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# GA Update

June 2021

# GPS APPROACHES





# HOW THINGS ARE CHANGING

## On June 25th the UK's use of EGNOS comes to an end, here's what it all means

**Y**ou've probably heard of 'GPS approaches', technically known as RNP approaches in the UK, even if you haven't flown one, but at the end of this month — June 25th to be precise — they'll be changing in the UK for the time being. That's because the UK has decided not to continue with membership of the European Galileo and EGNOS programmes following the UK's decision to leave the European Union.

While most aircraft use the U.S. worldwide satellite system for general navigation, for it to be precise enough for an 'instrument-type' approach it needs a bit of a boost which is where EGNOS (the European Geostationary Navigation Overlay Service) in Europe and WAAS (the Wide Area Augmentation System) in the U.S. come in.

These two Space Based Augmentation Systems (SBAS) and others around the world provide corrections to give even better lateral and vertical position accuracy — less than three metres — for safety-critical applications such as instrument approach procedures to lower minima.

It's this increased accuracy, particularly vertically, that's

facilitated some 'GPS approaches', or more accurately LPV, in the UK in the last few years.

LPV stands for Localiser Performance with Vertical guidance. The important word here is vertical, which means that properly equipped aircraft can use 'GPS procedures' for an approach to suitably equipped runways with minima similar to a Category 1 Instrument Landing System (ILS).

In practice that means aircraft using approved onboard equipment, rather than ground-based navigation aids such as an ILS, can descend to 200ft on the approach before deciding whether to continue to land or go-around. Without it the Minimum Descent Height tends to be 400ft or higher.

Without the use of the European 'augmentation system', and in close co-ordination with the affected aerodromes, NOTAMs are being issued to notify pilots that LPV lines of minima on the RNP IAPs are not available for use from the 25 June 2021 until further notice.

As a result, pilots will need to make use of the other elements of the RNP instrument approaches, LNAV and LNAV/VNAV(BaroVNAV)

or alternative instrument approach procedures where available, and plan flights taking account of the loss of LPV operating minima at affected airfields.

That said, Crown Dependency aerodromes such as Jersey, Guernsey and Alderney have separate arrangements for access to EGNOS and will retain their LPV procedures after June 25.

There are two EGNOS Ranging and Integrity Monitoring Stations (RIMS) in the UK and they will continue to operate; it's also expected that the signal-in-space will remain unchanged after 25 June 2021. So, provided that the received signal is still indicating adequate integrity, pilots won't be required to de-select the EGNOS signal from their GPS and the service can still be used in other flight phases.

**UNTANGLING 'RNP APPROACHES'**

'RNP approach' is really a catch-all name for a number of types of approach. To really understand them it's first worth reviewing the difference between Precision and Non-Precision Approaches.

Traditionally, a Precision Approach, such as an Instrument Landing System (ILS), provides lateral and vertical guidance for a stabilised continuous descent, whereas

a Non-Precision Approach (NPA) is based on conventional navigation aids such as an NDB, VOR and DME and provides lateral guidance only to bring the aircraft to a point where the runway is in view for a visual landing. So, 'RNP approaches' can provide both 'non-precision' (LNAV) approaches and approaches with vertical guidance (LPV and LNAV/VNAV) similar to those used on Precision Approaches.

'RNP approaches' come under the heading of Performance Based Navigation (PBN) which is becoming more established worldwide. It includes (standby for a load of acronyms...) approaches called RNP APCH and RNP AR APCH. In reality all of that's much less complex than it sounds — RNP stands for Required Navigation Performance, while APCH is simply an abbreviation for Approach and AR for Authorisation Required.

Essentially, then, RNP and RNP AR procedures allow pilots to use very accurate onboard navigation kit for approaches instead of traditional ground-based external guidance aids. In some circumstances they also allow the replacement of visual and circling approaches by instrument approaches.

So put simply, RNP and RNP AR

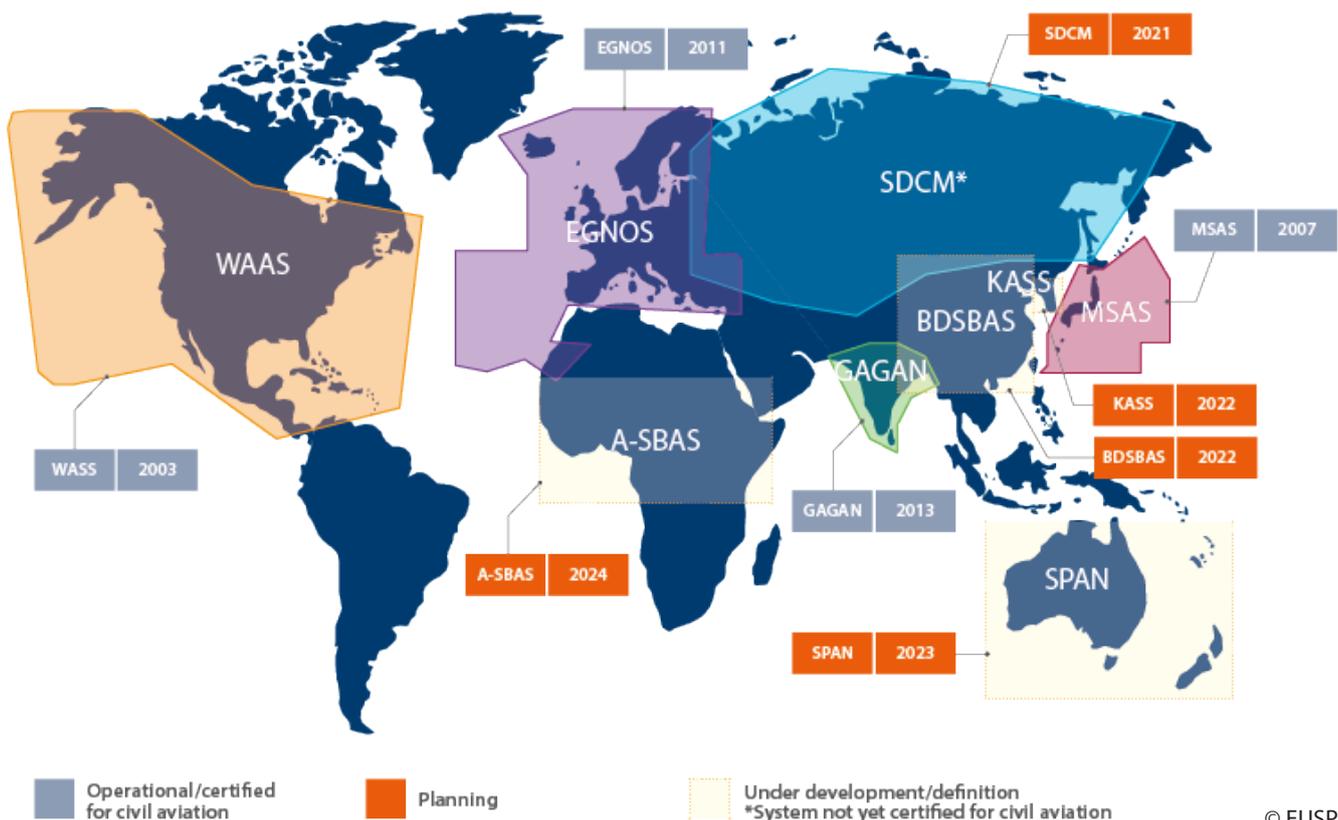
procedures can provide a lateral and vertical GPS path for pilots to fly to a decision height of 200ft from which the decision to continue the approach can be made.

The end of the EGNOS agreement in the UK will only impact the LPV elements of an RNP APCH (Instrument Approach Procedures) IAPs approach, so only the LPV line of minima will be NOTAM'd as unavailable, before being withdrawn. LNAV (Lateral Navigation only) and LNAV/VNAV (Lateral and Barometric VNAV) lines of minima published on RNP APCH will continue to be available.

To use 'RNP approaches' aircraft need to have a suitable IFR approved GNSS set-up installed. The equipment must also contain an up-to-date navigation database with details for the required 'RNP approach procedure' to an airfield. When activated, the aircraft navigation equipment automatically sequences through the procedure's legs to bring the aircraft to the runway.

There must also be an On Board Performance and Alerting system to warn the pilot of positioning errors, loss of signal, degraded tracking accuracy and other parameters.

**GPS augmentation around the world**





So how do they work in practice? RNP and RNP AR approaches use a series of waypoints, legs, speed and altitude limits stored in the navigation database to provide both a lateral and, crucially, a vertical trajectory.

The main difference from, say, an ILS is that rather than requiring costly ground facilities for the approach they use the aircraft's onboard navigation performance capability. An aircraft tracking the final approach course with a centred needle can be expected to be within 0.3 nm of the centreline 95 percent of the time.

Most 'RNP approaches' in the UK will be set up to give a 10nm track to the runway threshold. Depending on the design of the approach, the 10nm 'waypoint' might be known as the "initial fix" (IF) or the "intermediate fix" (IAF). Where this point is the intermediate fix there will be other legs leading to this point, the start of which will be the Initial Fix.

The Final Approach Fix (FAF), is usually set at around 5nm from the runway threshold. From the FAF a descent profile will be defined with a range/altitude countdown, usually at 1nm intervals to the missed

approach waypoint (mapt WP). The angle of descent varies slightly from airfield to airfield but is usually 3 to 3.5 degrees.

In practice, whichever type of 'RNP approach' you fly depends on the equipment in the aircraft. Some early model GNSS receivers allow lateral guidance only (LNAV) approaches, while later models might incorporate WAAS in the U.S. or EGNOS in Europe to allow vertical guidance as well.

For pilots flying near to airfields, especially those outside controlled airspace which have published RNP procedures, it's worth noting that aircraft flying these procedures could be up to 15nm from the airfield, so consideration must be given to maintaining suitable vertical and lateral separation from an aircraft on an 'RNP approach'.

So, while the primary purpose of the EGNOS service has been to increase precision flight, especially in marginal weather conditions and to lower flight decision minima, a range of alternate satellite based and instrument approach navigational aids will remain available to flight crews and aerodromes that continue to be safety approved, including Area Navigation (RNAV) Non-Precision Approaches and Instrument Landing Systems (ILS) Precision Approaches, respectively.

