



U.S. Department  
of Transportation  
Federal Aviation  
Administration

# Advisory Circular

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**Subject:** Installation Guidance for Domestic  
Flight Information Services - Broadcast

**Date:** 9/23/13

**AC No:** 20-149A

**Initiated by:** AIR-130

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## 1. Purpose.

a. This advisory circular (AC) supports the use of Flight Information Services - Broadcast (FIS-B) weather and other aeronautical data link products for enhanced situation awareness of flight conditions. In this AC, the Federal Aviation Administration (FAA) recommends one way to gain airworthiness approval for the installation of FIS-B avionics equipment. We identify safety and installation requirements for continued airworthiness of aircraft FIS-B avionics equipment, systems, and applications. This AC is not mandatory and does not constitute a regulation. This AC describes an acceptable means, but not the only means, to gain airworthiness approval for your FIS-B avionics equipment. However, if you use the means described in this AC, you must follow it in its entirety.

b. FIS-B was introduced to improve safety and to increase the utility, efficiency, and capacity of the National Airspace System (NAS). Timely delivery of quality, accurate, and consistent information is utilized by pilots for assisting in operational decisions.

c. This AC was revised to remove outdated information on the Flight Information Services Data Link (FISDL) program and replace with the current FIS-B system while maintaining alternative third party subscription services.

**2. Audience.** This AC is written for manufacturers and installers of FIS-B avionics equipment and software, FIS-B providers, applicants for FAA design approval of FIS-B systems, and FAA aircraft certification office (ACO) staff who assess FIS-B system installations.

## 3. Overview.

a. There are two methods of receiving FIS-B products on the flight deck. The FAA provides FIS-B through the Surveillance and Broadcast Service (SBS) over the 978 MHz frequency. Aircraft can receive this data through a Universal Access Transceiver (UAT) for domestic operations below 24,000 feet. The second method is made available through third party subscription providers.

**b.** The FAA SBS FIS-B provider broadcasts a basic set of free weather and aeronautical products for use by UAT equipped aircraft. The FAA SBS FIS-B set of products includes:

- (1) Aviation Routine Weather Reports (METARs);
- (2) Aviation Selected Special Weather Reports (SPECIs);
- (3) Terminal Area Forecasts (TAFs), and their amendments;
- (4) Significant Meteorological Information (SIGMET);
- (5) Convective SIGMETs;
- (6) Airman's Meteorological Information (AIRMET);
- (7) Pilot Reports (PIREPs);
- (8) Next Generation Radar (NEXRAD) Reflectivity (Continental United States (CONUS));
- (9) NEXRAD Reflectivity (Regional);
- (10) Notice to Airmen (NOTAM/Flight Data Center (FDC));
- (11) Temperatures aloft;
- (12) Winds aloft; and
- (13) Special Use Airspace (SUA) Status.

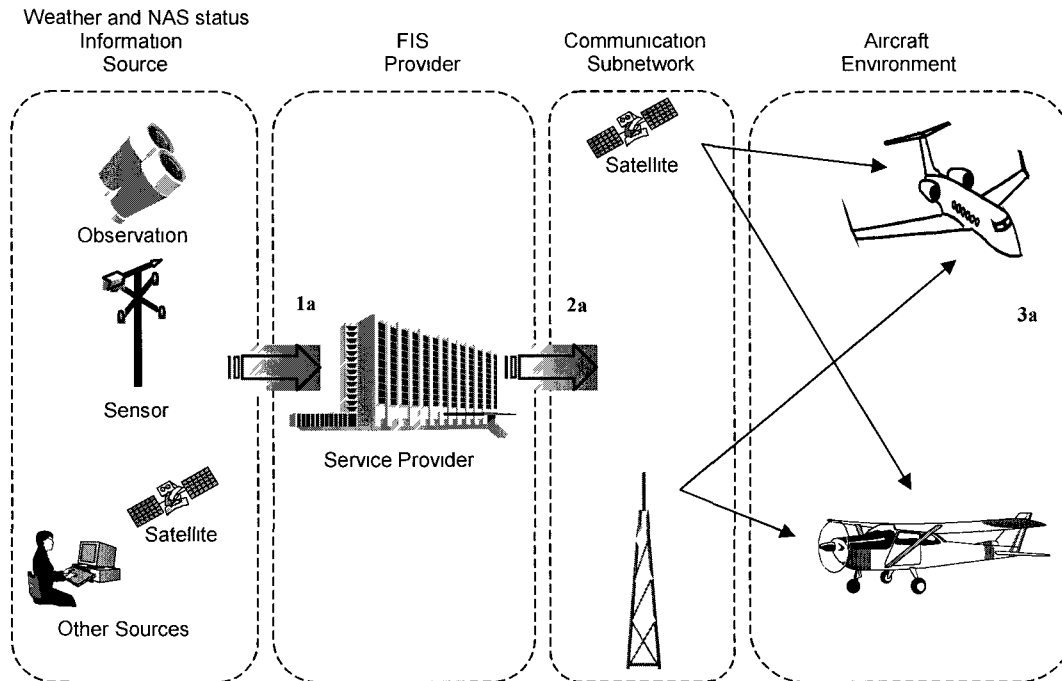
**c.** FIS-B third party value-added services are provider-unique products for paid subscribers. Value-added services may offer more data content and format than the basic requirements listed above. They can include:

- (1) Precipitation maps based on NEXRAD mosaics;
- (2) Graphical presentations of in-flight icing conditions and turbulence depictions;
- (3) NOTAMs; and
- (4) SUA depictions.

Figure 1 represents a one-way, non-addressed, FIS-B broadcast service that uses either ground or space-based data link systems. As this example shows, the FIS service provider assimilates weather and other information gathered from observations, weather sensors, instruments, and other data sources (*1a*). Once formatted and processed, the service provider encodes and

distributes that information to the broadcast communication subnetwork (2a), where the FIS-B data is broadcast to the aircraft and displayed in cockpits of properly equipped aircraft (3a).

**Figure 1. FIS-B System**



**4. Scope.** Portable display systems not requiring design approval are outside the scope of this AC. See AC 120-76B, *Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags*, dated June 1, 2012. Instead, this AC covers the following:

**a.** FIS providers are responsible for gathering weather and NAS status information from sources appropriate for the services they intend to provide. FIS providers then process this information into a format suitable for data link. This formatted information is then encoded for distribution to their communication subnetwork. The guidance in this AC applies to any of the following:

- (1) FIS-B services provided by the FAA utilizing the 978 MHz UAT.
- (2) Non-FAA FIS-B providers utilizing alternative data link methods and frequencies.

**b. Communication Subnetworks.** This AC allows the FIS-B system to use a variety of air-, ground-, and space-based communication subnetworks.

**c. Aircraft Environment.** The aircraft FIS-B system communicates with ground end-systems managed by a service provider. Depending on the FIS service in question, the aircraft's FIS-B avionics equipment will monitor the appropriate subnetwork for broadcast FIS services.

The aircraft's FIS-B avionics are responsible for the control and display of FIS products in the flight deck.

## 5. Safety Assessment Considerations.

a. FIS-B information is intended to enhance pilot awareness of weather and airspace conditions. Therefore the hazard classification should be no greater than minor. You should conduct a safety assessment to ensure the minor classification is applicable to your FIS-B avionics equipment. The safety assessment should determine, classify, and evaluate failure conditions resulting from malfunction, loss of function, or design errors. The safety assessment should also evaluate failures or design errors of the FIS-B equipment which could cause or contribute to failure conditions of other systems. Reference AC 23.1309-1E, *System Safety Analysis and Assessment for Part 23 Aircraft*, AC 25.1309-1A, *System Design and Analysis*, AC 27.1309, *Equipment, Systems, and Installations*, or AC 29.1309, *Equipment, Systems, and Installations*, as applicable, for conducting your safety assessment.

b. This AC is applicable for FIS-B avionics equipment when:

(1) the loss of the FIS-B function is no greater than a minor failure condition, or

**Note:** FIS-B supplements existing requirements for voice communication capability and does not replace or substitute the required preflight planning, air traffic control (ATC), Flight Service Station (FSS), or Airline Operations Control Center (AOCC) voice communications for aeronautical weather, special use airspace, NOTAM, or other operational information.

(2) the effects of undetected errors in FIS-B products (e.g., messages received out of sequence, errors in message address, weather severity, displayed errors in weather and NOTAM location (offset) errors, and errors in the data compression technique) is no greater than a minor failure condition, or

**Note:** FIS-B is limited to the operational context of paragraph 5.a above. These failures are directly mitigated by operational and procedural constraints in the safety requirements (Airplane/Rotorcraft Flight Manual (A/RFM) Section 3) found in paragraph 11 below.

(3) the corruption of FIS-B information intended for display to the pilot or flight crew during normal flight operations introduces no more than a marginal increase in pilot workload. At a minimum, this increase in pilot workload contributes to no more than a minor failure condition classification.

## 6. Design Considerations.

a. Aircraft FIS-B avionics equipment should meet the requirements in FAA technical standard order (TSO)-C157a, *Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment*, dated September 9, 2011.

b. To ensure compatibility with existing displays and to ensure that they maintain their effectiveness across a wide variety of functions and applications, the applicant should apply the following principles when determining what, if any, features of FIS-B displays should be coded red, amber (yellow) and green. Use the following 14 CFR part 25 guidance instead of the color guidance found in RTCA DO-267A, section 3.8 and Table 3-2:

(1) Color assignments should follow the “strategic display philosophy of increasing potential safety hazard” so that the progression from green to amber (yellow) to red corresponds to increasing degrees of threat, hazard, safety criticality, or need for flight crew awareness or response.

(2) The use of red, amber (yellow), and green should be compatible, although not necessarily identical, across the various displays and indications in order to ensure they maintain their effectiveness and intended functions.

(3) If used, red should be associated with conditions that represent serious near-term or serious potential threats to safety.

(4) If used, amber (yellow) should be associated with conditions representing moderate near-term or moderate potential threats to safety.

(5) If used, green should be associated with normal, safe operation.

(6) At no time should a display simultaneously present color-coded information requiring immediate awareness and possible action in combination with like color-coded information that is advisory in nature.

(7) The flight crew should be able to quickly, accurately and consistently differentiate between time-critical information and dated, non-time-critical information.

**Note:** Guidance found in AC 23.1311-1C, *Installation of Electronic Display in Part 23 Airplanes*, dated November 17, 2011; or AC 25-11A *Electronic Flight Deck Displays*, dated June 21, 2007, and AC 25.1322-1 *Flight Crew Alerting*, dated December 13, 2010 should be used in lieu of the color guidance in RTCA DO-267A, Section 3.8 and Table 3-2.

**7. Electromagnetic Compatibility.** Electromagnetic compatibility tests should be performed to demonstrate the FIS-B avionics equipment does not adversely affect other aircraft systems, including required radio systems. Radio frequency (RF) emissions tests on the FIS-B avionics equipment using AC 21-16G, *RTCA Document DO-160 versions D, E, F, and G, "Environmental Conditions and Test Procedures for Airborne Equipment"* (section 21) dated June 22, 2011, is recommended.

**8. Lightning Protection.** If a newly installed external antenna is required to support the FIS-B system, then determine lightning zones and account for system lightning protection. General guidance on lightning protection can be found in AC 20-136B, *Aircraft Electrical and Electronic System Lightning Protection*, dated September 7, 2011. Due to the minor failure effect of FIS-B avionics equipment, the indirect effects of lightning are not required for consideration.

**9. Additional Installation Considerations.** General guidance on installations, including external antennas, can be found in AC 43.13-2B, *Acceptable Methods, Techniques, and Practices – Aircraft Alterations*, dated March 3, 2008.

a. Install the equipment in accordance with the manufacturer's installation instructions.

b. If your FIS-B avionics equipment contains a memory retention device which is a rechargeable lithium battery, the flammability risk must be addressed. Installed FIS-B avionics equipment employing a rechargeable lithium battery must ensure the lithium ion battery meets airworthiness standards appropriate for the battery size and intended function, such as TSO-C179a, *Permanently Installed Rechargeable Lithium Cells, Batteries and Battery Systems*, dated April 19, 2011.

c. If your FIS-B avionics equipment includes an additional external antenna(s) and the aircraft is approved for flight in known icing conditions, the antenna must not accumulate harmful amounts of ice that may be ingested into the engine, degrade aerodynamic performance, or adversely affect the structural integrity of the aircraft for the respective category of aircraft. Reference the applicable AC on Ice Protection (AC 23.1419-2D, *Certification of Part 23 Airplanes for Flight in Icing Conditions*, AC 25.1419-1A, *Certification of Transport Category Airplanes for Flight in Icing Conditions*, AC 27.1419, *Ice Protection* found in AC 27-1B Chg. 3 *Certification of Normal Category Rotorcraft*, or AC 29.1419, *Ice Protection* found in AC 29-2C Chg. 3 *Certification of Transport Category Rotorcraft*).

## **10. Ground and Flight Tests.**

a. **Ground Tests.** The ground tests for certification should:

(1) Ensure the general arrangement and operation of controls, displays, circuit breakers, annunciations, and any placards for the FIS-B system have an unobstructed view and are easily accessible.

(2) Ensure any self-test features, failure mode displays, and annunciations display clearly when active.

(3) Evaluate the system installation ensuring clear identification, accessibility, and visibility during both day and night conditions.

(4) Evaluate the integration of the system with other aircraft communication, navigation, and surveillance (CNS) systems ensuring proper operation of the integrated system, if applicable.

(5) Perform aircraft electromagnetic compatibility ground tests to ensure the FIS-B system is compatible with aircraft electrical and electronic systems. Aircraft electromagnetic compatibility ground tests should be performed in accordance with the following guidelines:

(a) Conduct tests with the FIS-B avionics equipment powered by the aircraft electrical power system.

(b) Power on all aircraft safety-related and required electrical and electronic systems during the electromagnetic compatibility tests.

(c) Evaluate all reasonable combinations of control settings and operating modes for the FIS-B system and aircraft safety-related and required electrical and electronic systems. With FIS-B equipment energized on the ground, individually operate other electrically operated equipment and systems on the aircraft to demonstrate electromagnetic compatibility.

**b. Flight Tests.** The flight tests for certification should:

(1) Demonstrate FIS-B electromagnetic compatibility with aircraft safety-related and required electrical and electronic systems. Aircraft safety-related and required electrical and electronic systems that could not be adequately operated during the aircraft electromagnetic ground tests should be specifically monitored during the flight tests. Required aircraft radio receivers should be monitored with receivers tuned to frequencies where effects were observed during the aircraft electromagnetic compatibility ground tests, or where significant spurious emissions or harmonic emissions were recorded during emissions tests (see paragraph 7).

(2) Insert (simulate) failure modes for conditions that could not be tested on the ground, as necessary, in order to verify aural and visual annunciation and assess additional pilot workload.

**11. Airplane/Rotorcraft Flight Manual (A/RFM) Supplement.** A/RFM or A/RFM supplement wording for operating procedures applies to FIS-B installations covered by this AC. The A/RFM, Section 3, *Normal Operating Procedures*, should state the following:

*FIS-B information is intended to enhance pilot awareness of weather and airspace conditions. It does not replace positive two way communication when making safety critical weather or routing decisions. Use FIS-B weather and NAS status information as follows:*

(a) *To aid pilot awareness of hazardous meteorological conditions and awareness of the regulatory status of the airspace.*

(b) *Changes in hazardous meteorological conditions and/or airspace status the pilot should communicate with the ATC controller, FSS specialist, or operator dispatch for more information about the current meteorological conditions or regulatory airspace status.*

(c) *FIS-B information is meant to enhance flight planning only. It lacks sufficient resolution and updating necessary for tactical maneuvering.*

## **12. Related Documents.**

**Note:** In this AC, when another AC is referenced and a later revision becomes available, it is acceptable to utilize the latest revision.

- a. AC 00-45G, *Aviation Weather Services*, dated July 29, 2010.
- b. AC 120-76B, *Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags*, dated June 1, 2012.
- c. AC 23.1311-1C, *Installation of Electronic Display in Part 23 Airplanes*, dated November 17, 2011.
- d. AC 25-11A *Electronic Flight Deck Displays*, dated June 21, 2007.
- e. AC 23-1309-1E, *System Safety Analysis and Assessment for Part 23 Airplanes*, dated November 17, 2011.
- f. AC 25-1309-1A, *System Design and Analysis*, dated June 21, 1988.
- g. AC 27.1309, *Equipment, Systems, and Installations*, found in master AC 27-1B Chg. 3 *Certification of Normal Category Rotorcraft*, dated September 30, 2008.
- h. AC 29.1309, *Equipment, Systems, and Installations*, found in master AC 29-2C Chg. 3 *Certification of Transport Category Rotorcraft*, dated September 30, 2008.
- i. AC 25-1322 *Flight Crew Alerting*, dated December 13, 2010.
- j. AC 21-16G, *RTCA Document DO-160 versions D, E, F, and G, "Environmental Conditions and Test Procedures for Airborne Equipment"*, dated June 22, 2011.
- k. AC 43.13-2B, *Acceptable Methods, Techniques, and Practices – Aircraft Alterations*, dated March 3, 2008.
- l. AC 23.1419-2D, *Certification of Part 23 Airplanes for Flight in Icing Conditions*, dated April 19, 2007.



**m.** AC 25.1419-1A, *Certification of Transport Category Airplanes for Flight in Icing Conditions*, dated May 7, 2004.

**n.** AC 27.1419, *Ice Protection* found in master AC 27-1B Chg. 3 *Certification of Normal Category Rotorcraft*, dated September 30, 2008.

**o.** AC 29.1419, *Ice Protection* found in master AC 29-2C Chg. 3 *Certification of Transport Category Rotorcraft*, dated September 30, 2008.

**p.** RTCA DO-267A, *Minimum Aviation System Performance Standard (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link*, dated April 29, 2004.

**q.** TSO-C157a, *Aircraft Flight Information Services-Broadcast (FIS-B) Data Link Systems and Equipment*, dated September 9, 2011.

**r.** TSO-C179a, *Permanently Installed Rechargeable Lithium Cells, Batteries and Battery Systems*, dated April 19, 2011.

### **13. Where to Find Related Documents.**

**a.** You may access all ACs and TSOs on the FAA website at [http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgWebcomponents.nsf/FrameSet?OpenPage](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgWebcomponents.nsf/FrameSet?OpenPage)

**b.** Order copies of RTCA documents from RTCA Inc., 1150 18th Street NW, Suite 910, Washington, D.C. 20036-4007, telephone (202) 833-9339, fax (202) 833-9434. You can also order copies online at [www.rtca.org](http://www.rtca.org).



for David W. Hempe  
Manager, Aircraft Engineering Division  
Aircraft Certification Service

## Appendix A. Definitions

### 1. Definitions.

**a. Airline Operations Control Center (AOCC):** An air carrier dispatch service, or other operator's aeronautical weather and operational information service.

**b. Broadcast Data Link:** A data link transmission with no requirement for an initiating request from the receiving station. Further, the broadcast data link transmission, as defined in RTCA/DO-267A, does not contain message recipient address information.

**c. Broadcast message:** A message using a broadcast protocol that does not depend on a request from the receiver. This AC refers specifically to the broadcast protocol in RTCA/DO-267A.

**d. Flight Information Services (FIS):** The International Civil Aviation Organization (ICAO) defines FIS in the 15<sup>th</sup> Edition of Doc 4444, ATM/501, *Procedures for Air Navigation Services / Air Traffic Management*, November 22, 2007, as a service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flight. Further, ICAO defined specific request-reply data link services found in the Aeronautical Telecommunications Network (ATN) Standards and Recommended Practices (SARPs) document 9705. The term "FIS" in this AC, however, includes a much broader scope of services, applications, and formats: FIS includes near real-time advisories and warnings that may affect flight safety and flight information planning services used in strategic flight planning. Additionally, FIS is limited to broadcast data link services not requiring request-reply.

**e. Flight Information Services-Broadcast (FIS-B):** Means of disseminating FIS by broadcast (a non-directed transmission intended to be received by all stations).

**f. Flight Information Service Provider (FAA):** A commercial vendor providing FAA FIS-B on the ADS-B 978 MHz UAT data link under an agreement with the FAA.

**g. Flight Information Service Provider (Non-FAA):** An organization that operates a commercial data link service providing aviation weather and operational information independent of a vendor service agreement with the FAA.

**h. Graphical product:** A FIS product composed of graphics with associated supporting text.

**i. NEXRAD:** Next Generation Weather RADAR (NEXRAD) is a doppler weather radar system developed and deployed as a tri-agency program by the Department of Transportation (FAA), the Department of Commerce, and the Department of Defense. NEXRAD provides surface weather radar coverage and is an essential input to various aviation weather products.

- j. DAR-88:** Doppler (WSR-88D).
- k. Text product:** A FIS product composed of text only.
- l. Universal Access Transceiver (UAT):** UAT transmits on 978 MHz. The UAT supports ADS-B, FIS-B and Traffic Information Service - Broadcast (TIS-B).
- m. Value-Added Product:** A product offered by a third party provider for a fee.

**Appendix B. Acronyms**

<b>Acronym</b>	<b>Description</b>
AC	Advisory Circular
ACO	Aircraft Certification Office
AIRMET	Airman's Meteorological Information
AOCC	Airlines Operation Control Center
A/RFM	Airplane/Rotorcraft Flight Manual
ATC	Air Traffic Control
ATN	Aeronautical Telecommunication Network
CNS	Communication, Navigation and Surveillance
CONUS	Continental United States
FAA	Federal Aviation Administration
FDC	Flight Data Center
FIS-B	Flight Information Services – Broadcast
FSS	Flight Service Station
ICAO	International Civil Aviation Organization
METARs	Aviation Routine Weather Reports
NAS	National Airspace System
NEXRAD	Next Generation Radar
NOTAM	Notice to Airmen
PIREPs	Pilot Reports
RF	Radio Frequency
SARPS	Standards and Recommended Practices
SBS	Surveillance and Broadcast Service
SIGMET	Significant Meteorological Information
SPECIs	Aviation Selected Special Weather Reports
SUA	Special Use Airspace
TAFs	Terminal Area Forecasts
TIS-B	Traffic Information Services - Broadcast
TSO	Technical Standard Order
UAT	Universal Access Transceiver