What’s the deal with GLS approaches?

Chris Shieff
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A new and reliable technology is being steadily introduced across the world that stands poised to eventually replace the humble ILS all together.

In fact it has already been rolled-out to well over one hundred major airports. It’s called GBAS, or **Ground Based Augmentation System** if you want to get fancy. And it enables pilots to fly GLS approaches – a different type of precision approach that can get you all the way down to CAT I minima.

From a pilot’s perspective, flying a GLS approach is pretty much identical to flying an ILS approach which is why hardly any extra training is required. **But what is the actual difference?** And why are GLS approaches arguably much better?

Let’s take a closer look.

What’s wrong with the good ol’ ILS?

Believe it or not, it has been with us since the 1930s, and it hasn’t changed much since then. Put simply, technology is beginning to move on.

The conventional ILS has been around since the 1930s.

A conventional ILS uses a complicated array of antennas for each runway to broadcast two frequency lobes for both the localiser and the glide slope. Where the two meet in the middle is exactly where we want to be. Simples.

But the problem is that these antennas must be located close to the runway. Which means vehicles or other aircraft can easily interfere with the signal causing the ILS to fluctuate, and our fully coupled airplanes to suddenly or erratically deviate off-course.

These are known as critical areas and are usually only protected from interference during low visibility operations.

There are some other disadvantages too. The glideslope of an ILS cannot be easily adjusted which means when there is a displaced threshold, it cannot be used. The upkeep of all the equipment can also be expensive and time-consuming requiring multiple flight tests and calibrations.

So, in recent years, the industry began to look for something better and they found it – the GLS.

ILS approaches require complex arrays of localiser and glideslope antennas for each runway.

How does it work?

This ain't no radio shack, so let's keep things simple.

GLS stands for GBAS Landing System and uses equipment on the ground to augment or 'enhance' the accuracy of conventional GPS signals within 23nm of an airport, allowing aircraft to fly a precision approach. It is incredibly precise.

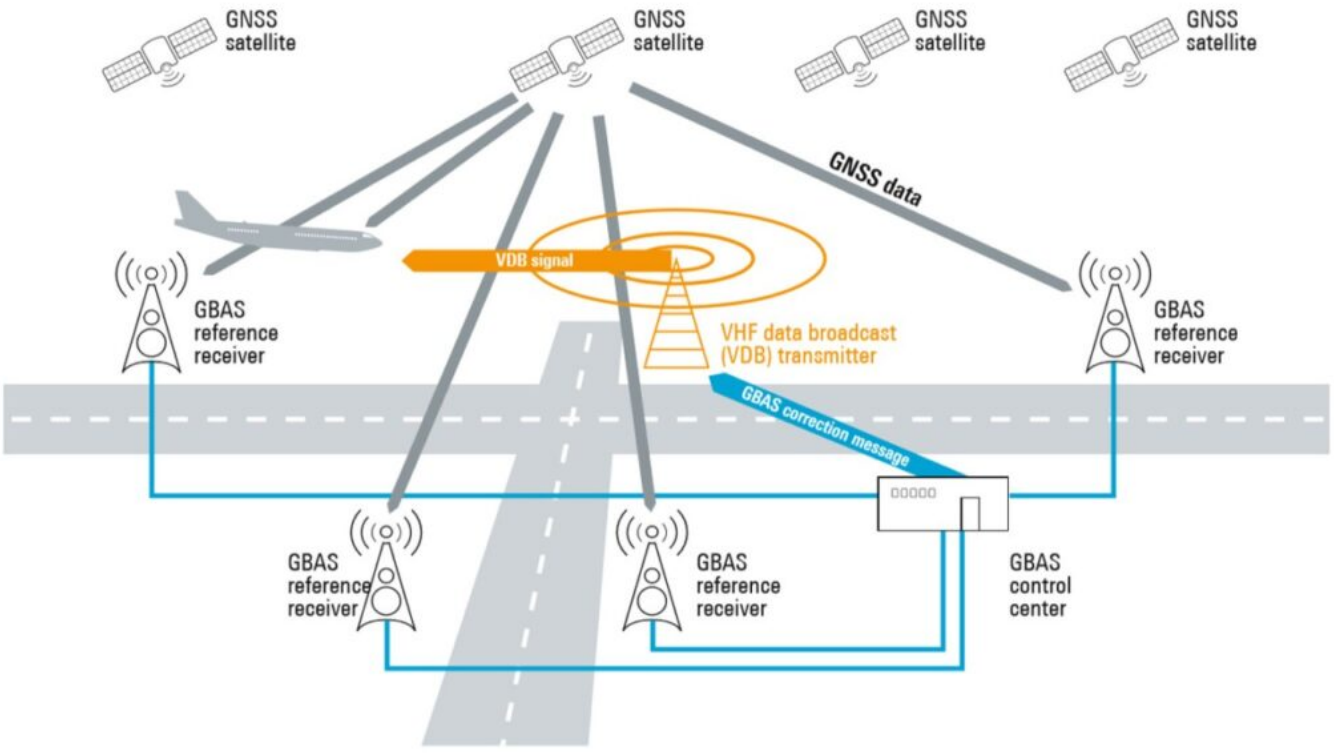
A GBAS landing system uses much less equipment than a conventional ILS – **and there only needs to be one set up for all runways.**

Essentially it consists of three things – a bunch of GPS antennas on the ground, a sophisticated computer and a VHF data antenna. That's it. They don't even need to be near a runway.

GBAS GPS antenna at Sydney Airport.

Here’s where things start to get a little tech-y. The GPS antennas receive signals from GPS satellites and measure how long they took to arrive. This is converted into a distance. The computer already knows the exact location of the antennas and exactly where the satellites are, and so it compares the calculated distance with the actual distance and voila, it can figure out the position error in the signal.

It takes an average of these errors across all antennas and sends a correction by VHF up to any GBAS capable aircraft which are tuned in. **And hey presto, uber accuracy!** In other words, the computer is constantly calculating errors in the GPS signal and fires off correction data twice a second to anyone up there who is in range and listening.



GBAS in action – GPS antennas, a computer and a VHF antenna.

This extremely accurate signal can be used to fly precision approaches. In the flight deck they are flown in the exact same way as an ILS. The only real difference is that the pilots are tuning a five-digit channel number, rather than a frequency. And they don't need to worry about interference.

Just how accurate is GLS?

Very. It comfortably meets ICAO's requirements for CAT I approaches i.e., 16m (52') laterally, and 4m (13') vertically. But the majority of the time, **the position error is less than a meter.**

Advantages

Okay so the tech is fancy. But what are the actual hard advantages to a conventional ILS?

- The major one we've touched on already is **interference**. ILS signals are prone to it while GLS signals are rock-solid stable.
- There is **much less equipment**. One GBAS set up costs about as much as a single ILS but can cater for up to 46 different approaches to different runway ends or multiple approaches onto a single runway.
- **The approaches can be curved** to avoid terrain or noise sensitive areas.
- **The vertical profile can be easily adjusted.** So GLS approached can continue to be used even with a displaced threshold.
- Flight checking of a GBAS system is simple and maintenance very easy. This saves dosh for airport operators.

Any disadvantages?

Yep – not everyone has the right gear on board to be able to shoot a GLS approach. **You'll need GBAS capable avionics incorporated into a Multi-Mode Receiver for the magic to happen.** While this is quickly becoming standard on airliners, this may not be the case in older aircraft.

As one GBAS system can hold up to 46 different GLS approaches it is important that pilots ensure they cross check that they have the correct procedure tuned. They can do that by cross checking the approach ID on the plate.

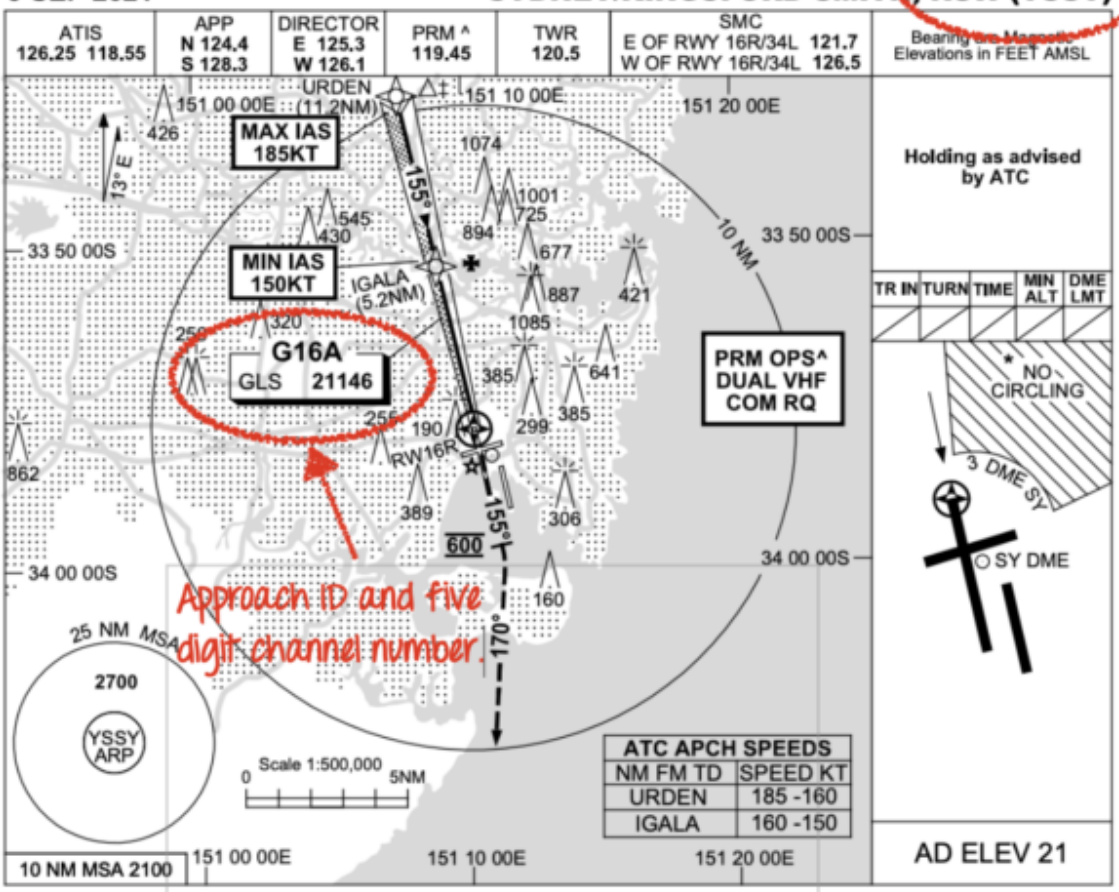
GLS Approach

GLS RWY 16R

9 SEP 2021

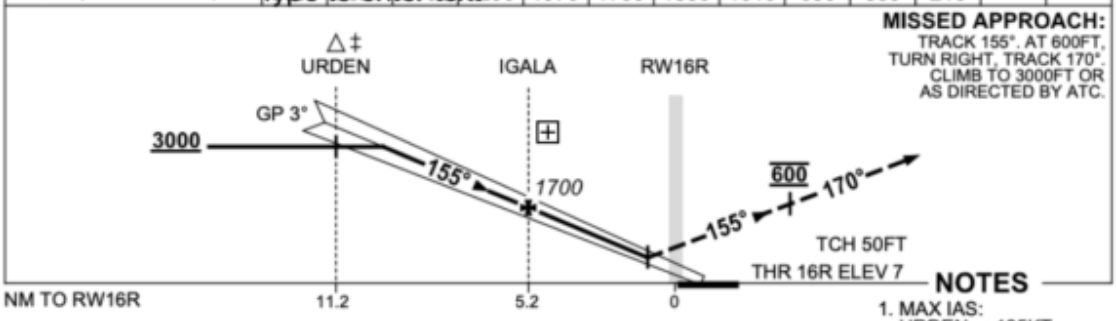
USE QNH

SYDNEY/KINGSFORD SMITH, NSW (YSSY)



Approach ID and five digit channel number.

RW16R DIST	9.2	9	8	7	6	5.2	4	3	2	1	0.5		
ALT (3° APCH PATH)	Type to enter text				1970	1700	1330	1010	690	380	210		



NOTES

1. MAX IAS: URDEN : 185KT.
‡2. ACFT MAY BE RADAR VECTORED TO FNA.
^3. SIMULTANEOUS APCH AUTHORISED WITH RWY 16L. SEE PRM USER INSTRUCTIONS FOR ADDN RQMNTS.
*4. NO CIRCLING BEYOND 3 DME SY EAST OF RWY 16R & NORTH OF RWY 25.

CATEGORY	A	B	C	D
S-I GLS	**210** (203) 0.8			550RVR
CIRCLING *	**710** (689-2.4)		**1000** (979-4.0)	**1000** (979-5.0)
ALTERNATE	(1189-4.4)		(1479-6.0)	(1479-7.0)

Changes: NOTE 3.

SSYGL03-168

CAUTION: CLOSELY SPACED PARALLEL RUNWAYS ^

airservices

Be sure to cross check the approach ID and channel number to what you have put in the box.

CAT IIIC is coming…

Work is ongoing to produce a GBAS system so accurate that it will allow **landings in zero visibility**. Quite a lot still needs to happen to get to the technology to this level including improved integrity monitoring and robustness. But it will be on the scene in the not-too distant future. Watch this space.

What the WAAS?

If there is one thing aviation can't get enough of, it's acronyms. It can make you cross-eyed. So here are a couple of clarifications while we're at it.

GBAS used to be called **LAAS** in the US – which stands for **Local-area Augmentation System**. GBAS is the new term, so don't worry too much about LAAS.

WAAS is different – it stands for **Wide Area Augmentation System**. It's beyond the scope of this article but works using satellites to enhance the accuracy of GPS signals over a much wider area – like the entire US NAS. Look out for an article on this tech soon.

Other handy things…

- The US FAA's write-up on how GBAS works can be found here.
- Click here for some more info from the folk at Skybrary.

UK: No more LPV approaches after June

OPSGROUP Team
6 December, 2021

On June 25 the UK's current EGNOS working agreement comes to an end, and they are not renewing it. This means their access to EGNOS will stop – which means **LPV approaches at UK airports will no longer be possible.**

So let's talk LPVs. What exactly are they? What on earth is EGNOS? And what has Brexit got to do with all of this?

What is an LPV approach?

If you read this and are thinking "That isn't something I've ever flown" then you can probably stop reading (unless you're interested in a bit of aviation geekery), because this probably won't have much of an impact on you. If you do fly these, and fly them in the UK, then read on.

LPV means **localizer performance with vertical guidance**. It is a GPS based approach sort of like LNAV/VNAV but also, confusingly, sort of like an ILS.

More confused? Us to. Let's dig deeper.

An LPV has vertical guidance but is not a precision approach (which your standard ILS of course is). Instead, it is classified as an 'approach with vertical guidance', or APV for short.

So an LPV is an APV? Yes, and the point of this distinction is that it's a lot cheaper, quicker and easier to implement than an ILS because there is a lot less paperwork involved, but it still offers "nearly" the same precision as an ILS – meaning you get down low if you need to.

You might also see the term SBAS used in the same breath. SBAS stands for **satelitte-based augmentation system**, and is a generic term for the use of geostationary satellites which broadcast augmenting information.

That's the basics, but how does it actually work?

They provide lateral and guidance down to a DA, just like an ILS. And just like an ILS, they get more sensitive the closer to the runway you get, which is what allows you to operate down to lower minimas than, say, your **less sensitive LNAV option.**

There are a few things you also need to know – first up, **you need a special receiver** on your plane for it (which is probably why a lot of folk are scratching their chins and wondering what on earth as LPV is).

Secondly, if you're planning on using an airport without an ILS or some sort of ground based navaid as your alternate, then the FAA wants you to plan on LNAV minimas.

Why do we like them?

Well, because they get us nice and low so we can see the runway in not so nice weather.

They also use GPS, so the equipment you need is on your plane. An ILS needs a whole bunch of ground and plane equipment meaning there is a lot more that can fail on us. **RNP and SBAS approaches are the future.**

Okay, so what is EGNOS?

Not to be confused with the delicious Christmassy drink, EGNOS stands for 'European Geostationary Navigation Overlay Service'. It is basically a bunch of European satellites, (actually just 3 out of the Galileo GNSS system, and a network of 30 referencing stations), that improves positioning measurements and gives much better accuracy than GPS alone.

In fact, it has **95% accuracy**, which translates into the locating of a position to 1-3 meters horizontal accuracy, and between 2-4 meters vertical accuracy.

So EGNOS is what gives LPVs their precision.

Brexit…

Yep, we're pretty bored of it now too. Brexit means the leaving of the UK from the EU. Not to be confused with Europe the continent – the UK is still part of that. But leave the EU it has, which means leaving all EU related programs including EGNOS (even though the UK's NATS was one of the founders of EGNOS…)

Anyway, the EGNOS working agreements are not going to be renewed, so as of **25 June 2021**, **the UK will not longer participate in the EGNOS program** and their LPV approaches will no longer have the accuracy assurance that EGNOS provided.

How many airports are affected?

The UK has 125 licensed aerodromes and out of these 69 have at least one instrument approach (surprisingly low given how miserable the weather often is in the UK.)

Anyway, **ILS is still the most popular in the UK** with 81 runways having an ILS approach available on them. **Only 45 runways use LPVs** and 20 of those have an ILS as well anyway, but that does leave a few airports where the other option is your old school, much higher minima non-precision approach.

Like poor old **EGPL/Benbecula** for example, which only has a VOR. A very old VOR which they are really hoping to retire. Or **EGHE/St Mary's** which has a timed NDB…

The first LPV approach in the UK only went operational in 2014 at EGTE/Exeter airport, with Flyer magazine saying the country no longer needed to "hang its head in shame" because they had finally caught up with the rest of the modern aviation world…

The Impact

It isn't huge – most airports have alternative approaches. However, there are a few points to think about:

- Where there is an ILS, the minima will be the same, but the redundancy for approaches is now reduced.
- Where this is only an LNAV, or non-precision approach, the minima will be higher so watch out for that poor weather.

The official word on it all

Here are the official FAQs on the UK leaving the EGNOS program.

The FAQs have the following statement in them –

If EGNOS or an alternative SBAS SoL service becomes available before 31st December 2021, the LPV may be notified subject to the following:

- An impact assessment to confirm nothing has changed since the time of approval before implementation.
- IFPs shall be safeguarded against the latest obstacle data to ensure the procedures are

obstacle clear.

Alas, unless the UK renegotiate the EGNOS Working Agreements (EWAs), or are able to find a replacement solution, then from **25 June 2021 the LPV approaches in the UK will stop.**

Up for some further reading?

- **AOPA UK** put out a great article explaining LPVs which you can find here.
- To find out which space programs the UK is still involved in, you can find the government website on it here.
- The **UK CAA Skywise site** promises to keep you up to date with all this UK aviation (although are yet to update their info on LPVs).
- **The FAA** probably explain all this better with their info on Wide Area Augmentation System (WAAS).