



Low-Flying Aircraft Detection Along the Northern Border

August 9, 2019

Fiscal Year 2018 Report to Congress



**Homeland
Security**

U.S. Customs and Border Protection

Message from the Deputy Commissioner of CBP

August 9, 2019

I am pleased to present the following report, “Low-Flying Aircraft Detection Along the Northern Border,” which has been prepared by U.S. Customs and Border Protection (CBP).



The report was compiled pursuant to the language set forth in the Joint Explanatory Statement, which accompanies the Fiscal Year 2018 Department of Homeland Security (DHS) Appropriations Act (P.L. 115-141). The report describes DHS’s persistent wide-area domain awareness capabilities and highlights CBP’s investments that optimize air surveillance system performance to meet our homeland security mission needs better. The report outlines DHS’s near-term plan to establish a Northern Border Test Bed to employ and test capabilities that address low-flying aircraft along the Northern Border.

The report also outlines DHS’s and CBP’s planned way forward to leverage new, more affordable air surveillance technologies. In conjunction with the Spectrum Efficient National Surveillance Radar program’s assessment of candidate technical solutions, some of the technical solutions will be analyzed at the Northern Border Test Bed. The Test Bed should result in the identification of technologies that provide a significantly improved domestic air surveillance network that would allow DHS, for the first time ever, to be aware of small, low-altitude aircraft, including drones, as well as larger, higher flying noncooperative aircraft across the Northern and Southern Border regions persistently. This surveillance will enhance DHS’s overall border security posture significantly.

Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

The Honorable Lucille Roybal-Allard
Chairwoman, House Appropriations Subcommittee on Homeland Security

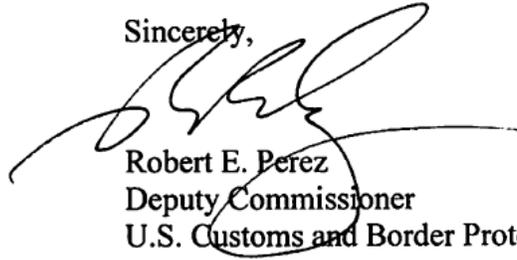
The Honorable Chuck Fleischmann
Ranking Member, House Appropriations Subcommittee on Homeland Security

The Honorable Shelley Moore Capito
Chairman, Senate Appropriations Subcommittee on Homeland Security

The Honorable Jon Tester
Ranking Member, Senate Appropriations Subcommittee on Homeland Security

I would be pleased to respond to any questions that you may have. Please do not hesitate to contact my office at (202) 344-2001.

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Perez', with a long horizontal flourish extending to the right.

Robert E. Perez
Deputy Commissioner
U.S. Customs and Border Protection



Low-Flying Aircraft Detection Along the Northern Border

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I. Legislative Language

This document was compiled pursuant to the legislative language set forth in the Joint Explanatory Statement accompanying the Fiscal Year (FY) 2018 Department of Homeland Security (DHS) Appropriations Act (P.L. 115-141).

The Joint Explanatory Statement states:

Due to the consolidated requirements and extended deployment and implementation schedule associated with the Spectrum Efficient National Surveillance Radar (SENSR) Program, low-flying aircraft detection coverage gaps along the northern border remain a national security threat. Within 180 days after the date of enactment of this Act, AMO is directed to provide the Committees with short-term deployment plans for low-flying aircraft detection along the northern border. These plans shall incorporate the anticipated implementation schedule for the SENSR program and acquisition and deployment schedules for interim technology or asset use.

II. Current Air Surveillance Capabilities and Requirements

DHS relies heavily on Federal Aviation Administration (FAA) radars, particularly those that have long-range radar capabilities, to execute its air border security responsibilities. Although these FAA radar systems have been DHS's best available option to provide persistent air surveillance, they never have met DHS's needs completely. The attacks of September 11th and the continuing lethality of our adversaries exacerbate the gap between the air surveillance that the Nation has and the air surveillance that the Nation requires. For DHS, this is particularly acute in lower altitude airspace in the border regions. These factors have put DHS and the other Departments responsible for securing and defending the homeland from air threats at a significant disadvantage.

In the late 1990s, FAA recognized that legacy National Airspace System (NAS) aircraft tracking technology¹ was insufficient to meet the air challenges of the future, which led to FAA development of its Next Generation Air Transportation System Plan (NextGen). Although NextGen intends to address future cooperative air traffic² needs, gaps still exist in addressing its future noncooperative air surveillance needs comprehensively.

Over the past 12 years, U.S. Customs and Border Protection (CBP) Air and Marine Operations (AMO) has expended \$400 million of its appropriations to operate and sustain the FAA-owned and -operated primary long-range radars in a cost-sharing arrangement with the U.S. Department of Defense (DOD). Of those funds, \$32 million was spent on capital improvements, and an additional \$152.5 million went toward a service life extension program (SLEP) that replaced obsolete analog system components of the 1960s and 1970s with solid-state technology. The SLEP produced the Common Air Route Surveillance Radar System, which replaced FAA's original Air Route Surveillance Radar (ARSR) 1, ARSR 2, ARSR 3, and FPS-series radar systems. In addition to these long-range radars, CBP's U.S. Border Patrol operates limited capabilities to track smaller, low-altitude aircraft along the U.S. southwest land border using shorter range radar systems. However, the existing systems fall far short of meeting DHS's air surveillance needs, which, as noted earlier, are greatest in DHS's ability to detect and track low-flying small aircraft, including drones, in the border regions.

DHS's overall air surveillance requirements reflect the difficult mission that its men and women perform, which is exacerbated by the challenges associated with the decades-old technology used to perform that mission, even with the SLEP. Replacing the current, dated, long-range radar systems with modern long-range radar systems will improve performance, but studies, such as the North American Air Domain Awareness Surveillance Analysis of Alternatives, indicate that

¹ FAA owns, maintains, and operates the air surveillance systems that until relatively recently have formed the bedrock of surveillance for the NAS. Beginning in 2005, DHS and DOD established an agreement with FAA to pay for the operating costs of the FAA long-range radars operating in the L-Band spectrum. This agreement remains in place.

² In this report, cooperative air traffic refers to aircraft that are meeting the legal and regulatory requirements to operate within the NAS.

this approach may be cost-prohibitive and still will not meet the current and emerging requirements. DHS's ongoing and potential near- and long-term capability development efforts are designed to meet both technology and cost challenges that have plagued past departmental and interagency efforts.

III. Near-Term Capability Development – Northern Border Air Surveillance Test Bed

In the near-term, DHS has decided to focus its efforts on identifying its air surveillance gaps, codifying its air surveillance requirements, evaluating its current air surveillance system performance, and testing both legacy and emerging technologies to meet the greatest risk to DHS's current air domain awareness posture: the limited ability to detect and track low-flying, small-airframe operations. The risks are accentuated on the Northern Border of the United States because of the rugged terrain, harsh winters, and the fact that there were fewer sensors originally sited along the Northern Border for cooperative air traffic control purposes. The Northern Border is fertile ground for adversary exploitation and provides an air environment conducive to undetected noncooperative air movements.

The establishment of a Northern Border Test Bed will affirm the effectiveness of new air surveillance technologies and approaches, thus adding value to the longer term interagency SENSR Program described in the following section of this report, while also providing air surveillance enhancements along the Northern Border. The Test Bed will focus on detecting aircraft operating at 8,000 feet and below, spanning a 20-nautical-mile-radius on either side of the Northern Border, from the Pacific Northwest to the east side of the Dakotas, with a 95-percent probability of detection of aerial vehicles as small as 0.25 square meters in size (the average size of a small drone). DHS anticipates that it will take a minimum of 6 months of continuous operations to capture representative air movement data and to allow DHS, for the first time, to have a comprehensive awareness of low-altitude small aircraft operating in the vicinity of the U.S. Northern Border. On the basis of analysis conducted in April 2018 in conjunction with the DHS Science and Technology Directorate, CBP believes that the effort will require a minimum of 10 sensor locations to capture enough measurable data. The number of sensor locations and resulting geographic coverage can be increased, if additional funds become available, to acquire more sensors to populate a larger geographical area. CBP believes that these sensors can be placed on existing government-owned property, reducing possible system placement sensitivity and security concerns. Finally, CBP intends to make available data obtained by the Northern Border Test Bed to interagency partners.

The below plan details DHS and CBP/AMO's short-term deployment plans for the Northern Border Test Bed.

Phase I

- Activities
 - Request for Information to Industry – explore advances in conventional sensor technology as well as passive technology
 - Site Inventory – identify all federal, state, and local government facilities as potential host locations for various sensor systems
 - Research and Development
 - Cold Weather Hardening – mitigate the effects of weather on system performance

- Self-Contained Emitters – provide sources of transmission where needed to fill required coverage volume

Phase II

- Activities
 - Site Selection
 - Optimization and Integration
 - Cross-domain Integration
 - Data Analysis

Phase III

- Activities
 - Sensor Acquisitions
 - Request for Proposal
 - Operational Capability Demonstrations
 - Deployment and Solution Implementation

If successful, the Northern Border Test Bed will provide valuable proof of the system-of-systems concept for noncooperative air surveillance, as well as performance information on potentially more affordable air surveillance sensor alternatives that will meet DHS's low-altitude requirements

IV. Long-Term Capability – Future Homeland Security Air Surveillance Network

Following the enactment of the Spectrum Pipeline Act,³ FAA, DOD, DHS, and the National Oceanic and Atmospheric Administration (NOAA)⁴ created the SENSR Program to explore the feasibility of vacating, without mission impact, a minimum of 30 megahertz (MHz) within the L-Band 1,300 to 1,350 MHz for reallocation to shared federal and nonfederal use.⁵ This portion of the spectrum currently is being used by the FAA NAS long-range radars used exclusively for missions performed by DHS and DOD. Ceasing operations of the radar systems residing in the targeted portion of the L-Band, including the FAA long-range radars, will have a grave impact on DHS's mission if not resolved satisfactorily through the SENSR Program.

As part of this effort, DHS is working with its interagency partners to identify its full set of air surveillance requirements and to begin planning for a future, modern-technology, affordable, domestic air surveillance network. Emerging technologies, including passive sensor technology, present a potentially viable capability alternative for addressing homeland security vulnerabilities and needs and are anticipated to be considerably more affordable than traditional radar systems. DOD already owns and deploys passive sensor technology for military use. On the basis of the results seen by DOD, it is very likely that DHS could use similar passive sensor technology to carry out border security and other homeland security missions requiring robust air surveillance.

DHS, through the SENSR effort, also is exploring the option of establishing and potentially owning a homeland security, noncooperative aircraft-focused network that would allow for technology optimization and upgrades based on evolving homeland security needs and the ability to incorporate necessary data and cyber security frameworks into the system. The use of appropriate data-sharing arrangements would ensure that other air surveillance stakeholders could leverage DHS system capabilities to supplement their own mission needs. In addition, by employing passive sensor technologies in a homeland security-focused air surveillance network, the U.S. Government also would avoid the lengthy FAA system certifications process for sensor incorporation into the NAS, accelerating the acquisition and fielding of this network, while maximizing spectrum efficiency, both of which likely would increase the auction value of the vacated spectrum.

³ The Spectrum Pipeline Act of 2015, Title X of the Bipartisan Budget Act of 2015, P.L. 114-74, 129 Stat. 621 (Nov. 5, 2015), requires that the U.S. Government explore opportunities to reallocate at least 30 MHz of electromagnetic spectrum from federal use to nonfederal use or to shared federal and nonfederal use by the year 2024. The U.S. Government will make this spectrum available for auction to the commercial wireless industries. The Act provides additional funds to the Spectrum Relocation Fund, managed by the Office of Management and Budget, for research and development and planning activities.

⁴ NOAA formally withdrew from the SENSR effort in October 2018 because of technology immaturity issues associated with its future weather radar requirements.

⁵ An additional objective of the SENSR Program effort is to maximize the spectrum efficiency of new and legacy air surveillance and weather sensors.

V. Conclusion

DHS is committed to exploring every opportunity to increase its domestic air surveillance capabilities to meet operational and security needs. As noted, DHS has invested considerable time and resources to close partially some of the gaps that exist in detecting lower altitude, smaller aircraft that are used for smuggling illicit goods and people, as well as for other nefarious uses, across U.S. borders. Despite these efforts, DHS has not been able to make substantial progress in closing the gap between what exists and what is needed.

In the near term, DHS's proposed Northern Border Test Bed provides a vital operational testing and proof-of-concept for new air surveillance technologies in concert with the longer term SENSUR Program while concurrently providing much-needed air domain awareness along the U.S. border with Canada. The Test Bed provides a number of derivative benefits that include, but are not limited to, validating promising low-cost technologies, qualifying and quantifying nefarious air activity along major stretches of the border, and providing a blueprint to address the low-flying, small-airframe detection problem in other priority areas. DHS also believes that by implementing the Northern Border Test Bed, the U.S. Government will be positioned better to receive industry "best value" passive surveillance options by affording smaller companies an opportunity to compete without needing to team with the larger radar houses.

In the long term, the interagency SENSUR effort provides a once-in-a-lifetime opportunity to attain a modern air surveillance network that is responsive to the needs of the homeland security stakeholders. If successful, the new network will allow DHS to have a high level of confidence in identifying illicit air traffic in support of national efforts to attain comprehensive operational security of U.S. borders.

Appendix: List of Acronyms

Acronym	Definition
AMO	Air and Marine Operations
ARSR	Air Route Surveillance Radar
CBP	U.S. Customs and Border Protection
DHS	Department of Homeland Security
DOD	Department of Defense
FAA	Federal Aviation Administration
FY	Fiscal Year
MHz	Megahertz
NAS	National Airspace System
NOAA	National Oceanic and Atmospheric Administration
NextGen	Next Generation Air Transportation Plan
SENSR	Spectrum Efficient National Surveillance Radar
SLEP	Service Life Extension Program