

capability, the VOR capability must be independent of the FMS.

[d] To satisfy the requirement for two independent navigation systems, if the primary navigation system is GPS-based, the second system must be independent of GPS (for example, VOR or DME/DME/IRU). This allows continued navigation in case of failure of the GPS or WAAS services. Recognizing that GPS interference and test events resulting in the loss of GPS services have become more common, the FAA requires operators conducting IFR operations under 14 CFR 121.349, 125.203, 129.17 and 135.65 to retain a non-GPS navigation capability consisting of either DME/DME, IRU, or VOR for en route and terminal operations, and VOR and ILS for final approach. Since this system is to be used as a reversionary capability, single equipment is sufficient.

3. Oceanic, Domestic, En Route, and Terminal Area Operations

(a) Conduct GPS IFR operations in oceanic areas only when approved avionics systems are installed. TSO-C196() users and TSO-C129() GPS users authorized for Class A1, A2, B1, B2, C1, or C2 operations may use GPS in place of another approved means of long-range navigation, such as dual INS. (See TBL 1-1-5 and TBL 1-1-6.) Aircraft with a single installation GPS, meeting the above specifications, are authorized to operate on short oceanic routes requiring one means of long-range navigation (reference AC 20-138, Appendix 1).

(b) Conduct GPS domestic, en route, and terminal IFR operations only when approved avionics systems are installed. Pilots may use GPS via TSO-C129() authorized for Class A1, B1, B3, C1, or C3 operations GPS via TSO-C196(); or GPS/WAAS with either TSO-C145() or TSO-C146(). When using TSO-C129() or TSO-C196() receivers, the avionics necessary to receive all of the ground-based facilities appropriate for the route to the destination airport and any required alternate airport must be installed and operational. Ground-based facilities necessary for these routes must be operational.

(1) GPS en route IFR operations may be conducted in Alaska outside the operational service volume of ground-based navigation aids when a TSO-C145() or TSO-C146() GPS/wide area aug-

mentation system (WAAS) system is installed and operating. WAAS is the U.S. version of a satellite-based augmentation system (SBAS).

[a] In Alaska, aircraft may operate on GNSS Q-routes with GPS (TSO-C129 () or TSO-C196 ()) equipment while the aircraft remains in Air Traffic Control (ATC) radar surveillance or with GPS/WAAS (TSO-C145 () or TSO-C146 ()) which does not require ATC radar surveillance.

[b] In Alaska, aircraft may only operate on GNSS T-routes with GPS/WAAS (TSO-C145 () or TSO-C146 ()) equipment.

(2) Ground-based navigation equipment is not required to be installed and operating for en route IFR operations when using GPS/WAAS navigation systems. All operators should ensure that an alternate means of navigation is available in the unlikely event the GPS/WAAS navigation system becomes inoperative.

(3) Q-routes and T-routes outside Alaska. Q-routes require system performance currently met by GPS, GPS/WAAS, or DME/DME/IRU RNAV systems that satisfy the criteria discussed in AC 90-100, U.S. Terminal and En Route Area Navigation (RNAV) Operations. T-routes require GPS or GPS/WAAS equipment.

REFERENCE-

AIM, Paragraph 5-3-4, Airways and Route Systems

(c) GPS IFR approach/departure operations can be conducted when approved avionics systems are installed and the following requirements are met:

(1) The aircraft is TSO-C145() or TSO-C146() or TSO-C196() or TSO-C129() in Class A1, B1, B3, C1, or C3; and

(2) The approach/departure must be retrievable from the current airborne navigation database in the navigation computer. The system must be able to retrieve the procedure by name from the aircraft navigation database. Manual entry of waypoints using latitude/longitude or place/bearing is not permitted for approach procedures.

(3) The authorization to fly instrument approaches/departures with GPS is limited to U.S. airspace.

(4) The use of GPS in any other airspace must be expressly authorized by the FAA Administrator.