(c) Navigation Issues. Pilots should be aware of their navigation system inputs, alerts, and annunciations in order to make better−informed decisions. In addition, the availability and suitability of particular sensors/systems should be considered.

(1) GPS/WAAS. Operators using TSO−C129(), TSO−C196(), TSO−C145() or TSO−C146() systems should ensure departure and arrival airports are entered to ensure proper RAIM availability and CDI sensitivity.

(2) DME/DME. Operators should be aware that DME/DME position updating is dependent on navigation system logic and DME facility proximity, availability, geometry, and signal masking.

(3) VOR/DME. Unique VOR characteristics may result in less accurate values from VOR/DME position updating than from GPS or DME/DME position updating.

(4) Inertial Navigation. Inertial reference units and inertial navigation systems are often coupled with other types of navigation inputs, e.g., DME/DME or GPS, to improve overall navigation system performance.

NOTE−
Specific inertial position updating requirements may apply.

(d) Flight Management System (FMS). An FMS is an integrated suite of sensors, receivers, and computers, coupled with a navigation database. These systems generally provide performance and RNAV guidance to displays and automatic flight control systems.

Inputs can be accepted from multiple sources such as GPS, DME, VOR, LOC and IRU. These inputs may be applied to a navigation solution one at a time or in combination. Some FMSs provide for the detection and isolation of faulty navigation information.

When appropriate navigation signals are available, FMSs will normally rely on GPS and/or DME/DME (that is, the use of distance information from two or more DME stations) for position updates. Other inputs may also be incorporated based on FMS system architecture and navigation source geometry.

NOTE−
DME/DME inputs coupled with one or more IRU(s) are often abbreviated as DME/DME/IRU or D/D/I.

(e) RNAV Navigation Specifications (Nav Specs)

Nav Specs are a set of aircraft and aircrew requirements needed to support a navigation application within a defined airspace concept. For both RNP and RNAV designations, the numerical designation refers to the lateral navigation accuracy in nautical miles which is expected to be achieved at least 95 percent of the flight time by the population of aircraft operating within the airspace, route, or procedure. (See FIG 1−2−1.)

(1) RNAV 1. Typically RNAV 1 is used for DPs and STARs and appears on the charts. Aircraft must maintain a total system error of not more than 1 NM for 95 percent of the total flight time.

(2) RNAV 2. Typically RNAV 2 is used for en route operations unless otherwise specified. T-routes and Q-routes are examples of this Nav Spec. Aircraft must maintain a total system error of not more than 2 NM for 95 percent of the total flight time.

(3) RNAV 10. Typically RNAV 10 is used in oceanic operations. See paragraph 4−7−1 for specifics and explanation of the relationship between RNP 10 and RNAV 10 terminology.

1−2−2. Required Navigation Performance (RNP)

a. General. While both RNAV navigation specifications (NavSpecs) and RNP NavSpecs contain specific performance requirements, RNP is RNAV with the added requirement for onboard performance monitoring and alerting (OBPMA). RNP is also a statement of navigation performance necessary for operation within a defined airspace. A critical component of RNP is the ability of the aircraft navigation system to monitor its achieved navigation performance, and to identify for the pilot whether the operational requirement is, or is not, being met during an operation. OBPMA capability therefore allows a lessened reliance on air traffic control intervention and/or procedural separation to achieve the overall safety of the operation. RNP capability of the aircraft is a major component in determining the separation criteria to ensure that the overall containment of the operation is met. The RNP capability of an aircraft will vary depending upon the aircraft equipment and the navigation infrastructure. For example, an aircraft may be eligible for RNP 1, but may not be capable of RNP 1 operations due to limited NAVAID coverage