U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Criteria for Approval/Authorization of All Weather Operations (AWO) for Takeoff, Landing, and Rollout

Date: 7/2/18 **AC No:** 120-118
Initiated by: AFS-400 **Change:**

This advisory circular (AC) provides an acceptable means, but not the only means, for obtaining and maintaining authorization of operations in Category (CAT) I, CAT II, and CAT III landing weather minima and instrument flight rules (IFR) lower-than-standard takeoff minima. This AC does not change, add, or delete regulatory requirements or authorize deviations from regulatory requirements. This AC addresses the operational authorizations formerly published in AC 120-28, Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout, and AC 120-29, Criteria for Approval of Category I and Category II Weather Minima for Approach, and any subsequent developments.

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CHAPTER 1. INTRODUCTION

1-1. PURPOSE. This AC provides an acceptable means, but not the only means, for obtaining and maintaining authorization of operations in Category (CAT) I, CAT II, and CAT III landing weather minima and instrument flight rules (IFR) lower-than-standard takeoff minima. Terms used in this AC such as "should" or "must" are used only in the sense of ensuring applicability of these particular methods of compliance when the acceptable means of compliance described herein is used. This AC does not change, add, or delete regulatory requirements or authorize deviations from regulatory requirements. This AC addresses the operational authorizations formerly published in AC 120-28, Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout, and AC 120-29, Criteria for Approval of Category I and Category II Weather Minima for Approach, and any subsequent developments.

a. Overview. This AC is the basis for AWO flight operations and should be used in conjunction with AC 20-191, which provides airworthiness criteria for aircraft system certification. Authorization for operators to act in compliance with their standard CAT II and III operations specifications (OpSpecs), management specifications (MSpecs), and letters of authorization (LOA) are also discussed at length in this AC.

b. Regulatory Basis. CAT II and III operations conducted by Title 14 of the Code of Federal Regulations (14 CFR) part 91 operators are done primarily in accordance with part 91, §§ 91.189, 91.191, 91.193, and part 91 appendix A, Category II Operations: Manual, Instruments, Equipment, and Maintenance; 14 CFR part 61, §§ 61.66, 61.67 and 61.68; and further provisions as authorized by the FAA Administrator in the operator's LOA. Section 91.189(g) states that CAT II and III operations conducted by certificate holders operating under 14 CFR part 121, 125, 135, part 129 foreign air carriers, or holders of MSpecs issued in accordance with part 91 subpart K (91K), may conduct CAT II or CAT III operations only in accordance with their OpSpecs or MSpecs.

c. International Harmonization. This new AC also incorporates information pertaining to international AWO criteria harmonization between the Federal Aviation Administration (FAA), European Aviation Safety Agency (EASA), and several other regulatory authorities. Subsequent revisions of this AC will be published as additional AWO harmonization items are agreed upon by FAA, EASA, and other regulatory authorities.

d. Nomenclature Changes. This AC reflects the changes which occurred in 2011 when the FAA removed the definitions of CAT IIIa, IIIb, and IIIc operations and discontinued the use of this nomenclature in subsequent documentation. Some FAA instrument procedures may still retain CAT IIIa nomenclature until these procedures are updated or amended. These definitions are outdated and no longer utilized for aircraft certification or operational authorization. Any references to these terms in this AC are used for historical context.

e. CAT III Landing Minima. The CAT III landing minima at a particular runway are currently based on the demonstrated qualities and capabilities of the signal utilized for approach on that runway. The approach charts now show only the lowest possible CAT III landing minima on a runway. For example, the approach chart for a landing at an airport may only state that the Runway Visual Range (RVR) is 600 and will not make any reference to the CAT IIIb operations

definition. Operators now use the published minima in conjunction with their OpSpecs/MSpec to determine the lowest landing minima allowed to them.

f. All Weather Operations. The term AWO, as used in this AC, is meant to include operations during low-visibility takeoff and landing conditions. This encompasses takeoff below standard weather minima and instrument approach procedures (IAP) for CAT I, II and III, to include Special Authorization (SA) CAT I and II.

g. Responsible Flight Standards Office. There are numerous instances in this AC where the term "responsible Flight Standards office" is used. The intent of this phrase is to direct the operator to the proper office/organization with authorization authority based upon the type of operation referenced.

h. Dispatcher. For the purposes of this document, the term "dispatcher" refers to a person or persons exercising operational control over a flight other than the flightcrew.

1-2. WHERE YOU CAN FIND THIS AC. You can find this AC on the FAA's website at http://www.faa.gov/regulations_policies/advisory_circulars.

1-3. RELATIONSHIP OF THIS AC WITH AC 20-191 AND THEIR IMPACT UPON AC 120-29A AND AC 120-28D. This AC contains the revised operational authorization information previously found in AC 120-28D, Criteria for Approval of Category III Weather Minima for Takeoff, Landing, And Rollout, dated July 13, 1999, and AC 120-29A, Criteria for Approval of Category I and Category II Weather Minima for Approach, dated August 12, 2002. Prior to the publication of this AC, operational authorization and aircraft certification information was consolidated in either AC 120-29A (for CAT I and II), or AC 120-28D (for CAT III).

Aircraft certification information currently contained in AC 120-28D and AC 120-29A remains in effect until revised by the publication of AC 20-191. The publication of AC 20-191 will subsequently cancel AC 120-28D and AC 120-29A.

1-4. APPLICABILITY. The intent of this AC is to provide information for all operators, including part 91, considering or currently operating under AWO. New operational authorizations (e.g., C052, C060, C078, etc.) should use the criteria of this AC. Operations approved based upon earlier criteria may continue or operators may seek additional operational credit provided by this AC. Airworthiness criteria and demonstrations are addressed in AC 20-191.

1-5. EXPLANATION OF CONTENT. The AC includes incorporation and significant revision of information previously contained in AC 120-29 and AC 120-28 into a single document, the extraction of airworthiness criteria and relocation into AC 20-191, and the removal of information pertaining to Required Navigation Performance (RNP) and microwave landing system (MLS). Many changes to the content of those previous ACs have been made to improve clarity, accuracy, completeness, and consistency. It is suggested that this AC be read in its entirety due to the new presentation of this subject matter.

a. Takeoff, Approach, Landing, and Rollout Operations. This new AC discusses takeoff, approach, landing, and rollout operations which involve ground-based Navigational Aids (NAVAID) used for AWO approach operations. The AC includes information on AWO takeoff guidance systems, expanded SA CAT I guidance, updated CAT II/III guidance for use in conjunction with Head-Up Display (HUD) systems, Ground Based Augmentation System (GBAS) Landing System (GLS), and use of CAT II/III during certain engine inoperative operations.

b. Enhanced Flight Vision Systems (EFVS) and Synthetic Vision Guidance Systems (SVGS). Additional information is included addressing operations utilizing EFVS and SVGS during AWO operations, as well as operations involving hybrid approach and landing systems. Expanded information and guidance on EFVS and its authorized use are located in AC 90-106, Enhanced Flight Vision Systems. The EFVS rule, § 91.176, effective March 21, 2017, and associated EFVS operational authorizations (e.g., OpSpecs) contain unique operational capabilities and regulatory exceptions that are not addressed in this document. Readers must refer to AC 90-106 for a complete understanding of differences which may apply when conducting EFVS operations or using EFVS during conduct of operations discussed in this AC (e.g., CAT II or III operations).

c. New Technology Demonstration (NTD). A new term, NTD, is introduced in this AC as a process of generic demonstration of technology, providing an equivalent or acceptable level of safety to the current operation. The NTD was formerly known as Proof of Concept (PoC) in AC 120-28 and AC 120-29. An NTD is typically initiated by an operator or manufacturer after consultation with the Flight Technologies and Procedures Division.

d. Operator Use Suitability Demonstration (OUSD) Changes. Changes to the topic of OUSD are also contained in this AC. Operators should pay particular attention to several updated minimum requirements for demonstration of appropriate performance, automation, and technology involved in an acceptable OUSD. Changes to the equipage, training, and maintenance requirements for SA CAT I authorization and operations are included in this new AC. Finally, steep angle approach operational approval is examined and authority for operational authorization is established.

e. Satellite-Based Augmentation System (SBAS). This AC does not discuss operations based upon SBAS. Operations relating to this subject are discussed in the most current versions of AC 90-101, Approval Guidance for RNP Procedures with AR, AC 90-105, Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System and in Oceanic and Remote Continental Airspace, AC 90-107, Guidance for Localizer Performance with Vertical Guidance and Localizer Performance without Vertical Guidance Approach Operations in the U.S. National Airspace System and AC 90-108, Use of Suitable Area Navigation (RNAV) Systems on Conventional Routes and Procedures.

1-6. RELATED REGULATIONS AND REFERENCES.

a. Title 14 CFR:

- Part 23, § 23.2510.
- Part 25, §§ 25.1309, 25.1322, 25.1329, 25.1581 and 25.1583.
- Part 61, §§ 61.21 and 61.66.
- Part 91, §§ 91.175, 91.176, 91.189, 91.191, 91.193 and Appendix A.
- Part 121, §§ 121.579 and 121.651.
- Part 125, §§ 125.379 and 125.381.
- Part 129, § 129.11.
- Part 135, § 135.225.

b. ACs, FAA Orders, and Operational Authorizations. Unless a specific reference is made to a particular version of a rule or AC, current editions of the following FAA orders, operational authorizations, and ACs should be used:

(1) ACs:

- AC 20-153, Acceptance of Aeronautical Data Processes and Associated Databases.
- AC 20-185, Airworthiness Approval of Synthetic Vision Guidance System.
- AC 25-7, Flight Test Guide for Certification of Transport Category Airplanes.
- AC 25-31, Takeoff Performance Data for Operations on Contaminated Runways.
- AC 25-32, Landing Performance Data for Time-of-Arrival Landing Performance Assessments.
- AC 90-101, Approval Guidance for RNP Procedures with AR.
- AC 90-105, Approval Guidance for RNP Operations and Barometric Vertical Navigation in the U.S. National Airspace System and in Oceanic and Remote Continental Airspace.
- AC 90-106, Enhanced Flight Vision Systems.
- AC 90-107, Guidance for Localizer Performance with Vertical Guidance and Localizer Performance without Vertical Guidance Approach Operations in the U.S. National Airspace System.
- AC 90-108, Use of Suitable Area Navigation (RNAV) Systems on Conventional Routes and Procedures.
- AC 90-112, Development and Submission of Special Instrument Procedures to the FAA.
- AC 91-79, Mitigating the Risks of a Runway Overrun Upon Landing.
- AC 120-53, Guidance for Conducting and Use of Flight Standardization Board Evaluations.
- AC 20-191, Criteria for Airworthiness Approval of Low Visibility Takeoff and CAT II/III Approaches.
- AC 120-57, Surface Movement Guidance and Control System.
- AC 120-62, Takeoff Safety Training Aid.

- AC 120-71, Standard Operating Procedures and Pilot Monitoring Duties for Flight Deck Crewmembers.
- AC 120-76, Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags.
- AC 120-91, Airport Obstacle Analysis.
- AC 120-105, Foreign Terminal Instrument Procedures (FTIP) Acceptance/Review.
- AC 121.195-1, Operational Landing Distances for Wet Runways; Transport Category Airplanes.

(2) FAA Orders:

- FAA Order 8400.13, Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations.
- FAA Order 8900.1, Flight Standards Information Management System (FSIMS).
- FAA Order 6750.16, Siting Criteria for Instrument Landing Systems.
- FAA Order 6750.24, Instrument Landing System and Ancillary Electronic Component Configuration and Performance Requirements.
- FAA Order JO 7110.65, Air Traffic Control.
- FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS).
- FAA Order 8260.60, Special Instrument Procedures.
- RTCA DO-253, Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment.
- RTCA DO-359, Minimum Aviation System Performance Standards (MASPS) for Synthetic Vision Guidance Systems.

c. OpSpecs/MSpecs/LOAs:

- Standard OpSpecs Parts A and C.
- OpSpec C048, Enhanced Flight Vision System Operations.
- OpSpec/MSpec/LOA C051, Terminal Instrument Procedures.
- OpSpec C052, Straight-in Non-Precision, APV, and Category I Precision Approach and Landing Minima—All Airports.
- OpSpec C055, Alternate Airport IFR Weather Minimums.
- OpSpec C056, IFR Takeoff Minimums, Airplane Operations—All Airports.
- OpSpec C057, IFR Takeoff Minimums, 14 CFR Part 135 Airplane Operations—All Airports.
- OpSpec C060, Category II and Category III Instrument Approach and Landing Operations.
- OpSpec C061, Flight Control Guidance Systems for Automatic Landing Operations Other Than Categories II and III.

- OpSpec C062, Manually Flown Flight Control Guidance System Certified for Landing Operations Other Than Categories II and III.
- OpSpec C078, IFR Lower Than Standard Takeoff Minima, Airplane Operations—All Airports.
- OpSpec C079, IFR Lower Than Standard Takeoff Minima, 14 CFR Part 135 Airplane Operations—All Airports.
- OpSpec D072, Aircraft Maintenance – Continuous Airworthiness Maintenance Program (CAMP) Authorization.

CHAPTER 2. BACKGROUND

2-1. OPERATIONAL AUTHORIZATIONS VERSUS AIRWORTHINESS DEMONSTRATIONS. Takeoff and approach weather minima are approved through applicable operating rules, use of approved instrument procedures, and issuance of operations specifications (OpSpecs), management specifications (MSpecs), and letters of authorization (LOA). Airworthiness demonstration of aircraft equipment is usually accomplished on a one-time basis at the time of type certification (TC) or Supplemental Type Certification (STC). This demonstration is based upon the airworthiness criteria in place at that time. Since operating rules may change after airworthiness demonstrations are conducted, additional operational credit may be applied. In general, information related to operational approvals is contained in the main body of this AC and criteria related primarily to the airworthiness demonstration of systems or equipment is contained in AC 20-191.

2-2. EXPLANATION OF TERMS. A comprehensive list of definitions pertinent to this AC is included in Appendix 1. Within this AC, RVR values are specified in units of feet unless otherwise noted. A conversion table may be found in OpSpec C051. Minima typically used during LVO are provided in the appropriate OpSpecs.

2-3. APPROACH TERMINOLOGY. Terminology used in this AC is consistent with current OpSpecs, MSpecs, and LOAs. Definitions of instrument approach categories are listed in Appendix 1, Definitions and Acronyms. While there are slight variations of these definitions as used within International Civil Aviation Organization (ICAO) and various countries internationally, the broad objectives and practical operational applications are similar. Also, in certain states, lowest authorized minima may be slightly different than as specified by the U.S. or ICAO criteria. The definitions used in standard OpSpecs, where different from ICAO, apply and take precedence for U.S. operators or for international operators conducting operations within the United States or at U.S. facilities.

CHAPTER 3. OPERATIONAL CONCEPTS

3-1. INSTRUMENT OPERATIONS. This AC addresses operational authorization for terminal instrument operations using ground-based Navigational Aids (NAVAID) or space-based NAVAIDs augmented by ground-based equipment. These operations include takeoff in lower-than-standard visibility conditions, Category (CAT) I, CAT I Landing Minima with Reduced Lighting (Runway Visual Range (RVR) 1800), Special Authorization (SA) CAT I, CAT II, SA CAT II, and CAT III. Some of these operations require special aircrew and aircraft certification. These operations are collectively referred to as AWO throughout the course of this document.

a. Airborne Systems. Basic airworthiness certification for instrument flight rules (IFR) is typically considered acceptable for operational approval of an aircraft for standard CAT I. However, CAT II and III airborne system requirements, as well as those for takeoff guidance systems used for lower-than-standard minima, are specified in AC 20-191. Airborne systems intended to meet CAT I Landing Minima with Reduced Lighting (RVR 1800) and SA CAT I/II requirements, while not addressed in AC 20-191, are specified in paragraph 3-7 below.

(1) For aircraft intended for AWO operations and previously approved using AC 120-29 and/or AC 120-28, the airworthiness criteria for airborne systems specified in the approved Airplane Flight Manual (AFM) are still valid.

(2) Airborne equipment listed in AC 20-191 must be operative in accordance with provisions of applicable standard operations specifications (OpSpecs). Airframe manufacturers and individual operators may also include other optional equipment as part of the CAT II/III configuration; however, that equipment does not need to be operative to conduct a CAT II/III approach unless required by that operator's OpSpecs and consistent with the FAA-approved minimum equipment list (MEL).

b. Magnetic Variation (MagVar) Data and Onboard Database. Issues with MagVar primarily occur when the MagVar data being used internally in the aircraft is not close enough to the current MagVar at a location, or when it is not close enough to the MagVar used in the approach procedure.

(1) Some avionics convert true heading references to magnetic heading references by using worldwide MagVar data contained in an onboard database. Algorithms convert the data into a specific magnetic heading reference for a specific geographic reference point. However, since the Earth’s magnetic fields constantly change, MagVar databases need periodic updates to provide accurate magnetic heading references. The National Oceanic and Atmospheric Administration (NOAA) offers a World Magnetic Model available at http://www.ngdc.noaa.gov/geomag/geomag.shtml. This product is one acceptable source for MagVar information.

(2) The MagVar update is generally only critical for CAT II/III operations, coupled approach, and practice autoland CAT I operations. When flying these procedures, the aircraft systems construct a track in True, used for guidance during rollout and as a cross check on final, apply MagVar from the onboard source(s), and compare the resulting magnetic course to the

published Final Approach Course (FAC). If the difference is greater than some predetermined value (typically three or four degrees) the system may flag or disengage the autopilot. The difference between the onboard source and the published procedure may be in the opposite direction from the current MagVar at the location, one leading and one lagging. Therefore, the total amount of difference must be considered, not just the difference from the current local MagVar.

(3) Aircraft design approval holders should identify any operating limitations of their aircraft associated with application of the MagVar data to ensure sufficiently accurate magnetic heading references are presented and used in the aircraft. Consider at least the following in determining the operating limitations: the error characteristics of magnetic heading references, especially where local magnetic anomalies occur or in regions of high magnetic field inclination or high secular rates of change; intended operation (instrument landing system (ILS) approach, automatic landing, en route navigation, display of course/track to the pilot, etc.); errors in the magnetic reference of any radio navigation aid used; and/or the accuracy of the magnetic reference of the procedure. Operational limitations need to be re-evaluated commensurate with the intended use and the dynamics of error associated with the magnetic heading reference. Conditions under which operations do not meet the intended function must be clearly identified.

(4) Avionics may use values other than the Localizer (LOC) MagVar, such as the aerodrome magnetic or the on aerodrome NAVAID, or a calculated value, as the onboard source. Also, some aircraft have more than one onboard source of MagVar data, which may cause an internal MagVar disagreement when one database is updated and the other is not. This internal disagreement may cause flags and disconnects. Some aircraft seem to experience problems only when there is a strong crosswind. The MagVar on the aerodrome diagram is not related to instrument procedures, and is updated on a different schedule. Therefore, it should not be used in any determination of coupled approach and autoland capability.

(5) While issues with MagVar have occurred mostly at aerodromes with a high rate of change, most of which are located at higher latitudes, they can occur at any location where the onboard MagVar data and the published procedures are further apart than the avionics tolerance. Operators should consult manufacturer guidance concerning the onboard MagVar database and its suitability for autoflight and autoland at aerodromes they intend to operate. The aircraft design approval holders' continuing airworthiness requirements must define the conditions under which the MagVar database and, if applicable, conversion algorithms or hardware, must be updated. This could be contained in a periodic airplane flight manual update or other Original Equipment Manufacturer (OEM) documentation. These requirements should also define the maintenance procedures necessary to update the onboard MagVar database for their avionics.

(6) In some instances, Notices to Airmen (NOTAM) may contain MagVar restrictions. A change in the ILS procedure or aerodrome MagVar should be evaluated to determine whether autoflight is still supported with the current onboard MagVar data. Also, updating the onboard data may cause issues at an aerodrome where the procedure MagVar has not been updated. When conducting autoflight and autoland operations at any new aerodrome, it is therefore imperative that flightcrews should use caution. Company/operator training and procedures should adequately cover this potential issue.

c. Airborne Databases and Interface. It is highly recommended that all airborne databases (e.g., Terrain Awareness and Warning System (TAWS), Enhanced Ground Proximity Warning System (EGPWS), Synthetic Vision Guidance System (SVGS)) be current with the intended area of operation for AWO operations. Terrain, runway, and obstacle database requirements must support the intended function. Valid and compatible databases for SVGS must be installed and contain current data. Refer to AC 20-153 for guidance on the importance of database currency and integrity. Additionally, to ensure continued airworthiness and nuisance-free operation, airborne equipment used for approach operations should be compatible with systems using airborne databases.

3-2. TAKEOFF.

a. Takeoff Minima. Takeoff minima are addressed by §§ 91.175(f), 91.1039; §§ 121.649, 121.651; 125.381; § 135.225 and standard OpSpecs; MSpecs and/or letters of authorization (LOA).

(1) When lower-than-standard minima are necessary, applicable criteria for use of those OpSpec minima are specified in this AC. When appropriate, principal operations inspectors (POI) issue OpSpecs specifying the lower minima through paragraph C056 and C078 for part 121 and 125 operators and OpSpecs paragraphs C057 and C079 for part 135 operators. OpSpecs specifying the lower minima through paragraph C056 may be issued to part 129 operators. OpSpecs/MSpecs or LOAs contain specific guidance regarding pilots, aircraft, and airports when lower-than-standard takeoff minima are used. Authorization of takeoff minima below the level supported by use of visual reference alone requires the use of a guidance system that has been demonstrated to provide an acceptable level of performance and satisfactory workload for the minima approved, with or without the use of visual reference. The performance and workload assessment of such a system must have considered any compensation that may be introduced by the pilot for particular guidance system characteristics (e.g., coping with a slight LOC signal offset during initial runway alignment) or concurrent use of the guidance system with limited or patchy visual references.

(2) Provisions for demonstration of systems eligible for takeoff minima below the level supported by use of visual reference alone may be found in AC 20-191.

(3) An NTD is necessary for initial authorization of takeoff minima less than RVR 300.

b. Pilot Assessment of Equivalent RVR. For takeoff circumstances where touchdown zone (TDZ) RVR is inoperative or is determined by the pilot to be significantly in error (e.g., patchy fog obscuring an RVR Visibility Sensor (VS) but not the runway, snow on transmissometer causing erroneous readings), operators may be authorized to make a pilot assessment in lieu of RVR (see subparagraph 6-4c.).

(1) To be eligible to use this provision, the operator must ensure that each pilot authorized to make this determination has completed approved training addressing pilot procedures to be used for visibility assessment in lieu of RVR, and the pilot can determine the necessary runway markings or runway lighting that must be available to provide an equivalent RVR to that which is specified to ensure adequate visual reference for the takeoff.

(2) When any pilot assessment of equivalent RVR is made, the pilot must be able to positively determine position on the airport, the correct runway, and positively establish that the aircraft is at the correct position for initiation of takeoff. A pilot may assess visibility at the takeoff position in lieu of reported TDZ RVR (or equivalent) in accordance with OpSpec C078/C079 and subparagraph 6-4c.

3-3. LANDING.

a. Approach and Landing Concepts.

(1) CAT I operations are considered to be any Standard Instrument Approach Procedure (SIAP) with a decision altitude (DA) or minimum descent altitude (MDA) greater than or equal to 200 feet height above touchdown (HAT) and a visibility requirement greater than or equal to RVR 1800.

NOTE: With SA, CAT I minima below RVR 1800 and 200 feet HAT may be authorized via OpSpec, MSpec, or LOA (See subparagraph (4) below).

NOTE: For enhanced flight vision system (EFVS) considerations during CAT I approach operations to reduced visibilities, refer to AC 90-106.

(2) CAT II operations are considered to be any SIAP with a DA/decision height (DH) or visibility requirement less than that specified for CAT I, but greater than or equal to 100 feet HAT and RVR 1000.

(3) CAT III operations are considered to be any SIAP with a DH less than that specified for CAT II (or with no DH, or with an Alert Height (AH)) and a visibility less than that specified for CAT II).

(4) SA CAT I/II operations described in this AC are considered nonstandard with respect to minima historically associated with their approach category. These operations may require additional aircraft equipment and aircrew qualifications, and may allow the use of runways with less than the normal lighting facilities required for their approach category. (See subparagraphs 3-7e and f for further guidance).

(5) CAT II operations are restricted by standard OpSpec C060 authorizations to be flown using a Head-Up Display (HUD), an autopilot coupled to DH, or an autoland system. However, if an operator of aircraft with advanced approach and landing systems desires the option of flying a manual approach using head-down guidance (e.g., flight director (F/D)), nonstandard OpSpec language authorizing this is required and additional operating restrictions and pilot training may be required.

(6) Additional demonstration or operational assessment beyond that required for basic IFR flight, under provisions of basic aircraft part 25, typically is necessary for operational authorization of an aircraft for CAT II/III. For CAT II/III minima, certain non-normal conditions are typically considered in the assessment and authorization process. Response to those non-normal conditions may be explicitly defined in the CAT II/III authorization (e.g., electrical component failure or engine inoperative CAT II/III). For failures other than those addressed by

the CAT II/III authorization, the pilot or operator may need to adjust the operating minima used, introduce wind limit constraints, or address other factors to ensure safe operation for the particular non-normal condition. Specific criteria for airworthiness demonstration of systems or capabilities for CAT II/III are included in AC 20-191.

b. Acceptable Instrument Approach Procedure (IAP) Basis. IAPs used by operators in accordance with this AC should be based on:

(1) U.S. SIAPs (i.e., 14 CFR part 97 instrument procedures designed to conform to Order 8260.3 and other related 8260 series orders).

(2) For non-U.S. airports, foreign IAPs acceptable to FAA promulgated by the state of the airport of landing (i.e., International Civil Aviation Organization (ICAO), State of the Aerodrome). Refer to AC 120-105.

(3) Terminal IAPs at U.S. Military airports, regardless of their physical location (e.g. Ramstein Air Base in Germany), when authorized by the Department of Defense (DOD) and the terminal instrument procedure are constructed using criteria based on Order 8260.3; ICAO Document 8168-OPS, Procedures for Air Navigation Services—Aircraft Operations (PANS-OPS), Volume II; or Military Instrument Procedures Standardization (MIPS); or other special criteria approved by the Flight Technologies and Procedures Division.

(4) Special IAPs developed and approved by the FAA.

(5) Special IAPs developed by an FAA-approved third party and approved by FAA.

c. Considerations for the Use of Procedures Other Than U.S. Standard Procedures. For procedures other than those developed in accordance with Order 8260.3 or other pertinent FAA 8260 series orders, the operator must ensure consideration of at least the following factors related to use of those instrument procedures:

(1) Availability of suitable weather reporting and forecasts;

(2) Identification of any necessary alternate airports or alternate minima;

(3) Ability to discontinue an approach from any point to touchdown;

(4) Suitability of the airborne equipment to use the procedure (e.g., compatibility of the airborne equipment with the type/characteristics of the navigation facilities used);

(5) Suitability of ground systems/equipment (e.g., lighting, RVR sensors, and pilot control of lighting);

(6) Suitability of NAVAIDs (e.g., maintenance and monitoring);

(7) Suitability of airport/runway (e.g., obstructions, clear zones, and markings);

(8) Availability of Aeronautical Information (AI) (e.g., timely NOTAM availability);

(9) Identification of any special training or qualification related to the procedure; and

(10) Resolution of any issues identified from adverse "service experience" with the procedure.

d. Special IAPs. Special procedures are approved by the Flight Technologies and Procedures Division and issued/authorized by the POI after coordination with pertinent FAA organizations (refer to AC 90-112). Operator requests for the use of special procedures should be coordinated by the POI with the Flight Standards office having responsibility for the airport of the procedure. If applicable, these special procedures should address any provisions associated with application of § 121.445 for special airport qualification.

e. Glide Path Angle (GPA) and Vertical Descent Angle (VDA). Operators must consult the FAA-approved AFM for aircraft limitations which may apply to use of GPAs and/or VDAs other than standard.

(1) CAT I straight-in approaches are normally constructed with a standard GPA or VDA of 3.0° whenever practical. Standard GPAs should not be less than 3.0° and should not exceed the values stipulated in Table 3-1, Maximum Standard Approach Design Glide Path Angles/Vertical Descent Angles. Standard VDAs should not be less than 2.75° and should not exceed the values stipulated in Table 3-1.

TABLE 3-1. MAXIMUM STANDARD APPROACH DESIGN GLIDE PATH ANGLES/VERTICAL DESCENT ANGLES

CAT	Maximum Angle
A (80 knots or less)	6.40
A (81-90 knots)	5.70
B	4.20
C	3.77
D	3.50
E	3.10*

*USAF/USN CAT E maximum is 3.50°

(2) SA CAT I/II and CAT II/III approaches are constructed with a standard GPA of 3.0°. U.S. domestic approach angles for SA CAT I/II and CAT II/III approaches other than 3.0° require approval of the Flight Technologies and Procedures Division.

f. Steep Angle Approach. A procedure with a GPA or VDA at or above 4.5° is considered to be a steep angle approach for operations using transport category airplanes. Refer to AC 25-7 for detailed guidance on required certification and AFM documentation. The use of any steep approach will require specific AFM supplemental information including operational procedures and restrictions, any limitations, airplane configurations (e.g., flaps, gear, inoperative engines, etc.), performance information, as well as any flightcrew training necessary.

Historically, some airport authorities may also require a letter of written approval from the certificating body. Authorization will be required for the use of a non-part 97 or non-PANS-OPS procedure (refer to Order 8260.60 and AC 90-112). Contact the responsible Flight Standards office for further guidance.

3-4. ENGINE INOPERATIVE CAT II/III. See Appendix 2, Engine Inoperative Category (CAT) II/III Approach Operations.

3-5. GO-AROUND SAFETY. A multiengine aircraft conducting an instrument approach should be capable of safely executing a go-around from any point on an approach prior to touchdown with the aircraft in both normal and specified non-normal configurations (e.g., engine out). This capability is necessary to provide for go-around safety due to missed approaches or rejected landings for a variety of circumstances.

a. CAT I Go-Around. Pilots must be aware that after the aircraft has passed the DA/DH or missed approach point (MAP), the published missed approach does not guarantee standard missed approach obstacle clearance. Pilot preplanning for such non-normal events is discussed further in the Aeronautical Information Manual (AIM).

b. CAT II/III Go-Around. The evaluation of this capability is based on normal or specified non-normal CAT III operations at the lowest controlling RVR authorized. This should account for factors related to geometric limitations during the transition to go-around, limited visual cues, autopilot mode switching, and other pertinent factors. For aircraft in which a go-around from a very low altitude may result in touchdown, the safety of such a procedure should be established considering its effect on related systems. This includes operation of auto spoilers, automatic braking systems, autopilot mode switching, auto-throttle mode, reverse thrust initiation, and other systems affected by a low altitude go-around. Except for failure conditions shown to be extremely improbable, a safe go-around must be possible from any point on the approach.

c. Automatic Go-Around. If an automatic go-around capability is provided, it should be demonstrated that a go-around can be safely initiated and completed from any point on an approach prior to touchdown. If the automatic go-around mode can be engaged at or after touchdown, it should be shown to be safe. The ability to initiate an automatic go-around at or after touchdown is not required.

3-6. REQUIREMENTS FOR CAT I OPERATIONS.

a. General Requirements. In general, authorization for standard CAT I operations do not require airworthiness, maintenance, equipage, qualification, or training provisions beyond those required for basic IFR operations under the appropriate 14 CFR part (e.g. part 91, 121) and appropriate for the type of operation being flown. However, parts 121, 125, 129, and 135 operators may only conduct CAT I instrument approaches in accordance with the minima and procedures set forth in their OpSpecs, which should be completed in accordance with Chapter 8 and/or Chapter 9.

b. CAT I Landing Minima with Reduced Lighting (RVR 1800). These operations differ from standard CAT I by allowing for reduced runway lighting requirements (CL and TDZ lights

not required), mitigated by the use of additional onboard equipment. Along with any applicable equipment otherwise specified for CAT I, these operations require an F/D, autopilot, or HUD approved for at least CAT I. The equipment used must provide course and glide path guidance to the DA or until initiation of a missed approach. When authorized by an OpSpec, commercial operators may conduct these operations where designated by a note on a SIAP or on regular RVR 1800 approaches when installed CL and/or TDZ lighting is inoperative. Commercial single-pilot operations are prohibited from using the F/D to conduct these operations without the accompanying use of an AP or HUD.

3-7. REQUIREMENTS FOR OPERATIONS BELOW RVR 1800 TO 1000.

a. General Requirements.

(1) Flightcrew training and qualification consistent with provisions of Chapter 5 for these operations have been completed;

(2) Appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown should be consistent with Chapter 6 of this AC;

(3) With the exception of SA CAT I-only operations, an acceptable continuing airworthiness/maintenance program for the airborne system is provided in accordance with Chapter 7; and

(4) An operational authorization has been completed in accordance with Chapter 8 for a U.S. operator or Chapter 9 for a non-U.S. operator.

NOTE: See Table 3-2, Special Authorization Category II and Category II Minima Matrix, for associated approach RVR minima.

b. Specification of CAT II DA/DH. The lowest authorized DA/DH is cited in this paragraph as an equivalent DH related to height above TDZ elevation (e.g., HAT value of 100 feet). This is done even though operational minima for these operations are typically specified as an equivalent DH value based on radio altitude height above the underlying approach terrain. While a DA is conceptually not precluded for use with CAT II, DAs are not routinely used for these operations, except as a backup for inner marker (IM)-based minima when irregular terrain precludes reliable radio altimeter use to determine minima.

c. Eligibility for CAT II Minima Not Less Than 100 Feet DA/DH. Instrument approach operations that may be authorized CAT II minima currently include only ILS. The FAA may authorize CAT II operations based on Ground Based Augmentation System (GBAS) Landing System (GLS) at a future date.

d. Use of IM. Use of the IM or approved substitute may be authorized in lieu of a DA/DH. An IM is typically used at runways designated by the applicable procedure, such as where radio altimeter (RA) use is limited or Not Authorized (NA) due to irregular underlying terrain (e.g., RA NA).

e. SA CAT I. SA CAT I differs from standard CAT I by allowing for reduced runway lighting and RVR requirements while lowering the DA/DH, offset by the use of additional onboard equipment. The SA CAT I approach procedure has a visibility minimum as low as RVR 1400 and a DH as low as 150 feet HAT therefore requiring the use of radio altimeter (RA) minima or approved substitute. Minimum required lighting includes a medium intensity Approach Light System (ALS) with runway alignment indicator lights (RAIL) (MALSR) or better ALS (i.e., ALSF or simplified short ALS with RAIL (SSALR)) and High Intensity Runway Lights (HIRL) on the runway. TDZ and runway CL lights are not required. Refer to Order 8400.13 for additional information on airfield infrastructure requirements (i.e., lighting, power, air traffic control, etc.) if required. A single RVR system in the TDZ is also sufficient. SA CAT I requires less runway lighting, approach lighting, and RVR reporting than would normally be required for approach operations at this low visibility, but requires a higher level of aircraft capability than is normally necessary for a CAT I operation. Operators are approved for this operation by the appropriate OpSpec/management specification (MSpec) or LOA. Single-pilot operations are prohibited from using SA CAT I landing minima.

(1) Visual references required for approved SA CAT I operations are discussed below in subparagraph 3-7i(2).

(2) Future use of navigation signals other than ILS for SA CAT I operations (e.g., GLS) may require further evaluation of signal suitability and airborne system compatibility via approved New Technology Demonstration (NTD).

(3) The following, along with any applicable equipment otherwise specified for CAT I, is the minimum aircraft equipment considered necessary for an authorization for SA CAT I:

(a) Two independent navigation receivers, or equivalent, of each type intended for use.

(b) A radio altimeter is required. Two independent radio altimeters are recommended. A certified substitute for the radio altimeter may be approved in coordination with the Flight Technologies and Procedures Division.

(c) Rain removal equipment for each pilot (e.g., windshield wiper, bleed air, and rain repellant).

(d) A suitable manual or automatic flight guidance system (FGS) certified and maintained to support a DH of 150 feet or lower. This system will contain the following attributes in a manner acceptable to the FAA:

1. Manual FGSs must provide each pilot with course and glide path command guidance to the DH, while simultaneously providing the pilot flying (PF) with a continuous indication of the desired trajectory to the runway TDZ independent of the guidance used for the approach. The guidance system must also provide the PF with dynamic perception of aircraft position relative to the TDZ of the runway of intended landing in order to facilitate the transition to the visual segment of the approach by reducing the time needed for the acquisition of visual cues. An aircraft type and/or system previously approved for SA CAT I, based upon HUD equipment, is considered to meet the requirements of this paragraph.

2. Automatic FGSs certified for CAT II per AC 20-191 and operated and maintained in accordance with the provisions of this AC for CAT II may be authorized. The approved automatic FGS may not be used below 100 feet HAT for this operation, unless otherwise authorized by the Flight Technologies and Procedures Division. This type of authorization requires coordination with the Flight Technologies and Procedures Division and may require further evaluation via an approved NTD.

f. SA CAT II.

(1) SA CAT II differs from standard CAT II primarily by decreased runway and approach lighting requirements (i.e., TDZ lighting and runway centerline lights not required). A MALSR or a SSALR can be substituted for (normally required) ALS with Sequenced Flashing Lights (ALSF-1/2). HIRLs are still required for SA CAT II operations. Refer to Order 8400.13 for additional information on airfield infrastructure requirements (e.g., lighting, power, air traffic, etc.) if required. Operators must be authorized for SA CAT II operations via OpSpec/MSpec/LOA paragraph C060 and must use aircraft currently operationally approved for autoland or HUD with guidance to touchdown capability. Operators who are authorized to conduct SA CAT II ILS approaches may also continue CAT II operations at runways with standard CAT II/III lighting and a CAT II minimum when TDZ and/or runway centerline lights fail as long as the authorized operator uses autoland or HUD to touchdown. Instrument approach operations may be authorized CAT II minima not less than 100 feet DA/DH. See Table 3-2 for associated approach RVR minima.

(2) The future use of navigation signals other than ILS or vision guidance equipage for SA CAT II operations (e.g., GLS) may require further evaluation of signal suitability and independent airborne system position validation via approved NTD.

(3) SA CAT II operations require the use of an automatic flight control system or a manual FGS designed to meet CAT III criteria of AC 20-191.

(4) An aircraft type and/or system previously approved for CAT III using AC 120-28 or equivalent criteria is considered to meet the requirements of this AC for SA CAT II approval.

g. CAT II Using RVR 1000 Minima. CAT II using RVR 1000 minima may be authorized when meeting provisions of standard OpSpec, MSpec, or LOA paragraph C060 (see Appendix 3). Only those operators with an authorized OpSpec, MSpec, or LOA for CAT II operations using aircraft that are currently certified and maintained for CAT III operations (i.e., autoland or HUD certified to touchdown capability) may be considered eligible for these operations. The OpSpec, MSpec, or LOA must include the limitation requiring the use of autoland or HUD to touchdown as a condition of the minimum. See Table 3-2 for associated approach RVR minima.

TABLE 3-2. SPECIAL AUTHORIZATION CATEGORY II AND CATEGORY II MINIMA MATRIX

CAT II Authorization	DH	Approach/Landing System TDZ RVR			
		Autopilot	HUD	FP HUD	Autoland
OUSD	100’	1600			
Standard	100’	1200			
	100’	N/A		1000	
SA CAT II	100’	N/A		1200	

N/A = Operation not authorized
FP HUD = Fail Passive Cat III certified Head-Up Display

h. Application of a DA/DH or Equivalent (e.g., IM), for CAT II. Procedures using CAT II minima typically use a radio altimeter and the associated DH (of the specified DA/DH) for minima determination.

(1) For CAT II, a DH of a published DA/DH, or an equivalent IM, is used as the applicable descent minima. Any “altitude” value specified is considered to be advisory. The altitude value is available for cross reference and backup. Use of the barometrically referenced DA element of a published DA/DH is not currently authorized for part 121, 129, or 135 operations at U.S. facilities.

(2) Procedures that have “Radio Altitude Not Authorized (RA NA)” (e.g., due to irregular underlying terrain) typically use the first indication of arrival at the IM as a means to establish DA/DH. In this instance, both radio altitude and barometric altitude are advisory. However, an operator may elect to use first indication of arrival at either the IM or the barometric altitude DA, whichever comes first, as the means for minima determination. In this case, barometric altitude may be an acceptable means to establish DA/DH, but only if it occurs before arriving at the IM.

i. Visual Reference Requirements.

(1) For SA CAT I operations, the required visual references are those provisions listed in § 91.175(c) and (d).

(2) For all other instrument approach operations below RVR 1800, § 91.189 and Standard OpSpecs or MSpecs specify the required visual references to continue the approach.

(3) For SA CAT II operations, note that the ground lighting system configuration may be non-standard. Refer to subparagraph 3-7f for further detail.

(4) The reference to Visual Glide Slope Indicator (VGSI) in § 91.175 includes the use of Visual Approach Slope Indicators (VASI), precision approach path indicators (PAPI), Pulsating Visual Approach Slope Indicators (PVASI), or tri-color VASIs.

(5) Section 91.176 contains the requirements pertaining to visibility and visual reference when operations are based on using EFVS.

j. Precision Approach Radar (PAR). PAR minima may be authorized via OpSpec to minima of not less than 100 feet HAT, or the published minima, whichever is higher. PAR authorizations are limited to those operators and crews specifically qualified to use PAR.

3-8. REQUIREMENTS FOR OPERATIONS BELOW RVR 1000.

a. General CAT III Requirements. The following requirements apply to the operational authorization of CAT III IAPs:

(1) The airborne system should meet the applicable requirements of Chapter 3 and AC 20-191,

(2) Flightcrew qualification consistent with provisions of Chapter 5 for CAT III has been completed,

(3) Appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown, consistent with Chapter 6, should be available,

(4) An acceptable continuing airworthiness/maintenance program for the airborne system provided in accordance with Chapter 7, and

(5) An operational authorization has been completed per Chapter 8 for a U.S. operator or Chapter 9 for a non-U.S. operator.

b. Concepts and Objectives. CAT III minima were formerly classified as CAT IIIa, CAT IIIb, and CAT IIIc. Title 14 CFR part 1 no longer contains definitions of these classifications. CAT III landing minima are now based on and often described in terms of a three-legged stool (i.e., aircraft approach and landing system capabilities, crew qualification, and approach system classification). For example, for a crew authorized for minima as low as RVR 300, if either the aircraft or approach is limited to RVR 600, then the lowest actual minima is limited to RVR 600, which is the highest value of the three legs. Visual conditions encountered in CAT III operations range from visual references being adequate for manual control during rollout to visual references being inadequate even for taxi operations without special visual reference enhancements or suitable synthetic references. Failure effects and system capabilities after failure are associated with different levels of visual conditions (ceiling and visibility) to derive landing minima (AH, DH, and RVR).

(1) Aircraft having statements in the FAA-approved AFM indicating approval for certain CAT III operations (e.g., formerly CAT IIIa operations) are considered to continue to meet the requirements of this AC. Determination of equivalence between previous CAT IIIa, IIIb, and IIIc classifications and CAT III description in terms of failure effects and system capabilities are described below.

(2) CAT III operations may be conducted manually using approved FGSs, automatically using approved autoland systems, or with hybrid systems that employ both

automatic and flight guidance elements. If the particular FGS depicts F/D or other command guidance, it may be approved in accordance with AC 20-191 or equivalent. Additionally, other FGSs may be used if the NTD is satisfactorily demonstrated. When an automatic system is to be the primary means of control, the use of that system should not require pilot intervention. A means for crew intervention must be provided in the event the pilot detects inadequate system performance (e.g., the pilot determines that an automatic landing cannot be accomplished within the TDZ). If a hybrid system is employed, then the primary mode of operation must be automatic to touchdown, with manual control used as an alternate means to complete the operation.

(3) To be approved for CAT III operations, the airplane and its associated systems should be shown to be capable of safely completing an approach, touchdown, and rollout and permitting a safe go-around from any altitude to touchdown following any failure condition not shown to be extremely improbable. A single system failure should not cause total loss of CAT III capability. A combination of failures may cause a loss of CAT III but must not prevent a safe go-around.

(4) Flight deck design, instrumentation, annunciations, and warning systems should be adequate in combination to ensure the pilot(s) can verify the aircraft should touch down within the TDZ and safely rollout when the controlling visibility is reported at or above applicable minima. Concepts other than those currently authorized may be acceptable if NTD testing can demonstrate an equivalent or greater level of safety as presently specified for approval of automatic systems (e.g., hybrid systems or vision enhancement systems).

(5) To be approved for CAT III operations, the airplane and its associated systems should be shown to be able to perform to the necessary level of accuracy, integrity, and availability. This is typically shown initially by the manufacturer during airworthiness demonstration, confirmed during the operational authorization process, and is monitored by the operator on a continuing basis.

(6) CAT III operations are predicated on meeting requirements for CAT II, or equivalent, for that portion of the approach to 100 feet HAT.

(7) The provisions of this AC, or any version of the former AC 120-28 for aircraft previously certified, are considered to be the applicable criteria to assure the necessary performance from flare to landing and rollout.

c. Fail Operational (FO) CAT III Systems. An FO system is a system that, after failure of any single component, is capable of completing an approach, flare, and touchdown, or approach, flare, touchdown, and rollout by using the remaining operating elements of the FO system. The failure effects of single components of the system, airplane, or equipment external to the airplane that could have an effect on touchdown or rollout performance must be considered when evaluating FO systems. FO systems may be used to touchdown with or without a rollout system. Use of an FO system to touchdown in conjunction with a rollout system that is not FO is acceptable as long as suitable minimum RVR values are specified in the OpSpecs.

(1) As of the publication of this AC, the lowest authorized minima for U.S. operators are touchdown, mid, and rollout RVR 300.

NOTE: A landing system is considered to include each of the elements in the aircraft that are necessary to perform the landing and rollout function (e.g., flight control, hydraulic system(s), electrical system(s), and sensors).

(2) The reliability and performance of the required operational systems should be such that continued safe operation to landing, or landing and rollout, can be achieved following any failure condition occurring below the AH that is not shown to be extremely improbable. Systems identified below and in AC 20-191 or equivalent are considered to meet the intent of this provision.

(3) The redundancy required for approval of an FO CAT III aircraft may be provided by multiple automatic landing systems, multiple automatic landing and rollout systems, redundant manual FGSs, or suitably redundant approved hybrid systems (NTD).

(4) Failure conditions that result in the loss or disconnect of all the redundant landing or landing and rollout systems, occurring below the AH, are permissible if the occurrence of these failure conditions is extremely remote and the loss or disconnect is accompanied by acceptable warning indications for the pilots. Airplanes that are demonstrated to meet the airworthiness assessments of AC 20-191 for FO systems are considered to meet these reliability and performance criteria.

(5) The following are typical arrangements that may be acceptable for FO systems:

(a) Two or more monitored fail passive (FP) autopilots or integrated autopilot F/D systems, each with dual channels making up an automatic FO system designed so that at least one autoflight system remains operative after the failure of one system, and the failed system is not used or cannot cause unacceptable autoflight system performance.

NOTE: Following a failure with this configuration, it is not intended that a landing be continued with F/D alone, unless a successful NTD has been completed.

(b) Three autopilots or integrated autopilot F/D systems designed so that at least two remain operative after failure to permit comparison and provide necessary monitoring and protection while continuing to a landing.

(c) A monitored FP automatic flight control system with automatic landing capability to touchdown and rollout, if applicable, plus an independent and adequately failure-protected manual FGS, suitable for landing and rollout with guidance provided for the PF and monitoring displays for the pilot monitoring (PM). An NTD may be necessary for this arrangement.

(d) Two independent and adequately monitored manual FGSs with independent displays for the PF and the PM, each capable of supporting a landing and rollout. An NTD would be necessary for this arrangement.

(6) Aircraft meeting FO requirements of AC 20-191, or equivalent, for landing and rollout may be authorized for FO CAT III to the lowest currently applicable minima specified in OpSpecs for this type of system.

(7) Aircraft previously demonstrated to meet acceptable FO criteria may receive additional credit beyond those already authorized, as specified in provisions of this AC, through proof of compliance with applicable operational provisions of this AC and any subsequent amendment of applicable OpSpecs.

(8) Aircraft with an FO landing system, but without a rollout system, that were originally approved in accordance with previous versions of AC 120-28 may typically be approved for minima not less than TDZ and mid RVR 600. Eligibility for RVR 600 requires compliance with appropriate current Service Bulletins (SB) in accordance with the manufacturer's recommendations, and a determination by FAA that "in-service" operational performance of the system is acceptable.

(9) Aircraft originally approved in accordance with FAA "Special Conditions" for a rollout system, or criteria of versions of AC 120-28, are considered to have rollout capability equivalent to FO for minima not less than TDZ, mid, and rollout RVR 300. For these aircraft, appropriate current SB compliance should be reviewed and completed, and line operational performance of the system must be shown to be acceptable. However, it is important to note that, as with other aircraft types, CAT III authorization for some of these aircraft may be restricted to certain runway facilities since landing or rollout performance may not necessarily be acceptable due to site-specific irregular underlying approach terrain, TDZ slope, or ILS beam characteristics.

d. Alert Height.

(1) FO CAT III is based on use of an AH. The AH is the height above a runway based on characteristics of the airplane and its FO system, above which a CAT III approach must be discontinued and a missed approach initiated if a failure occurs in one of the redundant parts of the flight control or related aircraft systems, or if a failure occurs in any one of the relevant ground systems. The AH design philosophy requires an aircraft be capable of safely completing a touchdown and rollout (if applicable) following a single failure occurring in the systems noted above, below the specified AH.

(2) Operational AHs must always be equal to or lower than that specified in the airworthiness demonstration, and may be specified at or below 200 feet HAT. The AH is specified by an operator of an aircraft and approved by the FAA. The operational AH used must be consistent with the aircraft design, training, ground facilities, and other factors pertinent to the air carrier's operation. Typically, a minimum usable operational AH is 50 feet HAT. Lower AHs may be approved if there is an appropriate reason to do so (e.g., for certain types of hybrid systems).

(3) Airworthiness demonstration of an AH is specified in AC 20-191. To ensure the necessary reliability of aircraft systems, airworthiness demonstrations of AH should be from an altitude of at least 200 feet above the TDZ elevation.

e. Fail Passive CAT III Systems.

(1) A fail passive system is a system that, in the event of a failure, causes no significant deviation of aircraft flightpath or attitude. The capability to continue the operation may be lost and an alternate course of action (e.g., a missed approach) may be required. An FP system is the minimum acceptable system for CAT III operation with a DH.

(2) FP approach operations meeting provisions of AC 120-28, AC 20-191, or equivalent, are typically conducted with a DH not lower than 50 feet, and are limited to RVR values that provide suitable visual reference to address normal operations as well as failure contingencies. Authorization of DH less than 50 feet HAT may require NTD.

(3) An FP CAT III system does not provide sufficient redundancy to successfully continue the approach and landing to touchdown following any failure in the flight control system not shown to be extremely remote. Therefore, a DH is specified in this instance. In the event of a failure of the airborne system at any point in the approach to touchdown, a missed approach is required. However, this provision does not preclude a pilot's authority to continue an approach if continuation of an approach is considered by the pilot to be a safer course of action.

(4) Such a failure, however, does not preclude continuation to CAT I or CAT II minima if the necessary remaining elements of the aircraft system are operational and if the flightcrew qualification addresses necessary action to continue such an approach is met. Any adjustments to approach minima or procedures made on final approach should be completed at a safe altitude.

(5) An aircraft using an FP system for CAT III should be shown to provide the capability to touchdown in the TDZ or to complete a safe manual or automatic go-around. This capability should be demonstrated from any altitude to touchdown following any failure condition not shown to be extremely improbable.

(6) Typical arrangements that may be used to meet the requirements for CAT III FP operations using a 50 feet DH include the following:

(a) A single monitored automatic flight control system with automatic landing capability.

(b) An FO automatic flight control system with automatic landing that has reverted to an FP configuration or has been dispatched in an FP configuration. This provision is in place for dispatch and prior to initiating the approach. It is not intended to allow switching to an FP configuration if a FO system degrades during the approach. In that event, a missed approach should be initiated.

(c) An FGS designed for manual control by the PF (e.g., FP HUD), and for monitoring by the PM. Aircraft intended for FP CAT III operations should have aircraft systems that meet the criteria specified in AC 20-191. Aircraft previously demonstrated to meet earlier FP criteria may continue to operate using CAT III minima in accordance with approved OpSpecs.

f. Decision Height.

(1) For CAT II and certain CAT III procedures (e.g., when using an FP landing system), a DH (or an approved equivalent) is used as the controlling minima. The "Altitude" value specified is considered as advisory and is available for cross reference. Use of a barometrically referenced DA for CAT III is not currently authorized.

(2) A DH is applied to all FP operations and is specified at certain international locations where FO minima are authorized. For CAT III, a DH is a specified radio altitude above terrain on the final approach or TDZ. The DH is established to ensure that prior to passing that point the pilot is able to determine that adequate visual reference exists to allow verification that the aircraft should touch down in the TDZ.

g. CAT III Operations with Not Lower than RVR 700 Landing Minima.

(1) Operations with landing minima of not lower than RVR 700 may be conducted with a FO or FP landing system, with or without a rollout control system (See Table 3-3, Lowest Minima Currently Authorized for Fail Operational or Fail Passive Landing Systems, or Landing and Rollout Systems, for specific minima). Previous testing and harmonization efforts led to lowering CAT IIIa minima to RVR 600; however, CAT III operations with RVR 700 minima are the lowest suitable for use on navigation facilities that support guidance for positioning through touchdown but do not support unmonitored rollout guidance. Some facilities and/or legacy aircraft are limited to RVR 700 based upon approach classification or aircraft certification. See subparagraph 3-8i, CAT III Operations RVR Minima Rationale, below for further discussion. These operations were formerly defined as CAT IIIa in the CFR and FAA documents. They may still be defined as CAT IIIa in ICAO annexes and foreign documents.

NOTE: Some FAA instrument procedures may still retain CAT IIIa nomenclature until these procedures are updated or amended.

NOTE: Reported TDZ and mid RVR must meet the approach chart minima to conduct any CAT III operation. The reported rollout RVR, while still controlling, may be lower than charted minima, if authorized via OpSpec.

(2) Operations using an FO system without an operational rollout control system require the use of a DH to ensure suitable visual reference of the TDZ.

(3) For FO systems, there should be a sufficient combination of information from flight instruments, annunciations, and alerting systems to ensure the pilot can verify that the aircraft should touch down within the TDZ, and safely initiate rollout.

(4) Aircraft demonstrated to meet the airworthiness provisions of AC 120-28 for FP systems remain eligible for any previously approved operational authorization under provisions of this AC and do not require additional airworthiness demonstration. Aircraft previously having completed an airworthiness demonstration in accordance with AC 120-28 remain eligible for any operational authorization that was permitted by AC 120-28.

(5) Aircraft demonstrated to meet airworthiness criteria prior to AC 120-28B, and not currently authorized in OpSpecs for CAT III, may be approved for new FP CAT III operations on a case-by-case basis depending on facilities to be used, SB compliance status, and other relevant safety factors.

(6) Aircraft that were authorized for FO CAT III, but have not been demonstrated to meet the provisions for FP systems shown in previous versions of AC 120-28 or AC 20-191, may be approved for FP operations with landing minima limited to RVR 1000 provided the following criteria are met:

(a) The aircraft must be shown to be in compliance with relevant SBs for the applicable flight control system and displays.

(b) An auto throttle system must be installed and operational.

(c) The system must be shown to provide reliable autoland performance in line operations.

(d) A demonstration using an appropriately approved full flight simulator (FFS) or aircraft must be completed for that operator and aircraft type, showing that the system and procedures applicable to FP operations can be practically applied for that air carrier's operation.

(7) Aircraft not previously authorized or not currently authorized by the FAA to use minima less than RVR 1000 based on a FP system must meet the airworthiness requirements of AC 20-191 or equivalent for any new authorization of minima less than RVR 1000.

(8) New aircraft types or derivative aircraft with new flight control system designs should be demonstrated in accordance with AC 20-191 for FP systems, or equivalent requirements, if FP authorization is sought.

h. CAT III Operations with Landing Minima RVR 600 or Less.

(1) CAT III operations with landing minima of RVR 600 or less are usually conducted with FO systems. These operations were formerly defined as CAT IIIb in the CFR and FAA documents, and may still be defined as CAT IIIb in some ICAO annexes and foreign documents.

(2) Airborne systems authorized for landing at or below mid RVR 600 must include a rollout system. Either a manual FGS or an automatic rollout or control system for lateral steering may be acceptable. Either system must provide the means to control the aircraft until the aircraft slows to a safe taxi speed. Operations based on FO systems require the use of systems that, after passing AH, are capable of the safe completion of the approach, touchdown, and rollout, following any failure conditions not shown to be extremely remote. When FO systems are used, they do not require operating procedures which specify that the approach must be continued after a failure.

(3) Operations based on FO systems with an approved rollout system are generally conducted to an AH. The availability of visual reference is not a specific requirement for continuation of an approach to touchdown. The design of flight instrument systems,

annunciations, and alerting systems should be adequate to ensure the pilot can verify the aircraft should touch down within the TDZ and rollout.

(4) Operations may be conducted to a TDZ RVR of not less than 600 and a mid RVR not less than 400 with an FO or FP landing system and with any FAA-approved rollout control system.

(5) Operations may be conducted to a TDZ and mid RVR not less than 400 when using an FO landing system and a rollout control system shown to meet FP criteria of AC 20-191 (or earlier FAA criteria applicable to a rollout system).

(6) In all cases above, operations may be conducted with a rollout RVR as low as 300.

(7) Irrespective of CAT III definitions and certification standards which may reference lower RVR minima, as of the publication of this AC, the lowest authorized minima for U.S. operators are touchdown, mid, and rollout RVR 300. A summary of the minima that may now be authorized based on the above criteria are shown below in Table 3-3.

(8) See note below for criteria, and subparagraph 3-8c above for examples of various aircraft types, systems, and minima that may be authorized.

NOTE: AC 120-28D Appendix 3 amended criteria for FO rollout control systems. As a result, certain systems previously certificated using the criteria of AC 120-28B or 120-28C, which were not considered FO due to conditions noted in the AFM as exceptions, were considered under AC 120-28D to meet FO criteria.

i. CAT III Operations RVR Minima Rationale.

(1) The concept of CAT III approach requires no visual segment. However, TDZ RVR values must be sufficient such that adequate visual reference exists to allow verification that the aircraft should touch down in the TDZ when using FP landing systems. The TDZ RVR values shown in Table 3-3 for FP systems are not sufficient for an unguided, visual landing, but are only sufficient for the pilot to verify aircraft position to land when arriving at DH. TDZ RVR values must also be adequate for initial pilot control of rollout after touchdown either without a rollout system or in case of FP rollout system failure.

(2) Mid RVR reports must be sufficient to allow pilot visual confirmation of rollout guidance system performance and also be sufficient to support safe, unguided, manual control during the high speed rollout segment in case of FP system failure.

(3) Minimum rollout RVR in all cases must support low speed (40 knots or less) rollout and taxi operations. For aircraft or operator procedures known to require the maximum allowable rollout distance and commensurate higher speed in the rollout RVR area, a higher required RVR report may be necessary.

(4) RVR 600 is the lowest RVR that provides visual cues necessary in verifying that the aircraft should touchdown in the TDZ using a 50 foot DH or during unguided rollout. RVR 600

is therefore the minimum required for landing operations using a 50 foot DH (i.e., with FP landing systems) and high speed rollout in the mid RVR area without a rollout system. Lower RVR values and associated DH using hybrid systems may be acceptable upon completion of NTD testing. RVR 400 is the minimum visibility necessary to confirm proper rollout system operation or for control in case of rollout system failure. Therefore, RVR 400 is the lowest visibility assigned for FP system controlled rollout in the mid RVR area. RVR 400 is also necessary for an FO landing system if the rollout system is FP. RVR 300 is the lowest visibility used for operations with FO landing and rollout systems. While visual references for touchdown or rollout are not required for FO systems, RVR 300 is used for all FO CAT III operations as a practicable minimum value for final, low speed rollout to runway turnoff. RVR 300 is also accepted as the lowest generally useable minimum for safe ground operations using natural vision. Lower RVR values for FO systems may be achievable through the use of advanced vision or sensor systems upon successful completion of an NTD.

(5) A summary of the minima that may now be authorized based on the above criteria are shown below in Table 3-3.

TABLE 3-3. LOWEST MINIMA CURRENTLY AUTHORIZED FOR FAIL OPERATIONAL OR FAIL PASSIVE LANDING SYSTEMS, OR LANDING AND ROLLOUT SYSTEMS

Landing System Type	Rollout System Type	TDZ RVR	Mid RVR	Rollout RVR
FP or FO	None	600 (175m)	600 (175m)	300 (75m)
FP	FP or FO	600 (175m)	400 (125m)	300 (75m)
FO	FP	400 (125m)	400 (125m)	300 (75m)
FO	FO	300 (75m)	300 (75m)	300 (75m)

NOTE: "Relevant" or "applicable" mid or rollout RVR is considered to be any RVR sensor report (or equivalent instrumentally derived RVR measurement) considered to be covering a portion of the runway where the aircraft is operating at a speed above a safe taxi speed (See subparagraph 6-4b).

j. Previously Approved CAT I/II/III Operations or Use of Previous or New CAT I/II/III Criteria. Operators approved in accordance with AC 120-29 or AC 120-28 may continue to operate in accordance with their previously approved program, consistent with current standard OpSpecs or any special provisions approved for that operator in that operator's approved OpSpecs.

(1) Approval criteria used for a particular aircraft are typically listed in an AFM. If not shown in an AFM, the applicable FAA Aircraft Evaluation Division may be consulted through the POI or certificate management office (CMO) to determine eligibility.

(2) Aircraft qualified using other than FAA criteria will be as designated in approved OpSpecs or as designated by the applicable Aircraft Evaluation Division (e.g., through the FAA Flight Standardization Board (FSB) Report for the aircraft type) or the Flight Technologies and Procedures Division.

(3) Aircraft demonstrated to meet airworthiness provisions of versions of AC 120-29 or AC 120-28 may remain eligible for previously approved operational authorizations. Additional airworthiness demonstrations are not necessary for these aircraft unless the operator specifically seeks additional credit based on the provisions of this AC.

(4) Operators seeking credit provided for only by this AC which was not available in previous versions of AC 120-29 or AC 120-28 must meet operational criteria as described in the main body of this AC.

3-9. VISIBILITY AND RVR. Visibility minima are as specified in standard or special IAPs approved for use by the operator, or as otherwise listed in standard OpSpecs applicable to that operator. CAT I operating minima may be expressed as meteorological visibility or RVR while SA CAT I/II, CAT II, and CAT III minima are expressed solely in RVR. Takeoff minima below ¼ statute mile/RVR 1600 are expressed solely in RVR.

a. Meteorological Visibility. Meteorological visibility may be used as reported by the National Weather Service (NWS), a source approved by the NWS to include U.S. Military weather reporting facilities, by FAA, or a source approved by the Administrator.

b. Overseas Visibility Reporting. Outside of the United States, the FAA may accept meteorological reporting sources for use by a particular operator. Outside of the United States, meteorological visibility determination may vary. An operator should ensure that the meaning, definition and significance of any meteorological visibility reported for use in determining minima is understood by that operator's pilots.

c. Non-NWS Sources. For approval of use of aviation weather sources not already addressed by current directives, operators should consult their responsible Flight Standards office. Air carriers should refer to § 121.101 for pertinent information on non-NWS weather reporting facilities. A Flight Standards office requiring assistance in responding to operator inquiries regarding approval of weather sources should consult the Flight Technologies and Procedures Division.

3-10. RUNWAY VISUAL RANGE. RVR is an instrumentally derived value measured by transmissometers or forward-scatter meters. RVR is calibrated by reference to runway lights and/or the contrast of objects.

a. Controlling RVR. The controlling RVR(s) are those reported values of one or more RVR reporting locations used to determine if operating minima are met for the purpose of takeoff initiation, approach initiation, or in some cases, approach continuation. For instrument approaches described in this AC, the controlling RVR(s) are as specified by the operator's authorization.

b. Operating Minima. U.S. operating minima below ½ statute miles (RVR 2400) for landing and ¼ statute miles (RVR 1600) for takeoff are generally based on RVR as reported by the controlling agency. For EFVS operations, refer to § 91.176 and AC 90-106.

c. Instrumentally Derived RVR Limitations. The use of RVR has practical limitations that should be familiar to both the operator and pilot. For example, RVR is a value that typically only has meaning for the portions of the runway associated with the RVR report. RVR is a value that may vary with runway light step settings (1 through 5). Operators should ensure that pilots are familiar with runway light setting effects on reported RVR. RVR may not be representative of actual visibility along portions of the runway due to the location of the sensor baseline and limited length of the baseline, or due to variable conditions of fog, blowing snow, or other obscurations along the runway, obscurations varying rapidly in time (e.g., patchy fog), or due to lighting source (e.g., LED or incandescent). Thus, pilots and operators should note that RVR is an instrumentally derived value that has operationally significant limitations and can be greater than or less than the actual visibility available to a pilot at typical flight deck eye height. This is particularly true at night, if runway lights are not at settings standard for the prevailing conditions, or if unusual daylight conditions are experienced (e.g., a runway aligned with a sunrise or sunset condition, in shallow or patchy fog).

d. Non-Instrumentally Derived RVR Reports. Outside of the United States, some RVR reports may not necessarily be instrumentally derived, and may alternately be made by pilots or other weather observers. Accordingly, operators should ensure that the meaning, definition, significance, and variability of any non-instrumentally derived value of RVR reported to the pilot for use in determining minima is understood by that operator, and that operator's pilots.

3-11. RUNWAY FIELD LENGTH REQUIREMENTS AND RUNWAY CONTAMINATION. Landing distance requirements are specified by operating rule and are further expanded upon below.

a. AFM Landing Distance Data. All operators should understand the basis by which their landing distance charts are constructed, to include which factors were used to ensure compliance with any applicable portions of their operating rules.

b. Wet Runway Considerations. If it is determined during dispatch that the landing runway may be wet, the effective runway length must meet the requirements of the applicable operating rules. Operators should consider the possible need for an adequate buffer beyond that required by these operating rules if braking action is reported or expected to be less than "good." Further details may be found in AC 91-79 and AC 121.195-1.

c. Use of Autobrakes. Prior to dispatch or release, the pilot should possess and consider any necessary information regarding AFM stopping distance data upon which dispatch was determined (e.g., autobrake setting). If FAA-approved AFM autobrake data conforming to AC 121.195-1 is to be used, then the operator should provide the applicable stopping distance information/autobrake setting and stopping procedures to the flightcrew.

d. Emergency Return After Takeoff. When an operator needs to provide for an instrument approach and low-visibility landing following an emergency return after takeoff, or

when using a takeoff alternate, the operator should consider the expected landing configuration, braking method, and initial braking speeds in assessing landing field length requirements (e.g., consider landing weight, engine out flap settings, engine inoperative speeds as applicable, potential for partial brakes, or partial antiskid, or inoperative reverse thrust).

e. Alternate Airport Field Length. When determining alternate airport field length provisions in accordance with the applicable operating rule, it is recommended that the operator consider the engine inoperative weights, flap settings, and approach speeds that may be applicable for that alternate airport. The operator must consider engine inoperative speeds and configurations in the assessment of the required landing distance in order to receive credit for the use of a CAT II alternate airport based on "Engine Inoperative CAT II" capability.

f. Acceptable Field Length Factors and Considerations. The following field length factors and elements should be considered:

(1) The Runway Field-Length Requirement for operations when conditions are expected to be below RVR 4000 is as specified by the applicable operating rule for a wet runway.

(2) The use of declared distances for runways should follow guidance provided in AC 150/5300-13, Airport Design. Declared distances are listed in the FAA Chart Supplement for all runways at certificated airports. NOTAMs may have an effect on the declared distances of runways due to airport construction, Runway Safety Area (RSA) construction and/or special events. Operators are responsible for the proper application of NOTAMs with respect to runway declared distances.

(3) Braking Action Considerations. CAT II and/or III operations should not normally be conducted with braking action less than "fair." Operators should ensure that timely updates of field conditions are provided to the flightcrew, and dispatcher, if applicable. The flightcrew and/or dispatcher should be able to assess from the updates whether sufficient runway length is available for the landing in the conditions reported.

(4) Runway Field Length Airborne Considerations.

(a) In the event of unforecast adverse weather en route to the destination, or if braking system or other failures affecting stopping performance occur while en route, the crew should consider any adverse landing distance consequences that may result from a decision to make a landing on a particular runway (e.g., braking action reports, runway surface composition and length, reported runway and weather conditions, AFM limitations, operational procedures, and aircraft equipment status).

(b) Information on autobrake distance provided by the manufacturer may be used as the basis for field length determinations prior to execution of the approach. When autobrake systems are used, information must be available to the flightcrew to assist in making the proper selection of a suitable autobrake setting consistent with the field length available for landing and the runway condition, including braking action. If FAA-approved AFM certificated autobrake data conforming to AC 121.195-1 is used as the basis for determining acceptable landing distance, the operator should ensure that appropriate factors for use of autobrakes are considered,

and if appropriate, accounted for (e.g., brake configuration, autobrake setting(s), runway surface friction, and runway slope).

3-12. ROLLOUT DECELERATION SYSTEMS OR PROCEDURES FOR CAT II AND/OR III.

a. Stopping Means. A means to determine that an aircraft can be reliably stopped within the available length of the runway is necessary to conduct CAT II/III operations. At least one of the following means to assess stopping performance should be used:

(1) An automatic braking system that includes information for the flightcrew about appropriate autobrake settings to be used for landing or that provides landing distance information suitable for use by the flightcrew to determine which autobrake setting may or may not be appropriate.

(2) A ground-speed indicating system based on inertial information or other equivalent source such as Global Navigation Satellite System (GNSS), together with acceptable procedures for its use.

(3) A deceleration display or other indication that can advise the pilot of the adequacy of aircraft deceleration to stop within the available runway length.

(4) A runway remaining indicator display reliably showing the length of remaining runway after touchdown.

(5) A procedural means to assure a safe stop acceptable to the FAA for minima at or above RVR 300. An automated system is required for minima less than RVR 300.

b. Antiskid Systems. Unless otherwise specified by the FAA, aircraft authorized for CAT I and II do not have specific antiskid system installation or use requirements beyond those specified in the applicable AFM, applicable FAA-approved Master Minimum Equipment List (MMEL) and MEL, and applicable field length operating rules.

(1) Unless otherwise determined to be acceptable to the FAA, aircraft authorized for CAT III should have an operable antiskid system installed and operative per the applicable FAA-approved MMEL and MEL.

(2) The authorization for aircraft to operate using CAT III minima without antiskid is determined by the POI for each aircraft type, considering the following factors:

(a) Extra field length margin of runways to be authorized, compared with field lengths necessary for the aircraft type, and

(b) The braking system characteristics of the aircraft regarding susceptibility to tire failure during heavy braking, and susceptibility to tire failure during operations with reduced or patchy runway surface friction.

3-13. VISION SYSTEMS. Certified vision systems may be used in accordance with applicable airworthiness and operational approvals. Use of other vision systems must be demonstrated to be acceptable through NTD testing prior to consideration for operational approval.

a. Synthetic Vision Systems (SVS)/Enhanced Vision Systems (EVS) Situation Awareness. SVS and/or EVS may be used to enhance situational awareness during CAT I, II, or III AWO operations.

b. Synthetic Vision Guidance Systems (SVGS). SVGS are typically implemented on a primary display. The display integrates flight guidance information (path deviation indications and command guidance) with a geospatially corrected image of the landing runway, the surrounding environment, and trajectory reference information. The trajectory reference information includes Flight Path Vector (FPV) and flightpath angle reference cue (FPARC). The trajectory reference information will provide the pilot with indications that the trajectory is projected to the runway TDZ (refer to AC 20-185 for information on SVGS airworthiness approval). In a system designed to support operations in which additional credit is sought, the system must meet the integrity, accuracy, and reliability requirements appropriate for the operation.

c. Enhanced Flight Vision Systems. For a description of EFVS, refer to § 91.176 and AC 90-106.

3-14. HYBRID SYSTEMS. Hybrid systems (e.g., an FP autoland system used in combination with a monitored HUD FGS) may be acceptable for CAT III if each element of the system alone is shown to meet its respective suitability for CAT III, and if taken together, the components provide the equivalent performance and safety to a non-hybrid system as specified for the minima sought (e.g., FO CAT III). Hybrid systems should meet the criteria specified in AC 20-191 or may be authorized following a successful NTD. For hybrid systems used for CAT III, an AH or DH will be determined and demonstrated during authorization.

CHAPTER 4. PROCEDURES

4-1. OPERATIONAL PROCEDURES. Operational procedures should consider the pilot qualification and training program, Airplane Flight Manual (AFM), crew coordination, monitoring, appropriate takeoff and landing minima including specification of minimum descent altitude (MDA), decision altitude (DA)/decision height (DH) or an Alert Height (AH) for landing, crew call-outs, and assurance of appropriate aircraft configurations.

a. Application of AFM Provisions. During airworthiness demonstrations, the operator's procedures for takeoff or landing during low visibility should be consistent with AFM provisions specified in the normal or non-normal procedures sections. Adjustments of procedures consistent with operator requirements are permitted when approved by the principal operations inspector (POI). Operators should ensure that adjustments to procedures are not made that invalidate the applicability of the original airworthiness demonstration.

b. Crew Coordination. Appropriate procedures for crew coordination should be established so that each flightcrew member can carry out the assigned responsibilities. Briefings prior to takeoff or approach should be specified to ensure appropriate and necessary crew communications. Responsibilities and assignment of tasks should be clearly understood by crewmembers. Tasks should be accomplished consistent with the operator's specified provisions for the aircraft type, model, or series, and each crewmember position, unless otherwise approved by the POI. Any transfer of aircraft control or responsibility should not interfere with the safe landing of the aircraft.

c. Monitoring. Operators should establish appropriate monitoring procedures for each type of AWO approach, landing, and missed approach. Training and procedures should ensure that adequate crew attention can be devoted to control of the aircraft flightpath, displacements from the intended path, mode annunciations, failure annunciations and warnings, and adherence to minima requirements associated with MDA, DA/DH, or AH.

d. Use of the MDA, DA, DH, or AH.

(1) MDA is typically used for CAT I procedures that do not have vertical path guidance.

(2) DA is a barometrically determined altitude minimum and typically used for CAT I approaches with vertical guidance (e.g., instrument landing system (ILS), Ground Based Augmentation System (GBAS) Landing System (GLS)).

(3) Except where use of an inner marker (IM) is authorized in lieu of a DH, DHs using radio altimeter minima are normally used for Special Authorization (SA) Category (CAT) I, all CAT II, and fail passive (FP) CAT III operations. If specifically authorized by the FAA, a DA may be used for CAT II.

(4) AHs are typically used for fail operational (FO) CAT III operations. The operator may elect to use an AH at or below 200 feet height above touchdown (HAT), as suitable for each specific procedure.

(5) Setting of reference bugs, call-outs including applicable minima, and visual reference identification/requirements necessary at minima should be clearly specified.

(6) Use of QFE procedures for MDA, DA/DH, or AH for operators that are not already so authorized must be specifically approved by the responsible Flight Standards office, after coordination with the Flight Technologies and Procedures Division.

e. CAT I, II, and III Flightcrew Procedures Compatibility.

(1) The operator should ensure flightcrew and operational procedures for CAT I, II, and III are consistent to the maximum extent possible, to minimize confusion (refer to AC 120-71 for further guidance).

(2) Altitude/height call-outs should be compatible and consistent to as many categories of operation as practicable. Operators may elect to have crew callouts in addition to the required automated callouts.

(3) Call-outs should be specified to address any non-normal configurations, mode switches, or failures that could affect safe flight, continuation of the landing, or a missed approach. Any use of crew-initiated call-outs at altitudes below 100 feet should ensure undue concentration of the pilot monitoring (PM) is not required. Automatic altitude call-outs or tones are recommended for altitude awareness, at least at and after passing DH or AH.

(4) Operators approved under § 91.176(a) and authorized for operations specification (OpSpec) C048 and C060 operations should ensure compatible call-outs and crew training if an enhanced flight vision system (EFVS) is to be used during a CAT II or III approach.

f. Flightcrew Response to Non-Normal Events.

(1) Approach weather minima are intended for normal operations. When non-normal events occur, flightcrews and aircraft dispatchers are expected to take the safest course of action to assure safe completion of the flight (refer to § 91.3). In some instances, guidelines are established for particular failure situations, such as failure of required aircraft systems prior to reaching AH.

(2) Specific guidelines for initiation of a CAT II/III approach with an inoperative engine are provided in Appendix 2. Guidelines for other configuration situations may be provided by the normal or non-normal procedure section of the airplane flight manual or by the operator.

4-2. AWO TAKEOFF AND CAT II/III INSTRUMENT APPROACH PROCEDURES (IAP).

a. Takeoff Guidance System Procedures. When takeoff minima are predicated on use of a takeoff guidance system meeting the criteria of AC 20-191, procedures for use should be consistent with the approved AFM or applicable operational authorization. Procedures should address at least the following items or factors:

- Setup, initialization, and testing of the guidance system and NAVAIDs, as applicable;
- Roles and responsibilities of the pilot flying (PF) and PM;
- Suitable alignment and tracking of the runway centerline;
- Suitable transfer of control between pilots for failures or incapacitation, as applicable; and
- Suitable response to failures (e.g., engine failure before and after V_1, electrical failure, and guidance system alerts, warnings, and failures, as applicable).

b. Standard Obstacle Clearance for Approach and Missed Approach. Standard approach and missed approach criteria for obstacle clearance are as specified in Order 8260.3. For non-U.S. airports, International Civil Aviation Organization (ICAO) PANS-OPS is standard criteria used by many foreign authorities. Criteria that is based on or derived from ICAO PANS-OPS may be used where found to be acceptable to the FAA (e.g., European Aviation Safety Agency (EASA) approved procedures).

c. Special Obstacle Criteria.

(1) Procedures developed using criteria other than Terminal Instrument Procedures (TERPS) or PANS-OPS are normally issued through OpSpecs as special procedures.

(2) For non-normal operations (e.g., engine inoperative), measures equivalent to that specified in AC 120-91 may be applied for those portions of an approach or missed approach not otherwise addressed by procedure design for normal operations (e.g., engine out missed approach gradients, or engine inoperative flap retraction and acceleration segments, or a rejected landing climb back to procedurally protected airspace after loss of visual reference at an airport with significant nearby obstacles or mountainous terrain).

d. Irregular Terrain Airports. Most aircraft systems that have completed airworthiness demonstrations consider irregular terrain in the pre-threshold area. Additional operational evaluations are nonetheless appropriate for certain airports having difficult pre-threshold terrain conditions. These additional evaluations consider each particular aircraft type and the particular flight control system, and may include consideration of particular system elements such as the type of radio altimeters installed or other equipment. Such evaluations must be conducted prior to OpSpec approval and use by air carriers using automatic or manual guidance to touchdown. The process for the evaluation of irregular pre-threshold terrain airports is contained in Appendix 4, Irregular Terrain Assessment. Approval of operators or procedures regarding operations at runways with irregular pre-threshold terrain is addressed in paragraph 8-9. For a current list of affected airports, refer to http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/.

4-3. CONTINUING APPROACHES IN DETERIORATING WEATHER CONDITIONS.

In some cases, it may be acceptable to continue approach operations in deteriorating visibility or wind conditions.

a. Approach Ban. The ICAO term "approach ban," while not defined in 14 CFR, refers to information found in §§ 121.651, 125.381, and 135.225. Weather conditions should be at or above landing minima prior to initiating the final segment of an instrument approach. However, the applicability of the above operating rules and the determination of the point on the approach at which they apply can be different for certain domestic and international operations. Operators should be familiar with the applicable CFR section(s) noted above, §§ 91.175, 91.189, and pertinent OpSpecs/MSpecs or letters of authorization (LOA), as well as state of the aerodrome regulations for international operations.

b. Wind Constraint Applicability.

(1) When wind constraints apply to CAT I, CAT II, or CAT III procedures, the limit is considered to apply to the point of touchdown. If a report of a crosswind component value greater than the limit is received while on approach, an aircraft may continue the approach, but a subsequent wind report indicating that winds are within limits or a pilot determination that actual winds are within limits must be made prior to touchdown. The flightcrew should use the most recent, reliable, and appropriate information.

(2) When an FAA-approved AFM or other manufacturer's reference material (e.g., Flightcrew Operating Manual (FCOM)) states, "Maximum wind component speeds when landing weather minima are predicated on autoland operations," or an equivalent statement, an operator or flightcrew may consider those wind values to apply to "steady state" wind components. Any gust values that exceed the steady state wind limit need not be limiting for landing but should be considered in the decision to continue to landing.

4-4. LOW-VISIBILITY TAXI PROCEDURES.

a. Low-Visibility Taxi Procedures. Airports approved for scheduled air carrier operations below Runway Visual Range (RVR) 1200 are required to have some or all of the various lighting systems (taxiway centerline lights, runway guard lights, stop bars, and clearance bars) discussed in AC 150/5340-30, Design and Installation Details for Airport Visual Aids, per the criteria in AC 120-57. In addition to the airport's low-visibility taxi procedures and information, the aircraft operator should provide:

(1) Any necessary gate identification information to find gates, ramp areas, or lead in vehicles;

(2) Any necessary information about identification of critical area protection zones or areas;

(3) Any necessary emergency response information for takeoff, landing, or other emergencies that are different for AWO operations (e.g., markings or other ways to easily find and identify explosive holding areas in low visibility conditions);

(4) Information on any known airport characteristics where ground vehicle traffic conflicts, taxi speed, points requiring judgmental oversteering, or aircraft wing tip clearance pose unusual difficulty; and

(5) Any other information necessary to facilitate safe ground operations in very low visibility (e.g., visual references that may be used for operations when standard markings may not be visible due to construction, snow cover, etc.).

b. Day/Night Provisions. Provision should be made for both day and night operations if applicable.

c. Electronic Presentations. Electronic presentations of airport diagrams are appropriate. Refer to AC 120-76 for further information.

d. Surface Movement Guidance and Control System (SMGCS). For low-visibility taxi operations below RVR 1200, refer to AC 120-57.

4-5. ASSESMENT OF THRESHOLD CROSSING HEIGHT (TCH), APPROACH DESCENT GRADIENT, AND RUNWAY SLOPE.

a. Operator Assessment. Operators should assess instrument procedures to be used at destination, alternate, and planned contingency airports to ensure a satisfactory specified descent gradient and TCH for the type of aircraft to be flown. TCHs of less than 48 feet should not be used by wide body air carrier aircraft without special review by the operator.

b. Runway Characteristics. Certain runways have unusual general slope or complex varying slope that should be assessed by the operator for operational consequence to ensure pilot awareness (e.g., operator specifies that the aircraft must touchdown by a certain point on the runway, or the last portion of the runway is not visible during flare in the touchdown zone (TDZ) due to changing slope).

c. Airport Layout Plan (ALP). At U.S. 14 CFR part 139 certificated airports, as well as those accepting Federal funding, an FAA-approved ALP is required. Operators should contact airport management in order to review the ALP for any nonstandard conditions and to gain specific engineering information relative to safety areas, runway gradients, Modification of Standard design requirements of AC 150/5300-13, etc.

4-6. METRIC ALTITUDES. The operator should address appropriate flightcrew and dispatch procedures for identification of and appropriate setting and use of altimeters, altitude alert systems, and altitude reference bugs, when used. This should include emphasis on distinguishing appropriate use of metric versus non-metric units for altimeter settings, change over points, and call-outs.

4-7. APPROACH NAVAID REQUIREMENTS. The operator should address appropriate flightcrew and dispatch procedures for identification of all necessary NAVAIDs and/or equipment required for each approach planned to be flown. For some procedures, NAVAIDs and/or equipment which are not necessarily shown in the procedure title may be required.

CHAPTER 5. TRAINING AND CREW QUALIFICATION

5-1. GENERAL.

a. Ground Training and Flight Training. Training and qualification should include ground training and flight training to ensure safe aircraft operation for instrument procedures and AWO operations in normal and specified non-normal conditions. This is typically accomplished through initial qualification, recurrent qualification, upgrade qualification, differences qualification, transition qualification, recency of experience, and requalification. The operator's program should be tailored to the operator's lowest authorized minima and provide appropriate training and qualification for each crewmember expected to have knowledge of or perform duties related to AWO takeoff and landing operations. If minima are sought or authorized using multiple methods of flight control such as automatic landing, Head-Up Display (HUD), enhanced flight vision system (EFVS), and/or Synthetic Vision Guidance System (SVGS), the training program should assure an appropriate level of knowledge and proficiency using each authorized mode or system.

b. Terminal Instrument Procedures (TERPS). Each pilot or dispatcher having duties related to flight planning or use of TERPS is expected to have comprehensive knowledge of areas described in subparagraph 5-3a below. Each pilot expected to perform instrument procedures in normal or specified non-normal operations or perform duties associated with those procedures should have successfully demonstrated the necessary skills in accomplishing those designated maneuvers or procedures as shown in this chapter. Demonstration of skill in performing instrument procedures typically is accomplished through full flight simulator (FFS) training and checking, or during line operating experience or evaluations. Pilots other than a pilot in command (PIC) or second in command (SIC) (e.g., international relief officers) may only be expected to perform those relevant duties, procedures, or maneuvers related to instrument procedures that are applicable to their own crew position or assigned duties.

5-2. TRAINING AND CHECKING FOR CAT I QUALIFICATION.

Training, testing, checking, and evaluation for CAT I are basic to qualification for instrument flight rules (IFR) operations and should be accomplished in conjunction with basic aircraft type, model and/or series qualification. Training, testing, and evaluation should ensure each pilot has the necessary knowledge and skill appropriate to the type of qualification being completed. If CAT I Landing Minima with Reduced Lighting (Runway Visual Range (RVR) 1800) authorization is sought, flightcrews must demonstrate proficiency in approaches to authorized minima using the FD, AP, or HUD as applicable.

5-3. GROUND TRAINING.

a. Ground Systems and NAVAIDs.

(1) Ground systems and NAVAIDs are considered to include characteristics of the airport, electronic navigation aids, lighting, markings, other systems (e.g., RVR), and any other relevant information necessary for safe AWO operations.

(2) The training and qualification program should appropriately address the operational characteristics, capabilities, and limitations of each of the following if applicable to operation:

(a) NAVAIDs. The navigation systems to be used, such as the instrument landing system (ILS) with its associated critical area protection criteria, marker beacons, distance measuring equipment (DME), compass locators, or other relevant systems should be addressed to the extent necessary for safe operations. For Ground Based Augmentation System (GBAS) Landing System (GLS)), any characteristics or constraints regarding that method of navigation must be addressed (e.g., proper procedure waypoint selection and use, integrity assurance, loss of satellite availability or failure, terrain masking).

(b) Visual Aids. Visual aids including Approach Lighting Systems (ALS), runway lighting systems, markings/lighting associated with declared distances, taxiway lighting, color coding of the centerline lighting for distance remaining, Low-Visibility Operations (LVO)/Surface Movement Guidance and Control System (SMGCS) lighting, and any other lighting systems relevant to an AWO environment should be addressed.

(c) Runways and Taxiways. The runway and taxiway characteristics concerning width, safety areas, obstacle free zones, markings, hold lines, signs, holding spots, runway slope, suitability of threshold crossing height (TCH), critical area protection, taxiway position markings, runway distance remaining markings, runway distance remaining signs, and LVO/SMGCS should be addressed.

(d) Meteorological Information. Meteorological information that should be addressed includes:

- Meteorological Terminal Aviation Routine (METAR) weather reports;
- Terminal Aerodrome Forecasts (TAF);
- Visibility reporting;
- RVR systems (including sensor locations, sensitivity to lighting levels set for the runway edge lights, variation in the significance of reported values during international operations, controlling and advisory status of readouts, and requirements when RVR sensors become inoperative);
- Appropriate use of temperatures in °C or °F;
- Conversion of temperatures between °C and °F;
- Impacts of temperature at the location of the barometric pressure reading (i.e., airport temperature, not aircraft outside air temperature) on altimeters and resultant need for cold temperature adjustments to published instrument procedure altitudes;
- Appropriate use of pressure information including altimeter settings in units of hPa or inches, QNE, QNH, QFE (if applicable);
- Appropriate use of transition level and transition altitude; and
- Appropriate interpretation and use of reported wind and gust information, in true or magnetic direction, as applicable to the source and circumstance.

(e) Notices to Airmen (NOTAM) and Other Aeronautical Information (AI). NOTAMs and other AI to be addressed includes facility status, proper interpretation of outage reports for lighting components, standby power, or other factors and proper application of NOTAMs regarding the initiation of AWO operations.

b. The Airborne System. The training and qualification program should address the characteristics, capabilities, limitations, and proper use of each appropriate airborne system element applicable to AWO takeoff or landing, including the following:

(1) Flight Guidance. The crew should be aware of automatic or manual input requiring parameters, such as inbound course or automatic/manually tuned navigation frequencies, the importance of checking that proper selections have been made to ensure appropriate system performance, and the sequence and management of any mode changes.

(2) Speed Management. The automatic throttle, flight management computer, or other speed management system, if applicable.

(3) Instruments. Situation information displays, as applicable.

(4) Supporting Systems. Other associated instrumentation and displays including any head-up display, guidance system, vision system, monitoring displays, status displays, mode annunciation displays, failure or warning annunciations, and associated system status displays that may be relevant. When such airborne systems are used as the basis for category(s) of minima (e.g. HUD or SVGS for Special Authorization (SA) CAT I; AP, F/D, or HUD for CAT I Landing Minima with Reduced Lighting (RVR 1800)), training should address the relationships between the various system components and the minima for which they are required.

(5) Other Flight Deck Systems. Other flight deck systems related to AWO operations (e.g., autobrakes or autospoilers), and any associated limitations, characteristics, or constraints (e.g., touchdown pitch up or pitch down tendency of certain autospoiler or autobrake settings or non-normal conditions, time delays, or auto-deactivation features with go-around).

(6) Go-Around. Proper airborne system use for go-around, including consideration of height loss during transition to a go-around, performance assurance for obstacle clearance, management of any necessary mode changes, and assurance of appropriate vertical and lateral flightpath tracking.

(7) Aircraft Characteristics. Any aircraft characteristics relevant to AWO operations, such as flight deck visibility cutoff angles and the effect on flight deck visibility of proper eye height, seat position or instrument lighting intensities related to transition through areas of varying brightness levels. Pilots should be aware of the effects on flight visibility related to use of different flap settings, approach speeds, use of various landing or taxi lights, and proper procedures for use of windshield wipers and rain repellent. If windshield defog, anti-ice, or de-icing systems affect forward visibility, pilots should be aware of those effects and be familiar with proper settings for use of that equipment related to low-visibility landing.

NOTE: The operator may consult the responsible Flight Standards office to ensure that information presented by the operator about any training or qualification items or issues referenced above, or any additional issues pertinent to the type aircraft or system used, are consistent with the pertinent FAA Flight Standardization Board (FSB) Report for the applicable aircraft type. FSB reports may be accessed at http://fsims.faa.gov/PICResults.aspx?mode=Publication&doctype=FSB%20Reports.

c. Flight Procedures and Associated Information.

(1) Operations Specifications (OpSpecs). Pilots, operators, and aircraft dispatchers should be familiar with, and able to properly apply, OpSpecs applicable to AWO takeoff or landing.

(2) Normal and Non-Normal Procedures. Pilots should be familiar with appropriate normal and non-normal procedures including crew duties, monitoring assignments, transfer of control during normal operations, appropriate automatic or crew-initiated call-outs, proper use of standard or special IAPs, applicable minima for normal configurations or for alternate or failure configurations, and reversion to higher minima in the event of failures.

(3) Weather and RVR. Pilots and aircraft dispatchers should be familiar with weather associated with AWO operations and proper application of controlling and/or advisory RVR, appropriate runway light settings, and proper determination of RVR values reported at foreign facilities.

(4) Use of Minimum Descent Altitude (MDA), Decision Altitude (DA)/Decision Height (DH), or Alert Height (AH). Pilots should be familiar with the proper application of MDA, DA/DH, or AH, including proper use and setting of altimeter bugs, use of the inner marker (IM) where authorized or required due to irregular underlying terrain, and appropriate altimeter setting procedures for the barometric altimeter consistent with the operator's practice of using either altimeter setting referenced to airport ambient local pressure (QNH) or altimeter aetting referenced to airport field elevation (QFE).

(5) Use of Visual Reference. Pilots should be familiar with the availability and limitations of visual references encountered during taxi, takeoff, approach, and landing.

(a) Visual reference information should address aircraft geometry limitations on visual references, actions to take with loss or partial loss of visual references, risks of inappropriate use of visual references, and necessary visual references for continuation after MDA or DA/DH. Issues discussed in Chapter 4, Procedures, for continuation or discontinuation of an approach should be comprehensively addressed.

(b) The operator should provide some means of demonstrating the expected minimum visual references that occur on approach when the weather is at acceptable minimum conditions as well as the expected sequence of visual cues during an approach in which the visibility is at or above the specified landing minima. Training on this topic should include identifying required visual references over a range of actual or simulated low-visibility

conditions. Flight training scenarios should provide an opportunity for pilots to experience what the "sight picture" of relevant visual references should be.

(c) While there are no specific requirements when an AH is used, pilots should be familiar with the expected visual references sequence likely to be encountered during an approach and/or rollout.

(d) Specific information on visual references may need to be provided on a site-specific basis to assure that misidentification of runways, taxiways, or other adjacent runways does not occur.

(e) For takeoff, procedures should address the transition from visual flight to instrument flight for both the pilot flying (PF) and pilot monitoring (PM), to include the use and limitations of any flight guidance or visual systems in use. Pilots should be aware of the operator's policy for responding to loss of suitable visual reference during takeoff, in the low and high speed regimes, both before and after V_1 (refer to AC 120-62 for additional information and recommendations for training).

(6) Procedures should address the transition from electronic monitoring displays to external visual references for both PF and PM for systems that include such displays.

(7) Acceptable Flightpath Deviations. Pilots should be familiar with the recognition of the limits of acceptable aircraft position and flightpath tracking during approach, flare and rollout. This should be addressed using appropriate displays or annunciations for either automatic or manual landing systems.

(8) Wind Limitations. Environmental effects should be addressed and include appropriate constraints for head winds, tail winds, crosswinds, and the effect of vertical and horizontal wind shear on automatic systems, flight directors (F/D), or other system (e.g., HUD, SVGS, etc.) performance. For systems such as HUDs that have a limited field of view (FOV), or synthetic reference systems, pilots should be familiar with the display limitations of these systems and expected pilot actions in the event that the aircraft reaches or exceeds a display limit capability.

(9) Contaminated Runways. Pilots and dispatchers should be familiar with the operator's policies and procedures concerning constraints applicable to AWO takeoffs and landings on contaminated or cluttered runways. Limits should be noted for use of wet or icy runways as far as directional control or stopping performance is concerned, and flightcrews should be familiar with appropriate constraints related to braking reports and the obscuration of appropriate lighting or markings. Refer to AC 91-79 for detailed information on runway contaminants and condition reporting.

(10) Airborne System Failures. Pilots should be familiar with the recognition and proper reaction to significant airborne system failures experienced prior to and after reaching the final approach fix (FAF), MDA, DA/DH, or AH. Expected pilot response to failure after touchdown should be addressed as well. Engine inoperative provisions are addressed further in Appendix 2.

(11) Ground or Navigation System Faults. Pilots are expected to appropriately recognize and react to ground or navigation system faults, failures or abnormalities at any point during the approach and landing.

(12) Reporting Anomalies. Pilots should be familiar with the need to report navigation system anomalies or discrepancies, failures of any lighting system (e.g., approach lights, runway lights, touchdown zone (TDZ) lights, centerline lights), or any other discrepancies that could be pertinent to operations.

(13) International Procedures. Pilots, and dispatchers, if applicable, should be familiar with any international procedures including application of Obstacle Clearance Altitude (OCA), Obstacle Clearance Height (OCH), appropriate State Aeronautical Information Publication (AIP) or regional supplements (if not otherwise addressed by the operator in the Flightcrew Operating Manual (FCOM) or equivalent) and pertinent excerpts from International Civil Aviation Organization (ICAO) references (e.g., ICAO Doc 9365-AN/910, Manual of All Weather Operations). Regulatory requirements and responsibilities at non-U.S. international airports should be understood.

(14) Performance and Obstacle Clearance. Pilots and dispatchers should be familiar with aircraft performance or weight limit information to ensure safe obstacle clearance for "all engine" or "engine inoperative" missed approaches or rejected landings. Performance information should consider, as appropriate, flap settings, go-around procedures, acceleration segments or transition following an engine failure between the specified "all-engine lateral flightpath" (or radar vectors) and any specified "engine-inoperative lateral flightpath," using flap retraction, and cleanup height procedures. Refer to AC 120-91 for further information.

(15) Vision Systems. When a vision system (e.g., Enhanced Vision Systems (EVS), Synthetic Vision System (SVS), CVS, EFVS, or SVGS) is used, pilots should be familiar with the interpretation of the display to ensure proper identification of the runway and positioning of the aircraft relative to continuation of the approach to landing. Pilots should understand the limitations of these systems, operational credits available, and authorization required for use. For more information on EFVS, refer to AC 90-106.

5-4. FLIGHT TRAINING FOR AWO (AIRCRAFT OR FFS).

a. Types of Procedures and Conditions to be Addressed. Maneuvers and procedures trained should be tailored to the types of instrument procedures used by the operator, the environment in which they are flown, the airborne and ground equipment required for each type of operation, and any special considerations that may apply. Operating policies, procedures, and documentation applicable to the operator should be used. Training and evaluation should ensure that procedures can be safely flown considering the following factors:

(1) Types of instrument procedures used (standard and special, lowest straight-in, or circling minima, if applicable);

(2) The operator's manuals, charts, and checklists;

(3) Aircraft type(s) model and/or series flown;

(4) Flight guidance and/or visual system(s) and their corresponding category(s) of minima for each authorized system;

(5) NAVAID(s) and visual aids used (LVO/SMGCS lighting if applicable);

(6) Flightcrew procedures used (e.g., PF/PM duties, monitored approach, or call-outs);

(7) Airport and runway characteristics typically experienced;

(8) Nearby critical terrain or obstruction environment;

(9) Relevant normal, non-normal, and environmental conditions. Training and evaluation need only be conducted using relevant and representative procedures and conditions (e.g., a representative mix of day, night, dusk, variable/patchy conditions, representative temperatures, landing runway altitudes, precipitation conditions, turbulence, and icing conditions); and

(10) When multiple types of equipment, flight guidance, and/or systems are used (e.g., FD, SVGS, HUD, autoland, RA), training programs should address each combination of equipment and category of minima. For example, if the operator is authorized to conduct SA CAT I approaches using HUD and CAT II approaches using autoland, training should address each authorized combination separately.

b. Combining Multiple Requirements. Combining multiple requirements for maneuvers may be approved at the discretion of responsible principal operations inspector (POI). During each maneuver or procedure, crewmembers are expected to perform their respective duties. In situations where crewmembers are being qualified other than as part of the complete flightcrew (e.g. two PICs), it is necessary that each candidate complete the required maneuvers or procedures. When level C or D FFS is used, successful crew performance should be assessed using a sample of procedural types, environmental conditions, and other factors listed above under both normal and non-normal conditions.

c. Maneuvers.

(1) Flight training for approach and landing should address at least the following maneuvers:

(a) Normal landings at the lowest applicable minima for each authorized flight guidance and/or visual system.

(b) A missed approach from the MDA, DA/DH, or AH.

(c) A missed approach from a low altitude that could result in a touchdown during go-around (balked or rejected landing).

(d) Appropriate aircraft and ground system failures.

(e) Engine failure prior to, or during an approach.

(f) Except for aircraft using an automatic fail operational (FO) rollout system, manual rollout in low visibility at applicable minima.

(g) Landings at the limiting environmental conditions authorized for that operator with respect to wind, crosswind components, and runway surface friction characteristics.

(h) Representative non-normal configuration approaches and landings in instrument conditions should be demonstrated. For these approaches, the simulated weather minima may be above, or well above, the lowest minima authorized. Minima should be at levels that might typically be experienced in line operations for a landing with the non-normal condition used. During these approaches, representative autoflight, instrument, and aircraft system configurations or combinations of configurations should be demonstrated (e.g., F/D, autopilot, HUD, vision systems, autothrottles, raw data, and inoperative electrical or hydraulic components).

(2) Flight training for operators authorized for lower-than-standard takeoff minima should address the following maneuvers and procedures:

(a) Normal takeoff at lowest applicable minima;

(b) Rejected takeoff from a point prior to V_1 (including an engine failure);

(c) Takeoff continued following failures including engine failure after V_1, and any critical failures for the aircraft type that could lead to lateral asymmetry during the takeoff;

(d) Limiting crosswinds, winds, gusts, and runway surface friction should be demonstrated to levels authorized. Training should be done at weights or on runways that represent a critical field length; and

(e) For low-visibility takeoff minima where a flight guidance and/or vision system is required, the following additional maneuvers and procedures should be demonstrated:

1. Rejected takeoff requiring transfer of control (if applicable); and

2. A takeoff and rejected takeoff with failure of the flight guidance device or ground-based guidance system, at a critical point of the takeoff, unless these systems have failure characteristics that are extremely improbable.

(3) Low visibility taxi and ground operations should be trained to the extent practical and beneficial. Such training should address operations at typical airports or alternately, at airports frequently experiencing low-visibility conditions, complex airports on the operator's route system, airports with particular low visibility ground movement difficulties, or rarely used but significant contingency airports, as determined appropriate by the operator.

(4) Crewmembers should be able to perform either PF or PM duties, unless otherwise limited by the operator's policies or aircraft characteristics (e.g., single HUD).

d. Addressing Applicable Regulations. Maneuver or procedure training should generally address applicable FSB guidance, part 121 Appendix E or F provisions, an approved Advanced Qualification Program (AQP), approach and landing events specified in part 61, relevant FAA airman certification takeoff and landing provisions, competency or instrument checks, and/or FAA Airman Certification Standards (ACS).

5-5. INITIAL QUALIFICATION. The operator's training and qualification program should provide appropriate AWO ground and flight training for each pilot, flightcrew member, and dispatcher expected to have knowledge of or perform duties related to AWO takeoff and landing operations. Training should address airborne equipment required for AWO operations and/or used as the basis for any category of minima being trained.

a. Ground Training. PIC and SIC pilots are expected to have a comprehensive level of knowledge with respect to each of the ground training subjects and assigned duties for AWO takeoff and landing.

b. Flight Training. Flight training should be conducted using an appropriately qualified and approved FFS capable of performing the maneuvers specified and representing the appropriate limited visual conditions. Where an FFS is not available, an aircraft with a suitable view limiting device may be used if authorized by the assigned POI. The operator is expected to provide sufficient training to ensure that crewmembers can perform each of the maneuvers or procedures specified in paragraph 5-4 to an acceptable degree of proficiency. When minima are based on manual operations using systems like HUD with F/D, a number of repetitions of the maneuvers specified by FSB may be necessary to ensure each of the required maneuvers can be properly and reliably performed. Guidance for acceptable programs can be found in FSB reports for specific aircraft types. Operators should adhere to FSB guidelines when published.

5-6. RECURRENT QUALIFICATION. Recurrent training should emphasize unusual or critical procedures used by that operator which are not flown routinely or may not have been flown recently by a flightcrew member. Emphasis may be placed on any critical non-normal procedures, and any special emphasis procedures or items found to require attention due to in-service feedback by the operator. Procedures should be sampled at or near limiting weather conditions. Repetition of maneuvers frequently accomplished successfully in line operations (e.g., normal ILS or normal autoland) may be de-emphasized by limited sampling and assessments of those conditions and procedures.

a. Recurrent Ground Training. Recurrent ground training should provide any necessary review of topics specified in paragraphs 5-1 and 5-3 to ensure continued familiarity with those topics. Emphasis should be placed on any program modifications, changes to aircraft equipment or procedures, and review of any pertinent occurrences or incidents. Additionally, emphasis may be placed on topics such as mode annunciations for failure conditions or other information pilots may not routinely see during normal line operations. Topics to be addressed are those necessary for the performance of the assigned duties for each respective flightcrew member or aircraft dispatcher.

b. Recurrent Flight Training. Recurrent flight training should be conducted using an appropriately qualified (e.g., level C or D) and approved FFS. When an FFS is not available,

recurrent flight training may be accomplished in the aircraft using suitable view-limiting devices if approved by the POI. Recurrent flight training should include a sample of the procedures authorized for the operator, at least one approach to a landing using the lowest authorized weather minima (unless the pilot has recently performed this maneuver), and one approach requiring a go-around from an altitude below AH or DA/DH prior to touchdown using the lowest authorized weather minima.

(1) Recurrent flight training must include at least one rejected takeoff at the lowest authorized minima, with an engine failure just prior to V_1. For AWO operations, sufficient training should be provided to ensure competency in each of the maneuvers or procedures listed in paragraph 5-4. When takeoff minima are based on more than one method (e.g. natural vision, HUD guidance, and vision systems), the training program should assure an appropriate level of proficiency using each authorized mode or system.

(2) Recurrent flight training maneuvers may be accomplished individually or may be integrated with other maneuvers required during proficiency training or during proficiency checking. If minima are authorized using several methods of flight control such as automatic landing, HUD, EFVS, and/or SVGS, then the training program should ensure an appropriate level of proficiency using each authorized mode or system. Where minima are based on manual control using flight guidance (e.g. HUD), appropriate emphasis should be placed on failure conditions a pilot does not normally experience in line operations.

(3) Numbers of maneuvers or procedures to be performed during recurrent training or checking should not be less than the following:

(a) An engine inoperative approach to a landing and a go-around.

(b) Appropriate aircraft or ground system NAVAID failures.

(c) Approaches and landing(s) with environmental conditions at a representative sample of limiting values authorized for that operator.

(d) Any special emphasis procedures or items identified by the operator or responsible Flight Standards office or POI.

(e) A low-visibility takeoff with critical performance or a suitable failure condition.

c. Qualification in Conjunction with AQP. Appropriate requalification or recurrent qualification programs may be adjusted as necessary when incorporated in AQP or other single visit training programs. However, each area of knowledge specified by paragraph 5-3 and each area of competency specified in paragraph 5-4 must be ensured.

5-7. REQUALIFICATION. Previous qualification in the same type, model or series, may be considered in determining an operator's type of program, length of program, or required maneuvers to be completed for requalification. Any requalification program should ensure that the pilots have the necessary knowledge of the topics specified in paragraph 5-3 and are capable to perform their assigned duties for AWO, considering the maneuvers or procedures identified in paragraph 5-4 as well as the airborne equipment used for each authorized category of minima.

5-8. TRANSITION QUALIFICATION. For an operator's training program that considers previous AWO qualification in a different aircraft type, model or series, the transition program should ensure all differences that could lead to pilot misunderstanding of appropriate characteristics or procedures in the new type are addressed.

5-9. UPGRADE QUALIFICATION. Previous AWO qualification in a different crew position in the same type, model, or series may be considered in determining the type of program, length of program, and required maneuvers to be completed. Upgrade programs should ensure that the pilot has the necessary knowledge of the topics specified in paragraph 5-3 and is able to perform assigned duties for the new crew position for AWO operations considering the maneuvers or procedures identified in paragraph 5-4 as well as the airborne equipment used for each authorized category of minima. Refer to AC 120-53 for additional information.

5-10.FLIGHT DECK OR AIRCRAFT SYSTEM DIFFERENCES. For AWO programs using aircraft that have several models, training programs should ensure that pilots are aware of any differences that exist and understand the consequences of those differences. Guidelines for addressing differences can be found in AC 120-53 and FSB reports applicable to a particular type.

5-11.RECENCY OF EXPERIENCE.

a. Requirements. Recency of experience requirements specified by §§ 121.439, 135.247, 61.21, 61.66, or in accordance with AC 120-53 normally provide an assurance of the necessary level of experience for AWO operations. In the event that special circumstances exist where crewmembers may not have exposure to the airborne system(s) upon which takeoff and landing minimum(s) are based (e.g. automatic landing system, HUD, EFVS, FD, or SVGS) for periods of time beyond that permitted by §§ 121.439, 135.247, 61.21, 61.66, or AC 120-53, the operator should ensure the recency of experience guidelines are complied with prior to pilots conducting AWO operations predicated upon those systems.

b. Re-Establishing Recency of Experience. In the event that the recency intervals above are allowed to lapse, an FFS refresher, recurrent training, checking event, line operational use in weather conditions better than basic visual flight rules (VFR) minima, flight with a check pilot, or other similar method acceptable to the POI must be used to re-establish recency of experience with that system.

5-12. SIMULTANEOUS TRAINING FOR AWO. Training and qualification may simultaneously address more than one category of minima (i.e., any combination of CAT I, SA CAT I, CAT II, SA CAT II, or CAT III) or may be completed individually, as appropriate. When combined AWO training is completed, pilots must be aware of responsibilities for each category of minima used, including differences in methods for determination of minima, controlling visibility or RVR, use of correct procedures and call-outs for each category, requirements for airborne equipment for initiation of approach, and response to typical failure cases appropriate for each category of approach.

5-13. SIMULTANEOUS CHECKING FOR AWO. When qualification programs simultaneously address more than one category of minima (i.e., any combination of CAT I,

SA CAT I, CAT II, SA CAT II, or CAT III), testing events may be appropriately combined, and the FAA or operator need not repetitively test each type of approach at each landing category. However, when different airborne equipment is used as the basis for different minima, the provisions of subparagraph 5-4a(10) still apply.

5-14. CHECKING FOR SA CAT I QUALIFICATION.

a. Additional SA CAT I Requirements. In addition to CAT I qualification completion, flightcrew members should demonstrate proper use of SA CAT I related aircraft systems for which credit is being sought (e.g., HUD, SVGS, RA) as well as approved operator procedures including any provisions specified by an applicable FSB report. Pilots should demonstrate proficiency in SA CAT I approaches. The following events may be accomplished individually or in any combination:

- A normal approach to a landing at SA CAT I minima;
- A normal approach to a go-around at SA CAT I minima;
- Approaches with related aircraft system, navigation system, or flight guidance; failures;
- An engine-inoperative approach; or
- A go-around from an altitude below DA/DH.

b. Qualified CAT II Flightcrew Members. Qualified CAT II flightcrew members may be considered to be SA CAT I qualified, but may require additional checking unless the same on-board equipment is used for the SA CAT I operation (e.g., HUD is used for SA CAT I while autoland is used for CAT II or lower operations) and they are trained on the differences in accordance with Chapter 3.

5-15. CHECKING FOR CAT II QUALIFICATION. In addition to CAT I qualification completion, flightcrew members should demonstrate proper use of CAT II related aircraft systems for which credit is being sought and also demonstrate the approved operator procedures including any provisions otherwise specified by an applicable FSB report. Pilots should demonstrate proficiency in CAT II approaches. The following events may be accomplished individually, or in any combination:

- A normal approach to a landing at CAT II minima;
- A normal approach to a go-around at CAT II minima;
- Approaches with related aircraft system, navigation system, or flight guidance failures;
- Engine-inoperative approach (if authorized for engine-inoperative CAT II approaches); or
- At least one landing and one go-around from below DA/DH but before touchdown, recognition and proper response to a failure condition, and other relative non-normal conditions or adverse weather situations.

NOTE: SA CAT II aircrew qualification is identical to CAT II qualification; however, SA CAT II authorization requires a CAT III equipped aircraft.

5-16. CHECKING FOR CAT III QUALIFICATION. In addition to CAT II qualification completion, for both initial and recurrent qualification, crewmembers should demonstrate proper use of aircraft systems for which credit is being sought and correct procedures as follows, unless otherwise specified by an applicable FSB report:

a. Automatic Systems. At least one automatic landing to a complete stop and one go-around from at or below DH or AH should be demonstrated. If the crewmember has accomplished an automatic landing within a period for autoland currency for that operation and aircraft type, then the automatic landing to a full stop may be waived for recurrent qualification.

b. Manual Systems. Demonstrate at least one landing to a complete stop at the lowest applicable minima and one go-around from low altitude below DH and at least one response to a failure condition during the approach to a landing or a missed approach.

5-17. CHECKING FOR LOW-VISIBILITY TAKEOFF QUALIFICATION.

a. New/Reduced Minima. For new or reduced minimum takeoff authorizations, pilots should have successfully demonstrated in an FFS at least one takeoff at the lowest applicable minima with an engine failure at or after V_1, and one rejected takeoff with an engine failure or other appropriate failure prior to V_1.

b. No FFS Demonstration. If an acceptable FFS is not available, the demonstration may be conducted in the type of aircraft to be authorized. Representative failure speeds and conditions may be used that do not risk or adversely affect the aircraft or its systems (e.g., tires and brake energy). Use of a view-limiting device for the pilot being evaluated is not necessary.

5-18. EXPERIENCE WITH LINE LANDINGS. When a qualification program has been completed using only an FFS program, at a minimum, the following is recommended before initiating SA CAT I or CAT II/III operations, unless otherwise specified by an applicable FSB report:

a. Automatic Systems. Accomplish at least one-line landing using the auto flight system approved for CAT II/III minima in weather conditions at or better than CAT II, unless a pilot's qualification has been completed in level C or D qualified FFS found acceptable for that autoland system.

b. Manual Systems. For manual systems such as HUD FGSs or vision systems, the PIC must have completed at least ten line landings, using the approved system in the configuration specified for SA CAT I or CAT II/III and at suitable facilities (e.g., facilities having appropriate ground facilities for the lowest minima authorized, or equivalent).

5-19. CREW RECORDS. The operator should ensure records suitably identify the initial and continued eligibility of pilots for AWO. Records should note the appropriate completion of training for both ground and flight qualifications. Additionally, records should note completion of initial, upgrade, recurrent, transition, or requalification training.

5-20. DUAL QUALIFICATION.

a. Appropriate Training. When qualified in multiple crew positions and/or multiple aircraft types, models, or series, appropriate training and qualification must be completed to ensure each crewmember can perform the assigned duties for each crew position and each aircraft type, model or series. Applicable seat-dependent training and qualification should be completed if a pilot is authorized to serve in either seat.

b. Program Approval. For programs involving dual qualification, the particular operator's program approval will be based upon the degree of differences involved in the aircraft systems, the assigned duties for each crew position, and criteria such as AC 120-53 related to differences. If a pilot serving as SIC is not expressly restricted from performing PF duties during AWO takeoffs or landings, then that pilot must satisfactorily complete the requirements for a PF regarding maneuvers specified in paragraph 5-4.

5-21. INTERCHANGE. When aircraft interchange is involved between operators, flightcrew members and aircraft dispatchers must receive sufficient ground and flight training to ensure familiarity and competency with respect to the particular aircraft system or systems of the interchange aircraft. Guidelines for differences should be consistent with those specified in AC 120-53 and FSB reports.

5-22. AWO TRAINING FOR USE OF FOREIGN AIRPORTS. Operators authorized to conduct operations at foreign airports with procedures or limitations different than those required within the United States should ensure flightcrew members and aircraft dispatchers are familiar with any differences appropriate to operations at those foreign airports.

5-23. LINE CHECKS. Operators should include assessments of AWO procedures and practices as necessary during line checks when operations are conducted at facilities appropriate for AWO operations or at facilities appropriate for simulating AWO operations.

5-24. SPECIAL PROCEDURES AND/OR SPECIAL QUALIFICATION AIRPORTS. Certain authorizations/operations may require additional training, qualification, and/or equipage such as Simultaneous Operations using Precision Radar Monitor (PRM) or Converging Approaches. Additionally, special qualification may be required for particular instrument procedures, types of procedures, or airports as determined appropriate by the operator or the responsible Flight Standards office.

5-25. PARTICULAR APPROACH SYSTEM/PROCEDURE QUALIFICATION.

a. Aircraft Equipment Dependent Approach System Qualification. The operator will consult the aircraft-specific FAA FSB Report to ensure that information presented by the approved training or qualification program addresses particular aircraft equipment and any additional issues pertinent to the type aircraft or system used for authorized operations (e.g., autoland, HUD, EFVS, SVGS). Training should be consistent with the pertinent recommendations of the FAA FSB Report for the applicable aircraft type. Some of the requirements for qualification may be completed in an appropriately qualified FFS or by observation during Operating Experience (OE) or line operations as stipulated in the FSB Report.

b. Approach and Landing with an Engine Inoperative.

(1) Training should ensure pilots and dispatchers can select appropriate en route alternate airports, in accordance with OpSpecs and 14 CFR in order to safely conduct approach and landing. Operators should provide training to flightcrews and dispatchers to address the following factors considering that an engine failure may occur in any phase of flight, resulting in a landing, go-around, or missed approach:

(a) Engine (or engines) inoperative aircraft configuration.

(b) Other potentially affected aircraft systems (e.g., electrical or hydraulic).

(c) Weather conditions.

(d) Use of appropriate minima for the configuration and possible need for adjustment of approach and landing minima to suit the particular circumstances (e.g., engine-out missed approach obstacle or terrain assurance and balked landing obstacle avoidance considerations).

(e) Selection of most favorable NAVAIDs, runway, or runway conditions (e.g., regarding braking friction, clutter).

(f) Availability of emergency services.

(g) Airport and procedure familiarity.

(h) Nearby terrain or obstruction considerations.

(i) Minimum equipment list (MEL) status.

(2) Crews should be aware of the engine inoperative capabilities of the aircraft by referring to the FAA-approved Airplane Flight Manual (AFM). For operators authorized via OpSpec to initiate or continue a CAT II/III approach with an inoperative engine, training should ensure that crews can properly apply the provisions of Appendix 2. For operators not authorized via OpSpec to initiate or continue a CAT II/III approach with an engine inoperative, crews should be familiar with the provisions above and the procedures specified in their AFM for normal or non-normal operations.

c. Circling Approaches. Operators may be authorized to perform circling approaches as published, or may choose not to train flightcrews to accomplish circling maneuvers and accept corresponding high minima limitations regarding circling approaches. In such cases, limitations of 1000 feet Height Above Aerodrome (HAA) MDA and three-mile visibility, or greater, are typically included in OpSpecs. In any case, it is recommended that wide body aircraft, or aircraft needing to accomplish circling maneuvers in excess of 165 KTS ground speed, should not be authorized circling minima below 1000 feet HAA and three-mile visibility.

CHAPTER 6. AIRPORTS, NAVIGATION FACILITIES, AND METEOROLOGICAL CRITERIA

6-1. AIRPORT AUTHORIZATION.

a. Authorized. U.S. and Non-U.S. Airports and Runways. Currently authorized U.S. and non-U.S. airports and runways authorized for Category (CAT) I, II, or III are those either having published part 97 Standard Instrument Approach Procedures (SIAP), or as otherwise authorized in the operator's operations specification (OpSpec), MSpec, or letter of authorization (LOA). Restricted U.S. facilities that may be approved for CAT II/ III operations and foreign facilities that may be approved for CAT II/III operations may be found at http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/.

b. Authorization Requests. Requests for authorization to use other airports/runways should be coordinated with the Flight Technologies and Procedures Division, through the operator's applicable Flight Standards office.

6-2. USE OF CAT I/II/III NAVIGATION FACILITIES.

a. Standard CAT I/II/III Navigation Facilities. Operations may be approved on standard United States or International Civil Aviation Organization (ICAO) navigation facilities as follows:

(1) U.S. facilities for which part 97 procedures are published;

(2) Other U.S. facilities deemed acceptable by the Flight Technologies and Procedures Division for the type of aircraft equipment and minima sought;

(3) Non-U.S. facilities meeting ICAO criteria (ICAO Annex 10, Aeronautical Telecommunications, ICAO Doc 9365-AN/910, Manual of All Weather Operations, etc.) and that are promulgated by the "State of the Aerodrome;" and

(4) Non-U.S. facilities meeting acceptable criteria other than ICAO (e.g., European Aviation Safety Agency (EASA)) as determined to be acceptable by the Flight Technologies and Procedures Division;

(5) CAT II/III operations require applicable facilities assessed and classified at least through point D (i.e., at least 3000 feet beyond the threshold) or equivalent. For a detailed description of approach facility classifications, refer to ICAO Annex 10, Volume 1, and/or the FAA Chart Supplement (formally referred to as the Airport/Facility Directory) of the applicable U.S. region's legend, Section 1, ILS Facility Performance Classification Codes.

b. Non-Standard CAT I/II/III Facilities. Operations may be approved using emerging types of navigation facilities or using other acceptable position fixing and integrity assurance methods, if NTD demonstrations acceptable to FAA are successfully complete.

(1) Other United States facilities may be approved for CAT I, II or III (Ground Based Augmentation System (GBAS) Landing System (GLS), or a Type I instrument landing system (ILS) used in conjunction with an acceptable aircraft integrity assurance system, etc.) as determined by the Flight Technologies and Procedures Division.

(2) Non-U.S. facilities meeting criteria other than ICAO may be used if found acceptable by the Flight Technologies and Procedures Division.

6-3. LIGHTING SYSTEMS.

a. CAT I Lighting Systems. Lighting for CAT I is as specified by Standard OpSpecs, part 97 SIAPS, or any special provisions or procedures identified in OpSpecs.

b. CAT II/III Lighting Systems. Lighting used for CAT II must include the following systems, or ICAO equivalent systems:

- U.S. Standard ALSF-1, ALSF-2, SSALR, or SSALS;
- U.S. Standard touchdown zone (TDZ) Lights;
- U.S. Standard Runway Centerline Lights; and
- U.S. Standard High Intensity Runway Lights (HIRL).

c. Surface Lighting Below Runway Visual Range (RVR) 1200. For ground operations below RVR 1200, U.S. Standard Taxiway Centerline Lights and any other lighting applicable for safe AWO operations should be considered. Refer to AC 150/5340-30 and AC 120-57 for further information.

d. Lighting Systems for SA CAT I/II. Lighting Systems for SA CAT I/II approaches must include the following systems, or ICAO-equivalent systems, unless approved by the Flight Technologies and Procedures Division (e.g., for non-United States airports):

(1) U.S. Standard ALSF-1, ALSF-2, SSALR, SSALS, or MALSR (sequence flashing lights (SFL) may be inoperative where installed); and

(2) U.S. Standard HIRLs.

e. Lighting Exceptions. Exceptions to the above lighting criteria may be approved by the Flight Technologies and Procedures Division only if equivalent safety can be demonstrated by an alternate means (e.g., substitution for required approach lighting components demonstrated during an NTD).

6-4. METEOROLOGICAL SERVICES AND RVR AVAILABILITY AND USE.

a. Meteorological Services. Appropriate meteorological services are necessary for each airport/runway intended for use by an operator. Non-U.S. facilities should meet criteria of ICAO Doc 9365-AN/910, Manual of All-Weather Operations. Meteorological information must be readily available to both the crew and the aircraft dispatcher.

b. RVR Availability and Use Requirements. RVR use by operators and pilots is as specified in standard OpSpecs, MSpecs, LOAs, or § 91.1039 for part 91K operators. In general, controlling RVRs provided by the controlling agency will be used for takeoff, landing, and rollout, and are as follows:

(1) Takeoff.

(a) Takeoff minima below ¼ statute mile are typically not authorized.

(b) Refer to OpSpec C078 for details of currently authorized operations and the associated required and controlling RVR reports.

(2) Landing:

(a) Visibility values below ½ statute mile are typically not authorized.

(b) Only RVR reports for the runway of intended landing may be used.

(c) For CAT I operations:

1. TDZ RVR reports, when available for a particular runway, are controlling for all approaches to and landings on that runway.

2. Mid RVR and rollout RVR reports (if available) provide advisory information to pilots.

3. The mid RVR report may be substituted for the TDZ report if the TDZ RVR report is not available.

(d) For SA CAT I operations, TDZ RVR reports are controlling. The mid RVR report may not be substituted for the TDZ RVR report in SA CAT I operations.

(e) For all CAT II and SA CAT II operations, except as specified below, typical minimum RVR values are shown in Table 3-2:

1. All available RVR reports are controlling, except as specified in subparagraph 5 below.

2. The TDZ RVR report is required.

3. The mid RVR report is not required.

4. The rollout RVR report is required for all operations at TDZ 1200 RVR and below, except as specified in subparagraph 5 below:

5. If the mid and rollout RVR reports are unavailable, the TDZ report must be at least 1400 RVR. If the rollout RVR report is unavailable, a mid or far end RVR report may be substituted. Mid RVR reports substituted for unavailable rollout reports must be 600 RVR or

greater, far end reports substituted for unavailable rollout reports must be 300 RVR or greater. Far end RVR reports are advisory unless substituted for the rollout RVR report.

(f) For CAT III operations, except as specified below, typical minimum RVR values are shown in Table 3-3:

1. All RVR reports are required and controlling except as specified below.

2. For operations using a fail passive (FP) landing system with an FP or FO rollout system, either the mid or rollout RVR reporting system may be temporarily inoperative.

3. For operations using an FO landing system with an FP or FO rollout system, any one RVR reporting systems may be temporarily inoperative.

4. Where four RVR reporting systems are installed, the far end RVR report may provide advisory information to pilots or may be substituted for the rollout RVR report if that is not available.

c. Pilot Assessment of Takeoff Visibility Equivalent to RVR. Operators may be authorized for pilot assessment of takeoff visibility equivalent to RVR through OpSpec paragraphs C078/C079 when an FAA-approved procedure, training and evaluation are provided to the flightcrew. Under such authorizations, a pilot may assess visibility at the takeoff position when TDZ RVR is inoperative or otherwise not reported, or when the pilot determines that a significantly different visibility exists than the reported TDZ RVR. Such assessments will be made in accordance with the following provisions:

(1) Pertinent markings, lighting, and electronic aids are clearly visible and in service (e.g., no obscuring clutter);

(2) A pilot assessment is made using an accepted method regarding identification of an appropriate number of lights, markings, or of known spacing visible to the pilot when viewed from the flight deck when the aircraft is at the takeoff point; and

(3) A Pilot Weather Report (PIREP), is forwarded to a suitable Air Traffic Service (ATS) facility, and if applicable, dispatch facility prior to departure.

d. Alternate RVR Requirements for Short Field Length Operations. When approved as an exception in OpSpecs, aircraft capable of certificated landing or takeoff distance of less than 4000 feet may be approved to use a single TDZ, mid, or rollout RVR as applicable to the part of the runway used. For such operations, RVR values not used are considered to be optional and advisory, unless the aircraft operation is planned to take place on the part of the runway where a mid or rollout RVR sensor is located.

e. International RVR Reporting and Use Equivalence Considerations. For RVR reporting and use outside of the United States, operators may appropriately equate international sensor locations and reports to equivalent U.S. sensor positions and reports for the purpose of applying OpSpec, MSpec, or LOA provisions. This applies to the number and locations of RVR sensors installed, available, reports, or controlling minima determinations.

(1) When making such a determination, the operator should consider the applicable portions of the runway used by the aircraft type(s) in question for takeoff (including rejected takeoff), touchdown, and rollout.

(2) RVR coverage and reporting comparable to that permitted at authorized U.S. airports should be available.

(3) For CAT I approach operations where minima are specified only in RVR and only meteorological visibility is provided, the certificate holder or pilot should compute the RVR as shown in § 91.175(h)(2) or in OpSpec/MSpec/LOA C051, if applicable. This provision should not be used for takeoff minima, SA CAT I/II or CAT II/III minima, or when a reported RVR is available.

6-5. ILS CRITICAL AREA PROTECTION. Airports and runways must have suitable NAVAID critical area protection, as applicable to the ground and aircraft systems used. Where uncertainty regarding acceptability of airport procedures is a factor, (e.g., for non-U.S. airports and runways where any doubt exists regarding adequacy of procedures encountered in routine operations) operators may refer to Order 6750.16 and/or ICAO Doc 9365-AN/910, Manual of All-Weather Operations, or contact the Flight Technologies and Procedures Division for clarification.

6-6. OPERATIONAL FACILITIES: OUTAGES AND NOTICES TO AIRMEN (NOTAM).

a. Outages. Operators must consider the status of components identified in paragraphs 6-2 through 6-5 above, as necessary for AWO operations and take appropriate action for inoperative components. The following guidelines are considered acceptable unless otherwise precluded in OpSpecs:

(1) Outer, middle, or inner marker (IM) beacons may be inoperative unless an operation is predicated on their use (e.g., an Alert Height (AH) or a decision height (DH) is predicated on use of an IM due to irregular terrain as the aircraft system(s) requires use of a marker beacon for proper function).

(2) Lighting systems are in normal status except that isolated lights of an approach light or runway light system may be inoperative, so long as this does not detract from their function; approach light components not necessary for the particular operation (e.g., runway end identification lights (REIL), Visual Glide Slope Indicator (VGSI), RAIL, or SFL) may be inoperative. Lights may not be completely obscured by snow or other such contaminants so that their function is impaired, if necessary for the operation to be conducted.

b. Notices to Airmen. Any adverse effect of NOTAMs for NAVAIDs, facilities, lighting, marking, or other capabilities upon the aircraft system operation, or the availability or suitability of CAT I, II, or III procedures at the destination and alternate must be considered for both dispatch and continued flight operations. If an operator or dispatcher employs any type of NOTAM filtering system or otherwise makes the determination that a NOTAM does not impact the aircraft system and procedures being used for a particular flight, then the pilots must be advised of any filtering criteria or relevant information to the decision.

6-7. SPECIAL PROVISIONS FOR FACILITIES USED FOR EXTENDED OPERATIONS (ETOPS) OF MULTI-ENGINE AIRCRAFT OR ALTERNATES.

a. Airport Requirements. ETOPS operations are typically conducted over oceanic or remote areas (refer to AC 120-42, Extended Operations (ETOPS and Polar Operations) and § 121.161 for requirements or criteria). In addition to criteria specified above, an airport used as an ETOPS CAT II or III engine-out alternate should satisfy the provisions of Appendix 2 for the authorized operation.

b. Airport Information. Sufficient information should be provided for flightcrews and dispatchers to be familiar with characteristics of ETOPS alternate airports not routinely used in normal operations.

6-8. ALTERNATE MINIMA. Use of alternate minima for all operators is specified in 14 CFR or in standard OpSpecs part C. OpSpec C055 provides a two- to four-line table (as applicable to approved operations) from which the operator, during the initial dispatch or flight release planning segment of a flight, derives alternate airport instrument flight rules (IFR) weather minima when an alternate airport is required. For applicability of "engine inoperative CAT II or CAT III" capability, see Appendix 2.

6-9. FLIGHT PLANNING TO AIRPORTS THAT HAVE WEATHER CONDITIONS BELOW LANDING MINIMA. Commercial operators holding a specific regulatory exemption may be permitted to flight plan or dispatch an aircraft to a destination airport with current or forecast weather below landing minima. Dispatch in such cases is considered acceptable under the terms and conditions of the exemption and the following additional conditions:

- All requirements (e.g., aircraft, crew, airport facilities, NAVAIDs) to use the landing minima at the destination and at each alternate airport on which the dispatch is predicated are met.
- When alternate minima are based on availability of CAT II/III, or engine-inoperative CAT II/III capability, each of the airborne systems applicable must be available at the time of flight planning.

CHAPTER 7. CONTINUING AIRWORTHINESS/MAINTENANCE

7-1. MAINTENANCE PROGRAM GENERAL PROVISIONS. In accordance with 14 CFR part 91, § 91.191, each operator conducting CAT II or CAT III approaches must have an approved AWO maintenance program (also known as Lower Landing Minimums (LLM) maintenance program). For operations under parts 121 and 135, this may be in the form of an approved part of a Continuous Airworthiness Maintenance Program (CAMP) authorized by OpSpec D072. For part 135 operations with aircraft having less than ten seats, an Approved Aircraft Inspection Program (AAIP) may include the AWO program. The approved AWO maintenance program must include any necessary provisions to address the operator's intended operations and the manufacturer's recommended maintenance program. A maintenance program should consider any applicable Maintenance Review Board (MRB) requirements if applicable or equivalent requirements (e.g., Airworthiness Directives (AD), mandatory Service Bulletins (SB)) that may relate to AWO operations. Emphasis should be on maintaining and ensuring total system performance, accuracy, availability, reliability, and integrity for the intended AWO operations. An approved AWO maintenance program is not required for CAT I or Special Authorization (SA) CAT I operations.

7-2. MAINTENANCE PROGRAM REQUIREMENTS. The maintenance program should be compatible with an operator's organization and ability to implement and supervise the program. Maintenance personnel should be familiar with the operator's approved program, their individual responsibilities in accomplishing that program, and availability of any resources within or outside of the maintenance organization that may be necessary to ensure program effectiveness (e.g., SB or service letter information).

a. AWO Operations. Provision for AWO operations may be addressed as a specific program or may be integrated with the general maintenance program.

b. Maintenance Program. Regardless of whether the maintenance program is integrated, or is designated as a specific approved LLM program, the maintenance program should at least address the following:

(1) Maintenance procedures necessary to ensure continued airworthiness relative to AWO operations.

(2) A procedure to revise and update the maintenance program.

(3) A method to identify, record, or designate personnel currently assigned responsibility in managing the program, performing the program, maintaining the program, or performing quality assurance for the program. This includes identification of any contractor or sub-contractor organizations, or where applicable, their personnel.

(4) Verification should be made of the LLM systems and configuration status for each aircraft brought into the lower minimum maintenance program. Unless otherwise accepted by the FAA, each aircraft should meet relevant criteria specified by the applicable aircraft manufacturer or avionics manufacturer for associated systems and equipment (e.g., Valid U.S. type certificate (TC), appropriate Supplemental Type Certificate (STC) records and compliance, ADs, SBs, or other compliance).

(5) Identification of modifications, additions, and changes which were made to qualify aircraft systems for the intended operation or minima, if other than as specified in the Airplane Flight Manual (AFM), TC, or STC.

(6) Identification of maintenance requirements and log entries necessary to change minima status.

(7) Any discrepancy reporting procedures that may be unique to the AWO program.

(8) Procedures that identify, monitor, and report lower minimum system and component discrepancies for the purpose of quality control and analysis.

(9) Procedures that define, monitor, and report chronic and repetitive discrepancies.

(10) Procedures that ensure aircraft remain out of lower minimum status until successful corrective action has been verified for chronic and repetitive discrepancies.

(11) Procedures that ensure the aircraft system status is placarded properly and clearly documented in the aircraft log book, in coordination with maintenance control, engineering, flight operations, and dispatch, or equivalent.

(12) Procedures to ensure the downgrade of an aircraft low visibility capability status, if applicable, when maintenance has been performed by persons other than those trained, qualified, or authorized to use or approve procedures related to AWO operations.

(13) Procedures for periodic maintenance of systems ground check, and systems flight check, as applicable. For example, following heavy maintenance, suitable checks may need to be performed prior to return to service.

(14) Provisions for an aircraft to remain in a specific low visibility capability status (e.g., CAT II, CAT III, fail operational (FO), fail passive (FP)) or other designated operational status used by the operator.

(15) Provision should be made for periodic operational sampling of suitable performance. Typically, at least one satisfactory approach should have been accomplished within a specified period approved for that operator, unless a satisfactory systems ground check has been accomplished. A recording procedure for both satisfactory and unsatisfactory results should be included. Fleet sampling is not typically acceptable in lieu of individual aircraft assessment. At least one satisfactory low visibility system operational use, or a satisfactory systems ground check, should be accomplished within 6 months for an aircraft to remain in CAT II status. For CAT III systems, at least one satisfactory low visibility system operational use, or a satisfactory systems ground check, should be accomplished within 30 days for an aircraft to remain in CAT III status. Any extension to an aircraft sampling period should be based on the demonstrated reliability of that operator’s aircraft flight guidance system (FGS) performance in service. Failure of an operator to maintain an acceptable reliability record should result in timely and appropriate remedial action. This could lead to reconsideration of suitability of any sampling period extensions or fleet statistical sampling authorizations. Aircraft certified with a continuous

monitored LLM system will not have a specific ground test developed. In the case of continuous monitored system architecture, all sampling will be based on actual approaches flown.

NOTE: Maintenance programs meeting the requirements for, and approved for, CAT III operations typically are also considered acceptable for CAT II operations. Aircraft low visibility systems status, however, must be clearly identified for pilots, maintenance, and dispatch, when combined programs are used.

7-3. INITIAL AND RECURRENT MAINTENANCE TRAINING.

a. Training of Maintenance Personnel. Maintenance personnel should be knowledgeable regarding the information contained in this AC and, if applicable, 14 CFR, related to any significant aspects of LLM that pertain to maintenance. Operator and contract maintenance personnel including mechanics, maintenance controllers, avionics technicians, personnel performing maintenance inspection or quality assurance, or other engineering personnel if applicable, should receive initial and recurrent training as necessary for an effective program. The training curriculum should include specific aircraft systems and operator policies and procedures applicable to AWO operations. Recurrent training should typically be accomplished at least annually, or when a person has not been involved in the maintenance of the specified aircraft or systems for an extended period (e.g., greater than 6 months). Training may lead to a certification or qualification (e.g., for LLM) if the operator so designates such qualification in their approved program.

b. Training Requirements. The training should at least include, as applicable:

(1) An initial and recurrent training program for appropriate operator and contract personnel. Personnel considered to be included are maintenance personnel, quality and reliability groups, maintenance control, and incoming inspection and stores, or equivalent organizations. Training should include both classroom and at least some “hands-on” aircraft training for those personnel who are assigned aircraft maintenance duties. Otherwise, training may be performed in a classroom, by computer based training, in full flight simulators (FFS), in an airplane, or in any other effective combination of the above consistent with the approved program, and considered acceptable to the FAA.

(2) Subject areas for training should include: Operational concepts, aircraft types and systems affected, models/series and differences where applicable, procedures to be used, manual or technical reference availability and use, processes, tools, or test equipment to be used, quality control, methods for testing and return to service, signoffs required, and proper minimum equipment list (MEL) application. General information should also be included about where to get technical assistance as necessary, necessary coordination with other parts of the operator’s organization (e.g., flight operations, dispatch), and any other maintenance program requirements unique to the operator or the aircraft types, models, or series flown (e.g., human factors considerations, problem reporting).

(3) Procedures to ensure use of outside vendors, or vendors' parts, are compatible with program requirements and establish measures to control and account for parts overall quality assurance.

(4) Procedures to ensure tracking and control of components that are "swapped" between systems for troubleshooting when systems discrepancies cannot be duplicated. These procedures should provide for total system testing and/or removal of aircraft from lower minimum status.

(5) Procedures to assess, track, and control the accomplishment of changes to components or systems pertinent to AWO operations (e.g., ADs, SBs, engineering orders, 14 CFR requirements).

(6) Procedures to record and report lower minimum operation(s) that are discontinued and/or interrupted because of system(s) malfunction(s).

(7) Procedures to install, evaluate, control, and test system and component software changes or updates with special emphasis on configuration control.

(8) Procedures related to the MEL remarks section use, which identify low visibility related systems and components, specifying limitations, upgrading, and downgrading.

(9) Procedures for identifying and addressing performance issues for AWO-related components and systems, whether performed in-house or by contract vendors. Integration of the AWO maintenance program into an operator's Continuous Analysis and Surveillance System (CASS) Program is essential.

7-4. TEST EQUIPMENT/CALIBRATION STANDARDS. Test equipment use is based on manufacturer's instructions for continued airworthiness (ICA) recommendations and required accuracy and reliability to return systems and components to service following maintenance. It is the operator's responsibility to ensure the equipment called for in ICAs are being used by contract maintenance organization. Deviations to these recommendations must be substantiated by the operator's internal procedures to show equivalency. Traceability to a national standard should be maintained when the test equipment is calibrated or repaired.

7-5. RETURN TO SERVICE PROCEDURES.

a. Maintenance Procedures. Procedures should be included to upgrade or downgrade system status concerning AWO operations capability. The method for controlling operational status of an aircraft should ensure that flightcrews, maintenance and inspection departments, dispatch, and other necessary personnel are appropriately aware of aircraft and system status.

b. Testing. The appropriate level of testing should be specified for each component or system. The manufacturer's recommended maintenance program or maintenance instructions should be considered when determining the role built-in test equipment (BITE) should play for return to service procedures, or for use as a method for low visibility status upgrade or downgrade. Additional consideration is given for systems certified to be continuously monitored and require no testing following maintenance.

c. Contract Maintenance. Facilities or personnel should follow the operator's FAA-approved maintenance program to approve an aircraft's return to service. The operator is responsible for ensuring that contract organizations and personnel are appropriately trained, qualified, and authorized.

7-6. PERIODIC AIRCRAFT SYSTEM EVALUATIONS.

a. Evaluation Method. The operator should provide a method to periodically evaluate aircraft CAT II /III system performance. These periodic evaluations will assist in maintaining AWO system availability and reliability. Typical intervals for these evaluations are 6 months for CAT II or 30 days for CAT III. These intervals may be extended by data substantiation and approval from the FAA.

b. Performance Evaluation. The preferred method to evaluate performance of a low visibility FGS (e.g., autoland or Head-Up Display (HUD)) is to periodically use the system. A record such as a logbook entry or computer Aircraft Communications Addressing and Reporting System (ACARS) record showing system performance is typically an acceptable method for documenting system operation. In cases where performance was not satisfactory, the record entry should include system malfunction, location (specific runway/airport), and weather conditions. This level of detail will assist in troubleshooting to include determination if the fault was the result of factors external to the aircraft.

c. FGS and/or Autoland System Checks. Periodic FGS and/or autoland system checks for aircraft not certified as continuously monitored, should be conducted in accordance with procedures recommended by the airframe or avionics manufacturer (e.g., ICA, SB, service letter compliance), or by an alternate procedure approved by the FAA.

7-7. RELIABILITY REPORTING AND QUALITY CONTROL. No special reliability reporting or quality control requirements are applicable to CAT I. For CAT II or III, a monthly summary should be submitted to the certificate holding office for a period of 1 year after an applicant has received an authorization. The following information should be reported:

a. Total Approaches. The total number of approaches tracked, the number of satisfactory approaches tracked, by aircraft/system type, and visibility (Runway Visual Range (RVR)), if known or recorded.

b. Unsatisfactory Approaches. The total number of unsatisfactory approaches, and reasons for unsatisfactory performance, if known, listed by appropriate category (e.g., poor system performance, aircraft equipment problem/failure; ground facility problem, Air Traffic Service (ATS) handling, lack of critical area protection, or other).

c. Unscheduled Component Removals. The total number of unscheduled removals of components of the related avionics systems.

> **NOTE: Reporting after the initial 1-year period should be in accordance with the operator's established reliability and reporting requirements and acceptable to the FAA.**

7-8. CONFIGURATION CONTROL/SYSTEM MODIFICATIONS. The operator should ensure that any modification to systems and components approved for AWO operations are not adversely affected when incorporating software changes, SBs, hardware additions, or modifications. Any changes to system components should be consistent with the aircraft manufacturer, avionics manufacturer, industry, or FAA-accepted criteria or processes.

7-9. RECORDS.

a. Operator Requirements. The operator should keep suitable records (e.g., both the operator's own records and access to records of any applicable contract maintenance organization). This is to ensure that both the operator and FAA can determine the appropriate airworthiness configuration and status of each aircraft.

b. Contract Maintenance Organization Requirements. Contract maintenance organizations should have appropriate records and instructions for coordination of records with the operator.

7-10. PART 129 FOREIGN OPERATOR MAINTENANCE PROGRAMS.

a. Maintenance of Part 129 Foreign Registered Aircraft. For part 129 operators of foreign registered aircraft (e.g., § 129.14 is not applicable), the cognizant Civil Aviation Authority (CAA) is the CAA of the operator. For those situations, the FAA may implicitly accept that the maintenance program is considered to be acceptable if the cognizant CAA has approved it, and if the operator or CAA indicates that the program meets U.S. criteria, U.S. equivalent criteria (e.g., criteria such as European Aviation Safety Agency (EASA) criteria), or International Civil Aviation Organization (ICAO) criteria (e.g., Annex 6, Operation of Aircraft, and ICAO Doc 9365-AN/910, Manual of All Weather Operations), and the cognizant CAA has authorized CAT II/III U.S. operations. The FAA then issues the pertinent part 129 CAT II/III operations specification (OpSpec) based on the other CAA's approval for that operator. However, the FAA reserves the authority to ensure competence of both the operator and authorizing and supervising CAA, depending on whether the CAA or operator are considered to be from a category 1, 2, or 3 country (safety classification, not a low visibility landing classification), and if there have been any reported problems with the operator or CAA. Evidence of the operator satisfying or being consistent with the manufacturer's recommended maintenance program should serve as evidence of an acceptable maintenance program, regardless of the capability of the CAA or the operator, unless the FAA has specifically addressed maintenance requirements beyond those of the manufacturer for that aircraft type (e.g., required SB compliance or AD compliance related to the FGS).

b. Maintenance of Part 129 Foreign Operated U.S. N-Registered Aircraft. Foreign operators of U.S. N-registered aircraft (e.g., those operators to which § 129.14 is applicable) should have maintenance programs equivalent to that required for a U.S. part 121 operator. Use of the part 91 provisions for general aviation is not applicable or appropriate. Principal operations inspector (POI) approval of CAT II/III OpSpecs for a § 129.14 operator may implicitly be considered to also accept the maintenance program adequacy. Accordingly, coordination between the applicable POI and principal avionics inspector (PAI) is necessary before part 129 OpSpec authorization is completed. The FAA is ultimately the cognizant CAA

for the maintenance program in this instance, if the aircraft is N-registered. However, the FAA may accept oversight of the operator's CAA if that CAA is judged by the FAA to have equivalent processes, criteria and procedures for oversight of maintenance programs (e.g., EASA countries). The basis for any such maintenance program should be the recommended airframe manufacturer (or avionics vendor) program, considering any adjusted MRB requirements.

CHAPTER 8. APPROVAL OF U.S. OPERATORS

8-1. GENERAL. Other than part 91 standard CAT I operations, all AWO operations covered by this AC require authorization via operations specification (OpSpec), MSpec, or letter of authorization (LOA). Application packages should be completed in coordination with the responsible Flight Standards office and should detail compliance with the applicable provisions of this AC and the requested authorization.

8-2. OPERATIONS MANUALS AND PROCEDURES.

a. Manuals.

(1) Prior to CAT I/II/III approval, appropriate flightcrew operating manuals, flight manuals, airline policy manuals, maintenance manuals, training manuals, and related aircraft checklists, quick reference handbooks (QRH) or other equivalent operator information should incorporate pertinent CAT I/II/III provisions in accordance with applicable operating rule (e.g., part 91 Appendix A).

(2) Information covered in ground training and procedures addressed in flight training should be available to flightcrews and dispatchers in an appropriate form for reference use.

b. Procedures. Prior to approval for AWO operations, provisions of Chapter 5 of this AC should be implemented by the operator. Flightcrew member duties during the takeoff, approach, and landing phases should be described. Duties should address pilot flying (PF) and pilot monitoring (PM) responsibilities and tasks during all stages of the takeoff, approach, landing, rollout, and missed approach appropriate to each category of minima being implemented. The duties of any additional crewmembers should also be explicitly defined and incorporated into the applicant's qualification program.

8-3. TRAINING PROGRAMS AND CREW QUALIFICATION. Training programs, Advanced Qualification Program (AQP), crew qualification, and checking provisions and standards, differences qualification, check pilot qualification, line check, route check, and Operating Experience (OE) programs should each satisfactorily incorporate necessary AWO provisions (see Chapter 5 for details). An acceptable method to track pertinent crewmember AWO qualification must be established (see paragraph 5-17).

8-4. DISPATCH PLANNING. Appropriate provisions for minimum equipment lists (MEL) and Configuration Deviation Lists (CDL) should be made as necessary to address AWO operations. Dispatch procedures to ensure appropriate weather, field conditions, facility status, Notice to Airmen (NOTAM) information, alternate airport designation, engine-inoperative missed approach performance, crew qualification, aircraft system status, and fuel planning should be implemented.

8-5. OPSPECS. Authorizations, limitations, and provisions applicable to AWO operations are specified in part C of the OpSpecs. An example of an appropriate OpSpec is provided in Appendix 3.

a. OpSpec Contents. Proposed OpSpecs should list pertinent approved airports/runways, Runway Visual Range (RVR) limits, required RVR sensors, minimum descent altitude (MDA), decision altitude (DA)/decision height (DH), and Alert Height (AH) use provisions, aircraft equipment provisions for normal and engine-out operations, landing field length provisions, and any other special requirements identified by the responsible Flight Standards office or the Flight Technologies and Procedures Division. The operator's manuals, procedures, checklists, QRHs, MELs, dispatch procedures, etc. must be shown to be consistent with the proposed OpSpecs.

b. OpSpec Maintenance. The operator is responsible for maintaining current OpSpecs reflecting current approvals authorized by the FAA. Once the FAA has authorized a change for aircraft systems, new runways, or other authorizations, appropriate and timely amendments to affected OpSpecs should be issued.

c. OpSpec Amendments. Issuance of amendments to guidance or procedures in other related material such as the Flight Operations Manual or Training Program may also be required. When updated standard OpSpecs provisions are adopted by the FAA, provisions of those updated OpSpecs should be applied to each operator's program as directed by the accompanying notice or other FAA direction.

8-6. OPERATIONAL DEMONSTRATIONS. Unless otherwise specified by the Flight Technologies and Procedures Division, appropriate "airborne system suitability" and "operational use suitability" demonstrations must be completed as described in subparagraphs a and b below. The purpose of these operational demonstrations is to determine or validate the use and effectiveness of the aircraft flight guidance systems (FGS), training, flightcrew procedures, maintenance program, and manuals for the program being approved. Operators of aircraft having FAA-approved Airplane Flight Manuals (AFM) referencing AC 20-191, AC 120-28, or AC 120-29 as the criteria used as the basis for CAT II or III airworthiness demonstration already are considered to meet provisions of subparagraph a below. These operators typically need only address provisions of subparagraph b below for verification of operational use suitability.

a. Aircraft System Suitability Demonstration. FAA operating rules and regulations addressing AWO requirements are addressed by standard OpSpecs and parts 61, 91, 97, 121, 125, and 135. These provisions apply continuously, as defined at the time of a particular operation. Conversely, airworthiness rules (parts 23, 25, etc.,) primarily apply at the time a "certification basis" is established for type certificate (TC) or Supplemental Type Certificate (STC) and do not necessarily reflect "present" requirements, except through issuance of ADs updated with an amended TC or new STC application. It is the operator's responsibility to ensure compliance with current operating rules.

(1) To minimize the need for repeating initial airborne system operational suitability demonstrations for each operator, airborne system suitability is usually demonstrated in conjunction with airworthiness approval (TC or STC) of airborne systems and components. This approach optimizes the use of analysis and flight demonstration. Aircraft system suitability is normally demonstrated through an initial airworthiness demonstration meeting applicable provisions of this AC and/or AC 20-191 (or combined airworthiness/operational evaluation for new systems or concepts).

(2) If such a demonstration has not been conducted during airworthiness certification, or the AFM does not reflect completion of such a demonstration, then the operator may propose and the FAA may approve an assessment and demonstration program. This provision typically applies to operators seeking to establish CAT II/III capability of an aircraft or FGS. In such instances, criteria of AC 20-191 may be used as a guideline to formulate the operator's assessment and demonstration program. For such a program, the numbers of approaches conducted by the operator and the data collected to establish suitable performance and reliability should be equivalent to that which otherwise would be provided by an airworthiness demonstration in accordance with AC 20-191.

(3) Airworthiness demonstration to an acceptable earlier version of AC 120-29 or AC 120-28, or equivalent criteria, remains valid for aircraft/aircraft systems initially TC'd prior to issuance of AC 20-191 and having the earlier criteria as the type certification basis. However, previously demonstrated aircraft or aircraft systems seeking operational credit specified only in provisions of this AC (e.g., for Head-Up Display (HUD), Hybrid Autoland/Head-Up Display (HUD) credit) must meet criteria specified in this AC and AC 20-191.

(4) Acceptable results of such airworthiness evaluations are usually described in Section 3 (Normal and Non-Normal Procedures) of the FAA-approved AFM or AFM Supplement. Unless otherwise specified by the Flight Technologies and Procedures Division, the responsible Flight Standards office should ensure that aircraft proposed for CAT II/III have completed an appropriate airborne system operational suitability demonstration, and that result should normally be reflected in the approved AFM or AFM Supplement.

(5) For aircraft certified by the FAA through 14 CFR part 21, § 21.29 (certain non-U.S. manufactured aircraft), AFM provisions may vary. In certain instances, AFM provisions may not be consistent with U.S. policy or rules. In such instances, prior coordination by the responsible Flight Standards office with the Flight Technologies and Procedures Division is appropriate to provide guidance to operators regarding applicability of various AFM provisions (e.g., AH, DH, and RVR limitations, acceptable NAVAID use, alerting system use, and required versus recommended crew procedures). As a general guideline, AFMs meeting airworthiness standards recognized by or harmonized with the FAA (e.g., European Aviation Safety Agency (EASA), Transport Canada, etc.) may be accepted without further demonstration.

(6) While considering an AFM of an aircraft certificated by a non-U.S. airworthiness authority other than as described above, or for additional credit for existing systems based on uncertain foreign AFM provisions, operational assessments in accordance with criteria in this AC, or equivalent criteria, may be necessary. In such instances, the applicable Aircraft Evaluation Division or the Flight Technologies and Procedures Division should be consulted. If necessary, the Flight Technologies and Procedures Division may specify suitable criteria to apply.

b. Operator Use Suitability Demonstration (OUSD).

(1) The OUSD is to demonstrate and validate the reliability and performance of lower minimum programs in line operations consistent with the operational concepts specified in this AC for each make, model, and series of a fleet.

(a) For CAT I, unless a responsible Flight Standards office specifies approach demonstrations are necessary due to unusual circumstances or special situations, or for special systems such as "Autoland," operators may conduct CAT I operations without need for special demonstrations, if the aircraft type AFM does not preclude the intended operation.

(b) An OUSD application is required for CAT II/III approvals for each make, model, and series of a fleet. Demonstration requirements are established considering any applicable FAA Flight Standardization Board (FSB) criteria, previous operator service experience, experience with a specific aircraft type by other operators, experience of crews of that operator, and other such factors. The demonstration period is typically 6 months long for each phase (CAT II and III) of a progression to CAT II or CAT III landing minima. This permits the FAA to evaluate the ability of the operator to maintain and operate its proposed lower minima program.

(2) The OUSD consists of two phases:

(a) The first phase is referred to as the OUSD landing phase. During this phase, the operator conducts the required number of landings using the CAT II or III systems approved in the submitted OUSD plan. Typically, a specified number of successful landings should be accomplished in line operations using the specified weather minima for demonstration requirements. See Table 8-1 Operator Use Suitability Demonstration Requirements, for specific requirements.

1. A success rate of 90 percent is required. During the demonstration period, at least 10 percent of the required number of landings should be observed by an appropriately qualified FAA operations inspector.

2. If an excessive number of failures (e.g., unsatisfactory landings or system disconnects) occur during the landing demonstration phase, a determination should be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, or system modifications).

(b) The second phase, the OUSD validation phase, begins after completion of the OUSD landing phase. The OUSD validation phase is typically 6 months for a new operator. The purpose of the OUSD validation phase is to validate that the operator's proposed maintenance and operational procedures are suitable to CAT II/III operations. Due to the importance of this maintenance tracking during the OUSD validation phase, special emphasis should be placed on Chapter 7 maintenance reporting and procedures. A second OUSD validation phase may be required to reach the lowest CAT III minima.

(3) Regardless of credit permitted by the responsible Flight Standards office, if an operator is not aware of current CAT II/III operations at a particular runway by some other operator and similar aircraft type, it is a good practice for the operator to have conducted at least one approach using the CAT II or III system to each runway intended for CAT II/III operations in weather better than that requiring use of CAT II/III minima. Such demonstrations may be conducted in line operations, during training flights, or during aircraft type or route proving runs.

(4) The system should demonstrate reliability and performance in line operations consistent with the operational concepts specified in Chapter 3. In situations where the completion of the required number of landings may be disproportionate to the probable level of operations and make this requirement onerous, a reduction in the required number of landings may be considered if equivalent reliability can be assured. Reduction of the number of landings to be demonstrated requires a justification for the reduction, and prior approval from the Flight Technologies and Procedures Division.

(5) U.S. air carriers are approved to conduct CAT II and/or CAT III landing demonstrations on U.S. facilities that have published part 97 CAT II or CAT III instrument approach procedures (IAP), approved foreign facilities listed on the Flight Operations Branch website at http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/, or U.S. Type I facilities (see subparagraph 8-6c below for details). If using CAT I facilities for demonstration, there is a greater chance to end in an unsuccessful landing which could prolong the OUSD process. Sufficient information must be collected and investigated to determine the cause of any unsatisfactory performance (e.g., critical area was not protected, etc.).

(6) If an operator has different models of the same aircraft utilizing the same or slightly different basic flight control and display systems, the operator should show that the various make and model combinations have satisfactory performance, but a separate operational demonstration may not need to be completed for each make and model. The responsible Flight Standards office should coordinate such demonstration decisions with the Flight Technologies and Procedures Division prior to approving OUSD plan.

(7) OUSD Data Collection and Analysis. The successful accomplishment of the OUSD will require close coordination by the applicant and the responsible Flight Standards office(s).

(a) Data Collection for Airborne System Demonstrations. Each applicant should develop a data collection method to record approach and landing performance specific to aircraft make/model/series combinations. The resulting data and a summary of the demonstration data should be made available to the assigned Flight Standards office. An evaluation of data discussed below will be made to determine system suitability for further CAT II/III operations. The reported data should, at a minimum, include the following information:

1. Information regarding the inability to initiate an approach or identify deficiencies related to airborne equipment.

2. Information regarding abandoned approaches, stating the reasons the approach was abandoned and the altitude above the runway at which the approach was discontinued or the automatic landing system was disengaged.

3. Information regarding any system abnormalities which required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

(b) Data Analysis. Unsatisfactory approaches using facilities approved for CAT II or CAT III where landing system signal protection was provided should be fully documented. The following factors should be considered:

1. Air Traffic Service (ATS) Factors. ATS factors that result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close to the final approach fix (FAF)/point for adequate course and glide path capture, lack of protection of instrument landing system (ILS) critical areas, or ATS requests the flight to discontinue the approach.

2. Faulty NAVAID Signals. NAVAID irregularities, such as those caused by other aircraft taxiing, over-flying the NAVAID (antenna), or where a pattern of such faulty performance can be established should be reported.

3. Other Factors. Any other specific factors affecting the success of CAT II/III operations that are clearly discernible to the flightcrew should be reported.

c. Use of Autoland or Head-Up Guidance at U.S. Type I Facilities or Equivalent.

(1) Operators may conduct autoland or HUD operations at runways with facilities other than those with published CAT II/III IAPs without need for special demonstrations, if the aircraft type AFM does not preclude the intended operation. For autoland system use on CAT I facilities, OpSpec C061 is issued if required. For HUD system use on CAT I facilities, OpSpec C062 is issued if required. Precautions to be taken for such operations include the following:

(a) The operator must not conduct automatic landings, or landing operations using a HUD, to any runway unless the certificate holder determines the flight control guidance and instrument approach guidance systems being used permit safe automatically flown or HUD-guided approaches and landings to be conducted at that runway.

(b) The runway and associated instrument procedure must have no outstanding NOTAMs or chart notes that would preclude the use of the autoland or HUD system (e.g., “Localizer unusable inside the threshold,” or “Glideslope unusable below xxx feet”).

(c) Suitable ILS Critical Area protection should be requested from ATS. The crew must remain alert to any unsuitable system performance, whether or not critical protection is being provided.

(d) The published threshold crossing height (TCH) should be equal to or greater than that required for the aircraft type. Operators should also consider potential issues with irregular pre-threshold terrain at airports when determining suitability to exercise autoland systems.

(e) For additional information on the ILS/Ground Based Augmentation System (GBAS) Landing System (GLS) capabilities/limitations specific to each approach considered, operators must be familiar with, and refer to, the ILS facility performance classification code (e.g., I/D) for that runway. These codes may be found in the current Chart Supplement (formerly referred to as Airport/Facility Directory) and further explained in the legend.

(f) Operators should maintain a list of runways eligible (or ineligible) for autoland or HUD operations due to known approach performance capabilities (or anomalies).

8-7. DETERMINING THE PROPER OUSD FOR AN OPERATOR'S REQUESTED AUTHORIZATION.

a. Table Definitions. The following definitions are provided for use with Table 8-1 below to determine the proper OUSD plan for a particular operator's request for CAT II or III authorization.

(1) Operator Experience:

(a) CAT I. A new operator or an operator not currently meeting CAT II or CAT III experience described below.

(b) CAT II. Operator must have a current OpSpec/MSpec/LOA that has been authorized for at least 1 year for unrestricted CAT II operations to an RVR 1200 or lower minimum.

(c) CAT III. Operator must have a current OpSpec/MSpec/LOA that has been authorized for at least 1 year for CAT III operations to no more than an RVR 700 minimum.

(2) New Aircraft. An aircraft type new to an operator's fleet (e.g., A-330 operator adding A-350). For CAT I only experienced operators, the aircraft is considered new for purposes of Table 8-1, regardless of how long it has been in the operator's fleet.

(3) New Equipment. Newly added or replacement/upgraded flight control and display equipment (e.g., newly installed autopilot/HUD etc.) to an existing operator's aircraft type or the addition of the same aircraft type with different flight control and/or display systems (e.g., B-767 Autoland vs. B-767 HUD or B-737-800 vs. B-737-8 MAX). Equipment for which the operator is not currently approved is considered "new equipment" irrespective of the certification date or basis.

(4) Existing. Current aircraft type and equipment in use by a CAT II experienced operator requesting CAT III authorization.

(5) OUSD Landing Phase. The initial phase during which the operator conducts the number of required landings/minima listed in Table 8-1 using the CAT II or III systems approved in the submitted OUSD plan.

(6) OUSD Validation Phase. The subsequent phase(s) during which the operator's proposed maintenance and operational procedures are verified suitable for CAT II/III operations. To reach the lowest CAT III minima, a second OUSD Validation Phase may be required. In some cases, portions of the OUSD Validation Phase may be conducted concurrently with the OUSD Landing Phase. Table 8-1 shows the required OUSD Validation Phase for each type of approval.

NOTE: When a new series of the same make and model is determined to require an OUSD, it may be defined as "new aircraft" or "new equipment" based upon the FSB report and differences between FGSs, landing systems, and avionics systems.

b. Table Use. To use Table 8-1, first determine the lowest minima category authorization the operator is seeking. Table 8-1 is divided in half, as the top of the chart contains an OUSD resulting in CAT II authorization while the bottom contains an OUSD resulting in CAT III authorization. Enter the table with operator's current "Operator Experience" and use aircraft/equipment qualifiers in the second column, to further define the operator's particular case. At this point, simply read across the corresponding line in Table 8-1 to determine the required landings and minima during the initial "OUSD Landing Phase," followed by the "OUSD Validation Phase 1," followed by "OUSD Validation Phase 2," if required, arriving at the final, lowest "Authorized RVR Minima" that may be approved.

c. Minimum Landings. Upon successfully completing 90 percent of the required landings, the principal operations inspector (POI) may initiate the OUSD Validation Phase 1, by issuing the appropriate portions of OpSpec/MSpec/LOA C060 and authorizing CAT II minima. In cases where the OUSD Landing Phase and OUSD Validation Phase 1 run concurrently, once successfully completing 90 percent of the required landings and the 3-month OUSD Validation Phase 1, the POI may authorize Validation Phase 2.

d. New Flight Control Equipment OUSD. In cases where an existing CAT II operator is seeking CAT II or III minima with new flight control equipment, all landings for OUSD credit must use the new flight control equipment, and must be conducted at CAT I weather minima or greater. At the POI's discretion, the operator may continue to use CAT II minima for other landings provided the new flight control equipment is not depended upon for the operation and the requirements of the current authorization continue to be met. If CAT II operations cannot be conducted safely using the current authorization due to differences in crew procedures, training, etc., the operator's CAT II authorization should be de-authorized until the OUSD Landing Phase requirements are met.

e. Six-Month Validation Phase Relief. During the 6-month OUSD Validation Phase, an operator seeking CAT II authorization may request to eliminate the restriction of DH 100 and RVR 1600, based on operational credit for the use of CAT III systems to conduct CAT II operations. The appropriate portions of OpSpec/MSpec/LOA C060 must specify that all CAT II operations using DH 100 and RVR 1200 must be conducted with the airborne equipment operating to CAT III standards.

f. Small Fleet OUSD. For operators with small fleets, the POI, with concurrence from the Flight Technologies and Procedures Division, may adjust the OUSD Landing Phase to a number of landings manageable for the operator, while still meeting the intent of this AC. The number of landings will depend on the operator's prior experience with SA CAT I or CAT II/III, the number of aircraft in the operator's fleet, and the FAA's experience in SA CAT I or CAT II/III operations with the operator's aircraft. Past practice has allowed a combination of approach and landings in a level C or D qualified full flight simulator (FFS) (i.e., 50 percent maximum) and the actual aircraft.

TABLE 8-1. OPERATOR USE SUITABILITY DEMONSTRATION REQUIREMENTS

<table>
<tr><th colspan="6">Requesting CAT II Authorization</th></tr>
<tr><th>Operator Experience</th><th>Aircraft</th><th>Required Landings/Minima</th><th>OUSD Validation Phase 1 RVR Mins/Mos</th><th>OUSD Validation Phase 2 RVR Mins/Mos</th><th>Authorized RVR Minimums</th></tr>
<tr><td>CAT I</td><td>New</td><td>100/Cat I</td><td rowspan="2">1600/6 or 1200/6[6]</td><td rowspan="2">N/A</td><td rowspan="4">1200 or 1000[1]</td></tr>
<tr><td rowspan="2">CAT II</td><td>New</td><td>50/Cat I</td></tr>
<tr><td>New Equipment Only</td><td colspan="2">25/Cat I/3</td><td>1600/3 or 1200/3[6]</td></tr>
<tr><td>CAT III</td><td>New</td><td>50/Cat I</td><td>1600/6 or 1200/6[6]</td><td>N/A</td></tr>
<tr><th colspan="6">Requesting Cat III Authorization</th></tr>
<tr><th>Operator Experience</th><th>Aircraft</th><th>Required Landings/Minima</th><th>OUSD Validation Phase 1 RVR Mins/Mos</th><th>OUSD Validation Phase 2 RVR Mins/Mos</th><th>Authorized RVR Minimums</th></tr>
<tr><td>CAT I</td><td>New</td><td>100/Cat I</td><td>1200/6[7]</td><td>700[3] or 600/6</td><td rowspan="6">400 or 300[2]</td></tr>
<tr><td rowspan="3">CAT II</td><td>Existing</td><td colspan="2">25/Current Cat II mins/3[4]</td><td>700[3] or 600/3[5]</td></tr>
<tr><td>New Equipment Only</td><td rowspan="3">50/Cat I</td><td rowspan="3">1000[1]/6</td><td rowspan="3">700[3] or 600/6</td></tr>
<tr><td>New</td></tr>
<tr><td rowspan="2">CAT III</td><td>New</td></tr>
<tr><td>New equipment only</td><td colspan="2">25/Current Cat II mins/3[4]</td><td>700[3] or 600/3[5]</td></tr>
<tr><td colspan="6">[1] 1000 RVR authorization requires use of Autoland or FP HUD via OpSpec/MSpec/LOA</td></tr>
<tr><td colspan="6">[2] 300 RVR authorization via OpSpec/MSpec/LOA requires a Fail Operational Rollout System</td></tr>
<tr><td colspan="6">[3] 700 RVR authorization based on CAT IIIa approval via AC 120-28C or earlier criteria</td></tr>
<tr><td colspan="6">[4] Landing phase and OUSD Validation Phase 1 may run concurrently</td></tr>
<tr><td colspan="6">[5] Validation Phase 2 and all reporting requirements apply even if operator is not seeking RVR 400/300 mins</td></tr>
<tr><td colspan="6">[6] CAT II minima of 1200 RVR may be authorized for operators seeking CAT II 1000 RVR minima in accordance with Note 1</td></tr>
<tr><td colspan="6">[7] CAT II minima of 1000 RVR in accordance with Note 1 may be authorized in conjunction with initial CAT III authorization after completion of OUSD Validation Phase 1</td></tr>
</table>

8-8. CAT II/III PROGRAM STATUS FOLLOWING OPERATOR ACQUISITIONS/MERGERS. CAT II/III operators involved in acquisitions of other operators or mergers, and their responsible Flight Standards office, must ensure compatibility of programs, procedures, aircraft systems, runways served, and any other relevant issues before amending OpSpecs, or advising the surviving or controlling operator of the status of CAT II/III OpSpecs of the acquired or merged operator. If doubt exists with the responsible Flight Standards office regarding applicability or status of CAT II/III OpSpec provisions for a resulting new, surviving, acquired, or merged carrier, the Flight Technologies and Procedures Division should be consulted.

8-9. IRREGULAR PRE-THRESHOLD TERRAIN AND OTHER RESTRICTED RUNWAYS. Airports/runways with irregular pre-threshold terrain, or runways restricted due to NAVAID or facility characteristics may require special evaluation or restrictions. Various procedures used by the FAA to assess irregular pre-threshold terrain, as described in Appendix 4, should be considered by the operator prior to OpSpecs authorization. For specific facilities affected, Refer to the FAA website for restricted/nonstandard U.S. facilities approved for CAT II and CAT III operations at http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/.

8-10. U.S. CARRIER AWO OPERATIONS AT FOREIGN AIRPORTS. An applicant having U.S. lower-than-standard takeoff minima and/or CAT I/II/III approval may be authorized to use those minima at foreign airports in accordance with its OpSpecs. Information on the approval process for all Foreign Terminal Instrument Procedures (FTIP) is located in AC 120-105.

a. Post-Approval Requirements. Once approved, the operator must comply with both FAA and local requirements. The operator must also ensure current status information for NOTAMs are available and advise its responsible Flight Standards office of incompatible requirements (e.g., use of Obstacle Clearance Altitude (OCA (H)) etc.) for resolution by the responsible Flight Standards office or the Flight Technologies and Procedures Division.

b. Consistency with U.S. Standards. Although it is recognized that the systems at foreign airports may not be exactly in accordance with U.S. standards, it is important that any foreign facilities used provide the necessary information or functions consistent with the intent of the U.S. standards. Carriers desiring CAT II/III approvals at foreign airports or runways not on the FAA-approved list should submit such requests through its FAA POI to the Flight Technologies and Procedures Division. Refer to the website for foreign facilities approved for CAT II/III operations at http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/.

8-11. EVALUATION OF NEW TECHNOLOGY AND/OR OPERATIONAL CONCEPTS.

a. New Technology Demonstration (NTD) Process. As used in this AC, NTD is a demonstration in an environment and conditions necessary to show concept validity in terms of

various criteria, which may include performance, system reliability, repeatability, and typical pilot response to failures, as well as to demonstrate an equivalent or acceptable level of safety. The NTD is a flexible process intended to meet a number of potential varied scenarios and determine the proper scope of demonstration. The NTD is similar to, and replaces the Proof of Concept (PoC) as described in AC 120-29 and AC 120-28. Participants in this process may vary and could include such entities as operators, specific equipment manufacturers, Original Equipment Manufacturers (OEM), the Aircraft Evaluation Division, and the Flight Technologies and Procedures Division.

b. NTD Methodology. NTD may be established by a combination of analysis, FFS, and/or flight demonstrations in an operational environment. NTD may be a combined effort of FAA airworthiness, operational organizations, the applicant, and inputs from any associated or interested organizations. Where novel technology is involved, an accompanying but separate STC process may be required. In cases where currently-certified equipment is proposed to be used in a new way, the NTD process may require little or no participation by FAA airworthiness. A successful NTD will typically result in a change to an OpSpec, management specification (MSpec), or LOA to authorize the new operation and could result in changes to operations procedures, operations manuals, airplane flight manuals, ACs, and other FAA guidance material.

c. Process Illustration. The process may be tailored on a case-by-case basis and based upon the credit sought. An example of a potential NTD process is presented in Figure 8-1.

d. Conformity Inspections. The FAA uses conformity inspections for both quality assurance and engineering purposes. Data produced from NTD testing and analysis is not automatically considered as approved certification data in the event that an STC is required. This is especially true when the applicant does not have all of the final conformed system hardware and software installed during the NTD phase of the project. The objectives of the NTD testing are not likely to be entirely consistent with the objectives of any follow-on certification testing. However, some tests performed during the NTD may not need to be re-accomplished if the FAA determines the configuration of the final conformed hardware, software, and installation were fully verified as being compliant with FAA regulations.

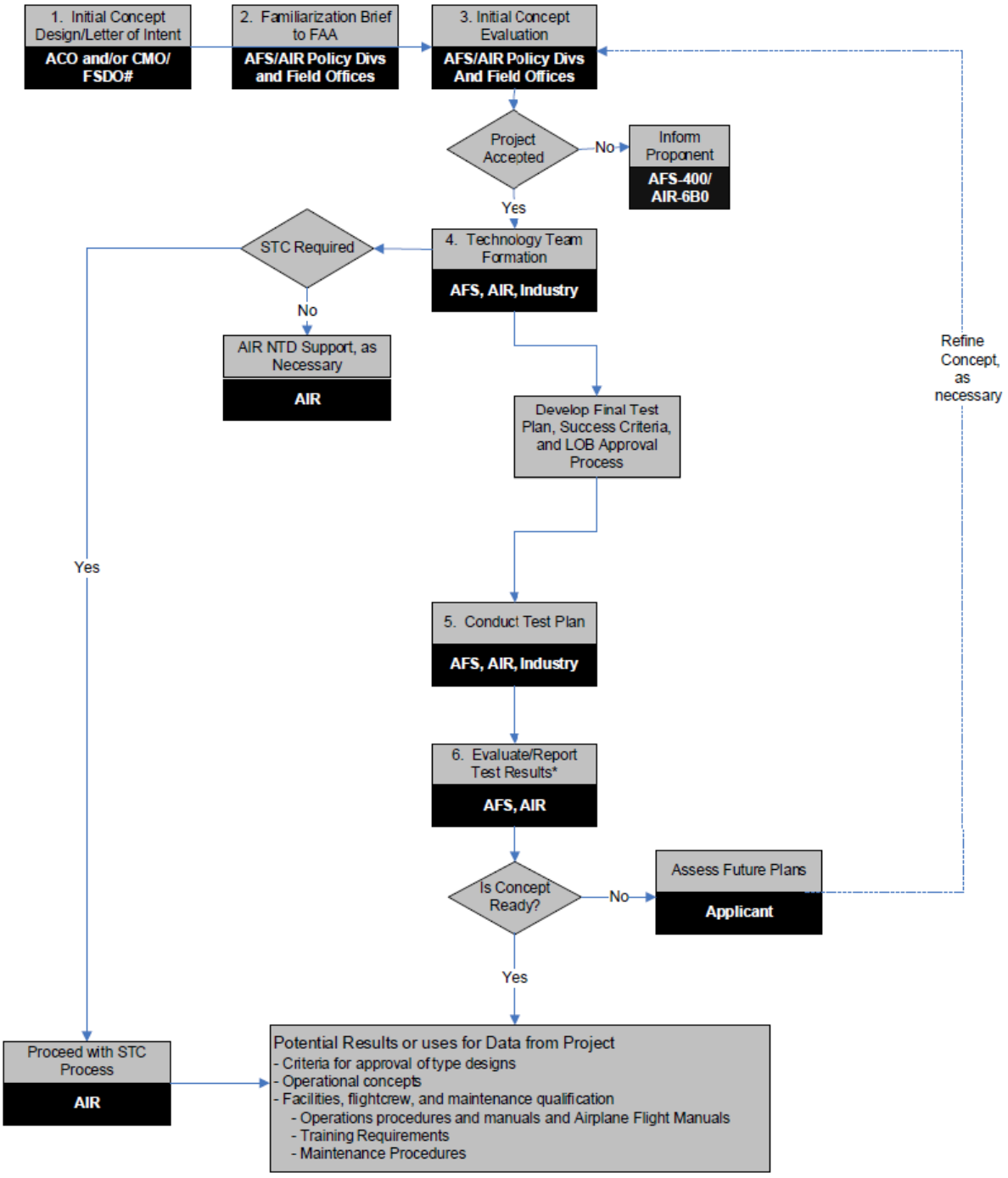
e. Post-NTD Operational Safety Assessment (OSA) or Review (OSR). If the NTD testing results in a recommendation for an operational approval without further modification or testing, the Technology Team (Flight Standards, Aircraft Certification Service (AIR) and industry) must complete an OSA/OSR. The OSA/OSR is part of the FAA Aviation Safety (AVS) Safety Management System (SMS). The OSA/OSR will describe the change to the National Aerospace System (NAS), conduct a risk assessment, identify any necessary risk mitigation strategies and tracking, and document all activities in an OSA/OSR report.

f. Exclusive Benefit to Single Applicant. Some new technology and innovative operational concept projects proposed will benefit only a single applicant or operator. The FAA can accept these projects as permitted by resources, but they will have a lower priority than a project benefiting a larger user group or enabling future industry wide deployment.

g. Pre-Application or Advanced Research. Applicants may propose projects to the FAA that will not result in an operational approval or new criteria upon completion. These projects

may simply be for research and development and the data gained used later for certification or another effort. The FAA and the applicant should sign a Memorandum of Agreement (MOA) defining roles and responsibilities. If it is determined to be beneficial to the government, some type of federal funding could be allocated for this type of work.

FIGURE 8-1. NEW TECHNOLOGY DEMONSTRATION PROCESS



The FAA field office(s) will contact the Flight Technologies and Procedures Division and Systems and Equipment Standards Branch when the applicant's proposal involves advanced technology and innovative operational concepts and there is insufficient guidance, approval criteria, or agency policy

* Project reporting should normally include a summary of the testing results and an Operational Safety Assessment (OSA) or Operational Safety Review (OSR)

CHAPTER 9. INTERNATIONAL (FOREIGN) OPERATORS CONDUCTING AWO AT U.S. AIRPORTS

9-1. ACCEPTABLE CRITERIA. International (Foreign) operators requesting or authorized for AWO operations at U.S. airports should meet the criteria of this AC, equivalent European Aviation Safety Agency (EASA) criteria, or the International Civil Aviation Organization (ICAO) Doc 9365-AN/910, Manual of All Weather Operations.

a. Previously Approved Operators. Operators previously approved by the FAA in accordance with earlier criteria may continue to apply those earlier criteria. International operators seeking credit for operations addressed only by this AC (e.g., CAT III Head-Up Display (HUD) operations) must meet criteria of this AC, or equivalent criteria acceptable to the FAA, for those applicable provisions.

b. Airplane Flight Manual (AFM) Stated AWO Capability. Unless otherwise authorized by the FAA, aircraft used by international operators for AWO within the U.S. should have AFM provisions reflecting an appropriate level of AWO capability as demonstrated to, or authorized by, the FAA or an authority recognized by FAA, as having acceptable equivalent airworthiness criteria (e.g., EASA, Transport Canada, UK Civil Aviation Authority (CAA)).

9-2. CAT II/III AUTHORIZATION AND DEMONSTRATIONS.

a. Authorization. Authorization may be in accordance with provisions of their own regulatory authority or in accordance with standard provisions of part 129 operations specifications (OpSpecs), whichever is the more restrictive. International air carriers meeting FAA or other acceptable criteria, and having more than 6 months of experience in CAT II/III operations with the applicable aircraft type may be authorized for CAT II/III operation in the United States via OpSpec C060.

b. Demonstration. The FAA does not require a separate demonstration period for international operators if the State of the operator does not require such a demonstration. However, operators approved in accordance with this provision may be subject to additional FAA demonstration for special situations, such as at restricted airports with irregular pre-threshold terrain (see paragraph 8-9), or for aircraft types not having flown CAT II/III procedures at U.S. facilities.

c. Addition of New Aircraft Type. International operators with current U.S. CAT II or CAT III authorization, seeking to add a new type aircraft to that existing authority, may have the demonstration period reduced or waived, if a successful demonstration has been accepted by the FAA for the same type aircraft by any other U.S. or international operator.

d. Additional Information. International operators not meeting the provisions above may be subject to the demonstration which is required of U.S. operators, described in paragraphs 8-6 (Operator Use Suitability Demonstration (OUSD)) and 8-9 (irregular pre-threshold terrain) as determined by the FAA.

9-3. USE OF 14 CFR NON-PART 97 PROCEDURES OR SPECIAL AUTHORIZATION (SA) PROCEDURES.

a. Non-Part 97 Instrument Approach Procedures (IAP). The FAA may authorize non-part 97 procedures via part 129 for international operators. These procedures may require specific airborne equipment and/or training, or non-standard facility and obstacle assessments. These procedures will not be published as a Standard Instrument Approach Procedure (SIAP).

b. Procedures Requiring SA. International operators may be eligible to use certain types of procedures that require authorization (e.g., SA CAT I) and are approved both by the FAA and via their own controlling (State) authority.

CHAPTER 10. OPERATOR REPORTING AND TAKING CORRECTIVE ACTIONS

10-1. OPERATOR REPORTING.

a. Standard AWO Performance Reporting. The reporting of satisfactory and unsatisfactory Category (CAT) II/III aircraft performance is a useful tool in establishing and maintaining effective maintenance and operating policy and procedures. Additionally, when maintained over longer periods of time, the report data substantiates a successful program and can identify trends or recurring problems that may not be related to aircraft performance. Information obtained from reporting data and its analysis is useful in recommending and issuing appropriate corrective action(s).

b. Additional Reporting Requirements. In addition to the process described in paragraph 8-7, for a period of at least 1 year after an applicant has been advised that its aircraft and program meet CAT II/III requirements, and reduced minima are authorized, the operator is to provide a monthly summary to the responsible Flight Standards office of the following information:

(1) The total number of approaches where the equipment constituting the airborne portion of the CAT II/III system was used to make satisfactory (under actual or simulated CAT II/III conditions) approaches to the applicable CAT II/III minima (by aircraft type).

(2) The total number of unsatisfactory approaches by airport and aircraft registration number with explanations in the following categories: airborne equipment faults, ground facility difficulties, aborts of approaches because of Air Traffic Service (ATS) instructions, or other reasons.

(3) The operator should also notify the responsible Flight Standards office as soon as possible of any system failures or abnormalities that require flightcrew intervention after passing 100 feet during operations in weather conditions below CAT I minima.

(4) Upon request, the responsible Flight Standards office will make this information available to the Flight Technologies and Procedures Division for overall CAT II/III program management or to assist in assessment of program or facility effectiveness.

10-2. CAT II/III OPERATOR CORRECTIVE ACTIONS.

a. AWO Corrective Action Responsibility. Operators are expected to take appropriate corrective actions when they determine that conditions exist that could adversely affect safe CAT II/III operations. The operations and maintenance manuals should address any corrections needed. Some examples include repeated aircraft system difficulties, repeated maintenance write-ups, chronic pilot reports of unacceptable landing performance, deep snow in glideslope critical areas, and the inability to confirm appropriate critical area protection at non-U.S. airports.

b. Example Corrective Actions. Examples of appropriate corrective action could be an adjustment of CAT II/III programs, procedures, training, modification to aircraft, restriction of minima, limitations on winds, restriction of NAVAID facility use, adjustment of payload, Service Bulletin (SB) incorporation, or other such measures necessary to ensure safe operation.

APPENDIX 1. DEFINITIONS AND ACRONYMS

Definitions

This appendix contains the definition of terms and acronyms used within this AC. It also contains certain terms that are used in related ACs, and are included for convenient reference. The definitions and acronyms are also provided to facilitate common use of this appendix for other related ACs.

Airborne Navigation System	The airborne equipment that senses and computes the aircraft position relative to the defined path and provides information to the displays and to the flight guidance system (FGS). It may include a number of receivers and/or system computers such as a flight management computer and typically provides inputs to the FGS.
Alert Height (AH)	A height above the runway based on the characteristics of the aircraft and its fail operational (FO) landing system, above which a Category (CAT) III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the FO landing system, or in the relevant ground equipment (International Civil Aviation Organization (ICAO) Doc 9365-AN/910, Manual of All Weather Operations).
All Weather Operations (AWO) (ICAO Definition)	Any surface movement, takeoff, departure, approach, or landing operations in conditions where visual reference is limited by weather conditions.
Automatic Go-Around	A go-around that is accomplished by an autopilot following pilot selection and initiation of the “go-around” autopilot mode.
Availability	An expectation that systems or elements required for an operation will be available to perform their intended functions so that the operation will be accomplished as planned to an acceptable level of probability.
Balked Landing	A discontinued landing attempt. Term is often used in conjunction with aircraft configuration or performance assessment, as in “balked landing climb gradient.” Also, see “Rejected Landing.”
CAT I (FAA)	An instrument approach operation with a minimum descent altitude (MDA), decision altitude (DA), or decision height (DH) not lower than 200 feet (60 m) and with either a visibility not less than ½ SM, or a Runway Visual Range (RVR) not less than 1800 feet (550 m).
CAT I (ICAO)	Any precision approach and landing operation with a DA/H of 60 m (200 feet) or higher and with a minimum visibility of 550 m RVR or greater will be termed a Standard CAT I operation.
CAT II (FAA)	A precision instrument approach operation with a DH lower than 150 feet but not lower than 100 feet and a RVR not less than 1000 feet.

CAT II (ICAO)	Standard CAT II operations are made to a DA/H below 60 m (200 feet), but not lower than 30 m (100 feet), with associated RVRs ranging from 550m (1800 feet) to 300 m (1000 feet).
CAT III (FAA)	A precision instrument approach or approach and landing with a DH lower than 100 feet (30 m), or no DH, or a RVR less than 1000 feet (300 m).
CAT IIIa (ICAO)	A precision instrument approach and landing operation with a DH lower than 30 m (100 feet) or no DH and an RVR not less than 175 m (600 feet).
CAT IIIb (ICAO)	A precision instrument approach and landing operation with a DH lower than 15m (50 feet) or no DH and an RVR lower than 175m (600 feet) but not less than 50m (200 feet).
CAT IIIc (ICAO)	A precision instrument approach and landing with no DH and no RVR limitations.
Combined Vision System (CVS)	A combination of synthetic and enhanced systems. Some examples of a CVS include database-driven synthetic vision images combined with real-time sensor images superimposed and correlated on the same display. This includes selective blending of the two technologies based on the intended function of the CVS.
Contaminated Runway	A runway is considered contaminated when more than 25 percent of the runway surface area (within the reported length and width being used) is covered by standing water (greater than 1/8 inch or 3 mm), frost, ice, and any depth of snow, slush, or heavy rubber deposits. Refer to AC 25-32.
Decision Altitude (DA)	A specified altitude in approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. (Adapted from ICAO IS&RP Annex 6). The “altitude” value is typically measured by a barometric altimeter or equivalent (e.g., inner marker (IM)) and is the determining factor for minima for CAT I instrument approach procedures (IAP). The “height” value specified in parenthesis is typically a radio altitude equivalent height above the touchdown zone (TDZ) (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain.
Decision Height (DH)	A specified height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established (Adapted from ICAO IS&RP Annex 6). For CAT II and certain CAT III procedures (e.g., when using an FP auto flight system), the DH (or an equivalent IM position fix) is the controlling minima, and the altitude value specified is advisory. The altitude value is available for cross reference. Use of a barometrically referenced DA for CAT II is not currently authorized

	for part 121, 129, or 135 operations at U.S. facilities (Adapted from ICAO IS&RP Annex 6).
Design Eye Box	The three-dimensional volume in space surrounding the design eye position from which the Head-Up Display (HUD) information can be viewed.
Design Eye Position	The position at each pilot's station from which a seated pilot achieves the optimum combination of outside visibility and instrument scan.
Desired Flightpath	The path that the pilot, or pilot and Air Traffic Service (ATS), expect the aircraft to fly.
Dispatcher	An airman certificated under 14 CFR part 65 who exercises joint responsibility with the pilot in command (PIC) in the safe conduct of flight(s) in connection with any civil aircraft in air commerce (Refer to AC 120-101, Part 121 Air Carrier Operational Control). For the purposes of this document, the term "dispatcher" refers to a person or persons exercising operational control over a flight other than the flightcrew.
Dry Runway	A runway is dry when it is neither wet nor contaminated. For purposes of condition reporting and airplane performance, a runway can be considered dry when no more than 25 percent of the runway surface area (within the reported length and the width being used) is covered by visible moisture or dampness, frost, slush, snow (any type), or ice. Refer to AC 25-32.
Enhanced Flight Vision System (EFVS)	An installed aircraft system that uses an electronic means to provide a display of the forward external scene topography (the natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, including but not limited to Forward Looking Infrared (FLIR), millimeter wave radiometry, millimeter wave radar, or low-light level image intensification. An EFVS includes the display element, sensors, computers and power supplies, indications, and controls. Refer to AC 90-106.
Enhanced Vision System	An electronic means to provide the flightcrew with a sensor-derived or sensor-enhanced image of the external scene (e.g., millimeter wave radar or FLIR). Refer to AC 90-106.
External Visual References	Information the pilot derives from visual observation of "real world" external cues outside the flight deck.
Extremely Improbable	A probability of occurrence on the order of 1×10^{-9} or less per hour of flight, or per event (e.g., takeoff, landing).
Extremely Remote	A probability of occurrence between the orders of 1×10^{-9} and 1×10^{-7} per hour of flight, or per event (e.g., takeoff, landing).

Fail Operation System	A system capable of completing the specified phases of an operation following the failure of any single system component after passing a point designated by the applicable safety analysis (e.g., AH).
Fail Passive (FP) System	A system that, in the event of a failure, causes no significant deviation of aircraft flightpath or attitude.
Field of View (FOV)	As applied to an HUD, the angular extent of the display that can be seen from within the design eye box.
Frequent	Occurring more often than 1 in 1000 events or 1000 flight hours.
Final Approach Course (FAC)	The final bearing/radial/track of an instrument approach leading to a runway, without regard to distance. For certain previously designed approach procedures that are not aligned with a runway, the FAC bearing/radial/track of an instrument approach may lead to the extended runway centerline, rather than to alignment with the runway.
Final Approach Fix (FAF)	The fix from which the final approach to an airport is executed. For standard procedures that do not involve multiple approaches segments intercepting the runway centerline near the runway, the FAF typically identifies the beginning of the straight-in Final Approach Segment (FAS).
Final Approach Point (FAP)	The point applicable to instrument approaches other than xLS, with no depicted FAF (e.g., on-airport very high frequency omni-directional range (VOR) or Non-Directional Beacon (NDB)), where the aircraft is established inbound on the FAC from a procedure turn, and where descent to the next procedurally specified altitude, or to minimum altitude, may be commenced.
Final Approach Segment (FAS)	The approach segment beginning at the FAF and ending at the point at which the missed approach segment starts (e.g., missed approach point (MAP) or point of lowest nominal DA/DH).
Flight Guidance System (FGS)	The means available to the flightcrew to maneuver the aircraft in a specific manner either manually or automatically. It may include a number of components such as the autopilot, flight directors (F/D), and relevant display and annunciation elements, and it typically accepts inputs from the airborne navigation system.
Flight Path Angle Reference Cue (FPARC)	Pilot selectable reference cue on the pitch scale displaying the desired approach angle.
Flight Path Vector (FPV)	A symbol on the primary display (HUD or primary flight display (PFD)) that shows where the aircraft is actually going, the sum of all forces acting on the aircraft.
GBAS Landing System (GLS)	A differential Global Navigation Satellite System (GNSS) (e.g., GPS) based landing system providing both vertical and lateral position fixing capability.

	Note: Term may be applied to any GNSS based differentially corrected landing system providing lateral and vertical service for approach and landing equivalent to or better than that provided by a U.S. Type I instrument landing system (ILS), or equivalent ILS specified by ICAO Annex 10.
Glide Path (GP)	A descent profile determined for vertical guidance during a final approach.
Glideslope (GS)	Part of the ILS that projects a radio beam upward at an angle of approximately 3 degrees from the approach end of an instrument runway. The glideslope provides vertical guidance to aircraft on the FAC for the aircraft to follow when making an ILS approach along the Localizer (LOC) path.
Global Positioning System (GPS)	The GNSS operated by the U.S. Department of Defense (DOD). It is a satellite-based radio navigation system composed of space, control, and user segments. The space segment is composed of satellites. The control segment is composed of monitor stations, ground antennas, and a master control station. The user segment consists of antennas and receiver-processors that derive time and compute a position and velocity from the data transmitted from the satellites.
Global Navigation Satellite System (GNSS)	A worldwide position, velocity, and time determination system that uses one or more satellite constellations.
Guidance	Information used during manual control or monitoring of automatic control of the aircraft that is of sufficient quality to be used by itself for the intended purpose.
Go-Around	A transition from an approach to a stabilized climb.
Head-Up Display (HUD)	An aircraft system that provides head-up guidance to the pilot during flight. It includes the display element, sensors, computers and power supplies, indications, and controls. It may receive inputs from an airborne navigation system or FGS.
Hybrid System	A combination of two or more systems of dissimilar design used to perform a particular operation.
ICAO 2D Approach Operation	An instrument approach operation that utilizes only lateral guidance but does not utilize vertical guidance.
ICAO 3D Approach Operation	An instrument approach operation that utilizes both lateral and vertical guidance.
ICAO Type A	An instrument approach operation to a minimum DH or a DH at or above 75 m (250 feet).
ICAO Type B	An instrument approach operation to a DH below 75 m (250 feet) Type B instrument approach operations are further categorized as CAT I, II, and III defined above.

Independent System	A system that is not adversely influenced by the operation, computation, or failure of some other identical, related, or separate system (e.g., two separate ILS receivers).
Integrity	A measure of the acceptability of a system, or system element, to contribute to the required safety of an operation.
Instrument Landing System (ILS) Critical Area	A critical area is a specific ground area near a radiating LOC or glideslope antenna array, which must be protected from aircraft and vehicle parking and the unlimited movement of surface and air traffic, to ensure the continuous integrity of the signal received by the user aircraft.
Irregular Terrain	The guidance material in ICAO Annex 14, Volume I, makes reference to the maximum slopes of pre-threshold terrain that are normally acceptable when planning a new runway on which operations are to include coupled approaches and automatic landing. However, radio altimeter inputs may also be required when the airplane is on final approach as much as 8 km (5 NM) from touchdown.
Landing	For the purpose of this AC, landing will begin at 100 feet, the DH, or the AH, to the first contact of the wheels with the runway.
Landing Rollout	For the purpose of this AC, rollout starts from the first contact of the wheels with the runway and finishes when the airplane has slowed to a safe taxi speed (in the order of 30 knots).
Lower Landing Minimums (LLM) Program	A term used to describe special equipment and performance standards of an aircraft maintenance program for aircraft authorized to conduct low visibility approach and landing operations.
Minimum Descent Altitude (MDA)	A specified altitude in a non-precision approach or circling approach below which descent must not be made without the required visual reference. MDA is referenced to mean sea level. (ICAO IS&RP Annex 6).
Missed Approach	The flightpath followed by an aircraft after discontinuation of an approach procedure and initiation of a go-around.
Monitored HUD	A HUD that has internal or external capability to reliably detect erroneous sensor inputs or guidance outputs, to ensure that a pilot does not receive incorrect or misleading guidance, failure, or status information.
Navigational Aid (NAVAID)	Any visual or electronic device, airborne or on the surface, which provides point-to-point guidance information or position data to aircraft in flight.
New Technology Demonstration (NTD)	Formerly known as Proof of Concept (PoC), the NTD process is a generic demonstration that an equivalent or acceptable level of safety is provided. NTD is conducted in a full operational environment of

	facilities, weather, crew complement, airborne systems and other relevant parameters. NTD is to show concept validity in terms of performance system reliability, repeatability, and typical pilot response to failure. NTD may be established by a combination of analysis, FFS and/or flight demonstrations in an operational environment.
Non-Normal Conditions	Conditions other than those considered normal conditions (e.g., failure conditions, certain kinds of error conditions).
Notice to Airmen (NOTAM)	A notice distributed by means of telecommunication containing information concerning the establishment, condition, or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations (ICAO IS&RP Annex 6).
Performance	A measure of the accuracy with which an aircraft, a system, or an element of a system operates compared against specified parameters. Performance demonstration(s) typically include the component of Flight Technical Error (FTE).
Proof of Concept (PoC)	See NTD.
CAT I Landing Minima with Reduced Lighting (RVR 1800)	CAT I landing minima as low as RVR 1800 to approved runways without TDZ lights and/or runway centerline lights, including runways with installed but inoperative TDZ lights and/or runway centerline lights. These operations are authorized by an operations specification (OpSpec), MSpec, or letter of authorization (LOA) and require the use of F/Ds, autopilot, or HUD to DA. Special provisions may apply to single-pilot operations.
Redundant	The presence of more than one independent means for accomplishing a given function or flight operation. Each means need not necessarily be identical.
Rejected Landing	A discontinued landing attempt. A rejected landing typically is initiated at low altitude, but prior to touchdown. If from or following an instrument approach it typically is considered to be initiated below DA/DH or MDA. A rejected landing may be initiated in either Visual Meteorological Conditions (VMC) or Instrument Meteorological Conditions (IMC). A rejected landing typically leads to or results in a "Go-Around" and if following an instrument approach, a "Missed Approach." If related to consideration of aircraft configuration(s) or performance it is sometime referred to as a "Balked Landing.".
Remote	A probability of occurrence greater than 1×10^{-7} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
Required Visual Reference	That section of the visual aids or of the approach area that should have been in view for sufficient time for the pilots to have made an

	assessment of the aircraft's position and rate of change of position, in relation to the desired flightpath. In CAT III operations with a DH, the required visual reference is that specified for the particular procedure and operations (Refer to ICAO IS&RP Annex 6, DH definition, Note 2).
Special Authorization (SA) CAT I	SA CAT I (SA CAT I) approach operations are conducted with a DH as low as 150 feet and a visibility minima as low as RVR 1400.
SA CAT II	SA CAT II (SA CAT II) approach operations are conducted with a DH as low as 100 feet and a visibility minima as low as RVR 1200.
Special Instrument Approach Procedure (IAP)	Non-part 97 instrument procedures. Special Procedures authorized by The Flight Technologies and Procedures Division for specific qualified operators' use are not published in the Federal Register and are identified as "Special Procedures."
Standard Instrument Approach Procedure (SIAP)	Part 97 prescribes SIAPs to civil airports in the United States and the weather minima that apply to landings under instrument flight rules (IFR) at those airports.
Synthetic Reference	Information provided to the crew by instrumentation or electronic displays. May be either command or situation information.
Synthetic Vision System (SVS)	An electronic means to display a synthetic vision image of the external scene topography to the flightcrew. Synthetic vision creates an image relative to terrain and airport within the limits of the navigation source capabilities (position, altitude, heading, track, and the database limitations). SVS provides situation awareness but cannot be used in lieu of natural vision.
Synthetic Vision Guidance System (SVGS)	An integrated system of geospatially correct synthetic vision display, guidance, and trajectory elements which supports operations to published approach minima less than standard CAT I precision approach minima.
Takeoff Guidance System	A system that provides directional command guidance to the pilot during a takeoff, or takeoff and aborted takeoff. It includes sensors, computers, power supplies, indications, and controls.
Threshold Crossing Height (TCH)	The height of the straight line extension of the glide path above the runway at the threshold.
Touch Down Zone (TDZ)	The first 3000 feet of usable runway for landing, unless otherwise specified by the FAA, or other applicable ICAO or State authority (e.g., for Short Takeoff and Landing (STOL) aircraft, or in accordance with a Special Federal Aviation Regulation (SFAR)).

Wet Runway	A runway is wet when it is neither dry nor contaminated. For purposes of condition reporting and airplane performance, a runway can be considered wet when more than 25 percent of the runway surface area (within the reported length and the width being used) is covered by any visible dampness or water that is ⅛ inch (3 mm) or less. **Note:** A damp runway that meets this definition is considered wet, regardless of whether or not the surface appears reflective. Refer to AC 25-32.

Acronyms

Acronym	Expansion
14 CFR	Title 14 of the Code of Federal Regulations
AC	Advisory Circular
ACARS	Aircraft Communications Addressing and Reporting System
ACS	Airman Certification Standards
AD	Airworthiness Directive
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
AED	FAA Aircraft Evaluation Division
AFCS	Automatic Flight Control System
AFDS	Autopilot Flight Director System
AFM	Airplane Flight Manual
AGL	Above Ground Level
AH	Alert Height
AIM	Aeronautical Information Manual
AIP	Aeronautical Information Publication
ALP	Airport Layout Plan
ALS	Approach Light System
ALSF	Approach Lighting System With Sequenced Flashing Lights
AP	Autopilot
APM	Aircrew Program Manager
APU	Auxiliary Power Unit
AQP	Advanced Qualification Program
ATIS	Automatic Terminal Information Service

ATS	Air Traffic Service
AWO	All Weather Operations
BITE	Built-In Test Equipment
CAA	Civil Aviation Authority
CAMP	Continuous Airworthiness Maintenance Program
CASS	Continuing Analysis and Surveillance System
CAT	Category
CDL	Configuration Deviation List
CFR	Code of Federal Regulations
CL	Centerline Lights
CMO	FAA Certificate Management Office
CMU	FAA Certificate Management Unit
CVS	Combined Vision System
DA	Decision Altitude
DA/DH	Decision Altitude/Decision Height
DER	Designated Engineering Representative
DFDR	Digital Flight Data Recorder
DH	Decision Height
DME	Distance Measuring Equipment
DOD	Department of Defense
EADI	Electronic Attitude Director Indicator
EASA	European Aviation Safety Agency
EFVS	Enhanced Flight Vision System
EGPWS	Enhanced Ground Proximity Warning System
EHSI	Electronic Horizontal-Situation Indicator

ETOPS	Extended Operations
EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FAC	Final Approach Course
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Segment
FCOM	Flightcrew Operating Manual
F/D	Flight Director
FDR	Flight Data Recorder
FFS	Full Flight Simulator
FGS	Flight Guidance System
FLIR	Forward Looking Infrared Sensor
FO	Fail Operational
FOV	Field of View
FP	Fail Passive
FPARC	Flight Path Angle Reference Cue
FPV	Flight Path Vector
FSB	Flight Standardization Board
FTE	Flight Technical Error
FTIP	Foreign Terminal Instrument Procedures
GA	Go-Around
GBAS	Ground Based Augmentation System
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System

GP	Glide Path
GPA	Glidepath Angle
GPWS	Ground Proximity Warning System
GPS	Global Positioning System
GS	Glideslope
GSIA	Glide Slope Intercept Altitude
HAA	Height Above Aerodrome
HAT	Height Above Touchdown
HGS	Head-Up-Guidance System
HIRL	High Intensity Runway Light
HUD	Head-up Display
IAP	Instrument Approach Procedure
IAW	In Accordance With
ICA	Instructions for Continued Airworthiness
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
INS	Inertial Navigation System
IRS	Inertial Reference System
IRU	Inertial Reference Unit
LLM	Lower Landing Minimums
LNAV	Lateral Navigation
LOA	Letter of Authorization

LOC	[ILS] Localizer
LVO	Low-Visibility Operations
MagVar	Magnetic Variation
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MAP	Missed Approach Point
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
METAR	Meteorological Terminal Aviation Routine Weather Report
MIPS	Military Instrument Procedures Standardization
MLS	Microwave Landing System
MM	Middle Marker
MMEL	Master Minimum Equipment List
MMR	Multi-Mode Receiver
M/M/S	Make, Model, and Series
MOA	Memorandum of Agreement
Mos	Months
MRB	Maintenance Review Board
MSL	Mean Sea Level [altitude reference datum]
MSpecs	Management Specifications
NA	Not Authorized or Not Applicable
NAS	National Aerospace System
NAVAID	Navigational Aid
ND	Navigation Display
NDB	Non-Directional Beacon
NOAA	National Oceanic and Atmospheric Administration

NOTAM	Notice to Airman
NRS	National Resource Specialist
NTD	New Technology Demonstration
NWS	National Weather Service
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OE	Operating Experience
OEM	Original Equipment Manufacturer
OM	Outer Marker
OpSpecs	Operations Specifications
OSA	Operational Safety Assessment
OSR	Operational Safety Review
OTS	Other Than Standard
OUSD	Operational Use Suitability Demonstration
PAI	Principal Avionics Inspector
PAPI	Precision Approach Path Indicator
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
PAR	Precision Approach Radar
PF	Pilot Flying
PFC	Porous Friction Course [runway surface]
PFD	Primary Flight Display
PIC	Pilot in Command
PIREP	Pilot Weather Report
PM	Pilot Monitoring
POI	Principal Operations Inspector

PMI	Principal Maintenance Inspector
PRM	Precision Radar Monitor
PTS	Practical Test Standards
PVASI	Pulsating Visual Approach Slope Indicator
QFE	Altimeter Setting referenced to airport field elevation
QNE	Altimeter Setting referenced to standard pressure (1013.2 HPa or 29.92 INHG)
QNH	Altimeter Setting referenced to airport ambient local pressure
QRH	Quick Reference Handbook
RA	Radar Altimeter
RAIL	Runway Alignment Indicator Light System
RCL	Runway Centerline Lighting
REIL	Runway End Identification Lights
RNP	Required Navigation Performance
RSA	Runway Safety Area
RTO	Rejected Takeoff
RVR	Runway Visual Range
RWY	Runway
SA	Special Authorization
SB	Service Bulletin
SBAS	Satellite-Based Augmentation System
SFAR	Special Federal Aviation Regulations
SFL	Sequence Flasher Lights
SIAP	Standard Instrument Approach Procedure
SIC	Second in Command
SM	Statute Mile

SMGCS	Surface Movement Guidance and Control System
SMS	Safety Management System
SSALR	Simplified Short Approach Lighting System with Runway Alignment Indicator Lights
SSALS	Simplified Short Approach Lighting System
STC	Supplemental Type Certificate
STOL	Short Takeoff and Landing
SVGS	Synthetic Vision Guidance System
SVS	Synthetic Vision System
TAF	Terminal Aerodrome Forecast
TAWS	Terrain Awareness and Warning System
TC	Type Certificate
TCH	Threshold Crossing Height
TDZ	Touchdown Zone
TERPS	Terminal Instrument Procedures
USAF	United States Air Force
USN	United States Navy
VASI	Visual Approach Slope Indicator
VDA	Vertical Descent Angle
VFR	Visual Flight Rules
VGSI	Visual Glide Slope Indicator
VHF	Very High Frequency
VOR	VHF Omni-directional Radio Range
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
V_1	Takeoff Decision Speed

V_{ef}	Engine Failure Speed
V_{mcg}	Ground Minimum Control Speed
xLS	Generic term used to denote any landing system with lateral and vertical guidance (e.g., ILS or GLS)
VS	Visibility Sensor
WebOPSS	Web-based Operations Safety System

APPENDIX 2. ENGINE INOPERATIVE CATEGORY (CAT) II/III APPROACH OPERATIONS

1. General. Low visibility landing operations are typically based on normal operations to the authorized approach minima. Use of an engine inoperative configuration is based on the premise that the engine non-normal condition is an engine failure that has not adversely affected systems necessary to establish CAT II/III flight guidance configuration. Operators may be authorized for engine inoperative CAT III and/or CAT II via operations specification (OpSpec)/MSpec/letter of authorization (LOA), only if the provisions below are met.

a. Aircraft demonstrated to meet the engine inoperative provisions of AC 20-191, and which have an appropriate reference to engine inoperative CAT II/III capability in the FAA-approved Airplane Flight Manual (AFM), are typically considered to meet the CAT II/III provisions of this appendix.

b. The AFM or equivalent reference must suitably describe the demonstrated approach and missed approach performance for the engine inoperative configuration, and the aircraft must meet pertinent criteria otherwise required for all-engine CAT II, CAT III or equivalent criteria. This performance data should also be available in the automated flight planning, performance, and weight and balance systems normally used by the operator so as to be readily available to the pilot and, if applicable, the aircraft dispatcher so as:

(1) To ensure a safe landing capability, in the anticipated configuration and with anticipated speeds; and

(2) To establish safe go-around capability from decision altitude (DA)/decision height (DH) or Alert Height (AH). Some missed approach climb gradients may make the use of AC 120-91 for alternate flight track development for an engine inoperative configuration a necessity. Refer to AC 120-91 for further guidance on this process.

c. Aircraft with an AFM stating only an all-engine CAT II/III capability (i.e., no reference to engine inoperative CAT II/III capability) may be operationally demonstrated for an engine inoperative CAT II/III capability in accordance with AC 20-191 and AC 25-7.

d. Even if the aircraft, flightcrew(s), and operator(s) are authorized for engine inoperative CAT II/III, flightcrews are not required to use CAT II/III approach minima to satisfy requirements of § 121.565 regarding in-flight diversions. Pilots may elect to take a safer course of action by landing at a more distant airport than one at which a CAT II/III approach may be available. Conversely, pilots may elect to conduct the CAT II/III approach as a safe or the safest course of action. Having this aircraft capability should not be interpreted as requiring a CAT II/III landing at the “nearest suitable” airport. (i.e., does not require landing at the nearest suitable CAT II/III qualified airport).

e. In instances when CAT II/III engine inoperative operations are not authorized by OpSpec, but a CAT II/III approach is necessary, the flightcrew may use emergency authority.

f. The low weather minima capability of the aircraft in an emergency/non-normal situation must be known and available to the flightcrew and aircraft dispatcher. When using emergency

authority, and in non-normal operations, flightcrews and aircraft dispatchers are expected to take the safest course of action.

2. Qualification for Engine Inoperative CAT II/III.

a. For demonstration of engine inoperative capabilities, refer to AC 20-191 for additional information. When assessing engine-out CAT II or CAT III capability, the following exceptions to all-engine operations criteria may be used:

(1) The effects of a second engine failure when conducting CAT II or CAT III operations with an engine inoperative need not be considered, except for a demonstration that the airplane remains controllable when the second engine fails;

(2) Crew intervention to re-trim the aircraft to address thrust asymmetry following engine loss may be permitted;

(3) Alternate electrical and hydraulic system redundancy provisions may be acceptable, as suited to the type design (e.g., bus isolation and electrical generator remaining capability must be suitable for the engine out configuration);

(4) Requirements to show acceptable approach or landing performance may be limited to demonstration of acceptable performance during engine-out flight demonstrations (e.g., a safe approach to minima or a safe landing on the runway); and

(5) Approach or landing system "status" should accurately or conservatively reflect the aircraft configuration and capability. Aircraft limitations and manufacturer's recommendations may further limit aircraft capabilities.

b. Suitable information about flight guidance system (FGS) capability must be available to the flightcrew in flight, particularly at the time of a "continuation to destination" or "diversion to alternate" decision. This allows a determination of an adequate CAT II or CAT III approach capability when the approach is initiated (e.g., non-normal checklist specification of expected configuration during approach, autopilot, flight director (F/D) or autoland status annunciation of expected mode capability).

c. System performance should be demonstrated in appropriate weather conditions considering winds and any other relevant factors to determine whether any weather-related restrictions or limitations are necessary.

d. Performance information for an operator to ensure a successful go-around with an inoperative engine should be made available to the operator via the AFM and operational procedures. Examples of acceptable performance information are contained in Chapter 5 of AC 20-191.

3. Engine Inoperative CAT II or CAT III Operational Authorization.

a. Principal operations inspectors (POI) should ensure that the following conditions are met before authorizing Engine Inoperative CAT II or CAT III:

(1) Operations must be in accordance with the "engine inoperative CAT II" and/or "engine inoperative CAT III" AFM provisions (e.g., within demonstrated wind limits, using appropriate crew procedures), or within operationally determined equivalent provisions and procedures, if not specified in the AFM.

(2) Demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources and minimum equipment list (MEL) provisions).

(3) Weight, altitude, and temperature limits must be established, and engine-inoperative missed approach obstacle clearance from the touchdown zone (TDZ) must be ensured. This data should be readily available for flight planning (e.g., to the aircraft dispatcher) either by predetermined certification listing or through appropriate engine-inoperative programming in automated flight planning and performance systems.

(4) Appropriate training program provisions for the CAT II or III engine inoperative approaches must be provided (see Chapter 5).

(5) Pilots must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances or unusual conditions occur that are not addressed by the "engine-inoperative" CAT II or III demonstrated configuration (e.g., uncertain aircraft damage, possible fire, or weather deterioration).

b. OpSpecs should identify the type or types of "engine-inoperative" CAT II or III operations authorized. Types of operations are described in paragraphs below:

(1) CAT II/III Engine Failure During Approach, at or After AH or DA/DH. If an engine fails after passing the AH or DA/DH, the procedure specified in the AFM for normal or non-normal operations should be followed.

(2) CAT II/III Engine Failure During Approach Prior to AH or DA/DH and/or CAT II or III Engine Inoperative En Route. One or both of these types of operations may be authorized under the following conditions:

(a) If the aircraft, operator, and flightcrew meet the provisions of paragraph a above;

(b) The pilot and/or dispatcher have taken into account the landing runway length needed for the inoperative engine configuration and corresponding approach speeds, and obstacle clearance can be maintained in the event of a missed approach;

(c) The pilot and/or dispatcher have determined that the approach can be conducted within the wind, weather, configuration, or other relevant constraints demonstrated for the configuration;

(d) The pilot and/or dispatcher have determined from interpretation of the best available information that the runway is expected to be free from standing water, snow, slush, ice, or other contaminants; and

(e) The aircraft has not experienced damage related to the engine failure that would make an engine inoperative CAT II or III approach unsuccessful or unsafe.

(3) CAT II or III Engine Inoperative "Flight Planning." The operator (e.g., pilot or, if applicable, aircraft dispatcher) may consider "engine inoperative CAT II" or "engine inoperative CAT III" capability in planning flights for a takeoff alternate, en route (ETOPS) alternate, re-dispatch alternate, destination, or destination alternate only if each of the following conditions are met:

(a) If the aircraft, operator, and flightcrew meet the provisions of paragraph b above.

(b) Weather reports or forecast must indicate that specified alternate minima or landing minima will be available for the runway equipped with approved CAT II or III systems and procedures. The operator's use of engine inoperative capability credit should consider both the availability and reliability of meteorological reports and forecasts, the time factors involved in potential forecast accuracy, the potential for variability in the weather at each pertinent airport, and the ability for the crew and, if applicable, aircraft dispatcher to obtain timely weather reports and forecast updates during the time the flight is en route. Flight planning considerations must account for any expected Air Traffic Service (ATS) delays that might be experienced during arrival due to weather, snow removal, or other factors.

(c) Notices to Airmen (NOTAM) or equivalent information for airport and facility status are reviewed prior to dispatch to ensure that they do not preclude the accomplishment of a safe engine inoperative approach on the designated runway using approved CAT II or III procedures (e.g., temporary obstructions). Any change in NOTAM status of facilities related to use of landing minima or alternate minima must be available to the crew while en route.

(d) When engine inoperative CAT II/III provisions are applied to identification of any destination or destination alternate, more than one qualifying destination alternate should be considered (e.g., § 121.619). This is to provide for the possibility of adverse area-wide weather phenomena or unexpected loss of landing capability at the first designated alternate airport.

(e) Criteria otherwise applicable to "all engine" CAT II/III, such as flightcrew or dispatcher training, crew qualification, and availability of suitable procedures, must also be addressed for the engine inoperative landing case, if they are not the same as for the "all engine" case.

(f) An appropriate ceiling and visibility increment is added to the lowest authorized minima and specified in the operator's OpSpec.

4. Operators Using Combined CAT II/III Engine-Inoperative Approach Provisions. Unless otherwise specified by the FAA, CAT II and III engine inoperative authorizations and procedures may be combined when the operator meets the more stringent criteria for CAT III. Separate demonstrations for CAT II and III are not necessary beyond any inherent differences between CAT II and III operations (e.g., application of a DA/DH for CAT II versus an AH for certain CAT III operations). Operational suitability demonstration programs, qualification programs, and operational provisions may be simultaneously established and used as long as procedures and systems applicable to the respective CAT II and III capability and minima are

appropriately applied. Eligible minima for any particular engine-inoperative operation should be no lower than the highest applicable authorized minima for the aircraft, flightcrew, airport, procedure, or applicable OpSpecs limitation.

APPENDIX 3. STANDARD OPERATIONS/MANAGEMENT SPECIFICATIONS (OPSPECS/MSPECS) AND LETTERS OF AUTHORIZATION (LOA)

1. General. For the purposes of examination and viewing standard OpSpec formatting, this appendix provides an example of paragraph C060. C060 is one of the standard OpSpecs issued for operations described in this AC. Standard OpSpecs developed by FAA Flight Standards Service, Washington D.C., are specific to each operator and issued by their responsible Flight Standards office. This responsible Flight Standards office will incorporate necessary, specific information applicable to that operator, their fleet of aircraft, and/or any specific operational environment or requirements (e.g., areas of operation). Current versions of any OpSpec sought by an operator may be found via the Web-based Operations Safety System (WebOPSS) located at https://webopss.faa.gov/Policy.aspx?redirect=%2fTemplates%2fTemplateViewer.aspx.

2. Contact Information. Operators may contact their responsible Flight Standards office or the Flight Technologies and Procedures Division to attain the most current templates of applicable OpSpecs or MSpecs. The Flight Technologies and Procedures Division may be contacted at (202) 267-8795.

3. C060 CAT II and III Instrument Approach and Landing Operations.

Sample OpSpec C060, Category II and Category III Instrument Approach and Landing Operations: 14 CFR Part 121

a. The certificate holder is authorized to conduct [CAT II/CAT II and CAT III] instrument approach and landing operations as authorized below using the limitations, provisions, procedures, and minimums specified in this paragraph.

b. Authorized Approach and Landing Minimums. The certificate holder is authorized to conduct the operations in subparagraph a using TDZ, mid, and rollout RVR minimums no lower than those prescribed for the specific make, model, and series (M/M/S) of airplane listed below in Table 1 for CAT II operations and, if applicable, Table 2 for CAT III operations.

(1) For CAT II operations, TDZ RVR reports must be no lower than the approach chart minimums.

[Select the applicable text from the following options. If CAT III operations are authorized, select option 1; if CAT III operations are not authorized, select option 2. An option must be selected.]

O (2) For all CAT III operations, TDZ and mid RVR reports must be no lower than the approach chart minimums.

OR

O (2) CAT III operations are not authorized.

(3) Operations must be conducted in accordance with RVR report requirements in subparagraph d.

Table 1 – CAT II Airplane Systems and Landing Minimums

Airplane M/M/S	Approach/ Landing System*	DH	TDZ/Mid/RO RVR	Special Operational Equipment and Limitations
	Autopilot HUD FP HUD Autoland	150 DH 100 DH	1600/600/300 1200/600/300 1000/600/300	

Note: * The term HUD assumes Manual HUD, HUD = CAT II certified Head-Up Display; FP HUD = CAT III certified Head-Up Display; FP = Fail Passive Landing or Rollout Control System; NA = Not Applicable.

Table 2 – CAT III Airplane Systems and Landing Minimums

Airplane M/M/S	Approach/ Landing System*	Rollout System*	DH/ AH	TDZ/Mid/RO RVR	Special Operational Equipment and Limitations
	FP HUD FP Autoland FO Autoland	None FP FO	50 DH 30 DH 200 AH 100 AH 50 AH	700/700/300 600/600/300 600/400/300 400/400/300 300/300/300	

Note: * FP HUD = CAT III certified Head-Up Display; FP = Fail Passive Landing or Rollout Control System; FO = Fail Operational Landing or Rollout Control System; NA = Not Applicable.

a. Required Airborne Equipment. The flight instruments, radio navigation equipment, and other airborne systems required by the applicable section of 14 CFR and the FAA-approved AFM for the conduct of the operations authorized above in subparagraph a must be installed and operational. Any additional airborne equipment that is required must be operational and listed in Table 1 and, if applicable, Table 2.

b. Required RVR Reports. The certificate holder is authorized to conduct the operations described above in Table 1 and, if applicable, Table 2, if the following requirements for RVR reports are met. Only RVR reports for the runway of intended landing may be used.

(1) For all CAT II operations:

(a) All available RVR reports are controlling.

(b) The TDZ RVR report is required.

(c) The mid RVR report is not required.

(d) The rollout RVR report is required for all operations at 1200 RVR and below, except as specified in subparagraph d(1)(e).

(e) If the mid and rollout RVR reports are unavailable, the TDZ report must be at least 1400 RVR. If the rollout RVR report is unavailable, a mid or far end RVR report may be substituted. Mid RVR reports substituted for unavailable rollout reports must be 600 RVR or greater; far end reports substituted for unavailable rollout reports must be 300 RVR or greater. Far end RVR reports are advisory unless substituted for the rollout RVR report.

[Select the applicable text from the following options. If CAT III operations are authorized, select option 1; if CAT III operations are not authorized, select option 2. An option must be selected.]

O (2) For all CAT III operations:

(a) All available RVR reports are required and controlling, except as specified below in subparagraphs d(2)(b), (c), and (d).

(b) For operations using an FP landing system with an FP or FO rollout system, either the mid or rollout RVR reporting system may be temporarily inoperative.

(c) For operations using an FO landing system with an FP or FO rollout system, any one RVR reporting system may be temporarily inoperative.

(d) Where four RVR reporting systems are installed (i.e., TDZ, mid, rollout, and far end sensors), the far end RVR report may provide advisory information to pilots or may be substituted for the rollout RVR report if that is not available.

(e) If the landing or rollout system degrades from FO to FP or the rollout system fails, the certificate holder is authorized to conduct operations in accordance with its MEL and AFM, using minimums no lower than those shown below (subparagraphs d(2)(e)(i)–(iii)) corresponding to the type of landing and/or rollout systems operable after the failure.

(i) Rollout system fails: TDZ and mid RVR reports no lower than 600 RVR.

(ii) FP landing system operable with FP or FO rollout system: TDZ RVR report no lower than 600 RVR and mid RVR report, if available, no lower than 400 RVR.

(iii) FO landing system with FP rollout system operable: TDZ and mid RVR reports, if available, no lower than 400 RVR.

OR

O (2) CAT III operations are not authorized.

e. Pilot Qualifications and Approved Training Programs. The minimums prescribed in this operations specification are authorized only for those pilots in command (PIC) and seconds in command (SIC) who have completed the certificate holder's approved training program and who

are qualified for the operations authorized above in subparagraph a by one of the certificate holder's check pilots or an FAA inspector.

f. CAT II Operations.

(1) The CAT II approach systems listed in Table 1 must be used at least to the approach procedure DH for standard CAT II operations.

(2) Unless authorized otherwise, standard CAT II minimums are TDZ 1200 RVR.

[Select option 1 to authorize TDZ 1000 RVR CAT II, or option 2 to authorize Special Authorization (SA) CAT II, or option 3 to authorize both TDZ 1000 RVR CAT II and SA CAT II, as applicable. It is not required to select an option.]

O (3) TDZ 1000 RVR CAT II. The certificate holder is authorized to conduct standard CAT II operations to TDZ 1000 RVR. However, a CAT II approach to TDZ 1000 RVR minimums requires use of an autoland system or an FP HUD to be flown to touchdown.

OR

O (3) Special Authorization (SA) CAT II. The certificate holder is authorized to conduct CAT II operations on certain ILS facilities that do not meet the equipment requirements of a U.S. Standard or International Civil Aviation Organization (ICAO) Standard CAT II (e.g., European Other Than Standard (OTS) CAT II approaches).

(a) Runway and approach lighting required in subparagraphs g(1)(c) and (d) below are modified for SA CAT II as follows:

(i) Runway lights: High Intensity Runway Lights (HIRL).

(ii) Approach lights: Approach Lighting System with Sequenced Flashing Lights (ALSF), simplified short approach lighting system with runway alignment indicator lights (SSALR), simplified short approach lighting system (SSALS), or medium intensity approach lighting system with runway alignment indicator lights (MALSR). Sequence flashing lights (SFL) may be inoperative.

(b) An SA CAT II approach requires use of an autoland system or an FP HUD. Either system must be flown to touchdown. These minimums may be no lower than 1200 RVR.

(c) For a standard CAT II instrument approach, if TDZ and/or centerline (CL) lighting are inoperative or the ALSF approach lights are operating in an SSALR or SSALS configuration, the certificate holder is authorized to conduct operations under this SA CAT II subparagraph. (This only applies to U.S.-based approaches.)

OR

O (3) TDZ 1000 RVR CAT II. The certificate holder is authorized to conduct standard CAT II operations to TDZ 1000 RVR. However, a CAT II approach to TDZ 1000 RVR

minimums requires use of an autoland system or an FP HUD to be flown to touchdown.

O (4) Special Authorization (SA) CAT II. The certificate holder is authorized to conduct CAT II operations on certain ILS facilities that do not meet the equipment requirements of a U.S. Standard or International Civil Aviation Organization (ICAO) Standard CAT II (e.g., European Other Than Standard (OTS) CAT II approaches).

(a) Runway and approach lighting required in subparagraphs g(1)(c) and (d) below are modified for SA CAT II as follows:

(i) Runway lights: High Intensity Runway Lights (HIRL).

(ii) Approach lights: Approach Lighting System with Sequenced Flashing Lights (ALSF), simplified short approach lighting system with runway alignment indicator lights (SSALR), simplified short approach lighting system (SSALS), or medium intensity approach lighting system with runway alignment indicator lights (MALSR). Sequence flashing lights (SFL) may be inoperative.

(b) An SA CAT II approach requires use of an autoland system or an FP HUD. Either system must be flown to touchdown. These minimums may be no lower than 1200 RVR.

(c) For a standard CAT II instrument approach, if TDZ and/or centerline (CL) lighting are inoperative or the ALSF approach lights are operating in an SSALR or SSALS configuration, the certificate holder is authorized to conduct operations under this SA CAT II subparagraph. (This only applies to U.S.-based approaches.)

g. Operating Limitations. The certificate holder must not begin the Final Approach Segment (FAS) of an IAP authorized in subparagraph a unless the latest controlling RVR reports for the landing runway are at or above the minimums authorized for the operation being conducted and all of the following conditions are met:

(1) The following ground-based equipment must be operational:

(a) Localizer (LOC) and glideslope (GS).

(b) Outer marker or DME facility used to define the FAF.

Note: A published waypoint or minimum GS intercept altitude fix may be used in lieu of an outer marker or DME fix.

(c) Runway lights: TDZ lights, centerline (CL) lights, High Intensity Runway Lights (HIRL), or foreign equivalent.

(d) Approach lights: Approach Lighting System with Sequenced Flashing Lights (ALSF), simplified short approach lighting system with runway alignment indicator lights (SSALR), simplified short approach lighting system (SSALS), or foreign equivalent. Sequence flashing lights (SFL) may be inoperative.

(e) The crosswind component on the landing runway is less than the AFM crosswind limitations, or 15 knots or less, whichever is more restrictive.

(f) Once established on the FAS, all operations conducted using automatic rollout systems or FP HUD rollout guidance may continue if any RVR report decreases below the authorized minimums.

(g) For CAT II Radar Altimeter minimums Not Authorized (RA NA)-only, an inner marker to identify the DH.

(2) The certificate holder must not conduct landing operations to any runway using autoland or FP HUD systems listed above in Table 1 or, if applicable, Table 2, unless the certificate holder determines that the flight control guidance system being used provides safe automatically (autoland) or manually (FP HUD) flown approaches and landings to be conducted at that runway.

(3) All CAT III and CAT II to 1000 RVR landing and subsequent ground operations must be conducted in accordance with the airport's low visibility operations plan (e.g., U.S. Surface Movement Guidance and Control System (SMGCS), European Aviation Safety Agency (EASA), or ICAO criteria for CAT III operations).

[Only select this text if CAT III operations are authorized.]

(4) CAT III operations may be commenced or continued even if the approach lights become inoperative.

h. Missed Approach Requirements. A missed approach must be initiated when any of the following conditions exist:

(1) For all CAT II operations:

(a) After passing the FAF, the approach guidance system or any other airborne equipment required for the particular CAT II operation being conducted becomes inoperative or is disengaged.

(b) Before arriving at DH, any of the required elements of the CAT II ground system becomes inoperative.

(c) At the DH, if the pilot has not identified the required visual references with the TDZ or TDZ lights to verify that the airplane will touch down in the TDZ.

(d) If, after passing the DH, visual reference is lost or a reduction in visual reference occurs, which prevents the pilot from continuing to verify that the airplane will touch down in the TDZ.

Note: If the certificate holder is authorized enhanced flight vision system (EFVS) operations under 14 CFR Part 91, § 91.176(a), the certificate holder may use the EFVS to meet the visual reference requirements of subparagraphs h(1)(c) and (d)

above, but must still comply with all RVR and other limitations of this CAT II authorization.

[Select the applicable text from the following options. If CAT III operations are authorized, select option 1; if CAT III operations are not authorized, select option 2. An option must be selected.]

O (2) For all CAT III operations:

(a) If the pilot determines that touchdown cannot be safely accomplished within the TDZ.

(b) When any of the required runway lighting elements becomes inoperative prior to arriving at DH or alert height (AH), or prior to touchdown for airplanes without a rollout system.

(c) When any GS or LOC failure occurs prior to touchdown.

(d) The crosswind component at touchdown is greater than 15 knots or greater than the AFM's crosswind limitations, whichever is more restrictive.

(e) When a failure in an FP landing system occurs prior to touchdown, or a failure occurs in an FO system before reaching the AH.

(f) For CAT III operations without a rollout control system, no later than DH, if any controlling RVR is reported below the lowest authorized minimums.

(g) For CAT III operations using an FP landing system without a rollout control system or airplanes using an FP landing system and FP rollout control system:

(i) At the DH, if the pilot has not identified the required visual references with the TDZ or TDZ lights to verify that the airplane will touch down in the TDZ.

(ii) If, after passing the DH, visual reference is lost or a reduction in visual reference occurs, which prevents the pilot from continuing to verify that the airplane will touch down in the TDZ.

Note: If the certificate holder is authorized EFVS operations under § 91.176(a), the certificate holder may use the EFVS to meet the visual reference requirements of subparagraphs h(2)(g)(i) and (ii) above, but must still comply with all RVR and other limitations of this CAT III authorization.

OR

O (2) CAT III operations are not authorized.

i. Foreign Airports. The certificate holder is authorized to conduct the operations in subparagraph a at only those specifically approved runways at foreign airports listed in Table 3 below.

Table 3 – Foreign Airports and Runways

Approach Category, Airport Name/Identifier, Runway(s)	Limitations

j. Runway Restrictions. The certificate holder is authorized to conduct the operations in subparagraph a using autoland or FP HUD landing systems into the restricted U.S. facilities listed in Table 4 below.

Table 4 – Restricted/Nonstandard U.S. Facilities

Approach Category, Airport Name/Identifier, Runway(s)	Limitations

k. Maintenance. The certificate holder must maintain the airplanes and equipment listed above in Table 1 and, if applicable, Table 2, in accordance with its approved Lower Landing Minimums (LLM) maintenance or inspection program.

l. Engine Inoperative Operations. The certificate holder is approved for operations authorized in subparagraph a with an inoperative engine using the airplanes and limitations specified in Table 5 below.

Table 5 – Engine Inoperative Operations

Airplane M/M/S	Operational Authorization	Limitations

[Select the following text, if applicable.]

m. Hybrid CAT III Operations. The certificate holder is authorized to conduct CAT III operations using Autoland and Head-Up-Guidance Systems (HGS) together as a Hybrid Landing system. All Hybrid CAT III operations must be conducted in accordance with the approved Hybrid Landing system training programs, operating manuals, and maintenance programs. CAT III Hybrid operations may be conducted to minimums as low as TDZ RVR 400 (125m), mid RVR 400 (125m) and rollout RVR 300 (75m), in accordance with subparagraph b.

APPENDIX 4. IRREGULAR TERRAIN ASSESSMENT

1. General. The following information describes the operational evaluation process, procedures, and criteria used in approving flight guidance systems (FGS) (e.g., autoland or Head-Up Display (HUD)) supporting Category (CAT) II/III procedures and minima at restricted airports. These airports have irregular underlying approach terrain and are identified on the FAA website under Restricted/Nonstandard U.S. Facilities Approved for Category II/III Operations at http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs400/afs410/cat_ils_info/.

a. This appendix describes the general evaluation process, procedures, and criteria to be applied during irregular terrain assessments. Since circumstances often are unique in assessing aircraft/FGS/site performance, this summary represents an acceptable method to determine acceptable performance at these "special terrain airports." It is not the only method that may be proposed by the FAA or an applicant. Credit may be applied for relevant testing by the manufacturer for similar airborne systems or for performance at similar locations (e.g., subsequent irregular terrain airport approvals). Certain aircraft/FGS combinations may require more extensive testing when an aircraft may exhibit unique characteristics at a particular runway (e.g., transient Radio Altimeter failure indication due to disagreement or unlock, inappropriate auto throttle response, inconsistent flare performance).

b. For aircraft not using autoland for CAT II operations, this evaluation consists primarily of ensuring availability of an appropriate method for identification of decision altitude (DA)/decision height (DH) (e.g., assessing acceptable radio altimeter indications approaching and at DA/DH, or substituting use of inner marker (IM) in lieu of radio altimeter). Assessing acceptable radio altimeter indications is done by ensuring sufficient radio altimeter display readout stability and continuity to easily read the radio altimeter when approaching DA/DH and at DA/DH, while over-flying the irregular underlying terrain. This assessment may typically be done during operations using weather minima no lower than CAT I, or may be based on operations at that runway by that operator with an equivalent radio altimeter installation (e.g., previously in a B-757, for new B-767 operations), or may be based on other U.S. operators who have completed an assessment using the same aircraft type and radio altimeter system combination, or equivalent.

c. Accordingly, before establishing test requirements with a manufacturer or operator for irregular terrain airports or particular runways, the proposed evaluation plan should be coordinated with the Flight Technologies and Procedures Division. This should be done prior to any testing or data collection agreement by the operator's principal operations inspector (POI) or principal avionics inspector (PAI).

2. FGS Evaluation Process at Irregular Terrain Airports or Runways Proposed for CAT II/III Autoland or HUD to Touchdown Procedures or Minima.

a. Case I—First of a Type/Model at Any Irregular Terrain Airport/Runway. Case I concerns the first time a particular aircraft type/model is to be approved for any irregular terrain airport/runway (e.g., the first B-787 autoland approval at any irregular terrain airports listed on

the Restricted/Nonstandard U.S. Facilities Approved for Category II/III Operations spreadsheet on the FAA website).

(1) Evaluation Objective. Assess and verify normal FGS performance from an operational perspective, and identify miscellaneous factors needed for a safe CAT II/III Autoland or HUD to touchdown operation (e.g., Alert Height (AH) or DH identification).

(2) Procedure. Perform at least four to six successful evaluation landings (in nonrevenue service) in typical atmospheric conditions regarding wind and turbulence, using the applicable operational aircraft configuration, with a representative aircraft from the fleet (e.g., a typical aircraft maintained using routine maintenance practices, not specially configured, not specially tested, or otherwise not specially selected from the operator's fleet). If the FGS may be susceptible to an uncertain performance characteristic (e.g., long flare in a tailwind condition, pitch/throttle coupling oscillation during flare) the evaluation should take place when the system may be put to an appropriate test of the applicable crosswind, tailwind, headwind, wind gradient, or other critical condition applicable, consistent with the operator's proposed conditions or limits and the Airplane Flight Manual's (AFM) demonstrated conditions or limits.

Confirm the initial assessment of four to six data recorded evaluation landings, with subsequent successful initial operational landings (typically the first 15 or more) as reported by the operator (e.g., data recording or other special observation, other than by the regularly assigned flightcrew, is not required).

(3) Evaluator(s). A person qualified to assess FGS function and performance should conduct these evaluations as the FAA observer (e.g., typically a CAT II/III Autoland or HUD to touchdown qualified and experienced aircrew program manager (APM) of a CAT II/III authorized operator, a qualified Aircraft Evaluation Division representative, or an appropriate FAA national resource specialist (NRS)). The FAA may designate other suitably qualified representatives to assess FGS function and performance as necessary (e.g., suitably qualified check pilot, fleet manager, FAA Designated Engineering Representative (DER)).

(4) FGS Performance/Data Recording. Generally, some form of quantitative data should be recorded and reviewed as verification of performance. Past methods of data collection include, but are not limited to, the three methods below or any combination:

(a) Method A - Data Recording and Observation. Record pertinent FGS performance data using a digital flight data recorder (DFDR), quick-reference recorder, or equivalent that has ability to record the parameters shown below. The recording should be at a sufficiently high sample rate (e.g., at a rate > 1 sample per second), for the part of the flightpath of interest (typically from 300 feet height above touchdown (HAT) through de-rotation after touchdown).

- Barometric altitude,
- Radio altitude,
- Radio altitude rate,
- Glide path error,
- Vertical speed,

- Elevator command,
- Pitch attitude,
- Throttle position,
- Airspeed, and
- Mode transition or engagement.

Manual observations may be made for touchdown point (lateral, longitudinal), wind profile from 1000 feet to surface (e.g., from an inertial navigation system (INS) or IRS that is capable of displaying winds at typical approach speeds).

(b) Method B - Review of Manufacturer's Data. A review of the manufacturer's data from FGS development flight testing at the same irregular terrain runway, or equivalent, may be used to confirm items shown in (5) below.

(c) Method C - Photo Recording. Photo recording of pertinent instruments or instruments and outside view, with a video camera or equivalent, allowing post flight replay and review of indications noted in Method A above.

(5) Data Review and Analysis. The final approach, flare, and touchdown profile should be reviewed to ensure suitability of at least each of the following:

(a) Suitability of the resulting flightpath;

(b) Acceptability of any flightpath displacement from the nominal path (e.g., glide path deviation, deviation from nominal flare profile);

(c) Proper mode switching;

(d) Suitable touchdown point;

(e) Suitable sink rate at touch down;

(f) Proper flare initiation altitude;

(g) Suitable flare "quality" (e.g., no evidence of early or late flare, no over-flare or under-flare, no undue "pitch down" tendency at flare initiation or during flare, no flare oscillation, no abrupt flare, no inappropriate pitch response during flare, no unacceptable floating tendency, or other unacceptable characteristic that a pilot could interpret as failure or inappropriate response of the FGS and disconnect, disregard, or contradict the FGS);

(h) No unusual flight control displacements (e.g., elevator control input spikes, or oscillations);

(i) Appropriate throttle retard (e.g., no early or late throttle retard, no failure to retard, no undue reversal of the retard, no undue pitch/throttle coupling);

(j) Appropriate speed decay in flare (e.g., no unusually low speed risking high pitch attitude and tail strike, no excessive float, appropriate speed decay even if well above V_{REF} at flare initiation due to planned wind or gust compensation); and

(k) Proper mode initiation or mode transition relating to altitude or radio altitude inputs (e.g. crosswind alignment initiation).

(6) Miscellaneous Issues.

(a) Determine acceptability of any variable radio altitude indications. Regarding AH or DH identification, determine the acceptability of any variable radio altitude indications or displays (e.g., considering variability due to underlying terrain variability in the last stage of the approach near AH or DH). Ensure that display indications are sufficiently stable and continuous to readily identify or define AH or DH. If an IM is used to establish AH or DH, determine if the IM function is adequate.

(b) Address any anomalies occurring during the assessment (e.g., autopilot trip, firm landing, flare oscillation, etc.). Additional testing may be needed to clearly identify and resolve any particular problem(s).

(c) Determine if special training or other operational constraints are needed to accommodate peculiar approach or flare characteristics (e.g., require visual reference at flare initiation, apply a 50 feet DH).

(d) Authorization for use should occur only after repeated successful landings have been demonstrated and any anomalies experienced have been resolved.

b. Case II - First of a Type/Model at Any Subsequent Irregular Terrain Airport/Runway. Case II concerns a particular type/model of aircraft previously approved at one of the irregular terrain airports, now seeking initial approval at a different irregular terrain airport/runway. (e.g., the first B-767 autoland approval at KPIT RWY 10L, after being previously approved at KSEA).

(1) Evaluation Objective. Same as Case I.

(2) Procedure. Same as Case I.

(3) Evaluator(s). Same as Case I.

(4) FGS Performance/Data Recording. Data recording is generally not required. However, if the results of landings are marginal or unacceptable, the data recording and assessment procedures applicable to Case I may be needed to assess any remedial action required.

(5) Data Review and Analysis. Same as Case I.

(6) Miscellaneous Issues. Same as Case I.

c. Case III - Subsequent Operator Use of a Particular Irregular Terrain Airport/Runway and Type Combination. Case III concerns an operator seeking approval for a particular irregular terrain airport/runway using an aircraft type/model previously approved by a different operator. (e.g., ABC airline requests approval of B-757 operations at KDEN RWY 34R. This combination was previously demonstrated and approved by XYZ airlines).

The responsible Flight Standards office (e.g., POI, PAI, APM) may review a request for an operator to use a particular irregular terrain airport/runway and aircraft type, and with Flight Operations Branch concurrence, approve subsequent airline operation of a particular type at that irregular terrain airport/runway. Any authorization should be based on 15 or more successful "line" landings reported by the operator requesting authorization, in weather conditions not requiring credit for FGS system use. During this reporting period, the operator should not experience any unsuccessful landing attempts or failures. If problems or failures are encountered, then Case II or Case I procedures may be needed to resolve potential unique aircraft configuration, procedural, maintenance, or other effects that may be hindering successful operations.

d. Case IV – "Not-For-Minima Credit" Use of Irregular Terrain Airport/Runway and Type Combinations.

(1) "Not-For-Credit" use of "Irregular Terrain Airport/Runway and Type Combinations" applies to operators desiring to use an FGS (e.g., autoland or Flight Guidance HUD) at an Irregular Terrain Airport/Runway, but not for any landing minima credit (i.e., CAT I autoland or HUD to touchdown only).

(2) In this instance, a representative of the responsible Flight Standards office may evaluate the use during first line operations or specify that an operator representative (e.g., technical pilot, qualified management pilot, or check pilot who is experienced with FGS operation and performance) assess and verify adequate FGS performance. This assessment should be completed prior to initiating routine operational use of the FGS to touchdown at each "Irregular Terrain" runway. It is desirable, but not necessary, that a qualified APM, or equivalent, witness each "irregular terrain airport" evaluation.

(3) The responsible Flight Standards office should request and review FGS reports from line crews for at least the first five line landings to confirm appropriate performance. If problems occur, processes for Cases I through IV may be needed to resolve problems depending on the severity and cause of problem (e.g., maintenance problem, unusual winds, lack of Air Traffic Service (ATS) critical area protection, problem with a modification to the FGS, use of a different associated component, such as substitution of a different and incompatible radio altimeter model).

(4) "Not-For-Credit" evaluation. A "Not for Credit" evaluation may be done in line operation as long as no previous reported problems have been noted with the same or similar aircraft type, and no Notices to Airmen (NOTAM) or other restrictions preclude such operations. If problems have been reported for the same or similar type, treatment as Case I through III, as applicable above, may be appropriate.

NOTE: Unless otherwise restricted by an operator or the responsible Flight Standards office, FGS operations "Not-for-Minima-Credit" may generally be conducted on any instrument landing system (ILS) runway that does not have a restricting note on the approach plate (e.g., Localizer (LOC) unusable for rollout, glideslope unusable below xxx feet above ground level (AGL)), and that has an adequate threshold crossing height (TCH) suitable for the aircraft type. If problems are noted in the operator's evaluation, the operator should specify that FGS use should not be accomplished at that site to touchdown. This may be done through a flightcrew bulletin or equivalent. Conversely, an operator may publish a list of runways approved for FGS use to touchdown, or through rollout.

Advisory Circular Feedback Form

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by contacting the Flight Technologies and Procedures Division at 9-AWA-AFS400-Coord@faa.gov or the Flight Standards Directives Management Officer at 9-AWA-AFS-140-Directives@faa.gov.

Subject: AC 120-118, Criteria for Approval/Authorization of All Weather Operations (AWO) for Takeoff, Landing, and Rollout

Date: _____

Please check all appropriate line items:

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows:

_____

_____

☐ In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

_____

_____

☐ Other comments:

_____

_____

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____