AVIATION SPECIFICATION 1
PERFORMANCE CLASSES

EFFECTIVE DATE : 1 OCTOBER 2018
REVISION NO: 0

Contents

1 Introduction

1.1 These Aviation Specifications 1 (“AS-1”) set out the Performance Class requirements for operations under the following Air Navigation Regulations:

(a) Air Navigation (121 – Commercial Air Transport by Large Aeroplanes) Regulations 2018 (G.N. No S444/2018) (“ANR-121”);
(b) Air Navigation (135 – Commercial Air Transport by Helicopters and Small Aeroplanes) Regulations 2018 (G.N. No S445/2018) (“ANR-135”).

1.2 This AS-1 is issued by the Director-General of Civil Aviation (DGCA).

2 Definitions

2.1 Any term in these Specifications that is defined in the First Schedule to the Air Navigation (91 – General Operating Rules) Regulations 2018 (G.N. No. S441/2018) has the meaning given to that term in that Schedule unless the term is otherwise defined in the First Schedule to ANR-121, ANR-135 or the Appendix 1 to this AS-1.

3 Aeroplanes Performance Class A

3.1 Take-off Mass

(a) The take-off mass does not exceed the maximum take-off mass specified in the aeroplane flight manual for the altitude of the aerodrome and for the ambient temperature existing at the time of the take-off.

(b) The maximum take-off mass is calculated, assuming that the critical engine fails at V_{REF}, using a single value of V_1, to ensure that:

(1) the accelerate-stop distance required does not exceed the accelerate-stop distance available;

(2) the take-off distance required does not exceed the take-off distance available;

(3) any clearway forming part of the take-off distance available shall not exceed half the length of the take-off run available;

(4) the take-off run required does not exceed the take-off run available using V_1 for the rejected and continued take-off;

(5) on a wet or contaminated runway, the take-off mass does not exceed that permitted for a take-off on a dry runway under the same conditions; and

(6) in the case of a wet or contaminated runway, the take-off distance is calculated to the point at which the aircraft reaches a height of at least 15 feet above the take-off surface using a reduced V_1.

(c) The maximum take-off mass takes account of:

(1) aerodrome elevation;

(2) the pressure altitude of the aerodrome when the atmospheric pressure varies by more than 1% from the International Standard Atmosphere;

(3) ambient temperature at the aerodrome;

(4) the type of runway surface and the runway surface condition;

(5) the runway gradient in the direction of take-off; and

(6) not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

3.2 Take-off flight path

(a) With the critical engine inoperative, all obstacles within the net take-off flight path are cleared by at least a vertical margin of at least 35 ft, or by a horizontal distance of 90m + (0.125 x D), where D is the distance –

(1) the aeroplane has travelled from the end of the take-off distance available; or

(2) the end of the take-off distance if a turn is scheduled before the end of the take-off distance available; or

(3) in the case of aeroplanes with a wingspan of less than 60m, a horizontal distance of half the aeroplane wingspan + (0.125 x D).

(b) When calculating the net take-off flight path:

(1) the following factors are taken into account:

(i) take-off mass at the commencement of the take-off run; and

(ii) aerodrome elevation; and

(iii) pressure altitude at the aerodrome when the atmospheric pressure varies by more than 1% from the International Standard Atmosphere; and

(iv) ambient temperature at the aerodrome; and

(v) not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component; and

(2) a track change exceeding 15° is not made before a height of 50 feet above the take-off surface has been achieved; and

(3) unless otherwise authorised by the DGCA:

(i) the bank angle up to and including a height of 400 feet above the take-off surface does not exceed 15°; and

(ii) the bank angle above a height of 400 feet above the take-off surface does not exceed 25°; and

(4) allowance is made for:

(i) the effect of the bank angle on operating speeds and flight path; and

(ii) distance increments resulting from increased operating speeds; and

(iii) retention of stall margin and loss of climb gradient.

(b) Obstacles must be considered, except in the following circumstances:

(1) Where the intended flight path does not require track changes of more than 15°, and the lateral distance of the obstacle is –

(i) 300 m, in the case of flight is conducted under conditions allowing visual course guidance navigation, or if navigation aids are available enabling the pilot to maintain the intended flight path with the same accuracy; or

(ii) greater than 600 m in the case of flights under all other conditions.

(2) Where the intended flight path does require track changes of more than 15°, and the lateral distance of the obstacle is greater than:

(i) 600 m, in the case of a flight conducted under conditions allowing visual course guidance navigation;

(ii) 900 m in the case of flights under all other conditions.

3.3 En-route – one engine inoperative

(a) In the meteorological conditions expected for the flight and using the one engine inoperative en-route net flight path data:

(1) the flight path has a positive gradient at 1,500 feet above the aerodrome where the landing is assumed to be made after engine failure, taking account of any ice protection system if meteorological conditions require their operation; and

(2) the net flight path clears all terrain and obstructions within 10 NM either side of the intended track, by at least 1,000 feet vertically and with a positive gradient; or

(3) the net flight path permits the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be safely made, clearing vertically by at least 2,000 feet all obstacles within 10 NM either side of the intended track, and taking account of:

(i) engine failure at the most critical point along the route; and

(ii) the effect of the icing protection systems if the meteorological conditions require their operation; and

(iii) the forecast ambient temperature; and

(iv) the effects of forecast wind on the flight path; and

(v) fuel jettisoning to an extent consistent with reaching the aerodrome with the required fuel reserves; and

(b) The aerodrome where the aeroplane is assumed to land after engine failure meets the following criteria:

(1) the performance requirements at the expected landing mass are met; and

(2) weather reports and forecasts, and aerodrome condition reports, indicate that a safe landing can be made at the time of the intended landing.

(c) Track clearance to 5 NM either side of track may be used if navigational accuracy reaches at least 95% containment level.

3.4 En-route – aeroplanes with three or more engines, two engines inoperative

(a) Subject to sub-paragraph (b), each aeroplane with three or more engines is not more than 90 minutes away (at the all engines long-range cruising speed at standard temperature and in still air) from an aerodrome at which a safe landing can be made.

(b) An aircraft with three or more engines may be operated at more than 90 minutes away from an aerodrome at which a safe landing can be made, provided that:

(1) the two-engine inoperative en-route flight path data permits the aeroplane to continue the flight, in the expected meteorological conditions, from the point where two engines are assumed to fail simultaneously, to an aerodrome at which it is possible to land using the prescribed procedure for a landing with two engines inoperative;

(2) the net flight path, taking into account the effect of any ice protection systems if the meteorological conditions require their operation must clear vertically by an altitude of at least 2,000 feet all terrain and obstructions within 10 NM of the intended track to be flown;

(3) the net flight path has a positive gradient at an altitude of 1,500 feet above the aerodrome where the landing is assumed to be made after the failure of two engines;

(4) fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required reserves;

(5) the expected mass of the aeroplane at the point where the two engines are assumed to fail shall be not less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at an altitude of at least 1 500 feet directly over the aerodrome and after that to fly level for at least 15 minutes; and

(6) assuming that the two engines fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes (at

the all-engines long-range cruising speed at standard temperature and still air) away from aerodrome at which a safe landing can be made.

(c) Track clearance to 5 NM either side of track may be used if navigational accuracy reaches at least 95% containment level.

3.5 Landing – destination and alternate aerodromes

(a) The landing mass of the aeroplane does not exceed the maximum landing mass, taking into account the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome; and

(b) For instrument approaches with decision heights below 200 feet, the approach mass of the aeroplane, taking into account the take-off mass and the fuel expected to be consumed in flight, allows a missed approach net climb gradient, assuming that the critical engine is inoperative in the approach configuration, of:

(1) at least 2.5%; or

(2) at least the net climb gradient required to clear any obstacles in the missed approach flight path in accordance with paragraph 3.2 (b)(3) and (4).

3.6 Landing – dry runways

(a) The landing mass for the estimated time of landing does not exceed the landing mass specified in the aeroplane flight manual.

(b) The landing mass for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing on a dry runway from a point 50 feet above the threshold within:

(1) 60% of the landing distance available at the destination and at any alternate aerodrome for a turbojet powered aeroplane; and

(2) 70% of the landing distance available at the destination aerodrome and at any alternate aerodrome for a turbo-propeller powered aeroplane; and

(c) The landing mass takes account of

(1) the altitude of the aerodrome; and

(2) the type of runway surface and the runway surface condition; and

(3) the runway gradient in the direction of landing; and

(4) not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

(d) It is assumed that the aeroplane will land on:

(1) the most favourable runway in still air; and

(2) the aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and also considering other conditions such as landing aids and terrain.

(e) If unable to comply with (d)(1) and (2) for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated that permits compliance, except when operating to a destination with a single runway requiring a favourable wind component, two suitable alternate aerodromes shall be designated

3.7 Landing – wet and contaminated runways

(a) When the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the landing distance required by paragraph 3.6; and

(b) When the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available is at least:

(1) 115% of the landing distance required by paragraph 3.6; or

(2) 115% of the landing distance determined in accordance with the approved contaminated landing distance data, whichever is greater.

(c) a landing distance on a wet runway shorter than that required by sub-paragraph (a), but not less than that required by paragraph 3.6, may be used if performance data in AFM includes specific additional information which would allow a shorter landing distance on wet runways.

4 Aeroplanes Performance Class B

4.1 Take-off Mass

The take-off mass does not exceed the maximum take-off mass specified in the aeroplane flight manual for the altitude of the aerodrome and for the ambient temperature existing at the time of the take-off.

4.2 Take-off distance

(a) The unfactored take-off distance as specified in the aeroplane flight manual does not exceed, when multiplied by a factor of 1.25, the take-off run available; or

(b) When a stopway and/or clearway is available, the unfactored take-off distance does not exceed:

(1) the take-off run available; and

(2) when multiplied by a factor of 1.15, the take-off distance available; and

(3) when multiplied by a factor of 1.3, the accelerate-stop distance available

(c) Account is taken of the following

(1) the mass of the aeroplane at the commencement of the take-off run;

(2) the pressure altitude at the aerodrome; and

(3) the ambient temperature at the aerodrome; and

(4) the runway surface condition and the type of runway surface; and

(5) the runway gradient in the direction of take-off; and

(6) not more than 50% of the reported head-wind component, or not less than 150% of the reported tail-wind component.

(d) For seaplane operations account is taken of the following:

(1) the wind component normal to the direction of take-off;

(2) the water state and density

(3) the water surface condition; and

(4) the strength of the current.

4.3 Take-off and landing climb

(a) Twin engine aeroplanes which do not meet the following climb requirements are treated as a single engine aeroplane.

(b) Take-off climb, all engines operating:

(1) The steady gradient of climb after take-off shall be at least 4% with:

(i) take-off power selected on each engine;

(ii) the landing gear extended, except that if the landing gear can be retracted in not more than 7 seconds, it may be assumed to be retracted

(iii) the wing flaps in the take-off position;

(iv) a climb speed not less than the greater of $1.1V_{MC}$ and $1.2V_{SI}$.

(c) Take-off climb, one engine inoperative:

(1) The steady gradient of climb at an altitude of 400 feet above the take-off surface shall be measurably positive with:

(i) the critical engine inoperative and its propeller in the minimum drag position; and

(ii) the remaining engine at take-off power; and

(iii) the landing gear retracted; and

(iv) the wing flaps in the take-off position; and

(v) a climb speed equal to that achieved at 50 ft.

(2) The steady gradient of climb shall be not less than 0.75% at an altitude of 1 500 feet above the take-off surface with:

(i) the critical engine inoperative and its propeller in the minimum drag position; and

(ii) the remaining engine at not more than maximum continuous power; and

(iii) the landing gear retracted; and

(iv) the wing flaps retracted; and

(v) a climb speed not less than $1.2V_{SI.}$

(d) Landing climb, all engines operating:

(1) The steady gradient of climb shall be at least 2.5% with:

(i) not more than the power of thrust that is available 8 seconds after initiation of movement of the power controls from the minimum flight idle position; and

(ii) the landing gear extended; and

(iii) the wing flaps in the landing position; and

(iv) a climb speed equal to $V_{REF.}$

(e) Landing climb, one engine inoperative:

(1) The steady gradient of climb shall be not less than 0.75% at an altitude of 1 500 feet above the landing surface with:

(i) the critical engine inoperative and its propeller in the minimum drag position; and

(ii) the remaining engine at not more than maximum continuous power; and

(iii) the landing gear retracted; and

(iv) the wing flaps retracted; and

(v) a climb speed not less than $1.2V_{SI}$

(f) Landing gear requirements shall be applied equally to floats and skis where appropriate.

4.4 Take-off flight path – multi-engine aeroplanes

(a) The take-off flight path of aeroplanes with two or more engines, determined in accordance with this paragraph, clears all obstacles by a vertical margin of at least 50 ft, or by a horizontal distance of at least 90 m plus 0,125 x D, where D is the horizontal distance travelled by the aeroplane from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available.

(b) When showing compliance with sub-paragraph (a) above, account is taken of the following:

(1) the take-off flight path begins at a height of 50 feet above the surface at the end of the take-off distance required, and ends at a height of 1 500 feet above the surface;

(2) the aeroplane is not banked before the aeroplane reaches a height of 50 feet above the surface, and that thereafter the angle of bank does not exceed 15°;

(3) failure of the critical engine occurs at the point on the all engine take-off flight path where visual reference for the purposes of avoiding obstacles is lost;

(4) the gradient of the take-off flight path from 50 feet to the assumed engine failure height is equal to the average all engines operating gradient during climb and transition to the en-route configuration multiplied by a factor of 0.77; and

(5) the gradient of the take-off flight path from the height reached in accordance with sub-paragraph (b)(4) to the end of the take-off flight

path is equal to the one engine inoperative en-route climb gradient shown in the aeroplane flight manual.

(c) Obstacles do not have to be considered where –

(1) the intended flight path does not require track changes of more than 15°, and the obstacle has a lateral distance greater than:

(i) 300 m, if the flight is conducted under conditions allowing visual course guidance navigation, or if navigation aids are available enabling the pilot to maintain the intended flight path with the same accuracy; and

(ii) 600 m for flights under all other conditions.

(2) the intended flight path does require track changes of more than 15°, and the obstacle has a lateral distance greater than:

(i) 600 m, if the flight is conducted under conditions allowing visual course guidance navigation; or

(ii) 900 m for flights under all other conditions.

(e) when showing compliance with sub-paragraphs (a), (b) and (c), account is taken of the following:

(1) the mass of the aeroplane at the commencement of the take-off run; and

(2) the pressure altitude at the aerodrome; and

(3) the ambient temperature at the aerodrome; and

(4) not more than 50% of the reported head-wind component, or not less than 150% of the reported tail-wind component.

4.5 En-route – multi-engine aeroplanes

(a) An aeroplane is to be capable of continuing flight at or above the relevant minimum altitudes for safe flight to a point 1,000 feet above an aerodrome at which the performance requirements can be met, in the event of failure of one engine, with the remaining engines operating within the maximum continuous power, in the meteorological conditions expected for the flight.conditions specified, the aeroplane is capable.

(b) When showing compliance with sub-paragraph (a) above:

(1) it shall not be assumed that the aeroplane will be flying at an altitude exceeding that at which the rate of climb equals 300 feet per minute with all engines operating within the specified maximum continuous power conditions specified; and

(2) the assumed en-route gradient with one engine inoperative shall be the gross gradient of descent or climb, as appropriate, respectively increased by a gradient of 0.5%, or decreased by a gradient of 0.5%.

4.6 En-route – single- engine aeroplanes

(a) An aeroplane is to be capable of reaching a point from which a safe forced landing can be made, in the event of failure of the engine, in the meteorological conditions expected for the flight., the is.

(a) In the case of a landplane, a safe forced landing must be a place on land, unless the DGCA otherwise authorises.

(c) When showing compliance with sub-paragraph (a) above:

(1) it shall not be assumed that the aeroplane will be flying, with the engine operating within the specified maximum continuous power conditions, at an altitude exceeding that at which the rate of climb equals 300 feet per minute; and

(2) the assumed en-route gradient shall be the gross gradient of descent increased by a gradient of 0.5%.

4.7 Landing – destination and alternate aerodromes

(a) The landing mass of the aeroplane does not exceed the maximum landing mass specified in the aeroplane flight manual for the altitude and ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

4.8 Landing – dry runways

(a) The landing mass of the aeroplane for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold within 70% of the landing distance available.

(b) The DGCA may approve the use of factored landing distance data based on a screen height of less than 50 ft, but not less than 35 ft.

(c) When showing compliance with sub-paragraph (a) above, account is taken of the following:

(1) the altitude of the aerodrome;

(2) the runway surface condition and the type of runway surface;

(3) the runway gradient in the direction of landing; and

(4) not more than 50% of the reported head-wind component, or not less than 150% of the reported tail-wind component.

(d) When showing compliance with sub-paragraph (a) above, the following conditions will be assumed to exist:

(1) the aeroplane will land on the most favourable runway, in still air; and

(2) the aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and also considering other conditions such as landing aids and terrain.

(e) If an operator is unable to comply with sub-paragraph (d)(2) for the destination aerodrome, the aeroplane may be despatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (c) and (d) above.

4.9 Landing – wet and contaminated runways

(a) When the appropriate weather reports or forecasts, or both, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the landing distance required by paragraph 4.8.

(b) When the appropriate weather reports or forecasts, or both, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance, determined in accordance with data acceptable to the DGCA for those conditions, does not exceed the landing distance available

4.10 Landing – Seaplanes

(a) The landing distance required is the horizontal distance between the point at which the seaplane is 50 ft above the water surface to the point where the seaplane has reached a speed of 3 knots (6 km/hr).

(b) The landing mass of the aeroplane allows a safe landing to be made in the landing distance available.

(c) When showing compliance with sub-paragraph (a), account is taken of:

(1) the altitude of the water aerodrome; and

(2) the ambient temperature at the water aerodrome; and

(3) the water density; and

(4) the water surface condition; and

(5) the strength of the current.

5 Aeroplanes Performance Class C

5.1 Take Off Mass

The take-off mass does not exceed the maximum take-off mass specified in the aeroplane flight manual for the altitude of the aerodrome and for the ambient temperature existing at the time of the take-off.

5.2 Take Off distance

(a) Aeroplanes that have take-off field length data in the aeroplane flight manual which does not allow for engine failure, the distance from the start of the take-off roll required by the aeroplane to reach a height of 50 ft above the surface with all engines operating does not exceed the take-off run available at the departure aerodrome, when multiplied by the following factors:

(1) 1.33 for two-engine aeroplanes; or

(2) 1.25 for three-engine aeroplanes; or

(3) 1.18 for four-engine aeroplanes.

(b) Where field length data which allows for engine failure is available:

(1) the accelerate-stop distance must not exceed the accelerate-stop distance available; and

(2) the take-off distance must not exceed the take-off distance available, with a clearway not exceeding half the take-off run available; and

(3) the take-off run must not exceed the take-off run available; and

(4) these parameters must be met using a single value of V_1 for the rejected and continued take-off; and

(5) on a wet or contaminated runway the take-off mass must not exceed the permitted take-off on a dry runway under the same conditions.

(c) When complying with sub-paragraphs (a) or (b) above, account is taken of the following:

(1) the pressure altitude at the aerodrome; and

(2) the ambient temperature at the aerodrome; and

(3) the runway surface condition and the type of runway surface; and

(4) the runway gradient in the direction of take-off; and

(5) not more than 50% of the reported head-wind component, or not less than 150% of the reported tail-wind component.

5.3 Take off Obstacle Clearance

(a) The take-off flight path with one engine inoperative clears all obstacles by a vertical margin–

(1) of at least 50 feet plus 0.01 x D; or
(2) by a horizontal distance of at least 90 m + (0.125 x D); or
(3) in the case of aeroplanes with a wingspan of less than 60m, a horizontal distance of half the aeroplane wingspan + (0.125 x D);

where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available.

(b) The take-off flight path begins at a height of 50 feet above the surface at the end of the take-off distance required by paragraph 5.2(a) or (b), and end at a height of 1500 feet above the surface; and

(c) When showing compliance with sub-paragraph (a), account shall be taken of the following:

(1) the mass of the aeroplane at the commencement of the take-off run; and

(2) the pressure altitude at the aerodrome; and

(3) the ambient temperature at the aerodrome; and

(4) not more than 50% of the reported head-wind component, or not less than 150% of the reported tail-wind component.

(c) Track changes are not allowed up to the point in the take-off path where a height of 50 feet above the surface has been achieved.

(d) After a height of 50 feet above the surface has been achieved and up to a height of 400 feet, the aeroplane should not be banked more than 15°.

(e) Bank angles greater than 25° should not be planned above 400 feet.

(e) In a case where the intended flight path does not require track changes of more than 15°, obstacles do not have to be considered if they have a lateral distance greater than:

(1) 300 m, if the flight is conducted under conditions allowing visual course guidance navigation, or if navigation aids are available enabling the pilot to maintain the intended flight path with the same accuracy; and

(2) 600 m for flights under all other conditions.

(f) In a case where the intended flight path does require track changes of more than 15°, obstacles do not have to be considered if they have a lateral distance greater than:

(1) 600 m, if the flight is conducted under conditions allowing visual course guidance navigation; or

(2) 900 m for flights under all other conditions.

5.4 En-route – all engines operating

In the meteorological conditions expected for the flight, at any point on its route or on any planned diversion from that route, the aeroplane is capable of a rate of climb of at least 300 feet per minute with all engines operating at no more than maximum continuous power at:

(a) the minimum altitudes for safe flight for each stage of the route to be flown, or of any planned diversion; and

(b) the minimum altitudes necessary to comply with the condition prescribed in paragraphs 5.5 and 5.6.

5.5 En-route – one engine inoperative

(a) In the meteorological conditions expected for the flight, and in the event of one engine becoming inoperative and the other engine or engines operating at no more than maximum continuous power, the aeroplane is capable of continuing the flight from the cruising altitude to an aerodrome where a safe landing can be made, clearing all obstacles within 5 NM either side of track by at least:

(1) 1 000 feet when rate of climb is zero or greater; or

(2) 2 000 feet when rate of climb is less than zero.

(b) the flight path shall have a positive gradient at 1 500 feet above the aerodrome where the landing is assumed to be made following engine failure.

(c) for the purposes of these calculations the available rate of climb of the aeroplane shall be taken as 150 feet per minute less than the gross rate of climb specified

(d) fuel jettisoning is permitted to the extent consistent with reaching the aerodrome with the required fuel reserves.

(e) Track clearance to 5 NM either side of track may be used if navigational accuracy reaches at least 95% containment level.

5.6 En-route – aeroplanes with three or more engines, two engines inoperative

(a) Except as provided in sub-paragraph (b) below, each aeroplane with three or more engines is not more than 90 minutes away (at the all engines long-range cruising speed at standard temperature and in still air) from an aerodrome at which a safe landing can be made

(b) An aircraft with three or more engines may be operated at more than 90 minutes away from an aerodrome at which a safe landing can be made, provided that:

(1) the two engine inoperative flight path must permit the aeroplane to continue the flight, in the expected meteorological conditions expected for the flight, clearing all obstacles within 10 NM of the intended track to

be flown, vertically by an altitude of at least 2 000 feet to an aerodrome at which a safe landing can be made; and

(2) the rate of climb of the aeroplane for the purpose of this paragraph shall be taken to be 150 feet per minute less than that specified; and

(3) fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required reserves; and

(4) the expected mass of the aeroplane at the point where the two engines are assumed to fail shall be not less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at an altitude of at least 1500 feet directly over the aerodrome and after that to fly level for at least 15 minutes.

(5) it is assumed that the two engines fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes (at the all-engines long-range cruising speed at standard temperature and still air) away from an aerodrome at which a safe landing can be made.

(d) Track clearance to 5 NM either side of track may be used if navigational accuracy reaches at least 95% containment level

5.7 Landing – destination and alternate aerodromes

The landing mass of the aeroplane does not exceed the maximum landing mass, taking into account the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

5.8 Landing – dry runways

(a) The landing mass of the aeroplane allows a full stop landing from 50 feet above the threshold within 70% of the landing distance available at the destination and alternate aerodromes.

(b) The landing mass takes into account–

(1) the altitude at the aerodrome;

(2) the type of runway surface;

(3) the runway gradient in the direction of landing; and

(4) not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

(c) It is assumed that the aeroplane will land on:

(1) the most favourable runway in still air; and

(2) the aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and also considering other conditions such as landing aids and terrain.

(d) If the operator is unable to comply with sub-paragraph (c)(2) for the destination aerodrome, the aeroplane may be despatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (b) and (c) above.

5.9 Landing – wet and contaminated runways

(a) When the appropriate weather reports or forecasts indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the landing distance required by paragraph 5.8.

(b) When the appropriate weather forecasts and reports indicate that the runway expected at the time of landing may be contaminated, the landing distance required does not exceed the landing distance available.

6 Helicopters Performance Class – General

6.1 Significant performance factors

To determine the performance of the helicopter, account should be taken of at least the following factors:

(a) mass of the helicopter;

(b) elevation or pressure-altitude and temperature; and

(c) wind, as follows:
  (1) no more than 50 per cent of any reported steady headwind component of 5 knots or more, for take-off and landing;
  (2) where take-off and landing with a tailwind component is permitted in the flight manual, not less than 150 per cent of any reported tailwind component should be allowed; and
  (3) where precise wind measuring equipment enables accurate measurement of wind velocity over the point of take-off and landing, the values in sub-paragraph (c)(1) and (2) may be varied.

6.2 Obstacle accountability area

(a) For the purpose of the obstacle clearance requirements, an obstacle should be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than:

  (1) for VFR operations:

    (i) half of the minimum width of the final approach and take-off area (FATO) (or the equivalent term used in the helicopter flight manual) defined in the helicopter flight manual (or when no width is defined, 0.75 D), plus 0.25 x D (or 3 m, whichever is greater), plus:

      (A) 0.10 DR for VFR day operations;

      (B) 0.15 DR for VFR night operations;

      where
      - “D” is the maximum dimension of the helicopter; and
      - “DR” is means the horizontal distance that the helicopter has travelled from the end of the TODAH.

  (2) for IFR operations:

    (i) 1.5 D (or 30 m, whichever is greater), plus:

      (A) 0.10 DR for IFR operations with accurate course guidance;

      (B) 0.15 DR for IFR operations with standard course guidance;

(C) 0.30 DR for IFR operations without course guidance;

(3) for operations with initial take-off conducted visually and converted to IFR/IMC at a transition point, the criteria required in (a)(1) applies up to the transition point and the criteria required in (a)(2) applies after the transition point; and

(4) for a take-off using a backup take-off procedure, an obstacle located below the backup flight path should be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than half of the minimum width of the FATO (or the equivalent term used in the helicopter flight manual) defined in the helicopter flight manual (or when no width is defined 0.75D), plus 0.25 times D (or 3 m, whichever is greater), plus:

(i) 0.10 distance travelled from the back edge of the FATO for VFR day operations;

(ii) 0.15 distance travelled from the back edge of the FATO for VFR night operations;

Note. — Standard course guidance includes ADF and VOR guidance. Accurate course guidance includes ILS, MLS, or other course guidance providing an equivalent navigational accuracy.

(b) Obstacles may be disregarded if they are situated beyond, where “R” is the rotor radius of the helicopter:

(1) 7 R for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

(2) 10 R for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

(3) 300 m if navigational accuracy can be achieved by appropriate navigation aids; and

(4) 900 m in the other cases.

(c) The transition point should not be located before the end of take-off distance required (TODRH) for helicopters operating in performance Class 1 and before the defined point after take-off (DPATO) for helicopters operating in performance Class 2.

(d) When planning the missed approach flight path, the divergence of the obstacle accountability area should only apply after the end of the take-off distance available.

7 Helicopters Performance Class 1

7.1 Take-off mass

(a) Subject to sub-paragraph (b), the mass of the helicopter at take-off does not exceed the maximum take-off mass specified in the flight manual for the procedures to be used and to achieve a rate of climb of 100 ft/min at 200 ft (60 m) and 150 ft/min at 1 000 ft (300 m) above the level of the heliport with the critical engine inoperative and the remaining engines operating at an appropriate power rating, taking into account the parameters specified in paragraph 6.1.

(b) The take-off mass is such that:

(1) the rejected take-off distance required does not exceed the rejected take-off distance available; and

(2) the take-off distance required does not exceed the take-off distance available.

(c) Despite sub-paragraph (b)(2), a helicopter, with the critical engine failure recognised at Take-off Decision Point (TDP) can, when continuing the take-off, clear all obstacles to the end of the take-off distance required by a vertical margin of not less than 35 ft (10.7 m).

(d) That part of the take-off up to and including TDP shall be conducted with the surface in sight.

7.2 Take-off flight path

From the end of the take-off distance required with the critical engine inoperative:

(a) the take-off mass is such that the climb path provides a vertical clearance of –

(1) not less than 35 ft (10.7 m) for VFR operations; or
(2) 35 ft (10.7 m) + 0.01DR for IFR operations,

above all obstacles located in the take-off flight path, including the obstacles specified in paragraph 6.2.

(b) where a change of direction of more than 15° is made, obstacle clearance requirements are to be increased by 15 ft (5 m) from the point at which the turn is initiated, provided that this turn is not initiated before reaching a height of 200 ft (60 m) above the take-off surface.

7.3 En-route

(a) The take-off mass is such that it is possible, in case of the critical engine failure occurring at any point along the flight path, to continue the flight to an appropriate landing site and achieve the minimum flight altitudes for the route to be flown.

(b) Fuel jettisoning can be planned to take place only below 1,000 feet above terrain and shall be consistent with reaching the heliport with the required fuel reserves and carried out utilising a safe procedure.

(c) A helicopter with three or more engines must, in the event of any two engines becoming inoperative, be able to continue a flight to a suitable operating site and carry out a landing, if –

(1) a suitable intermediate operating site is available on any part of the route; and

(2) the total duration of the flight allows for the probability of a failure of a second engine.

7.4 Approach, landing and baulked landing

(a) The estimated landing mass of the helicopter at the destination or alternate heliport:

(1) does not exceed the maximum take-off mass specified in the flight manual for the procedures to be used and to achieve a rate of climb of 150 ft/min at 1 000 ft (300 m) above the level of the heliport with the critical engine inoperative and the remaining engines operating at an appropriate power rating, taking into account the parameters specified in paragraph 6.1.

(2) the landing distance required does not exceed the landing distance available unless the helicopter, with the critical engine failure recognized at landing decision point (LDP) can, when landing, clear all obstacles in the approach path;

(3) in case of the critical engine failure occurring at any point after the LDP, it is possible to land and stop within the FATO; and

(4) in case of the critical engine failure occurring at any point before the LDP, it is possible either to land and stop within the FATO, or to overshoot meeting the condition of paragraph 7.2(a) and (b)

(b) That part of the landing from the LDP to touchdown is with the surface in sight.

8 Helicopters Performance Class 2

8.1 Take-off

(a) The mass of the helicopter at take-off should not exceed the maximum take-off mass specified in the flight manual for the procedures to be used and to achieve a rate of climb of 150 ft/min at 1 000 ft (300 m) above the level of the heliport with the critical engine inoperative and the remaining engines operating at an appropriate power rating, taking into account the parameters specified in paragraph 6.1.

(b) That part of the take-off prior to or at the defined point after take-off shall be conducted with the surface in sight.

8.2 Take-off flight path

(a) The mass of the helicopter is such that the initial climb path provides a vertical clearance of not less than 35 ft (10.7 m) above all obstacles located along the climb path, all engines operating, including obstacles specified in paragraph 6.2 have to be considered.

(b) From DPATO or, as an alternative, no later than 200 ft (60 m) above the take-off surface with the critical engine inoperative, the conditions of paragraph 7.2 (a) and (b) are met.

8.3 En-route

The conditions of paragraph 7.3 are met.

8.4 Approach, landing and baulked landing

(a) The estimated mass at the destination or alternate heliport is such that:

(1) it does not exceed the maximum mass specified in the flight manual for a rate of climb of 150 ft/min at 1 000 ft (300 m) above the level of the heliport with the critical engine inoperative and the remaining engines operating at an appropriate power rating, taking into account the parameters specified in paragraph 6.1;

(2) it is possible, in case of the critical engine failure occurring at or before the DPBL, either to land, or to overshoot satisfying the conditions of paragraph 7.2(a) and (b).

(b) That part of the landing from the defined point before landing to touchdown is conducted with the surface in sight.

9 Helicopters Performance Class 3

9.1 Take-off

(a) The mass of the helicopter at take-off does not exceed the maximum mass specified in the flight manual for a hover in ground effect with all engines operating at take-off power, taking into account the parameters specified in E6.005; or

(b) If conditions are such that a hover in ground effect is not likely to be established, the take-off mass does not exceed the maximum mass specified for a hover out of ground effect with all engines operating at take-off power, taking into account the parameters specified in E6.005.

9.2 Initial climb

The mass is such that the climb path provides a vertical clearance of not less than 35 ft (10.7 m) above all obstacles located along the climb path, all engines operating, including obstacles specified in paragraph 6.2.

9.3 En-route

The take-off mass is such that it is possible to achieve the minimum flight altitudes for the route to be flown with all engines operating.

9.4 Approach, landing and baulked landing

(a) The estimated mass at the destination or alternate heliport is such that:

(1) it does not exceed the maximum mass specified in the flight manual for a hover in ground effect with all engines operating at take-off power, taking into account the parameters specified in paragraph 6.1;

(2) despite sub-paragraph (1), if conditions are such that a hover in ground effect is not likely to be established, the take-off mass should not exceed the maximum mass specified for a hover out of ground effect with all engines operating at take-off power, taking into account the parameters specified in paragraph 6.2; and

(2) it is possible to perform a balked landing, satisfying the conditions of paragraph 9.2.

Appendix 1 Definitions

“Accelerate-stop distance available” or “ASDA” means the lengths of the take-off run available to an aeroplane plus the length of stopway, if provided;

“Aerodrome elevation” means the elevation of the highest point of the landing area;

“Approach and landing phase” means that part of the flight of a helicopter from 300 m (1,000 ft) above the elevation of the FATO, if the flight is planned to exceed this height, or from the commencement of the descent in the other cases, to landing or to the balked landing point;

“Contaminated runway” means a runway whose surface area (whether isolated or not) within the required length and width that is in use is covered, to an extent of more than 25%, by the following:

(a) surface water more than 3 mm (0.125”) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125”) of water; or
(b) snow which has been compressed into a solid mass which resists further compression and will hold together or break with lumps if picked up; or
(c) ice, including wet ice;

“Defined point after take-off” or “DPATO” means the point, within the take-off and initial climb phase, before which a helicopter’s ability to continue the flight safely, with the critical engine inoperative, is not assured and a forced landing may be required;

“Defined point before landing”, in relation to helicopters operated in Performance Class 2, means the point, within the approach and landing phase, after which a helicopter’s ability to continue the flight safely, with the critical engine inoperative, is not assured and a forced landing may be required;

“Dry, in relation to a runway”, means a runway that is neither wet nor contaminated, and includes a paved runway that has been specially prepared with grooves or a porous pavement to retain effectively dry braking action even when moisture is present;

“Final approach and take-off area” or “FATO” means a defined area over which the final phase of the approach manoeuvre to hover or land is completed and from which the take-off manoeuvre is commenced, and includes, where the FATO is to be used by helicopters operating in Performance Class 1, the the rejected take-off area available;

“Integrated survival suit” means a survival suit which meets the combined requirements of the survival suit and life jacket;

“Landing distance available” or “LDA” means the length of the runway which is declared available and suitable for the ground run of an aeroplane landing;

“Landing distance available” or “LDAH” means the length of the final approach and take-off area plus any additional area declared available and suitable for a helicopter to complete the landing manoeuvre from a defined height;

“Landing decision point” or “LDP” means the point used in determining landing performance of a helicopter from which, a engine failure occurring at this point, the landing may be safely continued or a balked landing initiated;

"Landing distance required" or "LDRH" means, in relation to helicopters operating in Performance Class 1, the horizontal distance required to land and come to a full stop from a point 10.7 m (35 ft) above the landing surface;

"Net take-off flight path" means the vertical profile of an aircraft beyond the take-off point, giving the minimum height that will be attained by an aircraft flown in accordance with the aircraft flight manual following failure of the most critical engine;

"Rejected take-off distance available" or "RTODAH" means the length of the final approach and take-off area declared available and suitable for a helicopter operating in Performance Class 1 to complete a rejected take-off;

"Rejected take-off distance required" or "RTODR" means the horizontal distance required from the start of the take-off to the point where a helicopter comes to a full stop following an engine failure and rejection of the take-off at the take-off decision point;

"Take-off distance available" or "TODA" means the length of the TORA plus the length of the clearway, if provided;

"Take off distance available" or "TODAH" means the length of the final approach and take-off area plus the length of the helicopter clearway (if provided) declared available and suitable for a helicopter to complete the take-off;

"Take-off decision point" or "TDP" means, in relation to helicopters operating in Performance Class 1, the point used in determining take-off performance from which, a engine failure occurring at this point, either a rejected take-off may be made or the take-off safely continued;

"Take-off distance required" or "TODRH" means, in relation to helicopters operating in Performance Class 1, the horizontal distance required from the start of the take-off to the point at which V_{TOSS}, a height of 10.7 m (35 ft) above the take-off surface, and a positive climb gradient are achieved, following failure of the critical engine at TDP and the remaining power-units operating within approved operating limits;

"Take-off run available" or "TORA" means the length of runway declared available and suitable for the ground run of an aeroplane taking off;

"Take-off mass" means the mass of an aeroplane that includes everything and everyone carried at the commencement of the take-off run.

"Wet runway" means a runway when its surface is covered with water, or equivalent, less than that specified for a contaminated runway, or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.

'V_{EF}' means the speed at which the critical engine is assumed to fail during take-off.

'V_{MC}' means minimum control speed with the critical engine inoperative.

'V_{REF}' means reference landing speed.

'V_{SO}' means the stall speed or the minimum steady flight speed in the landing configuration.

'V_{S1}' means the stall speed or the minimum steady flight speed obtained in a specified configuration.

“V_{TOSS}” means the minimum speed of a helicopter at which climb shall be achieved with the critical engine inoperative, the remaining engine operating within approved operating limits;

‘V_1’ means the maximum speed in the take-off at which the pilot must take the first action (e.g. apply brakes, reduce thrust, deploy speed brakes) to stop the aeroplane within the accelerate-stop distance. V_1 also means the minimum speed in the take-off, following a failure of the critical engine at V_{EF}, at which the pilot can continue the take-off and achieve the required height above the take-off surface within the take-off distance.

‘V_2’ means take-off safety speed.