LPV. Retrofit experience from a Part 21J DOA

EGNOS workshop

27 September 2016

Gama Aviation

About us

- World-wide multi-disciplinary company. Charter, management, maintenance.
- EASA/FAA Part 145, Part 21J & G, Part M
- UK MAOS and DAOS certified
- Engine repair and overhaul (Lycoming & CMI), including components and NDT
- Fixed wing & rotary maintenance and modification
- Authorised service facilities (Beechcraft, Cirrus, Twin Commander)
- Avionics specialists- Garmin design partner

INTELLIGENT
AVIATION—
SINCE 1983

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LPV. How to certify the aircraft

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Requirement of our STC

To approve an existing Garmin GPS installation for LPV

Provide a simple upgrade path for non-WAAS aircraft

Minimize any additional rework of the aircraft

Gain exemptions from restrictive certification requirements

Cessna 172 with single GNS430W and raw CDI – no slaved HSI.

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The STC solution.

Garmin GNS 430W/530W. The first LPV capable GPS unit for general aviation. Over 130,000 made between 1998 and 2012.

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What aircraft are included in this EASA LPV STC?

- All EASA-certified single-crew Part 23 aircraft (including single and twin turboprops such as Pilatus PC12 and Beech 1900).

- In total 1150 specific aircraft types or variants!

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Excluded aircraft

- Part 23 Light jets which can be operated as 2-crew per the EASA type certificate.
- Any aircraft on the Part 23 EASA orphaned list.

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What specific GPS units are approved?

- Garmin GNS unit of the following versions:
- GNS530W, GNS530AW, GNS530W-TAWS, GNS530AW-TAWS
- GNS430W, GNS430AW
- Only one GPS unit is required.
- Additionally:
  The STC includes upgrading any of the non-WAAS units to the equivalent WAAS version

  Note: You can’t add additional capability such as TAWS under this STC.

Other LPV equipment for general aviation

- Garmin G1000 (with GIA63W units). TC/STC upgrades or system retrofit STC such as KingAir series

- Garmin GTN750/650 – existing EASA Part 23 AML STC plus individual STCs for light jets and helicopters.

- Avidyne IFD540/440 – existing EASA Part 23 AML STC

LPV STC approval history

- Sponsored by UK NATS through Professional Air Training.
- First locally available airport was Alderney in Channel Islands
- Initial STC issued in Dec. 2011 for Beech single/twin piston types
- Second STC in parallel for Aurigny Airlines using the BN Trislander.
- Aurigny were the first European commercial operator approved to perform LPV operations
- STC extended in 2015 to include most Part 23 aircraft under a sponsorship agreement with GSA and with support from PPL-IR.

Airworthiness requirements

- AMC20-4A for BRNav (RNav 5)
- AMC20-28 for LPV
- AMC20-27A for APV Baro VNav (but using geometric altitude per EASA CM-AS-002 iss 2)
- JAA TGL-10 for PRNav
- Under the FAA, the above come under AC20-138d and AC90-107.

Pre-requisite LPV requirements

- An E/TSO C146 WAAS GPS
- A standard deviation display within the primary field of view (EFIS or mechanical indicator)
- Alternate means of Nav (VOR, DME etc) in the event of GPS failure (required by all compliance standards)
- Alternative means of Comm (to meet AC23-1309-1E appendix 1 – total loss of all Nav and comm is hazardous).
- ADF to be retained where an LPV uses an NDB for the missed approach procedure.

Specific LPV aircraft certification requirements

- Displayed Nav source and GPS status annunciation within the primary field of view.
- Auto-slewed course pointer
- Distance display to the fictitious threshold within the primary field of view (AMC20-27A and 20-28 requirement)

Achieved deviations for GA aircraft

- No auto-slewed course pointer
- No additional annunciators in most aircraft.
- GPS distance can be on the GPS unit in the radio stack

An easily compliant cockpit

Piper PA28 with Garmin G600 EFIS and dual GNS-W.

Key achievements

This STC harmonises the aircraft requirements with Garmin's GNS-W FAA STC and also matches the requirements of the similar GTN650/750 series EASA STC

It allows LPV certification ***without*** the need to install a dedicated set of remote annunciators subject to panel layout provisions

No Auto-slewed course pointer

Distance display can be on the GPS unit in the radio rack

The EASA approval process

Initial application and pay the STC fees

Agree the certification plan – compliance with regulations and negotiate agreed deviations

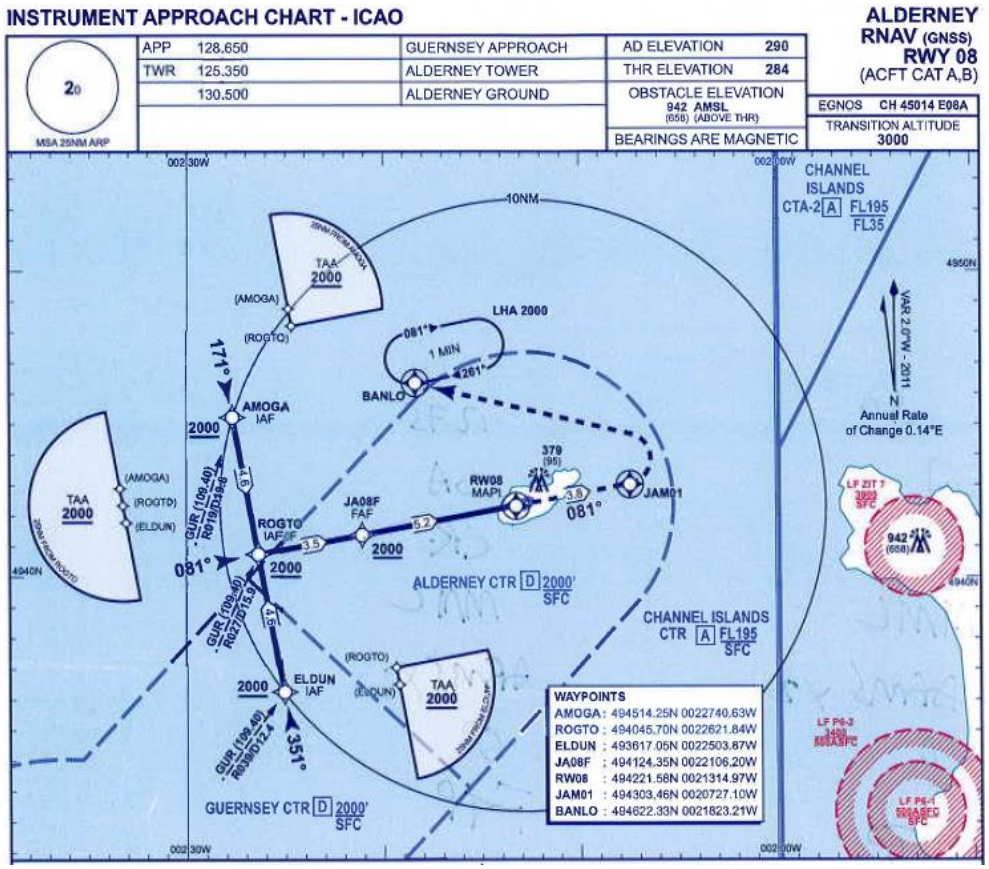
Agree the content of the aircraft model list. Only include aircraft that have a current EASA TC.

Complete a trial installation and gain an EASA permit-to-test

Conduct a series of test flights (witnessed by a UK CAA test pilot)

Submit the full data pack including flight test and AFM supplement to EASA for approval.

The test flights



Three approaches flown on each end of the runway.
– two manual and one auto-pilot coupled.

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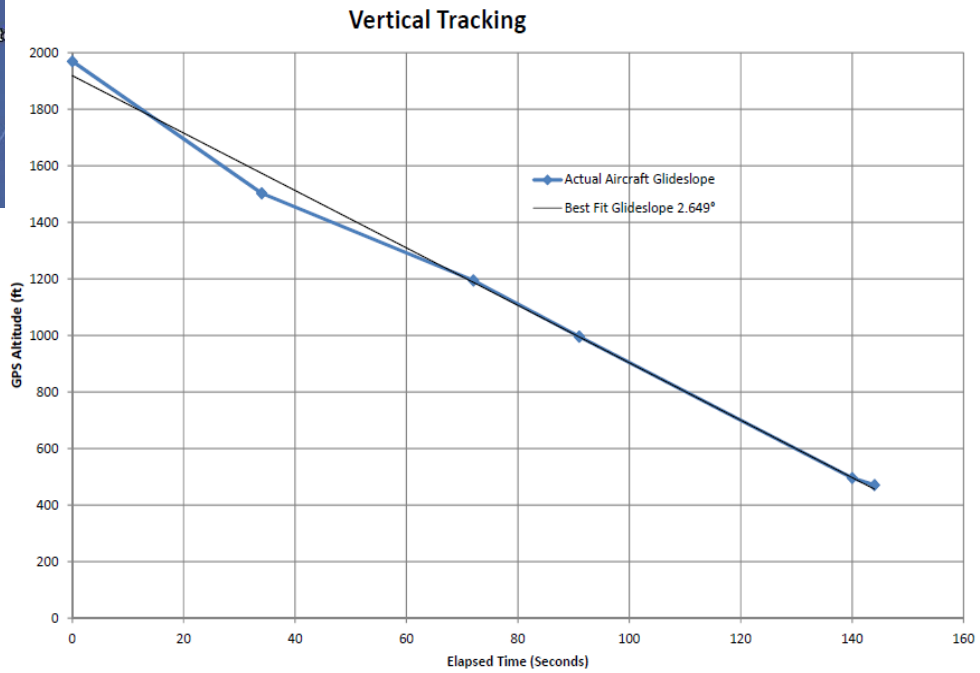
Flight test data

Data recorded using a Shadin Avionics portable GPS logger and data imported into Google Earth for map overlay.



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The STC process – good and bad

- **EASA Positives:**
- Mutual recognition of TSOs between EASA and FAA.
- AML STCs - allowing multiple aircraft types within a single STC.
- **Negatives:**
- Lack of harmonised requirements between EASA and FAA. Need a single GPS airworthiness AMC as per FAA AC20-138d
- Need to allow the DOA to work fully within the terms of it's approval:

> Subject to 21.A.257(b), the Agency shall accept without further verification compliance documents submitted by the holder of this design organisation approval for the purpose of obtaining a supplemental type-certificate.

- Timescales – STCs can easily take over 6 months!
- Automatic repeat fees if a project rolls over 12 months!

Future STC plans

- Additional STCs on Part 23 2-crew light jets
- STCs for orphaned aircraft.
- Helicopter approvals.
- Part 25 regional turbo-props and business jets.

I’ve bought this STC. What next?

- The aircraft requires a conformity inspection and for some specific testing to be carried out. This work must be certified by an approved maintenance company or Part 66 B2 engineer.
- If the aircraft is compliant, then issue the logbook entry, install the new AFM supplement and you’re approved.
- Part NCO has removed the need for any specific operational approval for non-commercial operators in GA but there are future PBN training requirements.
- AOC holders will need specific approvals in their operations manuals and provide crew training.

How much does it cost?

- **STC data package is €300 per aircraft.**

  Note*:* No additional changes can be incorporated into the data to suit a particular aircraft.

- The STC can be bought directly by owners or maintenance companies.

- Must work with a Garmin dealer if WAAS upgrade required.

- Implementation cost is between the owner and their maintenance provider who will be carrying out the aircraft conformity inspection. Typically around 4 hours of labour for an aircraft that is physically compliant.

- **Garmin's retail price for a GNS WAAS upgrade is US $3300 (plus local taxes) and includes the new GA35 antenna.**

Any questions?

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Contact details

Questions on the STC and certification:

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To buy a copy of the STC:

Contact the Part 21J design office
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+44 (0) 1276 857888

To have your aircraft upgraded by us:

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Thank you for listening.

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