

**AVIATION OPERATIONAL MEASURES FOR FUEL AND
EMISSIONS REDUCTION WORKSHOP**

Alternate Airport Selection During
Flight Planning to Enhance Fuel
Efficiency


Captain Richard Sowden
Project Pilot

Air Canada Flight Operations Technical Group



Airline Planning Panel
Ottawa, 5-6 November 2002

Objective

- 
- Explain how developing airline policy for use by flight dispatchers and pilots to select an alternate airport during the flight planning process, can have a positive environmental and operating cost benefit



Agenda

- Alternate selection regulatory requirements
- Alternate selection policy objectives & principles
- Alternate selection policy benefits
- Alternate selection process
- External influences



Alternate Regulatory Requirements

- ✈ Current regulatory requirements:
 - ✧ Are conservative and have not been revised for over 20 years
 - ✧ Apply “lowest common denominator” philosophy for aircraft, approach aid and airport technology and flight crew skill
 - ✧ Focused on safety and do not consider commercial costs





Alternate Regulatory Requirements - The Result

- ✈ In many cases alternates are not necessary for weather conditions, but are required to comply with regulations
- ✈ Examples:
 - ✧ Unable "No Alternate IFR" due NOTAMS or due to flight time/ departure point restrictions
 - ✧ Destination weather below no alternate IFR, but at or above Standard Alternate minima





Alternate Selection Policy Objective

- 
- 
- Define a risk based process to select an alternate during flight planning for maximum efficiency, once safety and regulatory compliance have been assured



What risk are we managing?

- 
- 
- The “risk” being managed is the commercial risk to the airline of unnecessary fuel carriage costs and the costs associated with flight diversions



Alternate Selection Policy Principles

- ✈️ Alternate selection policy must maintain the following principles:
- ✧ Flight safety is the number one priority
 - ✧ Selected alternate will meet regulatory requirements
 - ✧ Manage commercial risks based on the likelihood that the alternate will be utilized
 - ✧ Use conservative selection criteria during flight planning to manage risk associated with conditions changing once the flight is airborne
 - ✧ Separate the management of risk associated with destination/alternate weather and the risk of airborne delays





Alternate Selection Policy Benefits



- Ensures consistent alternate selection process applied to all flight plans
- Provides criteria in addition to regulatory requirements to consider commercial impacts
- Manages corporate resources efficiently
- Ensures that the correct fuel is boarded on each flight

Alternate Selection Commercial Impact

- 
- 
- Poor alternate choices can:
 - ✧ Incur significant incremental fuel burn due to unnecessary fuel carriage
 - ✧ Result in high commercial costs when diversions occur



Fuel Consumption Impact

✈ Jet fuel:

- ✧ Costs ~\$0.63/litre

- ✧ Represents 15 – 20% of an airline operating budget

✈ Every 100 litres of fuel burned releases the following combustion by-products

- ✧ CO₂ – 233 kg

- ✧ CH₄ – 219 g

- ✧ NO_x – 23 g



Unnecessary Fuel Carriage Impact

✈️ Carriage of unnecessary fuel results in an incremental fuel burn and has a detrimental impact on:

- ✧ The environment due to increased emissions
- ✧ Airline operating costs



Incremental Fuel Burn

✈ Incremental fuel burn from boarding unnecessary fuel:

- ✧ Is a function of fuel weight boarded and flight duration
- ✧ Approximately 4%/hr. of flight time

✈ Worst case scenario:

- ✧ A long flight with a distant alternate



Fuel Carriage Cost (%)



B767 - 6 hours flight time
 22% or 220 kg of fuel is burned to carry 1,000 kg of unnecessary fuel

Aircraft Type	1	2	3	4	5	6	7	8
B744	2.2	5.3	8.0	11.6	15.8	21.2	24.8	28.6
A340	3.0	6.1	10.4	13.2	15.8	18.6	21.6	24.8
B767	3.2	6.6	10.4	14.6	18.5	22.0	25.5	29.0
A320	3.0	6.1	9.4	13.0	18.1	24.3		

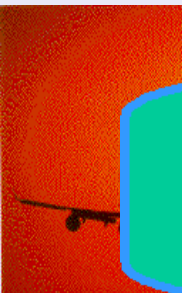
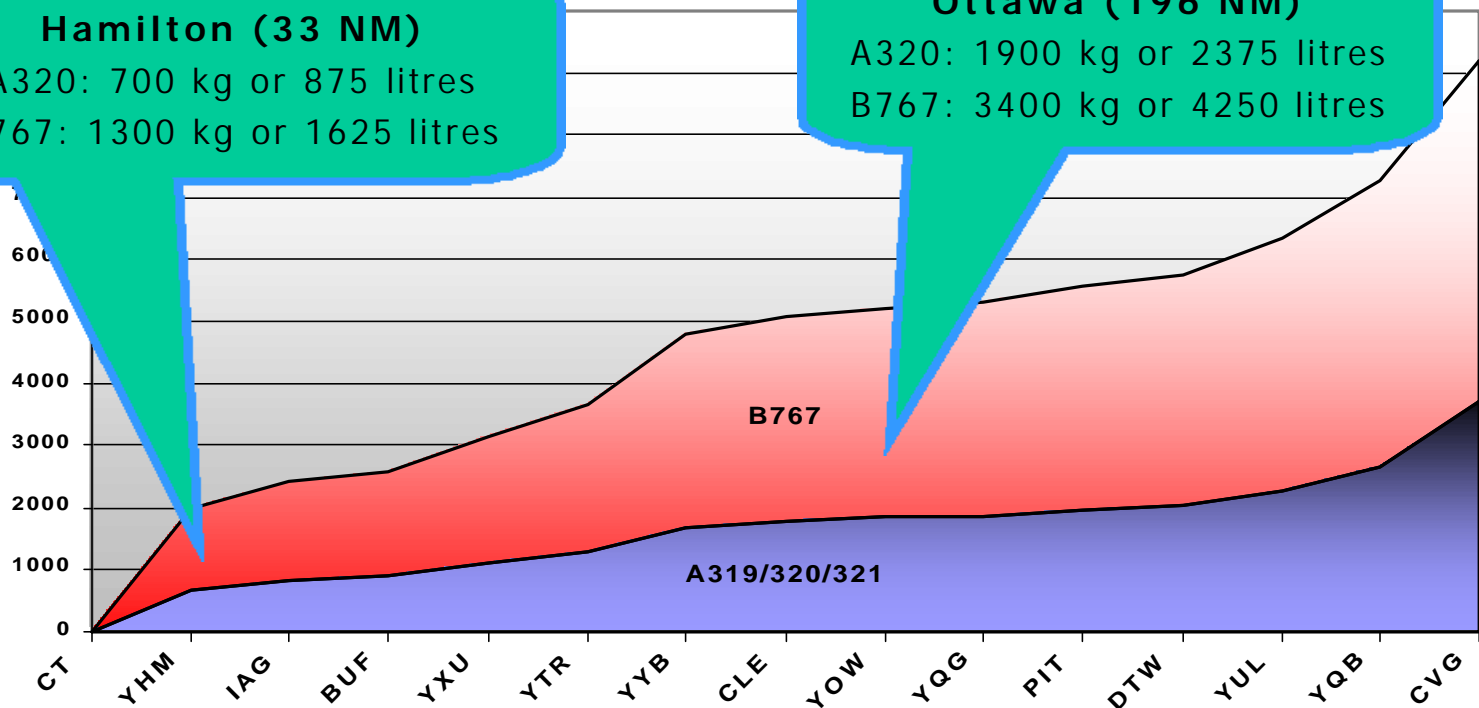


Alternate Fuel Carriage Vancouver – Toronto (Weight)

Alternate Fuel (kg) - Various Alternates

Hamilton (33 NM)
 A320: 700 kg or 875 litres
 B767: 1300 kg or 1625 litres

Ottawa (196 NM)
 A320: 1900 kg or 2375 litres
 B767: 3400 kg or 4250 litres



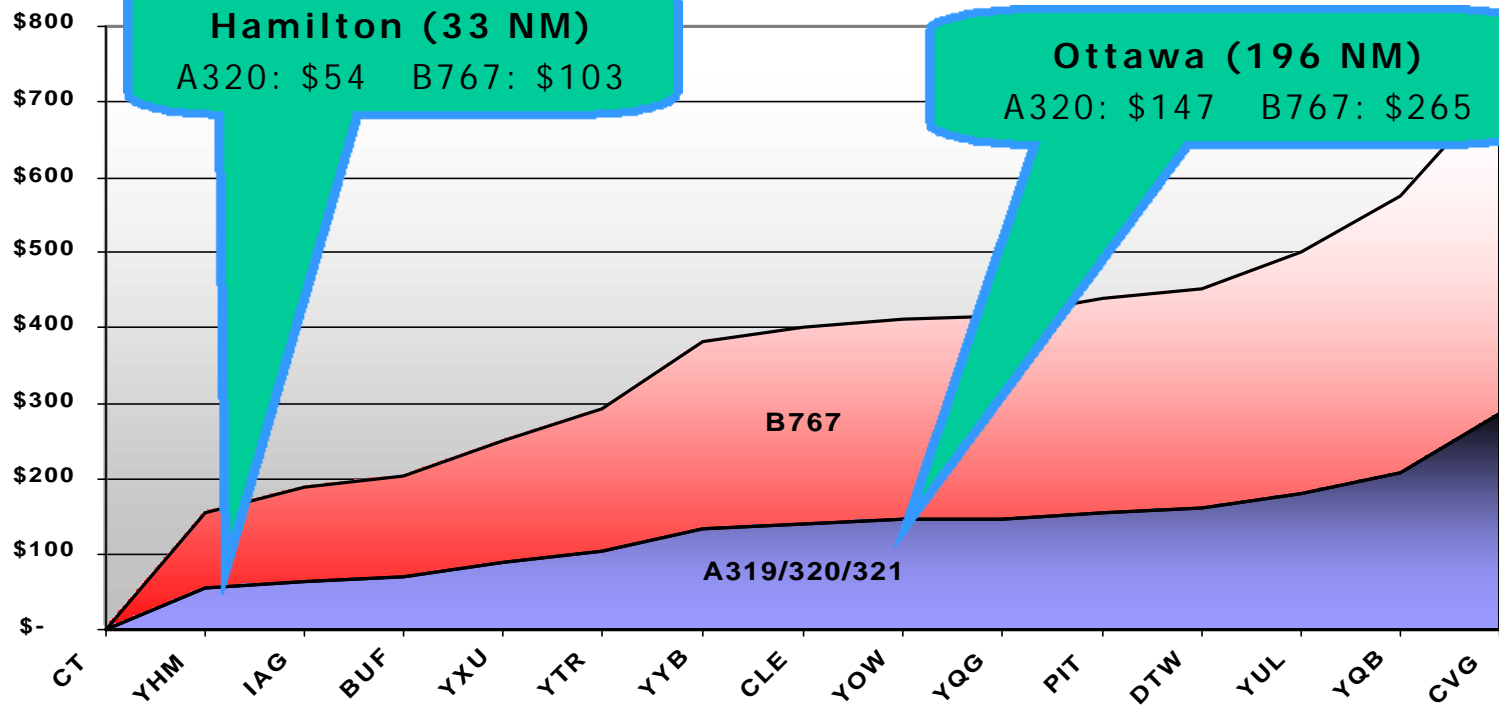


Transport
Canada

Transports
Canada

Alternate Fuel Carriage Vancouver – Toronto (Cost \$CDN)

Cost to Carry Alternate Fuel (\$) - Various Alternates



Airline Planning Panel
Ottawa, 5-6 November 2002



Diversions

✈ Well planned diversions incur a minimum commercial impact

✈ Diversions are:

✧ Rare given the high level of aircraft & airport technology and flight crew training

✧ Approximately 1 for every 1100 flights & for the following reasons:

- Maintenance – 57%
- Passenger illness – 17.5%
- Poor weather known prior to departure – 22.5%





Real World Alternate Fuel Savings



- Air Canada flight dispatcher diligence in selecting efficient alternates has lowered incremental fuel burn from unnecessary fuel carriage by 8.5 million litres for the period January 1, 2002 to September 30, 2002



Alternate Selection Process

- 
- 
- ✈️ Alternate selection flowchart for use by dispatcher's/pilots based on the following concepts:
 - ✧ If the likelihood of requiring the alternate is low then "No Alternate" or the closest legal alternate should be chosen
 - ✧ If the likelihood of requiring the alternate is high then the alternate(s) chosen should consider commercial requirements in addition to weather





Alternate Selection Process...2



- Alternate selection based on “Standard Alternate Minima”
- Flowchart analyzes destination and alternate weather
- Cannot consider all factors and final decision is up to the PIC





New Alternate Selection Process Terminology

- 
- 
- ✈️ Alternate selection process requires consistent terminology for:
- ✧ “Marginal” destination or alternate weather forecast (TAF)
 - ✧ “Other Operational Factors” that affect the ability of the aircraft to carry out a landing
 - ✧ “Commercial Requirements” that affect customer service and operational integrity



Alternate Selection Terminology

- 
- 
- ✈ Marginal weather forecast:
 - ✧ Ceiling 100 feet or less above applicable minima (not less than CATI)
 - ✧ Visibility ½ mile or less above applicable minima (not less than CATI)
 - ✧ Risk of thunderstorms is TEMPO or greater



Alternate Selection Terminology...2

✈ Other Operational Factors:

- ✧ Crosswind/tailwind component
- ✧ MEL restrictions
- ✧ Runway surface condition
- ✧ NOTAMS
- ✧ Single runway operation
- ✧ Curfew
- ✧ Pilot qualifications
- ✧ Ground Delay Program



Alternate Selection Terminology...3

→ Commercial Requirements:

- ✧ Airport capacity limitations
- ✧ Commercial partner support
- ✧ Aircraft handling capabilities (customs, fuel, gates, ground support)
- ✧ Passenger handling capabilities (connections, alternate travel modes, hotels, facility size, food & beverage)
- ✧ Future aircraft routing
- ✧ Flight & cabin crew replacement



Alternate Selection Risk Scenarios

✈ Low Risk:

- ✧ "No Alternate IFR" Operations
- ✧ "No Alternate IFR" prohibited by regulation not weather
- ✧ Destination weather is below "No Alternate IFR", but above applicable Standard Alternate Minima (800-2 or 600-2)



Alternate Selection Risk Scenarios...2

✈️ Medium Risk

- ✧ Destination weather is below “No Alternate IFR”, but above applicable alternate minima (800-2 or 600-2) & there are “Other Operational Factors”
- ✧ Destination weather is below “No Alternate IFR” but above applicable alternate minima (800-2 or 600-2) & closest alternate is “Marginal”



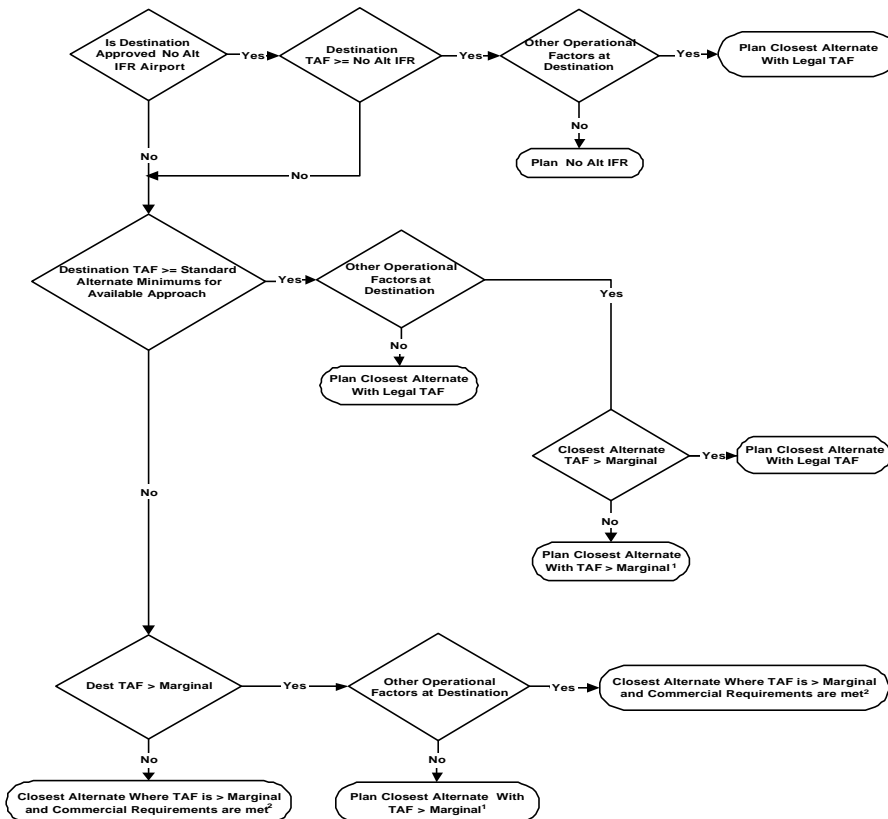
Alternate Selection Risk Scenarios...3

→ High Risk

- ✧ Destination is below alternate minima and there are “Other Operational Factors”
- ✧ Destination is below alternate minima and closest alternate is “Marginal”
- ✧ Destination is “Marginal” or worse



Alternate Selection Flowchart



RISK



1. When closest alternate TAF is "Marginal", select next closest alternate where TAF is greater than marginal for fuel/ICAO flight plan purposes and show closest legal alternate as "info" on OFF.
2. When evaluating "Commercial Requirements" consider using a multi or via alternate to provide sufficient fuel to permit a landing at a more commercially suitable alternate with a marginal TAF.

RISK



Airline Planning Panel
Ottawa, 5-6 November 2002



Completing the Risk Management Process

- 
- 
- ✈️ Once a flight has commenced, the flight planned alternate requires management for the following reason:
 - ✧ Selecting an alternate based on “risk” requires a similar process to manage changes in weather conditions at flight planned destinations and alternates once the flight is airborne



Airborne Alternate Management

Process for pilots and dispatchers to manage planned alternate(s) once the flight is airborne using:

- Operational recommendation matrix based on risk
- Decisions to be made by discussion between the Captain and controlling dispatcher
- Final decision on appropriate course of action is at the discretion of the Captain



Successful Implementation

→ Making it work requires:

- ✧ Management support
- ✧ Constant reinforcement that:
 - Fuel efficient procedures are the norm
 - Safety is always the first consideration
- ✧ Provide education & awareness material to explain “why”
- ✧ Training to teach the new SOP
- ✧ Checking to reinforce the SOP
- ✧ Monitoring and reporting of success





External Influences

- 
- 
- ✈ The single biggest influence on the alternate selection process is the weather forecast (TAF)
 - ✧ Accuracy & reliability are critical to success
 - ✧ Documentation & distribution of accuracy & reliability data is required to build dispatcher & pilot confidence





Small Change Big Impact

- 
- 
- Small differences in a weather forecast such as:
 - ✧ Ceiling reduction of 100 feet
 - ✧ Visibility reduction by ½ mile
 - ✧ Use of TEMPO instead of PROB
 - Can have dramatic impacts on alternate selection such as:
 - ✧ Precluding the use of No Alternate IFR
 - ✧ Precluding the use of the airport as an alternate



Industry Partners in Success

- 
- 
- Canada is a world leader in weather forecast performance monitoring
 - Nav Canada, Environment Canada and Air Canada are partnering to develop:
 - ✧ Improved forecast accuracy for:
 - No Alternate IFR
 - 6 – 12 hr forecast period
 - ✧ Enhanced, more effective forecast performance measurement criteria and reporting tools for:
 - Error rate & magnitude
 - False alarm ratio



Conclusion

- ➔ Defined processes for selecting of alternates during the flight planning process can produce significant environmental and economic benefits with little or no associated implementation costs



AVIATION OPERATIONAL MEASURES FOR
FUEL AND EMISSIONS REDUCTION
WORKSHOP



Thank you !

Contact: richard.sowden@aircanada.ca

