Concept and benefits of GBAS - SBAS

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GBAS & SBAS

- Concept
- Benefits
- Implementation challenges
Satellite constellations

Several types of errors:
- Satellite clock & ephemerid
- Ionosphere
- Troposphere

And lack of integrity

Need to elaborate corrections
Global Navigation Satellite System (GNSS)

Three types of augmentations:
- GPS
- Glonass
- Galileo
- Beidou

Aircraft Based Augmentation System (ABAS)
Ground Based Augmentation System (GBAS)
Satellite Based Augmentation System (SBAS)

Future: Development of dual frequency multi constellation receiver. Great improvement of PBN coverage all over the globe, especially for the vertical.
SBAS architecture

- GPS satellites
- 3 geostationary satellites
- Transmitting Station
- Processing Facility
- Reference Stations
- Corrections
GBAS architecture

- GPS satellites
- Reference Station
- VHF Data Broadcast antenna
- Ground Facility
- Ground Facility
- Correction and FAS DB

ICAO UNITING AVIATION

NO COUNTRY LEFT BEHIND
Each procedure based on GBAS or SBAS system is defined by a unique Final Approach Segment Data Block.

The final segment can be intercepted before the FAP.
Final Approach Segment Data Block

Table B-66. Final approach segment (FAS) data block

<table>
<thead>
<tr>
<th>Data content</th>
<th>Bits used</th>
<th>Range of values</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation type</td>
<td>4</td>
<td>0 to 15</td>
<td>1</td>
</tr>
<tr>
<td>SBAS provider ID</td>
<td>4</td>
<td>0 to 15</td>
<td>1</td>
</tr>
<tr>
<td>Airport ID</td>
<td>32</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Runway number</td>
<td>6</td>
<td>1 to 36</td>
<td>1</td>
</tr>
<tr>
<td>Runway letter</td>
<td>2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Approach performance designator</td>
<td>3</td>
<td>0 to 7</td>
<td>1</td>
</tr>
<tr>
<td>Route indicator</td>
<td>5</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Reference path data selector</td>
<td>8</td>
<td>0 to 48</td>
<td>1</td>
</tr>
<tr>
<td>Reference path identifier</td>
<td>32</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>LTP/FTP latitude</td>
<td>32</td>
<td>±90.0°</td>
<td>0.0005 arcsec</td>
</tr>
<tr>
<td>LTP/FTP longitude</td>
<td>32</td>
<td>±180.0°</td>
<td>0.0005 arcsec</td>
</tr>
<tr>
<td>LTP/FTP height</td>
<td>16</td>
<td>-512.0 to 6 041.5 m</td>
<td>0.1 m</td>
</tr>
<tr>
<td>ΔFPAP latitude</td>
<td>24</td>
<td>±1.0°</td>
<td>0.0005 arcsec</td>
</tr>
<tr>
<td>ΔFPAP longitude</td>
<td>24</td>
<td>±1.0°</td>
<td>0.0005 arcsec</td>
</tr>
<tr>
<td>Approach TCH (Note)</td>
<td>15</td>
<td>0 to 1 638.35 m or</td>
<td>0.05 m or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 3 276.7 ft</td>
<td>0.1 ft</td>
</tr>
<tr>
<td>Approach TCH units selector</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>GPA</td>
<td>16</td>
<td>0 to 90.0°</td>
<td>0.01°</td>
</tr>
<tr>
<td>Course width</td>
<td>8</td>
<td>80 to 143.75 m</td>
<td>0.25 m</td>
</tr>
<tr>
<td>Runway offset</td>
<td>8</td>
<td>0 to 2 052 m</td>
<td>8 m</td>
</tr>
<tr>
<td>Final approach segment CRC</td>
<td>32</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: — Information can be provided in either feet or metres as indicated by the approach TCH unit selector.
GBAS & SBAS

Concept

Benefits

Implementation challenges
GBAS SBAS expected benefits

- Main benefit on the final segment

  Horizontal and Vertical geometric guidance

  ILS like display in the cockpit

  with a Decision Altitude / Height

  Independent of QNH setting and of temperature
GBAS SBAS expected benefits

- Can bring operations
  - SBAS: down to CAT I  
    (APV 250 ft and SBAS CAT I 200 ft)
  - GBAS: CAT I to CAT III  
    (special study for Ionosphere)

- Can serve
  - SBAS: All IFR runway ends on a whole continent
  - GBAS: All IFR runway ends at the same airport
GBAS SBAS expected benefits

- Reduces environmental impact
- Improves safety
- Improves operational efficiency
- Reduces infrastructure
- Increases airspace capacity
GBAS & SBAS

- Concept
- Benefits
- Implementation challenges
Implementation challenges

- AIRSPACE USERS
  - Fleet readiness
  - AFM

- ANSP/AIRPORT
  - Procedure
  - Safety Assessment
  - ATC Interface
  - NOTAM

- GNSS CONSTELLATION

- GBAS SBAS SYSTEM
  - Industry
  - Operator
  - Performance compliance

- REGULATOR
  - Approval
  - Certification
Implementation challenges

SBAS

GBAS

Operational validation

Procedure development

Performance assessment

System installation

Preliminary study
Implementation challenges

Need to involve all your stakeholders
ENJOY THE WORKSHOP

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THANK YOU!