



Civil Aviation Advisory
Publication

GUIDELINES FOR AIRCRAFT FUEL REQUIREMENTS

November 2006

This publication is only advisory but it gives a CASA preferred method for complying with the Civil Aviation Regulations (CARs) 1988.

It is not the only method, but experience has shown that if you follow this method you will comply with the Civil Aviation Regulations.

Always read this advice in conjunction with the appropriate regulations.

Contents ...

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The relevant regulations and other references

This publication should be read in conjunction with regulations 220 and 234 of the Civil Aviation Regulations (CARs) 1988.

Who this CAAP applies to

This CAAP applies to all operators of Australian aircraft.

Why this CAAP was written

This CAAP provides information and guidance on fuel requirements for aircraft required by regulations 220 and 234 of CAR 1988.

Status of this CAAP

This is the second CAAP to be written on this subject.

For further information

Telephone the CASA Office closest to you on 131757.

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2. Abbreviations.

AOC	Air Operators Certificate
CAO	Civil Aviation Order
CAR	Civil Aviation Regulations (1988)
ENR	En route
IFR	Instrument Flight Rules
INTER	Intermittent / Intermittently
NVFR	Night Vision Flight Rules
TEMPO	Temporary / Temporarily

3. Definitions.

3.1. In these guidelines a number of expressions have defined meanings. The following expressions have been so defined and they have the following meanings:

alternate aerodrome means an aerodrome specified in the flight plan to which a flight may proceed when it becomes inadvisable to land at, or continue toward, the aerodrome of intended landing.

destination aerodrome means the aerodrome to which a flight is planned.

fixed fuel reserve means an amount of fuel, expressed as a period of time holding at 1 500 feet above an aerodrome at standard atmospheric conditions, that may be used for unplanned manoeuvring in the vicinity of the aerodrome at which it is proposed to land, and that would normally be retained in the aircraft until the final landing.

fuel means the material that is burnt as the source of power for a flight and includes any other material (such as oil) that is consumed in the power-generation process.

holding fuel means an amount of fuel that will allow an aircraft to fly for a specified period of time, being an amount that is calculated at the holding rate established for the aircraft at a level not greater than flight level 200 and at a temperature not less than forecast.

reserve fuel means an amount of fuel on board an aircraft not being the amount that is required for the purposes of paragraphs 5 (a) and 6.1 (a) and subparagraphs 8.1 (a) (i) and 8.1 (b) (i).

variable fuel reserve means an amount of fuel on board an aircraft that is sufficient to provide for unexpected fuel consumption caused by factors other than a loss of pressurisation or an engine failure.

4. Matters to be considered when calculating fuel requirements.

4.1 When calculating the amount of fuel that may be required for a particular flight, allowance should always be made for the additional fuel that might be required because of:

- (a) forecast weather conditions en route and the additional fuel that is consumed during flight in icing conditions;
- (b) planned air traffic control routing (including departure and arrival procedures);
- (c) any delays resulting from traffic holding notified for:
 - (i) where an alternate aerodrome is required — that alternate aerodrome; or
 - (ii) where an alternate aerodrome is not required — the destination aerodrome;
- (d) contingencies of the kind referred to in section 8 in this CAAP.

5. How much fuel should be carried when an alternate aerodrome is not necessary?

5.1 Where it has been determined that an alternate aerodrome to the destination aerodrome is not necessary, the amount of fuel on board an aircraft at any particular point in the flight should be an amount that is sufficient:

- (a) to enable the aircraft to fly from that point to a height of 1 500 feet above the destination aerodrome, make an approach and land; and

- (b) to enable the aircraft to continue to fly at a cruising speed for a specified percentage of the time that it would take to fly in accordance with paragraph (a), being the percentage specified in Table 1 of this CAAP for that category and class of aircraft; and
- (c) to provide for contingencies of the kind described in section 6; and
- (d) to provide holding fuel to take account of any traffic delays of the kind mentioned in paragraph 4 (c); and
- (e) to provide the fixed fuel reserve that is specified in Table 2 of this CAAP.

6. How much fuel should be carried when an alternate aerodrome is required?

6.1 Subject to subsection 6.2, where it has been determined that an alternate aerodrome to the destination aerodrome is required, then the amount of fuel on board an aircraft at any particular point in the flight should be an amount that is sufficient:

- (a) to enable the aircraft
 - (i) to fly from that point to a height of 1 500 feet above the destination aerodrome; and
 - (ii) to make an approach to that aerodrome; and
 - (iii) to make a missed approach to that aerodrome; and
 - (iv) to fly to the alternate aerodrome; and
 - (v) to make an approach to that alternate aerodrome; and
 - (vi) to land at that alternate aerodrome; and
- (b) to enable the aircraft to continue to fly at a cruising speed for a specified percentage of the time that it would take to fly in accordance with paragraph (a), being the percentage specified in Table 1 of this CAAP for that category and class of aircraft; and
- (c) to provide for contingencies of the kind described in section 8; and
- (d) to provide holding fuel to take account of any traffic delays of the kind mentioned in paragraph 4 (c); and
- (e) to provide the fixed fuel reserve that is specified in Table 2 of this CAAP.

6.2 Where:

- (a) because of the forecast weather conditions at a destination aerodrome, it would normally be necessary to determine an alternate aerodrome; but

7. How much fuel is required when planning an en-route diversion to another aerodrome?

- (b) the forecast is annotated with the expression “INTER” or “TEMPO”;

then, for paragraph 6.1 (a), it is sufficient if the aircraft carries holding fuel in accordance with the Aeronautical Information Publication ENR 1.1 Section 72 rather than carrying an amount of fuel that would be calculated by the method to enable the aircraft to fly to an alternate aerodrome.

7.1 A flight to a destination aerodrome should not be commenced if the amount of fuel on board an aircraft is less than the amount that is required in sections 5 and 6 of this CAAP unless:

- (a) the flight is planned via an en route diversion point to another aerodrome that has been approved as an alternative destination for that flight; and
- (b) the amount of fuel on board the aircraft is sufficient to enable the aircraft to fly to that alternative destination in accordance with whichever of the fuel requirements set out in sections 5 and 6 is applicable; and
- (c) the aircraft continues to fly to the destination aerodrome from the diversion point only after it has been determined that the fuel on board the aircraft at that point is sufficient, in accordance with fuel requirements set out in sections 5 or 6 of this CAAP, to enable the aircraft to complete the flight to that destination aerodrome.

8. Contingencies which should be taken into account when calculating fuel requirements.

8.1 At any time after take off, the fuel on board an aircraft should be sufficient:

- (a) if there has been a loss of pressurisation — to enable the aircraft:
 - (i) to fly to a height of 1 500 feet above an aerodrome of a kind described in subsection 8.2, make an approach and land; and
 - (ii) to complete the flight and still have on board the fixed fuel reserve specified in Table 2 of this CAAP for that type of aircraft and that type of flight; and
- (b) if there has been an engine failure — to enable the aircraft:
 - (i) to fly to a height of 1 500 feet above an aerodrome of a kind described in subsection 8.2, make an approach and land; and
 - (ii) to continue to fly at a cruising speed for a specified percentage of the time that it would take to fly in accordance with subparagraph (i), being the percentage specified in Table 1 for that category and class of aircraft; and
 - (iii) to complete the flight and still have on board a fixed fuel reserve of 10 minutes.

8.2 The aerodrome referred to in subparagraphs 8.1 (a) (i) and 8.1 (b) (i) should be either:

- (a) for aircraft and operations of a type referred to in Civil Aviation Order (CAO) 20.7.1B — an “adequate aerodrome” within the meaning of CAO 20.7.1B; or
- (b) for all other types of aircraft and operations — an aerodrome that has been approved for normal operation of that type of aircraft and in respect of which the forecast weather is above the approved instrument approach minima.

8.2 Contingency operations for the contingencies referred to in subsection 8.1 are to be carried out in accordance with the procedures set out in the operator’s operations manual or approved flight manual.

9. What are the fuel requirements if a flight plan is amended in flight?

9.1 Where it is proposed to amend a flight plan during flight in order to replan the flight to another destination aerodrome, the fuel requirements set out in these guidelines in respect of the original destination aerodrome should be observed in respect of that other destination aerodrome.

10. Variable fuel reserve and fixed fuel reserve.

10.1 The variable fuel reserve that should be carried on an aircraft is set out in Table 1 of this CAAP.

10.2 The fixed fuel reserve that should be carried on an aircraft is set out in Table 2 of this CAAP.

11. Holders of air operator's certificates to specify fuel policy in operations manual.

11.1 The holders of Air Operator’s Certificates (AOCs) are reminded that regulation 220 of CAR 1988 requires an operator to include in their operations manuals specific instructions for the computation of the quantities of fuel to be carried on each route.

12. Establishing fuel on board.

12.1 Fuel gauges, particularly on smaller aircraft may occasionally be unreliable. In addition, except when the tank is full, it is extremely difficult to establish the quantity of fuel in a tank unless the aircraft is perfectly level and the manufacturer has provided an accurately graduated dipstick, sight gauge, drip gauge or tank tab. Any direct reading of a partially filled tank must be discounted or rounded down to a figure consistent with the next lower tab or marking unless:

- a) the aircraft is level; and
- b) the fuel is at or above a tab with a clearly established value; or
- c) the fuel gauge reading corresponds to a dipstick value.

13. Fuel quantity cross-check.

13.1 Unless assured that the aircraft tanks are completely full, or a totally reliable and accurately graduated dipstick, sight gauge, drip gauge or tank tab reading can be done, the pilot should endeavour to use the best available fuel quantity cross-check prior to starting. The cross-check should consist of establishing the fuel on board by at least two different methods such as

- a) Check of visual readings (tab, dip, drip, sight gauges) against fuel consumed indicator readings: or
- b) Having regard to previous readings, a check of electrical gauge or visual readings against fuel consumed indicator readings: or
- c) After refuelling, and having regard to previous readings, a check of electrical gauge or visual readings against the refuelling installation readings: or
- d) Where a Series of flights is undertaken by the same pilot and refuelling is not carried out at intermediate stops, cross-checks may be made by checking the quantity gauge readings against computed fuel on board and/or fuel consumed indicator readings, provided the particular system is known to be reliable.

Table 1
Variable fuel reserve

Aeroplanes and airships				Helicopters			
Category and class				Category and class			
Private and aerial work		Public transport and charter		Private and aerial work		Public transport and charter	
		Piston engined	Turbine engined propeller or jet				
Nil		15%	10%	Nil		15%	

Note: For flights with sectors of 3 hours or more between suitable aerodromes at which a safe landing can be made, it is recommended that private and aerial work flights carry a variable reserve of 10%.

Table 2
Fixed fuel reserve

Aeroplanes and airships		Helicopters	
Flight		Category	
V.F.R. and I.F.R.	V.F.R. and I.F.R.		
Piston engined	Turbine engined propeller or jet	V.F.R.	I.F.R.
45 mins	30 mins	20 mins	30 mins