International Civil Aviation Organization

FIFTH MEETING OF SPECTRUM REVIEW WORKING GROUP (SRWG/5)

Video Teleconference, 15 – 17 March 2021

Agenda Item 7: State and regional updates

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

(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.

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.

States are invited to note the importance in extending protection of ILS CA/SA from two dimensional to three dimensional as stated in ICAO Annex 10 (7th Edition, Amendment 92), Volume I, Attachment C, Paragraph 2.1.9.5, be aware that departing aircraft and/or manoeuvring helicopters/aircraft can cause disturbances to ILS signals received by arriving aircraft under single runway mixed mode operation and to take measures to mitigate potential impacts caused by disturbances in ILS signals under single runway mixed mode operation. ICAO is invited to provide guidance materials in establishing three dimensional ILS CA/SA and their protection.

The contents of this paper have been presented as WP/21 and discussed in the Twenty-fourth Meeting of the Communications/Navigation and Surveillance Sub-Group (CNS SG/24) of APANPIRG and adopted by the meeting as Conclusion CNS SG/24/11. ICAO APAC will forward the paper and its presentation file to secretary of the ICAO Navigation Systems Panel (NSP) for consideration by Conventional Navaids and Testing Working Group (CNTWG).

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.

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, those reported observations at HKIA was not unique but were applicable and observed at other airports as well, especially those airports which often use single runway mixed-mode operation. 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. States/Administrations are invited to note the importance of extending protection of ILS CA/SA from 2D (horizontal) context to 3D, especially for LOC.

2.4. The above has been presented in a working paper (WP/21) and discussed in the Twenty-fourth Meeting of the Communications/Navigation and Surveillance Sub-Group (CNS SG/24) of APANPIRG. In the meeting, Australia echoed the observations and views expressed by Hong Kong, China and our consultant concerning the ILS 3D CA/SA, and supported the recommendations.

---

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

2.5 In view of the significance in the protection of ILS CA/SA in 3D, CNS SG/24 adopted the Conclusion CNS SG/24/11 as listed below and ICAO APAC will forward the working paper (WP/21) shared by Hong Kong, China in CNS SG/24 and its presentation file to secretary of the ICAO Navigation Systems Panel (NSP) for consideration by Conventional Navaids and Testing Working Group (CNTWG).

<table>
<tr><td colspan="3">Conclusion CNS SG/24/11- Protection of ILS Critical and Sensitive Areas in Three Dimensional</td></tr>
<tr><td colspan="2">What: That, States to:
a) take note of the importance in extending protection of ILS Critical and Sensitive Areas (CASA) from two dimensional to three dimensional as stated in ICAO Annex 10 (7th Edition, Amendment 92), Volume I, Attachment C, Paragraph 2.1.9.5;
b) be aware that departing aircraft and/or manoeuvring helicopters/aircraft can cause disturbances to ILS signals received by arriving aircraft under single runway mixed mode operation;
c) take measures to mitigate potential impacts caused by disturbances in ILS signals under single runway mixed mode operation;

and ICAO to:
d) provide guidance materials in establishing three dimensional ILS CASA and their protection.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒Ops/Technical</td></tr>
<tr><td>Why: In accordance with ICAO Annex 10 (7th Edition, Amendment 92), Volume I, paragraph 2.1.9.5 – “While critical and sensitive areas are evaluated in a two-dimensional (horizontal) context, protection should actually be extended to volumes, as departing aircraft and/or manoeuvring helicopters/aircraft can also cause disturbances to the ILS signals”. However, no detailed guidance was given as to how to establish the ILS CA/SA in three dimensional and how to protect them.</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 4-Dec-20</td><td colspan="2">Status: Adopted by Sub-group</td></tr>
<tr><td colspan="3">Who: ☒ Sub groups ☒ APAC States ☐ICAO APAC RO ☒ICAO HQ ☐Other:</td></tr>
</table>

3. ACTION BY THE MEETING

3.1. The meeting is invited to:

a) note the information containted in this paper; and

b) discuss any relevant matters as appropriate.

– – – – – – – – – – – –