U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

John L. Mica
Ranking Republican Member

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

James W. Coon II, Republican Chief of Staff

October 15, 2007

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Aviation

FROM: Subcommittee on Aviation Staff

SUBJECT: NextGen: the FAA's Automatic Dependent Surveillance-Broadcast (ADS-B) Contract

PURPOSE OF HEARING

At 2:00 p.m. on Wednesday, October 17, 2007, in Room 2167 Rayburn House Office Building, the Subcommittee on Aviation will hold a hearing to consider the Federal Aviation Administration's (FAA) Automatic Dependent Surveillance Broadcast (ADS-B) contract.

Background

In the U.S., Air Traffic Control (ATC) surveillance and aircraft separation services are provided by the use of primary and secondary surveillance radar (SSR) systems, and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services.

Primary radar measures the range, bearing and velocity of a particular aircraft. It transmits a beam that is reflected by a target. This reflection forms a return signal that is translated into an aircraft position by ATC automation systems. Primary radar is a passive detection method that requires no special equipment aboard the aircraft. SSR systems consist of antennas, transmitters, and processors installed in ATC facilities, and radio transponder devices that are installed in aircraft. An SSR transmits interrogation pulses that elicit responses from transponders on board the aircraft. A transponder installed on the aircraft "listens" for the interrogation signal and sends back a reply that provides aircraft identification information. The aircraft is then displayed as a tagged icon on the air traffic controller's radar screen.

While radar technology has advanced over the last several decades, it has limitations. Most radars show where a target was a few seconds ago because they take time to receive return signals

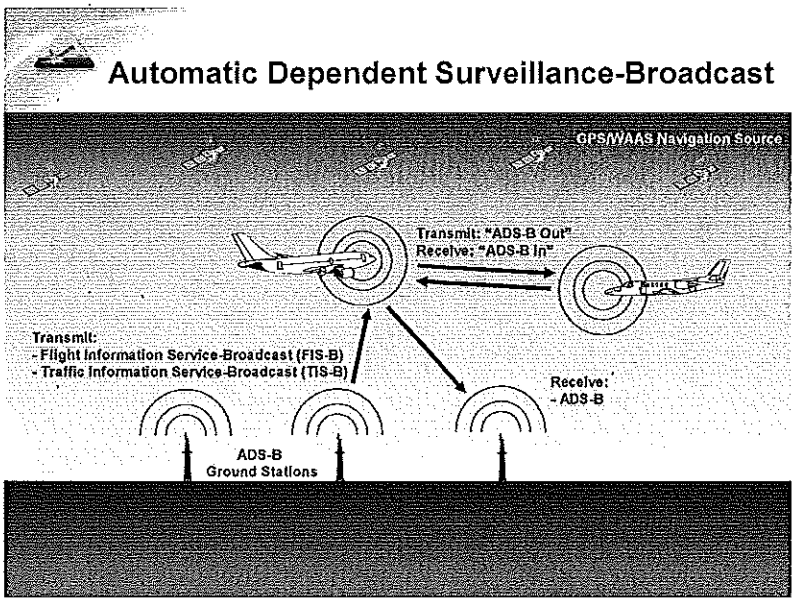
and update the controllers' displays. Additionally, radar occasionally has problems distinguishing airplanes from migratory birds and rain "clutter." Further, the accuracy of radar diminishes as the distance to the target increases. Moreover, both primary and SSR systems are large structures that are expensive to deploy and maintain; they also require the FAA to lease land for site installation.

The Department of Transportation (DOT) predicts up to a tripling of passengers, operations, and cargo by 2025. According to the FAA, to accommodate the projected level of traffic, more comprehensive surveillance in the national airspace system (NAS), including more radar sites in certain areas, would be necessary. However, the FAA also believes that even if more radar sites were commissioned, there are many areas in which radar coverage is not feasible, either geographically (e.g., mountainous areas) or in a cost-effective manner (e.g. remote areas). Therefore, the FAA has determined that the future of air traffic surveillance cannot be based solely on the use of radar, and it has initiated a transition to satellite-based surveillance, while maintaining a reduced radar network for back-up.

Automatic Dependent Surveillance – Broadcast (ADS-B) is the FAA's flagship program to transition to satellite-based surveillance. For the last few years, the FAA has tested and demonstrated ADS-B in Alaska (the "Capstone Program") and the Ohio River Valley ("Safe Flight 21"), and it recently signed a Memorandum of Agreement with the Helicopter Association International (HAI), helicopter operators and oil and gas platform owners in the Gulf of Mexico, to facilitate ADS-B implementation in the Gulf. Within the last 90 days, the FAA awarded a service contract to begin nationwide deployment of ADS-B and published a notice of proposed rulemaking (NPRM) mandating that aircraft operating in certain classes of airspace equip with ADS-B avionics by 2020.

Internationally, EUROCONTROL, a cooperative organization of 37 member states in Europe, is focused on developing a seamless, pan-European Air Traffic Management system -- The Single European Sky Air Traffic Research Project, commonly known as SESAR. In support of its objective, EUROCONTROL is considering a plan to install ADS-B ground broadcast transceivers in European areas that do not have adequate radar coverage. NAV Canada is deploying ADS-B in northern Canada to provide surveillance in the airspace over Hudson Bay where currently there is no radar coverage. NAV Canada anticipates having ADS-B in the rest of Canada as a replacement for, or complement to radar.

I. What is ADS-B?



Key elements of ADS-B include the Global Positioning System (GPS), aircraft avionics, and ground stations. ADS-B works by having aircraft avionics receive GPS signals and use them to determine the aircraft's precise position in the sky. Avionics then convert that position into a unique digital code and combines it with other data from the aircraft's flight monitoring system — such as the type of aircraft, its speed, its flight number, and whether it

is turning, climbing, or descending. This position is accurate to within 3 feet at any range, a vast improvement over the current 150 feet at 10 miles and 600 feet at 40 miles.

The code containing all of this data is automatically broadcast from the aircraft's avionics once per second. This broadcast is called "ADS-B Out" because the aircraft is broadcasting information out to other aircraft equipped to receive the data and ADS-B ground stations up to 200 miles away. "ADS-B In" refers to a properly equipped aircraft's ability to receive another aircraft's ADS-B Out information, as well as traffic information of non-equipped aircraft through the transition TIS-B capabilities described below. ADS-B In effectively enables aircraft to "see" other aircraft on flight deck displays.

ITT Corporation, the FAA's prime contractor for ADS-B, estimates that approximately 800 ground stations would be required to provide service for the entire the NAS. In turn, ground stations transmit this data to various "service delivery points" near TRACONs, en route centers and other facilities,[1] where automation systems process the ADS-B messages and generate air traffic displays for controllers, flow managers, and other personnel.

On October 5, 2007, the FAA published a NPRM that would mandate and specify performance requirements for ADS-B Out equipage by 2020. Equipage requirements would be tied to the class of airspace that an aircraft operates in. Generally speaking, the proposed rule would require ADS-B Out equipage for operation in Class A, B, and C airspace (high altitude airspace above 18,000 feet as well as airspace nearby congested and positive controlled airports), and in all airspace within 30 nautical miles (NM) of the busiest airports. FAA expects to publish the final rule in November 2009, and for aircraft to begin to equip shortly thereafter. The NPRM would not mandate aircraft to equip with ADS-B In.

To avoid frequency congestion, ADS-B transmissions will be broadcast over two frequencies. 1090 MHz Extended Squitter (ES) is the internationally agreed upon link for ADS-B, and will support operations by air carriers and high performance aircraft operating above 24,000 feet. 978 MHz Universal Access Transceiver (UAT) will be used primarily for general aviation (GA) aircraft flying at lower altitudes.

In addition to ADS-B surveillance services (referred to as "critical" services), the program will also provide two other ground-based uplink broadcast services (referred to as "essential" services) to aircraft equipped with ADS-B In. To enhance pilot situational awareness, Traffic Information Services-Broadcast (TIS-B) is a ground-based uplink report to pilots of proximate traffic that is under surveillance by ATC but is not ADS-B-equipped. For GA aircraft using UAT, Flight Information Services-Broadcast (FIS-B) is a ground-based uplink of flight information services (e.g. Notices to Airmen, Temporary Flight Restrictions, etc.) and weather data.[2]

---

[1] The FAA uses three types of facilities to control traffic: *Airport towers* direct traffic to the ground before landing and after takeoff within 5 nautical miles of the airport and about 3,000 feet above the airport. *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about 5 nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 feet above the ground. *En route centers* control aircraft in high-altitude en route airspace – i.e., in transit and during approaches to some airports, generally controlling air space that extends above 18,000 feet for commercial aircraft.

[2] UAT is intended to support applications for the general aviation user community that are not needed by air carriers because air carriers have weather radar, fly at high altitudes, and have other aeronautical links. Additionally, the 1090ES

The costs to equip commercial aircraft with ADS-B Out capability range from $32,000 to $175,000, depending on the age of the aircraft and its existing avionics. The additional costs to equip with ADS-B In, over and above ADS-B Out, range from $160,000 to $670,000; however, FAA officials estimate that most costs will be between $160,000 and $250,000.

For GA aircraft, average unit costs for UAT ADS-B Out range from $7,644 - $10,920, depending on aircraft type. Average unit costs for UAT ADS-B In and Out range from $10,444 - $29,770, depending on aircraft type. According to the FAA, costs will be reduced for aircraft that already have some portion of the required avionics (i.e. GPS, cockpit display), and costs are projected to be reduced by approximately 30% over time.

II. ADS-B Benefits

The FAA has described ADS-B as the "cornerstone" and "backbone" of the Next Generation Air Transportation System (NextGen), and "the future of air traffic control." The FAA clearly believes that ADS-B offers tremendous potential benefits to both the FAA and NAS users, estimating approximately $5 billion in benefits through 2035.

For the FAA, ADS-B may offer cost savings because it requires less ground-based infrastructure to maintain, refurbish, and replace. The FAA plans to keep primary radars in place as back up for the foreseeable future. However, ADS-B will enable the FAA to significantly reduce SSRs, while maintaining a network at high-density airports to ensure a back-up in case of a GPS outage. More specifically, FAA plans to reduce SSRs by almost 50 percent, from 365 to 190, between 2018 and 2024, resulting in an estimated $371 million in cost avoidance through 2035.

For NAS users, ADS-B could offer: better safety through enhanced pilot situational awareness, additional services (e.g. weather services) broadcast to the flight deck, and surveillance coverage to areas that are not now radar accessible, as well as greater capacity and efficiency due to reduced separation and ultimately aircraft self-separation.

ADS-B has a number of technical characteristics that make it potentially more accurate than radar. First, GPS, from which the ADS-B Out transmission is derived, is inherently more accurate than radar, and unlike radar its accuracy does not change with distance. ADS-B transmits position reports once per second, whereas terminal radars generate reports once every 4 to 5 seconds and en route radars generate reports once every 10 to 12 seconds. Faster position reporting can improve the display of target movement as well as the performance of software applications that use target reports as input. Particularly important while managing traffic in the terminal environment, the one-second reporting also gives more accurate positioning data while one aircraft is turning. In addition, ADS-B receives data directly from transmitters, rather than passively scanning for input like radar, so it does not have a problem with clutter like radar. Greater accuracy could allow the FAA to reduce current separation standards of 5 NM in the en route environment and 3 NM in the terminal environment. Regarding aircraft self-separation, the FAA states:

---

broadcast link does not support applications available from FIS-B, like weather and related flight information due to bandwidth limitations of the 1090ES link for transmitting the large message structures required by FIS-B.

> When properly equipped with ADS-B, both pilots and controllers will, for the first time, see the same real-time displays of air traffic. Pilots will have much better situational awareness because they will know where their own aircraft are with greater accuracy, and their displays will show them all the aircraft in the air around them. Pilots will be able to maintain safe separation from other aircraft with fewer instructions from ground-based controllers.[3]

Yet despite ADS-B's potential, there are uncertainties regarding when significant tangible benefits can realistically be expected. First, FAA officials have noted that ADS-B is a relatively mature technology, stating that the "technology is not highly complex."[4] But according to the Department of Transportation Inspector General's (DOT IG) office, nationwide ADS-B implementation will in fact be a technically complex undertaking. For example, the FAA will need to significantly modify existing automation systems (e.g., controller displays, software, and related computer equipment) in both the terminal and en route environments. Currently, most automation systems do not process and display ADS-B information. If existing controller displays and related equipment are not modified, air traffic surveillance applications for ADS-B cannot be used.

In addition, many of ADS-B's anticipated benefits depend heavily on the willingness of NAS users to equip and vary based on the type of equipage. Even if the contractor does not slip from the FAA's deployment schedule, the FAA's NPRM would not require NAS users to equip with ADS-B Out until 2020. Moreover, some of the greatest potential long-term ADS-B benefits (e.g. advanced capabilities like self-separation) rely on ADS-B In, which would not be mandated by the FAA's NPRM at all.

Nevertheless, FAA officials state that in some areas where there is currently little or no surveillance coverage (e.g. the Gulf of Mexico), and therefore very large aircraft separation standards, there could be tangible user benefits as early as 2009. Further, some NAS users may equip early to take advantage of new broadcast services such as TIS-B, FIS-B, or additional services provided by the contractor. Further, FAA officials have suggested that the FAA could encourage equipage by providing preferred airspace routes at higher altitudes for properly equipped aircraft, like a high occupancy vehicle (HOV) lane in the sky. In addition, some have suggested that Congress could also provide subsidies, low-interest loans, or tax incentives to accelerate equipage and accompanying financial and safety benefits to the system.

III. The ADS-B Contract

On August 30, 2007, the FAA awarded a performance-based service contract for ADS-B services to a consortium led by ITT Corporation.[5] The total value of the contract, which has a number of options extending through 2025, is $1.86 billion. Segment 1 is a $207 million cost-plus incentive fee contract that requires the contractor to: begin deployment of ground infrastructure in early 2008; provide TIS-B and FIS-B broadcast services for FAA commissioning in November 2008;

---

[3] Id.

[4] FAA Surveillance and Broadcast Services, *House Subcommittee on Aviation: Contract Briefing*, May 21, 2007.

[5] Also on ITT Corporation's team are: AT&T, Thales; WSI, Corp; Science Applications International Corporation (SAIC); PriceWaterhouseCoopers; Aerospace Engineering; Sunhillo; Comsearch; Mission Critical Solution (MCS) of Tampa; Pragmatics; Washington Consulting Group; Aviation Communications and Surveillance Systems (ACSS); NCR Corporation; and L-3 Avionics Systems and Sandia Aerospace.

and achieve FAA ADS-B surveillance service commissioning by September 2010. If the contractor completes Segment 1 successfully, Segment 2 will be a fixed price contract with subscription charges that will require all ground infrastructure be in place, and services to be available where current surveillance exists, by the end of fiscal year 2013.

Instead of adopting a more traditional acquisition strategy for ADS-B, whereby the FAA would own, operate, and maintain the system, the FAA has opted for a service contract approach, whereby the ITT team will build the ADS-B ground stations and own and operate the equipment. The FAA will pay subscription charges for ADS-B broadcasts transmitted to properly equipped aircraft and air traffic control facilities.

FAA officials believe that a service contract approach for ADS-B will reduce FAA costs by allowing the FAA to forego the expense of acquiring or leasing the land (and to forego associated environmental due diligence requirements) necessary to deploy the ADS-B ground infrastructure, as well as foregoing other acquisition, operating, and maintenance costs. The FAA estimates that a service contract would save the FAA approximately $820 million through 2035 versus a more traditional acquisition. The FAA also believes that a service contract will enable more rapid deployment of ground infrastructure. According to FAA, under a more traditional acquisition it would take until 2018 to complete NAS-wide deployment of ground infrastructure, which ITT expects to have deployed by the end of FY 2013 under the contract.

In addition, FAA officials believe that its approach provides more opportunity for private sector innovation that could result in new and improved services for users (and therefore greater incentives to equip) and even savings to the Government. For example, the contract enables the contractor to develop and sell "value added services" to NAS users and other customers. FAA officials have suggested that the contractor, subject to FAA approval, might develop more sophisticated weather services for NAS users, or it might sell air traffic data to airports or other customers that are interested in that data. A portion of the contractor's revenue from the secondary sale of these "value added services" will act as a rebate against the FAA's subscription fee, thus offering the potential for cost savings for the agency.

However, this approach may raise new management and oversight challenges for Congress and the FAA, since the contractor would not only own and operate the infrastructure, but would hold a competitive advantage, potentially even a monopoly, over new "value added services" provided over its infrastructure. Looking forward, Congress and the FAA may need to actively monitor this issue and, where appropriate, take measures that will ensure competition, quality service, affordable rates, and other consumer interests in the sale of these services. One such control included in the contract is the Performance Control Board. This Board has the approval responsibility of all value added services. Currently, the Board is comprised of FAA and ITT officials, and the agency has recently approached user groups and the stakeholder community for participation.

Some have suggested that there are inherent risks in allowing a private interest to own and operate such a critical piece of infrastructure, and that doing so will call for a heretofore unseen level of FAA oversight. Section 204 of the House-passed H.R. 2881, the *FAA Reauthorization Act of 2007*, would require the FAA to insert provisions into the contract that protect the Government's interest and ensure adequate safeguards are in place if the contractor is acquired by another firm, enters bankruptcy, or experiences performance problems. In fact, the FAA ADS-B contract does contain

several such protection provisions, some of which, according to FAA officials, were included in anticipation of H.R. 2881. Examples of these protection provisions include:

- "Succession Plan"/"Performance Guarantee" - requires a succession plan with a major subcontractor (AT&T) ready and agreed to perform if the prime contractor (ITT) cannot.

- "Continuity of Services" - requires the contractor to perform for up to two years in order to assure a smooth transition to a new contractor in the event of the contractor's default, bankruptcy, or acquisition by another entity or other event jeopardizing the uninterrupted provision of services.

- "Incentives/Disincentives Regarding Contract Performance" - adjusts the subscription charges the FAA would pay if the required service levels are not met.

- "Novation and Change-of-Name Agreements" – stipulates that the contractor needs the FAA's permission before another entity may assume the contract and receive payments under the contract.

- "Ownership and Filtering of data" - specifies that the FAA controls access and distribution of data used in the ADS-B program.

- "Performance Control Board" – establishes a board comprised of FAA and the contractor personnel that provides for monthly monitoring of the contractor against specified performance metrics, review changes to the system, and mutually resolve disagreements.

WITNESSES

PANEL I

Mr. Vincent Capezzuto
Manager, Surveillance and Broadcast Services Program Office
Federal Aviation Administration

The Honorable Calvin L. Scovel, III
Inspector General
U.S. Department of Transportation

Mr. John Kefaliotis
ADS-B Program Director
Defense
ITT Corporation

Dr. Agam N. Sinha
Senior Vice President and General Manager
Center for Advanced Aviation System Development
The MITRE Corporation

Mr. Tom Brantley
President
Professional Airways Systems Specialists (AFL-CIO)