

# Out of Range?

The United States Federal Aviation Administration (FAA) is leading a programme to replace over 700 long and short range surveillance radar systems used for air traffic control by the FAA and the US Department of Defense (DoD), weather detection by the US Weather Service, and for security surveillance by both the DoD and the Department of Homeland Security Customs and Border Protection (CBP).

If the Spectrum Efficient National Surveillance Radar (SENSR) programme is successful, all US radars used for air traffic control, weather, and many security and law enforcement missions will be replaced with new systems that will provide state of the art capability, less expensive to operate, less expensive to maintain and provide enhanced safety and security for the US. The ultimate goal is to have their development, testing and fielding funded by industry through a frequency auction to support the growing requirements of the telecommunications industry for more spectrum.

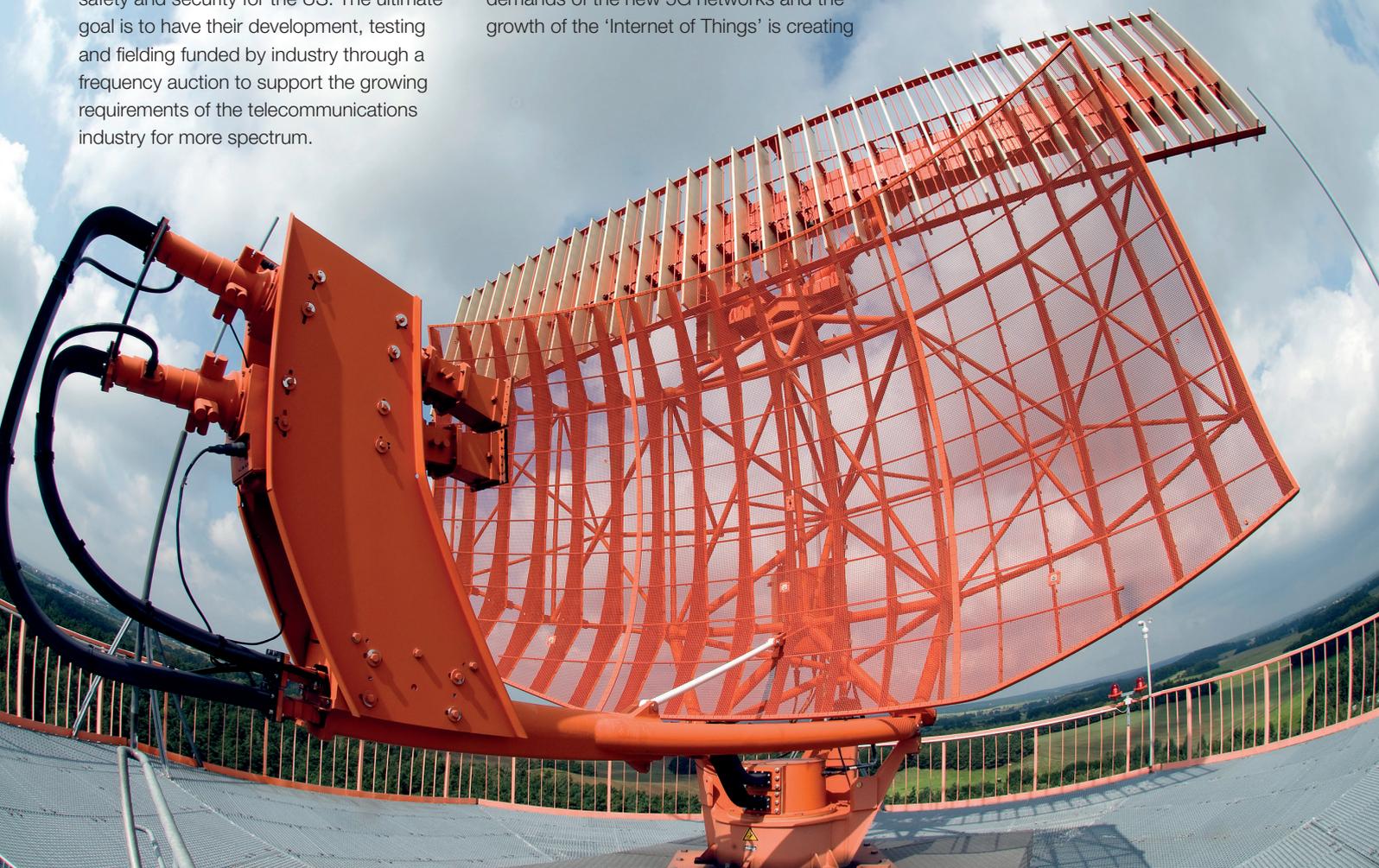
In 2015, the United States Congress passed the Bipartisan Budget Act which included the Spectrum Pipeline Act of 2015 that authorised the use of federal money for “research and development, engineering studies, economic analyses or other planning activities intended to improve the efficiency and effectiveness of the spectrum use by federal entities”. This bill built upon an earlier law, the Commercial Spectrum Enhancement Act of 2004, that created a Spectrum Relocation Fund (SRF) for federal agencies to recover the study and analysis costs associated with reallocating systems from spectrum bands that could be auctioned for commercial purposes.

The explosive growth in demand for wireless mobile connectivity, including the demands of the new 5G networks and the growth of the ‘Internet of Things’ is creating

The SENSR programme will replace aging infrastructure with modern, state of the art surveillance capabilities, something that will call for novel financing by industry

the need for more spectrum for use by the telecommunications industry. In addition to commercial users, the 5G network will support mission-critical emergency service and safety providers and will become an important part of a modern nation’s infrastructure. In response to this need for more spectrum, the US Congress passed the The Spectrum Pipeline Act of 2015 which required the identification of 30 megahertz of spectrum to be reallocated from federal to non-federal use by July 2024.

To assist the current users to vacate the identified spectrum bands, the Spectrum Pipeline Act calls for an auction of the identified frequencies. The proceeds of the auction will be used to cover relocation or



spectrum costs and finance the replacement of the existing systems. The US Government's Federal Communications Commission (FCC) since 1993 has successfully conducted more than 80 spectrum auctions and raised over \$100 billion. Estimates vary widely but the valuation of 30 MHz of L-Band spectrum suitable for telecommunications and available in a timely manner could exceed the \$20 billion.

To comply with the Spectrum Pipeline Act of 2015, the FAA, part of the Department of Transportation, is leading the SENSR Joint Program Office (JPO) along with representatives from the DoD, DHS, and the Department of Commerce (DOC). This joint effort by four federal departments in 2017 was provided \$71 million to begin the engineering work to plan for and vacate an appropriate band for auction.

The distribution of the funds and work of the JPO is being overseen by a technical panel led by the White House Office of Management and Budget (OMB) with the assistance of representatives from the National Telecommunications and Information Administration (NTIA) and the FCC.

### Capabilities

One of the key requirements of the SENSR programme is that the spectrum auction will result in no loss or degradation of existing or planned capabilities in the US or its territories. In fact, one major goal is, by utilising modern technologies and systems, that the existing capabilities can be expanded to cover even more of the DHS and DoD missions by increasing the capabilities of the surveillance systems and their associated coverage volumes. The SENSR JPO has identified the 1300 MHz – 1350 MHz band (in the L-band frequency range) as a candidate for the spectrum auction.

This band is the home of the FAA's legacy long range radars, the Air Route Surveillance Radars (ASR-4) and the Common Air Route Surveillance Radar (CARSR). These radars provide surveillance within a 250 mile range (DHS CBP Tethered Aerostat Radar System TARS balloons along the US southern border used for drug interdiction and other border protection missions also operate radars in this band as do some military tactical radars) and serve the FAA for its air route traffic control mission, the DoD for its air defence mission and CBP for its security mission.

To meet the need of the telecommunications industry for clear spectrum free from strong surveillance radar

interference the radars will need to vacate their current L-Band spectrum. Due to the strong broadcast signals they generate and the safety critical nature of their mission, any band the long range radars are moved to will require the appropriate spectrum allocations to insure frequency protection for the radars and other system users. This requirement limits the number of bands available for relocation.

With the issues involved in establishing new allocations to protect frequencies - because of the issues involved in establishing a new allocation in an existing band, the JPO is not currently seeking new frequency allocations - it is most expedient to utilise existing frequency allocations. The problem is, almost all potential spectrum frequencies the ARSR-4 and CARSR use, have radar systems that would need to co-exist with these new high power radars. The best candidate to move to is in the S-Band at 2.7 GHz to 2.9 GHz. This band currently has air traffic control short range (Terminal) and doppler weather radars operating in that band. Namely, ASR-8, ASR-9, ASR-11, NEXRAD.

To move the long range radars to a band already used by safety critical systems, all radars that currently exist in the 2.7 GHz to 2.9 GHz band will need to be modified so all the radars can co-exist without interference. Thus the SENSR JPO programme believes a full recapitalisation of all the radars, long and short range, will be required and they have therefore developed and submitted for approval to the White House a Pipeline Plan calling for the modernisation and or replacement of all air traffic control and weather radars in this band.

The SENSR Pipeline Plan does not specify required technology solutions. Vendors are free to propose updated traditional spinning radars, active electronically scanned array (AESA) systems, or even other technologies for airborne surveillance not tied to current radar solutions. A key goal of the Pipeline Plan is that the modernised radar architecture will utilise the spectrum more efficiently, existing inefficient redundant coverages will be reduced, and fewer radars will be required to provide the current operational coverage.

### Coverage

The plan anticipates that a competitive procurement will be conducted - the JPO is also seeking technology solutions and associated costs to improve current operational coverage to meet more stringent requirements - and a selection of a vendor (or

vendors) technical solution will be completed by the end of the 2021 calendar year. This will allow the programme 18 to 24 months to prepare for the spectrum auction scheduled to be completed by July 2024.

A significant problem arises as there is a funding gap from the proposed 2021 contract award to the start of system deployment scheduled in 2024. The US Government has made no budget appropriations for SENSR. The Government, through the SRF has provided very limited funding to date; and restrictions on SRF use means there is no funding available for vendors to finalise and develop their systems.

Additionally, the auction proceeds will not be available to fund new radar deployments until 2024 or 2025. With the source selection scheduled to be completed by the end of 2021 and no funds from the auction until 2024 there exists a significant programme risk. This uncertainty will directly impact the value of the auction.

It is apparent that spectrum being auctioned that is already available for use will be worth significantly more than spectrum that will need to be vacated. This programme will be the largest radar replenishment programme in history requiring a significant industrial base, investment by vendors, and time to build, test, and field new technology. It is feasible that without additional funding the waiting time for the telecommunications industry to fully benefit from the use of the spectrum may be over a decade.

Thus, when calculating the value of the spectrum being auctioned, the telecom industry must consider the investment of money that won't be actualised for many years. The auction proceeds may not be enough to cover the actual cost of the modernisation of the radars for the SENSR programme. Because the schedule of availability of the spectrum is a major driver for the value of the auction, the need for vacating the spectrum either in full or in significant part prior to the auction cannot be ignored.

Any potential delay and uncertainty in frequency access on and after the auction date results in the SENSR spectrum auction becoming more speculative. There are at least four potential solutions to this dilemma. First, the US Congress can appropriate funding to replace the radars; second, the needed funds can be borrowed from the US Treasury to be paid back at the conclusion of the spectrum auction; third, funds can be allocated out of the Airport & Airway Trust ►



Fund (AATF); fourth, industry partnering with government can develop an innovative financing process to identify funding sources and establish a mechanism and organisation to support the needs of the government and the telecommunications industry.

### Cycle

The use of appropriated funds from the US Budget is not a feasible option. The budget cycle in the US is a multi-year process requiring justification three years ahead of the time funds are required. If started now the earliest budget that could be influenced would be the 2022 budget which is too late to have much impact on the 2024 auction. The second option, borrowing from the US Treasury carries high risk to the programme. This is not a process that is normally done and there would be significant OMB and

Congressional Budget Office analysis and scoring required. The third option, use of the surplus in the AATF could be considered.

The problems with this approach are numerous. These funds are used to offset the spending from the general fund of the US Budget. Second, when the funds will be required, in 2021 to 2024 there is no guarantee that there will in fact be a surplus or even sufficient funds in the AATF. The AATF receives its funding from revenues from ten aviation-related excise taxes, including taxes on airfares, fuel, and cargo. Any downturn in the industry could result in less money flowing into the AATF. It would be difficult to base programme success on a funding source so sensitive to a downturn in the economy or the aviation industry.

The last option, and probably the most appropriate for this programme is the use of innovative financing. This approach is consistent with the Administration's infrastructure funding goals and because it will bring the needed financing to the programme, it will result in a savings of billions of dollars to the federal government and taxpayers while lowering the programme execution risk. Through an innovative financing solution, the government can maximise the proceeds

of the auction while simultaneously mitigating its risk. Both government and industry should endorse an innovative financing solution and the programme should require the SENSR contract bidder to deploy private-industry capital to execute on its vision.

The US Government would be able to leverage private sector efficiencies while also realising higher auction proceeds. There are a number of potential public/private funding models which have been demonstrated in other transportation projects and many of these could be adapted to the needs of this critical infrastructure programme.

The SENSR programme is an exciting opportunity to make the US airspace safer and more efficient for those who use the system while making the airspace more secure. The US Government will realise reduced operational and maintenance costs that will continue to pay significant benefits for many years to come. Using appropriate funding mechanisms, the entire cost to replace this aging infrastructure with a modern, state of the art system can be funded by industry without having to use government funds. A win for everyone, the government, the telecommunications industry and travellers.

Dan Hanlon is an Associate, Aviation Management Associates - [avmgt.com](http://avmgt.com) 

*"the entire cost to replace this aging infrastructure with a modern, state of the art system can be funded by industry without having to use government funds"*