CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Advisory Circular
AC91-3

Revision 1

25 May 2022

Aeroplane Performance Under Part 91

General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an acceptable means of compliance with the associated rule.

Consideration will be given to other methods of compliance that are presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

Purpose

This AC provides describes an acceptable means of compliance with 91.201(2). It is intended for each pilot-in-command of a small single-engine aeroplane being operated under Part 91 on VFR operations.

Related Rules

This AC relates to Civil Aviation Rule Part 91, especially rule 91.201(2).

Change Notice

This is Revision 1 of this AC, and it replaces Revision 0, which was dated 1 April 1997. When this AC was reviewed in May 2022, it was found to be largely current, except for two aspects:

- The wording of rule 91.201(2) needed to be updated
- The status and relevance of Civil Aviation Safety Order 4 (CASO4), which is no longer in use but is the basis for the calculations in this AC, needed to be explained.

The opportunity was also taken to update the format, correct typos and inconsistencies in style and add a version History in line with other ACs.

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Version History

History Log

Revision No.	Effective Date	Summary of Changes
0	1 April 1997	Initial issue of this AC
1	25 May 2022	Updates the wording of rule 91-201(2) Explains the relevance of CASO4, which is no longer in use, but is the basis for the calculations in this AC Updates the format to the modern AC style, corrects typos and standardises abbreviations Adds a Version History

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Introduction

The take-off and landing phases of flight are the most critical phase of flight and a significant number of accidents and incidents occur during these phases. A critical element for a safe take-off or landing is that they can be conducted within the confines of the runway to be used. The distance required can be predicted with some accuracy, so this AC provides you with methods of doing such calculations.

This AC is primarily for the guidance of pilots operating small single-engine aeroplanes which only have basic performance data in their aircraft flight manual (AFM). The AFMs for larger aeroplanes and multi-engine aeroplanes usually contain comprehensive performance data for all flight regimes. The data in this AC is not intended to be used to determine aeroplane performance in place of that comprehensive data.

Aeroplane performance

1. Performance requirements

1.1 Rule 91.201(2) states that:

> *A pilot-in-command of an aircraft must:*
>
> *…*
>
> *(2) during the flight, ensure the safe operation of the aircraft and the safety of its occupants*

1.2 Performance is one of many factors to be considered for compliance with this rule. It is a critical factor particularly in relation to take-off and landing.

2. Civil Aviation Safety Order NR 4 (CASO4)

2.1 Under the Civil Aviation Regulations 1953 your aeroplane performance requirements were prescribed under CASO4. The AFM contained a performance chart (P chart) for you to determine compliance with the complex requirements of CASO 4. Although CASO4 is not still used, the guidance in this AC, which is based on material in CASO4, is still applicable.

2.2 Based on the all-up weight of your aeroplane, the P chart allowed you to determine the take-off or landing distance required, taking the following into account:

a) density altitude of the aerodrome to be used, then

b) correction for the runway surface, paved or grass, then

c) correction for the runway slope, then

d) correction for the surface wind (head-wind or tail-wind).

2.3 If the aircraft you operate has a P chart in its AFM, you may continue to use the P chart to calculate take-off and landing distances using the day private operations data.

3. Group rating system

3.1 Another method for compliance with the Civil Aviation Regulations 1953 performance requirements was the group rating system.

3.2 The performance group rating system has been in use for a number of years as a simple method for operators of aeroplanes with a MCTOW of 2270 kg or less to determine the adequacy of the runway length for their particular aeroplane type.

3.3 Each aircraft type with a MCTOW of 2270 kg or below was given a group rating number in the AFM. The number for a particular aircraft type is determined on the basis of its take-off and landing performance.

3.4 Each runway is given a group number and, in practice, a pilot may use any runway that has a group number equal to or greater than the aeroplane group rating for the aeroplane type.

3.5 If the aircraft you operate is given a group rating number in the AFM, you may continue to use that group rating number for compliance with the performance requirements.

4. Aircraft flight manual (AFM) data

4.1 For calculating aircraft performance, the aircraft manufacturer has supplied performance data in the AFM. This data allows you to calculate the take-off and landing distances with a correction for density altitude at various weights and for the surface wind. The manufacturer does not provide you with data to calculate the effect of runway slope or the different runway surface types.

4.2 You should use the AFM data to determine the take-off distance to 50 feet as this ensures that you have the capability to clear any obstacles close to the runway end.

4.3 In addition, you should correct the take-off distance to 50 feet derived from the AFM for:

a) other than a paved runway surface by applying the factors in Table 1, and

b) runway slope by applying the factors in Table 2 up to a maximum of 3% slope.

Table 1. Runway surface factors

SURFACE TYPE	TAKE-OFF DISTANCE FACTOR	LANDING DISTANCE FACTOR
Paved	x 1.00	x 1.00
Coral	x 1.00	x 1.05
Metal	x 1.05	x 1.08
Rolled earth	x 1.08	x 1.16
Grass	x 1.14	x 1.18

Table 2. Runway slope factors

DIRECTION OF SLOPE	% OF SLOPE	TAKE-OFF DISTANCE CORRECTION	LANDING DISTANCE CORRECTION
Uphill	1	+5%	-5%
	2	+10%	-10%
	3	+15%	-15%
Downhill	1	-5%	+5%
	2	-10%	+10%
	3	-15%	+15%

Note: *For slopes expressed to a decimal point, the correction is 0.5% distance for each 0.1% slope. For example, for a runway slope of 1.6% the correction factor is 8%.*

5. Wet and contaminated runways

5.1 The preceding three methods for calculating aircraft performance assume that the runway surface used is not wet and is free of any contamination such as snow, ice or slush. In the case of a grass runway, it is assumed that the grass is regularly mowed.

5.2 Wet and contaminated runways are defined as:

> **Wet:** in relation to a runway, means a runway with sufficient moisture on its surface to cause it to appear reflective but without significant areas of standing water.
>
> **Contaminated:** in relation to a runway, means more than 25% of the runway surface area within the required length and width is covered by surface water, slush, or loose snow more than 3 millimetres in depth, or ice on any part of the runway surface area.

5.3 If any of these runway surface conditions exist on the runway you intend to use, you should assume that the calculated runway distance required may not be adequate.

Landing distance

1.1 In the case of a wet or contaminated runway, air transport operators must have a landing distance available that is at least 115% of the landing distance calculated for a dry runway. It would be prudent for you to do the same in similar circumstances.

1.2 If you are using the group rating system, it would be prudent for you to ensure that the group rating of the runway to be used is at least one group rating greater than the one specified in the AFM. Alternatively, you can use the option of calculating the

distance using a P chart or the AFM data and apply the factor as in the preceding paragraph.

Take-off distance

1.1 Unlike the aircraft landing distance, the effect on the take-off distance from a wet or contaminated runway has not been quantified. Pilots operating aircraft on air transport operations are not required to increase take-off distances in such circumstances as the distance is already factored for the dry runway distance which in effect provides a reasonable buffer.

1.2 The three alternative methods for calculating performance presented in this AC do not provide any margin for the take-off distance. As these conditions will increase the take-off distance required, it would be prudent for you to apply the same corrective factors as for the landing distance.

Long grass

1.1 The effect of long grass is not calculable, though, for certain, the longer and denser the grass the more effect it will have in retarding the aircraft's acceleration and thus increasing the distance required. The best advice is not to operate off a runway with long uncut grass. However, if you do need to do so, apply at least the same corrective factors as for a wet and/or contaminated runway.