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Agenda Item 5.5
30/11/20 – 04/12/20

International Civil Aviation Organization

Twenty-fourth Meeting of the Communications/ Navigation and Surveillance Sub-group (CNS SG/24) of APANPIRG

Web-conference, 30 November – 4 December 2020

Agenda Item 5: Navigation

5.5 Other Navigation Related Issues

PROTECTION OF INSTRUMENT LANDING SYSTEM (ILS) CRITICAL AND SENSITIVE AREAS IN THREE-DIMENSIONAL AND ILS FACILITY PERFORMANCE CATEGORY REQUIREMENTS

(Presented by Hong Kong, China)

SUMMARY

In July 2018, the ICAO published in the 7th Edition of Annex 10 Vol. I, drawing State's attention on the need to extend protection of the ILS Critical and Sensitive Areas (CA/SA) from two-dimensional (horizontal) context to volumes (three-dimensional). There were cases reported by pilots of arriving aircraft at the Hong Kong International Airport (HKIA) that there were Localizer (LOC) signal fluctuations when departing aircraft on the same runway flied over the LOC antenna.

Moreover, the HKIA is planning to install and commission new ILS for its Three-Runway System (3RS), and to utilize the required Facility Performance Category of the new ILS, in accordance with the ILS classification system stipulated in ICAO Annex 10 Vol. I Amendment 92, which provides the latest requirements on the level of integrity and continuity of service.

In this paper, Hong Kong, China would like to share our observations on potential impacts of departing aircraft on arriving aircraft under runway mixed-mode operation with respect to LOC signal fluctuations, as well as the considerations of applying the ILS classification system for newly installed ILS. States are invited to note the importance of protecting the ILS CA/SA in volumes and the minimum evaluation period for specific ILS facility performance category. ICAO was requested to provide more guidance for ANSPs to protect CA/SA in volumes and to achieve the required facility performance category for new ILS installations within shortest period.

1. INTRODUCTION

1.1 The ICAO published in the 7th Edition of Annex 10 Vol. I, Attachment C, Paragraph 2.1.9.5, highlighting the need for States to extend protection of the ILS Critical and Sensitive Areas (CA/SA) from two-dimensional (2D) (horizontal) context to volumes. There were cases of Localizer (LOC) signal fluctuations at the Hong Kong International Airport (HKIA), which occurred during single runway mixed-mode operation. The pilots of arriving aircraft reported LOC signal fluctuations at the time when departing aircraft on the same runway flied over the LOC antenna.

1.2 Besides, under 3RS project at the HKIA, it is planned to install and commission new ILS. According to the latest ICAO Annex 10 Vol. I Amendment 92 applicable on 5 November 2020, in order

to utilize the Facility Performance Category II and III, the level of integrity and continuity of service of the new ILS in accordance with the ILS classification system shall be at least level 3. The mean time between outages (MTBO) of the new ILS should be confirmed by evaluation under an operational environment, and the evaluation period should be sufficient to determine achievement of the required level with acceptable confidence level. For meeting the level 3 requirement, at least 3,200 hours of the new ILS operations would be needed. However, taking into consideration the need to assess the seasonal influence of the environment, one year is typically required for new ILS installations.

2. DISCUSSION

2.1. For the aforesaid cases of LOC signal fluctuations, it was found that they occurred under single runway mixed mode operation and there were departing aircraft flying over LOC antenna of the same runway at the time the pilots of arriving aircraft reported such fluctuations. The ILS CA/SA on ground was found clear without any intrusion. Besides, the departing aircraft were found to be of heavy type wake turbulence.

2.2. Hong Kong, China has enquired our consultant on the observations. According to the consultant's advice, departing aircraft may cause disturbances to LOC signals. Various factors need to be considered, such as whether the departing aircraft deviates from its normal climbing path/slope, which may cause potential asymmetric scattering of LOC signals resulting in distortions, the size of the departing aircraft, as well as distance of the arriving aircraft to runway threshold, and etc. The consultant provided referenced publications of the relevant theories and recommendation[1].

2.3. Currently, it is noted that in Annex 10 Vol. I Attachment C concerning guidance in protection of ILS CA/SA, the guidance focuses on protection in 2D instead of 3D.

2.4. According to the latest ICAO Annex 10 Vol. I Amendment 92, in order to achieve Facility Performance Category II and III for operational utilization in accordance with the ILS classification system, the level of integrity and continuity of service of the new ILS shall be at least level 3. The sequential test method is introduced under Annex 10 Vol. I Attachment C to evaluate the MTBO. It suggests that a minimal evaluation period of one year is typically required for a new type of installation in a particular environment and this period may be reduced in case the operating environment is well controlled and there are other similar proven installations. However, no further details are elaborated in Annex 10 as to how to reduce the evaluation period. More guidance on how to reduce the evaluation period would help ANSPs to achieve the required Facility Performance Category of the newly installed ILS within the shortest period of time.

2.5. States/Administrations are invited to note the importance of extending protection of ILS CA/SA from 2D (horizontal) context to 3D, especially for LOC, as well as the minimum evaluation period required in the operational environment to utilize the facility performance category for new ILS

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1 "*Challenges in Near-Threshold Flight Inspection Measures", P164-170, Proceedings of 17th International Flight Inspection Symposium 2012,* Gerhard Greving, NAVCOM Consulting, and L. Nelson Spohnheimer, Spohnheimer Consulting

http://www.icasc.co/sites/faa/uploads/documents/17_IFIS_Paper_Collection/ifis_2012_proceedings_120612_Update_Internet.pdf

"*Critical and Sensitive Areas of ILS and its 3rd Dimension – Examples, Effects and Proposals", 20th International Flight Inspection Symposium 2018,* Gerhard Greving, NAVCOM Consulting, and L. Nelson Spohnheimer, Spohnheimer Consulting

http://www.icasc.co/sites/faa/uploads/documents/20th_IFIS_Papers/Papers/IFIS18-0032.pdf

installations. It is proposed that CNS Sub-group to consider formulating Draft Conclusions as per the below paragraph 3.1.

3. ACTION BY THE MEETING

3.1. The meeting is invited to:

a) reinstate importance in extending protection of ILS CA/SA from 2D to 3D in accordance with ICAO Annex 10, Vol. I, Attachment C, Paragraph 2.1.9.5;

b) request the ICAO Regional Office to coordinate with ICAO Headquarters to work on development of guidance materials to facilitate ANSPs to:

(i) protect ILS CA/SA in 3D; and
(ii) reduce the evaluation period for achieving Facility Performance Category for new ILS installations within the shortest period.

c) consider formulating Draft Conclusions, if appropriate, with a view to taking forward the subject matters for effective follow-up under relevant forums.

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