GAST-A Using SBAS Correction Data

Thomas Dautermann, Thomas Ludwig, Robert Geister
A synchronized common approach is crucial to break the wall and create a positive momentum on GBAS technology deployment

**ANSPs:**
- Reduced cost of operation after decommissioning of ILS Technology (at least partially)
- Implement concepts of operations (and motivate ATCOs), that deliver benefits to Airlines to push equipage rate (e.g. Best Equipped Best Served concept)

**Airports:**
- Reduced impact of aircraft noise by higher glide slope intercept altitudes (avoid low level flight segments) or steeper glideslopes
- Higher airport capacity in low visibility operations (LVO)
- Establish concepts to clear traffic off the runways in LVO

**Airlines:**
- Strive for high equipage rates of aircraft crucial to realize beneficial effects and to decrease ATC controllers workload (traffic differentiation)
- Train and motivate pilots to execute GBAS approaches

**Manufacturers:**
- Support Airlines (Air) and ANSPs/Airports (Ground) to create business cases for investments and align Ground/Air efforts

**ICAO/Regulators:**
- Deliver appropriate framework to allow quick progress

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An approach towards sustainable GBAS deployment

Group ATM Development | SESAR

Lufthansa Group
GLS ... “Chicken-and-Egg Problem”

- **Airframers & Avionics Suppliers**: Only build new functionality if the Airlines will buy it!
- **Airlines**: Only buy new functionality if ATC gives benefits for it!
- **ATC**: Only provide benefits if the Airframers have built it!
Business Case: Approaches with LPV Only
LNAV Minimum 770ft
From GBAS & SBAS to GLASS (GLS Approaches using SBAS)

GLASS Technical Flow

\[ P_{\text{corrected},i} = P_{\text{CSC},j} + \frac{P_{\text{RC}}(t_{\text{GAL}})}{R_{\text{RC}}(t_{\text{GAL}})} \times (t_{\text{GAL}} - t_{\text{SAT}}) + \Delta T_{\text{IC},j} \]

\[ \sigma_i^2 \sigma_{\text{pr, snr}}^2 [i] + \sigma_{\text{prop}}^2 [i] + \sigma_{\text{pr, atm}}^2 [i] + \sigma_{\text{iono}}^2 [i] \]

**Inserted, if mapping of SBAS HPL to GBAS LPL is desired**
FAS DB & Associated Issues

Approach Performance Designator APD=0

Normally should trigger a multiplier of 2 for the coded FASVAL → not evaluated by CMA-6024, GLU925, INR

Image Credit: AERODATA, taken with AERO FIS – CMA-6024 Receiver
The “Time to Alert” Question

APV-1 → Requires 10s Time-to-Alert

Calculation for the GLASS System:

• The SiS TTA is the 5.2s from SBAS (unpublished proof in “EGNOS Signal-in-Space System Safety Case Part A (Design, Development and Deployment) Issue 3 from 21 February 2008.”)
• 3.5s for the missed message allocation
• 10s - 3.5s - 5.2s = 1.3s

Processing on a Standard Linux PC takes about 20ms
Ground Testing

Using real avionics

- Rockwell Collins GLU 925 (Airbus version)
- Honeywell INR (B787 version)

Width of RWY centerline marking.
Flight Validation

Flight Calibration Services performed standard GBAS Flight Validation
Lufthansa Charter D-AIBI (A319)
DLR’s Advanced Technology Research Aircraft
Flight Tests in Kerkyra (CFU)
Test with German Air Force

Installation at Wunstorf ETNW

• Airbus A400M test upcoming
Questions for the Group

SARPS has little content about GAST-A, if so mostly related to GRAS

Receiver behavior: APD-0 is being ignored

Planned tests: Collins GLU2100, Thales MMR, Honeywell IMMR