

## Technology Briefing

Subject: <b>Performance Based Navigation (PBN)</b>	Date: Feb 13, 2017
Distribution: <b>Citation/Beechcraft/Hawker Operators</b>	Revision: 2

**Note: Changes since the last version of this document (Rev 1 – Dec 22, 2015) is the addition of Addendum 1 for European Operations.**

*Note: The following definitions are based upon information contained in the ICAO PBN Manual, Doc 9613, 4<sup>th</sup> Edition, 2013. Part of the challenge in understanding performance-based navigation specifications is that the terminology has changed over time. For example, the navigation specification formerly known as RNP 5 has more recently been designated as RNAV 5 if it does not include a requirement for performance monitoring and alerting. For this reason, it is important to understand the specific technical basis for navigation specifications referenced in Approved Flight Manuals (AFMs) or AFM supplements when determining aircraft eligibility for specific operations.*

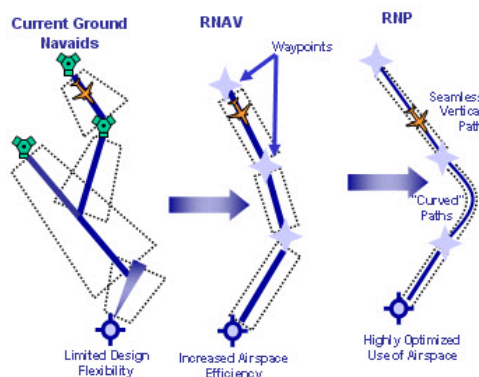
### Definitions

**Global Navigation Satellite System (GNSS)** – Generic term for a system that provides satellite-based navigation services for aircraft, such as GPS (US), GLONASS (Russia), and Galileo (planned system for Europe).

**Space Based Augmentation System (SBAS)** – A system that corrects GNSS navigation signals for regional atmospheric variations in order to further refine an aircraft’s navigation accuracy, both laterally and vertically. Examples of SBAS systems include the Wide Area Augmentation System (WAAS) in North America as well as the European Geostationary Navigation Overlay Service (EGNOS).

**Area Navigation (RNAV)** – A method of airborne navigation that permits aircraft to operate on any desired lateral flight path (i.e. not just navaid-to-navaid) within the coverage of ground- or space-based navigation aids or within the limits of the capability of onboard, self-contained aids [e.g., Inertial Navigation System (INS)], or a combination of these.

**Required Navigation Performance (RNP)** – A statement of the navigation performance necessary for operation on a given route or approach. RNP is area navigation (RNAV) with the addition of onboard performance monitoring and alerting capability to ensure that required navigation accuracy criteria are met.



Source: FAA

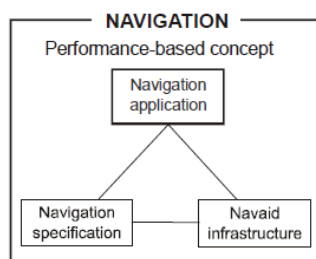
**Actual Navigation Performance (ANP)** – ANP refers to the ability of an aircraft navigation system to calculate its own deviation from the desired flight path. For example, if an aircraft flying along an RNP 1 route calculates its

own ANP deviation to be .2 nm, it is well within the required tolerance of 1 nm. However, if the aircraft calculates an ANP deviation of 1.1 nm, appropriately equipped systems would issue an alert to inform the pilots of the unacceptable deviation.

**Performance Based Navigation (PBN)** – Area navigation (RNAV) with specific, consistently defined lateral navigation accuracy requirements for a given route or approach. PBN represents a shift away from sensor-specific navigation criteria (e.g., VOR, ILS, GPS, etc.) to a performance-based concept that can exist independently of the particular navigation systems employed to achieve the required level of performance. The PBN concept comprises the following elements:

- **Navigation Application** – A navigation application employs a *navigation specification* and an associated *navaid infrastructure* to define a route, instrument approach procedure, or other defined airspace in accordance with a desired airspace concept.
  - **Navigation Specification** – A set of defined navigation requirements to support a particular navigation application within a defined airspace. Examples of navigation specifications include RNAV 1, RNAV 5, RNP 1, RNP 0.3, etc. As applied to PBN, a navigation specification includes the following:
    - Performance required of the RNAV or RNP system in terms of accuracy, integrity, and continuity
    - Which navigation functionalities the RNAV or RNP system must have
    - Which navigation sensors must be integrated into the RNAV or RNP system
    - What requirements are placed on the flight crew
  - **Navaid Infrastructure** – Ground-based (e.g., VOR, DME) or space-based (GNSS) navigation aids employed to support a given navigation application.

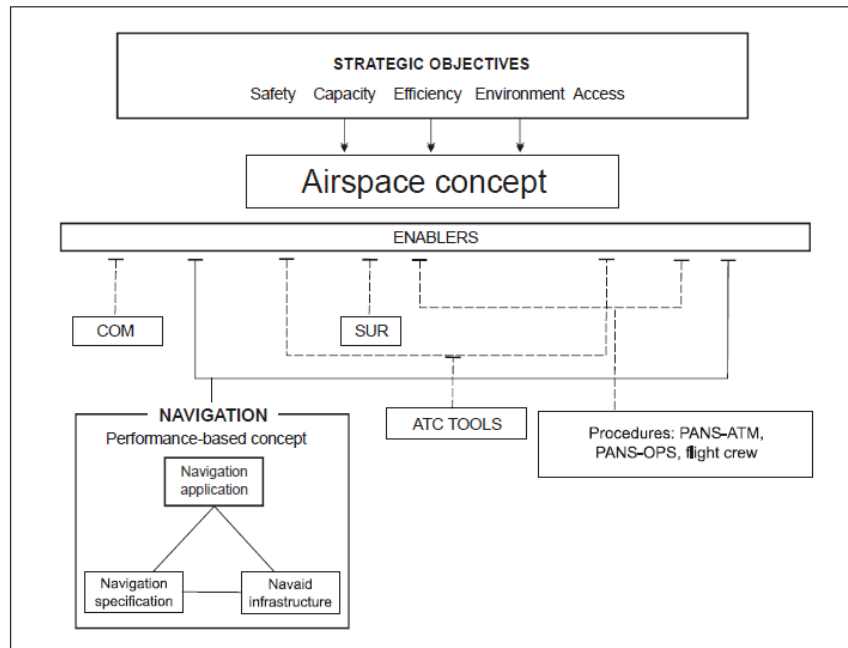
**Relationship Between PBN Elements (i.e., between Navigation Application, Navigation Specification, and Navaid Infrastructure)** – A navigation application includes a navigation specification and an associated navaid infrastructure, which can differ in different airspace concepts. For example, a navigation specification in one airspace concept might involve RNAV 1 (navigation specification) based upon SBAS (navaid infrastructure), whereas a navigation concept in another airspace concept might involve RNAV 1 (navigation specification) based upon DME/DME/IRU (navaid infrastructure).



Source: ICAO PBN Manual, 2013

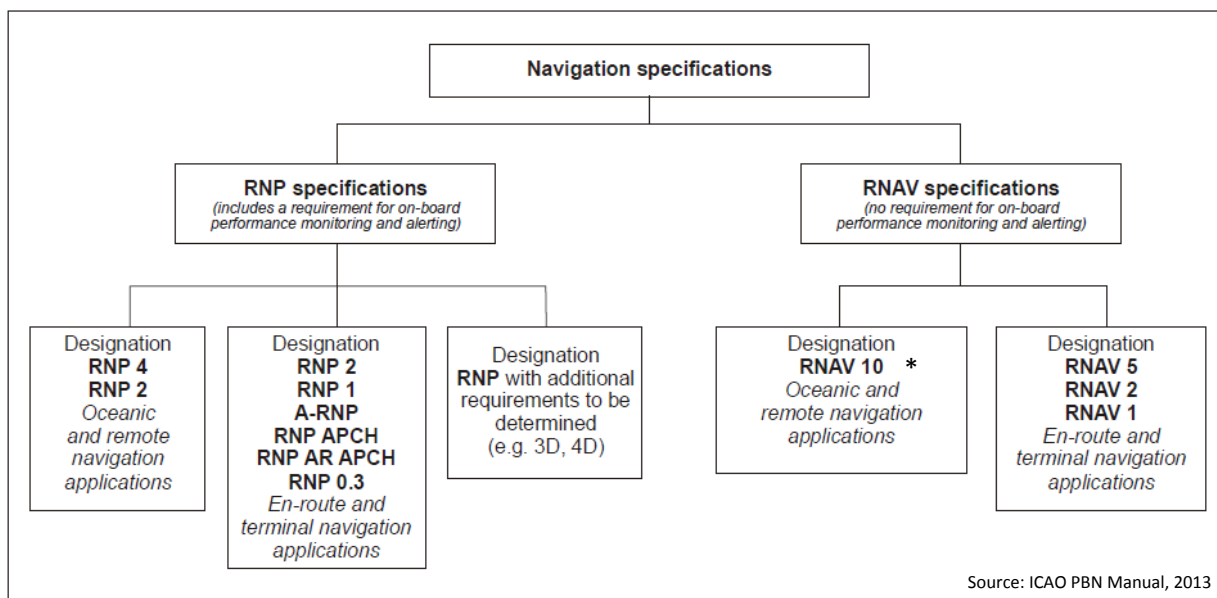
**Airspace Concept** – An airspace concept describes the intended operations within a given airspace. It is developed to satisfy strategic objectives such as improved safety, increased air traffic capacity, improved efficiency, more accurate flight paths, and reduced environmental impact. Examples of airspace concepts include oceanic, remote continental, continental en route, terminal, and approach airspace environments.

**Relationship Between Airspace Concept and Performance Based Navigation** – PBN is an *enabler* for a particular airspace concept, along with other enablers such as communications, Air Traffic Surveillance (ATS), Air Traffic Management (ATM), Air Traffic Control (ATC) tools, and flight operations.



Source: ICAO PBN Manual, 2013

**Navigation Specifications (RNAV “X”, RNP “X”, etc.)** – An RNAV or RNP navigation specification is typically expressed in terms of an “RNAV” or “RNP” prefix followed by a number. The number designates the Total System Error (TSE) tolerance criteria in nautical miles. For example, an RNAV 1 route requires that aircraft operating along that route be certified as capable of keeping to within 1 nautical mile (nm) of the defined route a minimum 95% of the time. It is important to note that each RNAV or RNP specification exists independently of other specifications; in other words, an aircraft qualified to meet RNAV 1 criteria is not automatically qualified for RNAV 2, even though RNAV 1 requires the more accurate navigation performance. The following chart provides an overview of commonly encountered RNAV specifications and the airspace concepts with which they are typically associated.



Source: ICAO PBN Manual, 2013

\*Note: RNAV 10 in oceanic airspace is still designated as RNP 10, even though it does not require performance monitoring and alerting. RNAV 10 would be the more technically accurate designation.

**RNP APCH (Required Navigation Performance – Approach)** – Navigation specification for RNAV-based approach procedures with straight segments. *(Note: ICAO considers this specification to encompass existing RNAV (GNSS) approaches with descent to LNAV/VNAV as well as LPV and LP minimums; however, RNAV approaches do not require on-board performance monitoring and alerting, whereas RNP approaches do.)*

**RNP AR APCH (Required Navigation Performance, Authorization Required – Approach)** – Navigation specification for RNAV-based approaches which, due to the critical nature of the procedures and the requirement to keep to within a very narrow navigation tolerance, require specific aircraft performance capability as well as specialized crew training. Such approaches are often developed for airports in mountainous regions or for airport environments where approach paths are narrowly spaced and there is very little room for navigation error. RNP AR approaches may involve curved [e.g., Radius-to-Fix (RF)] approach segments. In order to achieve the lowest RNP AR approach minimums (i.e., less than 0.3), required equipment includes an Inertial Navigation System (INS) in order to maintain navigation capability if primary navigation signals are lost at a critical point during an approach.

**A-RNP (Advanced RNP)** – An overarching navigation specification that encompasses RNAV 5, RNAV 2, RNAV 1, RNP 2, RNP 1, and RNP APCH. It is designed to simplify aircraft qualification and operational approval processes for aircraft that meet the requirements of all of these navigation specifications.

**Basic-RNP 1** – Outdated terminology for RNP 1. The “Basic-RNP 1” designation does not appear in the latest ICAO PBN manual. According to an ICAO PBN presentation, RNAV 1 is primarily intended for defining procedures where radar surveillance is applied (e.g., SIDs, STARs), while RNP 1 is primarily intended for defining procedures where radar surveillance is not available.

**RNP 0.3** – Navigation specification that defines a single accuracy of 0.3 nm for all phases of flight, intended primarily for helicopter operations. (Note – This specification should not be confused with the 0.3 nm basic level of navigation accuracy associated with typical RNAV approaches or with the RNP 0.3 level of minima associated with RNP AR APCH operations.)

**P-RNAV** – Navigation specification in Europe for specific terminal routes. (Equates to RNAV 1 in current ICAO terminology.)

**B-RNAV** – Navigation specification for en route airspace. (Equates to RNAV 5 in current ICAO terminology.)

**Radius-to-Fix (RF) Leg** – A procedure segment between two RNAV waypoints consisting of a uniform curve with a fixed radius. RF legs are useful for designing procedures where a curved flight path is advantageous for avoiding obstacles or noise-sensitive areas as well as for de-conflicting traffic routes in dense terminal airspace. RF legs may be encountered in RNP 1, RNP 0.3, A-RNP, RNP APCH, and RNP AR APCH procedures.

## **Background**

RNAV systems have enabled the rapid development of more direct and efficient routes within airspace regions on a worldwide scale. Rather than specifying which specific types of RNAV systems must be installed in an aircraft to operate within a specific region, the International Civil Aviation Organization (ICAO) has fostered the development of performance-based airspace concepts that exist independently of the particular navigation system(s) employed to meet performance-based criteria. This approach is intended to save operators undue expense in having to continually re-equip aircraft as new RNAV-based technologies are developed as well as to prevent navigation requirement definitions from becoming obsolete. RNP takes RNAV a step further by requiring onboard monitoring and alerting (as well as additional requirements such as inertial navigation systems and crew training requirements, when appropriate).

## **Key Benefits for Operators**

- Ability to operate properly equipped aircraft in specific airspace regions or on specific routes or approaches that require precise navigation performance. This can include oceanic routes as well as terminal and approach procedures.

## **Equipment Requirements**

The following equipment must be installed, certified, and approved in order for an aircraft to comply with RNAV or RNP requirements:

- RNAV system(s) suitable for RNAV and/or RNP operations. Typically this includes a space-based satellite navigation system, i.e., GNSS. It may also include SBAS capability for refinement of GNSS position accuracy, such as equipment compatible with the United States' Wide Area Augmentation System (WAAS), Europe's Geostationary Satellite Navigation Overlay Service (EGNOS), etc. Some regions and routes, particularly oceanic routes, may require dual, long-range RNAV systems for redundancy.
- For RNP operations, FMS system(s) capable of monitoring actual navigation performance (ANP) and a means of alerting the crew if the RNP parameters are exceeded.
- For RNP AR approach operations, additional requirements may apply such as the requirement for dual autopilot systems as well as an Inertial Navigation System (INS).

## **Key RNAV and RNP Airspace Regions, Routes, and Procedures**

Certain regions, routes, and procedures in various countries as well as in oceanic airspace require specific RNAV or RNP capabilities. While it is not possible to provide an exhaustive listing here of all such regions and routes, key areas of interest are listed in Table 1 below.

## **Status of Citation, Beechcraft, and Hawker Aircraft**

Refer to Tables 2, 3, and 4 for information regarding the status of various Citation, Beechcraft, and Hawker aircraft models with respect to key RNAV and RNP capabilities.

## **Links**

- [FAA NextGen Update: Performance Based Navigation](#)
- [FAA AC 90-100A - U.S. Terminal and En Route Area Navigation \(RNAV\) Operations](#)
- [FAA AC 90-101A - Approval Guidance for RNP Procedures with AR](#)
- [JAA TGL-10 Rev 1 - Airworthiness and Operational Approval for P-RNAV Operations in Designated European Airspace](#)
- [Hong Kong AIC 12/13 - Basic-RNP 1 Requirement for Aircraft Operating at Hong Kong International Airport \(HKIA\)](#)

**Contact:** For further information, contact your Citation or Beechcraft Sales or Customer Service Representative.

**Table 1: Key RNAV and RNP Airspace Regions, Routes, and Procedures**

Specification(s)	Region(s)	Reference	Applications	Remarks
RNAV 1, RNAV 2	United States	AC 90-100A	US RNAV routes (Q-Routes, T-Routes, DPs, and STARs)	
RNP APCH, RNP AR APCH	United States, Europe	AC 90-101A	RNAV (RNP) approaches at airports in the United States	<ul style="list-style-type: none"> <li>Currently, the only procedures in the United States designated as RNP are approach procedures.</li> </ul>
P-RNAV	Europe	JAA TGL-10 Rev 1	Specific routes in terminal airspace in Europe	<ul style="list-style-type: none"> <li>See Addendum 1.</li> </ul>
RNP 1	Hong Kong	Hong Kong AIC 12/13	SIDs and STARs in Hong Kong Airspace	
RNP 4	Oceanic		North Atlantic Organized Track System (NAT OTS)	
RNP 10 (RNAV 10)	Oceanic		Pacific Organized Track System (PAC OTS)	

**Table 2: PBN Status of Citation Aircraft**

**Models Currently In Production**

*Note: This table is provided for general information purposes only and lists navigation specifications that are currently mentioned in the AFMs or AFM supplements for the given aircraft models. It does not include detailed information regarding which specific documents are referenced as the defining basis for the listed navigation specifications (e.g. FAA advisory circulars vs. EASA documents, etc.). It also does not take into account the changes in navigation specification terminology that has occurred over time since some of the AFMs and supplements were written or last revised. For these reasons, operators must consult the relevant AFMs or AFM supplements directly and consult with the relevant civil aviation authorities in order to make a definitive determination regarding eligibility to utilize specific routes or procedures in various world regions. It is also the responsibility of the operator to obtain any required operational approvals from the relevant authorities.*

Name	Model (Serial Range)	Flight Management System	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches - LNAV/VNAV	RNAV (GPS) Approaches - LPV	RNAV (GPS) Approaches - LP	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks	
Mustang	510 (1 and on)	Garmin G1000				✓	✓	✓	✓	✓		✓			✓	✓						
M2	525 (800 and on)	Garmin G3000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓			✓	
CJ3+	525B (1 and on)	Garmin G3000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓			✓	
CJ4	525C (1 and on)	Collins FMS-3000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓	
XLS+	560 (6001 and on)	Collins FMS-3000	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓		✓				
Latitude	680A (1 and on)	Garmin G5000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓*	Q4 2016	* Includes RNP procedures to a minimum value of 0.3 for initial through final approach segments. RNP AR procedures, procedures with a missed approach RNP less than 1.0 or procedures with RF legs are currently not authorized. RNP APCH capability to a minimum value of less than 0.3 and/or with missed approach RNP less than 1.0 is scheduled to be available in Q4 2016. RF leg capability is also scheduled to be available in Q4 2016.	
Sovereign+	680 (501 and on)	Garmin G5000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓*	Q4 2016	* Includes RNP procedures to a minimum value of 0.3 for initial through final approach segments. RNP AR procedures, procedures with a missed approach RNP less than 1.0 or procedures with RF legs are currently not authorized. RNP APCH capability to a minimum value of less than 0.3 and/or with missed approach RNP less than 1.0 is scheduled to be available in Q4 2016. RF leg capability is also scheduled to be available in Q4 2016.	

Citation X+	750 (501 and on)	Garmin G5000	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓*	Q4 2016	* Includes RNP procedures to a minimum value of 0.3 for initial through final approach segments. RNP AR procedures, procedures with a missed approach RNP less than 1.0 or procedures with RF legs are currently not authorized. RNP APCH capability to a minimum value of less than 0.3 and/or with missed approach RNP less than 1.0 is scheduled to be available in Q4 2016. RF leg capability is also scheduled to be available in Q4 2016.
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**Models No Longer In Production**

*Note: This table is provided for general information purposes only and lists navigation specifications that are currently mentioned in the AFMs or AFM supplements for the given aircraft models. It does not include detailed information regarding which specific documents are referenced as the defining basis for the listed navigation specifications (e.g. FAA advisory circulars vs. EASA documents, etc.). It also does not take into account the changes in navigation specification terminology that has occurred over time since some of the AFMs and supplements were written or last revised. For these reasons, operators must consult the relevant AFMs or AFM supplements directly and consult with the relevant civil aviation authorities in order to make a definitive determination regarding eligibility to utilize specific routes or procedures in various world regions. It is also the responsibility of the operator to obtain any required operational approvals from the relevant authorities.*

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches - LNAV/VNAV	RNAV (GPS) Approaches - LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks
CitationJet	525 (1-359)	Universal UNS-1K					✓		✓								✓						
CitationJet	525 (1-359)	Garmin G1000		✓	✓		✓	✓	✓	✓	✓			*	✓	✓		✓					*Listed in supplement, but references an outdated definition of RNP 1. Does not include monitoring and alerting.
CJ1	525 (360-558)	Universal UNS-1L or UNS-1Esp with 802.X Software					✓		✓								✓	✓					
CJ1	525 (360-558)	Universal UNS-1Lw with LP/LPV Monitor	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓		✓		✓			
CJ1+	525 (601-701)	Collins FMS-3000 (Without WAAS/SBAS)					✓	✓	✓								✓	✓					
CJ1+	525 (601-701)	Collins FMS-3000 (With WAAS/SBAS)		✓	✓		✓	✓	✓	✓	✓					✓		✓					
CJ2	525A (1-245)	Universal UNS-1L or UNS-1Esp with 802.X Software				✓	✓		✓				✓					✓					
CJ2	525A (1-245)	Universal UNS-1Lw with LP/LPV Monitor	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓		✓		✓			
CJ2+	525A (300 and on)	Collins FMS-3000 (Without WAAS/SBAS)					✓	✓	✓								✓	✓					
CJ2+	525A (300 and on)	Collins FMS-3000 (With WAAS/SBAS)		✓	✓		✓	✓	✓	✓	✓					✓		✓					
CJ3	525B (1-415)	Collins FMS-3000 (Without SBAS/WAAS)					✓	✓	✓	✓							✓	✓					
CJ3	525B (1-415)	Collins FMS-3000 (With SBAS/WAAS)		✓	✓		✓	✓	✓	✓	✓					✓		✓					
Bravo	550 (801-1136)	Universal UNS-1L, UNS-1Esp, or UNS-1Csp+ with 802.X Software		✓	✓		✓	✓	✓	✓							✓	✓					
Bravo	550 (801-1136)	Universal UNS-1Lw with LP/LPV Monitor		✓	✓		✓	✓	✓	✓	✓					✓	✓	✓					
Ultra	560 (260-537)	Universal UNS-1Csp+ or UNS-1Esp with 802.X Software																					

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches - LNAV/VNAV	RNAV (GPS) Approaches - LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks	
Ultra	560 (260-537)	Universal UNS-1Espw with LP/LPV Monitor		✓	✓		✓	✓	✓	✓						✓	✓	✓						
Encore	560 (539-707)	Honeywell Primus 1000		✓	✓		✓	✓	✓	✓							✓	✓						
Encore+	560 (751-815)	Collins Pro Line 21 (Without WAAS/SBAS)					✓	✓	✓	✓								✓						
		Collins Pro Line 21 (With WAAS/SBAS)		✓	✓		✓	✓	✓	✓	✓						✓	✓	✓					
Excel	560 (5001-5372)	Universal UNS-1CSP+ or UNS-1Esp		✓	✓		✓	✓	✓	✓						✓	✓	✓						
		Universal UNS-1Espw FMS (Dual)		✓	✓		✓	✓	✓	✓	✓						✓	✓	✓					
		Honeywell FMS	✓				✓	✓	✓	✓							✓	✓	✓					
XLS	560 (5501-5830)	Universal UNS-1Esp		✓	✓		✓	✓	✓	✓							✓	✓	✓					
		Universal UNS-1Espw FMS (Dual)		✓	✓		✓	✓	✓	✓	✓						✓	✓	✓					
		Honeywell FMS					✓	✓	✓	✓			✓	*				✓	✓		✓			*Listed in supplement, but references an outdated definition of RNP 1. Does not include monitoring and alerting.
XLS+	560 (6001 and on)	Collins FMS-3000 (Without WAAS/SBAS)		✓	✓		✓	✓	✓	✓								✓					Note – The XLS+ is still in production, but early units didn't have SBAS capability and have to be upgraded via service bulletin	
		Collins FMS-3000 (With WAAS/SBAS)		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		✓				
Sovereign	680 (1-290) – Not Incorporating SB 680-34-20	Honeywell Primus EPIC (Without WAAS/SBAS)		✓	✓		✓	✓	✓	✓			✓			✓	✓	✓		✓	✓	✓		
	680 (291-349) and (1-290) incorporating SB680-34-20	Honeywell Primus EPIC (With WAAS/SBAS)		✓	✓		✓	✓	✓	✓	✓		✓			✓	✓	✓		✓	✓*	✓	*0.3 nm line of minima with missed approach RNP of 1.0 or greater (dual IRS sensors req'd for missed approach RNP of < 1.0)	
Citation X	750 (1-313)	Honeywell NZ-2000 FMS (Without WAAS/SBAS)	✓				✓	✓	✓	✓			✓			✓	✓	✓						
Citation X	750 (1-313)	Honeywell NZ-2000 FMS (With WAAS/SBAS)		✓	✓	✓		✓	✓	✓	✓			✓		✓		✓		✓		✓		

**Table 3: PBN Status of Beech Aircraft**

**Models Currently In Production**

*Note: This table is provided for general information purposes only and lists navigation specifications that are currently mentioned in the AFMs or AFM supplements for the given aircraft models. It does not include detailed information regarding which specific documents are referenced as the defining basis for the listed navigation specifications (e.g. FAA advisory circulars vs. EASA documents, etc.). It also does not take into account the changes in navigation specification terminology that has occurred over time since some of the AFMs and supplements were written or last revised. For these reasons, operators must consult the relevant AFMs or AFM supplements directly and consult with the relevant civil aviation authorities in order to make a definitive determination regarding eligibility to utilize specific routes or procedures in various world regions. It is also the responsibility of the operator to obtain any required operational approvals from the relevant authorities.*

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches - LNAV/VNAV	RNAV (GPS) Approaches - LPV	RNAV (GPS) Approaches - LP	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A -RNP	RNP APCH	RNP AR APCH	RF Legs
King Air C90GTx	C90GTi (LJ-1964, LJ-1966, LJ-1968, LJ-1972, LJ-1977 and on)	Collins Pro Line 21 (With WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓				✓				✓
King Air 250	B200GT (BY-117, BY-119 and on)	Collins Pro Line 21 (With WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓			✓	✓				
King Air 350i	B300 (Various from FL-672 and on)	Collins Pro Line 21 (FL-672 thru FL-714 without WAAS/LPV)	✓				✓	✓	✓	✓											
		Collins Pro Line 21 (FL-715 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓				✓	✓			
King Air 350iER	B300 (Various from FL-424 thru FL-888)	Collins Pro Line 21 (FL-424 thru FL-714 without WAAS/LPV)	✓				✓	✓	✓	✓											
		Collins Pro Line 21 (FL-715 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓				✓	✓			
King Air 350iC	B300C (Various from FM-1 and on)	Collins Pro Line 21 (FM-12 thru FM-36 without WAAS/LPV)	✓				✓	✓	✓	✓											
		Collins Pro Line 21 (FM-37 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓				✓	✓			
King Air 350iCER	B300C (Various from FM-14 thru FM-55)	Collins Pro Line 21 (FM-14 thru FM-36 without WAAS/LPV)	✓				✓	✓	✓	✓											
		Collins Pro Line 21 (FM-37 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓				✓	✓			

**Models No Longer In Production**

*Note: This table is provided for general information purposes only and lists navigation specifications that are currently mentioned in the AFMs or AFM supplements for the given aircraft models. It does not include detailed information regarding which specific documents are referenced as the defining basis for the listed navigation specifications (e.g. FAA advisory circulars vs. EASA documents, etc.). It also does not take into account the changes in navigation specification terminology that has occurred over time since some of the AFMs and supplements were written or last revised. For these reasons, operators must consult the relevant AFMs or AFM supplements directly and consult with the relevant civil aviation authorities in order to make a definitive determination regarding eligibility to utilize specific routes or procedures in various world regions. It is also the responsibility of the operator to obtain any required operational approvals from the relevant authorities.*

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches - LNAV/VNAV	RNAV (GPS) Approaches - LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks	
King Air C90GTi	C90GTi (Various from LJ-1847 thru LJ-1976)	Collins Pro Line 21 (LJ-1847 thru LJ-1952 without WAAS/LPV)	✓				✓		✓	✓													STC SA10969SC available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (LJ-1953 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓			✓					✓				✓	Production installed.
King Air B200	B200 (Various from BB-734 thru BB-2019)	Collins Pro Line 21 (BB-1834, BB-1843 thru BB-1977, BB-1979 thru BB-1987 without WAAS/LPV)					✓		✓	✓													STC SA10970SC available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (BB-1978, BB-1988 thru BB-2015 without WAAS/LPV)	✓				✓		✓	✓														STC SA10970SC available to add WAAS/LPV for aftermarket.
		Collins Pro Line 21 (BB-2016 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓			✓				✓	✓					Production installed.
King Air B200C	B200C (Various from BL-37 thru BL-171)	Collins Pro Line 21 (BL-148 thru BL-151 without WAAS/LPV)					✓		✓	✓													STC SA10970SC available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (BL-152 thru BL-154 without WAAS/LPV)	✓				✓		✓	✓														STC SA10970SC available to add WAAS/LPV for aftermarket.
		Collins Pro Line 21 (BL-155 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓			✓				✓	✓					Production installed.
King Air B200GT	B200GT (BY-1 thru BY-116, BY-118)	Collins Pro Line 21 (BY-1 thru BY-109 without WAAS/LPV)					✓	✓	✓	✓													STC SA10970SC available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (BY-110 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓			✓				✓	✓					Production installed.
King Air 350	B300 (Various from FL-1 thru FL-683)	Collins Pro Line 21 (FL-381, FL-383 and on without WAAS/LPV)					✓		✓	✓													STC SA10970SC available to add WAAS/LPV for aftermarket.	

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches -- LNAV/VNAV	RNAV (GPS) Approaches -- LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks
Premier 1A	390 (RB-102, RB-135 thru RB-295)	Collins Pro Line 21 (RB-102, RB-135 thru RB-281 without WAAS/LPV)							✓														SB 34-4007 (Kit 390-3416) available to add WAAS/LPV for aftermarket.
		Collins Pro Line 21 (RB-282 and on with WAAS/LPV)	✓	✓		✓	✓	✓	✓	✓	✓			✓					✓				✓
Beechjet 400A	400A (RK-1 thru RK-353)	Collins Pro Line 4 (without WAAS/LPV)					✓		✓								✓						STC ST02325LA available to add WAAS/LPV for aftermarket.
		Collins Pro Line 4 (with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓

**Table 4: PBN Status of Hawker Aircraft**

**Models No Longer In Production**

*Note: This table is provided for general information purposes only and lists navigation specifications that are currently mentioned in the AFMs or AFM supplements for the given aircraft models. It does not include detailed information regarding which specific documents are referenced as the defining basis for the listed navigation specifications (e.g. FAA advisory circulars vs. EASA documents, etc.). It also does not take into account the changes in navigation specification terminology that has occurred over time since some of the AFMs and supplements were written or last revised. For these reasons, operators must consult the relevant AFMs or AFM supplements directly and consult with the relevant civil aviation authorities in order to make a definitive determination regarding eligibility to utilize specific routes or procedures in various world regions. It is also the responsibility of the operator to obtain any required operational approvals from the relevant authorities.*

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches -- LNAV/VNAV	RNAV (GPS) Approaches -- LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks	
Hawker 400XP	400A (RK-354 thru RK-604)	Collins Pro Line 4 (without WAAS/LPV)					✓		✓								✓						STC ST02325LA available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 4 (with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	With STC ST02325LA installed.
Hawker 750	750 (HB-1 thru HB-74)	Collins Pro Line 21 (HB-1 thru HB-66 without WAAS/LPV)					✓	✓	✓	✓							✓						SB 34-4001 (Kit 149-3430) available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (HB-67 and on with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	Production installed.
		Collins Pro Line 21 (HB-1 thru HB-66 with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓	✓							✓				✓	With Kit 149-3430 installed.
Hawker 800XP	800XP (Various from 258541 thru 258722)	Collins Pro Line 21 (without WAAS/LPV)					✓	✓	✓	✓							✓						SB 34-4001 (Kit 149-3431) available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	With Kit 149-3431 installed.
Hawker 800XPi	800XP (Various from 258699 thru 258847)	Collins Pro Line 21 (without WAAS/LPV)					✓	✓	✓	✓							✓						SB 34-4001 (Kit 149-3431) available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	With Kit 149-3431 installed.
Hawker 850XP	850XP (Various from 258750 thru 258984)	Collins Pro Line 21 (without WAAS/LPV)					✓	✓	✓	✓							✓						SB 34-4001 (Kit 149-3432) available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	With Kit 149-3432 installed.
Hawker 900XP	900XP (HA-0001 thru HA-0213)	Collins Pro Line 21 (HA-0001 thru HA-0149 without WAAS/LPV)					✓	✓	✓	✓							✓	✓					SB 34-4001 (Kit 149-3429) available to add WAAS/LPV for aftermarket.	
		Collins Pro Line 21 (HA-0150 and on with WAAS/LPV)		✓	✓	✓	✓	✓	✓	✓	✓								✓				✓	Production installed.

Name	Model (Serial Range)	Flight Management System	US RNAV Types A & B (Outdated definition that now equates to RNAV 2 and RNAV 1)	RNAV 1	RNAV 2	RNAV 5	B-RNAV	P-RNAV	RNAV (GPS) Approaches - LNAV	RNAV (GPS) Approaches -- LNAV/VNAV	RNAV (GPS) Approaches -- LPV	RNAV (GPS) Approaches - LP	RNP 0.3 (outdated definition associated with typical RNAV approaches)	RNP 1	RNP 2	RNP 4	RNP 5	RNP 10 (RNAV 10)	A-RNP	RNP APCH	RNP AR APCH	RF Legs	Remarks
Hawker 4000	4000 (RC-7 thru RC-76)	Honeywell Primus EPIC (RC-1 thru RC-58 without WAAS/LPV)					✓		✓							✓	✓	✓					SB 34-4030 available to add WAAS/LPV for aftermarket.
		Honeywell Primus EPIC (RC-59 and on with WAAS/LPV)		✓	✓		✓	✓	✓	✓	✓		✓			✓	✓	✓		✓	✓*	✓	Production installed. *0.3 nm line of minima with missed approach RNP of 1.0

## Technology Brief

Subject: <b>Performance Based Navigation (PBN)</b>	Date: Feb 13, 2017
Distribution: <b>Citation/Beechcraft/Hawker Operators</b>	Revision: 2

### Addendum 1: European Operations

Until the middle of 2016, EASA required agency authorization for different PBN operations. This led to slow incorporation of procedures and has delayed deployment/incorporation of the tremendous advantages of PBN operations and SBAS equipage. The continuous evolution of language and terminology around PBN has also led to confusion in determining the capability of any system or aircraft. EASA has now released new rulemaking and guidance material associated with performance based navigation. The goal was both economic and practical.

From EASA Website

The specific objectives of the rulemaking task are the:

- provision of PBN-related rules on pilot training and checking;
- removal of the requirements for specific approvals for most PBN operations;
- compliance with the fourth edition of the ICAO PBN Manual; and
- introduction of proportionate operating procedures where necessary.

Regulation (EU) No 965/2012 requires specific approvals for complex performance-based navigation (PBN) operations. **In contrast to complex, for all other PBN operations a specific approval is not anymore required**, taking into account the experience and maturity already reached in operations utilising the global navigation satellite system (GNSS), and in order to ensure consistency with the latest international safety standards. As a consequence, PBN-related AMC and GM have been added to Part- CAT for PBN operations not requiring a specific approval.

Textron Aviation aircraft for the purposes of this paper operate under Commercial Air Transport (Part CAT) and Non-Commercial Complex (Part NCC) rules. The examples in this paper are from Part-CAT, but are identical to Part-NCC. The table below provides links to the exact wording of the rulemaking and guidance material.

Item	Link
Guidance Material to Annex 1 Definitions	<a href="#">ED Decision 2016/016/R</a>
Acceptable Means of Compliance and Guidance Material for ARO	<a href="#">ED Decision 2016/014/R</a>
Acceptable Means of Compliance and Guidance Material for Commercial Air Transport	<a href="#">ED Decision 2016/015/R</a>
Acceptable Means of Compliance and Guidance Material for Non-Commercial Complex Operations	<a href="#">ED Decision 2016/017/R</a>
Acceptable Means of Compliance and Guidance Material for Non-Commercial Operations (Not Complex)	<a href="#">ED Decision 2016/018/R</a>
Acceptable Means of Compliance and Guidance Material for Organisation Requirements for Air Operations	<a href="#">ED Decision 2016/019/R</a>
Acceptable Means of Compliance and Guidance Material for Operations requiring Specific Approvals	<a href="#">ED Decision 2016/020/R</a>
Acceptable Means of Compliance and Guidance Material for Specialized Operations	<a href="#">ED Decision 2016/021/R</a>

The first and most important revision in requirements is to Operations requiring Specific Approvals (Part SPA). A table was added to GM1 SPA.PBN.100 showing the types of operations and specific approval requirements. The table is shown below. Notice that only RNP-AR APCH operations require a specific approval. RNP 0.3 (H) if for rotorcraft.

Navigation specification	FLIGHT PHASE							
	En route		Arrival	Approach				Departure
	Oceanic	Continental		Initial	Intermediate	Final	Missed	
RNAV 10	10							
RNAV 5		5	5					
RNAV 2		2	2					2
RNAV 1		1	1	1	1		1	1
RNP 4	4							
RNP 2	2	2						
RNP 1			1	1	1		1	1
A-RNP	2	2 or 1	1-0.3	1-0.3	1-0.3	0.3	1-0.3	1-0.3
RNP APCH (LNAV)				1	1	0.3	1	
RNP APCH (LNAV/VNAV)				1	1	0.3	1	
RNP APCH (LP)				1	1		1	
RNP APCH (LPV)				1	1		1	
RNP AR APCH				1-0.1	1-0.1	0.3-0.1	1-0.1	
RNP 0.3 (H)		0.3	0.3	0.3	0.3		0.3	0.3

Numbers specify the accuracy level       no specific approval required       specific approval required

**Table 1 from Annex to Decision 2016/020/R (Part-SPA)**



To expand the number of eligible aircraft and to leverage the decades of certification that exist for different PBN capabilities that exist in currently fielded aircraft, EASA has provided relief on the language and instructions in the guidance material to assist the crew in determining the capability of the aircraft. The figure below shows an example from Part-CAT of the Guidance Material to determine the capability of RNP-APCH to LNAV minimum (the highlighting is added for emphasis).

- (j) RNP APCH — LNAV minima
- (1) If a statement of compliance with **any** of the following specifications or standards is found in the **acceptable documentation** as listed above, the aircraft is eligible for RNP APCH — LNAV operations.
- (i) A-RNP;
  - (ii) AMC 20-27;
  - (iii) AMC 20-28;
  - (iv) FAA AC 20-138 for the appropriate navigation specification; and
  - (v) FAA AC 90-105 for the appropriate navigation specification.
- (2) Alternatively, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with **any** of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations. **Any limitation such as ‘within the US National Airspace’ may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.**
- (i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL3);
  - (ii) AMC 20-4;
  - (iii) FAA AC 20-130A; and
  - (iv) FAA AC 20-138.

**Example from PART-CAT for determining eligibility for RNP APCH to LNAV minima**

**Table A1-1** at the end of this Addendum is the result of Textron Aviation engineering evaluating the AFMs and other acceptable documentation as prescribed in the EASA guidance material to identify the navigation capability of the most popular Textron Aviation installed navigation systems. There are still requirements on the operator for crew training, operating manuals, and database management that must be followed.

### Table A1-1 – Navigation Capability in Europe

Note 1: If GNSS is lost, then aircraft is no longer capable of operation in this environment.

Note 2: If GNSS is lost, then aircraft is no longer capable of operation in this environment. Source for acceptable documentation is the United States FAA website for 90-100A compliance.

Note 3: If a Class A TAWS system is installed and Mode 5 alerting (Excessive Downward Deviation) is not provided for LPV, the lowest allowed approach minimum is 250 ft. If Mode 5 is available, then lower published minimums may be used.

KEY ✓=Capable; 1=See Note 1; 2=See Note 2; 3=See Note 3; Blank = Not capable with current documentation

Model	Serial Range	Flight Management System	RNAV 5	RNAV 1 / RNAV 2	RNP 1 / RNP 2 CONTINENTAL	RNP APCH - LNAV MINIMA	RNP APCH - LNAV / VNAV MINIMA	RNP APCH - LPV MINIMA*	RNAV 10	RNP 4	RNP 2 OCEANIC
King Air C90GTx	C90GTi (LJ-1964, LJ-1966, LJ-1968, LJ-1972, LJ-1977 and on)	Collins Pro Line 21 (With WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air C90GTi	C90GTi (Various from LJ-1847 thru LJ-1976)	Collins Pro Line 21 (LJ-1847 thru LJ-1952 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (LJ-1953 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air 250	B200GT (BY-117, BY-119 and on)	Collins Pro Line 21 (With WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air B200	B200 (Various from BB-734 thru BB-2019)	Collins Pro Line 21 (BB-1834, BB-1843 thru BB-1977, BB-1979 thru BB-1987 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (BB-1978, BB-1988 thru BB-2015 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (BB-2016 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air B200C	B200C (Various from BL-37 thru BL-171)	Collins Pro Line 21 (BL-148 thru BL-151 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (BL-152 thru BL-154 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (BL-155 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air B200GT	B200GT (BY-1 thru BY-116, BY-118)	Collins Pro Line 21 (BY-1 thru BY-109 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (BY-110 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air 350i	B300 (Various from FL-672 and on)	Collins Pro Line 21 (FL-672 thru FL-714 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (FL-715 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air 350iC	B300C (Various from FM-1 and on)	Collins Pro Line 21 (FM-12 thru FM-36 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (FM-37 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air 350iCER	B300C (Various from FM-14 thru FM-55)	Collins Pro Line 21 (FM-14 thru FM-36 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (FM-37 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
King Air 350	B300 (Various from FL-1 thru FL-683)	Collins Pro Line 21 (FL-381, FL-383 and on without WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓

Model	Serial Range	Flight Management System	RNAV 5	RNAV 1 / RNAV 2	RNP 1 / RNP 2 CONTINENTAL	RNP APCH - LNAV MINIMA	RNP APCH - LNAV / VNAV MINIMA	RNP APCH - LPV MINIMA*	RNAV 10	RNP 4	RNP 2 OCEANIC
Premier 1	390 (RB-1 thru 101, and RB-103 thru RB-134)	Collins Pro Line 21 without WAAS/LPV	✓	1	1	✓	✓		✓		
Premier 1A	390 (RB-102, RB-135 thru RB-295)	Collins Pro Line 21 without WAAS/LPV	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 with WAAS/LPV	✓	1	1	✓	✓	3	✓	✓	✓
Beechjet 400A	400A (RK-1 thru RK-353)	Collins Pro Line 21 without WAAS/LPV	✓			✓					
		Collins Pro Line 21 with WAAS/LPV	✓	1	1	✓	✓	3	✓		
Hawker 400XP	400A (RK-354 thru RK-604)	Collins Pro Line 21 without WAAS/LPV	✓			✓					
		Collins Pro Line 21 with WAAS/LPV	✓	1	1	✓	✓	3	✓		
Hawker 4000	4000 (RC-7 thru RC-76)	Honeywell Primus EPIC (RC-1 thru RC-58 without WAAS/LPV)	✓		1				✓	✓	✓
		Honeywell Primus EPIC (RC-59 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Hawker 750	750 (HB-1 thru HB-74)	Collins Pro Line 21 (HB-1 thru HB-66 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (HB-67 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
		Collins Pro Line 21 (HB-1 thru HB-66 with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Hawker 800XP	800XP (Various from 258541 thru 258722)	Collins Pro Line 21 (without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Hawker 800XPi	800XP (Various from 258699 thru 258847)	Collins Pro Line 21 (without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Hawker 850XP	850XP (Various from 258750 thru 258984)	Collins Pro Line 21 (without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Hawker 900XP	900XP (HA-0001 thru HA-0213)	Collins Pro Line 21 (HA-0001 thru HA-0149 without WAAS/LPV)	✓	1	1	✓	✓		✓		
		Collins Pro Line 21 (HA-0150 and on with WAAS/LPV)	✓	1	1	✓	✓	3	✓	✓	✓
Mustang	510 (1 and on)	Garmin G1000	✓	1	1	✓	✓	✓	✓		
CitationJet	525 (1-359)	Universal UNS-1K	✓	2	2	✓					
		GNS-XL/XLs with FDE single or dual	✓	2	2	✓					
CJ1	525 (360-558)	Universal UNS-1L or UNS-1Esp with 802.X Software	✓	2	2	✓			✓		
		Universal UNS-1Lw with LP/LPV Monitor	✓	1	1	✓	✓	3	✓	✓	✓
CJ1+	525 (601-701)	Collins FMS-3000 (Without WAAS/SBAS)	✓	1	1	✓	✓		✓		
		Collins FMS-3000 (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
M2	525 (800 and on)	Garmin G3000	✓	1	1	✓	✓	✓	✓	✓	✓

Model	Serial Range	Flight Management System	RNAV 5	RNAV 1 / RNAV 2	RNP 1 / RNP 2 CONTINENTAL	RNP APCH - LNAV MINIMA	RNP APCH - LNAV / VNAV MINIMA	RNP APCH - LPV MINIMA*	RNAV 10	RNP 4	RNP 2 OCEANIC
CJ2	525A (1-245)	Universal UNS-1L or UNS-1Esp with 802.X Software	✓	2	2	✓			✓		
		Universal UNS-1Lw with LP/LPV Monitor	✓	1	1	✓	✓	3	✓	✓	✓
CJ2+	525A (300 and on)	Collins FMS-3000 (Without WAAS/SBAS)	✓	1	1	✓	✓		✓		
		Collins FMS-3000 (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
CJ3	525B (1-415)	Collins FMS-3000 (Without SBAS/WAAS)	✓	1	1	✓	✓		✓		
		Collins FMS-3000 (With SBAS/WAAS)	✓	1	1	✓	✓	3	✓	✓	✓
CJ3+	525B (-0057 and -0451 and on)	Garmin G3000	✓	1	1	✓	✓	✓	✓	✓	✓
CJ4	525C (1 and on)	Collins FMS-3000	✓	1	1	✓	✓	3	✓	✓	✓
Bravo	550 (801-1136)	GNS-XIs with FDE single or dual	✓	2	2	✓				✓	✓
		Universal UNS-1L, UNS-1Esp, or UNS-1Csp+ with 802.X Software	✓	2	2	✓			✓	✓	✓
		Universal UNS-1Lw with LP/LPV Monitor or dual UNS-1Lw	✓	1	1	✓	✓	3	✓	✓	✓
		Honeywell FMS 5.3	✓	1	1	✓			✓	✓	✓
		Honeywell FMS 5.9	✓	1	1	✓	✓		✓	✓	✓
Ultra	560 (260-537)	GNS-XL/XLs with FDE single or dual	✓	2	2	✓					
		Universal UNS-1Csp+ or UNS-1Esp with 802.X Software	✓	1	1	✓	✓		✓	✓	✓
		Universal UNS-1Espw with LP/LPV Monitor or dual UNS-1Espw	✓	1	1	✓	✓	3	✓	✓	✓
		Honeywell FMS 5.3	✓	1	1	✓			✓	✓	✓
		Honeywell FMS 5.9	✓	1	1	✓	✓		✓	✓	✓
Encore	560 (539-707)	GNS-XL/XLs with FDE single or dual	✓	2	2	✓					
		Universal UNS-1Csp+ or UNS-1Esp with 802.X Software	✓	1	1	✓	✓		✓	✓	✓
		Universal UNS-1Espw with LP/LPV Monitor or dual UNS-1Espw	✓	1	1	✓	✓	3	✓	✓	✓
		Honeywell FMS 5.3	✓	1	1	✓			✓	✓	✓
		Honeywell FMS 5.9	✓	1	1	✓	✓		✓	✓	✓
Encore+	560 (751-5000)	Collins FMS-3000 (Without WAAS/SBAS)	✓	1	1	✓	✓		✓		
		Collins FMS-3000 (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
Excel	560 (5001-5372)	Universal UNS-1CSP+ or UNS-1Esp	✓	1	1	✓	✓		✓	✓	✓
		Universal UNS-1Espw	✓	1	1	✓	✓	3	✓	✓	✓
		Honeywell FMS	✓	1	1	✓	✓		✓	✓	✓
XLS	560 (5501-5830)	Universal UNS-1Esp	✓	1	1	✓	✓		✓	✓	✓
		Universal UNS-1Espw	✓	1	1	✓	✓	3	✓	✓	✓
		Honeywell FMS	✓	1	1	✓	✓		✓	✓	✓
XLS+	560 (6001 and on)	Collins FMS-3000 (Without WAAS/SBAS)	✓	1	1	✓	✓		✓	✓	✓
		Collins FMS-3000 (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓

Model	Serial Range	Flight Management System	RNAV 5	RNAV 1 / RNAV 2	RNP 1 / RNP 2 CONTINENTAL	RNP APCH - LNAV MINIMA	RNP APCH - LNAV / VNAV MINIMA	RNP APCH - LPV MINIMA *	RNAV 10	RNP 4	RNP 2 OCEANIC
Latitude	680A (1 and on)	Garmin G5000	✓	1	1	✓	✓	X	✓	✓	✓
Sovereign	680 (1-290) – Not Incorporating SB 680-34-20	Honeywell Primus EPIC (Without WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
	680 (291-349) and (1-290) incorporating SB680-34-20	Honeywell Primus EPIC (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
Sovereign+	680 (501 and on)	Garmin G5000	✓	1	1	✓	✓	✓	✓	✓	✓
Citation X	750 (1-313)	Honeywell NZ-2000 FMS (Without WAAS/SBAS)	✓	1	1	✓	✓		✓	✓	✓
		Honeywell NZ-2000 FMS (With WAAS/SBAS)	✓	1	1	✓	✓	3	✓	✓	✓
Citation X+	750 (501 and on)	Garmin G5000	✓	1	1	✓	✓	✓	✓	✓	✓