

# Surveillance takes a new turn

**Evidence points to expanding demand for primary surveillance technology that is capable of meeting more varied and demanding requirements**

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**S**ome of the world's largest radar manufacturers recently launched new products that reflect continued market demand for primary, in addition to secondary, surveillance capability. Taking advantage of modern processing power, these products recognise the need to detect a wider range of targets, including the ever-growing number of remotely piloted aircraft systems (RPAS). Some are also responding to the squeeze on spectrum frequency caused by expanding broadband services and demand for lower maintenance costs.

The Airport Surveillance Radar Next Generation (ASR-NG), developed by Airbus Defence and Space (DS), is a three-dimensional (3-D), S-band solid-state approach radar that draws on the company's experience with military and civil applications. The company unveiled enhanced detection capabilities and an increased range of up to 120 n miles (220 km) at World ATM Congress in March 2015, following a series of tests carried out by the company's German manufacturing arm in Ulm.

ASR-NG passed the first factory acceptance tests in May 2015, as part of a contract worth EUR50 million (USD54.65 million) to equip six Royal Canadian Air Force airfields with seven radars by early 2017. The radars will be used for approach control and airspace surveillance within a 64 n mile radius, monitoring both civil and military traffic. The radar is combined with Airbus' MSSR 2000 I secondary surveillance radar, tracking Mode S, Mode S and ADS-B equipped aircraft.

The company's ASR-S already operates across military airfields in Germany and Switzerland, where it tracks civil and military traffic. The new-generation ASR features enhanced signal processing capabilities, developed in association with Intersoft Electronics, which Airbus claims completely mitigates the effect of clutter caused by wind farm turbines. This feature has been field-proven in trials in the United Kingdom, witnessed by the Ministry of Defence (MoD).

The 3-D aspect of ASR-NG results from an



Airbus DS: 1632699

Airbus DS drew on its military and civilian experience to create ASR-NG.

extra antenna feed, which enables target height to be calculated, and Airbus claims targets as small as 0.5 m<sup>2</sup> can be recognised. The S-band signal is also protected against 4G/LTE mobile phone signals.

The more recent unveiling of the STAR NG primary radar by Thales, at the Paris Air Show in June 2015, reflects further investment in S-band technology. STAR NG features civil and military capabilities, which can be selected according to customer requirements.

These include altimetry, range resolution, electronic counter-countermeasures (ECCM), as well as the ability to track fast targets. Thales has also added cybersecurity safeguards and says STAR NG is designed to provide full coverage over wind farms, negating the need for gap-filler technology.

Thales already has its first orders for STAR NG: the UK MoD is deploying 20 systems as part of a wider national surveillance solution under Project Marshall, and the company predicts additional customers for the first

production systems in 2016.

The totally new concept of holographic radar, introduced by UK-based Aveillant, represents a departure from rotating radar technology. The company secured its first contract to install its Theia 16A model close to East Midlands Airport in early 2015, to mitigate the returns generated by nearby wind turbines. CEO David Crisp told *IHS Jane's* the equipment has met safety requirements for Part II of the four-part safety case required by the UK Civil Aviation Authority (CAA), and the company is now compiling data for Part III.

## Staring array

Aveillant's 3-D holographic radar uses a static, staring array to continuously and simultaneously monitor all the airspace it can see. Theia 16 provides extremely detailed surveillance over a radius of 5 n miles, using its array of 16 tiles to transmit and receive signals. The company's Theia 64 extends this range to 20 n miles, while the latest Theia 384 model provides 360° coverage over 40 n miles.

Crisp said the radar's modularity means it operates equally well over small or large areas. The company's long-term vision is to design a nationwide network, providing active surveillance for non-co-operative targets with significantly lower life-cycle costs than conventional rotating radar.

Aveillant conducted the first demonstration of Theia 384 technology at an airfield near Corby in July 2015, witnessed by industry observers, including the CAA and airport operators. Theia 384 comprises 12 phased array panels, angled to provide complete 360° coverage. The company produced four panels for the demonstration, which tracked a small general aviation aircraft over a 40 n mile radius in what the company believes to be the first example of angled, phased array panels working together.

"The modular technology enables you to put three of these quadrants together to obtain 360° surveillance," said Crisp. The company is teamed with Selex ES to bid on the upcoming tender at Glasgow Prestwick Airport, offering Theia 384 as an airport surveillance radar capable of seamlessly mitigating wind farm clutter.

Aveillant was among several manufacturers who participated in tests carried out by the MoD at West Freugh, Scotland, to track a range of unmanned aerial systems. The company says its Theia 16 and 64 models have successfully detected drones as small as the commercially



available Phantom II. "Now we are working on the algorithms you need for drone [RPAS] detection," said Crisp. "A key capability is the ability to differentiate between birds and drones. Because we are a staring radar, we get so much data about the target itself we can track its movement and behaviour. Our goal is to deliver an automated system."

Aveillant was selected by the CAA in 2014 to participate in its spectrum release programme, examining ways to free up spectrum for broadband use. As an L-band system, the holographic radar operates in a different bandwidth to conventional systems, and a nationwide network would require only 2 MHz of spectrum according to Crisp.

### Contract success

Freeing up bandwidth is a feature of the X-band SCANTER radar developed by Terma. The Danish manufacturer also carried out UK CAA trials aimed at spectrum release, and its SCANTER 4002 has completed several wind farm mitigation trials. Michael Agergaard Riis, Terma business development director, told *IHS Jane's* the company has just been selected as the preferred wind farm mitigation provider in a tender issued by Newcastle Airport. The radar will be located next to the airport's primary surveillance radar and feed data into the airport surveillance system, much like an infill solution. However, it is designed to provide a solution for future wind farm development, and provides surveillance coverage over 40 n miles radius and up to 20,000 ft (FL200).

Agergaard Riis added that Terma has completed Part II safety case work for SCANTER 4002 in the United Kingdom and is

currently in contract negotiations involving UK airports.

Terma is also active in the United States, where the company supplied a radar system to test obstruction lighting control technology at one of California's largest wind farms in April 2015. Terma's SCANTER 5202 X-band radar was used to detect aircraft in the vicinity of the Tehachapi wind farm, prompting the activation of obstruction lights on the wind

## New products recognise the need to detect a wider range of targets

turbines. The technology successfully detected and tracked a range of small aircraft at varying altitudes, thus avoiding the need to illuminate obstruction lights unnecessarily. The US Federal Aviation Administration (FAA) is due to release a report confirming successful completion of the test.

Agergaard Riis said the demonstrations verify the performance of SCANTER technology for small-target detection. The SCANTER 4002 is particularly suitable for primary terminal area surveillance, with the ability to see small remote-controlled aircraft out to 12 miles. "Everybody is looking to the United Kingdom to see what is happening, because these are real orders now, they are no longer demonstrations."

The new X-band radar launched by Raytheon in the fourth quarter of 2014 also provides high-performance, small-target detection. The Multifunction Phased Array Radar (MPAR) comprises non-rotating solid-state panels containing fixed antenna elements. Four panels can be combined to deliver 360° coverage.

Raytheon has conducted trials for the FAA and the UK CAA, as well as weather agencies, to demonstrate performance with a wide range of targets. The technology is designed to provide aircraft surveillance and weather monitoring from one unit, offering a solution to the FAA's NextGen Surveillance Weather and Radar Capability (NSWRC) programme launched in 2012.

Raytheon is building a number of similar panels to support demonstration work in the United States, in particular to test performance in a range of different environments.

### MSPSR

Innovation in Multi-Static Primary Surveillance Radar (MSPSR) continues to push the boundaries of primary surveillance technology, with leading manufacturers, including Thales, Airbus DS, and ERA, launching research projects in recent years.

ERA is focused on developing its Passive Coherent Location (PCL) for military applications and conducted a demonstration for NATO members in the second half of 2014. The exercise tracked flying targets and analysed the possibilities of the co-existence of primary radars with passive radar systems. ERA predicts air surveillance and defence will employ multifunction radars, which are able to meet the requirements of multiple scenarios and challenges in the future. Passive radar concepts allow the use of a range of remote transmitters, such as digital radio or television broadcast, which are likely to exploit the best properties of different bandwidths for different tasks.

ERA started development of an active surveillance system for the civil market, equipped with ERA transmitters that provide independent, non-co-operative surveillance. The company expects to launch a prototype for the civil market in 2018.

Meanwhile, Thales ATM has been working with Roke Manor and NATS in the United Kingdom to see whether standard broadcast signals could be used to track aircraft using passive surveillance technology. A Thales demonstrator installed on the Crystal Palace transmitter in London succeeded in tracking aircraft at altitudes of up to 10,000 ft, as part of a two-year demonstration project. Roke Manor concluded that television transmissions can be used to local aircraft with sufficient accuracy to meet standard separation requirements for air traffic control of 3–5 n miles. NATS plans to continue to investigate the new technology over the next five years. ■



The Theia 16A holographic radar was installed near East Midlands Airport in April 2015

Aveillant: 1638503