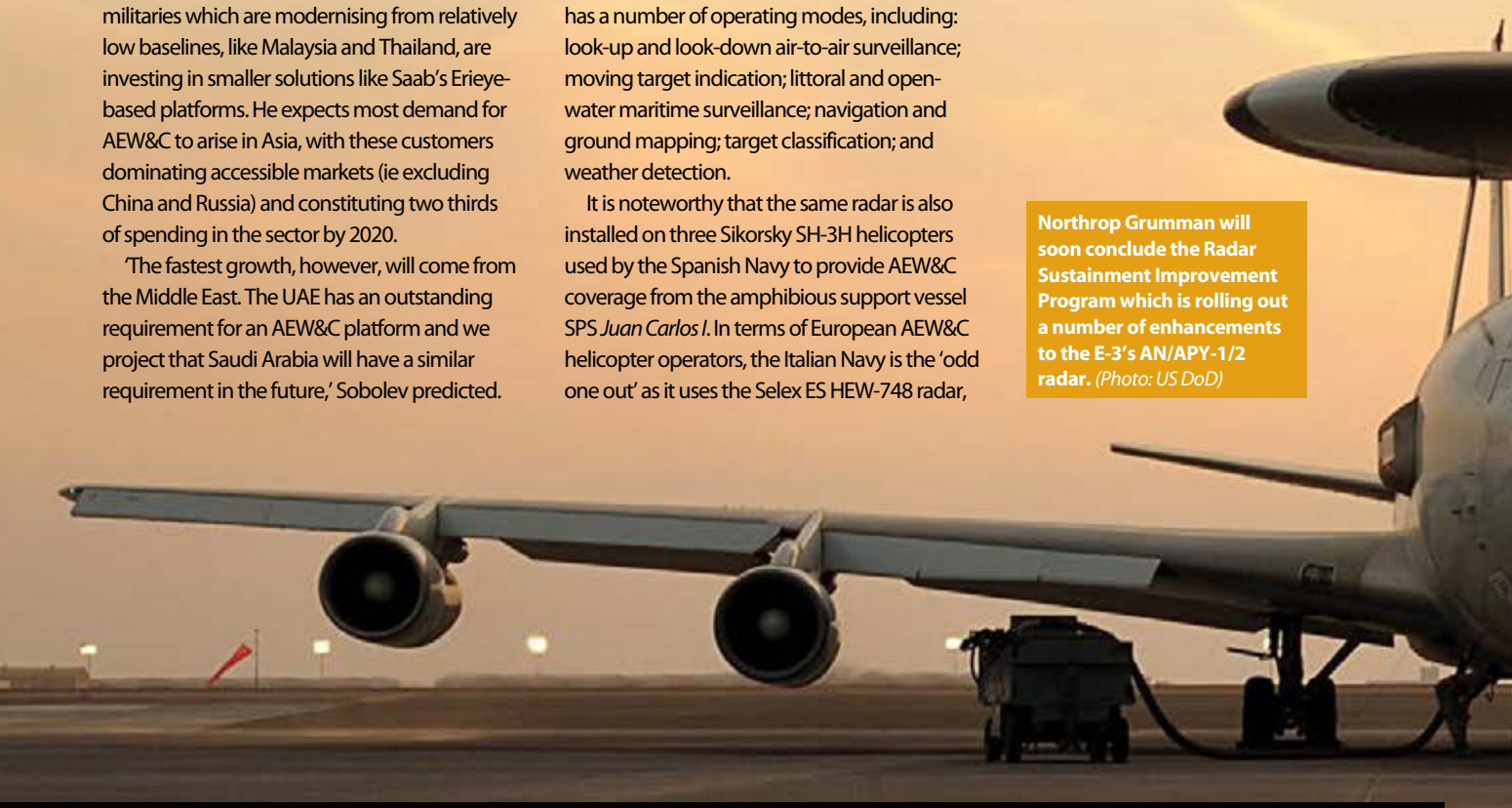
Among the nations seeking AEW&C platforms is the UK, which is looking to deploy a helicopter-based capability on board the RN's future *Queen Elizabeth*-class aircraft carriers. Dubbed 'Project Crowsnest' by the MoD, this procurement will replace the existing Westland Sea King ASaC (Airborne Surveillance and Control) Mk 7 helicopters which serve with Fleet Air Arm (FAA).

The FAA has 12 aircraft in service with 849 Naval Air Squadron at RNAS Culdrose in Cornwall, southwest England. These are equipped with Thales' X-band (8.5-10.68GHz) Searchwater 2000AEW radar. This system has a number of operating modes, including: look-up and look-down air-to-air surveillance; moving target indication; littoral and open-water maritime surveillance; navigation and ground mapping; target classification; and weather detection.

It is noteworthy that the same radar is also installed on three Sikorsky SH-3H helicopters used by the Spanish Navy to provide AEW&C coverage from the amphibious support vessel SPS *Juan Carlos I*. In terms of European AEW&C helicopter operators, the Italian Navy is the 'odd one out' as it uses the Selex ES HEW-748 radar, which provides 360° surveillance on board four AgustaWestland AW101 helicopters.

Project Crowsnest envisages a new AEW&C platform entering service with the FAA by the end of the decade. According to recent media reports, this will be three years after the retirement of the Sea King ASaC Mk 7 in 2016. In essence, the project will procure a new radar/mission equipment ensemble which can be accommodated on board the FAA's Merlin HM2 maritime support helicopters.

Lockheed Martin is the prime contractor under the terms of a £24 million ($40 million) contract awarded by the MoD in 2013 to



Northrop Grumman will soon conclude the Radar Sustainment Improvement Program which is rolling out a number of enhancements to the E-3's AN/APY-1/2 radar. *(Photo: US DoD)*

Despite entering service 50 years ago, the E-2 Hawkeye family is still going strong. *(Photo: USN)*

manage the overall Crowsnest programme. Selection of a supplier to provide the mission system comes down to a choice between Thales UK and a 'firewalled' Lockheed Martin effort.

So far, both companies have been awarded contracts worth £6.5 million to test and demonstrate their potential solutions. The procurement of the new AEW&C capability is expected to cost up to £500 million with a 'main gate' decision committing the MoD to investment in Crowsnest expected to be taken in 2017.

Beyond this UK initiative, several other nations around the globe have requirements for AEW&C aircraft, with Malaysia being one example. No formal announcement has been made regarding the quantity of aircraft the country may acquire, although media reports in March spoke of the possible acquisition of four platforms. The UAE, which already operates Saab's Erieye radar (see below), wants to acquire a new AEW platform although there is no official word on when this acquisition will take place, or how many aircraft it will encompass.

MULTIPLE SOLUTIONS

India, meanwhile, elected to develop its own indigenous AEW&C solution based on an Embraer ERJ 145 regional jet. The country's Defence Research & Development Organisation is currently testing an S-band (2.3-2.5/2.7-3.7GHz) AESA radar with range of 300km, according to DRDO representatives speaking to *Digital Battlespace* at the October 2013 ADEX event in Seoul. The officials added that the organisation currently has three airframes undergoing radar installation, with the first expected to be delivered to the Indian Air Force (IAF) by the end of this year.

Currently, the IAF has several (the exact number is uncertain, but reports suggest between three and six) Beriev A-50I AEW&C aircraft based on the Ilyushin Il-76 strategic airlifter which are equipped with the IAI Elta Systems EL/W-2090 radar.

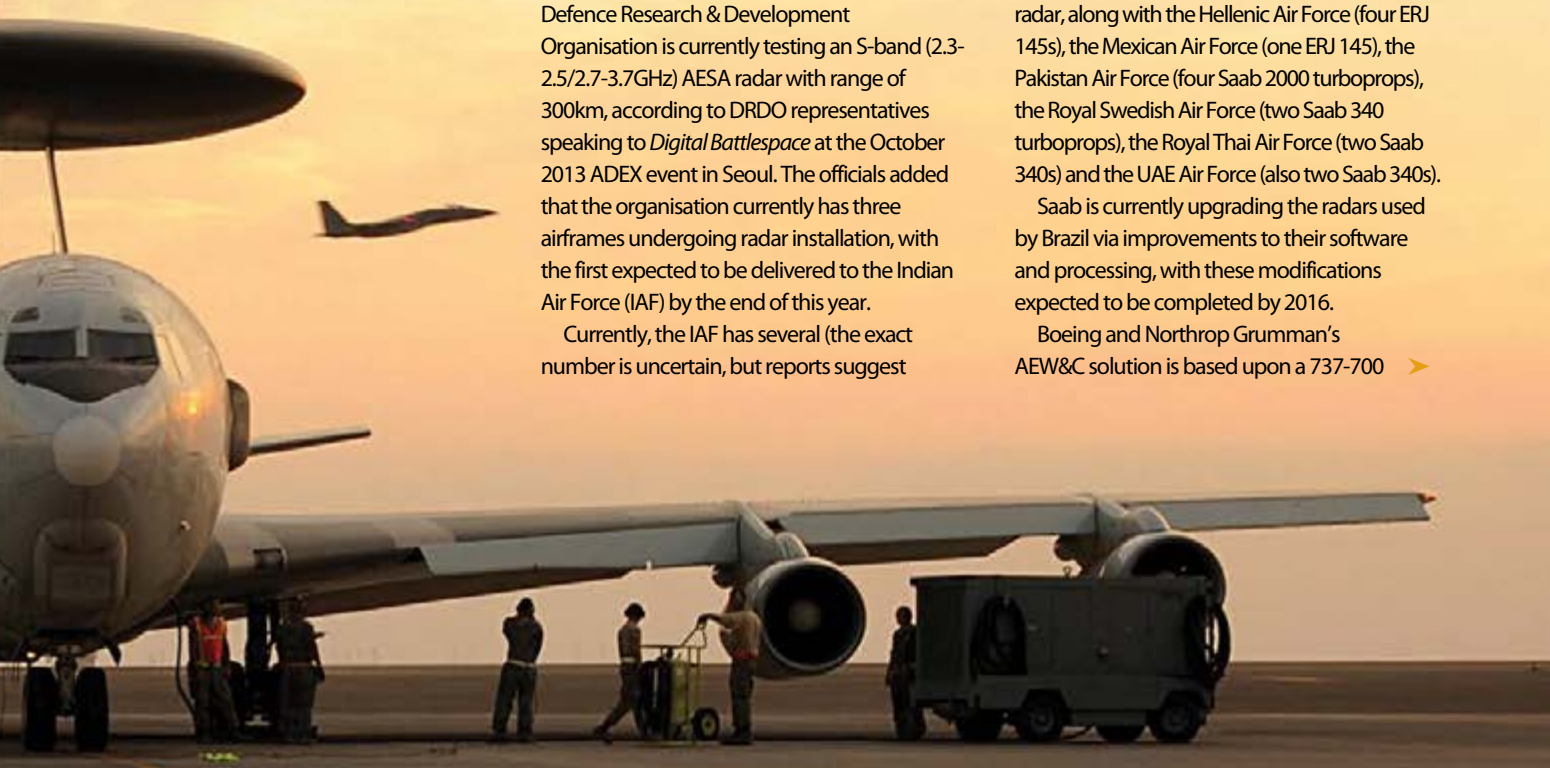
However, beyond the three ERJ 145s that it will induct into service, the IAF has a long-term requirement for up to six long-range AEW&C aircraft, with the DRDO representatives saying that the organisation has been tasked with development of a new radar to equip these platforms, which would be mounted in a circular radome rather than the oblong box housing found on the ERJ 145s.

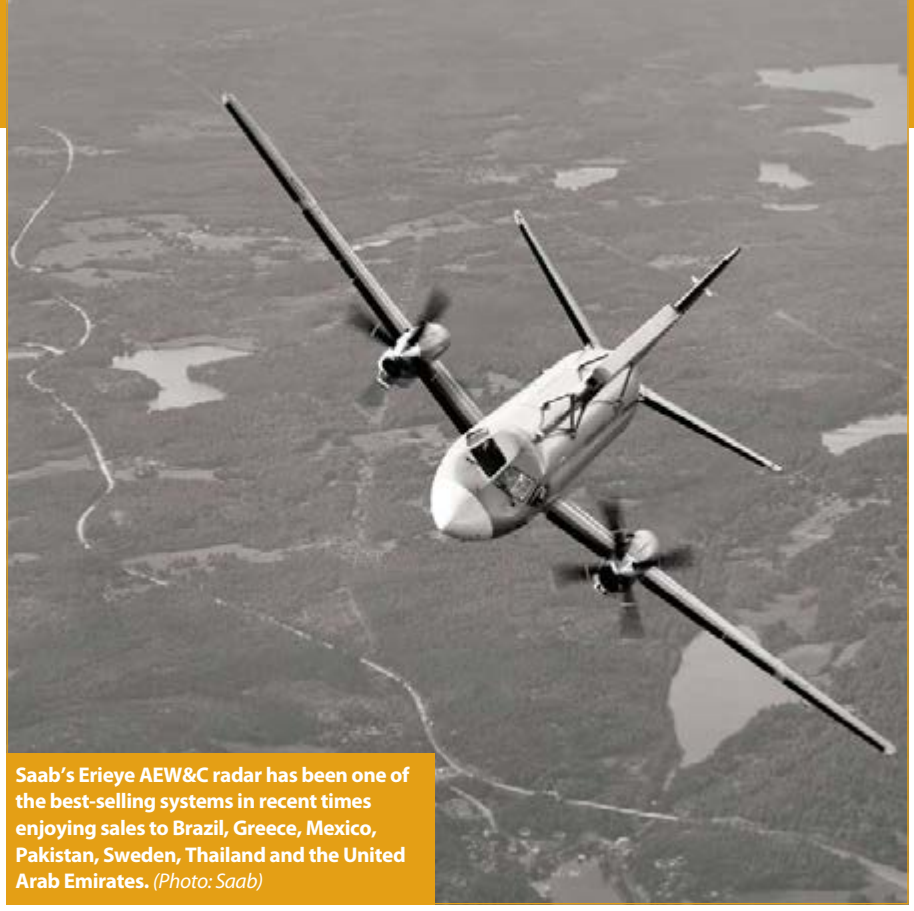
No platform for this new radar has yet been selected, although the DRDO said the turbofan-powered Multirole Transport Aircraft (MTA) currently under co-development by Russia and India could be one candidate, with an in-service date of 2020 expected for the AEW&C system.

Saab's Erieye radar, which debuted with the Royal Swedish Air Force in 1996, has enjoyed healthy sales around the world. The S-band AESA radar is mounted on top of an aircraft's fuselage in a large oblong fairing. Erieye is used by the Brazilian Air Force, which operates five ERJ 145s (locally designated E-99s) outfitted with the radar, along with the Hellenic Air Force (four ERJ 145s), the Mexican Air Force (one ERJ 145), the Pakistan Air Force (four Saab 2000 turboprops), the Royal Swedish Air Force (two Saab 340 turboprops), the Royal Thai Air Force (two Saab 340s) and the UAE Air Force (also two Saab 340s).

Saab is currently upgrading the radars used by Brazil via improvements to their software and processing, with these modifications expected to be completed by 2016.

Boeing and Northrop Grumman's AEW&C solution is based upon a 737-700 ➤





Saab's Erieye AEW&C radar has been one of the best-selling systems in recent times enjoying sales to Brazil, Greece, Mexico, Pakistan, Sweden, Thailand and the United Arab Emirates. *(Photo: Saab)*

airliner airframe with an MESA (Multi-Role Electronically Scanned Array) radar mounted atop the aircraft's fuselage in a fairing. MESA is an L-band (1.215-1.4GHz) system which provides air-to-air and air-to-surface surveillance of up to 880,595 sq km, according to company literature.

The radar uses AESA technology, with the antenna containing 288 T/R modules across two side arrays and the long 'top-hat' array mounted above the fairing to provide 360° coverage. Among the attractions of using L-band, according to Northrop Grumman, are that such transmissions have good performance in the rain compared to AEW radars using higher-band frequencies, and the ability to detect small targets at long ranges.

Orders for the 737 AEW&C platform have been forthcoming from the Royal Australian Air Force (six aircraft), the Republic of Korea Air Force (four aircraft) and the Turkish Air Force (TAF) (also four aircraft). This February, it was reported that the TAF had accepted the first of its example at Konya airbase in southern central Turkey. A further two aircraft are expected to be delivered to the TAF during 2014, with the final example being delivered in 2015.

CONFORMAL APPROACH

IAI Elta Systems has experienced success with its EL/W-2085 Conformal Airborne Early Warning (CAEW) radar mounted on board a Gulfstream G550 business jet. Italy is one country which has ordered the system, with the first of two aircraft expected to be delivered by the end of 2015. Israel and Singapore also operate two and four CAEW G550s respectively.

The EL/W-2085 uses conformal longitudinal fuselage and nose- and tail-mounted arrays to provide 360° coverage. The fuselage antennas transmit in the L-band with the nose and tail transmitting in the S-band. As illustrated by Boeing and Northrop Grumman's utilisation of the 737-700 airframe, and Saab's use of the ERJ 145, Saab 340 and Saab 2000, AEW&C packages are increasingly being installed on smaller airframes than the Boeing 707s and Il-76s used with legacy systems.

IAI Elta sources told *DB* that they expect the preference for using business jet airframes for applications such as AEW&C to continue in the future: 'These aircraft offer superior range, altitude and speed compared to conventional airliners, they also offer an enhanced level of comfort, which the rich and famous can attest to. This is not a luxury, but a necessity for airborne early warning crews on long missions.'

The sources argued that the EL/W-2085 has been a revolutionary system as it was the first AEW&C package to be deployed on a business jet. IAI Elta was able to achieve this by scaling down the architecture of the company's legacy AEW&C products such as the EL/W-2075 L-band Phalcon radar which was designed for large aircraft like the 707. 'We reduced everything by a factor of two in order to fit all of the radar's electronics into a business jet-sized platform,' the sources added.

In addition to offering CAEW, IAI Elta is furnishing Airbus Military with an AEW&C radar mounted in a mushroom-shaped fuselage-mounted radome for the latter company's C-295 AEW&C programme, which commenced flight testing in 2011.

INSTALLING UPGRADES

Japan is one of several countries which is upgrading its AEW&C fleet. The Japan Air Self Defence Force (JASDF) operates four Boeing 767-200 aircraft (locally designated E-767) outfitted with Northrop Grumman's AN/APY-2. This is an S-band radar with a published detection range of in excess of 400km and, like several of the radars surveyed in this article, is capable of tracking both air and sea targets.

SUBSYSTEM REQUEST

The US Defense Security Cooperation Agency announced in September 2013 that Japan has requested subsystems for the Boeing-led Mission Computing Upgrade for the aircraft, which will see the installation of four new ESM suites (presumably one per aircraft), eight Telephonics AN/UPX-40 IFF interrogators, eight Raytheon AN/APX-119 IFF transponders (presumably two per aircraft) and four KIV-77 cryptographic computers (presumably one per aircraft) produced by the same company.

The E-767's AN/APY-2 radar is also used on board the six Boeing E-3D Airborne Warning and Control System (AWACS) aircraft operated by the RAF, the four E-3Fs of the French Air Force and the 31 E-3C Sentry platforms flown by the USAF. Alongside the Northrop Grumman AN/APY-1 radars on board the E-3A/B aircraft used by NATO (17 aircraft) and the Royal Saudi Air Force (six aircraft), the AN/APY-2 has been cycled through the USAF/NATO Radar Sustainment Improvement Program (RSIP).

RSIP enhances the radar's resistance to ECM, changing its software language, improving its processing and adding COTS components to the computing architecture. Northrop Grumman has acted as the prime contractor for RSIP, ➤

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which has rolled out these improvements across the global combined AN/APY-1/2 inventory.

The programme is expected to conclude by the end of this year with the completion of the last upgrade for Saudi Arabia. The AN/APY-1/2 family is expected to remain in service until circa 2035. The key difference between the AN/APY-1 and AN/APY-2 is the latter's full maritime search capability.

SHIPBOARD SURVEILLANCE

Northrop Grumman is currently building the latest version of its E-2 series of AEW&C aircraft; the E-2D Advanced Hawkeye, for the USN. To date it has delivered 20 aircraft, and the service is expected to procure a further 55, following approval for full-rate production in February 2013. All the aircraft are expected to be in service by 2023.

At the heart of the E-2D is Lockheed Martin's AN/APY-9 UHF AESA radar, which has a range in excess of 550km. The AN/APY-9 will supersede the Lockheed Martin AN/APS-139 and AN/APS-145 radars used on board legacy E-2C Hawkeye and Hawkeye 2000 aircraft and offers a step-change in terms of capability.

The AN/APS-145 remains in service on the Hawkeye 2000 aircraft flown by the USN, six E-2Ts (similar in configuration to the E-2C) flown by the Republic of China Air Force, the JASDF's 13 E-2Cs and three flown by the French Navy. It is unclear whether the seven E-2C Hawkeyes flown by the Egyptian Air Force are still fitted with the legacy AN/APS-138 radar, which has a range of some 460km and the capability to detect small targets at a range of 280km, or the AN/APS-145.

OTHER PLAYERS

Few precise details exist regarding China's AEW&C endeavours. It is known that the country operates an indigenously developed AESA-based S-band radar on board some five Il-76 aircraft (locally designated KJ-2000) which the People's Liberation Army Air Force (PLAAF) is thought to use for AEW. Similarly, Beijing is known to have exported AEW&C technology to the Pakistan Air Force in the form of the Shaanxi Y-8 turboprop airlifter outfitted with a radome (ZDK-03). Similarly, the PLAAF may also use the same platform (locally designated KJ-200) for AEW, albeit equipped with the so-called 'Y-8 Balance Beam' system which has a strong resemblance to the MESA and Erieye installations.

Russia on the other hand continues to use around 13 Beriev A-50M aircraft which are thought to be equipped with the Vega Shmel-2 S-band radar. Publicly available data suggests that this radar can track up to 150 targets simultaneously and that it has a range of 230km for airborne targets and up to 400km for large surface targets.

Vega also provides the E-801M X-band radar used on the Kamov Ka-31 AEW helicopter. This can track up to 20 targets simultaneously, and has a detection range of up to 150km for airborne targets and up to 250km for large surface targets. Along with the Russian Navy, which is thought to operate two Ka-31s, the helicopter is used by the Indian Navy, which has nine aircraft and is planning acquisition of a further five, and the People's Liberation Army Navy which has two and is planning procurement of a further seven.

Nevertheless, both the E-801M and Shmel-2 are now legacy systems, leading to speculation that Russia, China and India may plan to replace these capabilities in future. At present there are no indications from any of these countries as to when this might occur, or how many airframes would be procured.

MARKET FORCES

With many nations procuring multirole combat aircraft, acquisition of an AEW&C capability is a logical step to ensure that these assets can be commanded and controlled during future operations using a platform which is capable of seeing the air battle in real time.

For other militaries, acquisitions are being driven by fleet recapitalisation. Several countries, particularly those operating the Boeing E-3 AWACS family, acquired their platforms during the Cold War and, despite these aircraft still being highly capable thanks to radar upgrades, they will require replacement over the next decade. DB

IAI Elta Systems has enjoyed success with its EL/W-2085 radar mounted on a Gulfstream G550 business jet platform. *(Photo: author)*

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Jose Yacopi
(1916 – 2006)

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Fine tuning

With the operational tempo increasing across Asia-Pacific, both indigenous and international companies are looking to satisfy emerging requirements. **Matthew Smith** looks at how the tactical communications market is shaping up in the region.

Tactical communications are a critical element of military capability, with some estimates suggesting that the global market could reach $4.5 billion within the next decade. Across Asia, the need to modernise capabilities to meet conventional and emerging threats is driving future soldier programmes, and these are likely to account for a significant proportion of this spend. US consultancy Strategy Analytics estimated in 2013 that Asia and Latin America would account for nearly half the global demand by 2022.

India represents the largest opportunity, but there are programmes across the region. Malaysia, for example, is currently looking to develop its Soldier Advanced Kombat Technology Integrated (SAKTI) effort; Singapore continues to iterate its Singapore Technologies-led Advanced Combat Man System; and Japan (Advanced Combat Infantry Equipment System) and South Korea also have programmes. US manufacturer Harris has successfully sold its Falcon III radio to a number of undisclosed Asian countries, meeting other iterative requirements.

INDUSTRY DEMAND

The size of the potential market means it is a magnet for suppliers of tactical communications equipment, offering a plethora of solutions.

Germany's Rohde & Schwarz told *Digital Battlespace* that it sees Asia as a 'highly interesting market', and is looking towards the DSA exhibition in Kuala Lumpur as a launchpad for its software-defined tactical radio in the region. Israel's Elbit Systems also sees Southeast Asia as 'one of its main growth engines', offering soldier radio systems such as the PNR-1000S – Soldier as well as its SATCOM On-the-Move (SOTM) system.

Anglo-Italian Selex ES identifies the expansion of soldier modernisation programmes as a principal driver of growth. Although unable to go into details of where the company is currently seeking sales, marketing manager for defence communications Mike Yeulett noted the importance of the Asian market.

'There are an awful lot of future soldier programmes going on around the world and we are involved in these in varying degrees. For some, we are just selling the radios to be integrated by others; in others we are doing the bulk of it, if not all of it. It varies from country to country and user to user.

'One of our key products is the Personal Role Radio [PRR]. To date, we have sold over 600,000 to 36 countries worldwide. We've been marketing it for six years and the Asian market is, of course, one we have penetrated and put a lot of effort into. We've picked up some major sales with major countries in the region – some are into the large future soldier programmes, but we have also sold considerable numbers of the SSR+ [Soldier System Radio Plus].'

The SpearNet soldier radio has been integrated with SOTM capability specifically for the Southeast Asia market. *(Photo: Exelis)*

INTEGRATION OPPORTUNITIES

For Exelis, integration of its SpearNet soldier radio and Global Network On the Move – Active Distribution (GNOMAD) wideband SATCOM is providing a substantial opportunity.

'We see a marriage for SOTM and soldier radio extension being a good value proposition for all countries in the region. India, Japan, South Korea, the Philippines, Indonesia, Malaysia – they all have a terrain problem that SATCOM solves very well and they all have a need to equip their soldiers with communications, situational awareness and that reachback capability,' said business development manager Rob Semple.

'There are a number of countries in the region that we are talking to about our GNOMAD solution,' agreed Marina Filla, offering strategist at the company. 'It provides capability to rapidly deploy military forces to meet a variety of mission sets – combat, disaster relief, stability operations and humanitarian operations.

'For the countries in Asia-Pacific, disaster relief is critical. Because of the geography and the fact that there are disparate islands, the ability to get SATCOM is critical and very much needed in the region.'

Thales also sees major opportunities for its tactical communications portfolio, a company spokesperson told *DB*.

'Soldier digitisation is progressing in many countries, with a need for soldier radios at both section and platoon levels. PR4G FASTNET is

Southeast Asian militaries, including the Japan Self-Defense Force, routinely contend with terrain issues in order to complete tactical communications. *(Photo: Japan Self-Defense Force)*

already in operation in about ten countries in the area. Other radios currently in service are FLEXNET [a high data rate SDR for C4I], HF 3000 Skyfast [for long-distance communications] and our new soldier radio, Starmille. The Thales MBITR multiband radio is also present in its export version.'

BIG SPENDER

However, the mother lode in Asia is India, which is currently running major communications programmes, with total spend expected to run into billions of dollars.

Semple noted: 'India is the key international market for soldier radio communications right now.'

There are three large projects in India: the Tactical Communications System (TCS), estimated to be worth $1-2 billion; the Battlefield Management System (BMS) worth around $6 billion; and Future Infantry Soldier as a System (F-INSAS).

For TCS, Exelis is supporting Tata Power to offer a field wireless system, with soldier radios extending the value of a backbone radio network. This has now been downselected, according to Semple.

BMS is at an earlier stage and around 14 different primes are thought to be interested, with Exelis working with several to bring its radio technology into the equation. The next milestone is in March 2014, after which there will be an evaluation period by the Indian MoD followed by a competitive downselection some time later.

'[F-INSAS] is more of a special forces programme associated with and working with the BMS, but which has a few more capabilities for reconnaissance teams, surveillance teams and special missions,' noted Semple.

Although that programme has taken a back seat in recent years, Exelis expects it to become more active in 2014 or early 2015.

GOING TO MARKET

Although these soldier modernisation programmes vary in terms of their budget and ambition, one constant is the need to provide a flexible, interoperable and low-cost solution.

'Cost is a major consideration,' stated Yeulett. 'You will find that, particularly in Asian markets, future soldier systems can vary considerably in terms of what the customer is trying to do. What we are finding, particularly with Asia, is that countries are doing it piecemeal. For some, the first stage in soldier modernisation is just giving the guys a radio and then growing that as they go along. There are several countries which have instigated small procurements, where they are building slowly and seeing where they will go with it.'

When asked why he thought the PRR had been a success in the region, the answer was clear: 'The main thing people like about the product is it's very simple to use. You can teach the average guy everything he needs to know about the radio in less than one hour, and of course, because of the production volume, it's cheap. If you are going to supply a PRR that's going to be given to, and kept by, an individual it has to be cheap.'

Selex is looking to leverage the existing PRR and SSR+ customer base for its latest product, the Frontline Soldier Radio (FSR), drawing on ➤

Current operations in topographically challenging areas such as Afghanistan have stressed the difficulty in achieving workable tactical communications. *(Photo: USMC)*

its ability to speak to the older radio systems. This is a major advantage, said Yeulett, because the ability to interface with legacy equipment is a major driver for cost-conscious users.

'With the FSR, we can directly interface with legacy equipment, all the radios these guys are familiar with, and they've got all the infrastructure set up – that's what they want to hear.'

COST CONCERNS

Exelis chief engineer Eric Whitehill noted: 'One of the good things about our system is that it's modular and scalable, plus we use COTS products – we just change the form factor to make it smaller. It's the same capability in a smaller package that requires less power, which lowers costs.'

He added that using COTS products helps remove R&D costs and makes it easy to keep up with technological changes, an important element in a rapidly evolving area like communications. 'Asia-Pacific customers are no different from the US customer in that they don't want to pay any development cost. So they are definitely looking for that off-the-shelf solution.'

Furthermore, because a lot of humanitarian and disaster-relief work in the region is undertaken under the aegis of multinational operations, there is a requirement for communications systems to integrate with allied forces, particularly the US as it rebalances towards Asia.

'A number of the countries we are talking to have a requirement to interoperate with coalition forces and the US military using SATCOM – our system provides them with that ability,' added Filla.

'Special forces are always a good way to get into the mainstream military,' Yeulett noted, describing how they often have their own budget. 'Some of the initial orders may only be fifties or hundreds, but if you leave that for a few years, [you can] sell tens of thousands – going for the big sale right away isn't always the right approach for this type of product.'

LOCAL PARTICIPATION

Winning business in Asia is increasingly dependent on providing the right kind of industrial participation, and there is growing pressure from local competition – Korea's LIG Nex1, for example, has a range of locally manufactured products, such as the PRC-96K VHF/FM handheld radio, PRC-999K FM radio and tactical SDR. The company also has strategic partnerships with US firm Rockwell Collins.

Indonesia has recently consolidated its defence electronics sector by merging state-owned PT Inti and PT Len into a single entity. In Malaysia, local firm STE develops VHF handheld radios, and has partnered with Samsung Thales to address the SAKTI soldier modernisation programme.

In order to address these competitive pressures, Western suppliers acknowledge the need to work with local industry.

Thales told *DB* that its partnerships in the region are a result of its policy of maintaining long-term customer relationships. 'It is important to set up the means to support, integrate and even develop new electronic equipment locally,' the spokesperson said. 'Thales has established JVs with local partners for radio design and production centres in Malaysia and South Korea. Malaysia, for instance, is one of Thales's competence centres for soldier radios, with the capability to develop and integrate new functionalities in the radio system.'

WINNING BIDS

Exelis is also unequivocal about the need for local participation. 'It's very important – local militaries and government entities are very keen to involve local companies,' said Filla. 'What we will do with many different countries is to get them involved in aftermarket support, for example training, installation and logistics, so we are bringing those local companies into the supply chain. They're not really our competitors but our partners.

'We like to use local companies for that because… it makes sense from the perspective that they are right there. For example, with logistics and training, instead of sending folks from the US, local contractors would be right there whenever needed. So it works for everyone.'

Thales' MBITR radio has been a faithful servant to US and NATO forces for many years now. *(Photo: US DoD)*

Industrialisation is also important with soldier radio systems, again with a focus on the aftermarket, with the exception of India where co-development is a firm requirement due to its extensive indigenisation policy.

Selex ES is aware of the need to involve local industry in the delivery of programmes. 'What you will also find is that some countries will have local industry they want to use as well,' Yeulett said. 'We have a very flexible approach to how we work – we don't turn up and expect to sell a whole system, because life's not like that.

'You've got to be adaptable as to what you are looking to sell and work with local companies. But where there is an indigenous company, for example in Korea, we are also beginning to see competition.'

For its part, Rohde & Schwarz has development centres in China, Singapore and South Korea, as well as production facilities in Malaysia and Singapore. The company said this allows it to ensure that production is close to the R&D activities at its Asian HQ.

As militaries across the region modernise their forces, it is clear they are going to have a broad range of capabilities to choose from, and companies wishing to provide them are going to have to compete harder than ever for those contracts. DB

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CLARION EVENTS

Militaries are increasingly turning to voice and data SATCOM to keep forward-deployed mobile units in the loop. **Beth Stevenson** talks to industry experts about the practicalities – and limitations – of the technology.

Moving targets

Space-based communications technology is used by the military and commercial sectors worldwide, providing a robust backbone for connectivity unaffected by most of the environmental factors associated with line-of-sight (LOS) communications.

Most satellites are in theory permanent infrastructure that remain 'in place' and can be tapped into should personnel require instant communications in any geographical arena.

The ability to access SATCOM on the move (SOTM) – usually to provide communications to a moving vehicle in-theatre – has been a necessity in Iraq and Afghanistan where terrestrial infrastructure to provide the bandwidth required to transmit voice and data is rarely present.

SATCOM on the move provides a critical capability for tactical vehicles on operations. *(Photo: USAF)*

CAMPAIGN STRATEGY

'As troops withdraw from places such as Afghanistan, there is a growing demand for C4ISR capability, which in turn entails a growing demand for SOTM,' Rick Greenwood, CTO of government communications at Airbus Defence and Space, told *Digital Battlespace*.

'Operations are also moving towards smaller campaigns in new territories such as naval anti-piracy off the coasts of Africa and in Asia-Pacific. The ability of military users to have a consolidated view of the operational picture in real time, during these types of operations, is growing in importance.'

However SOTM has its drawbacks. The speed at which vehicles travel can cause some SATCOM terminals to lose connectivity, and of course the nature of their orbits means satellites can physically move out of range.

'From a user perspective, there are differing philosophies of SOTM usage – some nations aim to maintain full communications capability on the move, while others are more pragmatic and aim to sustain voice and low-rate data/messaging,' Greenwood continued. ➤

'It is recommended that users be flexible and realistic in their expectations. After all, maintaining communications while traversing very rugged terrain or the high seas is not always possible 100% of the time.'

This sentiment was reflected by Michael Guzelian, VP of SATCOM and broadband products at General Dynamics C4 Systems, who said that vibration effects on systems have more negative consequences than the speed of the vehicle per se: 'For SATCOM on the move, the vehicle's speed is relatively unimportant when compared to the shock and vibration that takes place when the vehicle is moving, particularly on rugged terrain.

'In fact, faster speeds usually reduce shock and vibration effects, so increased velocity makes SATCOM on the move operation easier.'

WITHIN LIMITS

SWaP limitations are a problem as forces try to load as much equipment as they can onto vehicles, so SOTM terminals have to fit within these limits so as not to be a hindrance to the mission.

'Size, weight and power are limited on tactical vehicles,' an Institute of Electrical and Electronics Engineers paper, 'Army SATCOM on the move: technology initiatives' explains. 'There are many tactical vehicles in the army inventory, used differently by different units, representing diverse integration issues and challenges.'

The report adds that the data rates needed have to be supported within SWaP restrictions, which drives better antenna and RF performance.

'Ground communications are required in high-velocity, high-acceleration, high-blockage, cross-country environments, driving rigorous pointing requirements,' the paper continues. 'Systems need to be designed to work with current and planned military satellites in their respective frequency bands, which typically drives state of the art.'

'Size and weight are two of the largest concerns for SATCOM-on-the-move terminal users,' Guzelian continued. 'Power is not as big an issue, because total RF power is not the limiting factor with antennas this small.

The US DoD's WGS programme has launched six platforms to date, with a further ten on order. *(Photo: USAF)*

'The amount of RF power transmitted in a particular bandwidth becomes the real limit, because too much power in too little bandwidth causes interference to adjacent satellites. Using more bandwidth for the same data rate reduces interference, but takes more of the satellite transponder resource, costing more every transmission.'

Because the world relies on satellites to provide the backbone of communications, a broad range of commercial technology is available to the military user. Nevertheless, the particular bandwidth demands of armed forces – especially those setting up ad-hoc networks in-theatre – is huge, and secure transmission is vital.

The TacSat Razor has been delivered to an undisclosed special operations unit, according to manufacturer Selex. *(Photo: Selex)*

Interference from other systems is an issue, although the part of the spectrum that MILSATCOM operations take place over – usually the X-band – is limited, and this means that interference levels are easier to manage.

CURRENT REQUIREMENT

One current requirement for SOTM is from the Canadian Forces. In November 2013 an RfP was released by the Department of National Defence as it sought bids for mobile SATCOM terminals for a range of vehicles as part of the Land Command Support System Life Extension (LCSS LE) programme.

SOTM will improve the C2 and ISR capability of land vehicles while moving, and allow them to communicate with their tactical HQ or command posts via satellite and maintain communications when mobile.

It is believed that 110 mobile SATCOM terminals will be required, plus five transportable SATCOM terminals and associated logistics support, with options to procure up to 106 additional mobile terminals and three transportable terminals.

Under LCSS LE, DRS Technologies Canada received a C$38.7 million ($US34.9 million) contract in October 2012 to produce 13,624 Communications Selector Boxes and 4,937 Power Distribution Units – Small Form Factor. Components will be integrated into tactical vehicles such as the Light Armoured Vehicle III, now being upgraded by General Dynamics Land Systems – Canada and the new Tactical Armoured Patrol Vehicle being produced by Textron Marine & Land Systems.

NET GAINS

One significant SATCOM constellation is the UK MoD's Skynet 5, which is operated by Airbus Defence and Space (formerly Astrium) under a programme that started in 2003 and is worth some £4 billion.

The 5D satellite was launched at the end of 2012, since which the constellation and supporting ground systems have provided all BLOS communications to the UK MoD. Australia, Canada, the US and other NATO members have also benefited from Skynet 5, and it is expected the service will continue until 2022. ➤

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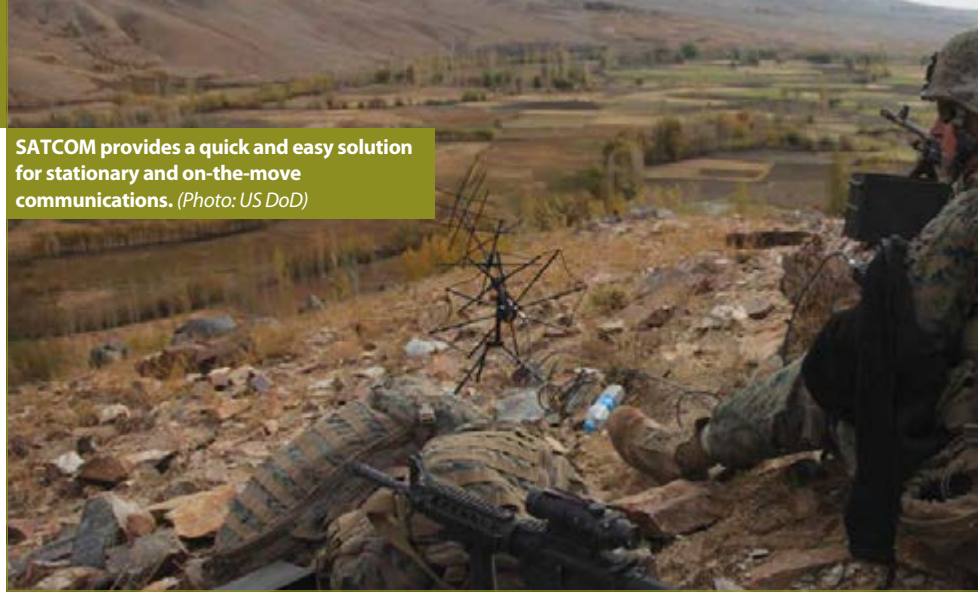


SATCOM provides a quick and easy solution for stationary and on-the-move communications. *(Photo: US DoD)*

'Skynet 5's footprints are designed to support military and government users for operations across the globe, especially in remote areas with little or no infrastructure and in mid-ocean, distanced from land and shipping lanes – making it ideal for naval and airborne platforms,' Greenwood explained. 'The benefits of having the world's most powerful MILSATCOM constellation owned by a commercial organisation is that it is available for use by allied nations and readily adaptable to urgent requirements.'

He admitted that there are challenges associated with SOTM in-theatre, including having to ensure that the antenna is pointed towards the satellite, and the Doppler effect produced by motion.

The terrain on which the terminal has to operate can affect performance, because it creates blockages and in turn communications outages, Greenwood explained.

'Platform size will often constrain the size of the antenna dish fitted to the platform, which will in turn determine the RF beam width – a smaller dish equals wider beam-width,' he continued. 'Although a wide RF antenna beam makes pointing and tracking less onerous, it means lower antenna gain. As the beam becomes wider, communications become susceptible to multipath interference, terrestrial interference local to the terminal and increased ground noise in the terminal receiver.'

ON TRACK

In light of these constraints, Airbus has developed satellite antenna systems that use different techniques to ensure that they remain on track, as well as advanced terminal modems that provide electronic signal tracking and waveform techniques to compensate for the Doppler effect and manage interference.

'Blockage of the satellite path by the platform itself as it moves and turns can be compensated for by either mounting the terminal as high as possible or, on platforms such as ships, by mounting two terminals and managing communications handover between them as the platform moves,' Greenwood continued. 'Where this is not possible, comms outages will occur and the user applications running across the SATCOM link need to be robust to manage these.

'The benefit of Skynet 5 is that Airbus Defence and Space's X-band is resilient to interference due to coordinated operations between all satellites. Minimum slot separation enforcement and "shapeable" beams on Skynet minimise interference further.'

WIDE ANGLE

The US DoD, meanwhile, has pledged to future-proof the communications network for its forces through the USAF-led Wideband Global SATCOM (WGS) effort contracted to Boeing.

Ten WGS satellites are currently on order, with six having been launched so far. The last is due to be completed by 2017, although a launch date has yet to be decided on by the USAF, Boeing told *DB*.

'All WGS satellites currently on order are expected to launch,' Mark Spiwak, the company's WGS programme director, explained. 'WGS 1-7 each provide 4.9GHz of available X- and Ka-band bandwidth to users. With the addition of an enhanced wideband digital channeliser beginning on WGS 8, each satellite will provide 9.5GHz of available bandwidth.'

One segment of WGS is an on-the-move element. 'With each satellite that is fielded in the WGS constellation, there is increased diversity and acquisition capability to support SOTM users,' Spiwak explained.

'WGS is the only satellite system that incorporates a digital channeliser and advanced X-band phased-array antennas to provide shapeable and steerable spot beams, high-capacity X- and Ka-band cross-banding, and geolocation capability.'

He said that Boeing is also participating in studies to apply new waveforms to provide an increased protected tactical communications capability over SATCOM systems, and improve SOTM performance over WGS.

'The WGS system addresses a critical need for MILSATCOM by increasing capacity and enhancing global coverage, supporting US and allied warfighters with communications bandwidth when they need it, regardless of location,' Spiwak continued.

Aside from the US, WGS is also available to Australia, Canada, Denmark, Luxembourg, the Netherlands and New Zealand, providing wideband communications that interconnect users who are geographically dispersed or use different frequency bands.

'US and allied partners participating in WGS are able to minimise investment costs by leveraging the existing worldwide infrastructure of compatible wideband ground and user terminals,' Spiwak noted. 'The international programme has allowed member nations to invest into the entire system in proportion to their specific level of MILSATCOM needs.'

This arrangement offers immediate access through an existing worldwide infrastructure, including multiple gateways, terrestrial networking and mission planning capabilities, Spiwak said, and international partners are able to leverage the user terminals and telecom equipment they already have.

MAN-TENNA

Selex launched a manpack variant of its SOTM antenna in February – the TacSat Razor – which is a phased-array system operating in the UHF band, and an SDR radio hosts the waveform for SATCOM operations. A NATO special operations force is understood to be the launch customer.

'Razor is a very smart antenna connected to the manpack,' Maurizio Viberti, marketing representative for defence communications

systems, Italy, at Selex, told *DB*. 'Every day [SOTM] is becoming more important. The key part of SATCOM on the move is a terminal used on vehicles that is capable of keeping the link with the satellite.'

TacSat Razor weighs 1kg with a maximum power output of 20W, and although it is slated as a manpack system, it can be also be mounted on a tripod or attached to a vehicle using a magnetic mount.

The manpack variant derives from the TSO-102/DX X-band vehicle version which has now been deployed with the Italian Army following deliveries last year, and is connected to the Thales Alenia Space Sicral satellite.

The vehicle-based system can operate at speeds of some 70km/h, which Viberti said is 'reasonable' for the operations it is required to carry out. 'I think that SATCOM on the move for vehicles and soldiers will continue to be used in larger numbers,' he continued.

Future developments include extending the SOTM range into the Ku- and Ka-bands, which Viberti said will allow terminals to be connected to commercial satellites, which is important because X-band is not widely used outside the military.

The company also offers airborne and naval variants of the SOTM system that operate in UHF, but Viberti affirmed that the vehicle-based system remains very popular and is considered the most sophisticated of the offerings.

The UK's Skynet 5 constellation also supplies users from Australia, Canada and the US. *(Photo: UK MoD)*

DIVERSE ENVIRONMENTS

General Dynamics C4 Systems provides SOTM terminals for both tracked and wheeled vehicles for a variety of military and government bodies, including NATO.

'These terminals deliver extremely accurate antenna pointing and tracking, so personnel communicating over SATCOM networks stay connected in diverse and often isolated environments,' Guzelian explained.

The company recently introduced a line of terminals which makes extensive use of carbon-fibre and composite materials rather than aluminium, he noted. 'The… materials in the antenna deliver the same rugged SATCOM terminal performance at a fraction of the weight of earlier SATCOM terminal models made of aluminium.'

He said that providing consistent, continuous connectivity between terminals and satellites is accomplished by a 'sophisticated antenna control unit/servo system'. This combines vehicle attitude information from a high-accuracy inertial reference, vehicle location information derived from a satellite navigation system, and antenna-pointing dynamics using sensors mounted on the satellite antenna.

Once the configuration is complete and the terminal is initially configured to operate on a particular satellite, the SATCOM antenna points to where the satellite look angle is calculated and the pointing direction is refined using a high-speed satellite tracking receiver, Guzelian explained.

'The end result is the ability to provide a true SATCOM-on-the-move antenna system that tracks the true satellite position to accuracies of better than +/-0.2°, and is on the air, transmitting, within a second or two of being commanded.'

He added that the company is concentrating on the 'high-performance' aspects of the terminals: 'These antennas, with their very accurate pointing and tracking ability, provide unmatched signal efficiency.

'This capability meets and often exceeds our customers' demand for high data rate links of 3-20Mbps, for example, while connected to satellite communications networks while on the move.'

ALL OVER THE PLACE

He said that SOTM terminals work 'effectively and efficiently in all environments', from extreme terrain in off-road conditions to paved urban environments surrounded by tall buildings, glass and concrete.

'Wherever there is a clear line of sight to the satellite you are connected with the SATCOM network,' he noted. 'In urban areas, SATCOM signals can be blocked due to RF attenuation caused by buildings and other structures. Optimal transmission signal structure and signal routing techniques can mitigate the connectivity challenge.'

The company's terminals connect with most military and civil satellites in use worldwide, Guzelian continued, and the SOTM products are currently operating in more than ten countries using both commercial and military satellites.

It seems that access to satellite bandwidth will continue to be required in future theatres as systems rely more on connectivity across different platforms, and all militaries look to this type of interoperability.

The geographical scope which operations will reach is also set to continue, and therefore more precedence will be laid on BLOS communications in order to effectively carry out missions. SOTM is an integral part of this, and industry and government are ensuring it be robust enough to carry this burden going forward, and are looking to overcome the challenges that the technology by definition faces. DB

Visual impact

Soldier modernisation efforts have seen a number of PCs, tablets and remote viewing devices developed over the years, often originating from COTS products. **Andrew White** canvasses the visual devices market.

As recent US Army evaluation exercises such as *Enterprise Challenge* at Fort Huachuca, Arizona, in July have highlighted, the use of COTS equipment continues to increase in popularity in the military market. Historically, such devices – be they smartphones, heads-up displays, tablets or laptops – have been unable to match the physical and environmental conditions experienced on exercise and operations.

However, the tide appears to have turned, with industry now routinely developing the same products for the commercial market, while meeting stringent MIL-STD specifications for robustness.

BRANCHING OUT

Traditionally, remote viewing terminals have been utilised by joint terminal attack controllers (JTACs), forward air controllers (FACs) and forward observers (FOOs), but the move towards soldier modernisation programmes in the 1990s and 2000s saw development of such technology pushed out to multiple members of infantry squads and patrols in both dismounted and mounted roles.

The initial frenetic pace of soldier modernisation development appears to have slowed in recent years, with only France's FELIN system, Germany's IdZ-ES and the US Land Warrior configurations having been deployed on operations in very limited capacities.

However, the market has seen renewed vigour for rugged remote viewing terminals once more thanks, in part, to the continued popularity of JTACs, FACs and FOOs in Afghanistan, as well as requirements to exploit the plethora of ISTAR information from a wide variety of platforms.

As Panasonic director for DoD sales James Poole told *Digital Battlespace* at AFCEA West in San Diego in February, the computer tablet will begin replacing ruggedised computers within the next 12 to 18 months.

'There is plenty of buzz and interest in the utilisation of computer tablets, although much will depend on funding approvals,' he admitted.

Currently, Panasonic's family of tablets includes the 20in 4K system, 10in G1 and 7in M1. However, Poole told *DB* that the company was looking at an even smaller system in the near-term.

'There is user interest in a tablet that could fit in a uniform pocket as well as a drop-down module integrated onto a chest rig or body armour,' he said, describing how the larger 20in model could be used for HD mapping in an operations room.

One just has to look in one of hundreds of tactical operation centres in Afghanistan to see just how popular plasma screens are, so smaller tablets appear a natural progression in this area.

OUT WITH THE OLD?

The Panasonic Toughbook has proven itself a popular system with international armed forces over past decades, and especially the special operations community using it to send data back to HQ elements.

However, Poole described how Panasonic's tablet family compared favourably in SWaP, as well as cost parameters. A tablet, for example, is worth around $2,200 compared to the Toughbook, which costs approximately $3,500 and weighs 4kg – compared to the G1 tablet at 1kg and M1 at 0.7kg.

Although the tablet comprises fewer connectivity ports, it does boast the same USB, HDMI, smart card access and WiFi capabilities, as well as GPS. Panasonic tablets are also Windows-compliant and MIL-STD ruggedised like the Toughbook CF-31 and -19 models.

According to Poole, these tablets could be used in support of JTACs and soldier modernisation projects such as the US Army's

The PCAS concept has been designed to allow JTACs to utilise sensor payloads of supporting aircraft as well as their own organic systems on the ground. *(Photo: US DoD)*

Modern tablets are ruggedised to meet MIL-STD requirements and the general 'wear and tear' of the operational environment. *(Photo: Juggernaut Defense)*

struggling Nett Warrior programme, which has been testing smartphone technology. They could also be used for medical support, flightline maintenance, mission planning and pre-flight inspections of aircraft. The USAF has already procured 1,000 systems for evaluation, he added. 'The US is starting to evaluate the transition from Toughbook to tablets. It's all about lightening the load.'

Additionally, he said the USMC, US Army and USSOCOM were also evaluating tablets, but was unable to provide further details for operational security reasons. 'You might see some cases where the DoD procured civilian-grade tablets and realised they were not supportive or secure,' he acknowledged. 'This is why the Windows software is beneficial, providing stabilisation and port legacy applications to new devices.'

COTS SOLUTIONS

Fujitsu is another company looking to integrate tablet technology into future defence programmes. According to Neil Dove, the company's CTO for defence, the military community is looking at how to use COTS technology for tablets and smartphones. He said: 'In future, will it be ruggedised and built simply for the military; will it have to be a bespoke design piece of equipment?'

Fujitsu's remote viewing options meet US MIL-STD-810G and include toughened glass. They also meet IP58 ratings, meaning they are resistant to being submerged in 1.5m of water for up to 30 minutes.

'The Q-series tablets have also been measured [against] a number of harsh parameters – including altitude, temperature, humidity, shock, vibration, drop and dust – to demonstrate the ruggedness of the hardware and its suitability to harsh usage scenarios,' company literature reads. 'Toughened-glass displays further enhance Fujitsu tablet usability away from safe office environments, while bespoke bump cases can be developed to help protect investment in Fujitsu devices over planned deployment life cycles.'

Referring to the company's product line of ruggedised tablets, Dove said: 'These are commercial products which met DoD standards for ruggedisation, with standard Windows and Android technology – commercial products, but built to those [military] standards. The tablet wasn't fully functional, but now it is with Windows 8 installed. Users are not getting a cut-down version. We are seeing our devices meet the same sort of standard and capability and are more powerful.

'With all the research that is going into tablets and that sort of technology, we are seeing fully functional systems in varying sizes and starting to do some very clever stuff, and looking to explore into military areas.'

HANDS-ON JOB

More specifically, Dove made reference to warfighter requirements to wear gloves in the field, a potential issue for tablet technology. Identifying a 'wearable device' in the form of a glove, Fujitsu has designed a system featuring near-field communication and gesture-based technology aimed at people wearing gloves while working. Gloves have become a staple of a warfighter's PPE [personal protective equipment], which also includes ballistic glasses and helmets.

For example, by touching a tablet, a user would be able to receive information displayed on a heads-up or helmet-mounted display. The technology is due to be made available in 2015, but such potential becomes even more exciting if one looks at technology being developed for the military by the Osterhout Design Group (ODG).

ODG's X-5 glasses (see *DB* November/December 2013, p26), were evaluated on *Enterprise Challenge*, allowing operators to view FMV from UAS, while simultaneously displaying GPS and IMU information. However, according to CEO Ralph Osterhout, follow-on development allows for blue force tracking; direction finding; enhanced visibility by day or night; auto-contrast; data recording; biometrics data; and medical support.

Meanwhile, Fujitsu has also demonstrated a 'haptic' tablet, allowing users to feel texture on the screen. The prototype has been demonstrated to replicate the 'sensation of plucking the strings of a Japanese harp' and the 'skin texture of an alligator'. ➤

Designed for the JTAC, Rockwell Collins' FireStorm system is a 'tactical PC' comprising a wide variety of utilities. *(Photo: Rockwell Collins)*

Achieved by switching between high-friction and low-friction zones, possible military applications for such a system could include 'textured mapping', where a user would be able to 'feel' different types of terrain. This could have utility in low-light operations, allowing an operator to check a map while avoiding enemy detection.

As Dove explained, modern tablets are miniaturised and include HD screens with full disc encryption. 'They are no longer old,' he said. 'They allow us to use the latest technology, but there is always a trade-off with security. We are looking at what secure wireless can be put on them.'

CLOUD DATA

He also highlighted the potential to store data centrally in a type of 'cloud', as opposed to on the machine itself, which would reduce security issues once deployed. Traditionally, radio systems require an operator to 'zero' or wipe data and crypto fills from a set if it is likely to be captured by enemy forces.

With regards to specific uses for such tablet technology, Dove said: '[There is] a lot of interest in logistics and aircraft repairs. Instead of a huge pile of papers in the corner, you could have a tablet with all relevant information. There is a move that way with the military. Imagine videos to show you how to fix an F-35?

'We are talking to the navy and big suppliers about future platforms. We can provide IT in smaller form factors.'

Fujitsu is also positioning itself for the concept stage of the UK's Bowman replacement programme, LE TacCIS. 'Bowman was a bespoke build,' added Dove. 'The MoD don't want to do that in future. They want to make use of technologies, including Broadband, 3G, 4G or 5G.

'We are also looking to integrate tablets onto DII and Whitehall, but how do we take those devices forward onto the battlespace? Another option is for future helicopters with manuals on a tablet on the helicopter.

'We have made units available and the MoD is evaluating, but we are only talking ones and twos in numbers. There is no mass rollout at the moment.'

One specific military programme which relies upon remote viewing terminals is the Persistent Close Air Support (PCAS) project, being run by DARPA and Raytheon.

According to Dr Dave Bossert, programme manager at Raytheon, 90% of the PCAS effort is based around ISR and its autonomous sensor employment. 'We feel like what we are doing on PCAS provides enabling technology for a JTAC to have access to airborne sensors,' he told *DB*. 'This is an expensive and capable piece of kit, and with this you don't have to carry it.

'It's a paradigm. Give him the ability to use pilot technology concurrently and take control over that sensor to do whatever he needs it to, before handing it back. This is an eye in the sky and everybody can borrow it.'

CURRENT VIEW

Modern remote viewing technology would allow a JTAC to look at two different targets with two different sensors concurrently. 'A JTAC can have his own organic sensor with a 2D view. But he can augment this with a 3D view from a [supporting] airborne platform with multiple sensor types such as SAR. This is something very useful, using any type of airborne platform and implementing architecture to take advantage of any sensors in the air.'

Companies including Juggernaut Defense have designed additional protected cases for ruggedised tablets. *(Photo: Juggernaut Defense)*

Also involved in the PCAS effort is Rockwell Collins, whose FireStorm system has also been designed for JTACs. Preston Johnson, principal marketing manager for surface solutions at the company, told *DB*: 'If you look at the history of handheld COTS displays used in the US Army's Nett Warrior programme, you will see that they have moved from one COTS display to the next very quickly. I don't see any change to that paradigm in the future.'

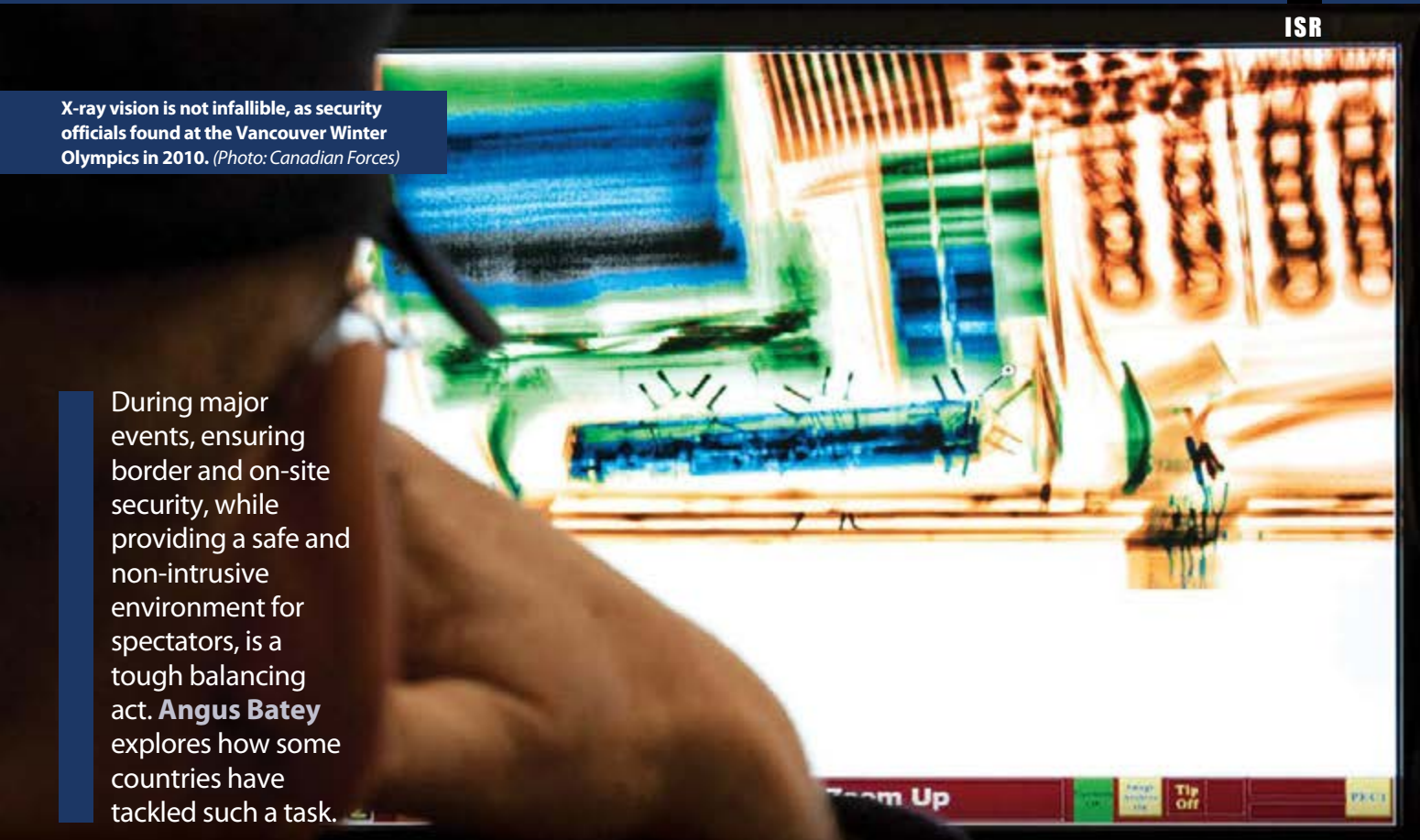
FireStorm was originally created in response to a UOR from the UK MoD for a system that delivered significantly more accurate target location capability than any other existing system in the dismounted market.

Proving the importance of modern day rugged computers and tablets in the field, a standard FireStorm system comprises laser rangefinder, azimuth augmentation unit, StrikeHawk tactical video downlink receiver, Rosetta joint fires digital targeting software and a power management system, all of which is integrated into what Rockwell terms the 'tactical PC'.

'All of these markets are moving towards a more tightly integrated solution that provides soldiers on the ground with increased situational awareness and access to remote weapons platforms,' said Johnson. 'Today, we are on the very leading edge of the digitally aided fires and CAS domains.

'Those areas will continue to mature and proliferate in the coming years until we reach the point where the ground soldier's last choice for engaging an enemy target will be with his individual weapon. He will instead be much more likely to utilise one of the myriad of remote weapons platforms he can access digitally [from a PC or tablet].'

The military development path of ruggedised PCs and tablets is set to remain dominated by COTS technology. With an ever-expanding envelope of C4ISR capabilities expected to continue, the future of remote viewing appears very exciting, whether head-, wrist- or chest-mounted. DB



X-ray vision is not infallible, as security officials found at the Vancouver Winter Olympics in 2010. *(Photo: Canadian Forces)*

During major events, ensuring border and on-site security, while providing a safe and non-intrusive environment for spectators, is a tough balancing act. **Angus Batey** explores how some countries have tackled such a task.

Events management

It is 12 February 2010, and a seven-year programme is entering its most critical phase. In the BC Place stadium in Vancouver, the opening ceremony of the 21st Winter Olympics is about to begin. But things are starting to go wrong.

Demonstrators, angry over various issues pertaining to Canada's hosting of the games, are barricading streets in the vicinity. Planners had anticipated problems, and participants and dignitaries have been issued with alternative routes to get to the stadium, but for the vast majority of the 60,000 people attending, getting there on time is more difficult than expected. So as they arrive late, queues form at the security screening stations, and pressure is building to get people into the venue.

At one of those stations, something has been picked up by electronic scanners which does not look quite right. An operator, uncertain about the wisdom of stopping what is probably an innocent spectator carrying nothing of any concern, delays a decision. The individual is allowed through the screening area. Then the operator decides to raise the alarm.

HARD CHOICES

'I'm not sure,' the operator says when they call in to control, 'but I may have detected a gun.'

This screening post is adjacent to the VIP area, and the motorcade carrying US Vice President Joe Biden has just entered the stadium area.

'Then, at the same time – sometimes, luck is not on your side – a guy with fake accreditation tried to enter the venue,' explained Francesco Norante, who, during the Winter Olympics in Turin in 2006 and Vancouver in 2010, was director of security planning for the organising committees.

'They were stopped, but it was picked up by a journalist. So the association was – potential gun, fake accreditation and the US vice president.'

Running a security operation for a major sporting event is a bit like playing in goal during a World Cup final – nobody will remember 89 minutes of excellence if, in one moment where you are unable to respond with the agility the situation requires, the opposition gets the ball past you into the net. And for security teams, the stakes are obviously much higher, as they cannot point to terrorist plans they thwarted and claim victory if more have been prevented than succeed.

PERFECT PERFORMANCE?

Of course, no sports team – except perhaps those who have represented certain dictatorships – has to cope with the ultimate added pressure that comes with knowing that people's lives depend on you putting in the perfect performance.

Security operations also have to be discrete, almost to the point of invisibility to the public. The kind of security screening that takes ➤

The Olympic Games in London, 2012, comprised an overt and covert military presence at all venues. *(Photo: Crown Copyright)*

place in an airport cannot be deployed at a sports arena, where tens of thousands will want to enter during a very short timeframe before the event begins. Options that may appear attractive – such as flying unmanned aircraft for persistent surveillance, which would require closing airspace to commercial traffic – are impossible to implement without defeating the purpose of the event.

The challenge facing organising committees for events such as the Olympics, the FIFA World Cup that takes place this summer in Brazil or the Commonwealth Games scheduled for Glasgow, Scotland, later this year, is complicated.

Ensuring nothing bad happens at a venue during an event is the culmination of a year-long process that includes elements of cyber security, surveillance and threat detection, political deal-making, fundraising and logistical planning.

This ultimately requires the refinement of the host nation's border security operations for months leading up to the event. Some of the problems demand technical solutions, but many can only be addressed by careful planning.

BEST ROUTE

Norante has moved jobs and is now heading Selex ES's work on the security plan for the Glasgow Commonwealth Games. Although constrained by the requirement to keep details of that operation secret, he has seen enough of major event security from the sharp end to be able to express some personal opinions about the scale of the task, and how best to go about it.

'I would say that [security for Glasgow] is probably less challenging than for Turin,' he said. 'We're an island, and you already have pretty good measures to protect the border. It was challenging for us to avoid illegal penetration into Italy during the Turin Olympics, because there are no border controls any more because of Schengen. [The 1985 Schengen Agreement, which became active in 1995, allows passport-free travel between most continental European nations.] For a little while, they discussed suspending the Schengen Agreement specifically for the games, but that wasn't very well received, so we needed to work with what we had.

'This, I think, is the million-dollar question. Is border security the responsibility of the organising committee, or does it become a national issue that requires co-operation between different countries to guarantee this kind of protection? It depends on what the purpose is of border protection. Are you protecting the border because you face a threat to the event, or are you protecting the border anyway, and you see an increased threat because you're hosting it?'

He added: 'My personal opinion is that this is never an easy task. For example, for the FIFA World Cup, border protection as a specific threat is not the biggest issue the Brazilian authorities are facing. If you just look at the newspapers, you'll see there are a lot of internal issues – demonstrations, riots, crime – which, probably at the moment, in approaching the event, I would consider much more pressing.'

INDUSTRY DRIVE

Technology can help secure physical and virtual borders, and during major events security can be augmented by advanced solutions to assist planners in minimising threats posed by illegal incursions. One company active in managing a low-profile but high-impact border security operation is Lockheed Martin, whose Tethered Aerostat Radar System (TARS) forms part of the US security plan for its southern border with Mexico, as well as counter-narcotics operations off the coast of Florida.

The 420K airships carry an L-88 surveillance radar and can be flown to a height of 15,000ft. The system is in use at nine locations in the southern US and one in Puerto Rico.

Lockheed also supplies its smaller Persistent Threat Detection System (PTDS) aerostats, as used by the US Army in Afghanistan, to customers requiring a solution for long-endurance border surveillance requirements. A tactical system, Mako, offers the same tethered capability in more portable form, making it potentially suitable for short-duration deployments, such as over a stadium on the day of an event.

'PTDS is a very successful and useful tool for border surveillance, as it offers high persistence and low maintenance,' said Jeremy Gildersleeves, marketing manager for Europe, the Middle East and Asia at Lockheed Martin Information Systems and Global Solutions. 'You can use aeroplanes for border security, but they're very costly to operate and maintain, and you need an awful lot of them to provide a 24/7 presence. Whereas with aerostats, they just sit up there for months on end doing their thing.'

COMPREHENSIVE CAPABILITIES

For customers looking for more comprehensive and flexible airborne border surveillance, Lockheed Martin has developed the Dragon ISR family. 'This encompasses a range of aircraft, from small to medium-sized business jets right down to UAVs, and everything in between,'

Gildersleeves explained to *DB*. 'And of course it includes the C2, cyber security and ground exploitation toolsets that you need to go with it.'

Maritime border security is a problem which some suppliers consider to be well enough understood. Antonio Levato, Selex ES's head of sales for land and border security, described it as 'for us, the most standard border control mission we're facing'.

Techniques are well established and understood, with solutions customisable and deployable to fit the needs of different nations' coastlines and security requirements.

'You may install radar or EO sensors on stationary towers or on mobile vehicles and boats, or you can install them on air platforms, manned or unmanned,' explained Levato. 'We [envisage] a sort of electronic fence, or an electronic border – a channel that is parallel to the coastline, which gives me the opportunity to check whoever and whatever enters. In that case, I'm tracking and identifying large boats, small boats, even swimming people – anything I don't know which is trying to enter the area without authorisation.'

LONG-TERM PLANNING

Some technologies offer powerful capabilities, but the planning required to maximise this potential means that fundamental decisions about the construction of air or sea ports may have to be taken years ahead of the event for which the heightened security is needed.

Levato noted that the 2015 Milan Expo is one event where organisers have acted early enough to ensure construction companies involve security contractors at the design phase. However, optimal border security means including security professionals when designing new air and sea ports.

'It's one thing if people are trying to enter a country illegally by crossing a border away from a key entry point and avoiding controls, but different when people are trying to enter illegally but in a legal way, by trying to enter using different passports,' he explained.

'New airport construction is now taking into account security as a key part of the project. Images of people who are considered suspicious are stored in a database and can be checked in real time, but to get the best results from these technologies you need specific installations in place, because the position of the camera that's taking the image of the face is very important.'

Collaboration between security professionals and architects is bearing fruit, but there is still untapped potential. Terrorist-proof public buildings may not be a practical goal, but research suggests there are ways of designing them – be they points of entry to a nation, event venues or public transport hubs – so that potential terrorists can be identified by how they use and navigate the premises.

DETECTION BY DESIGN

'Design can be used to improve detection of terrorist activities within or near public facilities,' explained Dr Hervé Borrion, deputy director of security science at University College London. The university helps run a project called Resilient Infrastructure and Building Security (RIBS), and Borrion recently led an EU project that examined how building design could aid detection of terrorists.

'As we know, behaviour is tightly related to operational objectives, and therefore a good understanding of terrorists' procedural objectives could in principle be exploited to "design out" terrorism,' he explained to *DB*. 'In practice, designers would be seeking to create environments that can synthetically exacerbate the observable differences between the behaviour of terrorists and that of regular visitors. This principle will not yield silver bullets, but research conducted in this area has the potential to further reduce the false alarm rate of detection technology.'

None of this, of course, will ultimately be much use if a home-grown terrorist or other legal resident manages to circumvent all plans and procedures, and sneaks a weapon into a stadium.

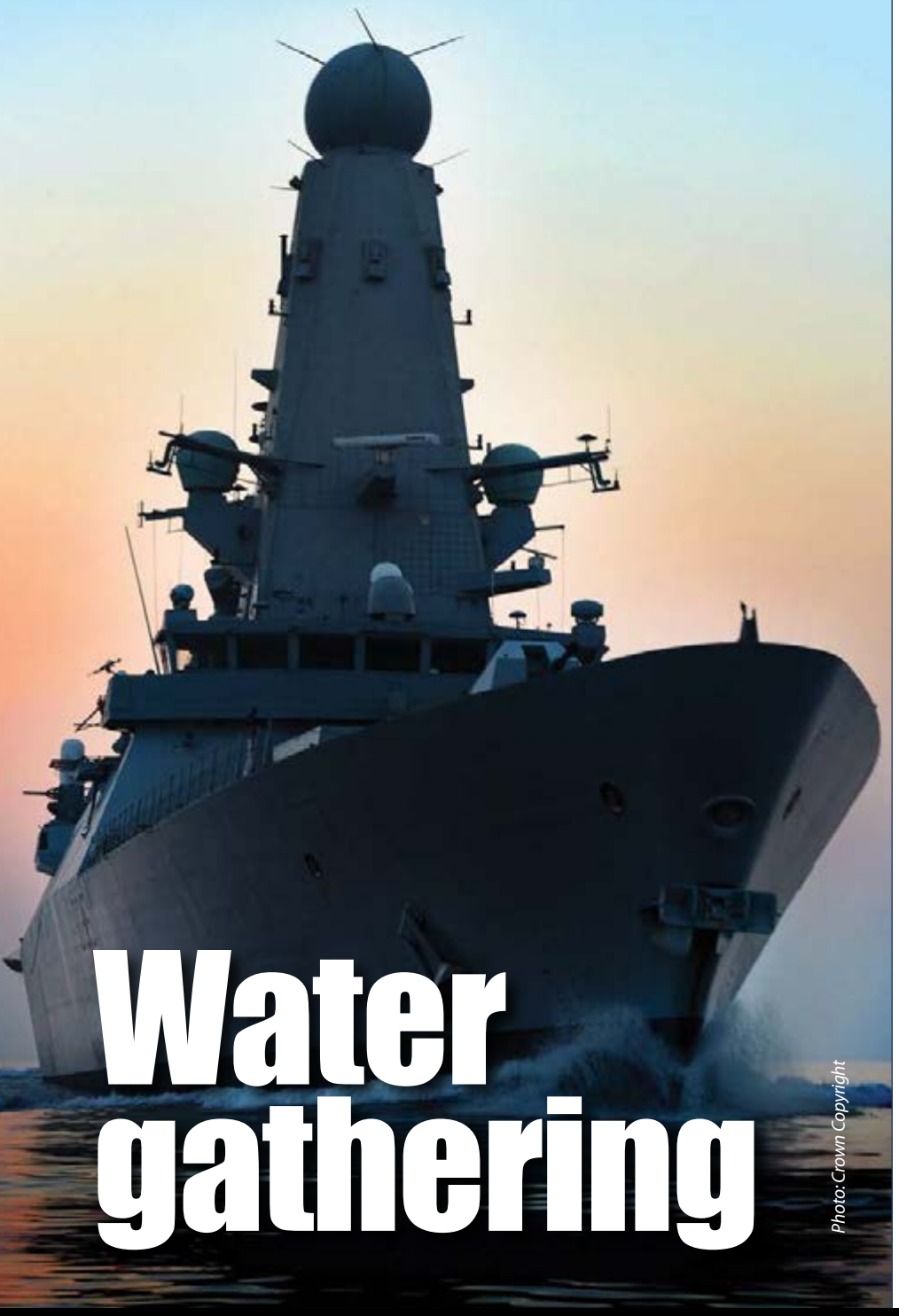
Nothing happened back in February 2010, but Norante was quick to put the lessons learned into practice to ensure the safety of the remainder of the Winter Olympics in Vancouver.

'In reality, the process was correct,' he recalled. 'We put in place all the contingency plans, and everything went well. [For following events] we created an additional security layout around the VIP area – a buffer zone between them and the public – and put additional police officers in.

'We think, with all our plans in place, that we're pretty comfortable to say it was not a weapon entering the venue,' he concluded. 'We brought experts from outside to examine the images from the screening machine – it was just a shadow, and not even the outside experts were able to identify whether it was a gun. But even now, after four years, I'm not able to tell you whether it was a real threat or not.' DB

A Russian UAV, based on Schiebel's S-100 Camcopter, was used for security at this year's Winter Olympics in Sochi. *(Photo: Schiebel)*

Naval SIGINT poses a subtly different set of challenges to its overland counterpart. **Claire Apthorp** examines the latest generation of surface and airborne maritime platforms, and the sensors that equip them.



Water gathering

Photo: Crown Copyright

SIGINT has been a central aspect of modern naval intelligence-gathering activities for decades. The ability to derive information from the EM spectrum, either by collection systems on board surface vessels or maritime aircraft, is vital for the enhanced detection, threat identification and strategic intelligence capabilities of naval forces.

SIGINT has two main elements: intelligence derived from the interception of communications (COMINT); and intelligence derived from the interception of the electronic signals that support the equipment (ELINT). Both provide discrete sets of information that together form a fused intelligence picture, providing commanders with an ISTAR architecture to assist in the planning and execution of operations, improved situation awareness and support throughout the decision-making process.

With the proliferation of communications satellites and highly capable ISR platforms across the globe, the gathering of SIGINT has become much easier in many respects. At the same time, the technologies involved can make collection and identification more challenging. As a result, SIGINT is a continuous technical challenge to enable the communicator to stay one step ahead of the gatherer; for the gatherer to stay one step ahead of the communicator, and so on.

This increasing complexity poses a challenge to industry, which must provide solutions that reduce difficulty levels down to actionable intelligence in an intuitive way, allowing operators to take advantage of key information while executing a myriad of additional duties.

Overall, SIGINT customer requirements are split between advanced technical capability and operational simplicity.

'From a technical point of view, the main trends are looking at low probability of intercept signals requiring wider receiver bandwidths and clever signal processing to pull signals out of noise, and networking sensors to fuse intelligence in real time to provide the commander with an up-to-date situational awareness picture, because at the end of the day he wants to know what is happening all the time,' Rob Jones, EW business development manager at MASS, told *Digital Battlespace*.

'You're also seeing a move toward commonality of systems across platforms to reduce capital and through-life costs, tighter integration and more automation of back office data management systems, and the constant requirement to reduce manpower.'

The maritime domain provides greater flexibility and mobility for SIGINT missions than land and air operations, where assets have to rely on transportation to move between areas of operation. Depending on the target and where SIGINT collectors need to be placed, a ship can move anywhere and self-sustain for weeks or even months.

The Triton forms part of USN plans to move SIGINT capabilities into the unmanned domain. *(Photo: USN)*

PRIME CAPABILITY

The Type 22 frigate was the prime SIGINT capability of the UK Royal Navy (RN) until its full retirement from service in mid-2011. Since then, the RN has had no indigenous maritime intelligence collection capability.

In June 2011, the UK government requested a number of AN/SSQ-137(V) Ship's Signal Exploitation Equipment (SSEE) Increment F sets, along with associated Selective Availability Anti-Spoofing Module (SAASM) GPS receivers and System Signal and Direction Finding Stimulator packages, from the US.

The proposed FMS arrangement would see the UK acquire the equipment as a Cryptologic Electronic Support Measure replacement for the Cooperative Outboard Logistics Update (COBLU) SIGINT capability then fitted on the Type 22, as well as being the future maritime CESM system equipping the Type 45 destroyers.

The Boeing/Argon ST SSEE Increment E (SSEE-E) programme resulted in a Tactical Cryptologic System (TCS) which performs all processing functions necessary to acquire, identify, locate and analyse signals for external and internal information.

Based on Argon ST's Lighthouse architecture, Increment F (SSEE-F) systems augment these capabilities with field-programmable gate array, embedded processing and server network technologies, and improve on the E's antennas, signal acquisition and DF, facilitating increased data collection and better identification of potential threats. The system is widely in use across the USN, with Argon ST having delivered the 100th system to the service in 2013.

However, while SSEE-F will bring the Type 45 SIGINT capabilities as an off-the-shelf solution, it does not give the UK an indigenous capability to fully replace the Type 22. And while Type 45 offers a solution for this gap, the vessels were not designed with a purpose-dedicated SIGINT space, which also poses a challenge.

'Just about any maritime platform can be fitted out with intercept/collection equipment, be that for COMINT or ELINT purposes, but without a purpose-built compartment and a DF capability, this is somewhat limited,' Dougie Holmes, EW consultant at MASS, told *DB*. 'The Type 45 destroyers were always earmarked to replace the SIGINT capability lost when the Type 22s left service, but even now they still only have a cobbled-together basic collection fit which can be enhanced by government/non-government agencies as required, dependent upon the tasking levied on the platform.'

NEW EQUIPMENT

In an effort to fill the SIGINT gap post-Type 22, the Type 23 frigates are to be fitted with Argon ST's Hammerhead communications ESM (CESM) system, which will provide an enhanced electronic surveillance capability to the fleet. Babcock was awarded a contract by the MoD in November 2013 to work with principal subcontractor Argon ST to provide the off-the-shelf system at the required technology readiness level.

Hammerhead provides a surveillance capability, supporting both tactical indicators and warnings and other tasked requirements, using technology proven on naval platforms. It has commonality with other Lighthouse CESM systems currently in use, providing the opportunity for common spares, training and operator flexibility.

Hammerhead's modular design enables the system configuration to be flexible, and should allow the MoD to 'future-proof' the capability – something that could assist in migrating the hardware to the Type 26 Global Combat Ships when they enter service in the early 2020s.

That Argon ST equipment has been selected for the Type 45 and Type 23/Type 26 points to a focus by the RN on commonality across its SIGINT assets. This will allow simplified upgrades, logistics and training, and side-step the traditional issue of various disparate systems that are unable to interoperate with other national or international assets for sharing and transferring information.

'Generally, customers are looking for scalable, open-architecture systems which fit into a variety of cost and capability configurations – they want the flexibility to deploy systems on a range of platforms using a common system architecture,' an Argon ST/Boeing spokesperson told *DB*.

'We are actively evolving our widely deployed Lighthouse architecture to meet the next generation of warfighter needs, including updated intuitive user interfaces, complete system automation and a family ➤

The USN currently operates 11 EP-3E Aries II systems. *(Photo: USN)*

of system solutions scaling across the full range of military platforms.'

Looking ahead, this scalable architecture should also benefit customers as the market progresses to include platforms of increasingly variable size.

'While traditional larger platforms require a full-scale SIGINT system, smaller platforms, including coastal patrol craft, have an increasing need for a right-sized SIGINT system,' the spokesperson added. 'Argon ST investing in a common scalable architecture allows budget-sensitive organisations to field more capability across a wider range of platforms.'

STUDY SKILLS

In February 2008, the USN awarded study contracts to three industry teams for the EP-X Manned Airborne Intelligence, Surveillance, and Reconnaissance Aircraft programme. This aimed to develop a new platform as the replacement for the USN's EP-3 Aries SIGINT fleet.

EP-X was envisioned as a shore-based, manned aircraft providing ISR and targeting support to carrier strike groups and theatre, combatant and national commanders. The aircraft would work in cooperation with other maritime patrol and reconnaissance platforms, including the P-8A Poseidon and what would become the MQ-4C Triton UAS.

The $1.25 million study contracts were awarded to Northrop Grumman/L-3, Boeing/Argon ST and EP-3 OEM Lockheed Martin, and would see the teams develop EP-X programme requirements and potential system concepts.

At the time of the awards, Capt Joe Rixey of the Maritime Patrol and Reconnaissance Aircraft Program Office said that the contracts would 'allow industry to work with the navy to analyse the current requirements for the EP-X system and will further develop the concepts, cost and schedule for the programme. These contractors will help us determine the technical criteria necessary to build a strong foundation for the EP-X programme'.

However, such a foundation did not materialise, and in the US government's budget proposal for FY2012, the DoD cancelled the EP-X programme on the basis that the analysis of future ISR requirements and the most effective means of meeting those had failed to be clarified.

The EP-3E Aries II is currently the USN's only land-based SIGINT aircraft. The 11 in the navy's inventory are based on the P-3 Orion airframe and provide fleet and theatre commanders worldwide with near real-time tactical SIGINT. With sensitive receivers and high-gain dish antennas, the EP-3E can exploit a wide range of emissions from deep within targeted territory, with the fleet having been heavily engaged in reconnaissance in support of NATO forces in Bosnia, joint forces in Korea and in Operation *Southern Watch*, *Northern Watch* and *Allied Force*.

With the EP-3 and associated special projects aircraft expected to be fully retired from service by 2020, it has emerged that the USN plans to maintain its SIGINT capabilities as part of wider ISR assets being developed in the unmanned sphere. The main project of note here is the Northrop Grumman MQ-4C Triton.

GOING UNMANNED

The Triton will operate with the Boeing P-8A Poseidon maritime patrol aircraft, and play a key role in providing fleet commanders with a persistent, reliable picture of maritime surface contacts, during missions lasting up to 24 hours. According to Northrop Grumman, the aircraft will be equipped with sensors including the Multi-Function Active Sensor (MFAS), which provides a 360° view of its surroundings at a radius of over 3,700km; the MTS-B multi-spectral targeting system; AIS; and the AN/ZLQ-1 ESM sensor with specific emitter identification.

The system's design has been built around enabling the aircraft to descend through cloud layers during its mission to gain a closer view of ships and other targets when required, with the current sensor suite allowing vessels to be tracked over time by gathering information on their speed, location and classification.

The MFAS is an AESA radar designed for maritime surveillance. The X-band 2D sensor features a combination of electronic scanning and mechanical rotation, allowing the radar to spotlight a geographic area of interest for longer periods and increase detection capabilities of smaller targets, particularly in sea clutter. The system's mode agility means it can switch between various surveillance methods.

Using unmanned technology for SIGINT offers a number of potential advantages. As a multi-mission platform, Triton will provide multipurpose capabilities, reducing manpower requirements through greater automation of processes. But it also poses a number of challenges.

'Keeping more people out of harm's way and operating remotely is an advantage, but the challenge is having a platform large enough to put all the SIGINT equipment on, and more importantly, that is also capable of acting as a communications platform as well,' Jones said.

'It's all very well having that collection capability, but if you can't turn it around in a very near-real-time timeframe, it becomes expired and you're on to the next problem. The UAV concept is well thought out, but it does have its challenges – it's a trade-off between the collection equipment and the communications equipment to relay that information back to base.'

SIGINT in the maritime domain will continue to evolve in line with customer requirements and budgets. Industry is expected to support users in their likely need to move away from the blanket collection and analysis of traditional adversary communications, towards specific threats that emerge from the evolving battlespace, be it counter-weapons proliferation, counter-terrorism or anti-piracy. DB

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Russian realisations

Major General Khalil Arslanov, Acting Chief of the Department of Communications, Russian MoD, explains to Eugene Gerden how digital command systems now have 'significant importance' for the army.

As *Digital Battlespace* went to press, Russia's occupation of Crimea continued to dominate world headlines, with commentators describing military exercises – conducted in Russia's Central Military District – as intimidation of Ukraine and its armed forces.

Whatever the intention of these exercises, which started on 13 March, they allowed Russia's High Command to test a new indigenously developed C4ISR solution to fill a major capability gap in its armoury – a digital command system.

Maj Gen Arslanov described how the concept of such a digital command system had in recent years gained 'significant importance for many armies, including Russia's'.

Sources close to Russia's High Command expressed to *DB* how officials have continued to monitor international progression in this domain, with particular interest in Israeli and US, and even Indian, efforts.

JOINING THE RANKS

However, the time has come for Russia to unveil its own capability, with Arslanov suggesting the possibility that Russia may soon join these ranks with the design and adoption of a mature digital command system.

'The experience of local wars and armed conflicts with the participation of the US and NATO showed that the achievement of informational advantages over the enemy as part of the "network-centric warfare" concept should be one of the priority targets for the Russian army over the next 20 years.'

Highlighting NATO missions in Afghanistan, the Balkans, Iraq and Libya, he stressed efforts to not only defeat enemy 'manpower' and critical infrastructure, but civilian and military communication and computing capabilities.

'At present, the Department of Communications of the Russian MoD imposes strict requirements on sustainability, survivability and reliability of the recently designed digital command system, which should provide the MoD with advanced telecommunication services for the exchange of information, including on a global scale, using channels of SATCOM and radio systems.

'The development and adoption of the new digital command system in the Russian armed forces is a very important task, which is reflected by the fact that this has accounted for up to 18% of the total Russian military budget in recent years.'

More specifically, it will be based on a joint automated digital communication system, which will include air, land, sea and space echelons, as well as systems of automated control and information security.

The space echelon will centre around a SATCOM grid, providing voice, data and video capabilities to both stationary and mobile military platforms, while the air solution will focus on air-to-air and air-to-ground communications as well as airborne relay platforms.

In 2012, the MoD began to design a unified third-generation SATCOM system (ECS-3), built on the principles of modern high-speed information and standardised software and hardware, with the organisation of inter-SATCOM.

'So far, the new technologies have been introduced on 989 military facilities and objects, while by 2020, this figure will be increased up to 2,000 objects,' Arslanov described. 'We are currently working on the equipment with each soldier of the national army.'

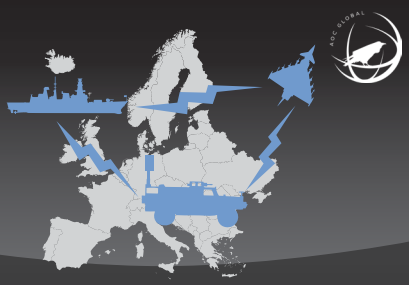
UNIFIED SOLUTION

As part of these plans, the MoD has completed development of a 'unified military set', which provides a soldier with navigation, orientation, target detection and weapons control. This, he said, would increase combat capabilities, improve survivability and mobility [on the battlefield].'

This soldier system comprises a new generation of radio communications, including a tactical terminal electronic map-board designed to solve applied computational and analytical tasks and problems of navigation using a digital magnetic compass and GLONASS/GPS receiver.

Arslanov revealed that the MoD, in collaboration with various research institutes, is completing the design of a national, automated ECM-protected secure voice network.

'Such activities should speed the development of portable, wearable and transportable radio base stations of the sixth generation,' Arslanov explained. 'This will provide an opportunity… in favour of self-organising and adaptive networks. It will also provide the possibility of expanding the range of frequencies, to ensure their more active use and introduce new operation modes.' DB



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