

Flight Planning

Altimetry

Before commencing the descent, to ensure safe ground clearance we need to determine accurately the aircraft position.

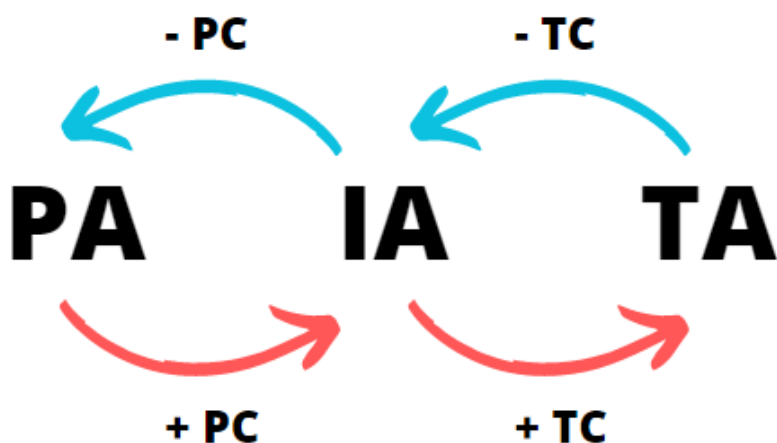
[PC] Pressure correction = $30 * (QNH-1013)$

[TC] Temperature correction = $\pm 4\%$ every $\pm 10^{\circ} \text{ C}$ (AGL/AAL, so use IA – altitude of the AD to correct TC)

PA = pressure altitude (FL)

IA = indicated altitude (altimeter)

TA = true altitude (AGL)



Fuel policy [BTT CAA FE]

Block fuel = Taxi + Trip + Contingency + Alternate + Additional + Final reserve + Extra

- Taxi fuel = engines start up + APU + taxi at departure aerodrome (not destination)
- Trip fuel (including any step climb)
- Contingency fuel is the higher of: fuel to fly 5 minutes at holding speed at 1500 ft
5% trip fuel
- Alternate includes the missed approach fuel for the alternate aerodrome
- Final reserve:
 - JET = 30 min at 1500 ft at holding speed in ISA condition (at alternate if given)
 - JET = as above +15 min if no destination alternate is planned
 - PROP = 45 min at 1500 ft at holding speed in ISA condition (at alternate if given)
- Additional: holding for 15 minutes at 1 500 ft (450 m) above destination aerodrome elevation in standard conditions, when a flight is operated without a destination alternate aerodrome.
- Extra: at commander or dispatcher discretion
- Reserve: Contingency + Alternate + Final reserve

Fuel penalty

Apply fuel penalty only if limited by Landing mass. Do NOT apply it if limited by Take-off mass.

Under-load * fuel penalty → to be added to final fuel

Example: +300 kg of fuel penalty each +1000 kg of fuel added = $UL * 300/1000$

Step 1 - Maximum TOM - Actual TOM

Step 2 - Maximum LM - Actual LM + Fuel Penalty

Step 3 - Tank capacity - Block fuel



The answer will be the lowest of these values

Tailwind and Headwind only affect Ground speed and NGM, but they don't affect TAS and NAM.

Extra Fuel

Smallest of:

- Regulated TOM – Actual TOM = RTOM – (Actual ZFM + TO Fuel)
- MLM – Landing Mass = MLM + Trip Fuel – (AZFM+TO Fuel)
- Tank Capacity – Block Fuel

Isolated aerodrome

An isolated aerodrome is one for which the **alternate and final reserve fuel required** to the nearest adequate destination alternate aerodrome **is more than:**

- PROP: 45 min + 15% flight time planned **at cruise** or 2h (the lesser)
- JET: 2h at cruise FF **above DEST, including final reserve fuel.**

Predetermined point procedure (PDP)

It provides an option to select an aerodrome as **destination alternate** which is at a distance from the planned destination that it **cannot be reached after first flying to the destination**.

It therefore **increases the maximum range** by reduction of mandatory fuel reserve.

If the operator's fuel policy includes planning to a destination alternate aerodrome where the distance between the destination aerodrome and the destination alternate aerodrome is such that a flight can only be routed via a predetermined point to one of these aerodromes, the amount of usable fuel, on board for departure, should be the greater of:

Destination

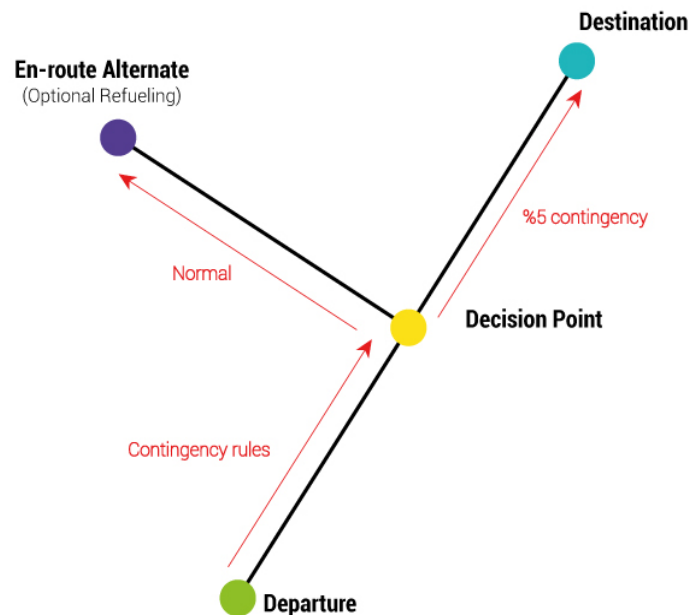
- Taxi
- Trip DEP – PDP – DEST
- Contingency
- Additional (> final reserve): JET: 2h at cruise FF **above DEST**
PROP: 45 min + 15% flight time planned **at cruise** or 2h (the lesser)
- extra by commander

Alternate

- Taxi
- Trip DEP – PDP – ALT
- Contingency
- Additional (> final reserve): JET: 30 min at holding FF **above ALT**
PROP: 45 min
- extra by commander

If the operator's fuel policy includes planning to an **isolated aerodrome**, the last possible point of diversion to any available en-route alternate (ERA) aerodrome should be used as the predetermined point.

Reduced contingency fuel procedure (RCF) or Decision Point Procedure (DPP)



It allows reducing the contingency fuel to uplift more traffic load.

Destination 1 + Decision point (DP) + Destination 2 (optional refuel destination)

Should be the greater of:

Destination 1

- Taxi
- Trip fuel to destination 1 via DP
- Contingency: 5% of estimated fuel from DP to destination 1
- Alternate fuel or no alternate if DP < 6h from destination 1
- Final reserve
- Additional^(*) + Extra fuel

Destination 2

- Taxi
- Trip fuel to destination 2 via DP
- Contingency: 5% of estimated fuel from Departure to destination 2
or
3% provided en-route alternate (ERA) aerodrome is available
- Alternate fuel or no alternate if DP < 6h from destination 2
- Final reserve
- Additional^(*) + Extra fuel

(*) Additional: **holding for 15 minutes** at 1 500 ft (450 m) above destination aerodrome elevation in standard conditions, when a flight is operated **without a destination alternate aerodrome**.

As **Decision Point** moves **closer to the destination**, the **contingency fuel decreases**.

Unless it states specifically that an ERA is present, use 5% contingency from DP to destination 1/2

Fuel ERA aerodrome should be located within a circle having:

a radius = 20% total flight plan distance

the center at 25% of the total flight plan distance

or

at least at 20% of the total flight plan distance + 50 NM, whichever is greater

PET (Point of Equal Time) - PSR (Point of Safe Return) – PNR (Point of No Return)

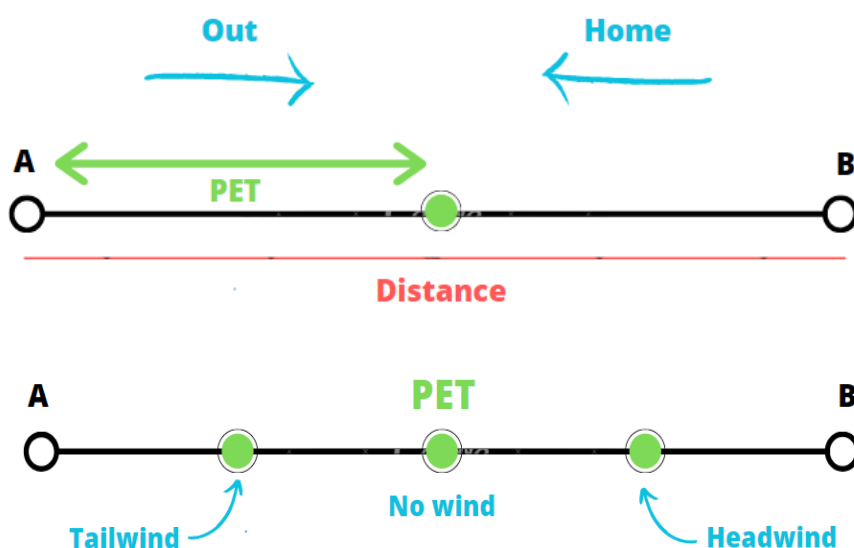
PET (or critical point) = equal time to continue to destination or return back at the point of departure.

$$PET = \frac{D * H}{O + H}$$

D = Distance A-B [NM]

O = GS A-B [kts]

H = GS B-A [kts]



- In still air (no wind) PET it is half way
- In case of wind, PET moves towards the wind

PSR (or PNR) = farthest point to return to the departure aerodrome with the required fuel reserve.

$$\text{Time to PSR [T]} = \frac{E * H}{O + H}$$

$$\text{Distance to PSR [D]} = \frac{E * O * H}{O + H}$$

E = Safe Endurance [h] = Total endurance – Final reserve

In still air PSR is the greatest. ANY wind component reduces PSR.

IFR

- Conditional route



G850 = identifier

2 = conditional route [CDR] (if there is a number)

- Category 1: Permanently Plannable CDR,
- Category 1: Non-Permanently Plannable CDR,
- Category 1: Not Plannable CDR.

- Area Navigation (RNAV) routes: L M N P [let me nut please]

- Not RNAV routes: A B G R [All girls ride boys]

} ATS

- RNAV routes: Q T Y O

- Not RNAV routes: H J V W

} NON ATS

Minimum Holding Altitude (MHA):

- < 3000 ft = 300 m
- 3000 - 5000 = 450 m
- > 5000 = 600 m

NOTAM

Used format: YYMMDD HH:mm

(23/03/05 16:14 is the 5th May 2023 at 4:14 pm UTC)

WEF = With Effect From

If planning an RNAV approach, verify satellites-based facilities are available at the ETA

EGNOS = European Geostationary Navigation Overlay System is a WAAS (Wide Area Augmentation System) used by aircraft for augmentation of the navigation system (increase position accuracy).

SBAS provides a high level of accuracy over wide areas. If EGNOS doesn't work, there is no SBAS available as no augmentation can be provided.

NANU = Notice to Navstar Users

NANU is an advisory message to inform users of a change in the GPS constellation. These messages are released 72 h in advance for orbit change or planned maintenance. So it is used to check GNSS availability.

Approach Type

- A: NPA, Minimum ≥ 250 ft
 - B: PA, Minimum < 250 ft
- SBAS has lower minima than Baro VNAV

Formulas

$$\text{Wind Correction Angle} = \frac{XW * 60}{TAS}$$

$$\text{Effective TAS: } ETAS = TAS * \cos(WCA) \quad [\text{Use ETAS instead of TAS if } WCA > 10^\circ]$$

$$ROC/ROD = \text{Climb Gradient (\%)} * GS = \% * GS * \frac{6076}{60} \quad [1 \text{ NM} = 6076 \text{ ft}] \quad | \quad [3\% = 0.03 \text{ or } \frac{3}{100}]$$

Climb Gradient (%) is always $>$ angle of climb

$$\text{Gradient (\%)} = 100 * \tan(\alpha)$$

$$\text{Specific Air Range } \left(\frac{NAM}{lbs_of_fuel} \right) = \frac{TAS}{FuelFlow} \quad \text{best to be fuel efficient}$$