Chapter 16.

JAR-OPS 1

Navigation for Long Range Flights

JAR-OPS 1.240 - Routes and Areas of Operation

a. An operator has to ensure that operations are only conducted along such routes or in areas, for which:

i. Ground facilities and services, including meteorological services, are provided which are adequate for the planned operation;

ii. The performance of the aeroplane intended to be used is adequate to comply with minimum flight altitude requirements;

iii. The equipment of the aeroplane intended to be used meets the minimum requirements for the planned operation;

iv. Appropriate maps and charts are available;

v. If two-engined aeroplanes are used, adequate aerodromes are available within the time/distance limitations.

vi. If single-engine aeroplanes are used, surfaces are available which permit a safe forced landing to be executed.

b. The operations have to comply with any restriction on the routes or the areas of operation, imposed by the Authority.

JAR-OPS 1.290 - Flight Preparation

a. The operator ensures that an operational flight plan is completed for each intended flight.

b. The commander cannot commence a flight unless he is satisfied that:

i. The aeroplane is airworthy;

ii. The aeroplane is not operated contrary to the provisions of the Configuration Deviation List (CDL);

iii. The instruments and equipment required for the flight are available;

iv. The instruments and equipment are in operable condition except as provided in the MEL;

v. Those parts of the operations manual which are required for the flight are available;

vi. The documents, additional information and forms required are on board;

vii. Current maps, charts and associated documentation or equivalent data are available to cover the intended operation of the aeroplane including any diversion which may reasonably be expected;

viii. Ground facilities and services required for the planned flight are available and adequate;

ix. The provisions specified in the operations manual in respect of fuel, oil and oxygen requirements, minimum safe altitudes, aerodrome operating minima and availability of alternate aerodromes, where required, can be complied with for the planned flight;

x. The load is properly distributed and safely secured;

xi. The mass of the aeroplane, at the commencement of take-off roll, will be such that the flight is within the specified performance limitations; and

xii. Any operational limitation in addition to those covered by sub-paragraphs (ix) and (xi) above can be complied with.

JAR-OPS 1.220 – Authorisation of Aerodromes by Operators

The operator can only authorise the use of aerodromes that are adequate for the type of aeroplane and operation concerned.

IEM OPS 1.220 - Authorisation of Aerodromes

When choosing an aerodrome the operator should take account of the following:

Adequate Aerodrome An adequate aerodrome is an aerodrome which the operator considers to be satisfactory, taking account of the applicable performance requirements and runway characteristics. In addition, it should be anticipated that, at the expected time of use, the aerodrome will be available and equipped with necessary ancillary services, such as ATS, sufficient lighting, communications, weather reporting, navaids and emergency services.

a. For an ETOPS en-route alternate aerodrome, the following additional points should be considered.

i. The availability of an ATC facility; and

ii. The availability of at least one letdown aid (ground radar is acceptable) for an instrument approach.

JAR-OPS 1.241 - Operation in Defined Airspace with Reduced Vertical Separation Minima (RVSM)

An operator cannot operate an aeroplane without RVSM approval where the vertical separation minimum of 300m (1000ft) applies unless approved to do so by the Authority.

JAR-OPS 1.243 - Operation in Areas with Specific Navigation Performance Requirements.

An operator cannot operate aeroplanes in MNPS, RNP or RNAV airspace without the approval of the authority.

JAR-OPS 1.245 - Maximum Distance from an Adequate Aerodrome for Two-Engined Aeroplanes without an ETOPS Approval

a. Unless specifically approved by the Authority in accordance with ETOPS Approval, an operator cannot operate a two-engined aeroplane over a route which contains a point further from an adequate aerodrome than, in the case of:

Performance Class A aeroplanes with either:

i. A maximum approved passenger seating configuration of 20 or more; or

ii. A maximum take-off mass of 45 360kg or more,

the distance flown in 60 minutes at the one-engine-inoperative cruise speed determined in accordance with subparagraph (b) below;

Performance Class A aeroplanes with either:

i. A maximum approved passenger seating configuration of 19 or less; or

ii. A maximum take-off mass of less than 45 360kg,

the distance flown in 120 minutes, or if approved by the authority up to 180 minutes for turbojet aeroplanes, at the one-engine-inoperative cruise speed determined in accordance with subparagraph (b) below;

Performance Class B or C aeroplanes:

i. The distance flown in 120 minutes at the one-engine-inoperative cruise speed determined in accordance with subparagraph (b) below; or

ii. 300 nautical miles,

whichever is less.

b. The operator determines a speed for the calculation of the maximum distance to an adequate aerodrome for each two-engined aeroplane type operated, not exceeding V_{MO}, based upon the true airspeed that the aeroplane can maintain with one-engine-inoperative under the following conditions:

1. International Standard Atmosphere (ISA);

2. Level flight:

(i) For turbojet aeroplanes at:

- FL 170; or
- At the maximum flight level to which the aeroplane, with one engine inoperative, can climb, and maintain, using the gross rate of climb specified in the AFM,

  whichever is less.

ii. For propeller driven aeroplanes at:

- FL 80; or
- At the maximum flight level to which the aeroplane, with one engine inoperative, can climb, and maintain, using the gross rate of climb specified in the AFM,

  whichever is less.

3. Maximum continuous thrust or power on the remaining operating engine;
4. An aeroplane mass not less than that resulting from:

i Take-off at sea-level at maximum take-off mass; and

ii All engines climb to the optimum long range cruise altitude; and

iii All engines cruise at the long range cruise speed at this altitude, until the time elapsed since take-off is equal to the applicable threshold prescribed above.

c. The operator must ensure that the following data is included in the Operations Manual:

1. The one-engine-inoperative cruise speed determined in accordance with b above; and
2. The maximum distance from an adequate aerodrome determined in accordance with a and b above.

Note: The speeds and altitudes (flight levels) specified above are only intended to be used for establishing the maximum distance from an adequate aerodrome.

JAR-OPS 1.060 - Ditching

The operator cannot operate an aeroplane with an approved passenger seating configuration of more than 30 passengers on overwater flights at a distance from land suitable for making an emergency landing:

- Greater than 120 minutes at cruising speed, or
- 400 nautical miles,

whichever is the lesser, unless the aeroplane complies with the ditching requirements prescribed in the applicable airworthiness code.

Performance Class A

JAR-OPS 1.500 - En-route - One Engine Inoperative

a. The operator ensures that with one engine inoperative an aeroplane flies above the minimum en-route altitude along the planned route. The net flight path must have a positive gradient at 1500 ft above the aerodrome where the landing is made after engine failure. If ice protection systems are required, 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 least 1000 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. The net flight path must clear vertically, by at least 2000 ft, all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track with regard to the conditions set out below:

i. The engine is assumed to fail at the most critical point along the route;

ii. Account is taken of the effects of winds on the flight path;

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

iv. The aerodrome where the aeroplane is assumed to land after engine failure must meet the following criteria:

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

(b) 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.

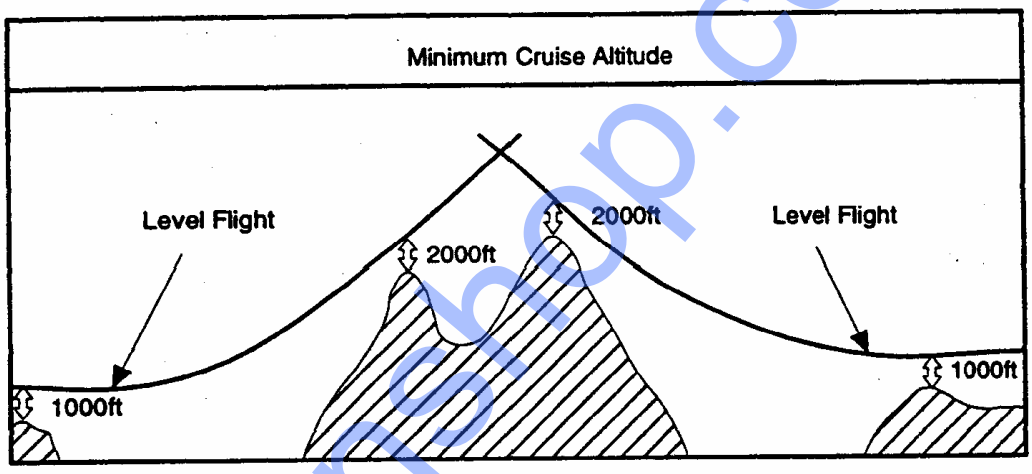
d. Where the navigation accuracy cannot meet the 95% containment level an operator can increase the width margins to 18.5 km (10 nm).

AMC OPS 1.500 - En-route - One Engine Inoperative

The high terrain or obstacle analysis required may be carried out in one of two ways, as explained below.

A detailed analysis of the route should be made using contour maps of the high terrain and plotting the highest points within the prescribed width margins. 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. This method is time consuming and requires the availability of detailed terrain maps.

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



Note: MEA or MORA normally provide the required 2000 ft obstacle clearance for driftdown. However, at and below 6000 ft altitude, MEA and MORA cannot be used directly as only 1000 ft. clearance is ensured.

JAR-OPS 1.505 - En-route - Aeroplanes with Three or More Engines, Two Engines Inoperative

a. The operator ensures that at no point along the intended track is an aeroplane with three or more engines 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 the details set out 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 safely. The net flight path must clear vertically, by at least 2000 ft all terrain and obstructions

along the route within 9.3 km (5 nm) on either side of the intended track. If ice protection systems are used then 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 to 18.5 km (10 nm).

c. The two engines are assumed to fail at the most critical point 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 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 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 1500 ft directly over the landing area and thereafter to fly level for 15 minutes.

Performance Class B

JAR-OPS 1.540 - En-Route - Multi-engined aeroplanes

a. The operator ensures that the aeroplane in the event of an engine failure, can fly above the relevant minimum altitudes for safe flight stated in the Operations Manual to a point 1000 ft above an aerodrome.

b. The following must be complied with:

i. The aeroplane is flying at an altitude where the rate of climb equals 300 ft per minute with all engines operating.

ii. The en-route gradient with one engine inoperative shall be the gross gradient of descent or climb respectively increased or decreased by a gradient of 0.5%.

JAR-OPS 1.542 - En-route - Single-Engine Aeroplanes

a. The aeroplane must be capable of reaching a place where a safe forced landing can be made. For landplanes, a place on land is required. This point should be 100 ft above the intended landing area.

b. The following limitations must be applied:

i. The aeroplane is flying at an altitude where the rate of climb is less than 300 ft per minute; and

ii. The assumed en-route gradient shall be the gross gradient of descent increased by a gradient of 0·5%.

Performance Class C

JAR-OPS 1.575 - En-Route - All Engines Operating

a. The aeroplane must be capable of a rate of climb of at least 300 ft per minute with all engines operating and be able to satisfy the engine inoperative limitations.

JAR-OPS 1.580 - En-Route - One Engine Inoperative

a. The operator ensures that the aeroplane will, in the event of a failure at any point on its route or on any planned diversion and with the other engine or engines operating, be capable of continuing the flight from the cruising altitude to an aerodrome where a landing can be made clearing obstacles within 9.3 km (5 nm) either side of the intended track by a vertical interval of at least:

(1) 1000 ft when the rate of climb is zero or greater; or

(2) 2000 ft when the rate of climb is less than zero.

b. The flight path must have a positive slope at an altitude of 450 m (1500 ft) above the aerodrome where the landing is assumed to be made after the failure of one engine.

c. The available rate of climb of the aeroplane is taken to be 150 ft per minute less than the gross rate of climb specified.

d. The width margins are increased to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

e. Fuel jettisoning is permitted if a safe procedure is used.

JAR-OPS 1.585 - En-Route - Aeroplanes with Three or More Engines, Two Engines Inoperative

a. At no point along the intended track, will an aeroplane with three or more engines be more than 90 minutes at the all-engine 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 the paragraphs below.

b. The two-engines inoperative flight path shown must permit the aeroplane to continue the flight clearing all obstacles within 9.3 km (5 nm) either side of the intended track by a vertical interval of at least 2000 ft, to an aerodrome at which the performance requirements are met.

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 away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.

d. 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 an altitude of a least 450 m (1500 ft) directly over the landing area and thereafter to fly level for 15 minutes.

e. The available rate of climb of the aeroplane shall be taken to be 150 ft per minute less than that specified.

f. The width margins are increased to 18·5 km (10 nm) if the navigational accuracy does not meet the 95% containment level.

g. Fuel jettisoning is permitted as long as the aircraft can reach the aerodrome with the required fuel reserves. A safe procedure must be used.

AMC OPS 1.580 - En-Route - One Engine Inoperative

Performance B aeroplanes have the same restrictions as Performance Class A aeroplanes.

JAR-OPS 1.295 - Selection of Aerodromes

a. The operator establishes procedures for the selection of destination and/or alternate aerodromes.

b. A take-off alternate is specified in the operational flight plan if it is not be possible to return to the aerodrome of departure for meteorological or performance reasons. The take-off alternate must be located within:

i. For two-engined aeroplanes in accordance with the AFM in still air standard conditions based on the actual take-off mass:

(a) One hour flight time at a one-engine-inoperative cruising speed; or

(b) The operators approved ETOPS diversion time up to a maximum of two hours at the one-engine-inoperative cruising speed; or

ii. Two hours flight time at a one-engine-inoperative cruising speed in still air standard conditions based on the actual take-off mass for three and four-engined aeroplanes; and

iii. If the AFM does not contain a one-engine-inoperative cruising speed, the speed to be used for calculation must be that which is achieved with the remaining engine(s) set at maximum continuous power.

c. The operator must select at least one destination alternate for each IFR flight unless:

i. Both:

(a) The duration of the planned flight from take-off to landing does not exceed 6 hours; and

(b) Two separate runways are available at the destination and the meteorological conditions prevailing are such that, for the period from one hour before until one hour after the expected time of arrival at destination, the ceiling will be at least 2000 ft or the circling height + 500 ft whichever is the greater. Visibility must be at least 5 km.; or

ii. The destination is isolated and no adequate destination alternate exists.

d. An operator must select two destination alternates when:

i. The appropriate weather reports or forecasts for the destination indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival, the weather conditions will be below the applicable planning minima; or

ii. No meteorological information is available.

ACJ-OPS 1.295 – Location of an En-Route Alternate Aerodrome

The en-route alternate should be located within a circle having a radius equal to 20% of the total flight plan distance:

- the centre of which lies on the planned routes at a distance from the destination of 25% of the total flight plan distance, or
- at least 20% of the total flight plan distance plus 50 nm

whichever is the greater.

All distances are to be calculated for still air conditions.

JAR-OPS 1.297 - Planning Minima for IFR Flights

a. **Planning minima for take-off alternates.** When selecting an alternate aerodrome the appropriate weather reports for a period commencing 1 hour before and ending 1 hour after the estimated time of arrival indicate the weather conditions will be at or above the applicable landing minima. The ceiling must be taken into account when the only approaches available are non-precision and/or circling approaches. Limitations related to one engine inoperative operations must be taken into account.

b. **Planning minima for destination and destination alternate aerodromes.** When selecting the destination aerodrome and/or destination alternate aerodrome(s) for 1 hour

before and ending 1 hour after the estimated time of arrival at the aerodrome, the weather conditions will be at or above the applicable planning minima as follows:

i. Planning minima for a destination aerodrome:

(a) RVR/visibility comply with the Aerodrome Operating Minima; and

(b) For a non-precision approach or a circling approach, the ceiling at or above MDH; and

ii. Planning minima for destination alternate aerodrome(s):

Type of approach	Planning Minima
Cat II and III	Cat I (Note 1)
Cat I	Non-precision (Notes 1 and 2)
Non-precision	Non-precision (Notes 1 and 2) plus 200 ft/1000 m
Circling	Circling

Table 1 Planning minima - En-route and destination alternates

Note 1 RVR.

Note 2 The ceiling must be at or above the MDH.

c. **Planning minima for an en-route alternate aerodrome.** When selecting an aerodrome as an en-route alternate aerodrome the appropriate weather reports indicate that, for a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome, the weather conditions will be at or above the planning minima above.

Separate Runways Runways on the same aerodrome can be considered to be separate when:

- They are separate landing surfaces which may overlay or cross such that if one runway is blocked it will not prevent the planned type of operations on the other runway, and
- Each of the landing surfaces has a separate approach procedure based on a separate aid

d. **Planning minima for an ETOPS en-route alternate.** When selecting ETOPS en-route alternate aerodrome unless the appropriate weather reports or forecasts for a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the aerodrome, the weather conditions will be at or above the planning minima prescribed below, and in accordance with the operator's ETOPS approval.

Type of Approach	**Planning Minima**	
(RVR/visibility required and ceiling if applicable)		
	Aerodrome with	
	at least 2 separate approach procedures based on 2 separate aids serving 2 separate runways	at least 2 separate approach procedures based on 2 separate aids serving 1 runway or at least 1 approach procedure based on 1 aid serving 1 runway
Precision Approach Cat II, III (ILS, MLS)	Precision Approach Cat I Minima	Non-Precision Approach Minima
Precision Approach Cat I (ILS, MLS)	Non-Precision Approach Minima	Circling minima or, if not available, non-precision approach minima plus 200 ft/1000 m
Non-Precision Approach	The lower of non-precision approach minima plus 200 ft/1000 m or circling minima	The higher of circling minima or non-precision approach minima plus 200 ft/1000 m
Circling Approach	Circling Minima	

Table 2 Planning minima – ETOPS

JAR-OPS 1.225 - Aerodrome Operating Minima

a. The operator specifies aerodrome operating minima for each departure, destination or alternate aerodrome authorised to be used.

b. Any increments imposed by the Authority must be added to the minima calculated above.

c. The minima for a specific type of approach and landing procedure are considered applicable if:

i. The ground equipment shown on the respective chart required for the intended procedure is operative;

ii. The aeroplane systems required for the type of approach are operative;

iii. The required aeroplane performance criteria are met; and

iv. The crew is qualified accordingly.

JAR-OPS 1.515 - Landing - Dry Runways (Performance Class A)

JAR-OPS 1.550 - Landing - Dry Runways (Performance Class B)

JAR-OPS 1.595 - Landing - Dry Runways (Performance Class C)

a. The operator ensures 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:

i. For turbo-jet powered aeroplanes, within 60% of the landing distance available; or

ii. For turbo-propeller powered aeroplanes, within 70% of the landing distance available; (All Performance B and C aircraft use 70%)

iii. For Steep Approach procedures a screen height of less than 50 ft, but not less than 35 ft may be used if the Authority gives permission.

b. The operator must take account of the following:

i. The altitude at the aerodrome;

ii. Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and

iii. The runway slope in the direction of landing if greater than ± 2%.

c. The following assumptions are made:

i. The aeroplane will land on the most favourable runway, in still air; and

ii. 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.

d. If an operator is unable to comply with (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with sub-paragraphs (a), (b) and (c).

Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR-OPS 1.510 and sub-paragraphs (a) and (b) above.

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

Landing - Wet and Contaminated Runways The LDA must be at least 115% of the required landing distance.

Steep Approach Procedures

Where a glideslope of greater than 4.5° is used then Steep Approach Procedures apply. Screen heights of less than 50 ft but not less than 35 ft can be approved providing:

- The AFM states the maximum glideslope angle.
- The aerodrome to be used must have at least a visual glidepath indicating system
- Weather minima must be specified for each approved runway. Consideration has to be given to:
  - The obstacles on the approach
  - The type of glidepath reference and runway guidance
  - The minimum visual reference required at DH/DA or MDH/MDA
  - Available airborne equipment
  - Pilot qualification and aerodrome familiarisation
  - AFM limitations
  - Missed approach criteria

Short Landing Operations

Where short landing operations are approved the following apply:

- The vertical distance between the path of the pilot's eye and the path of the lowest part of the wheels does not exceed 3 metres
- The visibility must not be less than 1.5 km. Wind limitations may also be specified

The above assumes that the aeroplane will cross over the beginning of the declared safe area at 50 ft.

Minimum Time Routes

A minimum time route is as the title says, the route which gives the shortest time between two points. This is not the straight line route but the route which takes into account ATC and airspace restrictions.

Establishment of Minimum En-Route Altitude (MEA)

MEA is based on the elevation of the highest point along the route segment concerned within a distance on either side of track as specified below:

Segment length up to 100 nm	10 nm (5 nm if in a TMA where navigational aids give a high degree of navigational accuracy)
Segment length more than 100 nm	10% of the segment length up to 60 nm

The MEA is calculated by using the following formula:

Elevation of the highest point plus the following increment:

Not above 5000 ft	1500 ft
Above 5000 ft but not above 10 000 ft	2000 ft
Above 10 000 ft	10% of the elevation plus 1000 ft

The resultant is then rounded up to the nearest 100 ft.

Fuel Policy

The following expands the fuel policy specified in Chapter 3. When an operator calculates the amount of fuel to be carried the following has to be taken into consideration:

The amount should be:

Taxy Fuel This should not be less than the amount expected to be used prior to take-off. Local conditions and APU consumption have to be taken into account.

Trip Fuel This includes:

- Take-off and climb fuel to take into account the expected departure routing
- Fuel from TOC to TOD
- The fuel from TOD to the point where the approach is initiated taking into account the expected arrival procedure
- Fuel for the approach and landing at the destination aerodrome

Contingency Fuel The higher of the following

- 5 minutes at holding speed at 1500 ft above the destination aerodrome in Standard conditions.

Or any of the following:

- 5% of the planned trip fuel or in the event of in-flight replanning 5% of the trip fuel for the remainder of the flight, or
- Not less than 3% of the planned trip fuel or in the event of in-flight replanning 5% of the trip fuel for the remainder of the flight provided that an en-route alternate is available, or
- An amount of fuel sufficient for 20 minutes flying time based on the trip fuel providing the operator has established a fuel monitoring programme, or
- An amount of fuel based on a statistical method approved by the authority which ensures an appropriate statistical coverage of the deviation from the planned to actual trip fuel.

    - The following values of statistical coverage have been decided:

        - 99% plus 3% of the trip fuel if the calculated flight time is less than 2 hours or more than 2 hours and no suitable en-route alternate is available
        - 99% coverage if the calculated flight time is more than 2 hours and a suitable en-route alternate is available
        - 90% coverage if:

            - the calculated flight time is greater than 2 hours
            - 2 separate runways are available at the destination, one of which is equipped with ILS/MLS. The weather conditions must comply with those of JAR-OPS 1.295 or the ILS/MLS is operational to Category II/III minima and the cloud base and visibility are better than 500 ft/2500 m.

Alternate Fuel Sufficient for:

Missed Approach	From the DA/DH or MDA/MDH at the destination aerodrome to the missed approach altitude
Climb	From missed approach altitude to the cruising level

Cruise From TOC to TOD

Descent From TOD to where the approach is initiated taking into account the expected arrival procedure

Approach and Landing

If in accordance with JAR-OPS two destination alternates are required the alternate fuel should be sufficient to the alternate which requires the greater amount of fuel.

Final Reserve Fuel

For Aeroplanes with Reciprocating Engines Fuel to fly for 45 minutes

For Aeroplanes with Turbine Power Units Fuel to fly for 30 minutes at holding speed at 1500 ft above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the alternate or destination when no alternate is required

Minimum Additional Fuel This fuel should permit:

- Holding for 15 minutes at 1500 ft above the aerodrome in standard conditions when a flight is operated without a destination alternate, and
- Following the failure of a power unit or the loss of pressurisation (based on the failure at the most critical point) the aeroplane to:
  - Descend as necessary and proceed to an adequate aerodrome
  - Hold for 15 minutes at 1500 ft above aerodrome elevation in standard conditions
  - Make an approach and landing

The additional fuel is only required when the previously stated fuels are not sufficient for the above.

Discretionary Fuel Extra fuel at the discretion of the commander. If the operator's fuel policy includes planning to a destination aerodrome via a decision point along the route the amount of fuel should be the greater of the two procedures below:

1. Taxy fuel

   Trip Fuel to the destination via the decision point

   Contingency fuel equal to not less than 5% of the estimated fuel consumption from the decision point to the destination aerodrome

Alternate fuel if a destination alternate is required

Final reserve fuel

Additional fuel

Extra fuel if required by the commander

2. Taxy fuel

Estimated fuel consumption from the departure aerodrome to a suitable en-route alternate via the decision point

Contingency fuel equal to not less than 5% of the estimated fuel consumption from the decision point to the destination aerodrome

Final reserve fuel

Additional fuel

Extra fuel if required by the commander

Isolated Aerodrome Procedures When planning to an isolated aerodrome for which a destination alternate does not exist the amount of fuel at departure should include:

- Trip fuel
- The contingency fuel stated on page 16-15
- Additional fuel if required which must not be less than:
  - For aeroplanes with reciprocating engines fuel to fly for 45 minutes plus 15% of the flight time planned to be spent at cruising level or 2 hours whichever is less, or
  - For aeroplanes with turbine power units fuel to fly for 2 hours at normal cruise consumption after arriving overhead the destination including final reserve fuel
- Extra fuel if required by the commander