GUYANA CIVIL AVIATION AUTHORITY
73 High Street
Kingston
Georgetown
GUYANA
TEL. NOs: (592) 225 6822, 225 0778, 227 8111
FAX: (592) 225 6800
E-mail: director-general@gcaa-gy.org

GCAA ADVISORY CIRCULAR

AERODROME & GROUND AID
AC NO: GCAA AC/AGA/004

SUBJECT: **CALCULATION OF DECLARED DISTANCE**

DATE INITIATED: JULY 15, 2016
INITIATED BY: DIRECTOR AVIATION SAFETY REGULATION

1. PURPOSE

The purpose of this Advisory Circular (AC) is to provide guidance to aerodrome operators on how to calculate declared distances and how RESA shall be incorporated into the calculations.

2. GENERAL INFORMATION/CANCELLATION

a. This Advisory Circular GCAA AC/AGA/004 is an initial issue and the effective date is January 1, 2017.

b. Declared distances of a runway represent the maximum distance available and suitable for meeting take-off and landing distance performance requirements of an aircraft. These distances are calculated to the nearest metre or foot for a runway intended to be used for international commercial air transport.

c. This AC applies to all aerodrome operators in Guyana.

3. RELATED REFERENCES

ICAO Annex 14.

4. CONTACT INFORMATION

Director General of Civil Aviation
@ Address and contact information shown in the header, or
Director, Aviation Safety Regulation
Phone: (592) 225 0778, Ext. 104
E-mail: dasr@gcaa-gy.org

5. DEFINITION/ACRONYM

ACRONYM		MEANING
ASDA	-	Accelerate-stop distance available
LDA	-	Landing distance available
RESA	-	Runway end safety area
TORA	-	The take-off run available
TODA	-	Take-off distance available

6. DECLARED DISTANCE

6.1 The following distances should be calculated for each runway:

i. take-off run available;

ii. take-off distance available;

iii. accelerate-stop distance available; and

iv. landing distance available.

6.2 The declared distances to be calculated for each runway direction comprise:

i. Take-Off Run Available (TORA);

ii. Take-Off Distance Available (TODA);

iii. Accelerate-Stop Distance Available (ASDA); and

iv. Landing Distance Available (LDA).

6.3 Where a runway is not provided with a stopway or clearway and the threshold is located at the beginning of the runway, the four (4) declared distances should normally be equal to the length of the runway, as shown at **A in Figure 1-1**.

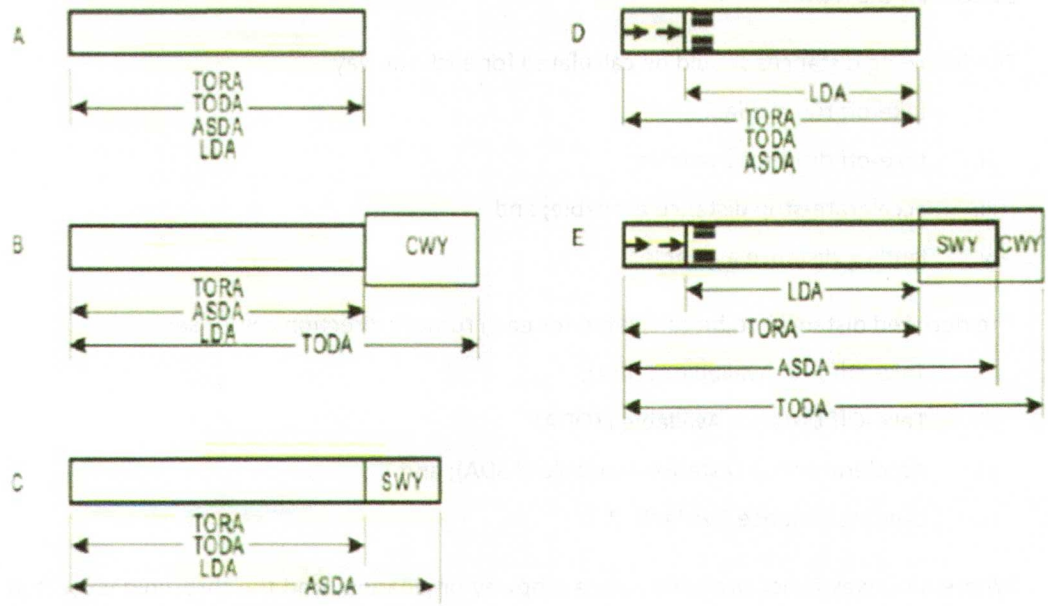
6.4 Where a runway is provided with a clearway (CWY), then the TODA shall include the length of clearway, as shown at **B in Figure 1-1**.

6.5 Where a runway is provided with a stopway (SWY), then the ASDA will include the length of stopway, as shown at **C in Figure 1-1**.

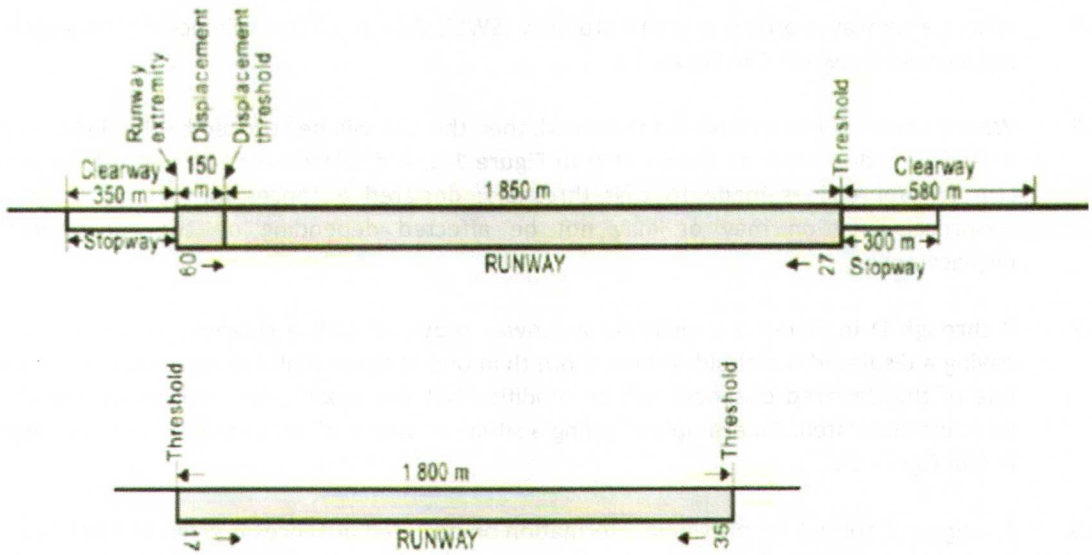
6.6 Where a runway has a displaced threshold, then the LDA will be reduced by the distance the threshold is displaced, as shown at **D in Figure 1-1**. A displaced threshold affects only the LDA for approaches made to that threshold; declared distances for operations in the reciprocal direction may or may not be affected depending on the cause of the displacement.

6.7 **B through D in Figure 1-1** illustrate a runway provided with a clearway or a stopway or having a displaced threshold. Where more than one of these features exist, then more than one of the declared distances will be modified but the modification will follow the same principle illustrated. An example showing a situation where all these features exist is shown at **E in Figure 2-1**.

6.8 A suggested format for providing information on declared distances is given at **F in Figure 1-1**. 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 useable* or the abbreviation NU entered.



Note.—All declared distances are illustrated for operations from left to right.



F

RUNWAY	TORA	ASDA	TODA	LDA
	m	m	m	m
09	2 000	2 300	2 580	1 850
27	2 000	2 350	2 350	2 000
17	NU	NU	NU	1 800
35	1 800	1 800	1 800	NU

FIGURE 1-1

7. RUNWAY END SAFETY AREA (RESA)

NOTE 1: ICAO Aircraft Accident/Incident Data Reports (ADREP) have indicated that aircraft undershooting or overrunning the runway during landings or take-offs suffer significant damage. To minimize such damage, it is considered necessary to provide an additional area beyond the ends of the runway strip.

NOTE 2: These areas, known as Runway End Safety Areas, should be capable of adequately supporting any aircraft which overruns or undershoots the runway and should be clear of all equipment and installations which are not frangible.

7.1 Runway End Safety Area

A runway end safety area is required to be provided at each end of a runway strip where:

i. the code number is 3 or 4; and

ii. the code number is 1 or 2 and the runway is an instrument one.

7.2 Length

a. A runway end safety area shall extend from the end of a runway strip to a distance of at least 90 m where:

   i. the code number is 3 or 4; and

   ii. the code number is 1 or 2 and the runway is an instrument one.

b. If an arresting system is installed, the above length may be reduced, based on the design specification of the system, subject to acceptance by the State.

c. If the runway is non-instrument code number 1 or 2 then the RESA shall be 30m.

7.3 Width

The width of a runway end safety area shall be at least twice that of the associated runway.

7.4 Objects

An object, other than equipment or an installation required for air navigation purposes, situated on a runway end safety area which may endanger aircraft should be regarded as an obstacle and should, as far as practicable, be removed. Any equipment or installation required for air navigation purposes which must be located on the runway end safety area is required to be frangible, mounted as low as possible and sited in such a manner as to reduce the hazard to aircraft to a minimum.

7.5 Clearing and Grading

A runway end safety area should provide a cleared and graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane undershooting or overrunning the runway. The surface of the ground in the runway end safety area does not need to be prepared to the same quality as the runway strip.

7.6 Combined Slopes

The slopes of a runway end safety area should be such that no part of the runway end safety area penetrates the approach or take-off climb surface.

7.7 Longitudinal slopes

a. The longitudinal slopes of a runway end safety area should not exceed a downward slope of 5 percent. Longitudinal slope changes should be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.

b. In order to accommodate aeroplanes making auto-coupled approaches and automatic landings (irrespective of weather conditions) it is desirable that slope changes be avoided or kept to a minimum on an area symmetrical about the extended runway centre line approximately 60 m wide, and 300 m long before the threshold of a precision approach runway. This is desirable because these aeroplanes are equipped with a radio altimeter for final height and flare guidance, and when the aeroplane is above the terrain immediately prior to the threshold, the radio altimeter will begin to provide information to the automatic pilot for auto-flare. Where slope changes cannot be avoided, the rate of change between two consecutive slopes should not exceed 2 percent per 30 m.

7.8 Transverse Slopes

The transverse slopes of a runway end safety area should not exceed an upward or downward slope of 5 percent. Transitions between differing slopes should be as gradual as practicable.

7.9 Strength

A runway end safety area should be so prepared or constructed as to reduce the risk of damage to an aeroplane undershooting or overrunning the runway, enhance aeroplane deceleration, and facilitate the movement of rescue and fire fighting vehicles. Since the graded portion of a strip is provided to minimize the hazard to an aircraft running off the runway, it should be graded in such a manner as to prevent the collapse of the nose landing gear of the aircraft. The surface should be prepared in such a manner as to provide drag to an aircraft and below the surface, it should have sufficient bearing strength to avoid damage to the aircraft. To meet these divergent needs, the following guidelines are provided for preparing the strip. Aircraft manufacturers consider that a depth of 15 cm is the maximum depth to which the nose gear may sink without collapsing. Therefore, it is recommended that the soil at a depth of 15 cm below the finished strip surface be prepared to have a bearing strength of California Bearing Ratio (CBR) value of 15 to 20. The intention of this underlying prepared surface is to prevent the nose gear from sinking more than 15 cm. The top 15 cm may be of lesser strength which would facilitate deceleration of aircraft

7.10 Reduction of Runway End Safety Area

Where it is impractical for airport authority to setup RESA to the required length as specified, airport authority can engineer an arresting system that is so design to substantially reduce speed in a short area. The arresting system is to protect aircraft and passengers from undue distress.

8. CALCULATION OF DECLARED DISTANCES

8.1 Determine the Distance

a. Determine the distance of the limit of the works area and the height of equipment that would be used in the area. In the case of partial runway closure due to disabled aircraft, the tail height of the aircraft may be the critical obstacle. In locating the Works Limit Markers, remember to leave enough space for the movement of vehicles and plant around the works area or disabled aircraft.

b. Read off the distance where the gradient intersects the runway in accordance to the Table 1 below. Add the required distance in paragraph 8.2 of this document and that is the displaced threshold location. Place the temporary V-bar markers and DTILs at this location.

c. LDA is read off from the displaced threshold chainage (distance) to the runway end.

d. Next establish the position where aircraft commence their take-off. The requirement is for adequate clearance between the works area and the point where aircraft commence take-off. This is dependent on the aircraft wing tip clearance or jet blast protection requirement, whichever is more demanding.

e. Use the critical aircraft to establish this distance. When established, this distance is the origin of the TORA, ASDA and TODA and the location for the un-serviceability cones.

8.2 Declared Distances Associated with Take-Off and Landing from the Other End

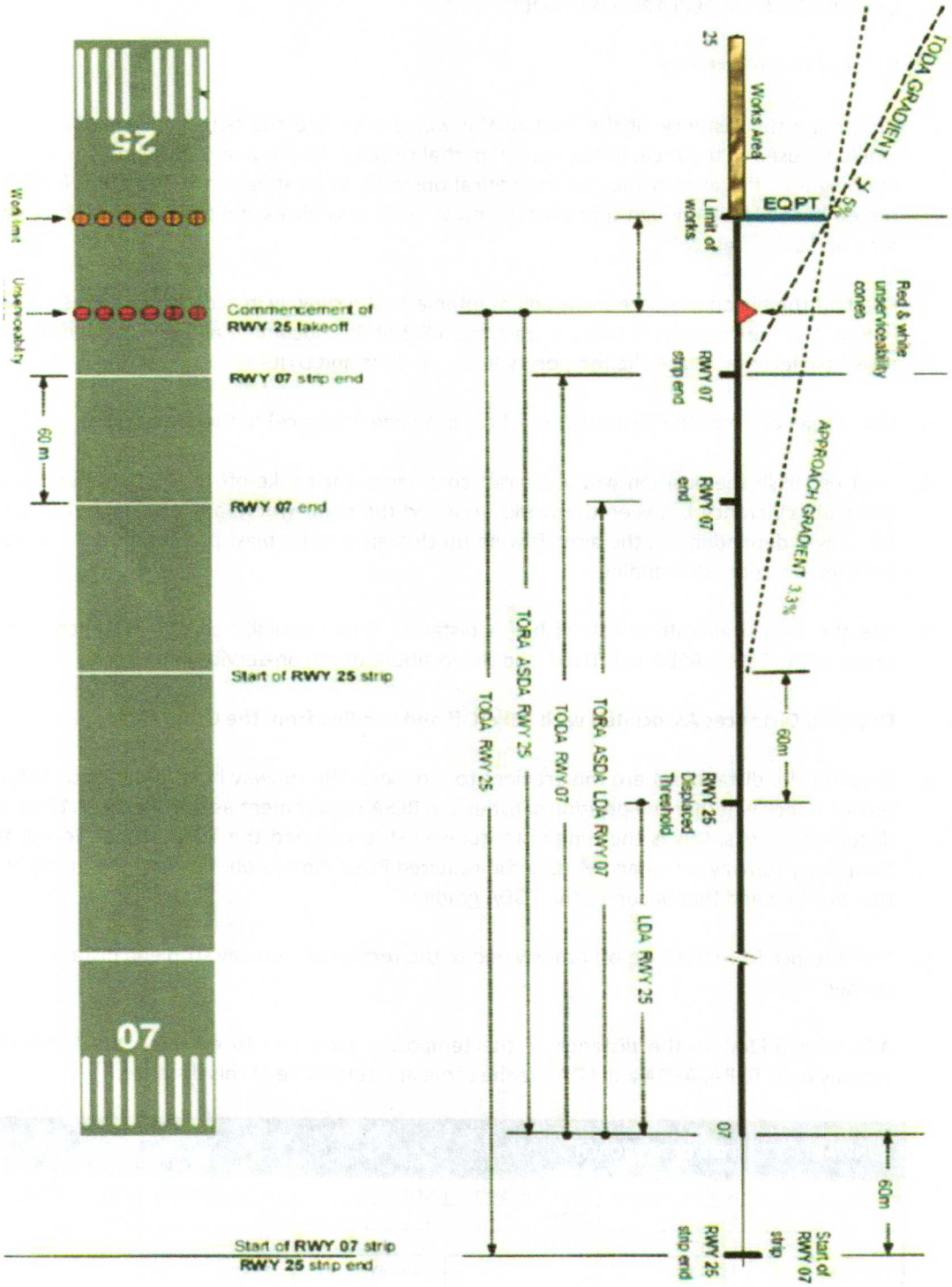
a. Read off the distance where the gradient to intersects the runway in accordance to **Table 1** below. Check whether the position satisfies the RESA requirement as specified in **7.10** of this document. If yes, this is the temporary runway strip end and the TODA. If not, locate the temporary runway strip end by using the required RESA dimension. Read off the gradient to that position and that becomes the TODA gradient.

b. The distance from the take-off runway end to the temporary runway strip end distance is the revised TODA.

c. Add 90m (RESA) to the distance of the temporary strip end to establish the temporary runway end. TORA, ASDA and LDA are the same and terminate at this distance.

RUNWAY	TYPE OF APPROACH				
Code	Non instrument	Non Precision	Code	Non instrument	Non Precision
1	5%	3.33%	1	5%	3.33%
2	4%	3.33%	2	4%	3.33%
Runway	Type of Approach		Runway	Type of Approach	
Code	Non instrument	Non Precision	Code	Non instrument	Non Precision

TABLE 1. GRADIENT OF SLOPE FOR RESPECTIVE RUNWAY WHEN DISPLACING THE RUNWAY



Approved By:

Chaitrani Heeralall
Director General of Civil Aviation (ag.)
Guyana Civil Aviation Authority