



ICAO

International Civil Aviation Organization

THE THIRTIETH MEETING OF THE COMMUNICATIONS / NAVIGATION AND SURVEILLANCE SUB-GROUP (CNS SG/30) OF APANPIRG

Bangkok, Thailand, 06 - 10 July 2026

Agenda Item 4: Navigation

4.3. Other navigation-related matters

ENHANCING CONTINUITY OF DVOR/DME SERVICES THROUGH A MODULAR STRUCTURE DESIGN

(Presented by Thailand)

SUMMARY

AEROTHAI has developed a modular DVOR/DME structure design using standard H-beam steel components, reducing installation duration from approximately six months to two months. This approach shortens airside occupation, accelerates restoration of navigation services, and strengthens redundancy and resilience within Thailand's conventional navigation network.

1. INTRODUCTION

1.1 As Thailand's Air Navigation Service Provider (ANSP), AEROTHAI maintains a conventional navigation infrastructure comprising 21 airports with CAT I ILS/DME, 2 airports with CAT II ILS/DME, and 35 DVOR/DME facilities. Despite Performance-Based Navigation (PBN) procedures being implemented nationwide, DVOR/DME remains a critical part of Thailand's navigation backbone, contingency capability, and overall airspace resilience.

1.2 A significant portion of the DVOR/DME network has reached mid-to-late lifecycle maturity, with an average operational age of approximately 15 years. On average, four to five DVOR/DME stations require replacement annually due to end-of-life considerations. In addition, airport expansion or aerodrome development projects often require relocation of existing DVOR/DME facilities in order to comply with siting criteria and maintain signal performance standards.

1.3 Replacement or relocation projects present practical challenges, as many DVOR/DME stations are located in restricted airside areas with limited construction windows. Conventional counterpoise systems require approximately six months for fabrication and installation, extending project timelines and reducing network redundancy and resilience during transition.

2. DISCUSSION

2.1 To address these challenges, AEROTHAI developed a modular DVOR/DME counterpoise structure using commercially available, standard H-beam steel components with bolt-and-nut connections. This replaces the traditional wire mesh design, eliminating extensive onsite

welding and enabling faster procurement, simplified assembly, and safer, more efficient structure installation.



Figure 1. Traditional Design vs Modular Design

2.2 The redesigned structure provides improved mechanical strength and offers a safer working environment for maintenance personnel. The design complies with applicable wind and seismic regulatory requirements. By optimising the structural layout, the number of required foundations and driven piles is reduced, lowering construction complexity. In addition, the modular steel concept avoids the recurring replacement costs typically associated with traditional wire mesh systems, supporting long-term cost efficiency.

Table 1. Comparison of Traditional and Modular Design

	Traditional Design	Modular Design
Installation Period	Approximately 6 months	Approximately 2 months
Onsite Welding	Extensive welding required	Minimal welding (bolt & nut connection)
Procurement	Custom fabrication required	Off-the-shelf components
Airside Occupation	Long duration	Reduced duration
Foundation Requirement	Higher number of sets	Optimized configuration
Structural Compliance	Wind and seismic compliant	Wind and seismic compliant
Service Restoration	Longer transition period	Faster return to service

2.3 Implementation experience has shown that the modular concept reduces the counterpoise replacement period from approximately six months to two months. This reduction shortens airside occupation time and minimizes operational disruption during relocation or replacement activities. The shorter installation period also supports faster restoration of DVOR/DME services, thereby maintaining redundancy within the conventional navigation network.

2.4 The DVOR installation at Surat Thani Airport in southern Thailand was the first site to implement this modular counterpoise design. Post-installation ground and flight inspection confirmed compliance with ICAO Annex 10 Vol.1 signal performance requirements. Following successful installation and confirmation of satisfactory operational performance, AEROTHAI is progressively applying the modular approach to additional replacement and relocation projects nationwide.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate
