



Operation on U.S. Area Navigation (RNAV) Routes, Standard Terminal Arrivals, and Departure Procedures

Background: Advisory Circular (AC) 90–100A, *U.S. Terminal and En Route Area Navigation (RNAV) Operations*, provides guidance for operation on Area Navigation (RNAV) terminal procedures and routes. It also reflects ICAO Performance Based Navigation (PBN) Manual guidance for RNAV 1 and RNAV 2 operations, as well as lessons learned from the initial implementation of US RNAV terminal procedures and routes.

Applicability: AC 90–100A applies to U.S. RNAV routes (Qroutes and Tango routes), Departure Procedures (Obstacle Departure Procedures and Standard Instrument Departures), and Standard Terminal Arrivals (STARs). It does not apply to overwater RNAV routes (ref 14 CFR 91.511, including the Qroutes in the Gulf of Mexico and the Atlantic routes) or Alaska VOR/DME RNAV routes ("JxxxR"). It does not apply to off–route RNAV operations.

List of Compliant Equipment: In developing AC 90–100A, industry and the FAA defined the minimum criteria for RNAV systems to operate on RNAV routes and procedures. Manufacturers evaluate their systems against these criteria and the FAA maintains a current list of compliant equipment, along with AC 90–100A, on the FAA Flight Standards Service, Flight Technologies and Procedures Division, Performancebased Operations Branch (AFS–470) website :

http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs470/media/AC90100compliance.xls

From this list, pilots and operators can confirm the capability of their equipment without additional airworthiness documentation, or obtain information from the relevant manufacturer. RNAV systems incorporating GPS and DME/DME positioning, but not complying with the criteria for DME/DME–based RNAV, may receive RNAV eligibility based solely on GPS.

Database Integrity: Navigation databases should be obtained from a database supplier holding an FAA Letter of Acceptance (LOA) in accordance with AC 20–153. This LOA provides recognition of a data supplier's compliance with the data quality, integrity and quality management practices of RTCA DO–200A, Standards for Processing Aeronautical Data. The operator's supplier (e.g., Flight Management

System (FMS) manufacturer) must have a Type 2 LOA. AC 20–153 contains procedures for database LOAs.

GPS RAIM Prediction: As described in AC 90–100A, paragraph 10.a.(5), if TSO–C129() equipment is used to solely satisfy the RNAV requirement, GPS RAIM availability must be confirmed for the intended route of flight (route and time) using current GPS satellite information. The availability of Space Based Augmentation System (SBAS) or Airborne Based Augmentation System (ABAS) fault detection can be determined through NOTAMs (if available) or through prediction for the intended RNAV 1 or RNAV 2 operation.

NOTE: For multi–sensor aircraft with operating GPS and DME/DME/IRU positioning, a RAIM check is not required as long as critical DME's are functioning normally.

Operators may satisfy the predictive RAIM requirement through any one of the following methods:

1. Operators may monitor the status of each satellite in its plane/slot position, by accounting for the latest GPS constellation status (e.g., NOTAMs or NANUs), and compute RAIM availability using modelspecific RAIM prediction software; or,
2. Operators may use the FAA en route and terminal RAIM prediction website: www.raimprediction.net; or,
3. Operators may contact a Flight Service Station (not DUATS) to obtain non–precision approach RAIM; or,
4. Operators may use a third party interface, incorporating FAA/VOLPE RAIM prediction data without altering performance values, to predict RAIM outages for the aircraft's predicted flight path and times; or,
5. Operators may use the receiver's installed RAIM prediction capability (for TSO–C129a/Class A1/B1/C1 equipment) to provide non–precision approach RAIM, accounting for the latest GPS constellation status (e.g., NOTAMs or NANUs). Receiver non–precision approach RAIM should be checked at airports spaced at intervals not to exceed 60 NM along the RNAV 1 procedures flight track. Terminal or Approach RAIM must be available at the ETA over each airport checked; or,
6. Operators not using model–specific software or FAA/VOLPE RAIM data will need FAA operational approval.

In the event of a predicted, continuous loss of RAIM of more than five (5) minutes for any part of the intended flight, the flight should be delayed, canceled, or rerouted where RAIM requirements can be met. Pilots should assess their capability to navigate (potentially to an alternate destination) in case of failure of GPS navigation.

If TSOC145/C146 equipment is used to satisfy the RNAV requirement, the pilot/operator need not perform the prediction if WAAS coverage is confirmed to be available along the entire route of flight.

NOTE: Outside the U.S. or in areas where WAAS coverage is not available, operators using TSO–C145/C146 receivers are required to check GPS RAIM availability.

The current RAIM prediction website is graphic-based and the FAA is developing automation improvements to this prediction service.

NOTE: Until June 30, 2009, a RAIM prediction does not need to be done for any RNAV route conducted where ATC provides radar monitoring or RNAV departure/arrival procedure that has an associated "RADAR REQUIRED" note charted. On July 1, 2009, operators filing RNAV 1 routes (Q and T), RNAV 1 STARs, and RNAV 1 DP's will need to perform a RAIM prediction as part of their preflight planning.

Performance Based Flight Systems Branch, 1/15/09

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