

# EGNOS in EUROMED States / MEDUSA

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**Joint ACAC / ICAO MID Workshop on GNSS**  
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# Background (1)

- EGNOS service introduction / exploitation and market preparation in parallel with infrastructure implementation for EGNOS SiS extension

2006 - 2009 → Euromed GNSS I / METIS

2012 - 2015 → Euromed GNSS II / MEDUSA (\*)

Under the umbrella of **EC's Neighbourhood Policy-Euromed Transport**

(\*) Partner countries (ACAC members) : *Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia*

- Aviation
- Non-aviation

# Background (2)



- |  |   |  |  |  |  |
|--|---|--|--|--|--|
| <ul style="list-style-type: none"> <li>▪ Aviation</li> <li>▪ Non-aviation / professional road freight transport &amp; logistics</li> </ul> | <ul style="list-style-type: none"> <li>▪ Key actors in the priority markets</li> <li>▪ Decision-makers</li> <li>▪ Users</li> <li>▪ Technology developers</li> <li>▪ Service providers</li> <li>▪ Researchers</li> </ul> | <ul style="list-style-type: none"> <li>▪ Present use</li> <li>▪ Competitive technologies / solutions in operations / planned</li> <li>▪ Gaps</li> <li>▪ Facilitators for introduction / operational adoption</li> <li>▪ Regulatory frame</li> <li>▪ Policies</li> <li>▪ Strategies</li> <li>▪ Market drivers / opportunities</li> <li>▪ Know-how / capacity building</li> <li>▪ CBA</li> </ul> | <ul style="list-style-type: none"> <li>▪ Focus on specific needs</li> <li>▪ Regional cooperation</li> <li>▪ Involvement of decision-makers (Ministry of Transport, Aviation Authority, ANSP)</li> <li>▪ Involvement of stakeholders</li> </ul> | <ul style="list-style-type: none"> <li>▪ Proofs of concepts in real use cases</li> <li>▪ Technical feasibility</li> <li>▪ Promotion of application / benefits</li> <li>▪ Experience sharing</li> <li>▪ Best practices</li> <li>▪ Training</li> </ul> | <ul style="list-style-type: none"> <li>▪ National strategy</li> <li>▪ Status / targets / actions / timing</li> <li>▪ Decision-making process</li> <li>▪ To-dos customized on specific country</li> </ul> |
|--|---|--|--|--|--|

# Background (3)

Programme of **technical assistance actions** for :

1. Awareness & benefits validation
  2. National / regional networking and cooperation
  3. Capacity building :
    - Training / know-how transfer
    - Best practice / experience sharing
    - Feasibility assessment
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- Tailored on countries' specificities (needs / maturity / priorities)
  - Depending on EGNOS coverage (current and perspective)
  - Involvement of countries (decision-makers & main stakeholders)
  - Supporting national strategies / decision making processes

# Main results

## Tangible results for countries :

- ✓ Proper information about EGNOS services
- ✓ Know-how on use in different applications
- ✓ Awareness about added value and benefits
- ✓ To-dos / “enablers” to create favourable conditions for introduction in operations / exploitation
- ✓ Survey of needs and recommendations for EGNOS SiS coverage / identification of priorities for EGNOS coverage extension (airports)
- ✓ Recommendations for national GNSS strategy

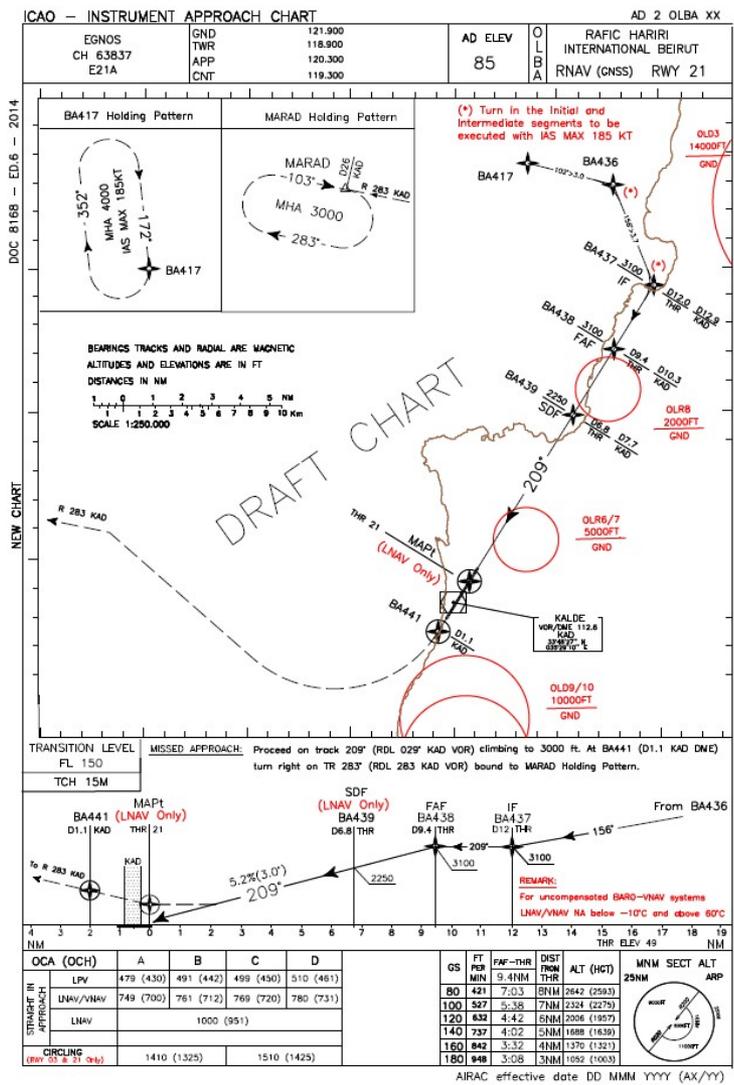
# Main results - aviation (1)

- ✓ **Trainings :**
  - GNSS / EGNOS receivers
  - GNSS data sources / collection / data performance analysis tools
  - GPS+RAIM monitoring (contribution to ICAO WG)
  - GNSS procedures design - PANS OPS 8168 advanced class

# Main results - aviation (2)

- ✓ **Procedures design / development :**
  - 7 pre-operational GNSS approach procedures developed in Algeria, Lebanon and Tunisia :
    - Tunisia / Monastir (2 RWYs)
    - Lebanon / Beirut (3 RWYs)
    - Algeria / Bejaia (2 RWYs)
  - Guidelines for safety assessment & 3 safety assessments
  - Guidelines for business case & 1 business case Tunisia / Monastir
  - Guidelines for electronic terrain & obstacle data (ETOD) & format / RNAV APCH procedures

# Main results - aviation (3)



## Understanding ICAO ETOD requirements

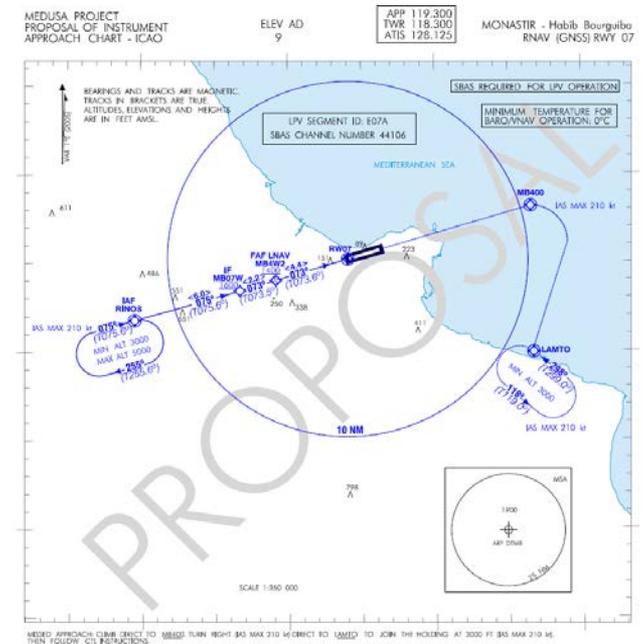
ICAO Study best GIS practice by Gilbert Lasnier

ICAO supports the implementation of ETOD (awareness, training, state implementation). Many agencies or third-parties vendors created tools, software and other added value provide ETOD.

## Lebanon / Beirut airport RWY 21

# Main results - aviation (4)

- ✓ **Flights & benefits validation :**
  - Technical and know-how transfer
  - Feasibility assessment
  - Cost and benefits analysis
  - Safety assessment
  - Enablers for operational introduction
  - “To-dos” for procedure publications
  - Support to decision-making



***Monastir airport RWY 07 (Tunisia)***  
***First complete validation outside Europe***



# Main results - aviation (5)

- ✓ **EGNOS adoption in operations & regulatory analysis :**
  - Definition of the institutional process
  - Regulatory framework based on 20 ICAO provisions (annexes & docs)
  - States' regulatory analysis - analysis of State's relevant regulations to assess readiness :
    - “Evaluation grid”
    - Assessment about readiness
    - Identification of next steps
    - Recommendations for GNSS national strategy
  - Various iterations + 9 vis-a-vis bilateral meetings with EC

# Main results - aviation (6)

## ✓ Evaluation grid :

ICAO Doc id	Title	Volume/Section	Area	Reference State's document(s)	Evaluation	Assessment	Remark / recommendation
Annex 2	Rules of the Air	Chapter 3. General rules Chapter 5. Instrument Flight rules	General-ATS				
Annex 4	Aeronautical Charts	Chapter 11. Instrument Approach Chart Chapter 13. Aerodrome/Heliport Chart	General-AIS				
Annex 10	Aeronautical Telecommunications	Volume I. Radio Navigation Aids Volume II. Communication Procedures including those with PANS status Volume III. Communication Systems Volume IV. Surveillance and Collision Avoidance Systems Volume V. Aeronautical Radio Frequency Spectrum Utilization	General-CNS				
Annex 10	Aeronautical Telecommunications	Volume II. Communication Procedures including those with PANS status	General-ATS				
Annex 10	Aeronautical Telecommunications	Volume I Chapter 3. Specifications for radio navigation aids Section 3.7 Requirements for the Global Navigation Satellite System (GNSS) Chapter 11. Recording of GNSS parameters Chapter 12. GNSS performance assessment Chapter 13. GNSS and database Attachment D/Section 11	Data recording/ Performance monitoring				
Annex 10	Aeronautical Telecommunications	Volume II Chapter 4. Aeronautical Fixed Service (AFS)/Section 4.4. Aeronautical fixed telecommunication network (AFTN)	NOTAM distribution				

# Main results - aviation (7)

Annex 10	Aeronautical Telecommunications	Volume I Attachment D Section 9	NOTAM proposal				
Annex 11	Air Traffic Services	Whole document	General-ATS				
Annex 11	Air Traffic Services	Whole document	Contingency Management				
Annex 11	Air Traffic Services	Chapter 7. Air traffic services requirements for information Section 7.3. Information on the operational status of navigation aids Attachment D. Material relating to contingency planning Section 6. Development, promulgation and application of contingency plans	NOTAM proposal				
Annex 13	Aircraft Accident and Incident investigation	Whole document	Accident and incident investigation and Reporting				
Annex 15	Aeronautical information services	Whole document	General-AIS				
Annex 15	Aeronautical information services	Chapter 5. NOTAM Chapter 10. Electronic terrain and obstacle data Appendix 4. Information to be notified by AIRAC Appendix 5. Predetermined distribution system for NOTAM Appendix 6. NOTAM format Appendix 7. Aeronautical data quality requirements Appendix 8. Terrain and obstacle data requirements	NOTAM proposal				
Doc. 8126	Aeronautical information services Manual	Chapter 6. NOTAM/Appendix A, B & C	NOTAM formatting				
Doc. 8168	Procedures for Air Navigation Services- Aircraft Operations (PANS-OPS)	Volume I. Flight Procedures/Part II. Flight Procedures - RNAV and Satellite-based/Section 1. General/Chapter 4: General information for Satellite-Based Augmentation System (SBAS) + Section 2. Departure procedures/Chapter 2: Area Navigation (RNAV) Departure Procedures for Satellite-Based Augmentation System (SBAS) + Section 4. Approach procedures with vertical guidance/Chapter 2. Area navigation (RNAV) arrival and approach procedures based on SBAS  Volume II. Construction of Visual and Instrument Flight Procedures/Part III. RNAV Procedures and Satellite-Based Procedures/Section 1. Underlying principles/Chapter 5. General criteria for SBAS GNSS receiver + Section 2. General criteria/Chapter 5. Navigation database coding + Appendix to Chapter 5. Path terminator coding rules + Chapter 6. Application of FAS data block for SBAS and GBAS + Appendix A to Chapter 6. FAS data block description for SBAS + Section 3. Procedure construction/Chapter 5. APV I/II procedures – SBAS + Appendix A to Chapter 7. Construction of obstacle clearance area for VOR/DME, DME/DME and GNSS RNAV holding + Section 5. Publication	Flight procedures design				

# Main results - aviation (8)

Doc. 8071	Manual on Testing of Radio Navigation Aids	Volume II. Testing of Satellite-based Radio Navigation Systems/Chapter 3. Satellite-based augmentation systems (SBAS)	Data recording/ Performance monitoring				
Doc. 9613	Performance-Based Navigation (PBN) Manual	Volume I. Concept and Implementation Guidance/Part B. Implementation guidance  Volume II. Implementing RNAV and RNP Operations	General				
Doc. 9859	Safety Management Manual	Chapter 7. Hazard and incident reporting Chapter 9. Safety analysis and safety studies Chapter 13. Safety Assessments	General-Safety				
Doc. 9906	Quality Assurance Manual for Flight Procedure Design	Volume I. Flight Procedure Design Quality Assurance System Volume II. Flight Procedure Designer Training Volume V. Validation of Instrument Flight Procedures Volume VI. Flight Validation Pilot Training and Evaluation	Flight procedures design/implementa- tion				
Doc. 9971	Manual on Collaborative Decision Making	Whole document	Collaborative Decision Making				

## Main results - aviation (9)

- *Almost all states ready from the regulatory perspective to introduce EGNOS SoL operations in aviation (ready to progress to the institutional arrangements with EC)*
- Minor implementation aspects (and not regulatory one) do not affect / prevent / stop the deployment of LPV procedures and the institutional step

# Lessons learnt

- Heritages for other non-EU countries / regions interested to use EGNOS
- Experience sharing already started (e.g. Balkans)
  
- **Methodology** (starting from priorities to GNSS national strategy)
- **Assistances tailored upon national drivers, involvement of decision-makers and key stakeholders**
- **Technical assistance in concrete cases :**
  - Aid the decision making process
  - Guide / transfer experience for the implementation of the enablers (e.g. safety guidelines, processes, Electronic Terrain and Obstacle Data, validation of procedures)
  - Inputs to national strategy (to ensure continuity)
  - Set-up of GNSS national committee
- **Regulatory analysis / grid**

- UNOOSA United Nations Office for Outer Space Affairs
- ICG WG (International Committee on Global Navigation Satellite Systems)  
[www.unoosa.org/oosa/en/ourwork/icg/icg.html](http://www.unoosa.org/oosa/en/ourwork/icg/icg.html)
- Proposed seminar on GNSS interference in 2017 - materials of December seminar in Vienna @ :  
[www.unoosa.org/oosa/en/ourwork/icg/activities/2015/icg-experts-meeting\\_presentations.html](http://www.unoosa.org/oosa/en/ourwork/icg/activities/2015/icg-experts-meeting_presentations.html)
- 2015 ICG activities report @ :  
<http://www.unoosa.org/oosa/en/ourwork/icg/activities.html>



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