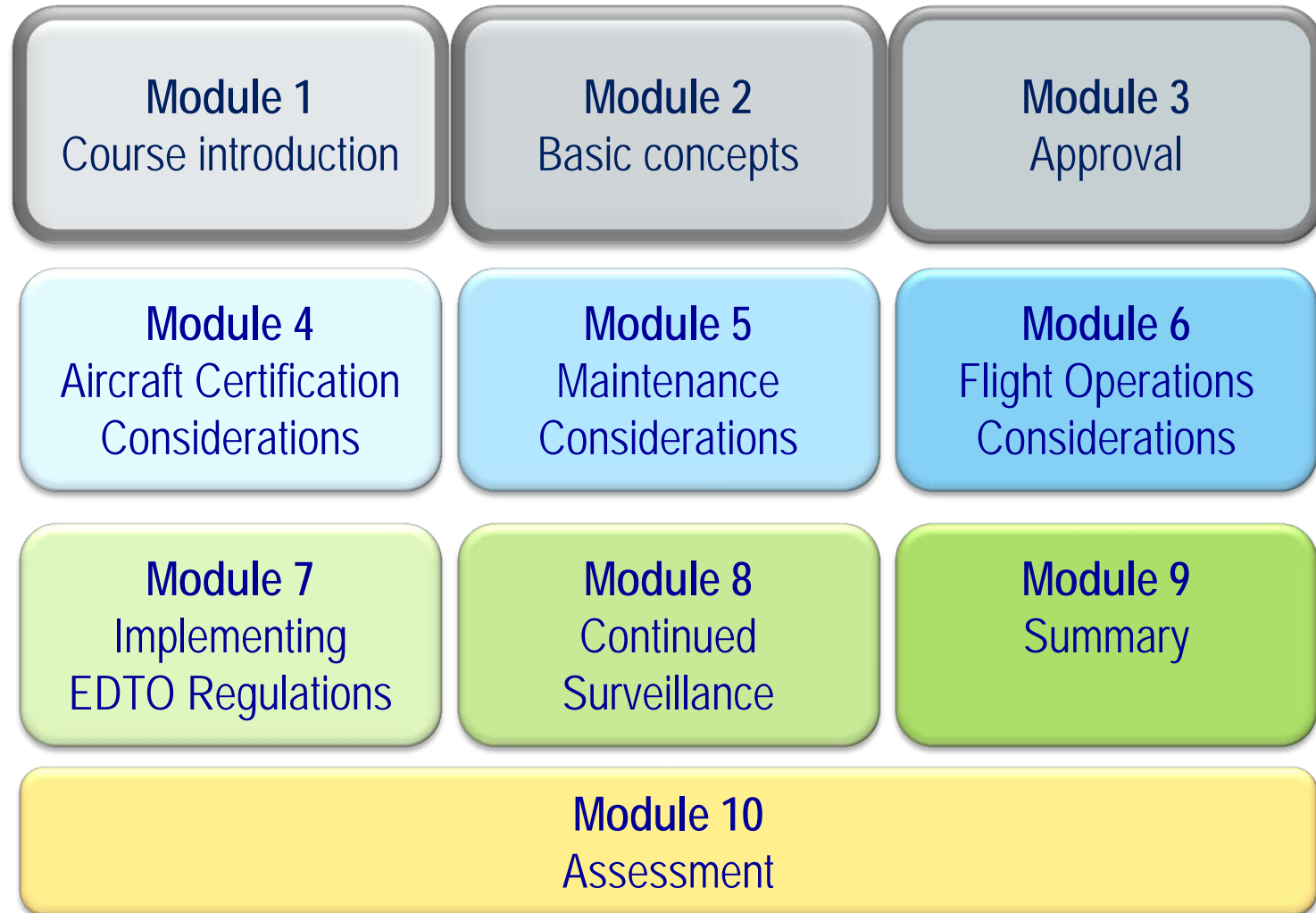


# EDTO Workshop

## Module N° 3 –Approval





- ❖ *At the end of this module, participants will be able to understand the EDTO approval process and related major requirements*

- ❖ Application for EDTO operational approval
- ❖ Required operator EDTO policy documentation and training programs
- ❖ Review EDTO capability of the aircraft and if applicable conduct validation of EDTO certification of the aircraft
- ❖ Evaluate operator EDTO program compliance (review gates)
- ❖ Conduct final EDTO validation
- ❖ Issue operational approval

## ❖ The 2 steps of the EDTO Approval Process

### ❖ EDTO Approval: Aircraft Type Design assessment

### ❖ EDTO operational approval of the Operator

- Required process elements
- Accelerated approval vs. In-service approval
- Approval status of current EDTO operators

### ❖ Conclusions

## ETOPS is a Two Step Process

- Manufacturer must perform the Type Design Assessment of the airframe/engine combination and get it approved / validated by the Type Design Authority.

*The Airplane is Ready*

- Airline operators must get Operational Approval from its National Authority to fly ETOPS

*The Airline is Ready*

**Preclude and Protect**

## ❖ The 2 steps of the EDTO Approval Process

### ❖ EDTO Approval: Aircraft Type Design assessment

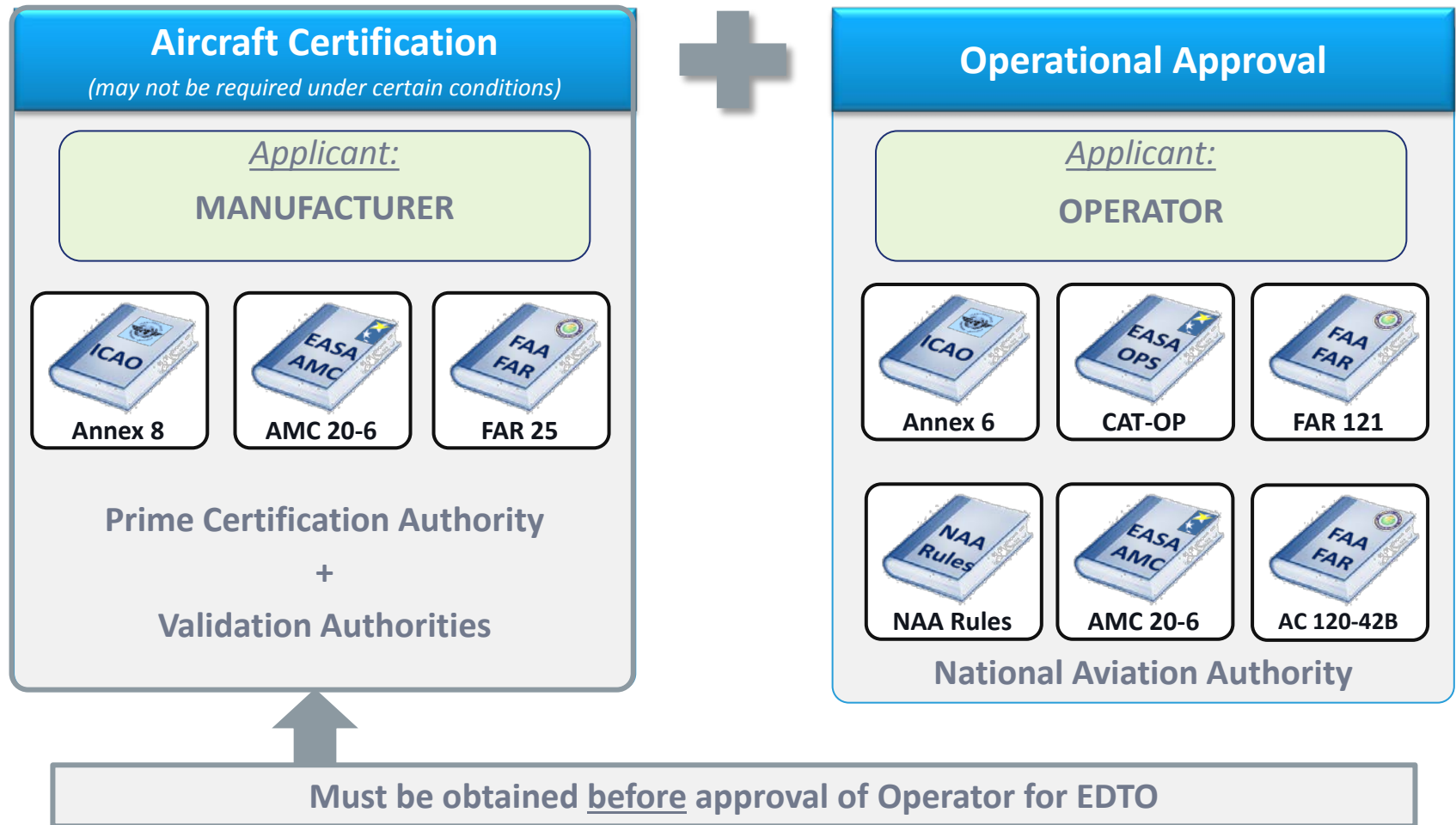
- ❖ EDTO operational approval of the Operator
  - Required process elements
  - Accelerated approval vs. In-service approval
  - Approval status of current EDTO operators

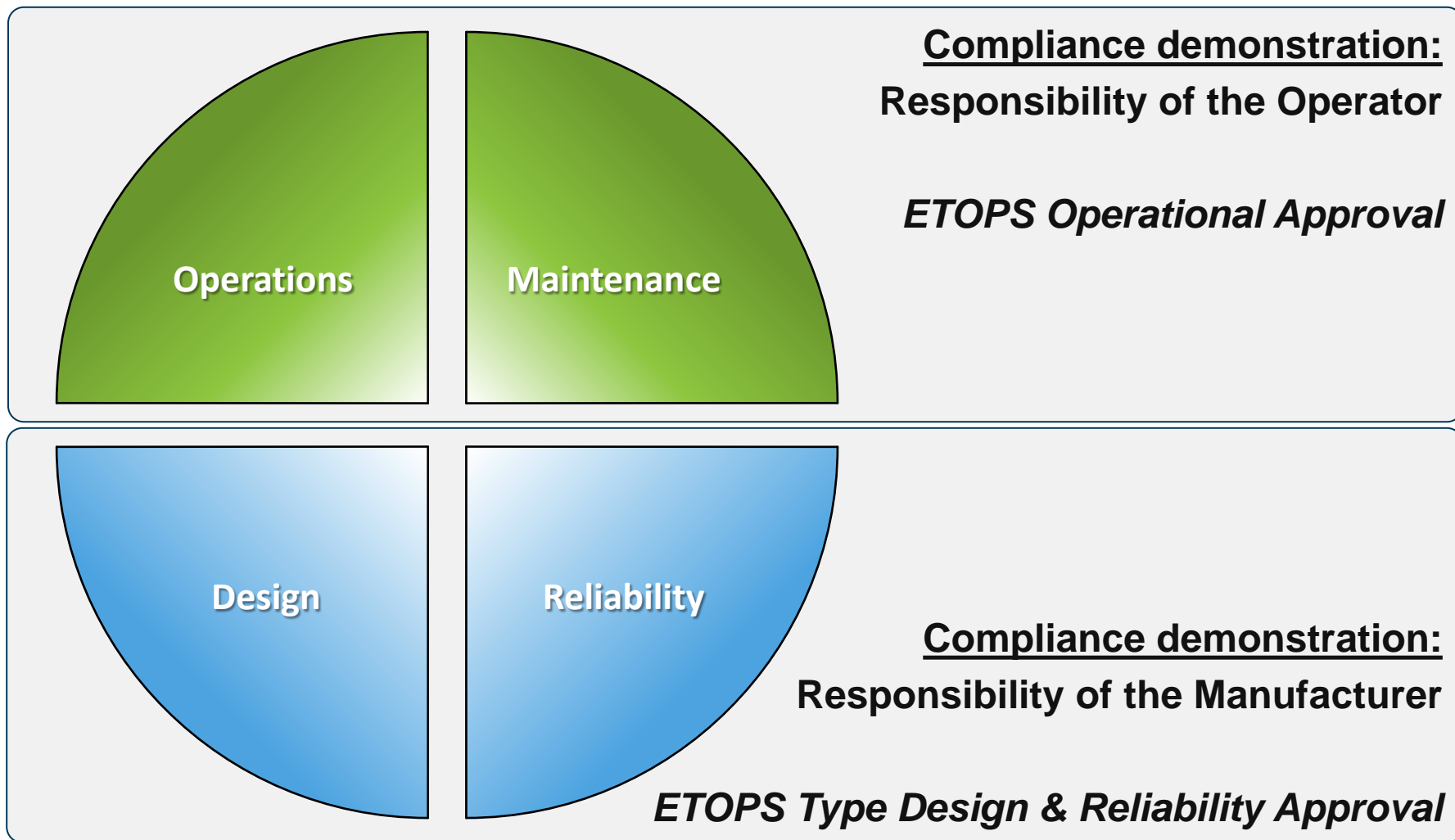
## ❖ Conclusions

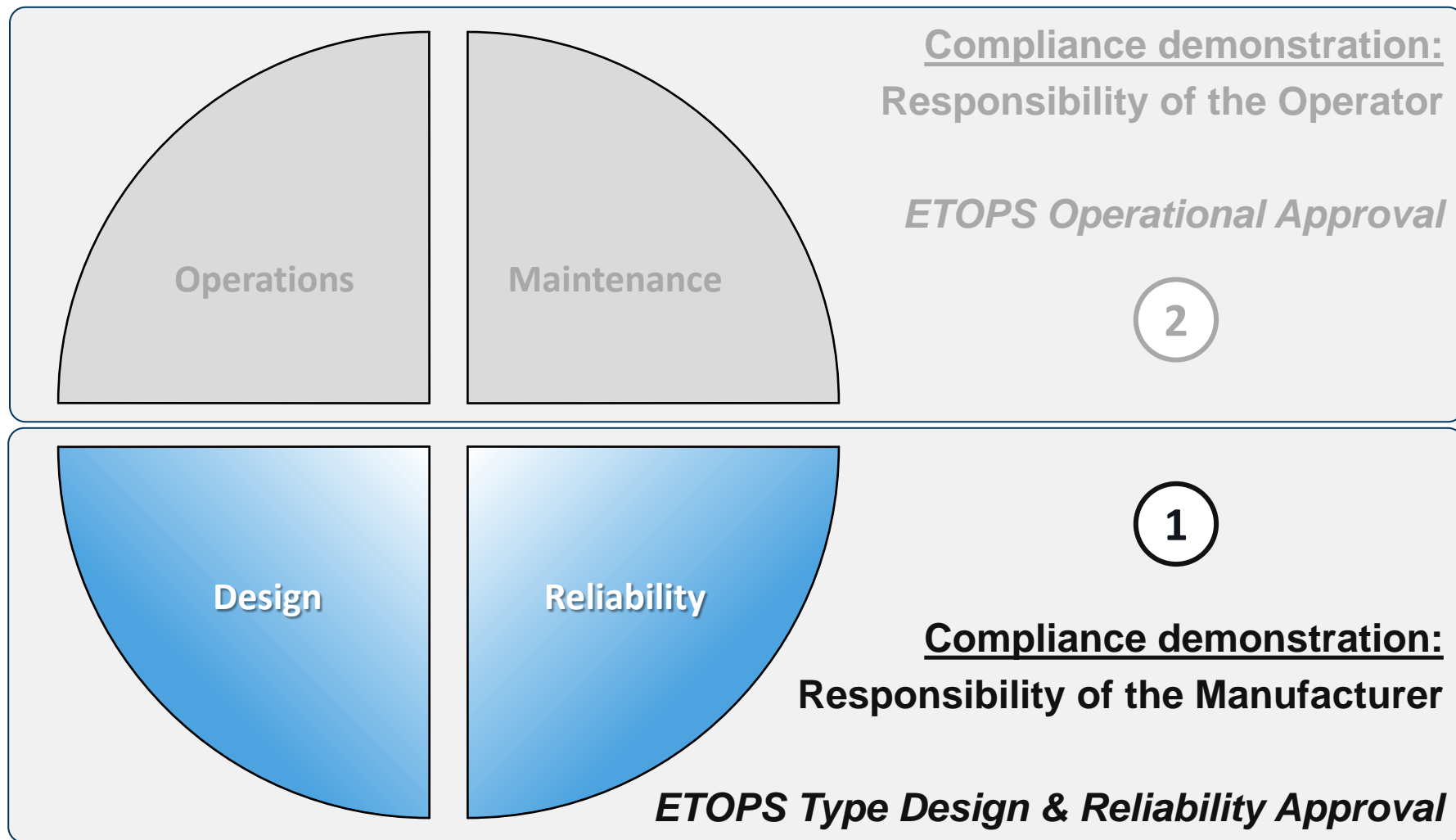
- ❖ As per ICAO decision (State Letter Ref. SP 59/4.1-11/8 of June 2011), the following applies to Airplanes with more than 2 engines engaged in EDTO operations :
  - ❖ *The capability of Time Limited System must be considered at dispatch for the purpose of identification and selection of en-route alternates (verification of weather)*
- ❖ *This may require an assessment of the aircraft design to identify / confirm the capability of relevant Time Limited System(s)*
  - ❖ *Usually, it is the capability of the Cargo Fire Suppression system which defines the applicable limitation for EDTO*
- ❖ *As per ICAO standards, there are no additional maintenance requirements nor additional certification requirements*
  - ❖ *Note: a given State may require an EDTO certification provided related design and reliability criteria have been defined*



To operate beyond threshold, two conditions must be met:



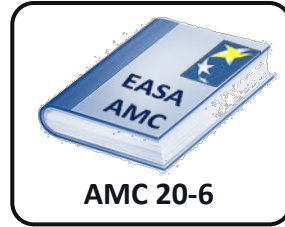




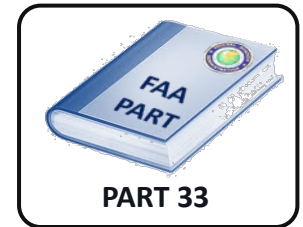
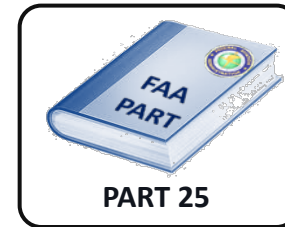
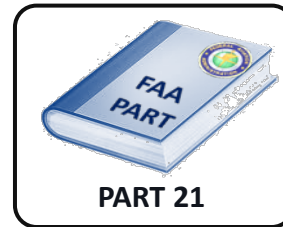
Examples of regulatory material for ETOPS Type Design & Reliability Approval :



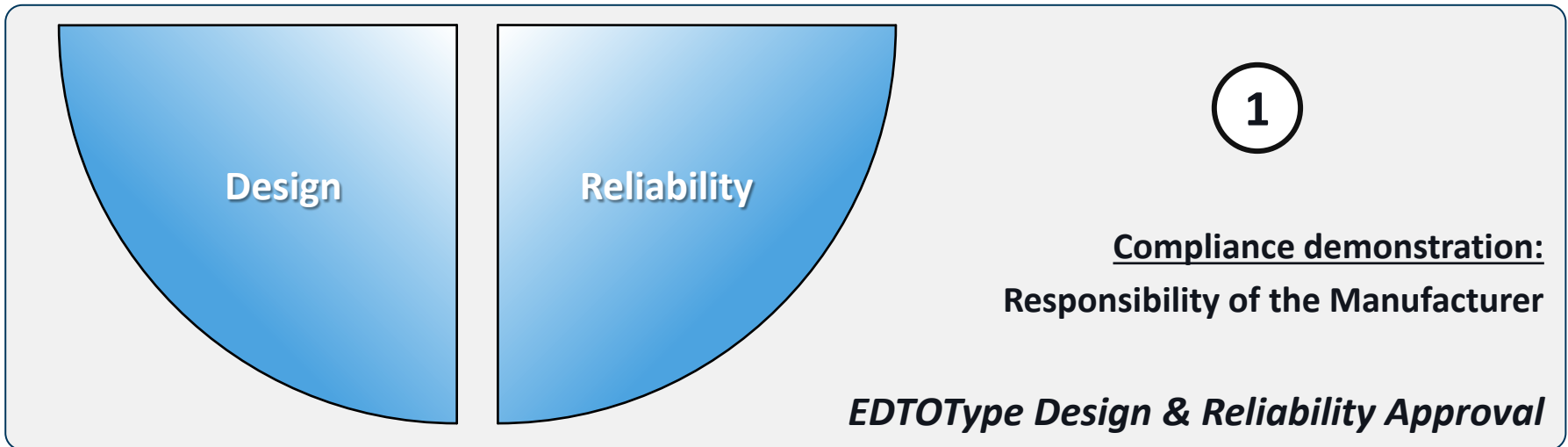
Additional  
guidance in  
A/W Manual 9760



Only the paragraphs  
related to ETOPS Type  
Design & Reliability  
assessment



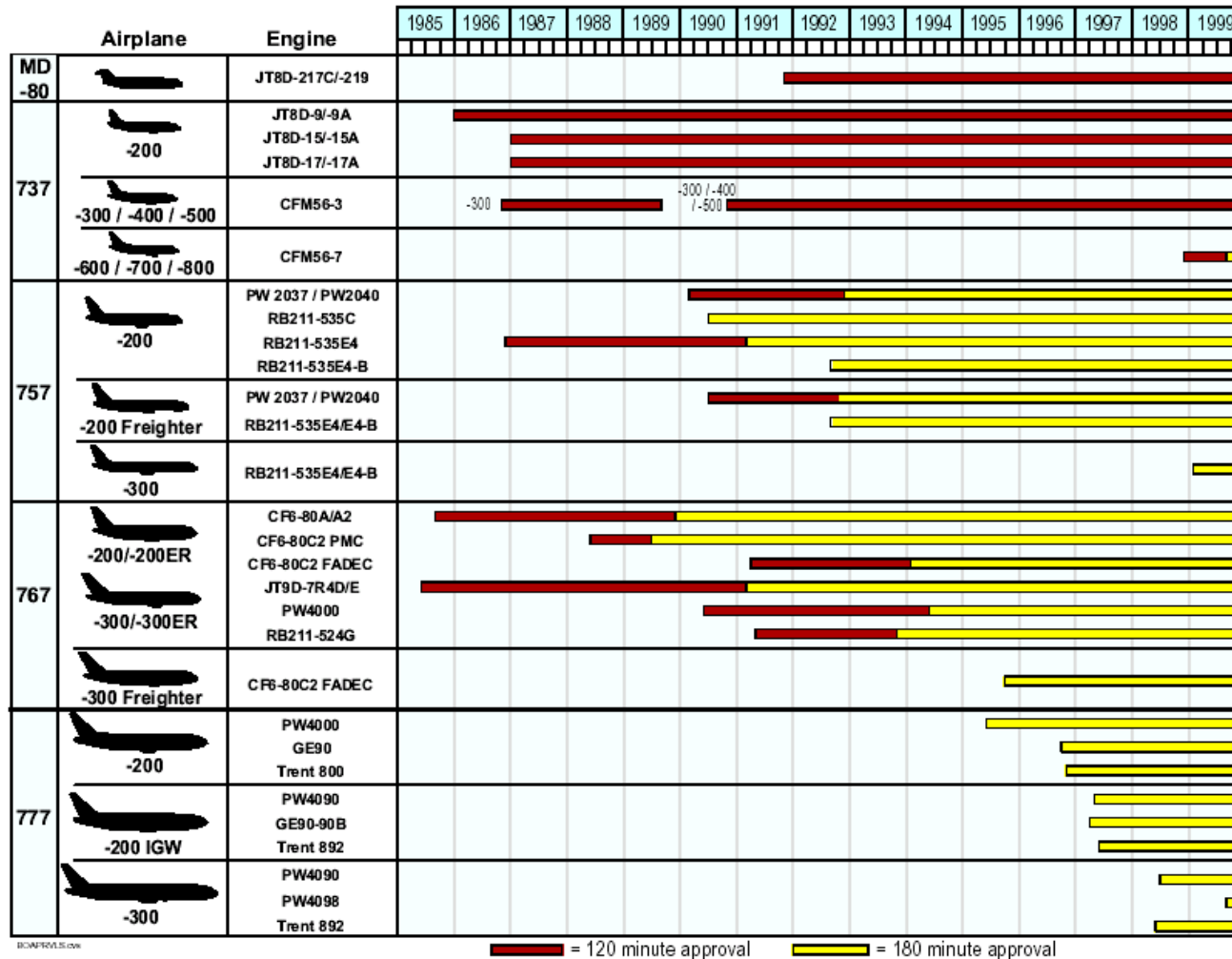
These FAA ETOPS Certification rules have  
superseded AC 120-42A in 2007  
Additional guidance in new AC for Part 25 still  
pending



## Airplane Models Approved Separately

- Each airframe/engine combination
- Each diversion time (120, 180, beyond 180...) for each combination
- Derivative airplanes require additional approval

## Approval History Through the End of 1999

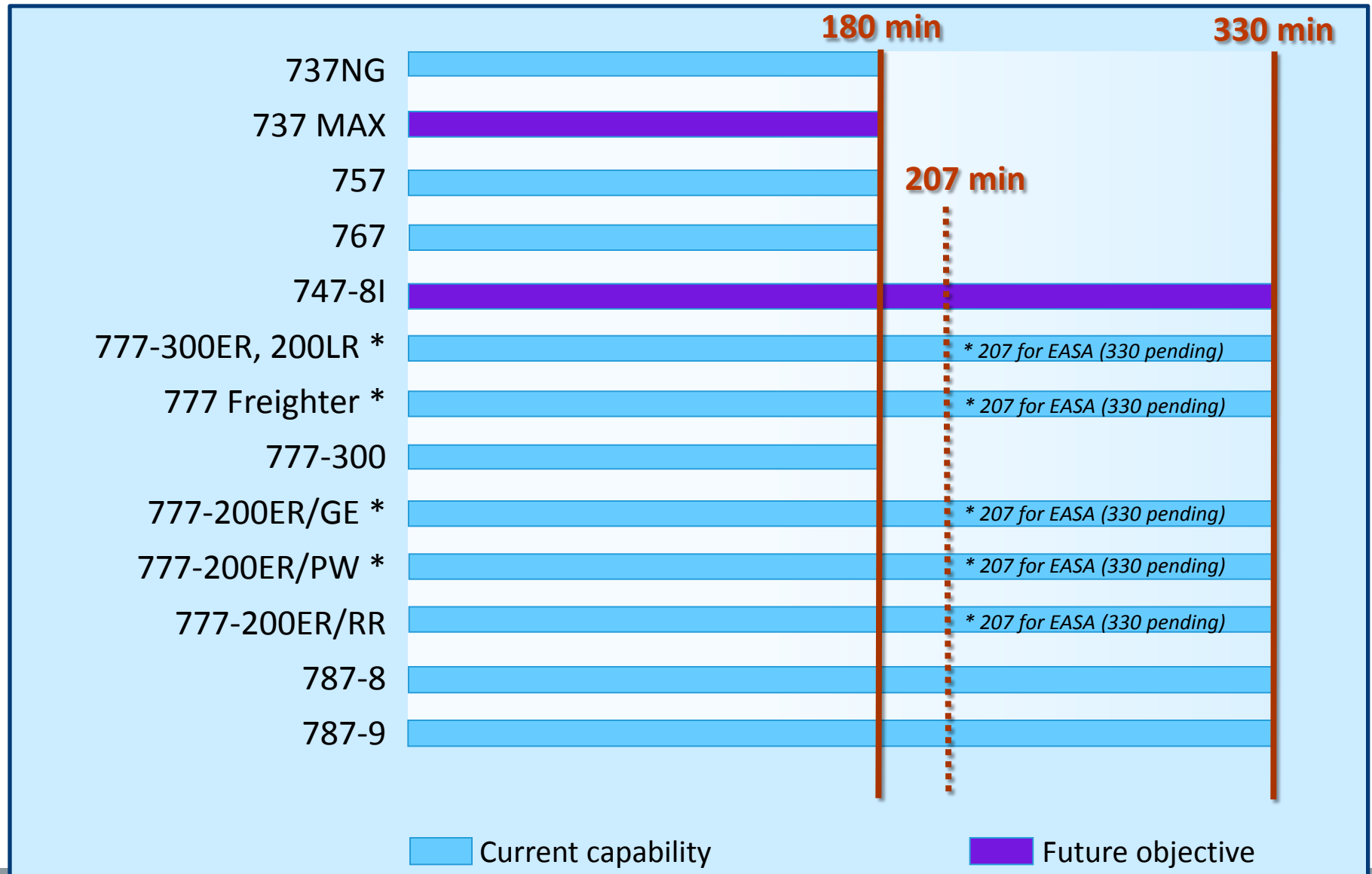




As of August 2014			FAA ETOPS Type Design Approvals				ETOPS Operators Counts					
Airplane		Engine Type	120-minutes		180-minutes		> 180-minutes		180 min	207 min	Beyond 180 min	Total at any level
717	-200	BR715	75-min May 2004						No 717 ETOPS operators			
737	-200	JT8D	December	1985								0
	-3/4/500	CFM56-3	September	1990								8
	-6/7/800	CFM56-7	December	1998	September	1999			15			48
	-900			April	2001			1	1			
	-900ER			April	2007			1	2			
757	-200	RB211-535C	July	1990	July	1990			0			0
		RB211-535E4	December	1986	July	1990			19			33
		RB211-535E4-B	September	1992	September	1992			4			4
		PW2037/PW2040	March	1990	April	1992			5			10
	-200 PF	RB211-535E4/E4-B	September	1992	September	1992			1			1
		PW2037/PW2040	July	1990	April	1992			0			1
	-300	RB211-535E4/E4-B	January	1999	January	1999			1			1
		PW2037/2040/2043		June	2002			1	1			
767	-200/300	JT9D-7R4D/E	May	1985	April	1990			3			5
		CF6-80A/A2	August	1985	April	1989			4			4
		CF6-80C2 PMC	May	1988	April	1989			11			11
		CF6-80C2 FADEC	March	1991	May	1993			22			31
		PW4000	April	1990	July	1993			19			29
		RB211-524H	March	1991	March	1993			1			2
	-300BCF	CF6-80C2 PMC			June	2008			1			1
		CF6-80C2 FADEC			October	2009			0			0
	-300F	CF6-80C2 FADEC			October	1995			6			7
		-400	CF6-80C2 FADEC			July	2000					2
777	-200	PW4000			May	1995			3	1		6
		GE90			October	1996			2	0		2
		Trent 800			October	1996			3	0		3
	-200ER	PW4000			March	1997	February	2013	9	4	0	10
		GE90			February	1997	November	2011	12	3	0	15
		Trent 800			April	1997			10	4		13
	-200LR	GE90-110B/115B			February	2006	November	2011	7	2	0	9
	F	GE90-110B/115B			February	2009	November	2011	9	1	0	12
	-300	PW4090			June	1998			1			2
		PW4098			April	2000			1			1
Trent 800				May	1998			3	4			
-300ER	GE90-115B			March	2004	November	2011	27	8	1	27	
787	-8	Trent 1000			August	2011	May	2014	6	1	0	6
		GEnx-1B			March	2012	May	2014	13	6	0	14
	-9	Trent 1000			June	2014	June	2014	1	0	0	1
		GEnx-1B			August	2014	August	2014				
											145	
											Boeing ETOPS Operators*	
* Many airlines are approved for ETOPS on two or more models, but are only counted once in the total.												

\* Many airlines are approved for ETOPS on two or more models, but are only counted once in the total.

# EDTO Design Capabilities and Objectives Summary





**Airbus has over 35 years of ETOPS experience:**

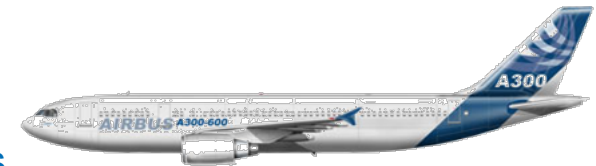
- 1976: 90 min (ICAO rule) operations with A300B2/B4
  - North Atlantic
  - Bay of Bengal
  - Indian Ocean
- 1985: 90 min 'ETOPS' operations
  - A310-200 -SIA
- 1986: 120 min ETOPS Type Design & Reliability approvals
  - A310-200 / A310-300 / A300-600
- 1990: 180 min ETOPS Type Design & Reliability approvals
  - A310-200 / A310-300 / A300-600 / A300-600R
  - First FADEC engine ETOPS approval (120 min - A310-324)



**A300 B2/B4**



**A310-200**



**A300-600**



**A310-300**

## Airbus has over 35 years of ETOPS experience (Cont'd):

- 1991: first Fly-By-Wire aircraft to be approved for ET
  - A320 (all models)
- 1994 : first accelerated 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 rule
  - A340 - Canadian Certification
- 1998 : A330-200 ETOPS approval
  - 180 min at E.I.S. (RR: February 99)
- 2009: first ETOPS>180 min certification
  - A330 (all pax models) - Max DT capability corresponds to ~240 min (ISA, still air)



A320



A330-300



A340



A330-200

As of 2014:

- Airbus ETOPS twins have accumulated over **13 million ETOPS FH**

ETOPS capabilities of Airbus aircraft (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.  
- All A330-200 and new -300 models have ETOPS approval for 180 min at E.I.S.  
- A330-200F (2 models) are approved for 180 min ETOPS



# A330 EDTO certification

## Certification status



	Model	Basic	Intermix	EASA	FAA
A330 <i>General Electric</i>	A330-201	CF6-80E1A2	-	>180	180
	A330-202	CF6-80E1A4 CF6-80E1A4/B	CF6-80E1A2	>180	180
	A330-203	CF6-80E1A3	-	>180	180
	A330-301	CF6-80E1A2	-	>180	180
	A330-302	CF6-80E1A4 CF6-80E1A4/B	-	>180	180
	A330-303	CF6-80E1A3	-	>180	180
A330 <i>Pratt &amp; Whitney</i>	A330-223	PW4168A (incl. -1D) PW4170	PW4168A (incl. -1D)	>180	180
	A330-223F	PW4170 PW4168A-1D	-	180	180
	A330-321	PW4164 PW4164-1D	-	>180	180
	A330-322	PW4168 PW4168-1D	-	>180	180
	A330-323	PW4168A (incl. -1D) PW4170	PW4168A (incl. -1D)	>180	180
A330 <i>Rolls Royce</i>	A330-243	Trent 772B-60 Trent 772C-60	-	>180	180
	A330-243F	Trent 772B-60 Trent 772C-60	-	180	180
	A330-341	Trent 768-60	-	>180	180
	A330-342	Trent 772-60	-	>180	180
	A330-343	Trent 772B-60 Trent 772C-60	Trent 772-60	>180	180

# A320 family EDTO certification

## A320 & A318 certification status



	Model	Basic	Intermix	EASA	FAA
A320 CFM	A320-111	CFM56-5A1	-	180	180
	A320-211	CFM56-5A1	-	180	180
	A320-212	CFM56-5A3	-	180	180
	A320-214	CFM56-5B4	-	180	180
	A320-215	CFM56-5B5	-	180	-
	A320-216	CFM56-5B6	-	180	-
A320 IAE	A320-231	V2500-A1	-	180	180
	A320-232	V2527-A5	-	180	180
	A320-233	V2527E-A5	-	180	180



	Model	Basic	Intermix	EASA	FAA
A318 CFM	A318-111	CFM56-5B8	-	180	-
	A318-112	CFM56-5B9	-	180	-
A318 PW	A318-121	PW6122A	-	180	-
	A318-122	PW6124A	-	180	-

# A320 family EDTO certification

## A319 & A321 certification status



	Model	Basic	Intermix	EASA	FAA
A319 CFM	A319-111	CFM56-5B5	-	180	180
	A319-112	CFM56-5B6	-	180	180
	A319-113	CFM56-5A4	-	180	180
	A319-114	CFM56-5A5	-	180	180
	A319-115	CFM56-5B7	-	180	180
A319 IAE	A319-131	V2522-A5	-	180	180
	A319-132	V2524-A5	-	180	180
	A319-133	V2527M-A5	-	180	180



	Model	Basic	Intermix	EASA	FAA
A321 CFM	A321-111	CFM56-5B1	-	180	180
	A321-112	CFM56-5B2	-	180	180
	A321-211	CFM56-5B3	-	180	180
	A321-212	CFM56-5B1	-	180	180
	A321-213	CFM56-5B2	-	180	180
A321 IAE	A321-131	V2530-A5	-	180	180
	A321-231	V2533-A5	-	180	180
	A321-232	V2530-A5	-	180	180



	Model	Basic	Intermix	EASA	FAA
A300-600 <i>Pratt &amp; Whitney</i>	A300B4-620	JT9D-7R4 H1	-	180	-
	A300C4-620	JT9D-7R4 H1	-	180	-
	A300B4-622	PW4158	-	180	-
	A300B4-622R	PW4158	-	180	-
	A300F4-622R	PW4158	-	180	180
A300-600 <i>General Electric</i>	A300B4-601	CF6-80C2A1	-	180	-
	A300B4-603	CF6-80C2A3	-	180	-
	A300B4-605R	CF6-80C2A5	-	180	180
		CF6-80C2A5F	-	180	-
	A300C4-605R/F	CF6-80C2A5	-	180	-
	A300F4-605R	CF6-80C2A5F	-	180	180
	A300F4-608ST	CF6-80C2A8	-	180	-



	Model	Basic	Intermix	EASA	FAA
A310 <i>Pratt &amp; Whitney</i>	A310-221	JT9D-7R4 D1	JT9D-7R4 E1 500 JT9D-7R4 E1 600	180	180
	A310-222	JT9D-7R4 E1 500	JT9D-7R4 D1 JT9D-7R4 E1 600	180	180
	A310-222/VAR100	JT9D-7R4 E1 500	JT9D-7R4 D1 JT9D-7R4 E1 600	180	-
	A310-322	JT9D-7R4 E1 500	JT9D-7R4 D1 JT9D-7R4 E1 600	180	-
	A310-324	PW4152	-	180	120
	A310-325	PW4156A	-	180	-
A310 <i>General Electric</i>	A310-203	CF6-80A3	-	180	-
	A310-203C	CF6-80A3	-	180	-
	A310-204/VAR100	CF6-80C2A2	-	180	-
	A310-304	CF6-80C2A4	-	180	-
	A310-308	CF6-80C2A8	CF6-80C2A4	180	-




- Airframe/engine combination designed to fail-safe (FAR Part 25) criteria
- Effect of operation with a failed engine
- Fuel management
- Independent sources of AC power
- Cargo fire protection system
- Equipment cooling
- Analysis of failure effects
- In-service experience (world fleet)
- Manufacturer validation flight test

***Model Specific Configuration,  
Maintenance and Procedures (CMP)  
Document defines additional  
requirements for ETOPS***

## Configuration, Maintenance and Procedures Document (CMP)

- *A document approved by the State of Design (e.g. FAA) that contains minimum configuration, operating, and maintenance requirements, hardware life-limits, and Master Minimum Equipment List (MMEL) constraints necessary for an airplane-engine combination to meet ETOPS type design approval requirements.*
- The CMP document is model specific and defines the minimum configuration standard for ETOPS



CAGE Code 81205

**Model 777 ETOPS Configuration, Maintenance, and Procedures**

DOCUMENT NUMBER: <b>D044W054</b>	RELEASE/REVISION: <b>REV X</b>	RELEASE/REVISION DATE: <b>October 5, 2012</b>
-------------------------------------	-----------------------------------	--

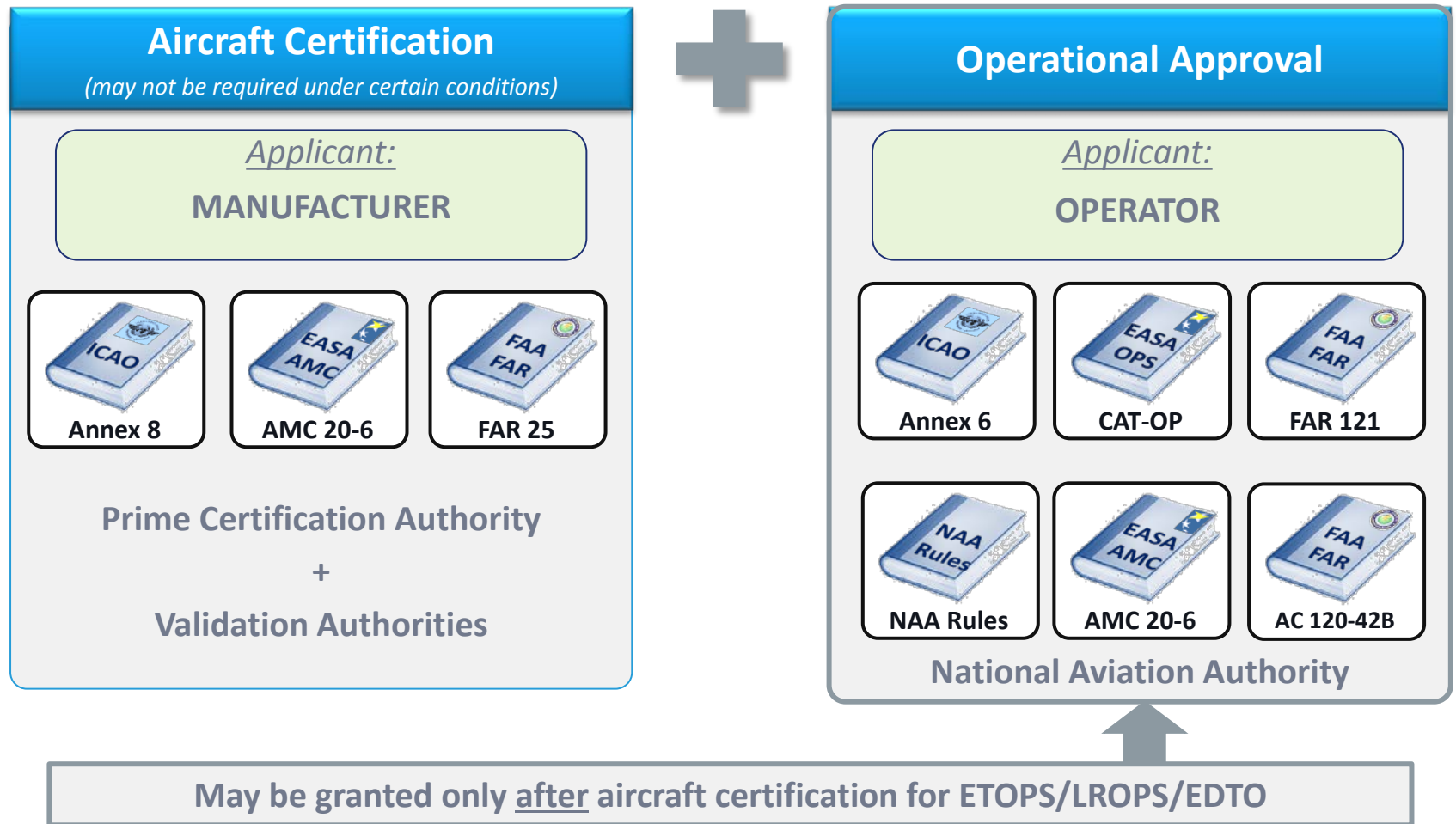
CONTENT OWNER:  
**Boeing Commercial Airplanes – ETOPS Programs (BH001)**

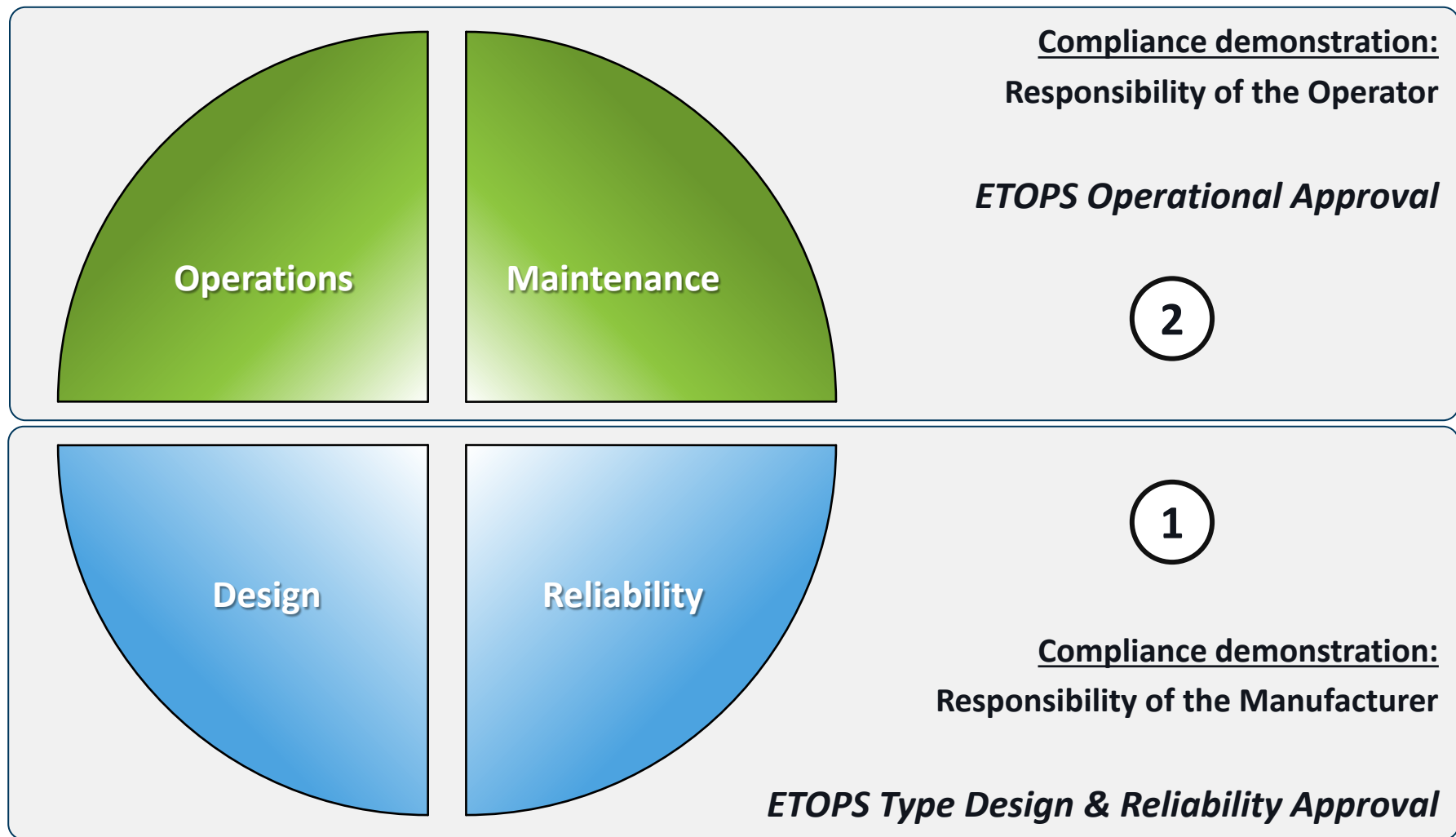
All revisions to this document must be approved by the content owner before release.

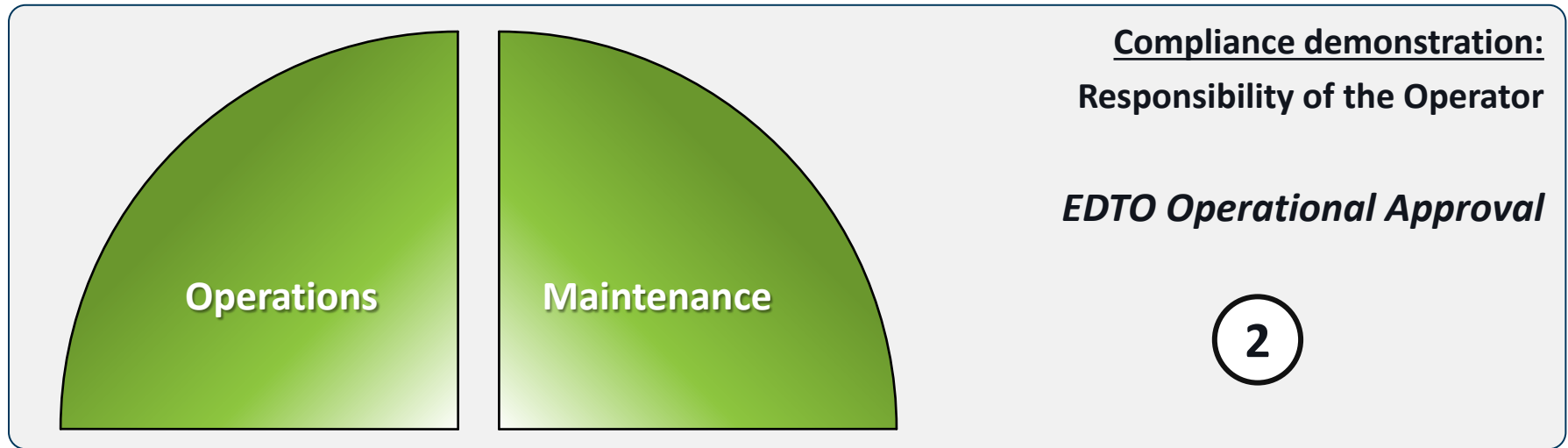
BOEING is a trademark of Boeing Management Company.

- ❖ The 2 steps of the EDTO Approval Process
- ❖ EDTO Approval: Aircraft Type Design assessment
- ❖ EDTO operational approval of the Operator
  - Required process elements
  - Accelerated approval vs. In-service approval
  - Approval status of current EDTO operators
- ❖ Conclusions

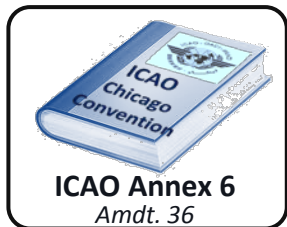
To operate beyond threshold, two conditions must be met:



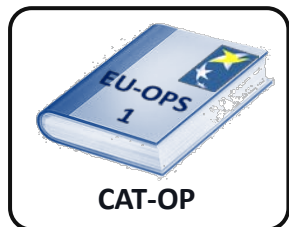




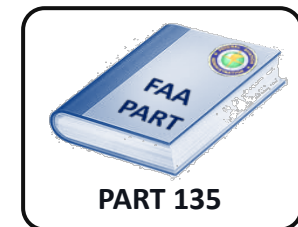
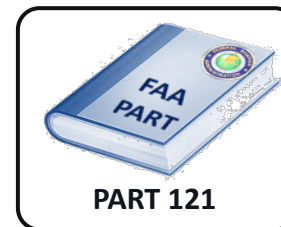
Examples of regulatory material for EDTO Operational approval



Additional guidance  
in  
Attachment D



Only the paragraphs  
related to ETOPS  
operational  
approval



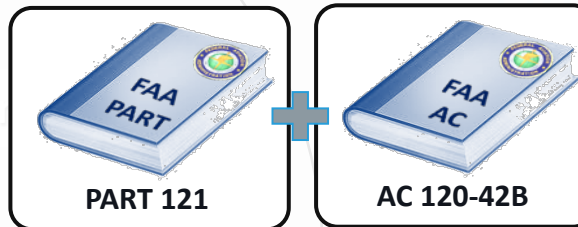
These FAA ETOPS Ops rules have superseded AC 120-42A in 2007  
Additional guidance is now provided in AC 120-42B

Applicability of regulatory material for EDTO Operational approval  
Issue valid at **time of operations**. For example:

## European ETOPS operators



## US ETOPS operators



liance demonstration:  
ibility of the Operator

Operational Approval

2

Applicability of regulatory material for EDTO Type Design & Reliability approval:

Issue valid at **time of application**. For example:



For A/C certified by  
EASA before 2011  
(e.g. A320, A330 180  
min ETOPS, etc...)



For A/C certified by  
FAA before 2007  
(e.g. A320, A310,  
B737, B767, etc...)

1

liance demonstration:  
y of the Manufacturer

Reliability Approval

In other words:

- The EDTO Operator must comply with **latest (current) issue** of applicable regulatory material for EDTO operational approval
- The EDTO aircraft must be in certified against the applicable regulatory material for EDTO Type Design & Reliability approval, **valid at time of initial certification**
- This is why the EDTO regulations usually specifies that EDTO/ETOPS Certification granted before issuance of new EDTO operational criteria remains valid:

- Refer to EASA AMC 20-6 Rev 2 Chapter 1 Section 1

ETOPS type design approvals and operational approvals obtained before the issue of this revision remain valid. Extension of existing ETOPS type design approvals or operational approvals beyond 180 min should be issued in accordance with this revision.

- Refer to FAA Part 121.162

(a) For a two-engine airplane, that is of the same model airplane-engine combination that received FAA approval for ETOPS up to 180 minutes

prior to February 15, 2007, the CMP document for that model airplane-engine combination in effect on February 14, 2007.

liance demonstration:  
ibility of the Operator

Operational Approval

2

1

liance demonstration:  
y of the Manufacturer

Reliability Approval

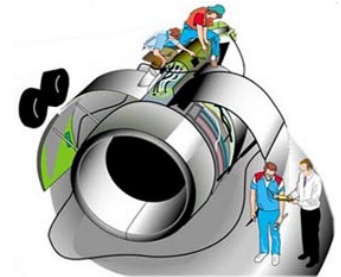
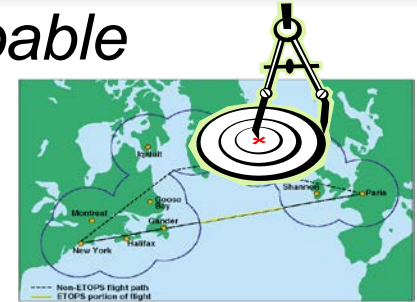


**Operational Approval:**

- The National Authority of the country of the operator in charge of operational matters is responsible for this approval
  - All documents subject to legal approval are signed & stamped by the National Authority
- The operator has to send an ETOPS application letter to its National AA, with the ETOPS objectives (Routes, desired diversion time, fleet, area of operations, planned date for the start of ETOPS flights, etc...)
- It is required to send this application letter at least 3 months before the intended date of start of ETOPS (6 months in case of accelerated ETOPS)

## *Approval Of The Airline To Operate An EDTO capable Airplane On EDTO Routes*

- ETOPS capable/configured airplane
- Application approval plan
- Operator ETOPS programs and documentation
  - Flight Operations
  - Maintenance (only for twins)
- Company training
- Operational validation flight
- Operations Specification



# EDTO processes and manuals

## Approval of the Airline

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

Aircraft operations compliance to EDTO/ETOPS CMP document \*  
(Continued process, includes parts-control)

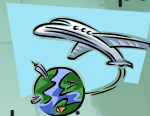
\* : these requirements do not apply to ops with airplanes with more than 2 engines

### Flight Operations Processes

EDTO Procedures Manual



EDTO Routes / selection of alternates  
passenger recovery



Flight planning  
(Airports, Time-limited systems, Fuel, MMEL ...)

Weather data



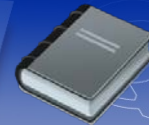
In-flight procedures

(communication, flight monitoring, diversion decision making)



### Maintenance Processes\*

EDTO Procedures Manual



EDTO Maintenance Program



Dual Maintenance Procedures

EDTO Tasks identification



EDTO Service Check



Oil Consumption Monitoring  
+ ECM + APU in-flight start



Reliability Monitoring & Occurrence Reporting



Training Program (covering all processes)



	(Conventional) In-Service EDTO Certification / Approval	Early / Accelerated EDTO Approval
<b>EDTO Approval of Aircraft</b>	<ul style="list-style-type: none"> <li>Up to 250 000 engine hours</li> </ul>	<ul style="list-style-type: none"> <li>Relevant Experience</li> <li>Specific tests</li> <li>Procedures validation</li> <li>...</li> </ul>
<b>EDTO Approval of Airline</b>	<ul style="list-style-type: none"> <li>One year experience for 120 mins</li> <li>One year at 120 mins for 180 mins</li> <li>2 years at 180 min for &gt;240 min</li> </ul>	<ul style="list-style-type: none"> <li>Compensating factors</li> <li>Transfer of experience</li> <li>...</li> </ul>

## Policy for Accelerated ETOPS Operational approval

- Created jointly by JAA/FAA
- Included in EASA AMC 20-6 Chapter 3 (section 5) and in FAA AC 120-42B
  - Similar criteria included in TP6327E, CAO82-0, etc...

## *Approval Methods Have Evolved Over Time*

### Various Methods

### Major differences

#### ■ In-service Method:

*(AC 120-42A)*



#### ■ Simulation Method:

*(Appendix 6 to AC 120-42A)*



#### ■ Early ETOPS:

*(777 Special Condition 25-ANM-84)*



#### ■ Accelerated ETOPS:

*(Appendix 7 to AC 120-42A, GAI-20)*

- Airline must have one to two years in-service experience on the specific airframe/engine combination
- 1000 cycle ETOPS operational and maintenance simulation must be completed using other airplane
- Airline must participate in the design, testing and Certification Review Gate Process of a new airplane type with the manufacturer
- Airlines must validate ETOPS processes prior to receiving ETOPS Operational Approval

***\*Accelerated ETOPS has become the Industry Standard***

### In-service EDTO approval :

- No special strategy is required
  - Action plan only needed in case of non compliance
- No compensating factors are required
- Judgment criteria straight forward: experience with candidate aircraft

### Accelerated EDTO approval:

- Defined strategy and open communication needed between airline & authority
- **Compensating factors** are basis of approval
- Facts and engineering judgment are used to determine “EDTO capability”

### Compensating factors:

- Previous experience with other airframe or engines of similar technology
- Previous ETOPS/EDTO experience (related experience)
- Specific EDTO training
- EDTO simulation
- ...

Required amount of compensating factors depends on:

- EDTO objectives (max DT, operational experience at start of EDTO, ...)
- Organization
  - Current versus EDTO
- Experience
  - ETOPS or EDTO / long range / route(s) / aircraft-engine technology
  - Experience with EDTO/ETOPS procedures is transferable from any real or simulated EDTO/ETOPS program
- ...

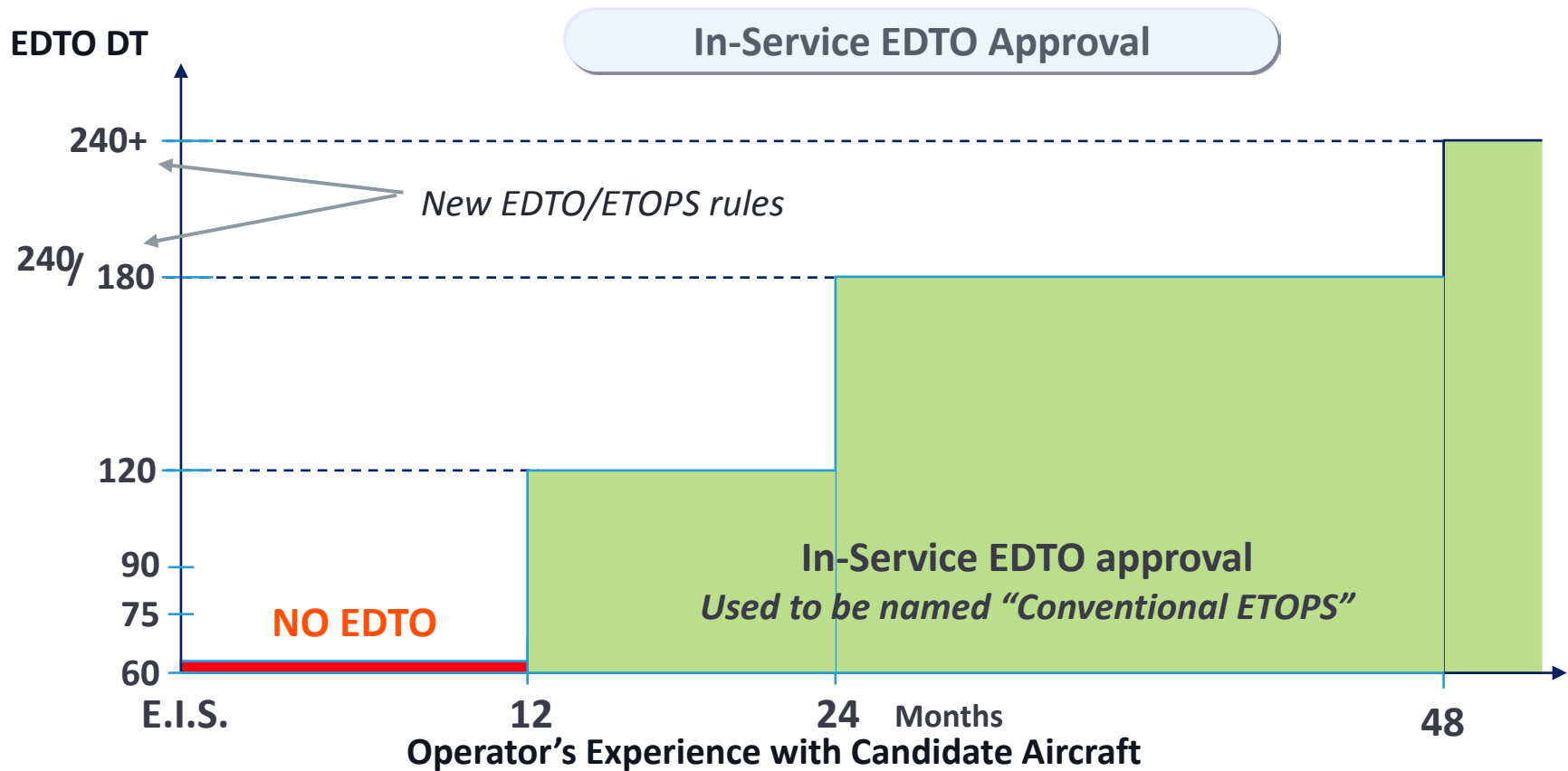
Time constraints and experience defines type of approval plan

In-service (Conventional) or Accelerated approval?

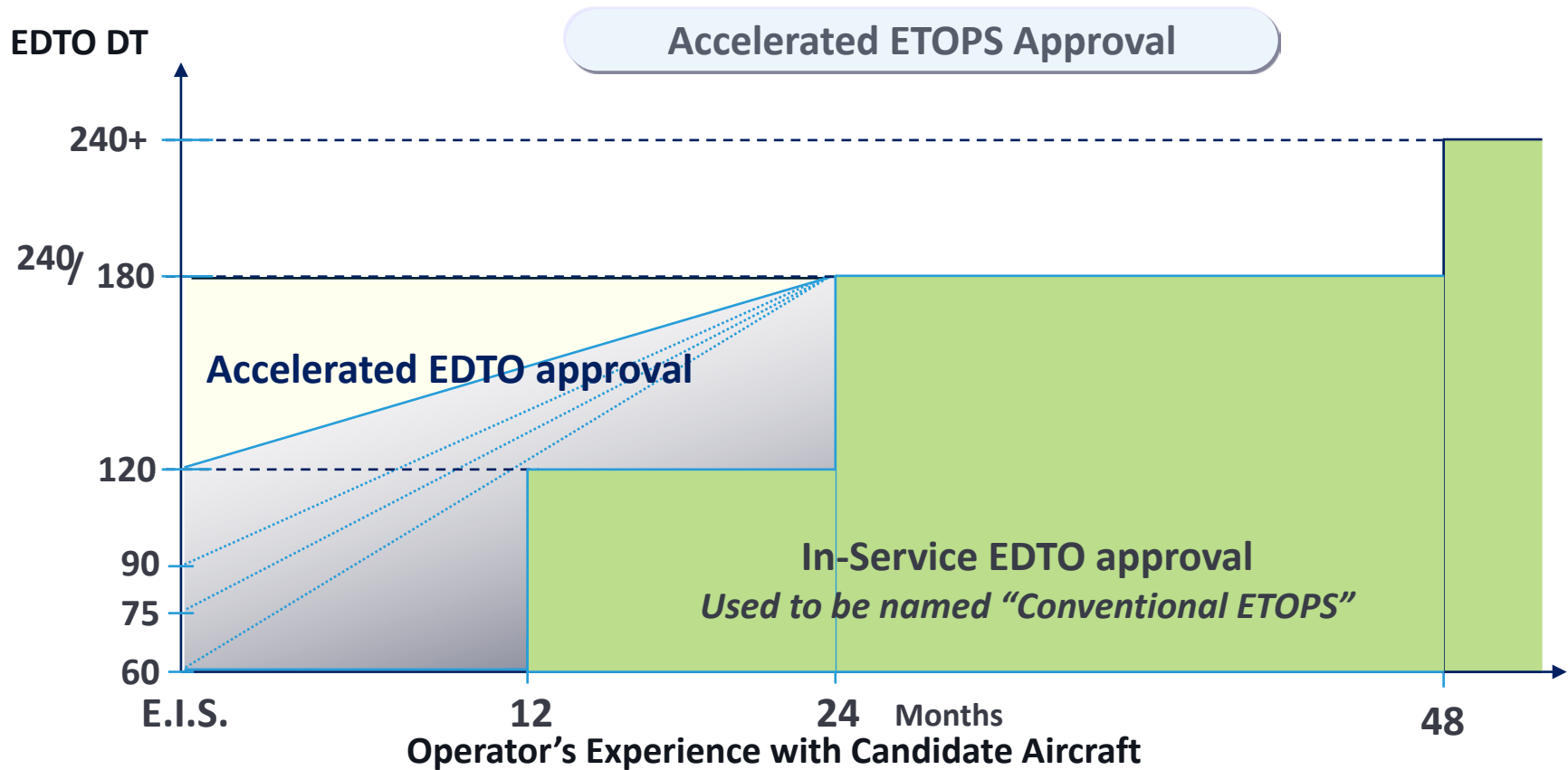
- In-service (Conventional) approval requires a specific amount of direct in-service experience with candidate aircraft, e.g.:
  - 1 year non EDTO operations for 120 min approval (twin engine aircraft)
  - 1 year 120 min for 180 min approval (twin engine aircraft)
- EDTO Approval with reduced prior experience with the candidate aircraft is called Accelerated EDTO
- The Approval Plan must be adapted to the contemplated degree of experience reduction



EASA AMC 20-6 (IL20 / AMJ 120-42) / FAA Part 121 appendix B & AC 120-42b  
AC 120-42a / CAP 513 / CTC 20 / TP6327...



EASA AMC 20-6 (IL20 / AMJ 120-42) / FAA Part 121 appendix B & AC 120-42b  
AC 120-42a / CAP 513 / CTC 20 / TP6327...



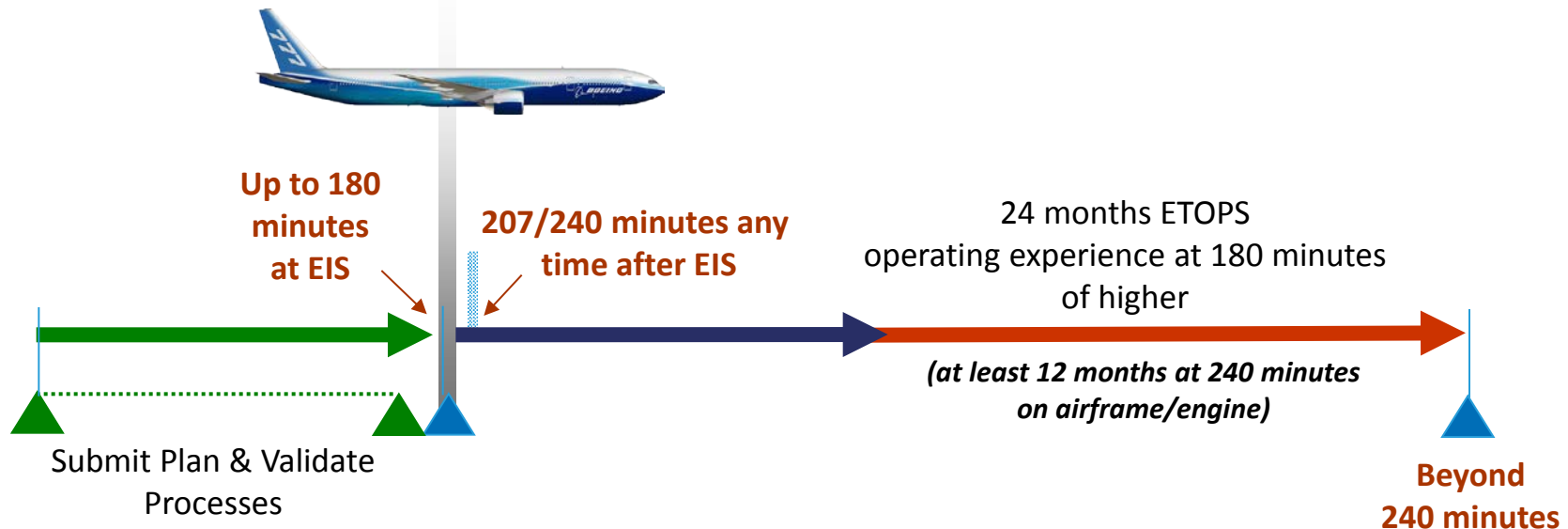


## *FAR 121 Appendix P and AC 120-42B*

### Accelerated Method (2 engine airplanes)\*

Initial application at least 6  
months before start of ETOPS

*Service Entry  
(EIS)*



\* EASA AMC 20-6 does not define specific service experience requirements for beyond 180 minute ETOPS

### A 'differences' exercise for experienced ETOPS operators

#### Regulatory Requirements



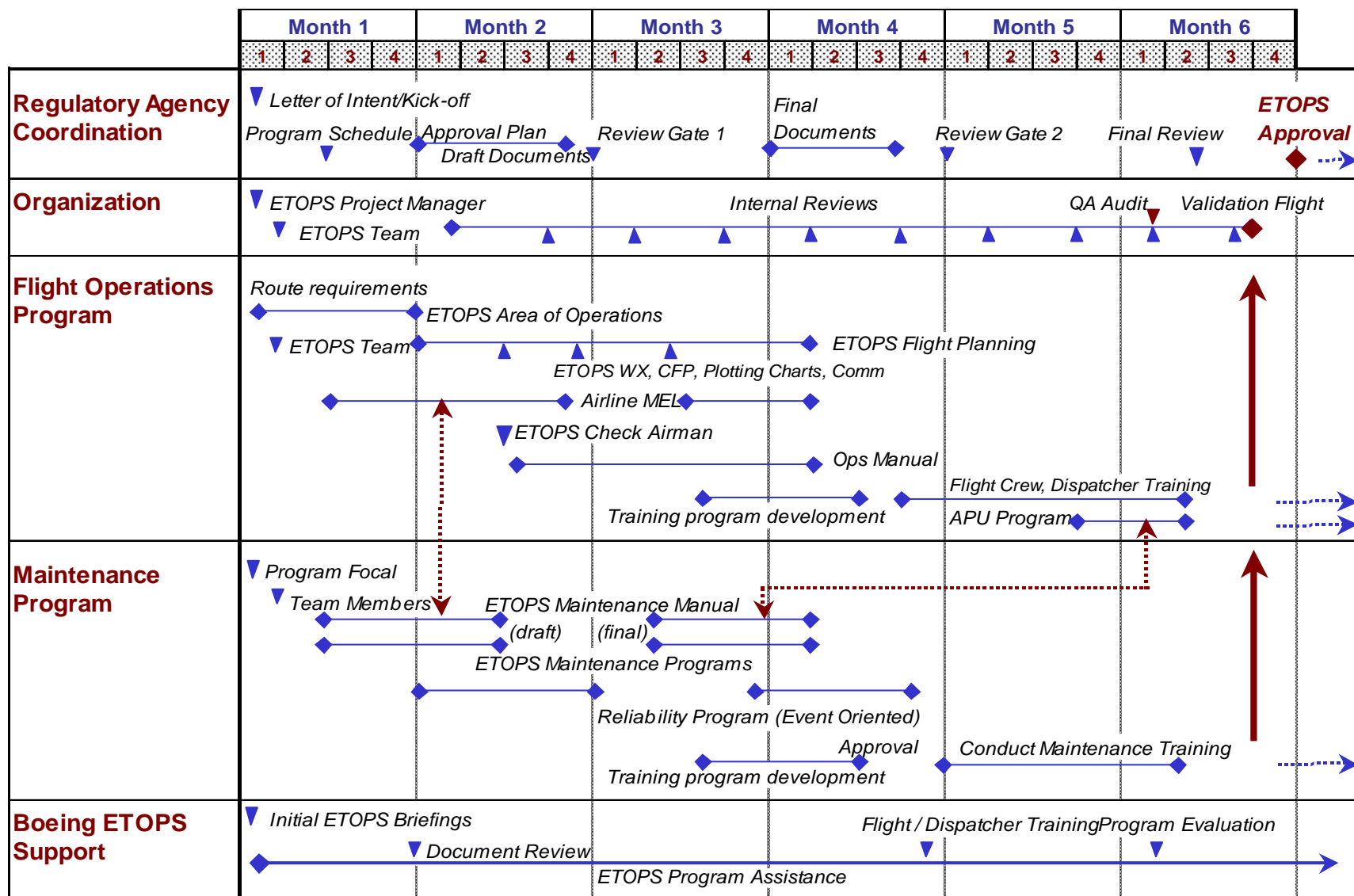
Flight Ops ➡	ETOPS Team Approval Plan*	⬅ Maintenance
<ul style="list-style-type: none"> <li>- Area of Operations <ul style="list-style-type: none"> <li>- Routes, Alternates, Speed, Time</li> <li>- Flight Planning, WX, Com</li> </ul> </li> <li>- MEL*, APU Start*</li> <li>- Check Airman, Training</li> </ul>	<div>↓ ↓</div> <hr/> <div>Review Gates</div> <div>↓ ↓</div>	<ul style="list-style-type: none"> <li>- ETOPS Significant Systems</li> <li>- Task Cards, Parts Control</li> <li>- Oil Consumption, ECM*</li> <li>- Problem Resolution*</li> <li>- Training</li> </ul>
<ul style="list-style-type: none"> <li>Demonstrated Processes ➡</li> <li>Operations Manual ➡</li> <li>*Validation Flight ➡</li> </ul>	<div>ETOPS Approval (ops spec)</div> <div>↓ ↓</div>	<ul style="list-style-type: none"> <li>⬅ Demonstrated Processes</li> <li>⬅ ETOPS Manual</li> <li>⬅ *Validation Flight</li> </ul>
<ul style="list-style-type: none"> <li>Dispatch Planning ➡</li> <li>Training ➡</li> </ul>	<div>Continuing Surveillance</div>	<ul style="list-style-type: none"> <li>⬅ ECM/IFSD Rate</li> <li>⬅ Reliability Reporting</li> </ul>

\* Involves coordination between departments



## Example EDTO Operational Approval Program

## 6 to 9 Month Minimum Timeline



*Just a few examples...*

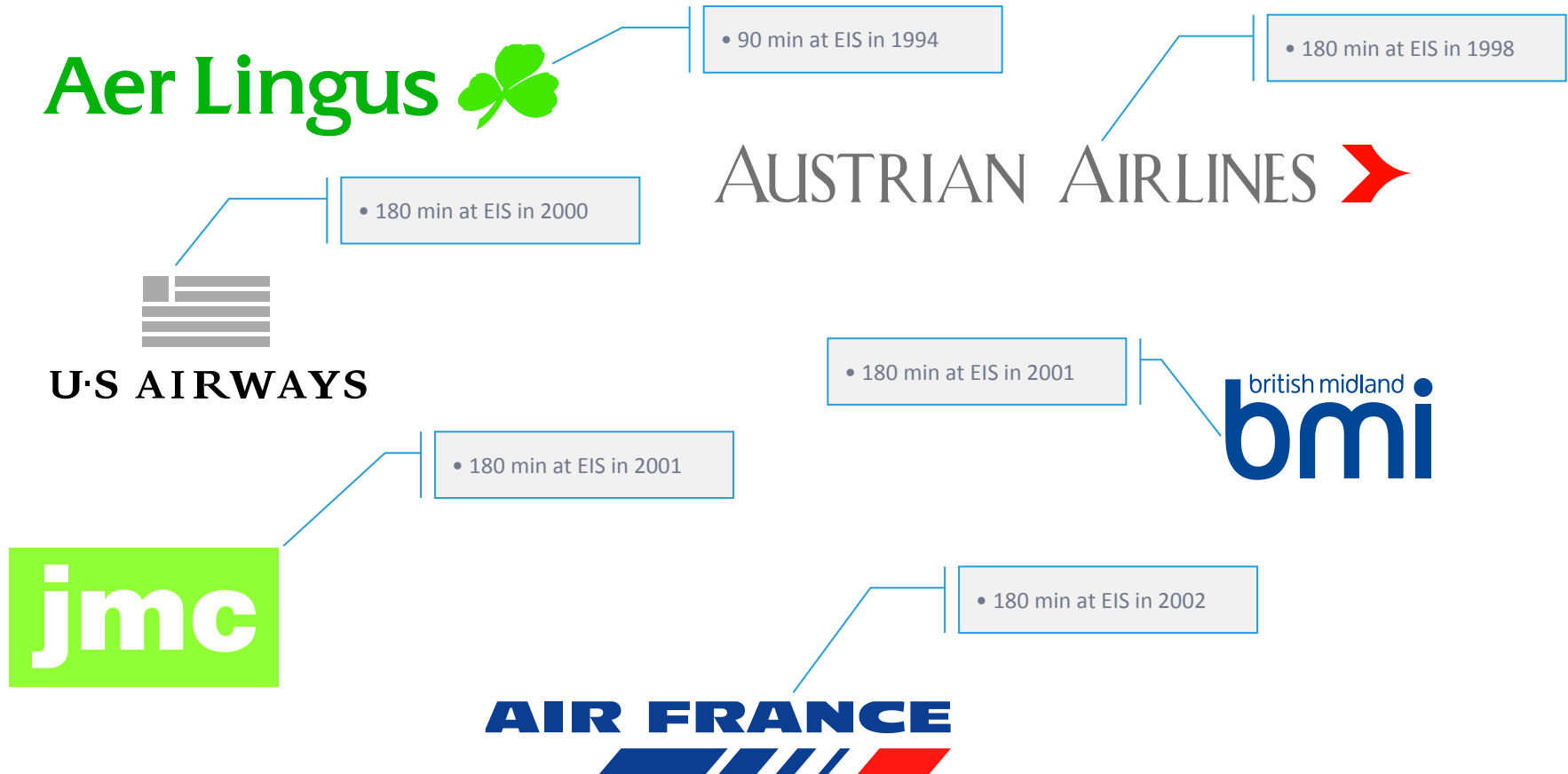
Airline	Airline Name	Model	Month of first delivery	ETOPS Approval Month	Months Experience	ETOPS Minutes
AUP**	Air Atlanta Europe	767-2/300	Nov-04	Nov-04	0	180
EAD	Emirates	777-300ER	Mar-05	Mar-05	0	180
				Sep-06		207
IDC**	Air India Express	737-800	Feb-05	Apr-05	0	120
MON	Monarch Airlines	767-300	Apr-05	Apr-05	0	138
				Apr-05		180
PIA	Pakistan International Airlines	777-2LR/3ER	Feb-06	Feb-06	0	120
AMX	Aero Mexico	777-200ER	Mar-06	Mar-06	0	180
FGS**	Flyglobespan	767-300	Apr-06	May-06	1	180
EYS	L'Avion	757	Nov-06	Dec-06	1	120
SIA	Singapore Airlines	777-300ER	Nov-06	Dec-06	0	207
FGS	Flyglobespan	757	Mar-07	Mar-07	0	180
ACN	Air Canada	777-300ER and 777-200LR	Apr-07	Apr-07	0	120
				Apr-07		138
				May-07		180
YFM	Zoom Airlines	757	Apr-07	Apr-07	0	120
JPL	Jet Airways	777-300ER	May-07	May-07	0	180
AIN	Air India	777-2LR/3ER	Jul-07	Jul-07	0	180
CAT	Cathay Pacific Airways	777-300ER	Sept-07	Sept-07	0	180
				Nov-07		207
QTR	Qatar Airways	777-300ER & 777-200LR	Nov-07	Dec-07	1	120
				Mar-08		138
DAL	Delta Airlines	777-200LR	Feb-08	Feb-08	0	207
JMA**	Thomas Cook Airlines	767	Mar-08	Apr-08	1	180
TPR	TAM Linhas Aereas	777-300ER	Aug-08	Aug-08	0	120
AFA	Air France	777F	Feb-09	Feb-09	0	180
EAD	Emirates	777F	Mar-09	Mar-09	0	180

**\*\* No prior ETOPS operational experience on any model**

# Approval status of Airbus EDTO operators

## A330 accelerated EDTO approvals

A few examples of accelerated ETOPS approvals (Over the first 10 years of A330 operations):



# Approval status of Airbus EDTO operators

## A330 accelerated EDTO approvals

### Summary of this review:

- Accelerated ETOPS approvals represents **85%** of all approvals
  - i.e. **6** accelerated approvals achieved for every **1** conventional ETOPS approval
- ETOPS approval granted at EIS: **65%** of all accelerated ETOPS approvals
- 180 min at EIS represents **35%** of all ETOPS approvals at EIS

### Above figures tend to increase

- Accelerated ETOPS is commonly used with new generation of ETOPS aircraft (A330, B777 & B787)
- Accelerated ETOPS operations have been successful worldwide
- Most ETOPS rules now include criteria for accelerated ETOPS





# Approval status of Airbus EDTO operators

## A330 EDTO operations

	Airline	Beginning of ETOPS	End of ETOPS	Current DT
1SW	Swissair	N/A	March 2002	180
AAR	Asiana Airlines	Feb 2006	N/A	120
AAW	Afriqiyah	2009	N/A	120
ACA	Air Canada	Jan 1999	N/A	180
ACI	Air Calédonie Int.	Jan 2003	N/A	180
AEA	Air Europa	Apr 2004	N/A	180
AFR	Air France	Dec 2001	N/A	180
AIH	Airtours International	N/A	October 2002	N/A
ALK	Srilankan Airlines	Jan 1999	N/A	120
AUA	Austrian Airlines	Aug1998	July 2007	180
AVA	Avianca	2008	N/A	180
BDY	Birdy Airlines	Aug 2002	October 2004	120
BEL	Brussels Airlines	Nov 2004	N/A	120
BMA	BMI	Jun 2001	March 2009	180
BTW	Metro Batavia	2010	N/A	75
CAL	China Airlines	No Data	N/A	180
CCA	Air China	Sep 2006	N/A	180
CHH	Hainan Airlines	Jun 2006	N/A	120
CMM	Canada 3000	May 1998	November 2001	180
CPA	Cathay Pacific	Feb 1995	N/A	180
CRL	Corsair	July 1997	N/A	180
CSN	China Southern	May 2005	N/A	120
DAH	Air Algérie	July 2007	N/A	120
DLH	Lufthansa	Jan 2003	N/A	180
DRD	Air Madrid	N/A	December 2006	N/A
EDW	Edelweiss	Aug 2001	N/A	>180
EEZ	Eurofly	Mar 2003	February 2010	180
EIN	Aer Lingus	May 1994	N/A	180
ETD	Etihad Airways	Jan 2005	N/A	120
EVA	Eva Air	Jan 2005	N/A	180
FVG	Delsey Airlines	July 2002	September 2002	120
FWI	Air Caraïbes	Dec 2003	N/A	180
GIA	Garuda	Nov 1998	N/A	120

	Airline	Beginning of ETOPS	End of ETOPS	Current DT
JMC	JMC	Nov2001	March 2003	180
JST	Jetstar Airways	Nov2006	N/A	180
KAL	Korean Airlines	Aug 2000	N/A	180
KLM	KLM	Sep 2005	N/A	180
LDI	Lauda Air Italy	June 2004	December 2005	180
LTU	LTU	Nov 1998	N/A	180
LVG	Livingston	Dec 2005	N/A	180
LXR	Air Luxor	Dec 2002	July 2006	180
MAS	Malaysia Airlines	March 1995	N/A	120
MAU	Air Mauritius	Dec 2007	N/A	180
MEA	Middle East Airlines	June 2003	N/A	120
MON	Monarch	April 1999	N/A	180
MPD	Air Comet	April 2007	December 2009	180
NVR	Novair	Jan 2000	2009	180
NWA/ DAL	NW Airlines / Delta Airlines	Dec 2003	N/A	180
OYC	Premiair	Nov 1999	May 2002	180
PAL	Philippine Airlines	Jan 2008	N/A	120
QFA	Qanats Airways	Jan 2003	N/A	180
QTR	Qatar Airways	Jan 2003	N/A	180
SAB	Sabena	Jan 1998	November 2001	135
SAS	Scandinavian Airlines	Jan 2002	N/A	180
SIA	Singapore Airlines	No Data	N/A	180
SSV	Skyservices Airlines	Apr 1997	2008	180
SWR	Swiss Int. Airlines	Nov1998	N/A	180
TAM	TAM	Jun 1999	N/A	180
TAP	TAP Portugal	Mar 2006	N/A	180
TCX	Thomas Cook Airlines UK	Apr 2003	N/A	180
THA	Thai Airways	July 1997	N/A	120
THY	Turkish Airlines	Dec 2005	N/A	120
TSC	Air Transat	May 1999	N/A	180
UAE	Emirates Airlines	Feb 2000	N/A	180
USA	US Airways	May 2000	N/A	180
VIR	Virgin Atlantic Airways	March 2010	N/A	180
VLE	CAI Second	Nov 2002	October 2004	138
	Thomas Cook Airlines			

*Through June 15, 2014*

Airline		Month of first delivery	First Revenue Departures	ETOPS Approval	Months Experience*	ETOPS Minutes
ACN	Air Canada	May-14	May-14	May-14	0	120
AIN	Air India	Sep-12	Sep-12	Sep-12	0	90
AMX	Aeromexico	Aug-13	Sep-13	Oct-13	1	180
ANA **	All Nippon Airways	Sep-11	Oct-11	Oct-11	0	180
BAB **	British Airways	Jun-13	Aug-13	Sep-13	1	180
BRI	Thomson Airways	Jun-13	Jun-13	Jun-13	0	180
ETH	Ethiopian Airlines	Aug-12	Aug-12	Aug-12	0	180
GUN	China Southern	May-13	Jun-13	Sep-13	3	120
				Dec-13		180
HNA	Hainan Airlines	Jul-13	Jul-13	Nov-13	4	180
HXL	Arkefly	Jun-14	Jun-14	Jun-14	0	180
JAL	Japan Airlines	Mar-12	Apr-12	Mar-12	0	180
JQS	Jetstar	Sep-13	Oct-13	Oct-13	1	180
KEN	Kenya Airways	Mar-14	Jun-14	Mar-14	0	180
LAN **	LAN Airlines	Aug-12	Oct-12	Aug-12	0	180
LOT **	LOT Polish Airlines	Nov-12	Dec-12	Dec-12	0	180
NLH **	Norwegian Long Haul	Jun-13	Jul-13	Jul-13	0	180
QTR	Qatar Airways	Oct-12	Nov-12	Nov-12	0	180
RBA **	Royal Brunei Airlines	Oct-13	Oct-13	Oct-13	0	180
TLB	Jetairfly	Dec-13	Dec-13	Dec-13	0	180
UAL	United Airlines	Sep-12	Nov-12	Dec-12	1	180

\* "Months Experience" is generally the time from entry into service (first revenue operations) to ETOPS operational approval.

\*\* Trent 1000 Operators

## *ANZ completes the world's first 777 240 minute ETOPS flight*

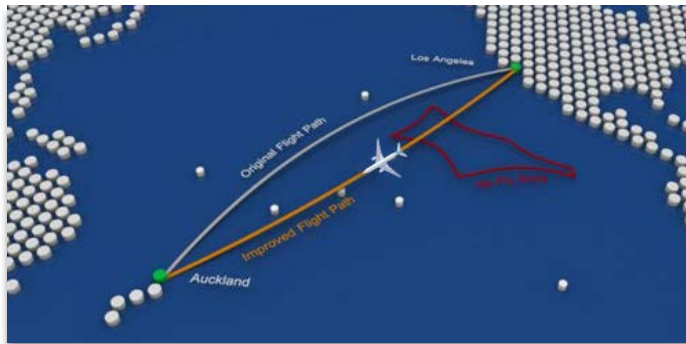


**November 30<sup>th</sup>, 2011**

- Boeing receives FAA type design approval for up to 330 minute ETOPS capability for most GE powered 777 models

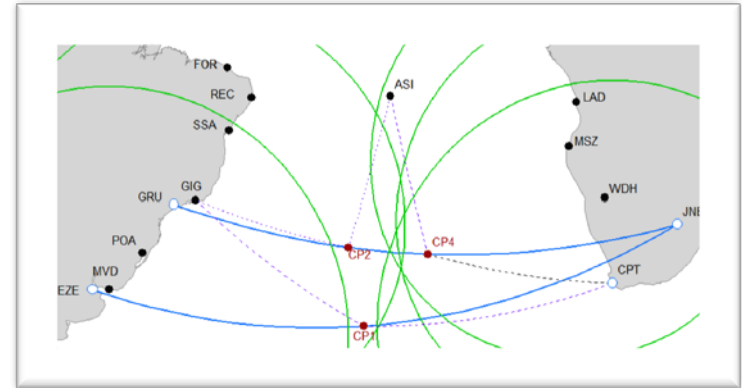
**December 3<sup>rd</sup>, 2011**

- Air New Zealand (ANZ) completes the first ever 777-300ER revenue flight with 240 minute ETOPS approval from LAX to AKL.

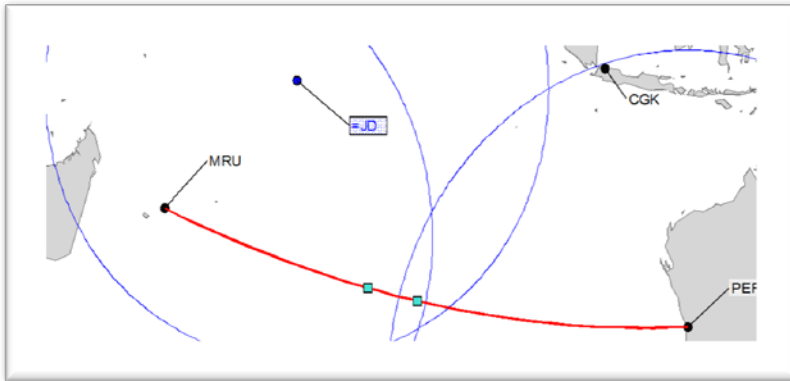


***Another ETOPS Frontier has been conquered!!***

*In 2014, two A330 operators have also received an ETOPS 240 min authorization*



South Atlantic area



South Pacific area



Air Mauritius

- ❖ The 2 steps of the EDTO Approval Process
- ❖ EDTO Approval: Aircraft Type Design assessment
- ❖ EDTO operational approval of the Operator
  - Required process elements
  - Accelerated approval vs. In-service approval
  - Approval status of current EDTO operators
- ❖ Conclusions

## ■ EDTO operations require

### 1. Assessment of airplane capability

- Twin engine aircraft: an EDTO certification is required
- Airplane with more than 2 engines: EDTO certification is NOT required, however the capability of relevant Time Limited System(s) must be identified.

### 2. Operational approval of the Operator

- Approval requires demonstration of compliance against applicable criteria for maintenance (operations with 2 engine aircraft only) and Flight Ops
- The approved maximum diversion time is granted by the State authority and must be within applicable capabilities of concerned airplane

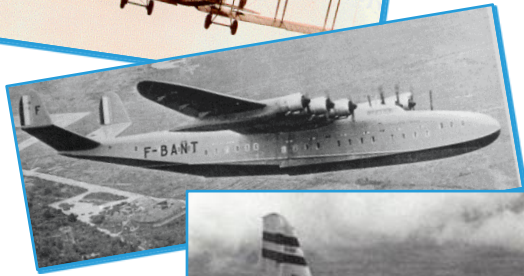
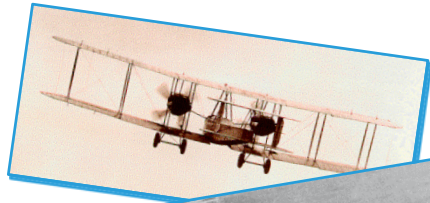
- **EDTO operations of twins are nowadays extensively performed worldwide**
  - ETOPS/EDTO capability is considered in the basic design of modern long range twins such as the B787 and A350.
  - Huge majority of operators of long range twins are flying ETOPS/EDTO, e.g. 90% of A330 and B777 operators have an ETOPS operational approval
  
- **EDTO criteria for airplanes with more than 2 engines are based on industry “Best Practices”**
  - Threshold is typically set at 180 min DT
  - No additional certification requirements
  - No additional maintenance requirements

# Module 3

## EDTO Approval Process







Thank You !!