International Civil Aviation Organization

Sixth Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/6)

Langkawi, Malaysia, 18 - 21 February 2025

Agenda Item 4: Planning, Design and Construction of Aerodromes

SIGNIFICANCE OF FRANGIBILITY REQUIREMNTS OF NAVIGATIONAL AIDS INSTALLED ON THE RUNWAY STRIP AND RESA

(Presented by Nepal)

SUMMARY

This paper highlights the significance of the frangibility requirements of navigational aids installed on runway strips and RESA. However, due to various unknown reasons, several equipment and installations at some airports are found on the runway strip or RESA posing potential hazards to aircraft in the event of runway excursion when such installations are mounted without meeting frangibility requirements.

Action by the Meeting is in Section 3.1.

1. INTRODUCTION

1.1 Visual and non-visual aids (e.g., approach lighting supports, meteorological equipment, radio navigational aids) are required for safe take-off and landing of aircraft. These navigational aids are often located near runways and taxiways and if inappropriately installed may present a significant hazard to aircraft in the event of aircraft undershooting, overshooting or veering-off from runway during landing, take-off or ground maneuvering of aircraft. All such equipment and their supports shall be frangible and mounted as low as possible. However, due to various unknown reasons, several equipment and installations at some airports are found on the runway strip or RESA which may potentially cause significant damage to aircraft including sever injuries to passengers in the event of runway excursion and if such installations are mounted without meeting frangibility requirements.

2. DISCUSSION

Objects on the runway strip and RESA

2.1 ICAO annex 14 Volume I Aerodrome Design and Operations includes the following SARPs for the objects on the runway strip.

> 3.4.6 **Recommendation.—** *An object situated on a runway strip which may endanger aeroplanes should be regarded as an obstacle and should, as far as practicable, be removed.*
>
> 3.4.7 No fixed object, other than visual aids required for air navigation or those required for aircraft safety purposes and which must be sited on the runway strip, and satisfying the relevant frangibility requirement in Chapter 5, shall be permitted on any part of a runway

strip of a precision approach runway delineated by the lower edges of the inner transitional surfaces. No mobile object shall be permitted on this part of the runway strip during the use of the runway for landing or take-off.

2.2 ICAO annex 14 Volume I Aerodrome Design and Operations provides the following SARPs for the siting of equipment and installations on operational areas:

9.9.1 Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation shall be:

a) on a runway strip, a runway end safety area, a taxiway strip or within the distances specified in Table 3-1, column 11, if it would endanger an aircraft; or

b) on a clearway if it would endanger an aircraft in the air.

9.9.2 Any equipment or installation required for air navigation or for aircraft safety purposes which must be located:

a) on that portion of a runway strip within:

1) 75 m of the runway centre line where the code number is 3 or 4; or

2) 45 m of the runway centre line where the code number is 1 or 2; or

b) on a runway end safety area, a taxiway strip or within the distances specified in Table 3-1; or

c) on a clearway and which would endanger an aircraft in the air;

shall be frangible and mounted as low as possible.

9.9.3 **Recommendation.—** *Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on the non-graded portion of a runway strip should be regarded as an obstacle and should be frangible and mounted as low as possible.*

9.9.4 Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation shall be located within 240 m from the end of the strip and within:

a) 60 m of the extended centre line where the code number is 3 or 4; or

b) 45 m of the extended centre line where the code number is 1 or 2;

of a precision approach runway category I, II or III.

9.9.5 Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on or near a strip of a precision approach runway category I, II or III and which:

a) is situated within 240 m from the end of the strip and within:

1) 60 m of the extended runway centre line where the code number is 3 or 4; or
2) 45 m of the extended runway centre line where the code number is 1 or 2; or

b) penetrates the inner approach surface, the inner transitional surface or the balked landing surface; shall be frangible and mounted as low as possible.

2.3 The following guidance is provided in Section 8.2, Attachment A of Annex 14, Volume I regarding objects on strips as appended below:

> *Within the general area of the strip adjacent to the runway, measures should be taken to prevent an aeroplane's wheel, when sinking into the ground, from striking a hard vertical face. Special problems may arise for runway light fittings or other objects mounted in the strip or at the intersection with a taxiway or another runway. In the case of construction, such as runways or taxiways, where the surface must also be flush with the strip surface,* ***a vertical face can be eliminated by chamfering from the top of the construction to not less than 30 cm below the strip surface level****. Other objects, the functions of which do not require them to be at surface level, should be buried to a depth of not less than 30 cm.*

2.4 The USOAP CMA AGA Protocol Question (8.191) under CE-6 seeks State's compliance and effective implementation of the requirements on the frangibility and height restriction which is appended as below:

> *Does the State ensure that aerodrome operators comply with the frangibility and height restriction requirements for equipment or installations located near or on a runway, on the non-graded portion of a runway strip, on precision approach runways, or for obstacles of operational significance?*

2.4.1 We often observe a variety of installations that do not adhere to the requirements of Annex 14, Attachment A, Section 8.2, such as approach light foundation, PAPI foundations, transformer chambers, drainage side walls located on the runway/ taxiway strips. These foundations with vertical faces could invite a disastrous outcome in the event of an aircraft overrun or veer off from the runway.

Figure 1: Elevated foundation of PAPI on the runway strip

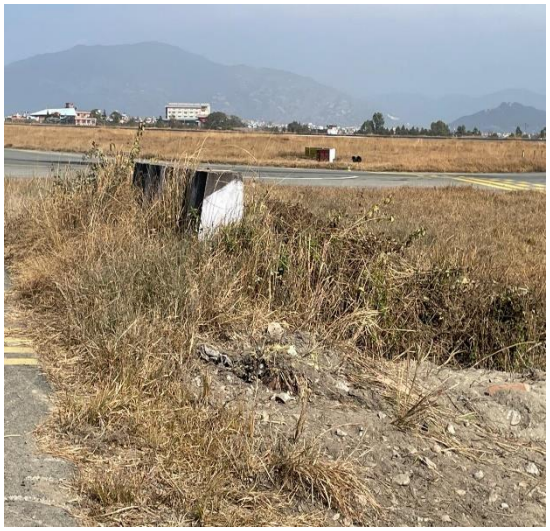

Figure 2: Elevated side wall near taxiway strip

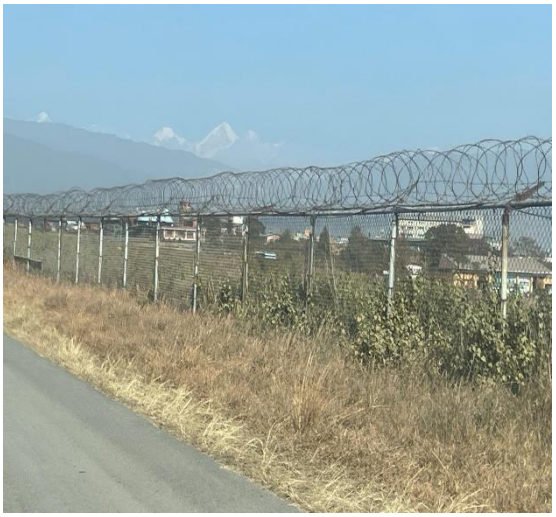

Figure 3: Non- Frangible security fence

ILS /GPA installations

2.5 The aerodrome design manual (Doc 9157) Part 6 includes the following consideration regarding the location of ILS/ GPA system.

2.1.7 The preferred location for the localizer antenna array is on the extended runway centre line beyond the far end of the runway. This location permits the radiated on-course signal to overlie the runway centre line.

ILS glide path antenna system

2.1.8 The lateral displacement of the ILS glide path antenna system should not be less than 120 m with respect to the runway centre line. The longitudinal location should be selected to place the ILS reference datum as close as possible to the recommended nominal value of 15 m above the threshold.

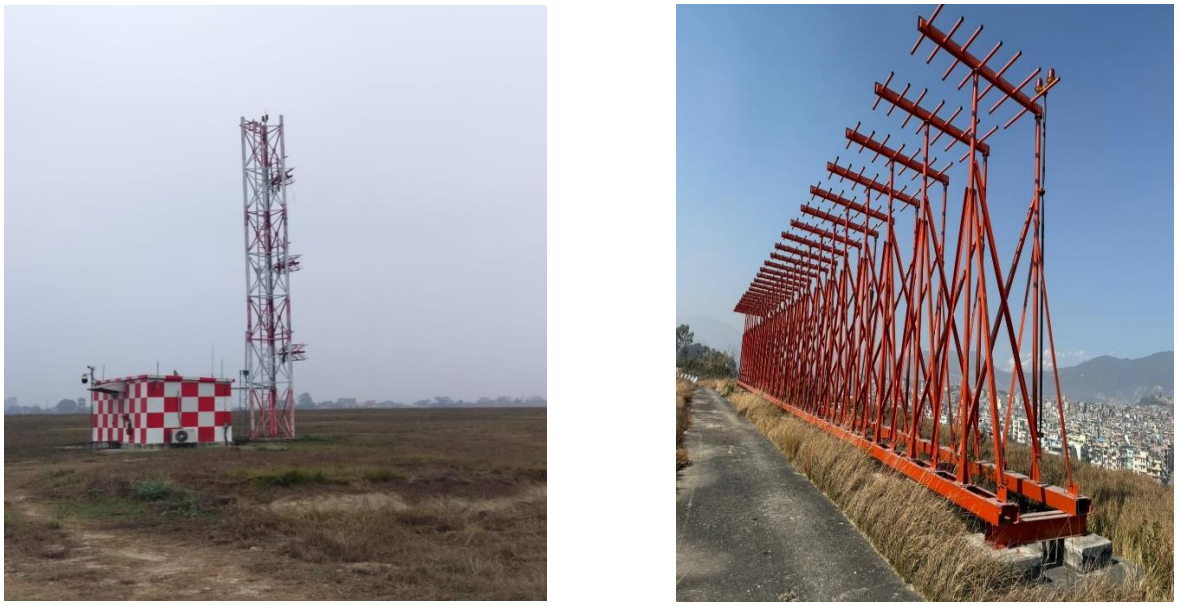

Figure 4: ILS / Glide path antenna and equipment on the runway strip

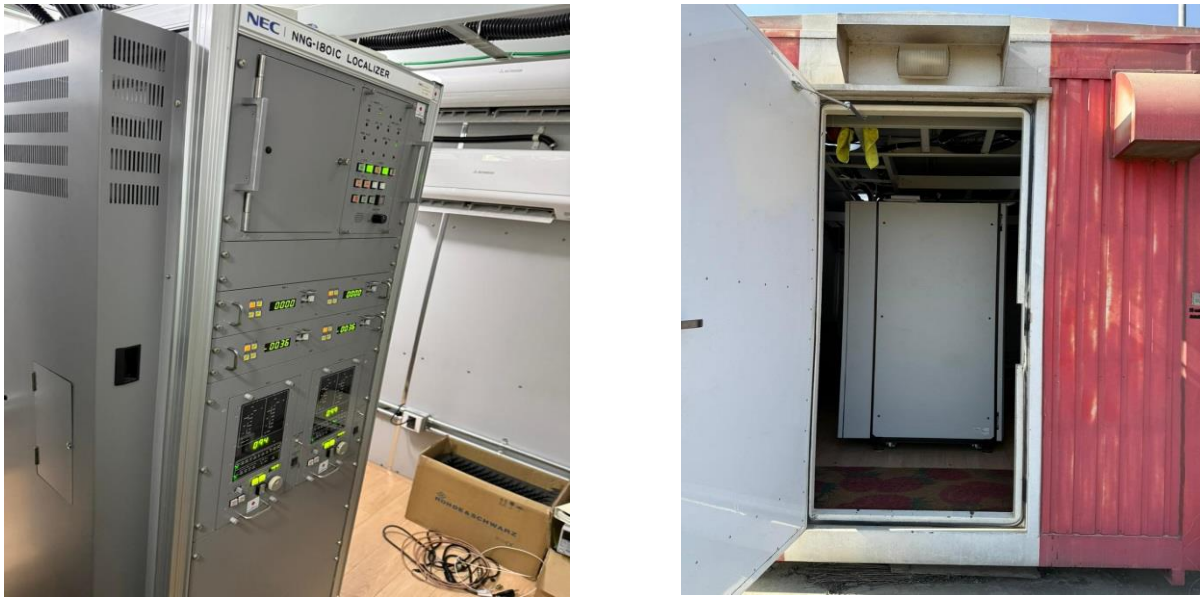

Figure 5: ILS Hut with equipment

2.6 The siting of the ILS/ GPA cannot be made risk free due to several airport constraints like Space Limitations, Topography, Runway Orientation and Layout, Financial and Resource Constraints: Infrastructure Development Costs etc.

2.7 Due to its heavy mass, the transmitter housing for ILS installations cannot be made frangible. Therefore, when planning for the installation of an ILS, the location of the transmitter housing for the localizer as well as for the glide path should be carefully considered. Where practicable, the transmitter housing for the ILS glide path should be located outside the runway strip and RESA.

2.8 Failure to meet the recommended placement guidelines for ILS transmitter housing typically results from a combination of space limitations, operational requirements, financial constraints. Despite these challenges, airports should strive to minimize risks through compliance with ICAO Annex 14 SARPs wherever possible.

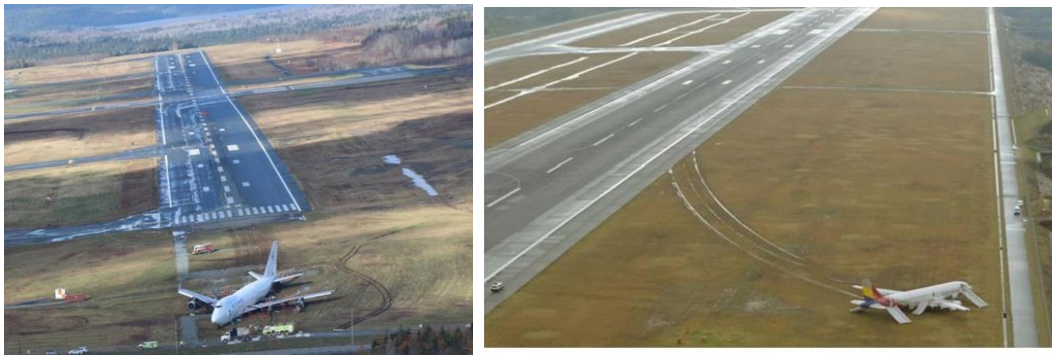

Figure 6: Aeroplane overshot and veered off from runway

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) all certified and registered aerodromes are encouraged to remove or correct the non-frangible hazards from the runway and taxiway strip and RESA;

c) develop regional guidance to provide interrelationship between ICAO Annex 10 Volume I, ICAO Annex 14 volume I and Aerodrome Design Manual (DOC. 9157) Part 6 with respect to visual and non-visual aids installation on runway and taxiway strips and RESA;

d) encourage States/Administration to share their best practices on location of ILS/GPA and ILS/GP huts with equipment; and

e) discuss any relevant matters as appropriate.

—END—