

Extended Diversion Time Operations Workshop



Alternate

Destination

ETP1

ETP2

Departure

Module 4 *Practical Exercise*



ICAO

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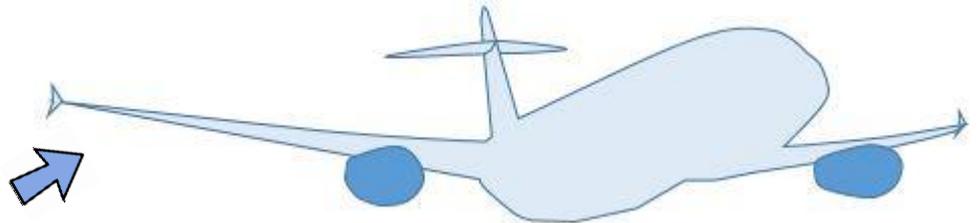


EDTO Certification strategy for a new aircraft The WonderPlanes® WP-X Project !

Your team is part of the Engineering of WonderPlanes® company.

- WonderPlanes® is specialized in the design and production of large commercial transport aircraft.
- The company has already a well established reputation for its advanced, efficient and reliable products, and in particular the famous WonderPlanes® WP-911, a medium to long-range twin-aisle and twin engine aeroplane fitted with **RG3350-89** engines from the engine manufacturer **Greenpush**.

Aeroplane model	Engines
WP-911	Greenpush RG3350-89





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- **WonderPlanes®** is about to launch a new program which will supplement its current product line.
 - This project, currently undisclosed and known within WonderPlanes as the **WP-X Project**, is a new long range aeroplane capable of carrying up to 450 passengers on routes up to 8,000NM.
- Preliminary studies have identified three possible design options:
 - ❑ **Option 1:** Twin-engine aeroplane - derivative design
 - ❑ **Option 2:** Twin-engine aeroplane – new design
 - ❑ **Option 3:** Three-engine aeroplane – new design

more info on
NEXT
slides! 

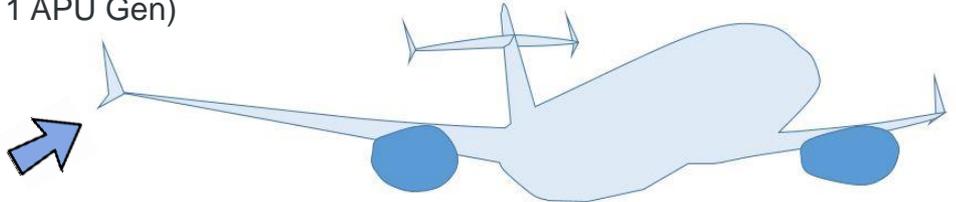
EDTO Certification strategy for a new aircraft

The WonderPlanes® WP-X Project !

Additional information on the 3 possible designs for the WonderPlanes® WP-X Project :

- ❑ **Option 1:** Twin-engine aeroplane – Derivative design
 - Re-design of the existing **WP-911** which has more than 10 years of in-service experience.
 - This re-design is called **WP-911SuperPlus**, and consists of:
 - New engines **Greenpush RG3350-SP** which are derivatives from existing **Greenpush RG3350-89** engines fitted on the **WP-911**
 - Refined aerodynamics, while keeping the same system architecture in particular for electrical generation (1 electrical generator per engine, 1 RAT, 1 APU Gen)

Aeroplane model	Engines
WP-911SuperPlus	Greenpush RG3350-SP



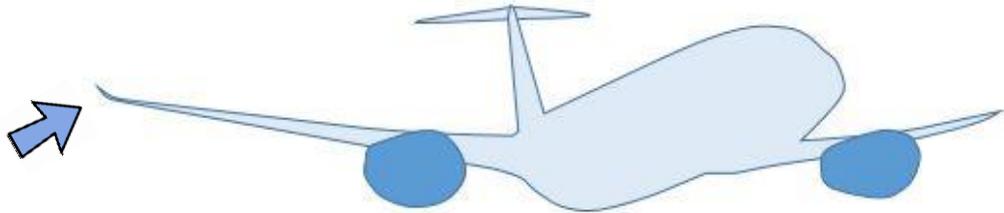
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The WonderPlanes® WP-X Project !

Additional information on the 3 possible designs for the WonderPlanes® WP-X Project :

- ❑ **Option 2:** Twin-engine aeroplane – New design
 - This new design is called **WP-Millennium**. It is a large twin-engine aeroplane integrating new materials for the structure and new technologies for the aeroplane systems
 - It is fitted with brand new engines **MT2050** from a new engine manufacturer called **MegaThrust**
 - System architecture is also new, in particular for electrical generation (3 generators per engine, 1 RAT, 2 APU Gen) which also provides backup for the hydraulics and pneumatics

Aeroplane model	Engines
WP-Millennium	MegaThrust MT2050



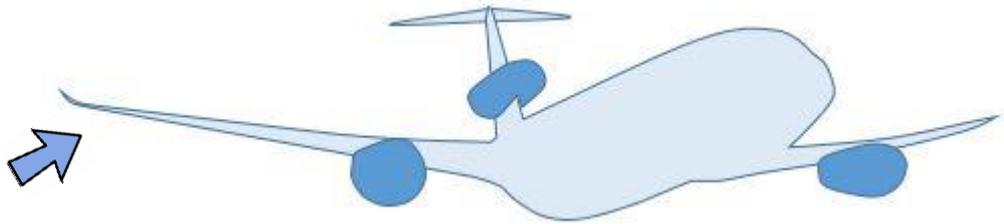
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The WonderPlanes® WP-X Project !

Additional information on the 3 possible designs for the WonderPlanes® WP-X Project :

- ❑ **Option 3:** Three-engine aeroplane – New design
 - This new design is called **WP-3skies**. It is a large three-engine aeroplane with new structure and systems similar to that of the **WP-Millennium** design, adapted for the 3 engine architecture: 2 electrical generators per engine, 1 RAT, and one optional 1 APU Gen.
 - It is fitted with new engines **MegaThrust MT2021** which are also similar to the engines of the **WP-Millennium** design but with reduced thrust.

Aeroplane model	Engines
WP-3skies	MegaThrust MT2021

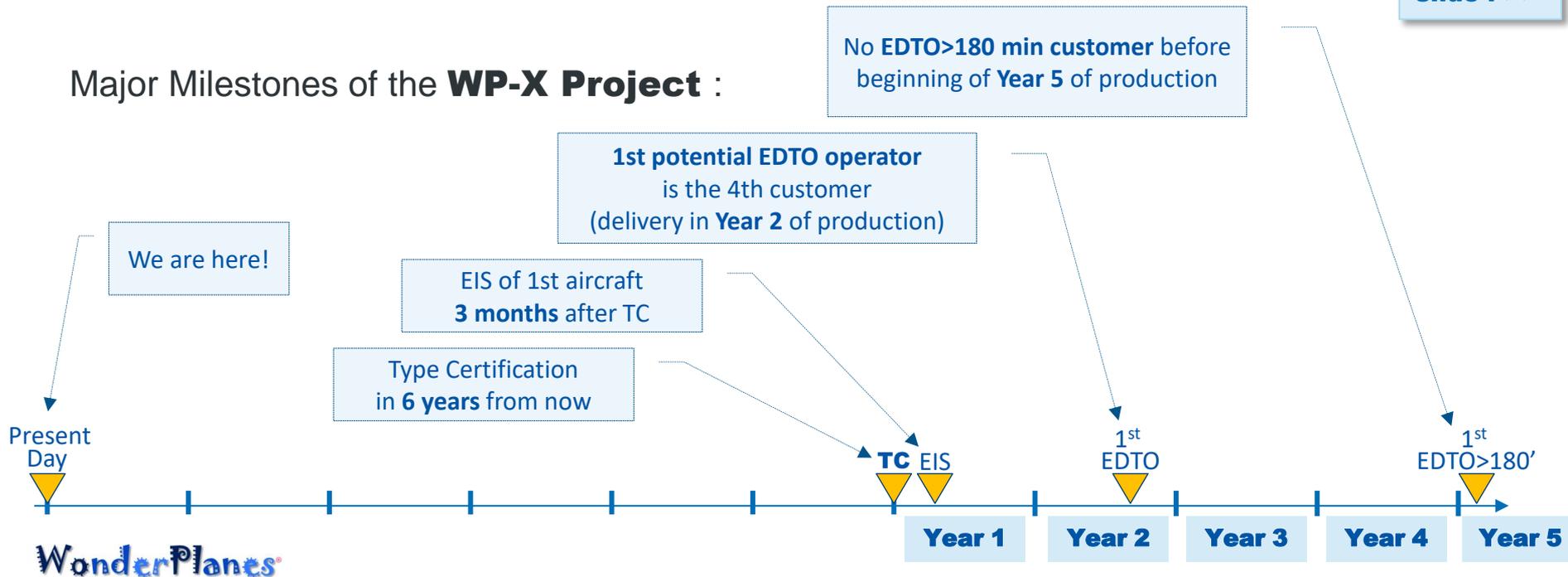


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The WonderPlanes® WP-X Project !

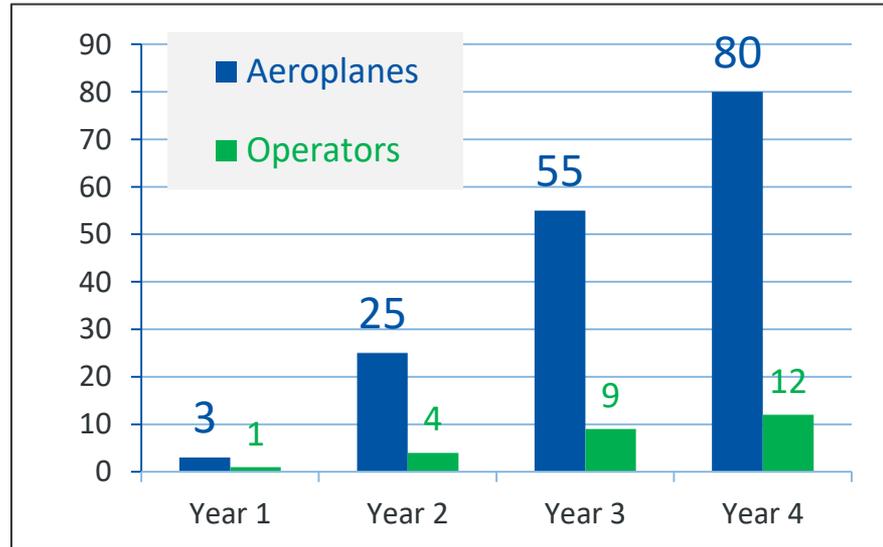
more info on
NEXT
slide ! 

Major Milestones of the **WP-X Project** :

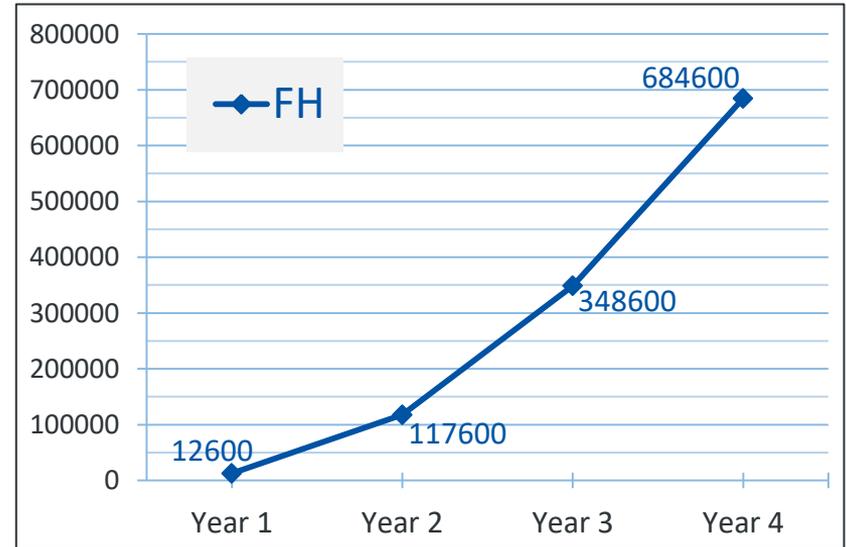


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Planned production and Flight Hours (FH) ramp-up:



Production ramp-up



Flight Hours ramp-up

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PURPOSE
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Recall/Summary of main EDTO certification* (Type Design & Reliability) requirements (1/3):

➤ Design

Aircraft must be fitted with **at least 3 electrical generators**

- Note: for EDTO>180 min, one additional generator may be required

Sizing of the Time Limited Systems:

- The cargo fire suppression system must provide protection for the contemplated diversion time (at All-Engine-Operative speed) + 15 min margin
- The most time limiting system (other than the cargo fire suppression system) must provide protection for the contemplated diversion time (at One-Engine-Inoperative speed) + 15 min margin



*Note : EDTO certification is **not required** for **aircraft with more than 2 engines** (ref ICAO Annex 6 Section 4.7.2)



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Recall/Summary of main EDTO certification* (Type Design & Reliability) requirements (1/3):

➤ **Reliability & Maturity** must be demonstrated either through :

In-service method:

- Minimum of 100,000 Hours (Engine Hours) up to 250,000 Hours must be accumulated in-service before EDTO can be granted
- Demonstration of compliance is based on review of in-service data, and corrective actions must be available to address EDTO relevant reliability issues.

Early EDTO method:

- No in-service experience is required
- Demonstration is based on extensive tests and analyses (3,000cy engine test, lessons learned, ...), and corrective actions must be available to promptly address EDTO relevant reliability issues encountered during the tests.



*Note : EDTO certification is **not required** for **aircraft with more than 2 engines** (ref ICAO Annex 6 Section 4.7.2)

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PURPOSE
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Recall/Summary of main EDTO certification* (Type Design & Reliability) requirements (3/3):

➤ Required **Tests** and typical sizing of the **Flight Test campaign**

In-service method:

- No specific ground test required
- A minimum of 1 test flight must be performed.
- May lead to ~30 Flight Hours of dedicated flight tests

Early EDTO method:

- No in-service experience is required
- Demonstration is based on extensive tests and analyses (typically more than 100 Flight Hours of dedicated EDTO flight tests, 3,000cy engine and APU test, lessons learned, ...), and corrective actions must be available to promptly address EDTO relevant reliability issues encountered during the tests.

Combined method

- Allows to take credit of some in-service experience in order to slightly alleviate the sizing of the EDTO Flight Test campaign
- Minimum of 15,000 Engine Hours and 10 aircraft in service expected for EDTO 180 min eligibility
- Minimum of 30,000 Engine Hours and 20 aircraft in service expected for EDTO > 180 min eligibility



See ***Note** on previous page

EDTO Certification strategy for a new aircraft

The WonderPlanes® WP-X Project !

Your task:

- As **experts on EDTO**, you and your team must advise the Project Director on the **best strategy** !
- Based on the elements you have, establish your position on what is (in your view) the **best strategy for EDTO** i.e. Early EDTO method, In-service or Combined method... or no EDTO certification!
- Accordingly develop the rationale on the **selected strategy** and on the **best suited design (Option 1, 2 or 3)** versus contemplated operations



Option 1
WP-911Super+



Option 2
WP-Millennium



Option 3
WP-3skies

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For this exercise, you will be using the **elements discussed in the preceding slides**. Please split up into your individual teams to begin the exercise.

You will have **20 to 30 minutes** (TBC) to review the information, prepare your conclusions on the best strategy for EDTO (**see Slide 12**) and select a team spokesperson(s).

We will conduct a role playing session with each team following the breakouts. Your team spokesperson(s) will play the role of the **WonderPlanes EDTO Expert**, who will be meeting with the **Project Director (Mike) and his team (Ian and Eric)**.





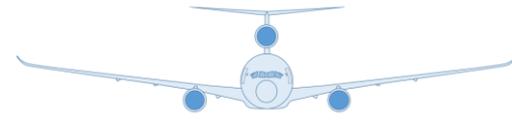
The WonderPlanes® WP-X Project !



Option 1
WP-911Super+



Option 2
WP-Millennium



Option 3
WP-3skies

Team Breakouts

(20 to 30 Minutes)



EDTO Workshop

Module 4 – Practical Exercise



EDTO Certification strategy for a new aircraft The WonderPlanes® WP-X Project !

Conclusions, Solutions, Answers... and food for thoughts!

- So considering **EDTO**, which project below is the best suited ?



- In fact there is no correct or wrong answer !
- Decision on most suitable design is **unlikely** to rely solely on EDTO certification strategy...

more info on
NEXT slides! 

EDTO Certification strategy for a new aircraft

The WonderPlanes® WP-X Project !

Conclusions, Solutions, Answers... and food for thoughts!

- Availability of **EDTO capability at EIS** is a must for long range twins.
 - A significant portion of the operations will be beyond 60 min
 - Therefore unavailability of EDTO capability is far less critical for airplanes with more than 2 engines
- Availability of **capability for EDTO beyond 180 min** is often a must for long range twins.
 - Strong customer demand exists (e.g. leasing companies), however it may not be needed at EIS
 - Marketing need may quickly evolve, while design and certification process is on-going (5+ years)
- **Sizing of flight test campaign** for EDTO certification should not be directly determined by the contemplated maximum diversion time capability. It should mostly depends on :
 - Design novelties
 - Lessons learned
 - State of Design Authority



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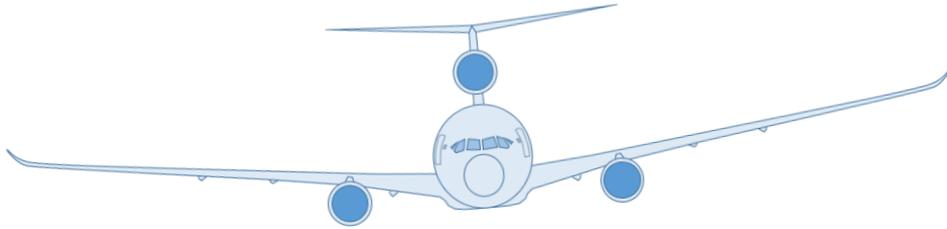


EDTO Certification strategy for a new aircraft The WonderPlanes® WP-X Project !

Conclusions, Solutions, Answers... and food for thoughts!

- Aeroplane with more than 2 engines are free from EDTO Certification constraints
 - Nevertheless the design must support the contemplated EDTO operations
 - In particular, the time capability of its most limiting relevant EDTO Significant System must match the targeted maximum diversion time capability
 - In most cases, the sizing system is the cargo fire suppression system





Thank You and Well Done!!

