



Technical Guidance Material for the Calculation of Declared Distances and Provision of a Runway End Safety Area Advisory Circular

Subject: TGM FOR THE CALCULATION OF DECLARED DISTANCES AND PROVISION OF A RUNWAY
END SAFETY AREA

Date: 25 FEBRUARY 2019

REFERENCE:

- i. South African Civil Aviation Regulations Part 139.
- ii. *South African Technical Standards Part 139.*
- iii. ICAO- Annex 14 Volume I
- iv. ICAO Doc 9137 AN/901 Part 1
- v. ICAO Doc 9137 AN/901 Part 4
- vi. ICAO Doc 9137 AN/898 Part 6

1. APPLICABILITY:

- 1.1. This Technical Guidance Material (TGM) is applicable to all aerodromes who have declared stop ways, clearways and displaced thresholds, and
- 1.2. To all aerodromes required by CAA regulations to provide a Runway End Safety Area.

2. PURPOSE:

- 2.1. The purpose of this document is to assist aerodrome authorities to calculate the declared distances and at the same time ensure accuracy in the calculation of such distances. It also ensures that appropriate procedures are in place to address and achieve the required safety standard. It is not intended that these guidelines limit or regulate the operation of an aerodrome.
- 2.2. This document is provided for information and guidance purposes. It may describe an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards with respect to the calculation of the declared distances as well as for the provision of a runway end safety area where required.

3. TERMS AND ABBREVIATIONS

TERM	DEFINITION
ASDA	The length of the take-off run available plus the length of the stop way, if provided.
LDA	The length of runway which is declared available and suitable for the ground run of an aeroplane landing.
TODA	The length of the take-off run available plus the length of the clearway, if provided.
TORA	The length of runway declared available and suitable for the ground run of an aeroplane taking off.

ABBREVIATION	DESCRIPTION
AIP	Aeronautical Information Publication
ASDA	Accelerate Stop Distance Available
CWY	Clearway
LDA	Landing Distance Available
RESA	Runway End Safety Area
SWY	Stop way
TGM	Technical Guidance Material
TODA	Take-off Distance Available
TORA	Take-off Run Available

4. CALCULATION OF DECLARED DISTANCES

The introduction of stop ways and clearways and the use of displaced thresholds on runways have created a need for accurate information regarding the various physical distances available and suitable for the landing and take-off of aeroplanes.

- 4.1. For these purposes, the term "declared distances" is used with the following four distances associated with a particular runway:
 - a) TORA - the length of runway declared available and suitable for the ground run of an aeroplane taking off.
 - b) TODA - the length of the take-off run available plus the length of the clearway, if provided.
 - c) ASDA - the length of the take-off run available plus the length of the stop way, if provided.
 - d) LDA - the length of runway which is declared available and suitable for the ground run of an aeroplane landing.
- 4.2. ~~Annex 14, Volume I~~ **SA-CARs 139**, calls for the calculation of declared distances for a runway intended for use by international commercial air transport, and Annex 15 calls for the reporting of declared distances for each direction of the runway in the AIP Figures 1 - A to F below illustrates typical cases.
- 4.3. Where a runway is not provided with a stop way or clearway and the threshold is located at the extremity of the runway, the four declared distances should normally be equal to the length of the runway as shown in ~~Figure A~~ **Figure 1 illustration A**.
- 4.4. Where a runway is provided with a CWY then the TODA will include the length of clearway as shown in ~~Figure B~~ **Figure 1 illustration B**.
- 4.5. Where a runway is provided with a SWY then the ASDA will include the length of stop way as shown in ~~Figure C~~ **Figure 1 illustration C**.
- 4.6. Where a runway has a displaced threshold, then the LDA will be reduced by the distance the threshold is displaced as shown in ~~Figure D~~ **Figure 1 illustration D**. A displaced threshold affects only the LDA for approaches made to that threshold; all declared distances for operations in the reciprocal direction are unaffected.
- 4.7. ~~Figures 1 illustrations B through D~~ illustrate a runway provided with a clearway, a stop way or having a displaced threshold. Where more than one of these features exists then more than one of the declared distances will be modified - but the modification will follow the same principle illustrated. ~~Figures E and F~~ **Figure 1 illustrations E and F** illustrate two situations where all these features exist.
- 4.8. If a runway direction cannot be used for take-off or landing, or both, because it is operationally forbidden, then this should be declared and the words "not usable" or the abbreviation "NU" should be used when publishing the data.

4.9. Where provision of a runway end safety area may involve encroachment in areas where it would be particularly prohibitive to implement, and the appropriate authority considers a runway end safety area essential, consideration may have to be given to reducing some of the declared distances.

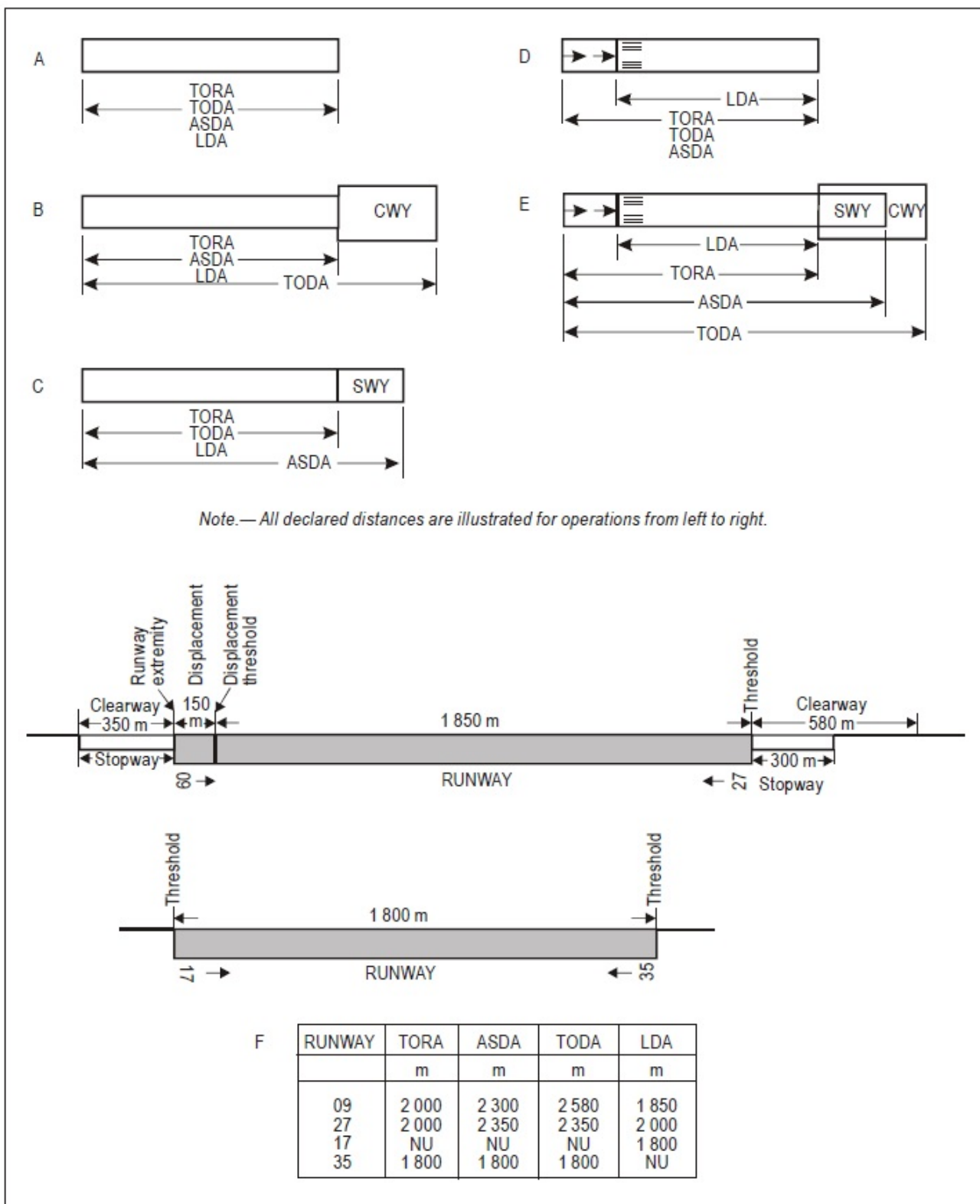


Figure 1 - Illustration of Declared Distances

5. PROVISION OF RUNWAY END SAFETY AREAS

5.1. General

RESA are intended to minimize risks to aircraft and their occupants when an aeroplane overruns or undershoots a runway. These areas shall be provided at each end of the runway strip enclosing all runways where the code number is 3 or 4, and instrument runways where the code number is 1 or 2.

Where a runway end safety area is provided in accordance with ~~Annex 14 Vol. 1 Chapter 3~~ **SA-CARs 139**, consideration should be given to providing an area long enough to contain overruns and undershoots resulting from a reasonably probable combination of adverse operational factors. On a precision approach runway, the ILS localizer is normally the first upstanding obstacle, and the runway end safety area should extend up to this facility.

5.2. Dimensions of runway end safety areas

The length of RESA needed for a specific runway will depend on a number of variables, such as the type and level of aircraft activity, and local conditions. The minimum requirement is 90m for all code 3 and 4 runways, and code 1 and 2 instrument runways.

The RESA width shall be at least twice that of the associated runway, but should be equal to that of the associated cleared and graded area of the associated runway strip.

If a RESA beyond the 90m minimum is deemed necessary, but there are physical constraints to achieving the desired distance, "declared distances" should be reduced unless other mitigation measures can be demonstrated to achieve an equivalent safety result for the same set of operational circumstances.

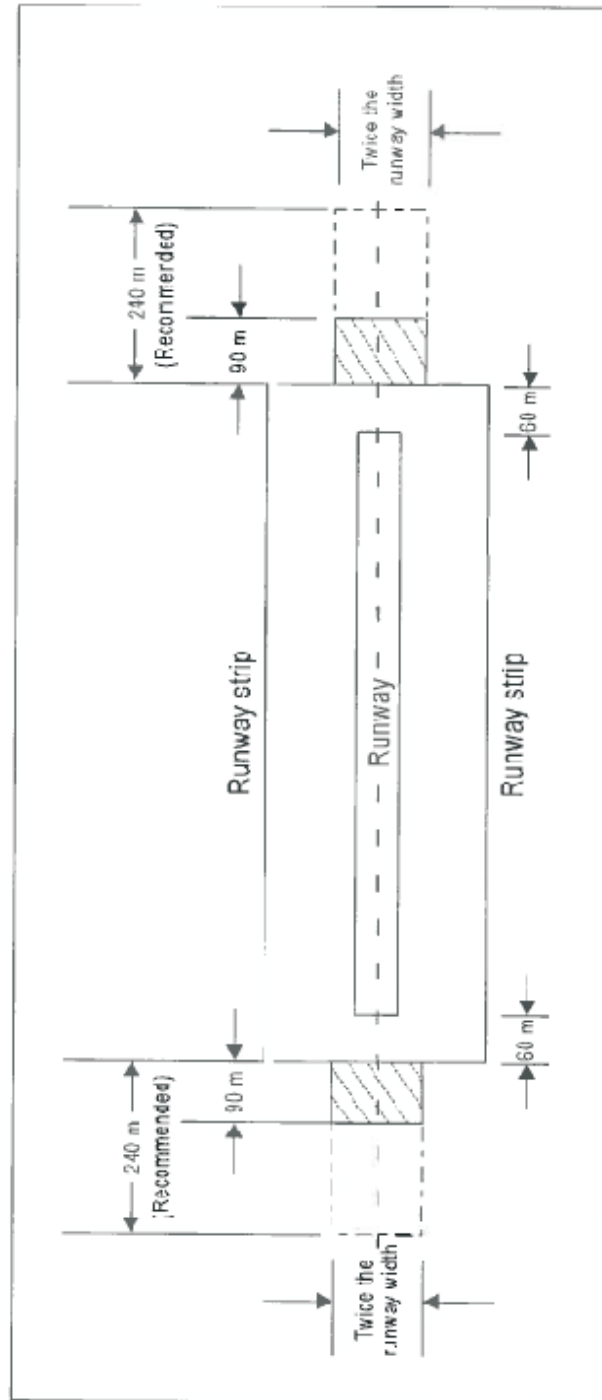
Licence holders should not assume that the minimum distance of RESA will not necessarily be sufficient. It is recommended that RESAs extend to at least 240m for code 3 or 4, and up to at least 120m for code 1 and 2 instrument runways, wherever practicable and reasonable. Therefore, as part of their system for the management of safety, licence holders should review and determine on an annual basis the RESA distance required for individual circumstances, taking into account in their risk assessments factors such as:

- 5.2.1. the nature and location of any hazard beyond the runway end;
- 5.2.2. the type of aircraft and level of traffic at the aerodrome, and actual or proposed changes to either;
- 5.2.3. aerodrome overrun history;
- 5.2.4. overrun causal factors;
- 5.2.5. friction and drainage characteristics of the runway;
- 5.2.6. navigation aids available;
- 5.2.7. scope for procedural risk mitigation measures; and
- 5.2.8. the net overall effect on safety of any proposed changes, including reduction of Declared Distances.

5.3. Surface of Runway End Safety Areas

The surface of a runway end safety area need not be prepared to the same standard as that of the graded area of the associated runway strip. It should enhance the deceleration of aeroplanes in the event of an overrun, but it should not:




- 5.3.1. hinder the movement of rescue and fire fighting vehicles, the effectiveness of the rescue and fire fighting provision; or
- 5.3.2. endanger aircraft in the event of an aeroplane undershooting or overrunning.



Runway end safety area for a runway where the code number is 3 or 4

Figure 2 – Illustration of Runway End Safety Area

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