Agenda

› Overview PBN Implementation Status

› Swiss AIP Change

› GNSS Interference Detection Method
  • Ground
  • Airborne

› Navigation Infrastructure / Procedure Planning
  (Flight Plan Data Analysis)
PBN Implementation Status in Switzerland

Legend
- In Operation
- Project

- Zurich
- Lugano
- Samedan
- St. Gallen
- Buochs
- Meiringen
- Alpnach
- Berne
- Inselspital
- Grenchen
- Emmen
- Les Eplatures
- Geneva
- Sion
- Lugano
- "Apollinaire"
- "Inselspital Luzern"
- "Dübendorf"
- "St. Gallen"
Swiss AIP Change

Part 2 En-route, ENR 1.1 General Rules

› Services are currently based on GPS (flight inspection/validation, performance monitoring, legal recording, GNSS NOTAM)

› Interim solution published in the AIP:

› 4.4 Use of GNSS
   GNSS may be used in the Swiss Airspace. Avionics receivers must be certified according ETSO (European Technical Standard Orders) / TSO (Technical Standard Orders). Consequently, the supported GNSS constellation is the NAVSTAR Global Positioning System (GPS) and the supported augmentation systems are the Aircraft Based Augmentation System (ABAS) and, the European Geostationary Navigation Overlay Service (EGNOS) - the European SBAS and the Ground-Based Augmentation System (GBAS).

› This will change in the future…
GNSS Interference Detection – Process


› Activity during implementation of new RNAV APCH:
  - 7 day static monitoring on ground
  - flight inspection (1 flight)

› Ground monitoring includes:
  - GNSS receiver (1Hz recordings)
  - Spectrum analyser (1 Hz recordings)

› Analysis includes:
  - GNSS performance calculation
  - GNSS Carrier-to-noise analysis
  - Spectrum analysis
GNSS Interference Detection – Results
GNSS Interference Detection – Results LSZA

Animation 15 minutes
GNSS Interference Detection - Airborne

› Project Helicopter Recording Random Flights

Cost efficient Quick Access Recorder (QAR) integration solution for military Swiss Air Force and Swiss Air Rescue Service REGA (SAR-helicopters)
Project HRRF: Objectives

› Performance Analysis (protection levels, service availability)

› Carrier-to-Noise analysis (interference detection)

› Flight technical error determination (navigation system flight path vs. desired flight path) if procedures are used

› Total system error determination for specific cases (use of additional geodetic GNSS receiver)

› Specific analyses…
For the data-recording modern helicopters are in use. These helicopters are operated by the partner organizations REGA and Swiss Air Force.

The following helicopter types are used:

- Swiss Air Force (SAF)
  18 Helicopters Eurocopter type EC635/135

- Swiss Air Rescue Service (REGA)
  6 Helicopters Eurocopter type EC145
  11 Agusta / Westland AW109SP (DaVinci)
Installation on REGA Agusta Westland AW109 DaVinci

MiniQAR Installation
Project HRRF: Project Status

Equipped:
› 3 Helicopters Eurocopter type EC635/135
› 2 Helicopters Eurocopter EC145
› 11 Agusta / Westland AW109SP (DaVinci)

Remaining helicopters will be equipped until end 2014

Data analysis just started…
Project HRRF: Flight Track Analysis
Navigation Infrastructure Planning / Flight Plan Data Analysis

- Plenty of possibilities for new procedures available
- Number of possible procedures limited (airspace complexity)
- Fleet equipment limited and different
- Existing navigation infrastructure often optimised for conventional procedures

→ Flight plan data analysis to obtain fleet equipment
Flight Plan Data Analysis

› Automated process to analyse FPL data
› Daily delivery of all FPL data
› Process to obtain:
  - PBN capability information
  - CNS equipment information
Minimum Capability LSAZ
RNP APCH to LNAV and LPV minima implemented 25.07.2013
All Flights 2013

- Conventional: 98.7%
- RNAVS requiring VOR: 0.4%
- PBN with other means of navigation: 0.9%
Flight Plan Data Summary

› Powerful tool to get information on fleet equipage

› Data quality depends on operators to correctly fill FPL data

› Partly, PBN capability is mentioned in remark field

› Considerable amount of PBN capable flights found which did not mark RNAV5 (either only RNP10 or RNAV1&RNP1&….)