Automatic Dependent Surveillance Broadcast (ADS-B)

Mission Need Statement-326

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INTRODUCTION

The Federal Aviation Administration's (FAA) strategic goal for system capacity and air traffic services is to provide improved accessibility, flexibility, and predictability for the user community, which includes air carriers, air taxis, general aviation and military users, while maintaining or improving the level of safety[1]. "Free flight" is an operational concept that addresses the FAA goal with a strong emphasis on increased user flexibility, with operating efficiencies and increased levels of capacity and safety to meet the growing demands of air transportation[1].

The concept of free flight was developed during 1995 by the RTCA Task Force on Free Flight, in which the FAA was an active participant. On April 20, 1995 FAA Administrator, David R. Hinson, asked RTCA to "...form a new task force led by an appropriate representative from the civilian aviation community, to develop consensus regarding free flight implementation." The RTCA Task Force produced a report entitled *The Final Report of RTCA Task Force 3: Free Flight Implementation* [2], that further defined the free flight operational concept, evaluated the free flight architecture and technology needs and identified a detailed incremental plan for transition to free flight. The RTCA Task Force 3 report also outlined specific operational capabilities and potential procedures and technologies that could achieve those concepts. Defined in the report is a future concept markedly different from today's rather rigid and largely procedural, analog, and ground-based system comprising HF/VHF-voice communications, terrestrial-based navigation systems, radar surveillance, and limited air traffic decision support. This future concept defines a flexible collaborative system to be achieved by applying today's technologies (e.g., satellite based)[2].

The free flight concept suggests that significant benefits can be achieved by concentrating on (1) removal of constraints and restrictions to flight operations, (2) better exchange of information and collaborative decision making among users and service providers, (3) more efficient management of airspace and airport resources, and (4) tools and models to aid air traffic service providers.

- ✓ ***Transition to free flight requires significant changes to the current air traffic management (ATM) and communications, navigation, and surveillance (CNS) systems of today[2].***

Several significant CNS technological advances have occurred that facilitate the movement toward free flight. The advent of satellite-derived position information (e.g., U.S. Global Positioning System (GPS)), with its unprecedented accuracy of position and time, the development of digital data link to allow rapid and reliable communications, and the growing capabilities of existing aircraft (and air traffic control facilities) offer many of the capabilities needed to support free flight implementation.

When coupled with advanced data communications technology, satellite-derived position information by accurately pinpointing positions in the air and on the ground, opens up vast opportunities to increase aerospace capacity and efficiency as well as aircrew and service provider productivity while enhancing safety. This coupling of satellite-derived position information and advanced data communications has created a new means of aviation surveillance commonly known as Automatic Dependent Surveillance-Broadcast (ADS-B). ADS-B is identified in the RTCA Task Force 3: Free Flight Implementation, as one of the enabling architectural elements on which the emerging ATM system is based.

- ✓ ***ADS-B is recognized as an enabling element of free-flight, i.e., serving as a means of relaxing restrictions and increasing flexibility in a number of environments. It will provide, air-to-air, air-to-ground, and ground-to-ground surveillance information, with advantages in cost, coverage, and performance when compared to extending current***

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[1] Instrument Flight Rules (IFR) aircraft handled at En Route Centers is forecast to increase over 22% through the year 2008 [11].

meet mandates and internal goals for NAS modernization. There are several ongoing and planned operational initiative touched by ADS-B (e.g., CDTI, Free Flight, etc.) in which investments have already been made. Delay or disapproval of ADS-B would come at great expense to these initiatives. A further consequence is that systems planned to be phased out may need replacement if ADS-B development and deployment does not proceed as planned. Also, any FAA delay in ADS-B implementation will impact user schedules for ADS-B equipage and free flight implementation.

Within the aviation industry there is clear agreement on the need to improve the flexibility of the air traffic system, to provide air traffic personnel with significantly improved tools with which they can better meet their responsibilities, and to provide air space users with sorely needed economic benefits as an inducement to make facilitating investments. For example, industry respondents commenting on the NAS Architecture ADS-B deployment schedule (in the 2008-2012 timeframe) favored a more aggressive implementation[12].

Fully exploiting ADS-B capabilities is dependent in large part on the extent of user equipage. Without full equipage of all controlled aircraft, ADS-B cannot replace secondary radars, which would provide the basis for further free flight benefits and reduce the overall surveillance costs to the FAA[13]. For airspace users, the motivation to equip will be based on the level of service available and benefits possible in any given airspace. These potential benefits will depend not only on the individual user's equipage, but also on the ground infrastructure and whether other users in the airspace are similarly equipped. Any perceived reluctance on the part of the FAA to fully commit to ADS-B implementation schedules will have a negative effect on the willingness of airspace users to equip.

The FAA has set as an objective the promotion of U.S. aviation system technologies, products, and services. International initiatives are ongoing to develop and deploy automatic dependent surveillance systems. For example, the Swedish Civil Aviation Administration (CAA) is working with an ADS-B technology known as VDL Mode 4. In light of this and other international initiatives (see Appendix A), the U.S. runs the risk of surrendering technical leadership in a potentially lucrative and growing market. This will adversely affect the ability of U.S. avionics manufacturers and software companies to compete for international product markets.

As noted above, the international aviation community is actively pursuing the development of automatic dependent surveillance technology. To ensure a continuos, seamless operation worldwide, ADS-B will require international harmonization, including ICAO Standards and Recommended Practices (SARPS). Consequently, a U.S. failure to proceed with ADS-B implementation may lead to lack of global interoperability.

10. LONG RANGE RESOURCE ALLOCATION PLAN RESOURCE ESTIMATE

A Rough Order of Magnitude (ROM) Benefit and Cost Analysis was prepared for this MNS. The ROM identified three primary benefit areas: safety, capacity and efficiency. The ROM used a 5:1 benefit/cost ratio to establish a projected upper range for the ADS-B resource allocation. The NAS architecture V3.0 resource estimate for ADS-B acquisition and implementation is outlined in Table 9. This estimate reflects the cost and schedule as currently proposed and is included as the lower range resource allocation estimate.

Table 9: Long Range Resource Estimate

$ Millions	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03	FY 04 - 20	Total
R, E, and D	0	7.2	8.5	9.1	5.2	1.3	2.0	33.3
F&E	0	0	0	0	0	3.4	686.4	689.8
OPS	0	0	0	0	0	0	1071.6	1071.6
TOTAL	0	7.2	8.5	9.1	5.2	4.7	1760	1794.7