# 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 2 – Review of Flight Ops & Maintenance requirements & Practices

Eric FORTUNATO, AIRBUS ETOPS & EDTO Expert



#### Technical awareness on ETOPS / EDTO



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# Speaker

**EDTO / ETOPS Technical awareness** 

#### **Airbus ETOPS / EDTO Team contacts**

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#### Technical awareness on ETOPS / EDTO

Session Times		Tonica							
Start	Finish	Topics:							
Day 1 (Tuesday 21 <sup>st</sup> - pm)									
13:30	16:30	Module 1 ETOPS / EDTO Background Information (Definitions, History, Main Concepts, etc.)  Module 2 ETOPS / EDTO Capability of the Aircraft  Module 3 Overview of Operational Approval and ETOPS / EDTO Maintenance & Flight Ops processes							
	Day 2 (Wednesday 22 <sup>nd</sup> )								
09:00	12:00	<b>Module 4</b> Review of ETOPS / EDTO Flight Ops Requirements & Practices							
13:30	16:30	Module 5 Review of ETOPS / EDTO Maintenance Requirements & Practices  Module 6  Wrap up and Conclusions							

# Schedule

EDTO / ETOPS
Technical awareness

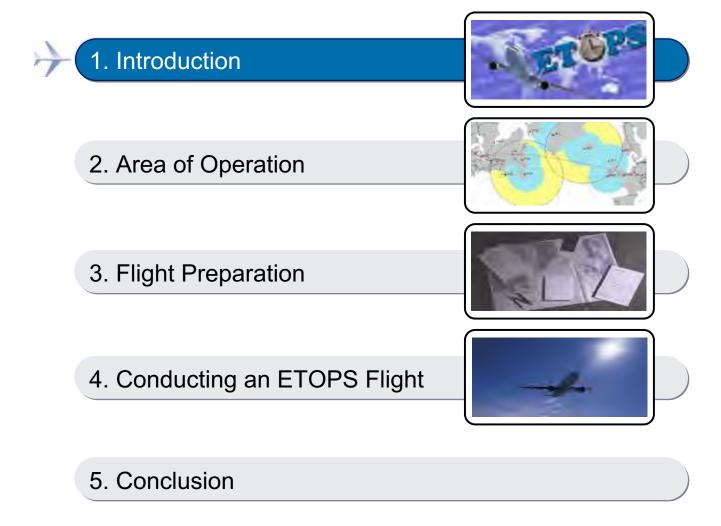
#### Content of this Technical awareness on ETOPS / EDTO:



- ETOPS Capability of the Aircraft
- Overview of Operational Approval ETOPS Maintenance & Flight Ops processes
- Review of ETOPS Flight Ops Requirements & Practices
- Review of ETOPS Maintenance Requirements & Practices
- 6 Conclusions

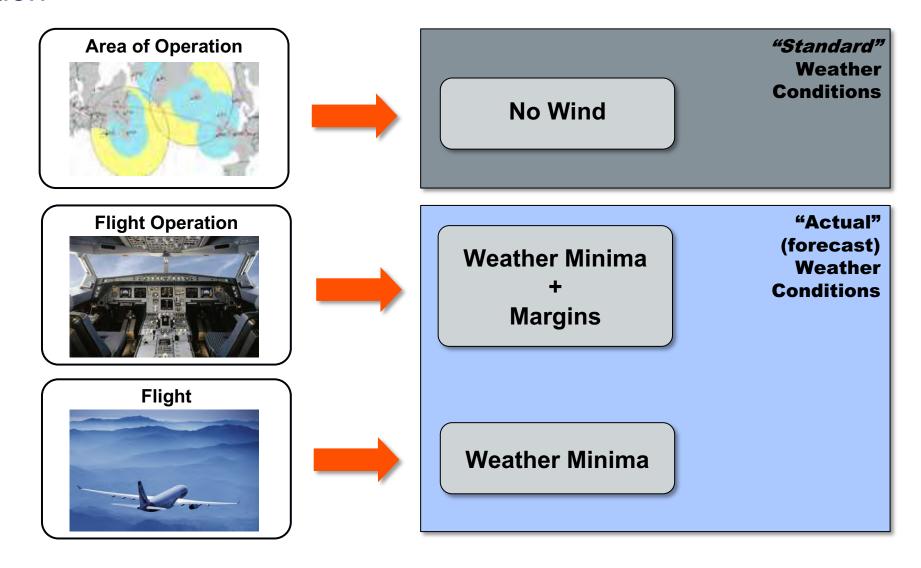


# Agenda





#### Introduction

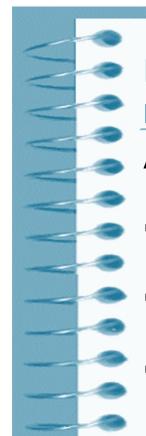




#### Agenda

1. Introduction 2. Area of Operation 2.1 Is ETOPS required? 2.2 ETOPS Diversion time & Area of operations 5. Conclusion





#### **ETOPS**

Extended range with Twin engine aircraft OPerationS

Applies to operations conducted with a twin engine aircraft over a route that

- Contains a point further than a threshold, 60 min flying time,
- At the approved one engine inoperative speed,
- From an adequate airport.

In Still air and ISA conditions



# Area of operations - Is ETOPS required? Adequate airport

### **Adequate Airport**

To be qualified as adequate, an airport must:

- Be available,
- Be compatible with the performance requirements for the expected landing weight,
- Have ground operational services such as ATS, lighting, communications, weather reporting,
- Have at least one let-down navigation aid (ILS, VOR, NDB, Radar),
- Have emergency services: Minimum Rescue and Fire Fighting Category: 4.

Note: Other criteria may be taken into account (e.g. Hotel Capacity, Maintenance facilities,...)



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In Still air and ISA conditions

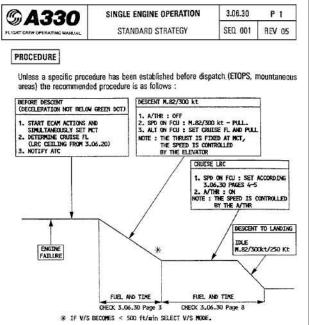


### Area of operations - Is ETOPS required? Diversion speed

# **Diversion Speed**

The approved one engine inoperative speed

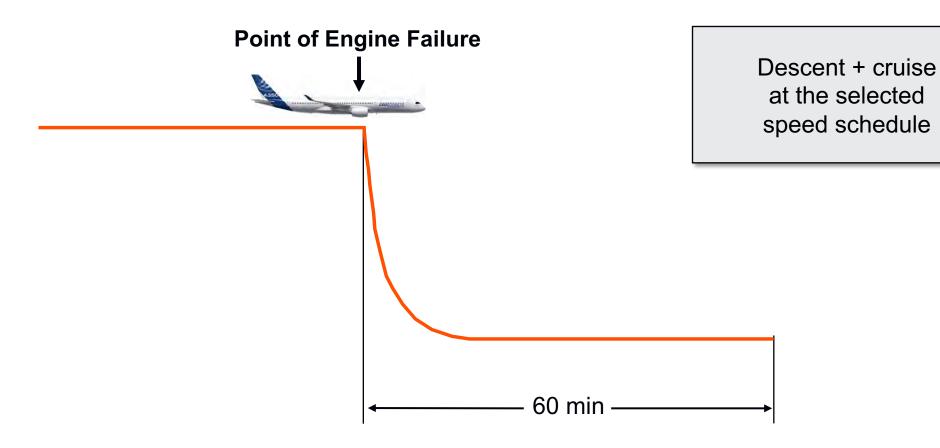
- A diversion speed could be an IAS, TAS or even a MACH number.
- As TAS is not constant, the diversion speed is established at a given MACH/IAS combination, according to the aircraft capability:



DESCENT M.82/300 kt 1. A/THR : OFF 2. SPD ON FCU: M.82/300 kt - PULL. 3. ALT ON FCU: SET CRUISE FL AND PULL NOTE: THE THRUST IS FIXED AT MCT, THE SPEED IS CONTROLLED BY THE ELEVATOR

Diversion speed

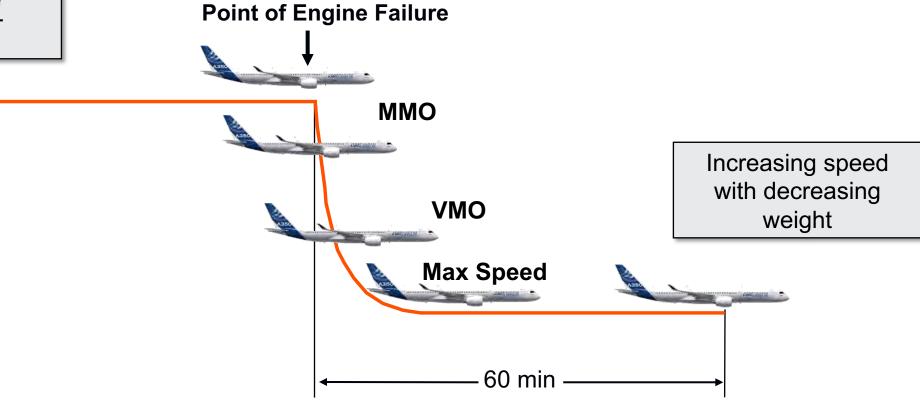
How to determine ETOPS Threshold and diversion distance?





Diversion speed

Descent profile example: Speed schedule Max speed/MCT



So which speed to follow?



#### Diversion speed

# Choice of a Strategy

#### **Diversion Speed**

- The "Strategy" is defined in terms of a diversion speed
- The chosen speed (which will be approved) will have an impact on the diversion distance and the fuel consumption.

- → Use speed schedule: Max Speed / MCT
- → Reduce if dictated by fuel considerations



# Area of operations - Is ETOPS required? Diversion speed

Descent profile example: Speed schedule **Point of Engine Failure** Max speed/MCT MMO Increasing speed with decreasing weight **VMO** Max Speed 60 min



#### 60 min calculation

		MAX	XIMUN DIVERS	ION DISTAN	CE			
CDEED	A/C	EL FOR	DIVERSION TIME (MIN)					
SPEED SCHEDULE	WEIGHT AT CRITICAL POINT (KG)	DIVERSION	60	90	120	180	240	
	150000	190	440	655	870	1301		
	160000	190	438	652	866	1295	1700	
MCT/330KT	170000	180	439	651	864	1289	1700	
	180000	180	437	650	862	1288	1700/	
	190000	180	435	646	857	1281	1700#	
-	200000	170	435	644	854	1273	1692	
12	210000	1/0	433	642	852	1271	1690	
2	220000	170	430	637	845	1263	1683	
alize with	a high we	eiaht to be	conserva	ative.	843	1257	1670	
		ction if ne			850	1269	1688	
	160000	210	430	640	849	1268	1687	
MCT/310KT	170000	210	427	635	843	1261	1680	
200	180000	200	427	634	840	1253	1666	
	190000	200	424	630	836	1249	1661	



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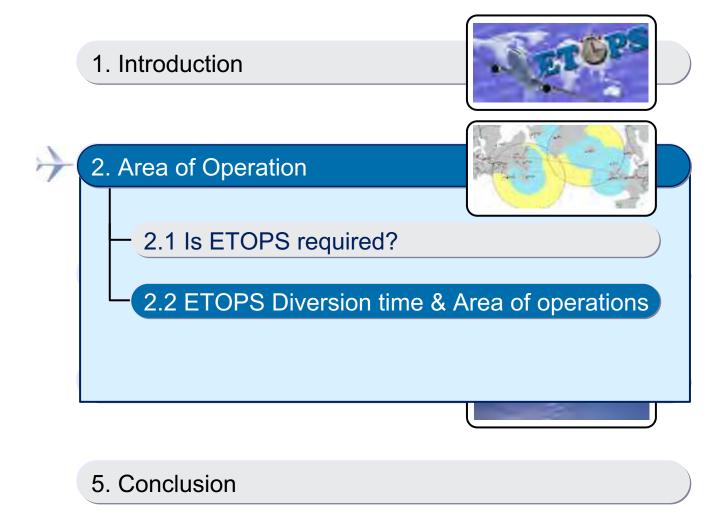
From an adequate airport.



In Still air and ISA conditions

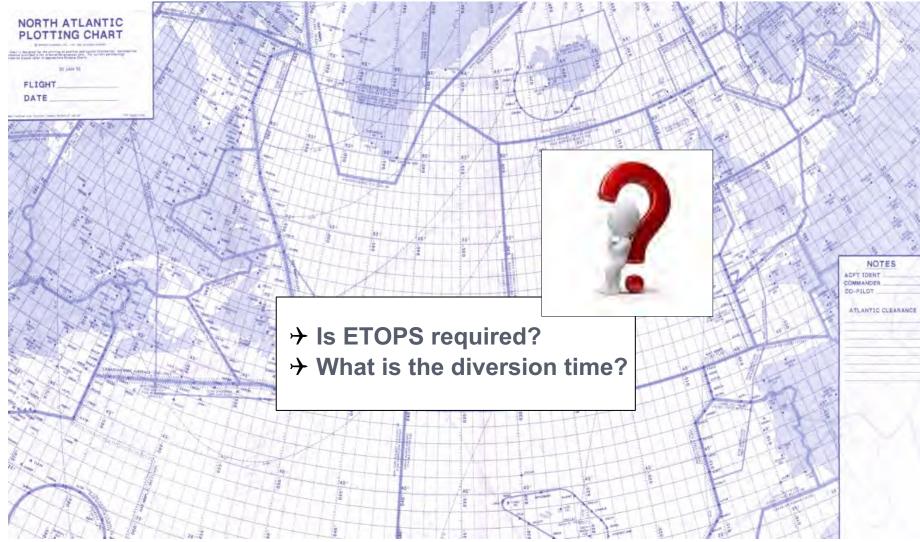


#### Agenda

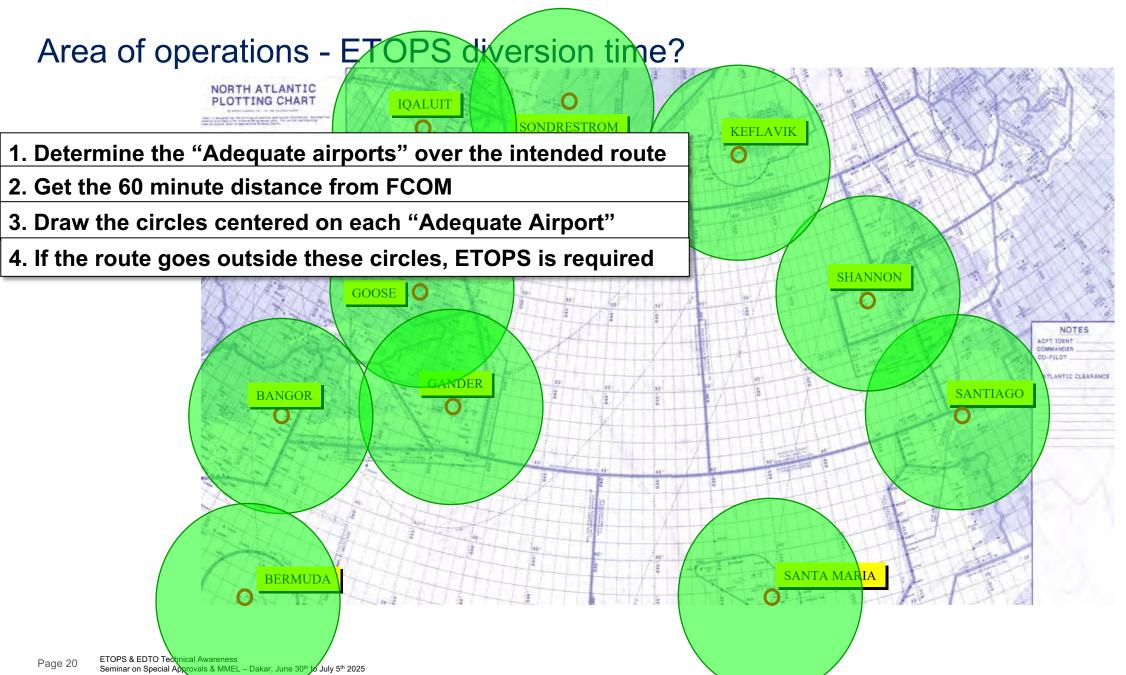


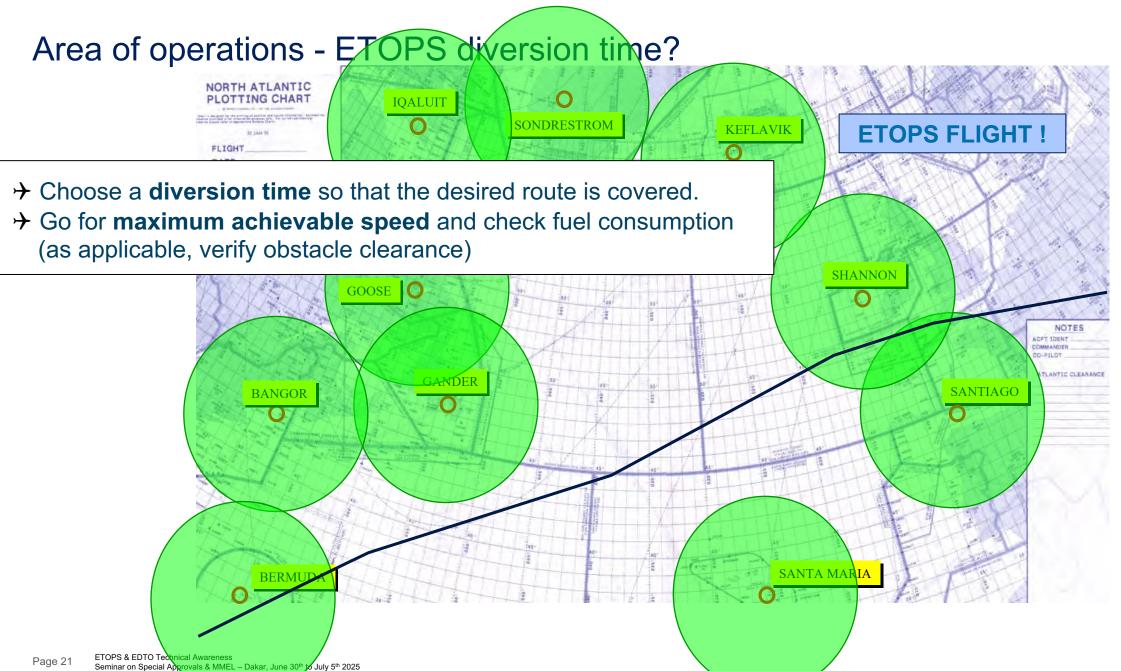


Area of operations - ETOPS diversion time?





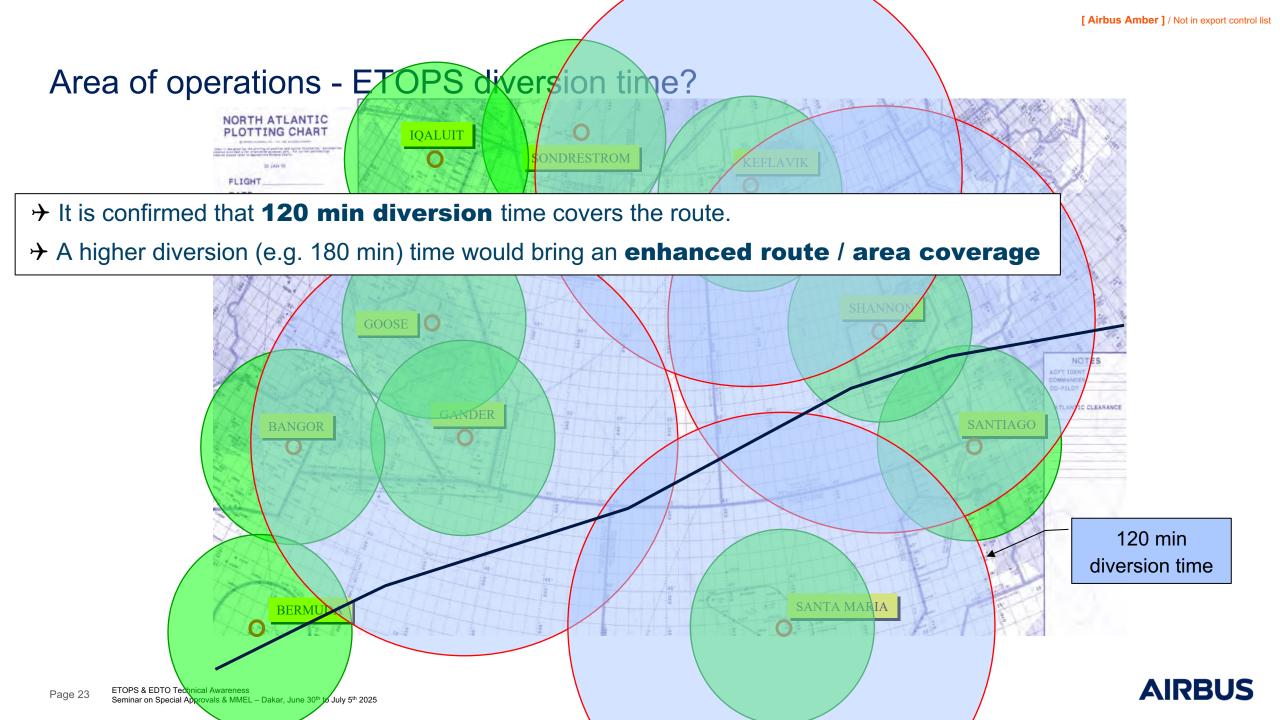




# Area of operations - ETOPS diversion time?

		MAX	IMUM DIVER	SION DISTANC	E		
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	DIVERSION	60	90	120	MIN) 180	240
	150000	190	440	655	870	1301	
	160000	190	438	652	866	1295	17000
	170000	180	439	651	864	1289	1700(1)
	180000	180	437	650	862	1288	17000
MCT/330KT	190000	180	435	646	857	1281	1700
	200000	170	435	644	854	1273	1692
	210000	170	433	642	852	1271	1690
	220000	170	430	637	845	1263	1683
	230000	160	430	637	843	1257	1670
	150000	210	431	641	850	1269	1688
	160000	210	430	640	849	1268	1687
MCT/310KT	170000	210	427	635	843	1261	1680
	180000	200	427	634	840	1253	1666
	190000	200	424	630	836	1249	1661





Area of operations – Summary

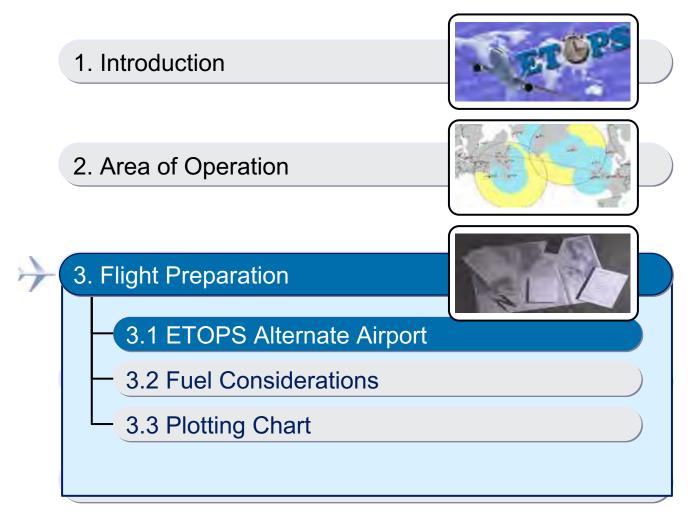


- → The **ETOPS** area of operations is defined considering :
  - The selected Speed Schedule, Reference Weight and Maximum Diversion Time
  - ISA conditions and Still Air (no wind)
- > It is approved as part of the **ETOPS operational approval** of the Operator :
  - It does not need to be updated to reflect actual weather conditions





#### Agenda





#### **ETOPS** alternate airport - Definition

#### **ETOPS Alternate Airport**

An airport may be designated as an **ETOPS Alternate Airport** (used to be called "suitable") if:

- It is an adequate airfield; and
- Weather and field conditions are ensuring a safe approach and landing during the required time window.





#### ETOPS alternate airport - Weather minima & surface conditions

#### **Weather Minima**



Ceiling and visibility forecast must be above the ETOPS dispatch weather minima

→ Higher than the normal minima, used for en-route decision making.

#### **Surface Conditions**

Forecast crosswind component, including gust, for the landing runway expected to be used should not exceed the maximum permitted crosswind for landing.

#### Concept applies for dispatch only

> ETOPS dispatch weather minima do not apply when airborne.

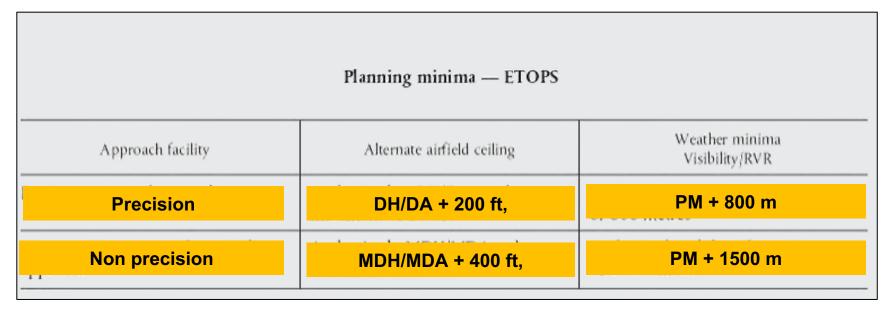


# ETOPS alternate airport - EU-OPS ETOPS weather minima





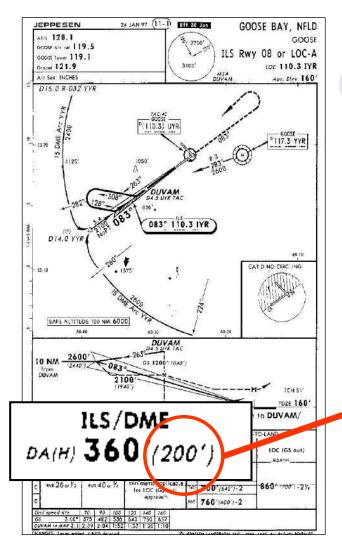
AMC 20-6 defines the planning minima for ETOPS flights:



The above criteria for precision approach are only to be applied to Category 1 approaches. For Category 2 and 3, the increments required by this table have to approved by the national authority

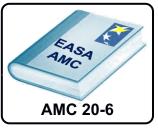


#### Example with EU-OPS ETOPS weather minima



#### **EXAMPLE: GOOSE BAY**

#### **EU-OPS** minima for ETOPS alternates



EASA ETOPS weather minima

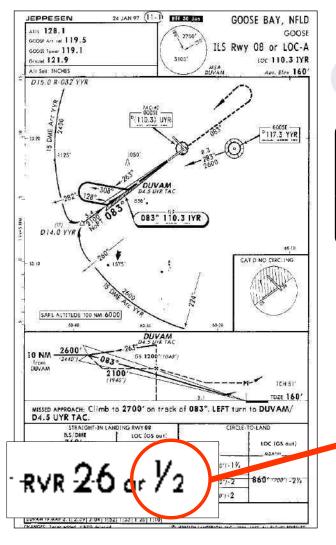
#### **PRECISION**

Ceiling (ft)/Visibility (m)

+ 200 ft = 200 ft 400 ft



#### Example with EU-OPS ETOPS weather minima



**EXAMPLE: GOOSE BAY** 

**EU-OPS** minima for ETOPS alternates



EASA ETOPS weather minima

#### **PRECISION**

Ceiling (ft)/Visibility (m)

200 ft + 200 ft = 400 ft

800 m + 800 m = 1600 m

1/2 statute mile is roughly equivalent to 800 m



#### Concept of Equal Time Point

# **EQUAL TIME POINT (or EQUITIME POINT): ETP** The **ETP** is the point of equal flight time between two diversion airports and at the furthest 'air mile' distance from this pair of airfields. SLL JIB **ETP** MGQ - CMB . MLE JRO The **ETOPS ETP** may be based either on : engine-failure case only (OEI FL) engine-failure case combined with depressurization (FL100) Effect of wind and temperature are therefore considered at the related altitude.



How to determine the Time Window?

The **Time Window** for each alternate should be based on:

- Earliest and Latest Estimated Time of Arrival (ETA) see Air Ops 1.297 or FAR 121.624b
- As per EASA rules, 1 Hour must be added to the Latest ETA

Diversion from each relevant ETPs is considered to determine the ETAs:

See below how the **Time Window** for Santa Maria (SMA) airport should be computed.

#### **Earliest ETA**

NO

PL(

Scheduled Take-off time + Flight time to **ETP1** 

+ diversion time to SMA (at Normal cruise speed/FL)

#### Example for Santa Maria:

	Take-off time	Flight time to <b>ETP</b>	diversion time	Buffer	ЕТА
•	04:05	03:20	01:45	N/A	09:10
*	04:05	04:25	02:10	01:00	11:40

#### Latest ETA

Scheduled Take-off time + Flight time to **ETP2** + diversion time to SMA (at LRC speed/FL100) + 1H

#### Remark

The Time Window is based on the Estimated Time of Departure and should be adjusted to the Actual Time of Departure should a delay occur.



# ETOPS alternate airport - Selection form

#### **ETOPS ALTERNATE SELECTION FORM**

DATE 13 April 1999 AIRCRAFT A330 ROUTE SNN-JFK

Maximum Tail Wind: 10 kt

MAX RECOMMENDED CROSS WIND

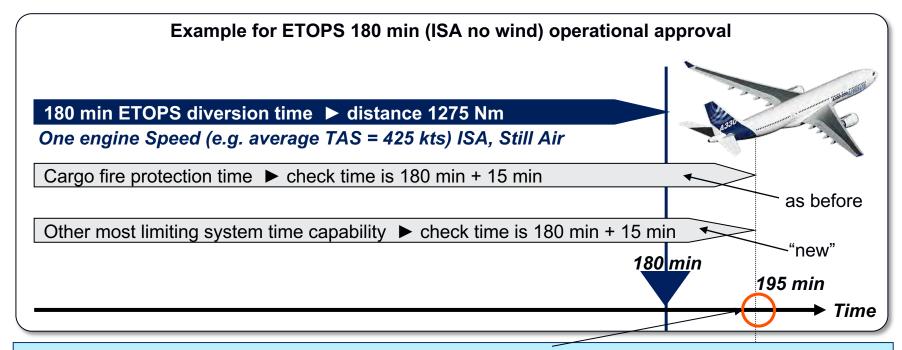
DRYWET 32 kf SLUSH 20 kf SNOW MY 15 kf

ICAO Code	RWY HDG	APPROACH	LANDING	WEATHER MINIMA				PERIOD		
aliportiame	Magn(true)	Cantegory	alds	EN ROUTE		ETOPS		From	То	
				C∌II. ft	VIS M	C∌II. ft	VIS M	н:шім	H:MIN	ок
EINN SHANNON	24 (23)	Precision Precision non Precision	Catilius ILS full	10 0 20 0 60 4	300 550 2400	500 600 1004	18 00 20 50 39 00			
	06/กก	Precision non Precision non Precision	ILS DME full VOR DME	200 404 604	700 1400 2400	600 804 1004	22 00 29 00 39 00			
	N2 Ø61	non Precision	VOR DME	253	1500	653	3000			
	11 (09)	Precision Precision non Precision non Precision	Catilies IESTUII VOR DME NDB	100 200 259 399	350 550 720 1200	500 600 659 799	18 50 20 50 22 20 27 00			
BIKF KEFLAVIK	29 (27)	non Precision non Precision	LOCIOME VORIDME	259 259	1500 1500	659 659	3000 3000			
	20 (18)	Precision Precision non Precision non Precision	Cat II ILS ILS DME full VOR DME NDB	100 200 257 387	350 800 720 1200	500 600 657 787	1850 2300 2220 2700			
BGSF	10 (06)	non Precision	LOC DME	350	1200	7.50	27 00			
SONERE STROM		non Precision	NOBOME	1670	4200	2070	63 00			
CYYR	08 (05)	Precision non Precision	ILS DME full	200 540	800 3 <b>2</b> 00	6 0 0 10 4 0	23 00 47 00			
GOOSE BAY	26 (23)	non Precision	LOC (back on)	287	1600	687	3100			
	04 (01)	Precision	ILS DME full	200	800	600	23 00			
CYOX	13 (11)	Precision non Precision	ILS full NDB	200 452	800 1609	600 8 <b>52</b>	23 00 3 1 0 9			
GA NDER	31 (29)	non Precision	LOC (back on )	360	2000	760	3500			
	22 (19)	non Precision non Precision	LOC (back on ) VOR	32 1 34 1	1600 1600	721 741	3100 3100			



# ETOPS alternate airport Consideration of Time Limited System - ETOPS up to 180 min

Consideration of Time Limited Systems at dispatch For ETOPS up to 180 min: consider ISA /Still Air conditions



- 1. Check at dispatch that these values do not exceed corresponding Time Limited system(s) capabilities
- 2. If one or both values are reduced (e.g. in case of MMEL) ► Select another route within the corrected Time Limited system(s) capabilities

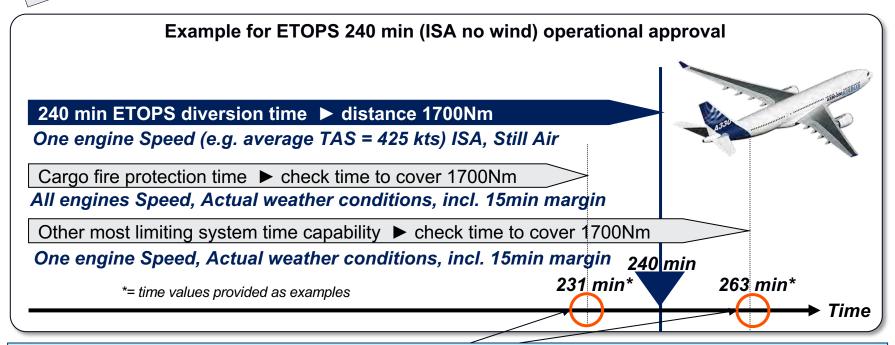
Manufacturer has to identify the time limited system(s) capabilities and to include the corresponding values in the AFM and ETOPS CMP Document



Consideration of Time Limited System - ETOPS beyond 180 min

NEW

Consideration of Time Limited Systems at dispatch For ETOPS >180 min: consider forecast wind and temperature



- 1. Check at dispatch that these values do not exceed corresponding Time Limited system(s) capabilities
- 2. If one or both values are reduced (e.g. in case of MMEL) ► Select another route within the corrected Time Limited system(s) capabilities

Manufacturer has to identify the time limited system(s) capabilities and to include the corresponding values in the AFM and ETOPS CMP Document

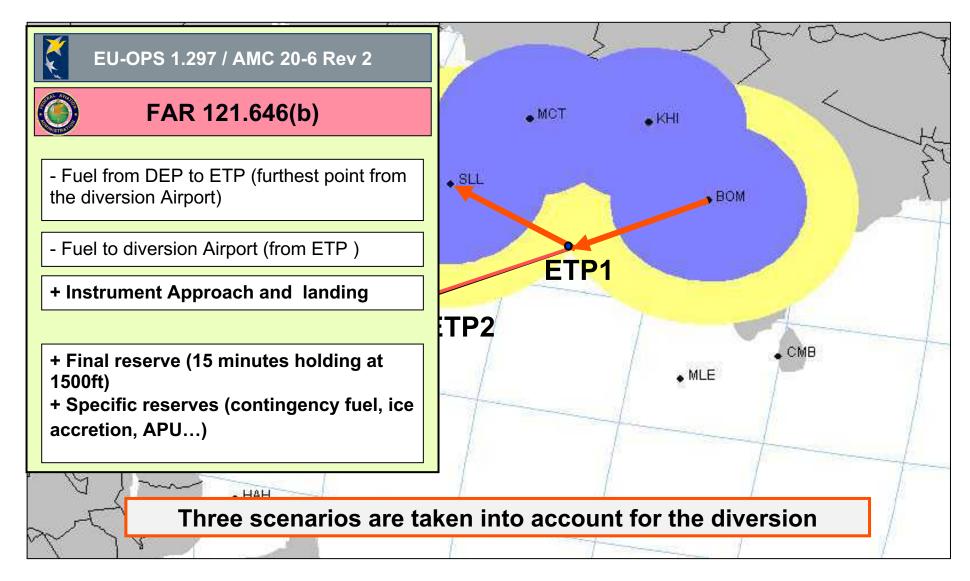
The time capability of the cargo fire suppression system is 260 min. The time capability of all the other ETOPS significant systems is 300 min. The maximum diversion distance is 1 700 nm.



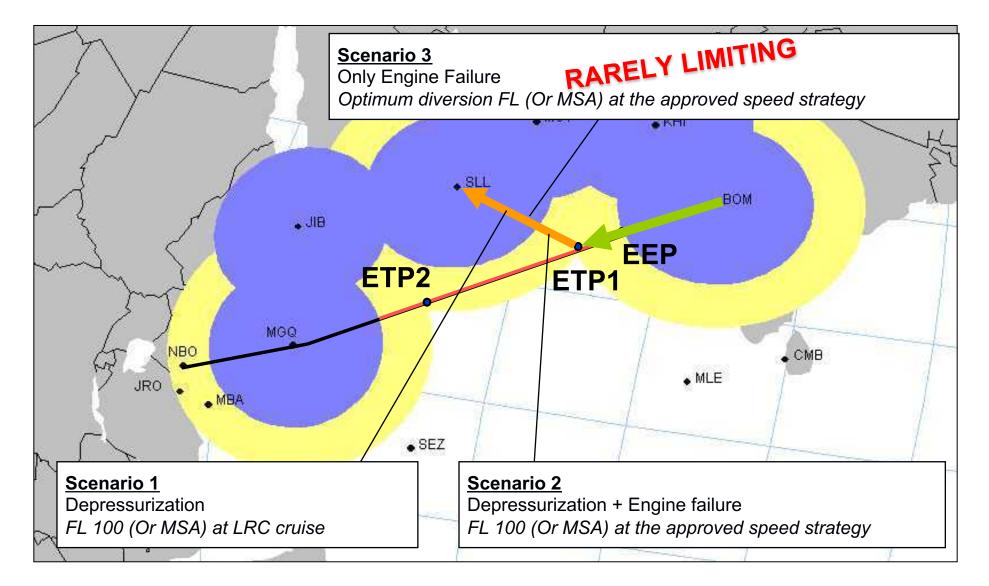
#### Agenda

1. Introduction 2. Area of Operation 3. Flight Preparation 3.1 ETOPS Alternate Airport 3.2 Fuel Considerations 3.3 Dispatch Check List

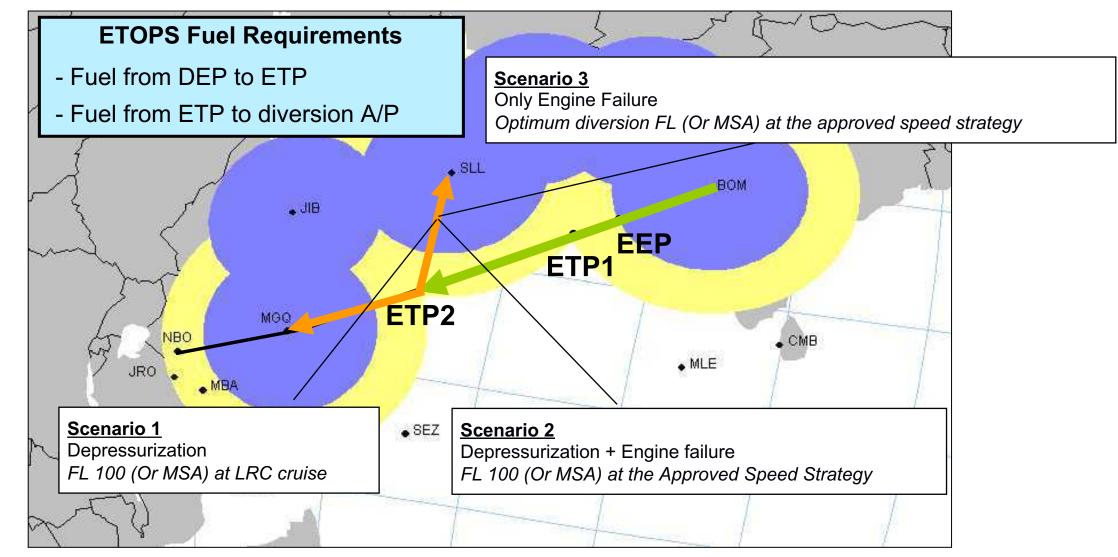


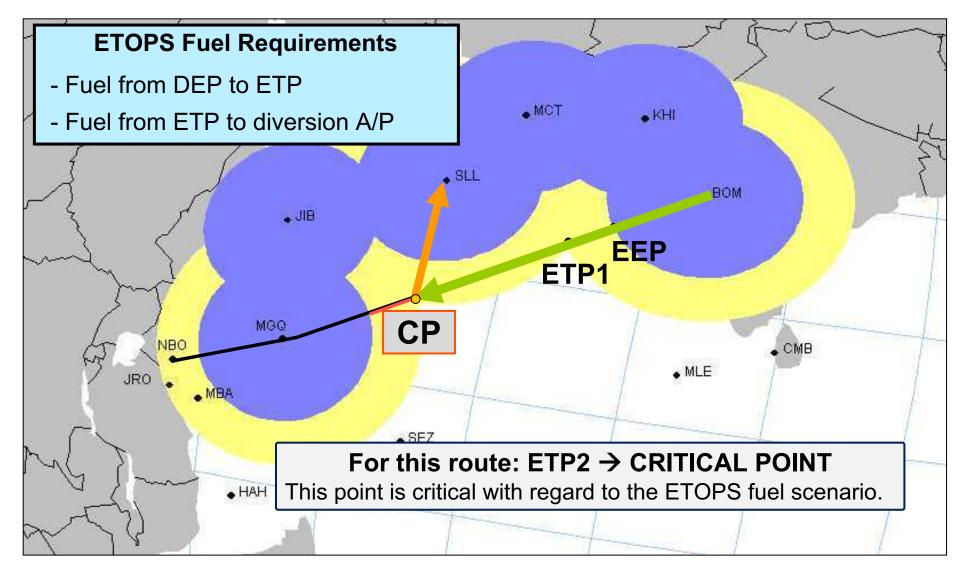














Standard Fuel vs ETOPS Fuel

■ The standard fuel is still applicable, indeed, both standard and ETOPS fuel requirements should be compared.

 Only, the most penalising one must be retained for dispatch PLAN 16450 COMPUTED 10:58Z FLIGHT PROGS 992509 MON AVE KLAX TO PHNL ETD 14:00Z 22/02/17 320N-79 A320 M78 KGS FLT/DAY DEP/ARR AVG WIND/AVG TEMP AIBFLIO /22 LAX/HNL ++++ CAUTION ++++ MANUAL WIND PLAN. HISTORICAL WIND COMPONENT FOR SEPTEMBER THIS FLIGHT PLAN IS ETOPS COMPLIANT USING THE FOLLOWING ETOPS ALTERNATES - 180 MINUTES/ KLAX PHNL

DEST	PHNL	011958			05.29	2280	2440	380	
RESV		000598		354	00.18				
TAL	PH.TR	001000			00.20	0098	0096	170	
FTO	PS A	dditional	fuel	2	00.30				
LI C	1 0 7 6	aditional		- 5	00.00	CAPT.	SIGN .	41.	0
ETPX		001901		7.					
TOF		016381		8.5	07.35				
TAXI		000400							
BLOCK		016781			07.45	BLOCK	FUEL.		de

E.FUEL A.FUEL E.TME

\*Reserve policy: 5 PCT

LFPG/CDG 1255/1313 2020/2020 GND DIS AIR DIS 3426 T006 LIMITATIONS MAXIMUM ZFW 170000 ESTIMATED ZFW 153500 LAW 158241 TOW 199059 FINAL PLN TOF 45519 8840 ALTN DIFF PLN TOF (CORRECTED) EXTRA 600 0017 ETOPS SUMMARY N5358.7W01952.7 EET 02.10 ETO .... CF(Y) 9.7

REO 1436-1857 WX MIN 400/1350

EXP(CYQX)366 N5341 2W04705 9 EET 04.11 ETO ... CF(Y) 9.0

CYQX 03 REQ 1633-1857 WX MIN 600/3219

As a matter of fact, ETOPS fuel requirements are very often (but not always!)
 covered by the standard fuel.

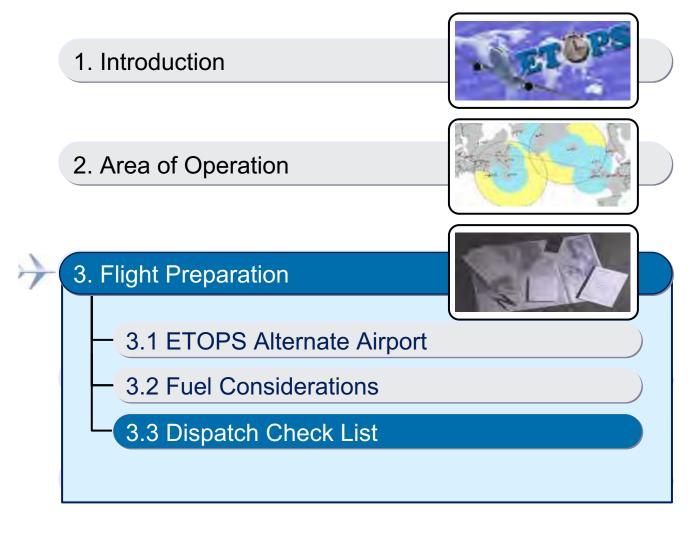
XWC 3.0

FOB 29.8

XWC 23.6

EFOB 23.4

## Agenda





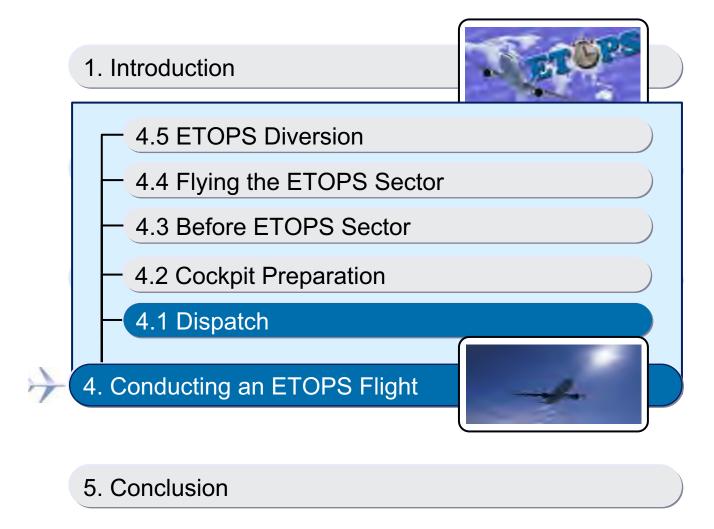
# Dispatch check list

#### **ETOPS Dispatch Check List**

AIR CRA FT	REGISTRATION
DATE	FLIGHT Nº
ETD FTOPS STATUS	DESTINATION
ETOPS APPROVED: COMPANY	
ETOPS APPROVED: CREW	
ETOPS APPROVED: ROUTE	
MAINTENANCE RELEASE STATEMENT	
MEL/CDL	
MEDUDL	
NOTAMS	
Departure Airport	
Destination Airport	
En route alternates	
En route	
Billodie	
WEATHER FOLDER	
TAF MET ARS SIGMETS:	
Departure Airport	
Destination Airport	
En-route Alternate	
WINDS AND TEMP CHARTS	l .
Cruise FL	
Diversion FL	
TBMSI charts	
ICING FORECAST	
OUT DIE AIRBORT FORM	
SHITA BLE AIRPORT FORM	
SELECTION OF SUITABLE AIP	
SPECIFIC NAVIGATION REQUIREMENTS	
MNPS/NOPAC/TRAMSPAC	
RVSM	
CAT II/ CAT III	
CALII/ CALIII	
ROLITING	
2 PLOTTING CHARTS	
ETOPS AREA	
ET OPS COMPUTERIZED FLIGHT PLAN	
PERF FACTOR	
COST INDEX	
ETOPS SCENARIOS EN ROUTE ALTERNATE	
EEP ETP EXP CP	
PROVISION FOR ICING CONDITIONS	
CRITICAL FUEL SCENARIO	
EXTRA FUEL FOR ET OPS	
EXTRA FUEL MEL/CDL	
FINAL FUEL ORDER	
FINAL FUEL UKUEK	

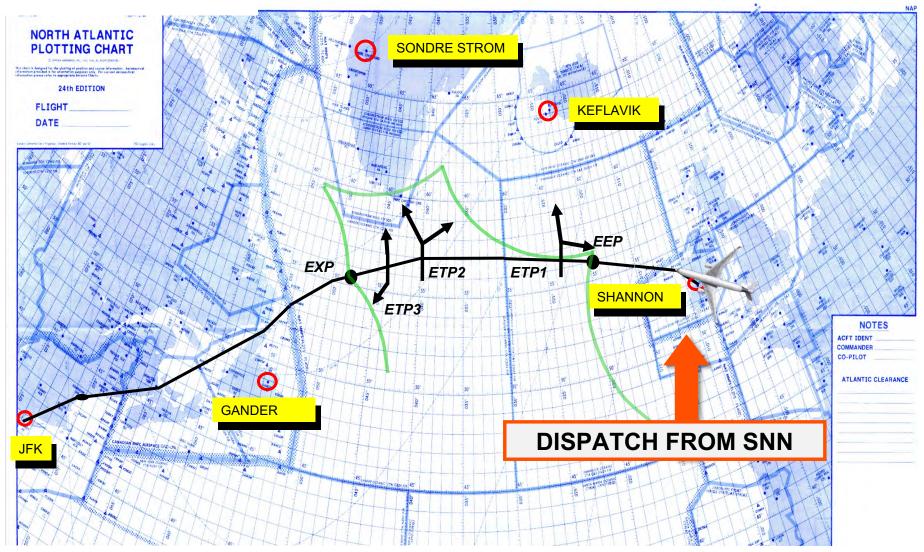


## Agenda





# Dispatch





# Overview of ETOPS Flight Operations – Flight dispatch



#### **Check Aircraft Configuration**

- Check ETOPS Status of the aircraft (MEL/CDL)
- **Check Time Limited Systems**



#### **Nominate ETOPS Alternate Airports**

- Check NOTAM
- Check Weather (TAF/METAR)



**Consider ETOPS Fuel Requirements** 

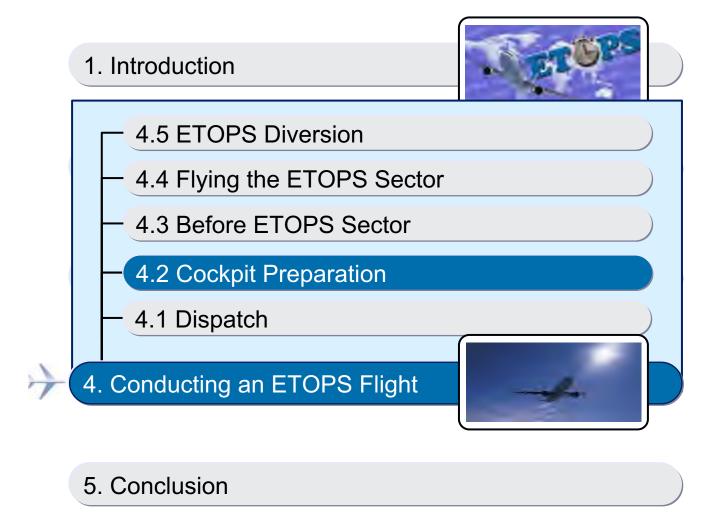


**Prepare Flight Folder** 

AIRCRAFT	REGISTRATION
DATE	FLIGHT N°
ETD	RESTINATION
ETOPS STATUS	4
ETOPS APPROVED : COMPANY	V/
ETOPS APPROVED : CREW	V/
ETOPS APPROVED : ROUTE	V/
MAINTENANCE RELEASE STATEMEN	√
MEL/CDL	V/
TIME LIMITED SYSTEM	
NOTAMS	2
Departure Airport	V/
Destination Airport	<b>V</b> /
En route alternates	<b>V</b> /
En route	<b>V</b>
WEATHER FOLDER	2
TAF METARS SIGMETS:	
Departure Airport	
Destination Airport En-route Alternate	<b>Y</b>
WINDS AND TEMP CHARTS	
Cruise FL	$\checkmark$
Diversion FL	
TEMSI charts	
ICING FORECAST	V



## Agenda





### Cockpit preparation

#### **Pre-Takeoff Checks**

### Specific pre-takeoff checks

- Flight crew: e.g. fuel x-feed valve, CSM/G
- Maintenance: e.g. engine oil level and DPI.



### **Checks depend on aircraft model**



Refer to ETOPS CMP document and AFM

#### **DATA in FMGS**

- EEP, ETP, EXP, CRUISE WINDS
- Entered as "FIX INFO" or "ABEAM"
  - Display these points on the ND
  - Do not create them as additional waypoints in the F-PLN, to avoid these points being transmitted via CPDLC or ADS



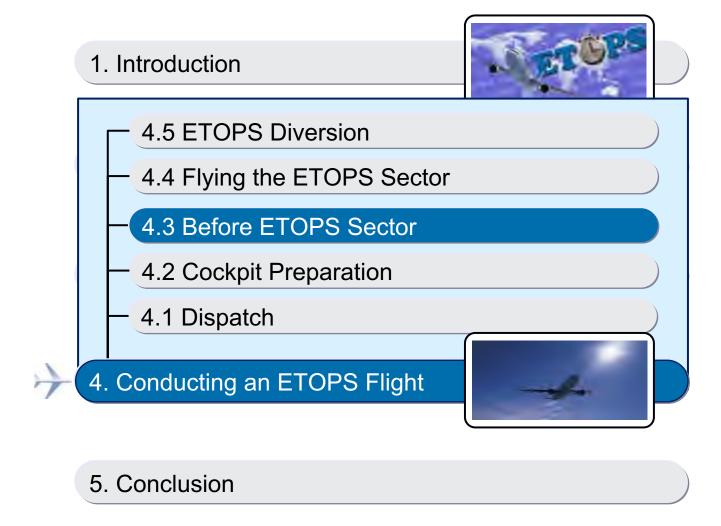


# Cockpit preparation



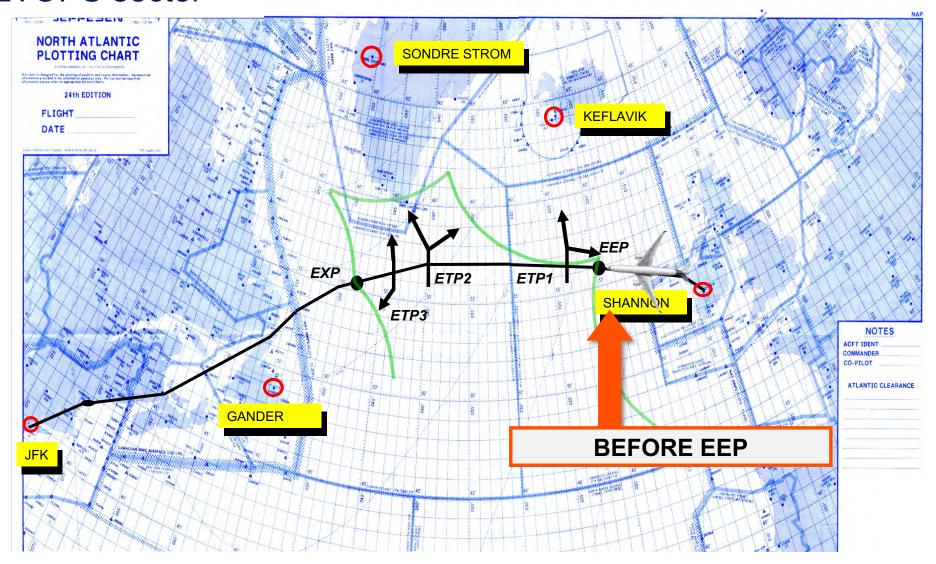


## Agenda





### Before ETOPS sector





### Before ETOPS sector

#### **ETOPS Alternates Status**

Crew must check any changes that would **preclude** a **safe approach and landing at an ETOPS alternate airport** during the related time window :

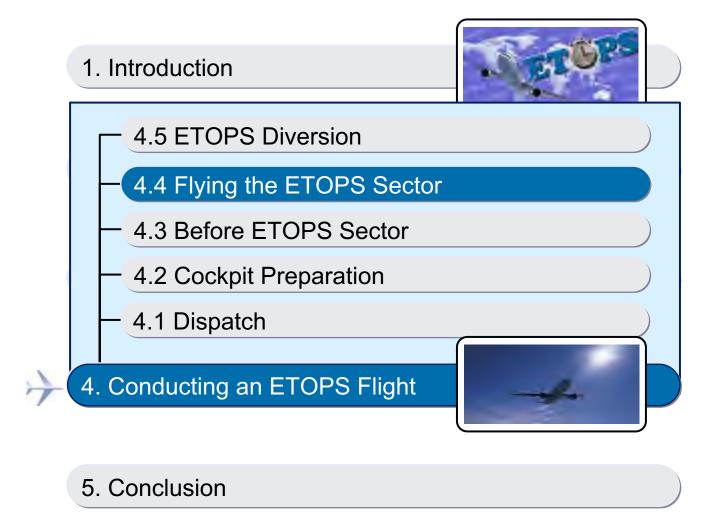
- Check minima at diversion airfields, ...
- Appropriate course of action must be taken if normal minima not fulfilled before EEP:
- Selection of another ETOPS alternate airport, re-routing, turn back,
- Consider operator's approved max DT and A/C ETOPS capability in case of re-routing or selection of another ETOPS alternate





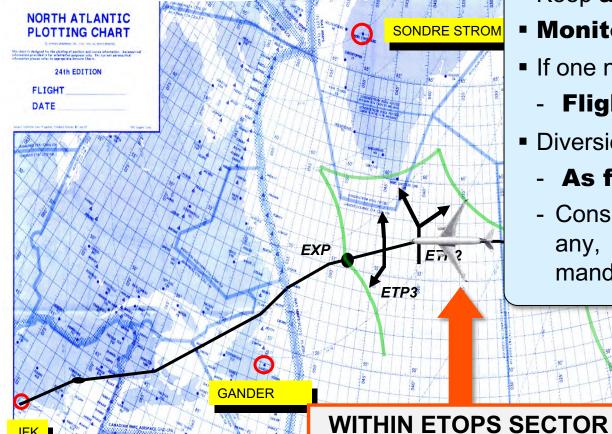


## Agenda





# Flying the ETOPS sector

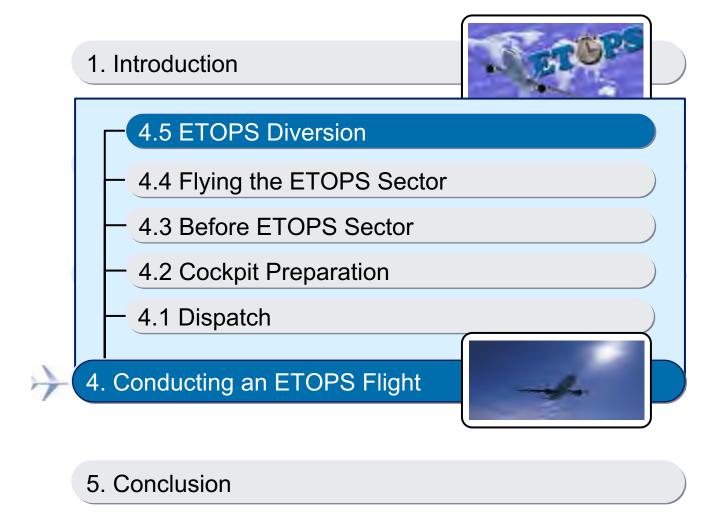


- Normal flight monitoring
- Keep awareness of diversion airport status
- Monitor Fuel On Board
- If one nominated ETOPS Alternate Airport closes:
  - Flight may continue
- Diversion decision making:
  - As for a non-ETOPS flight
  - Consider the **additional** ETOPS Diversion requirements, if any, given in the AFM / FCOM / CMP (e.g. diversion mandatory when flying on a single electrical source)

ATLANTIC CLEARANCE

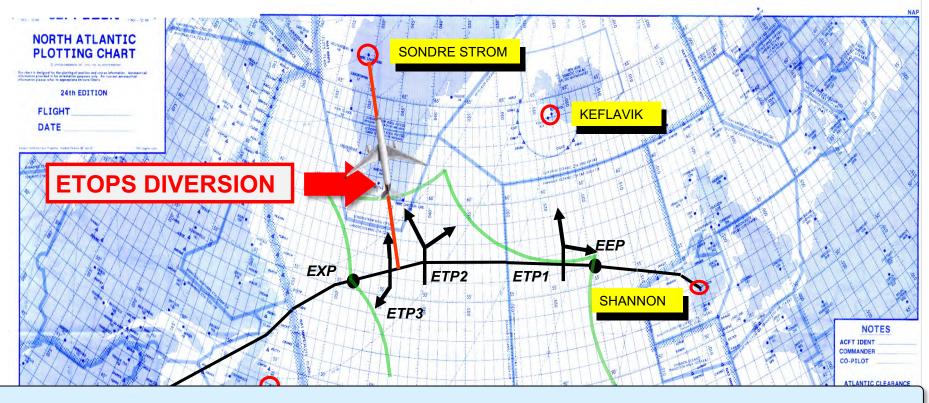


## Agenda





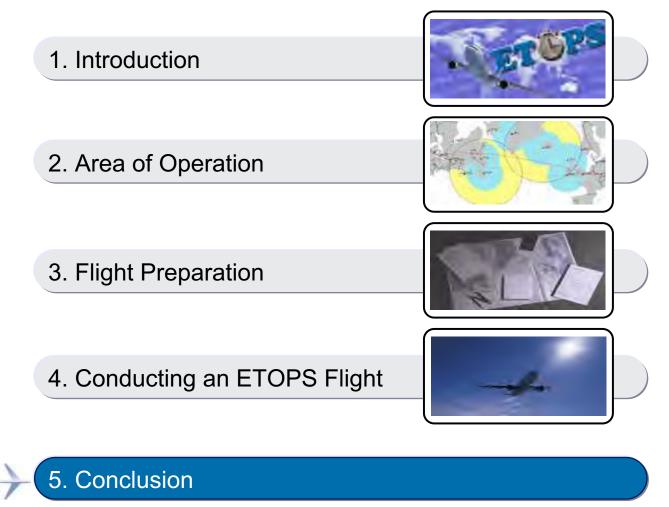
### **ETOPS** diversion



- No diversion procedure specific to ETOPS
  - Diversion in case of engine failure (twins only)
- Comply with route requirements (NAT, MNPS,...) as for non-ETOPS
- Selected diversion speed may differ from the approved ETOPS diversion speed



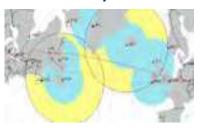
# Agenda





## Conclusion – Summary of ETOPS Flight Ops processes

#### **Area of Operation**





#### "Standard" Weather Conditions

**Approved diversion speed strategy** (OEI for twins / AEO for A/C with more than 2 eng)

**ETOPS** capability of the aeroplane

Operator's approved **ETOPS Maximum Diversion Time** 

#### **Flight preparation**





#### "Actual" (forecast) Weather Conditions

#### **ETOPS** alternate airports:

Weather (operating minima + margins), Time windows (earliest / latest estimated time of arrival)

### **Check of Time-Limited Systems**

ETOPS up to 180 min: ISA/Still air ETOPS>180 min: forecast wind/temp

#### **ETOPS** Fuel:

- 3 diversion scenarios (OEI / FL100 / OEI+FL100)
- Additional fuel reserves (Icing, wind forecast, APU...) are considered
- Standard fuel is still applicable and must be considered

#### **ETOPS Flight**





### **Pre-flight checks**

Weather (operating minima) / NOTAMs follow-up

Similar diversion decision making



### Content of this Technical awareness on ETOPS / EDTO:



- ETOPS Capability of the Aircraft
- Overview of Operational Approval ETOPS Maintenance & Flight Ops processes
- Review of ETOPS Flight Ops Requirements & Practices
- Review of ETOPS Maintenance Requirements & Practices
- 6 Conclusions



## Module 4: Review of Maintenance Requirements – Agenda



### 1. Introduction

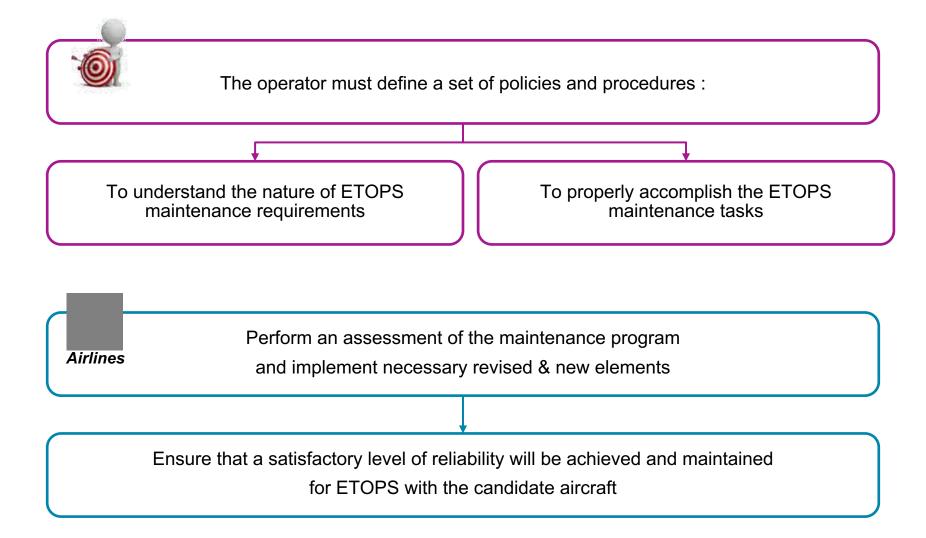
2. Maintenance Policies

3. Procedures

4. Conclusion

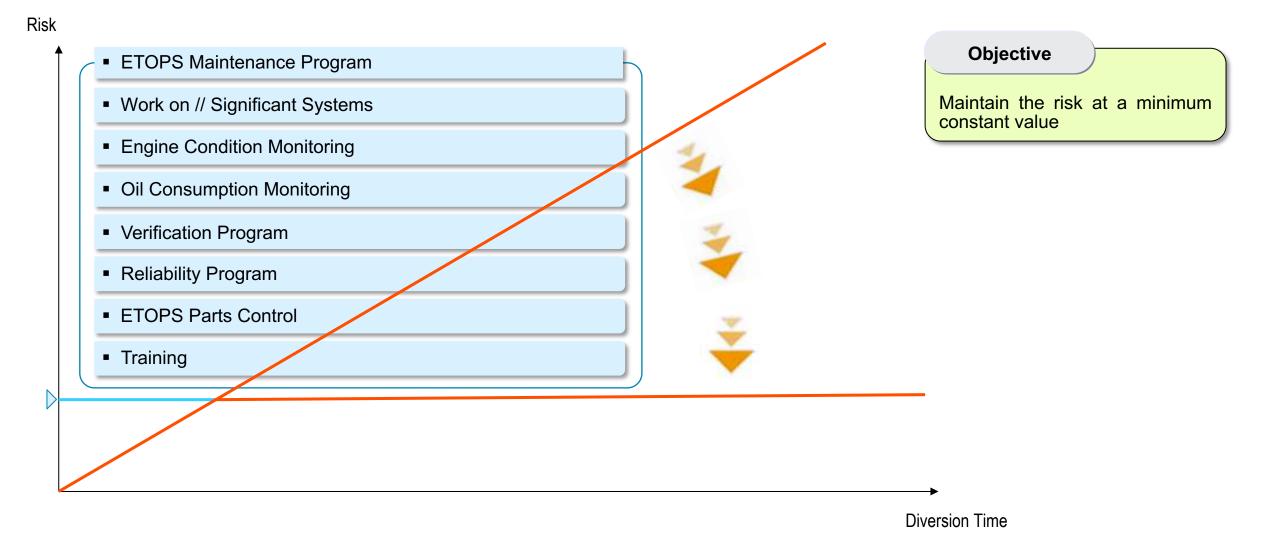


### Introduction



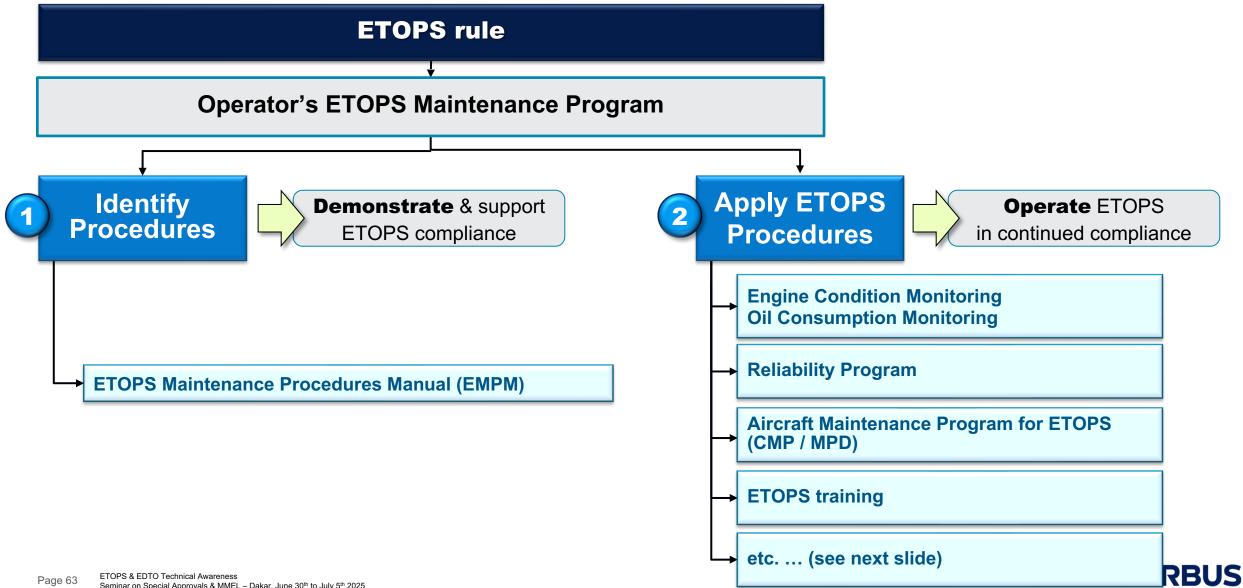


## Objective of the ETOPS Maintenance policies and procedures





### Operator's ETOPS maintenance program build-up

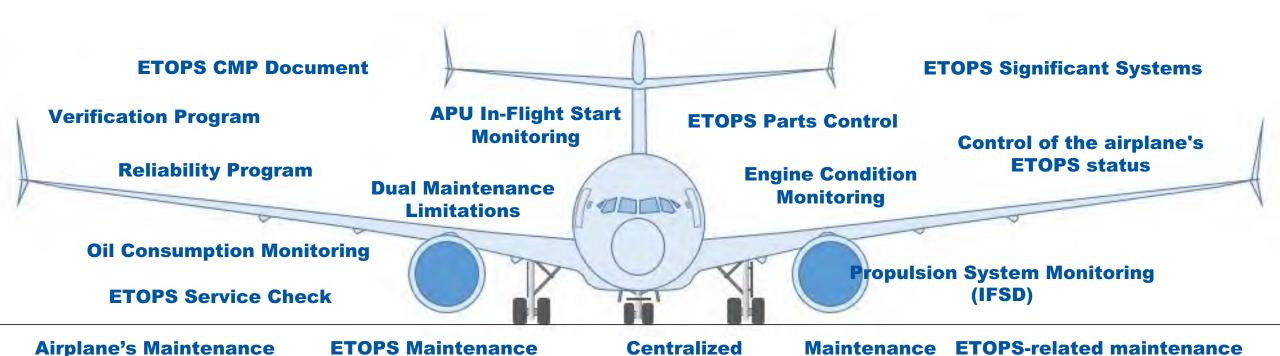


## Elements of the Operator's ETOPS maintenance Program

**Procedures Manual** 

The term Operator's "ETOPS maintenance program" means the maintenance related elements (maintenance tasks, organization manuals, procedures, etc.) that must be implemented by the operators to support their ETOPS operations.

In this context, the airplane's maintenance program for ETOPS is one element of the operator's ETOPS maintenance program



**Maintenance Control** 

**Training** 



tasks & Qualified staff

**Program for ETOPS** 

## Module 4: Review of Maintenance Requirements – Agenda

1. Introduction



2. Maintenance Policies

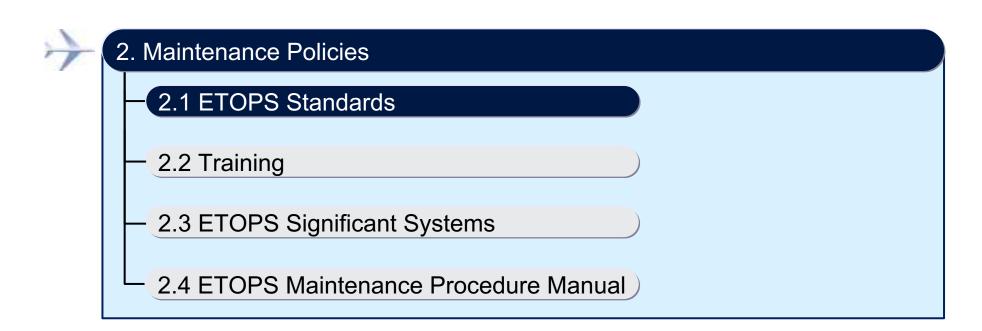
3. Procedures

4. Conclusion



### Module 4: Review of Maintenance Requirements – Agenda

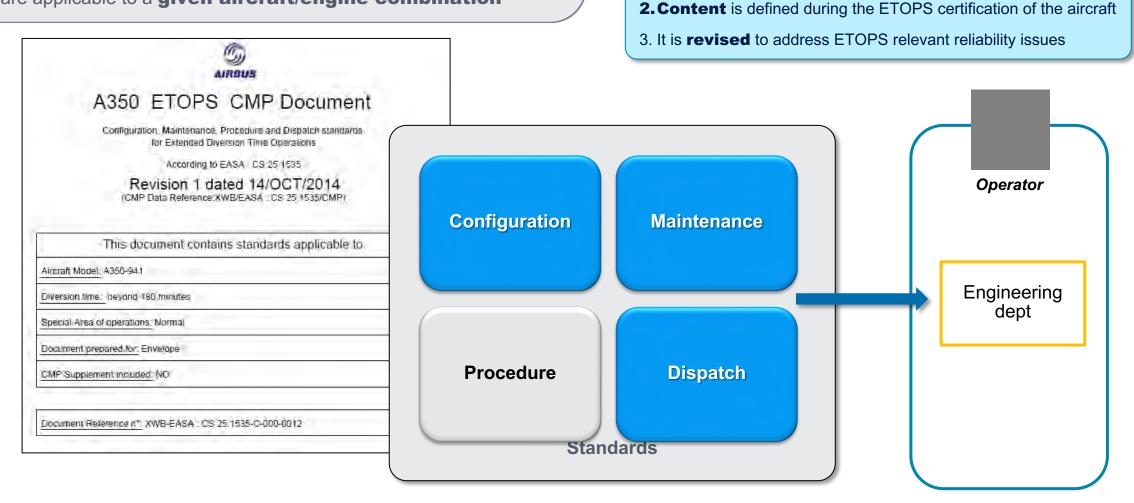
1. Introduction





### Policies – Standards for ETOPS

The ETOPS CMP document defines the Standards for ETOPS that are applicable to a given aircraft/engine combination



Recall:

1. ETOPS CMP Document is approved



## **ETOPS Configuration Standards**

The required ETOPS configuration of the aeroplane is defined by the applicable ETOPS CMP Document:

**CMP Configuration items** 

- Minimum Standard of system / component
- Additional system / component



- As per operational requirements, the aeroplane must be configured, maintained and operated in accordance with the ETOPS CMP Document, which means that the aeroplane should be configured as per the ETOPS CMP standards as long as it is operated on ETOPS flights.
  - Accordingly a Parts Control program must be put in place before start of ETOPS.



### **ETOPS Maintenance Standards**

### Elements of the Airplane's maintenance program for ETOPS:

**ETOPS Maintenance Standards** 

CMP Maintenance items (tasks)

- Scheduled
- Unscheduled

Airplane's Maintenance Program (MPD)

 All maintenance tasks (ETOPS or non-ETOPS related)

ETOPS operational requirements

**ETOPS Service Check** 

Airplane's Maintenance Program for ETOPS

The airplane should be maintained in accordance with the **airplane's** maintenance program for ETOPS as long as it is operated on ETOPS flights.

- It is not mandatory to comply with the airplane's maintenance program for ETOPS while the aircraft is not operated on ETOPS.
- However, compliance with the airplane's maintenance program for ETOPS becomes mandatory as soon as the ETOPS operations are resumed.

**AIRBUS** 



### **Question 4.1:**

The airplane's maintenance program for ETOPS is one element of the operator's ETOPS maintenance program. Which of the following is NOT part of the operator's ETOPS maintenance program?

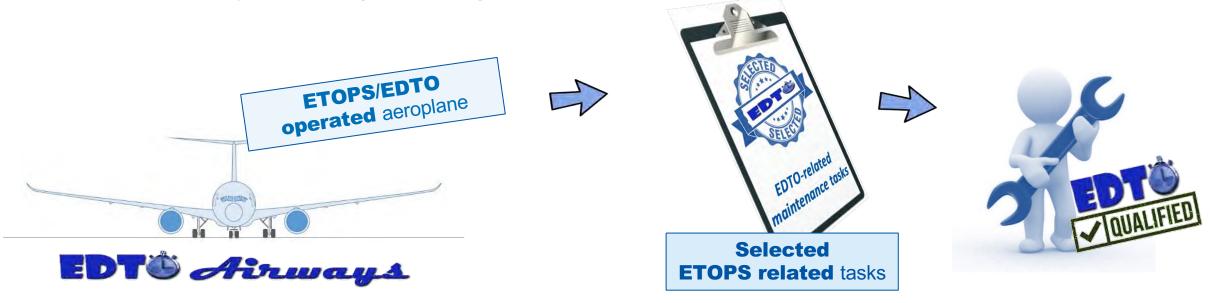
- 1. Oil consumption monitoring
- Dual maintenance limitations
- 3. Parts control program
- 4. Mechanics licensing
- 5. Reliability program



### ETOPS Maintenance Standards – Identification of tasks

### **Identification of ETOPS-related maintenance tasks:**

- The maintenance tasks related to ETOPS are typically tasks impacting ETOPS significant system(s)
  - Note: Tasks or sub-tasks which are not impacting any ETOPS significant system(s) should not be considered as EDTO-related tasks even tasks supporting the overall verification process.
- The operator should select from the list of ETOPS-related tasks those tasks which must be accomplished by ETOPS (or EDTO) qualified staff.





## **ETOPS Dispatch Standards**

### **ETOPS Dispatch Standards**

Procedure Dispatch Standards

**CMP** dispatch items

MMEL items for ETOPS

**MMEL** 

- Specific MMEL items for **ETOPS**
- Other MMEL items

Dispatch **ETOPS** 



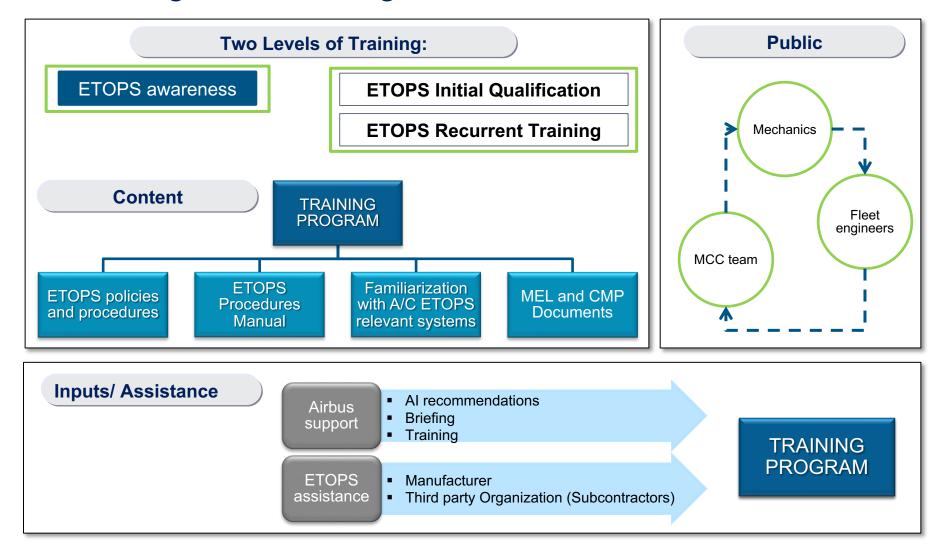
# Module 4: Review of Maintenance Requirements – Agenda

1. Introduction





#### Policies - Minimizing risk - Training





# Policies - Minimizing risk — Training EDTO Qualified Maintenance Staff

#### **Criteria for ETOPS/EDTO qualification:**

- An ETOPS (or EDTO) qualified staff is a person who has received an ETOPS training
- **Criteria to be met** for being rated as an ETOPS qualified staff, as well as for the currency of such qualification, should be detailed in the ETOPS Maintenance Procedures Manual (**EMPM**)
- Selected ETOPS related maintenance tasks should be accomplished by an ETOPS qualified staff
- Purpose: promote ETOPS/EDTO awareness by ensuring only ETOPS/EDTO qualified maintenance personnel accomplish selected ETOPS (or EDTO) related tasks





#### **Question 4.2:**

Out the following tasks, which is most likely to be identified as an EDTO-related task that must be accomplished by EDTO qualified staff?

- 1. Removal / installation of a computer identified as EDTO Significant
- 2. Removal / installation of IDG
- 3. Overhaul of the High Pressure Turbine module of the engine



### Example of ETOPS training content



The operator's ETOPS training programme should provide initial and recurrent training for as follows:

- INTRODUCTION TO ETOPS REGULATIONS
- a. Contents of AMC 20-6
- b. ETOPS Type Design Approval a brief synopsis
- 2. ETOPS OPERATIONS APPROVAL
- a. Maximum approved diversion times and time-limited systems capability
- b. Operator's Approved Diversion Time
- c. ETOPS Area and Routes
- d. ETOPS MEL
- 3. ETOPS CONTINUING AIRWORTHINESS CONSIDERATIONS
- a. ETOPS significant systems
- b. CMP and ETOPS aircraft maintenance programme
- c. ETOPS pre-departure service check
- d. ETOPS reliability programme procedures
  - (1) Engine/ APU oil consumption monitoring
  - (2) Engine/APU Oil analysis (if recommended)
  - (3) Engine conditioning monitoring
  - (4) APU in-flight start programme
  - (5) Verification programme after maintenance
  - (6) Failures, malfunctions and defect reporting
  - (7) Propulsion System Monitoring/Reporting
  - (8) ETOPS significant systems reliability
- e. Parts and configuration control programme
- f. CAMO additional procedures for ETOPS
- Interface procedures between Part-145 organisation and CAMO

# Reflecting ETOPS PROCEDURE MANUAL







# Module 4: Review of Maintenance Requirements – Agenda

1. Introduction 2. Maintenance Policies 2.1 ETOPS Standards 2.2 Training 2.3 ETOPS Significant Systems 2.4 ETOPS Maintenance Procedure Manual



#### ETOPS significant systems

#### **ETOPS Significant System definition (recall)**

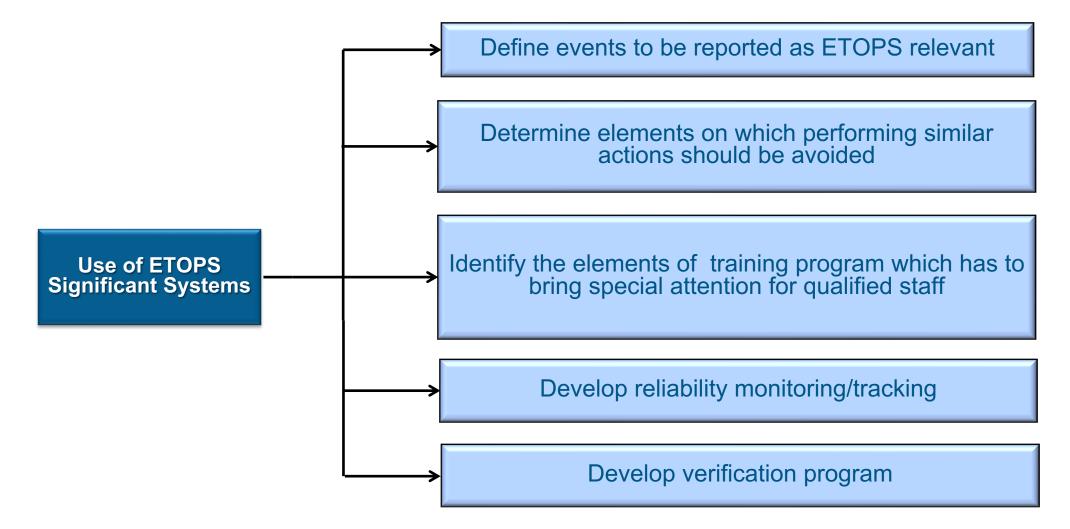
#### **ETOPS Significant System** means systems:

- Whose failure could adversely affect the safety specific to an ETOPS flight
- Whose functioning is specifically important to continued safe flight and landing during an **ETOPS** diversion.





#### Purpose of the ETOPS significant systems









#### **Question 4.3:**

On the aircraft shown above, the ETOPS dispatch with APU inoperative is allowed for 10 days as per the MMEL.

Furthermore, there is no configuration or maintenance standards related to the APU in its ETOPS CMP document, nor any APU related P/N that are not approved for ETOPS in the ETOPS Parts List.

Is it correct to say that the APU may therefore be removed from the ETOPS Significant System list of this aircraft?

- 1. Yes
- 2. No



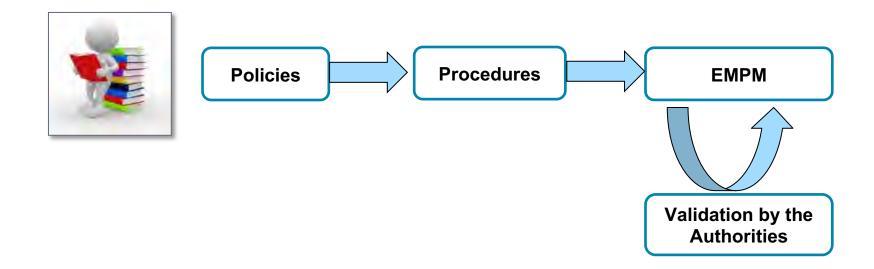
# Module 4: Review of Maintenance Requirements – Agenda

1. Introduction 2. Maintenance Policies 2.1 ETOPS Standards 2.2 Training 2.3 ETOPS Significant Systems 2.4 ETOPS Maintenance Procedure Manual



#### Policies - ETOPS Maintenance Procedures Manual (EMPM)

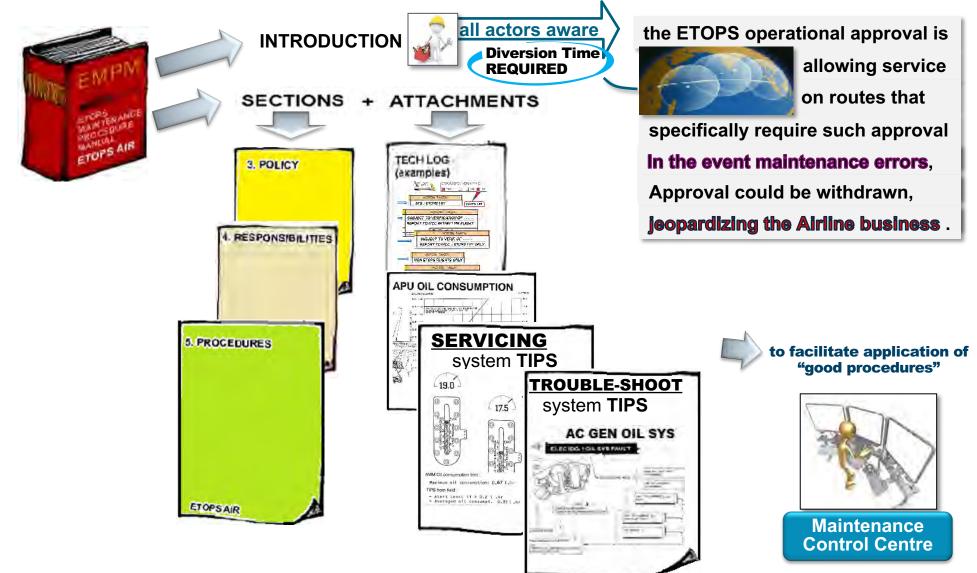
The Operator's ETOPS / EDTO policies and procedures should be detailed and gathered in a document subject to revision control and validated by the local authorities.



This document is usually called the **ETOPS Maintenance Procedures Manual** (EMPM). It contains the policies the procedures and requirements for ETOPS



### Building example of the ETOPS Maintenance Procedure Manual





# Module 4: Review of Maintenance Requirements – Agenda

1. Introduction

2. Maintenance Policies



3. Procedures

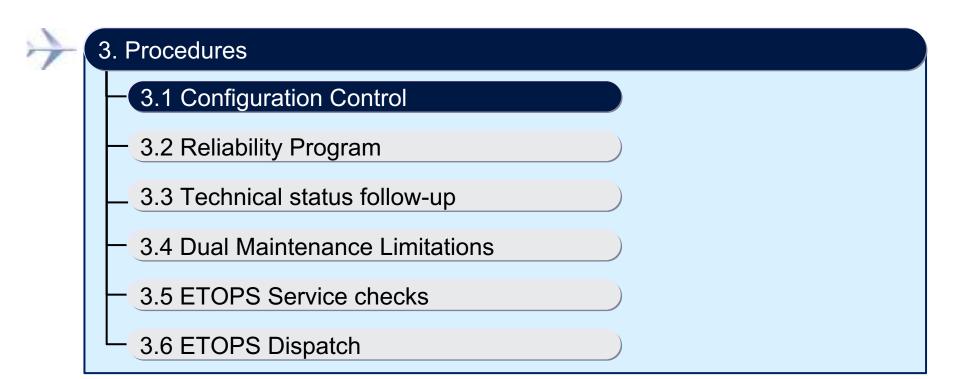
4. Conclusion



### Module 4: Review of Maintenance Requirements – Agenda

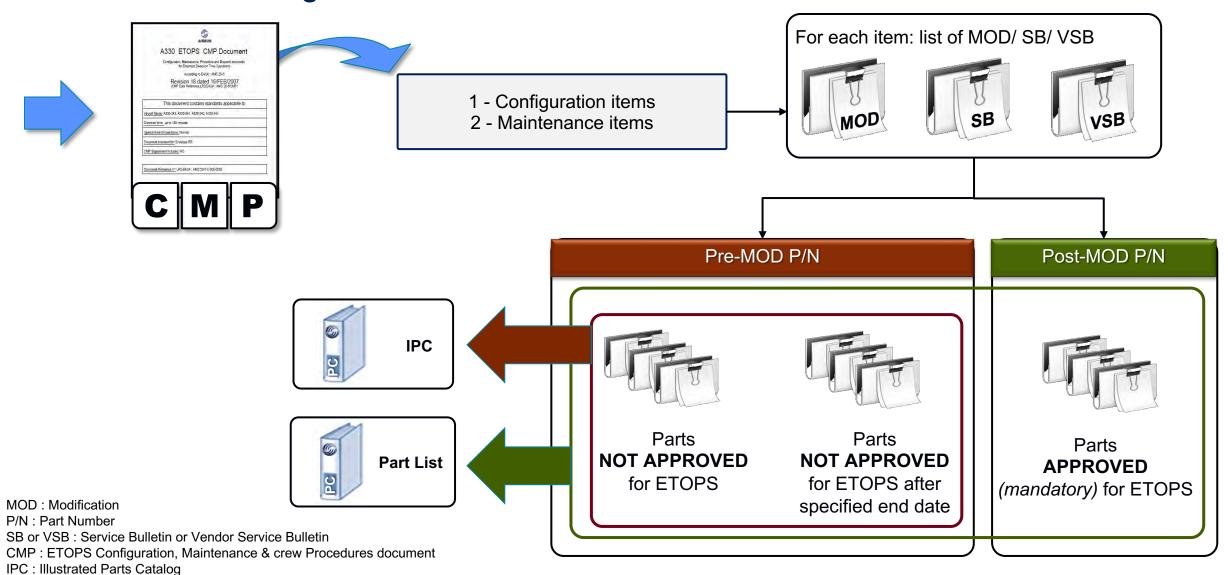
1. Introduction

2. Maintenance Policies



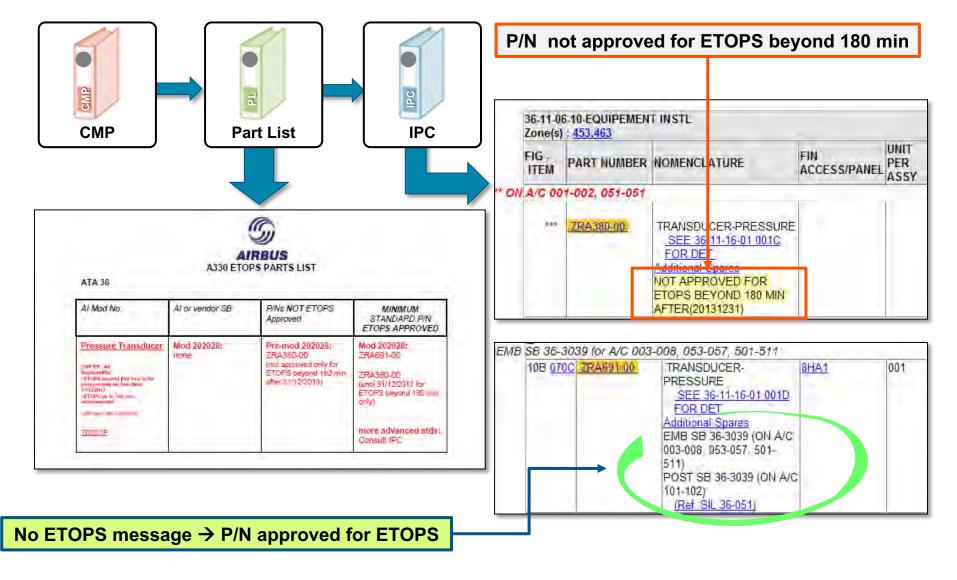


#### Procedures - Configuration control - Parts identification





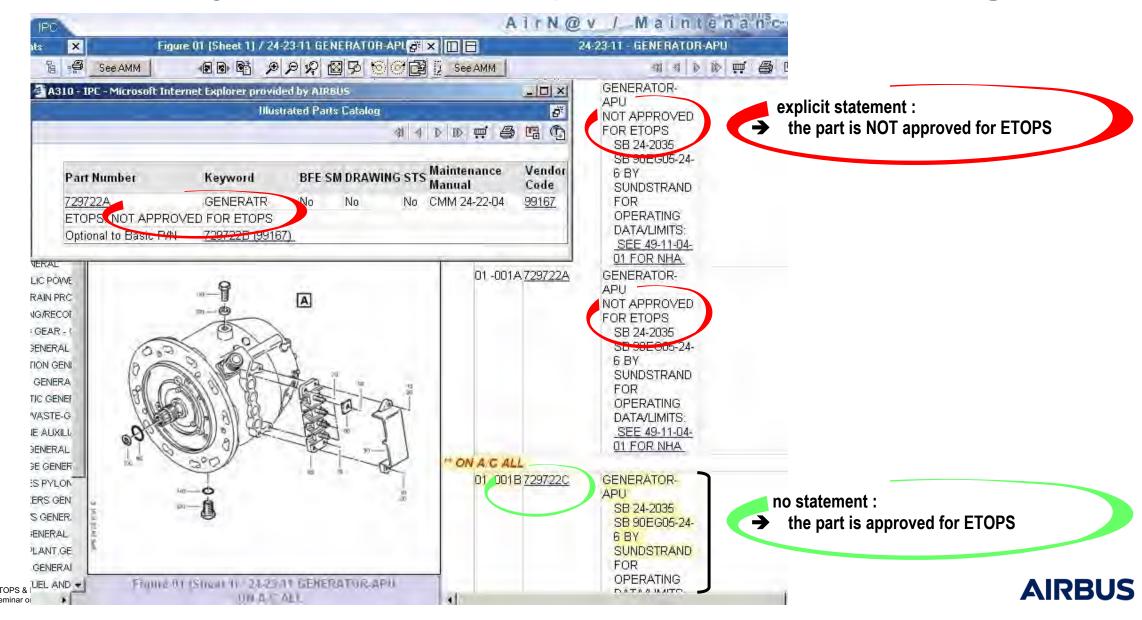
### Procedures - Configuration control - Parts identification





# Procedures - Configuration control - Example of ETOPS criteria in AirN@v

Page 89



### Procedures - Configuration control - Parts provisioning

#### Operators

#### The Assessment of

- ETOPS MEL requirements
- CMP Document-Configuration Standards / Parts List
- Reliability Data
- Area of operation / Route structure

#### Allows to define

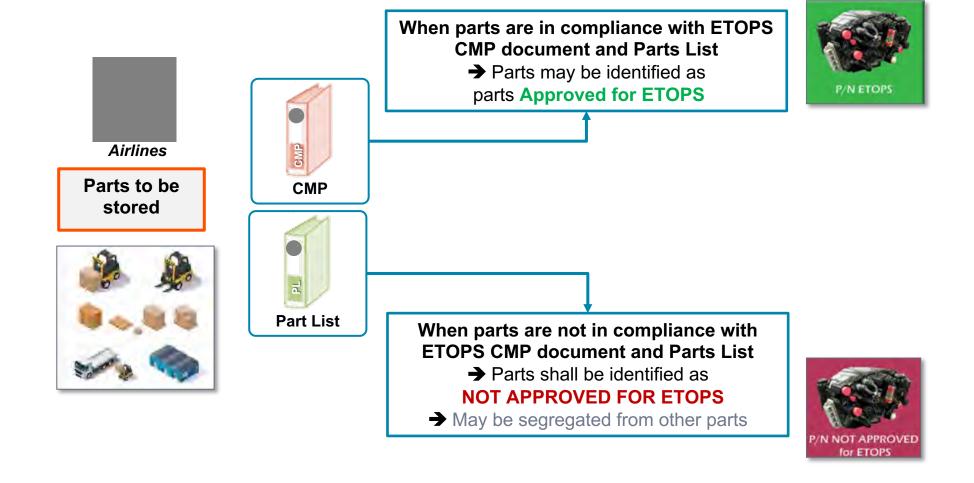




- For Main Base and Outstations
- In ETOPS Flight Kit (dependent of type / area of operation)

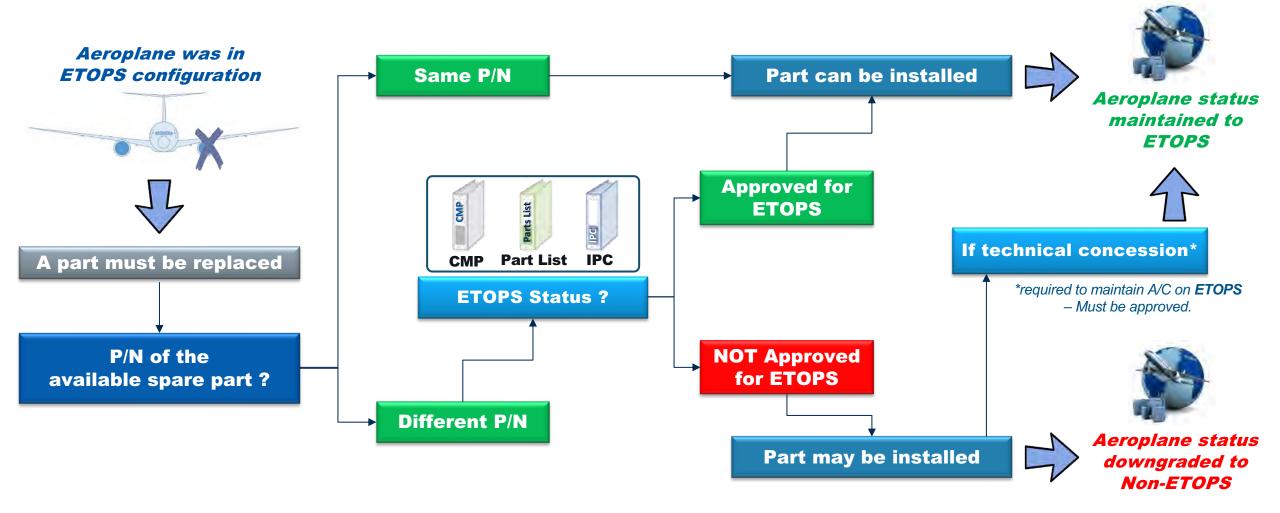


# Procedures - Configuration control - Storage





### Procedures - Configuration control - Parts replacement





### Procedures - Configuration control - Tech log management



The airline is required to develop procedures to inform Dispatchers and Flight Crews about the aircraft's ETOPS / EDTO dispatch status.

#### Addressed in the Technical Logbook:

- ETOPS dispatch statements; or
- Reference to an ETOPS dispatch sheet



To clearly reflect the aircraft's **ETOPS / EDTO operational status.**  Example of logbook statement if PART installed is

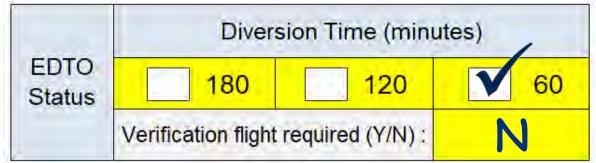
**NOT APPROVED for ETOPS / EDTO** 



ACTION TAKEN **ELEC GCU - NOT AT ETOPS STD** A/C DEGRADED NON ETOPS MEL / CDL ref Deferred Defect No. Raised

Example of related **EDTO** (**ETOPS**) dispatch status statement in the aircraft technical logbook:



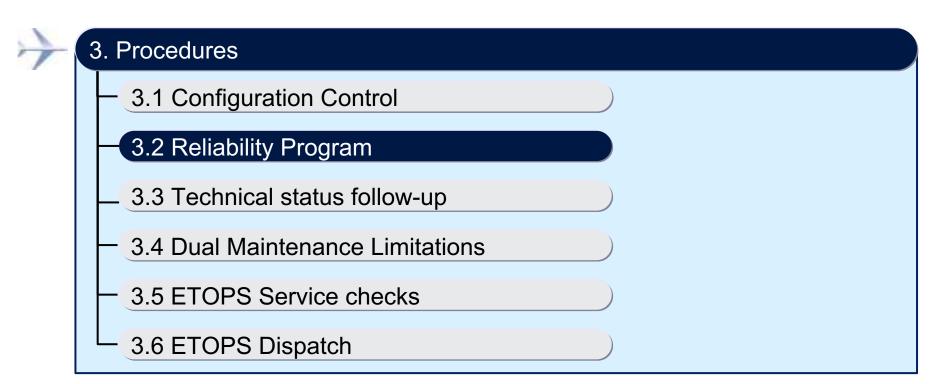




### Module 4: Review of Maintenance Requirements – Agenda

1. Introduction

2. Maintenance Policies







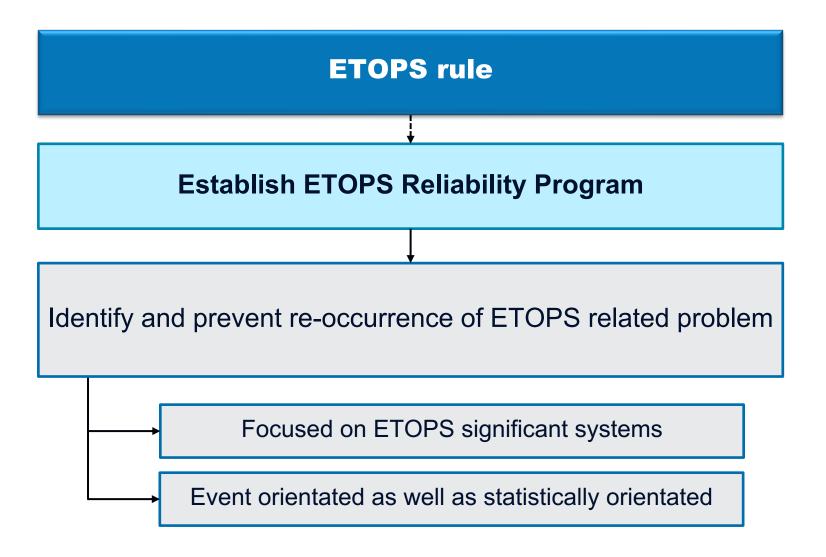
#### **Question 4.4:**

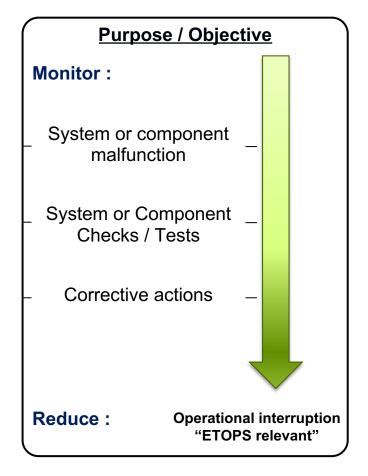
# What is the primary purpose of the Reliability Program for EDTO/ETOPS?

- 1. Allow early identification and prevention of EDTO/ETOPS related problems
- 2. Ensure that the IFSD rate is not exceeded
- 3. Monitor MTBF of EDTO/ETOPS Significant Systems
- 4. Reduce operational interruptions that are "EDTO/ETOPS relevant"



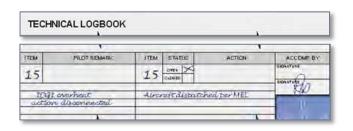
#### Procedures - Reliability program







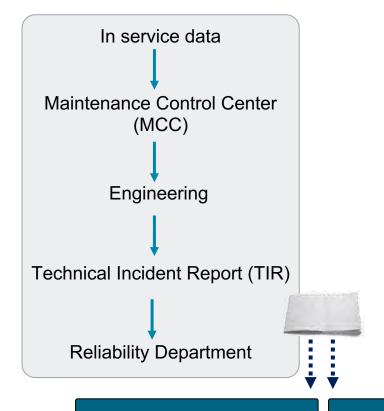
# Procedures - Reliability program - Reporting standards





The airline should define the **ETOPS Reliability Program** in its EMPM (ETOPS Maintenance Procedure Manual)

A list of typical events to be reported may be defined.



The ETOPS significant system List should be used to help defining the events

#### Examples:

**Uncommanded shut Down** 

Significant overspeed / over EGT

**Uncontained burst (compressor / turbine cooling fan)** 

Severe fuel / oil leak in the APU compartment

No relight in flight

Commanded or uncommanded in flight shut down

Uncommanded power loss / changes

**Nacelle fire warning** 

Oil / fuel leaks

**ATA 70** 

**ATA 49** 

**Manufacturer & Vendors** 

**Airworthiness Authority** 



### Procedures - Reliability program - APU reliability

#### Purpose:

To ensure successful start of the APU if needed during diversion



The APU must demonstrate a high degree of reliability and availability for ETOPS flights



Reliability targets:

- APU high altitude Start Success rate: 95%
- APU run reliability: depends on Type Design objectives Typically MTBF > 1000 APU hours

Recommendation to perform a high altitude cold soak start test after a maintenance action that may impact the start capability of the APU (\*):

- APU change
- Replacement of Electronic Control Box (ECB), Fuel Control Unit (FCU), ignitors...

(\*) Some National Authorities may still ask the Operator to perform the test of the APU on a regular basis, and it is expected that all ETOPS fleet is tested. In this case, typical interval ranges from 3 months to one year. Shorter interval (e.g. every month or every 100 flights) are typically requested during initial ETOPS operations.

Usually, a successful APU start is when the APU is started and running within 3 attempts.

Additional guidelines on APU in-flight start monitoring may be provided by the manufacturer.





#### **Question 4.5:**

APU in-flight start test should preferably be performed (select the most appropriate answer):

- 1. At the max ceiling of the airplane
- 2. Shortly after top of descent of the EDTO Flight
- 3. Shortly after take-off of the EDTO Flight
- 4. Within the EDTO Sector
- 5. During a 2 hour non-EDTO flight





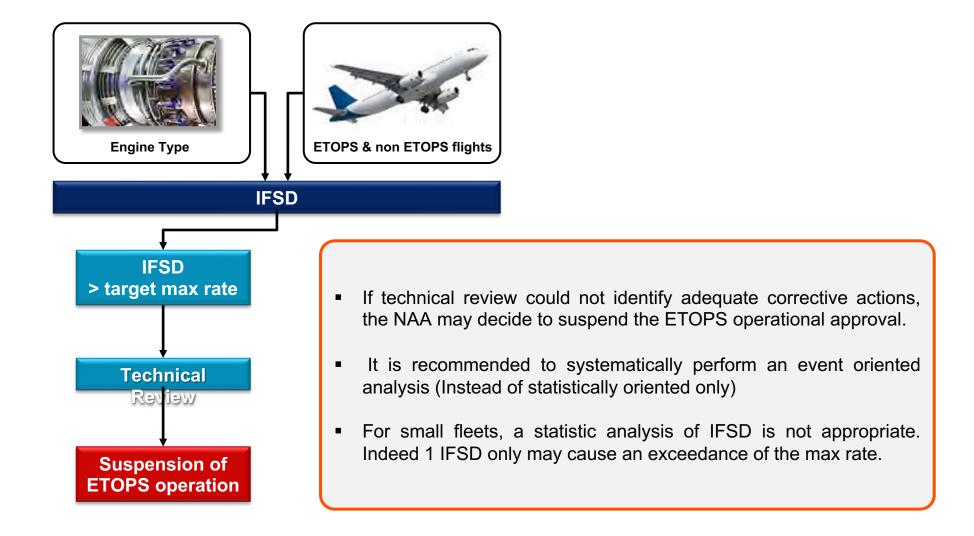
#### **Question 4.6:**

What is the minimum number of APU in-flight start tests that an Operator should perform before the EDTO approval may be granted?

- 1. Minimum number is 1,000
- 2. Minimum number is 100
- 3. Minimum number is 20
- 4. Minimum number is 5
- 5. Minimum number is 1
- 6. Minimum number is 0



#### Procedures - Reliability program - Propulsion system reliability







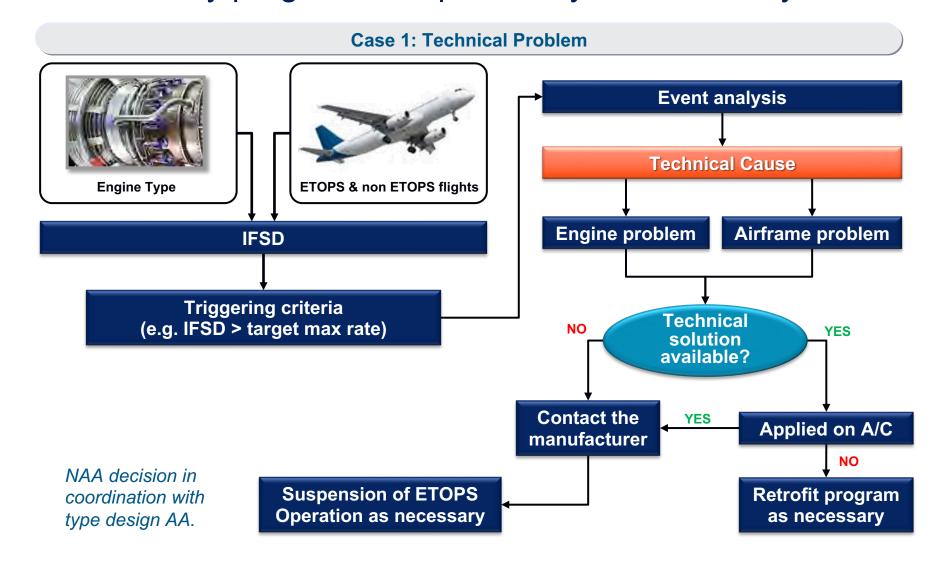
#### Question 4.7:

Which one of the following engine shutdown events should **NOT** be counted as an IFSD in the computation of the IFSD rate for EDTO?

- 1. Shutdown during climb prior to EDTO sector
- 2. Shutdown due to a bird strike
- 3. Shutdown after touchdown of an EDTO flight
- 4. Shutdown during cruise on a non-EDTO flight
- 5. Shutdown during a maintenance test flight

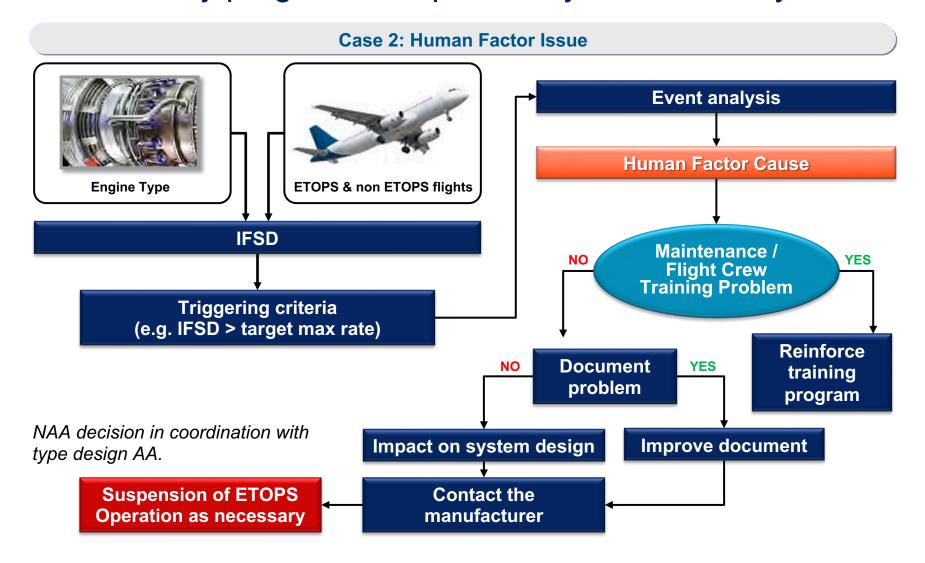


#### Procedures - Reliability program - Propulsion system reliability





#### Procedures - Reliability program - Propulsion system reliability





### Procedures - Reliability program - Engine condition monitoring

#### **Engine Condition Monitoring (ECM) Program** is an excellent tool for the operator and manufacturer to:

- Review engine trends on a continuous basis
- Assess the health of the airline's engines
- Reduce unscheduled maintenance and overhaul costs

#### Purpose of the **ECM (also called Engine Health Monitoring) Program** for ETOPS is to:

- Ensure that enough EGT margins are maintained for up to the maximum diversion time
- Predict / avoid that an engine is no longer capable of providing MCT power with sufficient margins

#### **ECM Trend Monitoring**

#### Short term review of ECM report

Note: short terms shifts may occur over a period of several days and require an immediate response to avert rapid engine deterioration, an in-flight shutdown, or an AOG.

- Short term shifts are best seen on ECM Reports.
- ECM's primary purpose is to find short term trends.

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32	T25 066.9 067.4	7295 052.0 069.5	₽3 142.7 147.6	73 411.7 420.0	HPTC 087.8 088.0	LPTC: 090.6 090.5	SVA 085, 62 087, 28	B25 NO1.5 NO1.8	DA DB		
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# Procedures - Reliability program - Oil consumption monitoring









Engine Oil consumption Monitoring

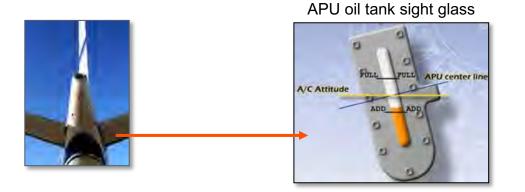
#### The engine and APU oil consumption monitoring program must:

- Be sensitive to oil consumption trend (Oil added with reference to a running average).
- Define responsibilities and interfaces.
- The **purpose** is to detect **sudden increase in oil consumption** and therefore prevent APU or Engine failure during an ETOPS flight.
- The program may also provide a procedure for oil analysis only if considered meaningful.



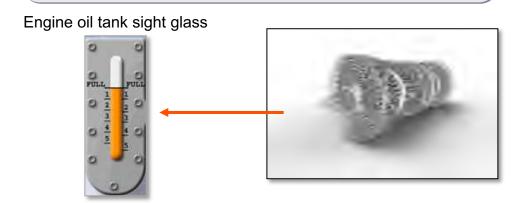
#### Procedures - Reliability program - Oil consumption monitoring

#### **APU Oil Quantity Indication**



Physical check

#### **Engine Oil Quantity Indication**





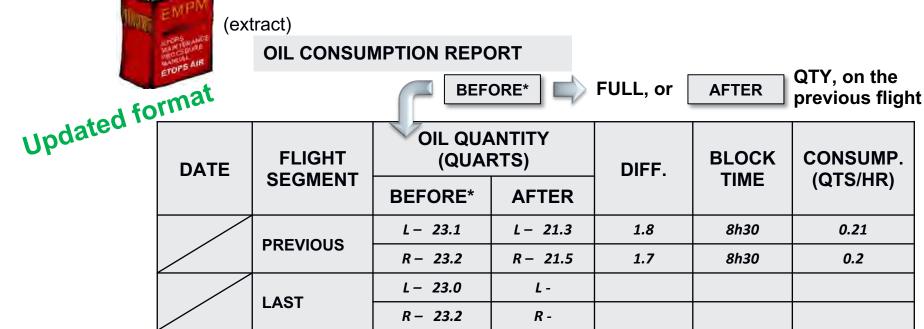
Cockpit

See "Service Check" to clarify when to perform cockpit checks or physical checks



# Example of calculation of OIL CONSUMPTION - on Ramp











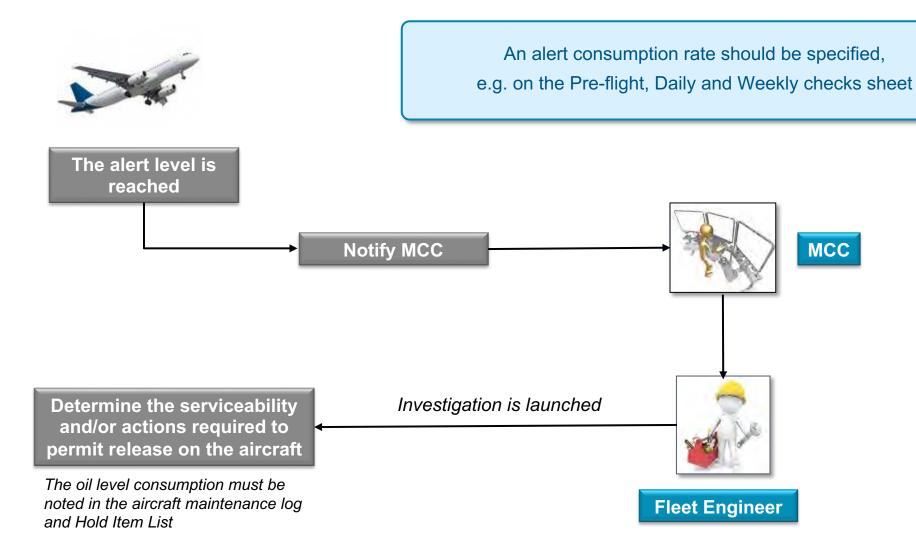
#### **Question 4.8:**

If there is no reference to oil consumption monitoring in the EDTO CMP Document, is oil consumption monitoring required for EDTO?

- 1. Yes
- 2. No



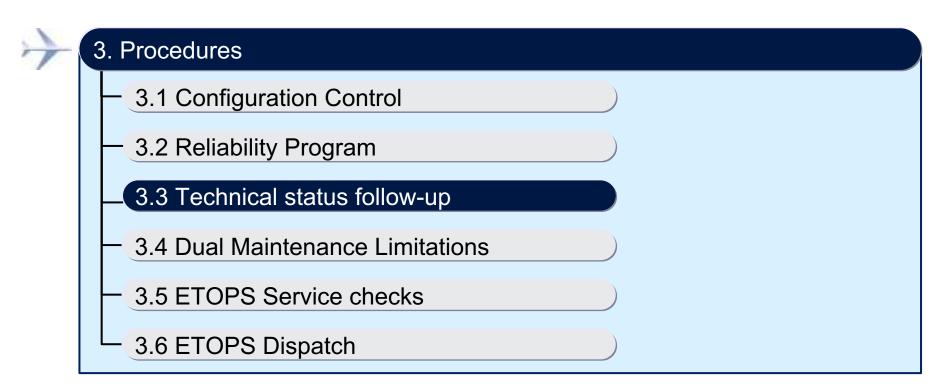
#### Procedures - Reliability program - Oil consumption monitoring





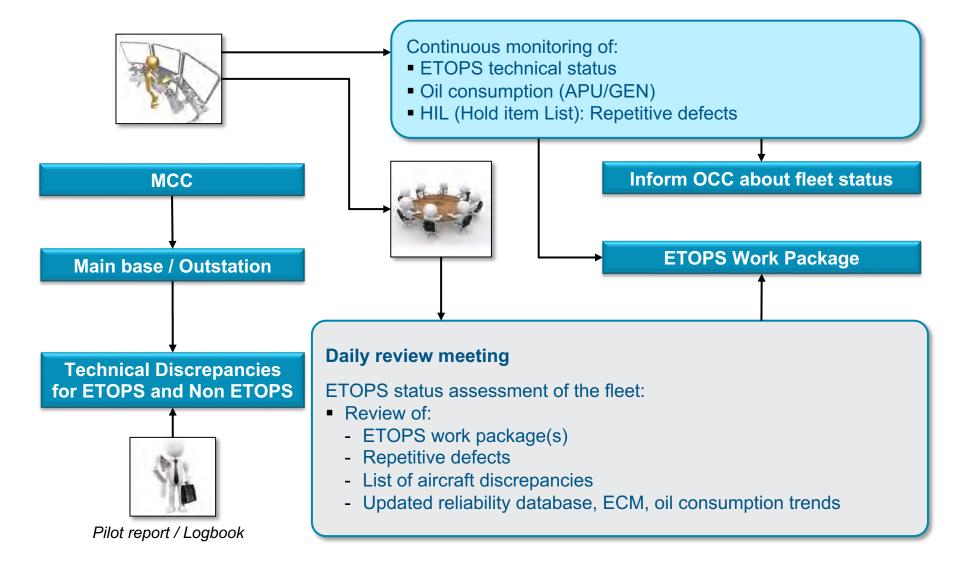
1. Introduction

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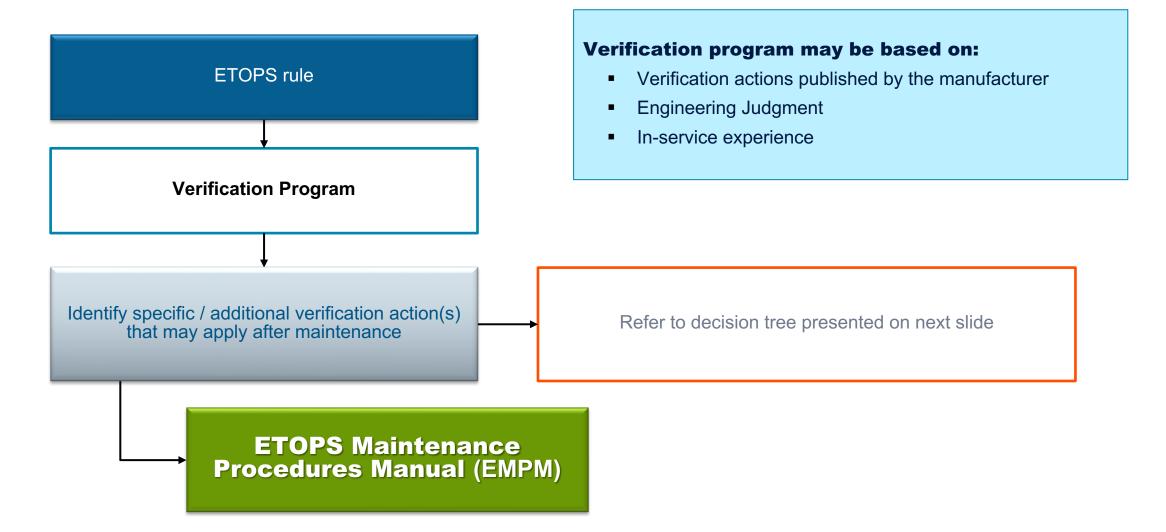




#### Procedures - Technical status follow-up - Review process

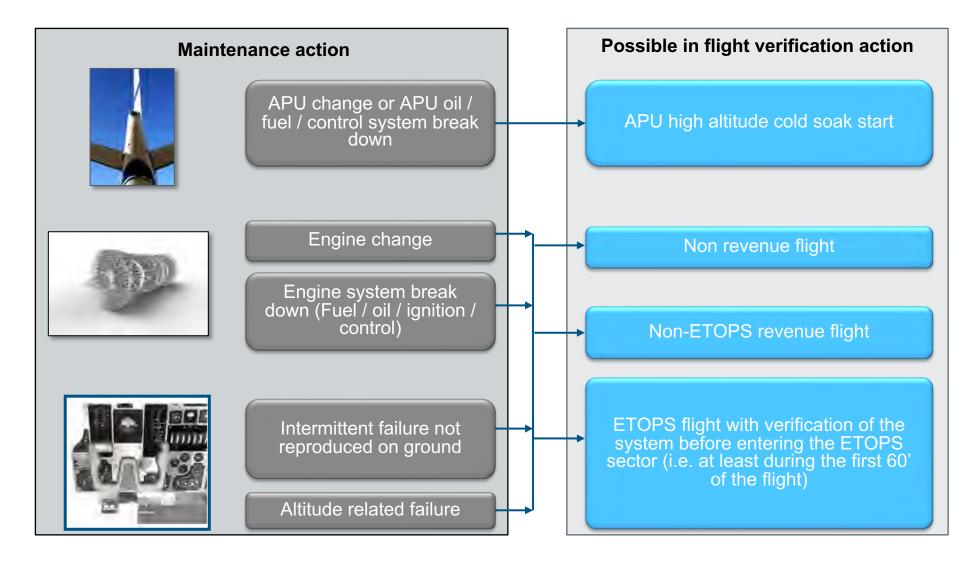


### Procedures - Technical status follow-up - Verification program





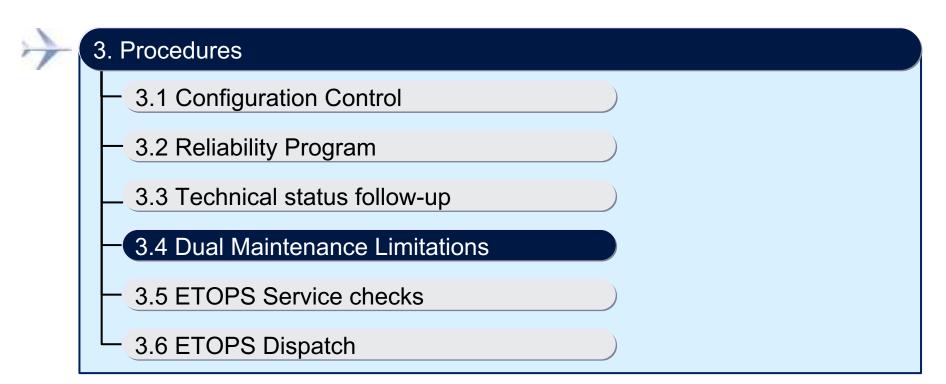
### Procedures - Technical status follow-up - Verification flight





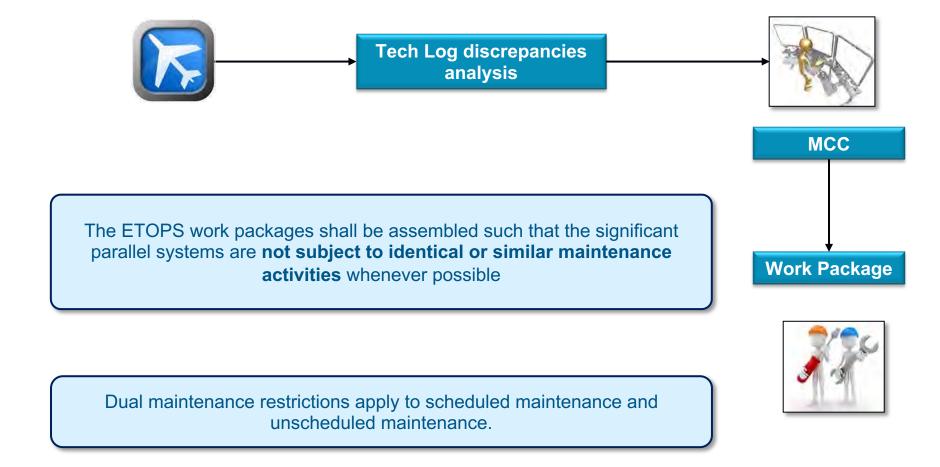
1. Introduction

2. Maintenance Policies





### Procedures - Dual maintenance on ETOPS significant systems







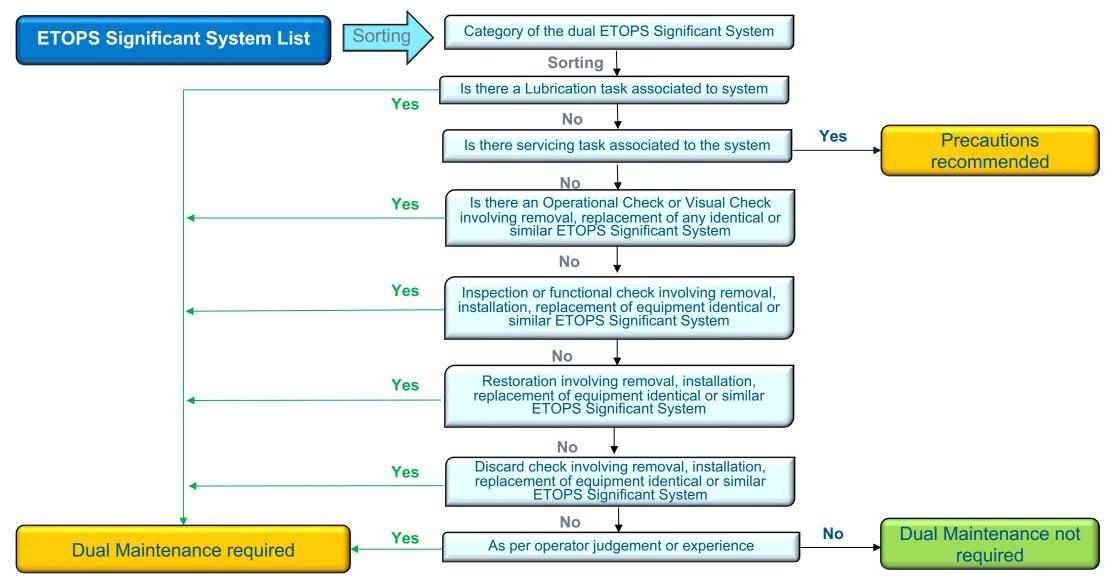
#### **Question 4.9:**

Simultaneous removal/installation of the IDG and of the APU GEN is performed before the EDTO dispatch of the aeroplane. Is this subject to dual maintenance limitations?

- 1. Yes
- 2. No

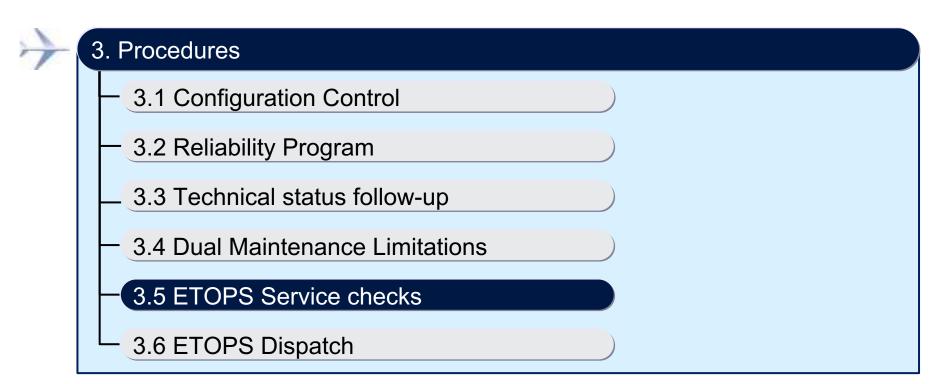


#### Procedures - Selection of ETOPS Dual Maintenance Tasks



1. Introduction

2. Maintenance Policies





#### Procedures - Service checks



Verify the condition of A/C Systems prior to the flight

**ETOPS** service check

Standard items

• Walk around items, wheels, brakes and tyres, ...

Long range items

• Survival equipment, communication, navigation, oxygen, ...

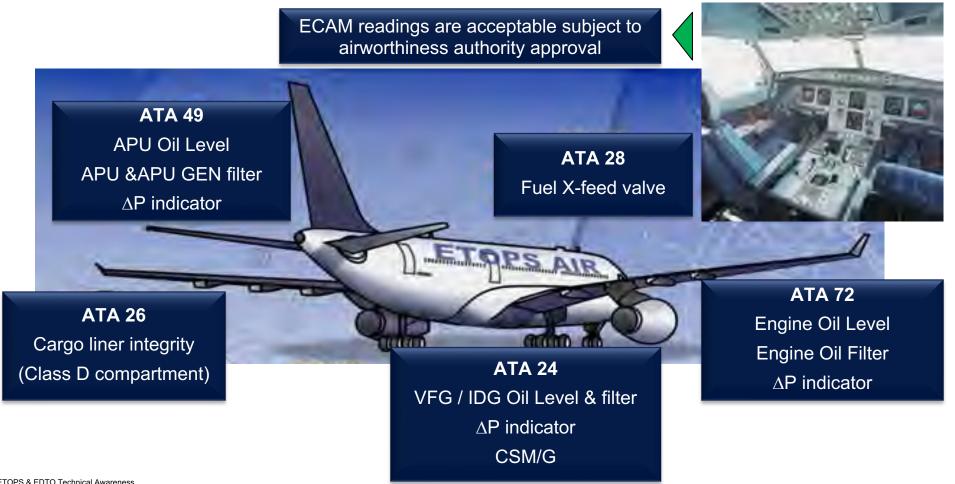
Items specific to the ETOPS dispatch

• e.g. Fuel X-feed valve, ...



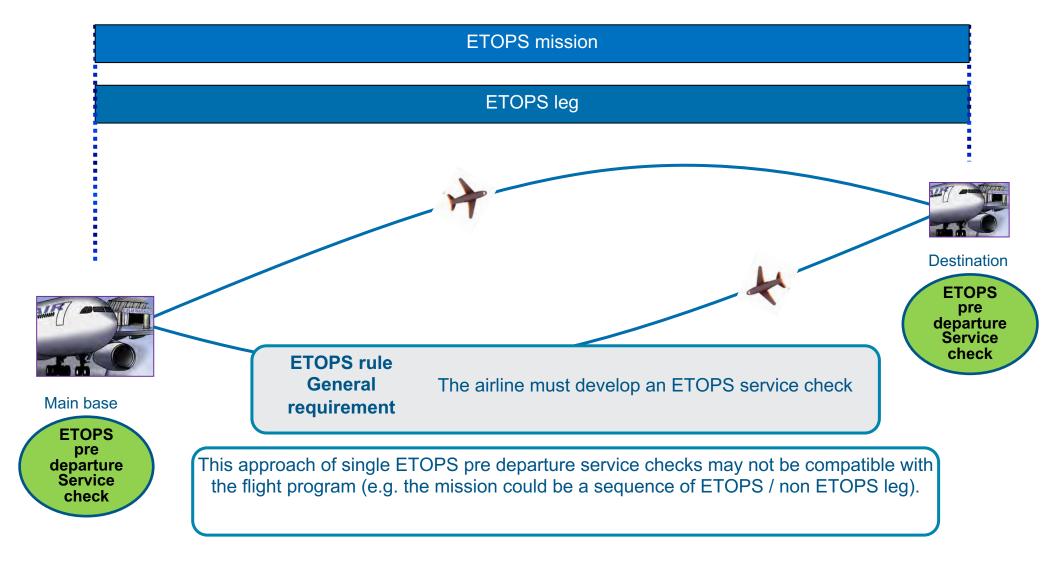
#### Procedures - Service checks

#### **Typical ETOPS Service Check items**



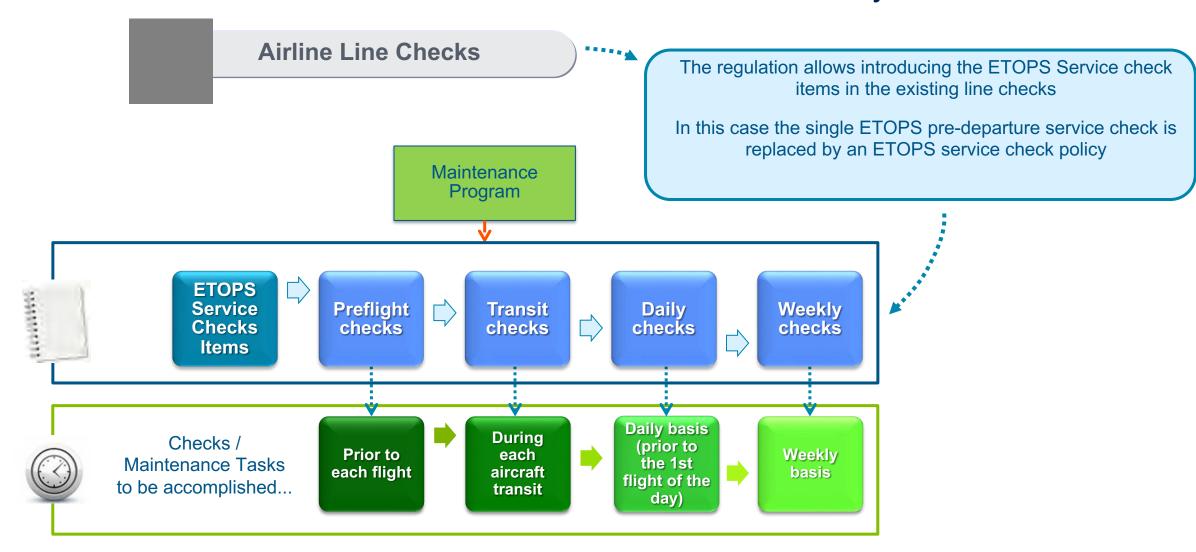


#### Procedures - Service checks - Basic interpretation





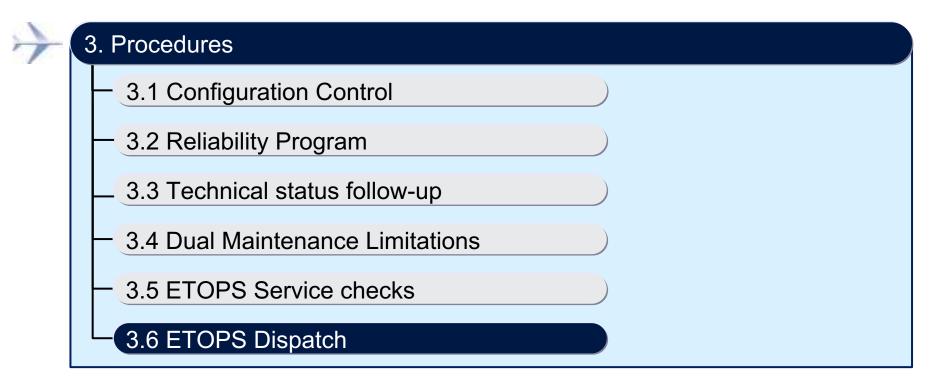
#### Procedures - Service checks – ETOPS Service Check Policy





1. Introduction

2. Maintenance Policies





#### Procedures - Dispatch - MMEL

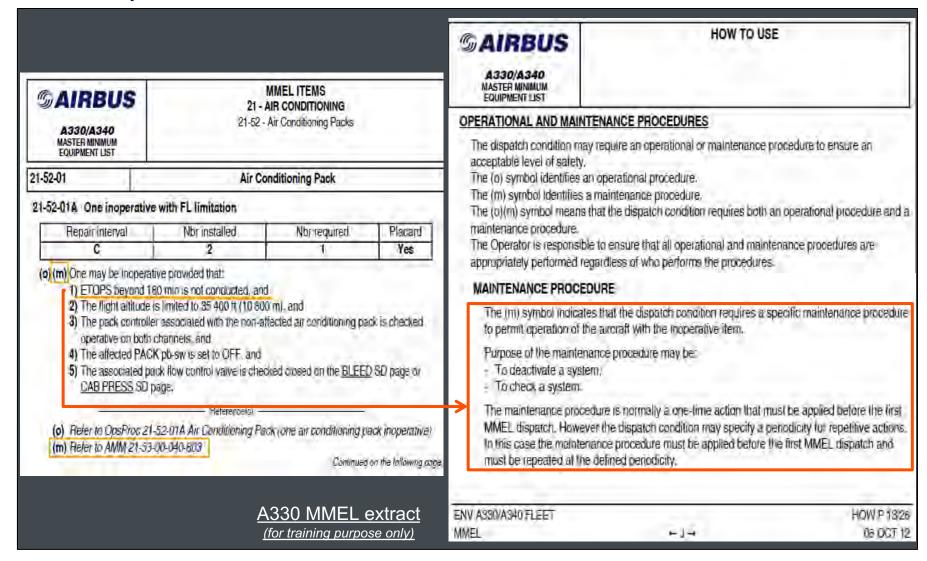
Relation between the CMP Dispatch standard and (m) procedures of MMEL.

**ATA 21** CMP Standards applicable to A330-343 Fitted with: FORWARD CARGO VENTILATION WITH TEMPERATURE CONTROL SYSTEM MOD/SB: MOD 40097 OR MOD 45199 OR MOD 57756 Dispatch item n°: Area of Operation: Normal Revision n°1 21-4-0000-001 Diversion Time Range: Compliance Schedule: from 60 to 180 min Item not applicable for operations up to 180 min D.T. greater than 180 min See text below Dispatch with one or both Air Conditioning Pack inoperative is not allowed for ETOPS beyond 180 minutes. Cross Reference: N/A Solutions: n°1: MMEL 21.52.01

> A330 CMP extract (for training purpose only)

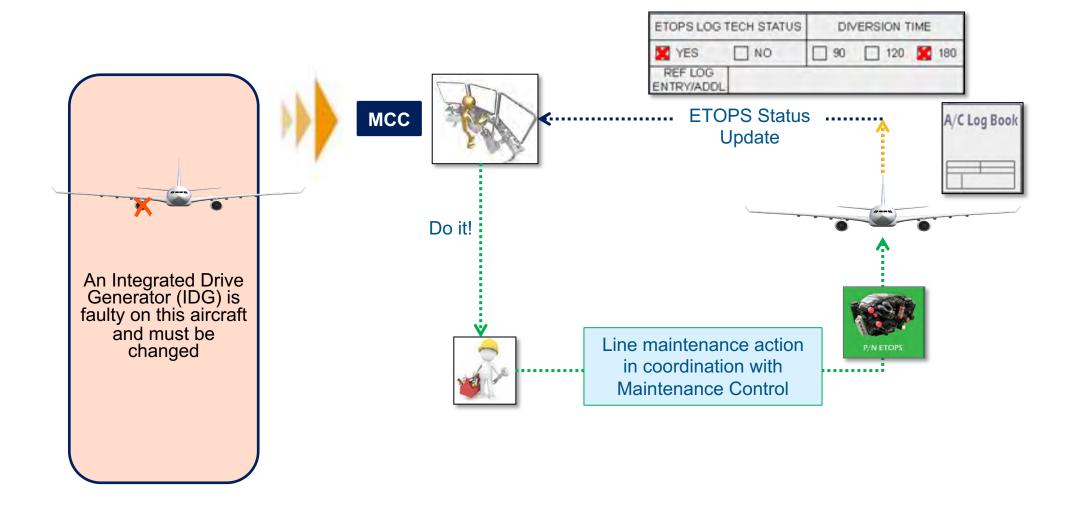


### Procedures - Dispatch - MMEL





### Procedures - Dispatch - Tech log handling

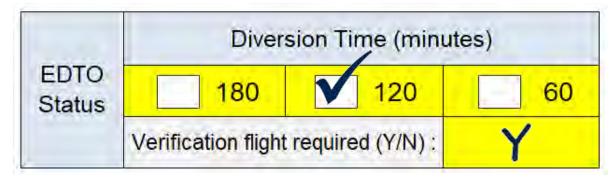






#### **Question 4.10:**

## What is the meaning of the status shown below?



- The EDTO capability of the aircraft is reduced to 120 min due to the need for a
  verification flight
- 2. The aircraft must be dispatched on a 120 min EDTO verification flight
- 3. A verification flight is required if the Diversion Time is 120 min or more
- 4. The EDTO capability of the aircraft is 120 min and a verification flight is required



1. Introduction

2. Maintenance Policies

3. Procedures



4. Conclusion



#### ETOPS / EDTO Maintenance - Conclusion

- The objective of ETOPS rules is to maintain the risk at a minimum constant value.
  - To do so, procedures such as dual maintenance, service check, monitoring (Engine / APU oil, etc.), configuration control, verification flight and reliability program have to be set.
- In this frame, the airline has to define and implement an ETOPS maintenance program to address the items above.
- Roles and responsibilities are detailed in the EMPM, which describes the operator's procedures and requirements for ETOPS.
  - Coordination and communication between Maintenance and Flight Operations organizations is necessary for reliable ETOPS operations
- Training and qualification of the involved maintenance personnel is also required for ETOPS operations.



#### Content of this Technical awareness on ETOPS / EDTO:



- **ETOPS Capability of the Aircraft**
- 3 Overview of Operational Approval - ETOPS Maintenance & Flight Ops processes
- **Review of ETOPS Flight Ops Requirements & Practices**
- **Review of ETOPS Maintenance Requirements & Practices**
- **Conclusions**



#### Conclusions

- ETOPS is considered as one of the major contributor to the global aviation safety in the last decades by introducing:
  - Higher aircraft & engine design and reliability standards
  - Robust operational and maintenance practices
- Latest ETOPS rules, which may be named EDTO, are based on the same initial concepts:
  - > Set requirements for design and reliability standards for twin engine aircraft,
  - Introduce enhanced operational practices (Maintenance & flight operations)
  - Demonstrate operational readiness (Aircraft and operator)
- These ETOPS / EDTO basic principles aims at:
  - > Precluding and Protecting the diversion should it occur.
  - > ETOPS rules have evolved mainly to allow "non-limiting" ETOPS operations of latest generation of twin engine aircraft
- ETOPS operations are nowadays extensively performed worldwide
  - > ETOPS capability is considered in the basic design of modern twins
  - Huge majority of operators of long range twins are flying ETOPS
  - ➤ Huge majority of ETOPS flights with twins remains with 180 min or less diversion time
  - ➤ ETOPS Flight Ops processes (e.g. selection of en-route alternates, consideration of relevant time limited system, ...), based on Industry good practices, are becoming applicable to operations with extended diversion time of airplanes with more than 2 engines
- Continued commitment to ETOPS / EDTO requirements is necessary to ensure safe and reliable operations, and in particular for the twins to maintain their remarkable ETOPS / EDTO safety records.



# Thank you

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AA ABD A/C AC ACJ ACMS A/P A/THR	Airworthiness Authorities Airbus Directives Aircraft Advisory Circular Advisory Circular Joint Aircraft Condition Monitoring System Auto Pilot Auto Thrust	CMS COI CP CPC CSM/G CTC CWC	Centralized Maintenance System Carry Over Item Critical Point Cabin Pressure Controller Constant Speed Motor/ Generator Conditions Techniques Complémentaires Continuing Wind Component
AD ADD AFM AIDS AMC AMJ AML AMM	Airworthiness Directive Aircraft Deferred Defect Aircraft Flight Manual Aircraft Integrated Data System (A320) Acceptable Means of Compliance Advisory Material Joint Aircraft Maintenance Log Aircraft Maintenance Manual	DA DGAC DH DME DPI DT	Decision Altitude Direction Générale de L'Aviation Civile) (French Civil Aviation Administration) Decision Height Distance Measuring Equipment Differential Pressure Indicator Diversion Time
AOC APU ARM ARS ATA ATC	Air Operator Certificate (AOC Holder) Auxiliary Power Unit Airworthiness Review Meeting Airworthiness Review Sheet Air Transport Association Air Traffic Control  Civil Aviation Publication	EASA ECAM ECB ECM EDTO EEP EGT	European Aviation Safety Agency Electronic Centralized Aircraft Monitoring Electronic Control Box Engine Condition Monitoring Extended Diversion Time Operations ETOPS Entry Point Exhaust Gas Temperature Entry Into Service ETOPS Maintenance Procedure Manual Engine Extended Range Extended Range OperationS ETOPS Technical Concession List
CDL CFP CHDO CMP	Configuration Deviation List Computerized Flight Plan Certificate Holding District Office Configuration, Maintenance, Procedures (ETOPS CMP Document)	EIS EMPM ENG ER EROPS ETCL	



	ETOPS	Extended Twin engine A/C OPerationS		IDG	Integrated Drive Generator
	ETOPS	Extended Operations (FAA definition)		IEM	Interpretative And Explanatory Material
	ETP	EquiTime Point	-	IFP	In-Flight Performance
	EXP	ETOPS Exit Point		IFSD	In-Flight Shut Down
				IL	Information Leaflet
	FAA	Federal Aviation Administration		ILS	Instrument Landing System
	FAR	Federal Aviation Regulations		IPC	Illustrated Parts Catalog
	FCOM	Flight Crew Operating Manual		ISA	International Standard Atmosphere
	FCU	Flight Control Unit	_		
	FCU	Fuel Control Unit		JAA	Joint Airworthiness Authority
	FH	Flight Hour	J	JAR	Joint Airworthiness Requirements
	FL	Flight Level			
	FMGS	Flight Mngmt Guidance envelope syst.		LCL	Line Check List
	FMS	Flight Management System		LRC	Long Range Cruise
	FORDRS	Flight Operational and Reliability Data		LROPS	Long Range OPerationS
		Retrieval System			
			M	MAN	Maintenance Advisory Notice
	GAI	General Acceptable means of	IAI	MCC	Maintenance Control Center
		of compliance/Interpretative and		MCT	Maximum Continuous Thrust
		explanatory material		MDA	Minimum Descent Altitude
	GM	Guidance Material		MDH	Minimum Descent Height
	GCU	Generator Control Unit		MEL	Minimum Equipment List
				MLS	Microwave Landing System
	HIL	Hold Item List		MME	Maintenance Management Exposition
П	HF	High Frequency		MMEL	Master Minimum Equipment List
	HP	Horse Power		MMO	Maximum Operating Mach number
				MNPS	Minimum Navigation Performance Specification
	IAS	Indicated Air Speed		MOD	Modifications
	ICAO	International Civil Aviation Organization		MOE	Maintenance Organisation Exposition
-				MPD	Maintenance Planning Document



M	MRB MRBR MSA MTBF MTBR MTBUR	Maintenance Review Board Maintenance Review Board Report Minimum Safe Altitude Mean Time Between Failure Mean Time Between Removal Mean Time Between UnscheduledRemoval	R	RFFS RH RTB RVR RWC	Rescue and Fire Fighting Services Relative Humidity Reliability Tracking Board Runway Visual Range Returning Wind Component Runway
	MTOP MTOW	Maintenance Task Operating Plan  Maximum TakeOff Weight	3	SB SSA	Service Bulletin System Safety Assessment
N O	NAA NAI NAT NDB NPA NT NTO OCC OCM OPS	National Airworthiness Authorities Nacelle Anti Ice North Atlantic Tracks Non Directional Beacon –Nav Aids Notice of Proposed Amendment Note No Technical Objections  Operational Control Center Oil Consumption Monitoring OPerationS	T	TAS TAT TCDS TDD Techlog TIR TFU T/O TP TSM	True Air Speed Total Air Temperature Type Certificate Data Sheet Airbus Technical Design Directives Technical Log Book (AML) Technical Incident Report Technical Follow-Up sheet Take-Off Technical Publication Trouble Shooting Manual
P	O.R  PCM PIREPS P/N PM	Operational Reliability  Program Certification Manager Pilot Reports Part Number Published Minima	V W	VSB VMO VOR V/S	Vendor Service Bulletin Maximum operating Speed Very Omnidirectional Range- Nav Aids Vertical Speed
Q	PPIPC QTS	Powerplant Illustrated Parts Catalog  Quarts (in US: 0.946 L)	Z	WAI ZFW	Wing Anti Ice Fuel Weight

