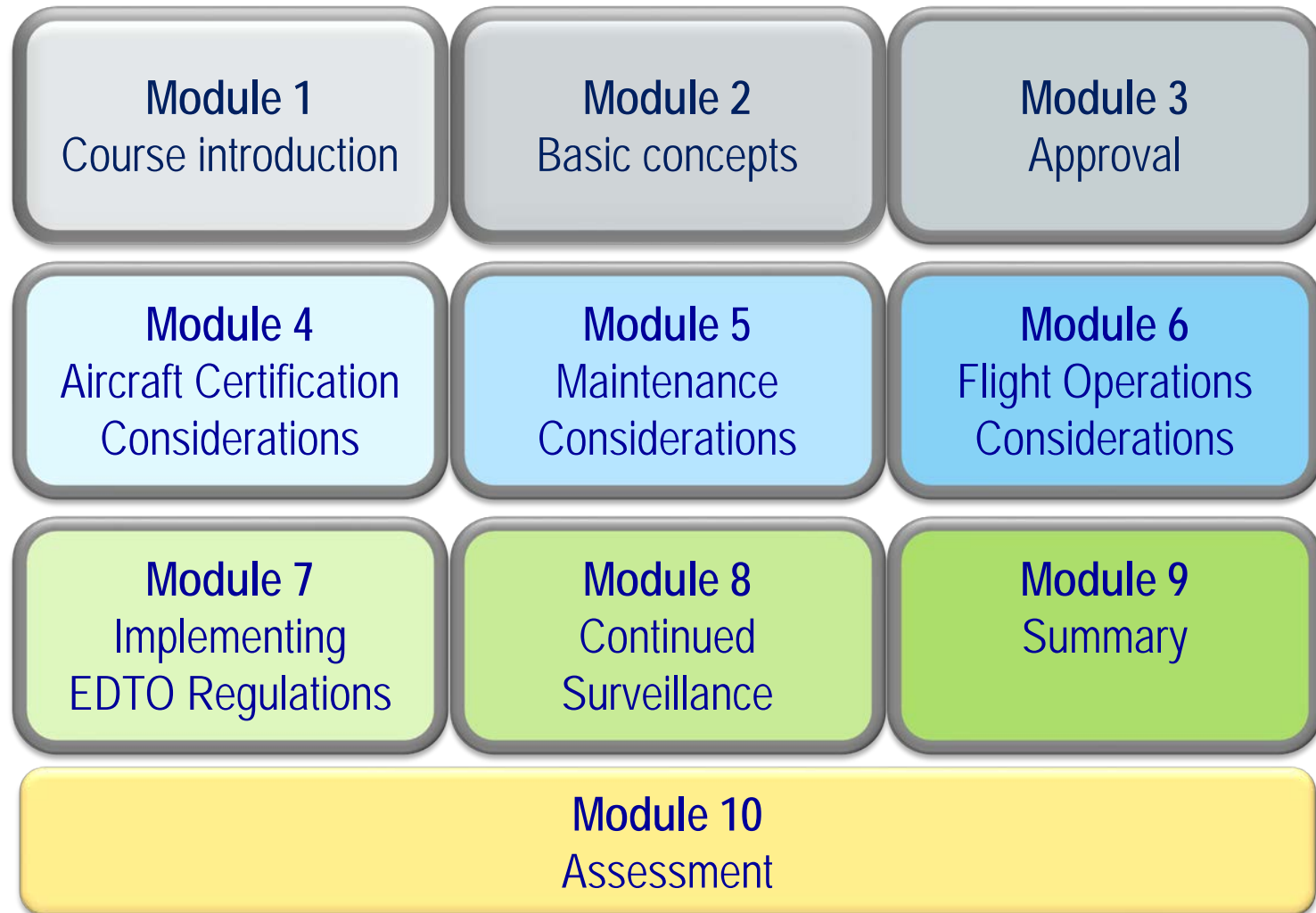


EDTO Workshop

Module N° 9 – Summary





- ❖ Review during this module the main items detailed in the other modules in order to clarify any misunderstanding by the audience, and propose a conclusion

- ❖ Basic EDTO Concepts
- ❖ Main evolutions of EDTO requirements
- ❖ EDTO approval concepts (aircraft assessment and operator's operational approval)
- ❖ Main EDTO Flight Ops requirements
- ❖ Main Maintenance requirements
- ❖ Continued Surveillance
- ❖ Conclusion

❖ Main Concepts and evolutions

❖ EDTO Approval:

- ❖ Aircraft Type Design assessment
- ❖ Operational approval

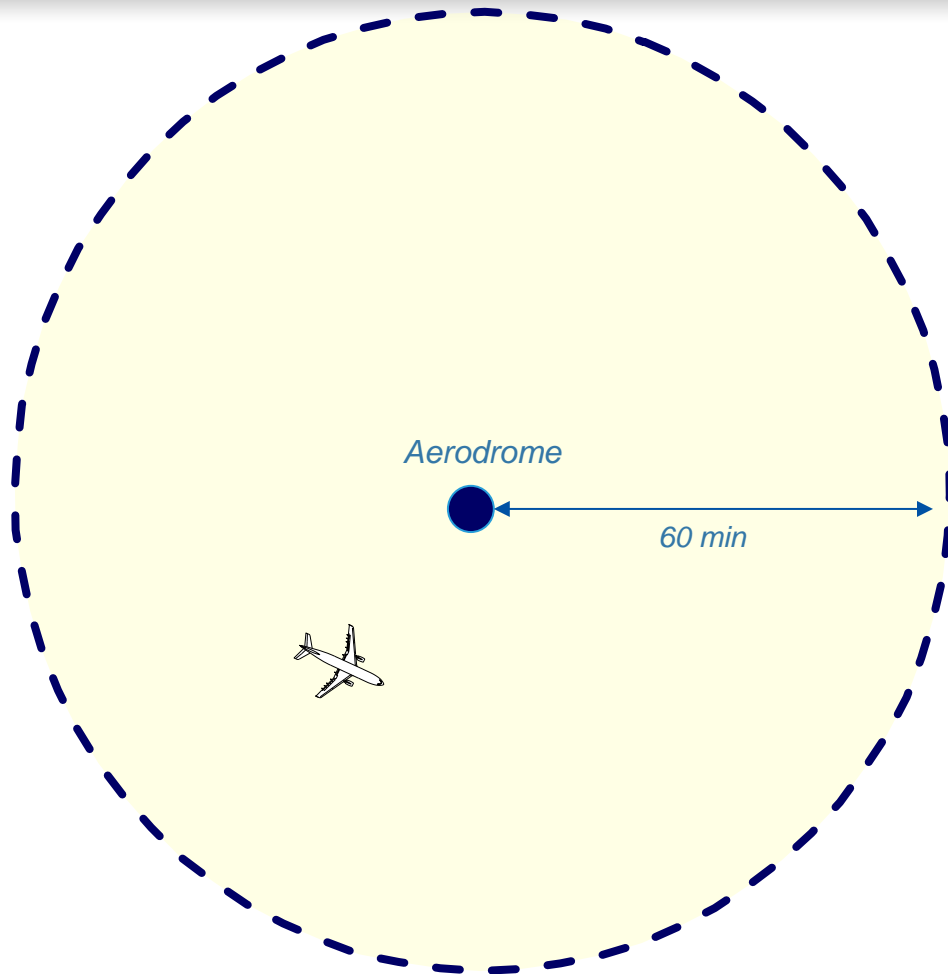
❖ Main EDTO operational requirements

- ❖ Flight operations
- ❖ Maintenance

❖ Continued Surveillance

❖ State Implementation

❖ Conclusions



When under the established Threshold:

- Additional flight planning principles apply
 - Operational control and dispatch procedures
 - Identify alternate aerodromes
 - Information on those aerodromes
 - For Twins, that the aerodrome will be available
 - Training programmes

Operations beyond the Threshold require a Specific Approval

There are sets of Certification & Operational requirements which apply when an aircraft is operated beyond applicable threshold

Aerodrome



60 min

X min



Maximum time (expressed in distance) that an aeroplane can be to an aerodrome

This defines the area of operation

Aerodrome

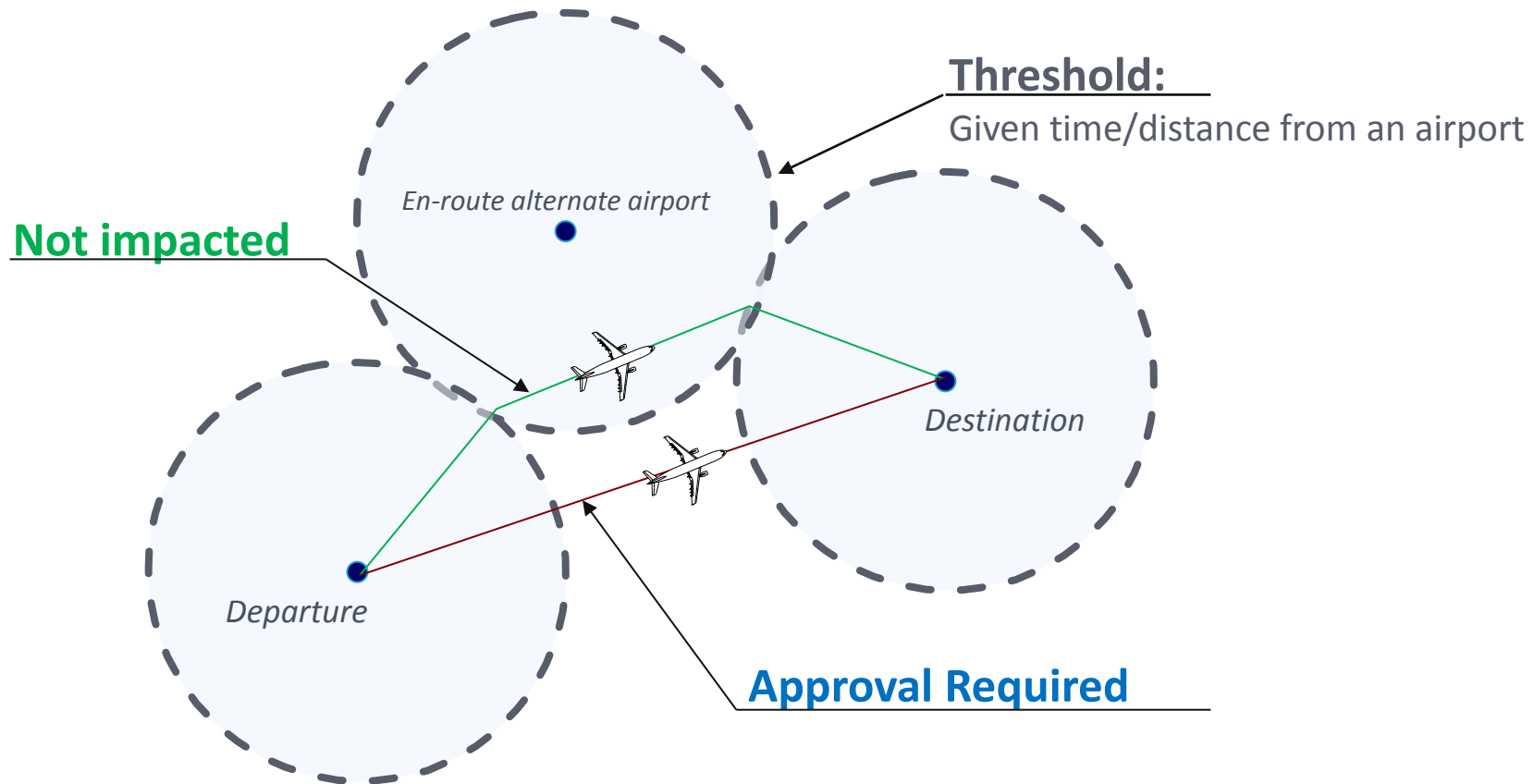
60 min

X min

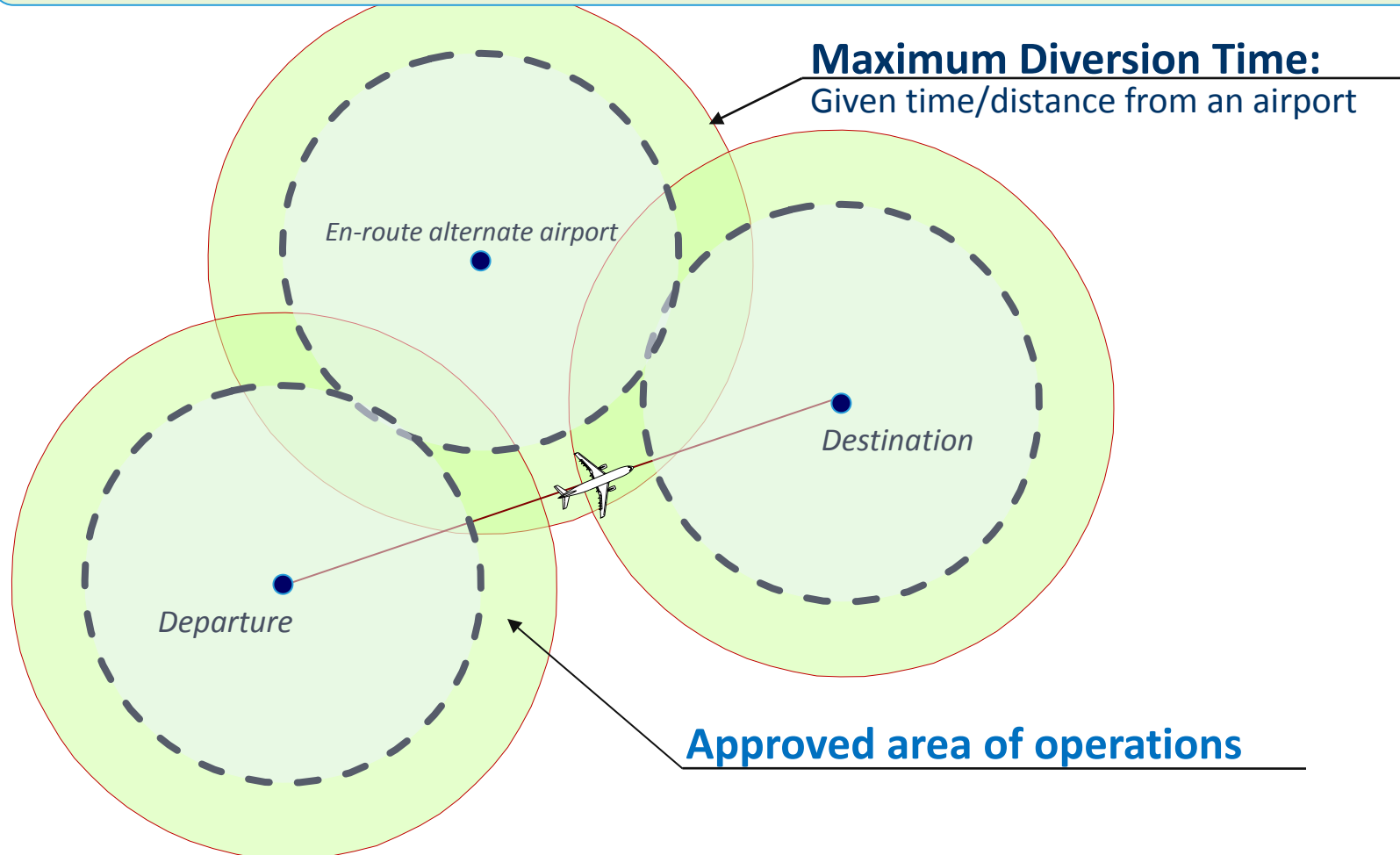
X min



There are sets of **Certification** & **Operational** requirements which apply when an aircraft is operated **beyond applicable threshold**



These **Certification & Operational** requirements, called **EDTO** (or ETOPS or LROPS) also introduce the concept of **Maximum Diversion Time**, thus defining an approved authorized area of operations





**Use of the term
“ETOPS” or “EDTO”
in the aircraft documentation:**

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

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

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

Note 1.— EDTO may be referred to as ETOPS in some documents.

- The new ETOPS requirements are renamed EDTO by ICAO in 2012:
 - Applicability is extended to tris & quads for operations beyond 180 min (AEO speed):
 - No change for the vast majority of current long-range operators
 - No additional maintenance requirements nor additional certification requirements
 - Main novelties: consideration of Time Limited System / identification of en-route alternates and verification of weather
 - The term “ETOPS” may still be used instead of “EDTO”
 - Twins certificated under the previous rules can operate ETOPS up to 180 min DT.
- The new EDTO / ETOPS requirements are mainly an evolution of existing rules, adapted to address the specificities of long range flights when diversion time exceeds 180 min (OEI speed, ISA), through new/revised criteria on:
 - Engine reliability: world fleet IFSD rate less than 0.01/1000 EFH for an airplane/engine combination is required for >180'
 - Consideration at dispatch of time capability of the Time limited systems :
 - Cargo Fire Suppression vs diversion at AEO speed
 - Other most limiting Time Limited System vs diversion at OEI speed
 - Previous ETOPS requirements for A/C equipment redundancies, crew training, maintenance standards and operating rules are optimized and completed

EDTO regulations

The intent of the new regulations

Basically, the ETOPS concept implemented 25 years ago is not changed:

PRECLUDE a diversion by

Designing reliable A/C engines & systems

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

ETOPS Type Design & Reliability approval (Certification) of the Aircraft

Implementing specific maintenance precautions, conservative practices & readiness demonstration

⇒ **retain a high level of reliability**

ETOPS Operational Approval of the Airline

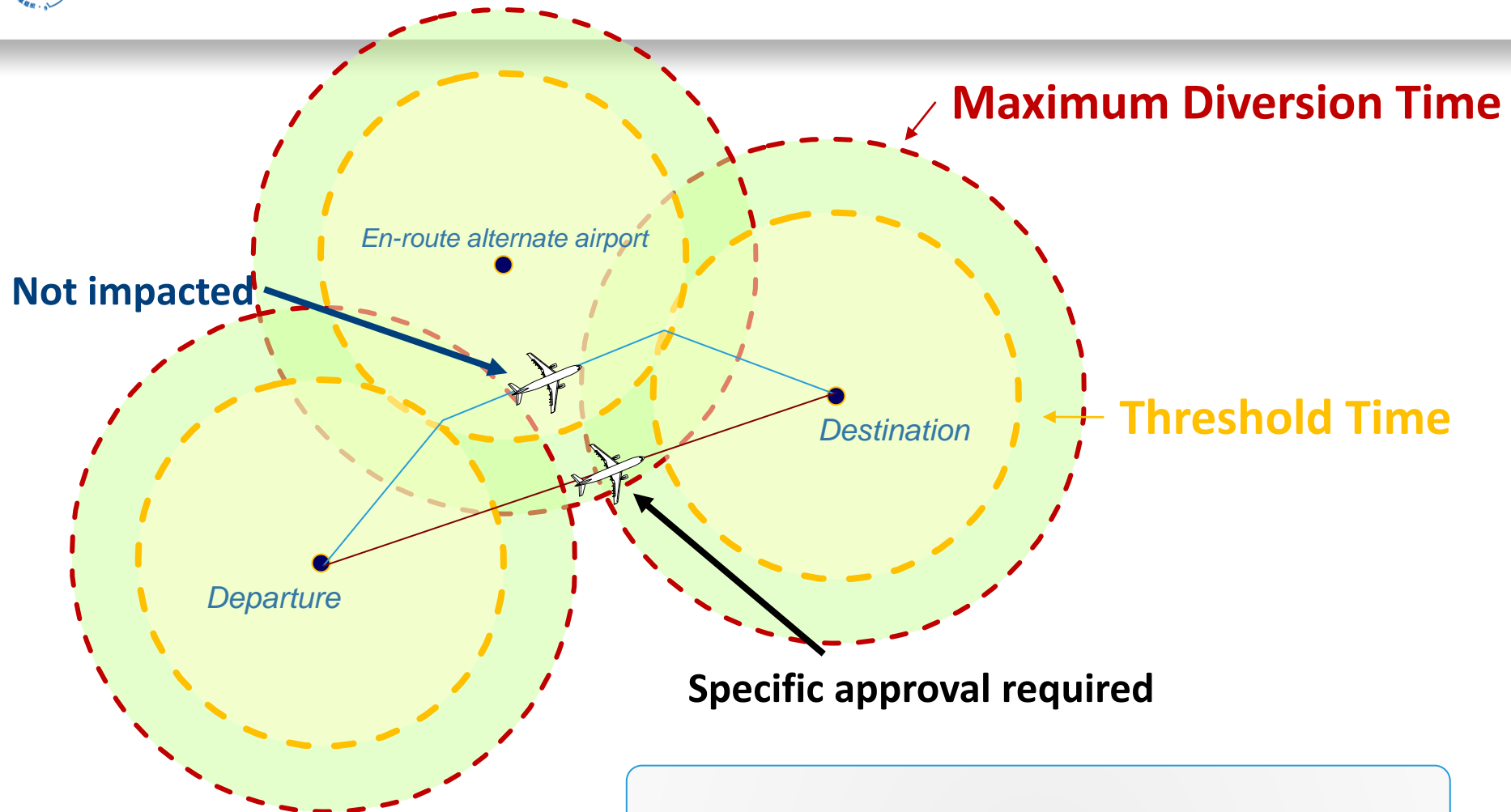
PROTECT the diversion by

Implementing systems/functions required for safe ETOPS diversion & landing

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

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

⇒ **cope with adverse operating conditions**



The State of the Operator:

Establishes the Threshold Time; and
Approves the Maximum Diversion Time

❖ Main Concepts and evolutions

❖ EDTO Approval:

- ❖ Aircraft Type Design assessment
- ❖ Operational approval

❖ Main EDTO operational requirements

- ❖ Flight operations
- ❖ Maintenance

❖ Continued Surveillance

❖ State Implementation

❖ Conclusions

EDTO 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.

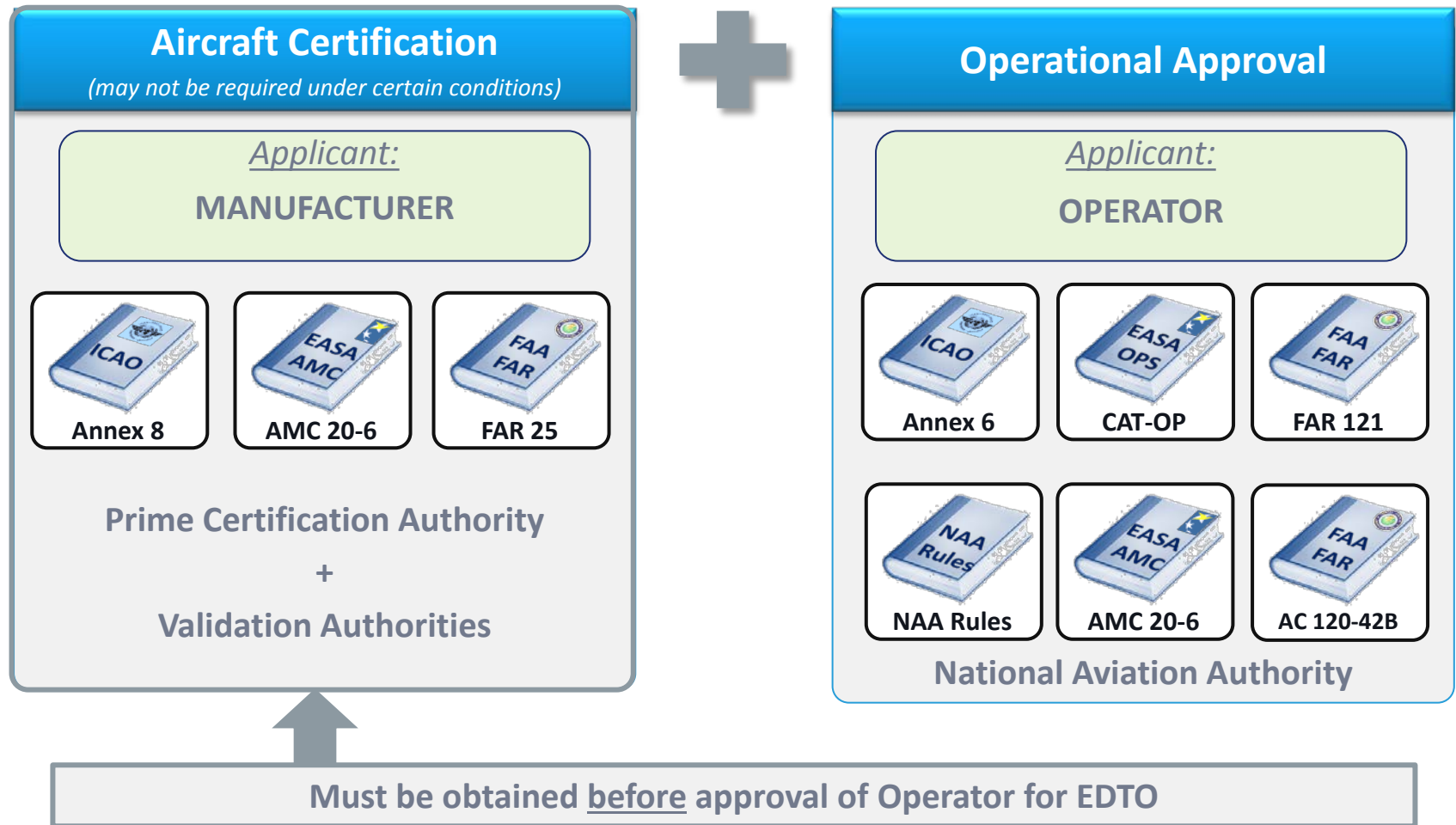
The Airplane is Ready

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

The Airline is Ready

Preclude and Protect

To operate beyond threshold, two conditions must be met:

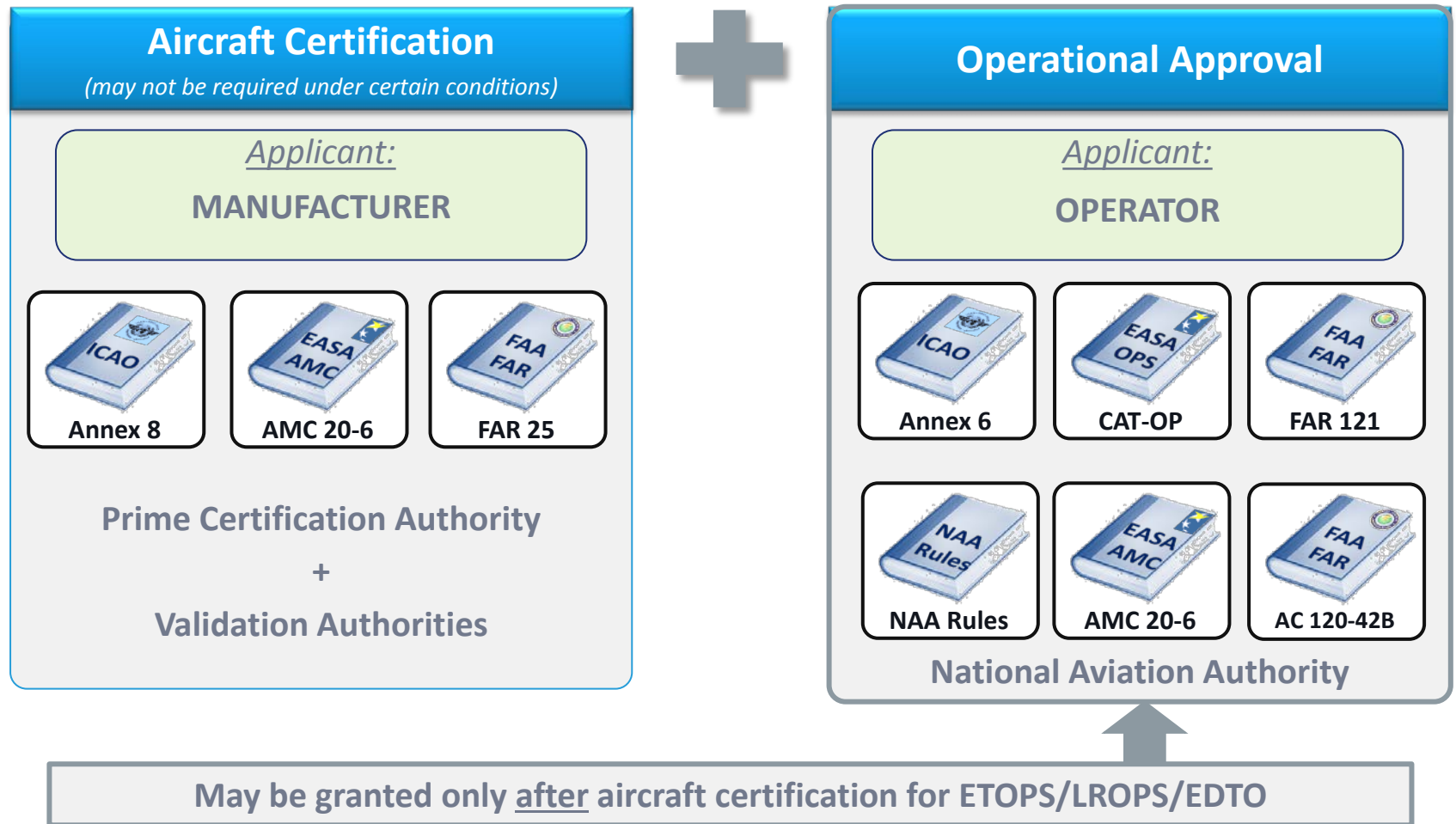


- ❖ As per ICAO decision (State Letter Ref. SP 59/4.1-11/8 of June 2011), the following applies to Airplanes with more than 2 engines engaged in EDTO operations :
 - *The capability of Time Limited System must be considered at dispatch for the purpose of identification and selection of en-route alternates (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*

Airplane Models Approved Separately

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

To operate beyond threshold, two conditions must be met:



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



- ❖ Main Concepts and evolutions
- ❖ EDTO Approval:
 - ❖ Aircraft Type Design assessment
 - ❖ Operational approval
- ❖ Main EDTO operational requirements
 - ❖ Flight operations
 - ❖ Maintenance
- ❖ Continued Surveillance
- ❖ State Implementation
- ❖ Conclusions

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

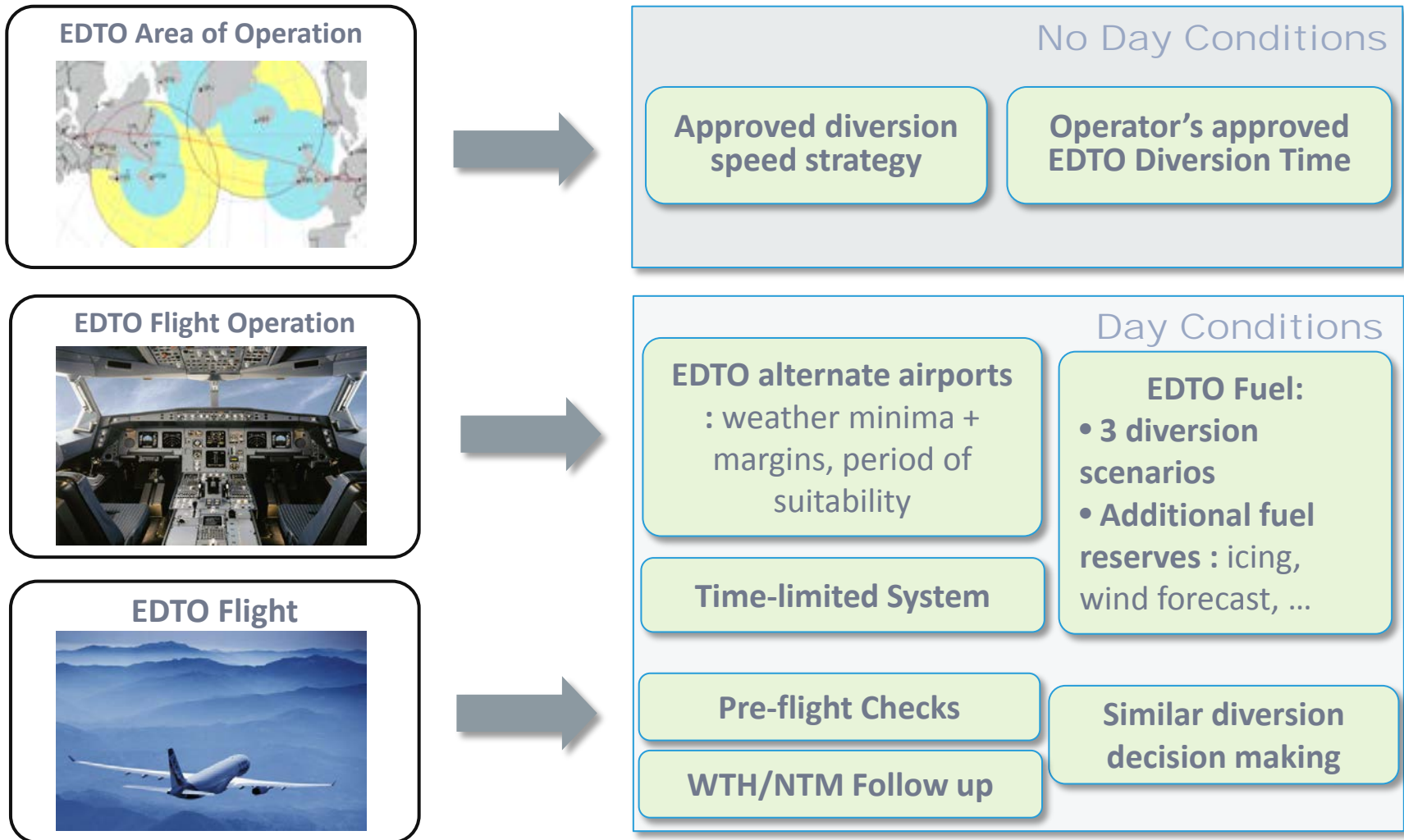
Oil Consumption Monitoring
+ ECM + APU in-flight start

Reliability Monitoring & Occurrence Reporting

Training Program (covering all processes)

EDTO operational requirements

Main Flight Operations





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EDTO operational requirements

Main Maintenance

Configuration

EDTO Parts Control

Engine Condition Monitoring

EDTO Verification Program

Propulsion System Monitoring (IFSD)

Reliability Program

Oil Consumption Monitoring

Centralized Maintenance Control

Pre-departure Service Check

Multiple Similar Systems

Task Identification

Procedural Changes

Maintenance Training

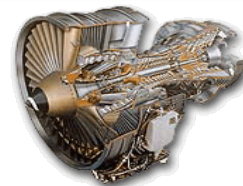
EDTO Maintenance Document

APU Start Reliability

- ❖ Main Concepts and evolutions
- ❖ EDTO Approval:
 - ❖ Aircraft Type Design assessment
 - ❖ Operational approval
- ❖ Main EDTO operational requirements
 - ❖ Flight operations
 - ❖ Maintenance
- ❖ Continued Surveillance
- ❖ State Implementation
- ❖ Conclusions

IFSD Monitoring and Resolution

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



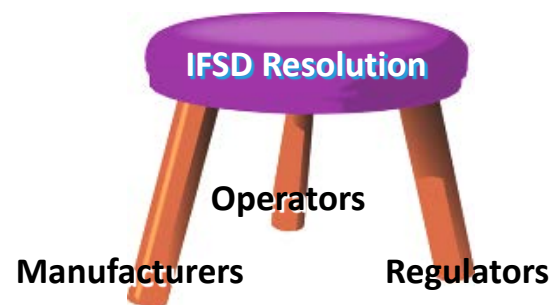
	<u>Type Design Target</u>	<u>Operator Alert Level</u>
120 min ETOPS	$\leq 0.05/1000$ engine hrs	0.05/1000 engine hrs
180/207 min ETOPS	$\leq 0.02/1000$ engine hrs	0.03/1000 engine hrs
Beyond 180 min ETOPS	$\leq 0.01/1000$ engine hrs	0.02/1000 engine hrs

- Airline trend monitoring

Engine Condition Monitoring, Oil Consumption, Reliability Reporting

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

*** FAA Regulation Defines Shared Responsibility**



- Continued airworthiness activities performed by the Manufacturers and their Primary Certifying authorities ensure that
 - EDTO capability of the concerned airplane are continuously monitored
 - Any necessary corrective actions are identified
- Identification of necessary corrective actions highly depends on effective reporting by the Operators of relevant in-service events data
 - Quick and comprehensive reports helps in defining efficient corrective actions that may be necessary to maintain or restore EDTO operations
 - Good communication between concerned parties (Authorities, Operators and Manufacturers) is also key for developing any necessary corrective action plan.
- Timely implementation of required corrective actions is a major contributor for ensuring continued safe EDTO operations

- ❖ Main Concepts and evolutions
- ❖ EDTO Approval:
 - ❖ Aircraft Type Design assessment
 - ❖ Operational approval
- ❖ Main EDTO operational requirements
 - ❖ Flight operations
 - ❖ Maintenance
- ❖ Continued Surveillance
- ❖ State Implementation
- ❖ Conclusions

- States need to translate EDTO ICAO SARPs into National regulations and policies. Additional guidance is available in:
 - Annex 6 Part I, Attachment D
 - EDTOM (under development)
 - FPFMM (Doc 9976)
 - Airworthiness Manual (Doc 9760)
- States should establish a Threshold Time for twins and more than two engine a/c
 - Is not intended to be area, operator or aeroplane type specific.
 - A baseline threshold time should be determined (e.g. 60 min for twins and 180 min for more than two engine a/c)
 - The ICAO SARPs allow flexibility to accommodate variations from the baseline for specific situations (e.g. domestic specificities, established operations)
- States should determine the criteria for approving Maximum Diversion Time
 - Assessment of the Operator's EDTO programme compliance
 - Criteria for specific diversion times
 - Area of operation
 - EDTO capabilities of the Operator's fleet

- ❖ Main Concepts and evolutions
- ❖ EDTO Approval:
 - ❖ Aircraft Type Design assessment
 - ❖ Operational approval
- ❖ Main EDTO operational requirements
 - ❖ Flight operations
 - ❖ Maintenance
- ❖ Continued Surveillance
- ❖ State Implementation
- ❖ Conclusions

- ETOPS has often been considered as one of the major contributor to the global aviation safety in the last 30 years by introducing:
 - Higher aircraft & engine design and reliability standards
 - Robust operational and maintenance practices

- The EDTO / ETOPS regulations have evolved to:
 - Allow “Non Limited” ETOPS operations for twins
 - ✓ based on propulsion reliability and overall operational safety of current ETOPS twins
 - Introduce similar ETOPS precaution to operations of tris & quads. The impact is limited as :
 - ✓ No Certification required as per ICAO EDTO amendments
 - ✓ Threshold commonly set at 180 min DT ⇒ only most southern routes may be impacted
 - ✓ Few additional operational requirements (No additional maintenance) based on Industry Best Practices (Consideration of Time Limited Systems / policy for selection and monitoring of en-route alternates)

- The latest EDTO rules are based on the same initial concepts:
 - Set requirements in terms of design and reliability standards for twin engine aircraft
 - Introduce enhanced operational practices (Maintenance & flight operations)
 - Demonstrate operational readiness (Aircraft and Operator)
- These EDTO basic principles aims at:
 - Precluding the diversion
 - Protecting the diversion should it occur.
- Continued commitment to these EDTO requirements is necessary to ensure safe and reliable EDTO operations.

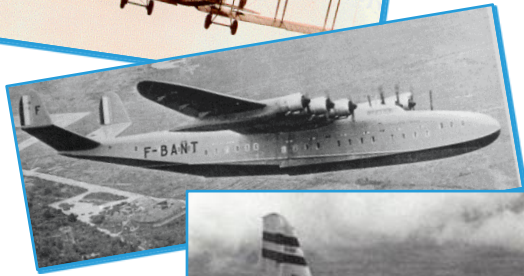
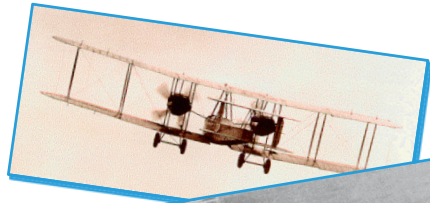
Module 9

Summary





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Thank You !!