EXHIBIT 300, ATTACHMENT 1

Final Program Requirements
for
Surveillance and Broadcast Services

Version 1.0

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1.0 BACKGROUND

The Federal Aviation Administration (FAA), RTCA, and Industry concept for the evolution of Free Flight establishes the need for surveillance improvements to increase safety and capacity on airport surfaces and throughout terminal, en route, and oceanic airspace, while decreasing delays. In the late 1990's the RTCA Free Flight Select Committee's Surveillance Working Group identified Automatic Dependent Surveillance-Broadcast (ADS-B) as the "cornerstone" of the future Air Traffic Control (ATC) surveillance system. The FAA's Flight Plan, National Airspace System Architecture, and Operational Evolution Plan, as well as the Joint Planning and Development Office's (JPDO) Next Generation Air Transportation System (NGATS) Integrated Plan all advocate ADS-B implementation into the National Airspace System (NAS) for enhanced surveillance.

The need for ADS-B is defined in the Mission Need Statement (MNS) # 326, Enhanced Surveillance Capability, which identifies the opportunity to take advantage of new technological advances in communication, navigation, and surveillance in order to meet the increasing demand for air traffic services. Specifically, this MNS focuses on the deployment of ADS-B technology to improve safety, capacity, and efficiency in the continued modernization of the NAS. It outlines the use of ADS-B in air-to-air, air-to-ground, ground-to-air, and airport surface surveillance to provide enhanced see-and-avoid, increased pilot situational awareness, reduce runway incursions, monitor aircraft and vehicles in airport movement areas, and provide surveillance in non-radar coverage areas.

Scope

This document details the requirements for the near term applications identified in the ADS-B Program Plan: Future application requirements will be identified in follow on requirement documents.

- ATC Surveillance
- Enhanced Visual Acquisition
- Enhanced Visual Approach
- Final Approach and Runway Occupancy Awareness
- Airport Surface Situational Awareness
- Conflict Detection
- Weather and NAS Status Situational Awareness

ADS-B is a system of systems, requiring functionality on participating aircraft and vehicles, in a ground infrastructure, and in participating automation systems. The ADS-B System provides ADS-B, TIS-B, ADS-R, and FIS-B Services. Performance for each of the services is specified and allocated herein to the aircraft/vehicle, the ground infrastructure, and the ATC automation system. It is anticipated that ADS-B to support ATC Surveillance will be mandated, all other application services and functions will be optional for the operator. This Document contains requirements that are subject to change as part of the system validation and therefore should not be used as the basis for aircraft avionics certification or approval.

The Program Requirements within this document are high-level performance requirements developed to drive performance level specifications, which are intended to allow a vender

maximum flexibility in meeting stated requirements. Program specifications derived from this document will provide a further level of detail.

2.0 OPERATIONAL CONCEPT

ADS-B is an advanced surveillance technology that enables equipped aircraft, or surface vehicles, to broadcast their identification, position, altitude, velocity, and other information. This concept utilizes a position source on the aircraft, which is more accurate than existing surveillance sources, for broadcasting positional information approximately once per second, thereby, providing improved accuracy and more timely information updates than conventional surveillance. The superior positional accuracy and the ability to provide additional aircraft-derived flight parameters (flight objects or flight data message elements) will result in enhanced surveillance in the NAS. ADS-B is automatic because no external stimulus is required; it is dependent because it relies on on-board navigation sources and onboard broadcast transmission systems to provide surveillance information to other users. The aircraft or vehicle originating the broadcast may or may not have knowledge of which users, aircraft or ground-based, are receiving its broadcast.

ADS-B technology additionally facilitates the implementation of Traffic Information Service-Broadcast (TIS-B), ADS-B Rebroadcast (ADS-R), and Flight Information Service-Broadcast (FIS-B) to support enhanced situational awareness and other applications. TIS-B service provides traffic information to equipped aircraft and surface vehicles based on the conventional radar returns received for non-equipped aircraft. ADS-R provides traffic information to equipped aircraft based on ADS-B transmission from aircraft on independent datalinks. FIS-B provides weather and NAS Status information to equipped aircraft.

Per the FAA's ADS-B Link Decision, two (2) data link technologies, the 1090 MHz extended squitter (1090ES) and the 978 MHz Universal Access Transceiver (UAT) have been approved for use in the NAS. It is anticipated that air transport category aircraft will equip with the 1090ES link and general aviation will equip with the UAT link.

The introduction of ADS-B services into the NAS will enable some well-established applications, currently supported by radar and other existing surveillance sources, and facilitate the introduction of new applications, that promise to improve safety and increase capacity. See the FAA's Surveillance and Broadcast Services Concept of Operations (CONOPS) for further details on ADS-B Services and Applications. Table 2-1 summarizes the relationship between ADS-B applications (Section 2.1), the ADS-B services (Section 2.2) that enable the applications, and the ADS-B operational system functions (Section 2.3) required to provide the ADS-B services.

Table 2-1 Applications, Services, and Functions

ADS-B Enabled Applications*	Services	Broadcast Services Function	Link-Specific Processing Function	ATC Automation Function	Aircraft / Vehicle Function
ATC Surveillance	ADS-B		X	X	X (Transmit)
Airport Surface Situational Awareness Final Approach Runway Occupancy Enhanced Visual Acquisition Enhanced Visual Approach Conflict Detection	ADS-B (only Aircraft/Vehicle Functionality Required) ADS-R TIS-B**	X	X		X (Transmit/ Receive)
Weather and NAS Status Situational Awareness	FIS-B	X	X		X (Receive)

* Only the ATC Surveillance will be mandated/required

** TIS-B, as specified herein, supports the Airport Surface Situational Awareness and Enhanced Visual Acquisition applications only

2.1 Applications

Many ADS-B applications are in various stages of development. A package of applications has been selected for ADS-B program implementation. The applications, listed in Table 2-1, were chosen based on maturity, cost and operational benefits, and adequacy of performance requirements development. An overview of each ADS-B application is provided in following sections.

2.1.1 ATC Surveillance

The objective of this application is to use the ADS-B surveillance information as a qualified surveillance source to provide ATC services throughout the NAS. Aircraft and vehicles will transmit the ADS-B positional and identification to ATC automation systems. ATC will use this ADS-B surveillance information in the same manner as current surveillance system information is used e.g., to assist aircraft with navigation, to separate aircraft, and to issue safety alerts and traffic advisories. Secondarily, the ADS-B surveillance information will be used to enhance the quality of existing surveillance information by providing an additional source of information for ATC automation system functions.

2.1.2 Airport Surface Situational Awareness

The objective of this application is to reduce the potential for aircraft and surface vehicle deviations, errors, and collisions through an increase in flight crew and vehicle operator, situational awareness while operating on the airport surface. Aircraft and surface vehicles are equipped with a display that shows their position information as well as that of other aircraft and vehicles in the vicinity.

2.1.3 Final Approach and Runway Occupancy Awareness

The objective of this application is to reduce the likelihood of flight crew errors and improve the capability of the flight crew to detect their own errors as well as potential ATC errors, by

increasing their awareness of aircraft and vehicles that are on or near the runway surface or up to approximately 1000 feet above ground level on final approach. This is accomplished through display of ADS-B traffic on a cockpit display that includes a depiction of the runway environment. The display is used by the flight crew to help determine runway occupancy and support go-around decision-making.

2.1.4 Enhanced Visual Acquisition

The objective of this application is to provide the flight crew enhanced traffic situational awareness in controlled or uncontrolled airspace/airports. A cockpit display enhances out-of-the-window visual acquisition of air traffic. Flight crews refer to the display during the instrument scan to supplement visual observations. The display can be used to either initially detect an aircraft or to receive further information on an aircraft that was reported by ATC.

2.1.5 Enhanced Visual Approach

The objective of this application is to allow an aircraft to safely perform approach procedures with its own visual separation from preceding aircraft. At busy airports, the use of this application on a more regular basis will enhance runway capacity. A cockpit display of nearby traffic provides continually updated identity and position information to assist the flight crew with achieving and maintaining visual contact with relevant traffic. Additional information such as range and speed assists flight crews in maintaining an appropriate distance from the preceding aircraft. The display may also be used to monitor aircraft on parallel approaches. The aircraft may be either ahead and approaching the same runway (i.e. in-trail), or ahead and approaching an adjacent closely spaced parallel runway.

2.1.6 Conflict Detection

The objective of Conflict Detection application is to enhance airborne situational awareness and reduce accidents and incidents by providing alerts and relevant traffic information to help the flight crew identify conflicts with other aircraft based on current flight states and intentions. A cockpit display shows location and intent information for traffic in the vicinity of the equipped aircraft. Additionally, the Conflict Detection application will alert pilots of developing conflicts in time to solve the conflict with minimum disruption to the flight path, given the long surveillance range afforded by ADS-B.

2.1.7 Weather and NAS Status Information Situational Awareness

The primary objective of this application is to provide the flight crew with improved access to textual and graphical weather and other aeronautical information (i.e., METAR, TAF, SIGMENT, PIREP, NOTAM, NEXRAD, Special Use Airspace status, etc). Many types of information, such as graphical weather products, are not easily conveyed by voice, as considerable detail is lost and the time and attention devoted to conveying the information is lengthy and diverts the pilot from primary flight duties. This application provides for the transfer of this information on the UAT data link only.

2.2 Services

The ADS-B System provides four services, ADS-B, TIS-B, ADS-R, and FIS-B. These services enable ADS-B applications to be performed. The following sections describe the ADS-B System services in more detail.

2.2.1 Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B equipped aircraft and vehicles broadcast their position and velocity and other information over one of the link technologies approved for use in the FAA NAS, UAT or 1090ES. These ADS-B Message broadcasts are received by other aircraft in the vicinity of the transmitting aircraft as well as the ADS-B ground infrastructure. Aircraft equipped with the proper equipment receive the ADS-B Messages and process and display the information for use in the applications described in Sections 2.1.2 through 2.1.6. The ADS-B ground infrastructure processes the ADS-B Messages and formats them into ADS-B Reports that are provided to ATC for use in delivering separation assurance and other services in support of the ATC Surveillance application.

During NAS-wide deployment of ADS-B, aircraft will begin equipping with ADS-B avionics. These equipped aircraft will receive broadcast ADS-B Messages directly from other aircraft equipped with the same data link technology. Thus, an aircraft equipped with a particular data link will have surveillance information on like-equipped aircraft. However, it will lack surveillance information on other aircraft in the vicinity that are not ADS-B equipped and those that are equipped with the other data link technology. The TIS-B and ADS-R Services address these shortfalls.

2.2.2 Automatic Dependent Surveillance-Rebroadcast (ADS-R)

As aircraft operating in the NAS may equip with either UAT or 1090ES data link technologies, the ground infrastructure will provide a service to rebroadcast ADS-B data received down one link back up the other link. This ADS-R Service permits aircraft and vehicles equipped with only a single data link to obtain a complete air traffic picture of all ADS-B equipped aircraft and vehicles.

2.2.3 Traffic Information Service-Broadcast (TIS-B)

TIS-B provides the ability of ADS-B equipped targets to see those aircraft that are not equipped with ADS-B. The ADS-B System ground infrastructure broadcasts TIS-B Messages for targets detected and reported by radar, or other surveillance systems, on both the UAT and 1090ES data links for reception by equipped aircraft. This permits the use of a subset of the air-to-air operations between equipped and non-equipped aircraft. TIS-B in conjunction with the ADS-R service will provide equipped aircraft the information needed for a complete picture of traffic in their vicinity. This TIS-B Service, as specified herein, supports the Enhanced Visual Acquisition and the Airport Surface Situational Awareness applications.

2.2.4 Flight Information Service-Broadcast (FIS-B)

FIS-B provides the broadcast of weather and non-control, advisory information, providing users valuable, near real-time aeronautical information, supporting safe and efficient operations. FIS-B products include, but are not limited to, graphical and textual weather reports and forecasts, Special Use Airspace (SUA) information, NOTAMS, electronic pilot reports (E-PIREPS), and

other similar meteorological and aeronautical information. FIS-B products, from both government and commercial sources, will be broadcast to aircraft from the ground on the UAT link only. In limited circumstances, aircraft will also broadcast FIS-B products. Aircraft derived products will be communicated in the ADS-B Message to other aircraft and to the ground.

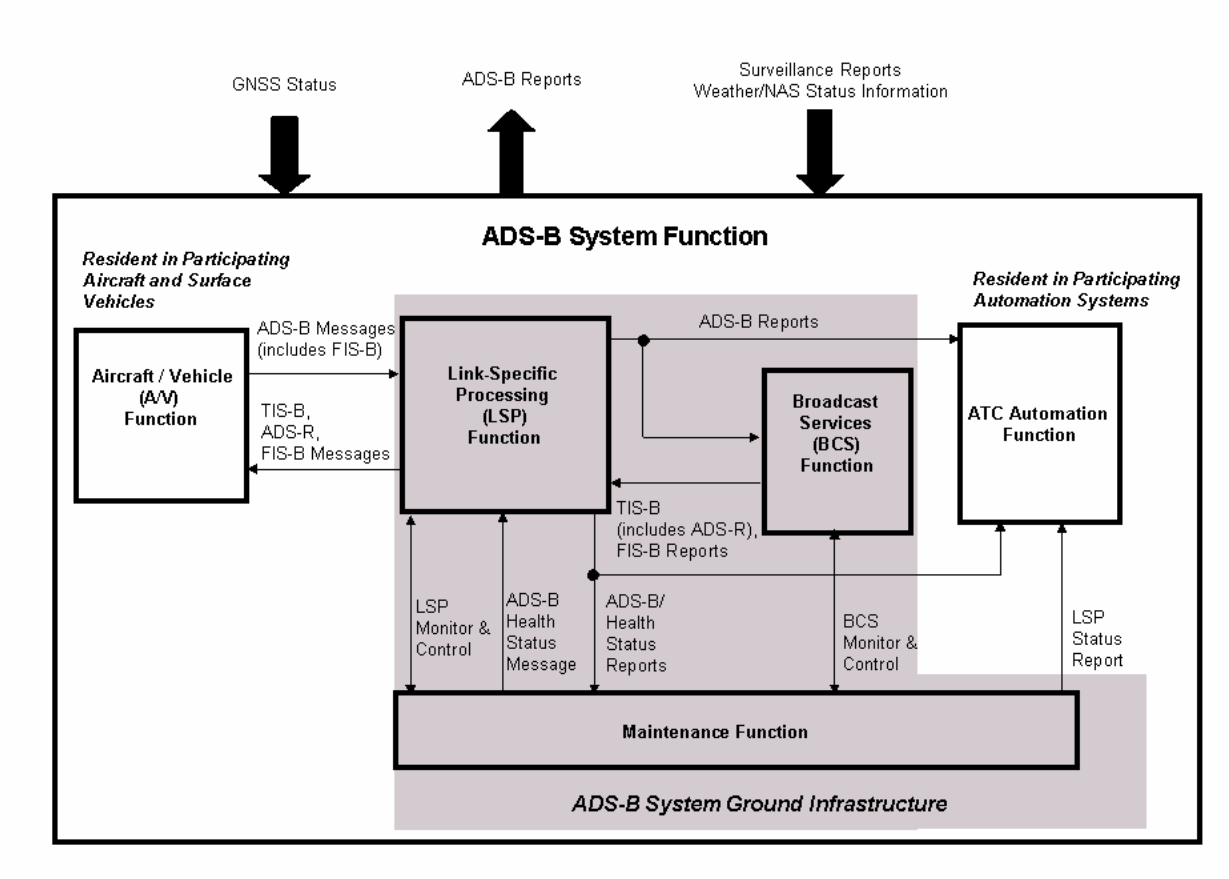
2.3 Functions

The ADS-B System can be logically divided into five major functions (see Figure 2.3-1):

1. Aircraft/Vehicle Function
2. Link-Specific Processing (LSP) Function
3. Broadcast Services (BCS) Function
4. ATC Automation Function
5. Maintenance Function

The first four functions are operational, while the Maintenance Function provides for the control and monitoring of the operational functions. Note that only the operational functions are listed in Table 2-1, as the Maintenance Function supports the services and applications in an indirect manner. The Aircraft/Vehicle Function resides in participant aircraft and surface vehicles. The ATC Automation Function resides in participant automation systems. The Link-Specific Processing, Broadcast Services, and Maintenance Functions form the ADS-B ground infrastructure.

The ADS-B System receives surveillance reports, from various NAS systems, to support the TIS-B service and weather and NAS status information, from government and commercial sources, to support the FIS-B service. The ADS-B system distributes ADS-B Reports to authorized user systems. The status of the GNSS and other NAS systems is also an input to the ADS-B System to determine degraded operations or an outage of these systems.



See Appendix 2 for the definitions of the information exchanges between functions.

Figure 2.1 ADS-B System Functions

2.3.1 Aircraft/Vehicle Function

The Aircraft/Vehicle includes a transmit capability that supports all applications and a receive capability for aircraft/vehicle based applications in Section 2.1.2 through 2.1.7.

2.3.1.1 A/V ADS-B Transmit Capability

The Aircraft/Vehicle Function is the source of ADS-B information. The Function derives state vector information, using GNSS or another navigation source, and determines the associated integrity and accuracy indicators. The Aircraft/Vehicle function also ascertains altitude information from a qualified barometric altitude source. Vehicles for surface use only could use a pre-programmed source for altitude information. The Function collects other ownship data, potentially including weather related measurements, and provides a means for crew input of additional information, such as aircraft identification data. The Aircraft/Vehicle Function encodes and broadcasts ADS-B Messages, conveying the collected information.

2.3.1.2 A/V ADS-B Receive Capability

The Aircraft/Vehicle Function receives and decodes ADS-B Messages transmitted by other Aircraft/Vehicles equipped with the same data link and TIS-B and ADS-R Messages transmitted

by the ADS-B LSP Function. Aircraft/Vehicle Functions equipped with the UAT data link additionally receive and decode FIS-B Messages transmitted by the LSP Function. The Aircraft/Vehicle Function processes and displays the information conveyed in received messages.

2.3.2 Link-Specific Processing Function

The LSP Function provides the ADS-B System transmit/receive functionality on the ground. The Function receives ADS-B Messages from equipped aircraft and surface vehicles, formats the associated ADS-B Reports, and distributes them to ATC Automation, the BCS Function, and other authorized users. LSP transmits TIS-B, ADS-R, and FIS-B Messages as directed by the BCS Function. This Function supports all services and applications.

2.3.3 Broadcast Services Function

The BCS Function processes, including tracking, filtering, and applying quality indicators, surveillance reports from external sources and ADS-B Messages from the LSP Function. Broadcast Services generates TIS-B and ADS-R Reports for transmission as TIS-B and ADS-R Messages by LSP. The BCS Function additionally processes weather and NAS status data from external sources and generates applicable FIS-B Reports for transmission as FIS-B Messages by LSP. This Function supports TIS-B, ADS-R, and FIS-B Services, but is not required for ADS-B. It supports all applications except ATC Surveillance.

2.3.4 ATC Automation Function

The ATC Automation Function uses ADS-B surveillance data similar to its use of radar system surveillance information. The Function supports environments with only ADS-B Surveillance as well as those having both ADS-B and radar surveillance. ATC Automation validates the position information provided in ADS-B Reports by comparing it with reports from other surveillance sources, as available. The Function associates the ADS-B Report data with filed flight plans, creates and updates tracks, and displays target and emergency information to Air Traffic Specialists. ATC Automation performs safety function processing, including Minimum Safe Altitude Warning, Conflict Alert, and Restricted Airspace Monitoring, using ADS-B and radar data, as available, and displays any associated alerts.

2.3.5 Maintenance Function

The Maintenance Function provides for the control and monitoring of the ADS-B ground infrastructure operational functions, Link-Specific Processing and Broadcast Services. Control includes the setting of configuration items, the download of new software, the request for read back of monitored parameter values, and any other actions necessary to control the operation and support the maintenance of the system. Monitoring includes the generation of alerts and alarms as well as the injection of Health Status Messages (test targets) into the LSP Function, and any other monitoring activities necessary to support the operation and maintenance of the system. The Maintenance Function uses information gathered in monitoring the system to generate Status Reports, containing high-level alarm and alert information and system counts, such as number of ADS-B Messages received, number of TIS-B Reports generated, etc. and distributing them to the ATC Automation Function.

The Maintenance Function additionally monitors ADS-B reception and the GNSS to analyze coverage and identify potential quality issues with Aircraft/Vehicle performance. The Function provides an interface to systems engineers and technicians for use in control and monitoring of the ADS-B System.

2.4 Implementation Strategy

The ADS-B System deployment approach is to implement the system via "pockets of opportunity" at select locations and expand the system NAS-wide as user and service provider interest and experience progress. Sites identified for earlier deployment have an immediate operational need and deployment will consist of a system infrastructure to support the initial ADS-B applications. Eventually, more complex applications and higher system functionality will be introduced NAS-wide. As these capabilities are introduced, updates to the ground infrastructure and A/V functionality will be implemented to support the new application.

ADS-B applications and supporting infrastructure will be introduced in a phased deployment consisting of four segments. This results in the implementation of a set of applications by segments. The general time interval for each segment is as follows:

Segment 1: FY 2007 – 2010

Segment 2: FY 2010 – 2014

Segment 3: FY 2015 – 2020

Segment 4: FY 2021 – 2025

As the ADS-B program progresses through the various segments, additional infrastructure and applications are deployed. ADS-B may also necessitate deployment of additional voice communications and weather infrastructure in selected locations to support ATC Services.

During Segment 1, ADS-B, TIS-B, and FIS-B services are provided in limited areas that can obtain benefits from early avionics equipage. An FAA rule is anticipated to be issued for equipping the aviation fleet to provide the basic functionality required for aircraft to support ATC Surveillance. Some aircraft will equip with advanced avionics to support airborne situational awareness applications. In this first Segment, future aircraft/vehicle based applications are evaluated and requirements are defined for these applications.

As the program transitions into Segment 2, the ground ADS-B service infrastructure is deployed on a NAS-wide scale and avionics equipage continues.

During Segment 3, all aircraft are equipped and the seven initial applications are available NAS-wide. Requirements definition has completed for some of the future **for** aircraft/vehicle based applications that provide benefits to users. Some of these future applications are partially deployed within the NAS. Requirements definition continues for other aircraft/vehicle based applications that are considered beneficial to

stakeholders. Existing legacy surveillance infrastructure removal commences during this segment to eliminate unnecessary redundant ADS-B / radar coverage.

Segment 4 is longer term and envisions the implementation of more complex aircraft/vehicle based applications, the removal of TIS-B services as full avionics equipage has been realized, and the decommissioning of unneeded legacy surveillance assets displaced by ADS-B coverage.

3.0 TECHNICAL PERFORMANCE

ADS-B System operational and functional requirements are detailed in section 3.1. Performance requirements are listed in section 3.2. Operational and functional requirements are traceable to the ADS-B functional analysis while performance requirements trace to multiple source documents (see Appendix 1 for further details).

3.1 Operational and Functional Requirements

3.1.1 Aircraft/Vehicle Function

3.1.1.1 ADS-B Transmission

3.1.1.1.1 Inputs

a. The Aircraft/Vehicle Function *shall* include an FAA approved sensor as the primary source of position and velocity and time data.

Note: The Aircraft/Vehicle Function may include a qualified alternate source of position data.

b. The Aircraft/Vehicle Function *shall* include an FAA approved pressure altitude sensor as the primary barometric altitude data source.

Note: Ground vehicles do not require pressure altitude sensor.

c. The Aircraft/Vehicle Function *shall* include a crew control interface to permit crew entry of data to support the minimum set of ADS-B data elements identified in Appendix 2.

Note: For example, operators with a call sign that changes from one flight to the other would need a crew interface for this element. Operators who use a static call sign would not need a crew interface for this element.

d. The Aircraft/Vehicle Function *shall* include a source for static configuration data associated with the aircraft that will be used to populate the ADS-B Message. (e.g., call sign, 24 bit ICAO address).

3.1.1.1.2 Processing

a. The Aircraft/Vehicle Function *shall* determine the accuracy and integrity of outgoing ADS-B data.
b. The Aircraft/Vehicle Function *shall* set the accuracy and integrity values in the ADS-B Message.
c. The Aircraft/Vehicle Function *shall* encode ADS-B Messages for transmission over an approved ADS-B datalink.

3.1.1.1.3 Outputs

a. The Aircraft/Vehicle Function *shall* broadcast ADS-B Messages in the UAT and /or 1090ES link format(s).
b. The Aircraft/Vehicle Function *shall*, at a minimum, provide the data elements identified in Appendix 2 within the ADS-B Messages.

Note: The ATC Surveillance Application is currently dependent on the Mode 3/A and ident. Future ATC automation systems may transition to ICAO codes or call sign and eliminate the need for ident.

3.1.1.2 ADS-B and Uplink Reception

The requirements in this section only apply if the Aircraft/Vehicle Function is intended to be used to support aircraft/vehicle based applications in Table 2-1.

3.1.1.2.1 Input

a. The Aircraft/Vehicle Function *shall* receive ADS-B information over one or both of the FAA approved datalinks, 1090ES and/or UAT.
b. The Aircraft/Vehicle Function *shall* receive ADS-R Message(s) over one or both of the FAA approved datalinks, 1090ES and/or UAT.
c. The Aircraft/Vehicle Function *shall* receive TIS-B Messages over one or both of the FAA approved datalinks, 1090ES and/or UAT.
d. The Aircraft/Vehicle Function *shall* receive FIS-B Messages when equipped with the UAT link.
e. The Aircraft/Vehicle *shall* include a current Airport Map Data Base (AMDB) to support the Airport Surface Situational Awareness and Final Approach and Runway Occupancy Awareness applications.

3.1.1.2.2 Processing

a. The Aircraft/Vehicle Function *shall* decode ADS-B Messages to extract the message information.
b. The Aircraft/Vehicle Function *shall* decode ADS-R Messages to extract the message information.
c. The Aircraft/Vehicle Function *shall* decode TIS-B Messages to extract message information.
d. The Aircraft/Vehicle Function *shall* process surveillance information in ADS-B and ADS-R Reports to identify traffic and alert situation.
e. The Aircraft/Vehicle Function *shall* process TIS-B Reports to identify proximate traffic.
f. The Aircraft/Vehicle Function *shall* decode FIS-B Messages to extract FIS data.
g. The Aircraft/Vehicle Function *shall* process FIS-B Messages to format this information for display.

3.1.1.2.3 Output

a. The Aircraft/Vehicle Function *shall* display Ownship information derived from its surveillance positioning source used for ADS-B.
b. The Aircraft/Vehicle Function *shall* display traffic derived from surveillance information within ADS-B, TIS-B and ADS-R Reports.
c. The Aircraft/Vehicle Function *shall* display alerts derived from surveillance information within ADS-B and ADS-R Reports.
d. The Aircraft/Vehicle Function *shall* display preloaded airport maps from the AMDB for use in terminal/surface operations.
e. The Aircraft/Vehicle Function *shall* display graphical and text based FIS-B Data.
   Note: The display of FIS-B data is only required for aircraft based equipment. Surface vehicles are not required to process or display this information.

3.1.2 Link-Specific Processing Function

3.1.2.1 Inputs

a. The LSP Function *shall* receive Universal Coordinated Time (UTC) as the standard reference of time to utilize for synchronization among all system components.
b. The LSP Function *shall* receive ADS-B Messages over both of the approved links, 1090 MHz Extended Squitter (1090ES) and the Universal Access Transceiver (UAT).
c. The LSP Function *shall* receive LSP Control Parameters from the Maintenance Function to configure and control operation of this function.
d. The LSP Function *shall* accept ADS-R Reports from the BCS function.
e. The LSP Function *shall* accept TIS-B Reports from the BCS function.
f. The LSP Function *shall* accept FIS-B Reports from the BCS Function.

3.1.2.2 Processing

a. The LSP Function *shall* decode ADS-B Messages to extract message information.
b. The LSP Function *shall* construct ADS-B Reports from the ADS-B Message data.
c. The LSP Function *shall* validate the position in ADS-B Reports to identify erroneous report positions.
d. The LSP Function *shall* extrapolate the position and altitude in the ADS-R Reports.
e. The LSP Function *shall* schedule ADS-R uplink broadcasts on 1090ES for ADS-B Messages received only on the UAT datalink.
f. The LSP Function *shall* schedule ADS-R uplink broadcasts on UAT for ADS-B Messages received only on the 1090ES datalink.
g. The LSP Function *shall* extrapolate the position and altitude in the TIS-B Reports.
h. The LSP Function *shall* schedule TIS-B uplink broadcasts on both the 1090ES and UAT datalinks.
i. The LSP Function *shall* schedule FIS-B uplink broadcasts on the UAT datalink.

3.1.2.3 Outputs

a. The LSP Function *shall* send ADS-B Reports to ATC Automation.
b. The LSP Function *shall* send ADS-B Health Status Reports to the ATC Automation Function.
c. The LSP Function *shall* send ADS-B Reports to the BCS.
d. The LSP Function *shall* send ADS-B Health Status Reports to the Maintenance Function.
e. The LSP *shall* transmit ADS-R Messages on the appropriate datalink.
f. The LSP *shall* provide sufficient information to enable the Aircraft/Vehicle Function to determine the availability of implemented TIS-B and ADS-R services.
g. The LSP Function *shall* transmit TIS-B Messages on both the UAT and 1090ES datalinks.
h. The LSP Function *shall* transmit TIS-B Messages on aircraft/vehicles in the airport movement area, and designated obstacles.
   Note: This requirement assumes surveillance on aircraft and vehicles is available. Obstacles may be provided to the TIS-B system through adaptation.
i. The LSP Function *shall* transmit FIS-B Messages on the UAT datalink.
j. The LSP Function *shall* send LSP Monitored Parameters to the Maintenance Function.

3.1.3 Broadcast Services Function

3.1.3.1 Inputs

a. The BCS Function *shall* receive UTC as the standard reference of time to utilize for synchronization among all ADS-R system components.
b. The BCS Function *shall* receive surveillance information from multilateration, primary/secondary surveillance radar systems, and ADS-B for use in generating TIS-B tracks.
c. The BCS Function *shall* receive FIS products from external functions for generating FIS-B uplink broadcast.
d. The BCS Function *shall* receive BCS Control Parameters from the Maintenance Function to configure and control the operation of this function.

3.1.3.2 Processing

a. The BCS Function *shall* generate an ADS-R Report for any unsupported data link of each ADS-B equipped aircraft/vehicle.
b. The BCS Function *shall* filter ineligible ADS-B Reports from the ADS-R Report output to LSP.
   Note: This filter is to prevent invalid or erroneous ADS-B Reports from being rebroadcast.
c. The BCS Function *shall* rate limit the TIS-B, ADS-R, and FIS-B Reports sent to the LSP to prevent overloading the datalinks.
d. The BCS Function *shall* track all targets detected by radars, both primary and secondary radars (i.e. radar reinforced), and/or multilateration systems.
e. The BCS Function *shall* generate and update a single TIS-B track from either single or multiple sensor inputs (multilateration, primary/secondary radar, or ADS-B) for a target.
   Note: The BCS Function may use ADS-B Reports to aid in the correction of radar registration and bias errors.
f. BCS Function *shall* generate a TIS-B Report for a target when the target's track state vector is updated by a sensor input.
g. The BCS *shall* associate ADS-B equipped targets with TIS-B tracks.
h. The BCS Function *shall* filter TIS-B Reports that have a corresponding ADS-B track on the same target.
i. The BCS Function *shall* process received FIS data to generate FIS-B Reports.
j. The BCS *shall* determine and report the availability of implemented TIS-B and ADS-R services for each Aircraft/Vehicle.
k. The BCS Function *shall* generate TIS-B Reports for those aircraft operating with a Mode A/C/S transponder that are not actively transmitting ADS-B.

3.1.3.3 Outputs

a. The BCS Function *shall* send TIS-B Service Status information to the LSP Function for broadcast to the Aircraft/Vehicle.
b. The BCS Function *shall* send ADS-R Reports to the LSP Function for broadcast over the appropriate datalink.
c. The BCS Function *shall* send TIS-B Reports to the LSP Function for broadcast over the appropriate datalink.

d. The BCS Function *shall* send ADS-R and TIS-B Reports to the LSP Function on aircraft/vehicles in the airport movement area, and designated obstacles.
   Note: This requirement assumes surveillance on aircraft and vehicles is available. Obstacles may be provided to the TIS-B system through adaptation.
e. The BCS Function *shall* send FIS-B Reports to LSP.
f. The BCS Function *shall* send BCS Monitored Parameters to the Maintenance Function for use in evaluating BCS operating status and performance.

3.1.4 ATC Automation Function

Note: that ATC Automation requirements apply to the appropriate automation systems only. For example, some requirements are noted to be specific to a particular domain (En Route, Terminal, or Surface).

3.1.4.1 Inputs

a. The ATC Automation Function *shall* receive ADS-B Reports for use in air traffic control functions.
b. The ATC Automation Function *shall* receive ADS-B Health Status Reports from the LSP Function.
c. The ATC Automation Function *shall* receive LSP Status Reports from the Maintenance Function.

3.1.4.2 Processing

a. The ATC Automation Function *shall* validate the position of ADS-B Reports with other surveillance sources when the surveillance source data is available.
   Note: Validation is employed to identify erroneous ADS-B position information.
b. The ATC Automation Function *shall* use the integrity and accuracy information in the ADS-B Report to determine whether tracks and safety functions should be updated with the report.
c. The ATC Automation Function *shall* use valid ADS-B Reports as a surveillance source to create or update tracks
d. The ATC Automation Function *shall* link valid ADS-B Reports with other surveillance sources to avoid duplicate tracks on a single target from being displayed.
e. The ATC Automation Function *shall* use valid ADS-B Reports as input to en route and terminal Safety Function processing, such as Minimum Safe Altitude Warning, Conflict Alert, Mode C Intruder, and Restricted Airspace Monitoring.
f. The ATC Automation Function *shall* process aircraft/vehicle status information in ADS-B Reports such as emergency ident, radio failure, etc.
g. The ATC Automation Function *shall* associate valid ADS-B tracks with flight plans.
h. The ATC Automation Function *shall* employ collision safety logic processing to detect and notify Air Traffic Specialists of ground movement area collision hazards for valid ADS-B targets.
i. The ATC Automation Function *shall* provide the capabilities necessary for simulation and training of Air Traffic and Airway Facilities specialists on ADS-B services.
j. The ATC Automation Function *shall* provide registration between ADS-B and radar.
   Note: The ATC Automation Function may use ADS-B Reports to aid in the correction of radar registration and bias errors.

3.1.4.3 Outputs

a. The ATC Automation Function shall provide Safety Function Alerts generated on targets regardless of the sensor source for the report (radar, ADS-B, or both).
b. The ATC Automation Function ***shall*** display either a single target position or a single system track for each target regardless of the surveillance sources reporting on the target.

3.1.5 Maintenance Function

3.1.5.1 Inputs

a. The Maintenance Function ***shall*** receive LSP Monitored Parameters to determine the health and performance of the LSP.
b. The Maintenance Function ***shall*** receive BCS Monitored Parameters to determine the health and performance of the BCS.
c. The Maintenance Function ***shall*** receive the ADS-B Health Status Report to evaluate the operating status of the ADS-B system.
d. The Maintenance Function ***shall*** receive GNSS status from external sources to assess the operational status of the GNSS sources in the Aircraft/Vehicle Function.
e. The Maintenance Function ***shall*** receive Radar Status Reports from external surveillance sources to assess the status of these sources.
f. The Maintenance Function ***shall*** receive ADS-B Reports for real-time Data Analysis.

3.1.5.2 Processing

a. The Maintenance Function ***shall*** monitor the operating status and performance of the LSP Function.
b. The Maintenance Function ***shall*** generate an LSP Status Report that identifies the operational status of the LSP function.
c. The Maintenance Function ***shall*** generate Health Status Messages to evaluate the processing performance of the LSP function.
d. The Maintenance Function ***shall*** configure and control the operation of the LSP Function.
e. The Maintenance Function ***shall*** monitor the operating status and performance of the BCS Function.
f. The Maintenance Function ***shall*** generate a BCS Status Report that identifies the operational status of the BCS Function.
g. The Maintenance Function ***shall*** configure and control the operation of the BCS Function.
h. The Maintenance Function ***shall*** provide a centralized monitor and control capability to evaluate performance during operation, control the equipment, monitor system health, and identify faulted modules.
i. The Maintenance Function ***shall*** generate Alerts and Alarms when monitored parameters exceed allowable tolerances.
j. The Maintenance Function ***shall*** assess ADS-B coverage using reception statistics from ADS-B targets of opportunity.
k. The Maintenance Function ***shall*** monitor individual aircraft and vehicles for compliance with ADS-B datalink standards.

l. The Maintenance Function *shall* include appropriate test tools to maintain and certify the operation of individual ground stations.
m. The Maintenance Function *shall* automatically restore the ADS-B System to normal operation when a fault condition clears.
n. The Maintenance Function *shall* record all ADS-B, TIS-B, FIS-B, and ADS-R Reports
o. The Maintenance Function *shall* record system configuration and adaptation information.
p. The Maintenance Function *shall* record system performance, alarms/alerts, and fault data.
q. The Maintenance Function *shall* date and time-stamp all recorded data.

3.1.5.3 Outputs

a. The Maintenance Function *shall* display system performance and certification data to the operator to assess the status of the system.
b. The Maintenance Function *shall* display Alerts and Alarms to the system operator.
c. The Maintenance Function *shall* display the operating status of system functions and components.
d. The Maintenance Function *shall* send control parameters to the LSP Function.
e. The Maintenance Function *shall* provide LSP Status Reports to the ATC Automation Function.
f. The Maintenance Function *shall* send control parameters to the BCS Function.
g. The Maintenance Function *shall* provide analysis results indicating areas where coverage is predicted to exist, where actual coverage is acceptable, where actual coverage is not acceptable, and areas where coverage is unknown due to lack of targets of opportunity.
h. The Maintenance Function *shall* provide a list of ADS-B equipped aircraft/vehicles that are not in compliance with the datalink standards.
i. The Maintenance Function *shall* display ADS-B Reports to the operator.
j. The Maintenance Function *shall* output recorded data to support the simulation capabilities necessary for second level engineering assessments.

3.1.6 ADS-B Backup

a. ATC Surveillance application *shall* continue to operate in the event of GNSS failure.
b. A backup system or strategy *shall* be provided with the ADS-B system to ensure that the ATC surveillance application can be provided in the event the navigation source is operating in a degraded state.

3.2 Product Characteristics and Performance Requirements

3.2.1 End to End Service Requirements

Availability is the probability of a service performing its required function at the initiation of the intended operation. It is quantified as the proportion of the time the service is actually available to the time the service is planned to be available.

3.2.1.1 ADS-B Service Availability

The ADS-B service is a safety-critical service as classified by NAS-SR-1000 for surveillance services. This requirement is driven by the ATC Surveillance application.

a. The ADS-B service *shall* meet a minimum Availability of 0.99999.

Note: ADS-B *Service availability applies to total outages in a service volume for the navigation source, back up surveillance source, the broadcast services infrastructure, and the automation system. It does not apply to outages that may occur on individual aircraft.*

3.2.1.2 TIS-B Service Availability

The TIS-B service is a safety-essential service as classified by NAS-SR-1000.

a. The service availability for TIS-B services *shall* be at least 0.999.
b. The LSP/BCS *shall* notify system users of TIS-B Service outages within 30 seconds of the outage occurrence.

Note: TIS-B Service availability applies to total outages in a service volume for the broadcast services infrastructure responsible for the TIS-B Service. It does not apply to outages that may occur on individual aircraft.

3.2.1.3 ADS-R Service Availability

The ADS-R service is a safety essential service as classified by NAS-SR-1000 for segment one applications.

a. The ADS-R service *shall* meet a minimum Availability of 0.999.

Note: ADS-R Service availability applies to total outages in a service volume for the broadcast services infrastructure responsible for the ADS-R Service. It does not apply to outages that may occur on individual aircraft.

3.2.1.4 FIS-B Service Availability

The FIS-B service is a safety-essential service as classified by NAS-SR-1000.

a. The service availability for FIS-B services *shall* be 0.999.

Note: FIS-B Service availability applies to total outages in a service volume for the broadcast services infrastructure responsible for the FIS-B Service. It does not apply to outages that may occur on individual aircraft.

3.2.1.5 System Latency for ATC Surveillance Application

The System Latency is the sum of the aircraft/vehicle latency from the time of applicability, the LSP/BCS latency with telecommunications, and the ATC Automation latency.

a. The latency from time of applicability of the ADS-B Message data until display by ATC Automation *shall* be less than or equal to 2.7 seconds to provide ATC Surveillance in Terminal airspace.
b. The latency from time of applicability of the ADS-B Message data until display by ATC Automation *shall* be less than or equal to 3.3 seconds to provide ATC Surveillance in En Route airspace.

3.2.2 Aircraft/Vehicle Function

The Aircraft/Vehicle Function is required for every application and participates in every service. The aircraft/vehicle transmits in support of the ADS-B Service and receives in support of all Services. The aircraft/vehicle performance requirements are presented herein for each Service. Within each Service, the requirements are broken into end-to-end performance for aircraft/vehicle based applications (for the ADS-B Service only), transmission, and reception subsections.

3.2.2.1 General Requirements

a. The Aircraft/Vehicle Function that supports 1090ES *shall* comply with FAA applicable Technical Standards Orders (TSO) and Advisory Circulars for this datalink..
b. The Aircraft/Vehicle Function that supports UAT *shall* comply with FAA applicable TSOs and Advisory Circulars for this datalink.

3.2.2.2 ADS-B Service

3.2.2.2.1 End to End Performance for Aircraft/Vehicle Based Applications

The requirements in this section apply to the end-to-end performance of the aircraft/vehicle based applications, Enhanced Visual Acquisition, Conflict Detection, Airport Surface Situational Awareness, Final Approach and Runway Occupancy Awareness applications. Where a particular application is not specified in the requirement text, the requirement applies to all applications. The requirements in this section only apply if the Aircraft/Vehicle Function is intended to be used to support aircraft/vehicle based applications in Table 2-1.

3.2.2.2.1.1 Latency

The latency is the time difference between the Time of Applicability (TOA) of information at the transmitting aircraft/vehicle to the display of this information on the receiving aircraft/vehicle.

a. The maximum latency from the TOA of position and velocity information in the transmitting aircraft/vehicle and display of this position/velocity information in the receiving aircraft/vehicle *shall* be less than 3 seconds to support the Conflict Detection, Airport Surface Situational Awareness, and Final Approach and Runway Occupancy Awareness applications.
b. The maximum latency from the TOA of position and velocity information in the transmitting aircraft/vehicle and display of this position/velocity information in the receiving aircraft/vehicle *shall* be less than 6 seconds to support the Enhanced Visual Acquisition and Enhanced Visual Approach applications.
c. The maximum latency from update of ID/Status information in the transmitting aircraft/vehicle to display of this information in the receiving aircraft/vehicle *shall* be less than 30 seconds.

d. The aircraft/vehicle maximum delay to indicate an integrity parameter value change *shall* be less than 40 seconds to support the Enhanced Visual Acquisition and Conflict Detection applications.
e. The aircraft/vehicle maximum delay to indicate an integrity parameter value change *shall* be less than 25 seconds to support the Enhanced Visual Approach, Airport Surface Situational Awareness, and Final Approach and Runway Occupancy Awareness applications.

3.2.2.2.1.2 Coverage Volume

The coverage volume is the region in which the aircraft-to-aircraft application performance requirements must be met.

a. The aircraft/vehicle *shall* meet all performance requirements for the Enhanced Visual Acquisition and Enhanced Visual Approach applications in a coverage volume defined by a 10 NM horizontal radius and ±3500 feet vertical about the center of the aircraft.
b. The aircraft/vehicle *shall* meet all performance requirements for the Conflict Detection application in a coverage volume defined by a 45 NM horizontal radius and ±15,600 feet vertical about the center of the aircraft.
c. The aircraft/vehicle *shall* meet all performance requirements for the Airport Surface Situational Awareness and Final Approach Runway Occupancy applications in the airport maneuvering area and within 3 NM of the runway threshold and less than 1000 ft AGL from the airport surface.

3.2.2.2.2 Aircraft/Vehicle ADS-B Transmission

The Aircraft/Vehicle transmits ADS-B Messages in support of all applications. The requirements in this section apply to all applications, unless a specific application is listed in the requirement text.

3.2.2.2.2.1 Transmission Power

a. The Aircraft/Vehicle transmit power *shall* be sufficient to support the ATC Surveillance Application as a minimum.
   Note: The minimum avionics requirements will be identified in FAA rule making
b. For Aircraft/Vehicles desiring to perform aircraft/vehicle based applications, the aircraft/vehicle transmit power *shall* be sufficient to support those aircraft/vehicle based applications.

3.2.2.2.2.2 Transmission Latency and Report Time Error

Report time error is defined as the reported time of applicability for an ADS-B Report minus the true time of applicability.

a. The Aircraft/Vehicle *shall* transmit position and velocity information within 1.0 second from the time of applicability of the ADS-B Message data for the ATC Surveillance application.
b. The Aircraft/Vehicle report time error *shall* be less than or equal to 1 second with a 95% probability to support the Enhanced Visual Acquisition, Airport Surface Situational Awareness, Final Approach and Runway Occupancy, and Enhanced Visual Approach applications.

c. The Aircraft/Vehicle report time error *shall* be less than or equal to 0.85 second with a 95% probability to support the Conflict Detection application.
d. The Aircraft/Vehicle report time error *shall* be less than or equal to 0.20 second with a 95% probability to support the ATC Surveillance application.
e. The aircraft/vehicle maximum delay to indicate an integrity parameter value change *shall* be less than 10 seconds to support the ATC Surveillance application.

3.2.2.2.2.3 Position and Velocity Transmission Frequency

The Aircraft/Vehicle must transmit position and velocity information frequently enough to support the update intervals required by each of the applications. The update interval is the time between successive updates of particular information, position and velocity in this case.

a. The Aircraft/Vehicle transmission rate of position and velocity *shall* be at least once a second.
b. The Aircraft/Vehicle transmission rate of identification data *shall* be at least once every 5 seconds.

3.2.2.2.2.4 Position and Velocity Information Accuracy

Vertical and horizontal position and velocity uncertainty is a 95% accuracy limit on the position and velocity, respectively.

3.2.2.2.2.4.1 Horizontal Position

a. The Aircraft/Vehicle *shall* provide horizontal position with a maximum error of less than or equal to 0.5 NM and equivalent bearing uncertainty less than 30 degrees with a 95% probability to support the Enhanced Visual Acquisition application.
b. The Aircraft/Vehicle *shall* provide horizontal position with a maximum error of less than or equal to 0.5 NM with a 95% probability to support the Conflict Detection application.
c. The Aircraft/Vehicle *shall* provide a horizontal position with a maximum error of less than or equal to 98.4 feet with a 95% probability to support the Airport Surface Situational Awareness and Final Approach and Runway Occupancy applications.
d. The Aircraft/Vehicle *shall* provide horizontal position with a maximum error of less than or equal to 0.1 NM with a 95% probability to support the Enhanced Visual Approach application.
e. The Aircraft/Vehicle *shall* provide position information with a 95% probability of a maximum error less than or equal to 0.3NM to support the ATC Surveillance application in the en route environment.
f. The Aircraft/Vehicle *shall* provide position information with a 95% probability of a maximum error less than or equal to 0.1NM to support the ATC Surveillance application in the terminal environment.
g. The Aircraft/Vehicle *shall* provide position information with less than 20 feet one sigma error to support ATC Surveillance on the airport surface.

3.2.2.2.2.4.2 Horizontal Velocity

a. The Aircraft/Vehicle *shall* provide a horizontal velocity with a maximum error of less than or equal to 9.8 feet per second with a 95% probability to support the Conflict Detection, Airport Surface Situational Awareness, and Final Approach and Runway Occupancy applications.

b. The Aircraft/Vehicle *shall* provide a horizontal velocity with a maximum error of less than or equal to 32.8 feet per second with a 95% probability to support the Enhanced Visual Approach application.
c. The Aircraft/Vehicle *shall* provide a horizontal velocity with a maximum error of less than or equal to 10 knots RMS to support the ATC Surveillance application.

3.2.2.2.2.4.3 Heading

a. The Aircraft/Vehicle *shall* provide a heading accuracy with a maximum error of less than or equal to 10 degrees with a 95% probability to support the Airport Surface Situational Awareness, Final Approach and Runway Occupancy applications.

3.2.2.2.2.4.4 Vertical Position

a. The Aircraft/Vehicle *shall* provide a barometric altitude accuracy with an error of less than or equal to 148 feet with a 95% probability for aircraft/vehicle based applications.
b. The Aircraft/Vehicle *shall* provide barometric altitude with an accuracy commensurate with the pressure altitude source to support the ATC Surveillance application.
   Note: Ground vehicles are not required to report altitude.

3.2.2.2.2.4.5 Vertical Velocity

a. The Aircraft/Vehicle *shall* provide a vertical velocity accuracy with a maximum error of less than or equal to 15 feet per second with a 95% probability to support the Airport Surface Situational Awareness and Final Approach and Runway Occupancy applications.
b. The Aircraft/Vehicle *shall* provide a vertical velocity accuracy that is as good as or better than that derived from barometric altimetry measurements to support the Conflict Detection application.

3.2.2.2.2.5 Information Integrity

Integrity indicates the level of trust in provided information. Position and Velocity integrity identifies the risk in the measured position or velocity estimate. An integrity containment bound is used to describe a region, relative to the reported value of position or velocity, within which the true value of that parameter is assured to fall. The integrity containment risk is the per flight hour probability that the reported position or velocity will exceed its containment bound without being detected and reported within the required maximum delay to indicate integrity containment change.

3.2.2.2.2.5.1 Horizontal Position Integrity Containment Bound

a. The Aircraft/Vehicle horizontal position integrity containment bound *shall* be less than 1 NM to support the Enhanced Visual Acquisition and Conflict Detection applications.
b. The Aircraft/Vehicle horizontal position integrity containment bound *shall* be less than 0.04 NM to support the Airport Surface Situational Awareness and Final Approach and Runway Occupancy Awareness applications.
c. The Aircraft/Vehicle horizontal position integrity containment bound *shall* be less than 0.2 NM to support the Enhanced Visual Approach application.
d. The Aircraft/Vehicle horizontal position integrity containment bound *shall* be less than 0.6 NM to support the ATC Surveillance application in the terminal environment.

e. The Aircraft/Vehicle horizontal position integrity containment bound *shall* be less than 2 NM to support the ATC Surveillance application in the en route environment.

3.2.2.2.2.5.2 Horizontal Position Containment Risk

a. The Aircraft/Vehicle integrity containment risk *shall* be less than or equal to 10^{-2} per hour to support the Enhanced Visual Acquisition and Conflict Detection applications.
b. The Aircraft/Vehicle integrity containment risk *shall* be less than or equal to 10^{-3} per hour to support the Enhanced Visual Approach, Airport Surface Situational Awareness, and Final Approach and Runway Occupancy Awareness applications.
c. The Aircraft/Vehicle integrity containment risk *shall* be less than or equal to 10^{-5} per hour to support the ATC Surveillance application.

3.2.2.2.2.5.3 Vertical Position Integrity Containment Bound

a. The Aircraft/Vehicle vertical position integrity containment bound *shall* be less than 1000 feet to support the Enhanced Visual Acquisition and Conflict Detection applications.
b. The Aircraft/Vehicle vertical position integrity containment bound *shall* be less than 367.5 feet to support the Airport Surface Situational Awareness and Final Approach and Runway Occupancy Awareness applications.

   Note: This requirement applies only to airborne aircraft performing these applications.

3.2.2.2.2.5.4 Identification and Altitude Integrity

a. The likelihood that the Aircraft/Vehicle transmits an aircraft identification (Mode A code, International Civil Aviation Organization (ICAO) code, or call sign) that differs from the true identification *shall* be less than 10^{-3} per flight hour to support the ATC Surveillance application.
b. The likelihood that the Aircraft/Vehicle transmits an incorrect altitude *shall* be less than 10^{-3} per flight hour for aircraft without an RVSM altimetry system to support the ATC Surveillance application.
c. The likelihood that the Aircraft/Vehicle transmits an incorrect altitude *shall* be less than 10^{-5} per flight hour for aircraft with RVSM altimetry systems to support the ATC Surveillance application.

3.2.2.2.2.6 Availability

Availability is defined separately for the aircraft/vehicle and is not included in the end-to-end service availability requirements in section 3.2.1.1.

a. Aircraft/Vehicle function shall provide a minimum availability of 0.9995 for non-redundant installations.

3.2.2.2.3 Aircraft/Vehicle ADS-B Reception

The Aircraft/Vehicle receives ADS-B Messages from other Aircraft/Vehicles in support of all applications, except ATC Surveillance. The requirements in this section apply to all of these supported applications, unless a specific application is listed in the requirement text. The requirements in this section only apply if the Aircraft/Vehicle Function is intended to be used to support aircraft/vehicle based applications in Table 2-1.

3.2.2.2.3.1 CDTI Track Drop Criteria

The maximum data age until dropped is the maximum time permitted between updates of measured data before the data is considered unsuitable for the application and is dropped from the CDTI.

a. The receiving Aircraft/Vehicle ***shall*** drop position and velocity data having an age greater than or equal to 36.3 seconds to support the Enhanced Visual Acquisition application.
b. The receiving Aircraft/Vehicle ***shall*** drop position and velocity data having an age greater than or equal to 30 seconds to support the Conflict Detection application.
c. The receiving Aircraft/Vehicle ***shall*** drop position and velocity data having an age greater than or equal to 15 seconds to support the Airport Surface Situational Awareness, Enhanced Visual Approach, and Final Approach and Runway Occupancy Awareness applications.

3.2.2.2.3.2 Airport Map

a. AMDB airport data ***shall*** be formatted in accordance with RTCA DO-291, *Interchange Standards for Terrain, Obstacle, and Aerodrome Mapping Data.*
b. The AMDB ***shall*** be in accordance with RTCA DO-272, *User Requirements for Aerodrome Mapping Information,* and DO 200-A, *Standards for Processing Aeronautical Data.*
c. The Aircraft/Vehicle ***shall*** include airport map databases for intended United States, civil and joint-use, towered-airports within the areas of operation.
d. AMDB production and maintenance capability ***shall*** be expandable and scalable to accommodate the airports at which the operator desires to employ the Airport Surface Situational Awareness and Final Approach and Runway Occupancy Awareness applications.

3.2.2.3 TIS-B Service

The Aircraft/Vehicle receives TIS-B information provided by the TIS-B Service. The Aircraft/Vehicle does not supply information to the TIS-B Service.

3.2.2.3.1 Aircraft/Vehicle TIS-B Transmission

The Aircraft/Vehicle does not transmit as part of the TIS-B Service, thus there are no transmit requirements.

3.2.2.3.2 Aircraft/Vehicle TIS-B Reception

a. The Aircraft/Vehicle ***shall*** meet the Aircraft/Vehicle ADS-B Reception requirements identified in section 3.2.2.2.3 for the TIS-B Service.

3.2.2.4 ADS-R Service

3.2.2.4.1 Aircraft/Vehicle ADS-R Transmission

The Aircraft/Vehicle does not transmit as part of the ADS-R Service, thus there are no transmit requirements.

3.2.2.4.2 Aircraft/Vehicle ADS-R Reception

a. The Aircraft/Vehicle *shall* meet the Aircraft/Vehicle ADS-B Reception requirements identified in section 3.2.2.2.3 for the ADS-R Service.

3.2.2.5 FIS-B Service on UAT Datalink

The FIS-B Service supports the Weather and NAS Status Information Situation Awareness application by providing this information to the pilot.

3.2.2.5.1 Aircraft/Vehicle FIS-B Transmission

The Aircraft/Vehicle function will not transmit as part of the FIS-B Service for segment one. Future applications may necessitate the aircraft/vehicle to transmit FIS-B data within the ADS-B Message. Therefore, there are no requirements for FIS-B transmission.

3.2.2.5.2 Aircraft/Vehicle FIS-B Reception

a. The Aircraft/Vehicle Function *shall* receive multiple Ground Uplink Messages in any one-second interval.

3.2.3 Link-Specific Processing & Broadcast Services Functions

The LSP and BCS Functions must meet the most stringent performance requirement for the ADS-B applications so that these functions support all the applications. The following sections present these requirements.

3.2.3.1 General Requirements

3.2.3.1.1 Time Source

a. The LSP/BCS *shall* be synchronized to UTC.
b. The LSP/BCS *shall* have an error less than +/-1 second from the true time for up to 1 hour after the loss of a timing source.

3.2.3.1.2 Time Accuracy

a. The LSP/BCS *shall* incorporate a timing source referenced to UTC that supports timing accuracy of +/-500 nanoseconds of UTC.

3.2.3.1.3 Scalability

a. The LSP/BCS *shall* be scalable for future expansion. Expansion may include additional surveillance or FIS sources, or additional uplink/downlink products processed by the LSP/BCS.

3.2.3.1.4 Enhanceability

a. The LSP/BCS *shall* be modular, allowing for improvement or upgrade of individual components without requiring changes to the other system components.

3.2.3.1.5 Software Compliance

a. The LSP/BCS software *shall* be developed in accordance with FAA-STD-026.

3.2.3.2 ADS-B Surveillance Service

The LSP/BCS receives ADS-B Messages from aircraft/vehicles and provides ADS-B Reports to ATC automation in support of the ATC Surveillance application.

3.2.3.2.1 Latency

The LSP/BCS latency includes receiving, processing and transporting ADS-B data to all ATC facilities designated to use the data for ATC services.

a. The uncompensated delay for LSP/BCS receiving, processing, and transporting ADS-B data *shall* not exceed 700 ms.

Note: The latency requirement applies when operating at system capacity.

3.2.3.2.2 Position Accuracy

The aircraft navigation source and avionics are contributors to ADS-B Report position and velocity accuracy. The ADS-B Report also includes quality parameters for the reported position and velocity.

a. The LSP/BCS Function *shall* preserve the target position and velocity accuracy represented in each ADS-B Report.

3.2.3.2.3 Update Rate

Each aircraft/vehicle will transmit ADS-B Messages with a position and velocity at least once every second. Aircraft/vehicle identification data may be transmitted less often. The ADS-B update rate as seen by the LSP/BCS is a function of operating environment and transmission range.

a. The LSP/BCS *shall* provide position and velocity data from each aircraft/vehicle in terminal airspace coverage with an update rate sufficient to support 3nm separation standards.
b. The LSP/BCS *shall* provide position and velocity data from each aircraft/vehicle in en route airspace coverage with an update rate sufficient to support 5nm separation standards.
c. The LSP/BCS *shall* provide position and velocity data from each aircraft/vehicle on the airport movement area with an update rate sufficient to support surface Air Traffic Control.
d. The LSP/BCS *shall* provide identification data from each aircraft/vehicle in coverage within 30 seconds with a 95% probability.

3.2.3.2.4 Integrity

ADS-B Messages are received, processed and transported by the LSP/BCS function to the ATC Automation Function. The integrity of ADS-B Reports cannot be compromised by the LSP/BCS as a result of software or hardware failures.

a. The probability that LSP/BCS introduces hazardously misleading information into an ADS-B Report while being processed *shall* be 10^{-5} or better per hour.

3.2.3.2.5 Coverage

ADS-B will provide ATC surveillance in current radar coverage areas and enable an expansion of these ATC services to include the airport surface at locations not presently serviced and some regions presently not in radar coverage.

a. ADS-B surveillance coverage *shall* include, but not be limited to the following:
   - in en route, terminal and air sovereignty airspace per NAS-SR-1000, section 3.2.3.G (3) and (4),
   - the aircraft movement area at airports with a control tower.

3.2.3.2.6 Capacity

a. The LSP/BCS *shall* process all ADS-B Messages received from aircraft/vehicles within ADS-B surveillance coverage (Reference section 3.2.3.2.5).

3.2.3.3 TIS-B Surveillance Service

The LSP/BCS receives surveillance data from ADS-B and radar-based sources and provides TIS-B Messages to aircraft/vehicles to enable advisory applications.

a. The TIS-B Service *shall* support the following applications:
   - Enhanced Visual Acquisition
   - Airport Surface Situation Awareness

3.2.3.3.1 Latency and Report Time Error

TIS-B latency is the difference between the time of measurement of the source position data and the time of transmission of the TIS-B Message. Report time error is the reported time of applicability minus the true Time Of Applicability.

a. The uncompensated delay for LSP/BCS processing of TIS-B Reports *shall* be less than 1.5 seconds.

   Note: This requirement applies to services delivered to the airport surface, terminal airspace and en route airspace. The TIS-B MASPS allocates 3.25 s from sensor measurement to TIS-B Message transmission. The expected maximum delay associated with getting target measurements from a radar sensor is 1.725 s, leaving the balance of time to the LSP/BCS.

   Note: The latency requirement applies when operating at system capacity.

b. The TIS-B Report time error *shall* not exceed 0.5 seconds with a 95% probability.
   Note: The TIS-B Report time error results from inaccuracies in estimating the time of sensor measurement.

3.2.3.3.2 Position Accuracy

The LSP/BCS updates aircraft position and velocity data using one or more surveillance sensors and is therefore the position accuracy is dependent on the accuracy of the contributing sensors.

a. The LSP/BCS *shall* provide TIS-B Reports with horizontal position accuracy better than 0.5 NM with a 95% probability for aircraft in en route and terminal airspace.
b. The LSP/BCS *shall* provide TIS-B Reports with horizontal position accuracy better than 98 feet with a 95% probability for aircraft on the airport surface.
c. The LSP/BCS *shall* provide TIS-B Reports with altitude accuracy of 148 feet with a 95% probability.

3.2.3.3.3 Update Rate

The LSP/BCS updates aircraft position and velocity data based on surveillance measurement events and is therefore dependent on the source sensor network for new data.

a. The LSP/BCS *shall* provide updated position and velocity data within a maximum of 12.1 seconds for aircraft in en route airspace.
b. The LSP/BCS *shall* provide updated position and velocity data within a maximum of 6 seconds for aircraft in terminal airspace.
c. The LSP/BCS *shall* provide updated position and velocity data within a maximum of 2 seconds for aircraft on the airport surface.

3.2.3.3.4 Integrity

The integrity of TIS-B Reports cannot be compromised by the LSP/BCS as a result of software or hardware failures. However, the integrity of the surveillance source data may also be determined and specified on an individual report basis.

a. The probability that LSP/BCS introduces hazardously misleading information into a TIS-B Report while being processed *shall* not exceed 10^{-3} per hour of operation.
b. The LSP/BCS *shall* provide information in each TIS-B Message to enable the Aircraft/Vehicle to determine the quality of the position and velocity data for each aircraft reported on by TIS-B.

   Note: If the TIS-B service is unable to specify the quality of the elements in the transmitted message, then elements which are unreliable or of unknown quality need to be appropriately identified, e.g., as invalid.

3.2.3.3.5 Coverage

The TIS-B coverage volume is the airspace within which transmitted information is received by and aircraft/vehicle. Coverage is limited by transmitter power and propagation characteristics of the data link radio.

a. TIS-B *shall* be user-accessible within the coverage volumes designated for this service.
b. TIS-B *shall* be user accessible on the airport surface and within airspace utilizing existing surveillance coverage from qualified radar-based sensors and ADS-B ground stations.

   Note: The TIS-B service volume is a region of coincident coverage from ground-based surveillance sensors used by TIS-B and ADS-B data link radio frequency coverage.

   Note: Qualified sensors include FAA digital radars and digitized analog radars. The intent is to use existing radars and not to deploy additional radars for the purpose of increasing TIS-B service coverage.

3.2.3.3.6 Capacity

a. The LSP/BCS *shall* be capable of simultaneously processing measurements received on all aircraft/vehicles with operating radar transponders or ADS-B transmitters within TIS-B coverage (section 3.2.3.3.5).

   Note: this requirement does not imply every received measurements result in a TIS-B Message transmission.

3.2.3.3.7 Communications Characteristics

a. The LSP/BCS *shall* communicate messages in the UAT TIS-B Message format specified in the UAT MOPS, RTCA DO-282A.
b. The LSP/BCS *shall* communicate messages in the 1090ES TIS-B Message formats specified in the 1090ES MOPS, RTCA DO-260A.

3.2.3.3.8 Service Volume

The TIS-B service volume is the airspace within which both ground-based surveillance coverage and data link radio coverage is available.

a. The LSP/BCS *shall* provide traffic information for all aircraft within the TIS-B service volume up to FL180. Within this volume, the following exception apply:
    i. Aircraft that have been observed to report ADS-B data on approved data links, on a link-by-link basis;
    ii. Aircraft who's TIS-B Reports have been designated for suppression.

3.2.3.3.9 False Report Rate

a. The LSP/BCS *shall* not increase the false TIS-B Report rate relative to the false measurement rate of the contributing sensor or sensors used to produce the TIS-B Reports.

3.2.3.4 ADS-R Surveillance Service

The LSP/BCS receives ADS-B on each approved data link and provides corresponding ADS-R Messages on the opposite datalinks.

a. The LSP/BCS *shall* provide ADS-R data on those aircraft/vehicles actively transmitting ADS-B only on UAT to aircraft able to receive on 1090ES.
b. The LSP/BCS *shall* provide ADS-R data on those aircraft/vehicles actively transmitting ADS-B only on 1090ES to aircraft able to receive on UAT.
c. The ADS-R service *shall* meet the performance requirements for the following applications:
    - Enhanced Visual Acquisition,
    - Airport Surface Situation Awareness,
    - Final Approach and Runway Occupancy Awareness,
    - Enhanced Visual Approach,
    - Conflict Detection.

3.2.3.4.1 Latency and Report Time Error

ADS-R latency is the difference between the time of ADS-B Message reception and the time of ADS-R Message transmission. Report time error is the reported time of applicability minus the true time of applicability.

a. The latency for LSP/BCS processing of ADS-R Reports *shall* be less than 1 second.
    Note: The latency requirement applies when operating at system capacity.
b. The report time error for ADS-R Reports *shall* meet the requirements for ADS-B Reports specified in the ADS-B MASPS, RTCA DO-242A.

3.2.3.4.2 Position Accuracy

The aircraft navigation source and avionics are contributors to aircraft-broadcasted ADS-B Report position and velocity accuracy. The avionics broadcast ADS-B Messages that include accuracy parameters in the ADS-B Report.

a. The LSP/BCS Function *shall* preserve the target position and velocity accuracy represented in each ADS-B Report.

3.2.3.4.3 Integrity

The integrity of ADS-R Reports could be compromised by the LSP/BCS as a result of software or hardware failures. Additionally, the integrity of the ADS-B State Vector data is specified on an individual report basis and passed through the LSP/BCS unchanged.

a. The probability that LSP/BCS introduces hazardously misleading information into an ADS-R Report while being processed *shall* not exceed 10^{-5} per hour of operation.
b. The LSP/BCS *shall* provide sufficient information in each ADS-R Message to enable the aircraft/vehicle to determine the quality of the position and velocity for each aircraft reported on by ADS-R.

3.2.3.4.4 Coverage

a. ADS-R *shall* be user-accessible within the coverage volumes designated for this service.
   Note: The coverage volume for ADS-R may not coincide with the ADS-B coverage volume due to performance differences between each service.
b. ADS-R coverage *shall* include, but not be limited to the following:
   - In en route, terminal and air sovereignty airspace per NAS-SR-1000, section 3.2.3.G (3) and (4),
   - The aircraft movement area at airports with a control tower.

3.2.3.4.5 Capacity

a. The LSP/BCS *shall* process all ADS-B Messages received from aircraft/vehicles with operating ADS-B transmitters and generate the necessary ADS-R Messages within the ADS-B surveillance coverage (section 3.2.3.2.5).

3.2.3.4.6 Communications Characteristics

a. ADS-R *shall* communicate messages in the UAT ADS-B Message format specified in the UAT MOPS, RTCA DO-282A.
b. ADS-R *shall* communicate messages in the 1090ES ADS-B Message format specified in the 1090ES MOPS, RTCA DO-260A.

3.2.3.5 FIS-B Products and Service on UAT Datalink

The FIS-B service and associated products support the Weather and NAS Status Information Situational Awareness Application. FIS-B products fall in one of two categories: meteorological or aeronautical information as presented in the following sections.

The LSP/BCS receives weather and NAS status information from government and commercial sources and provides FIS-B Messages to aircraft/vehicles.

a. The FIS-B service *shall* provide users with meteorological and aeronautical information.

3.2.3.5.1 Latency

The amount of time it can take to deliver a complete product to users will vary depending on the payload size and available uplink bandwidth. The FIS-B latency is the difference between the time the product source-data has been received and the time of transmission for the product to the aircraft/vehicle begins.

a. The delay for LSP/BCS processing of FIS-B products *shall* be less than 10 second.

3.2.3.5.2 Coverage

The FIS-B coverage volume is the airspace within which transmitted information is received by an aircraft/vehicle. Coverage is limited by transmitter power and propagation characteristics of the data link radio.

a. The FIS-B service *shall* be user-accessible within the coverage volumes designated for this service.
b. The FIS-B service *shall* be user accessible on the surface at designated airports.

3.2.3.5.3 Capacity

FIS-B will be delivered using an allocated portion of the UAT communication bandwidth.

a. The LSP/BCS *shall* be capable of transmitting up to 5 ground uplink blocks per second within each defined coverage volume.

3.2.3.5.4 Communications Characteristics

a. LSP/BCS *shall* communicate FIS-B products in the UAT Ground Uplink Message Format specified in the UAT MOPS, RTCA DO-282A.
b. LSP/BCS *shall* format FIS-B products for transmission in accordance with the FIS-B MASPS, RTCA DO-267A.

3.2.3.5.5 Service Volume

The FIS-B service volume is the spatial extent of an FIS-B product broadcast to users, which may vary by product.

a. The meteorological products *shall* represent the atmospheric conditions throughout the NAS airspace and at designated airports.
b. The aeronautical information products *shall* represent the status of NAS operational resources throughout the NAS airspace and at designated airports.

3.2.3.5.6 Basic Meteorological Products

a. Meteorological products *shall* be provided to users in graphic and/or text form.
b. The minimum set of meteorological products provided *shall* include, but are not limited to:
    - Airman's Meteorological Information (AIRMET),
    - Aviation Routine Weather Report (METAR) and Unscheduled Specials (SPECI)
    - Severe Weather Forecast Alerts (AWW) and Severe Weather Watch Bulletin (WW),
    - Ceilings,
    - Convective Significant Meteorological Information (SIGMET),
    - Echo tops,
    - Lightning strikes (cloud-to-ground),

- Next Generation Radar (NEXRAD) reflectivity,
- Pilot Reports (PIREPS) (urgent and routine),
- Significant Meteorological Information (SIGMET),
- Temperatures Aloft,
- Terminal Area Forecast (TAF) and unscheduled Amendments (AMEND),
- Terminal Weather Information for Pilots (TWIP),
- Winds aloft.

3.2.3.5.7 Basic Aeronautical Information Products

a. Aeronautical information products ***shall*** be provided to users in graphic and/or text form.
b. The minimum set of aeronautical information products provided ***shall*** include, but are not limited to:
   - Digital Automated Terminal Information Service (D-ATIS).
   - Local, Distant and Flight Data Center Notices to Airmen (NOTAMs) that are critical to flight safety or currently not available in FAA NOTAM Bulletin.
   - Status of Military Operations SUA.
c. The aeronautical information provided ***shall*** conform to applicable aeronautical information found in FAA approved Flight Information Publications.
d. The transmission of aeronautical information products(s) ***shall*** not degrade the transmission of meteorological products.

3.2.3.5.8 Value Added Products

Value added products are defined as those products beyond the basic meteorological and aeronautical information products defined in sections [3.2.3.5.1 and 3.2.3.5.2]. Value added products may be added to the basic product suite. Implementation timing of additional Value-Added products will depend on external factors, including:

- FAA Approval process for addition of FIS-B products.
- FAA Certification process for display of additional FIS-B products.
- Availability of UAT bandwidth for additional products without degradation of existing basic or value-added products.
- Refinement of bandwidth management techniques based on system operating experience.
- User demand and market penetration.
- Availability of suitable source FIS product data.

a. The FIS-B value added products ***shall*** be designed by the FAA as appropriate for aviation use.

   Note: Value added products will not be experimental.

3.2.3.5.9 Product Characteristics

a. The FIS-B products ***shall*** be consistent in content and extent with FIS information used by Flight Service and Air Traffic Specialists at NAS ground facilities.
b. All FIS products ***shall*** be based on government approved data sources.

   Note: Approved aviation weather information means that aviation weather information provided by the National Weather Service (NWS), sources approved by the NWS, or those sources authorized for approval by the Administrator in

FAA Order 8400.1 Air Transportation Operations Inspector's Handbook, Volume 3, Chapters 6 and 7.

c. Each FIS-B product ***shall*** be compliant with the FIS-B MASPS, RTCA DO-267A.
d. FIS-B products ***shall*** be available in both graphical and text formats, as appropriate.
e. FIS-B products ***shall*** conform to the product definitions in the FAA FIS-B Product Registry maintained by the FAA.

3.2.3.5.10 Product Delivery

Products will generally be received from the data source provider and processed on a first-in, first-out basis; however, a prioritization scheme may be used to ensure certain time-sensitive products are delivered in a timely manner. Each product will be retransmitted at a rate appropriate for the intended use of the information.

a. FIS-B products ***shall*** be updated and transmitted in accordance with the following table.

Product	Update Interval	Transmission Interval
AIRMET	As Available	5 minutes
AWW/WW	As Available, then at 15 minute intervals for 1 hour	5 minutes
Ceilings	As Available	5 minutes
Convective SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes
D-ATIS	As Available	1 minute
Echo tops	5 minutes	5 minutes
Lightning strikes	As Available	5 minutes
METAR	1 minute (where available), As Available otherwise	1 minute (for 1-min product only) or 5 minute
NEXRAD reflectivity	5 minutes	2.5 minutes
NOTAMs	As Available	5 minutes
PIREPS	As Available	5 minutes
SIGMET	As Available, then at 15 minute intervals for 1 hour	5 minutes
SUA Status	As Available	5 minutes
TAF	8 Hours	5 minutes
Temperature Aloft	12 Hours	5 minutes
TWIP	As Available	1 minute
Winds aloft	12 Hours	5 minutes

3.2.4 ATC Automation Function

Note that ATC Automation requirements apply to the appropriate automation systems only. For example, some requirements are noted to be specific to a particular domain (En Route, Terminal, or Surface).

3.2.4.1 ADS-B Surveillance Service (Terminal and En Route Airspace)

3.2.4.1.1 Latency

a. The ATC Automation Function maximum latency for automation processing of ADS-B surveillance inputs and display of ADS-B Reports ***shall*** be 1.0 second in terminal airspace.
b. The ATC Automation Function maximum latency for automation processing of ADS-B surveillance inputs and display of ADS-B Reports ***shall*** be 1.6 seconds in en route airspace.

3.2.4.1.2 Accuracy

a. The ATC Automation Function ***shall*** preserve the airborne horizontal position accuracy of ADS-B Reports.
b. The ATC Automation Function tracking performance with ADS-B data ***shall*** be equal or exceed tracking performance with radar in automation systems.
c. The ATC Automation Function ***shall*** only use ADS-B Reports with accuracy and integrity values that meet configured/adapted thresholds as inputs to tracking, safety alert and display functions.

3.2.4.1.3 Track Update Rate

a. The ATC Automation Function shall update tracks for a target with each incoming ADS-B report from the LSP/BCS Function, or at a configured/adapted rate that supports separation standards.

3.2.4.1.4 Integrity

a. The ATC Automation Function ***shall*** preserve the integrity of reported airborne horizontal positions.
b. The ATC Automation Function probability that Automation fails to detect large jumps in an aircraft position in an ADS-B Report that is outside the probable position ***shall*** be better than or equal to 10^{-3}.

   Note: The requirement addresses the ability to detect erroneous information in the report, which is not introduced by ATC Automation.
c. The ATC Automation Function allowable rate of false (self) conflict alerts due to non-correlation of ADS-B and radar targets in overlapping ADS-B/radar airspace ***shall*** not impact ATC's ability to control air traffic.

3.2.4.1.5 Coverage

a. The ATC Automation Function ***shall*** process and display ADS-B target data within the coverage volumes of the LSP Function and the BCS Function.

3.2.4.1.6 Automation System Capacity

a. The ATC Automation Function ***shall*** have sufficient capacity to process the ADS-B peak and steady state target capacity loading.

3.2.4.1.7 Display

a. The ATC Automation Function shall synchronize the display of ADS-B and other sensor position updates to support 3-nmi separation in the terminal environment.
b. The ATC Automation Function shall synchronize the display of ADS-B and other sensor position updates to support 5-nmi separation in the en route environment.

3.2.4.1.8 Safety Function

a. The ATC Automation Function alert time and other criteria for Conflict Alert, Minimum Safe Altitude Warning, Mode C Intruder, and Restricted Airspace Monitoring ***shall*** be met with ADS-B as an input source.
b. The ATC Automation Function rate of nuisance alerts with ADS-B input ***shall*** be less than or equal to that for the existing FAA automation systems with radar inputs.

3.2.4.2 Airport Surface Surveillance

3.2.4.2.1 Latency

a. The ATC Automation Function latency from receipt of an ADS-B Report to the display of the corresponding target ***shall*** be less than 1 second.

3.2.4.2.2 Accuracy

a. The ATC Automation Function ***shall*** preserve the horizontal position accuracy of ADS-B Reports.

3.2.4.2.3 Track Update Rate

a. The ATC Automation Function ***shall*** provide target/track updates at a minimum of once per second for ADS-B surface targets.

3.2.4.2.4 Integrity

a. The ATC Automation Function ***shall*** preserve the horizontal position integrity of ADS-B Reports.

3.2.4.2.5 Tracking

a. Surface ATC Automation Function ***shall*** track ADS-B Reports.
b. Surface ATC Automation Function ***shall*** update ADS-B tracks at least once per second.

3.2.4.2.6 Display

a. The ATC Automation Function shall synchronize the display of ADS-B and other sensor position updates to support surface Air Traffic Control.

3.2.4.2.7 Safety Alerts

a. The ATC Automation Function ***shall*** perform ground collision safety logic on ADS-B tracks for each track update.

3.2.5 Maintenance Function

3.2.5.1 Latency

a. The maximum latency for identification and notification of a system outage *shall* conform to NAS System outage reporting requirements.

3.2.5.2 Data Recording, Storage and Retrieval

a. All ADS-B, TIS-B, FIS-B, and ADS-R Reports *shall* be archived in accordance with NAS-SS-1000 Vol. 1, §3.2.1.2.8.3 and FAA Order 7210.3, Facility Operations.

4.0 PHYSICAL INTEGRATION

Note: The requirements in this section apply to equipments or facilities of the ADS-B system that are owned by the FAA or placed within an FAA facility.

4.1 Real Property

4.1.1 Land

Acquisition of land and facilities ***shall*** be in accordance with FAA Acquisition Management System policy, *Real Property Acquisition, Management and Disposal.*

4.1.2 Space

Acquisition of space ***shall*** be in accordance with the FAA Acquisition Management System Policy, *Real Property Acquisition,* and FAA Order 4420.4, *Space Acquisition.*

4.2 Reserved

4.3 Environmental

ADS-B System ***shall*** be in accordance with FAA Order 1050.1, *Policies and Procedures for Considering Environmental Impacts*; the *National Environmental Policy Act*; FAA Order 1050.10, *Prevention, Control and Abatement of Environmental Pollution at FAA facilities;* Title 40, Code of Federal Regulations (CFR), *Protection of the Environment;* 49 CFR, *Transportation*; and FAA Order 1050.19, *Environmental Due Diligence Audits in the Conduct of FAA Real Property Transactions.*

4.4 Energy Conservation

ADS-B System ***shall*** be in accordance with Executive Order 13123, *Greening of Government through Efficient Energy Management,* and FAA Order 1053.1, *Energy and Water Management Program for FAA Buildings and Facilities.*

4.5 Heating, Ventilation and Air Conditioning

Heating, ventilation, and air conditioning ***shall*** be in accordance with FAA Order 6970.3, *Plant Equipment Modification–Temperature Control, Ventilation,* and American Society of Heating, Refrigerating, and Air Conditioning Engineers 55, *Thermal Environmental Conditions for Human Occupancy.*

4.6 Grounding, Bonding, Shielding, and Lightning Protection

Grounding, Bonding, Shielding, and Lightning Protection of equipment ***shall*** be in accordance with FAA-Standard-019, *Lightning Protection, Grounding, Bonding, and Shielding for Facilities;* FAA-Standard-020, *Transient Protection Grounding, Bonding, and Shielding Requirements for Equipment;* National Fire Protection Association (NFPA) 70, *National Electrical Code®;* and IEEE Standard 1100-1999, *Recommended Practice for Powering and Grounding for Sensitive Electric Equipment.*

4.6.1 Acoustical Noise Criteria

ADS-B System acoustical noise criteria *shall* be in accordance with FAA-G-2100, *Electronics Equipment General Requirements;* and FAA-STD-020, *Transient Protection Grounding, Bonding, and Shielding Requirements for Equipment.*

4.7 Cabling

Cabling *shall* be in accordance with NFPA 70, *National Electric Code®;* FAA-C-1217, *Electric Work, Interior,* and FAA-G-2100, *Electronics Equipment General Requirements.*

4.8 Hazardous Materials

4.8.1 Handling of Hazardous Materials

Handling of hazardous materials *shall* be in accordance with 29 CFR 1910, *Occupational Safety and Health Standards;* FAA Order 8040.4, *Safety Risk Management;* 29 CFR 1000, *Air Contaminants;* and FAA Order 6000.54, *Airway Facilities Hazard Communications Program.*

4.8.2 Inherent Hazardous Materials

Hazardous materials inherent in ADS-B System *shall* be in accordance with FAA Order 1050.1, *Policies and Procedures for Considering Environmental Impacts,* and FAA Order 1050.10, *Prevention, Control and Abatement of Environmental Pollution at FAA Facilities*.

4.8.3 Asbestos and Lead

ADS-B System components *shall* be delivered without asbestos, Polychlorinated Biphenyls, and lead, in accordance with FAA Order 1050.20, *Airway Facilities Asbestos Control Program.*

Note: The only exception is lead used in lead solder in components.

4.9 Power Systems and Commercial Power

4.9.1 Electrical Power

Electrical power *shall* be provided in accordance with NFPA 70, *National Electric Code®;* FAA Order, *Electrical Power Policy;* FAA Order 6950.2, *Electrical Power Policy Implementation, NAS Facilities;* and FAA Order 6950.25, *Power Conditioning Devices at FAA Facilities.*

4.9.2 Power Profile

ADS-B System power profile *shall* be in accordance with FAA-G-2100, *Electronic Equipment, General Requirements.*

4.9.3 Electrical Quality

ADS-B System electrical quality *shall* be in accordance with FAA-G-2100, *Electronic Equipment, General Requirements.*

4.10 Telecommunications

Telecommunications *shall* be in accordance with FAA-STD-29, *Selection and Implementation of Telecommunications Standards;* and FAA Order 6000.36, *Communications Diversity.*

4.11 Property and Waste Disposal

ADS-B System equipment disposal plans ***shall*** be in accordance with FAA Order 4800.2, *Utilization and Disposal Of Excess and Surplus Personal Property;* 40 CFR, *Protection of the Environment;* FAA Order 1050.10, *Prevention Control and Abatement of Environmental Pollution at FAA Facilities*, FAA Order 1050.17, *Airway Facilities Environmental and Safety Compliance Program* and FAA Order 4660.8, *Real Property Management and Disposal*, and FAA Order 1050.19, *Environmental Due Diligence Audits in the Conduct of FAA Real Property Transactions.*

4.12 Seismic Activity

ADS-B System seismic activity ***shall*** be in accordance with FAA-G-2100, *Electronic Equipment, General Requirements.*

5.0 FUNCTIONAL INTEGRATION

5.1 Integration with NAS and Non-NAS Elements

5.1.1 Integration with FAA systems

a. ADS-B System *shall* be interoperable with FAA systems with which it operates and those by which it is monitored.

Note: FAA systems may include surveillance, tracking, and automation systems for Terminal, En Route, Oceanic, and Flight Service systems, Weather, and Aeronautical Information System, and the NAS Information Management System.

b. The ADS-B System *shall* interface with the following subsystems that are currently part of the FAA NAS or planned as a future NAS Upgrade:
   - Host Computer System (HCS).
   - Enhanced Backup Surveillance (EBUS).
   - En route Automation Modernization (ERAM).
   - Standard Terminal Automation Replacement System (STARS).
   - Common ARTS.
   - MEARTS.
   - NAS Infrastructure Management System (NIMS) / Remote Maintenance Monitoring Subsystem.
   - Air Route Surveillance Radars (ARSRs).
   - Airport Surveillance Radars (ASRs).
   - FAA Telecommunications Infrastructure (FTI)
   - Airport Surface Detection Equipment System (ASDE-X)
   - Advanced Technologies & Oceanic Procedures (ATOP).

5.1.2 Integration with non-FAA systems

ADS-B System subsystems *shall* interface with non-FAA public and private sector systems as necessary to perform their functions.

Note: Non-FAA systems may include Department of Defense surveillance, tracking, and automation systems used for NAS airspace, navigational aids, and air traffic control functions for Terminal, Tower, En Route, Surface Management System, Weather Systems, and Flight Plan operations.

5.2 Software Integration

ADS-B System software integration, development, and documentation *shall* be in accordance with FAA-STD-026, NAS *Software Development*.

5.3 Spectrum Management

Spectrum management *shall* be in accordance with FAA Order 6050.32, *Spectrum Management Regulations and Procedures Manual,* and FAA Order 6050.19E, *Radio Spectrum Planning.*

5.4 Standardization

ADS-B System functional characteristics, protocols, and data message format of ADS-B information ***shall*** be in accordance with the FAA *Interface Control Document*.

5.4.1 Interface Documents

ADS-B System interface documents ***shall*** be in accordance with FAA Standard 25, *Preparation of Interface Documents.*

5.4.2 Data Management

ADS-B System data management and standards ***shall*** be in accordance with FAA STD-060, *Data Standard for the NAS,* and FAA Order 1375.1, *Data Management*.

6.0 HUMAN INTEGRATION

6.1 Systems Engineering

Human Factors *shall* be addressed in the design, development, and testing of the ADS-B System, in accordance with FAA Order 9550.8, *Human Factors Policy*. These requirements apply only to ground based components of the system.

> *Note: The goal is to use human-centered design processes that will result in efficient, effective, user-acceptable system interfaces that will be simple to train on, use, and maintain.*

6.1.1 Human Factors Design Standard

The design of the ADS-B System *shall* be in accordance with Department of Transportation DOT/FAA/CT03/05 (HF-STD-001), *Human Factors Design Standard for Acquisition of Commercial-off-the-Shelf Subsystems, Non-Developmental Items, and Developmental Systems*.

6.1.2 Weather Situation Display Symbology

ADS-B System weather situation display symbology *shall* be in accordance with ACB2202002-02, *User Interface Designs for Advanced Weather of Terminal Air Traffic Control Displays.*

6.1.3 Usability

ADS-B System human system integration *shall* be in accordance with the HFDS, Section 3.2, *Design and Evaluation*.

> *Note: The metrics for usability are performance measurements, expert assessment ratings, and user feedback, as part of the human-centered design process.*

6.1.4 Operational Suitability

ADS-B System human-to-system interfaces *shall* be compatible and consistent within and across system and NAS elements, in accordance with the HFDS, Section 2.4.1, Standardize Hardware and Software; 3.4.2, *Provide Interface Consistency*; 3.12.14, *Integrated Displays*.

> *Note: As the system requirements evolve, the other systems in the NAS with which the ADS-B System must share human-to-system interface consistency must be specified. The design goal is to eliminate the need for users to learn different, and perhaps conflicting, system interfaces and interactions.*

6.1.5 Human Engineering Program

An ADS-B System Human Factors Engineering Program *shall* be developed in accordance with MIL-HDBK-46855A, *Human Engineering Program Process and Procedures*, Section 4, *Program Tasks*, and Section 7, *Human Engineering Procedures for Contractors*.

> *Note: The reference provides requirements for human factors planning, analysis, design, and testing activities.*

6.1.6 Human-to-System Interfaces

ADS-B System *human-to-system interfaces* ***shall*** be in accordance with the HFDS, Chapter 2, *General Design Requirements.*

6.1.7 Automation Guidelines

ADS-B System human-to-system interfaces ***shall*** be in accordance with the HFDS, Chapter 3, *Automation Guidelines.*

6.1.7.1 Fail Safe Design

Human-to-system interfaces ***shall*** be analyzed for system safety and personnel safety hazards in accordance with ASD-100-SSE-1, *The NAS Modernization System Safety Management Program*.

6.1.7.2 Human Error Resistant

ADS-B System human-to-system interfaces ***shall*** be in accordance with the HFDS, Section 3.1.18, *Make It Error Resistant and Error Tolerant*.

6.1.7.3 Infrequent Critical Tasks

ADS-B System human-to-system interfaces ***shall*** be in accordance with the HFDS, *Identify Alternatives in Rarely Used Modes*.

> *Note: The design goal is for The ADS-B System to be easy to use in critical or emergency situations in which human proficiency may have degraded because of infrequent performance of a task. The metrics for this requirement are time to perform and accuracy of performance for tasks and procedures deemed system- or personnel-safety-critical. Tasks and procedures will be defined as system- or personnel-safety-critical as a result of the ADS-B System Modernization System Safety Management Program, ASD-100-SSE-1.*

6.1.8 Human Computer Interface Requirements

ADS-B System human-to-computer interfaces ***shall*** be in accordance with the HFDS, Chapter 8, *Human-Computer Interfaces.*

6.1.9 Situation Displays and Controls

ADS-B System situation displays and controls ***shall*** be in accordance with the HFDS, Section *6.3, Visual Indicator-control Integration.*

6.1.10 Safety Labels

The ADS-B System ***shall*** be in accordance with the HFDS, Section 12.16, *Safety labels and placards*.

6.1.11 Documentation

ADS-B System user documentation and technical manuals ***shall*** be in accordance with the HFDS, Chapter 15, *User documentation*.

6.1.12 On-Line Help

The ADS-B System ***shall*** be in accordance with the HFDS, Section 8.6.1, *On-line help.*

6.1.13 Maintainability

ADS-B System maintainer-to-system interfaces ***shall*** be in accordance with the HFDS, Chapter 4, *Designing Equipment for Maintenance,* and Chapter 8, Computer-human Interface.

6.2 Employee Safety and Health

ADS-B System safety requirements ***shall*** be in accordance with FAA Order 3900.19 *Occupational Safety and Health Program;* the HFDS Chapter 12, *Personnel Safety*; and FAA-G-2100G *Electronic Equipment, General.*

> *Note: FAA Order 3900.19B requires adherence to 29 CFR 1910, Occupational Safety and Health Standards for General Industry; 29 CFR 1960, Basic Program Elements for Federal Occupational Safety and Health Programs; 29 CFR 1925, Safety and Health Standards for Federal Service Contracts; and 29 CFR 1926, Safety and Health*
>
> *Note: The design goal is for the system to be operable and maintainable by the current workforce, with no additional specialized skills and capabilities. This does not preclude new knowledge acquired through training.*

6.3 ADS-B System Equipment Installation

The ADS-B System physical and visual equipment installation and access ***shall*** be in accordance with the HFDS, Chapter 4, Designing Equipment for Maintenance and Chapter 10, Workstation and Workplace Design;29 CFR 1910.303, and FAA-G-2100G.

6.4 Training

ADS-B System training for Air Traffic and Airways Facilities Specialists ***shall*** be in accordance with HFDS Section, 2.6.4, Design Within User Abilities and include all relevant safety training as required by FAA-Order-3900.19 and applicable OSHA standards (29 CFR 1910).

> *Note: At a minimum, training should include applicable safe electrical work practices for operating and maintaining the ADS-B System and the required procedures for controlling hazardous energy sources per 29 CFR 1910.147, Control of Hazardous Energy Sources, and 1910.3333, Selection and Use of (Electrical) Work Practices and for any required personal protective equipment (29 CFR 1910 Subpart I, Personal Protective Equipment)."*

7.0 SECURITY

The ADS-B System and data shall be assigned appropriate Security Categorizations as defined in FIPS Publication 199 and NIST Special Publication 800-60 guidelines. Based on the Security Categorizations of the ADS-B system and data, the ADS-B System shall implement the appropriate, minimum security controls as defined in FIPS Publication 200 and NIST Special Publication 800-53.

7.1 Physical Security

ADS-B System physical security *shall* be in accordance with FAA Order 1600.69, *FAA Facility Security Management Program*.

7.2 Information Security

7.2.1 Level

ADS-B System *shall* have the required level of security and necessary training based upon risk analysis, threat, and vulnerability assessments in accordance with FAA Order 1370.82, *Information Systems Security Program***.**

7.2.2 Integrity/ Availability

ADS-B System *shall* be protected from threats to integrity and availability.

> *Note: Integrity/Protection is assurance resulting from the use of system and security mechanisms that ADS-B System systems are in their as-approved state and have not been illicitly modified and that ADS-B System data has not been illicitly modified from its correct form. Availability - Protection is assurance resulting from the use of system and security mechanisms that ADS-B System systems can support authorized users and are fully serviceable when needed.*

a. Modification

ADS-B System *shall* be protected from unauthorized modification.

b. Deletion

ADS-B System *shall* be protected from unauthorized information/data deletion.

c. Data Creation

ADS-B System *shall* be protected from unauthorized creation of data

d. Denial of Service

ADS-B System *shall* be protected from attacks that cause denial of service.

e. Degradation of Service

ADS-B System *shall* be protected from attacks that cause gradual degradation of service.

> *Note: Gradual degradation of service results from a threat attack that causes a reduction in system performance and/or an increase in the bit error rate.*

f. Misleading Data

ADS-B System *shall* be protected from introduction of misleading data into the NAS.

Note: Misleading data is any data that has been maliciously created or modified from official data and/or intruded into the ADS-B System for the purpose of causing a result other than that intended by the original official data. (See also "false data.")

g. False Data

ADS-B System *shall* be protected from introduction of false data into the NAS.

Note: False data is any unofficial data that has been maliciously created and/or intruded into the ADS-B System in a spoofing attempt. (See also "misleading data.")

7.2.3 Access

ADS-B System *shall* be protected from unauthorized access.

7.2.4 User Unique Identifiers

Users authorized access to ADS-B System *shall* have a unique identifier.

7.2.5 Verifiable

Users authorized access to ADS-B System *shall* be verifiable via an authentication mechanism.

7.2.6 Security Log

ADS-B System access attempts (date/time, quantity, etc.) *shall* be recorded in a security audit log.

Note: For systems, such as ADS-B System*, with geographically dispersed assets, security audit logs time-stamped with Universal Time (Z) facilitates forensic investigations of multiple threat attacks across different time zones. Therefore, use of Z-time is recommended, if practicable.*

7.2.6.1 Archived Security Log

ADS-B System *shall* preserve the security audit log for a minimum of 90 days.

7.2.6.2 Prevent Modification

ADS-B System *shall* prevent modification of the events recorded in the security audit log.

7.2.6.3 Malicious Activity

ADS-B System *shall* record all detected malicious activity in the security audit log.

7.2.6.4 System Security Rules

ADS-B System *shall* record all attempts to violate system security rules in the security audit log.

7.2.6.5 Administration Activities

ADS-B System *shall* record all security administration activities in the security audit log.

7.2.6.6 Audit Review Mechanisms

ADS-B System *shall* implement security audit review mechanisms.

7.2.7 Malicious Activity

ADS-B System assets *shall* be protected against malicious activity and malicious code.

> *Note: Malicious code is software that is illicitly inserted in a victim system or network with the intent of causing harm, such as denial of service or modification of official data. Examples of malicious code: viruses, worms, Trojan Horses, "logic bombs."*

7.2.7.1 Detection

ADS-B System *shall* detect malicious activity.

7.2.7.2 Deterrence

ADS-B System *shall* deter malicious activity.

7.2.7.3 Alert

ADS-B System *shall* alert specialists when malicious activity is detected.

7.2.8 Confidentiality

ADS-B System *shall* protect information system confidentiality based upon the result of a risk assessment.

> *Note: ADS-B* System *assets may be required to control the distribution of and access to flight plan data and flight tracking data for the aircraft of certain government agencies. Various controls are available for implementing this requirement; however, the defining risk assessment is an essential first step. Investment Analysis of candidate controls is also essential for making a business case for any design specifications.*

7.2.8.1 Disclosure

Disclosure of sensitive data *shall* be limited to authorized users.

7.2.8.2 Non-Repudiation

ADS-B System *shall* implement non-repudiation at a level based upon a risk assessment

7.2.9 Recovery

ADS-B System assets *shall* be capable of recovery measures from security incidents.

7.2.9.1 Security Incidents

ADS-B System assets *shall* have recovery measures for security incidents.

> *Note: Security incidents include denial of service attacks, unauthorized modifications of systems/data, penetrations, misuse, illicit access, etc.*

7.2.9.2 Access Control Recovery

ADS-B System asset access control mechanisms *shall* be operational at restart.

> *Note: The thrust of the requirement is to protect against a deliberately caused asset shutdown followed by a restart that bypasses access control mechanisms.*

7.2.9.3 Audit Control Recovery

ADS-B System asset security audit mechanisms *shall* be operational at restart.

> *Note: The thrust of the requirement is to protect against a deliberately caused asset shut-down followed by a restart that bypasses security auditing mechanisms.*

7.2.9.4 Security Controls

ADS-B System asset security controls *shall* be operational prior to placing the assets in service.

7.2.9.5 Certification and Authorization

ADS-B System certification and authorization *shall* be in accordance with FAA Order 1370.82, Information systems Security Program.

7.2.10 Data Interchange

ADS-B System data exchanged with other government agencies, aviation flight following organizations, education and research organizations, and other organizations *shall* be defined and controlled under the terms of agreement signed by an authorized FAA official and other party.

7.2.11 Access Controls

ADS-B System *shall* provide access control mechanisms.

7.2.11.1 Enforcement

ADS-B System *shall* enforce system security rules on an entity's access attempts.

7.2.11.2 Detection

ADS-B System shall detect repeated unsuccessful attempts to gain access to the system.

7.2.11.3 Deterrence

ADS-B System *shall* deter repeated unsuccessful attempts to gain access, in accordance with system security rules.

7.2.12 Security Operation

ADS-B System *shall* provide information security during all operational states.

7.2.12.1 Protection

ADS-B System *shall* protect access to assets during all operational states.

7.2.12.2 Record

ADS-B System *shall* record the security audit log during all operational states.

7.2.12.2 Enforcement

ADS-B System *shall* enforce the system security rules during all operational states.

7.3 Personnel Security

ADS-B System personnel security *shall* be in accordance with FAA Order 1600.1, *Personnel Security Program*.

7.4. Telecommunications Interface Security

ADS-B System *shall* interface with the FAA Telecommunications Infrastructure in accordance with the *Information System Security Handbook.*

7.4.1 Authenticate with ATC Automation Systems

The ADS-B System *shall* identify and authenticate itself to ATC automation systems.

7.4.2 Data Source Validation for ATC Automation Systems

The ADS-B System *shall* provide data source validation for ATC automation systems.

8.0 IN-SERVICE SUPPORT

8.1 Staffing

Support staffing for ADS-B System *shall* be in accordance with FAA Acquisition Management System Policy, *Integrated Logistics Support.*

8.2 Supply Support

8.2.1 Logistics

ADS-B System logistic support *shall* be in accordance with FAA Acquisition Management System Policy, *Integrated Logistics Support;* FAA Order 4250.9, *Field Material Management Control;* FAA Order 4650.19, *Supply Support Criteria for Repairable Items;* FAA Order 1100.157, *National Systems Engineering Divisions Maintenance Program, Procedures, Operational Support);* and MIL-PRF-49506, *Logistics Management Information.*

8.2.2 Life Cycle Provisioning

ADS-B System provisioning *shall* be in accordance with the process outlined in FAA Order 4560.1, *Policy and Procedures Covering the Provisioning Process During the Acquisition of FAA Material,* and MIL-PRF-49506, *Logistics Management Information.*

8.3 Tools and Equipment

Tools and equipment required for ADS-B System operation and maintenance *shall* be provided in accordance with FAA Order 6200.4, *Test Equipment Handbook,* and FAA Order 4250.9, *Field Material Management Control.*

8.4 Technical Data

8.4.1 Manuals and Instructions

ADS-B System manuals and technical instructions *shall* be provided in accordance with FAA-D-2494, *Technical Instruction Book Manuscripts: Electronic, Electrical, and Mechanical Equipment, Requirements for Preparation of Manuscript and Production of Books.*

8.4.2 Drawings and Specifications

ADS-B System drawings and specifications *shall* be provided in accordance with MIL-DTL-31000, *Technical Data Package Specifications*.

8.5 Training

ADS-B System training *shall* be in accordance with FAA Order 3000.10, *Airway Facilities Maintenance Technical Training Program;* FAA Order 3000.22, *Air Traffic Services Training;* FAA-STD-028, *Contract Training Program,* and FAA Order 3400.3, *Airway Facilities Maintenance Personnel Certification Program.*

8.6 First and Second-Level Repair

8.6.1 Maintenance

ADS-B System maintenance and repair ***shall*** be in accordance with FAA Order 6000.30, *National Airspace System Maintenance Policy.*

8.6.2 On-Site Maintenance

Upon commissioning, ADS-B System on-site maintenance ***shall*** be conducted in accordance with FAA Order 6000.15, *General Maintenance Handbook for Airway Facilities.*

8.6.3 Second-Level Engineering Support

ADS-B System Second-Level Engineering Support for hardware and software ***shall*** be provided in accordance with FAA Order 6000.30, *National Airspace System Maintenance Policy,* and FAA Order 1100.157, *National Systems Engineering Divisions Maintenance Program Procedures, Operational Support*.

8.6.4 Maintenance Management

ADS-B System ***shall*** be in accordance with FAA Order 6090.1, *NAS Managed Subsystems Development and Implementation*.

8.7 Bar Coding

ADS-B System equipment ***shall*** be bar-coded in accordance with FAA-BCATS-98-002, *Bar Code Asset Serial Number Symbology, Quality and Format Specifications,* and UCC/EAM 128, *Asset Supply Chain Management*

8.8 Sparing

ADS-B System site and depot sparing ***shall*** be determined in accordance with FAA Order 6000.38, *Policy to Determine NAS Equipment Initial Sparing Requirements for Airway Facilities Work Centers*

9.0 TEST AND EVALUATION

9.1 Critical Operational Issues

The operational requirements developed for ADS-B System *shall* be traceable to the following Critical Operational Issues (COI).

> *Note: The purpose of the Test and Evaluation section is to ensure that the requirements in this document can be met in an operational environment, and to resolve the Critical Operational Issues (COIs):*

COI 1.0 Coverage. Does the system performance and coverage volume support air traffic control operations?

COI 2.0 Aircraft Separation. Does the system detect closely spaced aircraft with sufficient reliability to allow the Air Traffic Specialist to maintain separation standards?

COI 3.0 Situational Awareness. Does the system provide the aircraft/vehicle operator information to support situational awareness of proximate traffic, potential conflicts, the NAS, and the weather environment?

COI 4.0 Reliability, Maintainability, Availability. Are the reliability, maintainability, and availability of the system suitable for incorporation into the NAS when used in an operational environment with the available resources, logistics plan, maintenance procedures, and personnel?

COI 5.0 Site Adaptations and Optimization. Do the system design and procedures allow the components of the ADS- B System to be optimized, adapted to site conditions, and certified by maintenance personnel?

COI 6.0 NAS Interoperability. Is the system operating effectively and capable of interfacing with other NAS systems?

COI 7.0 Safety. Is the system safe to operate and maintain?

COI 8.0 Human Factors. Does the system provide user-friendly interfaces that support operations and maintenance, minimize potential for operator confusion, and minimize personnel skill requirements and training time?

COI 9.0 Security. Does the system meet applicable physical, information, and personnel security imposed by the FAA?

9.2 Test and Evaluation Requirements

9.2.1 System Test

The following four major test activities *shall* be conducted: Development Test, Operational Test, Production Acceptance Test, and Site Acceptance Test.

9.2.1.1 Development Test

Development Test (DT) ***shall*** be conducted by the contractor at a site approved by the FAA, in accordance with the Acquisition Management System's Test and Evaluation Process, to verify that the new system meets contractual requirements.

9.2.1.2 Operational Test

Operational Test (OT) *shall* be conducted by the FAA at a site(s) approved by the FAA, in accordance with the Acquisition Management System's Test and Evaluation Process, to demonstrate that the system is operationally effective and operationally suitable to be integrated into the NAS.

9.2.1.3 Product Acceptance Test

Product Acceptance Test (PAT) *shall* be conducted by the contractor on each item at the production facility, in accordance with the Acquisition Management System's Test and Evaluation Process, to verify that each item conforms to applicable specifications, is free from manufacturing defects and is substantially identical to the qualified system.

9.2.1.4 Site Acceptance Test

Site Acceptance Test (SAT) *shall* be conducted by the contractor following each site delivery of the system, to verify proper installation and operational capability.

9.2.2 Field Familiarization

Field Familiarization testing *shall* be conducted at each site, by ATO personnel, to verify system operational readiness.

9.2.3 Independent Operational Test and Evaluation

If designated by the ATO, an IOT&E Team led by the Office of Independent Operational Test and Evaluation, *shall* conduct Independent Operational Test and Evaluation (IOT&E) in parallel with or after Field Familiarization at the key site(s). After System Test activities are complete, the development organization declares the system ready to enter IOT&E via an IOT&E Readiness Declaration (IOTRD**).**

9.2.4 Security Testing

The FAA *shall* conduct a security test and evaluation on the security risk mitigation control requirements of all ADS-B System products.

9.3 Aircraft Certification

The aircraft avionics *shall* be certified for use and inspected to ensure continued airworthiness in accordance with FAA policy.

10.0 IMPLEMENTATION AND TRANSITION

10.1 Deployment Planning

ADS-B System deployment planning *shall* be conducted in accordance with the FAA's Acquisition Management System Test and Evaluation Process guidelines.

10.2 Site Integration

ADS-B System integration with existing equipment and facilities *shall* be the responsibility of the installation vendor under the direct guidance of the appropriate representative from the NAS Implementation Program Directorate (ANI) and FAA designated resident engineer.

10.3 Co-existence with Present Systems

The installation and operation of the system *shall* produce no adverse impact upon the other subsystems with which it interfaces.

10.4 Joint Acceptance Inspection

ADS-B System Joint Acceptance Inspection *shall* be conducted by the FAA following successful completion of field familiarization and will result in a declaration of Initial Operational Capability (IOC).

11.0 QUALITY ASSURANCE

ADS-B System *shall* be developed and produced in accordance with Contractor processes and procedures that provide continuing system verification throughout all phases of design and production.

12.0 CONFIGURATION MANAGEMENT

ADS-B System configuration management *shall* be in accordance with FAA Order 1800.66, *Configuration Management Policy*.

12.1 Maintenance Policy

ADS-B System *shall* be managed in accordance with FAA Order 6000.30, ADS-B *Maintenance Policy*.

12.2 Performance Monitoring

ADS-B *shall* be maintained in accordance with FAA Order 6040.15, *National Airspace Performance Monitoring System.*

13.0 IN-SERVICE MANAGEMENT

ADS-B System *shall* be managed in accordance with FAA Order 6000.30, *National Airspace System Maintenance Policy*.

Note: The In-Service phase begins when ADS-B System goes into operational use and continues for as long as it is in use.

13.1 Performance

The performance of the system in the operational environment *shall* be monitored throughout the life cycle by Air Traffic Organization –Technical Operations (ATO-T) to ensure that it is providing the intended service.

Note: Methods of assessing system performance include reports, letters, and telephone contacts from regional airway facilities offices, employee suggestions, and NAS Change Proposal (NCP) submittals.

13.2 Configuration

The operational baseline configuration of the system *shall* be maintained by ATO-W, Technical Operations Services, including product baseline hardware and software configuration and user documentation and data.

13.3 Changes

Changes to the baseline configuration *shall* be made using the System Support Directive (SSD) process.

Note: ATO-T will work in concert with the Product Team to determine whether operational and dollar benefits are being achieved for the duration of the life cycle. The capacity of deployed assets will be constantly monitored to anticipate emerging demand for services so that replacement or upgraded capabilities can be obtained and in place when needed.

14.0 SYSTEM SAFETY MANAGEMENT

14.1 Safety Risk Management

ADS-B program safety management *shall* be in accordance with FAA Order 8040.4, *Safety Risk Management*.

14.2 Safety Assessments

ADS-B program safety assessments *shall* be conducted in accordance with ASD-100-SSE-1, *FAA System Safety Management Program* and the *Safety Management System Manual*.

14.2.1 ADS-B Operational Safety Assessment

The existing 2001 ADS-B Operational Safety Assessment (OSA) *shall* be conformed for use on ADS-B to identify the target level of safety.

14.2.2 Preliminary Hazard Analysis

A Preliminary Hazard Analysis (PHA) *shall* be conducted on the preferred alternative to support the final investment decision.

14.2.3 Additional Safety Risk Analysis

Additional safety risk analysis requirements *shall* be developed in accordance with the Integrated Safety Plan (ISP).

14.3 Integrated Safety Plan

An Integrated Safety Plan (ISP) *shall* be developed in accordance with ASD-100-SSE-1, *FAA System Safety Management Program.*

14.3.1 Hazard Tracking and Risk Resolution System

The ISP *shall* include utilization of a Hazard Tracking and Risk Resolution System (HTRR). It may include a Sub-System Hazard Analysis (SSHA), System Hazard Analysis (SHA), and Operations and Support Hazard Analysis (O&SHA).

14.4 Risk Acceptance and Safety Risk Management Documentation Approval

Program Risk Acceptance and Documentation Approval procedures *shall* be conducted in accordance with ASD-100-SSE-1, *FAA System Safety Management Program* and the *Safety Management System Manual.*

APPENDIX 1. REQUIREMENT TRACEABILITY MATRIX

The following traceability matrix maps operational and functional requirements to the ADS-B functional analysis while performance requirements trace to multiple source documents.

A List of Source Documents Including:

1. NAS-SR-1000, "National Airspace System Requirements Specification," FAA.
2. NAS-SS-1000, "National Airspace System Specification," FAA.
3. RTCA DO-260A, "Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B), Revision A," RTCA, Inc., April 10, 2003.
4. RTCA DO-282A, "Minimum Operational Performance Standards for Universal Access Transceiver (UAT), Automatic Dependent Surveillance-Broadcast (ADS-B), Revision A," RTCA, Inc., July 29, 2004.
5. RTCA DO-267, "Minimum Aviation Systems Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link," RTCA, Inc. April 29, 2004.
6. RTCA DO-286A, "Minimum Aviation Systems Performance Standards (MASPS) for Traffic Information Services-Broadcast (TIS-B), Revision A," RTCA, Inc., April 7, 2005.
7. RTCA DO-242A, "Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (ADS-B), Revision A," RTCA, Inc., June 25, 2002.
8. RTCA DO-289, "Minimum Aviation System Performance Standards for Aircraft Surveillance Applications (ASA)," RTCA, Inc., December 9, 2003.
9. RFG, "Enhanced ATS In Non Radar Areas Using ADS-B Surveillance (ADS-B-NRA)".
10. Requirements Document for Flight Information Service (FIS) Data Link.
11. NAS Subsystem Level Specification for Airport Surface Detection Equipment – Model X (ASDE-X), FAA.

Requirement	Source/Rationale
3.1.1.1.1 a	Functional Analysis 1.1.1 Gather Position Data and Velocity Data from qualified GNSS as primary source of position, velocity and time
3.1.1.1.1 b	Functional Analysis 1.1.3 Gather Barometric Altitude & Barometric Vertical Rate
3.1.1.1.1 c	Functional Analysis 1.1.2 Gather Aircrew Input (e.g., Flight ID that changes from one flight to another)
3.1.1.1.1 d	Functional Analysis 1.1.4 Gather static configuration data (e.g., 24-bit ICAO address)
3.1.1.1.2 a	Functional Analysis 1.2.1 Provide integrity and accuracy of outgoing ADS-B data
3.1.1.1.2 b	Functional Analysis 1.2.2 Generate ownship ADS-B Report
3.1.1.1.2 c	Functional Analysis 1.4.1 Encode UAT message for transmission, 1.4.2 Encode 1090ES message for transmission
3.1.1.1.3 a	Functional Analysis 1.4.3 Transmit Ownship ADS-B Message
3.1.1.1.3 b	Functional Analysis 1.4.1 Encode UAT message for transmission, 1.4.2 Encode 1090ES message for transmission
3.1.1.2.1 a	Functional Analysis 1.5.1 Receive ADS-B Message(s) (1090ES or UAT)
3.1.1.2.1 b	Functional Analysis 1.5.4 Receive ADS-R Message(s) (1090ES or UAT)
3.1.1.2.1 c	Functional Analysis 1.5.2 Receive TIS-B Message(s) (1090ES or UAT)
3.1.1.2.1 d	Functional Analysis 1.5.3 Receive FIS-B Message(s)
3.1.1.2.1 e	Functional Analysis 1.6.5 Display preloaded airport maps for use in terminal/surface operations
3.1.1.2.2 a	Functional Analysis 1.3.1 Decode UAT ADS-B Message to extract message information and process information to identify traffic & alert situation, 1.3.5 Decode 1090ES ADS-B Message to extract message information and process information to identify traffic & alert situation
3.1.1.2.2 b	Functional Analysis 1.3.3 Decode UAT ADS-R Message to extract message information and process information to identify traffic & alert situation, 1.3.7 Decode 1090ES ADS-R Message to extract message information and process information to identify traffic & alert situation
3.1.1.2.2 c	Functional Analysis 1.3.2 Decode UAT TIS-B Message to extract message information and process information to identify proximate traffic, 1.3.6 Decode 1090ES TIS-B Message to extract message information and process information to identify proximate traffic
3.1.1.2.2 d	Functional Analysis 1.3.8 Assemble ADS-B Report from decoded 1090ES ADS-B Message
3.1.1.2.2 e	Functional Analysis 1.3.9 Assemble TIS-B Report from decoded 1090ES TIS-B Message, 1.3.10 Assemble ADS-R Report from decoded 1090ES Message
3.1.1.2.2 f	Functional Analysis 1.3.4 Decode UAT FIS-B Message to extract FIS

Requirement	Source/Rationale
	data and format the data for display
3.1.1.2.2 g	Functional Analysis 1.3.4 Decode UAT FIS-B Message to extract FIS data and format the data for display
3.1.1.2.3 a	Functional Analysis 1.6.4 Display Ownship Data
3.1.1.2.3 b	Functional Analysis 1.6.1 Display ADS-B and ADS-R Data and alerts derived from them, 1.6.2 Display TIS-B Data
3.1.1.2.3 c	Functional Analysis 1.6.1 Display ADS-B and ADS-R Data and alerts derived from them
3.1.1.2.3 d	Functional Analysis 1.6.5 Display preloaded airport maps for use in terminal/surface operations
3.1.1.2.3 e	Functional Analysis 1.6.3 Display FIS-B Data (graphical and text)
3.1.2.1 a	Functional Analysis 2.1.3 Receive UTC
3.1.2.1 b	Functional Analysis 2.1.1 Accept & decode ADS-B Message @ UAT GBT, 1090ES GBT (Air-to-Ground Side)
3.1.2.1 c	Functional Analysis 2.1.4 Receive LSP Control Parameters
3.1.2.1 d	Functional Analysis 2.2.1 Accept TIS-B Report and ADS-R Report from Broadcast Services Function
3.1.2.1 e	Functional Analysis 2.2.1 Accept TIS-B Report and ADS-R Report from Broadcast Services Function
3.1.2.1 f	Functional Analysis 2.2.4 Accept FIS-B Reports from BCS
3.1.2.2 a	Functional Analysis 2.1.1 Accept & decode ADS-B Message @ UAT GBT, 1090ES GBT (Air-to-Ground Side)
3.1.2.2 b	Functional Analysis 2.1.2 Construct ADS-B Report from ADS-B Message (Air-to-Ground Side)
3.1.2.2 c	
3.1.2.2 d	Functional Analysis 2.2.2 Extrapolate the position of TIS-B Report and ADS-R Report to the scheduled time of transmission
3.1.2.2 e	Functional Analysis 2.2.3 Schedule TIS-B uplink broadcast (1090ES, UAT) (Ground-to-Air)
3.1.2.2 f	Functional Analysis 2.2.3 Schedule TIS-B uplink broadcast (1090ES, UAT) (Ground-to-Air)
3.1.2.2 g	Functional Analysis 2.2.2 Extrapolate the position of TIS-B Report and ADS-R Report to the scheduled time of transmission
3.1.2.2 h	Functional Analysis 2.2.3 Schedule TIS-B uplink broadcast (1090ES, UAT) (Ground-to-Air)
3.1.2.2 i	Functional Analysis 2.2.5 Schedule FIS-B uplink broadcast (UAT) (Ground-to-Air Side)
3.1.2.3 a	Functional Analysis 2.3.3 Send ADS-B Report (to F3 & F4) (Air-to-Ground Side)
3.1.2.3 b	Functional Analysis 2.3.4 Send ADS-B Health Status Report (to F5 & F4)
3.1.2.3 c	Functional Analysis 2.3.3 Send ADS-B Report
3.1.2.3 d	Functional Analysis 2.3.4 Send ADS-B Health Status Report (to F5 &

Requirement	Source/Rationale
	F4)
3.1.2.3 e	Functional Analysis 2.3.1 Transmit TIS-B Message (1090ES as DF18, UAT) to F1 (Ground-to-Air Side)
3.1.2.3 f	Functional Analysis 2.3.1 Transmit TIS-B Message (1090ES as DF18, UAT) to F1 (Ground-to-Air Side)
3.1.2.3 g	Functional Analysis 2.3.1 Transmit TIS-B Message (1090ES as DF18, UAT) to F1 (Ground-to-Air Side)
3.1.2.3 h	Functional Analysis 2.3.1 Transmit TIS-B Message (1090ES as DF18, UAT) to F1 (Ground-to-Air Side)
3.1.2.3 i	Functional Analysis 2.3.2 Transmit FIS-B Message (on UAT only) to F1 (Ground-to-Air Side)
3.1.2.3 j	Functional Analysis 2.3.6 Send LSP Monitored Parameters
3.1.3.1 a	Functional Analysis 3.3.5 Receive UTC
3.1.3.1 b	Functional Analysis 3.3.1 Receive ADS-B Report (from F2), 3.3.2 Receive Radar Measurement (from External Functions), 3.3.3 Receive Multilateration and Surface Data (from External Functions)
3.1.3.1 c	Functional Analysis 3.3.4 Receive FIS Products (from External Functions)
3.1.3.1 d	Functional Analysis 3.3.6 Receive BCS Control Parameters (from F5)
3.1.3.2 a	Functional Analysis 3.2.4.3 Rate Limit the ADS-R Reports to the LSP If Required
3.1.3.2 b	Functional Analysis 3.2.4.1 Filter Ineligible ADS-B Reports
3.1.3.2 c	Functional Analysis 3.2.4.3 Rate Limit the ADS-R Reports to the LSP If Required Functional Analysis 3.2.1.6 Rate limit TIS-B Reports sent to the LSP.
3.1.3.2 d	Functional Analysis 3.2.1.1 Track all targets detected by radars and/or multilateration
3.1.3.2 e	Functional Analysis 3.2.1.2 Generate and update a single TIS-B track from either single or multiple sensor inputs for a target
3.1.3.2 f	Functional Analysis 3.2.1.3 Generate a TIS-B Report when a track's state vector is updated by a sensor input
3.1.3.2 g	Functional Analysis 3.2.1.4 Track associate ADS-B equipped targets with TIS-B tracks
3.1.3.2 h	Functional Analysis 3.2.2.1 Perform Report Filtering
3.1.3.2 i	Functional Analysis 3.2.3.1 Process received FIS data to generate FIS-B Report
3.1.3.2 j	Functional Analysis 3.5.1.1 Send TIS-B data on aircraft/vehicle operating with Mode A/C/S transponder that are not actively transmitting ADS-B
3.1.3.2 k	Functional Analysis 3.5.1.1 Send TIS-B data on aircraft/vehicle operating with Mode A/C/S transponder that are not actively transmitting ADS-B
3.1.3.3 a	Functional Analysis 3.2.2.2 Manage Service
3.1.3.3 b	Functional Analysis 3.5.2 Send ADS-R Report (to F2)

Requirement	Source/Rationale
3.1.3.3 c	Functional Analysis 3.5.1 Send TIS-B Report (to F2)
3.1.3.3 d	Functional Analysis 3.5.1.2 Send TIS-B data in the airport movement area, and designated obstacles
3.1.3.3 e	Functional Analysis 3.5.2 Send FIS-B Report (to F2)
3.1.3.3 f	Functional Analysis 3.5.3 Send BCS Monitored Parameters (to F5)
3.1.4.1 a	Functional Analysis 4.1.1 Receive ADS-B Reports (from F2)
3.1.4.1 b	Functional Analysis 4.1.5 Receive ADS-B Health Status Report (from F2)
3.1.4.1 c	Functional Analysis 4.1.2 Receive LSP Status Report (from F2)
3.1.4.2 a	Functional Analysis 4.2.1 Validate the position of ADS-B Report with other surveillance sources when available
3.1.4.2 b	Functional Analysis 4.2.2 Use integrity and accuracy in ADS-B Report to determine if it should update tracks and safety functions
3.1.4.2 c	Functional Analysis 4.2.3 Use ADS-B Report as a source to create or update tracks
3.1.4.2 d	Functional Analysis 4.2.4 Associate ADS-B tracks with other sources (to avoid duplicate tracks)
3.1.4.2 e	Functional Analysis 4.2.5 Use ADS-B Report as input to safety function processing (e.g., MSAW, CA)
3.1.4.2 f	Functional Analysis 4.2.6 Process a/v status information in ADS-B Reports such as emergency ident, radio failure
3.1.4.2 g	Functional Analysis 4.2.7 Associate ADS-B Reports with flight plans
3.1.4.2 h	Functional Analysis 4.2.8 Employ collision safety logic processing to detect and notify controller of ground movement area collision hazards
3.1.4.2 i	Functional Analysis 4.2.4 Associate ADS-B tracks with other sources
3.1.4.2 j	Functional Analysis 4.2.1 Validate the position of ADS-B Report with other surveillance sources when available
3.1.4.3 a	Functional Analysis 4.3.1 Provide Safety Function Alerts generated on ADS-B equipped targets
3.1.4.3 b	Functional Analysis 4.3.2 Display either a single position or a single system track for a target regardless of the surveillance sources, including ADS-B , reporting on the target
3.1.5.1 a	Functional Analysis 5.1.1 Receive LSP Monitored Parameters
3.1.5.1 b	Functional Analysis 5.1.2 Receive BCS Monitored Parameters
3.1.5.1 c	Functional Analysis 5.1.3 Receive the ADS-B Health Status Report
3.1.5.1 d	Functional Analysis 5.1.4 Receive GPS constellation status from external sources to assess the operational status of the GPS sources
3.1.5.1 e	Functional Analysis 5.1.5 Receive Surveillance Status Reports from external surveillance sources to assess the status of these sources
3.1.5.1 f	Functional Analysis 5.1.6 Receive ADS-B Reports for real-time Data Analysis
3.1.5.2 a	Functional Analysis 5.2.1 Monitor the operating status and performance of the LSP

Requirement	Source/Rationale
3.1.5.2 b	Functional Analysis 5.2.2 Generate an LSP Status Report that identifies the operational status of the LSP function
3.1.5.2 c	Functional Analysis 5.2.3 Generate Health Status Messages to evaluate the processing performance of the LSP
3.1.5.2 d	Functional Analysis 5.2.4 Configure and control the operation of the LSP
3.1.5.2 e	Functional Analysis 5.2.5 Monitor the operating status and performance of BCS
3.1.5.2 f	Functional Analysis 5.2.6 Generate a BCS Status Report that identifies the operational status of the BCS
3.1.5.2 g	Functional Analysis 5.2.7 Configure and control the operation of the BCS
3.1.5.2 h	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation (i.e., control the equipment, monitor system health, and identify faulted modules)
3.1.5.2 i	Functional Analysis 5.2.9 Generate Alerts and Alarms when monitored parameters exceed allowable tolerances
3.1.5.2 j	Functional Analysis 5.2.10 Assess ADS-B coverage using reception statistics from ADS-B targets of opportunity
3.1.5.2 k	Functional Analysis 5.2.11 Monitor individual aircraft for compliance with ADS-B datalink standards
3.1.5.2 l	Functional Analysis 5.2.12 Maintain and certify the operation of individual ground stations
3.1.5.2 m	Functional Analysis 5.2.13 Recover to normal operation when a fault condition is cleared
3.1.5.2 n	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation
3.1.5.2 o	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation
3.1.5.2 p	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation
3.1.5.2 q	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation
3.1.5.3 a	Functional Analysis 5.3.2 Display the operating status of system functions and components
3.1.5.3 b	Functional Analysis 5.3.1 Display Alerts and Alarms to the system operator
3.1.5.3 c	Functional Analysis 5.3.2 Display the operating status of system functions and components
3.1.5.3 d	Functional Analysis 5.3.3 Send control parameters to the LSP Function
3.1.5.3 e	Functional Analysis 5.3.4 Provide LSP Status Reports to the ATC Automation Function
3.1.5.3 f	Functional Analysis 5.3.6 Send control parameters to the BCS Function.

Requirement	Source/Rationale
3.1.5.3 g	Functional Analysis 5.3.8 Provide analysis results indicating areas where coverage is predicted to exist, where actual coverage is acceptable, where actual coverage is not acceptable, and areas where coverage is unknown due to lack of targets of opportunity
3.1.5.3 h	Functional Analysis 5.3.9 Provide a list of ADS-B equipped aircraft/vehicles that are not in compliance with the datalink standards.
3.1.5.3 i	Functional Analysis 5.3.10 Display ADS-B Reports to the operator
3.1.5.3 j	Functional Analysis 5.2.8 Provide a centralized monitor & control capability to evaluate performance during operation
3.1.6 a	Derived from availability requirements
3.1.6 b	Derived from availability requirements
3.2.1.1 a	NAS-SR-1000, 3.8.1, for critical services
3.2.1.2 a	NAS-SR-1000, 3.8.1, for essential services
3.2.1.2 b	Derived. This assumes the notification can be communicated to the user. Otherwise, the user's avionics will need to infer the outage through the lack of information provided.
3.2.1.3 a	NAS-SR-1000, 3.8.1, for essential services
3.2.1.4 a	NAS-SR-1000, 3.8.1, for essential services
3.2.1.5 a	Derived from allocated Aircraft/Vehicle and ADS-B Ground Infrastructure latencies and existing ATC Automation System requirements.
3.2.1.5 b	Derived from allocated Aircraft/Vehicle and ADS-B Ground Infrastructure latencies and existing ATC Automation System requirements.
3.2.2.1 a	FAA's Link Decision, DO-260A, TSO-C166
3.2.2.1 b	FAA's Link Decision, DO-282A
3.2.2.2.1.1 a	DO-289, Table 2-3
3.2.2.2.1.1 b	DO-289, Table 2-3
3.2.2.2.1.1 c	DO-289, Table 2-3
3.2.2.2.1.1 d	DO-289, Table 2-3
3.2.2.2.1.1 e	DO-289, Table 2-3
3.2.2.2.1.2 a	DO-289, Table 2-3
3.2.2.2.1.2 b	DO-289, Table 2-3
3.2.2.2.1.2 c	DO-289, Table 2-3
3.2.2.2.2.1 a	Avionics will be expected to support the ATC Surveillance Application.
3.2.2.2.2.1 b	Applications beyond ATC Surveillance are optional.
3.2.2.2.2.2 a	Derived based upon and in conjunction with the system latency requirements in section 3.2.1.5.
3.2.2.2.2.2 b	DO-289, Table 2-3
3.2.2.2.2.2 c	DO-289, Table 2-3
3.2.2.2.2.2 d	RFG (SPR 18)
3.2.2.2.2.2 e	ASA MASPS, section 3.4.1, #8. NAS-SR-1000 (3.3.2.B, 3.2.3.K, 3.4.1.C and 3.2.5.C).
3.2.2.2.2.3 a	Derived. A transmission rate of once per second is needed to support

Requirement	Source/Rationale
	the required maximum update rates.
3.2.2.2.2.3 b	Derived. Rate sufficient to support information that does not change frequently.
3.2.2.2.2.4.1 a	DO-289, Table 2-3
3.2.2.2.2.4.1 b	DO-289, Table 2-3
3.2.2.2.2.4.1 c	DO-289, Table 2-3
3.2.2.2.2.4.1 d	DO-289, Table 2-3
3.2.2.2.2.4.1 e	RFG NRA (SPR 1) the 95% accuracy of the horizontal position measured at D shall be less than 911 m, need for more stringent requirement indicated by MITRE Technical Report MTR 05W0000008 (0.12 NM for en route) and MIT-LL Project Report ATC-323.
3.2.2.2.2.4.1 f	RFG NRA (SPR 4) the 95% accuracy of the horizontal position measured at D shall be less than 304 m, need for more stringent requirement indicated by MITRE Technical Report MTR 05W0000008 (0.04 NM for terminal) and MIT-LL Project Report ATC-323.
3.2.2.2.2.4.1 g	FAA-E-2942-1-1-081301 (ASDE-X Specification) Section 3.3.11
3.2.2.2.2.4.2 a	DO-289, Table 2-3
3.2.2.2.2.4.2 b	DO-289, Table 2-3
3.2.2.2.2.4.2 c	NAS-SR-1000, Section 3.5.1.2 - The NAS shall detect the velocity of an aircraft entering an ADIZ/DEWIZ to within 20 knots of the aircraft's actual speed in level-constant-speed flight and its course accurate to within 5 degrees (99th percentile) of the actual course. ADS-B accuracy should actually be able to support a more stringent 10 knot requirement.
3.2.2.2.2.4.3 a	DO-289, Table 2-3
3.2.2.2.2.4.4 a	DO-289, Table 2-3
3.2.2.2.2.4.4 b	RFG NRA (SPR 2) Altimeter accuracy and ADS-B encoding of altitude data shall conform to the RVSM provisions in ICAO Annex 10.
3.2.2.2.2.4.5 a	DO-289, Table 2-3
3.2.2.2.2.4.5 b	DO-289, Table 2-3
3.2.2.2.2.5.1 a	DO-289, Table 2-3
3.2.2.2.2.5.1 b	DO-289, Table 2-3
3.2.2.2.2.5.1 c	DO-289, Table 2-3
3.2.2.2.2.5.1 d	RFG NRA (SPR 6) The likelihood that a position error exceeds the maximum 1.0 NM containment radius without detection shall be less than 10^{-5} per flight hour. MITRE Technical Report MTR 05W0000008 (0.6 NM for terminal) is more stringent.
3.2.2.2.2.5.1 e	RFG NRA (SPR 3) For 5NM separation, the likelihood that a position error exceeds the maximum 2.0 NM containment radius without detection shall be less than 10^{-5} per flight hour. MITRE Technical Report MTR 05W0000008 (2.0 NM for en route)
3.2.2.2.2.5.2 a	DO-289, Table 2-3
3.2.2.2.2.5.2 b	DO-289, Table 2-3
3.2.2.2.2.5.2 c	RFG NRA (SPR 9) The probability of an undetected integrity failure affecting position shall be less than 10^{-5} per flight hour.

Requirement	Source/Rationale
3.2.2.2.2.5.3 a	DO-289, Table 2-3
3.2.2.2.2.5.3 b	DO-289, Table 2-3
3.2.2.2.2.5.4 a	RFG NRA (SPR 10) The likelihood that an A/C-Av transmits an incorrect aircraft identification (or mode A) shall be less than 10^{-3} per flight hour.
3.2.2.2.2.5.4 b	RFG NRA (SPR 11) The likelihood that an A/C-Av transmits an incorrect altitude shall be less than 1E-03 per flight hour.
3.2.2.2.2.5.4 c	Derived. Should improve with the RVSM altimetry system. Guidance material on RVSM AIR-100 (91-RVSM change 2).
3.2.2.2.2.6 a	ADS-B MASPS, DO-260A, DO-282A
3.2.2.2.3.1 a	DO-289, Table 2-3
3.2.2.2.3.1 b	DO-289, Table 2-3
3.2.2.2.3.1 c	DO-289, Table 2-3
3.2.2.2.3.2 a	DO-291
3.2.2.2.3.2 b	DO-272, DO 200-A
3.2.2.2.3.2 c	Derived. Need maps for all areas where the surface applications are to be executed.
3.2.2.2.3.2 d	Derived. Need the capability to expand the map database as desired areas of operation expand.
3.2.2.3.2 a	Derived, TIS-B and ADS-B Messages should be treated similarly by the Aircraft/Vehicle and have the same performance requirements.
3.2.2.4.2 a	Derived, ADS-R and ADS-B Messages should be treated similarly by the Aircraft/Vehicle and have the same performance requirements.
3.2.2.5.2 a	DO-282A
3.2.3.1.1 a	NAS-SR-1000
3.2.3.1.1 b	
3.2.3.1.2 a	Derived. BSGS V2.0, 3.2.3.2.2.5.
3.2.3.1.3 a	Derived. The system will evolve and support additional applications and/or product.
3.2.3.1.4 a	Derived. The system should support additional functionality and capacity to support new capabilities.
3.2.3.1.5 a	IEEE Standard 12207 and RTCA DO-278
3.2.3.2.1 a	Derived. Based on UAT MOPS (Rx and ADS-B report generation <200ms), NAS-SS-100 telecom budget (<300ms) and a site processor (<200ms)
3.2.3.2.2 a	Derived. The system should not unexpectedly alter the contents of ADS-B Reports.
3.2.3.2.3 a	Surveillance and Broadcast Services CONOPS
3.2.3.2.3 b	Surveillance and Broadcast Services CONOPS
3.2.3.2.3 c	Surveillance and Broadcast Services CONOPS
3.2.3.2.3 d	Derived. Based on ASA MASPS requirement for aircraft identification, which was established using committee judgment.

Requirement	Source/Rationale
3.2.3.2.4 a	Derived. Based on the transmit equipment integrity risk specified in the ASA MASPS, Table 3-1.
3.2.3.2.5 a	The NAS-SR-1000, 3.2.3.G. For ADS-B to be used for Aircraft Separation by ATC, it needs to support the existing coverage requirement. The addition of surface coverage provides additional safety and controller situation awareness where little, if any surveillance exists.
3.2.3.2.6 a	Derived. The LSP/BCS obviously, must process all messages received.
3.2.3.3 a	TIS-B MASPS
3.2.3.3.1 a	Derived. The TIS-B MASPS and ASA MASPS are the basis for the end-to-end requirement from which this requirement was determined.
3.2.3.3.1 b	TIS-B MASPS
3.2.3.3.2 a	ASA MASPS, Table 2-3
3.2.3.3.2 b	ASA MASPS, Table 2-3
3.2.3.3.2 c	ASA MASPS, Table 2-3
3.2.3.3.3 a	ASA MASPS, Table 2-3
3.2.3.3.3 b	Derived using ASA MASPS, Table 2-3 (EVAcq) desired update rate, since this should be achievable using measurements from a terminal radar.
3.2.3.3.3 c	ASA MASPS, Table 2-3
3.2.3.3.4 a	TIS-B MASPS, 2.8.2.
3.2.3.3.4 b	TIS-B MASPS 2.3.8-11, 3.1.2.2.2
3.2.3.3.5 a	TIS-B MASPS, 2.1.1
3.2.3.3.5 b	TIS-B MASPS, 2.1.1
3.2.3.3.6 a	Derived, the LSP/BCS must process the capacity within the coverage volume.
3.2.3.3.7 a	FAA Link Decision, UAT MOPS, DO-282A
3.2.3.3.7 b	FAA Link Decision, 1090ES MOPS, DO-260A
3.2.3.3.8 a	TIS-B MASPS, 2.1.1
3.2.3.3.9 a	Derived. The TIS-B system must process all received target measurements in coverage from both radars and ADS-B ground stations to correlate, associate and track TIS-B targets effectively.
3.2.3.4 a	TIS-B MASPS, 2.1.1.2
3.2.3.4 b	TIS-B MASPS, 2.1.1.2
3.2.3.4 c	Derived. The TIS-B MASPS establishes requirements for EVAcq and ASSA. Support for the remaining applications was a program decision.
3.2.3.4.1 a	TIS-B MASPS, 2.5
3.2.3.4.1 b	ADS-B MASPS, DO-242A; TIS-B MASPS, 2.5
3.2.3.4.2 a	Derived. The system should not unexpectedly alter the contents of ADS-B Reports.
3.2.3.4.3 a	Derived. Based on the transmit equipment integrity risk specified in the ASA MASPS, Table 3-1.
3.2.3.4.3 b	TIS-B MASPS 2.3.8-11, 3.1.2.2.2
3.2.3.4.4 a	The NAS-SR-1000, 3.2.3.G. For ADS-B to be used for Aircraft Separation by ATC, it needs to support the existing coverage

Requirement	Source/Rationale
	requirement. The addition of surface coverage provides additional safety and controller situation awareness where little, if any surveillance exists.
3.2.3.4.4 b	The NAS-SR-1000, 3.2.3.G. For ADS-B to be used for Aircraft Separation by ATC, it needs to support the existing coverage requirement. The addition of surface coverage provides additional safety and controller situation awareness where little, if any surveillance exists.
3.2.3.4.5 a	Derived. The LSP/BCS must process all messages received.
3.2.3.4.6 a	FAA Link Decision, UAT MOPS, DO-282A
3.2.3.4.6 b	FAA Link Decision, 1090ES MOPS, DO-260A
3.2.3.5 a	NAS-SS-1000 Vol. 1, FISDL RD, Capstone/SF21
3.2.3.5.1 a	Derived. There are similar requirements in NAS-SR-1000, 3.1.2.F and NAS-SS-1000 that require weather and AIS data retrieval times of as little as 3 sec and 15 sec. The most time-sensitive product is expected to be the wind-shear alerts in TWIP and 1 minute METARs, so it is estimated that 10 sec is sufficiently fast.
3.2.3.5.10 a	AIRMET, AWW/WW, Ceilings, Convective SIGMET, echo tops, lightning strikes, NOTAMS, PIREPS, SIGMET, SUA Status, TAF, Temperature Aloft, and Winds Aloft are Strategic-use products. D-ATIS: To support dynamic situations and changes in the terminal airspace and airport surface. Consist with ASOS update interval. METAR: Consist with ASOS update interval. NEXRAD reflectivity: Given the size of the product and its importance to pilots, it is transmitted twice within a product update interval to provide higher likelihood the product packets are received. TWIP: To support dynamic weather changes in the terminal airspace and approach/departure phase of flight.
3.2.3.5.2 a	The majority of users will likely be low-altitude flying aircraft, but must also support services to turbo-jet/prop aircraft operating at higher altitudes.
3.2.3.5.2 b	The majority of users will likely be low-altitude flying aircraft, but must also support services to turbo-jet/prop aircraft operating at higher altitudes.
3.2.3.5.3 a	UAT MOPS
3.2.3.5.4 a	UAT MOPS, DO-282A
3.2.3.5.4 b	FIS-B MASPS, DO-267A
3.2.3.5.5 a	Met data should be available where airplanes operate.
3.2.3.5.5 b	AIS data should represent the systems used by aircraft and that are operational in the NAS.
3.2.3.5.6 a	Capstone/SF21
3.2.3.5.6 b	Capstone/SF21, These products are viewed as the most useful to aircraft safety and utility. They are also consistent with the products being specified by RTCA SC-206.
3.2.3.5.7 a	Capstone/SF21, Derived
3.2.3.5.7 b	These products are viewed as the most useful to aircraft safety and

Requirement	Source/Rationale
	utility. They are also consistent with the products being specified by RTCA SC-206.
3.2.3.5.7 c	FISDL RD
3.2.3.5.7 d	FISDL RD
3.2.3.5.8 a	FISDL RD
3.2.3.5.9 a	NAS-SR-1000, 3.2.6.C
3.2.3.5.9 b	FISDL RD
3.2.3.5.9 c	FIS-B MASPS, DO-267A
3.2.3.5.9 d	FIS-B MASPS, DO-267A
3.2.3.5.9 e	FIS-B MASPS, DO-267A
3.2.4.1.1 a	(NAS-SS-1000, volume I, Table 3.2.1.2.7.1.1-1) of 1.0 second (terminal) and 1.6 seconds (en route)
3.2.4.1.1 b	(NAS-SS-1000, volume I, Table 3.2.1.2.7.1.1-1) of 1.0 second (terminal) and 1.6 seconds (en route)
3.2.4.1.2 a	RFG (SPR 79)
3.2.4.1.2 b	Similar to ERAM RD section 3.6.7.4.
3.2.4.1.2 c	MicroEARTS implementation and developmental software for CARTS and STARS
3.2.4.1.3 a	Separation Standards WG input and similar requirement in section 3.6.5.2 of ERAM Final Requirements Document
3.2.4.1.4 a	Extend RFG (SPR 79) to integrity
3.2.4.1.4 b	RFG (SPR 53)
3.2.4.1.4 c	False self alerts should not be frequent enough to affect ATC operations
3.2.4.1.5 a	Automation should process the ADS-B data provided by LSP/BCS
3.2.4.1.6 a	RFG (SPR 69)
3.2.4.1.7 a	Separation Standards WG Input
3.2.4.1.7 b	Separation Standards WG Input
3.2.4.1.8 a	MicroEARTS implementation and developmental software for CARTS.
3.2.4.1.8 b	Alert performance with ADS-B data should be as least as good as radar data
3.2.4.2.1 a	FAA–E-2942 R17 of multilateration says 2 seconds from detection to display; This # is halved to get automation portion-consistent with ASDE-X automation processing
3.2.4.2.2 a	Similar to RFG requirement for airborne targets
3.2.4.2.3 a	R8 of FAA-E-2942
3.2.4.2.4 a	Similar to RFG requirement for airborne targets and extended to integrity
3.2.4.2.5 a	R211, R215, R218, R219 and R223 of FAA-E-2942
3.2.4.2.5 b	R211, R215, R218, R219 and R223 of FAA-E-2942
3.2.4.2.6 a	Separation Standards WG input
3.2.4.2.7 a	SE-9, SE-16, SE-17, SE-26 of FAA-E-2942
3.2.5.1 a	Applicable FAA orders
3.2.5.2 a	NAS-SS-1000 Vol. 1, §3.2.1.2.8.3 and FAA Order 7210.3,

APPENDIX 2. BROADCAST DATA ELEMENTS

Minimum Broadcast Data Element Set for Aircraft/Vehicle Equipage

Broadcast Data Element	Required for Minimum Installation	Comments
ICAO 24-bit Address	YES	Preconfigured by installer
Latitude	YES	
Longitude	YES	
Barometric Pressure Altitude	YES	
Geometric Altitude	YES	
NIC	YES	
North Velocity	YES	
East Velocity	YES	
Ground Speed	YES	These elements only used when in the ON GROUND condition
Track Angle	YES	
Heading	NO	
Barometric Vertical Rate	NO	
Geometric Vertical Rate	YES	
A/V Length and Width, and POA	YES	Preset by installer
Emitter Category	YES	Preset by installer
Call Sign/Flight ID	YES	Pilot entry or Preset by installer when value is static
Emergency / Priority Status Selection	YES	Pilot entry
SIL	YES	
NAC_P	YES	
NAC_V	YES	
NIC_{BARO}	YES	Can be preset by installer
CDTI Traffic Display Capability	YES	Preset by installer
TCAS Installed and Operational	YES	Preset by installer
TCAS/ACAS Resolution Advisory Flag	YES	Can be installer preset to “NO” if installation does not include TCAS
IDENT Selection	YES	Pilot entry
“Receiving ATC Services” Flag	YES	Pilot entry
Mode 3/A code	YES	Pilot entry
<All other fields…>	NO	

APPENDIX 3. DEFINITIONS

1090 Megahertz Extended Squitter: A defined frequency of 1090 MHz dedicated for the transmission of ADS-B data link messages, primarily for air transport operators, containing a payload of user information (ADS-B and TIS-B) and overhead coding that supports the transfer of data.

Aircraft/Vehicle: (as used in this document) – Either 1) a machine or service capable of atmospheric flight, or 2) a vehicle on the airport surface movement area.

Alarm: For monitor and control purposes, an indication (either visual or both visual and audio) that a monitored parameter is outside the specified acceptable range.

Alert: A visual indication of a change in an operational status or condition of a hardware device, software component, or interface that may require action by the maintainer.

Applications: Specific use of systems that address particular user requirements. For the case of ADS-B, applications are defined in terms of specific operational scenarios involving aircraft, pilots, Air Traffic Specialists and the exchange of ADS-B Messages between aircraft and ATC automation systems.

Automatic Dependent Surveillance-Broadcast: Automatic Dependent Surveillance Broadcast (ADS-B) is a function that broadcasts position, altitude, vector and other information for use by other aircraft, vehicles, and by ground facilities. ADS-B supports improved use of airspace, improved surface surveillances, and enhanced safety, such as conflict management, for users.

Automatic Dependent Surveillance-Broadcast System: A system of services and ground-based equipment that receives, processes, and transmits ADS-B, TIS-B, and FIS-B data to and from aircraft, airport vehicles, and automation systems. This interoperating, "ground-based" equipment system receives, processes, and transmits ADS-B data, TIS-B data, and FIS-B data to and from aircraft and ground vehicles and to other automation system, such as, air traffic control and airline operations centers. The ADS-B System provides the hardware, software, and communication infrastructure necessary to support the input and delivery of organized information for user applications and ATC flight operations. The ADS-B System consists of the ground based transceivers, TIS-B servers, FIS-B servers, TIS-B Surveillance Data Processor, Multilink Rebroadcast Crossover, and the associated communications infrastructure necessary to support the interoperability of these components**.**

ADS-B Health Status Report: Internally generated ADS-B Report that exercises the Ground Station transmit/receive chain. An ADS-B Health Status Report is an ADS-B Report, with a specific Target Address and State Vector, generated periodically for built in test purposes.

ADS-B Message: A block of formatted data that conveys the information elements used in the development of ADS-B Reports. Message contents and formats are specific to the ADS-B data link.

ADS-B Rebroadcast (ADS-R): The automatic rebroadcast of ADS-B Messages received over one data link translated directly onto other data links for the purpose of extending ADS-B connectivity to users of incompatible data links. Due to the similarity to TIS-B and the potential use of common systems, ADS-R is a service of the TIS-B system.

ADS-B Report: The information elements assembled using messages received from a transmitting participant. These information elements are available for use by applications external to the ADS-B system.

ADS-R Report: The content of ADS-R information concerning a single target, suitable for broadcast in a TIS-B Message after appropriate formatting.
Availability: "The probability that a system or equipment, when used under stated conditions in an ideal support environment (i.e., readily available tools, spares, maintenance personnel, etc.) will operate satisfactorily at any point in time as required." It excludes preventive or scheduled maintenance actions, logistics and administrative delay time.
Barometric Altitude: The altitude determined by a barometric altimeter by reference to a pressure level and calculated according to the standard atmosphere laws
Barometric Vertical Rate: The apparent vertical rate of an aircraft as derived from the rate of change of static pressure.
Broadcast Services: The provision of ADS-B, TIS-B and FIS-B in the National Airspace System.
Broadcast Services Control Parameters: These parameters (set by a technician) control the BCS function. Some examples of control parameters are: Configuration Items, real time read back of monitoring values for the desired monitoring parameter, alarm/alert thresholds, reset, software upload enable/'disable, software upload.
Broadcast Services Monitored Parameters: These parameters report on the operation of the BCS Function (e.g., settings enacted by the BCS Function; parameter states of either normal, alert, or alarm; management of service areas, etc.).
Broadcast Services Manager: Identifies the ADS-B ground equipment infrastructure system components such as the Surveillance Data Processor, TIS-B server, and FIS-B server which are used to pre-process and organize the separate data received from the various and separate surveillance sensors and information service providers, into an organized and unified product for distribution to the users.
Cockpit Display of Traffic Information (CDTI): A generic display that provides the pilot with surveillance information about other aircraft, including their position. Traffic information for a CDTI may be obtained from one or multiple sources (including ADS-B, TCAS and TIS-B) and it may be used for a variety of purposes. Any means of communicating the information is acceptable (aural, graphical, heads-up, etc) as long as the information is conveyed effectively. Requirements for the CDTI information will vary based on intended use of the data (i.e., application).
Critical Service: Functions or services which, if lost would prevent the NAS from exercising safe separation and control over aircraft.
Enhanceability: The capability of a system to interface with additional unspecified systems, process data from those systems, and accommodate improvements to hardware and software elements, without needing to be modified.
Essential Service: Functions or services, which, if lost, would reduce the capability of the NAS to exercise safe separation and control over aircraft.
Event: Any state change or other reportable condition in which reportable conditions include, but are not limited to status changes, completion of requested action, hardware and software faults, and return to normal operation.
False Target: A False Target is an erroneous target position report generated by FRUIT, reflections, multipath, or splits or a position report with an error that exceeds 1200 feet from the actual position of the aircraft.
Fault: An abnormal operation of hardware.

Flight Information Service-Broadcast (FIS-B): The exchange of weather and non-control, aeronautical information (or products) using a broadcast communication system between ground systems and aircraft. FIS-B information is used for applications focused on enhancing flight safety and operational efficiency. FIS-B information includes but is not limited to aeronautical and flight information such as textual and graphical weather reports, and NOTAMS.
Flight Monitoring Data: The flight monitoring information consists of traffic and textual weather monitoring information and is provided to qualified users via an Internet connection to the Control Facility.
Flight Plan Information: Information that uniquely identifies A/C (e.g., call sign, mode 3A) and defines its trajectory. This information provides Mode 3/A to call sign Correlation.
Free Flight: FAA program to foster and maintain consensus within the aviation community on the priorities for modernization of the National Airspace System and to develop and deploy the technologies that will meet those priorities.
Global Navigation Satellite System (GNSS): A space-based positioning and time system composed of space, control and user segments. The United States Global Positioning System (GPS) is the preeminent GNSS with nominally 24 satellites in 6 orbital planes. Glonass is a Russian GNSS that is partially operational. The European Galileo is a planned GNSS that could double the number of available satellites. Various GNSS augmentation systems are used to improve the accuracy and the availability of integrity to meet stringent aviation system requirements
Health Status Reports: ADS-B Reports based on test targets injected into the LSP/BCS Function.
Link-Specific Processing & Broadcast Service Status Report: Report that is sent by the Maintenance Function on a periodic basis to the ATC Automation Function reporting on the status of the LSP and BCS functions.
Link-Specific Processing Control Parameters: These parameters (set by a technician) control the LSP function. Some examples of control parameters are: Configuration Items, real time read back of monitoring values for the desired monitoring parameter, alarm/alert thresholds, reset, software upload enable/'disable, software upload.
Link-Specific Processing Monitored Parameters: These parameters report on the operation of the LSP Function (e.g., settings enacted by the LSP Function; parameter states of either normal, alert, or alarm; management of service areas, etc.).
Link-Specific Processing Status Reports: A report containing status information, such as target discard counts, message transmission counts, and alerts, on the LSP Function**.**
Message: A broadcast transmission containing a payload of user information and overhead coding that supports the transfer of data.
Monitored Parameters: These parameters report the operation of the LSP & BCS Functions (e.g., settings enacted by the LSP & BCS Functions; parameter states of either normal, alert, or alarm; management of the service areas, etc.)
Report Time Error: Report Time Error is the reported time of applicability minus the true time of applicability.
Time of Applicability: The best estimate of time associated with the ADS-B Message data.
Traffic Information Service-Broadcast (TIS-B): A collection of surveillance services that broadcasts traffic information derived from one or more ground surveillance sources to suitably equipped aircraft or airport surface vehicles, with the intention of supporting ADS-B applications. Two prominent TIS-B services are the fundamental service, which supports

cockpit advisory applications, and the ADS-B Rebroadcast service, which may support both cockpit advisory and cockpit operational applications.

Universal Access Transceiver (UAT): A 1MHz channel at the 978 MHz frequency dedicated for the transmission of ADS-B data link messages, primarily for general aviation operators, containing a payload of user information (ADS-B, TIS-B, or FIS-B) and overhead coding that supports the transfer of data.

User(s): Operators or maintainers of ADS-B System, for example, ATCS, NAS Operations Mangers Traffic Management personnel, supervisors, and computer operators). External users include but are not limited to Airline Operations centers, dispatchers, airport vehicle operators.

Workstation: An integrated set of hardware and software components, including one or more data entry devices, processors, displays, power sources, and equipment cabinets.

APPENDIX 4. ACRONYMS AND ABBREVIATIONS

1090ES	1090 MHz Extended Squitter
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-B System	Automatic Dependent Surveillance-Broadcast System
ADS-R	Automatic Dependent Surveillance-Rebroadcast
AIRMET	Airman's Meteorological Information
AMDB	Airport Map Data Base
AMEND	Amendments
ANI	NAS Implementation Program Directorate
ARSR	Air Route Surveillance Radar (ARSR)
ASA	Aircraft Surveillance Applications
ASDE-X	Airport Surface Detection Equipment System (ASDE-X)
ASR	Airport Surveillance Radar (ASR)
ASSA	Airport Surface Situational Awareness
ATC	Air Traffic Control
ATO-T	Air Traffic Organization –Technical Operations
ATOP	Advanced Technologies & Oceanic Procedures
AWW	Severe Weather Forecast Alerts
BCS	Broadcast Services
CA	Conflict Alert
CD	Conflict Detection
CDTI	Cockpit Display of Traffic Information
CFR	Code of Federal Regulations
COI	Critical Operational Issues
CONOPS	Broadcast Services Concept of Operations
D-ATIS	Digital Automated Terminal Information Service
DT	Development Test
E-PIREP	electronic pilot report
EBUS	En Route Back-Up System
ERAM	En Route Automation Modernization
FAA	Federal Aviation Administration
FAROA	Final Approach and Runway Occupancy Awareness
FIS-B	Flight Information Services - Broadcast
FTI	FAA Telecommunications Infrastructure
ICAO	International Civil Aviation Organization
IOC	Initial Operational Capability
IOT&E	Independent Operational Test and Evaluation
IOTRD	IOT&E Readiness Declaration
ISP	Integrated Safety Plan
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HCS	Host Computer System
HFDS	Human Factors Design Standard

HTRR	Hazard Tracking and Risk Resolution System
IEEE	Institute of Electrical and Electronics Engineers
JPDO	Joint Planning and Development Office
LRUs	Line Replaceable Units
LSP	Link-Specific Processing
MASPS	Minimum Aviation Systems Performance Standards
METAR	Aviation Routine Weather Report
MEARTS	Micro-EARTS
MNS	Mission Need Statement
MSAW	Minimum Safe Altitude Warning
MTBF	Mean Time Between Failure
MTTR	Mean-Time-To-Restore
NAS	National Airspace System
NCP	NAS Change Proposal
NEXRAD	Next Generation Radar Reflective
NFPA	National Fire Protection Association
NGATS	Next Generation Air Transportation System
NIMS	NAS Infrastructure Management System
NM	Nautical Mile
NOTAM	Notices to Airmen
NWS	National Weather Service
O&SHA	Operations and Support Hazard Analysis
OSA	Operational Safety Assessment
OT	Operational Test
PAT	Product Acceptance Test
PHA	Preliminary Hazard Analysis
PIREP	Pilot Reports
RTCA	Radio Technical Commission for Aeronautics
SAT	Site Acceptance Test
SHA	System Hazard Analysis
SIGMET	Convective Significant Meteorological Information
SPECI	Unscheduled Specials
SSD	System Support Directive
SSHA	Sub-System Hazard Analysis
STARS	Standard Terminal Automation Replacement System
SUA	Special Use Airspace
TAF	Terminal Area Forecast
TIS-B	Traffic Information Services - Broadcast
TOA	Time of Applicability
TSO	Technical Standards Orders
TWIP	Terminal Weather Information for Pilots
UAT	Universal Access Transceiver
UTC	Universal Coordinated Time
WW	Severe Weather Watch Bulletin