ETOPS, Extended Operations, and En Route Alternate Airports

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So, What Are These Terms?

- ETOPS
- Extended Operations
- En Route Alternate Airports
Diversion Airports are Essential to Aviation Safety

- Apr 1993: MD-11, inadvertent slat extension
- Aug 1996: 747, crew illness
- Nov 1996: 747, unanticipated headwind
- Dec 1998: MD-11, smoke in cockpit

- 1999: 747, #3 engine problem
- 2000: Air Force F-16, hydraulic problem
- 2001: Air Force F-16, hydraulic problem
- 1992-2002: Total of 11 aircraft "saves"

- 2002: 727, engine out
- 2002: 727, hydraulic problems

- 1981: 747, passenger heart attack
- 1997: Navy P-3, engine out
- 1998: Marine C-130, electrical
- 2000: Air Force F-16, fuel transfer problem from tanker
- 2003: L1011 ferry flight, oil loss on 2 of 3 engines
- 2004: 777, engine oil loss, shutdown

- 1995 - 2000: 18 - 20 diversions, mostly by 747s due to weather/fuel

- Late 90s: 747, unanticipated headwind
- Late 90s: 747, smoke in cabin
- Late 90s: C130, hot battery bus
- Late 90s: DC10, smoke in cockpit
- Jun 2000: 777, oil filter message
- Mar 2001: MD11, vent fan short, smoke
History –

60 Minute Rule: Not Based on Modern Twins
Twin-Engine Restrictions Based on Piston Engine Reliability, circa 1953

- U.S. Federal Regulations FAR 121.161, adopted 1953
- Imposed restrictions on twin-engine airplanes
- Limited to routes within one hour of an adequate airport
- Recognized opportunities for exceptions on a case-by-case basis

Note: Three-engine jets were also restricted to one hour until 1964.
ETOPS — Current Definitions

**FAA Definition:** "Extended Range Operation with Two-engine Airplanes (ETOPS)" and also referred to as “Extended-range Twin-engine Operations (ETOPS)"

**Technical** - AC120-42A: "For the purpose of this AC, extended range operations are those flights conducted over a route that contain a point further than one hour flying time at the approved one-engine inoperative cruise speed (under standard conditions in still air) from an adequate airport."

**ETOPS Portion of Flight** - That portion of a flight that begins the first moment an aircraft is greater than one hour flying time at the approved single-engine inoperative cruise speed (under standard conditions in still air) from the nearest adequate airport, and ends the last moment it is greater than one hour from the nearest adequate airport."
ETOPS Has Been in Place for Over 18 Years
First FAA Approved ETOPS Flight, 1985

First FAA Approved ETOPS Flight:
February 1, 1985
TWA / 767-200
Boston - Paris / 2,986 nm
**Philosophy – “Preclude and Protect”**

**Preclude** — ETOPS design enhancements have increased the robustness of airplane systems and driven further gains in the extreme reliability of modern fanjet engines. ETOPS maintenance requirements also reduce diversions through engine condition and oil level/consumption monitoring, the aggressive resolution of reliability issues, and procedures to avoid human error during maintenance of airplane engines and systems.

**Protect** — ETOPS protects diverting jetliners through safety-enhancing operational requirements such as dispatch, communications, alternate airport weather, fuel.
The 60-Minute Rule Limits Twin-Engine Route Opportunities

Note: Typical operational range is 400 nmi. Blue represents regions beyond the 60-minute rule limit.
120-Minute ETOPS Rule Greatly Expands Route Opportunities

Note: Typical operational range is 800 n.m. Blue represents regions beyond the 120-minute rule limit.
180-Minute ETOPS Rule Further Expands Route Opportunities

Note: Typical operational range is 1,200 n.mi. Blue represents regions beyond the 180-minute rule limit.
Sample ETOPS Flight Tracks

- Sydney
- Auckland
- Nadi
- Majuro
- Kwajalein
- Kona
- Christmas Island

180 Minute Range Circles
737-700 & 737-800 - 1190nm

- Routes are great circle distances to Honolulu
Market Evolution - Pacific

ETOPS is Firmly Established in the Pacific

737 Operators
Air Caledonie (Aircalin)
Air Canada
Air China*
Air Europa
Air New Zealand
Air Niugini
Air Pacific
Air Tours Int'l*
All Nippon Airways
American Airlines
Ansett Australia
Asiana Airlines
Balkan Bulgarian
Britannia Airways
British Airways
Canadian Airlines Int'l
Condor*
Continental Airlines
Delta Airlines
Egyptair*
EVA Airways
Gulfair*
Hawaiian Airlines
Japan Airlines
LAN-Chile Airways
Lauda Air
Lufthansa-Sued* Malev Hungarian*
North American Airlines
Polynesian Airlines
Qantas Airways
Royal Brunei Airlines*
Trans World Airways
United Airlines

757 Operators
Air 2000
Air Holland
American Airlines
American Trans Air
Britannia Airways
Canada 3000 Airlines
Condor
Continental Airlines
Monarch Airlines*
North American Airlines
Omni Air International
Royal Airlines
Royal Brunei Airlines*
TAESA
Trans World Airlines
United Airlines

777 Operators
Air China*
All Nippon Airways
American Airlines
Asiana Airlines
British Airways
Cathay Pacific*
China Southern Airlines
Continental Airlines
Egyptair

*These operators flew ETOPS only in the Southeast Asia - Australian portion of this map.
ETOPS in the 21st Century

FAA ETOPS Working Group (ARAC) Findings:

- Preclude and Protect Philosophy has Been Successful
- Principles are appropriate to all airplanes and operations
- A new look at long-range requirements is appropriate
Extended Operations – New Definition

Reflecting the FAA’s Aviation Rulemaking Advisory Committee (ARAC) proposal, the FAA NPRM published on Nov 14, 2003 states that ETOPS requirements be applied more broadly to embrace all extended operations, regardless of number of engines, the ARAC further proposes that the ETOPS acronym be redefined as extended operations. Shifts guidance material to regulatory.

Under this revised definition, ETOPS flying would begin when the airplane is more than 60 minutes (for twinjets) or 180 minutes (for three- and four-engine jets) flying time from an adequate airport at an approved one-engine-inoperative cruise speed under standard conditions in still air.
Alternate Airports

Current Term:
Suitable En Route Alternate — This word currently has an ETOPS-applicable meaning (if used with reference to an en route airport, it denotes that this airport is above the required weather minimums and thus available for use as an ETOPS alternate). With the updating of ETOPS now proposed by the FAA NPRM, this ETOPS-specific meaning will go away and be replaced by ETOPS Alternate (see below). Once this rule takes effect, whenever suitable appears in the ETOPS regulations and associated guidance and advisory material, therefore, it should be interpreted according to its broadly accepted everyday definition.

New Term:
ETOPS Alternate — An airport that meets stated requirements for planned diversion use and at which the weather conditions are at or above operating minimums specified for a safe landing. This new ETOPS-specific term replaces suitable (see immediately above).
Current Requirements For En Route Alternates

• All operators must have a sufficient set of en route alternate airports

• Key Airport Provisions
  – Must be certificated under FAR Part 139, or meet equivalent criteria if outside FAA jurisdiction
  – Must be suitable to safely operate the aircraft, i.e., runway of sufficient length, width and strength (ref FAR Part 121)
  – Must have minimum of ARFF Index A (FAA) or Category 4 (ICAO) response capability within 30 minutes
  – Must have field reporting conditions (NOTAMS), Hourly weather reporting (METARS) and an instrument approach other than GPS.
  – Airport must be available but does not need to be continuously open (plan in place to reopen key airport services in case of aircraft emergency)
Proposed RFF For ETOPS Alternates

For dispatch, the minimum rescue fire fighting capability requirements are as follows:

• For ETOPS up to 180 minute diversion length, alternates must have rescue fire fighting capability equivalent to that specified by ICAO Category 4.
• For Two-Engine, 207 Minute operations, alternates must have rescue fire fighting capability equivalent to that specified by ICAO Category 4. In addition, at least one adequate airport within the 207 minute diversion time must have rescue fire fighting capability equivalent to that specified by ICAO Category 7.
• For all other ETOPS operations beyond 180 minutes, alternates must have rescue fire fighting capability equivalent to that specified by ICAO Category 7.
• If the necessary equipment and personnel are not immediately available at the airport, a 30 minute response time is deemed adequate if the initial notification to respond can be initiated while the diverting aircraft is en route. Such equipment must be available on arrival of the diverting airplane and should remain as long as their services are needed.
Military bases can be used as en route alternates

Typical Policy Statement for Remote US Military Airports:

"The US Navy advises that NSF Diego Garcia may be identified as an Extended Range Twin Engine Operations (ETOPS) emergency landing site (en route alternate) for flight planning purposes. This is consistent with US government policy that an aircraft can land at any US military airfield if the pilot determines there is an in-flight emergency that would make continued flight unsafe. However, as NSF Diego Garcia is a military facility, it is incumbent on aircraft operators to continuously monitor NOTAMS which may temporarily restrict the use of the airfield, even for emergency diversions. It is imperative that aircraft diverting to NSF Diego Garcia comply fully with all air defense procedures, as non-compliance could be misconstrued as a hostile act.

Further, it is understood there are published criteria for ETOPS airfields, and our policy concerning emergency use is not agreement or certification that this airfield meets those criteria. NSF Diego Garcia is a remote location with resources (accommodations, medical, hangars, crash/fire/rescue, etc) limited to levels essential for support of assigned personnel and the military mission. The airfield is available "as is" for emergency use only as indicated above."

- Policy Statement for NSF Diego Garcia, 2002
Remote Airports Play A Key Role In Aviation Safety For All Aircraft Operations

• All operators value the availability of en route diversion airports....

• Airlines typically include diversion planning because it enhances safety....