Realising EGNOS benefits in HEMS operations

The European GNSS Navigation Overlay Service (EGNOS) – the equivalent of the FAA WAAS – has now been available to European aviation for just over a year. The benefits to HEMS operations are easily identified, but operators have to overcome a number of obstacles before they will be able to enjoy those benefits. The issue for all airspace users – and HEMS operators in particular – is matching suitably equipped aircraft with new and planned flight procedures. Phillip Church of UK air transport consultants Helios explains more.

Benefits to helicopters
EGNOS increases the integrity and improves the accuracy of GPS, creating a real opportunity for operators to use instrument approach procedures to fly in locations where such procedures were not previously possible. Since EGNOS does not depend on any local ground navigation infrastructure at the aerodrome/heliport for an instrument approach procedure to be designed, even remote locations can now benefit. In particular, the integrity of the procedure can be determined by the aircraft instrumentation without requiring personnel on the ground and so it is ideally suited for use at HEMS sites or unmanned aerodromes.

So what exactly are these benefits? Essentially, EGNOS enabled instrument approach procedures – such as APV or PinS (Point-in-Space) – provide operators with guided approaches of improved minima. Previously, operators would have had to operate under Visual Flight Rules (VFR) restrictions and consequently with higher minima. By enabling these lower minima, EGNOS improves operational resilience because these instrument approach procedures allow operations to continue when they may have previously been cancelled or diverted.

As an instrument approach procedure with both lateral and vertical navigation, EGNOS enabled approaches are published on charts designed according to ICAO Localizer Performance with Vertical Guidance (LPV) criteria. This minimum is currently set as a decision height (DH) of not less than 250ft. The fact that such minima can be achieved without any ground based navigation aid (i.e. ILS) opens up the possibility for flight crew to fly to locations in low cloud base conditions where previously the
flight would have had to be cancelled, diverted or delayed. Depending on the operational range of the aircraft, and navigation requirements that it will be subject to, equipping with EGNOS could also mean that other navigation equipment is no longer required on board and can be removed – for example ADF (Automatic Direction Finder). Whilst such a move would require consultation with the national regulator, this possibility is especially attractive to helicopter operators with less space available for panel mounted instruments.

Not only does EGNOS improve the instrumented landing capabilities, it also supports the concept of implementing low level RNAV routes where, due to terrain or lack of existing infrastructure, coverage from terrestrial navigation aids is insufficient to support RNAV operations. As a recognised navigation aid meeting RNAV performance requirements, EGNOS could enable the introduction of such routes between fixed points – especially for HEMS operations during IFR conditions. Where HEMS operators frequently fly between hospitals or bases subject to recurrent low cloud base conditions, low level RNAV routes would facilitate all weather operations without the requirement to climb to en-route flight levels prior to transition.

Within Europe currently, the availability of those procedures does not necessarily impose any requirements for runway/FATO lighting requirements (unless night time operations are required). According to EU-OPS, even runways without lighting or markings can still benefit from the lower minima realised from an LPV approach procedure; although higher Runway Visual Range (RVR) and visibility is required in these cases.

In situations where a cloud break procedure is required, helicopter specific approaches – PinS – can be used. PinS is a procedure to a designated point in space from which the flight crew perform visual manoeuvring to the landing site. The use of cloud break procedures is one of the key benefits that helicopter operators are keen to realise. Not

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*Fig. 2: The helicopters already certified – image shows the AW 109SHP – are limited up to 9° LPV approaches, existing PinS criteria are based on barometric inputs and limited to an approach of 7.5° (Photograph: Rega)*
only does this enable a direct operational cost saving from improved reliability to destinations, it also benefits patients who are able to be transferred more quickly. Without a PinS — or another LPV procedure — emergency medical flights would have to go to more equipped airfields, so increasing flight time and patient transfer time to hospital. In some cases where a cloud break cannot be found, a rendezvous with an ambulance above the cloud layer may be required to complete the final patient transfer by road.

The visual segment of the PinS procedure can be performed in two ways:

- As a "Proceed VFR" procedure, when the helicopter passes the missed approach point (MAP) there is no obstacle protection and the flight crew must comply with VFR and cancel the IFR flight plan after passing the MAP.
- As a "Proceed Visually" procedure, the flight crew must visually acquire the landing location at or before arriving at the MAP. Obstacle protection is provided and the crew cancel the IFR flight plan after flying into VMC with landing location in sight, passing the MAP in the visual segment of the approach, or after landing.

**Regulatory barriers**

Despite the clamour from users for these procedures to be enabled, the infancy of the technology within Europe still requires progress on the regulatory front before a wider uptake can happen.

These procedures require the availability of both EGNOs enabled instrument approach procedures and suitably equipped aircraft. As of April 2012, only nine European aerodromes have instrument approach procedures published with LPV minima. As part of each State’s Performance Based Navigation (PBN)* implementation plan it is expected that there will be a gradual increase in the number of LPV procedures. Whilst these plans mainly target aerodromes, HEMS missions also stand to benefit once those same procedures are published to heliports, hospitals and other HEMS set down areas. The push for these additional procedures needs to come from the HEMS operators, heliports and hospitals working with the national regulators.

Within Europe there are currently only two helicopters certified by EASA to fly LPV procedures: the AgustaWestland 109SP and the Bell 429. More helicopter certifications are expected by the end of 2012, but the certification authorities are faced with the difficulty that the helicopter flight envelope is different to that of fixed-wing aircraft and currently no ICAO LPV design criteria for helicopters exists. This presents a certification challenge for both the manufacturer/operator and the regulator, as currently the procedure design criteria for LPV procedures are only available for fixed-wing aircraft. This can result in some limitations. For example the two helicopters already certified are limited up to 9° LPV approaches. Existing PinS criteria are based on barometric inputs and limited to an approach of 7.5°. Therefore,
PinS procedures based on LPV may be essential within inner city regions or obstacle-rich environments where the steeper approach allows obstacle clearances closer to the landing site.

The wide variation in helicopter vertical performance is making the assessment of the performance of helicopters against these design criteria difficult. Although options for certification are available within the ICAO and EASA framework, the onus is on the operator — which presents further challenges. It is this difficulty, amongst others, that resulted in EASA removing all helicopters from the recently approved AML for the Garmin GTN 650/750 (see Fig. 3). This All Model List provided a means by which a large number of aircraft could be approved for equipage of these Garmin products without having to procure a third-party Supplementary Type Certificate (STC).

However, progress with the availability of design criteria is expected towards the end of 2012. EASA recently published their Comment Response Document (CRD) to AMC 20-28 (Airworthiness Approval and Operational Criteria for RNAV GNSS approach operation to LPV minima using SBAS). This should mean that the approval process for LPV operations within Europe is simplified. In addition, ICAO has been working on new helicopter specific LPV design criteria. This has resulted in new criteria for Helicopter PinS approaches and departures being submitted to the ICAO Air Navigation Conference in November 2012 for approval. In addition, the criteria for SBAS PinS LPV as amendments to ICAO PANS OPS have been endorsed by the ICAO Instrument Flight Procedure Panel.

**Conclusions**

EGNOS has the potential to provide HEMS operators with a valuable increase in reliability and availability — increasing the opportunities to transfer patients to less equipped airfields and heliports. Before these benefits can be realised, operators must first gain airworthiness and operational approval from EASA. This will require some effort on their part in exploring the issues with implementation and use of instrument approach procedures within the uncontrolled airspace environment typical of many HEMS missions. Whilst this has proven difficult to date, due to a lack of criteria, the imminent publication of the new ICAO criteria is expected to ease the acceptance of those approach procedures that have clear operational and safety benefits.

With the imminent publication of design criteria, operators wishing to realise these benefits for day-to-day operations need to work with aerodromes, heliports and hospitals to implement LPV-based procedures. Since both an equipped aircraft and published procedure are necessary, achieving publication of procedures will provide a foundation for regulators and operators to gain the necessary experience to achieve widespread operational approvals. Perhaps 2013 will be the year when EGNOS benefits for HEMS operators finally take off.