ETOPS Flight Planning

Introduction

The purpose of the Project is to plan and dispatch an ETOPS flight across the North Atlantic from Barcelona to John F. Kennedy International airport.

The flight will depart from LEBL and will arrive at KJFK according to the following information:

- Departure time: 0800Z
- Arrival time: 1645Z
- Date of flight: 20 OCT

The aircraft used to carry out the flight will be a B787-800

Documentation to consider

- Weather reports
- NOTAM
- NAT Plotting chart *(print it in A2 size to represent the indicated scale in the chart)*
- SigWx
- Temperature chart
- Track message
- Performance charts
- Airport charts
- Aircraft performance

Project deliverable

As a result of the project the you shall:

- Provide a North Atlantic Plotting Chart, depicting the route to follow, the relevant waypoints and the contingency procedures.
- Calculate the required fuel to conduct the flight according to the regulations.
- Define the equipment, capabilities and approvals required to conduct the flight[1]
- Fill up the ATS flight plan. Indicate CNS capabilities in FPL fields 10, 10a and 18[2]
- Determine which are the ETOPS alternates to conduct the flight
- Provide the oceanic clearance obtained for the flight by Shanwick Center
- Deliver a report in Power point format (30 slides in English), detailing all the computations, considerations and decisions taken to conduct the flight.

Flight considerations

- B787-800 single-engine flight distance during 60 min (ISA atmosphere and still air conditions) is 352 NM
- ETOPS approval is 120 min + 15%
- B787-800 single-engine flight distance during 120 min + 15% is 810 NM
- The whole flight will be performed at M 0.85 and FL380

---

[1] North Atlantic Operations and airspace manual
[2] ATC FPL guide

- Approved destination alternate aerodromes are
  - Boston (KBOS)
  - Newark (KEWR)
  - Philadelphia (KPHL)
  - Baltimore (KBWI)

- Approved ETOPS alternates aerodromes are:
  - Kangerlussuaq (BGSF)
  - Keflavik (BIKF)
  - Santiago (LEST)
  - Halifax (CYHZ)
  - Saint John's (CYYT)
  - Lajes (LPLA)

- Approved adequate en route alternates
  - Halifax (CYHZ)
  - Saint John's (CYYT)
  - Keflavik (BIKF)
  - Shannon (EINN)
  - Boston (KBOS)
  - John F. Kennedy International (KJFK)
  - Barcelona (LEBL)
  - Madrid (LEMD)
  - Santiago (LEST)
  - Paris Charles de Gaulle (LFPG)
  - Faro (LPFR)
  - Lajes (LPLA)
  - Kangerlussuaq (BGSF)

Aircraft data
- Landing minima: ILS CAT IIIB
- PBN Approach capability: RNP 0.3
- DOW: 114406 kgs
- MTOW: 227930
- MLW: 172365
- MZFM: 161025
- PAX: 10F/250Y (Pax weight 99 Kgs)
- Cargo: 8500 Kgs
- Taxi Out fuel: 525 Kgs

Workflow

1. Create a scenario
   o Analyze Wx and NOTAM conditions at DEP, DEST, ALTN airports
   o Determine the ETOPS ALTN to be used
   o Plot adequate aerodromes in the Plotting Chart*
   o Plot ETOPS alternates in the Plotting Chart*. **The route must be covered with only two ETOPS alternates among the possible ones**
   o Determine the Destination ALTN to be used

   The Plotting chart scale is 1 inch = 150NM. Consider it constant for all latitudes.

2. Find the routing[3]
   o Oceanic part
     • Determine the NAT track to be used. Consider the required aircraft equipment and capabilities. Ensure the route is ETOPS compliant.
   o Continental part
     • Find the most optimum routing from the NAT track to arrival fix (first STAR WPT)
     • Find the most optimum routing from the departure fix (last SID WPT) to the NAT track
   o Destination ALTN
     • Find a routing from destination to alternate airport
   [3] Sky Vector

3. Departure/Arrival scenarios
   o Determine RWY's to be used considering Wx, NOTAM and aircraft performance
   o Select Terminal Procedures (SID/STAR)

4. Fuel requirements
   o Determine trip fuel based on routing mileage
     • Convert ground distance into air distance *(Average wind component along the route is 20kt Head wind)*
   o Determine the Standard Fuel Scenario

5. Weight and Balance
   o Compute payload
   o Determine TOM, ZFM
   o Determine trip fuel based on routing mileage
     • Convert ground distance into air distance (Average wind component along the route is 20kt Head wind)
   o Determine LAM
   o Ensure no maximum structural weight is exceeded

6. <u>ETOPS scenario</u>[4]
   - o Determine EEP and EXP in the Plotting Chart
   - o Allocate ETP in the Plotting Chart
   - o Correct ETP for the wind effect

7. <u>Diversion strategy</u>[4]
   - o Define the time frame in which both ETOPS ALTN must be suitable.
     - Compute earliest ETA (At ETP1, the aircraft divert to the ETOPS ALTN 1 at M0.85 and CRZ altitude)
     - Compute latest ETA (At ETP2, the aircraft diverts to ETOPS ALTN 1 at due to Engine failure)
     - The time frame from earliest ETA -1h to latest ETA +1h defines the period where an ETOPS ALTN must be suitable. Check their suitability within the required period.
   - o Check the required fuel for diversion is on board at the required time.

8. <u>Critical Fuel Scenario</u>[4]
   - o Define the Critical Point
   - o Check the required fuel for diversion is on board at the CP. Otherwise add fuel to reach the required amount.
   - o Compute ETOPS Fuels scenario
   - o Compare ETOPS and STD fuel scenario and select the highest one.
   - o Revise weight and balance section if required.

[4] ETOPS ICAO Workshop