



International Civil Aviation Organization

The Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force Working Group (ADS-B TF/3)

Bangkok, 23-25 March 2005

Agenda Item 6.5: Cost Benefits Studies:

**FUEL PENALTIES THAT ARE AVERAGES FOR JET OPERATIONS FOR THE
CALCULATION OF COST BENEFIT**

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SUMMARY

The attached information is provided from the Boeing Pilot Training manual and notes fuel penalties that are averages for Jet operations. This information may be useful for inclusion in the calculation of Cost Benefit studies.

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OPTIMUM FLIGHT LEVEL

The flight crew should choose a flight level that is as close to the optimum as possible. To obtain the optimum flight level, use the chart in the QRH or in the FCOM (Refer to FCOM 2.05.20).

As a general rule, an altitude that is 4000 feet below the optimum produces a significant penalty (approximately 5 % of fuel). Flight 8000 feet below the optimum altitude produces a penalty of more than 10 % against trip fuel.

Cruise Performance Economy

The flight plan fuel burn from departure to destination is based on certain assumed conditions. These include takeoff gross weight, cruise altitude, route of flight, temperature, wind enroute, and cruise speed.

Actual fuel burn should be compared with the flight plan fuel burn throughout the flight.

The planned fuel burn can increase due to:

- temperature above planned
- a lower cruise altitude than planned
- cruise altitude more than 2,000 feet above optimum altitude
- speed faster than planned or appreciably slower than long range cruise speed when long-range cruise was planned
- stronger headwind component
- fuel imbalance
- improperly trimmed airplane
- excessive thrust lever adjustments.

Cruise fuel penalties include:

- ISA + 10° C: 1% increase in trip fuel
- 2,000 feet above/below optimum altitude: 1% to 2% increase in trip fuel
- 4,000 feet below optimum altitude: 3% to 5% increase in trip fuel
- 8,000 feet below optimum altitude: 8% to 14% increase in trip fuel
- cruise speed M.01 above LRC: 1% to 2% increase in trip fuel.

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