Welcome

- Extended Operations History
- Extended Operations Benefits
- Extended Operations Requirements
- 787 Extended Operations Service History
Explaining ETOPS – Extended Operations

- ETOPS is the permission granted by regulators for an airplane to fly at extended distances from an airport suitable for landing.
- ETOPS approval requires manufacturers demonstrate compliance with ETOPS regulations for the airplane.
- Operators must also receive authority to fly ETOPS based on their ETOPS programs and operational capability.

ETOPS Enables More Direct and Efficient Routing
ETOPS History Shows Evolution of Rules

- 1953 – The “60-Minute Rule” prohibits two-engine airplanes from routes more than 60 minutes from an adequate airport.

- 1985 – ETOPS exemptions allowed with proven performance. Twinjets allowed up to 120 minutes from a suitable airport.


- 1995 – ETOPS possible from first day of operations.

Over 25 Years of History and Safe Flights with ETOPS
Recent ETOPS Developments


- 2007 – FAA established the first real rules for ETOPS. No longer confined to 180-minutes, ETOPS limits are now based on the proven capabilities of the airplane.

- 2007 – FAA also established requirements for three- and four-engine airplanes when flown more than 180 minutes from a suitable airport.
Allowing Optimal Use of Twinjet Advantages

- Twinjet efficiency advantage is multiplied when paired with ETOPS:
  - Industry leading safety record.
  - More fuel efficient.
  - More point-to-point city-pair operations.
  - Fewer emissions.
  - Superior reliability.
  - Lower maintenance cost.

- Twinjets and ETOPS have substantially reduced the overall environmental footprint of aviation
Current Boeing ETOPS Approvals

- 737 Classic – 120 minutes
- 737NG – 180 minutes
- 757 – 180 minutes
- 767 – 180 minutes
- 777 – up to 330 minutes
- 787 – 180 minutes
Design Requirements for ETOPS Airplanes

- ETOPS design requirements are intended to preclude the need to divert, and to protect the safety of a long diversion if it becomes necessary.

- “Preclude” and “protect” approach enhances airplane design:
  - Increased reliability and redundancy.
  - Increased auxiliary power unit (APU) capability.
  - Better fuel availability to any engine.

- ETOPS design intent is verified by analysis, lab tests, engine tests and airplane flight tests.
787 ETOPS Engine Test Requirements Met

- Engines “flew” 3,000 simulated flight cycles while on the ground:
  - Simulated aircraft system loads.
  - Intentionally imbalanced to validate durability.
  - Thrust reverser system used.
  - Multiple 330-minute maximum continuous thrust diversion cycle
  - Full post-test tear-down and inspection.
787 ETOPS Flight Test Requirements Met

- During its flight test program, the 787 demonstrated that it met regulatory requirements for ETOPS including:
  - Multiple safe flights of 345-minutes with only a single-engine operating.
  - Multiple safe flights of 345-minutes with numerous systems intentionally failed.
  - Maximum duration flight.
787 Fleet Performance Monitored

- ETOPS approval requires on-going tracking and reporting of engine problems.

- Additional reporting of certain types of events is required in initial operations, including:
  - Electrical failures.
  - Fuel loss or unavailability.
  - Cabin pressure failures.
  - Turn backs and diversions.

- Resolution of such events in the initial period must be approved by the FAA.

- After the initial period, ongoing reporting continues as problems are discovered and resolved, assuring continuous improvement of safety and reliability.
787 Events Understood Sooner

- Dedicated 787 Operations Control Center monitors fleet 24 hours a day, 7 days a week.

- Automatically receives performance data from 787s in flight, in real time.

- Provides feedback opportunities on fleet performance not currently available on any other airplane model.
787 Compares Favorably to 777

The number of airplanes delivered and miles flown is roughly equivalent for the two types of airplanes for the given timeframe.

Significantly Fewer Reportable Events
787 Has Fewer Reportable Events than 777

First 15 Months of Revenue Service

787 Has Fewer Events in Every Category
787 Continues Safe ETOPS Legacy

- All ETOPS regulatory requirements are being met.
- Performance is on par with industry best (777).
- More intense in-service fleet monitoring than any other program.