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swiss air navigation services ltd

Status Skyguide: GBAS CAT I ZRH Project

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2nd GBAS Coordination Meeting
Agenda Item 3.2: Status and Future Activities
Washington DC, December 14, 2004

Overview

- GBAS CAT I ZRH Project Status
- Changes in ZRH Precision Approach Environment
- Changes in International Context
- Changes in Project Structure
- Revised Cat III Strategy
- Conclusions and Recommendations

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GBAS CAT I ZRH Project Status

- Project background & status given at April Mtg.
  - Primary motivation Cat III sustainment
  - Multi-partner project with core working group and steering committee
  - Main work and investment accomplished by skyguide
- Updates since then:
  - Implementation approval from FOCA ready
  - GBAS frequency allocation extended
  - Installation plan finalized
  - Contract negotiations for "GBAS Recording Equipment" finalized
    - Part of phased acquisition strategy (GNSS-MLA Recording / VDB Testing / System Completion)

Swiss Federal Office for Civil Aviation (FOCA)

Swiss International Air Lines

unique zurich airport

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

Changes in ZRH Precision Approach Environment

- Loss of Cat III feared – prompted by midfield terminal construction
  - Construction is now completed
  - Result: additional restriction of clearance sector of ILS 16 to ±5°
    - Higher ATC workload
    - Remaining ILS OK (ILS14)
    - ILS 16 clearance issue could be solved with better LOC array
- Changes in TMA operating procedures due to political pressure
  - New approaches from East and South to avoid German territory
  - Intense debate around non precision approach minima (weather exceptions)
  - Consequently, need for ILS in extremely constrained environment
    - New ILS 34 (Cat I, ~$1.1M invest cost SG)
    - New ILS 28 (Cat I, ~$1.8M invest cost SG)
    - Numerous challenging airport compatibility issues
  - All feasible approaches will be equipped with ILS, negating GBAS side benefit

End Fire GP RWY 34

Rear Radiators

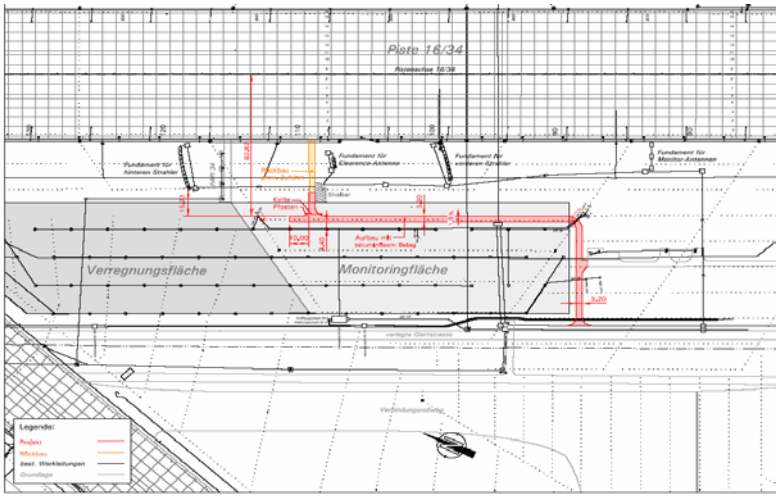
Front Radiators

Center
Clearance
Antenna

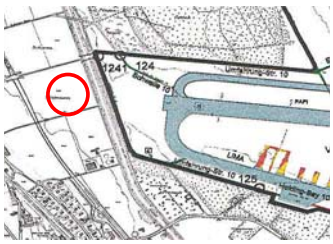
Monitors

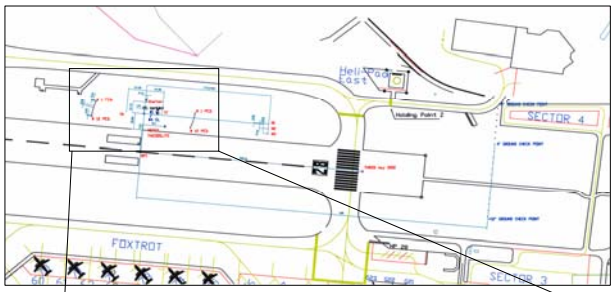
End Fire GP 34 Installation

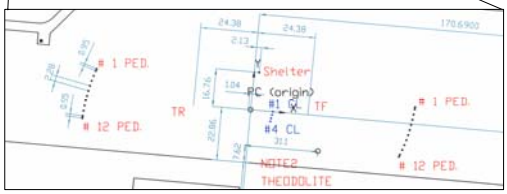
- Subterraneous GP Shelter
- Modifications to De-Ice sprinkling system
- Approach lighting modfication needed for LOC 34 array



ILS RWY 28 End Fire GP and LOC on Platform







- LOC outside of airport perimeter
- End fire on RWY with line up from both sides and Business Jet / Helicopter Ops
- Subterraneous shelter

Changes in International Context

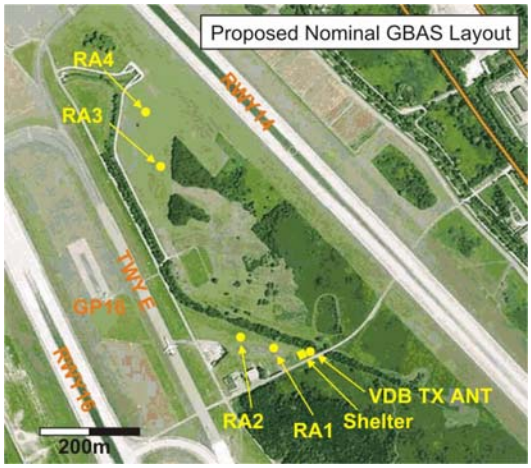
- Project approach based on Cat I first
  - Management requirement to install only certified ground equipment
  - Availability projections of such ground equipment continue to slip considerably
    - FAA Letter: FY2009 *given resolution of technical and business issues….*
    - No promising alternatives available at this point
- Project was already in "holding mode" over summer 2004
    - Expecting "positive signs" for project continuation
    - Various promising avenues did not materialze
- Given the excessive timescales and unclear committment, it is no longer possible to support an acquisition project

Changes in Project Structure (1/2)

- Skyguide GBAS Cat I Acquisition Project has been stopped
  - No contract will be awarded
  - Project documentation will be finalized to *minimize* duplication of work in case of restart (possibly 2007?)
  - Staff allocation dropped from 1.5 to 0.1 personnel units
- Project Team continues
  - Core working group will meet annually or as needed for updates
  - Steering committee dormant (activation via core working group)
  - Cat III sustainment strategy will be revised
  - Partners clearly continue to
    - see need for an ILS alternative and
    - support GBAS as the follow-on technology to ILS
- Skyguide will continue to support
  - EUROCAE WG28 (Cat III standards harmonization)
  - Eurocontrol LATO Working Group
  - Any effort leading to SARPs compliant and certified ground equipment

Changes in Project Structure (2/2)

- GBAS Site Protection
  - Frequency allocation will be maintained
  - Identified site will continue to be reserved
- Site Validation
  - Despite all intents, GBAS site will continue to face pressure from various interests
  - If specific competition turns up, GBAS antenna sites will have to be validated and defended



GBAS Cat III Development Strategy

- GBAS Development – Swiss State Position
  - GBAS Cat III end state should include Galileo for system robustness
  - Single equipment transition desirable
  - Single frequency & single constellation GBAS needs to be developed as a viable fall back mode
    - What is meant by "viable" is TBD (availability studies needed)
- Cat I Public Use GBAS continues to be needed as a first step
  - Experience gain vital for efficient Cat III development
  - Limited approval only suitable if restrictions are very minor
  - Internationally, there is a GBAS Cat I market
    - tapping into this market is key to maintain industry support
- GBAS Progress hampered by lack of effective operational development
  - Very few organizations worldwide do this well
  - Progressive review of LVP constraints is essential
- Skyguide will continue to act internationally in line with the above

Revised ILS Cat III Sustainment Strategy

- Engineering Efforts
  - Additional development of modelling, analysis and testing tools
  - Upgrades of problematic LOCs to state of the art arrays
  - New technologies such as modified clearance diagrams
    - 2nd RF distribution unit (ISPA 2004, skyguide – Démule)
    - Etc.
- Increase of ILS Site Protection Mechanisms
  - Legal and infrastructure planning means under discussion
- Adaptation of ICAO Standards
  - Interest to formalize LOC intercept with GNSS to provide for reduced clearance sector
- ILS sustainment cost will continue to rise significantly

Conclusions

- Cat III operations and associated innovations continue to be jeapordized
  - "Do nothing approach" not always safest nor the most cost effective
- Highlighted technical issues appear minor
  - Ionosphere storm issue based on several worst cases for Cat I
  - ILS spoofing vulnerability more than makes up for GNSS large area jamming outage risk
- Current state of GBAS resource comittments is a serious blow to
  - Anone trying to follow an internationally accepted strategy
  - Anyone supporting ICAO processes
  - Industry willingness to enter into cooperative developments
  - Innovation perspectives of TMA operations
  - The career of GBAS experts

Recommendations

- Continue to cooperate and pool resources
  - Focus on sustaining expertise and activities
  - Goal to produce an approved SARPs compliant Cat I ground station
- Proactively address GNSS & GBAS vulnerability issues
  - Assist in overcoming political obstacles
- Proactively address Low Visibility Procedures constraints
  - Assist in improving business case