Regional Seminar on MMEL/MEL and Special Operations

Organized by ICAO Regional Office for Western and Central Africa (WACAF)

Dakar - Senegal - from 30 June to 5 July 2025

ETOPS & EDTO

Part 1 – Introduction, Main concepts and Approval process

Eric FORTUNATO, AIRBUS ETOPS & EDTO Expert

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Technical awareness on ETOPS / EDTO

Eric FORTUNATO
ETOPS/EDTO Airbus Expert

eric.fortunato@airbus.com
+33 679 690 467 • Mobile

Airbus ETOPS / EDTO Team contacts

Operational Certification Department (1IAAVO) - Airworthiness & Certification

Generic email address:
etops-edto.support@airbus.com

Speaker

EDTO / ETOPS
Technical awareness

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Technical awareness on ETOPS / EDTO

Session Times		Topics :
Start	Finish	
Day 1 (Friday 4th)		
09:00	12:00	**Module 1** ETOPS / EDTO Background Information (Definitions, History, Main Concepts, etc.)
14:00	16h30	**Module 2** ETOPS / EDTO Capability of the Aircraft **Module 3** Overview of Operational Approval and ETOPS / EDTO Maintenance & Flight Ops processes
Day 2 (Saturday 05th)		
09:00	12:00	**Module 4** Review of ETOPS / EDTO Flight Ops Requirements & Practices
14:00	16:30	**Module 5** Review of ETOPS / EDTO Maintenance Requirements & Practices **Module 6** Wrap up and Conclusions

Schedule

EDTO / ETOPS
Technical awareness

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Content of this Technical awareness on ETOPS / EDTO :

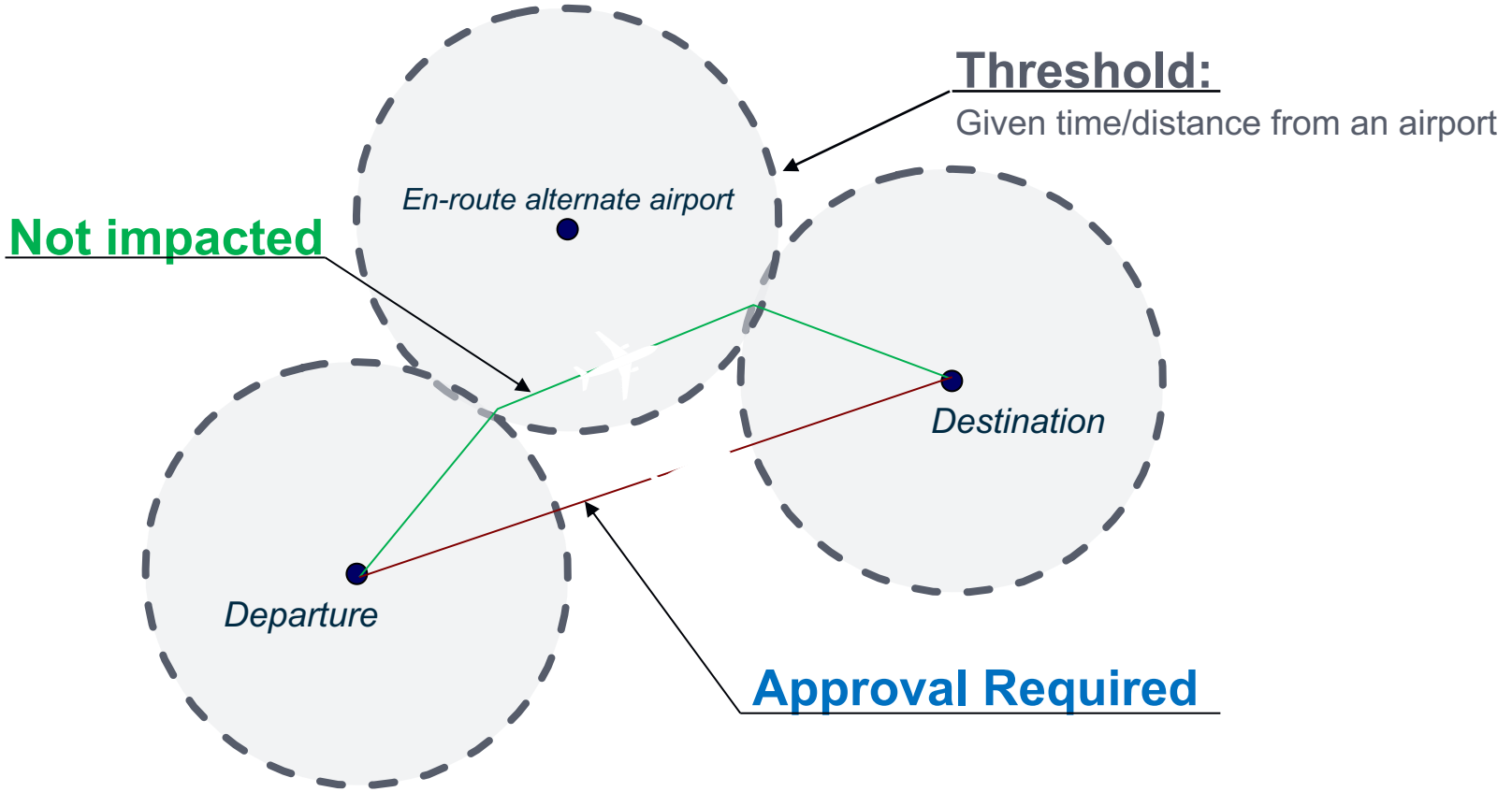
1. **ETOPS Background Information**
2. **ETOPS Capability of the Aircraft**
3. **Overview of Operational Approval** - *ETOPS Maintenance & Flight Ops processes*
4. **Review of ETOPS Flight Ops Requirements & Practices**
5. **Review of ETOPS Maintenance Requirements & Practices**
6. **Conclusions**

Module 1 : ETOPS Background Information – Agenda

1. Foreword
2. Introduction
3. ETOPS History: Major Milestones
4. ETOPS Regulations: Intent, Concepts & Applicability
5. Focus on ICAO EDTO criteria
6. Airbus ETOPS Experience
7. Airbus ETOPS Support & Organization
8. Conclusion

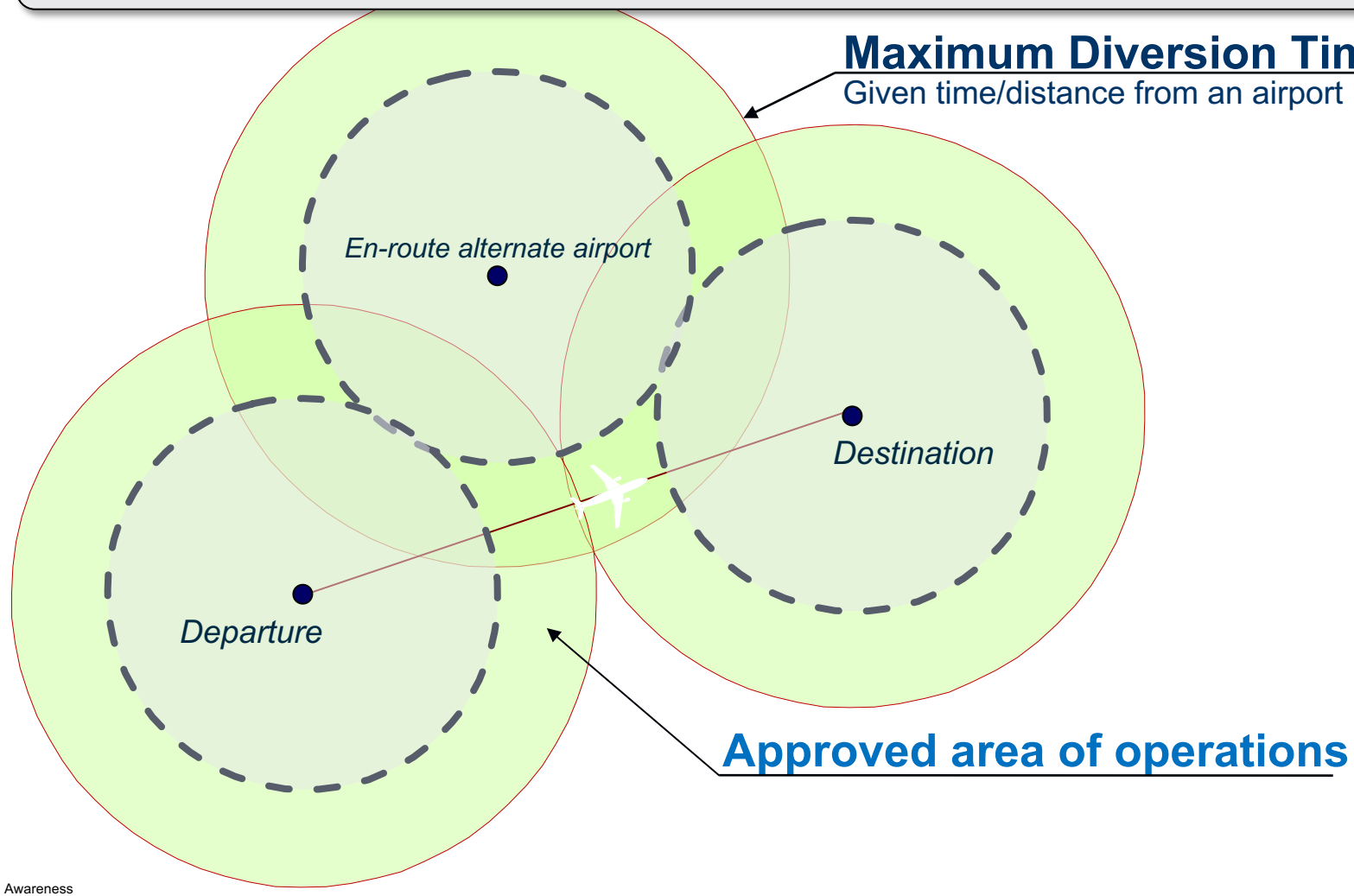
Applicability: Concept of threshold

There are sets of **Certification** & **Operational** requirements called **ETOPS** (or EDTO) which apply when an aircraft is operated **beyond applicable threshold**



Concept of Maximum Diversion Time

These **Certification** & **Operational** requirements also introduce the concept of **Maximum Diversion Time**, thus defining an approved **area of operations**.

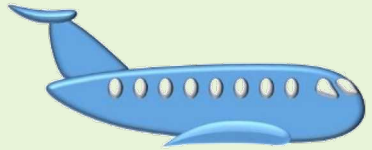


Certification & operational approval

Approval for ETOPS must go through Two Steps:

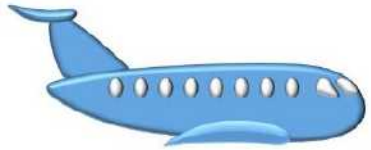
Phase 1

Must be performed **before** operational approval of Operator for ETOPS (or EDTO)



Applicant:
Aeroplane Manufacturer

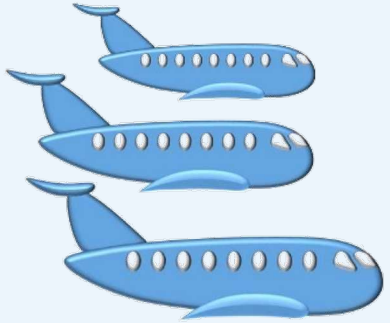
Design
assessments
Reliability



The Aeroplane is capable

State of Design

Phase 2



Applicant:
Operator

Maintenance
assessments
Flight Operations

The Operator is ready

State of the Operator

Different acronyms for the same subject

ICAO

as of 1985

ETOPS

Extended Twin OPerationS

Applicable to Twins only

Up to 180 min Diversion Time

as of 2012

ICAO

EDTO


Extended Diversion Time Operations

Applicable to Twins
and Aeroplanes with more than 2 engines

Includes Diversion Time > 180 min

as of 2007

FAA

ETOPS


ExTended OPerationS

Applicable to Twins
and Aeroplanes with more than 2 engines

Includes Diversion Time > 180 min

as of 2010

EASA

ETOPS

Extended Twin OPerationS

Applicable to Twins only

Includes Diversion Time > 180 min

LROPS

Long Range OPerationS

Applicable to A/C with more than 2 engines

***Cancelled** – Should be replaced by criteria in existing ops regulation*

ICAO: International Civil Aviation Organisation
EASA: European Aviation Safety Agency
FAA: Federal Aviation Administration

Different acronyms for the same subject

Use of the term "ETOPS" or "EDTO" in the aircraft documentation:

FAA

ETOPS

ExTended OPerationS

EASA

ETOPS

Extended Twin OPerationS

ICAO

EDTO

Extended Diversion Time Operations

- Most of the Authorities in the world are still using the term "ETOPS"
  - It is not planned to replace the term "ETOPS" with "EDTO" in existing docs
  - This is in line with the note introduced in the new Annex 6 §4.7 which clarifies that the term "ETOPS" may still be used instead of "EDTO"
    (see Note 1 in the Annex 6 extract copied below).

> 4.7.2.3 When approving the appropriate maximum diversion time for an operator of a particular aeroplane type engaged in extended diversion time operations, the State of the Operator shall ensure that:
>
> a) *for all aeroplanes:* the most limiting EDTO significant system time limitation, if any, indicated in the aeroplane flight manual (directly or by reference) and relevant to that particular operation is not exceeded; and
>
> b) *for aeroplanes with two turbine engines:* the aeroplane is EDTO certified.
>
> *Note 1.— EDTO may be referred to as ETOPS in some documents.*

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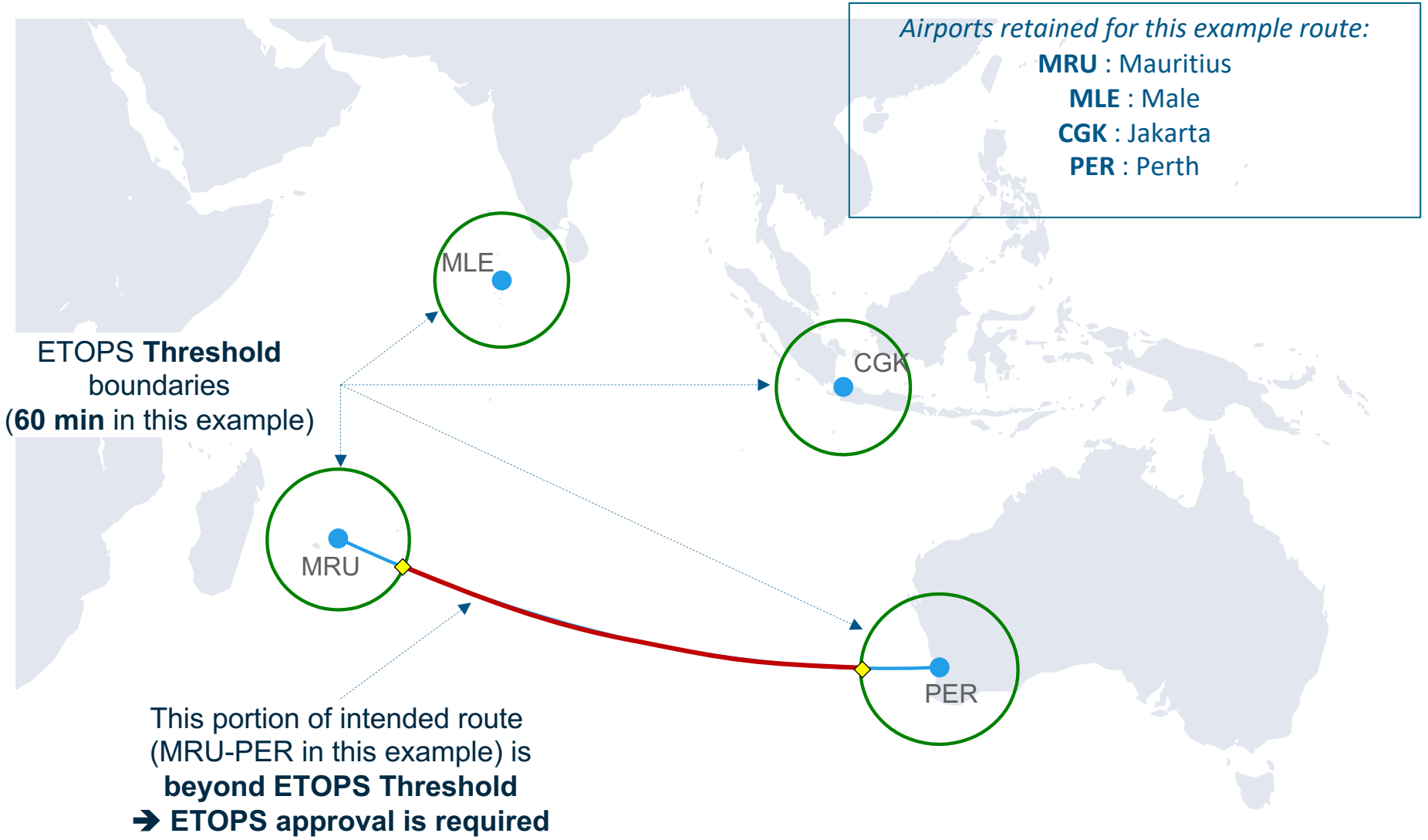
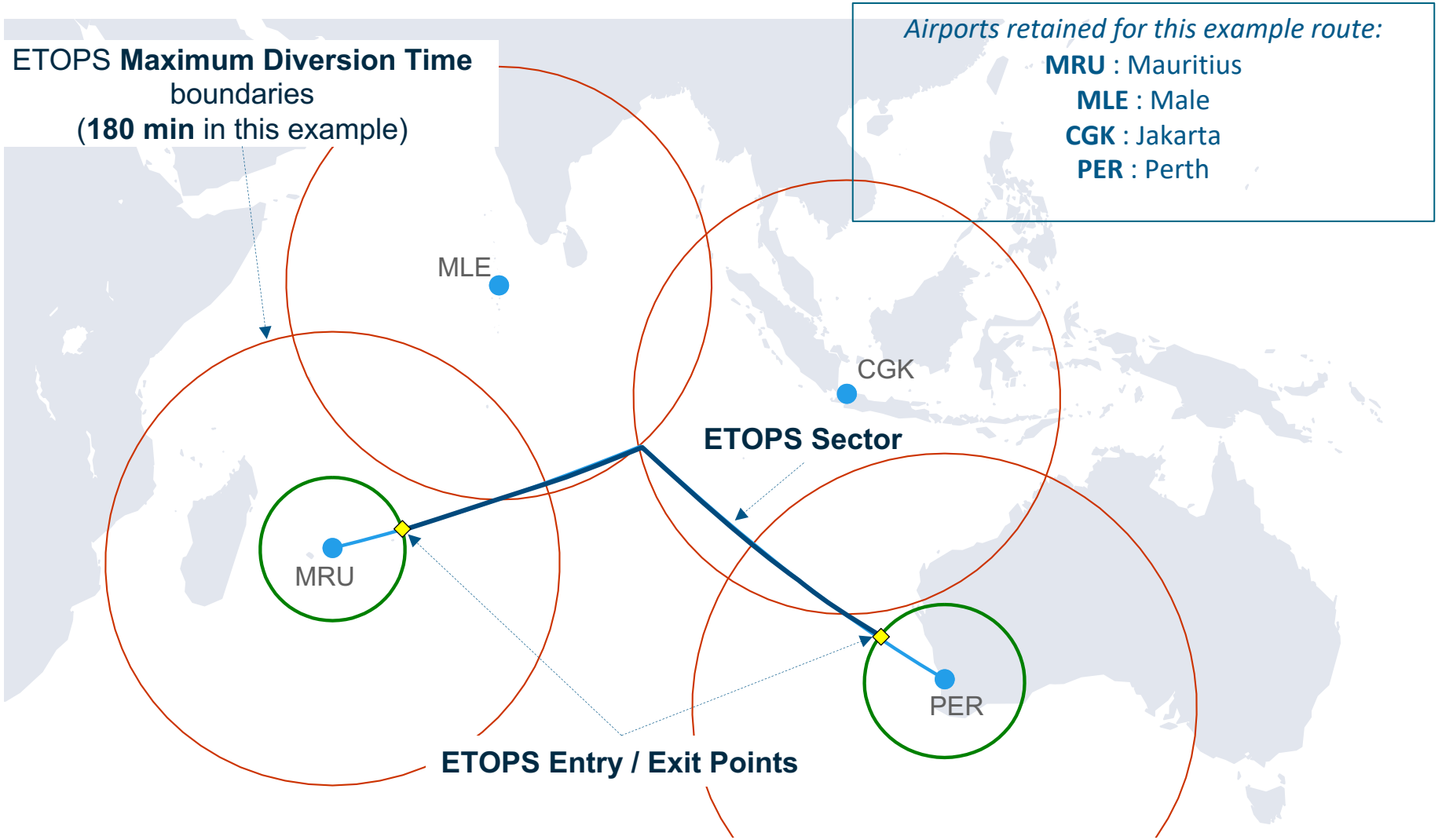
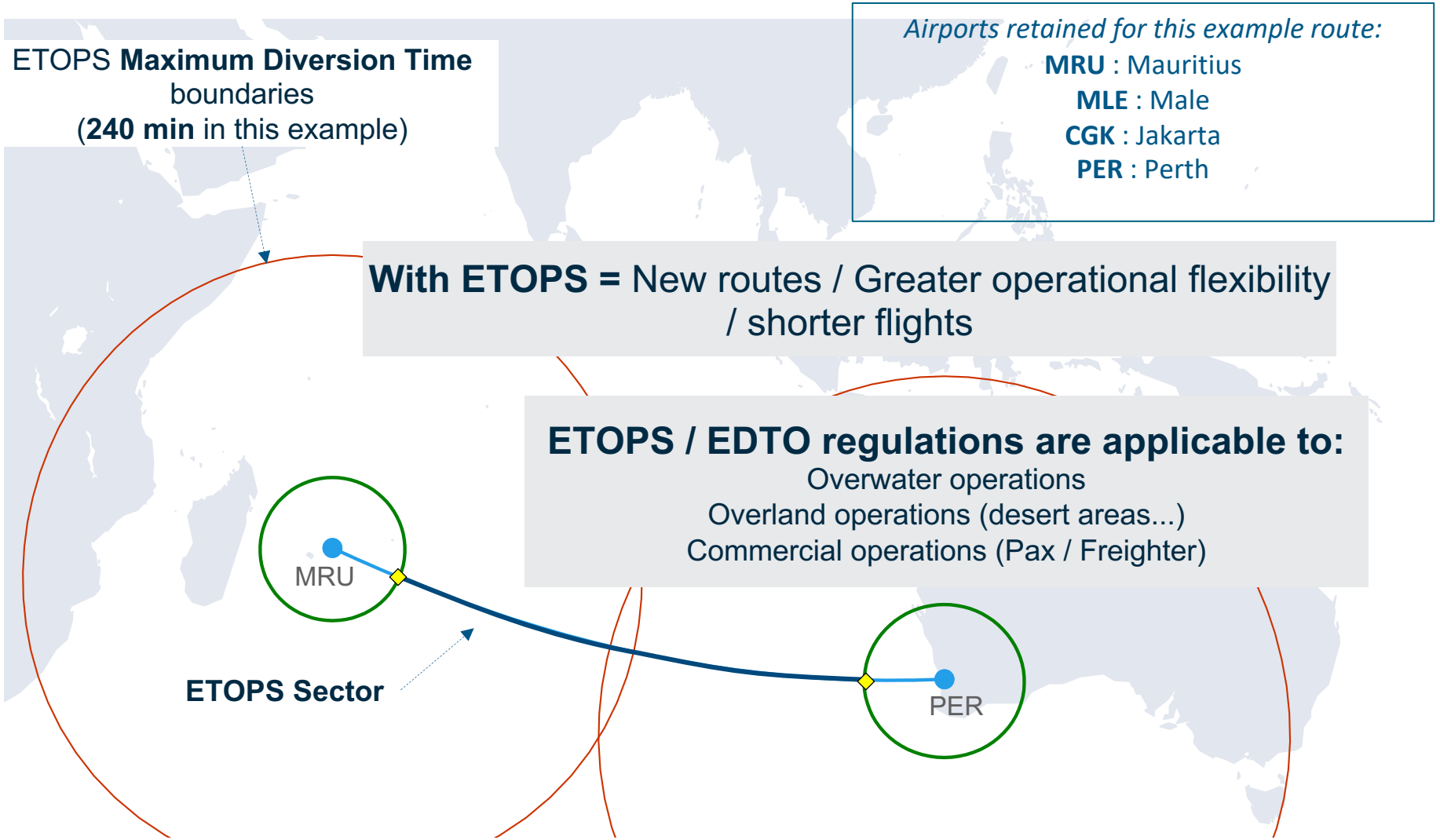
ETOPS / EDTO: When is it needed?



ETOPS / EDTO: When is it needed?



ETOPS / EDTO: When is it needed?



ETOPS Quiz

Question 1.1 :

A State has replaced its ETOPS regulation by a new EDTO regulation. Is it correct to say that an ETOPS certified airplane registered in this State must be re-certified for EDTO before it can be operated on EDTO ?

1. Yes
2. No

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Module 1 : ETOPS Background Information – Agenda

Extended diversion time operations milestones

ICAO: International Civil Aviation Organisation
EASA: European Aviation Safety Agency
FAA: Federal Aviation Administration

EDTO: Extended Diversion Time Operations
ETOPS: Extended Twin engine A/C OPerationS

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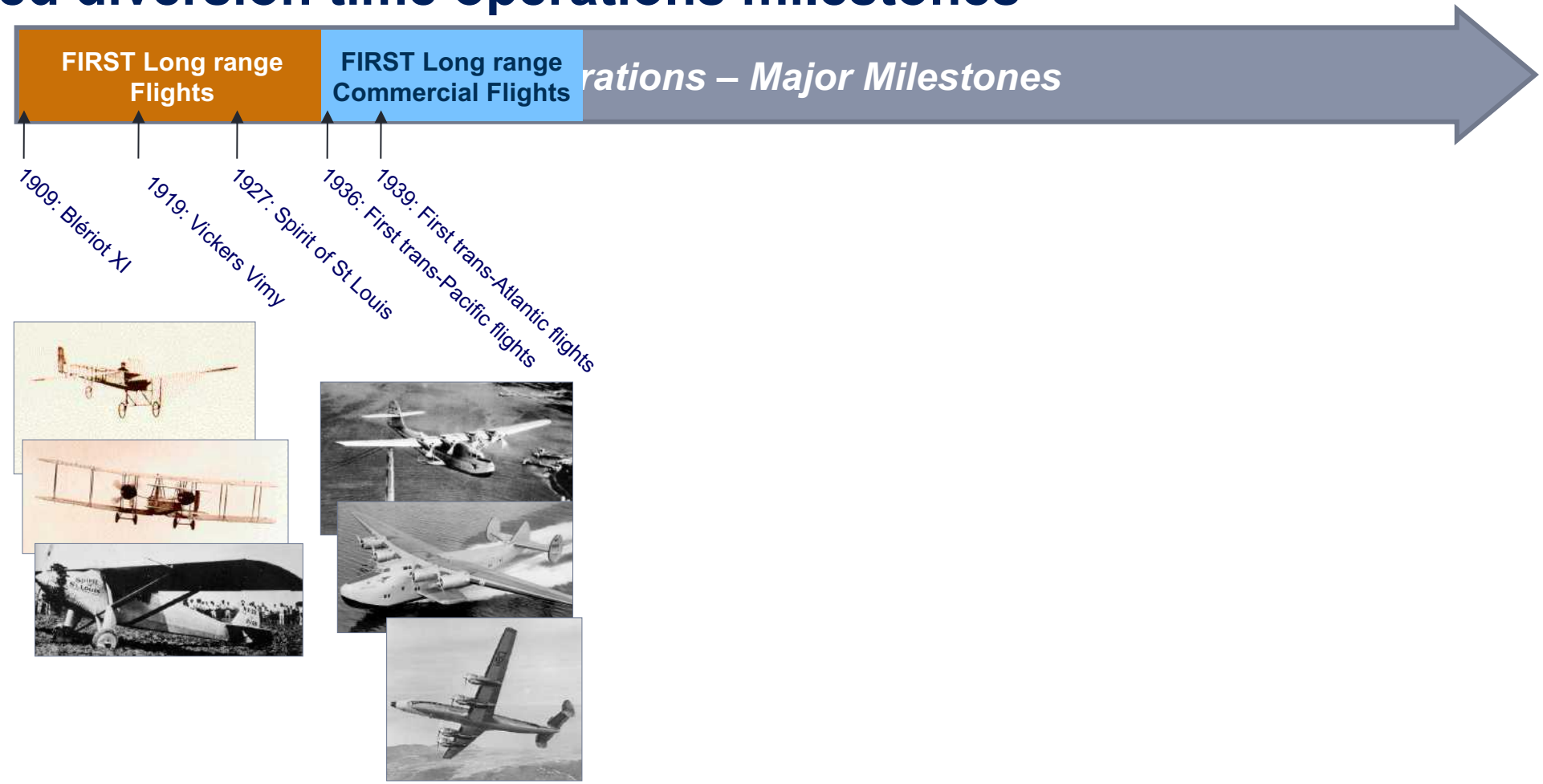
Extended diversion time operations milestones



ICAO: International Civil Aviation Organisation
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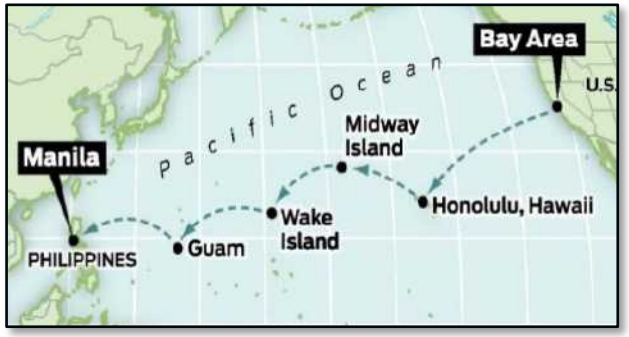
ETOPS: Extended Twin engine A/C OPerationS

ETOPS history: Major milestones

“Extended range” commercial operations started in the late 1930s:

- 1936: First Trans-Pacific commercial flights



- 1939: First Trans-Atlantic commercial flights

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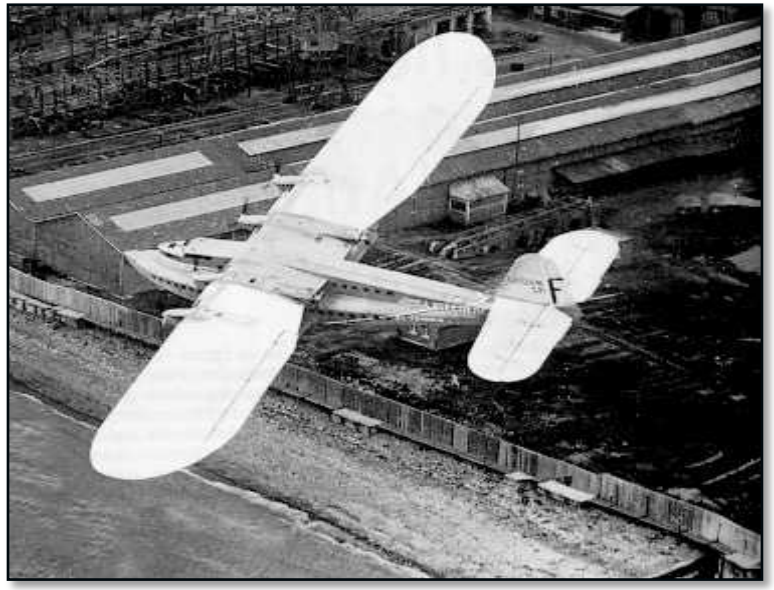
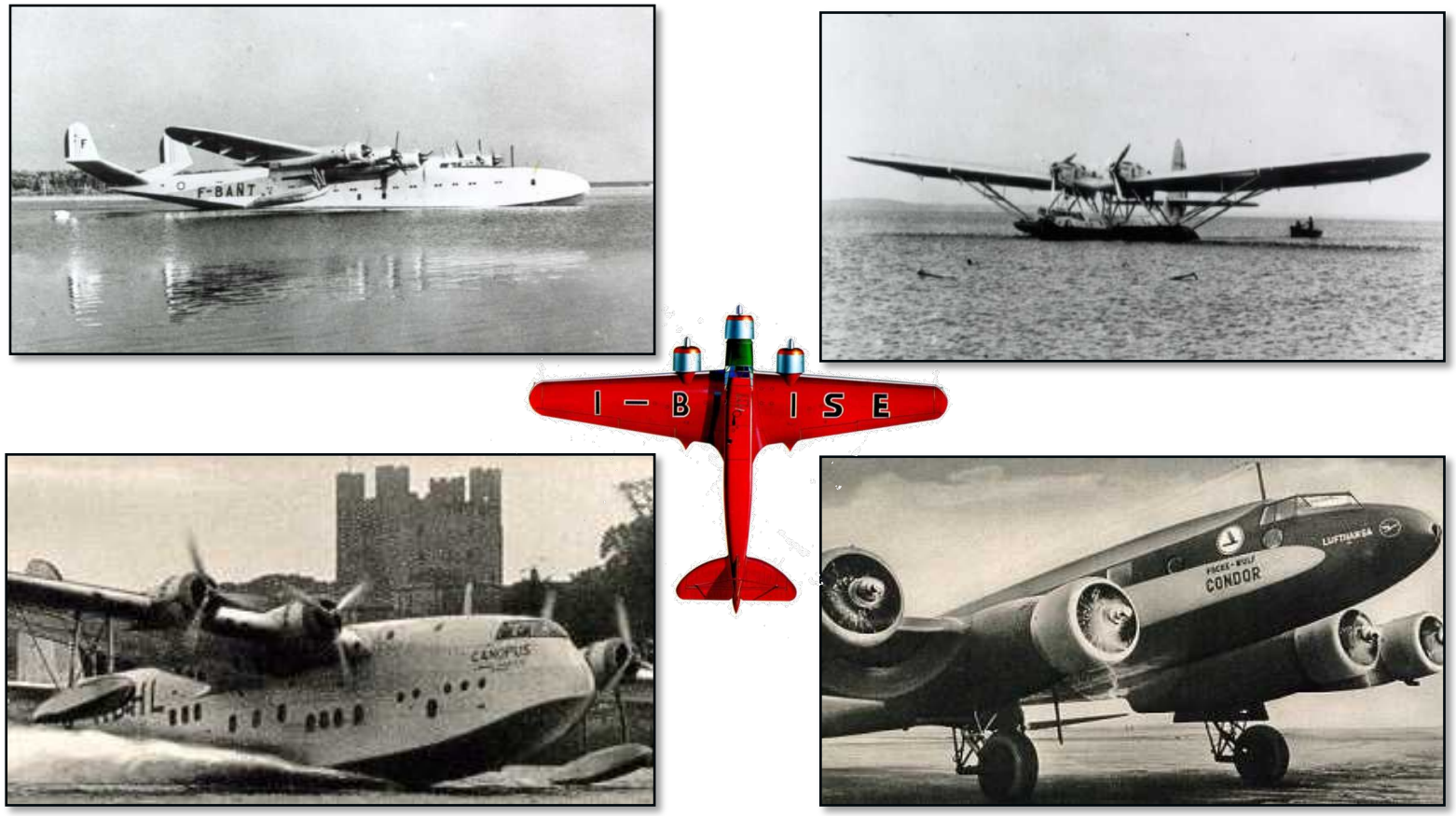
ETOPS history: Major milestones

These types of flights required large multi-engine flying-boats:



ETOPS history: Major milestones

Why these long rang flights were operated by multi-engine aircraft (mostly flying boats)?

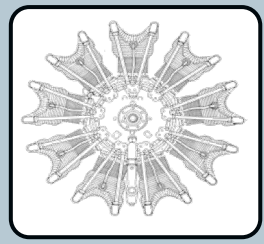


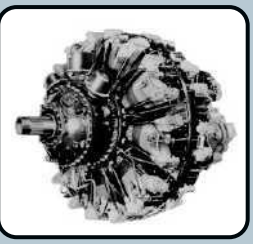
Poor engine reliability & performance could not allow design of equally efficient twin engine A/C

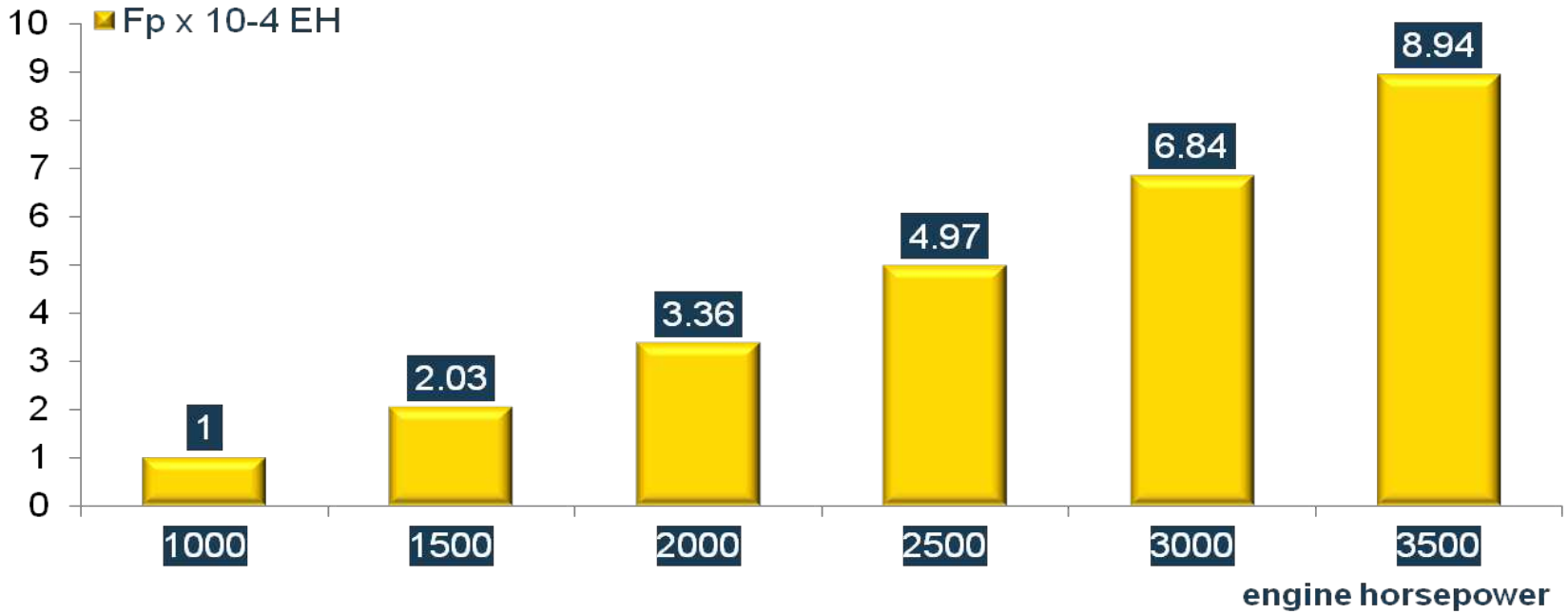
ETOPS history: Major milestones

Piston engine reliability

The following chart (1953 ICAO report) gives the probability of failure for piston engines vs. power at 1000 constant rpm:





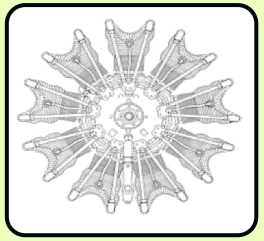


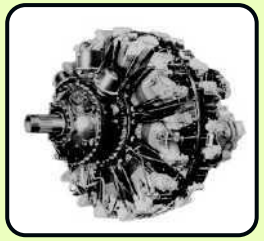
The probability of failure increases as power is increased

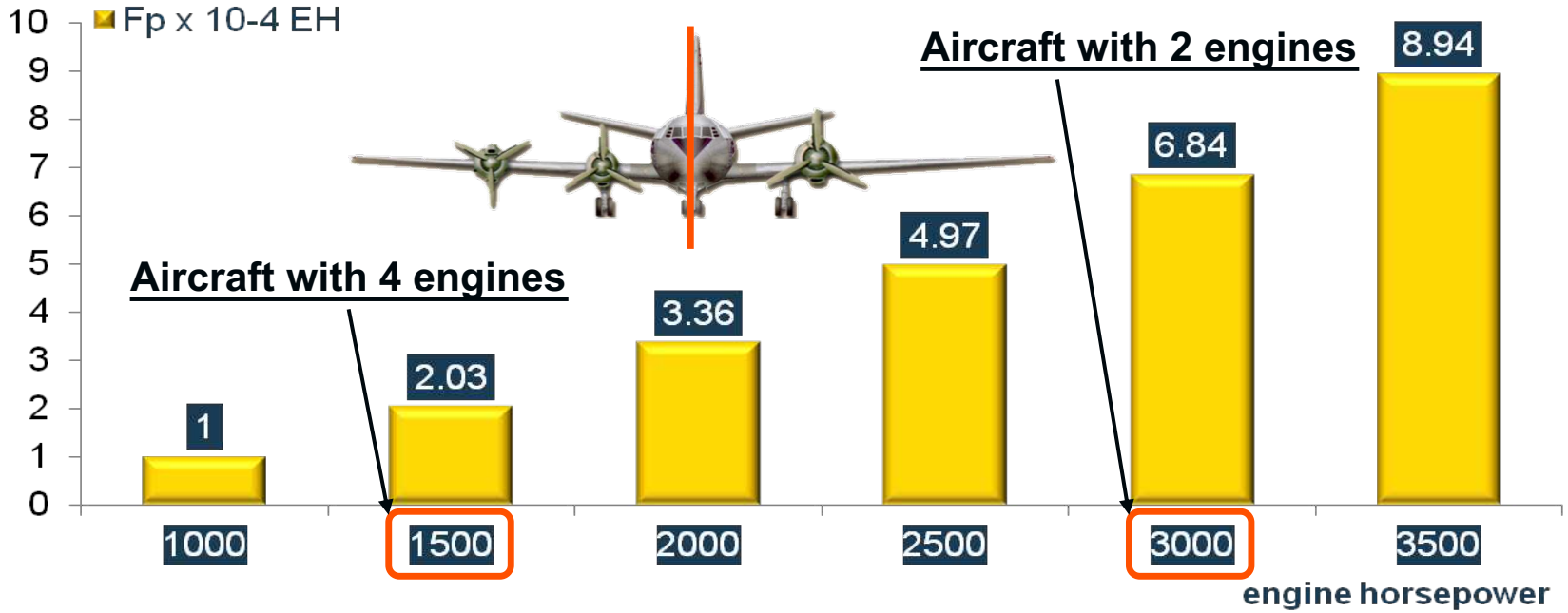
ETOPS history: Major milestones

Probability of failure of first engine (Example)

- This probability is linked to the number of engines fitted on the A/C
- Let's do the comparison of this probability between two possible layouts, i.e.:







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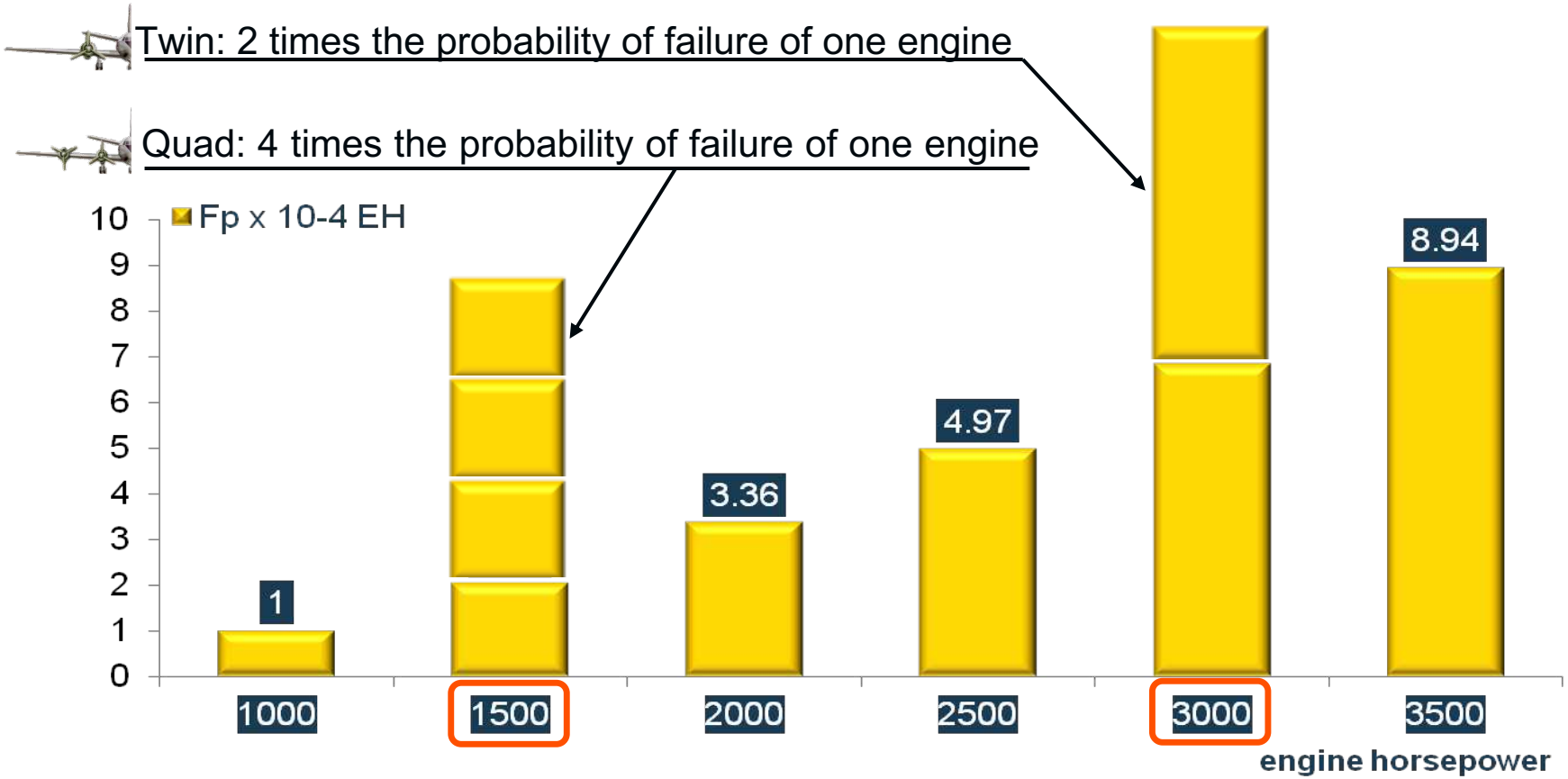
ETOPS history: Major milestones

Probability of failure of first engine (Example)



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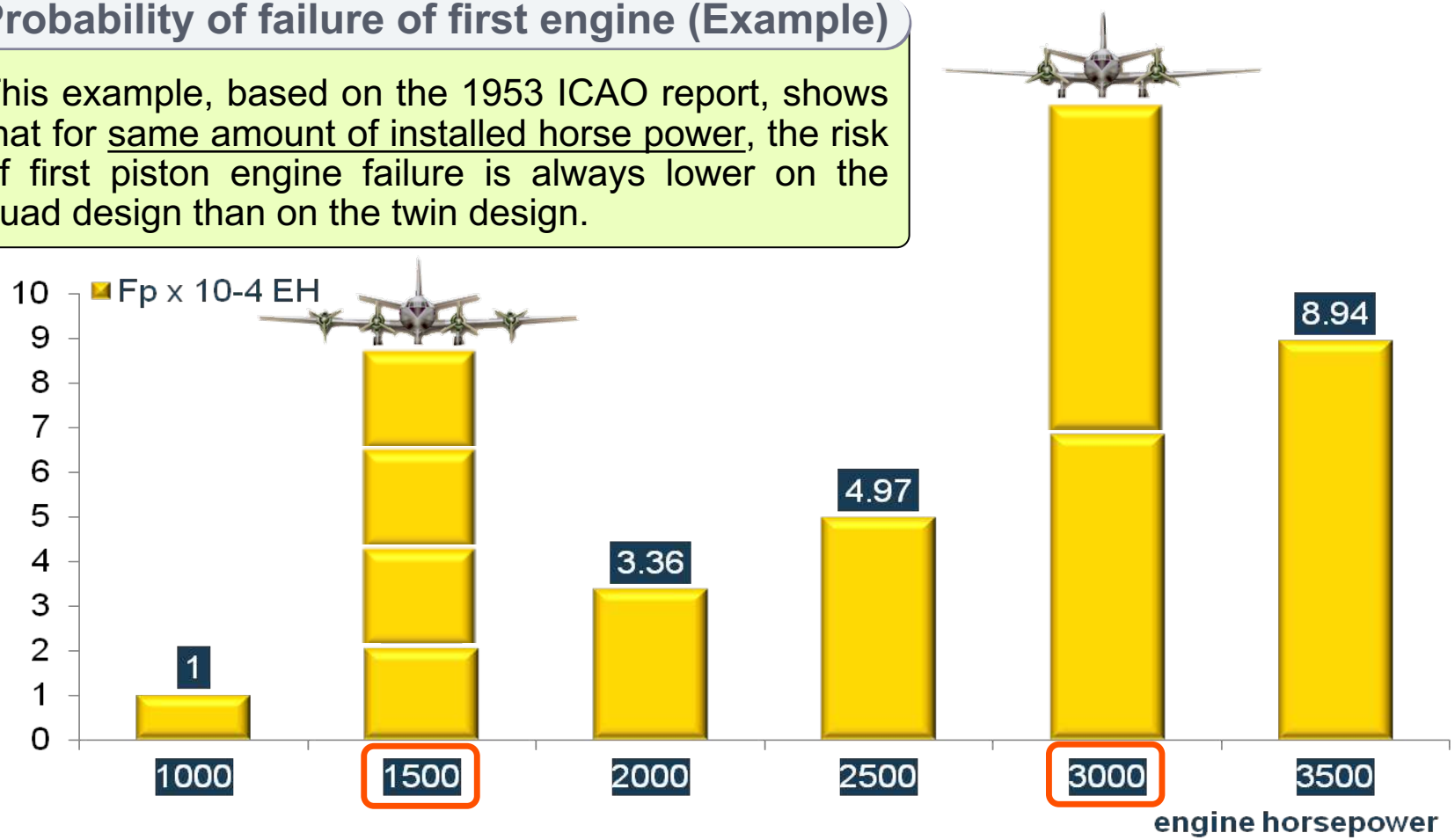
ETOPS history: Major milestones

Probability of failure of first engine (Example)

This example, based on the 1953 ICAO report, shows that for same amount of installed horse power, the risk of first piston engine failure is always lower on the quad design than on the twin design.



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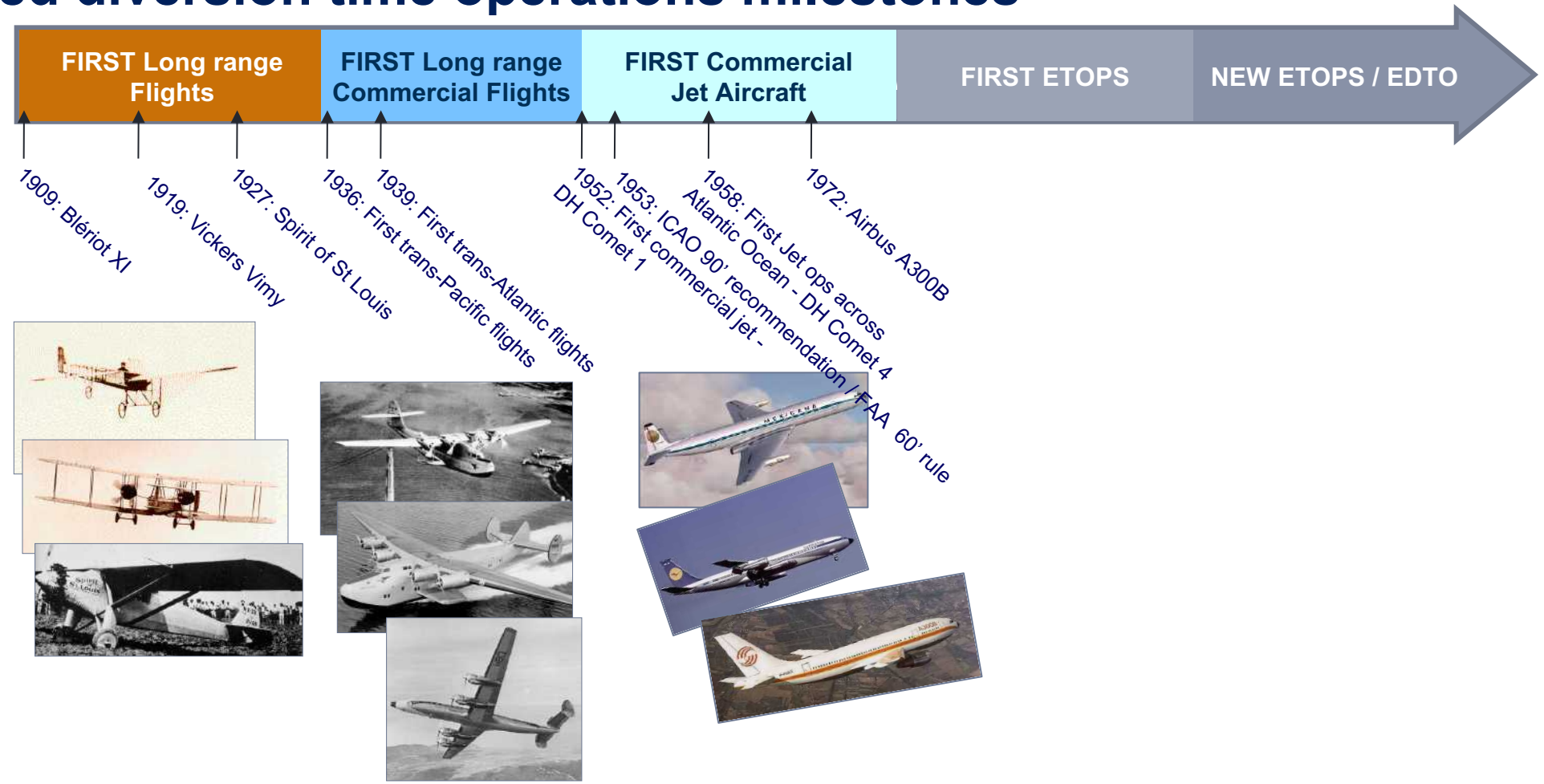
ETOPS history: Major milestones

As reliable and reasonably light engines had limited power:

- Design of long range aircraft (high weight) implied installation of several engines (more than two)

- Twin engine aircraft had limited payload/range performance and were only operated on short flights

Extended diversion time operations milestones



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ETOPS history: Major milestones

Until 1952, all commercial flights were operated with piston engine powered airplanes:

- 1952: First commercial operation with jet airplane (DH Comet 1)

- 1958: First transatlantic commercial jet operation (DH Comet 4)

Since 1960, jet engine powered aircraft progressively replaced piston engine powered aircraft:

- on all long range routes
- on most of regional routes

ETOPS history: Major milestones

ETOPS regulations: Past and present

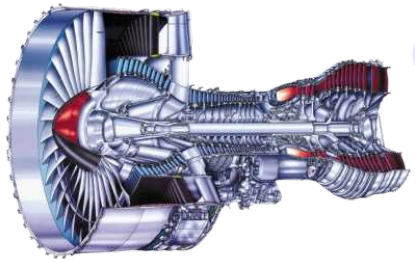
ICAO issued its “90 minutes” recommendations in the early 50s following a review of the piston engine reliability:

- no airplane shall be operated beyond 90 min (all engines operative) from a diversion airfield, except if the route can be flown with two engines inoperative
- common interpretation was that twin engine aircraft could be operated on routes up to 90 minutes maximum diversion time.

In 1953, the FAA published the initial “60 minutes” rule:

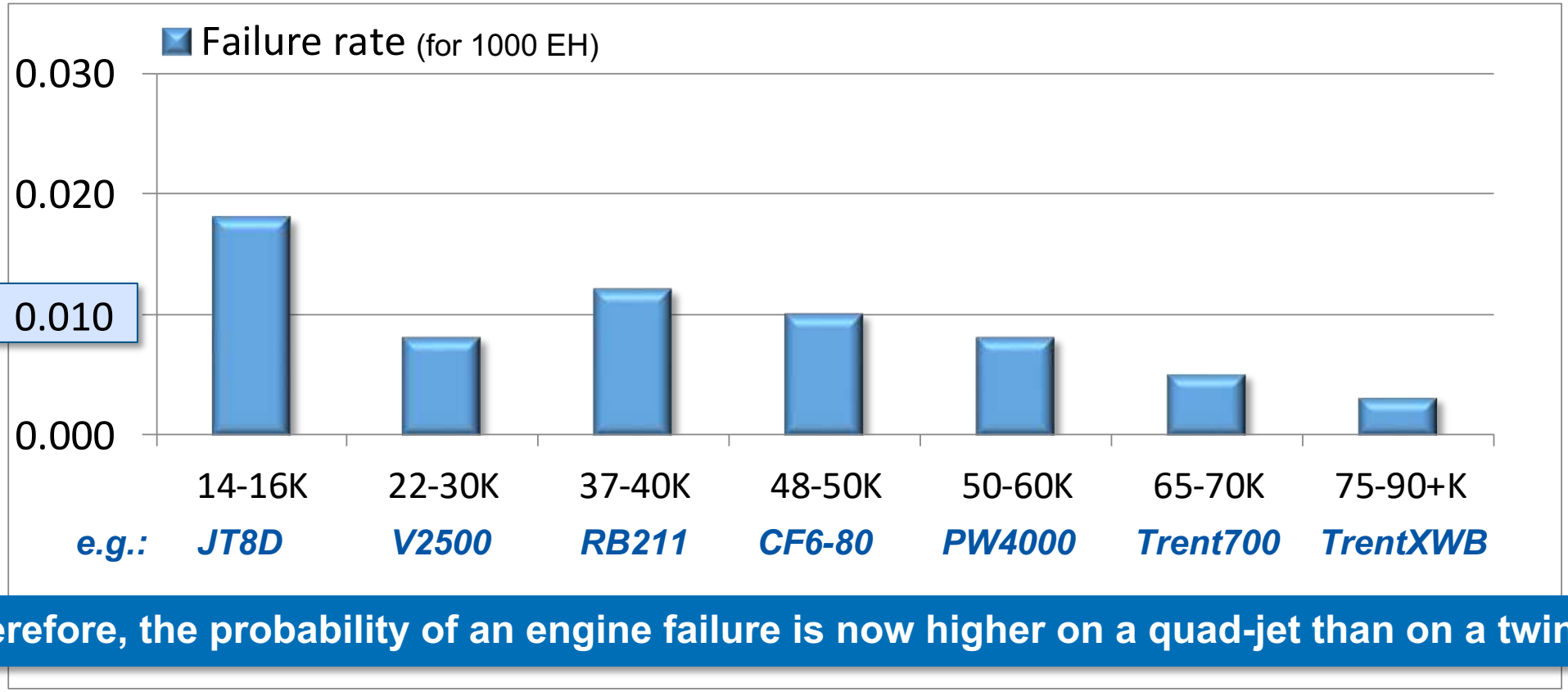
- applicable to three (until 1964) and two engine aircraft
- special approval for operations beyond 60 minutes

ETOPS history: Major milestones



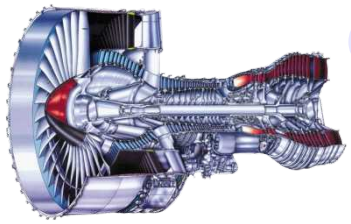
Jet engine reliability

More than 40 years of jet operations have shown that unlike piston engines, jet engine failure probability is not affected by the thrust or the size of the engine:



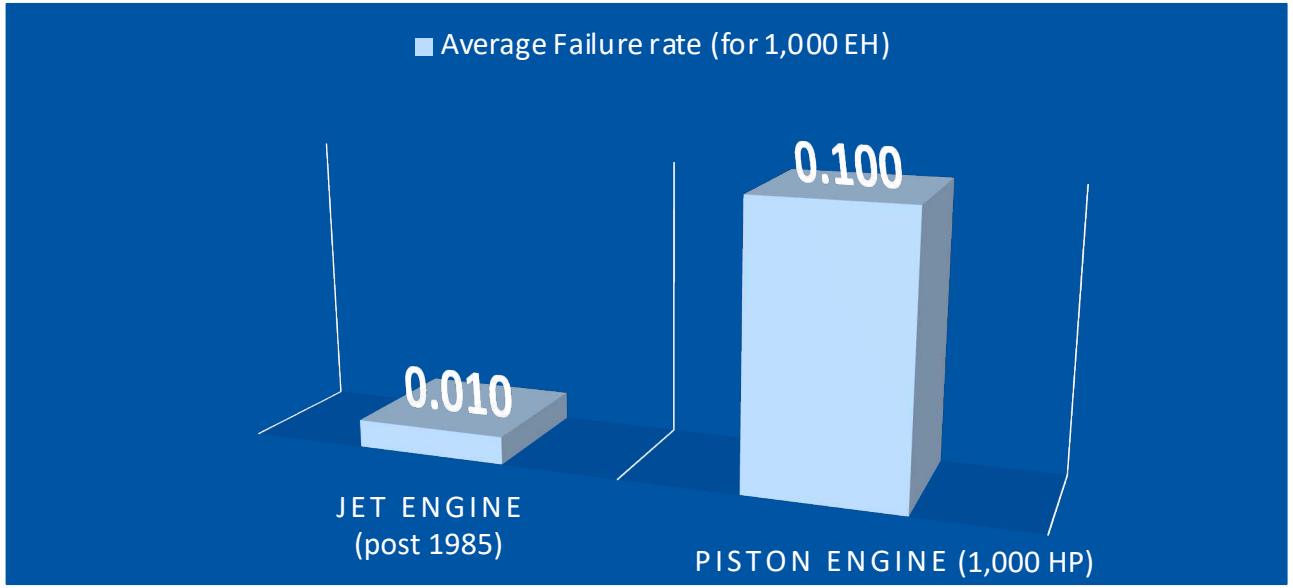
Therefore, the probability of an engine failure is now higher on a quad-jet than on a twin-jet

ETOPS history: Major milestones

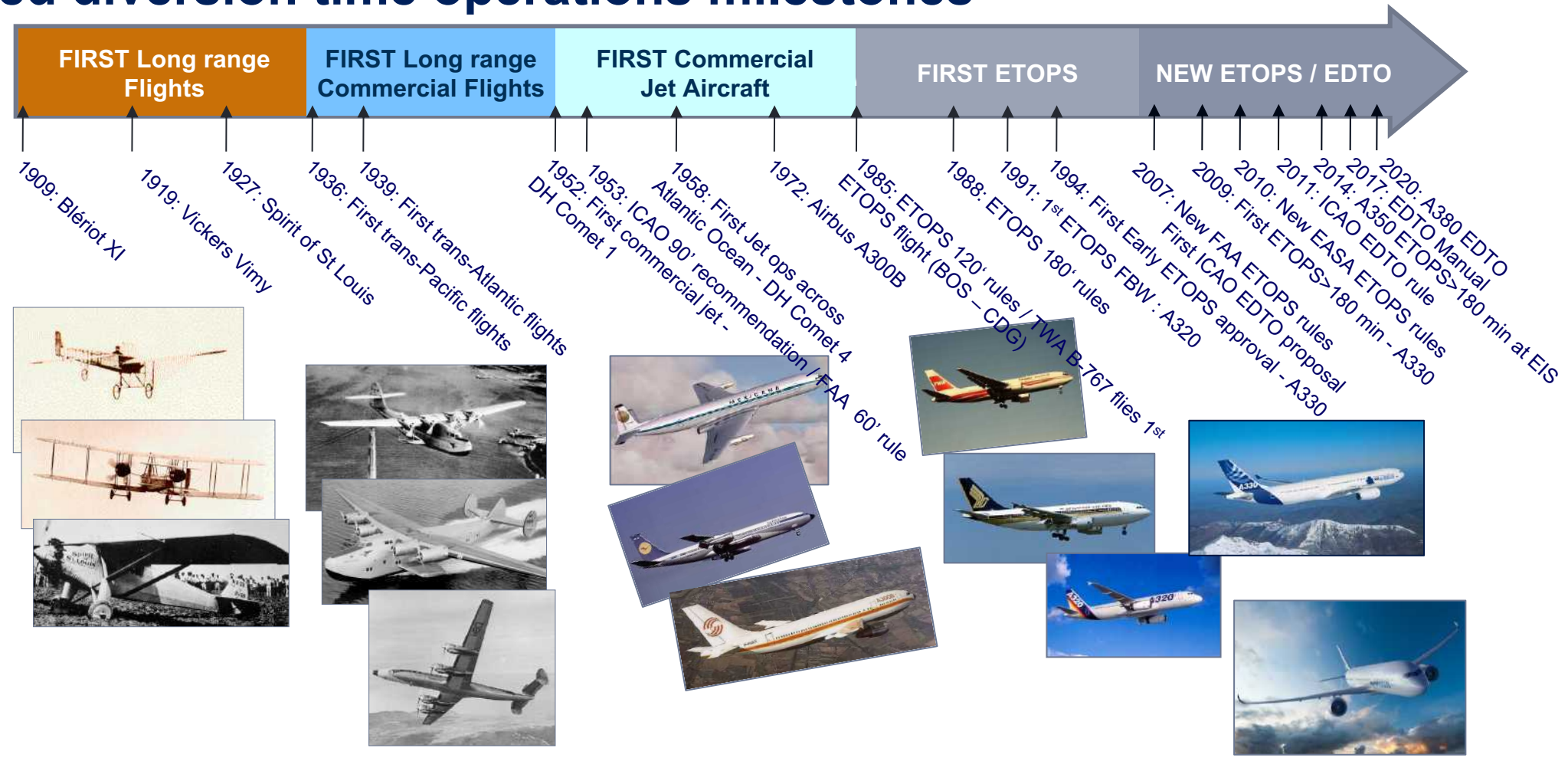


Jet engine reliability

In addition, modern Jet engines have a significantly better average reliability :



Extended diversion time operations milestones



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History – The advent and evolution of ETOPS

The introduction in the 1980s of twin aircraft (A310, B767) powered with modern (fuel efficient) turbofan engines made the old 60/90 minute rules inadequate:

1984

- ICAO ETOPS study group amend Annex 6

1985

- FAA publishes first ETOPS regulation to address 120 min operations / First ETOPS operation (SIA/A310 - TWA/B767)

1988

- The very good experience with 120 min operations allowed publication of 180 min ETOPS rules

2007

- January 2007 - FAA publishes new “Extended Operations” (ETOPS) regulation
- June 2007 – Transport Canada publishes new Extended Range Twin-Engine Operations (ETOPS)
- July 2007 – CASA publishes new “Extended Diversion Time Operations” (EDTO) regulation
- October 2007 – ICAO sent a State letter to introduce new “Extended Diversion Time Operations” (EDTO) regulation in its SARPs. Further to the numerous State replies, the ICAO has decided to postpone its implementation into the SARPs until at least end of 2009. A new Special Operations Task Force has been set-up to review the comments and propose new recommendations .

2010

- EASA publishes new ETOPS criteria (AMC 20-6 Rev 2)

2012

- ICAO State Letter on new EDTO provisions (based on SOTF conclusions) – Implementation as of 2012

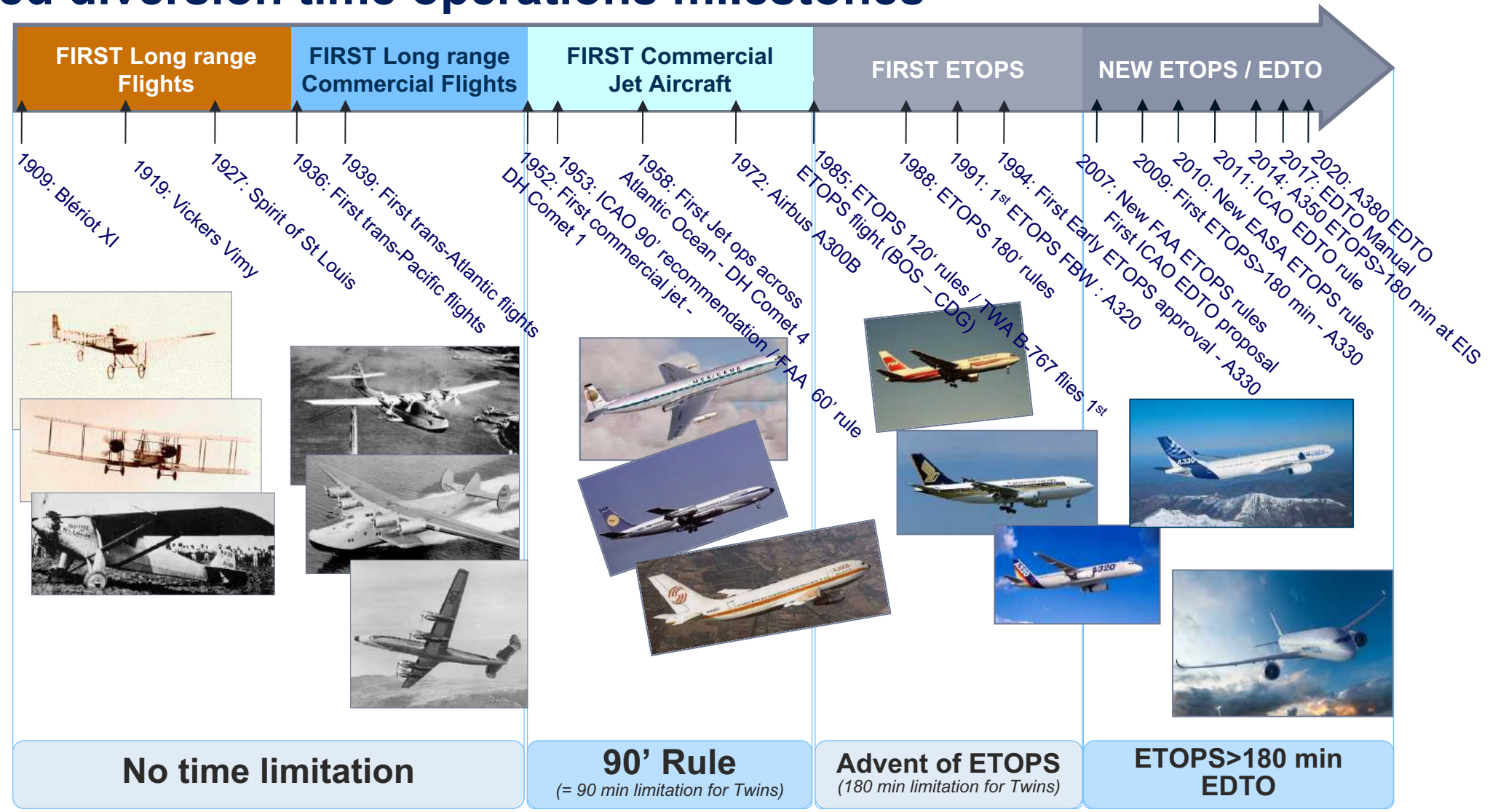
2017

- Publication of ICAO EDTO Manual (Doc 10085)

2020-2023

- EASA rulemaking on ETOPS/EDTO (repatriation of AMC 20-6 into Part 21, CS-25, CS-E, Part-M, Part-145 and Air Operations rules)

Extended diversion time operations milestones



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ETOPS regulations: Intent, concepts & applicability

The logic of ETOPS

ETOPS objective

The objective of initial ETOPS rules (1985):

"Overall level of operational safety consistent with that of **modern 3 and 4 engine aircraft**"

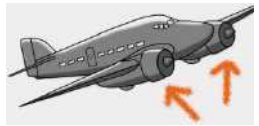
ETOPS regulations: Intent, concepts & applicability

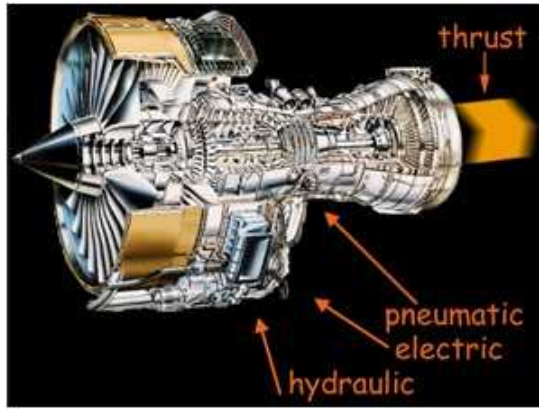
The logic of ETOPS: 2 vs. 4 engines

Comparison of a basic (non ETOPS) twin engine aircraft with a modern 3 or 4 engine aircraft:

- to spot the main differences in their architecture, and
- to understand how these differences may impact the safety of extended diversion time operations…

The most obvious difference is indeed the number of installed engines…





Recall: on top of thrust, engines provide as well:

- Electric power
- Hydraulic power
- Pneumatic power

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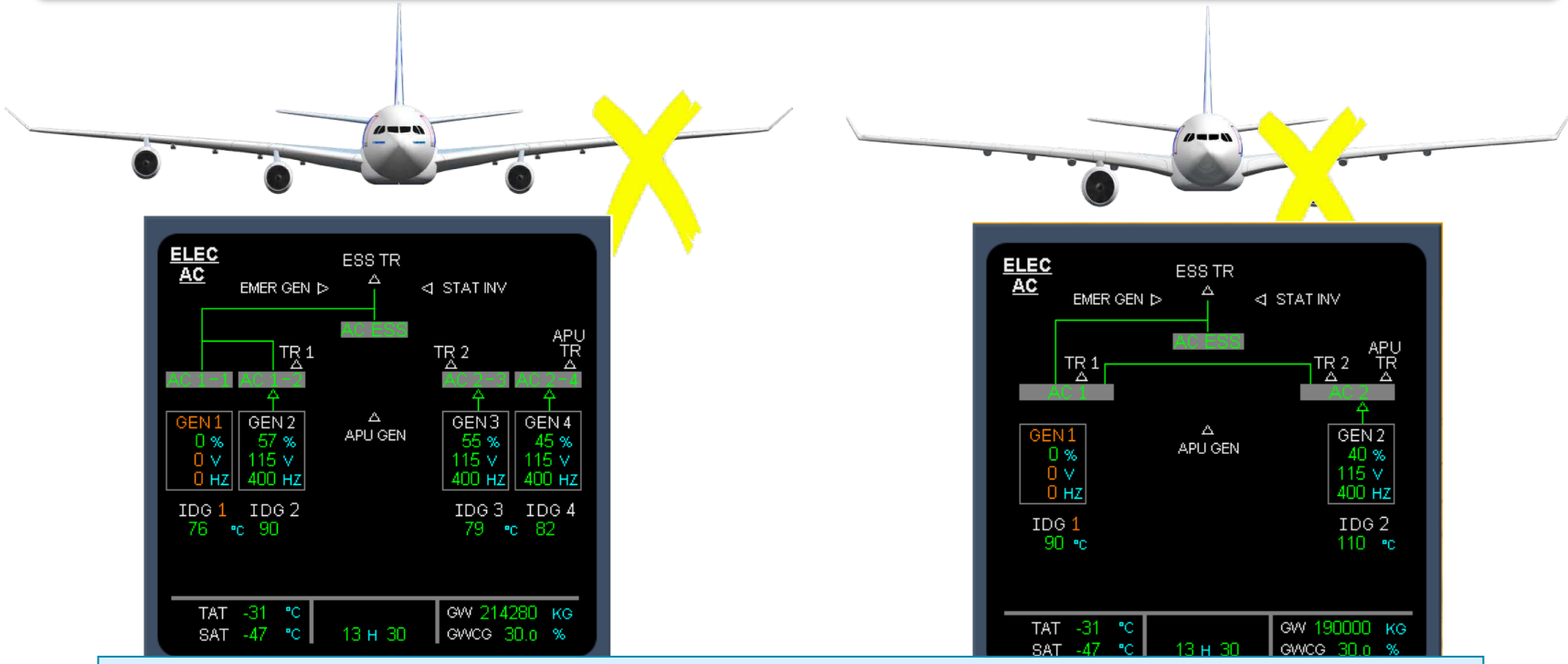
ETOPS regulations: Intent, concepts & applicability

The logic of ETOPS: 2 vs. 4 engines

Systems independence

Independence of some major aircraft systems is directly linked to the number of engines installed



Example of Electrical System: Remaining source(s) after engine failure:
3 sources on Quad /1 source on Twin

ETOPS regulations: Intent, concepts & applicability

The logic of ETOPS: 2 vs. 4 engines

Maintenance actions

System redundancy has a direct impact on error consequence after simultaneous maintenance action on parallel systems

Example of dual maintenance on 2 identical engine mounted systems.

Potentially affected systems: 2 out of **4** on Quad / **2** out of **2** on Twin

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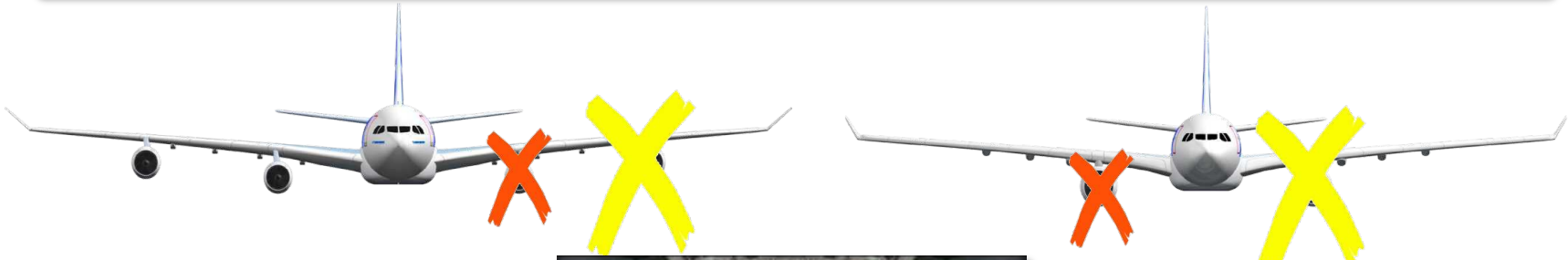
ETOPS regulations: Intent, concepts & applicability

The logic of ETOPS: 2 vs. 4 engines

Crew actions

System redundancy has also a direct impact on error consequence in system management after failure



Exemple of inapropriate course of action after system failure.

Potentially affected systems: 2 out of **4** on Quad / **2** out of **2** on Twin

ETOPS regulations: Intent, concepts & applicability

The logic of ETOPS: 2 vs. 4 engines

Exposure to weather

Level off altitude after an engine failure is often lower on twin

It may expose the twin to **more adverse weather conditions**…

This fact, combined with lower redundancy in the systems of (basic) twins, may have an **adverse impact on crew workload**.

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ETOPS regulations: Intent, concepts & applicability

Introducing the ETOPS concept

Basically, the ETOPS concept first implemented in 1984 remained unchanged :

PRECLUDE a diversion by

Designing reliable A/C engines & systems

⇨ **minimize the occurrence**
of degraded operating modes

PROTECT the diversion by

Implementing systems/functions required for safe ETOPS diversion & landing

⇨ **Ensure a high level of systems performance** in normal & degraded operational modes

ETOPS Type Design & Reliability assessment (or certification) of the Aircraft

Implementing specific maintenance precautions, conservative practices & readiness demonstration

⇨ **retain a high level of reliability**

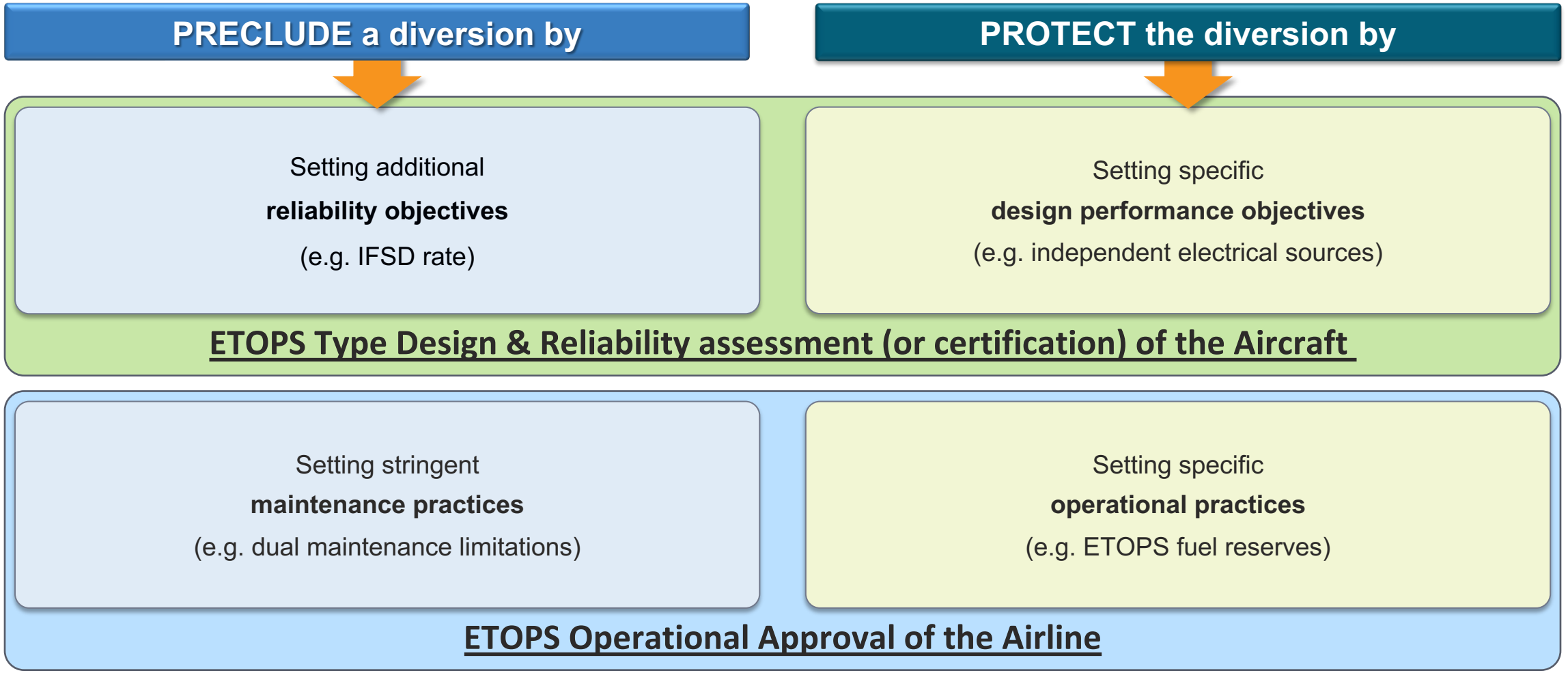
Having operational plans in place for readiness demonstration, aiming at
the protection of passengers and crew

⇨ **cope with adverse operating conditions**

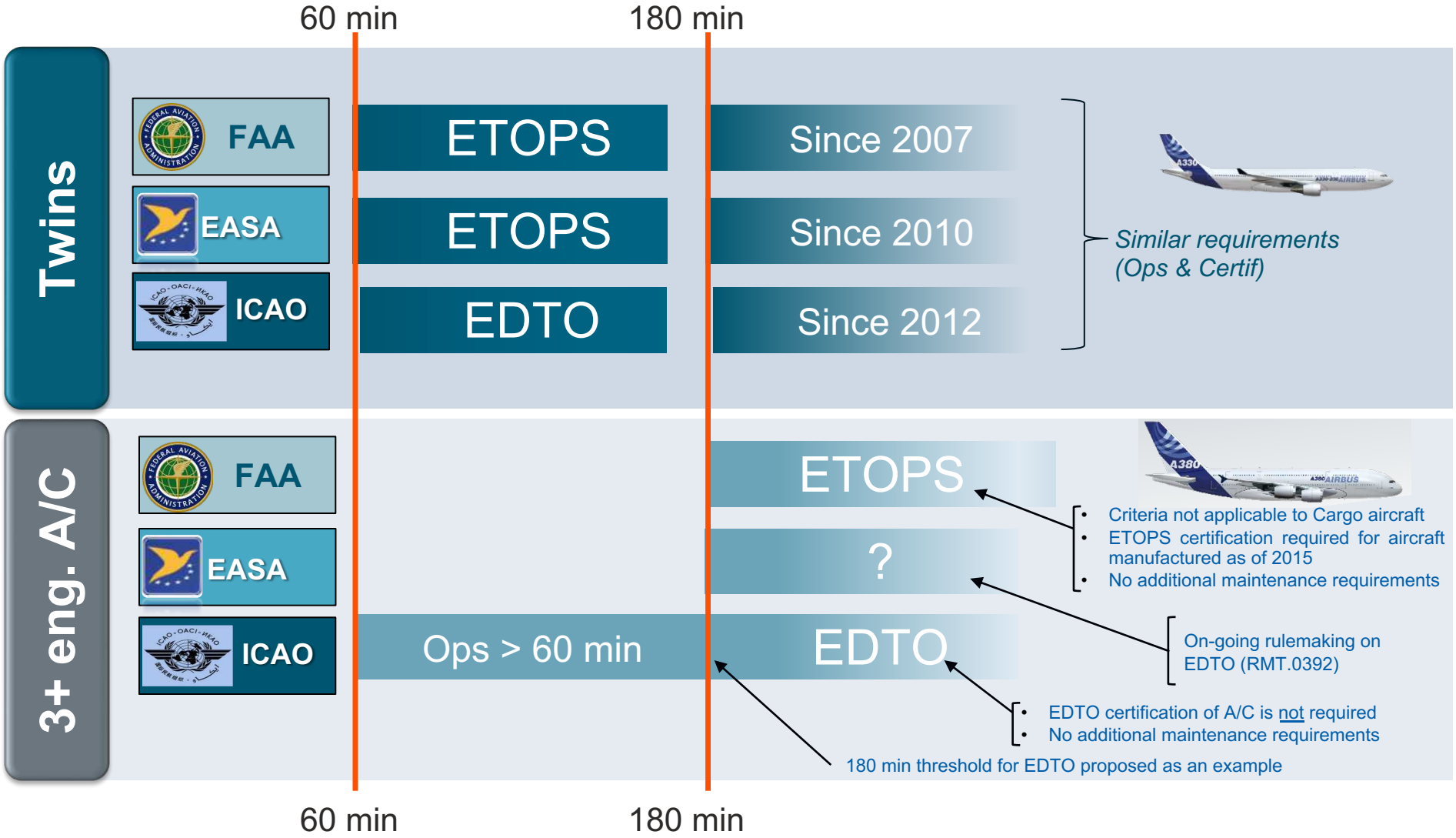
ETOPS Operational Approval of the Airline

ETOPS regulations: Intent, concepts & applicability

The ETOPS concept – Summarized view



ETOPS/EDTO thresholds



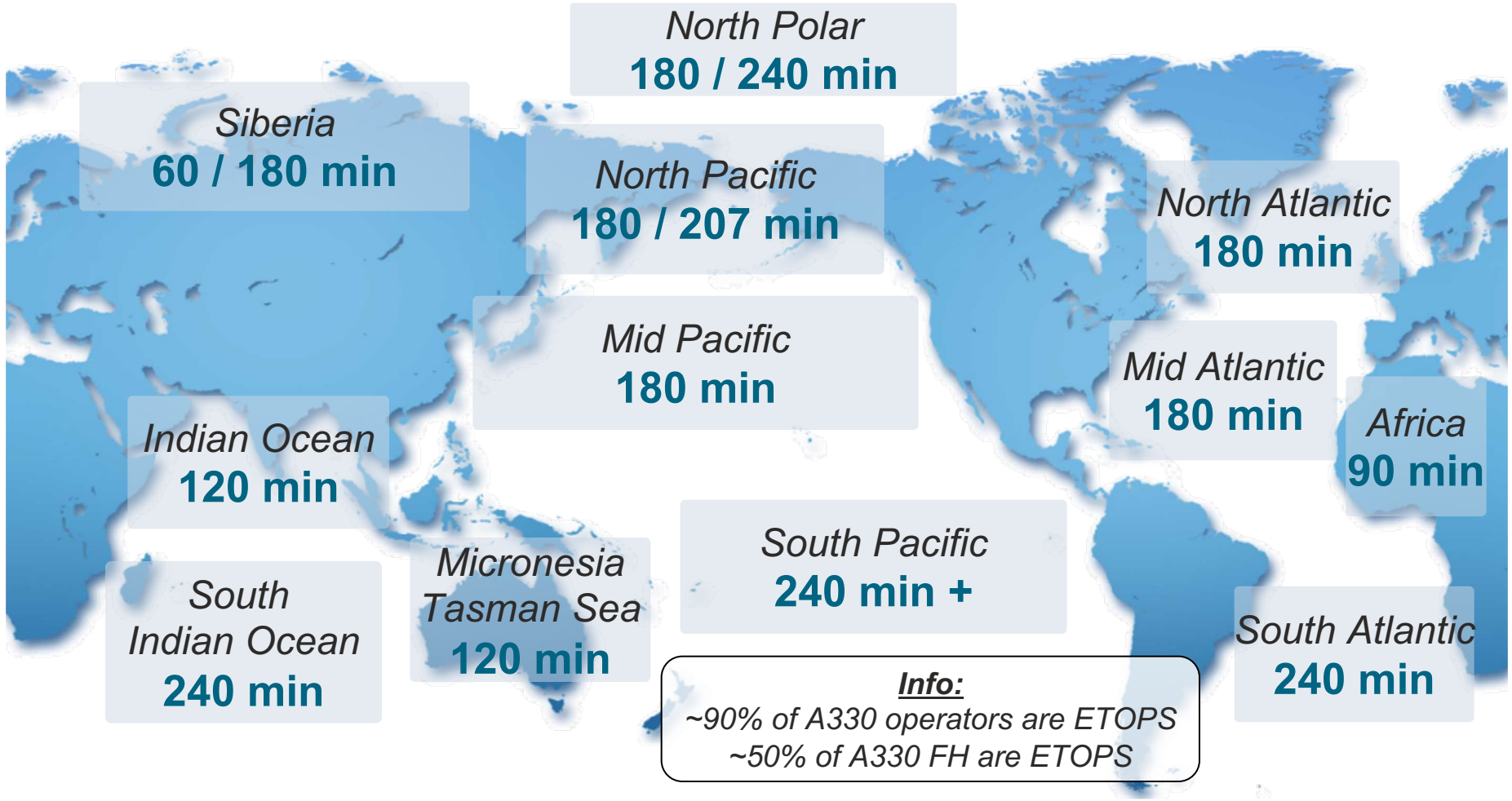
3+ eng. A/C : aircraft with 3 or more engines

ICAO: International Civil Aviation Organisation
EASA: European Aviation Safety Agency
FAA: Federal Aviation Administration

EDTO: Extended Diversion Time Operations
ETOPS: Extended Twin engine A/C OPerationS
RMT: Rulemaking Task

Today's ETOPS world with current aircraft (twins)

Typical Max Diversion Time required for main ETOPS areas for best operational flexibility



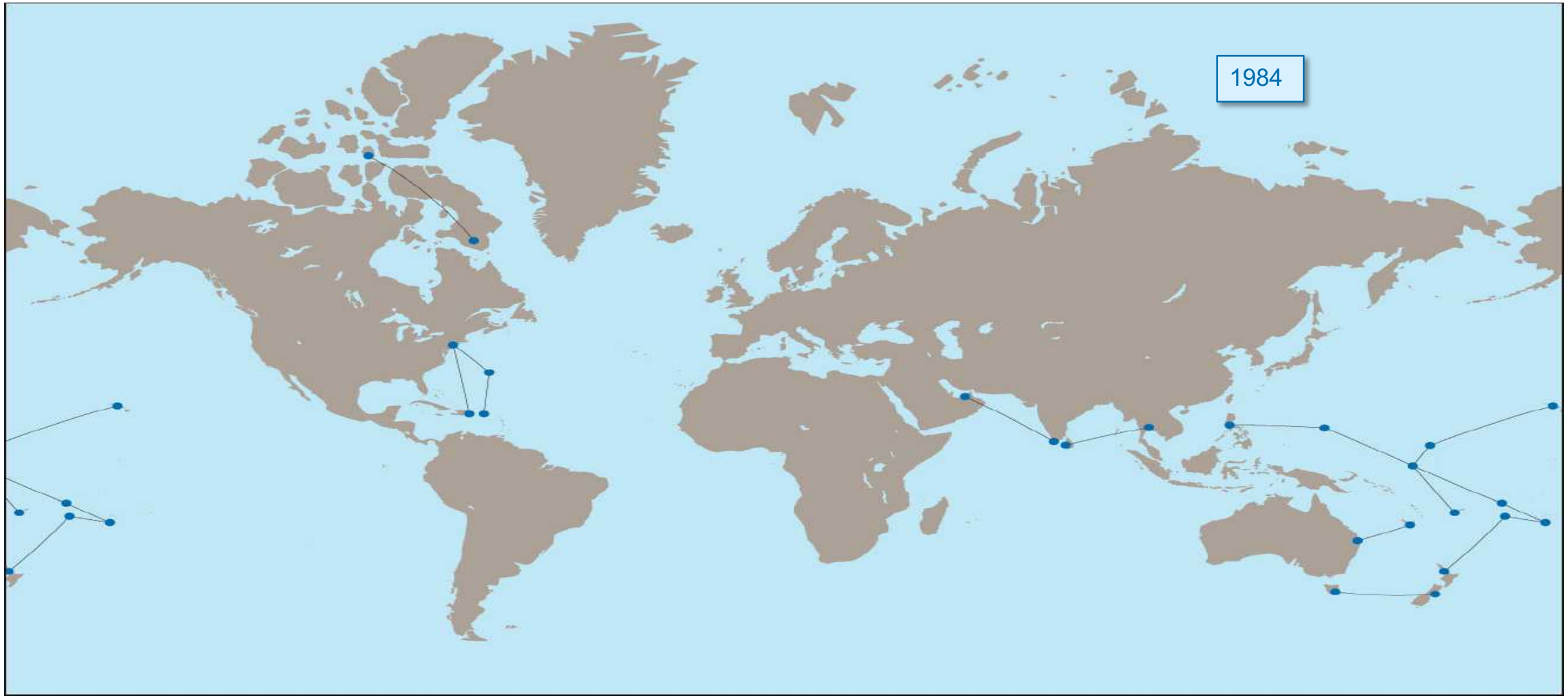
Typical Max Diversion Time based on 420 TAS (ISA - No wind - MCT/VMO)

ISA: International Standard Atmosphere
FH: Flight Hours
TAS: True Air Speed

ETOPS: Extended Twin engine A/C OPerationS
MCT: Maximum Continuous Thrust
VMO : Maximum operating limit

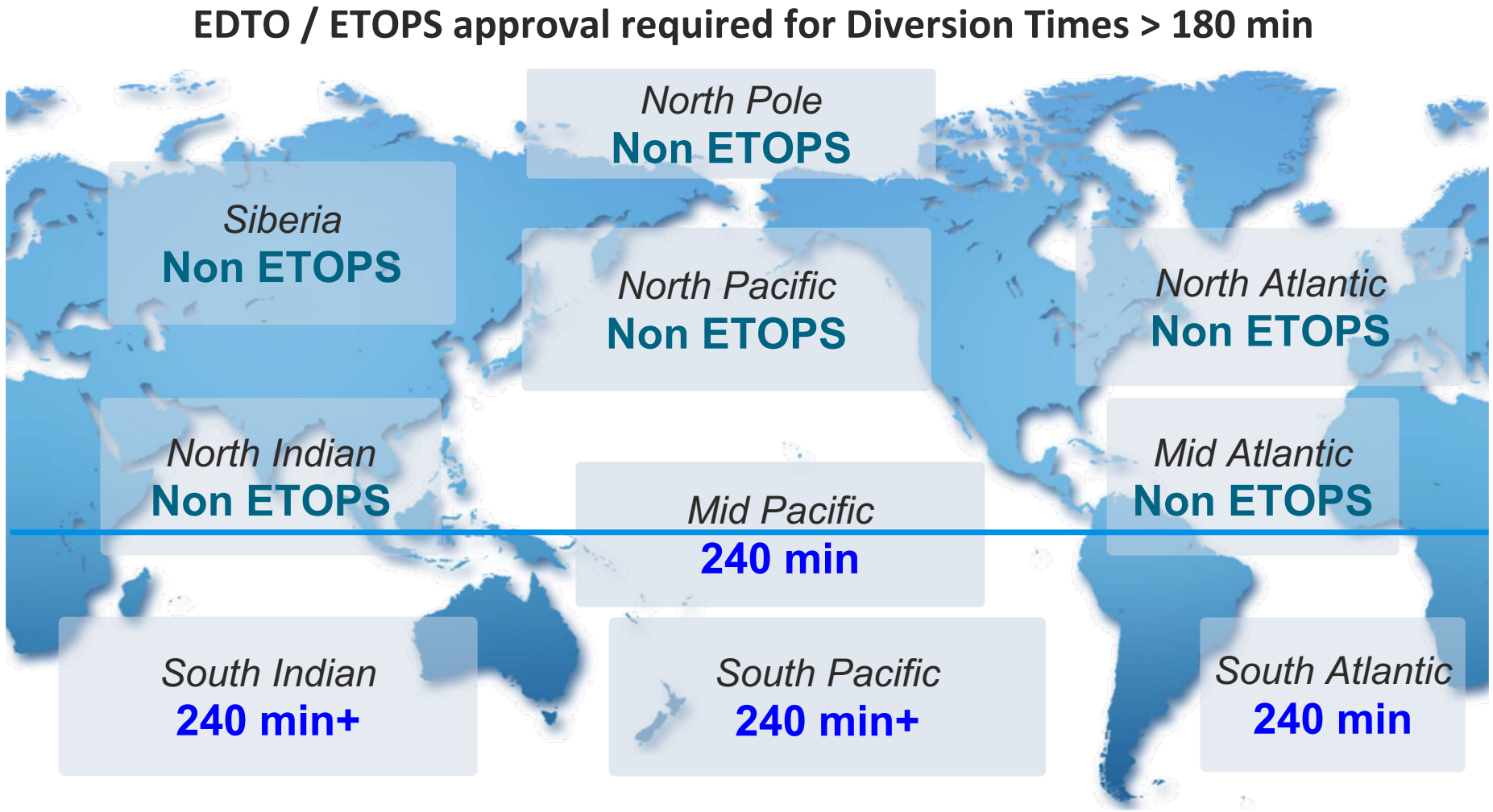
AIRBUS

Evolution of ETOPS traffic *(source: Boeing)*



Evolution of ETOPS traffic *(source: Boeing)*

EDTO / ETOPS for aircraft with more than 2 engines (mainly Quads)



EDTO: Extended Diversion Time Operations
ETOPS: Extended Twin engine A/C OPerationS

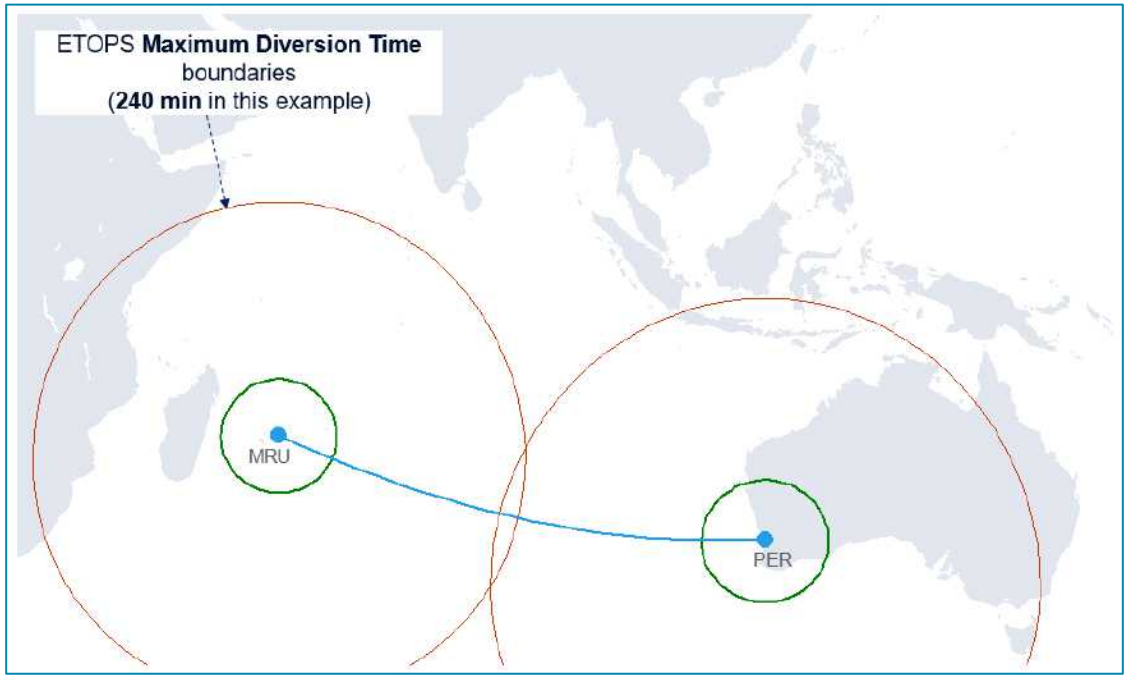
AIRBUS

ETOPS Quiz

Question 1.2 :

Can the Maximum Diversion Time value granted to the Operator exceed the ETOPS capability of the aircraft ?

1. Yes
2. No



Module 1 : ETOPS Background Information – Agenda

New ETOPS/EDTO rules: Main changes

What is really new in the proposed/revised EDTO/ETOPS/LROPS rules:

	ICAO	FAA	EASA
Provides Requirements for “Non-limiting ETOPS” (Twins)  Reduced ETOPS Fuel Reserves	✓	✓	✓
 Introduces new requirements on Airplanes with more than 2 engines	Threshold Established by State All ops (cargo & pax) No certif.	>180 min Cargo ops excluded Certif from 2015	?
 Addresses Polar Operations	Not addressed in EDTO elements of State Letter of 2011	✓	Addressed In Existing rules
 Addresses Passenger Recovery Plan	Not addressed in EDTO elements of State Letter of 2011	✓	Outside scope of EASA responsibilities

New ETOPS/EDTO rules: Main changes

Passenger Recovery Plan (FAA only) — Federal Aviation Administration

- For ETOPS beyond 180 min, the operator has to develop a passenger recovery plan for each ETOPS alternates
  - Note: This requirement also applies to designated alternates in the frame of Polar operations (except for cargo operations)
- This plan should validate the acceptability of airport infrastructure and services, taking into account:
  - Medical care
  - Physiological needs
  - Communications
- The evacuation of passengers and crew has also to be covered
  - Recovery of the passengers within 48 hours may be viewed as meeting the requirement to provide for the care and safety of the passengers

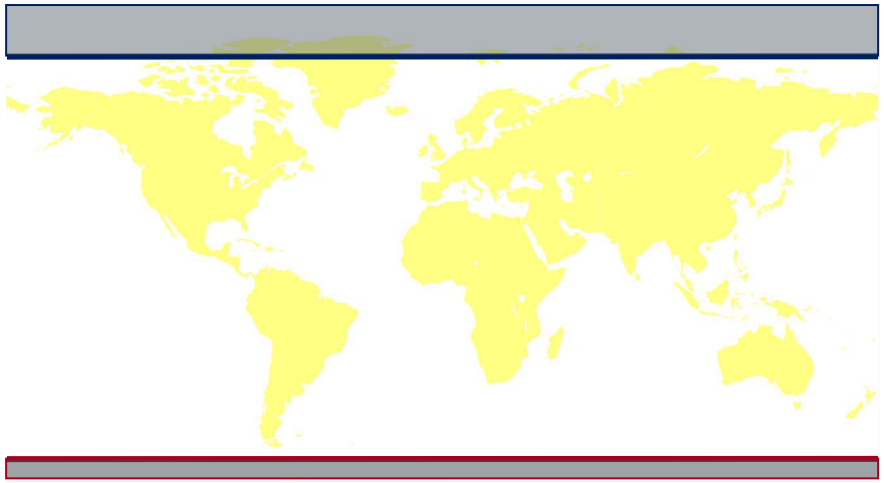
New ETOPS/EDTO rules: Main changes

Polar Areas (FAA only) — Federal Aviation Administration

Definition of “Polar Area”:

North Polar Area

North of latitude N 78°00



South Polar Area

South of latitude S 60°00

All operators applying for operations on a route entering the South or North Polar area must comply with Polar operations requirements

- Fuel freeze strategy & monitoring / Crew exposure to solar radiation / etc…

Focus on ICAO EDTO criteria: Summary *(Graphic)*

Two engine aircraft and aircraft with more than 2 engines

Diversion range (in time)

60 min

Threshold
(eg 60, 75, 90, 180 min)

Max Div Time

Operations beyond 60 MIN

- OPS Ctrl & Flight Dispatch
- OPS Procedures
- Training
- Identify alternates
- **For twins only**: verify alternates above minima

EDTO approval

- EDTO approval
- EDTO significant systems
- EDTO critical fuel
- Verify alternates above minima
- **For twins only**: *EDTO Certification*
- **For twins only**: *maintenance program*
- **For twins only**: *file alternate in ATS Flight Plan*

§4.7.1

§4.7.2

Fixed value

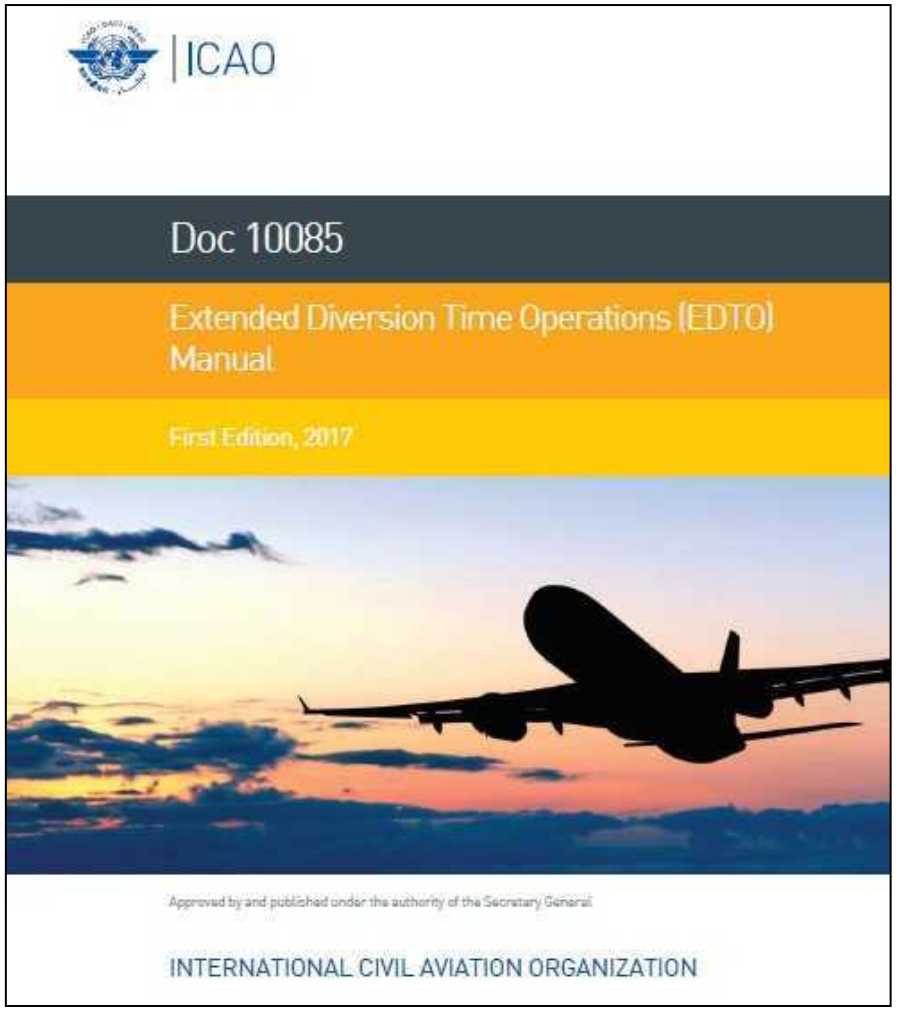
State established
(may be specific to aircraft type)

State approved
(specific to operator & aircraft type)

Focus on ICAO EDTO Manual *(1/3)*

- Purpose
  - Provide guidance and interpretative material of the EDTO elements introduced through Amendment 36

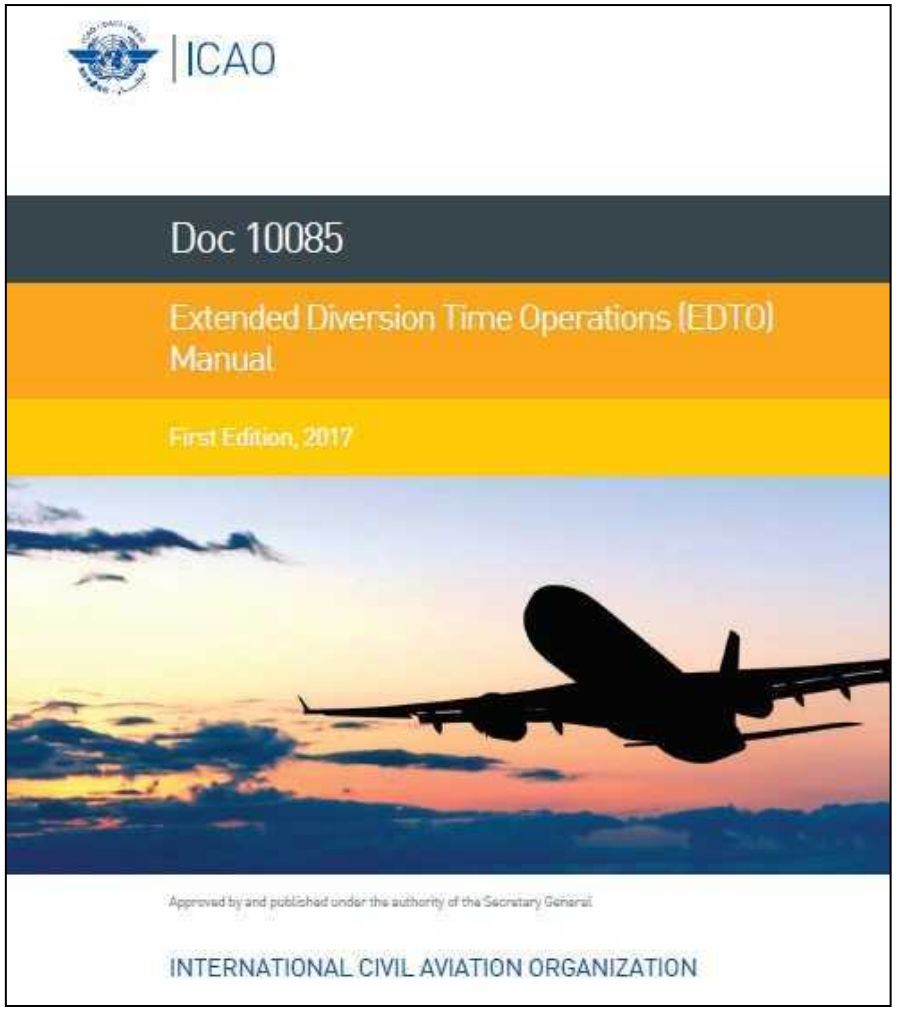
- EDTO manual details the standards, policies, procedures and guidelines:
  - For operations by transport category aeroplanes with turbine engines conducted beyond 60 minutes (from a point on a route to an en-route alternate aerodrome); and
  - For obtaining EDTO type design (when applicable) and/or EDTO operational approval for these aeroplanes to operate farther than the applicable EDTO threshold time.



Focus on ICAO EDTO Manual *(2/3)*

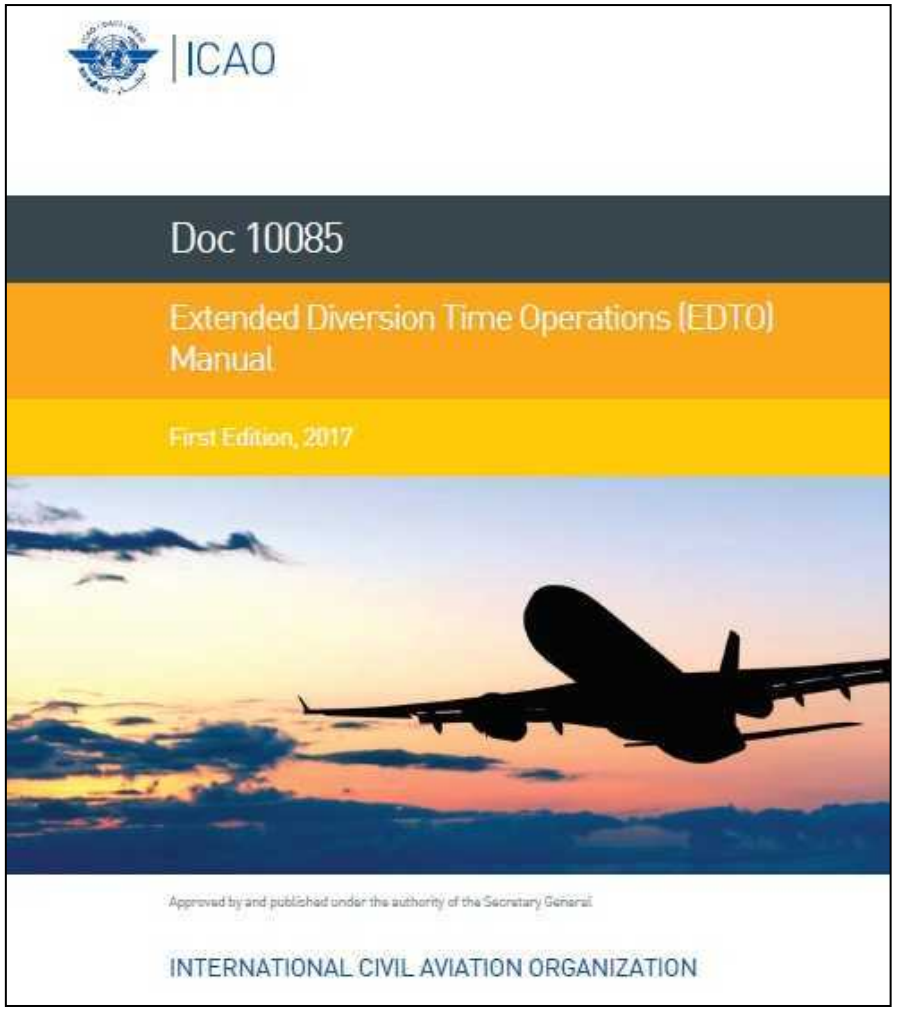
- The EDTO Manual (Doc 10085) is an outcome of the Regional Safety Oversight Organization (RSOO) Symposium convened by ICAO during October 2011
  - It was suggested that ICAO should assess the resource impacts of ICAO Annexes amendments on a State's safety oversight system.
  - In case of significant impacts, ICAO could identify champion(s) to develop a model implementation package (sample regulation amendment, Inspector Handbook amendment and/or training material).
  - This initiative is aimed at assisting the States in the implementation of the new/revised standards, through guidance material available to RSOOs or other interested parties

- Drafting of EDTO manual has been conducted by EDTO experts from the SOTF under the supervision of the FLTOPS/Panel secretariat.
  - Main contributors: International Coordinating Council of Aerospace Industries Associations (ICCAIA) and International Air Transport Association (IATA)



Focus on ICAO EDTO Manual *(3/3)*

- Structure and content of EDTO Manual (Doc 10085):
  - Foreword
  - Definitions and abbreviations
  - **Chapter 1**: Policy and General information
    - Details approval procedures and continuity of certification and operational approval
  - **Chapter 2**: Aircraft airworthiness considerations for EDTO
    - EDTO certification, continued airworthiness, EDTO significant systems…
  - **Chapter 3**: EDTO flight operations requirements
    - Threshold, maximum diversion time and distance, En-route Alternate Aerodrome, Area of operations, EDTO fuel, in-flight Monitoring, diversion, training, …
  - **Chapter 4**: EDTO Maintenance and reliability requirements
    - EDTO maintenance program, Parts control, EDTO Service Check, Reliability program, Propulsion system monitoring (IFSD rate), verification program, dual maintenance limitation, ECM, oil consumption monitoring, APU in-flight start, EDTO release, training, …

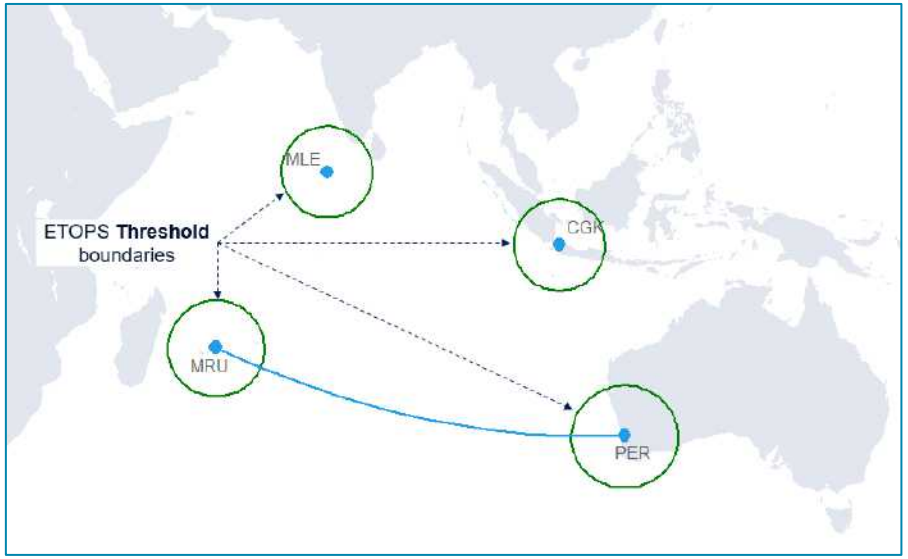


ETOPS Quiz

Question 1.3 :

What is the **ETOPS threshold time** for aircraft **with 2 engines** ?

1. 0 min
2. 60 min
3. 90 min
4. 180 min
5. Established by the State of the Operator

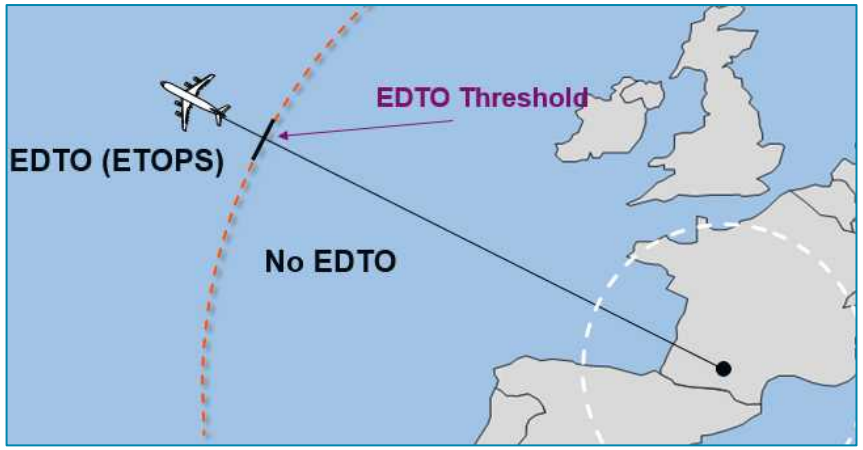


ETOPS Quiz

Question 1.4 :

What is the **EDTO threshold time** for aircraft with **more than 2 engines** ?

1. 60 min
2. 90 min
3. 180 min
4. Established by the State of the Operator

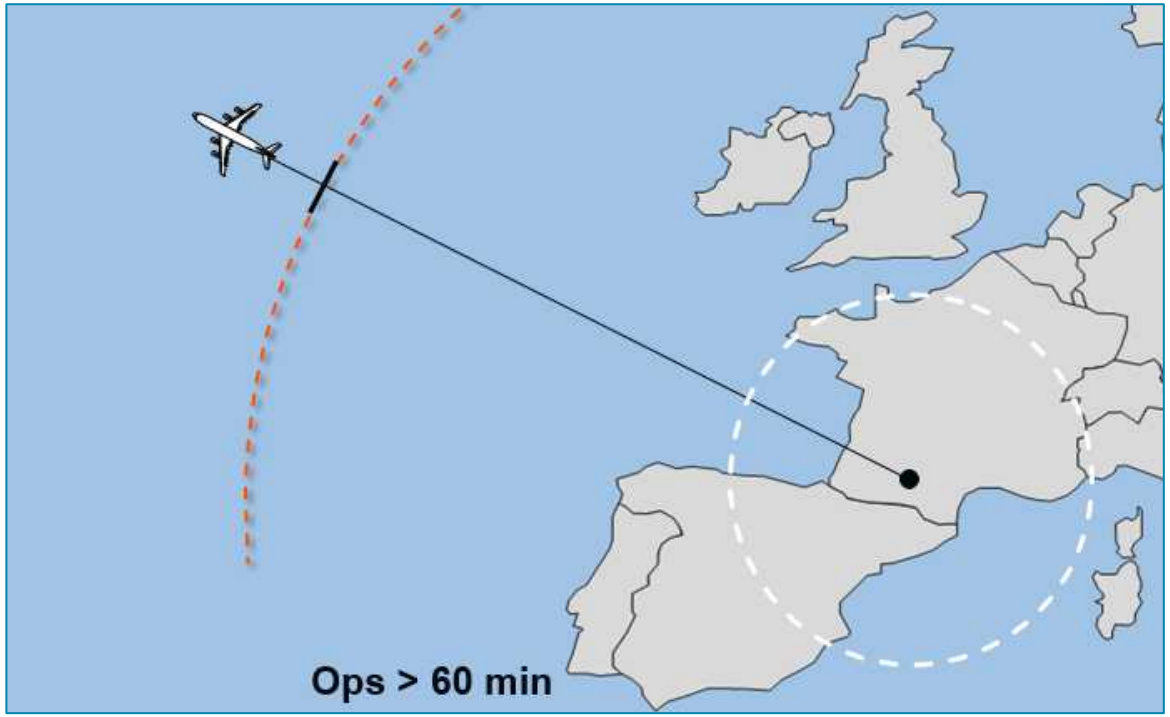


ETOPS Quiz

Question 1.5 :

As per Annex 6 Part I, Section 4.7, what is the **threshold time** for operations **beyond 60 minutes** ?

– Propose a value



Module 1 : ETOPS Background Information – Agenda

Airbus ETOPS experience (1/3)

Airbus has over 40 years of ETOPS experience:

- **1976**: 90 min (ICAO rule) operations with A300B2/B4
  - North Atlantic
  - Bay of Bengal
  - Indian Ocean

- **1985**: 90 min 'ETOPS' operations
  - A310-200 -SIA

- **1986**: 120 min ETOPS Type Design & Reliability approvals
  - A310-200 / A310-300 / A300-600

- **1990**: 180 min ETOPS Type Design & Reliability approvals
  - A310-200 / A310-300 / A300-600 / A300-600R
  - First FADEC engine ETOPS approval (120 min - A310-324)

- **1991**: first Fly-By-Wire aircraft to be approved for ETOPS
  - A320 (all models)

- **1994** : first Early ETOPS approval program
  - A330-300 - ETOPS approved 5 months after E.I.S. : direct service experience was less than 1,000 FH
- **1995**: first 4 engine aircraft compliance to ETOPS rules
  - A340 - Canadian Certification

- **1998** : A330-200 ETOPS approval
  - 180 min at E.I.S. (RR: February 99)

AIRBUS

Airbus ETOPS experience (2/3)

Airbus has over 40 years of ETOPS experience (Cont'd) :

- **2009**: first ETOPS>180 min certification
  - A330 (all pax models) - Max DT capability corresponds to ~240 min (ISA, still air)

- **2014**: ETOPS>180 min certification at EIS of A350
  - Approval of 180 min / 300 min / 370 min ETOPS capabilities

- **2017**: Early ETOPS 180 min certification of A320neo (PW and CFM)

- **2018**: Early ETOPS>180 min certification of A330neo
  - Same ETOPS capabilities as A330

- **2021**: FAA ETOPS>180 min certification of A380 (up to 275 min Max DT capability)
  - Follows-up to EASA approval in October 2020 of A380 EDTO limitations

- **2022**: ETOPS 180 min certification of A330 BelugaXL

- **2024/2025** : ETOPS 180 min certification of A321XLR

AIRBUS

Airbus ETOPS experience (3/3)

Status as of 2023 :

- Airbus ETOPS twins have accumulated over **30 million ETOPS FH**

ETOPS capabilities of Airbus twins (EASA Approvals)

- **A300B2/B4** capable of 90 min D.T.
- **A310/A300-600** 180 min D.T.
  - A300-600ST (“Beluga”): 180 min D.T.

- **A320/A319/A321/A318** 180 min D.T.

- **A330** (Pax models) ETOPS>180 min D.T.
  - A330-200F and A330XL are approved for 180 min ETOPS

- **A350** ETOPS>180 min D.T.
  - ETOPS capabilities: 180 min / 300 min / 370 min

Module 1 : ETOPS Background Information – Agenda

Airbus ETOPS / EDTO Support

Airbus can assist airlines to get their ETOPS/EDTO approval:

ETOPS continued customer support

- Answer to ETOPS queries (etops-edto.support@airbus.com)
- Guidelines/FAQ

ETOPS / EDTO Briefing

- ETOPS/LROPS/EDTO awareness course
- 1 to 2 days – Typically 3 sessions

Continuing

ETOPS Training (for qualification)

- Maintenance training
- Flight Crew training
- Dispatch training

ETOPS / EDTO Assistance

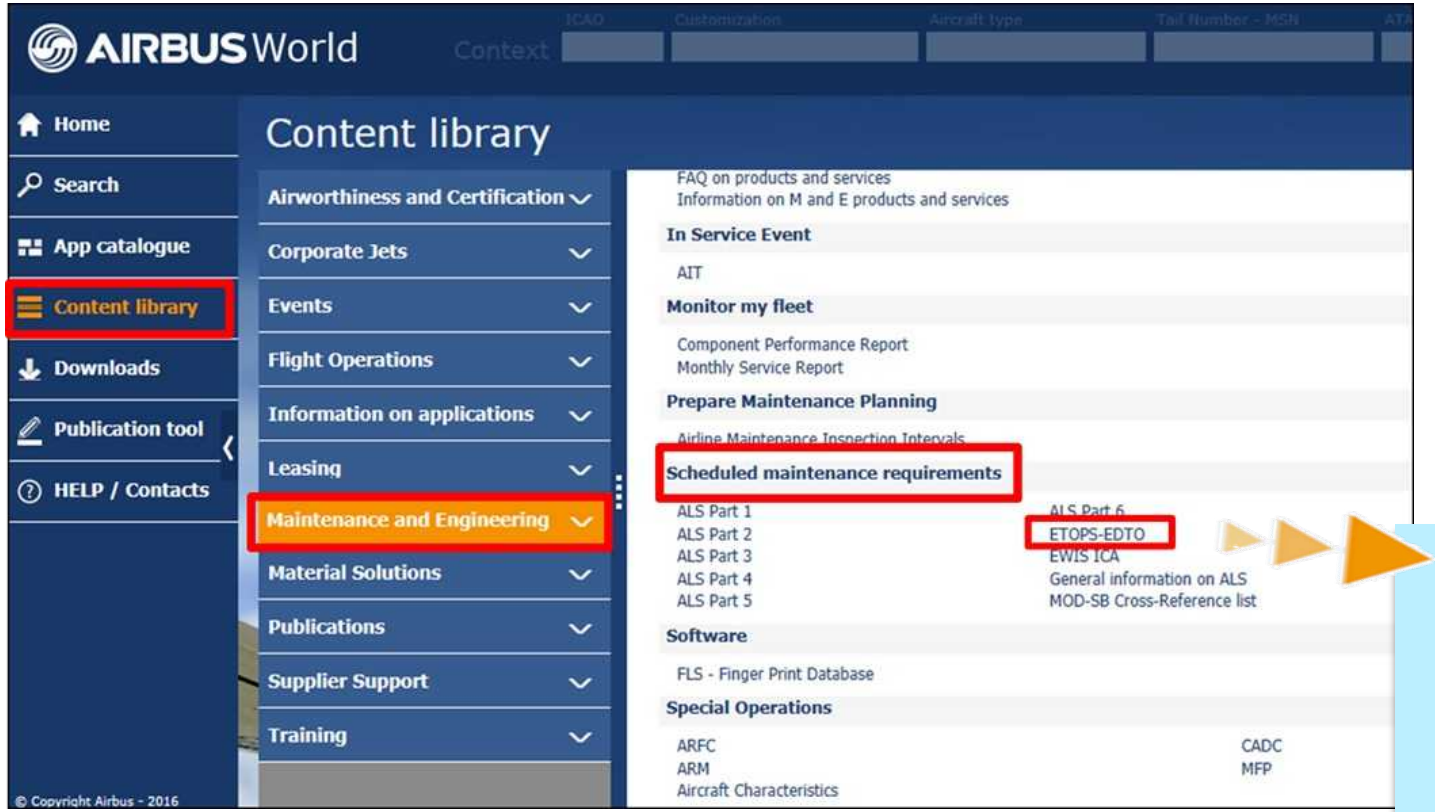
- on-site review of Airline's organization for ETOPS
- Set-up of approval plan based on Airline's objectives
- Typically 2 to 3 on-site visits

Service Catalog items

Airbus ETOPS / EDTO Support

ETOPS/EDTO eSite on Airbus|World portal:

Content Library ▸ Maintenance Engineering ▸ Scheduled maintenance requirements ▸ ETOPS-EDTO



Airbus ETOPS / EDTO Team
Generic email address:
etops-edto.support@airbus.com

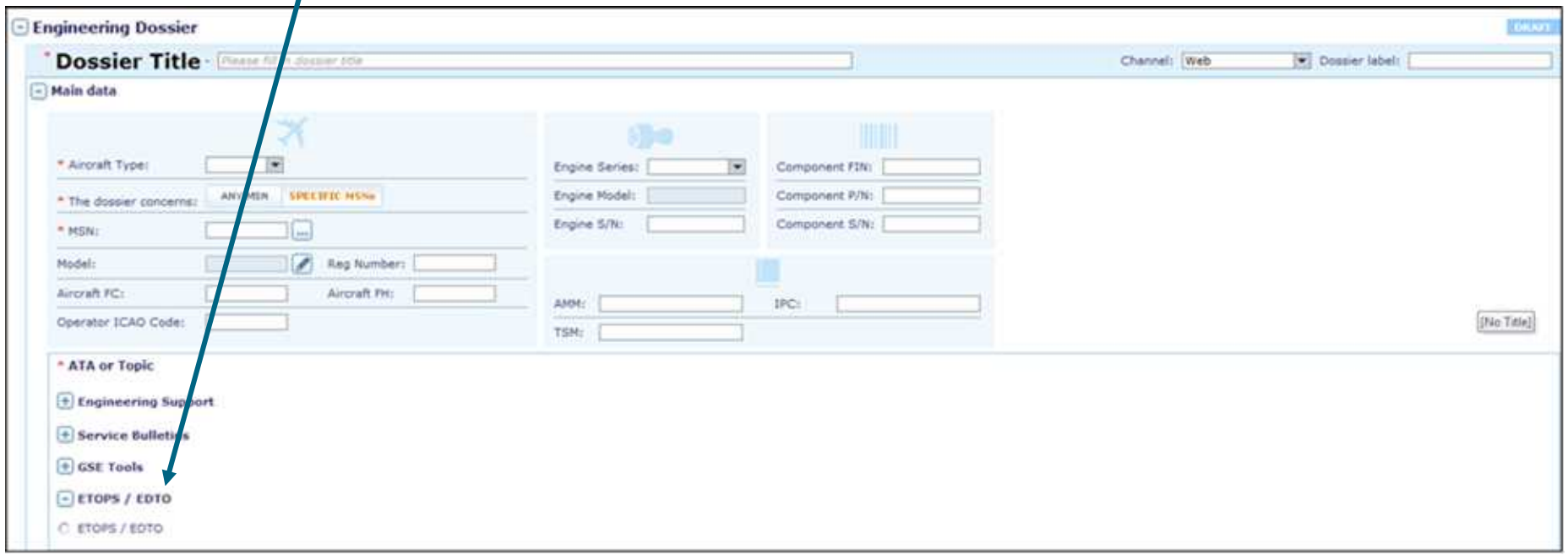
The following documents are available from this page:

- ETOPS CMP documents and Parts Lists
- ETOPS Info Letter
- Information on ETOPS/EDTO regulations.
- ETOPS Guidelines
- New brochures “Getting to Grips with ETOPS”
- … and more!

Airbus ETOPS / EDTO Support – TechRequest tool (1/3)

Log technical queries related to **Maintenance domain**

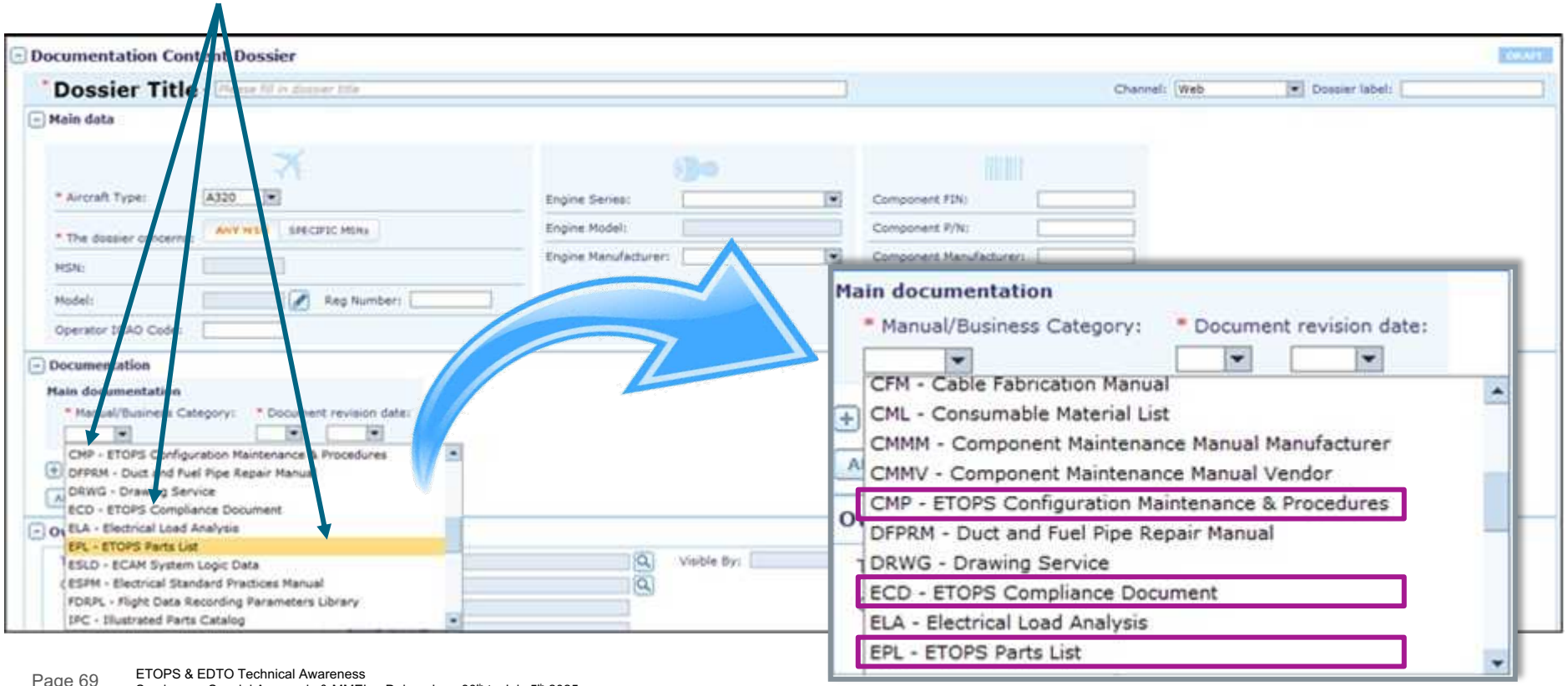
- To log ETOPS queries related to maintenance & engineering domain, the user can select ETOPS tag in “Engineering form”



Airbus ETOPS / EDTO Support – TechRequest tool (2/3)

Log technical queries related to **Document content domain**

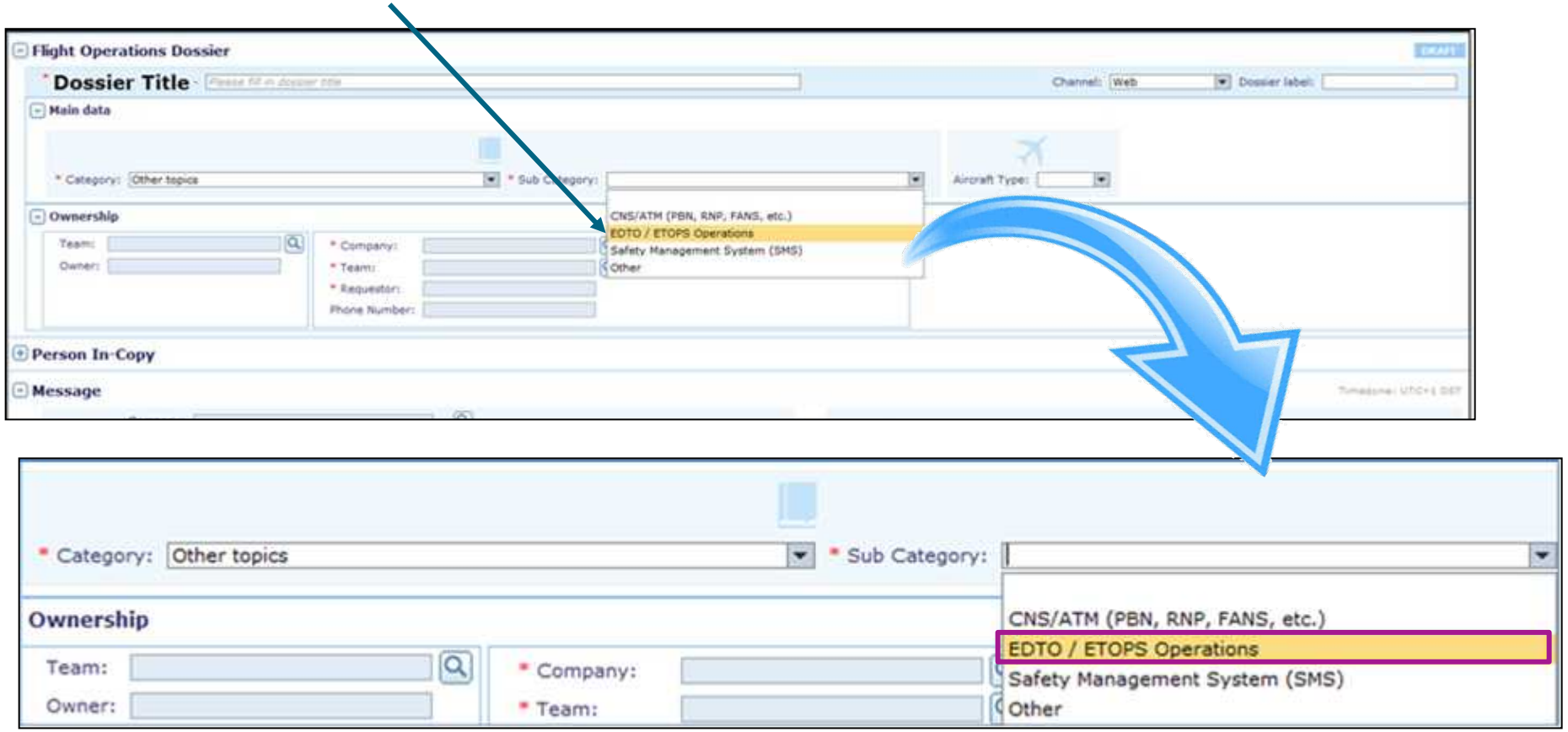
- To log queries related to ETOPS CMP document (and associated docs such as the ETOPS Parts List) and the ETOPS Compliance Document (ECD), the user can these topics in “Documentation Content” form:



Airbus ETOPS / EDTO Support – TechRequest tool (3/3)

Log technical queries related to **Flight Operations domain**

- To log ETOPS queries related to Flight Operations domain, the user can select ETOPS tag in “Flight Ops form”



Airbus ETOPS/EDTO Team

Generic email address:
etops-edto.support@airbus.com

AIRBUS

Operational Certification (dept. IIAAVO)
ETOPS/EDTO team

MISSIONS

The ETOPS/EDTO Department is involved in many missions whithin Airbus such as:

- To ensure that Operational Suitability certification is obtained before the first aircraft of the type is operated by an EU operator, and maintained as long as the aircraft type is operated by an EU operator.
- To ensure that the ETOPS/EDTO Certifications are obtained on time, and maintained throughout in-service life of the aircraft.
- To provide related operational expertise to the Airbus community.
- To ensure related operational support to Customers and their National Aviation Authorities.

Our key tasks and deliverables are the following ones:

- ETOPS and LROPS certifications and individual aircraft approval
- ETOPS and LROPS continued airworthiness
- ETOPS/LROPS Manual
- ETOPS/LROPS assistance programs to Customers in view of obtaining ETOPS/LROPS Operational approval
- ETOPS/LROPS briefing/training to all categories of personnel of Customers, Aviation Authorities, other Airbus department, as well as to concerned International Organizations
- Answers to operators ETOPS/LROPS queries

Airbus ETOPS/EDTO Team contacts

ETOPS Team – Operational Certification Department (1IAAVO)
Airworthiness & Certification

Eric FORTUNATO
ETOPS/EDTO Airbus Expert

eric.fortunato@airbus.com
+33 679 690 467 • Mobile

Audrey BELLEGARDE
ETOPS/EDTO Programs Manager

Audrey.a.bellegarde@airbus.com
+33 582 055 711 • Fixed phone

Ronan FLOC'H
ETOPS/EDTO Programs Manager

ronan.floc-h@airbus.com
+33 627 028 109 • Mobile

Sylvain MINETIAN
ETOPS/EDTO Programs Manager

sylvain.minetian@airbus.com
+33 607 567 038 • Mobile

You can also reach the ETOPS/EDTO Team at etops-edto.support@airbus.com or via TechRequest tool (select ETOPS-EDTO)

Module 1 : ETOPS Background Information – Agenda

1. Foreword
2. Introduction
3. ETOPS History: Major Milestones
4. ETOPS Regulations: Intent, Concepts & Applicability
5. Focus on ICAO EDTO criteria
6. Airbus ETOPS Experience
7. Airbus ETOPS Support & Organization
8. Conclusion

Conclusion (1/2)

- **ETOPS / EDTO / LROPS certification & operational requirements apply** whenever a commercial transport aircraft is operated beyond a defined threshold.
  - These requirements also introduce the concept of Maximum Diversion Time, thus defining an approved/authorized area of operations

- When the ETOPS rules have been implemented in the mid eighties, it was to allow operations of twin engine aircraft on remote routes (North Atlantic & North Pacific)
  - Initial objective of ETOPS rules was to ensure that these new operations have an overall level of operational safety consistent with that of modern 3 and 4 engine aircraft
  - This was achievable thanks to the level of reliability achieved by modern twin engine aircraft (A310 / B767)

- **The basic concept of ETOPS is to:**
  - preclude the diversion (i.e. minimize occurrences); and
  - to protect the diversion should it occur.

These objectives are achieved through **ETOPS certification of the aircraft** and **ETOPS operational approval of the airline**

Conclusion (2/2)

- **ETOPS rules have evolved mainly to allow "non-limiting" ETOPS operations** of latest generation of twin engine aircraft (A330 / A350 / B777 / B787)
  - Some of the ETOPS requirements for twins are now applicable to operations of airplane with more than two engines, but only beyond 180 minute diversion time.

- **ETOPS operations of twins are nowadays extensively performed worldwide**
  - Airbus ETOPS twins have accumulated over 25 millions of ETOPS FH (as of end 2019).
  - ETOPS capability is considered in the basic design of modern long range twins such as the A350.
  - Huge majority of operators of long range twins are flying ETOPS, e.g. 90% of A330 operators have an ETOPS operational approval.

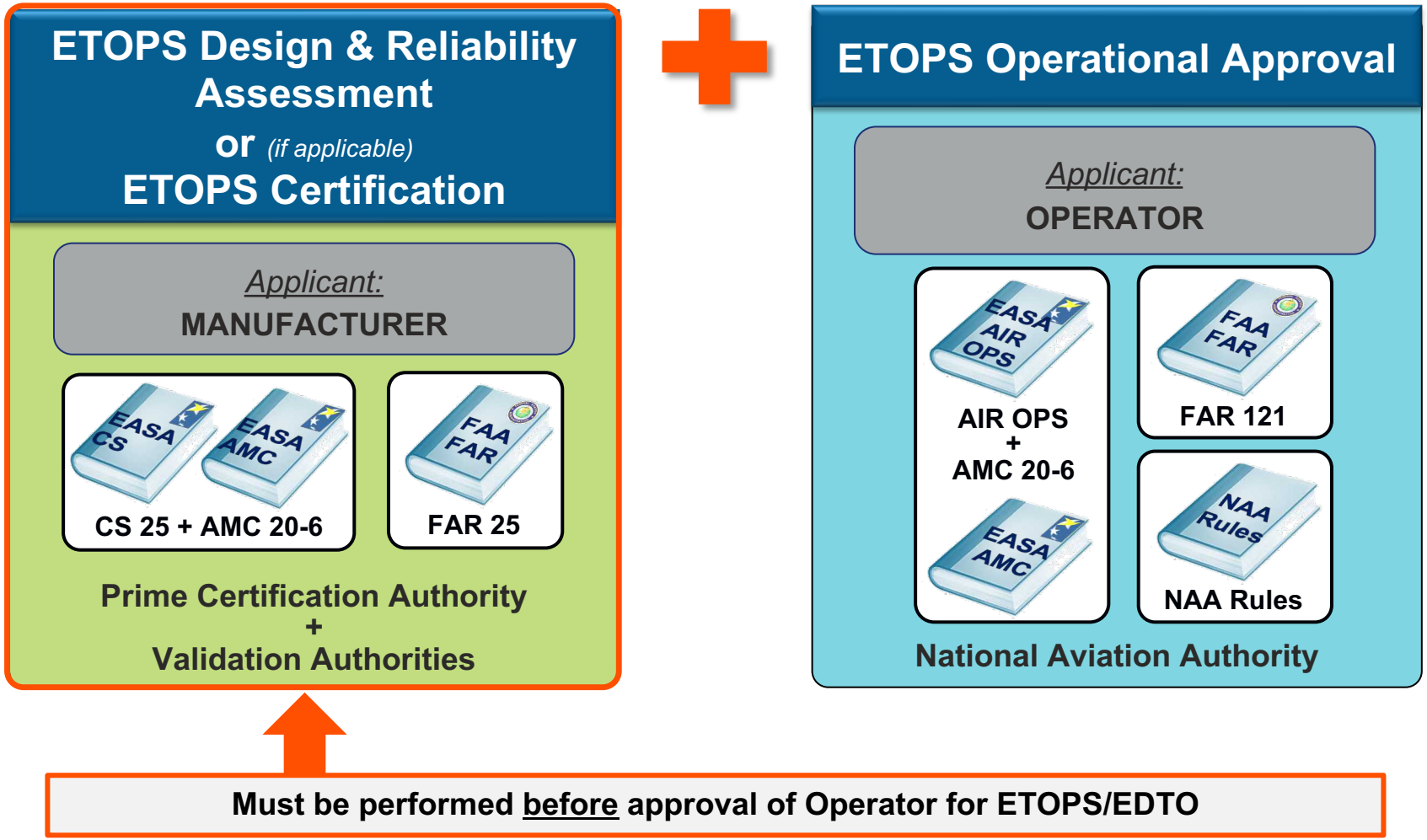
Content of this Technical awareness on ETOPS / EDTO :

Module 2 : ETOPS Capability of the aircraft – Agenda

1. Foreword
2. ETOPS Type Design Assessment
3. Continued Reliability Assessment (ETOPS Reliability Tracking Board)
4. ETOPS CMP Document & other manuals
5. Airbus ETOPS Certification Status
6. Conclusion

ETOPS Certification & Operational approval

To operate beyond threshold, two conditions must be met:



ETOPS Type Design and Reliability Assessment

Annex 6, Part 1 Section 4.7.2

Doc 10085 EDTO Manual

Annex 8, Part IIIA Section 9.2.7

Doc 9760 A/W Manual

Twins

§ 4.7.2.3
EDTO certification is required

§ 2.2.2
Elements of the EDTO certification

§ 9.2.7 / 7.2.8
Flying time limitations are established

§ 5.6
Systems performance and reliability assessment

Aircraft with more than 2 engines

§ 4.7.2.3
EDTO certification is **NOT** required

§ 2.3.1
Identification of Time capability of most limiting relevant EDTO significant system

§ 5.2.1
Identification of Time capability of most limiting relevant EDTO significant system

Methods for ETOPS reliability & maturity demonstration

3 methods:

In-service experience
Review of in-service data
Flight tests for ESS failures (incl. OEI diversions)

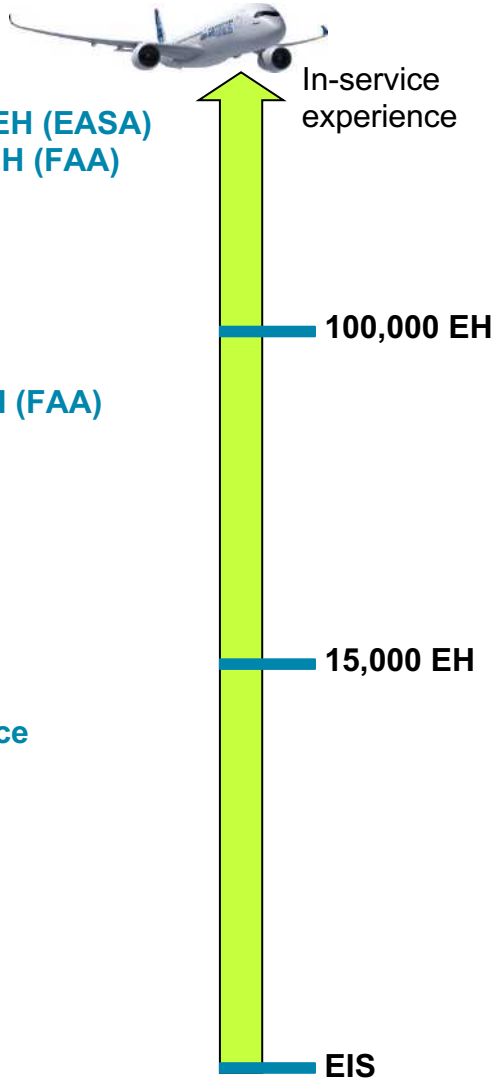
> 100 000 EH (EASA)
> 250 000 EH (FAA)

Combined service experience and Early ETOPS
Review of in-service data
Flight tests for ESS failures (incl. OEI diversions)
3000 cycles tests (APU + Engine)

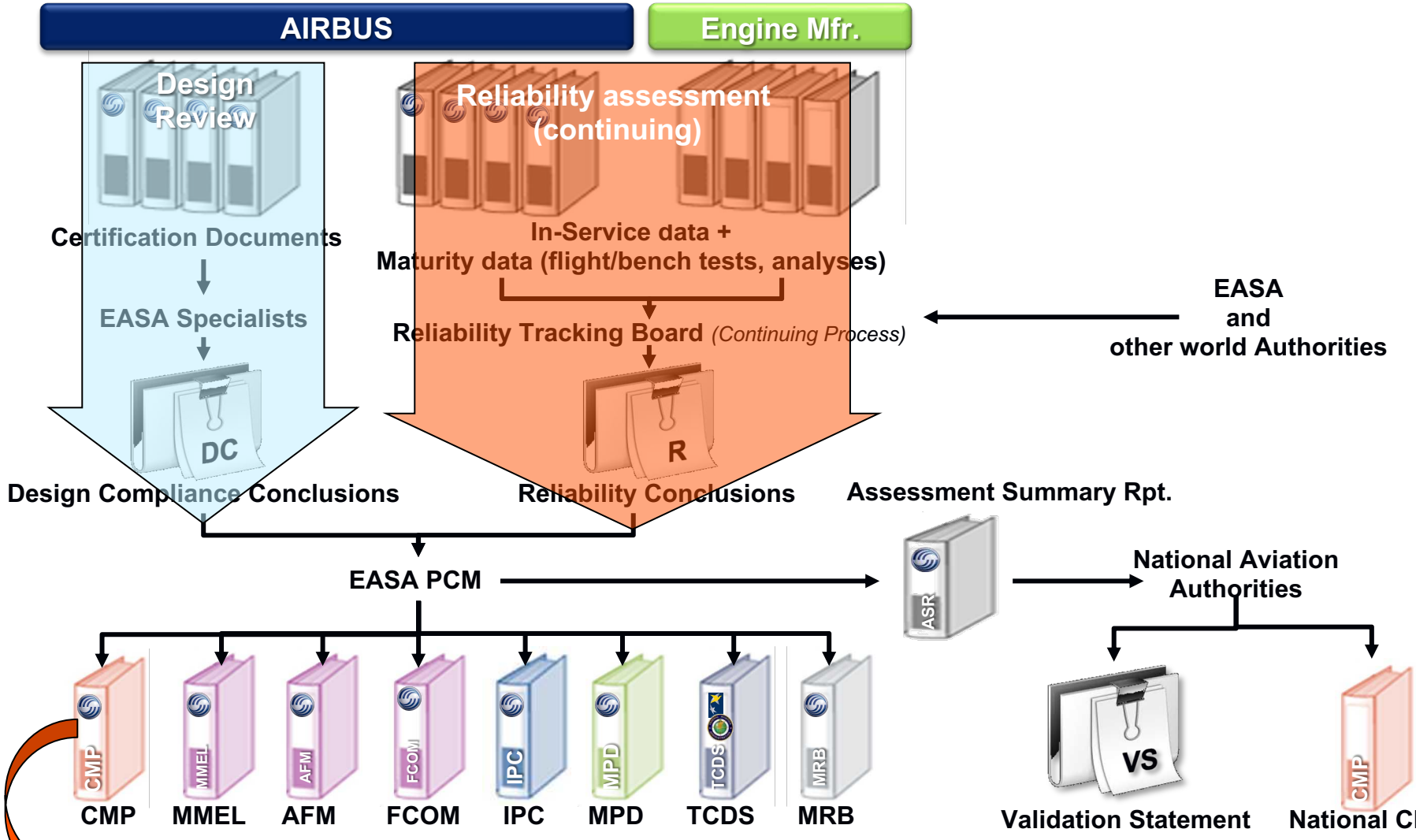
> 15 000 EH (FAA)

Early ETOPS
Flight tests for ESS failures (incl. OEI diversions)
3000 cycles tests (APU + Engine)
Flight + Bench Tests for maturity purpose
Lessons learnt activity
Early ETOPS reporting and tracking

No in-service experience



Type Design & Reliability Approval process



For **ETOPS**, the A/C must be **configured, maintained & operated** according to the ETOPS **CMP** document

ETOPS approval of the aircraft – Summary of compliance demonstrations

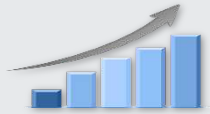
1

Design Assessment

Demonstration of compliance of aircraft design, covering in particular:

- Flight crew workload (flight tests)
- Cockpit & cabin environment (Avionic ventilation / Body Core Temperature / Cabin lighting & toilets)
- Communication system (minimum 1 HF / “SATCOM” for ETOPS>180 min)
- 3 independent electrical power sources
- Cargo fire protection time
- Fuel supply and cross-feed / Low fuel alert
- ETOPS ice shapes (impact on handling and perfos)
- APU in-flight start and run reliability
- Engine (oil cap, oil consumption, …)

2



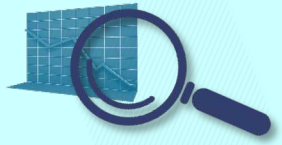
Initial Reliability/Maturity Assessment

Demonstration of initial ETOPS reliability through either:

- Review of in-service events
  - World fleet in-service data – verification of required minimum amount of in-service experience
  - Identification of necessary corrective actions (e.g. improved design)
  - Assessment of engine IFSD rate

- Early ETOPS demonstration:
  - Tests (e.g. 3,000cy test, flight tests)
  - Ops and reliability validation flights
  - Lessons Learned analyses
  - Events tracking and reporting

3



Continued Reliability Assessment

ETOPS approvals are maintained through Continued Airworthiness activities, which consist in reviewing the in-service reliability of:

- the aircraft systems
- the APU
- the engines

This is performed by the ETOPS Reliability Tracking Board (RTB) through:

- Dedicated meetings; or
- Review of ETOPS reliability reports

Above activities include monitoring of IFSD rate of relevant fleets, to ensure continued compliance with applicable target rate(s).

Initial ETOPS Certification (airplane-engine combination)
Approved ETOPS Capability reflected in AFM and ETOPS CMP Document

Maintaining the ETOPS Certification
As necessary, revision to ETOPS CMP Document standards (or other doc supporting ETOPS)

IFSD : In-Flight Shut Down (engine)

Module 2 : ETOPS Capability of the aircraft – Agenda

1. Foreword
2. ETOPS Type Design Assessment
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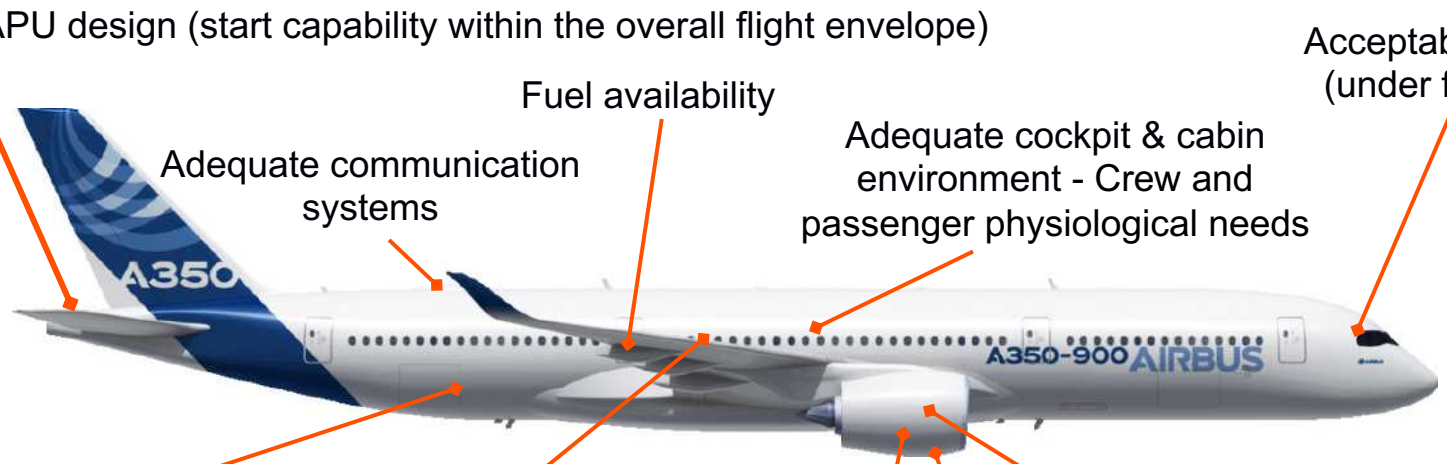
4. ETOPS CMP Document & other manuals
5. Airbus ETOPS Certification Status
6. Conclusion

ETOPS approval of the aircraft
(ETOPS certification)

To obtain an ETOPS approval of an aircraft, the Manufacturer must show :



Demonstration/analyses must consider failure conditions for the maximum diversion time/distance

ETOPS Significant Systems – Concept

- The concept of “ETOPS Significant System” is defined in both EASA and FAA ETOPS regulations
  - EASA AMC 20-6 Rev. 2 Chapter I, Section 4 §(d) and FAA 14 CFR Part 1, §1.1
  - Both aircraft manufacturers and operators have to develop an ETOPS Significant Systems List

- **Both Aeroplane Manufacturers and Operators have to develop an EDTO Significant Systems List**

- A system is identified as “**EDTO Significant**” when it has a unique influence for EDTO, i.e. it specifically participates to the EDTO philosophy : "Preclude and Protect the diversion“.

- Accordingly, a EDTO Significant System is either:

– A system whose functional failure or degradation could **adversely affect the safety particular to an EDTO flight**, or

– A system whose continued functioning is **specifically important to the safe flight and landing of an aeroplane during an EDTO diversion** (for the contemplated maximum diversion time)

ETOPS Quiz

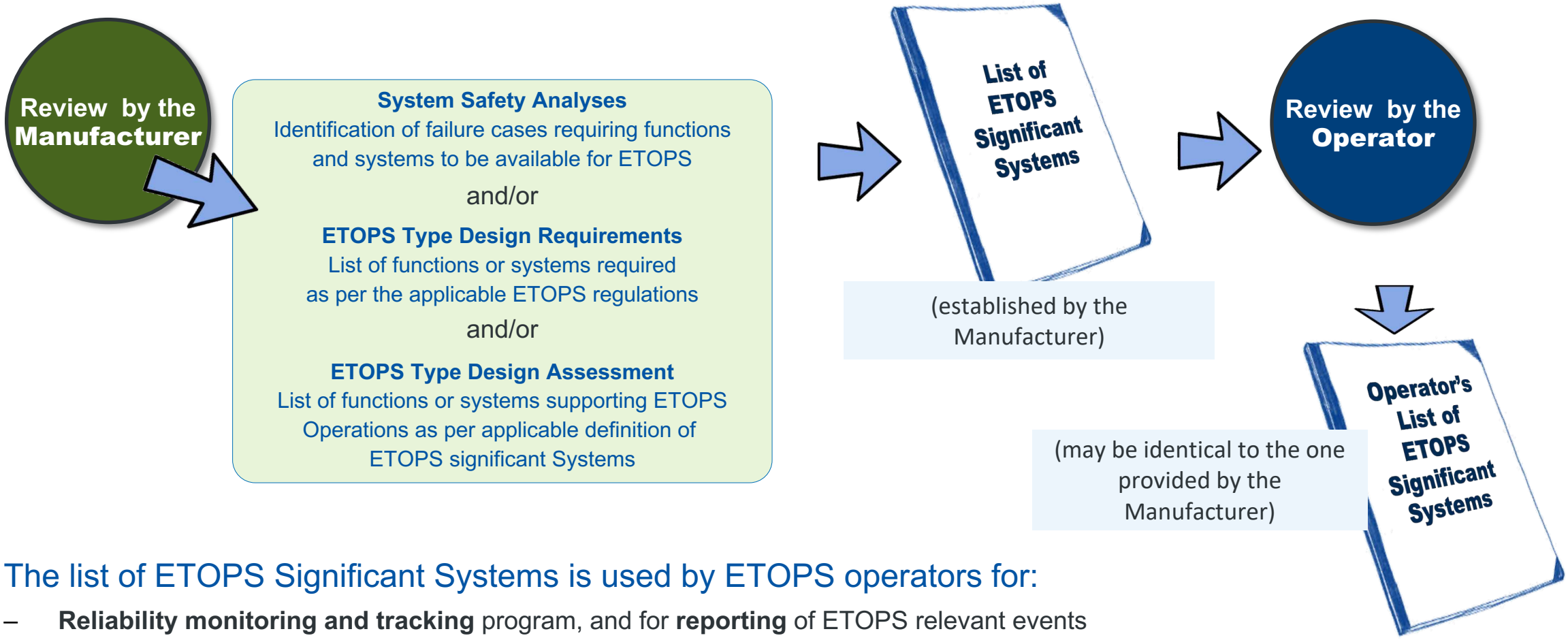
Question 2.1:

Which of the following systems is most likely an ETOPS Significant System?

1. Landing Gear
2. Thrust Reverser
3. Flight Controls
4. Toilets
5. Ram Air Turbine

ETOPS Significant Systems

ETOPS Significant Systems List Purpose and Utilization



The list of ETOPS Significant Systems is used by ETOPS operators for:

- **Reliability monitoring and tracking** program, and for **reporting** of ETOPS relevant events
- Maintenance (**verification program, Dual Maintenance restrictions,** elements of **training program** which has to bring special attention for **qualified maintenance personnel**)

ETOPS Significant Systems

Example of an ETOPS Significant System List (A350 extract)

A350 ETOPS Significant Systems List

The following list defines the A350 systems / functions which are ETOPS significant, as per the following criteria:
- The Group 1 & 2 classification is based on the definitions provided in EASA and FAA ETOPS rules.

Note: This classification is necessary only for the aircraft manufacturer when conducting the ETOPS reliability demonstration under the Early ETOPS method, i.e. in the frame of aircraft certification activities.
This classification should have no impact on the Operator's procedures and policies for the consideration of ETOPS Significant Systems.

- All Systems in the list below should be tracked as "ETOPS Significant" in the Reliability Program and may be reported as "ETOPS relevant" in case of failure
- Systems marked as "dual" should be treated as "ETOPS Parallel Systems" for dual maintenance (Refer to enclosed Dual Maintenance Matrix for additonal guidelines)

ATA Chapter	ATA Sect. / Descr.		Group	ETOPS Significant Functions of the selected system(s)	Rationale for selection of the function or system as ETOPS significant	Regulatory Reference EASA / FAA	Dual	Additional information on typical "ETOPS Relevant" events to be reported
21 - Air Conditioning	21-21	Cabin Fresh / Recirculated Air Distribution Control and Monitoring	2	- Aircraft pressurization capability - Cabin and cockpit temperature control	- Minimize occurrence of depressurization which leads to an ETOPS diversion at depressurized FL. It has subsequent impact on fuel consumption and exposure to more severe outside atmospheric conditions (icing). - Minimize occurrence of loss of cockpit and cabin temperature and ventilation control during an ETOPS diversion.	CS 25.1535 & AMC 20-6 Rev 2 Ch II.8.3.(v) and Ch II.8.3.(vi) / AMC 20-6 Rev 1 §8.c.8 and §8.c.9 / FAR §K25.1.2		- Loss of pressurization - Loss of temperature control - Loss of ventilation - Loss of pack
	21-22	Cockpit Air Distribution, Control and Monitoring	2					
	21-31	Pressure Control and Monitoring	2					
	21-51	Flow Control and Monitoring	2					
	21-52	Packs (Air Generation Units - AGU)	2				X	
	21-53	Packs (AGU) Control and Monitoring	2					
	21-61	Temperature Control and Monitoring	2					
22 - Auto Flight	22-12	Autopilot	2	Autopilot function	Autopilot is considered as important to maintain acceptable pilot workload over an ETOPS diversion.	CS 25.1535 & AMC 20-6 Rev 2 Ch II.7.5 and Ch II.7.7 / AMC 20-6 Rev 1 §8.b.5 and §8.b.7 / FAR §K25.1.2		Loss of system / function
	22-30	Autothrust	2	Autothrust function	Autothrust is considered as important to maintain acceptable pilot workload over an ETOPS diversion.			
	22-70	Flight Management System	2	Fuel prediction and alerting functions (computation, control and display)	- FMS fuel prediction functions are considered more important for management of an ETOPS flight (provide additional in flight fuel monitoring function). - Specific FMS functions used for diversion decision making (ETP, EEP,...).		X	
	22-80	Flight Guidance and Envelope System	2	Control of Autopilot functions	Flight Control Unit (FCU) or FCU Back-up functions allows controlling the Autopilot.			
23 - Communication	23-11	HF	2	HF voice function	- One Long Range means of communication is required for ETOPS up to 180 min. - Two Long Range means of communication are required for ETOPS beyond 180 minutes, one of which is SATCOM Voice.	AMC 20-6 Rev 2 Ch II.7.7 / AMC 20-6 Rev 1 §8.b.7 / FAR §K25.1.2		Non recoverable total loss of long-range voice communication in flight
	23-28	SATCOM	2	SATCOM voice function		AMC 20-6 Rev 2 Ch III.7.2.3.(ii) / AMC 20-6 Rev 1 §10.d.3.(ii) / FAR §121.122		
24 – Electrical Power	24-22	AC Main Generation	1	AC Main generation function(s)	The 4 VFGs and associated GCU constitute the three independent electrical power sources for ETOPS (including for ETOPS beyond 180 min). Note: for FAA one VFG on each engine and APU Gen constitute three independent electrical power sources for ETOPS (including for ETOPS beyond 180 min).	AMC 20-6 Rev 2 Ch II.7.8 / AMC 20-6 Rev 1 §8.b.8 / FAR §K25.1.3.b	X	Failure of VFG(s), APU Gen

ETOPS Design Requirements : impact on Safety Analyses

Safety Analyses

Safety analyses (FHA and SSA) are reviewed to consider the EDTO mission times:

- Contemplated Maximum Diversion Time
- Mean Flight Time (which is expected to be more than the non-EDTO mean flight time)

The criteria for assessing the safety risk severity vs probability is the same as for basic Type Design assessment :

- Same **classification of failure severity** versus the **expected/targeted probability**

Probability (per FH)	**Probable** 1 x 10-3	**Remote** 1 x 10-5	**Extremely remote** 1 x 10-7	**Extremely Improbable** 1 x 10-9
Severity	**Minor**	**Major**	**Hazardous**	**Catastrophic**

- However, the increased **Mean Flight Time** or **Diversion Time** used in **ETOPS safety analyses** may lead to **re-classify the severity** of a given failure condition (e.g from MAJ to HAZ) hence its expected probability.

ETOPS Design Requirements : impact on Safety Analyses

Safety Analyses

- Design assessment and Safety analyses (FHA and SSA) are performed considering the maximum permissible diversion time.
- It allows identification of the time limitation of the Most Time Limited System (other than the Cargo Fire Suppression System), and of the maximum diversion distance (if relevant), and both must be published in the Flight Manual and ETOPS CMP Doc.

Flight Manual
Appendix ETOPS

LIMITATIONS

Ident.: **TDU / APP-ETOPS-00021913.0002001 / 25 NOV 14** **EASA APPROVED**
Criteria: (XW and 102501)
Impacted DU: 00021124 Limitations
Belongs to TR29 Issue 1

The time capability of the cargo fire suppression system is 360 min.
The time capability of all the other ETOPS significant systems is 420 min.
The maximum diversion distance is 2 500 nm.

ETOPS diversion time + 15 min ≤ Time Limited System capabilities

Diversion distance limitation identified during ETOPS design assessment should also be quoted
ETOPS diversion distance ≤ Diversion distance limitation (if any)

ETOPS Quiz

t control list

LIMITATIONS

Ident.: **TDU / APP-ETOPS-00021913.0002001 / 25 NOV 14** **EASA APPROVED**
Criteria: (XW and 102501)
Impacted DU: 00021124 Limitations
Belongs to TR29 Issue 1

The time capability of the cargo fire suppression system is 360 min.
The time capability of all the other ETOPS significant systems is 420 min.
The maximum diversion distance is 2 500 nm.

Question 2.2 :

What is the meaning of this statement in the AFM ETOPS limitations section?

1. ETOPS significant systems are always physically time-limited
2. All ETOPS significant systems (other than the Cargo Fire Suppression system) will stop functioning as of 421 min
3. The ETOPS diversion speed shall not be less than 370 kt *(*see note)*
4. None of the above

** Note :*
- *420 min = 7h*
- *It is required to consider 15 min for approach and landing*
- *Hence 2,500 nm / 6,75 h = 370 kt (True Air Speed)*

Standby Airspeed Indicator

Module 2 : ETOPS Capability of the aircraft – Agenda

1. Foreword
2. ETOPS Type Design Assessment
3. Continued Reliability Assessment (ETOPS Reliability Tracking Board)
4. ETOPS CMP Document & other manuals
5. Airbus ETOPS Certification Status
6. Conclusion

EIS : Entry Into Service
IFSD: In Flight Shut Down
RTB: Reliability Tracking Board

ETOPS Reliability Requirements

ETOPS Reliability Requirements – IFSD rate monitoring

- Engines must meet ETOPS reliability objectives (IFSD target rate): Compliance with these reliability objectives must be demonstrated through in service experience and Early ETOPS demonstration in case of ETOPS at EIS

Review of propulsion system data & in-service experience should be conducted:

- Prior to first ETOPS Type Design approval; and
- On a continuing basis thereafter

The **IFSD target rate** are defined to ensure that dual engine failure for independent causes remains extremely improbable.

Accordingly, the IFSD target rate are usually set as follows:

ETOPS	up to 120 min	up to 180 min	Beyond 180 min
IFSD Target Rate per 1,000 Engine Hours	**0.050**	**0.020**	**0.010**

The IFSD rate is normally computed:

- For a given fleet of aeroplane/engine combination
- On a 12 month rolling basis.

Module 2 : ETOPS Capability of the aircraft – Agenda

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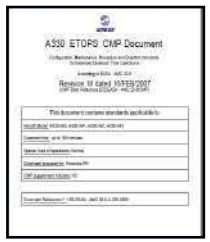
ETOPS CMP document

ETOPS CMP Document

The ETOPS CMP Document defines:

- The configuration of the airframe, the engines and the APU for ETOPS
- The maintenance requirements specific to ETOPS (Also found in the MRBR)
- The procedures specific to ETOPS (Also found in the AFM and FCOM)
- The dispatch limitations specific to ETOPS (Also found in the MMEL)



CMP Document

For ETOPS, the aircraft must be configured, maintained and operated according to the CMP Document

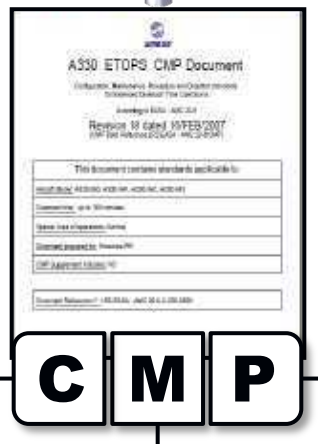
ETOPS CMP document

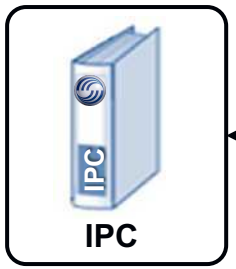
Before Entry into Service:

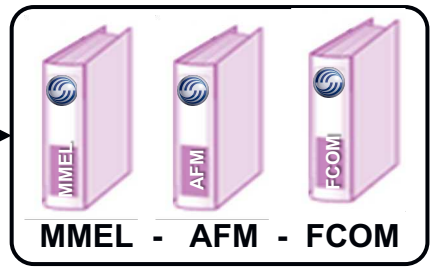
- Flight Test Results
- Simulation
- Syst. Safety Assmt.
- A/C Related Events

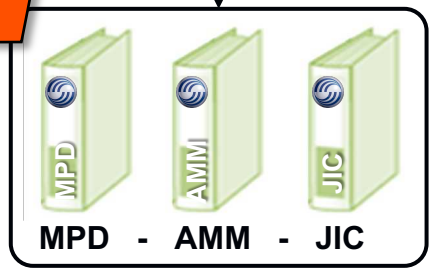
Aircraft in-service:

- Reliability trends
- Events (ARM-TFU)
- Modifications
- Other A/C Rel.events









ETOPS Maintenance Practices & Processes
ETOPS Significant Items

Example of Airbus ETOPS CMP document - CMP page layout

ATA 21

CMP Standards applicable to A330-223
MSN : L-6870, L-7332

Fitted with: FORWARD CARGO VENTILATION WITH TEMPERATURE CONTROL SYSTEM
MOD/SB: MOD 40097 OR MOD 45199

Configuration item n°:	21-1-0000-002	Revision n°14	Area of Operation: Normal
Diversion Time Range: from 60 to 180 min		**Compliance Schedule:** Priority	
Introduce Improved Packs and temperature Sensors.			
Cross Reference: N/A			
Solutions: n°1: LIEBHERR SB 9105A-21-01 AND LIEBHERR SB 958A-21-01 n°2: MOD 42628 AND MOD 42629 n°3: SB 21-3010			

Maintenance item n°:	21-2-0000-001	Revision n°7	Area of Operation: Normal
Diversion Time Range: from 60 to 180 min		**Compliance Schedule:** Interval: Not to exceed 2500 Flight hours	
Lower deck cargo compartment ventilation and cooling/heating. Operational check to verify automatic closing of isolation valves and shut-off of extraction fans in case of smoke warning.			

Item contains:

- Chapter:
  - 1- Configuration
  - 2- Maintenance
  - 3- Procedures
  - 4- Dispatch
- Diversion Time Range
- Compliance Schedule (For Conf. Maint. Items)
- Description
- Solution(s)

Overview of AFM ETOPS sup./FCOM/MMEL/MPD

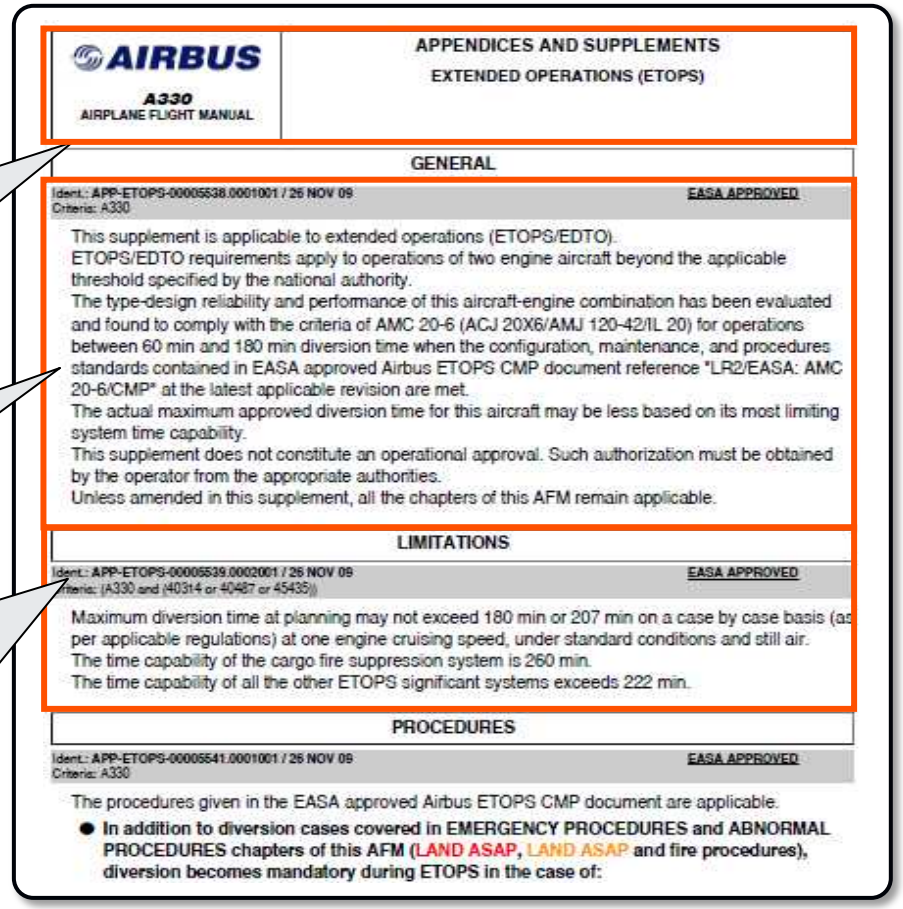
Approved AFM ETOPS Supplement

Approved AFM ETOPS Supplement
Appendices & Supplements
Extended Operations (ETOPS)

Applies to ETOPS operated airplanes

Identifies limitations for ETOPS :

- Max Diversion Time (and distance, if any)
- Time capabilities of cargo fire protection system and other most limiting ETOPS significant system



AIRBUS
A330
AIRPLANE FLIGHT MANUAL

APPENDICES AND SUPPLEMENTS
EXTENDED OPERATIONS (ETOPS)

GENERAL

Ident.: APP-ETOPS-00005538.0001001 / 26 NOV 09 — EASA APPROVED
Criteria: A330

This supplement is applicable to extended operations (ETOPS/EDTO).
ETOPS/EDTO requirements apply to operations of two engine aircraft beyond the applicable threshold specified by the national authority.
The type-design reliability and performance of this aircraft-engine combination has been evaluated and found to comply with the criteria of AMC 20-6 (ACJ 20X6/AMJ 120-42/IL 20) for operations between 60 min and 180 min diversion time when the configuration, maintenance, and procedures standards contained in EASA approved Airbus ETOPS CMP document reference "LR2/EASA: AMC 20-6/CMP" at the latest applicable revision are met.
The actual maximum approved diversion time for this aircraft may be less based on its most limiting system time capability.
This supplement does not constitute an operational approval. Such authorization must be obtained by the operator from the appropriate authorities.
Unless amended in this supplement, all the chapters of this AFM remain applicable.

LIMITATIONS

Ident.: APP-ETOPS-00005539.0002001 / 26 NOV 09 — EASA APPROVED
Criteria: (A330 and (40314 or 40487 or 45435))

Maximum diversion time at planning may not exceed 180 min or 207 min on a case by case basis (as per applicable regulations) at one engine cruising speed, under standard conditions and still air.
The time capability of the cargo fire suppression system is 260 min.
The time capability of all the other ETOPS significant systems exceeds 222 min.

PROCEDURES

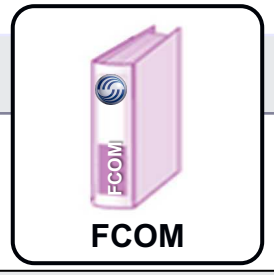
Ident.: APP-ETOPS-00005541.0001001 / 26 NOV 09 — EASA APPROVED
Criteria: A330

The procedures given in the EASA approved Airbus ETOPS CMP document are applicable.

- **In addition to diversion cases covered in EMERGENCY PROCEDURES and ABNORMAL PROCEDURES chapters of this AFM (LAND ASAP, LAND ASAP and fire procedures), diversion becomes mandatory during ETOPS in the case of:**

AFM : Airplane Flight Manual
FCOM : Flight Crew Operating Manual
MMEL : Master Minimum Equipment List
MPD : Maintenance Planning Document

Overview of AFM ETOPS sup./FCOM/MMEL/MPD



FCOM

FCOM ETOPS Chapter (PRO-SPO-40/-40A)

FCOM ETOPS Chapter
(PRO-SPO-40/-40A)

Provides information and procedures for ETOPS flight operations:

- Limitations
- Definition of area of operations
  - Maximum diversion distances
- Dispatch consideration
  - ETOPS fuel scenarios / ETOPS fuel reserves
  - Weather minima
- ETOPS Diversion
  - decision making
  - Performance
  - procedure

AIRBUS
A330
FLIGHT CREW
OPERATING MANUAL

PROCEDURES
SPECIAL OPERATIONS
EXTENDED RANGE OPERATIONS - GENERAL

GENERAL

Ident.: PRO-SPO-40A-10-00005194.0001001 / 17 NOV 11
Applicable to: ALL

The system design and the reliability of the engine installation of this airplane comply with the criteria for Extended Twin Operations (ETOPS) flights set forth in AMC 20-6 rev 2 (EASA) or FAR 25.1535 (FAA), when the aircraft is configured, maintained and operated in accordance with the Airbus CMP (Configuration, Maintenance and Procedure) document.
This statement of ability does not constitute an approval to conduct Extended-Range Operations.
The ETOPS EXTENDED OPERATIONS Chapter of the AFM APPENDICES AND SUPPLEMENTS Section refers to the approved Standard for Extended-Range Operations and the applicable limitations, procedures and performance references.
The operator is responsible for showing that he is complying with the regulation of his nation and for obtaining operational approval from his national authorities. The operator may amend this chapter, as needed.
The airplane must be configured in accordance with the Airbus Standard for Extended-Range Operations. However, the authorities may under certain conditions allow the operator to conduct ETOPS flights with limited maximum diversion time (for example, 75 min diversion time in a benign area of operation) without showing full compliance with these standards.

DEFINITION

Ident.: PRO-SPO-40A-20-00005195.0001001 / 17 NOV 11
Applicable to: ALL

For the purpose of EU-OPS 1-245 and FAR 121-161, Extended-Range Operations are those intended to be conducted over a route that contains a point beyond 60 min from an adequate airport at the selected one-engine-inoperative speed in still air and ISA (or prevailing delta ISA) conditions.
An adequate airport is an airport which satisfies the aircraft performance requirements applicable at the expected landing weight, and sufficiently equipped to be safely used. In particular, at the anticipated time of use, it should be available and equipped with the necessary services, including ATC, weather information, NAVAIDS and emergency services.
An ETOPS (en-route) alternate airport is a confirmed adequate airport which satisfies the dispatch weather minima requirements for ceiling and visibility within the required validity period.

Overview of AFM ETOPS sup./FCOM/MMEL/MPD

MMEL

MMEL ETOPS Items

Dispatch restrictions specific to ETOPS are identified in the basic MMEL

Example:

24-25-02	Manual Transfer (ALTN Function) of AC ESS FEED Control to AC BUS 2

Ident.: MI-24-25-00007111.0001001 / 22 MAR 10
Applicable to: ALL

24-25-02A

Repair interval	Nbr installed	Nbr required	Placard
C	1	0	Yes

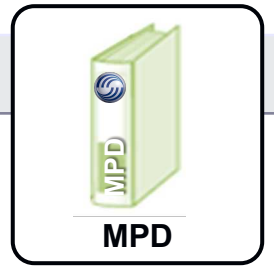
(o) May be inoperative provided that:
1) ETOPS is not conducted, and
2) The AC ESS FEED pb-sw is in the norm position, and
3) The three DC TIE contactors are operative.

The Operator's MEL must include the MMEL restrictions for ETOPS operations

- The MEL is a document agreed/approved by the relevant National Authorities.
- The MEL cannot be less restrictive than the MMEL

AFM : Airplane Flight Manual
FCOM : Flight Crew Operating Manual
MMEL : Master Minimum Equipment List
MPD : Maintenance Planning Document

Overview of AFM ETOPS sup./FCOM/MMEL/MPD



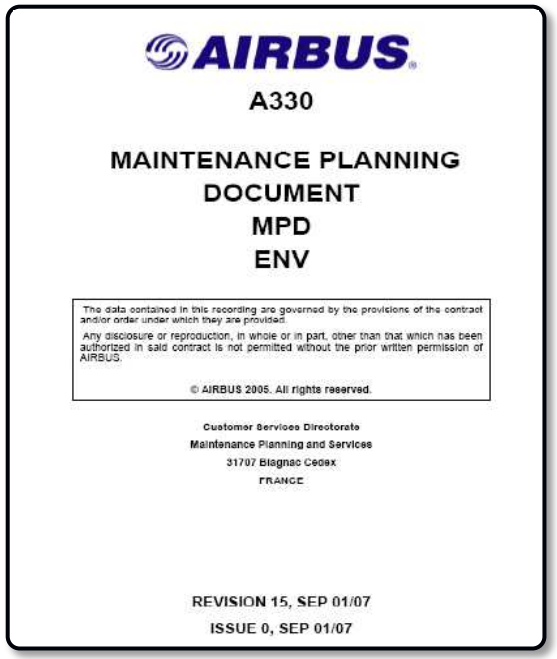
MPD ETOPS Items

ETOPS information is included in the MPD:

- ETOPS Specific tasks
- Tasks with interval specific to CMP

Identified with:

- ETOPS note in the applicability column
- CMP note in the source column


AIRBUS

A330

MAINTENANCE PLANNING DOCUMENT
MPD
ENV

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Customer Services Directorate
Maintenance Planning and Services
31707 Blagnac Cedex
FRANCE

REVISION 15, SEP 01/07
ISSUE 0, SEP 01/07

Example:

R	242400-01-3	210	AC EMERGENCY GENERATION EL OP OPERATIONAL CHECK OF EMERGENCY GENERATION SYSTEM	I:	50 FH	CMP	242400-710-801 CMP REFERENCE : 24-2-0000-010 CMR REFERENCE : 242000-00001-1-C MRB REFERENCE : 24.20.00/01 24.50.00/01 24.60.00/01	1	0.04 ETOPS

AFM : Airplane Flight Manual
FCOM : Flight Crew Operating Manual
MMEL : Master Minimum Equipment List
MPD : Maintenance Planning Document

ETOPS Quiz

Question 2.3 :

When operating ETOPS, the Operator must ensure that the aircraft is configured, maintained and operated according to the ETOPS CMP Document.

Does it mean that the **ETOPS CMP Document** contains **all applicable ETOPS requirements** that are necessary to operate an aircraft on **ETOPS** ?

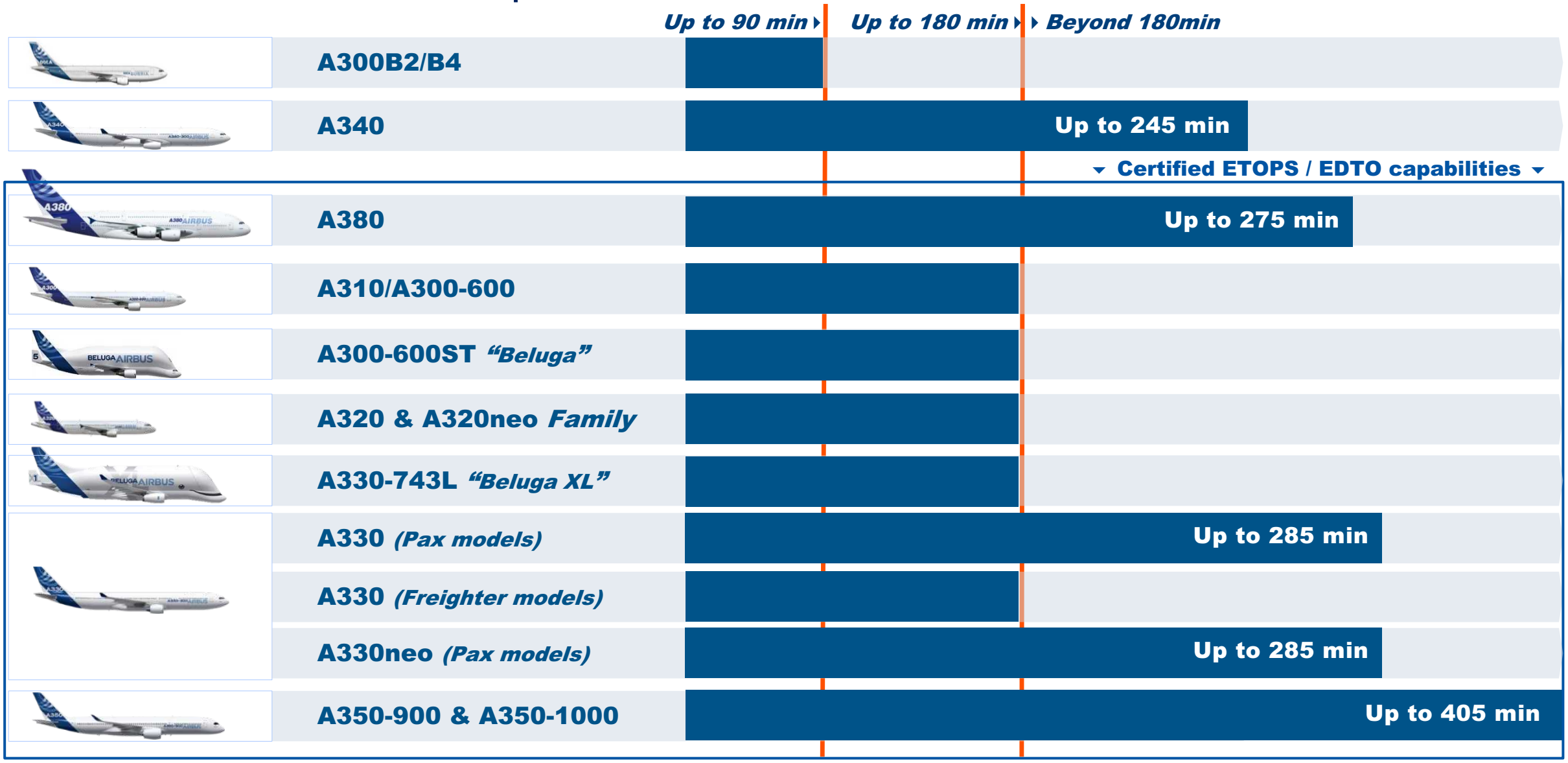
1. Yes
2. Highly probable
3. No
4. Highly unlikely

Module 2 : ETOPS Capability of the aircraft – Agenda

1. Foreword
2. ETOPS Type Design Assessment
3. Continued Reliability Assessment (ETOPS Reliability Tracking Board)
4. ETOPS CMP Document & other manuals
5. Airbus ETOPS Certification Status
6. Conclusion

Note: the ETOPS / EDTO capability of a given aircraft may be less that the applicable value (diversion time) shown below depending on its configuration (e.g. cargo fire suppression system)

Airbus ETOPS / EDTO capabilities and certification Status



Module 2 : ETOPS Capability of the aircraft – Agenda

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Conclusion

- **ETOPS Type Design and Reliability Approval** (Certification) is under the responsibility of the aircraft manufacturer and is granted by the Primary Certification Authority

- ETOPS Certification is a two-step process:
  - **ETOPS Type Design Review**: Compliance against applicable design requirement
  - **ETOPS Reliability Review**: Assessment of A/C Systems, APU & engines' reliability

- When granted, ETOPS certification is reflected in
  - **ETOPS CMP Document** (Approved document regularly revised)
  - Aircraft and Engine TCDS
  - AFM, MMEL, MRBR
  - Other non-approved documents: FCOM, MPD, IPC,…

- Once granted, **ETOPS certifications have to be maintained**

- For that purpose ETOPS Continued Airworthiness activities are managed by the **ETOPS Reliability Tracking Board**
  - Regular RTB meetings organized on a 2-year basis
  - Review of in-service events
  - Review of engines' IFSD rates

– Conclusions of RTB meetings are included in new revisions of ETOPS CMP Document

Content of this Technical awareness on ETOPS / EDTO :

1. **ETOPS Background Information**
2. **ETOPS Capability of the Aircraft**
3. **Overview of Operational Approval** - *ETOPS Maintenance & Flight Ops processes*
4. **Review of ETOPS Flight Ops Requirements & Practices**
5. **Review of ETOPS Maintenance Requirements & Practices**
6. **Conclusions**

Module 3 : Overview of Operational Approval – Agenda

1. ETOPS Operational Approval Plan
2. Operator’s Assessment & Approval
3. ETOPS Processes and Manuals
4. Approval status of Airbus ETOPS Operators
5. Conclusion

ETOPS Operational Approval

Contracting State Responsibilities

State of Design ➔ Primary Responsibility for EDTO (or ETOPS) Type Design Approval and Reliability Assessment (TCDS)

***State of Operator** ➔ Primary Responsibility for EDTO (or ETOPS) Operational Approval and Oversight (OpSpec)

***State of Registry** ➔ Primary Responsibility for EDTO (or ETOPS) Continuing Airworthiness Program Approval and Oversight and acceptance/validation of EDTO Type Design (C of A)

* Note: When the State of Registry and State of the Operator are different, shared safety oversight responsibilities may be established and filed through an **Article 83 *bis* agreement**

ETOPS Quiz

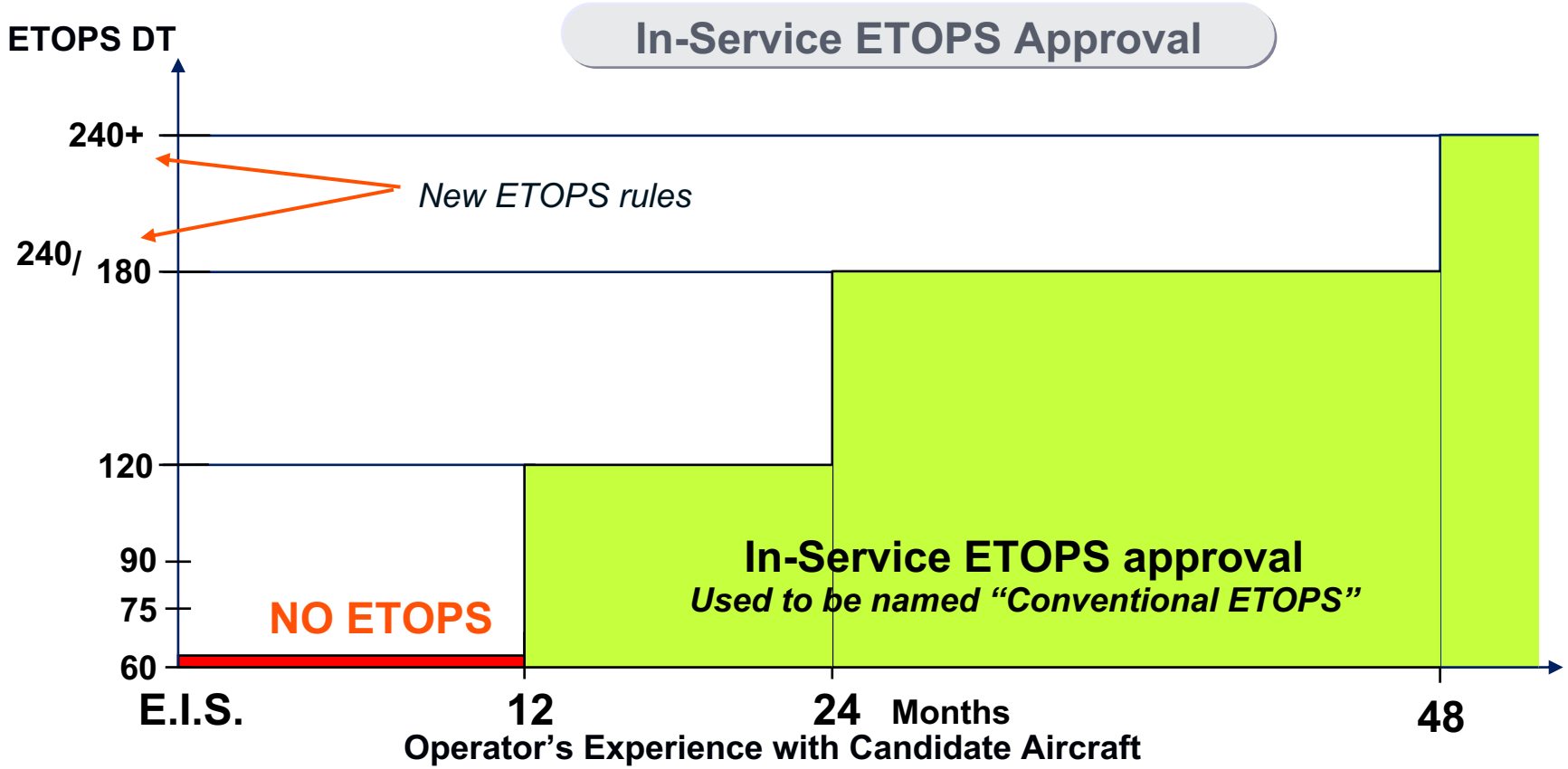
Question 3.1 :

The State of the Operator has replaced the ETOPS regulation by a new EDTO regulation. Is it correct to say that an Operator with an existing ETOPS approval would need to re-apply for EDTO approval ?

1. Yes
2. No

ETOPS Operational Approval – Type of Approval Plan

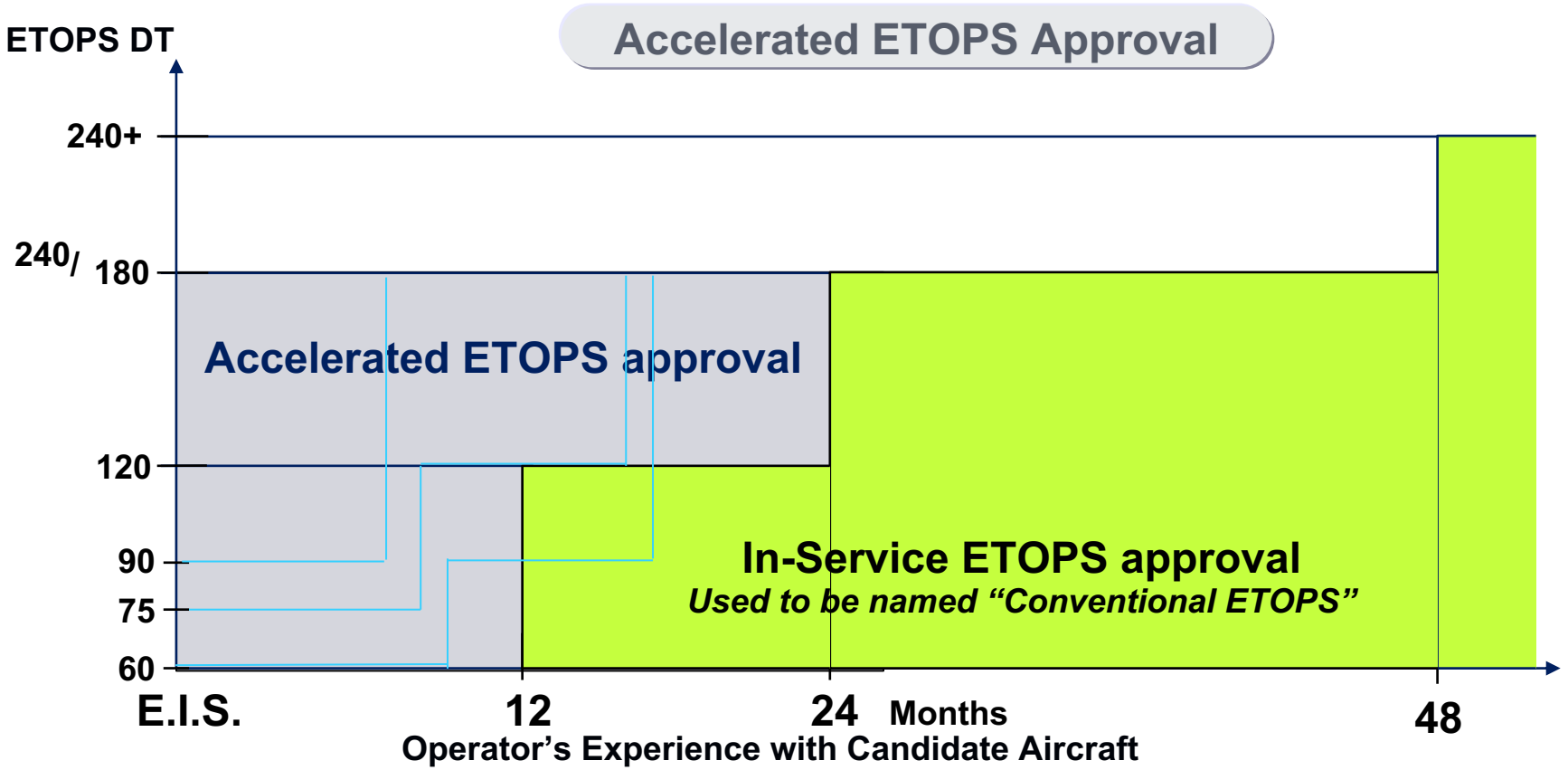
EASA AMC 20-6 / FAA Part 121 appendix B & AC 120-42b
AC 120-42a / CAP 513 / CTC 20 / TP6327…



ETOPS Operational Approval – Type of Approval Plan

EASA AMC 20-6 / FAA Part 121 appendix B & AC 120-42b

AC 120-42a / CAP 513 / CTC 20 / TP6327…



AIRBUS

Module 3 : Overview of Operational Approval – Agenda

1. ETOPS Operational Approval Plan
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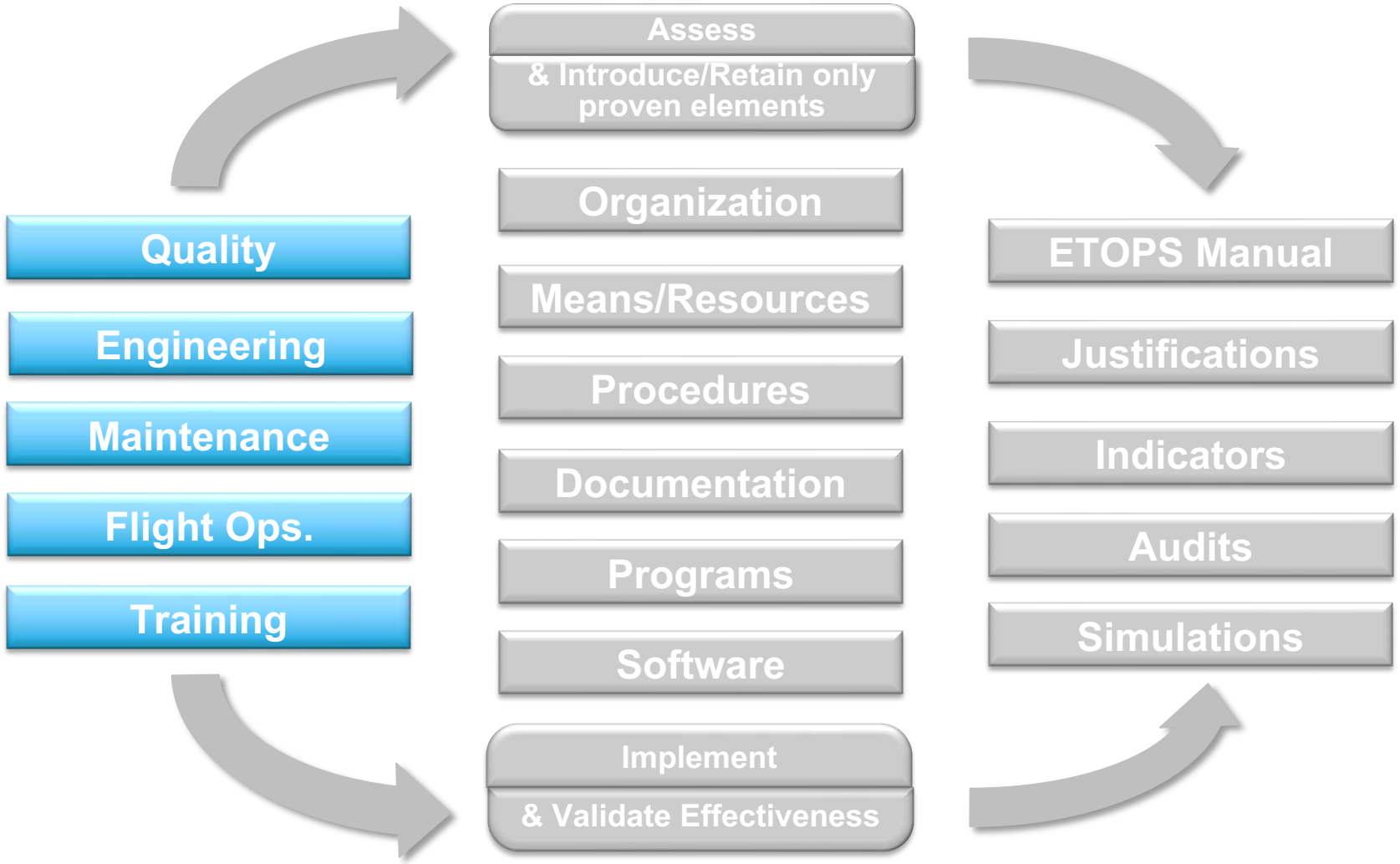
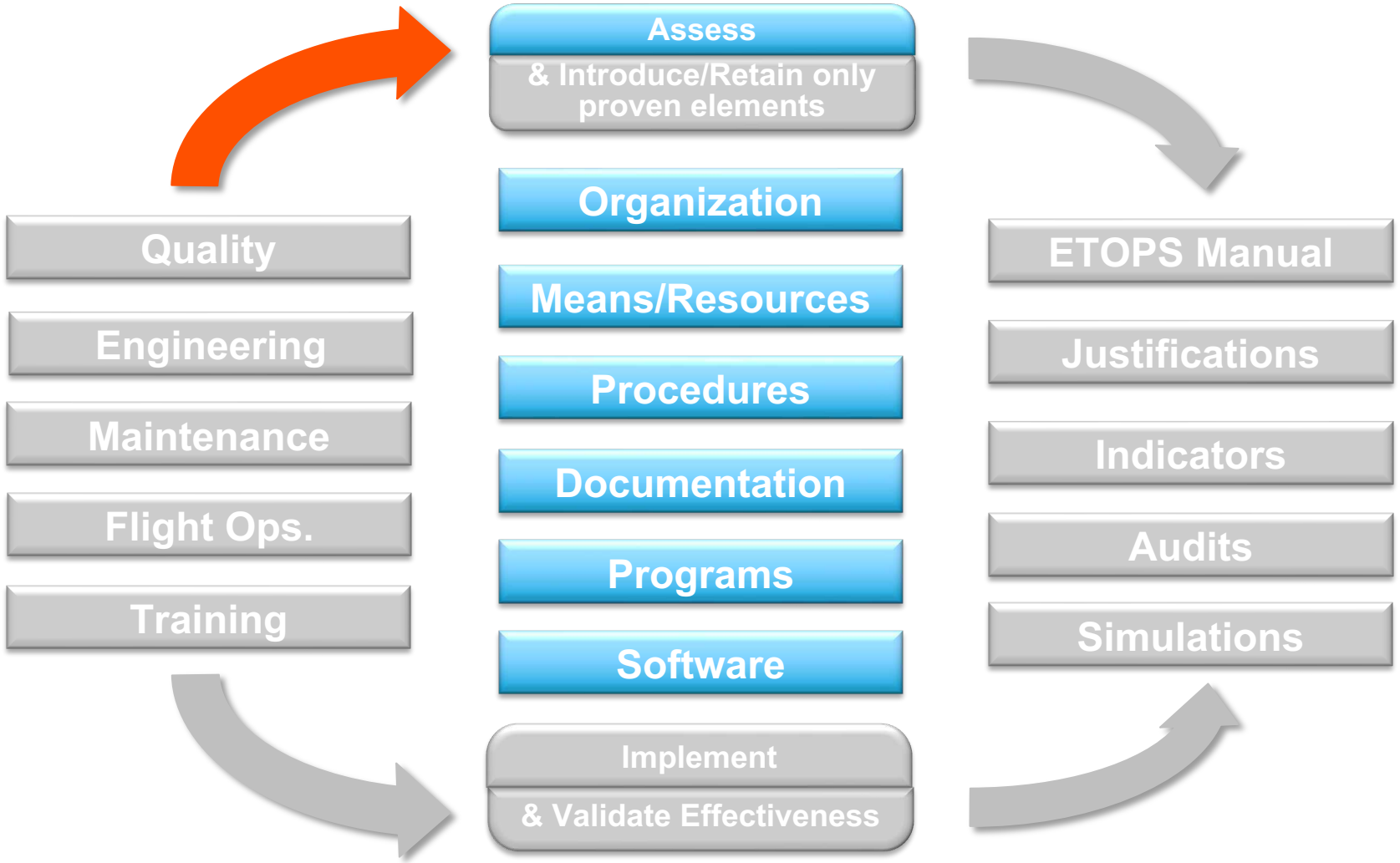
5. Conclusion

Operator’s assessment – Both In-Service and Accelerated methods



Operator's assessment – Both In-Service and Accelerated methods



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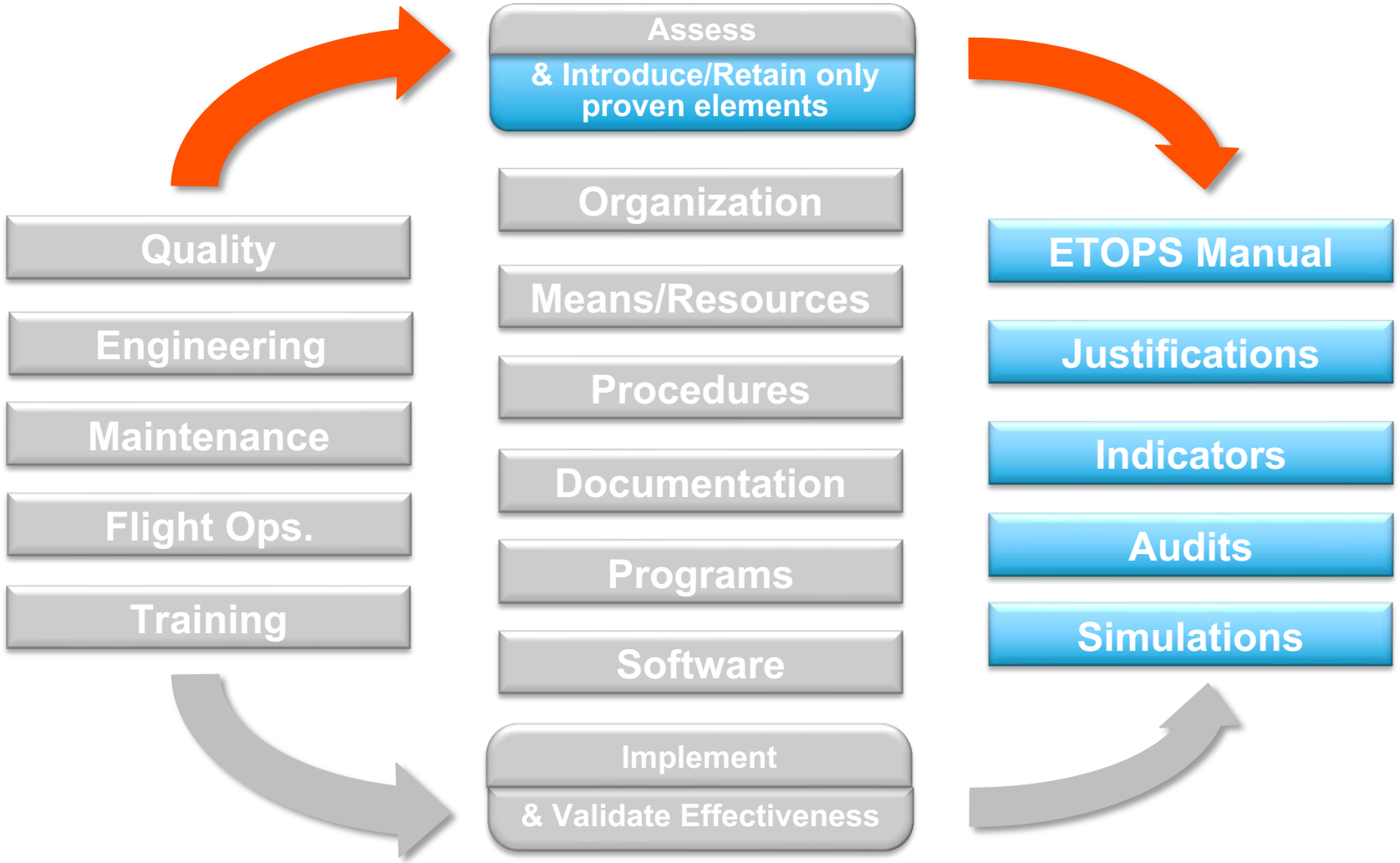
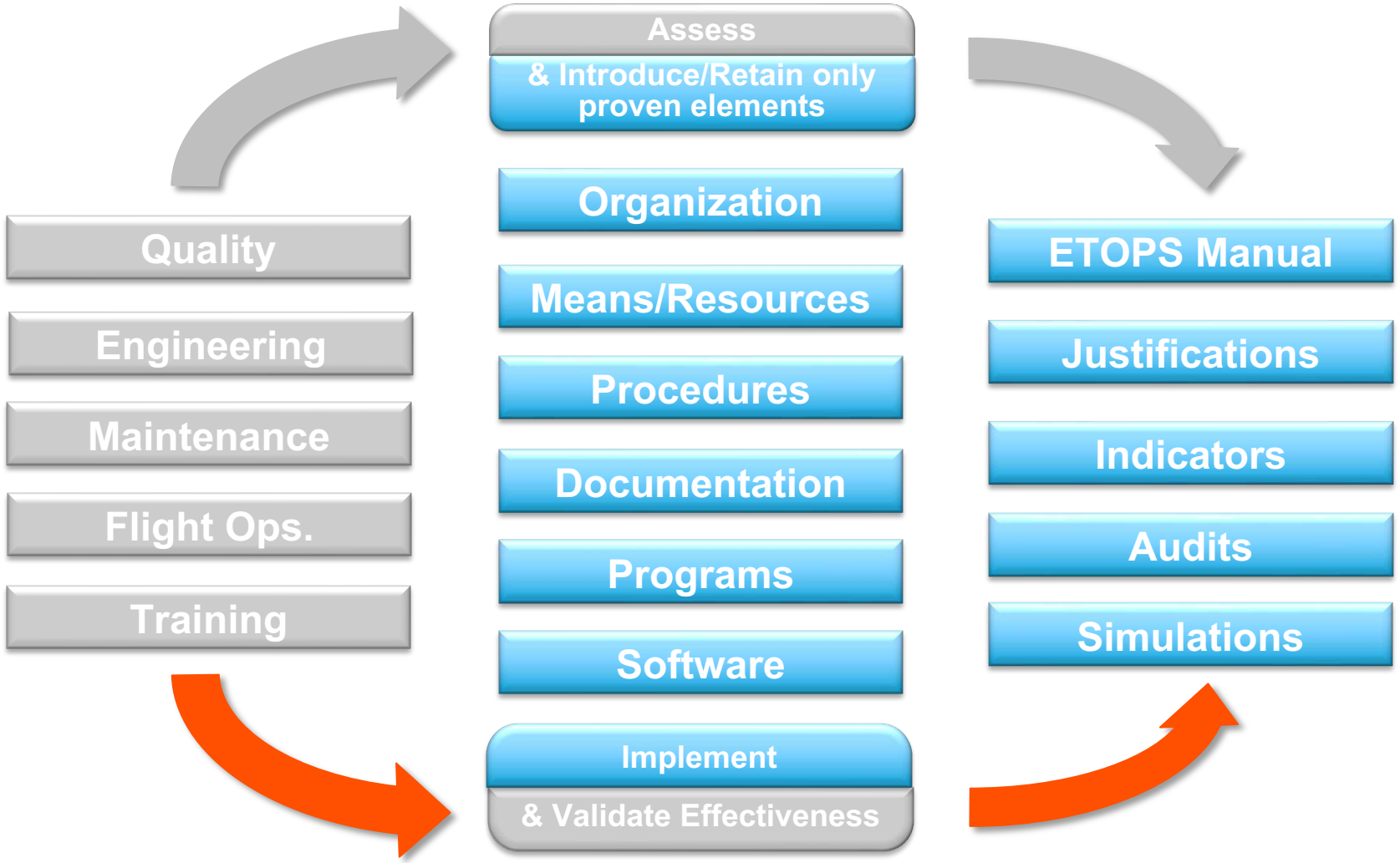
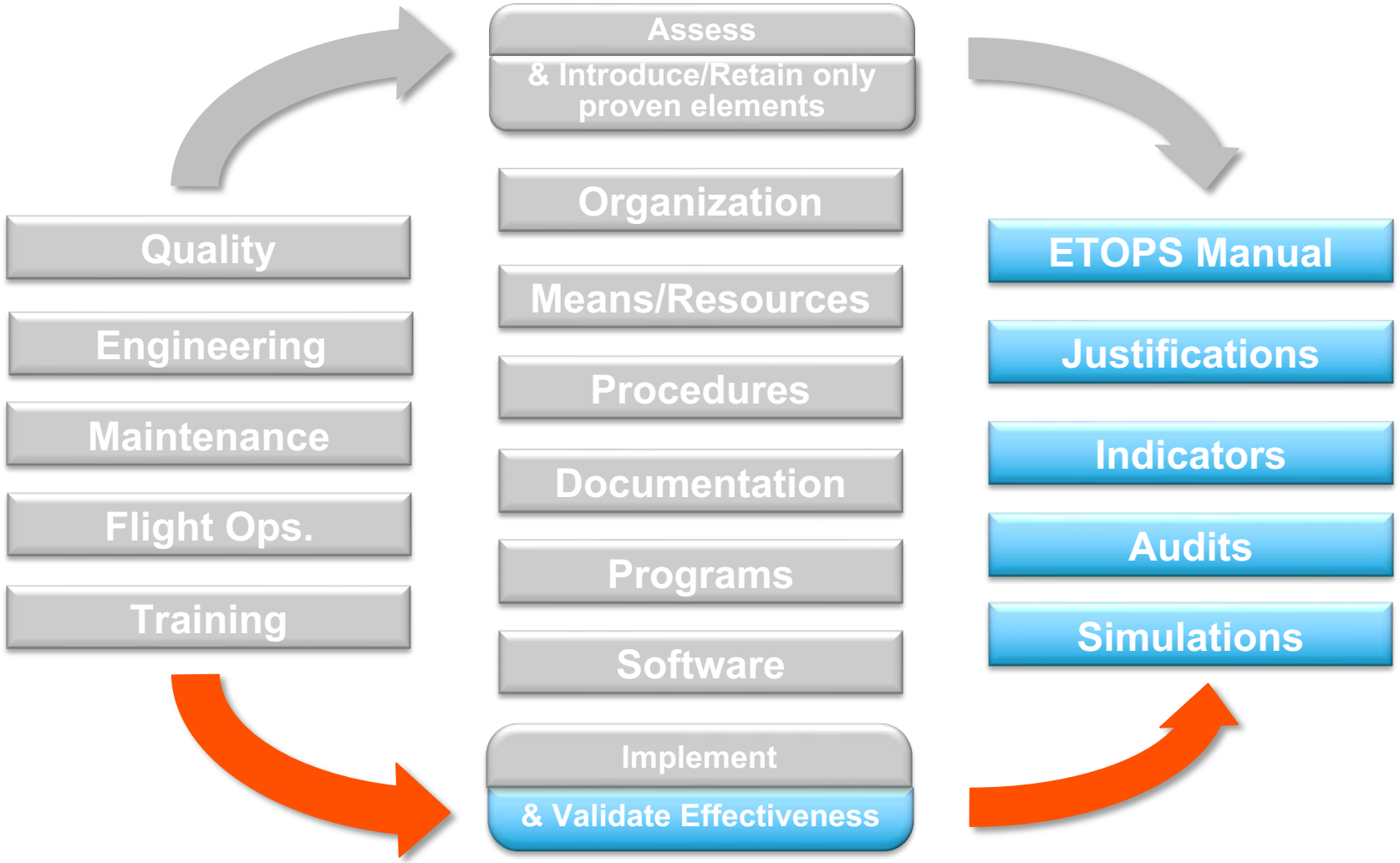


Operator’s assessment – Both In-Service and Accelerated methods



Operator’s assessment – Only required for Accelerated ETOPS method



Operator's approval – Operations Specifications for EDTO (1/3)

- EDTO operational authorization constitutes a 'Specific Approval' which should be listed in the Operations Specification for each approved aeroplane type:

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the operations manual)

ISSUING AUTHORITY CONTACT DETAILS[1]

Telephone: _____ Fax: _____ Email: _____

AOC#[2]: _____ Operator name[3]: _____ Date[4]: _____ Signature: _____

Dba trading name: _____

Aircraft model[5]:

Types of operation: Commercial air transportation ☐Passengers ☐ Cargo ☐ Other[6]: _____

Area(s) of operation[7]:

Special limitations[8]:

SPECIFIC APPROVAL	YES	NO	DESCRIPTION[9]	REMARKS
Dangerous goods	☐	☐		
Low visibility operations				
Approach and landing	☐	☐	CAT[10]: ____ RVR: ____ m DH: ____ ft	
Take-off	☐	☐	RVR[11]: ____ m	
Operational credit(s)	☐	☐	[12]	
RVSM[13] ☐ N/A	☐	☐		
EDTO[14] ☐ N/A	☐	☐	Threshold time[15]: ____ minutes Maximum diversion time[15]: ____ minutes	
AR navigation specifications for PBN operations	☐	☐	[16]	
Continuing airworthiness			[17]	
EFB			[18]	
Other[19]	☐	☐		

Annex 6, Part 1 - Appendix 6
Operations Specification Template

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the operations manual)

Aircraft model[5]:

Area(s) of operation[7]:

SPECIFIC APPROVAL	YES	NO	DESCRIPTION[9]	REMARKS
EDTO[14] ☐ N/A	☐	☐	Threshold time[15]: ___ minutes Maximum diversion time[15]: ___ minutes	

EDTO Related Content

Note : ICAO format for the OpsSpec presented here. Some States may have implemented different formats

AIRBUS

Operator's approval – Operations Specifications for EDTO (2/3)

OPERATIONS SPECIFICATIONS
(subject to the approved conditions in the operations manual)

Aircraft model [5]:

Area(s) of operation [7]:

SPECIFIC APPROVAL	YES	NO	DESCRIPTION [9]	REMARKS
EDTO [14] ☐ N/A	☐	☐	Threshold time [15]: ___ minutes Maximum diversion time [15]: ___ minutes	

Notes:

5. *Insert the CAST/ICAO designation of aircraft make, model and series or master series, if a series has been designated (e.g. Airbus A320-272, Airbus A350-1041, Boeing-737-3K2 or Boeing-777-232). The CAST/ICAO taxonomy is available at http://www.intlaviationstandards.org/.*
7. *List the geographical area(s) of authorized operations (by geographic coordinates or specific routes, flight information region or national or regional boundaries).*
9. *List in this column the most permissive criteria for each approval or the approval type (with appropriate criteria)*
14. *If extended diversion time operations (EDTO) approval does not apply based on the provisions of of Chapter 4, 4.7 select "N/A". Otherwise a threshold time and maximum diversion time must be specified.*
15. *The threshold time and maximum diversion time may also be listed in distance (NM) as well. Details of each particular aeroplane-engine combination for which the threshold time is established and maximum diversion time has been granted may be listed under 'remarks'. One line per approval may be used if different approvals are granted.*

Operator's approval – Operations Specifications for EDTO (3/3)

- Example of AOC content related to EDTO Specific approval:

OPERATIONS SPECIFICATIONS (subject to the approved conditions in the operations manual)				
Operator name: **EDTO Airways**				
Aircraft Model: **Airbus A330-301 and A350-941**				
Area(s) of Operation: **North Pacific Ocean and NAT/HLA**				
SPECIFIC APPROVAL	**YES**	**NO**	**DESCRIPTION**	**REMARKS**
EDTO ☐ N/A	☑	☐	Threshold time: **60 min (420 NM)** Maximum Diversion Times: **A330-301 : 180 min (1230 NM)** **A350-941 : 300 min (2000 NM)**	***A350-941:*** • ***300 minute authorization applies to the North Pacific area. Authorization is otherwise limited to 180 minutes.***

Threshold Time: Not intended to be aircraft or area specific. A single value can be listed , based on applicable State regulations, even if different MDT approval levels are specified.

Maximum Diversion Time values and use conditions may vary among State regulations. Typical examples include :
- Specific approval time levels up to 180 minutes (e.g. 75 min, 90 min, 120 min…)
- Specific approval time levels above 180 minutes (e.g. 240 min, beyond 240 min…)
- Operational extension on a flight by flight exception basis (e.g. 138 minutes, 207 min)
- Regional applicability (e.g. Indian Ocean, North Atlantic), which may also be detailed in the Remark column

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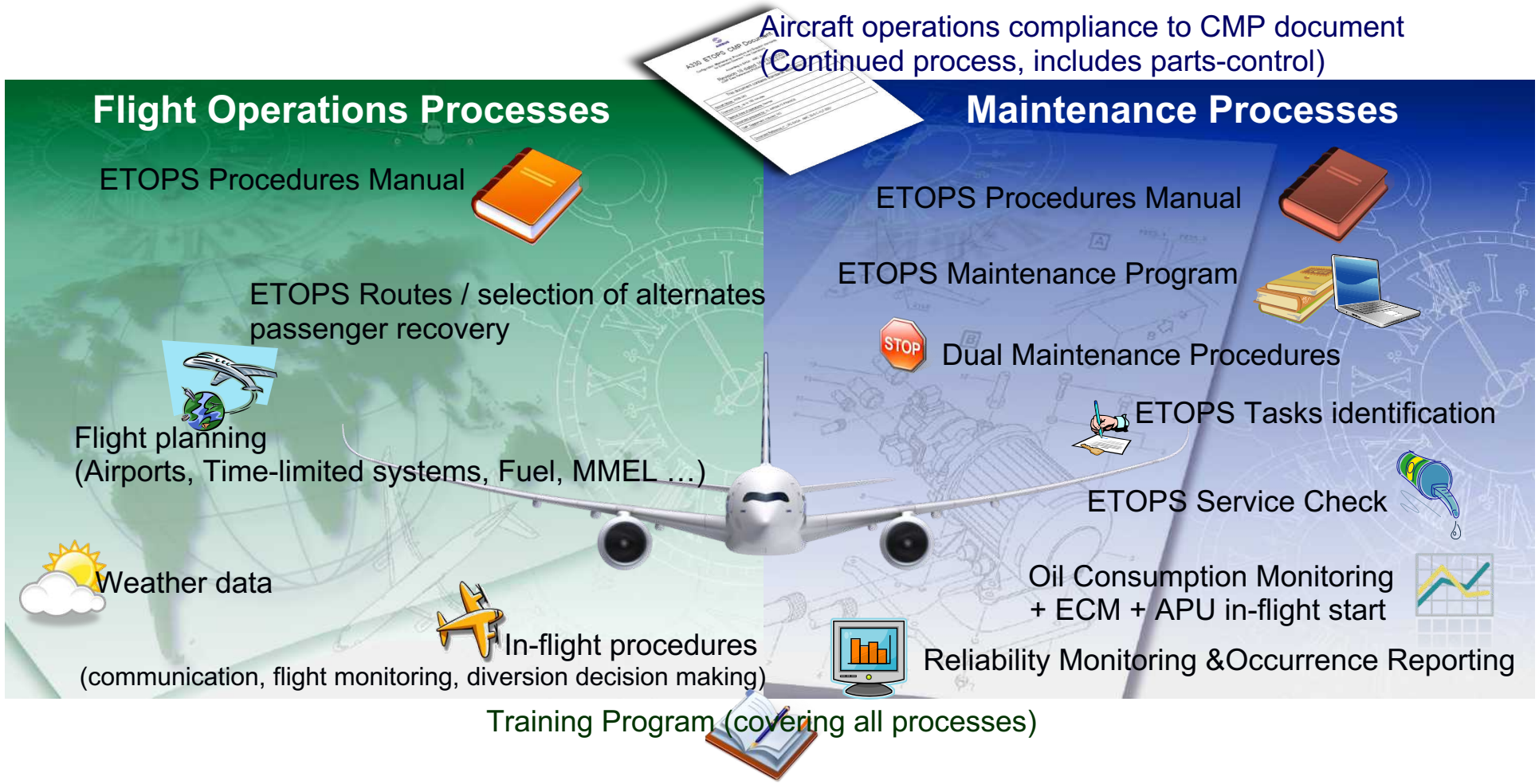
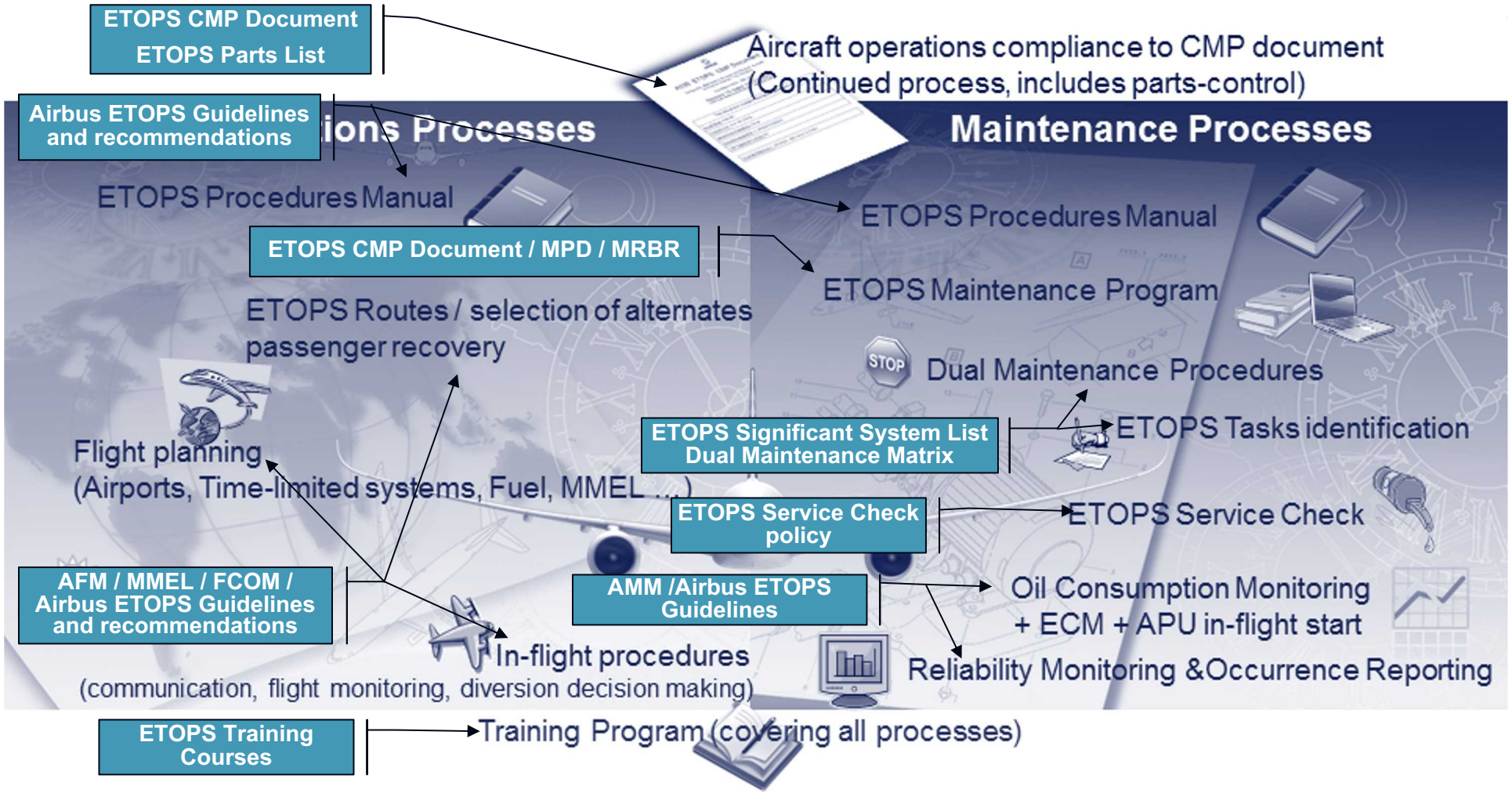
ETOPS processes and manuals - Approval of the Airline

To obtain an ETOPS / EDTO operational approval, the Airline must ensure that the required process elements are proven and implemented:



ETOPS processes and manuals – Inputs from the Aircraft Manufacturer

Inputs from the manufacturer are required and/or useful to assist the operator in gaining its ETOPS / EDTO operational approval:



ETOPS processes and manuals – Time Limited System (TLS) Considerations

Annex 6, Part 1 - 4.7.2.3: When approving the appropriate maximum diversion time for the operator of a particular aeroplane type engaged in extended diversion time operations, the State of the Operator shall ensure that:

a) *for all aeroplanes*: **the most limiting EDTO significant system time limitation, if any, indicated in the aeroplane flight manual (directly or by reference) and relevant to that particular operation is not exceeded.**

Accordingly, processes must be implemented by the EDTO operator to ensure that MDT at planning does not exceed:

- the approved MDT (as shown on the AOC); and
- the diversion time capability of the aircraft, as reflected in the Tech Log (EDTO dispatch statement).

Note: for EDTO beyond 180 minutes, Maximum Diversion Time (MDT, as shown on the AOC) and TLS capabilities are separate considerations:

- TLS diversion planning is based on forecast winds whereas MDT is a still air diversion consideration, so the two times are not directly comparable.
- TLS planning may consider different diversion speeds and Flight Levels than MDT, resulting in a different time to distance conversion.
- A note regarding TLS planning considerations (independent of MDT), clarifying that TLS may further restrict diversion distance capability, may be included in the AOC (Remark column) to avoid confusion while preserving intent of Annex 6 language

ETOPS processes and manuals - Continuing operational surveillance

A continuing surveillance and reporting system to the National Authority must be instituted.

Reporting shall include:

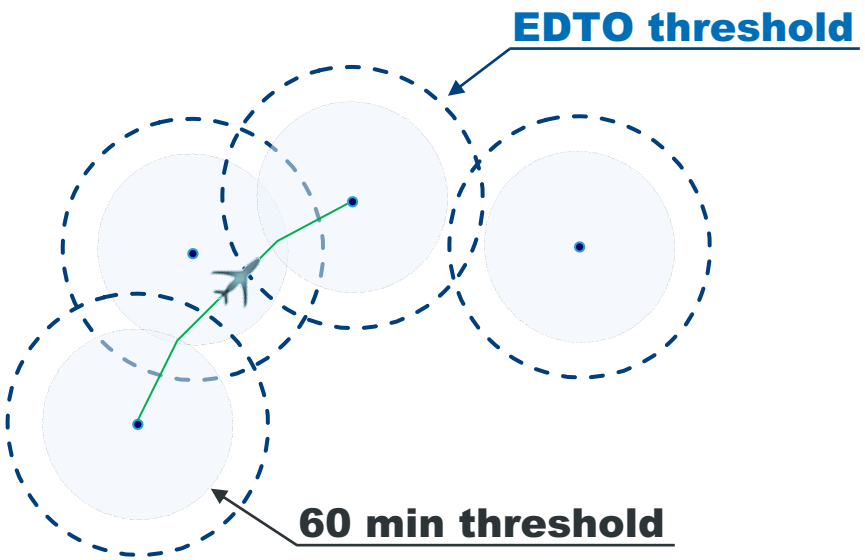
- Any significant service event in the ETOPS fleet
- Corrective actions for short and long term if any
- Statistical reliability indicators for essential systems and for engines

The National Authority may mandate actions, suspend or revoke ETOPS in case of necessity

ETOPS Quiz

Question 3.2 :

To operate on the indicated route (green line) which of the following apply?

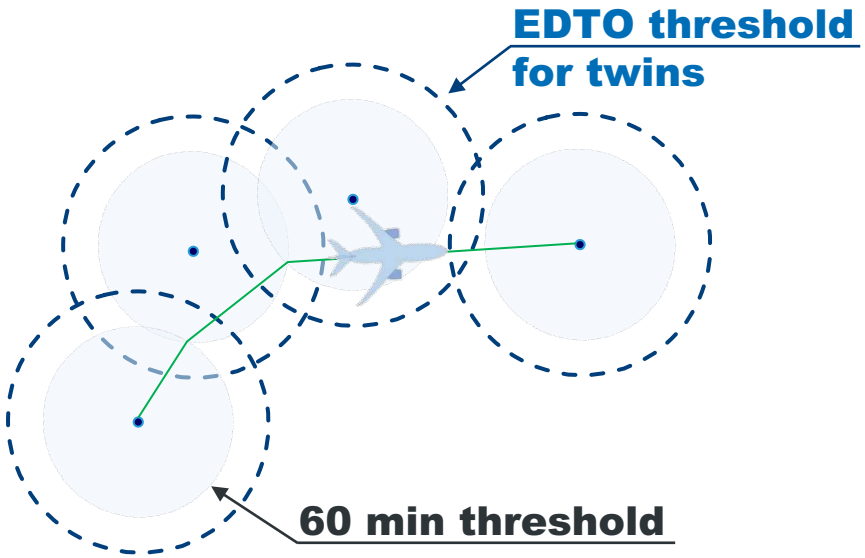


1. Only additional requirements for operations beyond 60 mins apply
2. An Operational Approval for EDTO is needed
3. No additional requirements apply

ETOPS Quiz

Question 3.3 :

What is required to operate this route (green line) with a Twin:



1. Only additional requirements for operations beyond 60 mins apply
2. An Operational Approval for EDTO is needed
3. No additional requirements apply

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Airbus worldwide ETOPS operation

- Status as of 2023:

Aircraft Family	Total FH	Nb of operators	Nb of aircraft delivered	ETOPS FH	ETOPS FH in %	ETOPS operators in %	ETOPS aircraft in %
A310 A300-600	26,380,000	30	567	2,950,000	~10%	~25%	~4%
A320	321,785,000	562	11,127	6,400,000	<2%	~5%	~20%
A330	64,478,000	160	1,588	19,000,000	~30%	~90%	100%
A350	8,021,000	39	564	2,704,000	~33%	100%	100%
Total	**420,664,000**	**-**	**13,846**	**31,054,000**	-	-	-

Focus on Airbus ETOPS beyond 180 min operations

- As of 2023, the following operators obtained an ETOPS beyond 180 min approval with Airbus aircraft:

Operator	Aircraft	ETOPS DT	Area	Routes
CPA	A350	240	North Pacific	HKG-LAX
FBU	A350	370	Mid Pacific	SFO-PPT
MAU	A330 A350	240 275	South Indian Ocean	MRU-PER
QFA	A330	240 (TBC)	South Indian Ocean / Mid Pacific	PER-JNB BNE-LAX
SAA	A330 A340 A350	260 245 300	South Atlantic / South Indian Ocean	JNB-GRU JNB-PER
SIA	A350	207	North Pacific	SIN-SFO

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Conclusion (1/2)

- ETOPS Operational Approval is under the responsibility of the operator and is granted by the National Airworthiness Authority supervising the operator

- ETOPS Operational Approval is a process-based approach aiming at demonstrating the operator's capability to perform safe and reliable ETOPS operations

- ETOPS operational regulations give two possibilities to get and ETOPS Operational Approval

  - In-service (Conventional) approval
    - Requires direct in-service experience with candidate aircraft:

  - Accelerated ETOPS Approval
    - Reduced prior experience with the candidate aircraft

- ETOPS Operational Approval is granted when the required process elements are documented and implemented

Conclusion (2/2)

- When granted, ETOPS operational approval is reflected in the relevant operational documents
  - Airline Operator Certificate (AOC)
  - Flight Operations Procedures Manual
  - ETOPS Maintenance Procedures Manual
  - Training Manuals

- Once obtained, ETOPS Operational Approvals have to be maintained and are subject to continuous monitoring by the National Airworthiness Authorities

- ETOPS operation is widespread around the world, most of long haul commercial routes are ETOPS

- Today ETOPS is the most important part of long range twin engine aircraft operations:
  - 50% of A330 flight hours are ETOPS, 90% of A330 operators are approved for ETOPS
  - Forecast: 70%+ of A350 flight hours will be ETOPS

- Accelerated ETOPS is commonly used with new generation long range twins (A330 / A350 / B777 / B787)
  - Accelerated ETOPS operations have been successful worldwide

Thank you

AIRBUS

A

AA	Airworthiness Authorities
ABD	Airbus Directives
A/C	Aircraft
AC	Advisory Circular
ACJ	Advisory Circular Joint
ACMS	Aircraft Condition Monitoring System
A/P	Auto Pilot
A/THR	Auto Thrust
AD	Airworthiness Directive
ADD	Aircraft Deferred Defect
AFM	Aircraft Flight Manual
AIDS	Aircraft Integrated Data System (A320)
AMC	Acceptable Means of Compliance
AMJ	Advisory Material Joint
AML	Aircraft Maintenance Log
AMM	Aircraft Maintenance Manual
AOC	Air Operator Certificate (AOC Holder)
APU	Auxiliary Power Unit
ARM	Airworthiness Review Meeting
ARS	Airworthiness Review Sheet
ATA	Air Transport Association
ATC	Air Traffic Control

C

CAP	Civil Aviation Publication
CDL	Configuration Deviation List
CFP	Computerized Flight Plan
CHDO	Certificate Holding District Office
CMP	Configuration, Maintenance, Procedures (ETOPS CMP Document)

C

CMS	Centralized Maintenance System
COI	Carry Over Item
CP	Critical Point
CPC	Cabin Pressure Controller
CSM/G	Constant Speed Motor/ Generator
CTC	Conditions Techniques Complémentaires
CWC	Continuing Wind Component

D

DA	Decision Altitude
DGAC	Direction Générale de L'Aviation Civile) (French Civil Aviation Administration)
DH	Decision Height
DME	Distance Measuring Equipment
DPI	Differential Pressure Indicator
DT	Diversion Time

E

EASA	European Aviation Safety Agency
ECAM	Electronic Centralized Aircraft Monitoring
ECB	Electronic Control Box
ECM	Engine Condition Monitoring
EDTO	Extended Diversion Time Operations
EEP	ETOPS Entry Point
EGT	Exhaust Gas Temperature
EIS	Entry Into Service
EMPM	ETOPS Maintenance Procedure Manual
ENG	Engine
ER	Extended Range
EROPS	Extended Range OperationS
ETCL	ETOPS Technical Concession List

E

ETOPS	Extended Twin engine A/C OPerationS
ETOPS	Extended Operations (FAA definition)
ETP	EquiTime Point
EXP	ETOPS Exit Point

F

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FCOM	Flight Crew Operating Manual
FCU	Flight Control Unit
FCU	Fuel Control Unit
FH	Flight Hour
FL	Flight Level
FMGS	Flight Mngmt Guidance envelope syst.
FMS	Flight Management System
FORDRS	Flight Operational and Reliability Data Retrieval System

G

GAI	General Acceptable means of of compliance/Interpretative and explanatory material
GM	Guidance Material
GCU	Generator Control Unit

H

HIL	Hold Item List
HF	High Frequency
HP	Horse Power

I

IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
IDG	Integrated Drive Generator
IEM	Interpretative And Explanatory Material
IFP	In-Flight Performance
IFSD	In-Flight Shut Down
IL	Information Leaflet
ILS	Instrument Landing System
IPC	Illustrated Parts Catalog
ISA	International Standard Atmosphere

J

JAA	Joint Airworthiness Authority
JAR	Joint Airworthiness Requirements

L

LCL	Line Check List
LRC	Long Range Cruise
LROPS	Long Range OPerationS

M

MAN	Maintenance Advisory Notice
MCC	Maintenance Control Center
MCT	Maximum Continuous Thrust
MDA	Minimum Descent Altitude
MDH	Minimum Descent Height
MEL	Minimum Equipment List
MLS	Microwave Landing System
MME	Maintenance Management Exposition
MMEL	Master Minimum Equipment List
MMO	Maximum Operating Mach number
MNPS	Minimum Navigation Performance Specification
MOD	Modifications
MOE	Maintenance Organisation Exposition
MPD	Maintenance Planning Document

M

MRB	Maintenance Review Board
MRBR	Maintenance Review Board Report
MSA	Minimum Safe Altitude
MTBF	Mean Time Between Failure
MTBR	Mean Time Between Removal
MTBUR	Mean Time Between UnscheduledRemoval
MTOP	Maintenance Task Operating Plan
MTOW	Maximum TakeOff Weight

N

NAA	National Airworthiness Authorities
NAI	Nacelle Anti Ice
NAT	North Atlantic Tracks
NDB	Non Directional Beacon –Nav Aids
NPA	Notice of Proposed Amendment
NT	Note
NTO	No Technical Objections

O

OCC	Operational Control Center
OCM	Oil Consumption Monitoring
OPS	OPerationS
O.R	Operational Reliability

P

PCM	Program Certification Manager
PIREPS	Pilot Reports
P/N	Part Number
PM	Published Minima
PPIPC	Powerplant Illustrated Parts Catalog

Q

QTS	Quarts (in US: 0.946 L)

R

RFFS	Rescue and Fire Fighting Services
RH	Relative Humidity
RTB	Reliability Tracking Board
RVR	Runway Visual Range
RWC	Returning Wind Component Runway

S

SB	Service Bulletin
SSA	System Safety Assessment

T

TAS	True Air Speed
TAT	Total Air Temperature
TCDS	Type Certificate Data Sheet
TDD	Airbus Technical Design Directives
Techlog	Technical Log Book (AML)
TIR	Technical Incident Report
TFU	Technical Follow-Up sheet
T/O	Take-Off
TP	Technical Publication
TSM	Trouble Shooting Manual

V

VSB	Vendor Service Bulletin
VMO	Maximum operating Speed
VOR	Very Omnidirectional Range- Nav Aids
V/S	Vertical Speed

W

WAI	Wing Anti Ice

Z

ZFW	Fuel Weight