



ICAO

The Second Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/2)  
*Video Teleconference, 26 to 29 January 2021*

## Agenda Item 2: Planning, Design and Construction of Aerodromes

### OVERVIEW OF ADVISORY CIRCULAR ON ENGINEERED MATERIAL ARRESTING SYSTEMS (EMAS) FOR AIRCRAFT OVERRUNS

(Presented by United States)

#### SUMMARY

This information paper presents standards for the design, installation, and maintenance of EMAS in runway safety areas (RSA). The IP highlights applicability considerations and safety benefits in lowering risk to non-standard RSA conditions and other local area conditions.

## 1. INTRODUCTION

1.1 United States standard RSA dimensions was designed to accommodate the containment of aircraft occasional runway excursion incident based on the Airplane Design Group (ADG) and approach speed. In some local conditions the standard RSA dimension are not attainable. An EMAS system could mitigate a runway excursion and capture a runaway aircraft with minimal to no structural damage, and most importantly without loss of life. After extensive research, the United States developed standards to design an arresting system to mitigate non-standard RSA conditions.

1.2 FAA developed Advisory Circular (AC) 150/5220-22B which contains guidelines for the planning, design, installation and maintenance of EMAS in RSAs. The AC is available at:

[https://www.faa.gov/airports/resources/advisory\\_circulars/index.cfm/go/document.current/document\\_number/150\\_5220-22](https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/document_number/150_5220-22)

## 2. DISCUSSION

2.1 APPLICATION. The RSA standards cannot be modified or waived. Continuous evaluation of all practicable alternatives to improve sub-standard RSA is required. Reduction of runway length, via Declared Distances (DD), to accommodate for standard RSA may not be the ideal solution. Airport operator may be reducing the utility of a runway to accommodate a lesser fleet of aircraft. If such practice does not affect the aerodrome capacity, the use of DD to achieve standard RSA is a practicable solution.

2.2 LOCAL CONDITIONS. Aerodromes with upward or downward grades that exceed runway profile standards, especially within the first or last ¼ of the runway length, may contribute to unsafe landing incidents. Pilot's perception may be impacted. A flatter runway ends may mitigate for safer landing to avoid short landing or long landing. Long landing results in the use of less pavement of actual runway length, causing a runway excursion incident. In addition, extreme downward slopes may not be conducive to slowing the aircraft to a manageable speed while attempting to exit the runway safely.

2.3 DESIGN. An EMAS is designed to stop aircraft from overrun by exerting a designed deceleration forces on its landing gear as the engineered material deforms. The location of EMAS is beyond the end of the runway and centered along the extended runway centerline. It is recommended the EMAS to begin at a setback from the end or runway pavement. The setback distance avoids damage due to aircraft jet blast and undershoot. Setback distance varies depending on the available RSA area and the material used. To the extent practicable, the EMAS design should consider both the aircraft that imposes the greatest demand upon the EMAS and the range of aircraft expected to operate on the runway. The airport operator, EMAS manufacturer, and the appropriate authorities must consult to select the design aircraft to optimize EMAS for a specific airport.

2.4 OTHER CONSIDERATIONS. Material type should be examined based on local site condition. Conditions of high wind speed and extreme temperature variations should be considered when selecting EMAS. Length and width of EMAS, entrance speed, affect to Navigational Aids, access by Aircraft Rescue and Fire Fighting, jet blast, and drainage site conditions are critical parameters.

2.5 INSPECTION AND MAINTENANCE. The cost of inspection and maintenance to the aerodrome operator should be taken into consideration. United States guidance clearly advise the aerodrome operator to ask the manufacturer to prepare an inspection and maintenance program. When an EMAS is damaged due to overrun or become less than fully serviceable, a NOTAM must be issued by the operator to alert airport users of the reduced performance of the EMAS.

2.6 OTHER MITIGATIONS TO REDUCE EXCURSIONS. The United States have used other methods to reduce runway excursions. Visual Aids systems to improve pilot situational awareness may reduce risk of incursions. We install Distance remaining signs to alert pilots of remaining useable runway length and help safe runway exit. Proper location of high-speed taxiway does help for safe aircraft exit from a runway, thus avoiding an excursion. We recommend following design standard for runway profile to reduce risk excursions. Removal of rubber accumulation from runway surface induces effective speed reduction within available pavement, thus minimize incidents of runway excursion.

### **3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) encourage States to consider adopting the guidelines found in FAA AC 150/5220-22B.

EMAS Photos:





— END —