CIVIL AVIATION AUTHORITY, PAKISTAN

Air Navigation Order
No. : 91.0029
Date : April 2006
Issue : One

AEROPLANES PERFORMANCE CODE AND LIMITATIONS

Contents

.

.

CIVIL AVIATION AUTHORITY, PAKISTAN

Air Navigation Order
No. : 91.0029
Date : April 2006
Issue : One

AEROPLANES PERFORMANCE CODE AND LIMITATIONS

1. Authority

This Air Navigation Order (ANO) is issued under Rule 241 of CARs 94 by Director General Civil Aviation Authority in pursuance of powers vested in him under Rule-4 of Civil Aviation Rules 1994.

2. Scope

All Operators shall ensure that aeroplanes are operated in accordance with code of performance established in this ANO that takes full account of SARPs contained in ICAO Annex-6 Part-1. The level of performance defined by the appropriate parts of this ANO for the aeroplanes is substantially equivalent to the overall level embodied in the SARPs.
Any amendments, additions, alteration and deletion necessitated in ICAO Annex 6, Part-1 Chap-5, ANOs and CARs would be applicable to the operator subject to intimation by CAA.
Performances Classs appended below are meant only for this ANO and not intended to contravene/differ with any definition provided by ICAO in this regard.

3. Applicability

This ANO shall apply to all commercial, charter and aerial work operations, in which:

(a) An operator shall ensure that multi-engine aeroplanes powered by turbopropeller engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg, and all multi-engine turbojet powered aeroplanes are operated in accordance with Performance Class A.

(b) An operator shall ensure that propeller driven aeroplanes with a maximum approved passenger seating configuration of 9 or less, and a maximum take-off mass of 5700 kg or less are operated in accordance with Performance Class B.

(c) An operator shall ensure that aeroplanes powered by reciprocating engines with a maximum approved passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5700 kg are operated in accordance with Performance Class C.

(d) Where full compliance with the requirements of the appropriate Class cannot be shown due to specific design characteristics (eg supersonic aeroplanes or seaplanes), the operator shall apply approved performance standards that ensure a level of safety equivalent to that of the appropriate Class.

4. Terminologies: Terms used in this ANO have the following meaning:

(a) Accelerate-stop distance available (ASDA). The length of the take-off run available plus the length of stopway, if such stopway is declared available by the appropriate Authority and is capable of bearing the mass of the aeroplane under the prevailing operating conditions.

(b) Contaminated runway. A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following:

- (i) Surface water more than 3 mm (0.125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125 in) of water;
- (ii) Snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or
- (iii) Ice, including wet ice.

(c) Damp runway. A runway is considered damp when the surface is not dry, but when the moisture on it does not give it a shiny appearance.

(d) Dry runway. A dry runway is one which is neither wet nor contaminated, and includes those paved runways which have been specially prepared with grooves or porous pavement and maintained to retain 'effectively dry' braking action even when moisture is present.

(e) Landing distance available (LDA). The length of the runway, which is declared available by the appropriate Authority and suitable for, the ground run of an aeroplane landing.

(f) Maximum approved passenger-seating configuration. The maximum passenger seating capacity of an individual aeroplane, excluding pilot seats or flight deck seats and cabin crew seats as applicable, used by the operator, approved by the Authority and specified in the Operations Manual.

(g) Take-off distance available (TODA). The length of the take-off run available plus the length of the clearway available.

(h) Take-off mass. The take-off mass of the aeroplane shall be taken to be its mass, including everything and everyone carried at the commencement of the take-off run.

(i) Take-off run available (TORA). The length of runway which is declared available by the appropriate Authority and suitable for the ground run of an aeroplane taking off.

(j) Wet runway. A runway is considered wet when the runway surface is covered with water, or equivalent, less than specified in sub-rule (b) above or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.

5. General Obligation of Operators

(a) Aeroplanes shall be operated in accordance with a comprehensive and detailed code of performance established in this ANO in compliance with the applicable Standards of ICAO Annex 6. Except as provided in 5.4, single-engine aeroplanes shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure.

(b) Except as provided in 5.4, single-engine aeroplanes shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure.

(c) Unless the operation has been specifically approved by the CAA, an aeroplane with two turbine power-units shall not, be operated on a route where the flight time at single engine cruise speed to an adequate en-route alternate aerodrome exceeds a threshold time established for such operations.

(d) The level of performance defined by the appropriate parts of the comprehensive and detailed national code referred to in sub-section (a) shall be at least substantially equivalent to the overall level embodied in the Standards of this chapter.

(e) An aeroplane shall be operated in compliance with the terms of its certificate of airworthiness and within the approved operating limitations contained in its flight manual.

(f) CAA shall take such precautions as are reasonably possible to ensure that the general level of safety contemplated by these provisions is maintained under all expected operating conditions, including those not covered specifically by the provisions of this ANO.

(g) A flight shall not be commenced unless the performance information provided in the flight manual indicates that the requirements of (h) to (o) below can be complied with for the flight to be undertaken.

(h) In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the aerodrome, temperature, wind, runway gradient and condition of runway, i.e. presence of slush, water and/or ice, for landplanes, water surface condition for seaplanes). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated.

(i) Mass limitations

1) The mass of the aeroplane at the start of take-off shall not exceed the mass at which (j) is complied with, nor the mass at which (m), (n) and (o) are complied with, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is envisaged in applying (m) and (n) and, in respect of alternate aerodromes, (j), (l) and (o).
2) In no case shall the mass at the start of take-off exceed the maximum take-off mass specified in the flight manual or Ops. Manual Part B (if it is more restrictive) for the pressure-altitude appropriate to the elevation of the aerodrome, and, if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition.
3) In no case shall the estimated mass for the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the maximum landing mass specified in the flight manual or Ops. Manual Part B (if it is more restrictive) for the pressure-altitude appropriate to the elevation of those aerodromes, and if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.
4) In no case shall the mass at the start of take-off, or at the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the relevant maximum masses at which compliance has been demonstrated

with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized in exceptional circumstances for a certain aerodrome or a runway where there is no noise disturbance problem..

(j) Take-off. The aeroplane shall be able, in the event of a critical power-unit failing at any point in the take-off, either to discontinue the take-off and stop within the accelerate-stop distance available, or to continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in a position to comply with (l). In determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

(k) En route — one power-unit inoperative. The aeroplane shall be able, in the event of the critical power-unit becoming inoperative at any point along the route or planned diversions therefrom, to continue the flight to an aerodrome at which the Standard of (o) can be met, without flying below the minimum flight altitude at any point.

(l) En route — two power-units inoperative. In the case of aeroplanes having three or more power-units, on any part of a route where the location of en-route alternate aerodromes and the total duration of the flight are such that the probability of a second power-unit becoming inoperative must be allowed for if the general level of safety implied by the Standards of this chapter is to be maintained, the aeroplane shall be able, in the event of any two power-units becoming inoperative, to continue the flight to an en-route alternate aerodrome and land.

(m) Landing. The aeroplane shall, at the aerodrome of intended landing and at any alternate aerodrome, after clearing all obstacles in the approach path by a safe margin, be able to land, with assurance that it can come to a stop or, for a seaplane, to a satisfactorily low speed, within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.

(n) Obstacle data: Obstacle data for T/off is provided in AIP. For Enroute, Approach & Missed Approach it is provided in both AIP & Route Manual. This is to enable the operator to develop procedures to comply with sub-section (j) while taking account of charting accuracy.

(o) An operator shall ensure that the approved performance Data contained in the Aeroplane Flight Manual is used to determine compliance with the requirements of the appropriate Class, supplemented as necessary with other data acceptable to the Authority as prescribed in the relevant Class. When applying the factors prescribed in the appropriate Class, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual performance data to avoid double application of factors.

(p) When showing compliance with the requirements of the appropriate Class, due account shall be given to aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance.

(q) For performance purposes, a damp runway, other than a grass runway, may be considered to be dry.

PERFORMANCE CLASS-A

A1 General

(a) An operator shall ensure that, for determining compliance with the requirements of this Class, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance Data in the Aeroplane Flight Manual is insufficient in respect of items such as:

(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2) Consideration of engine failure in all flight phases.

(b) An operator shall ensure that, for the wet and contaminated runway case, performance data determined in accordance with flight manual or equivalent acceptable to the Authority is used.

A2 Take-off

(a) An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.

(b) An operator must meet the following requirements when determining the maximum permitted take-off mass:

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

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

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

(4) Compliance with this section must be shown 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 that permitted for a take-off on a dry runway under the same conditions.

(c) When showing compliance with sub-section (b) above, an operator must take account of the following:

(1) The pressure altitude at the aerodrome;

(2) The ambient temperature at the aerodrome; and

(3) The runway surface condition and the type of runway surface (See A3);

(4) The runway slope in the direction of take-off ;

(5) Not more than 50% of the reported head-wind component or not less than 150% of the reported tailwind component; and

(6) The loss, if any, of runway length due to alignment of the aeroplane prior to take-off. (See A4)

A3 Take-off – Runway surface condition (see A2(c)(3))

(a) Operation on runways contaminated with water, slush, snow or ice implies uncertainties with regard to runway friction and contaminant drag and therefore to the achievable performance and control of the the aeroplane during take-off, since the actual conditions may not completely match the assumptions on which the performance information is based. In the case of a contaminated runway, the first option for the pilot-in-command is to wait until the runway is cleared. If this is impracticable, he may consider a take-off, provided that he has applied the applicable performance adjustments, and any further safety measures he considers justified under the prevailing conditions.

(b) An adequate overall level of safety will only be maintained if operations are limited to rare occasions. Where the frequency of such operations on contaminated runways is not limited to rare occasions, operators should provide additional measures ensuring an equivalent level of safety. Such measures could include special crew training, additional distance factoring and more restrictive wind limitations.

A4 Loss of runway length due to alignment (see A2(c)(6))

(a) The length of the runway which is declared for the calculation of TODA, ASDA and TORA, does not account for line-up of the aeroplane in the direction of take-off on the runway in use. This alignment distance depends on the aeroplane geometry and access possibility to the runway in use. Accountability is usually required for a 90° taxiway entry to the runway and 180° turnaround on the runway. There are two distances to be considered:

(1) The minimum distance of the main wheels from the start of the runway for determining TODA and TORA,"L"; and

(2) The minimum distance of the most forward wheel(s) from the start of the runway for determining ASDA,"N".

(b) Alignment Distance

A5 Take-off obstacle clearance

(a) An operator shall ensure that the net take-off flight path clears all obstacles by a vertical distance of at least 35 ft or by a horizontal distance of at least 90 m plus 0·125 x D, where D is the horizontal distance the aeroplane has travelled 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. For aeroplanes with a wingspan of less than 60 m a horizontal obstacle clearance of half the aeroplane wingspan plus 60 m, plus 0·125 x D may be used. (See A5 (g))

(b) When showing compliance with sub-section (a) above, an operator must take account of the following:

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

(2) The pressure altitude at the aerodrome;

(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 tailwind component.

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

(1) Track changes shall not be allowed up to the point at which the net take-off flight path has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run available. Thereafter, up to a height of 400 ft it is assumed that the aeroplane is banked by no more than 15°. Above 400 ft height bank angles greater than 15°, but not more than 25° may be scheduled;

(2) Any part of the net take-off flight path in which the aeroplane is banked by more than than 15° must clear all obstacles within the horizontal distances specified in sub-sections (a), (d) and (e) of this section by a vertical distance of at least 50 ft; and

(3) An operator must use special procedures, subject to the approval of the Authority, to apply increased bank angles of not more than 20º between 200 ft and 400 ft, or not more than 30º above 400 ft (see A13).

(4) Adequate allowance must be made for the effect of bank angle on operating speeds and flight path including the distance increments resulting from increased operating speeds. (see A5(h))

(d) When showing compliance with sub-section (a) above for those cases where the intended flight path does not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(1) 300 m, if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area (see A6); or

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

(e) When showing compliance with sub-section (a) above for those cases where the intended flight path does require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:

(1) 600 m, if the pilot is able to maintain the required navigational accuracy through the obstacle accountability area (see A6); or

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

(f) An operator shall establish contingency procedures to satisfy the requirements of A5 and to provide a safe route, avoiding obstacles, to enable the aeroplane to either comply with the en-route requirements of A8, or land at either the aerodrome of departure or at a take-off alternate aerodrome (see A7).

(g) In accordance with the definitions used in preparing the take-off distance and take-off flight path Data provided in the Aeroplane Flight Manual:

(1) The net take-off flight path is considered to begin at a height of 35 ft above the runway or clearway at the end of the take-off distance determined for the aeroplane in accordance with sub-section (b) below.

(2) The take-off distance is the longest of the following distances:

i. 115% of the distance with all engines operating from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway; or

ii. The distance from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V_1) for a dry runway; or

iii. If the runway is wet or contaminated, the distance from the start of the take-off to the point at which the aeroplane is atleast 15 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway.

(3) Section A5(a) specifies that the net take-off flight path, determined from the data provided in the Aeroplane Flight Manual in accordance with sub-sections 1(a) and 1(b) above, must clear all relevant obstacles by a vertical distance of 35 ft. When taking off on a wet or contaminated runway and an engine failure occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway, this implies that the aeroplane can initially be as much as 20 ft below the net take-off flight path in accordance with sub-section 1 above and, therefore, may clear close-in obstacles by only 15 ft. When taking off on wet or contaminated runways, the operator should exercise special care with respect to obstacle assessment, especially if a take-off is obstacle limited and the obstacle density is high.

(h) (1) The Aeroplane Flight Manual generally provides a climb gradient decrement for a 15° bank turn. For bank angles of less than 15°, a proportionate amount should be applied, unless the manufacturer or Aeroplane Flight Manual has provided other data.

(2) Unless otherwise specified in the Aeroplane Flight Manual or other performance or operating manuals from the manufacturer, acceptable adjustments to assure adequate stall margins and gradient corrections are provided by the following:

BANK	SPEED	GRADIENT CORRECTION
15°	V_2	1 x Aeroplane Flight Manual 15° Gradient Loss
20°	V_2 + 5 kt	2 x Aeroplane Flight Manual 15° Gradient Loss
25°	V_2 + 10 kt	3 x Aeroplane Flight Manual 15° Gradient Loss

Some older airplanes do not have gradient decrement in AFMs. In such cases a mass penalty(assuming a higher mass than actual) of 1/cos bank angle must be considered(-0.5% as a rule of thumb).

A6 Required Navigational Accuracy

(a) Flight-deck systems. The obstacle accountability semi-widths of 300 m (see A5(d)(1)) and 600 m (see A5(e)(1)) may be used if the navigation system under one-engine-inoperative conditions provides a two standard deviation (2 s) accuracy of 150 m and 300 m respectively.

(b) Visual Course Guidance

(1) The obstacle accountability semi-widths of 300 m (see A5(d)(1)) and 600 m (see A5(e)(1)) may be used where navigational accuracy is ensured at all relevant points on the flight path by use of external references. These references may be considered visible from the flight deck if they are situated more than 45° either side of the intended track and with a depression of not greater than 20° from the horizontal.

(2) For visual course guidance navigation, an operator should ensure that the weather conditions prevailing at the time of operation, including ceiling and visibility, are such that the obstacle and/or ground reference points can be seen and identified. The Operations Manual should specify, for the aerodrome(s) concerned, the minimum weather conditions which enable the flight crew to continuously determine and maintain the correct flight path with

respect to ground reference points, so as to provide a safe clearance with respect to obstructions and terrain as follows:

(i) The procedure should be well defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;

(ii) The procedure should be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;

(iii) A written and/or pictorial description of the procedure should be provided for crew use;

(iv) The limiting environmental conditions (such as wind, the lowest cloud base, ceiling, visibility, day/night, ambient lighting, obstruction lighting) should be specified.

A7 Engine failure procedures after T/off

If compliance with A5(f) is based on an engine failure route that differs from the all engine departure route or SID normal departure, a "deviation point" can be identified where the engine failure route deviates from the normal departure route. Adequate obstacle clearance along the normal departure with failure of the critical engine at the deviation point will normally be available. However, in certain situations the obstacle clearance along the normal departure route may be marginal and should be checked to ensure that, in case of an engine failure after the deviation point, a flight can safely proceed along the normal departure. To calculate the deviation point, all engine climb gradients must be available in Operations Manual Part B.

A8 En-route – One Engine Inoperative (see A8(e))

(a) An operator shall ensure that the one engine inoperative en-route net flight path data shown in the Aeroplane Flight Manual, appropriate to the meteorological conditions expected for the flight, complies with either sub-section (b) or (c) at all points along the route. The net flight path must have a positive gradient at 1 500 ft above the aerodrome where the landing is assumed to be made after engine failure. In meteorological conditions requiring the operation of ice protection systems, the effect of their use on the net flight path must be taken into account.

(b) The gradient of the net flight path must be positive at at least 1 000 ft above all terrain and obstructions along the route within 9·3 km (5 nm) on either side of the intended track.

(c) The net flight path must permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with A11 or A12 as appropriate, the net flight path clearing vertically, by at least 2 000 ft, all terrain and obstructions along the route within 9·3 km (5 nm) on either side of the intended track in accordance with sub-sections (1) to (4) below:

(1) The engine is assumed to fail at the most critical point along the route;

(2) Account is taken of the effects of winds on the flight path;

(3) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used; and

(4) The aerodrome where the aeroplane is assumed to land after engine failure must meet the following criteria:

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

(ii) Weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing.

(d) When showing compliance with A8, an operator must increase the width margins of subsections (b) and (c) above to 18·5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

(e)

(1) The high terrain or obstacle analysis required for showing compliance with A8 may be carried out in one of two ways, as explained in the following three sections.

(2) A detailed analysis of the route should be made using contour maps of the high terrain and plotting the highest points within the prescribed corridor's width along the route. The next step is to determine whether it is possible to maintain level flight with one engine inoperative 1000 ft above the highest point of the crossing. If this is not possible, or if the associated weight penalties are unacceptable, a driftdown procedure should be worked out, based on engine failure at the most critical point and clearing critical obstacles during the driftdown by at least 2000 ft. The minimum cruise altitude is determined by the intersection of the two driftdown paths, taking into account allowances for decision making (see Figure 1). This method is time consuming and requires the availability of detailed terrain maps.

(3) Alternatively, the published minimum flight altitudes (Minimum En route Altitude, MEA, or Minimum Off-Route Altitude, MORA or Grid MORA) may be used for determining whether one engine inoperative level flight is feasible at the minimum flight altitude or if it is necessary to use the published minimum flight altitudes as the basis for the driftdown construction. This procedure avoids a detailed high terrain contour analysis but may be more penalising than taking the actual terrain profile into account as in para 2.

(4) In order to comply with A8(c), one means of compliance is the use of MORA and, with A8(d), MEA provided that the aeroplane meets the navigational equipment standard assumed in the definition of MEA.

A9 En-route – Aeroplanes With Three Or More Engines, Two Engines Inoperative

(a) An operator shall ensure that at no point along the intended track will an aeroplane having three or more engines be more than 90 minutes, at the all-engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met unless it complies with sub-sections (b) to (f) below.

(b) The two engines inoperative en-route net flight path data must permit 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 and come to a complete stop when using the prescribed procedure for a landing with two engines inoperative. The net flight path must clear vertically, by at least 2 000 ft all terrain and obstructions along the route within 9·3 km (5 nm) on either side of the intended track. At altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data must be taken into account. If the navigational accuracy does not meet the 95% containment level, an operator must increase the width margin given above to 18·5 km (10 nm).

(c) The two engines are assumed to 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 in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.

(d) The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.

(e) Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

(f) The expected mass of the aeroplane at the point where the two engines are assumed to fail must not be 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 least 1 500 ft directly over the landing area and thereafter to fly level for 15 minutes.

A10 Landing – Destination and Alternate Aerodromes (see A11(f))

(a) An operator shall ensure that the landing mass of the aeroplane does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome allowing a missed approach (approach configuration: flaps for approach, gears up) gradient of atleast 2.5%.

(b) For all instrument approaches (approach configuration: flaps for approach, gears up), a one engine out missed approach gradient of 2·5% for twin engine airplanes, 2.7% for 3 engine airplanes and 3 % for four engine airplane is required.

(c) In case the missed approach gradient (approach configuration: flaps for approach, gears up) for a particular runway requires a higher gradient (more than 2.5%) then the approach mass must allow such a higher gradient.

(d) The required missed approach gradient may not be achieved by all aeroplanes when operating at or near maximum certificated landing mass and in engine-out conditions. Operators of such aeroplanes should consider mass, altitude and temperature limitations and wind for the missed approach. As an alternative method, an increase in the decision altitude/height or minimum descent altitude/height and/or a contingency procedure (see A5(f)) providing a safe route and avoiding obstacles, can be approved.

A11 Landing – Dry Runways (see A11(f))

(a) An operator shall ensure that 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:

(1) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

(2) For turbo-propeller powered aeroplanes, within 70% of the landing distance available;

(3) For Steep Approach procedures the Authority may approve the use of landing distance Data factored in accordance with sub-sections (a)(1) and (a)(2)

above as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft. (see A14)

(4) When showing compliance with sub-sections (a)(1) and (a)(2) above, the Authority may exceptionally approve, when satisfied that there is a need (see A15), the use of Short Landing Operations in accordance with A15 and A16 together with any other supplementary conditions that the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

(b) When showing compliance with sub-section (a) above, an operator must take account of the following:

(1) The altitude at the aerodrome;

(2) Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and

(3) The runway slope in the direction of landing if greater than +/-2%.

(c) When showing compliance with sub-section (a) above, it must be assumed that:

(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 considering other conditions such as landing aids and terrain. (See A11(g))

(d) If an operator is unable to comply with sub-section (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be despatched if 2 alternate aerodromes are designated which permit full compliance with sub-sections (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the pilot-in-command must satisfy himself that a landing can be made in full compliance with A10 and sub-sections (a) and (b) above.

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

(f) In showing compliance with A10 and A11, the operator should use either pressure altitude or geometric altitude for his operation and this should be reflected in the Operations Manual.

(g) There are two considerations in determining the maximum permissible landing mass at the destination and alternate aerodromes.

(1) Firstly, the aeroplane mass will be such that on arrival the aeroplane can be landed within 60%or 70% (as applicable) of the landing distance available on the most favourable (normally the longest)runway in still air. Regardless of the wind conditions, the maximum landing mass for an aerodrome/aeroplane configuration at a particular aerodrome, cannot be exceeded.

(2) Secondly, consideration should be given to anticipated conditions and circumstances. The expected wind at the time of arrival, or ATC and noise abatement procedures, may indicate the use of a different runway. These factors may result in a lower landing mass than that permitted under para(1) above, in which case, to show compliance with sub-section(a), despatch should be based on this lesser mass.

A12 Landing – Wet and contaminated runways

(a) An operator shall ensure that 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:

(i) Required landing distance for planning

= 60%(jet eng)/70%(prop) +15% Factor of the required landing distance,

(ii) Required landing distance for en-route/actual landing

= Un-factored Landing Distance + correction for contamination +correction for the system failure (if any) + 15% Factor

Note: The landing distance as calculated for actual landing shall never be less than that of (i) above.

(b) If the performance data has been determined on the basis of measured runway friction coefficient (see A1(b)), the operator should use a procedure correlating the measured runway friction coefficient and the effective braking coefficient of friction of the aeroplane type over the required speed range for the existing runway conditions.

PERFORMANCE CLASS-B

B1 General

(a) Except as provided in (b) & (c), single-engine aeroplanes shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure

(b) In approving operations by single-engine turbine-powered aeroplanes at night and/or in IMC, the CAA shall ensure that the airworthiness certification of the aeroplane is appropriate and that the overall level of safety intended by the provisions of Annexes 6 and 8 is provided by:

- i) The reliability of the turbine engine;
- ii) The operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes; and
- iii) Equipment and other requirements provided in accordance with Appendix 1&2.

(c) All single-engine turbine-powered aeroplanes operated at night and/or in IMC shall have an engine trend monitoring system, and those aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2005 shall have an automatic trend monitoring system.

(d) An operator shall treat two-engine aeroplanes which do not meet the climb requirements of section B2(b) as single-engine aeroplanes.

B2 Take-off and Landing Climb

(a) Take-off Climb

(1) All Engines Operating

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

(A) Take-off power on each engine;

(B) 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;

(C) The wing flaps in the take-off position(s); and

(D) A climb speed not less than the greater of 1.1 VMC and 1.2 VS1.

(2) One Engine Inoperative

(i) The steady gradient of climb at an altitude of 400 ft above the take-off surface must be measurably positive with:

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

(B) The remaining engine at take-off power;

(C) The landing gear retracted;

(D) The wing flaps in the take-off position(s); and

(E) A climb speed equal to that achieved at 50 ft.

(ii) The steady gradient of climb must be not less than 0.75% at an altitude of 1500 ft above the take-off surface with:

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

(B) The remaining engine at not more than maximum continuous power;

(C) The landing gear retracted;

(D) The wing flaps retracted; and

(E) A climb speed not less than 1.2 VS1.

(b) Landing Climb

(1) All Engines Operating

(i) The steady gradient of climb must be at least 2.5% with:

(A) Not more than the power or thrust that is available 8 seconds after initiation of movement of the power controls from the minimum flight idle position;

(B) The landing gear extended;

(C) The wing flaps in the landing position; and

(D) A climb speed equal to VREF.

(2) One engine Inoperative

(i) The steady gradient of climb must be not less than 0.75% at an altitude of 1500 ft above the landing surface with:

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

(B) The remaining engine at not more than maximum continuous power;

(C) The landing gear retracted;

(D) The wing flaps retracted; and

(E) A climb speed not less than 1.2 VS1.

B3 Take-off

(a) An operator shall ensure that the take-off mass does not exceed the maximum take-off mass specified in the Aeroplane Flight Manual for the pressure altitude and the ambient temperature at the aerodrome at which the take-off is to be made.

(b) An operator shall ensure that the unfactored take-off distance, as specified in the Aeroplane Flight Manual does not exceed:

(1) When multiplied by a factor of 1.25, the take-off run available; or

(2) When stopway and/or clearway is available, the following:

(i) The take-off run available;

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

(iii) When multiplied by a factor of 1.3, the accelerate-stop distance available.

(c) When showing compliance with sub-section (b) above, an operator shall take account of the following:

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

(2) The pressure altitude at the aerodrome;

(3) The ambient temperature at the aerodrome;
(4) The runway surface condition and the type of runway surface (see B4(a));
(5) The runway slope in the direction of take-off (see B4(b)); and
(6) Not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

B4 Take-Off - Performance Correction Factors

(a) Surface condition and the type of runway surface:

(1) Due to the inherent risks, operations from contaminated runways are inadvisable, and should be avoided whenever possible. Therefore, it is advisable to delay the take-off until the runway is cleared. Where this is impracticable, the pilot-in-command should also consider the excess runway length available including the criticality of the overrun area.

(2) Unless otherwise specified in the Aeroplane Flight Manual or other performance or operating manuals from the manufacturers, the variables affecting the take-off performance and the associated factors that should be applied to the Aeroplane Flight Manual data are shown in the table below. They should be applied in addition to the operational factors as prescribed in sub-section B3(b).

SURFACE TYPE	CONDITION	FACTOR
Grass (on firm soil) up to 20 cm long	Dry	1·20
	Wet	1·30
Paved	Wet	1·00

Notes:

1. The soil is firm when there are wheel impressions but no rutting.
2. When taking off on grass with a single engined aeroplane, care should be taken to assess the rate of acceleration and consequent distance increase.
3. When making a rejected take-off on very short grass which is wet, and with a firm subsoil, the surface may be slippery, in which case the distances may increase significantly.

(b) Runway Slope: Unless otherwise specified in the Aeroplane Flight Manual, or other performance or operating manuals from the manufacturers, the take-off distance should be increased by 5% for each 1% of upslope except that correction factors for runways with slopes in excess of 2% require the acceptance of the Authority.

B5 Take-off Obstacle Clearance - Multi-Engined Aeroplanes

(a) An operator shall ensure that the take-off flight path of aeroplanes with two or more engines, determined in accordance with this sub-section, 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 except as provided in sub-section s (b) and (c) below. When showing compliance with this sub-section (see Section B6) it must be assumed that:

(1) The take-off flight path begins at a height of 50 ft above the surface at the end of the take-off distance required by section B3(b) and ends at a height of 1500 ft above the surface;
(2) The aeroplane is not banked before the aeroplane has reached a height of 50 ft 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 purpose of avoiding obstacles is expected to be lost;
(4) The gradient of the take-off flight path from 50 ft to the assumed engine failure height is equal to the average all-engine 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-section (4) above 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.

(b) When showing compliance with sub-section (a) above for those cases where the intended flight path does not require track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:
(1) 300 m, if the flight is conducted under conditions allowing visual course guidance navigation, or if navigational aids are available enabling the pilot to maintain the intended flight path with the same accuracy (see B6); or
(2) 600 m, for flights under all other conditions.

(c) When showing compliance with sub-section (a) above for those cases where the intended flight path requires track changes of more than 15°, an operator need not consider those obstacles which have a lateral distance greater than:
(1) 600 m for flights under conditions allowing visual course guidance navigation (see B6);
(2) 900 m for flights under all other conditions.

(d) When showing compliance with sub-section s (a), (b) and (c) above, an operator must take account of the following:
(1) The mass of the aeroplane at the commencement of the take-off run;
(2) The pressure altitude at the aerodrome;
(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.

B6 Take-off Flight Path - Visual Course Guidance Navigation

In order to allow visual course guidance navigation with reference to B5(b)(1) & (c)(1), an operator must ensure that the weather conditions prevailing at the time of operation including ceiling and visibility, are such that the obstacle and/or ground reference points can be seen and identified. The Operations Manual must specify, for the aerodrome(s) concerned, the minimum weather conditions, which enable the flight crew to continuously determine and maintain the correct flight path with respect to ground reference points, so as to provide a safe clearance with respect to obstructions and terrain as follows:

(a) The procedure must be well defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;
(b) The procedure must be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;
(c) A written and/or pictorial description of the procedure must be provided for crew use; and
(d) The limiting environmental conditions must be specified (e.g. wind, cloud, visibility, day/night, ambient lighting, obstruction lighting).

B7 Obstacle Clearance in Limited Visibility

(a) The intent of the complementary requirements of section B5 is to enhance safe operation with Performance Class B aeroplanes in conditions of limited visibility. Unlike the Performance Class A Airworthiness requirements, those for Performance Class B do not necessarily provide for engine failure in all phases of flight. It is accepted that performance accountability for engine failure need not be considered until a height of 300 ft is reached.

(b) The weather minima up to and including 300 ft imply that if a take-off is undertaken with minima below 300 ft a one engine inoperative flight path must be plotted starting on the all-engine take-off flight path at the assumed engine failure height. This path must meet the vertical and lateral obstacle clearance specified in section B5.

(c) Should engine failure occur below this height, the associated visibility is taken as being the minimum which would enable the pilot to make, if necessary, a forced landing broadly in the direction of the take-off. At or below 300 ft, a circle and land procedure is extremely inadvisable. If the assumed engine failure height is more than 300 ft, the visibility must be at least 1500 m and, to allow for manoeuvring, the same minimum visibility should apply whenever the obstacle clearance criteria for a continued take-off cannot be met.

B8 En-Route - Multi-engined aeroplanes

(a) An operator shall ensure that the aeroplane, in the meteorological conditions expected for the flight, and in the event of the failure of one engine, with the remaining engines operating within the maximum continuous power conditions specified, is capable of continuing flight at or above the relevant minimum altitudes for safe flight stated in the Operations Manual to a point 1000 ft above an aerodrome at which the performance requirements can be met.

(b) When showing compliance with sub-section (a) above:
   (1) The aeroplane must not be assumed to be flying at an altitude exceeding that at which the rate of climb equals 300 ft per minute with all engines operating within the 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%.

(c) The altitude at which the rate of climb equals 300 ft per minute is not a restriction on the maximum cruising altitude at which the aeroplane can fly in practice, it is merely the maximum altitude from which the driftdown procedure can be planned to start.

(d) Aeroplanes may be planned to clear en-route obstacles assuming a driftdown procedure, having first increased the scheduled en-route one engine inoperative descent data by 0·5% gradient.

B9 En-Route - Single-engine aeroplanes

(a) An operator shall ensure that the aeroplane, in the meteorological conditions expected for the flight, and in the event of engine failure, is capable of reaching a place at which a safe forced landing can be made. Unless otherwise specified by the Authority, this point should be 1000ft above the intended landing area. For landplanes, a place on land is required, unless otherwise approved by the Authority.

(b) When showing compliance with sub-section (a) above:
   (1) The aeroplane must not be assumed to be flying, with the engine operating within the maximum continuous power conditions specified, at an altitude exceeding that at which the rate of climb equals 300 ft per minute; and

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

(c) (1) In the event of an engine failure, single-engine aeroplanes have to rely on gliding to a point suitable for a safe forced landing. Such a procedure is clearly incompatible with flight above a cloudlayer which extends below the relevant minimum safe altitude.

(2) Operators should first increase the scheduled engine-inoperative gliding performance data by 0·5% gradient when verifying the en-route clearance of obstacles and the ability to reach a suitableplace for a forced landing.

(3) The altitude at which the rate of climb equals 300 ft per minute is not a restriction on the maximum cruising altitude at which the aeroplane can fly in practice, it is merely the maximum altitude from which the engine-inoperative procedure can be planned to start.

B10 Landing - Destination and Alternate Aerodromes

(a) An operator shall ensure that the landing mass of the aeroplane does not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

(b) In showing compliance with B10 (a) & B11, the operator should use either pressure altitude or geometric altitude for his operation and this should be reflected in the Operations Manual.

(c) Unless otherwise specified in the Aeroplane Flight Manual, or other performance or operating manuals from the manufacturers, the variable affecting the landing performance and the associated factor that should be applied to the Aeroplane Flight Manual data is shown in the table below. It should be applied in addition to the operational factors as prescribed in B12(a).

SURFACE TYPE	FACTOR
Grass (on firm soil up to 20 cm long)	1·15

NOTE: The soil is firm when there are wheel impressions but no rutting

(d) Unless otherwise specified in the Aeroplane Flight Manual, or other performance or operating manuals from the manufacturer, the landing distances required should be increased by 5% for each 1% of downslope except that correction factors for runways with slopes in excess of 2% need the acceptance of the Authority.

B11 Landing – Dry runway

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

(1) The Authority may approve the use of landing distance data factored in accordance with this section based on a screen height of less than 50 ft, but not less than 35 ft.

(b) When showing compliance with sub-section (a) above, an operator shall take account of the following:

(1) The altitude at the aerodrome;

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

(3) The runway surface condition and the type of runway surface (See B9(c)); and
(4) The runway slope in the direction of landing (See B9(d))

(c) For despatching an aeroplane in accordance with sub-section (a) above, it must be assumed that:
(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 considering other conditions such as landing aids and terrain. There two considerations in determining the maximum permissible landing mass at the destination and alternate aerodromes:
(i) The aeroplane mass will be such that on arrival the aeroplane can be landed within 70% of the landing distance available on the most favourable (normally the longest) runway in still air. Regardless of the wind conditions, the maximum landing mass for an aerodrome/aeroplane configuration at a particular aerodrome, cannot be exceeded.
(ii)The expected wind at the time of arrival, or ATC and noise abatement procedures, may indicate the use of a different runway. These factors may result in a lower landing mass than that permitted under section 2 above, in which case, to show compliance with B10(a), despatch should be based on this lesser mass.

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

B12 Landing - Wet and Contaminated Runways

(a) An operator shall ensure that 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 equal to or exceeds the required landing distance, determined in accordance with B11, multiplied by a factor of 1.15.

(b) An operator shall ensure that 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, determined by using data acceptable to the Authority for these conditions, does not exceed the landing distance available.

(c) A landing distance on a wet runway shorter than that required by sub-section (a) above, may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

(d) Landing on Wet Grass Runways
(1) When landing on very short grass which is wet, and with a firm subsoil, the surface may be slippery, in which case the distances may increase by as much as 60% (1.60 factor).
(2) As it may not be possible for a pilot to determine accurately the degree of wetness of the grass, particularly when airborne, in cases of doubt, the use of the wet factor (1.15) is recommended.

PERFORMANCE CLASS - C

C1 General

An operator shall ensure that, for determining compliance with the requirements of this Class, the approved performance Data in the Aeroplane Flight Manual is followed. Incase this data is considered insufficient; it must be supplemented with additional data acceptable to the Authority. Presently, no aircraft with performance class C is being operated in Pakistan. However, in case an aircraft with this class is brought on Pakistan Register, the decision to accept the presented data shall be made on case to case basis.

Signed
Director General,
Civil Aviation Authority

Date: , March 2006

Appendix- A
ANO No. 91.0029

Additional Requirements For Approved Operations
By
Single-Engine Turbine-Powered Aeroplanes
At Night And/Or In Instrument Meteorological Conditions (IMC)

Airworthiness and operational requirements provided shall satisfy the following:

1. Turbine engine reliability

1.1 Turbine engine reliability shall be shown to have a power loss rate of less than 1 per 100,000 engine hours.

Note.— Power loss in this context is defined as any loss of power, the cause of which may be traced to faulty engine or engine component design or installation, including design or installation of the fuel ancillary or engine control systems.

1.2 The operator shall be responsible for engine trend monitoring.

1.3 To minimize the probability of in-flight engine failure, the engine shall be equipped with:

a) An ignition system that activates automatically, or is capable of being operated manually, for take-off and landing, and during flight, in visible moisture;
b) A magnetic particle detection or equivalent system that monitors the engine, accessories gearbox, and reduction gearbox, and which includes a flight deck caution indication; and
c) An emergency engine power control device that permits continuing operation of the engine through a sufficient power range to safely complete the flight in the event of any reasonably probable failure of the fuel control unit.

2. Systems and equipment

Single-engine turbine-powered aeroplanes approved to operate at night and/or in IMC shall be equipped with the following systems and equipment intended to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

a) Two separate electrical generating systems, each one capable of supplying all probable combinations of continuous in-flight electrical loads for instruments, equipment and systems required at night and/or in IMC;
b) A radio altimeter;
c) An emergency electrical supply system of sufficient capacity and endurance, following loss of all generated power, to as a minimum:
    i) Maintain the operation of all essential flight instruments, communication and navigation systems during a descent from the maximum certificated altitude in a glide configuration to the completion of a landing;
    ii) Lower the flaps and landing gear, if applicable;
    iii) Provide power to one pitot heater, which must serve an air speed indicator clearly visible to the pilot;
    iv) Provide for operation of the landing light specified in 2 j);
    v) Provide for one engine restart, if applicable; and
    vi) Provide for the operation of the radio altimeter;
d) Two attitude indicators, powered from independent sources;
e) A means to provide for at least one attempt at engine re-start;
f) Airborne weather radar;
g) A certified area navigation system capable of being programmed with the positions of aerodromes and safe forced landing areas, and providing instantly available track and distance information to those locations;
h) For passenger operations, passenger seats and mounts which meet dynamically-tested performance standards and which are fitted with a shoulder harness or a safety belt with a diagonal shoulder strap for each passenger seat;
i) In pressurized aeroplanes, sufficient supplemental oxygen for all occupants for descent following engine failure at the maximum glide performance from the maximum certificated altitude to an altitude at which supplemental oxygen is no longer required;
j) A landing light that is independent of the landing gear and is capable of adequately illuminating the touchdown area in a night forced landing; and

k) An engine fire warning system.

3. Minimum equipment list

The CAA shall require the minimum equipment list of an operator approved in accordance with this ANO to specify the operating equipment required for night and/or IMC operations, and for day/VMC operations.

4. Flight manual information

The flight manual shall include limitations, procedures, approval status and other information relevant to operations by single-engine turbine-powered aeroplanes at night and/or in IMC.

5. Event reporting

5.1 An operator approved for operations by single-engine turbine-powered aeroplanes at night and/or in IMC shall report all significant failures, malfunctions or defects to the CAA who in turn will notify the State of Design.

5.2 The CAA shall review the safety data and monitor the reliability information so as to be able to take any actions necessary to ensure that the intended safety level is achieved. The CAA will notify major events or trends of particular concern to the appropriate Type Certificate Holder and the State of Design.

6. Operator planning

6.1 Operator route planning shall take account of all relevant information in the assessment of intended routes or areas of operations, including the following:

a) The nature of the terrain to be overflown, including the potential for carrying out a safe forced landing in the event of an engine failure or major malfunction;
b) Weather information, including seasonal and other adverse meteorological influences that may affect the flight; and
c) Other criteria and limitations as specified by the CAA.

6.2 An operator shall identify aerodromes or safe forced landing areas available for use in the event of engine failure, and the position of these shall be programmed into the area navigation system.

7. Flight crew experience, training and checking

7.1 The CAA shall prescribe the minimum flight crew experience required for night/IMC operations by single-engine turbine-powered aeroplanes.

7.2 An operator’s flight crew training and checking shall be appropriate to night and/or IMC operations by single-engine turbine-powered aeroplanes, covering normal, abnormal and emergency procedures and, in particular, engine failure, including descent to a forced landing in night and/or in IMC conditions.

8. Route limitations over water

The CAA shall apply route limitation criteria for single-engine turbine-powered aeroplanes operating at night and/or in IMC on over water operations if beyond gliding distance from an area suitable for a safe forced landing/ditching having regard to the characteristics of the aeroplane, seasonal weather influences, including likely sea state and temperature, and the availability of search and rescue services.

9. Operator certification or validation

The operator shall demonstrate the ability to conduct operations by single-engine turbine-powered aeroplanes at night and/or in IMC through a certification and approval process specified by the CAA.