Civil Aviation Amendment Order (No. R7) 2004

I, WILLIAM BRUCE BYRON, Director of Aviation Safety, on behalf of CASA, issue the following Civil Aviation Order under subregulation 235 (2) of the *Civil Aviation Regulations 1988*.

[Signed Bruce Byron]

Bruce Byron
Director of Aviation Safety and
Chief Executive Officer

2 December 2004

---

1 Name of Order

This Order is the Civil Aviation Amendment Order (No. R7) 2004.

2 Commencement

This Order commences on gazettal.

3 Replacement of section 20.7.1B of the Civil Aviation Orders

Section 20.7.1B of the Civil Aviation Orders is omitted and a new section substituted as set out in Schedule 1.

Schedule 1 Substitution of section 20.7.1B of the Civil Aviation Orders

SECTION 20.7.1B

AEROPLANE WEIGHT AND PERFORMANCE LIMITATIONS — AEROPLANES ABOVE 5 700 KG — ALL OPERATIONS (TURBINE AND PISTON-ENGINED)

2 APPLICATION

2.1 Subject to paragraph 2.2, this section applies to:

(a) all turbine powered aeroplanes having a maximum permissible all-up weight in excess of 5 700 kg; and

(b) all new types of piston engine aeroplanes having a maximum permissible all-up weight in excess of 5 700 kg placed on the Register after 1 June 1963.

2.2 This section does not apply to an aeroplane described in paragraph 2.1 while the aeroplane is engaged in agricultural operations.

3 DEFINITIONS

3.1 In this section:

accelerate-stop distance available means the distance specified by CASA as being the effective length available for use by aircraft executing an interrupted take-off and may include stopway.

approved foreign flight manual, in relation to an aeroplane, means a flight manual for the aeroplane approved by the relevant regulatory aviation authority of the country where the aeroplane is, or was, manufactured.

clearway means a defined rectangular area at the end of a strip centrally located about the extended centre-line of its associated runway and approved by CASA as a suitable area over which an aircraft taking off can continue to climb to the minimum height required to establish obstacle clearance.

gross flight path means the flight path it is assumed an aeroplane will follow when flown in a particular configuration in accordance with specified procedures in ambient conditions and that is established from the aeroplane's certification performance data representing the average fleet performance of the aeroplane type.

landing distance available means the distance specified by CASA as being the effective operational length available for use by aircraft for landing.

manufacturer's data manual, in relation to an aeroplane, means a publication (however described) produced by the manufacturer of the aeroplane as a guide for the flight crew in the operation of the aeroplane.

net flight path means the gross flight path of an aeroplane reduced in elevation or extended in length by margins specified in this section. The margins are to allow for factors such as deterioration in aeroplane performance and variations in pilot techniques in relating aeroplane performance to obstacle clearance.

speeds:

V_1 means the decision speed;

V_2 means the initial climb out speed which is not less than the take-off safety speed;

V_R means the speed at which aeroplane rotation is initiated by the pilot during take-off;

V_S means the minimum speed in a stall or the minimum steady flight speed.

stopway means a defined rectangular area at the end of a runway, centrally located about the extended centre-line of its associated runway, approved by CASA as a suitable area in which an aeroplane may be stopped after an interrupted take-off.

suitable aerodrome means an aerodrome approved for normal operations and which is forecast not to require an alternate during the period nominated for possible use. Operational requirements for suitable aerodromes are as promulgated by CASA.

take-off distance available means the distance specified by CASA as being the effective operational length available for use by aircraft for take-off and may include clearway.

Note: The distances and areas referred to in the above definitions are normally specified in approved Aeronautical Information Publications but may be the subject of a specified approval from CASA.

the Regulations means the *Civil Aviation Regulations 1988*.

4 TAKE-OFF WEIGHT LIMITATIONS

4.1 For the purposes of paragraph 235 (2) (a) of the Regulations, the maximum weight at which an aeroplane to which this section applies may not exceed at take-off is the least of the weights determined in accordance with subparagraphs (a) to (d):

(a) a weight at which the take-off distance and accelerate-stop distance required under subsection 6 for the aerodrome elevation, temperature, wind component along the runway, runway slope and surface conditions at the time of take-off is equal to or less than the take-off distance and accelerate-stop distance available in the direction of take-off. Approved declared conditions may be used instead of the actual temperature;
(b) a weight which will permit compliance with the take-off climb and obstacle clearance requirements specified in subsections 7 and 12 taking into account ambient temperature and aerodrome elevation or approved declared conditions;
(c) a weight which will permit compliance with the en-route obstacle clearance requirements specified in subsection 12;
(d) a weight which, allowing for normal consumption of fuel and oil in flight to the destination and alternate aerodrome and taking into account either the forecast temperature and aerodrome elevation or approved declared conditions, will permit compliance with the landing distance limitations specified in subsection 11. It is to be assumed that the aeroplane will be landed on the most favourable runway and direction available and that no headwind component will be available for landing. When the primary runway is forecast to be unusable due to excessive crosswind, it may be assumed that where a suitable secondary runway is available the aeroplane can land on that runway using a headwind component derived from the minimum wind velocity which would render the primary runway unusable. In this case the weight must also not exceed the weight which would be permissible on the primary runway with no headwind component.

5 LANDING WEIGHT LIMITATIONS

5.1 For the purposes of paragraph 235 (2) (b) of the Regulations, the maximum weight which an aeroplane to which this section applies may not exceed at landing is the least of the weights determined in accordance with subparagraphs (a) to (c):

(a) a weight at which the landing distance required in accordance with subsection 11 for the aerodrome elevation, temperature, wind component along the runway, runway slope (when exceeding 1%) and surface conditions at the time of landing, is equal to or less than the landing distance available in the direction of landing. Approved declared conditions may be used instead of the actual temperature;
(b) a weight which will permit compliance with the approach climb requirements specified in subsection 9, taking into account ambient temperature and aerodrome elevation or approved declared conditions;

(c) a weight which will permit compliance with the landing climb requirements specified in subsection 10 taking into account ambient temperature and aerodrome elevation or approved declared conditions.

6 ACCELERATE-STOP AND TAKE-OFF DISTANCE REQUIRED

6.1 Subject to paragraph 6.4, the accelerate-stop distance required is the distance to accelerate from a standing start to a speed of V_1, to suffer failure of a critical engine such that it is recognised at V_1 and bring the aeroplane to a full stop in the case of land aeroplanes and to a speed of 3 knots in the case of aeroplanes operated on water.

6.2 Subject to paragraph 6.4, the take-off distance required is the greater of:

(a) the distance to accelerate from a standing start to a speed of V_2 and to attain a height of 35 feet above the take-off surface allowing for recognition of failure of a critical engine at V_1 speed; or

(b) the distance to accelerate from a standing start and with all engines operating to attain a height of 35 feet above the take-off surface, multiplied by a factor of 1.15; or

(c) where CASA has declared the availability of clearway for use in establishing compliance with subparagraphs (a) and (b), it will also declare a take-off run available. Where clearway is used an operator must ensure that the take-off run required in the flight manual does not exceed the take-off run available.

Note: 1: Despite the above requirements an operator may make application to CASA for the use of take-off distances based on a 'rolling start' technique.

Note: 2: The distances in subparagraphs 6.2 (a) and (b) are determined on the assumption that the aeroplane is on the ground until rotation is initiated by the pilot at rotation speed (V_R) and that prior to reaching speed V_2 the aeroplane will become airborne and attain V_2 speed by the time a height of 35 feet above the take-off surface is reached.

6.3 The accelerate-stop and take-off distances established in accordance with paragraphs 6.1 and 6.2 above must be increased by an amount approved by CASA for operation from runways covered by slush, snow or a depth of water.

6.4 Subject to paragraph 6.5, an aeroplane must, while engaged in private operations, be operated so as to comply with either the requirements relating to the accelerate-stop distance and the take-off distance set out in paragraphs 6.1, 6.2 and 6.3 or the requirements relating to the accelerate-stop distance and the take-off distance set out in:

(a) the manufacturer's data manual; or

(b) the approved foreign flight manual.

Note: The data contained in some manufacturers' data manuals is unfactored and makes no allowance for degraded aircraft performance.

6.5 Where a runway is covered with slush, snow or a depth of water, the accelerate-stop distance and the take-off distance set out in the manufacturer's date manual and the approved foreign flight manual must be increased by the amount approved by CASA for the purposes of paragraph 6.3.

6.6 Nothing in paragraphs 6.4 and 6.5 affects the requirements set out in subsection 7.

7 TAKE-OFF CLIMB PERFORMANCE

7.1 In the take-off configuration assuming failure of a critical engine at V_1, an aeroplane must be able to climb without ground effect at the speed established as the speed at which the aeroplane becomes airborne and in this configuration, without landing gear retraction, achieve a gross gradient of climb which is positive for two-engined aeroplanes, 0.3% for three-engined aeroplanes and 0.5% for four-engined aeroplanes.

7.2.1 In the take-off configuration existing when the landing gear is fully retracted following failure of a critical engine at speed V_1, an aeroplane must be able to climb without ground effect at speed V_2 to a height of 400 feet above the take-off point or to such greater height as may be necessary to achieve obstacle clearance and to effect a change in configuration and/or speed at that height. The available gross gradient of climb during this period must not be less than:

(a) if the aeroplane is a commuter type aeroplane — 2%; and

(b) if the aeroplane is not a commuter type aeroplane:

(i) if it has 2 engines — 2.4%; and

(ii) if it has 3 engines — 2.7%; and

(iii) if it has 4 engines — 3%.

7.2.2 When the net flight path is related to an obstacle clear gradient in accordance with paragraph 12.3, the gross gradients of climb specified in paragraph 7.2.1 must be available from the end of the take-off distance available taking account of the position of the landing gear until retraction is completed.

7.3 An aeroplane may be accelerated in level flight from V_2 speed to final take-off climb speed at a height of 400 feet or greater above the take-off surface. During any such level flight acceleration manoeuvre an aeroplane with a critical engine inoperative must have an available gradient of climb equivalent to 1.2% for twin-engined aeroplanes, 1.4% for three-engined aeroplanes and 1.5% for four-engined aeroplanes.

7.4 From the point at which acceleration to final take-off climb speed is completed until a height of at least 1500 feet above the take-off surface is reached, an aeroplane must have an ability to climb at final take-off climb speed with a critical engine inoperative and in this configuration

to achieve a gross gradient of climb of not less than 1.2% for twin-engined aeroplanes, 1.4% for three-engined aeroplanes and 1.5% for four-engined aeroplanes.

7.5 In determining the net flight path of an aeroplane to show compliance with subsection 12, the gross gradients of climb achieved in paragraphs 7.2 and 7.4 must be reduced by 0.8% for twin-engined aeroplanes, 0.9% for three-engined aeroplanes and 1.0% for four-engined aeroplanes. Similarly the horizontal distance to accelerate in compliance with paragraph 7.3 must be increased due to the acceleration reduction equivalent to the climb gradient reductions specified in this paragraph.

7.6 In this section:

commuter type aeroplane means:

(a) a SFAR 41 aeroplane; or

(b) an aeroplane that is certificated as a commuter category aircraft.

SFAR 41 aeroplane means an aeroplane that:

(a) is certificated as a normal category aircraft; and

(b) is such that an applicant under part 4 (c) of SFAR No. 41 would be entitled to a type certificate amendment or a supplemental type certificate that shows compliance with ICAO Annex 8 in relation to the aeroplane; and

(c) is operated in accordance with a flight manual that specifies performance standards that are at least equivalent to the standards set out in Annex 8 to the Chicago Convention.

SFAR No. 41 means Special Federal Aviation Regulation No. 41 of the United States of America.

7.7 For the purposes of this subsection, an aeroplane is certificated as a commuter category aircraft if:

(a) there is a certificate of airworthiness in force in relation to the aeroplane; and

(b) the certificate includes a statement to the effect that it is issued in the commuter category.

7.8 For the purposes of this subsection, an aeroplane is certificated as a normal category aircraft if:

(a) there is a certificate of airworthiness in force in relation to the aeroplane; and

(b) the certificate includes a statement to the effect that it is issued in the normal category.

8 EN-ROUTE CLIMB PERFORMANCE

8.1 The en-route climb performance of an aeroplane with critical engine inoperative is to be determined taking into account all normal operating altitudes, operating weights, and anticipated temperatures.

8.2 The en-route climb performance of a three- or four-engined aeroplane with the 2 most critical engines inoperative is to be determined taking into account all normal operating altitudes, operating weights, and anticipated temperatures.

8.3 In determining the net flight path of an aeroplane to show compliance with subsection 12, the gross climb gradients established in accordance with paragraph 8.1 must be reduced by 1.1% for twin-engined aeroplanes, 1.3% for three-engined aeroplanes and 1.4% for four-engined aeroplanes. Similarly the gross climb gradients established in accordance with paragraph 8.2 must be reduced by 0.3% for three-engined aeroplanes and 0.5% for four-engined aeroplanes.

9 APPROACH CLIMB PERFORMANCE

9.1 An aeroplane with a critical engine inoperative in the normal approach configuration must be able to climb at a speed not in excess of 1.5 V_S at a gross gradient of 2.1% for twin-engined aeroplanes, 2.3% for three-engined aeroplanes and 2.4% for four-engined aeroplanes.

10 LANDING CLIMB PERFORMANCE

10.1 For the purposes of subparagraph 5.1 (c), the landing climb requirements are met if, in the landing configuration an aeroplane has a gross gradient of climb of not less than 3.2% at a climbing speed not in excess of 1.3 V_S with all engines operating.

11 LANDING DISTANCE REQUIRED

11.1 For the purposes of subparagraph 5.1 (a), the landing distance required in relation to an aeroplane (other than a propeller driven aeroplane) engaged in charter, or regular public transport, operations is a distance equal to or greater than 1.67 times the distance required to bring the aeroplane to a complete stop in the case of land aeroplanes and to a speed of 3 knots in the case of aeroplanes operated on water, following an approach to land at a speed of not less than 1.3 V_S maintained to within 50 feet of the landing surface. This distance is to be measured from the point where the aeroplane first reaches a height of 50 feet above the landing surface. This paragraph applies irrespective of whether the aerodrome of landing is a destination or alternate aerodrome.

11.1.1 For the purposes of subparagraph 5.1 (a), the landing distance required in relation to a propeller driven aeroplane that is engaged in regular public transport, or charter, operations is:

(a) in the case of a landing at an alternate aerodrome — a distance equal to or greater than 1.43 times the distance required:

(i) if the aerodrome is on land — to bring the aeroplane to a complete stop; or

(ii) if the aerodrome is on water — to bring the aeroplane to a speed of 3 knots or less;

after approaching to land at a speed of at least 1.3 V_S, until the aeroplane is 50 feet above the landing surface; and

(b) in any other case — the distance determined under paragraph 11.1, measured in accordance with that paragraph.

11.1.2 The landing distance determined under subparagraph 11.1.1 (a) must be measured from the point where the aeroplane first reaches a height of 50 feet above the landing surface.

11.2 The landing distances established under paragraph 11.1 must be increased by an amount approved by CASA for operations conducted on runways covered by slush, snow, or a depth of water.

11.3 For the purposes of subparagraph 5.1 (a) and subject to paragraph 11.4, the landing distance required in relation to an aeroplane engaged in private, or aerial work, operations is the landing distance worked out in accordance with either the requirements relating to landing distance set out in paragraph 11.1 and 11.2 or the requirements relating to landing distance set out in:

(a) the manufacturer's data manual; or

(b) the approved foreign flight manual.

Note: The data contained in some manufacturers' data manuals is unfactored and makes no allowance for degraded aircraft performance.

11.4 Where a runway is covered with slush, snow or a depth of water, the landing distance set out in the manufacturer's data manual and the approved foreign flight manual must be increased by the amount approved by CASA for the purposes of paragraph 11.2.

11.5 This subsection does not apply in the case of an emergency.

12 OBSTACLE CLEARANCE REQUIREMENTS

12.1 For the purposes of subparagraph 4.1 (b), the take-off obstacle clearance requirements are met if the net flight path of the aeroplane, following failure of the critical engine at the critical point of the take-off run, would clear by at least 35 feet vertically all obstacles in the take-off area until compliance with paragraph 12.4 is established and can be maintained. For the purpose of meeting this requirement, the planned departure procedure may include a change of heading but, in

that event, the planned angle of bank must not exceed 15° the change of heading must not be initiated prior to a point where the net flight path clears all obstructions by at least 50 feet and, for the duration of the turn, the net flight path must clear by at least 50 feet vertically all obstructions in the planned take-off area.

12.1A In paragraph 12.1, take-off area means the area calculated by the operator in accordance with paragraph 12.1.1 or subsection 12A, at the operator's discretion.

12.1.1 Unless determined in accordance with subsection 12A, the take-off area is:

(a) in the case of V.M.C. operations by aeroplanes below 20 000 kg maximum all-up-weight — the area on either side of the planned flight path within a lateral distance of 150 feet plus 0.125D where D is distance measured horizontally along the planned flight path and commencing from the end of the take-off distance available. Despite this requirement area more than 1 000 feet either side of the planned flight path need not be considered unless the planned flight path involves a change of heading in excess of 15^{o}. In this latter event the lateral area will continue to expand throughout the turn and the limiting lateral distance shall become the greater of 1 000 feet or the distance represented by 150 feet plus 0.125D where D is measured to the point of completion of the turn;

(b) in the case of V.M.C. operations by aeroplanes at or above 20 000 kg maximum all-up-weight and all I.M.C. operations — the area on either side of the planned flight path within a lateral distance of 250 feet plus 0.125D where D is distance measured horizontally along the planned flight path and commencing from the end of the take-off distance available. The lateral expansion of the take-off area may be discontinued when the take-off area intersects the area of probability of a radio navigation aid in the planned take-off path, and the aid is available for use by the pilot of the aeroplane.

12.2 In the application of paragraph 12.1, it is to be assumed that the point on the net flight path where a horizontal flight segment commences is the same horizontal distance from the end of the runway as the point where the gross flight path intersects the height selected for the acceleration manoeuvre.

12.3 In establishing compliance with paragraph 12.1 it is acceptable (in those instances where detailed obstacle clearance data is not available) to relate the net flight path to the take-off area obstacle clear gradient in conjunction with the take-off distance available for take-off appropriate to that gradient which CASA declares available for any particular take-off direction. It is also acceptable to assume that the obstacle clear gradient becomes horizontal at the height of the highest obstruction within the take-off area.

12.4 For the purposes of subparagraph 4.1 (c), the en-route obstacle clearance requirements are met if the en-route configuration with a critical engine inoperative the net flight path of an aeroplane under V.M.C. clears by 1 000 feet vertically all obstacles within 5 nautical miles of the aeroplane's track or, under I.M.C., by such greater distance as is determined by the accuracy of the navigation aid(s) used. At the pressure height required to achieve this clearance of the critical en-route obstacles the net flight path must have a positive slope.

12.5 If compliance with paragraph 12.4 is not possible, a "drift down" procedure may be planned. For this purpose it must be established that, following failure of the critical engine at any point during climb or cruise, a net flight path from that point to a suitable aerodrome will clear, by 2 000 feet vertically, all obstacles within 5 miles laterally of the aeroplane's track under V.M.C. or, in the case of I.M.C., obstacles within such greater lateral distance from the aeroplane's track as is determined by the accuracy of the navigation aid(s) used.

12.6 The net flight path in the en-route configurations must have a positive slope at 1 500 feet above the aerodrome where a landing is assumed to be made following engine failure. If the aeroplane is to be landed at other than the destination or alternate aerodrome following an engine failure that aerodrome must be specified in the operational flight plan and be suitable for landing.

12.7 The following factors must be taken into account when determining net flight paths:

(a) the effect of wind;
(b) temperature (forecast temperature may be used in the determination of en-route net flight paths);
(c) altitude;
(d) fuel and oil consumption;
(e) fuel jettisoning — in accordance with an approved procedure, consistent with reaching an aerodrome;
(f) the effect of ice protection systems when anticipated weather conditions along the route indicate possibility of icing conditions.

12A Alternative take-off obstacle clearance requirements

12A.1 For the purposes of this subsection, the maximum permissible take-off weight of an aeroplane that permits compliance with the obstacle clearance requirements of paragraph 12.1 must be determined by taking into account the altitude of the aerodrome, the ambient temperature and the wind component existing at the time of take-off.

12A.2 Subject to paragraphs 12A.3 and 12A.4, the take-off area consists of the area on either side of the planned flight path within a lateral distance calculated using the formula:

90 metres + 0.125D

where **D** is the distance measured horizontally along the planned flight path and commencing from the end of the take-off distance available.

12A.3 Obstacles at a distance greater than 600 metres on either side of the planned flight path need not be cleared:

(a) if the planned flight path does not include a change of heading of more than 15^{o}; or

(b) in the case of operations conducted in V.M.C. by day.

12A.4 If paragraph 12A.3 does not apply, obstacles at a distance greater than 900 metres on either side of the planned flight path need not be cleared.

14 AEROPLANE CONFIGURATION AND PROCEDURES

14.1 The data necessary to show compliance with this Order must be established in accordance with the aeroplane configuration, procedures and limitations specified in Part 101.

14.2 Procedures to be followed consistent with this Order, including procedures anticipating engine failure at any time between the commencement of take-off and completion of landing, must be specified in the Operator's Operation Manual. The procedures so specified must be such that they can be consistently executed in service by flight crews of average skill and they must also be such that the take-off flight path with all engines operating is above the one-engine inoperative take-off flight path.