

PBN, RNP and what it all means

OPSGROUP Team

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All across Europe, 'Airspace Improvement Events' are occurring. It sounds huge. We were expecting new regions, routes, maybe some special-filtered cleaner air being puffed out into it...

Alas, we read through all the Airspace Improvement Event notices, and from what we gather, it is part of a big, ongoing project to implement things like **Free Route Airspace**, more **PBN routes**, and to basically **tidy up the airspace** a little. This is not limited to just Europe though – the world is going PBN.

So, less an 'Event' and more a 'Something'?

Everything is moving to Performance Based Navigation. It has something to do with being compliant with EC Regulation 2018/1048, but really just comes down to more efficient, better, safer, increased capacity airspace and approach benefits for everyone.

As simply as possible – **VORs are out, Waypoints are in.**

In a bit more detail – fixed ATS routes will continue to be implemented for better flow management and lateral separation, you'll hear more about Free Route Space, and you'll start seeing more RNP approaches popping up at airports.

So it is actually quite a big change, but one that will be slow to get implemented. Actually, most countries brought in things like **RNAV5 routes** and **SIDs/STARs that use RNAV1 and GNSS** instead of old-fashioned, Navaid-based manoeuvrings quite some time ago, so this isn't something pilots will necessarily notice and there is no Big Date to look out for.

Except for one – **December 1 2022** (but we will get to that later).

Why don't we like conventional Navaids anymore?

Well, old Navaids need a lot of maintenance and they break a lot. Ok, not a lot, but they do potentially **double the chance of some sort of issue** for an airplane relying on them. Take your bog standard ILS

for example – it has ground transmitters and aircraft receivers (and all the bits around them and in between then) and if any one of these conks out then you can't fly the ILS (quite so well) anymore.

Your **GPS approach** on the other hand relies on the aircraft system only, which means less to go wrong.*

*Actually satellites can have issues too – GPS Jamming is a big problem and the plan to decommission NavAids is being delayed because of this.



A relic almost as old as Stonehenge

So, what does this all actually mean, practically?

For operators, it doesn't mean a whole lot. Most aircraft will have been operating to RNAV5 for a fair old while now, so the only noticeable change will probably be some **newly named waypoints**, and some **slightly more efficient routings**.

You might need to **pay a little more attention to any MELs** that affect your performance capabilities, and be aware that approaches might no longer have conventional NavAids as backups in the future because a bunch of these are getting decommissioned.

But overall, it really means keeping an eye on them charts to see what's happening where, and to make sure you pull the right plate out for your arrival.

PBN, Say Again?

So, PBN, again. And December 1 2022. What happens then?

ICAO has ordered **all approach charts** to reflect the new specifications **by December 1, 2022**.

Navigation Specification	Existing chart title, permitted until 30 November 2022	Chart title required from 1st December 2022
RNP APCH	RNAV (GNSS) RWY 23	RNP RWY 23
RNP AR APCH	RNAV (RNP) RWY 23	RNP RWY 23 (AR)

This

What is changing?

All charts will say **RNP APCH** on them (or **RNP AR APCH**) instead of *RNAV*, *RNP (GNSS)* or whatever other random title they currently have. The chart should have the three lines of minima on it which you will need to know – your **LNAV**, **LNAV/VNAV** or your **LPV**.

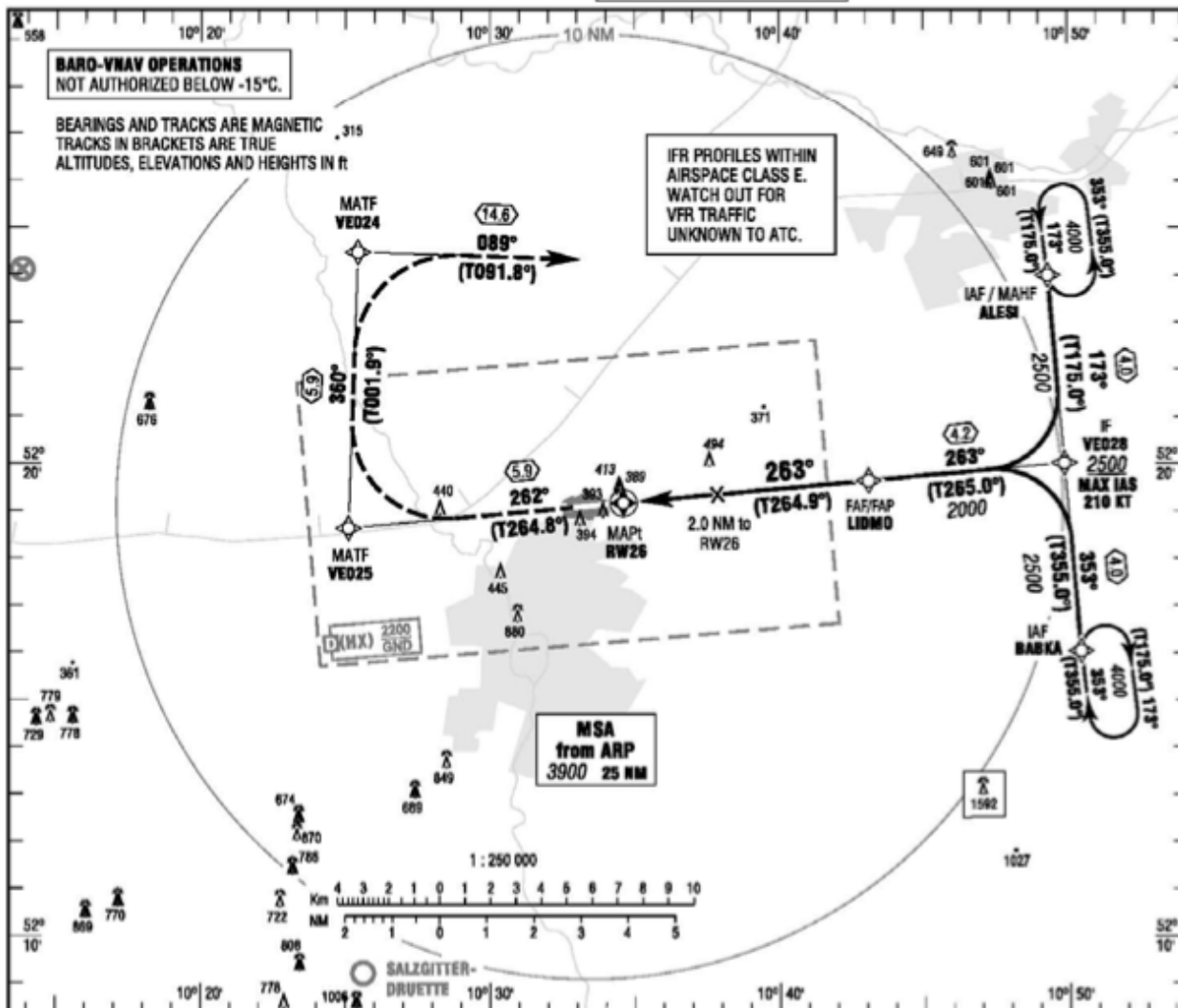
INSTRUMENT
APPROACH
CHART - ICAO

VAR 2° E

ELEV 297
OGH RELATED TO
THR 26 ELEV 268

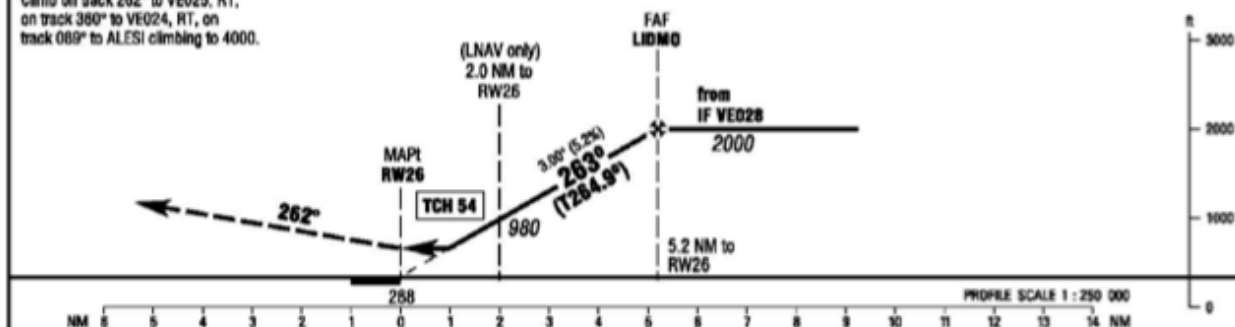
BRAUNSCHWEIG ATIS 134.455
BREITEN RADAR 131.330
BRAUNSCHWEIG TOWER 120.055

BRAUNSCHWEIG-WOLFSBURG
RNP RWY 26
EGNOS CH 99971 E26A



MISSED APPROACH PROCEDURE

Climb on track 262° to VED25. RT,
on track 360° to VED24. RT, on
track 089° to ALES1 climbing to 4000.



OCA (OGH)	A	B	C	D
LNAV	670 (380)	670 (380)	670 (380)	670 (380)
LNAV / VNAV	545 (257)	555 (267)	565 (277)	574 (286)
LPV	545 (257)	555 (267)	565 (277)	574 (286)

DIST THR / RW26	1	2	3	4	5
ALTITUDE	670	980	1300	1620	1940

Timing not authorized for defining the MAPt.

GS	kt	80	100	120	140	160	180
LIDMO - RW26 (5.2 NM)	MIN-SEC	3:54	3:07	2:36	2:14	1:57	1:44
Rate of descent (5.2%)	ft / MIN	420	530	640	740	850	960

Correction: Communications.

Which country is winning the chart race?

ICAO post updates on the implementation which you can follow here, although they last updated it in 2017 so let's hope it is looking a little better now.

All the R's

In case you are still lost at RNP instead of RNAV, here is a quick recap on some terms for you:

- **GNSS** is your Global Navigation Satellite System and it is a generic term for all satellite navigation systems including GPS, Galileo, GLONASS, and ones augmented by ABAS, SBAS, GBAS... all the BASEs.
- **LNAV, VNAV, LPV, LP** are your different minimums given on an RNP approach chart.
- **PBN** is Performance Based Navigation based on performance requirements of the aircraft on a route or approach or in designated airspace.
- **RNP** is required navigation performance which basically means the onboard monitoring and alerting system your aircraft has.
- **RNP Approach** is a generic term for any approach which uses GNSS to enable it and an RNP system to fly it.
- **RNAV Approach** is what RNP approaches used to be called.
- **RNP APCH** is the name of the navigation specification in the ICAO PBN manual for the 4 types of approach:
 - LNAV (GPS NPA)
 - LP (SBAS-based NPA)
 - LNAV/VNAV (APV Baro-VNAV)
 - LPV (APV SBAS or SBAS Cat I)
- **RNP AR APCH** is an approach that requires a specific aircraft qualification and operational approval. Usually because it takes place in an environment "rich in obstacles". The AR stands for 'approval required'. So you might be allowed to fly an RNP (RNAV) but not an RNP AR and your OpSpec (and training) are going to make this pretty clear.

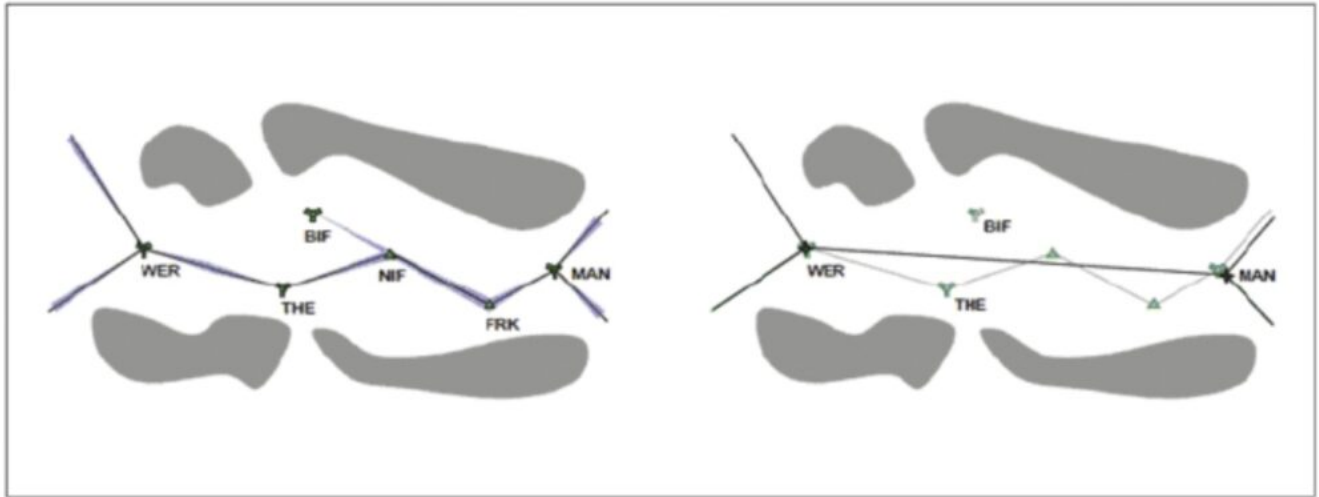
What is Free Route Airspace?

FRA is a specified volume of airspace in which users can freely plan a route between defined entry and exit points. It makes the sector much more efficient.

And because we mentioned it earlier, what about RNAV?

Way back in the olden days (not as far back as when airplanes just had a compass and a map to use, but before GPS came in), there used to be Navaids. Ancient relics called VORs and NDBs which helped pilots work out where they were.

Navigation by Conventional Navigation Compared to Area Navigation



Possibly the least necessary (and most boring) visual explanation of something we've ever seen

But then GPS came along and brought with it a way more effective and accurate way to navigate. How accurate is defined by ICAO under their four main navigation specifications – **RNAV10, RNAV5, RNAV2 and RNAV1**

RNAV5 is actually fairly basic. It has been around in Europe since 1998 and is mandated in pretty much all high level airspace there.

The 5 bit refers to the requirement for aircraft to operate to a **minimum navigational accuracy of +/-5nm for 95%** of the time.

RNAV1 is your precision RNAV (1 being +/-1nm). **RNAV10** is generally what you find over the oceans, and **RNAV2** is generally used in en-route areas of the US.

Fun fact: The UAE and Bahrain FIRs implemented RNAV1 a while back, which means you need GPS Primary to route into here. If you've encountered GPS jamming en-route, (common in Turkey, Iran, Iraq etc, read all about that here), then this might cause problems for you.

What do you need for RNAV5 operations?

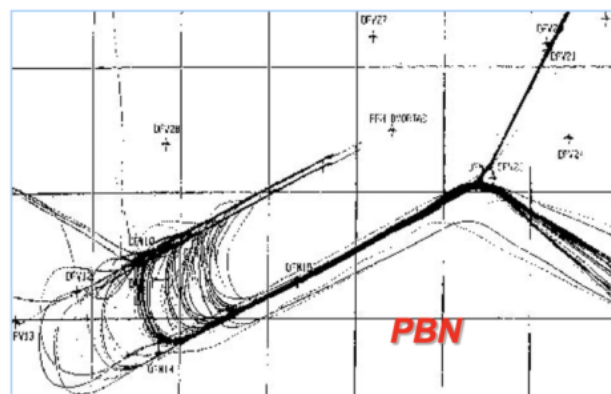
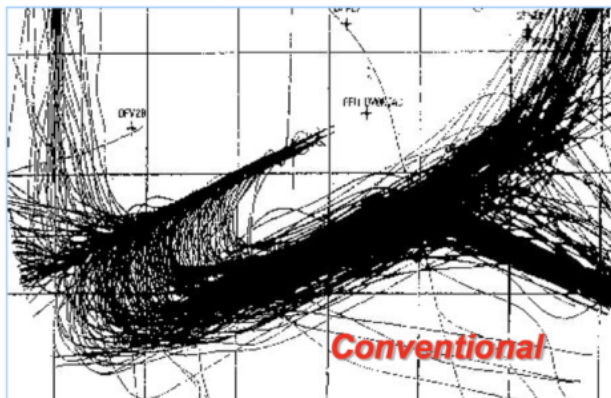
You need some sort of FMS, 1 IRS, 1 GPS or VOR/DME receiver and 2 nav displays.

What about RNP?

If it is an RNP navigation specification then there is also a requirement for on-board performance monitoring and alerting. RNAV refers to 'area navigation' and it is slightly different to an RNP system (the monitoring and alerting requirements). PBN requires an RNAV or RNP system, while an RNP APCH specifically requires an RNP system.

What else?

Actually, that's about it. Except for the poor old UK that will no longer support LPV approaches from June.



In case you were wondering about the accuracy, here is a glorious image to show you

Need to know more?

Here is ICAO EUR Doc 025 which contains all the EUR RNP APCH Guidance Material.