International Civil Aviation Organization

THE SEVENTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS IMPLEMENTATION TASK FORCE (GBAS/SBAS ITF/7)

(Bangkok, 14- 16 May 2025)

Agenda Item 4: Updates on GBAS/SBAS system and States' implementation status

IMPLEMENTATION OF LPV (GAGAN) APPROACHES IN INDIA

(presented by India)

SUMMARY

This paper presents status of Implementation of GAGAN (GPS Aided GEO Augmented Navigation) based LPV (Localizer Performance with Vertical Guidance) approaches at various airports in India, with distinctive emphasis on smaller underserved airports to improve the Access, Regularity and Efficiency of aircraft operations by implementing runway aligned 3D approaches.

1. INTRODUCTION

1.1 With the introduction of UDAN-"Regional Connectivity Scheme" (RCS) in India, several Regional Airports are being developed by Government of India, with the objective of making air travel affordable and to provide widespread connectivity, also to boost inclusive national economic development. Normally these airports have limited/no ground-based navigation infrastructure. In order to improve the Safety and Regularity of flight operations at these airports in a cost-effective manner, a decision was taken to develop and implement GAGAN based LPV approaches at such airports to improve Access, Regularity and Efficiency of aircraft operations to provide reliable connectivity to relatively remote places in India. Further, to take the advantages of technology the use LPV approaches are expanded to other airports where instrument runways are not served by precision approaches. The LPV approaches are also envisaged as an alternate of the conventional approaches.

2. DISCUSSION

2.1 At present 57 LPV approaches are in various stages of implementation. Kishangarh was the signature airport in Rajasthan, India where the LPV approach was implemented first on 14th July 2022.

2.2 Normally airports with short runways are served by aircrafts such as Q400/ATR 72, which are capable of conducting LPV approaches. Implementation of LPV approaches at such airports will result in an improved access (equivalent to ILS) for non-precision runway, with DH of order 250 ft., in a cost-effective manner, by making full utilization of the navigation capabilities of fleets operating there. It will result in huge reduction in operating costs for aerodrome operators and airline operators.

2.3 LPV approaches considered more flexible and safer since it is independent of temperature and pressure variations. Implementation of these approaches at terrain challenged airports where the siting of nav-aid is difficult due to line of sight limitations.

2.4 With the implementation of LPV approaches, ILS is not required anymore and it will result in huge savings of costs associated with ILS – such as Equipment, Calibration, Maintenance, CNS personnel, Training, cost of land required for installation of ILS. These types of approaches can also help in providing improved access to terrain challenged airports, where ILS cannot be installed due sitting issues. The vertical guidance provided is just like that of ILS glide slope and is not affected by temperature and pressure variations. LPV approaches can be developed for all the runways of the airport and thus negating the need for installation and maintenance of ILS equipment's for multiple runways surveying that particular airport. Further, LPV approaches will also reduce the carbon emission, reduce the cockpit workload and provides flight crew with more stable vertical guidance. This will allow pilots to land seamlessly in unfavorable weather conditions, reducing the risk of delays, diversions or cancellations.

2.5 Implementation of LPV approaches in India was a challenging task. Though the GAGAN was certified in 21 April 2015, but it could not be utilized due to lack of flight validation infrastructure and fleet/crew capability issues. The most challenging parts in LPV implementation were the flight validation of IFP and OPS approval.

2.6 **OPS approval process: - 5 PHASE PROCESS**

Documents used:-
ICAO Documentation – ICAO Annex 6, Part I and PBN Manual ICAO Docs 9613.
DGCA Documentation – Civil Aviation Requirement Section 8, Series S, Part IV, Ops Circular 03/2016 on Aircraft and Operators' Approval for RNP- APCH operations down to LNAV, LNAV/VNAV and LPV minima using GNSS augmented by SBAS .

Phase 1 (Pre-Application): Operator intending to undertake LPV operation, approached flight standard directorate and FSD studies operator need and provide advice/guidance on implementation strategies.

a. Initial application letter from the Operator.
b. Acceptance letter from DGCA
c. Pre-Application meeting planned & executed

Phase 2 (Formal Application Meeting): When the feasibility is established the operator submits the formal application with required documentation in phase 2.

Documents submitted by operator includes:

a. Operating procedures/SOPs/Checklist
b. Initial and recurrent training details – Flight Crew/Dispatch/Maintenance
c. Procedures for information and database management.
d. Other documentation such as dispatch procedures, abnormal/emergency procedures etc.
e. Minimum Equipment List (MEL).
f. Aircraft Flight Manual (AFM)
g. And lastly a statement verifying para wise compliance with our national regulations.
h. Formal meeting planned & executed with implementation plan.

Phase 3 (Evaluation Phase) –

a. Submitted documents are scrutinized by DGCA team.
b. And all procedures proposed by operator are evaluated to ensure safe operation.
c. Job Aid for Ops circular and CAR compliance are scrutinized by the FOI.
d. At this stage operator may be required to amend procedures and documentation to comply with any gaps that may be identify by DGCA team.

Phase 4 (Demonstration Phase)-

a. In this phase normal, abnormal and emergency operational procedures are simulated and tested in table top exercises and simulators. This is to ensure that the procedures evolved by the operator are comprehensive and safe.
b. Complex procedures like LPV is also tested in live environment in proving flights at this stage any new risk identified during the exercises will be mitigated.
c. First LPV GAGAN proving flight on ATR 72-600 was conducted at VIKG- Kishangarh airport on 28th April 2022 for RWY 05/23. The outcome of the flight trials was successful.

Phase 5 (Approval Phase)-

a. After successful outcome of phase 4, the relevant documents are put up for approval.
b. Letter of approval is issued by DGCA for LPV.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

a) Note the information contained in this papers; and
b) Discuss any relevant matters as appropriate.

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