Source Basis:
- Administrative.

4-21 GENERAL. This section contains direction and guidance to be used by certification teams and inspectors when approving operator requests for air navigation operations. Inspectors approve these operations by issuing appropriate operations specifications (OpSpecs) paragraphs in part B. Except for Class I navigation, the approval process normally requires validation testing (see paragraph 4-29). This section provides guidance specifically related to air navigation requirements.

4-22 SUBJECT FAMILIARIZATION AND APPROVAL REQUIREMENTS.

A. Subject Familiarization. Once an operator has requested approval for air navigation operations, it is essential that inspectors fully understand the concepts, national policies, standard practices, direction, and guidance related to the area of proposed operations. In addition, specialists are available to assist principal inspectors (PI) in understanding, evaluating, and approving air navigation operations.

B. Processing Initial Requests. When processing initial requests for any air navigation operations involving Class II navigation, certification teams and PIs must request guidance from a specialist in the Flight Operations Group (AFS-410) of the Flight Technologies and Procedures Division (AFS-400), or the International Program Division (AFS-50), for Letter of Authorization (LOA) applications for operators based outside the United States (see Volume 12). Certification teams and PIs must also request guidance from a specialist for any operations involving Special Areas of Operation (SAO) (e.g., Required Navigation Performance (RNP), North Atlantic High Level Airspace (NAT HLA), or West Atlantic Route System (WATRS)).

4-23 DETERMINING THE CLASS OF NAVIGATION. The first determination that must be made concerning an air navigation approval request is the category of operation proposed. The inspector must determine whether the proposed operation is Class I navigation, Class II navigation, or both. The decisive factor in this determination is the operational service volume of International Civil Aviation Organization (ICAO) standard ground-based navigational aids (NAVAID) within the proposed area of operation. If the minimum en route flight altitudes specified and the locations of the ICAO standard ground-based NAVAIDs ensure that the flight will always be within the operational service volume, the entire en route operation is Class I navigation. In situations where the entire area of operation (at the minimum flight altitude specified) is outside (beyond) the operational service volume of ICAO standard ground-based NAVAIDs, the operation is Class II navigation. When portions of the proposed area of operation are continuously within the operational service volumes of ICAO standard ground-based NAVAIDs, those portions are Class I navigation and the remaining portions are Class II navigation (see Volume 4, Chapter 1, Sections 3 and 4 for indepth discussions of Class I and
Class II navigation). The Global Positioning System (GPS) has been accepted by ICAO as a NAVAID; however, for purposes of defining Class II navigation, a distinction is made between standard ground-based NAVAIDs and GPS, which has (for all intents and purposes) an unrestricted operational service volume. Class II navigation is outside the operational service volume of ground-based NAVAIDs.

A. Flight Altitude. It is important to understand that the minimum flight altitude is a key factor in the determination of the category of navigation (Class I or Class II). The operational service volume of a particular standard ground-based NAVAID is heavily influenced by flight altitude. For example, at high altitudes (above flight level (FL) 180), most very high frequency omni-directional range (VOR) stations have an operational service volume that extends to a radius of at least 130 nautical miles (NM) from the facility. However, at low altitudes (below 10,000 feet mean sea level (MSL)), the operational service volume of many VORs seldom exceeds 40 NM. Therefore, it is highly probable that for a route length of 260 NM between VORs, operations above FL 180 would be Class I navigation, and operations conducted below 10,000 feet MSL would include both Class I and Class II navigation. The Class II navigation portion would begin at the edge of the operational service volume of the first VOR and end at the edge of the operational service volume of the second VOR. If the inspector determines that the proposal only involves Class I navigation, the direction and guidance in Volume 4, Chapter 1, Section 3 will be used. If the proposal involves both Class I and Class II navigation, the direction and guidance in Volume 4, Chapter 1, Sections 3 and 4 will be used for evaluation and approval or denial of the proposal.

NOTE: Refer to the Aeronautical Information Manual (AIM) for a more extensive discussion of operational service volume.

B. Range of Standard Ground-Based NAVAIDs. Generally, determination of the exact range (operational service volume) of the ground-based NAVAIDs intended to be used is not necessary. For example, a flight departing from the continental United States with a destination in Europe would obviously perform Class I and Class II navigation and require equipment appropriate for both. In other situations, it can be readily determined that flight operations will be conducted entirely within the operational service volume of standard ground-based NAVAIDs. However, sometimes a determination of the exact range of a NAVAID is required to evaluate compliance with the requirement for a reliable fix once each hour. NAVAID operational service volumes in the United States are published in the applicable Chart Supplement. Refer to Federal Aviation Administration (FAA) Order 6050.32, Spectrum Management Regulations and Procedures Manual, for more details.

C. Foreign/Remote Operations. In foreign countries and in oceanic/remote areas, determining the operational service volume of ground-based NAVAIDs is more complex. In general, VOR and VOR/distance measuring equipment (DME) routes and fixes published in those areas are within the operational service volume (or foreign equivalent) of the ground-based NAVAIDs specified. However, some Air Traffic Service (ATS) routes based on Nondirectional Radio Beacons (NDB) in oceanic/remote areas include considerable portions that are outside the standard service volume. The standard service volume (or coverage) of high-powered NDBs seldom exceeds 75 NM. NDBs on published airways generally have been evaluated by flight inspection to have an officially designated extended service volume, consistent with the length of
the published airway. National/regional Aeronautical Information Publications (AIP) and foreign flight inspection offices are the best and most up-to-date sources of information on the operational service volume of these NAVAIDs.

4-24 **SPECIAL OPERATIONS.** After determining whether a particular operation is Class I navigation, Class II navigation, or a combination of both, another important step is to determine if the operation involves any specific navigation authorizations to operate into SAOs, or will use equipment or special navigation techniques.

A. **SAOs.** Examples of SAOs include the following:

- Areas of magnetic unreliability (AMU).
- Polar operations.
- NAT HLA.
- Canadian MNPS airspace.
- Central East Pacific (CEP) airspace.
- North Pacific (NOPAC) airspace.
- Pacific Organized Track System (PACOTS).
- Restricted international areas.
- Arctic Ocean or Antarctic Ocean.
- WATRS and the Caribbean Sea.
- South Atlantic (Atlantic routes).
- Gulf of Mexico control areas (Gulf routes).
- RNP X (X is the value in NM associated with an airspace or route that requires a specific RNP).

B. **Special Navigation Equipment.** Examples include:

- Private (non-Federal) NAVAIDs or broadcast stations (refer to Title 14 of the Code of Federal Regulations (14 CFR) part 171, Non-Federal Navigation Facilities).
- Area Navigation (RNAV).
- Inertial navigation systems (INS) and inertial reference systems (IRS).
- GPS.

C. **Special Navigation.** Methods of special navigation include the following:

- Pilotage,
- Dead reckoning,
- Use of a flight navigator,
- Celestial navigation,
- Free gyro or grid, and
- Heading reference.
4-25 NAVIGATION EQUIPMENT.

A. Written Aircraft Eligibility Documentation. In all cases, it is necessary for the operator to provide written aircraft eligibility documentation that explicitly states that the aircraft is properly certificated, equipped, and maintained to perform the required functions for the specific type of navigation and other requirements related to any special operation (referred to in paragraph 4-24 above).

1) The written evidence may take the form of a type certificate (TC), Supplemental Type Certificate (STC), Aircraft Flight Manual (AFM), AFM Supplement (AFMS), or Flight Standardization Board Report (FSBR). In certain cases involving SAOs, such as AMU, RNP airspace, and NAT HLA, the airworthiness approval must reflect that these special requirements are also met.

2) The eligible aircraft must have equipment where the aircraft documentation explicitly states that the installation has received airworthiness approval for the type of operations in accordance with a field approval (e.g., FAA Form 337, Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)), Airworthiness Certificate, or other applicable documentation.

3) This determination must be coordinated closely with the Principal Avionics Inspector (PAI). It is FAA policy and guidance that the PIs coordinate with a specialist in AFS-410 (see paragraph 4-22). If the certificate holder or operator is not able to provide the PIs with specific eligibility from the AFM, AFMS, or FSBR, official written equipment eligibility must be attained.

4) If the Flight Standards District Office (FSDO) is unable to determine equipment eligibility from the approved documentation, it should forward the request and supporting data to the appropriate Aircraft Evaluation Division (AED) office. The applicable AED office will verify that the aircraft and equipment meet the criteria for the specific operations and that the system can safely fly the specified operation. That office can also provide written documentation (e.g., amend the FSBR or other official documentation) to verify the eligibility of that equipment.

B. Conventional Navigation Equipment. In the case of Class I navigation with conventional navigation equipment, such as VOR, VOR/DME, or NDB, a statement in the FAA-approved AFM or STC that the navigation system and/or equipment is approved for instrument flight rules (IFR) flight is usually sufficient. For Class I navigation with other types of RNAV equipment, the equipment must be certified for IFR operations and installed and maintained in accordance with the FAA-approved documentation appropriate for that specific RNAV equipment.

C. Area Navigation (RNAV). RNAV provides enhanced navigational capability. RNAV equipment can automatically compute the airplane position, actual track, and ground speed, and then provide meaningful information relative to a route of flight selected by the pilot. Typical equipment will provide the distance, time, bearing, and cross-track error relative to the selected “TO” or “active” waypoint and the selected route. Several RNAV systems with different navigational performance characteristics are capable of providing area navigational functions.
Present-day RNAV equipment is considered to be equipment that operates by automatically determining aircraft position from one or a combination of the following sensors with the means to establish and follow a desired path:

- VOR/DME,
- DME/DME, or
- INS. (INS must be approved under the provision of 14 CFR part 121, § 121.355 and appendix G. This approval is not specifically required for 14 CFR part 135, but the same approval criteria apply.)

1) GPS systems must be approved in accordance with the current editions of:

- Advisory Circular (AC) 20-138, Airworthiness Approval of Positioning and Navigation Systems; and
- Technical Standard Order (TSO) C129, Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS);
- TSO-C145, Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System (SBAS); or
- TSO-C146, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System Augmented by the Satellite Based Augmentation System (SBAS); and
- Other installation criteria.

2) Modern multisensor systems (such as IRS/flight management system (FMS)) can integrate one or more of the above sensors to provide a more accurate and reliable navigational system (refer to AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes).

3) RNAV systems used for visual flight rules (VFR) operations (Class I and/or Class II) must reflect an approval for VFR use. RNAV systems used for IFR Class I navigation (except operations in U.S. Class A airspace) and Class II navigation must reflect a statement that the system meets the reliability and performance criteria, that the system is approved for IFR flight, and if required, approved for any SAOs in accordance with the following ACs and TSOs, as applicable:

- AC 20-138.
- TSO-C129.
- TSO-C145.
- TSO-C146.
4-26 TRAINING PROGRAMS AND MANUALS. Other important areas that must be considered are approved/accepted training programs and approved/accepted company manuals for the equipment used. The training programs and company manuals must adequately address the special characteristics of the proposed area of operation and the operational (navigation) practices and procedures that must be used. Other sections of this chapter provide additional direction and guidance on some specific requirements for training programs and company manuals for the various navigation systems and/or areas of operation.

4-27 MINIMUM EQUIPMENT LISTS (MEL). Additionally, most approvals of navigation equipment and/or areas of operation new to a particular operator also require changes to the company MEL. In all cases, PIs must review the company MEL to ensure that complete and accurate direction and guidance are provided to company personnel.

4-28 NAVIGATION PRACTICES, TECHNIQUES, AND PROCEDURES. Navigation practices, techniques, and procedures are other important parts of the approval process. They are especially significant in long-range navigation systems (LRNS) and in operations using RNAV systems. The approval of these operations almost always necessitates changes in cockpit checklists and operating practices and procedures. Due to the complexity of these operations, the necessary changes must be determined on a case-by-case basis considering the operator, the equipment, and the area of operations.

4-29 VALIDATION TESTING REQUIREMENTS. It is essential for the inspector to evaluate the need for validation testing. In a simple case, such as approving Class I navigation in additional areas within the United States using conventional VOR/DME systems, a validation test is not necessary. However, in more complex cases, validation testing is required to demonstrate the operator’s capability and competence to safely conduct the proposed operation.

4-30 GUIDANCE FOR USE OF AIRCRAFT EQUIPMENT SUFFIXES. For guidance in the use of aircraft equipment suffixes (qualifiers) for air traffic control (ATC) flight plans, refer to the AIM. Any comments or inquiries concerning the criteria and guidance to qualify and use the equipment qualifiers should be directed to AFS-400.

4-31 FAA APPROVAL OF GPS EQUIPMENT AND OPERATIONS.

A. Portable Units. Portable handheld devices are addressed in the AIM, chapter 1.

B. GPS Equipment Classes. GPS equipment is categorized into classes A, B, and C, as described in TSO-C129, TSO-C145, and TSO-C146. Refer to the AIM, chapter 1, for guidance on equipment classes as they relate to authorized IFR operations.

C. Avionics—Initial Installations and Continued Airworthiness. The operator must ensure that the equipment is properly installed and maintained. No special maintenance requirements, other than the standard practices currently applicable to navigation or landing systems, have been identified that are unique to GPS (e.g., Airworthiness Directives (AD) or Service Bulletins (SB)). Documentation must be provided that validates approval of the installed GPS airborne receiver in accordance with AC 20-138, as appropriate, or other applicable airworthiness criteria established for GPS installations.
D. GPS Equipment Approval and Installation for Class II Navigation and Remote Areas. The equipment must be approved by the FAA Aircraft Certification Service (AIR) in accordance with AC 20-138.

E. System Availability. Refer to the AIM, chapter 1, for guidance on system availability and reliability. For operational control restrictions for Class II navigation in oceanic and remote areas:

1) Prior to departure, the operator must use the fault data and exclusion (FDE) prediction program to demonstrate that there are no outages in the capability to navigate the specified route of flight (the FDE prediction program determines whether the GPS constellation is robust enough to provide a navigation solution for the specified route of flight). 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, provides the maximum FDE outages permissible under RNP 2, 4, and 10 operations. Any predicted satellite outages that affect the capability of GPS equipment to provide the navigation function on the specified route of flight requires that the flight be canceled, delayed, or rerouted.

2) Once navigation function is ensured (the equipment can navigate on the specified route of flight), the operator must use the FDE prediction program to demonstrate that the maximum outage of the capability of the equipment to provide fault exclusion for the specified route of flight does not exceed the acceptable duration (fault exclusion is the ability to exclude a failed satellite from the navigation solution).

F. En Route Procedures for GPS Class II Navigation in Oceanic and Remote Areas. Refer to the AIM, chapter 1, and AC 90-100, U.S. Terminal and En Route Area Navigation (RNAV) Operations, for en route procedures.

G. Approved GPS Navigation System. Refer to the AIM, chapter 1, for guidance on using approved GPS systems in lieu of Automatic Detection Finding (ADF) and/or DME.

4-32 FAA APPROVAL OF GPS/WIDE AREA AUGMENTATION NAVIGATION SYSTEMS (WAAS). Refer to the AIM, chapter 1, for guidance on WAAS. Questions concerning the operational approval for en route, terminal, or approach procedures requiring a published RNP should be directed to AFS-410. For operational approval for operations in Alaska:


B. OpSpec B030. This is issued for IFR RNAV en route operations in the State of Alaska and its airspace on published air traffic routes using navigation systems, certified in accordance with TSO-C145 and TSO-C146, as the only means of IFR navigation appropriate for the route to be flown.

RESERVED. Paragraphs 4-33 through 4-50.