Advisory Circular 91-3

Aeroplane Performance under Part 91

04 February 2016

1.1 GENERAL. Civil Aviation Authority Advisory Circulars (AC) contains information about standards, practices and procedures that the Authority has found to be acceptable for compliance with the associated rule.

Consideration will be given to other methods of compliance which may be presented to the Authority.

When new standards, practices or procedures are found to be acceptable they will be added to the appropriate AC.

In addressing a subject the use of the imperative, a term not normally welcome in an AC, is because it is associated with mandatory provisions of the Rule itself.

Each reference to a number in this AC, such as 91.15, is a reference to a specific rule within Part 91.

1.2 PURPOSE. This AC provides methods acceptable to the Authority for showing compliance with 91.201(2).

1.3 CANCELLATION. There was no previous issue, so there is no cancellation.

1.4 FOCUS. This material is intended for each pilot-in-command of a small single-engine aeroplane being operated under Part 91 on VFR operations.

1.5 RELATED CAR. This AC relates specifically to 91.201(2).

1.6 CHANGE NOTICE.
Subject to "Memorandum for Technical Cooperation" between the CAA of Mongolia and New Zealand on mutual cooperation in implementation of the International Civil Aviation Organization Resolution of Global Rule Harmonization, which urges States to promote global harmonization of national rules, dated 6th of May, 1999, Mongolian Civil Aviation Safety Regulation has been reconciled to the Civil Aviation Regulation of New Zealand.

Amendment 164 of Annex 1 to the Chicago Convention on International Civil Aviation urges flight crew members, ATC personnel and aircraft maintenance engineers to comply with the language proficiency requirements; and

Under Article 14 of the Civil Aviation Law of Mongolia 1999, "Use of foreign language in civil aviation" the AC has been released in English version only, in order to prevent any mistranslation and misuse of the aviation safety related documents

This AC91-3 was developed based on NZ AC91-3 revision, dated on 01 April 1997.

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 and this advisory circular 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.

The aircraft flight manuals for larger aeroplanes and multi-engine aeroplanes usually contain detailed performance data for all flight regimes. This data is not intended to be used to determine aeroplane performance in place of that comprehensive data.

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Aeroplane performance

1. Performance requirements

1.1. The performance requirements under the Civil Aviation Regulations were quite specific and easily identifiable.

1.2. The performance requirements under Part 91 may not be readily identified and are subtly placed in rule 91.201(2) which reads–

Each pilot-in-command of an aircraft shall ensure the safe operation of the aircraft and the safety of the occupants during flight time.

1.3. 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 and is addressed in this AC.

1.4. The aeroplane flight manual contained a performance chart (P chart) for you to determine compliance with Part 91.

1.5. Based on the all up weight of your aeroplane, the P chart allowed you to determine the take-off or landing distance required, taing the following into account–

1.6. Density altitude of the aerodrome to be used; then

1.7. Correction for the runway surface, paved or grass; then

1.8. Correction for the runway slope; then

1.9. Correction for the surface wind (head- wind or tail-wind).

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

2. Group rating system

2.1. 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 2270kg or less to determine the adequacy of the runway length for their particular aeroplane type.

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

2.3. 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.

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

3. Aircraft flight manual data

3.1. For calculating aircraft performance, the aircraft manufacturer has supplied performance data in the aircraft flight manual. 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.
3.2. You should use the flight manual 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.
3.3. In addition you should correct the take- off distance to 50 feet derived from the aircraft flight manual for–
3.4. other than a paved runway surface by applying the factors in Table 1; and
3.5. 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%

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%.

4. Wet and contaminated runways

4.1. 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.

4.2. Wet and contaminated runways are defined as follows–

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 millimeters in depth, or ice on any part of the runway surface area:

4.3. 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

4.4. In the case of a wet or contaminated runway air transport operators are required 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.

4.5. 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 aircraft flight manual. Alternatively you can use the option of calculating the distance using a P chart or the aircraft flight manual data and apply the factor as in the preceding paragraph.

Take-off distance

4.6. 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.

4.7. 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

4.8. 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 have a compulsion to do so apply at least the same corrective factors as for the wet and contaminated runway.

Finally, as the saying goes **happy landings** but remember that such an occasion is dependent on an equally **happy take-off**!

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