54th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

Ulaanbaatar, Mongolia
07 – 11 August 2017

AGENDA ITEM 3: AVIATION SAFETY AND AIR NAVIGATION

GAGAN – BUSINESS CASE AND MANDATES

(Presented by India)

SUMMARY

This paper intends to take forward the action item 53/6 from 53rd DGCA Conference for recognizing the benefits accruable through Satellite-based Augmentation System (SBAS) implementation and India's efforts towards implementation of SBAS based PBN operations, the Conference encouraged States to consider examining feasibility for use of GAGAN (GPS Aided GEO Augmented Navigation).

This paper presents the further actions initiated by India for implementation of GAGAN based services through establishment of mandates by Government of India for new aircraft being registered in India from 1st January 2019. Also, actions undertaken for GAGAN utilization for states in Asia Pacific are highlighted. India plans to introduce GAGAN message service for disaster management and India Meteorological department to provide last mile reach to stakeholders within its footprint.

GAGAN – BUSINESS CASE AND MANDATES

1. INTRODUCTION

1.1 During the 53rd DGCA conference at Colombo in 2016, India presented the adoption and implementation of Satellite Based Augmentation System (SBAS) by states for enabling Localizer Performance with Vertical Guidance (LPV / SBAS) approaches. Conference noted that India was preparing their airports for enabling Performance Based Navigation (PBN) operations with capability for LPV SBAS. The paper also noted that India had mandated SBAS equipage on new aircraft procured after 1st January 2019.

1.2 MOU has been signed between India and Bangladesh on cooperation in the peaceful uses of outer space between Indian Space Research Organization (ISRO) and Bangladesh Telecom Regulatory Commission (BTRC) in April 2017. This MoU shall enable the areas of cooperation such as, space science, technology and applications including remote sensing of the earth; satellite communication and **satellite based navigation**; planetary exploration; use of spacecraft and space systems and ground system; and applications of space technology. It will provide impetus to explore possibilities in the field of satellite navigation, particularly use of GAGN for aviation.

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1.4 During the visit of Honorable Prime Minister of Thailand from 16-18 June 2016, the joint statement included Quote: "India offered Thailand indigenously developed GPS Aided Geo Augmented Navigation or GAGAN services, which provides advanced navigation and location assistance and information facilities in the Aviation, Maritime and other domains. In this regard, India also expressed readiness to provide requisite technical expertise" unquote.

1.5 India proposes to take forward the dialogue with Srilanka on the GAGAN implementation during the 54th DGCA Conference. India also proposes to offer GAGAN services within Asia Pacific States for enhancing satellite augmented navigation to meet the Global Air Navigation Plan.

1.6 Since the certification of GAGAN system by DGCA India, GAGAN signal-in-space is continuously available over Indian FIR and beyond. In order to provide geographical redundancy for GAGAN Master Control Centre, India has established an additional Master Control Centre at Delhi. The real time GAGAN performance is available on http://gagan.aai.aero/gagan/.

1.7 Airports Authority of India in coordination with all stakeholders has worked on a cost benefit analysis of GAGAN for its utilization in the Indian aviation sector. Based on the same, Ministry of Civil Aviation has considered mandates for new aircraft registered after 1st January 2019 and retrofits mandates from 1st January 2024.

1.8 Envisaging the benefits of GAGAN in Non-aviation applications, India has planned to utilize GAGAN signals for broadcasting short Message Service (SMS) with suitable changes in message structure using GAGAN satellites, this service is called as GAGAN Message Service (GAMES). This service will be used to broadcast early warning messages on the occurrence of natural disaster, calamity, danger, search & rescue, relief & humanitarian related message for the safety of life within GAGAN coverage area.

2. DISCUSSION

2.1 Recognizing the benefits accruable through SBAS implementation, National Civil Aviation Policy (NCAP) 2016 envisages to mandate SBAS equipage on new aircraft being procured after 1st January 2019. NCAP also encourages the retrofitting of the existing fleet by incentivizing airline operators. On successful completion of the development of the business case and stakeholder consultation, India will strive for mandating the use of GAGAN in all eligible aircraft from 1st January 2025.

2.2 Airports Authority of India has carried out extensive ground / obstacle surveys at 40 Indian airports and has designed Instrument Flight Procedures to LPV minima for 12 runway ends based on Procedures for Air Navigation Service – Operations (PANS-OPS) criteria. These procedures are undergoing ground / flight validation. Regulatory framework for aircraft and OPS approval for SBAS implementation has been notified thereby facilitating implementation of SBAS procedures.

2.3 Presently India has approx.100 operational airports catering schedule airlines, general aviation and cargo flights. Indian aviation market is projected to be among the one of the leading aviation market in the world by 2020. By analyzing the potential of GAGAN, Ministry of Civil Aviation in coordination with AAI has worked out a cost benefit analysis of GAGAN utilization in Indian aviation sector. The analysis is based on data, information, assumptions and prevailing market and aviation sector conditions as of 1st January 2017.

3. COST-BENEFIT ANALYSIS ON GAGAN:

3.1 A two-step approach has been adopted while carrying out economic and financial analysis of GAGAN implementation in the Indian commercial aviation sector. In the first step, AAI has developed a high-level assessment of the key costs involved in retrofitting existing aircraft operated by scheduled commercial operators; and second step has been worked out based on source materials, industry outreach, and industry research, and evaluated corresponding potential benefits from deploying GAGAN across the domestic commercial aviation fleet in the Indian FIR.

3.2 The forecast for domestic air traffic movements for the next 20 years has been made based on the annual air traffic projections by AAI considering FY 2017 as the base year. The air traffic movements in FY 2017 is around 1.6 million.

3.3 The key benefits for the scheduled commercial operators will be realized from an increase in the utilization of airspace, fuel savings from a reduction in delays, diversions and shorter approach path to the runway and other savings (crew costs, aircraft maintenance cost, aircraft ownership costs and miscellaneous cost) from reduction in delays, diversions and cancellations. The net benefit (undiscounted) for scheduled commercial operators will be approximately USD 1,364.64 million over a span of 20 years between FY 2018 and FY 2037.

3.4 The total cost incurred by all the stakeholders in civil aviation sector is approximately USD 360.71 million. The majority of cost i.e. USD 200.64 million is incurred by the scheduled commercial operators for retrofitting the existing fleet with suitable solutions and maintenance of GAGAN infrastructure i.e. USD 147.48 million. The procedure development cost of USD 12.60 million is essential for successful implementation of GAGAN in India.

3.5 As the availability of benefits is dependent upon adoption of GAGAN in the Indian FIR, the larger benefits arrive in the later part of the study period (i.e. Between FY 2018 and FY 2037). The majority of costs (i.e., retrofit costs) are incurred in initial part of the assessment period (i.e. between FY 2020 and FY 2024).

3.6 The total retrofit cost for scheduled commercial operators in India is estimated to be USD 200.64 million (by considering 422 eligible aircraft[1]) for retrofit. This cost will be partly covered through the incentives provided by the AAI and/or by the scheduled commercial operators over a span of aircraft's remaining operating life. The cost may also differ based on the number of changes required in the existing avionics of an aircraft. Broadly, the cost of retrofit may comprise of Cost of a SBAS receiver, Integration Cost, Documentation and certification cost, Training cost, Operations and maintenance cost, Opportunity cost for airlines due to additional grounding time, Age / model of the aircraft and Existing avionics suite installed.

1 The eligibility of an aircraft has been determined based on the Original Design Life (20 years) of aircraft in the year 2029 i.e. 10 years from the start of retrofit in India. All aircrafts that will be less than the ODL by 2029 have been considered for retrofit.

3.7 Although the cost benefit analysis for general and business aviation fleet was out of the purview of the study, but the study identifies 196 general and business aircraft for retrofit based on the Original Design Life (ODL). The cost of retrofitting these aircrafts is not clearly known till date as it may vary considerably with the aircraft type.

4. ACTION BY THE CONFERENCE

4.1 The Conference is invited to:

a) Note the current status of GAGAN implementation in Indian airspace; and

b) Consider GAGAN usage for SBAS Approval with Vertical Guidance (APV) by Asia Pacific States taking note of the India's efforts towards cost benefit analysis of GAGAN implementation for Indian aviation sector and proposed GAGAN mandate by Government of India for new aircraft being registered in India after 1st January 2019 and retrofits (eligible aircraft) by 1st January 2024.

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