

PBN fleet equipage according to FPL content

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Introduction

- 15 Nov 2012: standard ICAO format for airline flight plans changed.
- New fields have been added and/or modified to reflect current aircraft navigational and communications capabilities.
- The **fields 10 (Equipment and capabilities)** and **18 (Other Information - related PBN information)** within the new ICAO FPL form that have been revised enhance considerably the identification of aircraft capabilities.
- The objective of this assessment is to determine via the new flight plan information the current level of equipage and capabilities related to Navigation, as basis for deployment planning and monitoring.

Field 10: Equipment and capabilities

Indicator	NAV system	Equipment
A	Ground-Based Augmentation System (GBAS) is a safety-critical system that augments the GPS Standard Positioning Service (SPS) and provides enhanced levels of service.	GBAS landing system
B	Localizer Performance with Vertical guidance (LPV). Approach with Vertical guidance (APV-SBAS). Space Based Augmentation System (SBAS).	LPV (APV with SBAS)
C	Long Range Navigation (LORAN) C is a terrestrial radio navigation system using low frequency radio transmitters to determine the location and speed of the receiver	LORAN C
D	Distance Measuring Equipment (DME) is a transponder-based radio navigation technology that measures distance between the equipment on ground and an aircraft by timing the propagation delay of VHF or UHF radio signals.	DME
G	Global Navigation Satellite System (GNSS). The term GNSS encompasses all the satellite navigation systems such as GPS, GLONASS, GALILEO, etc	GNSS (If the letter G is used, the types of external GNSS augmentation, if any, are specified in field 18 following the indicator NAV/ and separated by a space)
I	An Inertial Navigation System (INS) or Inertial Reference System (IRS) or Inertial Reference Unit (IRU) is a navigation aid that uses a computer, motion sensors (accelerometers) and rotation sensors (gyroscopes) to continuously calculate the position, orientation, and velocity (direction and speed of movement) of a plane without the need for external references.	INS
R	R indicates the Performance Based Navigation (PBN) levels that can be met. It is used by ATC for clearance and routing purposes. The insertion of R in the field 10a requires PBN/ to be present in field 18. The PBN sub-field contains the RNAV and/or RNP certifications and operational approvals.	PBN approved (If the letter R is used, the performance based navigation levels that can be met are specified in field 18 following the indicator PBN/).

Field 18: Other Information – PBN information



Field 18 related PBN information (PBN/ Indication of RNAV and/or RNP capabilities): this field can include as many of the applicable descriptors, up to a maximum of 8 entries

NAV Capability	Indicator	Equipment
RNAV 10 (RNP 10)	A1	RNAV 10 (RNP 10)
RNAV 5	B1	all permitted sensors
	B2	GNSS
	B3	DME/DME
	B4	VOR/DME
	B5	INS OR IRS
	B6	LORAN
RNAV 2	C1	all permitted sensors
	C2	GNSS
	C3	DME/DME
	C4	DME/DME/IRU
RNAV 1	D1	all permitted sensors
	D2	GNSS
	D3	DME/DME
	D4	DME/DME/IRU

NAV Capability	Indicator	Equipment
RNP 4	L1	RNP 4
Basic RNP 1	O1	all permitted sensors
	O2	GNSS
	O3	DME/DME
	O4	DME/DME/IRU
RNP APCH	S1	RNP APCH
	S2	RNP APCH with barometric vertical navigation
RNP AR APCH	T1	RNP AR APCH with RF (authorization required)
	T2	RNP AR APCH without RF (authorization required)

Assessment

- **Analysis at aircraft equipment level:** Indication of equipment in field 10 (GNSS, DNE, INS...) in order to capture navigation capability information.
- **Analysis at aircraft navigation capabilities level:** If the letter R (PBN) is used in field 10: indication of RNAV or RNP capabilities by relevant codes in field 18 per flight phase (Oceanic, En-Route, Terminal and Final).
- **Analysis at segment level:** Results by aircraft segment (mainline, regional, business and general aviation) to ensure a global view on NAV capabilities.
- **Analysis per geographical area:** Statistics on specific areas of air traffic in Europe in order to analyse the navigation capability evolution (2013 survey: information collected from aircraft operating at specific European airports).

Aircraft equipment level (Item 10 content)

- Capability (equipment) is comprised of three elements: relevant serviceable equipment on board the aircraft, flight crew qualification and where applicable, authorisation from the appropriate authority.
- Numbers are based on the number of distinct aircraft (aircraft = piece of metal, this implies that changes of registrations has no impact on data).

Period	January - June		July - December		
Total aircraft	17016		17395		
Total flights	4577807		4999713		
Equipment	Indicator	% Aircraft	% Flights	% Aircraft	% Flights
GBAS landing system	A	2,63%	3,62%	2,89%	3,88%
LPV (APV with SBAS)	B	6,15%	2,06%	6,97%	2,10%
LORAN C	C	0,86%	0,12%	0,80%	0,12%
DME	D	96,95%	97,55%	96,96%	97,96%
GNSS	G	90,09%	87,31%	90,93%	87,90%
INS	I	74,27%	79,77%	74,44%	81,17%
PBN capable	R	95,98%	96,58%	96,15%	97,05%

PBN approval status (according FPL Item 18 content)



If the letter R is used
(indicating PBN capability)
in field 10:

Indication of RNAV or RNP
capabilities by relevant
PBN codes (in field 18)

Period	January - June		July - December	
Total aircraft	17016		17395	
Total flights	4577807		4999713	
	% Aircraft	% Flights	% Aircraft	% Flights
PBN Approved	96,0%	96,6%	96,2%	97,0%
A1 RNAV 10 (RNP 10)	62,6%	50,7%	63,1%	49,6%
B1 RNAV 5 all sensors	55,5%	61,7%	56,3%	64,3%
B2 RNAV 5 GNSS	30,5%	19,5%	30,3%	19,1%
B3 RNAV 5 DME/DME	26,5%	23,7%	24,8%	23,1%
B4 RNAV 5 VOR/DME	26,7%	22,5%	24,7%	21,4%
B5 RNAV 5 INS OR IRS	13,3%	13,1%	12,1%	13,1%
B6 RNAV 5 LORAN	0,3%	0,0%	0,2%	0,0%
C1 RNAV 2 all sensors	33,9%	29,7%	35,8%	29,8%
C2 RNAV 2 GNSS	7,2%	2,0%	7,5%	1,9%
C3 RNAV 2 DME/DME	4,8%	3,2%	4,5%	3,0%
C4 RNAV 2 DME/DME/IRU	3,7%	4,3%	2,9%	3,8%
D1 RNAV 1 all sensors	54,4%	62,1%	55,5%	63,4%
D2 RNAV 1 GNSS	15,1%	12,2%	15,5%	12,2%
D3 RNAV 1 DME/DME	12,0%	13,5%	11,9%	13,4%
D4 RNAV 1 DME/DME/IRU	7,8%	9,5%	7,1%	9,7%
L1 RNP 4	28,2%	19,8%	29,8%	19,1%
O1 RNP 1 all sensors	38,5%	41,9%	42,3%	43,2%
O2 RNP 1 GNSS	10,2%	6,7%	10,5%	7,0%
O3 RNP 1 DME/DME	6,4%	5,8%	6,1%	5,7%
O4 RNP 1 DME/DME/IRU	3,8%	3,5%	3,3%	3,3%
S1 RNP APCH	22,1%	19,1%	23,2%	21,1%
S2 RNP APCH Baro VNAV	30,2%	33,3%	31,5%	34,7%
T1 RNP AR APCH with RF	6,2%	4,6%	6,3%	4,8%
T2 RNP AR APCH without RF	0,7%	0,6%	0,7%	0,5%

PBN approval status (according FPL Item 18 content)



If the letter R is used in field 10a: indication of RNAV/RNP capability by relevant PBN codes (in field 18) per flight phase.

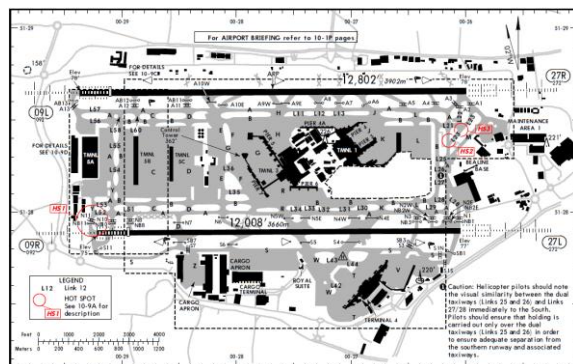
Flight phase	NAV Capability	All permitted sensors	GNSS	DME/DME	VOR/DME	DME/DME/IRU (or INS/IRS for B5)
Oceanic	RNAV 10 (RNP 10)	49,6%				
	RNP 4	19,1%				
En-Route	RNAV 5	64,3%	19,1%	23,1%	21,4%	13,1%
	RNAV 2	29,8%	1,9%	3,0%		3,8%
	RNAV 1	63,4%	12,2%	13,4%		9,7%
Terminal	RNAV 1	63,4%	12,2%	13,4%		9,7%
	RNP 1	43,2%	7,0%	5,7%		3,3%
Final	RNP APCH (LNAV)	21,1%				
	RNP APCH with Baro VNAV	34,7%				
	RNP AR APCH with RF	4,8%				
	RNP AR APCH without RF	0,5%				

Analysis per geographical area

RNAV 1, RNP 1, RNP APCH (with and without Baro), RNP AR APCH (with and without RF) declared capability for the 25 (and Istanbul) largest airports

PARIS CH DE GAULLE; FRANKFURT MAIN, LONDON/HEATHROW, AMSTERDAM, MUENCHEN 2, MADRID BARAJAS, ISTANBUL-ATATURK, ROME FIUMICINO, BARCELONA, WIEN SCHWECHAT, ZURICH, LONDON/GATWICK, COPENHAGEN, OSLO/GARDERMOEN, PARIS ORLY, BRUSSELS NATIONAL, DUESSELDORF, STOCKHOLM, MILANO MALPENSA, PALMA DE MALLORCA, TEGEL-BERLIN, MANCHESTER, DUBLIN, NICE, LONDON/STANSTED

Analysis per geographical area



Top 10 Aircraft	% of Flights	Segment	% of Flights
A320	26,4%	Mainline	99,28%
A319	20,3%	Regional	0,66%
A321	10,1%	Business Jet	0,05%
B772	7,6%	Military	0,01%
B744	7,0%	GA IFR	0,01%
B763	6,0%	Other	0,01%
B77W	5,2%		
A333	2,5%		
A388	2,0%		
A346	1,7%		

EGLL (London Heathrow)	January – June	July – December	Trend
RNAV 5	99,7%	99,8%	0,1%
RNAV 1	97,8%	98,0%	0,2%
RNP 4	18,1%	21,1%	3,0%
RNP 1	75,2%	76,3%	1,1%
RNP APCH	14,1%	15,1%	1,0%
RNP APCH Baro VNAV	71,7%	71,7%	0,0%
RNP AR APCH with RF	5,2%	5,6%	0,4%
RNP AR APCH without RF	1,0%	0,9%	-0,1%

Conclusions

- Survey included trends from 1st half of the year to 2nd half of the year
- Small increase in declared PBN capability: 97,0% of all flights have PBN capability (0,5 % increase over 6 months)
- GNSS capability: 91% of all aircraft (representing 88% of all flights)
- Baro VNAV capability: 34,7% (2010 IATA - mainline aircraft operators survey indicated 34,0%)
- Statistics are quite stable from one period to the other
- FPL data can be used to check fleet PBN capability without needing to conduct operator surveys
- We need to keep in mind that FPL data is “as provided” by operators