Flight Planning and Monitoring

Eliott Johnson

VFR Navigation Plan

01 Flight Planning for IFR Flights

T = MOCA = Minimum Obstacle / Obstruction Clearance Altitude

a = MORA = Minimum Off Route Altitude

mountainous terrain
600 m (2000ft) – 8km

- MOC
  - < 3000 ft : 300 m
  - > 3000 ft and 5000 ft : 450 m
  - > 5000 ft (1500 m) : 600 m (2000 ft)

MSA (Minimum Sector Altitude)
- Gives 300m (1000 ft) obstacle clearance within 46 km (25 NM) of navaid

obstacle clearance requirement

MEA → Radio Signal coverage

MOCA
- 5 NM

MORA
- 10 NM

SID/STAR are **magnetic courses** to fly VOR

Fuel Planning

General
- Fuel consumption affected by
  - Altitude
  - Temperature
  - Power setting
  - Aircraft mass

- **Mass**
  - **1 kg = 2.2 lbs**
- **Volume**
  - **1 IG (Imperial Gallon) = 4.55 ℓ**
  - **1 USG = 3.785 ℓ**
  - 1 IG = 1.2 USG

Density = $\frac{m}{Volume}$

NAM = TAS · t   in still air   NAM = NGM
NGM = GS · t   in Headwind   NAM > NGM
                 in Tailwind   NAM < NGM

$\frac{NAM}{TAS} = \frac{NGM}{GS}$

NGM = NAM ± (Wind component × sector time [h])

- ⚠ a fuel flow in kg/h is not influenced by specific gravity

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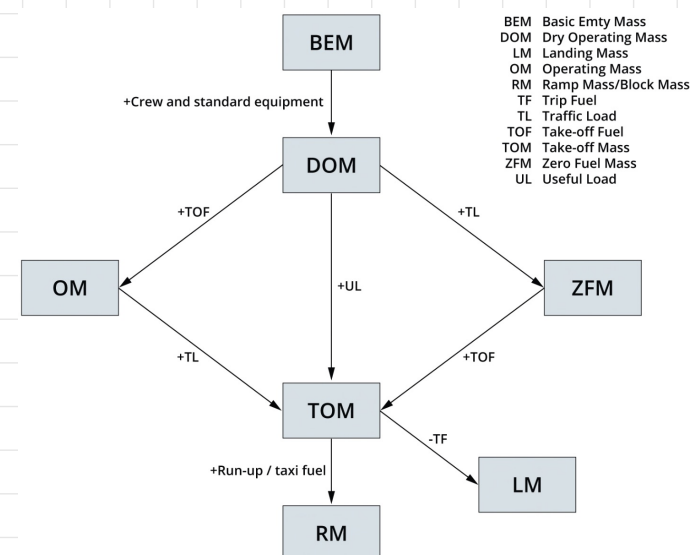## Pre-Flight fuel planning for commercial flights

Contingency: 5% or 5min whichever is greater

Final: 30 min for jets
       45 min for piston

Additional fuel no Alternate:
- 15 minutes
- at 1500 ft

taxi fuel at destination not taken into account

BEM	Basic Empty Mass	
DOM	Dry Operating Mass	
LM	Landing Mass	
OM	Operating Mass	
RM	Ramp Mass/Block Mass	
TF	Trip Fuel	
TL	Traffic Load	
TOF	Take-off Fuel	
TOM	Take-off Mass	
ZFM	Zero Fuel Mass	
UL	Useful Load	

BEM
+Crew and standard equipment
DOM
+TOF → OM   +TL → ZFM
+UL
+TL → TOM   +TOF
-TF
+Run-up / taxi fuel → RM   → LM

Specific fuel-calculation procedures

((PDP) Predetermined point procedure) → increases max range by reduction of fuel
- jet/turbine → 30 min

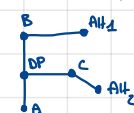((DPP) Decision point procedure) → decision point
↳ reduces minimum fuel required

Fuel Price Ratio = $\frac{Dep \$}{Dest \$}$

- **Reduced contingency fuel procedure RCF**

Greater of:
1) From A to B + (5% DP to B)
2) From A to C + (5% A to C)
- Add alternate + Final fuel + taxi fuel
  ↳ 30 min
  + 15 no alternate

B ◦ Alt₁
DP ◦ C ◦ Alt₂
A ◦

Isolated aerodrome

Greater of:

Piston 1) Fuel to fly 45 min + 15% flight time cruise or 2h (whichever less)

2) Fuel to fly 45 min

Jet/turbine:

1) **2h normal cruise consumption above destination including final reserve fuel**

2) 30 min holding 1500 ft

04 Pre-Flight Preparation

Notice to airmen (NOTAM) briefing
- Check the GNSS availability on NANU → changes to **GPS** – 72h before **planned maintenance**

Meteorological Briefing

Point of Equal Time (PET) and Point of Safe Return (PSR)

- **PET (critical point)**
  - In still air condition it is mid-point between airfields
  - If wind, the PET moves **into** the wind

  $$D_{PET} = \frac{D_{TOT} \cdot GS_H}{GS_{OUT} + GS_H}$$

- **PSR (Point of no return)**
  - Furthest point from the airfield you can still return to base
  - Wind always **reduces** the **distance** to PSR (bad), always **closer** to departure
  - Safe endurance: time aircraft can fly with safety
  - Total endurance: time aircraft can fly until dry tanks

  $$t_{PSR} = \frac{Safe\ Endurance \cdot GS_H}{GS_{OUT} + GS_H}$$

  - negative (–) wind is a headwind (memo: bad to get to destination)
  - use $V = \frac{d}{t}$

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05 ICAO Flight Plans

Y   start IFR then VFR
Z   start VFR the IFR

EET: T/O → OVH
DEP Time: off-block

Speed TAS N0470   coord: 6666 N 6666 W

MNPS, RVSM → X, W

Route   max interval   30' or 370 Km

RPL
- 10 occasions

Let Me Nut Please (LMNP) – RNAV Route
All Girls Ride Boys (AGRB) – Conventional non-RNAV route

06 Flight Monitoring and In-Flight Re-planning

Flight Monitoring

In-Flight replanning

Other
- Sun down → frequency down
- RNAV SID overlay follows the **same path** as conventional procedure but with GNSS
  → allow **efficient sequencing** of traffic flow

LO = locator

Flight plan:
- N0431 means kts TAS