



International Civil Aviation Organization

WORKING PAPER

A42-WP/464¹
TE/183
29/7/25

ASSEMBLY — 42ND SESSION

TECHNICAL COMMISSION

Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

DYNAMIC RUNWAY STRIPS AND RUNWAY END SAFETY AREAS ACCORDING TO DIRECTION OF OPERATION AND DECLARED DISTANCES: AN ALTERNATIVE APPROACH IN ACCORDANCE WITH ANNEX 14, VOLUME I

(Presented by Argentina and supported by Belize, Bolivia (Plurinational State of), Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Peru and Uruguay)

EXECUTIVE SUMMARY

This working paper analyzes a new approach to the dimensions and relative location of runway strips and runway end safety areas (RESAs) by direction of operation based on declared distances, and in accordance with the provisions of Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations*.

This aims to:

- maximize the use of available infrastructure;
- ensure that the infrastructure allows for safe operations; and
- maintain runway strip and RESA locations and dimensions protect against potential runway overrunning or undershooting, and overflight during landing and take-off.

Traditionally, a runway is considered to have a single runway strip, with RESAs positioned accordingly. This proposal analyzes the concept of four runway strips and associated RESAs depending on the direction of operation, since safety assessments are in fact carried out in this manner. The potential exposure to risks in the runway strip or the RESA will depend on the landing or take-off operation, according to the direction of operation and the declared distances.

Action: The Assembly is invited to:

- a) note this working paper and the need to adapt ICAO's regulatory provisions in order to optimize the use of available infrastructure in a context of global resource scarcity;
- b) request that ICAO, through its Aerodrome Design and Operations Panel (ADOP) and other pertinent panels, develop unified criteria and conditions for the applicability of this proposal, including technical guidelines on dimensions and resulting geometric characteristics; and
- c) consider the concept of dynamic runway strips depending on direction of operation and available or potential declared distances in the development of future aerodrome design and operation and aircraft operation standards.

¹ Spanish version provided by Argentina.

<i>Strategic Goals:</i>	This working paper relates to Strategic Goals <i>Every Flight is Safe and Secure</i> ; <i>Aviation Delivers Seamless, Accessible, and Reliable Mobility for All</i> ; and <i>The Economic Development of Air Transport Assures the Delivery of Economic Prosperity and Societal Well-Being for All</i> .
<i>Financial implications:</i>	This working paper is not expected to have direct financial implications for ICAO. For airports: Maximize the use of runway pavement.
<i>References:</i>	Annex 14 — <i>Aerodromes</i> , Volume I — <i>Aerodrome Design and Operations</i>

1. INTRODUCTION

1.1 The need to optimize the use of airport infrastructures is becoming increasingly critical, given the physical constraints faced by many aerodromes and the economic, operational, and environmental challenges inherent to the sector. In this context, it is key to perform a critical review of traditional concepts applied to the design of runway strips and runway end safety areas (RESAs) within the scope of ICAO Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations*.

1.2 Current regulations establish uniform geometric criteria for runway strips and RESAs based on a defined traffic mix and a given approach system. However, this approach can be limiting when considering the multiple ways in which a runway can be used depending on the direction of operation (landing or take-off) and the declared distances for each case.

1.3 In this context, this paper introduces the concept of dynamic strips, defined according to the specific operation and its direction, as a tool to boost operational capabilities without compromising safety levels.

1.4 The proposed approach abandons the notion of single-strip runway in favour of a four-strip runway, based on the direction of operation and declared distances.

1.5 This new perspective is consistent with the current regulatory framework and allows runway strips and RESAs to be adapted to actual operational scenarios, reducing unnecessary constraints and maximizing the use of available space.

2. DISCUSSION

2.1 This working paper proposes a conceptual review of the design and application RESAs, introducing the notion of dynamic strips depending on the direction of operation, the declared distances and the type of approach selected.

2.2 The specific objectives of this proposal include:

2.2.1 Optimizing the use of airport infrastructure by maximizing the available operational area without compromising safety.

2.2.2 Adapting the geometric design of strips and RESAs to the type of operation (landing or take-off), the direction of runway use, and the type of approach.

2.2.3 Avoiding unnecessary operational restrictions imposed by rigid interpretations of the single strip concept, particularly in contexts with displaced thresholds or runways with segregated operations.

In line with this, a safety assessment considers runway excursion or overflight scenarios according to the direction of use, and it is therefore reasonable to adapt the strip to that same direction.

3. CONCLUSION

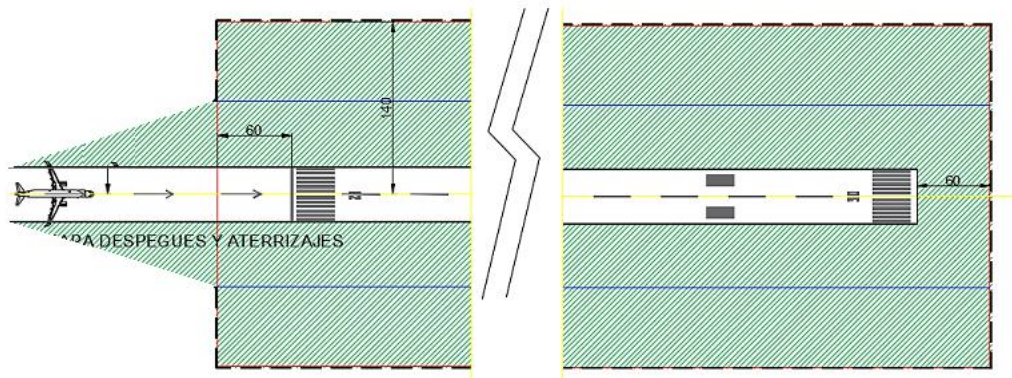
3.1 This paper demonstrates that it is both technically and regulatorily feasible to apply a dynamic approach to the design and layout of runway strips and runway end safety areas (RESAs), considering the direction of operation, type of approach, and declared distances associated with each type of runway use.

3.2 The concept of dynamic strips allows, within the framework of Annex 14, greater flexibility and more efficient use of available or required infrastructure.

3.3 Furthermore, it questions the relevance of assigning a longitudinal dimension of the runway strip preceding the paved surface to declared distances (TORA, TODA, ASDA), as the operational rationale of this dimension is not clearly defined.

3.4 In this context, it is particularly relevant to analyze specific cases, such as a take-off from a runway with a displaced threshold, to determine the appropriate initial width of the strip, considering the operational speeds in that area and historical records of runway excursions (veer-off).

3.5 It is also recommended to redefine these two dimensions to adopt a model similar to that illustrated in the figure below.



3.6 Schematic view of a dynamic strip, showing the adjustment of the strip for a departure from a displaced threshold, considering the actual location of the aircraft (which, after turning will, depending on aircraft type, stretch several meters behind the main landing gear and engines).

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