Operational Flight Plan

An Operational Flight Plan is required for all flights.

ATS Flight Plan

An operator must ensure that Air Traffic Services are used for all flights whenever available.

An ATS flight plan should be filed or, alternatively, adequate information should be deposited in order to permit the alerting services to be activated if required.

The ATS flight plan nowadays is usually prepared automatically as part of the computer flight plan along with the Operational Flight Plan given to the pilots.

Once prepared, either the pilot in command or the flight operations/dispatch officer must forward it to the nearest Air Traffic Service facility.

The reasons for filing the ATS flight plan are to advise Air Traffic Services of the flight operation and to enable Air Traffic Control to clear the proposed flight operation.

When unable to submit or to close the ATS flight plan, due to lack of ATS facilities or any other means of communications to ATS, an operator should establish procedures, instructions and list of authorised persons to be responsible for alerting search and rescue services.

To ensure that each flight is located at all times, these instructions should provide the authorised person with at least the information required to be included in a VFR flight plan and the location, date and estimated time for re-establishing communications.

The instructions should provide that the information will be retained at a designated place until the completion of the flight.

If an aeroplane is overdue or missing, the procedures should provide for notification to the appropriate ATS or Search and Rescue facility.

Direct Routings

From a commercial point of view the operator would wish to fly the direct, great circle track to destination, operating at all times at the optimum level and speed.

Three things get in the way:

- Effect of wind. The shortest distance may not be the quickest route.
- ATC routings and requirements.
- Regulatory Authority which impose restrictions on the routing to make sure that the flight is adequately safe.

Effect of Wind

It is possible to roughly work out a min time routing by construction.

This can be done by dividing the route into one hour sectors and using the triangle of velocities to find the shortest time.
The modern reality is that min time, min fuel and min cost routes and levels are selected by the computer flight planning system. The computer system produces the flight plan to an exact company specification. Variables such as aircraft weight, forecast winds and temperatures can all be taken into account in the selection of route and levels.

**ATC Requirements**

Certain routes such as the trans-Atlantic track from the US to Europe attract large amounts of traffic at particular times of day. Over the North Atlantic most of the traffic flies west to east overnight and back to the States in the daytime. As all the aircraft take-off over a short time period and all want the optimum levels and tracks there are ATC routing requirements to keep them apart. This is the North Atlantic Organized Track System (NAT OTS).

The NAT OTS is the most extreme example of organised routing over the oceans but examples also exist in other areas such as the Pacific.

**Alternate Aerodromes**

When flying under Instrument Flight Rules (IFR), an alternate aerodrome must be included in the operational flight plan. An operator has to establish procedures for the selection of destination and alternate aerodromes that are adequate for the types of aeroplanes to be used and the operations to be undertaken.

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.

For an ETOPS en-route alternate aerodrome the operator should also consider the number of letdown aids and runways available for an instrument approach.

**Take-Off Alternate Aerodrome**

A take-off alternate aerodrome must be selected and specified in the operational flight plan if:

- The weather conditions at the aerodrome of departure are at or below the applicable aerodrome operating landing minima.
OR

- It would not be possible to return to the aerodrome of departure for other reasons.

The take-off alternate aerodrome must be located within the following distance from the aerodrome of departure:

Aeroplanes with Two Engines

- Within the distance equivalent to a flight time of one hour, at single engine cruise speed in still air, standard conditions, based on the actual take-off mass.

OR

- If authorised for ETOPS, the approved ETOPS diversion time (subject to any MEL restriction), up to a maximum of 2 hours, at single engine cruise speed in still air, standard conditions, based on the actual take-off mass.

Aeroplanes with Three or More Engines

- Within a distance equivalent to a flight time of two hours, at the one engine inoperative engine cruise speed, in still air, standard conditions, based on the actual take-off mass.

If the Flight Manual 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.

En-Route Alternate Aerodromes

For the majority of IFR flights, the requirement for alternate aerodromes is limited to one for departure (if required) and at least one for the destination.

However, for certain planning procedures an en-route alternate must be nominated at the planning stage.

- **ETOPS En-Route Alternates**

In the case of ETOPS a number of en-route alternate aerodromes must be selected in order for the aircraft to be within the authorized ETOPS diversion time from a suitable diversion.

The aerodrome must be adequate in terms of facilities (at least one instrument approach procedure) and the weather reports or forecasts must be better than the applicable planning minima for the period between the anticipated time of landing until one hour after the latest possible time of landing.

- **En-route Alternates (including RCF and 3% ERA)**

Certain fuel planning procedures (RCF or 3% ERA procedures) make use of en-route alternates which must be nominated at the planning stage.
The weather must be at or above planning minima from one hour before ETA to one hour after ETA.

Quote:

3% ERA: Contingency fuel is calculated by using 3% of Trip Fuel (instead of the standard 5%). Use of this option requires the selection of an En-Route Alternate (ERA) aerodrome. For details see: 3% ERA

RCF is Reduced Contingency Fuel. For details see: RCF Procedures

Destination Alternates

An operator must select at least one destination alternate for each IFR flight unless:

The flight time (take-off to landing) is less than 6 hours.

Two separate runways are available at the destination.

Meteorological conditions prevailing are such that, at ETA ±1 hour:

a) Ceiling is 2000 ft or circling height + 500 ft, whichever is greater.

b) Visibility is 5 km.

OR

The destination is isolated and no adequate destination alternate exists. In this case:

a) Weather must be at least that required for a destination alternate aerodrome.

b) On arrival in the overhead at least 2 hours of fuel (at cruise) should remain in tanks.

Separate runways in this context are separate landing surfaces, which may cross.

If one of the runways is blocked, it must not prevent the planned type of operations on the other runway.

Each of the landing surfaces must have a separate approach procedure based on a separate aid.

An operator must select two destination alternates when:

=> At ETA ±1 hour, weather conditions will be below the applicable planning minima.

OR
Minimum Flight Altitudes

The minimum flight altitudes to be used and the method of calculating them are specified in the Operations Manual and approved by the National authority.

They may not be less than those established by the States flown over or those prescribed by another responsible State.

When determining the method of calculation the following should be considered:

- The accuracy and reliability with which the position of the aeroplane can be determined.
- The accuracies of the altimeters used.
- The characteristics of the terrain (e.g. sudden changes in the elevation).
- The probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents).
- Possible inaccuracies in aeronautical charts.
- Airspace restrictions.

In practice operators use one of a group of generally accepted methods to calculate minimum altitudes usually based on the highest terrain in an area and a safety margin of 1000 to 2000 ft depending on the height of the terrain.

The method chosen will probably produce one of the following:

MSA - Minimum Safe Altitude.

MOCA - Minimum Obstacle Clearance Altitude

MORA - Minimum Off-Route Altitude

MEA - Minimum Safe en-Route Altitude

GRID MORA - Grid Minimum Off-Route Altitude

Optimum Level

Any aircraft should, ideally, be operated at the altitude that gives the best performance.

For a jet this normally means operating as high as possible within the constraints of the cruise buffet boundary.

Optimum altitude increases as the aeroplane mass decreases.

Operating above optimum altitude reduces the buffet boundaries.

Operating below optimum altitude results in a fuel penalty and therefore a range penalty.
The optimum altitude is bound to be constrained by ATC requirements.

One would normally file for the next available FL above the optimum.

Reason being; As the fuel burns, this level would become first the optimum then lower than the optimum.

Once this happens then the aircraft can climb another 2000 ft to 4000 ft if ATC and the cruise buffet boundary permit.

**Fuel Penalties**

Not flying the optimum level will result in fuel penalties.

e.g. For a mass of 55,000 Kg, determine the Optimum Altitude for Cruise at Mach No 0.78

Use the table to determine the fuel penalty if the aeroplane operates at an altitude of 29,000 ft at this mass.

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<th>Off-Optimum Condition</th>
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<tr>
<td>2000 ft above</td>
<td>-1</td>
</tr>
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Be careful to use the correct weight scale!

Entering at the base of the graph at the CRUISE WEIGHT 55,000 Kg.
For a cruise at 0.78 Mach the optimum altitude comes out to be 33,400 ft.

The penalty in fuel and mileage is determined by interpolation from the above table.

For 0.78 Mach, 29,000 ft is 4400 ft below the optimum.

The penalty will be -4.7%

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