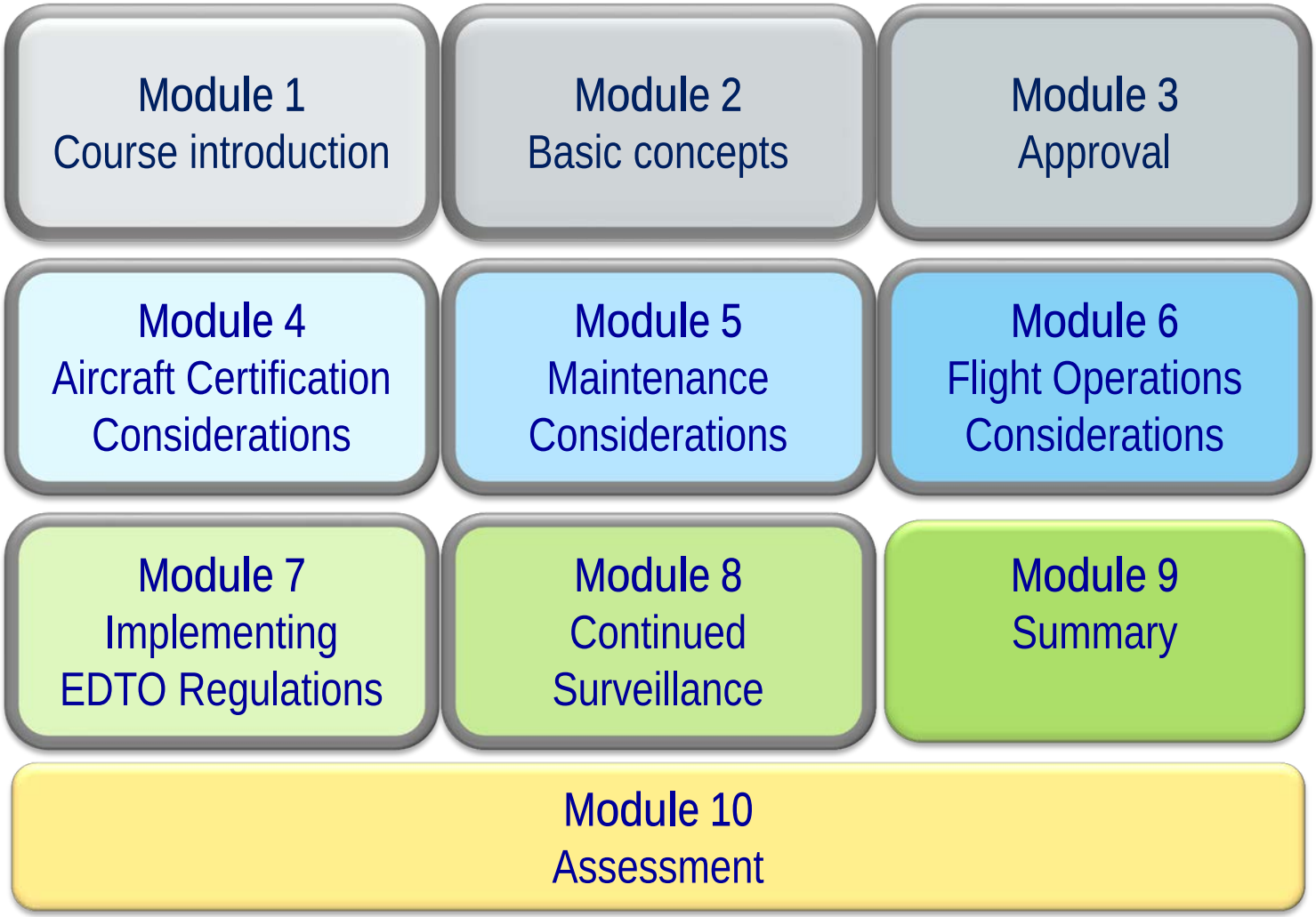
EDTO Workshop

Module N° 8 – Continued surveillance

Course Structure



Objectives

- *At the end of this module, participants will understand the shared responsibility of continued surveillance for airframe and propulsion systems supporting EDTO operations by the airline, airplane/engine manufacturer, and relevant authorities in charge of type certification or operational approvals.*

Outline

- Understand the continued surveillance of fleet reliability performed by the primary certification Authority (State of Design)
- Identify key EDTO Significant Systems to monitor following certification and EDTO operations in the Operator's State.
- Identify and track any operational events associated with EDTO Significant Systems and identify any needed corrective actions.
  - ✓ Create and encourage fleet team resolution processes supporting EDTO design and operational improvements.
  - ✓ Identify reporting requirements for the airline and expectations from oversight offices.

Agenda

- EDTO Continued Reliability Monitoring and corrective actions
- EDTO Relevant events
- Conclusions

EDTO Continued Reliability Monitoring and corrective actions

A/C Type EDTO Capability – Twin engine aircraft

Aircraft model approval for EDTO (Type design approval + Reliability demonstration)

Twin Engine Aircraft Model
Not approved for EDTO

Manufacturer

Design review

Reliability review

EDTO Type Design and Reliability approval

TCDS

CMP

Aircraft model approval for EDTO

In service events

Continued monitoring of EDTO reliability by State of design Authority

CMP revisions or EDTO ADs

EDTO Continued Reliability Monitoring and corrective actions (Cont)

A/C Type EDTO Capability – Aircraft with more than 2 engines

Aircraft model assessed for EDTO

Aircraft Model
Not assessed for EDTO

Manufacturer

Design review

EDTO Capability based on time limitation of relevant TLS

In service events

Continued monitoring of in-service reliability by State of design Authority

ADs

Agenda

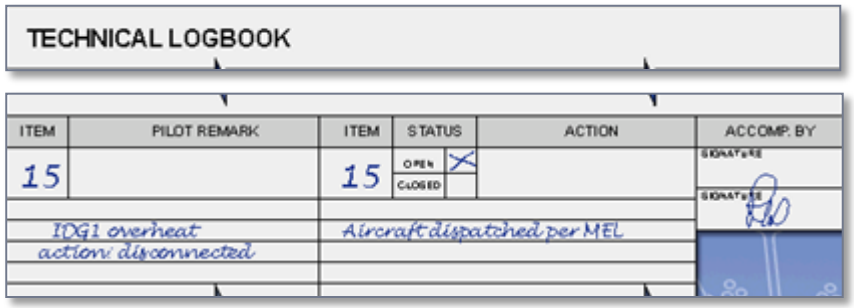
- EDTO Continued Reliability Monitoring and corrective actions
- EDTO Relevant events
- Conclusions

Reliability program

Reporting standards

Airlines

The airline has to define the list of events to be reported to the authorities.



TECHNICAL LOGBOOK

ITEM	PILOT REMARK	ITEM	STATUS	ACTION	ACCOMP. BY
15	IDG1 overheat action: disconnected	15	OPEN / CLOSED	Aircraft dispatched per MEL	SIGNATURE

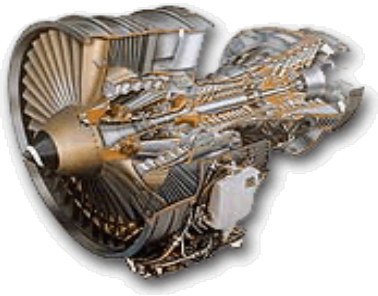
For twin engine aircraft, the EDTO / ETOPS significant system List can be used to help defining the events.

Examples

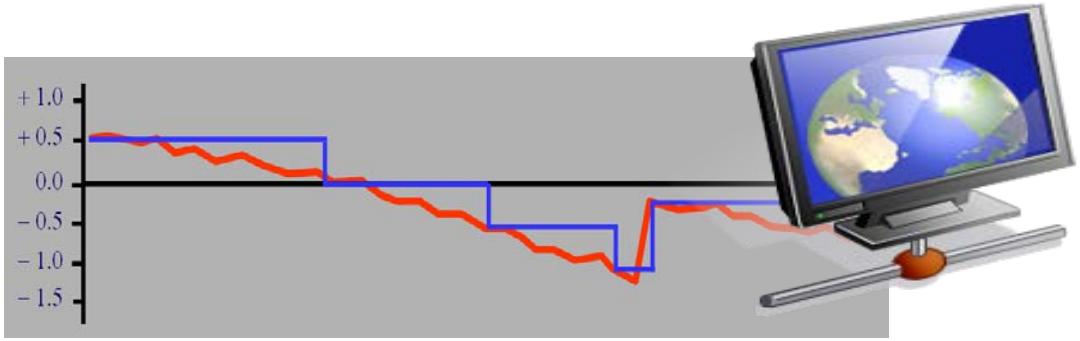
ATA 49	Uncommanded shut down Significant overspeed / over EGT Uncontained burst (compressor / turbine cooling fan) Severe fuel / oil leak in the APU compartment No relight in flight
ATA 70	Commanded or uncommanded in flight shut down Uncommanded power loss / changes Nacelle fire warning Oil / fuel leaks

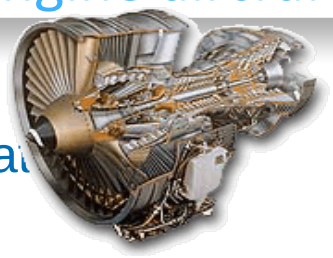
Continuing Surveillance

- Fleet average In-flight Shutdown (IFSD) rate monitored



- Trend monitoring
- Special evaluation of operational events and corrective actions





IFSD Monitoring and Resolution

- World fleet average and operator In-flight Shutdown (IFSD) rat monitored on a 12 month rolling average

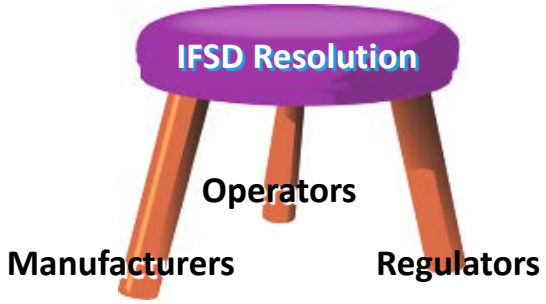
	Type Design Target	Operator Alert Level
120 min ETOPS	≤ 0.05/1000 engine hrs	0.05/1000 engine hrs
180/207 min ETOPS	≤ 0.02/1000 engine hrs	0.03/1000 engine hrs
Beyond 180 min ETOPS	≤ 0.01/1000 engine hrs	0.02/1000 engine hrs

- Airline trend monitoring

  Engine Condition Monitoring, Oil Consumption, Reliability Reporting

- Investigation of common cause effects or systemic errors when *operator IFSD rate* exceeds maintenance program thresholds *

* FAA Regulation Defines Shared Responsibility



EDTO Relevant Event*

Definition:

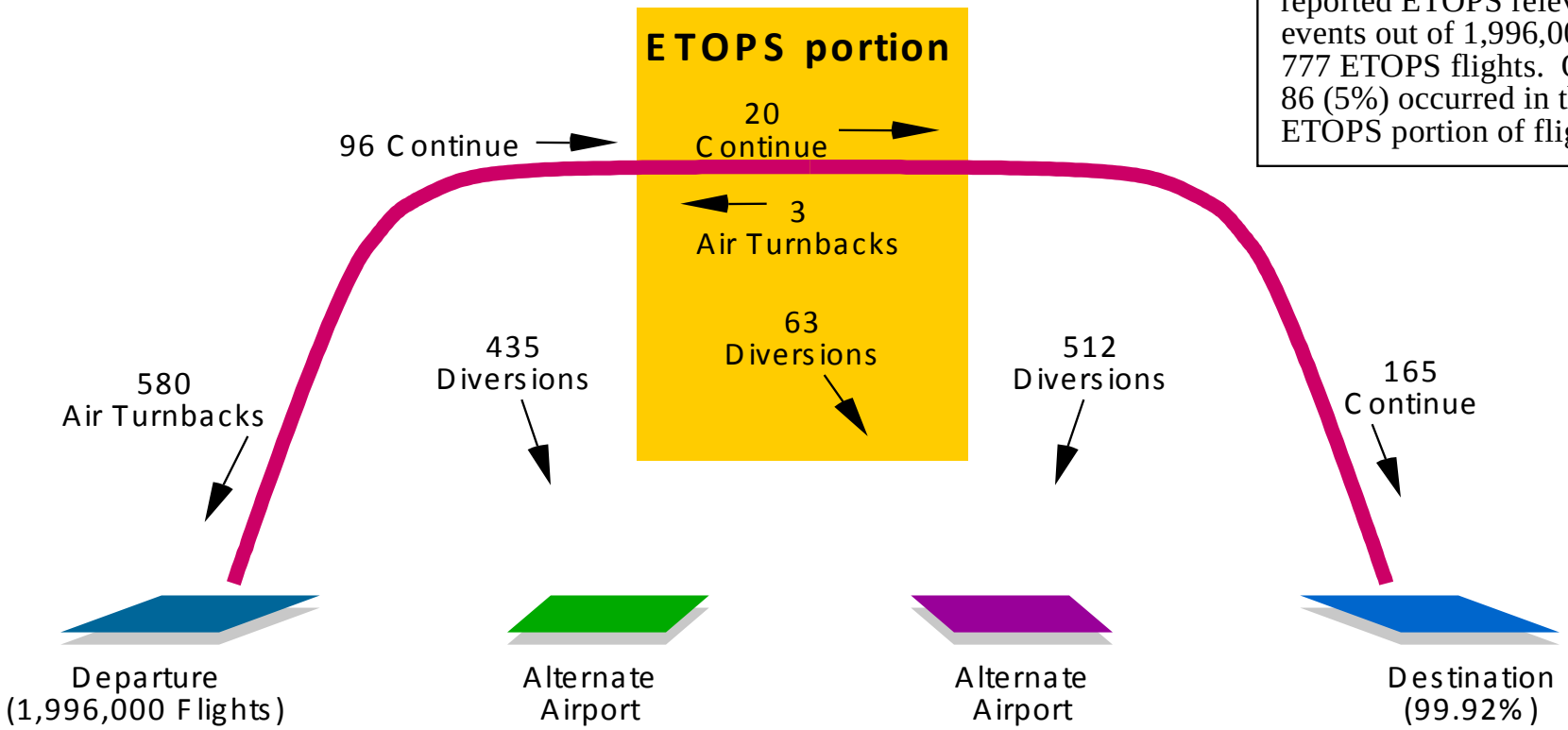
- Any system malfunction, degradation or other in-flight event that requires the crew to make a decision whether to turn back, divert or continue under an increased level of alertness
  - regardless of whether it relates specifically to a two engine airplane.

*Most ETOPS Relevant Events have non-technical causes such as weather, passenger medical, bird-strikes, crew, maintenance errors, etc.

777 EDTO Events are Rare

June 1995 through September 2011

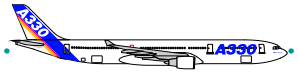
A summary of 1,874 reported ETOPS relevant events out of 1,996,000 777 ETOPS flights. Only 86 (5%) occurred in the ETOPS portion of flight.



ETOPS Events Usually Occur Outside the ETOPS Portion of Flight

A330 EDTO events
1994-2002

ETOPS take-offs : 210,000 **Total events : 79 (0.037% i.e. 99.96% to destination)**



Climb & early cruise

In flight turn-back

ATA	nb
00	1
21	2
24	5
25	1
27	1
28	1
29	2
30	1
31	1
32	3
33	1
34	4
36	5
49	1
52	2
56	1
72-80	23

55
(0.026%)

Diversion

ATA	nb
21	5
25	2
29	1
30	1
34	1
36	2
72	1
79	1

88 %

(1 event / 3,000 flights)

14
(0.007%)

ETOPS segment

Diversion

ATA	nb
29	1
34	1
36	1
72	2

6 %

(1 event / 40,000 flights)

5
(0.002%)

End of cruise & descent

Diversion

ATA	nb
26	1
27	1
28	1
35	1
77	1

6 %

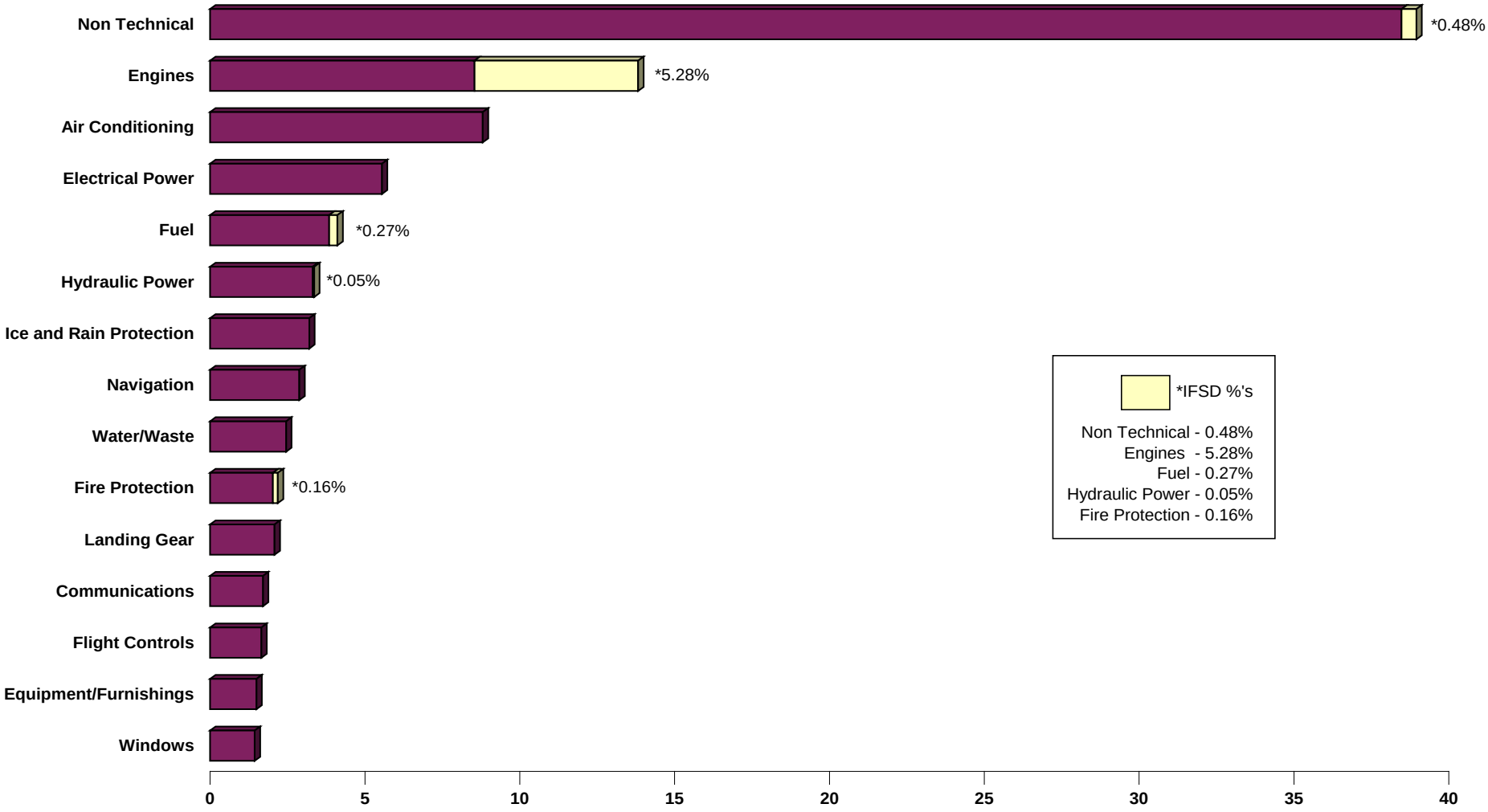
(1 event / 40,000 flights)

5
(0.002%)

EDTO Events Are Rare and Usually Not Engine Related

A Summary of the Top 15 causes of ETOPS Relevant Events on 777 ETOPS Flights

June 1995 through September 2011

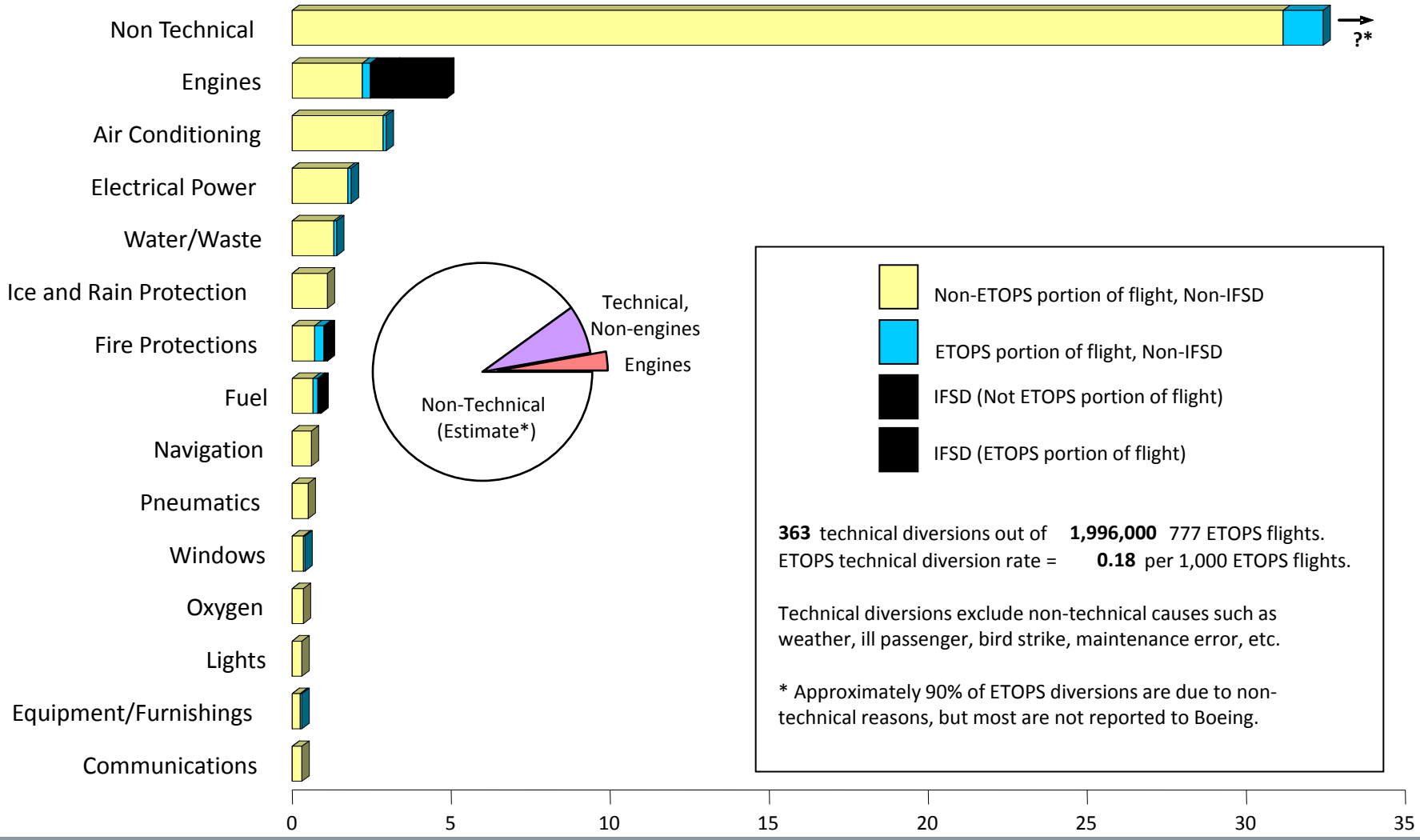


EDTO Diversions are Rare

Often Non-Technical Causes

A Summary of the Causes of 777 Diversions from ETOPS Flights

June 1995 through September 2011

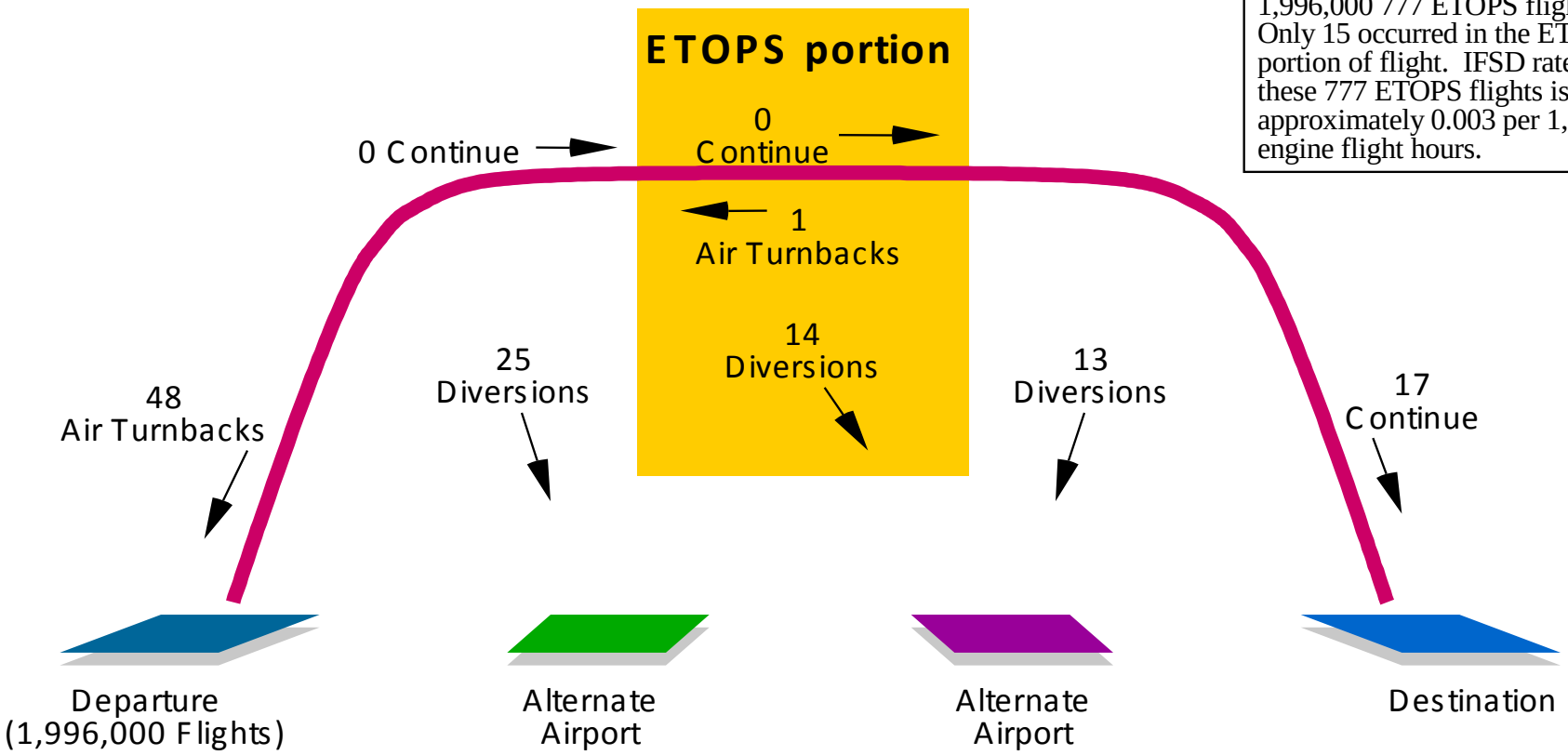


Most 777 In-flight Shutdowns (IFSDs)

Occur Outside the EDTO Portion of Flight

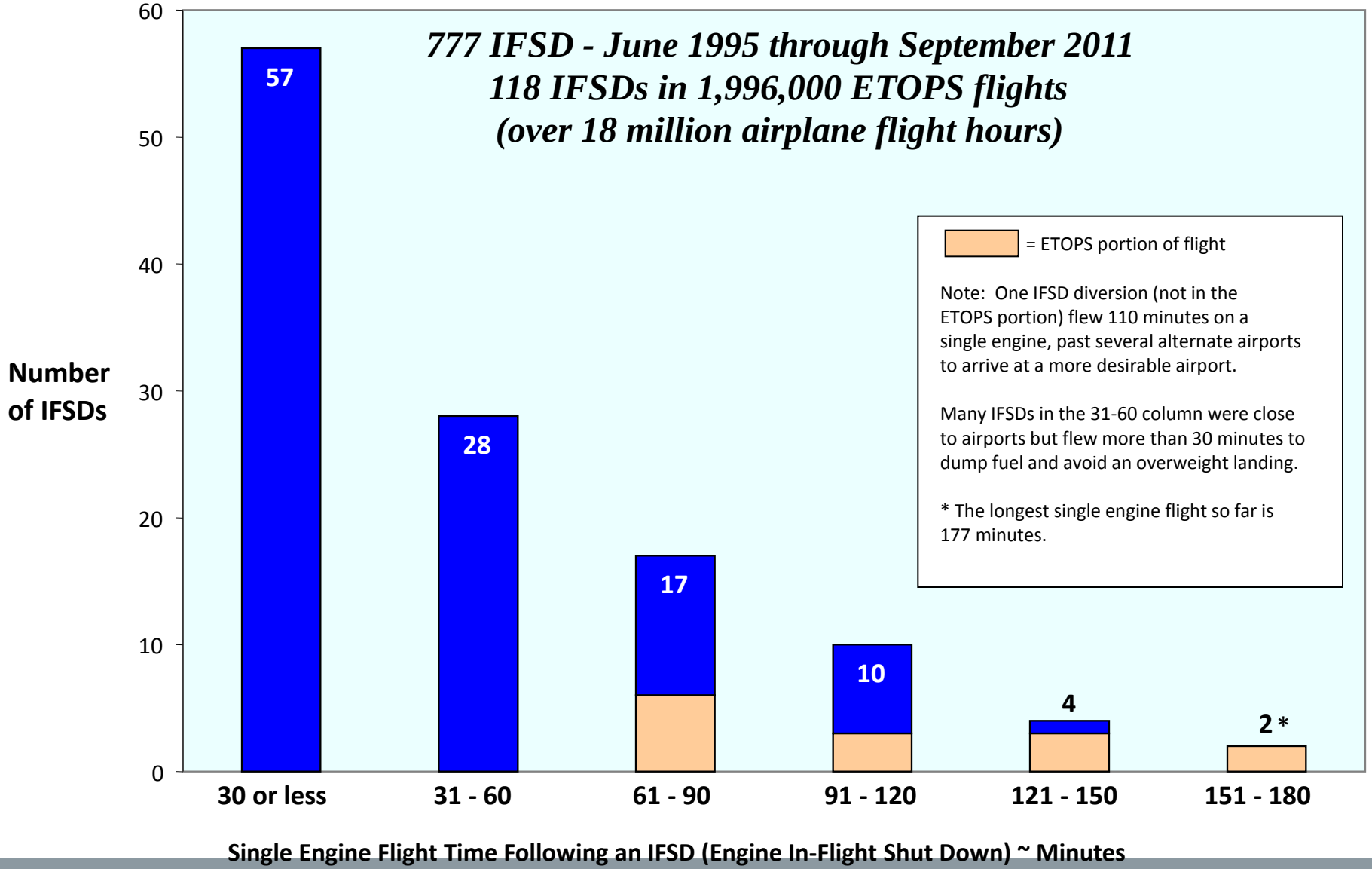
June 1995 through September 2011

A summary of 118 IFSDs out of 1,996,000 777 ETOPS flights. Only 15 occurred in the ETOPS portion of flight. IFSD rate on these 777 ETOPS flights is approximately 0.003 per 1,000 engine flight hours.



Less than one out of 100,000 ETOPS flights diverted from the ETOPS portion of flight due to engine IFSD.

The Largest Portion of EDTO Single-Engine Flight Times is Less Than 30 Minutes



Agenda

- EDTO Continued Reliability Monitoring and corrective actions
- EDTO Relevant events
- Conclusions

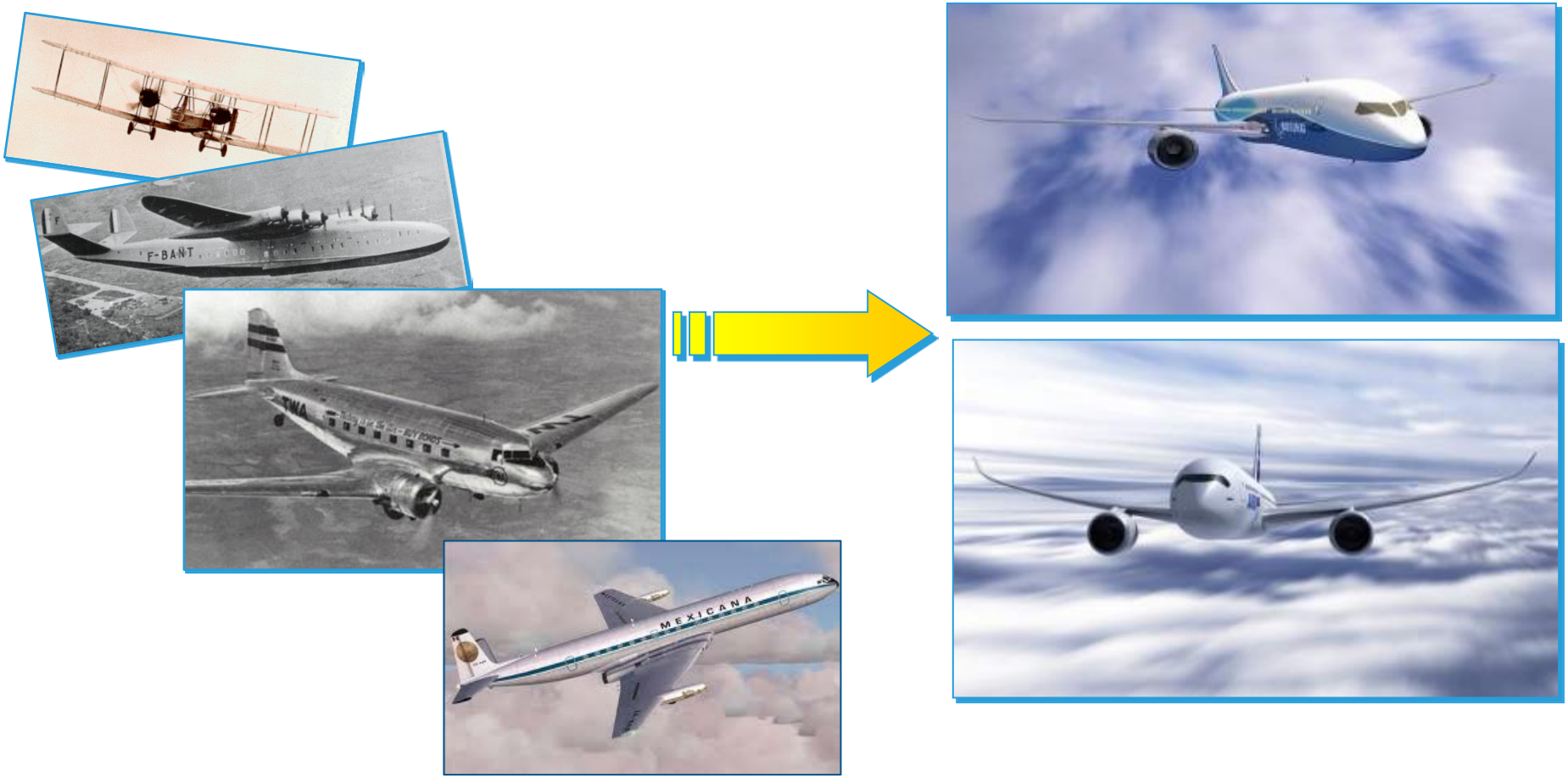
Conclusions

- Continued airworthiness activities performed by the Manufacturers and their Primary Certifying authorities ensure that
  - EDTO capability of the concerned airplane are continuously monitored
  - Any necessary corrective actions are identified

- Identification of necessary corrective actions highly depends on effective reporting by the Operators of relevant in-service events data
  - Quick and comprehensive reports helps in defining efficient corrective actions that may be necessary to maintain or restore EDTO operations
  - Good communication between concerned parties (Authorities, Operators and Manufacturers) is also key for developing any necessary corrective action plan.

- Timely implementation of required corrective actions is a major contributor for ensuring continued safe EDTO operations

Module 8
EDTO Continued surveillance



Thank You !!