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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.

## HELIOPTER 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.

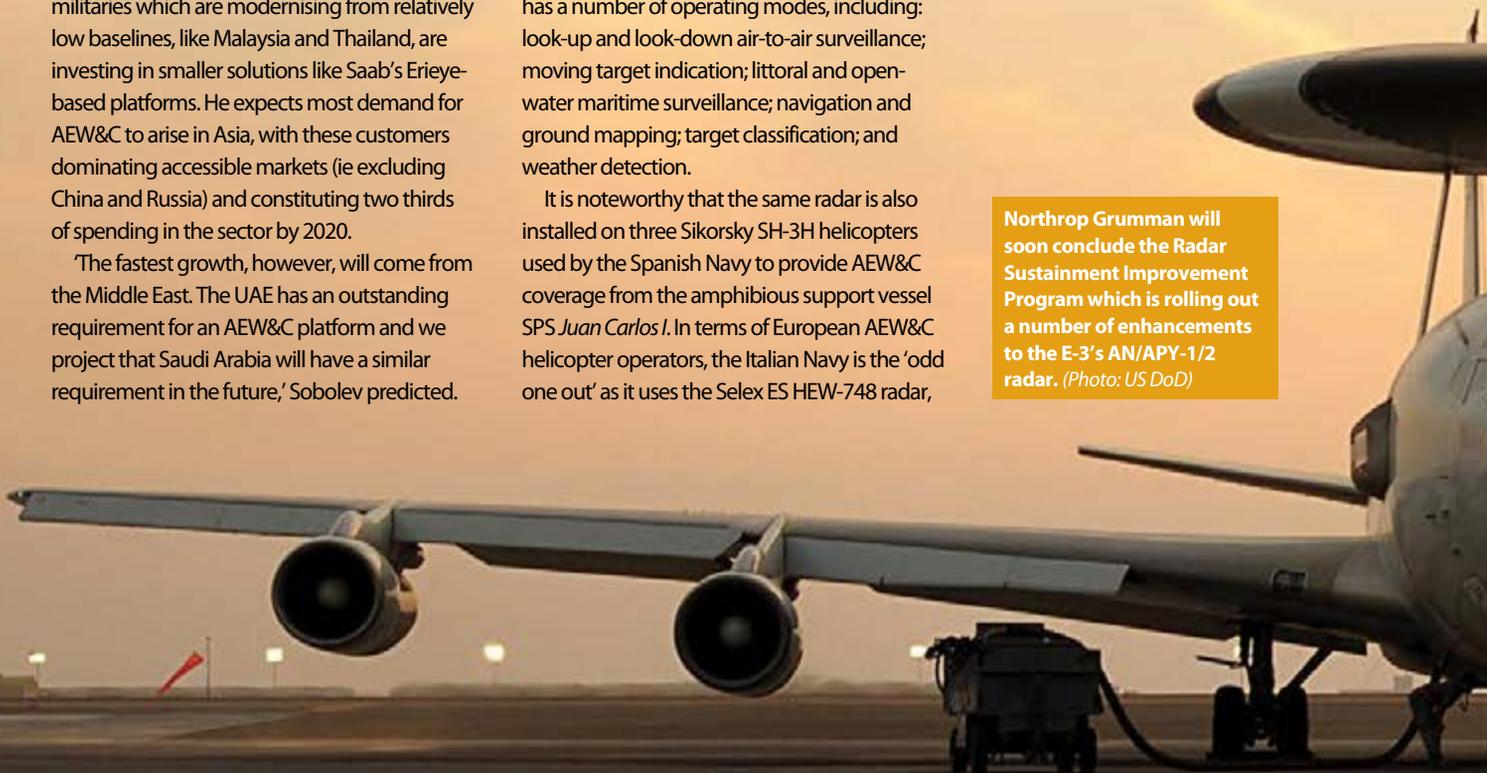
It is noteworthy that the same radar is also installed on three Sikorsky SH-3H helicopters used by the Spanish Navy to provide AEW&C coverage from the amphibious support vessel SPS *Juan Carlos I*. In terms of European AEW&C helicopter operators, the Italian Navy is the 'odd one out' as it uses the Selex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



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.

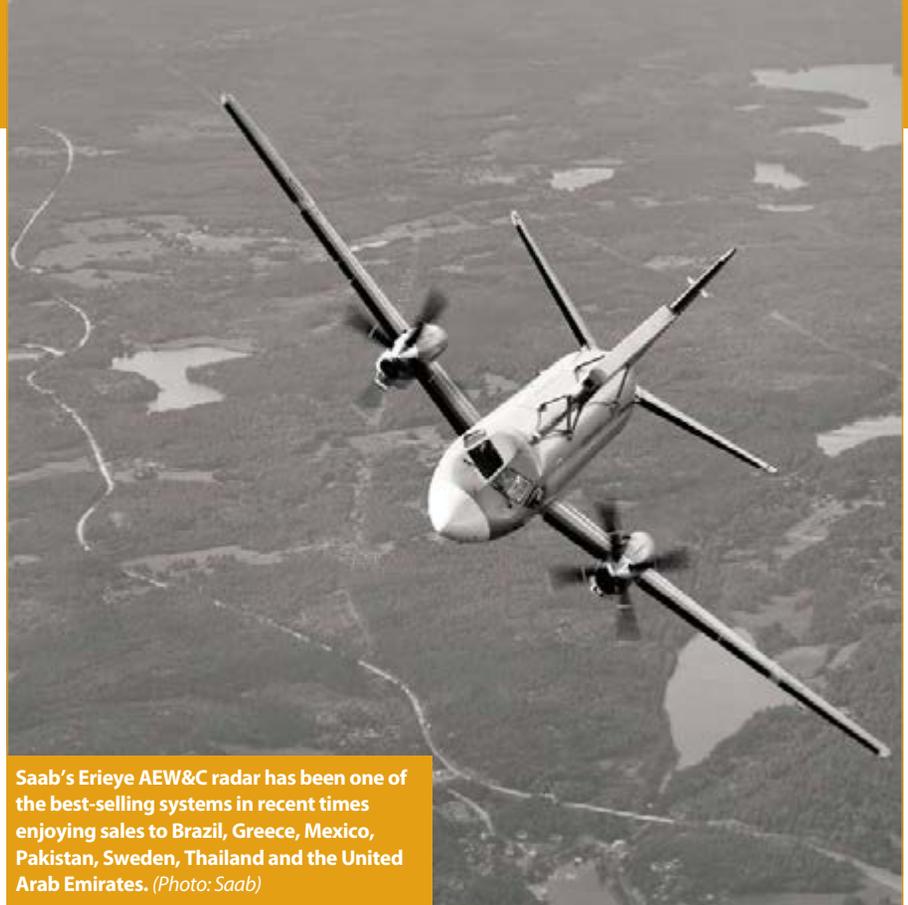
Orders for the 737 AEW&C platform have been forthcoming from the Royal Australian Air Force (six aircraft), the Republic of Korea Air Force (four aircraft) and the Turkish Air Force (TAF) (also four aircraft). This February, it was reported that the TAF had accepted the first of its example at Konya 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



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)

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 Erieeye 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. **BB**

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

