U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Installation of an Airborne Low-Range Radio Altimeter System

Date: 07/24/2026 **AC No:** 20-199
Initiated By: AIR-626B

This advisory circular (AC) provides guidance for the installation design approval of a radio altimeter (RA) system to comply with the requirements of title 14, Code of Federal Regulations (14 CFR) 91.220(b). An RA system consists of an RA transceiver, RA antenna(s), coaxial cabling, and display(s) or indicator(s). This AC provides guidance for all the components of the RA system, as well as for the use of the existing RA antenna(s) and display(s) or indicator(s) as part of the RA system installation. This AC includes guidance for system installation and testing to assure proper functioning of the installed RA system, including external radio frequency interference (RFI) tolerance, as well as proper functioning of integrated avionics and flight control systems that utilize the RA.

If you have suggestions for improving this AC, you may use the form at the end of this AC.

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CHAPTER 1. GENERAL INFORMATION

1.1 Purpose.

This advisory circular (AC) provides guidance for the installation design approval of a radio altimeter (RA) system that is intended for showing compliance with the requirements of title 14, Code of Federal Regulations (14 CFR) 91.220(b). An RA system consists of an RA transceiver, RA antenna(s), coaxial cabling, and display(s) or indicator(s). This AC provides guidance for all components of the RA system, as well as for the use of the existing RA antenna(s) and display(s) or indicator(s). This AC includes guidance for system design (chapter 2 of this AC) and testing (chapter 3 of this AC) to assure proper functioning of the installed RA system, including external radio frequency interference (RFI) tolerance, as well as proper functioning of integrated avionics and flight control systems that utilize the RA. When the RA system is properly installed in an aircraft, in accordance with applicable installation and operational approval guidance and regulations, it is expected that all aircraft-level functional and operational performance criteria will be met.

1.2 Applicability.

This AC is for RA system design organizations, type certificate (TC) applicants (including amended TC and supplemental type certificate (STC) applicants), installers, operators, foreign regulatory authorities, Federal Aviation Administration (FAA) engineers, and the Administrator's designees.

1.3 Intent of this AC.

1.3.1 This is a guidance document. Its content is not legally binding in its own right and will not be relied upon by the Department as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with the guidance document is voluntary only. Nonconformity will not affect rights and obligations under existing statutes and regulations.

1.3.2 This AC establishes an acceptable means, but not the only means, of compliance. The FAA will consider other methods of demonstrating compliance that an applicant may elect to present. Since the guidance material presented in this AC is not regulatory, terms having a mandatory definition, such as "shall" and "must," apply either to the reiteration of a regulation itself, or to an applicant who chooses to follow a prescribed method of compliance without deviation. If the FAA becomes aware of circumstances in which following this AC would not result in compliance with the applicable regulations, the FAA may require additional substantiation as the basis for finding compliance. This material does not change or create any additional regulatory requirements or authorize changes in or permit deviations from regulatory requirements.

1.4 **Related Material.**

See appendix C of this AC for related material that applies to this AC.

1.5 **Definition of Key Terms and Acronyms.**

See appendix D of this AC for terms and definitions, and appendix E of this AC for acronyms that apply to this AC.

1.6 **Background.**

1.6.1 **RA System Approval for Operations in the U.S.**

1.6.1.1 Aircraft with RA systems must meet the interference tolerance requirements in § 91.220(b) by the deadlines indicated in §§ 91.220(a), 14 CFR 121.326, and 14 CFR 129.16. Operators can comply by operating aircraft equipped with a next generation RA system. Next generation RA are new or modified RA systems that comply with the performance requirements in § 91.220(b), described in table 1 of § 91.220 as an interference tolerance mask (ITM). These performance requirements are also presented for reference in section 2.4 and table 2-1 of this AC.

1.6.1.2 Pilots or operators of aircraft with a special airworthiness certificate with an installed RA should evaluate the RA and determine if it is compliant with the ITM. If the RA meets the performance requirements of this final rule, no separate or specific FAA approval is required for operation of an aircraft that has a special airworthiness certificate.

1.6.2 **RA System Description.**

1.6.2.1 An RA system consists of the functional components necessary to transmit and receive radio frequency (RF) signals, process radio altitude, and present that data to the pilot(s) and downstream systems. These elements include:

- A transmitter that generates and amplifies a modulated RF signal.
- A transmitting antenna that radiates this RF signal from an aircraft toward the terrain surface beneath the aircraft.
- A receiving antenna that receives the reflected RF signal from the terrain surface and any surface features.
- Coaxial cabling or RF transmission lines.
- A receiver that demodulates the received RF signal.
- A signal processor that measures the round-trip RF signal propagation time, converts this into a radio altitude value, and outputs this value to an indicator or display or other downstream systems.

1.6.2.2 These elements may be implemented as separate components or combined, integrated, or distributed across multiple units depending on the aircraft architecture. Generally, the transmitter, receiver, and signal processing functionality are all implemented in a single component, referred to as the transceiver, and the transmitting and receiving antenna are combined into a single antenna.

1.6.3 **RA Integrated Systems.**

1.6.3.1 The RA system is an essential aeronautical safety system that measures aircraft height above terrain and obstacles. The RA system is primarily used during takeoff, approach, and landing, and when terrain clearance is within range, but it is operational in all phases of flight. The height information supplied by RAs is utilized to support numerous navigation and safety functions and operational capabilities, including:

- Displays of the aircraft height above terrain.
- Autoflight systems, such as autopilot, flight director, autothrottle, autoflare, and alerting systems, that are critical during approach and landing operations in low-visibility conditions.
- Terrain avoidance systems, including terrain awareness and warning systems (TAWS) and enhanced ground proximity warning systems, which provide information about terrain and obstacles to help pilot(s) avoid controlled flight into terrain.
- Collision avoidance systems, including traffic alert/airborne collision avoidance systems (TCAS/ACAS), which detect nearby aircraft and provide guidance to help pilot(s) avoid mid-air collisions. The radio altimeter is used to ensure availability and provide proper inhibitions near the ground.
- Wind shear protection systems that detect, alert, and manage the flight path during wind shear conditions encountered on takeoff and landing.
- Vision systems and operations, including enhanced flight vision systems (EFVS), synthetic vision systems, and night vision goggle (NVG) operations, all of which increase pilot visibility and situational awareness.
- Other flight control systems, such as tailstrike avoidance systems and ground spoiler/speed brake deployment logic.
- Other avionics systems, such as transponders, automatic dependent surveillance-broadcast, and weather radars.
- Flight deck information, including alerts to aid pilot(s) during landing and awareness of height above terrain.

1.6.3.2 Refer to appendix A of this AC for standards and policy related to these functions, systems, and operations.

CHAPTER 2. RADIO ALTIMETER SYSTEM INSTALLATION DESIGN APPROVAL

2.1 Classification of Change and Areas Affected.

2.1.1 The approval of a change under the TC, or an amended TC or STC, considers the extent to which the modification of the previously approved RA transceiver affects the performance of the transceiver as installed in accordance with § 21.93. If the RA supplier approves a minor change to an RA manufactured under a previously issued TSO authorization (TSOA) and demonstrates that the ITM-related alterations do not have an appreciable effect on other performance parameters, the replacement of the RA can also be considered a minor change to the type design. For new RA systems, or if the ITM-related alterations to existing RA systems do appreciably affect other performance parameters, the effect of those changes must be assessed and compliance demonstrated for any areas that are affected as a major change to the type design, in accordance with § 21.97. Appendices A and B of this AC provide references and RA system-specific considerations that may apply depending on the scope of the change in the type design.

2.1.2 When demonstrating compliance with the ITM under a TC or STC, the TC or STC holder or applicant should consider the supporting data and assumptions from the RA supplier. If the installation is within the parameters defined by the RA supplier and the RA supplier has demonstrated compliance with the ITM, an additional aircraft-level showing of compliance is not necessary. If the installation is outside the parameters defined by the RA supplier, those parameters must be addressed and ITM compliance demonstrated as appropriate.

2.2 TSO Authorizations.

2.2.1 TC/STC applicants who are showing compliance for an installation may use the TSO authorization of a third-party supplier who manufactures the RA transceiver. RA transceiver manufacturers with authorization under TSO-C87(), *Airborne Low-Range Radio Altimeter*, must provide manuals containing installation procedures, maintenance instructions, and limitations that will allow the article to continue to meet TSO requirements after installation. The RA's installation manual (IM) or design data should include the declared antenna and aircraft installation characteristics and provide any data necessary to support the TC/STC applicant's demonstration of compliance.

2.2.2 Next Generation RA—TSO-C87() Minor Design Change (§ 21.619(a)).

2.2.2.1 For RA suppliers who are modifying an RA design that is approved under TSO-C87 or TSO-C87a, the new design is a minor change under the existing TSO authorization if the scope of the change is not extensive enough to require a substantially complete investigation (within the meaning of § 21.619(b)) into the compliance with the requirements of the applicable TSO. In this case, the changed article keeps the original model number (part numbers may be used to identify minor changes).

2.2.2.2 Data establishing compliance with the ITM, or with transceiver-related requirements related to the ITM, are considered related data approved under the TSO and do not affect the eligibility of the change as a minor change. The TSOA holder should document the means of compliance with the ITM and retain the MOC and supporting data for use by the aircraft installation design approval applicant. The FAA recommends that ITM compliance be shown as addressed in section 2.4, section 3.1, and appendix B of this AC.

2.2.2.3 In this case, the RA supplier should also identify any changes to the performance of its RA, other than the demonstrated interference tolerance, to support TC and STC holders assessing the impact of replacing the original RA with the modified design.

Note: Refer to AC 21-46A, *Technical Standard Order Program,* for additional information on design changes and non-TSO functions, including substantiation data to support the installation.

2.2.3 **Next Generation RA—New Products or TSO-C87a Major Design Changes (§ 21.619(b)).**

2.2.3.1 These changes include new RAs and modifications to existing RAs approved under TSO-C87a by the manufacturer that are extensive enough to require a substantially complete investigation (within the meaning of § 21.619(b)) to determine compliance with the TSO. Before making a major change, the manufacturer must assign a new type or model designation to the article and apply for a TSO authorization under § 21.603.

2.2.3.2 Data establishing compliance with the ITM, or with transceiver-related requirements related to the ITM, are considered related data approved under the TSO and do not affect the eligibility of the change as a minor change. The TSOA holder should document the means of compliance with the ITM and retain the MOC and supporting data for use by the aircraft installation design approval applicant. The FAA recommends that ITM compliance be shown as addressed in section 2.4, section 3.1, and appendix B of this AC.

Note: Refer to AC 21-46A for additional information on design changes and non-TSO functions, including substantiation data to support the installation. TSO-C87a will not be revised to incorporate RFI requirements.

2.2.4 **Next Generation RA—New RA Standard.**

The FAA plans to issue a new TSO (TSO-C221, *Airborne Low-Range Radio Altimeter Transceiver*) to recognize a new industry standard expected in 2027. This TSO will include a demonstration of compliance with the ITM as a minimum requirement, as

well as other minimum requirements arising from the voluntary consensus standard process to facilitate aircraft integration of a new RA design.

2.3 Aircraft Type Design Change.

2.3.1 Compliance with the ITM must be established for the installed RA system in a particular aircraft type design. If the TSOA holder for the RA transceiver has established compliance for the transceiver, that information can be used to establish compliance at the aircraft level. The TC/STC applicant should follow all sections of the AC applicable to the RA system installation change impact.

2.3.1.1 **Design Approval Without a TSO or Outside the Scope of the TSO.** All airworthiness requirements not demonstrated at the equipment level must be demonstrated by the TC/STC applicant at the aircraft level. This may include installations with certain aspects that fall outside the scope of the RA transceiver manufacturer's IM or installations requiring additional modifications outside the RA transceiver (e.g., antenna or cabling).

2.4 Radio Frequency Interference (RFI)—Reference § 91.220, *Radio Altimeter Systems.*

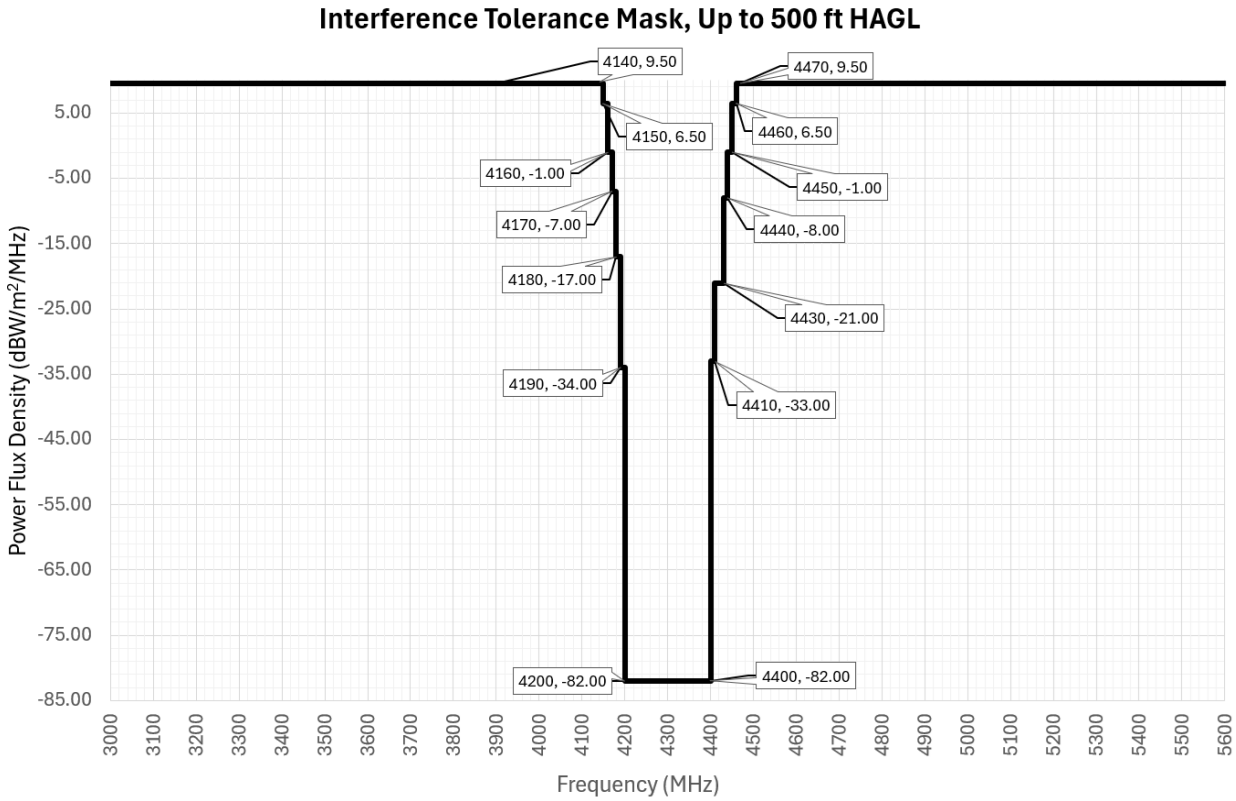
2.4.1 The power flux-density (PFD) levels for the RFI tolerance requirements represent the total exposure from all RFI sources within the relevant frequency bands. The RA system will be simultaneously exposed to both in-band and out-of-band RFI, and some sources of RFI may simultaneously present both types of interference at significant levels; however, it is not required to test both simultaneously (refer to appendix B of this AC). The interference tolerance is specified in § 91.220(b), table 1, and replicated in table 2-1 and depicted in figure 2-1 of this AC.

Table 2-1. Interference Tolerance Mask (ITM)

Frequency Range (MHz)	Power Flux-Density, RMS (dBW/m^2/MHz), 0–500 ft Height Above Ground Level (HAGL)
3000 ≤ f < 4000	9.5
4000 ≤ f < 4100	9.5
4100 ≤ f < 4150	9.5
4150 ≤ f < 4160	6.5
4160 ≤ f < 4170	-1
4170 ≤ f < 4180	-7
4180 ≤ f < 4190	-17
4190 ≤ f < **4200** **4200 ≤ f < 4400** **4400** < f ≤ 4410	-34 -82 -33
4410 < f ≤ 4430	-21
4430 < f ≤ 4440	-8
4440 < f ≤ 4450	-1
4450 < f ≤ 4460	6.5
4460 < f ≤ 4500	9.5
4500 < f ≤ 4600	9.5
4600 < f ≤ 5600	9.5

Note: The PFD levels define the maximum safely tolerable RFI environment at the surface of the RA antenna and are 6 dB higher than the expected, authorized environment to provide a safety margin. This safety margin aligns with the International Civil Aviation Organization (ICAO) recommendations in ICAO Doc 9718, *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation*, which specify that a safety margin of 6−10 dB is to be applied for aeronautical safety systems.

Figure 2-1. Interference Tolerance Mask (ITM)



2.4.1.1 **RA System Performance.**

The RA system must meet all its performance requirements as installed in the aircraft when the RFI environment at the RA antenna(s) is at or below the PFD levels specified in table 2-1 of this AC. These requirements are derived from the aircraft-level and integrated system-level safety assessment process. For retrofit installation designs, the requirements from the original certification can be used without reevaluation, since replacing RA system components does not affect the higher-level requirements derived from the integration.

2.4.1.2 **RA System Antenna Gain.**

2.4.1.2.1 The PFD levels at the frequencies defined in table 1 of § 91.220(b) (replicated in table 2-1 of this AC) must be met with the maximum RA antenna gain. Refer to section 3.1 of this AC for additional details on how the RA antenna gain is considered when the RA transceiver is tested to verify compliance with the interference requirements. This ensures full-

spectrum compatibility with RFI that may be directed into the RA at any angle, including at boresight.

2.4.1.2.2 Studies of previously-fielded RA antennas indicate that the maximum antenna gain is 11.5 dBi. Therefore, if the RA transceiver demonstrates compliance with the ITM for an antenna with a maximum gain of 11.5 dBi and without any frequency selectivity required from the antenna, data for the antenna selectivity is not required to show compliance with the performance requirements of § 91.220(b). In this case, previously approved and installed antennas may be used without further showing.

2.4.1.2.3 The accuracy of the integrated system may be degraded if the selectivity (and corresponding group delay) exceeds the design expectations. TC/STC applicants should consider the requirements of systems that use the RA output, and the demonstrated RA accuracy, to determine whether additional accuracy testing is appropriate for the integrated system. If additional testing is needed, comparative testing of the accuracy of a previously approved RA and the RFI-tolerant RA can be used to show acceptable performance. By using comparative analysis, the RF environment need not be considered in the accuracy test.

2.5 Aircraft Flight Manual (AFM).

In the Normal Procedures, Normal Operations, or equivalent section of the AFM, AFM supplement, or *Pilot Operating Handbook,* **the applicant should include a statement that the aircraft has been demonstrated to meet § 91.220, *Radio Altimeter Systems*.** That statement may be used by pilots or operators for demonstrating compliance to the operating requirements of § 91.220, § 121.326, or § 129.16, as appropriate**.** For example, the AFM may state: “This aircraft has an RA system that operates in the interference environment described in 14 CFR 91.220(b).”

CHAPTER 3. RADIO ALTIMETER SYSTEM TESTING

3.1 Radio Frequency Interference Testing.

3.1.1 The RFI injection test setup and requirements are specified in appendix B of this AC and may be done:

- At the RA transceiver line replacement unit (LRU), or
- By testing the RF Filter Subassembly (RFFSA) and RA transceiver separately.

3.1.2 For the LRU level, the conducted interference power levels associated with the system ITM (PFD levels) are directly injected into the RA transceiver RF ports. When testing the RFFSA and RA transceiver separately, test the RFFSA at the maximum level (direct conducted) and use the resulting data to reduce the level of interference into the RA transceiver. The equations that define the interference power levels are provided in equations B-1 to B-3 of appendix B in this AC, which assumes specific values for installation parameters, including antenna gain and cable loss. Under these interference power levels, the RA transceiver must meet the measurement validity, accuracy, and noise requirements. As stated in note 1 in appendix B, section B.4, of this AC, the assumed antenna gain must be the gain specified in the RA transceiver IM that is sufficient to maintain the required RA performance, and it may include engineering judgment to bound the antenna gain at all applicable frequencies in real aircraft installations.

3.1.3 Demonstration of compliance may be done using the RA transceiver manufacturer's data, and an analysis showing that the data is applicable to the installation (i.e., the installed antenna gain and cable loss is within the RA transceiver assumed parameters) across all frequency bands specified in table 2-1 of this AC.

3.2 Installed RA System Testing (as applicable to the change impact).

Installed RA system testing should include testing with the aircraft on the ground using simulated or real inputs or with the aircraft in flight using real inputs. The TC/STC applicant should:

- Demonstrate that the RA system performs appropriately with real terrain returns for all integrated systems. Various types of complex terrain scenarios should be assessed. There is no need to perform this demonstration in the presence of RFI interference.
- Demonstrate that the accuracy and performance are not degraded by installing a new RA system. Negligible degradation may be acceptable if it is shown that all integrated systems continue to meet their intended function, safety, and performance requirements.
- Demonstrate compliance using the manufacturer's data for the RA transceiver, antenna, or display, as applicable, and an analysis showing the data is applicable to the installation.

3.3 **Integrated System Testing (as applicable to the change impact).**

The TC/STC applicant should perform regression and additional integrated system testing appropriate to the design change and its impact on the integrated systems. When replacing one RA with another, it is acceptable to demonstrate that any degradation in performance (e.g., accuracy) is within the integrated system's performance requirements. Testing should be conducted as applicable to the systems, functions, and operations integrated into the aircraft. Demonstration of compliance may be accomplished using the RA transceiver, antenna, or by displaying the manufacturer's data. Refer to appendix A of this AC for additional guidance.

APPENDIX A. INTEGRATED SYSTEM REFERENCES

Table A-1. Standards and Policy for Integrated Systems

Operational Application	System or Function	Reference TSO	Reference Advisory Circular
Terrain Avoidance[1]	TAWS	FAA or EASA TSO-C151d	AC 23-18 AC 25-23
	HTAWS	FAA or EASA TSO-C194 EASA TSO-2C522	AC 27-1B AC 29-2C
Collision Avoidance[1]	TCAS/ACAS I	FAA or EASA TSO-C118a	
	TCAS/ACAS II	FAA or EASA TSO-C119e	AC 20-131A AC 20-151C
	ACAS X	FAA or EASA TSO-C219a	
Windshear Protection[1]	Weather Radar	FAA TSO-C63g EASA TSO-C63f	AC 25-12 AC 20-182A
	Predictive Windshear		
	Reactive Windshear	FAA or EASA TSO-C117b	
Flight Guidance Systems	Autopilot (AFGCS/FD)	FAA or EASA TSO-C198	AC 120-29A/120-28D AC 25.1329-1() AC 20-138()
	Autothrottle		
	Flight Guidance Alerting		
	Approach and Landing Systems (including Autoflare)		

[1] These safety systems are required by regulation for certain aircraft operations by multiple state aviation authorities.

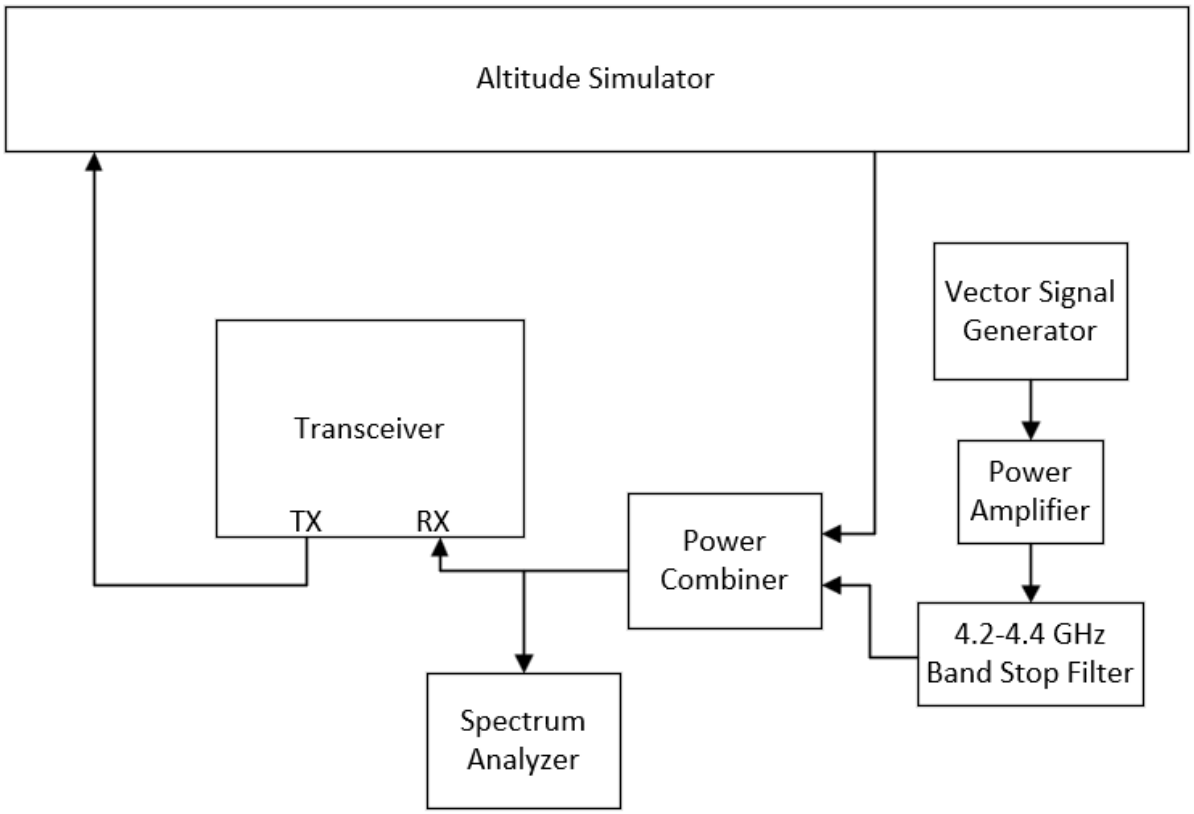
Operational Application	System or Function	Reference TSO	Reference Advisory Circular
	FMS Guidance/ Approach		
Flight Control Systems	Tail Strike Avoidance	Performance and safety requirements tied to aircraft system integration	
	Ground Spoiler/ Speedbrake Deployment		
Cockpit Information	Instrument Approach DH Determination and Alerting (Audio or Visual)	Performance and safety requirements tied to aircraft operation	
	Crew Alerting System Triggers or Inhibitions for Various Warnings and Alerts		
	Situational Awareness of Radio Altitude		
Vision Systems	EFIS	SAE AS6296, SAE 8034B, FAA or EASA TSO-C209	AC 25-11B
	EVS/CVS/EFVS		AC 20-167()
	SVS/SVGS		AC 20-185()
	Night Vision Goggle (NVG) Operations	FAA or EASA TSO-C164a	
Surveillance System	Transponder	FAA or EASA TSO-C166()	
	ADS-B Out		AC 20-165

APPENDIX B. RADIO FREQUENCY INTERFERENCE TOLERANCE TESTING

Note: This appendix contains an acceptable means of compliance for RA transceivers or systems to demonstrate compliance with the performance requirements in § 91.220. The TC/STC applicant is only expected to address this testing for RA system installations that have not demonstrated compliance under a TSO authorization.

B.1 **RF Interference Test Setup—Receive Port (RX) Injection.**
A simplified block diagram of one possible test setup used for RF interference injection into the receive port of the RA transceiver, either at the LRU level or as a subassembly, is shown in figure B-1 of this AC.

Figure B-1. RF Interference Test Setup—RX Injection

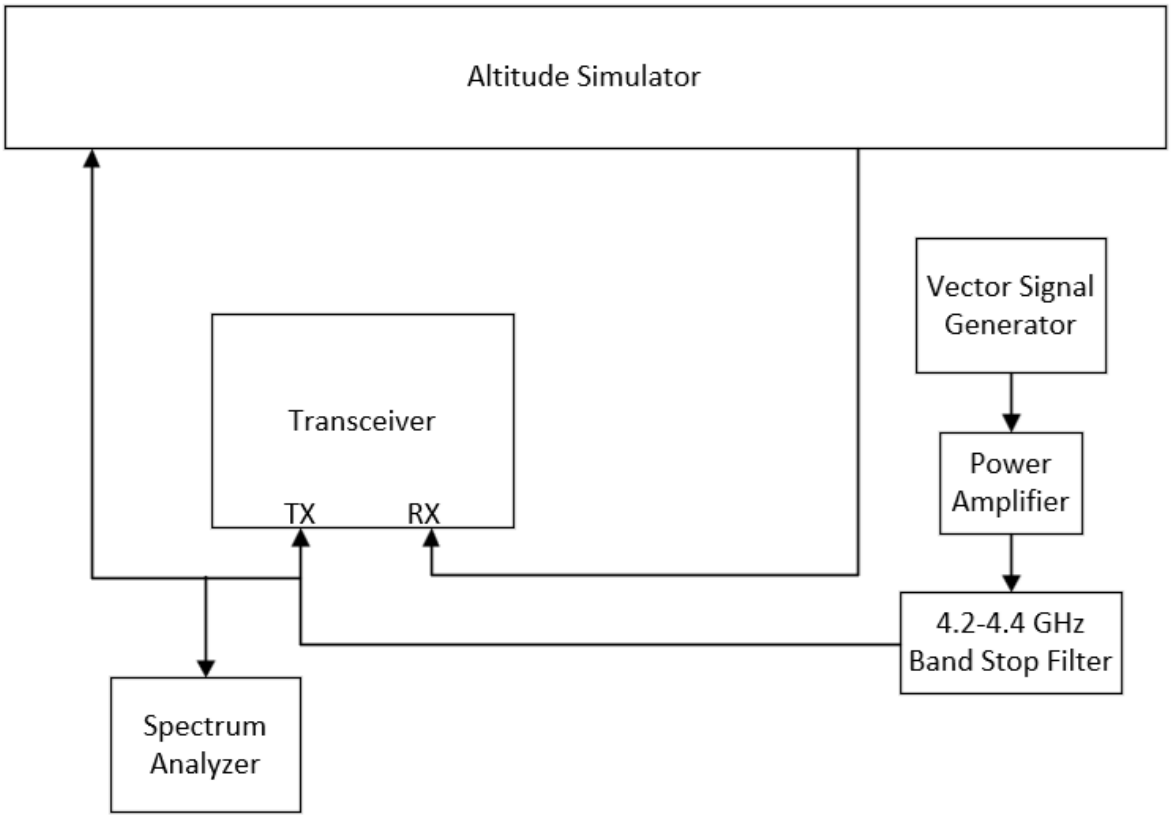


The 4.2–4.4 GHz band stop filter is used to suppress broadband noise from the power amplifier when performing out-of-band interference tests. When performing in-band tests where the required interference level does not necessitate the use of the power amplifier, or near-band tests where the use of the band stop filter will unacceptably distort the interference waveform, the band stop filter and power amplifier can be omitted or bypassed.

B.2 **RF Interference Test Setup—Transmit Port (TX) Injection.**

A simplified block diagram of one possible test setup used for RF interference injection into the transmit port of the RA transceiver, either at the LRU level or as a subassembly, is shown in figure B-2 of this AC.

Figure B-2. RF Interference Test Setup—TX Injection

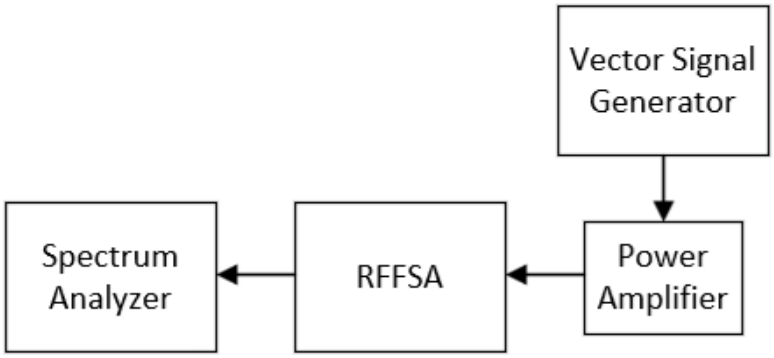


As in the RX injection test setup, the 4.2–4.4 GHz band stop filter and power amplifier can be omitted or bypassed when performing in-band tests where the required interference level does not necessitate the use of the power amplifier, or near-band tests where the use of the band stop filter will unacceptably distort the interference waveform.

B.3 **RF Interference Test Setup—RF Filter Subassembly.**

A simplified block diagram of the test setup used for RF interference testing of an RFFSA of the RA transceiver is shown in figure B-3 of this AC. This test setup is used only when the RFI testing is performed through a combination of subassembly tests rather than a full LRU-level test.

Figure B-3. RF Interference Test Setup Subassembly



B.4 **RA Transceiver RFI Injection Test.**

The RA system must meet the measurement validity, accuracy, and noise when injecting RFI into the RF or TX ports of the RA transceiver with a conducted power level calculated using equation B-1 of this AC:

(Equation B-1)

$$P_{test}(f_c) = PFD\left(f_c \pm \frac{BW \times 10^6}{2}\right) + 30 - 10 \times \log_{10}(4\pi) + 20 \times \log_{10}\left(\frac{c}{f_c}\right) + G(f_c) + 10 \times \log_{10}(BW) - L_{coax}$$

Where:

$P_{test}(f_c)$ = input power at RA Transceiver TX or RX port, in dBm

$PFD(f)$ = power flux-density specified in table 2-1 at the frequency f, in dBW/m^2/MHz

c = speed of light, in meters per second

f_c = center frequency of waveform specified in table B-1, in Hz

$G(f_c)$ = assumed RA antenna gain at the frequency f_c, in dBi

BW = bandwidth of waveform specified table B-1, in MHz

L_{coax} = coaxial cable loss between the RA antenna and the RA transceiver, in dB

Note 1: The assumed antenna gain is the gain specified in the RA transceiver IM that is sufficient to maintain the required RA performance.

Note 2: For RFI injection testing into the TX port, the coaxial cable loss is the minimum required cable loss in the TX path specified in the RA transceiver IM. For RFI injection testing into the RX port, the coaxial cable loss in is the minimum required cable loss in the RX path as specified in the RA transceiver IM.

B.5 **RF Filter Subassembly (RFFSA) and RA Transceiver RFI Injection Test.**

If the RFI injection testing is performed using separate tests of an RFFSA and a transceiver subassembly, the measurement validity, accuracy, and noise must meet the requirements with the test levels at the RF port of the transceiver subassembly calculated using either equation B-2 of this AC, if the RFFSA is tested with continuous waveform (CW) only, or equation B-3 of this AC, if the RFFSA is tested with the same waveforms as the transceiver subassembly.

(Equation B-2)

$$P_{TXR}(f_c, W_n) = P_{test}(f_c, W_n) - \min\left[FDR\left(f_c - \frac{BW}{2}\right), FDR\left(f_c + \frac{BW}{2}\right)\right]$$

Where:

$P_{TXR}(f_c, W_n)$= input power at transceiver subassembly TX or RX port, in dBm

$P_{test}(f_c, W_n)$ = test level at input port of RFFSA calculated from equation B-1, in dBm

$FDR(f)$ = RFFSA frequency-dependent rejection at frequency f measured with CW, in dB

f_c = center frequency of waveform W_n, as specified in table B-1, in MHz

BW = bandwidth of waveform W_n, as specified in table B-1, in MHz

(Equation B-3)

$$P_{TXR}(f_c, W_n) = P_{test}(f_c, W_n) - FDR(f_c, W_n)$$

Where:

$P_{TXR}(f_c, W_n)$= input power at transceiver subassembly TX or RX port, in dBm

$P_{test}(f_c, W_n)$ = test level at input port of RFFSA calculated from equation B-1, in dBm

$FDR(f_c, W_n)$ = RFFSA frequency-dependent rejection at frequency f_c measured with waveform W_n, in dB

f_c = center frequency of waveform W_n, as specified in table B-1, in MHz

Table B-1. RFI Test Waveforms

Frequency	3000-4100 MHz	4100-4200 MHz	4200-4400 MHz	4400-4500 MHz	4500-5600 MHz
Waveform	2	3	1	3	2

B.6 **RFI Test Waveforms.**

1. Band-limited additive white Gaussian noise (AWGN) fully within the 4.2-4.4 GHz frequency band with a minimum bandwidth of 99 percent of the actual bandwidth of the transceiver unit under test (UUT) (a maximum bandwidth of 200 MHz), a minimum peak-to-average power ratio (PAPR) of 10 dB, and a 100 percent duty cycle.
2. Band-limited AWGN fully outside of the 4.2-4.4 GHz frequency band with a minimum bandwidth of 100 MHz, minimum PAPR of 10 dB, and 100 percent duty cycle.
3. Band-limited AWGN fully outside of the 4.2-4.4 GHz frequency band with a minimum bandwidth of 10 MHz, minimum PAPR of 10 dB, and 100 percent duty cycle.

Note 1: The ITM average power represents the constraining scenario from an RFI compatibility perspective. However, to fully characterize the RA performance, peak power testing should be considered to capture data to support any future applications.

Note 2: If testability constraints are encountered for waveform 2, a reduced PAPR may also be acceptable for testing that exceeds the average power to meet an equivalent peak power (i.e., over test of the average power). These methods demonstrate that the RA system can meet or exceed both the ITM average power and any peak power spikes simultaneously.

B.7 **RFI Test Altitudes.**

Simulated HAGL greater than 10 ft and less than or equal to 75 ft.

Simulated HAGL greater than 75 ft and less than or equal to 200 ft.

Simulated HAGL greater than 200 ft and less than or equal to 500 ft.

Note 1: The test loop losses at each altitude should include the worst-case loop loss in accordance with TSO-C87().

Note 2: RA performance requirements for operations above 500 ft HAGL are not addressed in § 91.220(b). Up to 500 ft represents the constraining scenario for the RA equipment and is critical for compatibility with the RFI environment. However, to fully characterize the RA performance, it is recommended to test using simulated HAGL greater than or equal to 500 ft, less than or equal to 2500 ft, greater than 2500 ft, and up to and just above the maximum HAGL of the RA to capture data to support any future applications.

B.8 **RFI Testing with Multiplex Installations.**

The ITM specified in table 2-1 of this AC must be met in the presence of all aircraft RA systems (i.e., dual or triple installations).

B.9 **Environmental Degradation.**

The ITM specified in table 2-1 of this AC must be met, accounting for any degradation in performance due to the operating environment. The temperature of the equipment has an impact on performance, so the demonstration should be conducted at the maximum equipment operating temperature.

B.10 **UUT and Test Equipment Tolerances.**

The testing should account for unit-to-unit variations in the UUT and test equipment uncertainty.

APPENDIX C. RELATED MATERIAL

Note: The regulations and guidance should be applicable to the aircraft or design change certification basis or to a later revision.

C.1 Title 14, Code of Federal Regulations (14 CFR).

The following 14 CFR regulations are related to this AC. You can download the full text of these regulations from the Federal Register website at http://www.ecfr.gov/.

- § 23.2335, *Lightning protection.*
- § 23.2500, *Airplane level systems requirements.*
- § 23.2505, *Function and installation.*
- § 23.2510, *Equipment, systems, and installations.*
- § 23.2515, *Electrical and electronic system lightning protection.*
- § 23.2520, *High-intensity Radiated Fields (HIRF) protection.*
- § 23.2600, *Flightcrew interface.*
- § 23.2605, *Installation and operation.*
- § 23.2610, *Instrument markings, control markings, and placards.*
- § 23.2615, *Flight, navigation, and powerplant instruments.*
- § 23.2620, *Airplane flight manual.*
- § 23.1529, *Instructions for Continued Airworthiness.*
- § 25.777, *Cockpit controls.*
- § 25.581, *Lightning protection.*
- § 25.1301, *Function and installation.*
- § 25.1302, *Installed systems and equipment for use by the flightcrew.*
- § 25.1309, *Equipment, systems, and installations.*
- § 25.1310, *Power source capacity and distribution.*
- § 25.1316, *Electrical and electronic system lightning protection.*
- § 25.1317, *High-intensity Radiated Fields (HIRF) Protection.*
- § 25.1321, *Arrangement and visibility.*
- § 25.1322, *Flightcrew alerting.*
- § 25.1329, *Flight guidance system.*
- § 25.1331, *Instruments using a power supply.*
- § 25.1333, *Instrument systems.*
- § 25.1351, *General.*
- § 25.1431, *Electronic equipment.*
- § 25.1529, *Instructions for Continued Airworthiness.*
- § 27.610, *Lightning and static electricity protection.*
- § 27.777, *Cockpit controls.*
- § 27.1301, *Function and installation.*
- § 27.1303, *Flight and navigation instruments.*
- § 27.1309, *Equipment, systems, and installations.*
- § 27.1316, *Electrical and electronic system lightning protection.*

- § 27.1317, *High-intensity Radiated Fields (HIRF) Protection.*
- § 27.1321, *Arrangement and visibility.*
- § 27.1322, *Warning, caution, and advisory lights.*
- § 27.1329, *Automatic pilot and flight guidance system.*
- Part 27, Appendix B / 29.1431.
- § 27.1529, *Instructions for Continued Airworthiness.*
- § 29.610, *Lightning and static electricity protection.*
- § 29.777, *Cockpit controls.*
- § 29.1301, *Function and installation.*
- § 29.1303, *Flight and navigation instruments.*
- § 29.1309, *Equipment, systems, and installations.*
- § 29.1316, *Electrical and electronic system lightning protection.*
- § 29.1317, *High-intensity Radiated Fields (HIRF) Protection.*
- § 29.1321, *Arrangement and visibility.*
- § 29.1322, *Warning, caution, and advisory lights.*
- § 29.1329, *Automatic pilot and flight guidance system.*
- § 29.1331, *Instruments using a power supply.*
- § 29.1333, *Instrument systems.*
- § 29.1351, *General.*
- § 29.1431, *Electronic equipment.*
- § 29.1529, *Instructions for Continued Airworthiness.*
- § 91.220, *Radio Altimeter Systems.*
- § 135.160, *Radio altimeters for rotorcraft operations.*

C.2 **FAA Advisory Circulars.**

The following ACs are related to the guidance in this AC. The latest version of each AC referenced in this document is available on the FAA website at FAA Advisory Circulars and on the Dynamic Regulatory System (DRS).

- AC 20-73A, *Aircraft Ice Protection.*
- AC 20-115D, *Airborne Software Development Assurance Using EUROCAE ED-12() and RTCA DO-178().*
- AC 20-131A, *Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II) and Mode S Transponders.*
- AC 20-136B, *Aircraft Electrical and Electronic System Lightning Protection.*
- AC 20-138D, *Airworthiness Approval of Positioning and Navigation Systems.*
- AC 20-151C, *Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II), Versions 7.0 & 7.1 and Associated Mode S Transponders.*
- AC 20-152A, *Development Assurance for Airborne Electronic Hardware.*
- AC 20-155A, *Industry Documents to Support Aircraft Lightning Protection Certification.*
- AC 20-158B, *The Certification of Aircraft Electrical and Electronic Systems for Operation in the High-Intensity Radiated Fields (HIRF) Environment.*

- AC 20-167B, *Airworthiness Approval of Enhanced Vision System, Enhanced Flight Vision System, and Combined Vision System Equipment.*
- AC 20-175, *Controls for Flight Deck Systems.*
- AC 20-185A, *Airworthiness Approval of Synthetic Vision Systems, Synthetic Vision Guidance Systems and Aircraft State Awareness Synthetic Vision Systems.*
- AC 20-190, *Aircraft Electromagnetic Compatibility Certification.*
- AC 21-16G, *RTCA Document DO-160 versions D, E and F, "Environmental Conditions and Test Procedures for Airborne Equipment."*
- AC 21-46A, *Technical Standard Order Program.*
- AC 21-50, *Installation of TSOA Articles and LODA Appliances.*
- AC 23-8C, *Flight Test Guide for Certification of Part 23 Airplanes.*
- AC 23-17C, *Systems and Equipment Guide for Certification of Part 23 Airplanes and Airships.*
- AC 23-18, *Installation of Terrain Awareness and Warning System (TAWS) Approved for Part 23 Airplanes.*
- AC 23.1309-1E, *System Safety Analysis and Assessment for Part 23 Airplanes.*
- AC 23.1311-1C, *Installation of Electronic Display in Part 23 Airplanes.*
- AC 25-7D, *Flight Test Guide for Certification of Transport Category Airplanes.*
- AC 25-11B, *Electronic Flight Displays.*
- AC 25-12, *Airworthiness Criteria for the Approval of Airborne Windshear Warning Systems in Transport Category.*
- AC 25-23, *Airworthiness Criteria for the Installation Approval of a Terrain Awareness and Warning System (TAWS) for Part 25 Airplanes.*
- AC 25.1302-1, *Installed Systems and Equipment for Use by the Flightcrew.*
- AC 25.1309-1B, *System Design and Analysis.*
- AC 25.1322-1, *Flightcrew Alerting.*
- AC 25.1329-1C, *Approval of Flight Guidance Systems.*
- AC 25.1701-1, *Certification of Electrical Wiring Interconnection Systems on Transport Category Airplanes.*
- AC 27-1B, *Certification of Normal Category Rotorcraft.*
- AC 29-2C, *Certification of Transport Category Rotorcraft.*
- AC 120-28D, *Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout.*
- AC 120-29A, *Criteria for Approval of Category I and Category II Weather Minima for Approach.*
- AC 120-118, *Criteria for Approval/Authorization of all Weather Operations for Takeoff, Landing, and Rollout.*

C.3 FAA Technical Standard Orders.

The following TSOs are related to the guidance in this AC. The latest version of each AC referenced in this document is available on the Dynamic Regulatory System (DRS).

- TSO-C63g, *Airborne Weather Radar Equipment.*
- TSO-C87(), *Airborne Low-Range Radio Altimeter.*

- TSO-C117b, *Airborne Windshear Warning and Escape Guidance Systems for Transport Airplanes.*
- TSO-C118a, *Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS I.*
- TSO-C119e, *Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS II With Hybrid Surveillance.*
- TSO-C151d, *Terrain Awareness and Warning Systems (TAWS).*
- TSO-C164a, *Night Vision Goggles.*
- TSO-C194, *Helicopter Terrain Awareness and Warning System (HTAWS).*
- TSO-C198, *Automatic Flight Guidance and Control System (AFGCS) Equipment.*
- TSO-C209, *Electronic Flight Instrument System (EFIS) Display.*
- TSO-C219a, *Airborne Collision Avoidance System (ACAS) Xa/Xo.*
- TSO-C221, *Airborne Low-Range Radio Altimeter Transceiver.*
- TSO-C222, *Airborne Low-Range Radio Altimeter Antenna.*
- TSO-C223, *Airborne Low-Range Radio Altimeter Display.*

C.4 FAA Airworthiness Directives.

The following Airworthiness Directives (AD) are related to the guidance in this AC and are available on the Federal Register website at https://www.federalregister.gov/.

- AD 2023-10-02, Transport and Commuter Category Airplanes, Amendment 39-22438, 88 FR 34065 (May 26, 2023), https://www.federalregister.gov/documents/2023/05/26/2023-11371/airworthiness-directives-transport-and-commuter-category-airplanes.
- AD 2023-11-07, Various Helicopters, Amendment 39-22453, 88 FR 40685 (June 22, 2023), https://www.federalregister.gov/documents/2023/06/22/2023-13319/airworthiness-directives-various-helicopters.

C.5 FAA Policy Statements.

The following Policy Statement is related to the guidance in this AC. The latest version is available on the FAA website at FAA Policy Statements and on the Dynamic Regulatory System (DRS).

- PS-AIR-21.16-02, *Establishment of Special Conditions for Aircraft Systems Information Security Protection*.

C.6 EASA Certification Specifications.

The following Certification Specifications (CS) are related to the guidance in this AC. The latest version is available on the EASA website at https://www.easa.europa.eu/home.

- Certification Specifications for European Technical Standard Orders (CS-ETSO).

C.7 **European Union Aviation Safety Agency (EASA).**

The following Acceptable Means of Compliance (AMC) are related to the guidance in this AC. The latest version of each AMC referenced in this document is available on the EASA website at https://www.easa.europa.eu/home.

- Acceptable Means of Compliance and Guidance Material to Annex IV (Part-CAT) and Annex V (Part-SPA) of Commission Regulation (EU) No 965/2012 of 5 October 2012, and later amendments.
- Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances (AMC-20), AMC 20-42 "Airworthiness information security risk assessment".

C.8 **ASTM Consensus Standards.**

FAA-accepted consensus standards for part 23 normal category airplanes, including any required changes for acceptance, are available online at https://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/small_airplanes_regs.

- F3061, *Standard Specification for Systems and Equipment in Small Aircraft.*
- F3117, *Standard Specification for Crew Interface in Aircraft.*
- F3233, *Standard Specification for Instrumentation in Small Aircraft.*
- F3367, *Standard Practice for Simplified Methods for Addressing High-Intensity Radiated Fields (HIRF) and Indirect Effects of Lightning on Aircraft.*
- F3532, *Standard Practice for Protection of Aircraft Systems from Intentional Unauthorized Electronic Interactions.*

C.9 **RTCA.**

The following RTCA (formerly Radio Technical Commission for Aeronautics) documents are related to the guidance in this AC. Unless otherwise specified, use the latest FAA-accepted revision for guidance. If the document is revised after publication of this AC, you should verify that the FAA accepts the subsequent revision or update as an acceptable form of guidance. This document can be ordered online at https://www.rtca.org.

- DO-152A, *Development Assurance for Airborne Electronic Hardware.*
- DO-155A, *Minimum Performance Standards Airborne Low-Range Radar Altimeters.*
- DO-160G, *Environmental Conditions and Test Procedures for Airborne Equipment.*
- DO-161A, *Minimum Performance Standards-Airborne Ground Proximity Warning Equipment.*
- DO-174, *Development of Civil Aircraft and Systems.*
- DO-178C, *Software Consideration in Airborne Systems and Equipment Certification.*
- DO-185B, *Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance System II (TCAS II) Airborne Equipment.*

- DO-197A, *Minimum Operational Performance Standards for an Active Traffic Alert and Collision Avoidance System I (Active TCAS I).*
- DO-220B, *Minimum Operational Performance Standards (MOPS) For Airborne Weather Radar Systems.*
- DO-254, *Design Assurance Guidance for Airborne Electronic Hardware.*
- DO-300A, *Minimum Operational Performance Standards (MOPS) for Traffic Alert and Collision Avoidance System II (TCASII) Hybrid Surveillance.*
- DO-309, *Minimum Operational Performance Standards (MOPS) for Helicopter Terrain Awareness and Warning System (HTAWS) Airborne Equipment.*
- DO-315B, *Minimum Aviation System Performance Standards (MASPS) for Enhanced Vision Systems, Synthetic Vision Systems, Combined Vision Systems and Enhanced Flight Vision Systems.*
- DO-325, *Minimum Operation Performance Standards (MOPS) for Automatic Flight Guidance and Control Systems and Equipment.*
- DO-326B, *Airworthiness Security Process Specification.*
- DO-355A, *Information Security Guidance for Continuing Airworthiness.*
- DO-356A, *Airworthiness Security Methods and Considerations.*
- DO-359, *Minimum Aviation System Performance Standards (MASPS) for Synthetic Vision Guidance Systems.*
- DO-367, *Minimum Operational Performance Standards (MOPS) for Terrain Awareness and Warning Systems (TAWS) Airborne Equipment.*
- DO-376, *Minimum Operational Performance Standard for Offshore Helicopter Terrain Awareness and Warning System (HTAWS).*
- DO-385A, *Minimum Operational Performance Standards for Airborne Collision Avoidance System X (ACAS X) (ACAS Xa and ACAS Xo).*
- DO-391, *Aeronautical Information System Security Framework Guidance.*
- DO-392, *Guidance for Security Event Management*.
- DO-405, *Minimum Operating Performance Standard (MOPS) for Helicopter Terrain Awareness Warning System (HTAWS) for Onshore Helicopter Operations.*

C.10 **European Organization for Civil Aviation Equipment (EUROCAE).**

The following EUROCAE documents are related to the guidance in this AC. Unless otherwise specified, use the latest FAA-accepted revision for guidance. If the document is revised after publication of this AC, you should verify that the FAA accepts the subsequent revision or update as an acceptable form of guidance. The documents are available online at https://www.eurocae.net.

- ED-14G, *Environmental Conditions and Test Procedures for Airborne Equipment.*
- ED-30, *MPS for Airborne Low Range Radio (radar) Altimeter Equipment.*
- ED-202B, *Airworthiness Security Process Specification.*
- ED-203A, *Airworthiness Security Methods and Considerations.*
- ED-204A, *Information Security Guidance for Continuing Airworthiness.*

C.11 **Society of Automotive Engineers (SAE) International.**

The following SAE Aerospace Recommended Practice (ARP) documents are related to the guidance in this AC. Unless otherwise specified, use the latest FAA-accepted revision for guidance. If the document is revised after publication of this AC, you should verify that the FAA accepts the subsequent revision or update as an acceptable form of guidance. The documents are available online at https://www.sae.org.

- AS6296, *Electronic Flight Instrument System (EFIS).*
- AS8034B, *Minimum Performance Standard for Airborne Multipurpose Electronic Displays.*
- ARINC 707-7, *Radio Altimeter.*
- ARP4102-7, *Electronic Displays.*
- ARP4754B, *Guidelines for Development of Civil Aircraft and Systems.*
- ARP4761A, *Guidelines for Conducting the Safety Assessment Process on Civil Aircraft, Systems, and Equipment.*

C.12 **International Civil Aviation Organization (ICAO).**

- ICAO Doc 9718, *Handbook on Radio Frequency Spectrum Requirements for Civil Aviation.*

APPENDIX D. DEFINITION OF KEY TERMS

The following definitions apply for the purpose of this AC:

D.1 **Decision Height (DH).**

See 14 CFR 1.1, *General Definitions.*

Note: During operation of the approach procedure, the RA system is the only source of determining (or annunciating) when the decision height has been reached.

D.2 **Electrical Height Output.**

The reported RA quantity from the RA system provided as an electrical output interface signal. Note: The output interface may be analog or digital.

D.3 **Height Above Ground Level (HAGL).**

The distance from the portion of aircraft structure in which the RA antenna(s) is/are installed to the terrain surface at a given point along a flight path.

D.4 **In-Band Radio Frequency Interference (RFI).**

External RFI signals within the RA operating frequency (4.2–4.4 GHz).

D.5 **Installation Time Delay.**

The actual round-trip RF signal propagation time delay in an RA system installation on an aircraft relative to the desired zero-height reference point. This may include, for example, the propagation delays in the coaxial cables or transmission lines between the RA transceiver and the RA antenna(s), and the free-space propagation from the RA antenna(s) to the terrain surface when the aircraft is on the ground with the main landing gear touching in a pre-established aircraft attitude (i.e., nose gear may not be touching).

D.6 **Installation Height Offset.**

A value, determined by calibration, configuration, or installation of the RA system, which defines a constant bias to be subtracted from the measurement result of the RA transceiver in order to account for the height of the RA antenna(s) above the terrain while the aircraft is on the ground (with the main landing gear touching in a pre-established aircraft attitude, the length of coaxial cables or transmission lines between the RA transceiver, and the RA antenna(s) and any other system delays as needed).

D.7 **Installation Manual (IM).**

A document developed and made available by the equipment manufacturer of a system, subsystem, or component that specifies the performance characteristics, interface specifications, installation constraints and limitations, installation requirements, calibration (if applicable), on-aircraft testing, maintenance, troubleshooting procedures, and any necessary requirements for other integrated equipment.

D.8 **Interference Tolerance Mask (ITM).**

The specification that defines the maximum amount of RFI at the surface of the RA antenna(s) that the RA system can safely tolerate.

D.9 **Irregular Approach Terrain.**

Includes cliffs, valleys, sea-walls, hilltops, and sloping runways, in the area of final approach, within approximately 1500 ft of the landing threshold.

D.10 **Loop Loss.**

The round-trip attenuation of the RF signal received by the radio altimeter system consisting of a delayed, attenuated, and possibly dispersed or modulated version of the transmitter output waveform due to propagation of this signal through space and interaction of the signal with one or more radar targets (i.e., sources of radar reflectivity).

D.11 **Multiplex Installation.**

An installation of more than one RA system of the same type onboard a single aircraft. Typically, this will consist of either dual or triplex installation.

D.12 **Out-of-Band Radio Frequency Interference (RFI).**

External RFI signals outside the RA operating frequency band (i.e., at frequencies less than 4.2 GHz or greater than 4.4 GHz).

D.13 **Radio Altimeter Antenna.**

The subsystem or component of the RA system that takes a conducted RF signal provided by the transceiver and radiates it toward the terrain and receives a radiated RF signal reflected from the terrain and provides a conducted RF signal to the transceiver. An RA system will include one or multiple RA antennas.

D.14 **Radio Altimeter Indicator or Display.**

The subsystem or component of the RA system provides a visual indication of the measured altitude result determined by the RA transceiver. An RA system may include

one, multiple, or no RA indicators or displays. It may be a standalone indicator or display component for the sole purpose of displaying RA system outputs, or it may be a function incorporated into an MFD system, such as an EFIS.

D.15 **Radio Altimeter System.**

A complete system consisting of receiver and transmitter, one or more antennas, RF cables (if the antenna(s) are not integrated into the same LRU as the receiver and transmitter), and input/output interfaces (which may include a display of altitude information as a visual output interface, either integrated or as a part of a separate display or indicator component).

D.16 **Radio Altimeter Transceiver.**

The subsystem or component of the RA system that generates and transmits the RF signal and receives, processes, and determines a measured altitude result from the RF signal reflected from the terrain. An RA will include one and only one RA transceiver.

D.17 **RF Filter Subassembly (RFFSA).**

A subassembly implemented within the RA transceiver LRU that selectively filters RF signals outside of the RA band. The RA transceiver could be implemented with an RFFSA at the transmitter output port, the receiver input port, or both.

D.18 **Transceiver Subassembly.**

A subassembly implemented within the RA transceiver LRU that performs all of the normal functions of the RA, with the exception of the selective filtering implemented in one or more RFFSAs.

D.19 **Terrain Smoothness.**

Ranging from smooth to rough (where rough terrains may be further characterized by the feature size and density of the surface roughness).

D.20 **Terrain Flatness.**

Ranging from flat to undulating (where undulating terrains may be further characterized by the depth and period of their undulations).

D.21 **Terrain Inclination.**

Ranging from level to sloped (where sloped terrains may be further characterized by the angle of the terrain slope).

D.22 **Terrain Surface Features.**

Ranging from bare to densely featured. Terrains may be further characterized by the density of the surface features (e.g., sparsely or densely featured, as well as the size of the surface features).

APPENDIX E. ACRONYMS

Acronym	Definition
AC	Advisory Circular
ACAS	Airborne Collision Avoidance System
AFGCS	Automatic Flight Guidance and Control System
AFM	Aircraft Flight Manual
AMC	Acceptable Means of Compliance
ARP	Aerospace Recommended Practice
AWGN	Additive White Gaussian Noise
CS	Certification Specification
CW	Continuous Waveform
DH	Decision Height
EASA	European Union Aviation Safety Agency
EFIS	Electronic Flight Instrument System
EFVS	Enhanced Flight Vision Systems
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
HAGL	Height Above Ground Level
HIRF	High-Intensity Radiated Fields
HTAWS	Helicopter Terrain Awareness and Warning System
ICAO	International Civil Aviation Organization
IM	Installation Manual
ITM	Interference Tolerance Mask
LRU	Line Replaceable Unit
MASPS	Minimum Aviation System Performance Standards
MFD	Multifunction Display
MOC	Method of Compliance
MOPS	Minimum Operational Performance Standards
NVG	Night Vision Goggle
PAPR	Peak-to-Average Power Ratio
PFD	Power Flux-Density
RA	Radio Altimeter
RF	Radio Frequency
RFFSA	RF Filter Subassembly
RFI	Radio Frequency Interference
RTCA	Radio Technical Commission for Aeronautics
RX	Reverse Port
SAE	Society of Automotive Engineers
SSA	System Safety Assessment
STC	Supplemental Type Certificate
TAWS	Terrain Awareness and Warning System
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance System

Acronym	Definition
TSO	Technical Standard Order
TSOA	Technical Standard Order Authorization
UUT	Unit Under Test

Advisory Circular Feedback Form

If you find an error in this Advisory Circular, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by emailing this form to 9-avs-air-directives-management-officer@faa.gov or faxing it to the attention ____N/A____ at ____N/A_____.

Subject: AC 20-199 Date: 07/24/2026

Mark all appropriate line items:

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