

Impact of Performance Based Navigation (PBN) Technology on Air Navigational Activities at Bandaranaike International Airport Sri Lanka

S K N M Dayawansa

General Sir John Kotelawala Defence University, Sri Lanka

R M N T Sirisoma

General Sir John Kotelawala Defence University, Sri Lanka

1. Introduction

Performance Based Navigation (PBN) is a system which uses satellite-based navigation to improve airport access, shorten flight paths, and increase en route efficiency. Enroute Efficiency is one of the two key components of Next Generation Air Transportation system as per to the article ‘Assessing the Benefits of Next Gen Performance Based Navigation (PBN)’ by Timar and Hunter (2013). Air navigation mainly consists of air traffic controlling, flight information service and alerting service. In air traffic control (ATC), the PBN system plays a pivotal role all over the world ensuring safety and efficiency of air navigation. The PBN system mainly collaborates with satellite navigation to ensure smoother flow of air traffic. The PBN technology has been implemented at Bandaranaike International Airport (BIA) in July 2016.

In the report ‘RNAV Training for ATC –Part1’ by Air Traffic Control Association of Japan, it has explained that RNAV (area navigation) is a method of navigation which permits aircraft operation on any desired flight path within the coverage of the station-referenced navigation aids or within the limits of the capability of self-contained aids, or combination of both. ‘Without new technologies, operational procedures and corresponding regulations, it is not possible to increase capacity without decreasing system safety’ (Netjasov, 2010). In this study, the authors explain that the increasing demand for the air transportation services will not be able to serve if new technologies are not introduced in the future.

This research explores whether PBN has improved the air transport movement and air traffic controlling activities at BIA in terms of safety, reduction of workload of the air traffic controllers, time saving and cost.

2. Methodology

The researchers have used the qualitative research approach and data collection was done via interviews and questionnaires. The improvements and issues were studied with respect to workload, time saved, cost and safety. The air traffic controllers at Ratmalana radar room and at the main tower of BIA were identified as the best cohort for obtaining primary data, as they are the ones who are directly involved with the new implementation of PBN to BIA. There were only limited number of population of about twenty-eight air traffic controllers who are involved directly with this PBN implementation. Since the population is less than 30 it was decided to distribute the questionnaire form to all the air traffic controllers at BIA. Among them twenty-six responded (93% of the population) for the survey. Out of seven senior air traffic controllers with more than 20 years of experience at BIA, one person was interviewed as open-ended interview in order to collect data. The collected data was analysed in the means of textual method, graphical method and tabular method for a clear and precise statement.

3. Results

It was observed in the analysis that although 84% of the respondents agreed that their workload has been reduced after the implementation of the PBN system at the BIA. 66% of the respondent agreed that the flight route structure has been changed with the new system. Of the respondents 42% said that there is only a minor impact on air transportation cost reduction by PBN implementation. 38% said that it has a moderate impact on the reduction of air transportation costs. According to the respondents, the frequency of reported incidents is very much low at BIA. 65% says that incidents occur sometimes where 35% says that it is rare. Considering the last three months, to here had been no any incident recorded after the implementation of the PBN system.

During the interview with one of the senior air traffic controllers in the radar room of BIA, he expressed an opinion that although the PBN system has been implemented, there are further adjustments to be made. According to him the cost reductions can be gained by gradual descending and ascending of aircrafts through new automatic PBN technologies. Since the new system helps to manage the holding times effectively, minimum holding times for flights can be achieved reducing costs of aircraft operations. Also cost advantages would be achievable in the future through reduction of equipment usage, particularly equipment used for Instrumental Landing System. It is well depicted from the responses that 73% agrees that the equipment usage has been reduced after implementation of PBN. It will also result in reduction of errors that can occur from both the air traffic controller and the pilot. Due to several issues in the route structures, the air traffic controllers at BIA are unable to get maximum benefit from the PBN implementation at present.

4. Conclusion/Recommendation

As per the opinion of the respondents this concept is highly economical when compared to previous technologies. One of the main objectives of this system was to reduce the instrumental landing system and to control them through GPS points. But it was observed that some air traffic controllers still use the older landing system with the PBN. So, it is recommended to give a proper training on the new system to air traffic controllers in order to achieve the required output from PBN. Cost reduction through this system can be benefited in three ways: reduction in fuel costs by reducing flight route distances effectively managed holding patterns and cost savings through the reduction of equipment usage. Through the study it was identified that although the cost advantages from holding patterns and route structure changes have been achieved to a certain extent, maximum advantage of the system had not been gained yet from the system. More discussions between pilots and air traffic controllers are required further. As per the results of the study it is recommended to establish unique holding patterns, and more coordination between the parties in order to achieve the maximum output.

5. References

- [1] Kaplan, Elliott, (2006). Understanding GPS principles and applications.2nd ed. New York: Artech House.
- [2] Meric, Ozlem. (2015). Optimum Arrival Routes for Flight Efficiency,Journal of Power and Energy Engineering,Vol3, 2 pp 449-452.
- [3] Netjasov, Fedja. (2010). Risk Analysis and Safety Assessment of Air Traffic Control System. Unpublished Dissertation.
- [4] Scovel, Calvin. (2013, July). FAA's Progress and Challenges in Advancing the Next Generation Air Transportation System. Statement of The Inspector General U.S. Department of Transportation09.07.2016, from <http://transport.house.gov/uploadedfiles/documents/2013-07-17-scovel.pdf>.
- [5] Timar, S., Hunter, G. & Post, J. (2013). Assessing the Benefits of NextGen Performance Based Navigation. Air traffic Control Quarterly, vol21, pp 1-4.
- [6] Anon., n.d. Japan RNAV Training For ATC, s.l.: Air Traffic Control Association Japan.

Keywords: *PBN, air navigation, GPS, efficiency, air traffic control*