Applications of Global Navigation Satellite Systems Workshop
Baku, Azerbaijan, 11 – 15 May 2009

Perspectives of GNSS application in
AZERBAIJAN AIR NAVIGATION SERVICES
INTRO

♦ AZANS – is subsidiary of “Azerbaijan Hava Yollary” CJSC and responsible for the Air Navigation Services within the airspace of Azerbaijan Republic.

AZANS was established in 1996.

♦ Airspace area of Azerbaijan Republic:
  Land - 86,6 ths. sq.km
  Above Caspian sea area - 78,8 ths sq.km.
  Total - 165,4 ths. sq.km

♦ Air Route network – total length 8000 km.
♦ Average annual movements – 90 000
Main goals of AZANS

♦ To guarantee safety of the flights and high-quality air navigation services to meet the international standards;
♦ To flexibly utilize new international standards and recommendations, develop and modernize technical systems and information services;
♦ To train and equip qualified personnel;
♦ To provide quick and high-quality information that meets the demands of operators;
Heydar Aliyev International Airport at Baku

- Fitted out with highest standards level ATC system
- ATC services according to ICAO SARP’s
- RVSM zones
Baku FIR

(AIP AZ 12 April 2007)
Airspace Classification AZ
Overflights picture

- Singapore Airlines
- Cathay Pacific
- China Sothern
- Thai Airways
- Lufthansa
- Air France
- Turkish Airlines
- Azerbaijan Airlines
- Aeroflot
- Korean Airlines
- Pakistan Intl
- EIAI Israel Air
- Silk Way Airlines

- Uzbekistan Airways
- Air Ukraine
- Kazakhstan Airlaines
- Malaysia Airlines
- British Airways
- Condor
- Cargolux
- Egypt Air
- KLM
- Finnair
- Asiana Airlines Group
- Lauda Air
- Austrian Airlines
STATISTICS

<table>
<thead>
<tr>
<th>Year</th>
<th>Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>87 983</td>
</tr>
<tr>
<td>2005</td>
<td>85 436</td>
</tr>
<tr>
<td>2004</td>
<td>77 925</td>
</tr>
<tr>
<td>2003</td>
<td>68 724</td>
</tr>
<tr>
<td>2002</td>
<td>51 098</td>
</tr>
<tr>
<td>2001</td>
<td>49 711</td>
</tr>
</tbody>
</table>
Strategic role of Civil Aviation of Azerbaijan in international transport infrastructure

TRACECA
TRAnsport Corridor Europe, Caucasus, Asia

Ancient Silk Way Renaissance
Cargo&Passengers Airport Hub
Caspian Sea natural resources exploration
Caspian Sea as important Transport linkage
♦ Surveillance
Currently the main surveillance system in use is – RADARS

Advantages:
- Reliable
- Independent
- Passive mode detection
- Airborne equipment

Disadvantages:
- Expensive equipment,
- Data transmission lines
- Expensive in operation/power consumption
- Mechanical part failures
- Coverage problems
Modernization program

- Heydar Aliyev International Airport at Baku is equipped with modern en-route control radar RSM 970S

- Although there is yet the need to provide sufficient aerodrome radar control at Baku, Gyanja and Nakhchivan
Radar Modernization

- Modern en-route control MSSR in Evlakh

- Installation of PSR/SSR is ongoing at Heydar Aliyev Int. Airport
Radar coverage.
SSR @ 30,000' (AIP AZ 13 May 04)
ADS – B

**Disadvantages**
- Not all aircrafts is equipped
- Ground augmentation system
- Dependence (GPS/GLONASS/GALILEO)
- Accuracy
- Transmitting (Mode S ES, VDL Mode 4, UAT)
- Harmonization of the requirements

**Advantages**
- ICAO Global CNS/ATM Concept - Future of the Air Navigation
- Availability (En-route and on the Ground)
- Helicopter operations (onshore/offshore)
- Search and rescue
- Minimum ground infrastructure
- RNVA, RNP, P- RNAV facilitation
- Time Synchronization
♦ Surveillance
♦ Navigation
NAV AIDS

♦ DVOR
♦ DME
♦ ILS
♦ NDB
♦ VNF ADF

Advantages
♦ Accurate
♦ CAT III
♦ Independent

Disadvantages
♦ Terrain requirements
♦ Limited coverage
♦ Narrow approach path (ILS)
GNSS

Disadvantages
♦ CAT I
♦ Dependence
♦ Airborne equipment
♦ Ground infrastructure
♦ Uniformity of the standards

Advantages
♦ RNAV
♦ RNP
♦ Availability
GNSS Projects in AZANS

♦ 2001 in frame of EU Southern Ring II Project ADS – B trails in Baku
♦ Satellite Meteorological Services
♦ ATC VSAT Communication
♦ A-SMGCS (MLAT/ADS-B) Implementation projects at Heydar Aliyev International Airport
♦ WAM and ADS for Helicopter operations
  - Onshore and for Offshore oil and gas exploration
  - Along the oil/gas pipelines
  - Search and Rescue
A-SMGCS

♦ MLAT system is a failsafe, highly reliable system for surveillance and monitoring from the final approach through to parking areas in all weather conditions

♦ Permits to:
  ● Track vehicles and aircraft using one or more sensors (SMR, Gap Filler, ADS-B, multilateration …etc)
    ➔ at 1-second rate
    ➔ with an accuracy of 5 metres
  ● Present airport movements on controller’s consoles
  ● Determine in advance possible conflicts
  ● Perform legal recording of the controller’s consoles
  ● Supervise the status of the single units
\[ X_2 - X_1 = c \cdot (\text{TOA}_2 - \text{TOA}_1) \]

\[ X_1 = c \cdot \text{TOA}_1 \]

\[ X_2 = c \cdot \text{TOA}_2 \]
SMR
MLAT
ADS-B – Extendend squiter
Vehicle tracking with ADS-B
CNS/ATM concept

EUROCONTROL ATM 2000+ STRATEGY

ICAO CNS/ATM GLOBAL IMPLEMENTATION

NAVIGATION STRATEGY FOR ECAC

Today

Future
(2007 vs. 2030 in the Regulation & Growth scenario.)
FUTURE

♦ GNSS systems provide independent navigation, where the user performs on-board position determination from information received from broadcast transmissions by a number of satellites. **GNSS** provides highly reliable, highly accurate and high integrity global coverage independently. Although the **RNP** concept allows for more than one satellite navigation system to be in use simultaneously, from an aircraft equipment point of view maximum interoperability is essential as it would significantly simplify avionics and thereby reduce cost. It would also be attractive if satellite navigation systems could serve as complementary to and/or in a back-up role for each other.

♦ The introduction of **air-ground data links**, together with sufficiently accurate and reliable aircraft navigation systems, present the opportunity to provide **surveillance services** in areas which lack such services in the present infrastructure, in those areas where the current systems prove difficult, uneconomic, or even impossible, to implement.

♦ **ADS** is a function for use by ATS in which aircraft automatically transmit, via a data link, data derived from on-board navigation systems. As a minimum, the data should include the four-dimensional position. The ADS data would be used by the automated ATC system to present information to the controller. ADS will find beneficial application in other areas, including high-density areas, where ADS may serve as an adjunct and/or back-up for secondary surveillance radar and thereby reduce the need for primary radar.
FUTURE

♦ Unification of the standards,
♦ Interoperability of the GNSS / airborne equipment
♦ Certification, State support, Interstate agreements
♦ Harmonization on the regional levels
♦ Safety assessments

Benefit from - Smooth implementation of GNSS in Air Navigation