*International Civil Aviation Organization*

**Performance Based Navigation Sub Group (PBN SG)**

**First Meeting**
***(Cairo, Egypt, 1 – 3 April 2014)***

**Agenda Item 5: GNSS Implementation in the MID Region**

# GNSS IMPLEMENTATION IN THE MID REGION

*(Presented by the Secretariat)*

**SUMMARY**

This paper provides information on the GNSS activities in the MID Region.

Action by the meeting is at paragraph 3.

**REFERENCES**

- MEDUSA Presentations
- MIDANPIRG/14 Report

## 1. INTRODUCTION

1.1 The Fourteenth Meeting of the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG/14) was held in Jeddah, Saudi Arabia, 15 - 19 December 2013.

1.2 The MID Regional Coordination Meeting was held at the ICAO Middle East Regional Office (Cairo, Egypt, 17 February 2014). The meeting was attended by a total of twelve (12) participants from 4 organizations AACO, ACAC, CANSO, IATA, and ICAO.

1.3 The EUROMED GNSS II/MEDUSA project (Global Navigation by Satellite Systems EGNOS/GALILEO) Egypt national workshop was held in Cairo on 12 March 2014.

## 2. DISCUSSION

2.1 MIDANPRG/14 meeting recalled that the 12th Air Navigation Conference (AN-Conf/12) noted the status of implementation for different Global Navigation Satellite System (GNSS) constellations and augmentations systems, mainly the modernization of Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), Galileo GNSS constellation, BeiDou system, EGNOS, and GAGAN. Accordingly, the AN-Conf/12 discussed the introduction of multi-constellation, multi-frequency GNSS that will entail number of new technical and regulatory challenges beyond those already associated with current GNSS implementation. The recommendations concerning GNSS adopted by AN-Conf/12 are in **Appendix A** to this working paper.

2.2 Based on the above, MIDANPIRG/14 meeting emphasized on the importance of thorough follow-up on these developments and encouraged States to conduct Workshop/Seminars to share experiences related to PBN and GNSS including GBAS implementation.

2.3 The MIDANPIRG/14 meeting noted that ACAC was persuading the SBAS Implementation in the Regions of ACAC and ASECNA (SIRAJ) project, which is based on EGNOS extension. Furthermore ACAC indicated during the first MID Regional Coordination held at the ICAO Middle East Regional Office (Cairo, Egypt, 17 February 2014), that GNSS implementation in the Region in collaboration with EU commission (SIRAJ/EGNOSS) is part of their Organizations main Priorities/Projects.

2.4 The meeting may wish to note that EUROMED GNSS II/MEDUSA project (Global Navigation by Satellite Systems EGNOS/GALILEO) held Egypt national workshop, in Cairo, Egypt 12 March 2014. The morning session of the workshop was dedicated to civil aviation. Presentations from different stake holders such as (Egypt MOT, MEDUSA, NANSC, Egypt Air and NAVISAT) were provided. It was interesting to note that now Egypt Air are considering the SBAS.

2.5 Furthermore, the meeting may wish to recall that, Egypt has adopted an initiative to establish a Regional Aeronautical Mobile Satellite (Route) System to provide Aeronautical Safety Communication, Navigation and Surveillance/Air Traffic Management Services over Africa and Middle East Regions; the initiative is called “NAVISAT”. Furthermore. It was noted that Egypt would organize a NAVISAT Seminar in 2014. Accordingly, the MIDANPIRG/14 meeting encouraged States to attend the NAVISAT Seminar and agreed that the Recommendations of this Seminar be presented to the relevant MIDANPIRG subsidiary bodies for further consideration.

2.6 The meeting may wish to note that the following States (Egypt, Iran, Jordan, and Syria) did not complete the decommissioning of NDBs. Accordingly; MIDANPIRG/14 meeting encouraged these States to properly set plans for the decommissioning of NDBs by 2014.

2.7 Based on all of the foregoing, the MIDANPIRG/14 meeting reviewed and updated the MID Region GNSS Implementation Strategy which is integrated with the MID Region PBN Implementation Plan, since GNSS is the only sensor that supports all the PBN Navigation Specifications.

2.8 The meeting may wish to recall that the ICAO Council adopted the ASBU concepts/methodology and ICAO MID Regional office conducted surveys to support the selection/prioritization of the block 0 modules for implementation in the MID Region, Accordingly, MIDANPIRG/14 meeting endorsed the ASBU Block 0 Modules prioritization table and Draft MID Air Navigation Strategy which will be further reviewed and updated under WP/7.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) provide update on the GNSS activities in their Sates;

b) propose appropriate action for conduct of joint GNSS activities in support to Implementation of ASBU modules selected in the MID Air Navigation Strategy;

c) urge concerned States (Egypt, Iran, Jordan, and Syria) to provide the ICAO MID Regional Office with their plans for the decommissioning of NDBs; and

d) provide update on observations of the effects of ionosphere on GNSS signal in the States and mitigation measures taken.

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**APPENDIX A**

| RECOMMENDATIONS ADOPTED BY AN-CONF/12 | Remark |
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| **Recommendation 6/5 – ICAO work programme to support global navigation satellite system evolution**<br><br>That ICAO undertake a work programme to address:<br><br>a) interoperability of existing and future global navigation satellite system constellations and augmentation systems, with particular regard to the technical and operational issues associated with the use of multiple constellations;<br><br>b) identification of operational benefits to enable air navigation service providers and aircraft operators to quantify these benefits for their specific operational environment; and<br><br>c) continued development of Standards and Recommended Practices and guidance material for existing and future global navigation satellite system elements and encouraging the development of industry standards for avionics. | Progressing in ICAO Panels |
| **Recommendation 6/6 – Use of multiple constellations**<br><br>That States, when defining their air navigation strategic plans and introducing new operations:<br><br>a) take advantage of the improved robustness and availability made possible by the existence of multiple global navigation satellite system constellations and associated augmentation systems;<br><br>b) publish information specifying the global navigation satellite system elements that are approved for use in their airspace;<br><br>c) adopt a performance-based approach with regard to the use of global navigation satellite system (GNSS), and avoid prohibiting the use of GNSS elements that are compliant with applicable ICAO Standards and Recommended Practices; | <u>On regional Level this was included in the MID Regional GNSS Implementation Strategy</u><br><br>a) States take advantage of the improved robustness and availability made possible by the existence of multiple GNSS constellations and associated augmentation systems;<br><br>b) States publish information specifying the GNSS elements that are approved for use in their airspace;<br><br>c) States adopt a performance-based approach with regard to the use of GNSS, and avoid prohibiting the use of GNSS elements that are compliant with applicable ICAO SARPs |

| RECOMMENDATIONS ADOPTED BY AN-CONF/12 | Remark |
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| d) carefully consider and assess if mandates for equipage or use of any particular global navigation satellite system core constellation or augmentation system are necessary or appropriate;<br><br>That aircraft operators:<br><br>e) consider equipage with GNSS receivers able to process more than one constellation in order to gain the benefits associated with the support of more demanding operations. | d) States carefully consider and assess if mandates for equipage or use of any particular global navigation satellite system core constellation or augmentation system are necessary or appropriate;<br><br>e) IOs consider equipage with GNSS receivers able to process more than one constellation in order to gain the benefits associated with the support of more demanding operations |
| **Recommendation 6/7 – Assistance to States in mitigating global navigation satellite system vulnerabilities**<br><br>That ICAO:<br><br>a) continue technical evaluation of known threats to the global navigation satellite system, including space weather issues, and make the information available to States;<br><br>b) compile and publish more detailed guidance for States to use in the assessment of global navigation satellite system vulnerabilities;<br><br>c) develop a formal mechanism with the International Telecommunication Union and other appropriate UN bodies to address specific cases of harmful interference to the global navigation satellite system reported by States to ICAO; and<br><br>d) assess the need for, and feasibility of, an alternative position, navigation and timing system. | Progressing well at the ICAO Panels. |

| RECOMMENDATIONS ADOPTED BY AN-CONF/12 | Remark |
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| **Recommendation 6/8 – Planning for mitigation of global navigation satellite system vulnerabilities**<br><br>That States: | <u>On regional Level this was included in the MID Regional GNSS Implementation Strategy</u> |
| a) assess the likelihood and effects of global navigation satellite system vulnerabilities in their airspace and apply, as necessary, recognized and available mitigation methods; | a) States assess the likelihood and effects of GNSS vulnerabilities in their airspace and apply, as necessary, recognized and available mitigation methods. |
| b) provide effective spectrum management and protection of global navigation satellite system (GNSS) frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance; | b) States provide effective spectrum management and protection of GNSS frequencies to reduce the likelihood of unintentional interference or degradation of GNSS performance. |
| c) report to ICAO cases of harmful interference to global navigation satellite system that may have an impact on international civil aviation operations; | c) States report to ICAO cases of harmful interference to global navigation satellite system that may have an impact on international civil aviation operations. |
| d) develop and enforce a strong regulatory framework governing the use of global navigation satellite system repeaters, pseudolites, spoofers and jammers; | d) States develop and enforce a strong regulatory framework governing the use of global navigation satellite system repeaters, pseudolites, spoofers and jammers. |
| e) allow for realization of the full advantages of on-board mitigation techniques, particularly inertial navigation systems; and | e) States allow for realization of the full advantages of on-board mitigation techniques, particularly inertial navigation systems. |
| f) where it is determined that terrestrial aids are needed as part of a mitigation strategy, give priority to retention of distance measuring equipment (DME) in support of inertial navigation system (INS)/DME or DME/DME area navigation, and of instrument landing system at selected runways. | f) States where it is determined that terrestrial aids are needed as part of a mitigation strategy, give priority to retention of DME in support of inertial navigation system (INS)/DME or DME/DME area navigation, and of instrument landing system at selected runways. |

| RECOMMENDATIONS ADOPTED BY AN-CONF/12 | Remark |
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| **Recommendation 6/9 – Ionosphere and space weather information for future global navigation satellite system implementation** | |
| That ICAO: | Progressing in ICAO Panels also Manual on Ionosphere |
| a) coordinate regional and global activities on ionosphere characterization for global navigation satellite system implementation; | |
| b) continue its effort to address the global navigation satellite system (GNSS) vulnerability to space weather to assist States in GNSS implementation taking into account of long-term GNSS evolution as well as projected space weather phenomena; | |
| c) study the optimum use of space weather information that is globally applicable from low to high magnetic latitude regions for enhanced global navigation satellite system performance at a global context; | |
| That States: | On regional Level this was included in the MID Regional GNSS Implementation Strategy |
| d) consider a collaborative approach to resolve ionospheric issues including ionospheric characterization for cost-effective, harmonized and regionally suitable global navigation satellite system implementation. | d) States consider a collaborative approach to resolve ionospheric issues including ionospheric characterization for cost-effective, harmonized and regionally suitable global navigation satellite system implementation |
| **Recommendation 6/10 – Rationalization of terrestrial navigation aids** | |
| That, in planning for the implementation of performance-based navigation, States should: | |
| a) assess the opportunity for realizing economic benefits by reducing the number of navigation aids through the implementation of performance-based navigation; | a) States assess the opportunity for realizing economic benefits by reducing the number of navigation aids through the implementation of PBN; |

| RECOMMENDATIONS ADOPTED BY AN-CONF/12 | Remark |
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| b) ensure that an adequate terrestrial navigation and air traffic management infrastructure remains available to mitigate the potential loss of global navigation satellite system service in their airspace; and | b) States ensure that an adequate terrestrial navigation and air traffic management infrastructure remains available to mitigate the potential loss of global navigation satellite system service in their airspace; and |
| c) align performance-based navigation implementation plans with navigation aid replacement cycles, where feasible, to maximize cost savings by avoiding unnecessary infrastructure investment. | c) States align performance-based navigation implementation plans with navigation aid replacement cycles, where feasible, to maximize cost savings by avoiding unnecessary infrastructure investment. |

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