Open sesame: CAA investigates methods to liberate bandwidth

The UK is selling off parts of the S-band for public use, paving the way for alternatives to traditional primary radar

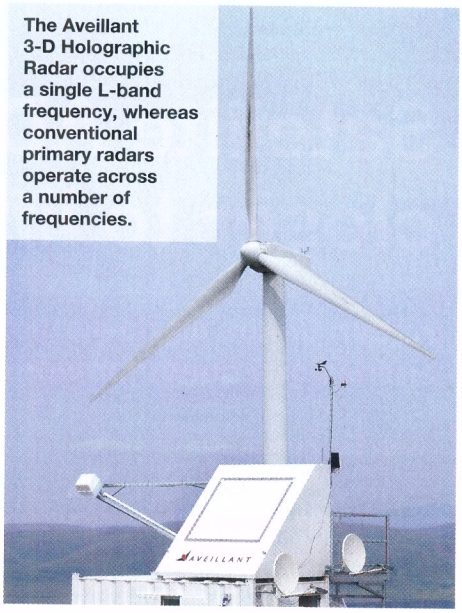
JENNY BEECHENER

The UK Civil Aviation Authority (CAA) is investigating whether it can release spectrum frequency in the bandwidth used by civil and military primary radar. The UK government is planning to give up a portion of public sector spectrum for commercial use, such as mobile broadband, and replace it with alternative surveillance technology. The GBP10 million to GBP20 million (USD17 million to USD34 million) programme offers a welcome boost for alternatives to conventional primary radar.

The CAA is assessing the feasibility of releasing 100 MHz of the 2.7-2.9 GHz used by S-band primary radar by 2020, and is talking to as many as six different suppliers. The CAA has issued contracts to Aveillant, ERA, and Airbus Defence and Space (formerly Cassidian), and is working with suppliers, including Thales. The first equipment demonstrations are due to take place in 2015, with feasibility and test phase of the programme due to be completed by the end of 2018.

Among innovative ideas, UK company Aveillant is proposing its 3-D Holographic Radar. The technology operates on a single frequency in the L-band, rather than the range of frequencies needed for primary radar. It uses multiple beams to look continuously in all directions, rather than rotating and scanning targets, and units can be networked to cover larger areas. Aveillant estimates approximately 40 units, each with 100 miles (160 km) range, would cover the UK. The holographic platform relies on powerful processors to achieve a level of detection that is far greater than existing primary radar. Trials conducted in 2013, independently assessed by Helios, found 99% probability of detection compared with the UK's current requirement of 90%.

Aveillant Engineering Director Tim Quilter told *IHS Jane's*: "We've harnessed modern processing capability and that gives you a fundamental increase in performance. You see targets continually so you not only detect a target but you can look at what it is doing. You see speed variation, rotating blades for helicopters, and small aircraft manoeuvres."



The Aveillant 3-D Holographic Radar occupies a single L-band frequency, whereas conventional primary radars operate across a number of frequencies.

Aveillant: 1531844

The company plans to deliver a factory demonstration to the CAA later this year, followed by a field test early in 2015. Two units will function co-operatively to demonstrate they can use a single frequency. Aveillant estimates that the technology costs about 40% less than conventional primary radar, with the likelihood of further savings arising from falling processing costs in the future. It has no rotating parts, reducing overall lifetime costs.

Meanwhile, Czech manufacturer ERA proposes a non-cooperative solution called Multi-Static Primary Surveillance Radar (MSPSR). Rather than relying on a dedicated transmitter to locate aircraft, MSPSR uses existing digital broadcast signals. The solution is based on advanced multilateration technology, where the location of aircraft is derived from the time of arrival of the broadcast signal reflected from the aircraft and measured at multiple receiver locations on the ground. A network of stations can transmit and receive omni-directional and continuous wave-forms using active or passive transmitters. It can use existing transmitters such as radio or TV broadcast masts.

Passive radar

ERA put together a demonstrator for European air navigation service providers towards the end of 2013, and is currently building a prototype it expects to complete by 2015. The company has already developed a military product based on passive coherent location that it has started to industrialise for release in late 2014. This is an entirely passive radar that relies on existing infrastructure as opposed to active transmission technology. ERA is designing the civil version with independent transmitters to ensure signal availability.

A separate MSPSR research programme is underway led by Roke Manor Research, along with team members NATS and Thales. The UK Technology Strategy Board began a 24-month demonstration programme in February 2013 to demonstrate the [illegible] of MSPSR as a replacer[illegible] costly, primary surveill[illegible] work to date, Thales te[illegible] nology using the London transmission tower at Alexandra Palace in the last quarter of 2013. The data was integrated with surveillance returns from wide area multilateration (WAM), Automatic Dependent Surveillance – Broadcast (ADS-B), and MSPSR. ■

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A revolution for radar?

While the CAA initiative is driven by increasing demand for the use of the electromagnetic spectrum, there are other challenges for primary surveillance. In addition to accurate target detection over wind turbine farms, the introduction of remotely piloted aerial vehicles demands accurate tracking data. Non-cooperative sensors are increasingly important in ensuring all vehicles can be tracked in controlled airspace. By sponsoring research into low-cost alternatives, the CAA programme may contribute to the first major revolution in radar since its introduction during the Second World War.