



# EASA

European Aviation Safety Agency

# Product Certification and Design Organisation Approval Workshop 22<sup>nd</sup> – 23<sup>rd</sup> November 2017

TE.GEN.00409-001  
**Your safety is our mission.**

An agency of the European Union 



# EASA

European Aviation Safety Agency

## Level of Involvement

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TE.GEN.00409-001



# Our journey this morning ...

- ✈ What do we intend to change, and why?
- ✈ Main milestones (past and present)
- ✈ Reminder of the main principles of LOI
- ✈ LOI in projects applied for by DOA holders
  - ✈ DOA holder performance
  - ✈ Risk assessment
  - ✈ Design Assurance System

- ✈ Lessons learnt during advanced application projects with DOA holders
  - ✈ Advanced Application Projects
  - ✈ Proportionality
  - ✈ Administrative burden & complexity
  - ✈ Other lessons learnt and Statistics
  - ✈ Lessons learnt environment
  - ✈ Your experience so far?
- ✈ Risk assessment in projects where capability is demonstrated through AP to DOA or CP
- ✈ Risk assessment in ETSOA projects
- ✈ Future milestones



# Our journey this morning ...

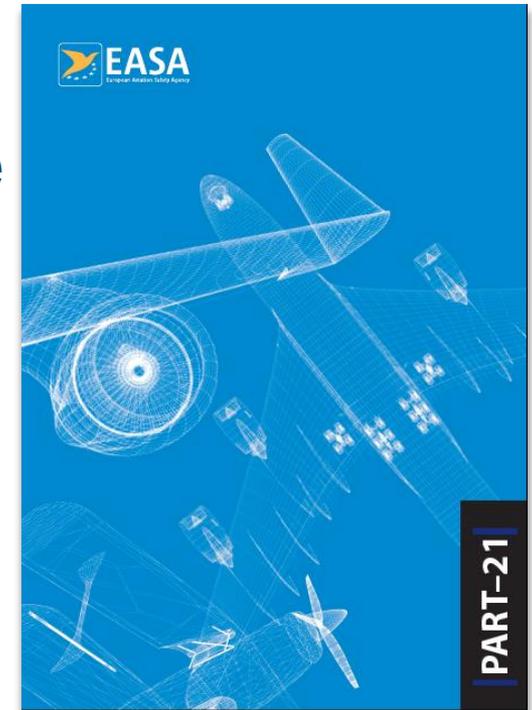
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# The issue

- While the applicant demonstrates and verifies compliance, the Authority has to be convinced that this is performed successfully. This is done by sampling via a second verification.
- The current Part-21 does not provide criteria to decide about the involvement of the Agency





# The objectives

- To include a risk-based approach to Agency's compliance verification in Part-21
  - focus resources on aspects of certification projects posing higher risk
- To develop objective criteria and transparent processes
  - controlled processes
  - certain predictability
  - equal treatment
- To initiate the implementation of the safety risk management standards of ICAO Annex 19 into Part-21





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# The rulemaking project: The rule

## RMT.0262 Level of Involvement (LOI)



August 2013

ToR and Concept Paper



June 2015

Public consultation of a draft proposal (NPA 2015-03)



May 2016

EASA issued opinion 7/2016 with a proposal for amendment of Part-21



Commission currently prepares the proposal for the legislative process



European Aviation Safety Agency

Opinion No 07/2016

Embodiment of level of involvement requirements into Part-21

RELATED NPA/CRD 2015-03 – RMT.0262 (MDM.060) – 23.5.2016

### EXECUTIVE SUMMARY

This Opinion addresses a systemic issue of introduction of safety management principles into the process of airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as changes and repairs thereto in accordance with Part-21 (Annex I to Regulation (EU) No 748/2012).

The Opinion is linked with the [European Plan for Aviation Safety \(EPAS\) 2016-2020](#) action RMT.0262.

The main specific objective is to further strengthen the Part-21 certification processes performance in general, and the verification part of these processes by the European Aviation Safety Agency (hereinafter referred to as 'the Agency') in particular, so that their safety and environmental goals are consistently met in an effective and efficient manner. This will be achieved by introducing into Part-21 the new rules accommodating a risk-based approach to compliance verification through embodiment of the concept of level of involvement (LoI) of the Agency in the certification process. The risk-based LoI concept is in line with the safety risk management standards of International Civil Aviation Organization (ICAO) Annex 19, and will enable the Agency to better identify the areas of product certification more prone than others to risk with regard to safety and environmental protection. This will allow the Agency to focus its certification resources primarily on these areas that need a direct and high LoI in order to thoroughly verify that compliance has been demonstrated by applicants. In other certification areas, where the risk to product safety or environmental protection is assessed lower, the Agency may, when justified by their adequate performance, rely on approved design organisations. Moreover, this proposal will further enhance the oversight system of design organisations to become 'performance-based'. Some design organisations may obtain new design organisation approval (DOA) privileges to certify certain major changes to type-certificates (TCs), supplemental type-certificates (STCs), and/or major repair designs without the Agency's involvement, but only in technical domains where they demonstrate to the Agency their satisfactory experience and performance in compliance assurance.

The present opinion is the first step towards transposing the ICAO Annex 19 'Safety Management' standards into Part-21. A further proposal to amend Part-21 in accordance with the ICAO safety management system (SMS) standards for design and production organisations, State Safety Programme (SSP) standards, and critical elements of a safety oversight system for the competent authorities (CAS), including the Agency, is being established by the Agency in a separate rulemaking task (RMT).

Applicability		Process map	
Affected regulations and decisions:	— Annex I to Regulation (EU) No 748/2012 (Part-21) — ED Decision 2012/020/R	Terms of reference (ToR), Issue 1:	27.8.2013
Affected stakeholders:	Applicants for and holders of any certificate issued in accordance with Part-21; national aviation authorities (NAAs) contracted by the Agency to perform certain certification tasks on its behalf.	Concept paper (CP):	Yes
Driver/origin:	Safety, efficiency/proportionality, level playing field	Rulemaking group (RMG):	No
Reference:	Please refer to Section 3.3	Regulatory impact assessment (RIA) type:	Full
		Technical consultation during notice of proposed amendment (NPA) drafting:	Yes
		NPA publication date:	2.3.2015
		NPA consultation duration:	3 months
		Review group (RG):	No
		Focused consultation:	Yes
		Decision expected publication date:	2017/Q2

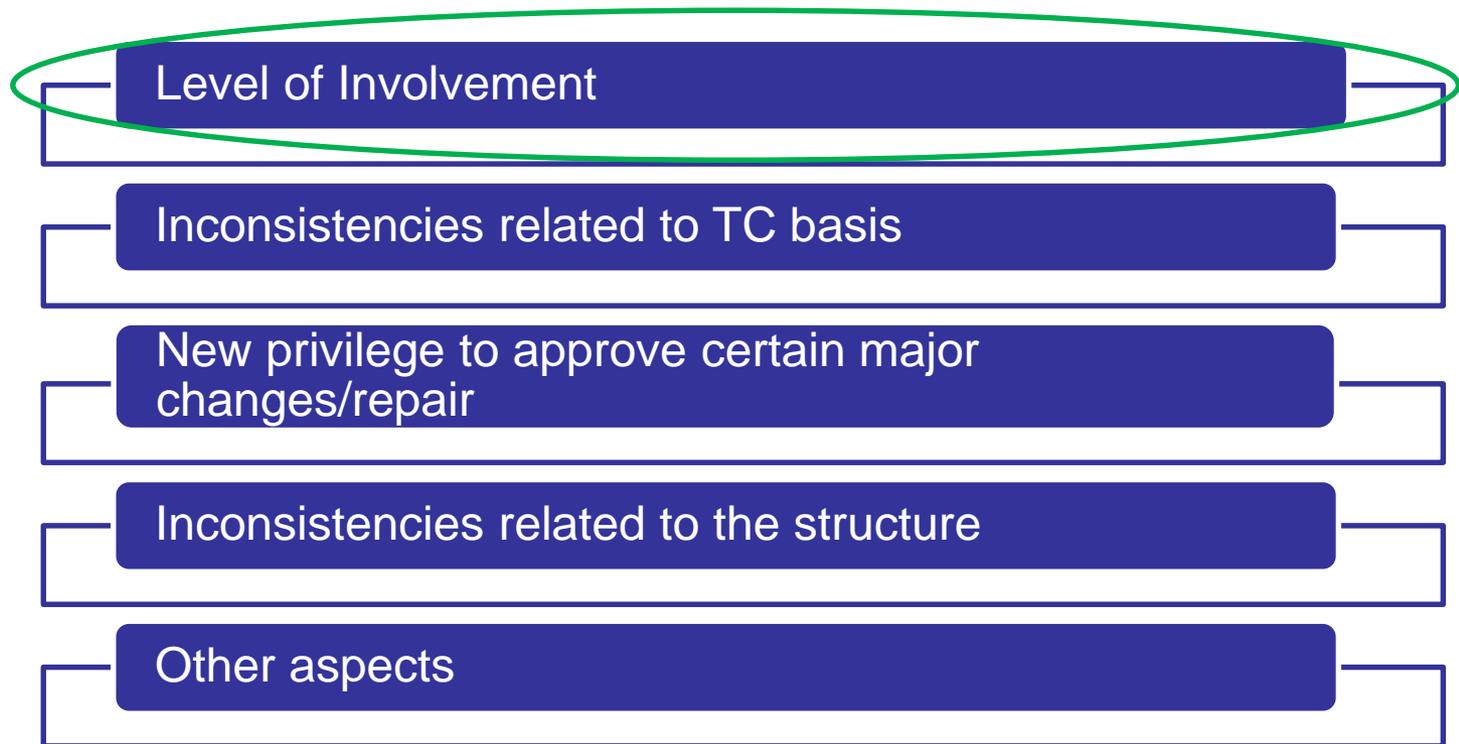


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# The proposal: Opinion 07/2016

► The opinion proposes the following amendments to Part-21:



(proposals limited to Subparts B, D, E, J, M and O)



# Implementation: The guidance (CM)

→ LOI specific guidance drafted in advance; vehicle used: Certification Memorandum (CM)

→ January 2017  
Public consultation of a draft CM

<https://www.easa.europa.eu/document-library/product-certification-consultations/proposed-cm-21a21b-001>

→ July 2017  
Finalisation of draft 2 of the CM considering the results of the public consultation

EASA Proposed CM No.: Proposed CM-21.A/21.B-001 Issue 01



**Notification of a Proposal to issue a Certification Memorandum**

**Criteria for the determination of the Agency's level of involvement in product certification**

EASA Proposed CM No.: Proposed CM-21.A/21.B-001 Issue 01 issued 23 January 2017

Regulatory requirement(s): 21.A.15 (b)(5) and (6), 21.A.93 (b)(3)(ii) and (iii), 21.A.113 (b), 21.B.100, 21.B.103 (a)(2), 21.B.107 (a)(2), 21.B.110 (a)(2), 21.B.115 (a)(2) and 21.B.117 (b)<sup>1</sup>

In accordance with the EASA Certification Memorandum procedural guideline, the European Aviation Safety Agency proposes to issue an EASA Certification Memorandum (CM) on the subject identified above. All interested persons may send their comments, referencing the EASA Proposed CM Number above, to the e-mail address specified in the "Remarks" section, prior to the indicated closing date for consultation.

**About Certification Memoranda**

EASA Certification Memoranda clarify the Agency's general course of action on specific certification aspects. They are intended to provide guidance on a particular subject and, as non-binding material, may provide complementary information and guidance. Certification Memoranda are provided for information purposes only and must not be misconstrued as formally adopted Acceptable Means of Compliance (AMC) or Guidance Material (GM). Certification Memoranda are not intended to introduce new requirements or to modify existing requirements and do not constitute any legal obligation. Applicants may use the guidance provided in this CM in order to comply with the above mentioned regulatory requirements, but they may also propose to comply differently.

EASA Certification Memoranda are living documents into which either additional criteria or additional issues can be incorporated as soon as a need is identified by EASA.

<sup>1</sup> As proposed per EASA Opinion 07-2016.



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# Implementation: The guidance (AMC/GM)



Draft AMC/GM for all subjects proposed in Opinion 7/2016 are being developed (phase 2 of RMT.0262) – main elements of a.m. CM are part of it



Nov/Dec 2017

Public Consultation of draft AMC/GM will start in few days



approx. Q2/3 2018

Public Consultation of few additional draft AMC/GM



after entry into force of Part-21  
Decision adopting AMC/GM

The screenshot shows a document titled "Notice of Proposed Amendment 2017-XX" from the European Aviation Safety Agency. The subject is "Acceptable means of compliance and guidance material to Part-21 related to the embodiment of level of involvement and other changes into Part-21". The document includes an executive summary, a table of affected rules and stakeholders, and a timeline of milestones.

**European Aviation Safety Agency**  
**Notice of Proposed Amendment 2017-XX**

**Acceptable means of compliance and guidance material to Part-21 related to the embodiment of level of involvement and other changes into Part-21'**  
RMT.0262 (MDM.060) – XX.XX.2017

**EXECUTIVE SUMMARY**

The objective of this NPA is to provide new or amended Acceptable Means of Compliance (AMC) and Guidance Material (GM) to support the embodiment of level of involvement (LoI) and other changes into Part-21 (as proposed by EASA Opinion 07/2016<sup>1</sup>).

The AMC/GM provides means of compliance to support an applicant's proposal for EASA's level of involvement in certification projects, and for EASA's determination of their LoI. Guidance is proposed for the application of the criteria given by Part-21 to determine the EASA involvement in a risk-based manner, as well as for the process to determine EASA's involvement.

Furthermore, this AMC/GM provides guidance on the application of the new privileges for certain major changes, major repairs and STCs.

Finally, the AMC/GM provides new or amended means of compliance and guidance material necessitated by the changes introduced into Part-21, and in particular, it relocates the guidance for the points of Part-21 that have been moved from Section A to Section B.

The proposed changes are expected to support the application of the amendments to Part-21 proposed by Opinion 07/2016.

<b>Action area:</b>	Safety Management	<b>Rulemaking group:</b>	No
<b>Affected rules:</b>	ED Decision 2016/007/R.	<b>Rulemaking Procedure:</b>	Standard
<b>Affected stakeholders:</b>	Design approval holders (DAH), EASA		
<b>Driver:</b>	Safety		
<b>Impact assessment:</b>	No		

**EASA rulemaking process milestones**

Start Terms of Reference (1) | Consultation Notice of Proposed Amendment (2) | Decision Certification Specifications, Acceptable Means of Compliance, Guidance Material (3)

Timeline: 27.08.2013 | DD.MM.2017 (today) | 20XX/QX

<sup>1</sup> <https://www.easa.europa.eu/document-library/opinions/opinion-072016>

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# Level of Involvement – What is it?



- the compliance demonstration activities and data that EASA retains for verification during the certification process, and
- the depth of these verifications

Method:





# Definition of the “risk”

## What is the risk based approach?

### Dictionary meaning

RISK = the probability of occurrence of an unwanted event multiplied by the consequence of the event.

Impact	5. Extreme	Yellow	Yellow	Red	Red	Red
	4. Very High	Yellow	Yellow	Yellow	Red	Red
	3. Medium	Green	Yellow	Yellow	Yellow	Red
	2. Low	Green	Green	Yellow	Yellow	Yellow
	1. Negligible	Green	Green	Green	Yellow	Yellow
		1. Rare	2. Unlikely	3. Moderate	4. Likely	5. Almost Certain
		Likelihood				

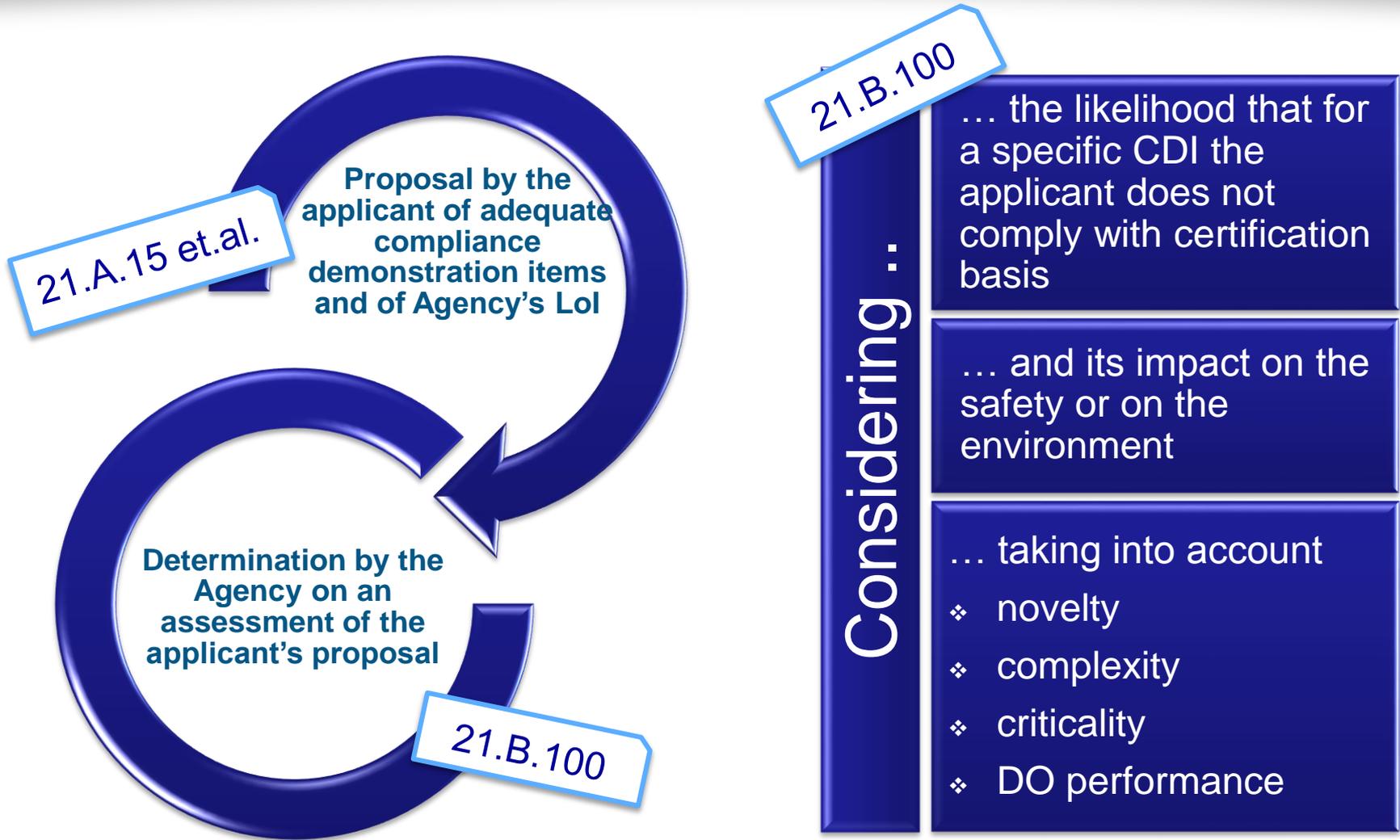
### Application in product certification

- Applicant demonstrates compliance (21.A.21) [and independently checks it (21.A.239)]
- EASA, before issuing the TC, needs be convinced that compliance has been demonstrated and verified (21.A.21): i.e. involvement
- Areas and depth of involvement is decided using a risk-based approach

RISK = likelihood of a non-compliance with a part of the certification basis, which is not identified through Agency involvement, in combination with its potential impact on product safety or environmental protection



# Level of Involvement in the new Part-21





# Risk assessment: CDI

- Part-21 will require that risk assessment is to be made (in most cases) per Compliance Demonstration Item
- CDI is a new element – what is it?

## CDI

CDI is a **meaningful group of compliance demonstration activities and data** taken from the certification programme, which **can be considered in isolation** for the purpose of performing the risk assessment



# Risk assessment: CDI

- Why was it necessary to create this new element?



**CDI: a tool to facilitate the risk assessment at a meaningful level !**



- Otherwise – using existing elements – the risk assessments needed to be made at the level of each compliance demonstration activity / data, or at the level of the certification project: often impracticable

## CDI

CDI is a **meaningful group of compliance demonstration activities and data** taken from the certification programme, which **can be considered in isolation** for the purpose of performing the risk assessment



# The 'new' Certification Process

## APPLICANT

Files it  
(complemented with a first version of the certification programme)

Makes a proposal

Provides

+

Makes a proposal (based on risk assessment)

Informs EASA in case of difficulty

Demonstrates and verifies compliance

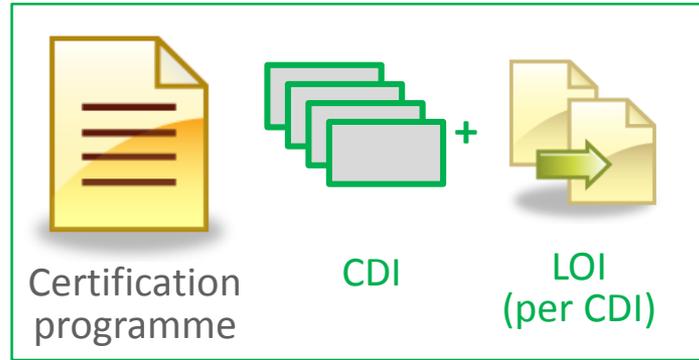
Declares compliance



Application



TC basis  
Env. Prot.  
OSD CB



Certification programme

CDI

LOI (per CDI)



Compliance demonstration and verification



Compliance declaration

Accepts

Establishes and notifies

Accepts

+

Determines and notifies

Verifies compliance by sampling

Verifies declaration and that 21.A.21 is complied with



May adjust LOI





# To be noted!

- Lol is proposed as part of the cert. programme
- Agency determines Lol
  - after technical familiarisation
  - on the basis of the certification programme to be accepted
  - sufficiently detailed means and methods of compliance
  - before applicant starts compliance demonstration

Phase I – Technical Familiarisation and establishment of the Initial Type Certification Basis  
Phase II – Acceptance of the Certification Programme and determination Level of Involvement  
Phase III – Applicants compliance demonstration  
Phase IV – Final Report and issue of the Certificate



# How to determine LOI – Overview

## LOI determination



*Compliance demonstration data / activities retained by the Agency.*



**Class 1:** no further involvement



**Class 2:** few documents, low participation



**Class 3:** class 2 “plus” ..



**Class 4:** class 3 “plus” ..

## Identification of Risk Class

Step 1: Likelihood of an unidentified non-compliance		Step 2: Risk classes	
no or few or complex aspects	no complex aspects	Very low	Low
Very low	Medium	Class 1	Class 2
Low	High	Class 2	Class 3
Medium	Very high	Class 3	Class 4
High	Very high	Class 4	Class 4

Severity of the non-compliance	Step 2: Risk classes			
	Very low	Low	Medium	High
High	Class 1	Class 2	Class 3	Class 4
Medium	Class 2	Class 3	Class 4	Class 4
Low or critical	Class 3	Class 4	Class 4	Class 4

**Assessment of likelihood of unidentified non-compliance and its severity ...**

**... using the 4 criteria provided by Part-21 (novelty, complexity, organisation performance + severity)**

**How?**

**How?**



# How to determine LOI – Overview

Proposed AMC/GM: 3 steps for determining LOI, using the risk based approach and the 4 criteria proposed in Part-21 as follows:



**3.** The last step of the proposal is the identification of the data and activities which should be retained by EASA for verification



# Criteria 1: Novelty

- Ratings: 
- Novelty regarding
  - Technology
  - Operations
  - Installation
  - Requirements
  - Use of MOC
- Novel for applicant or for Agency
- Also considering time between last and current project





# Criteria 2: Complexity

➤ Ratings:



➤ Complexity of

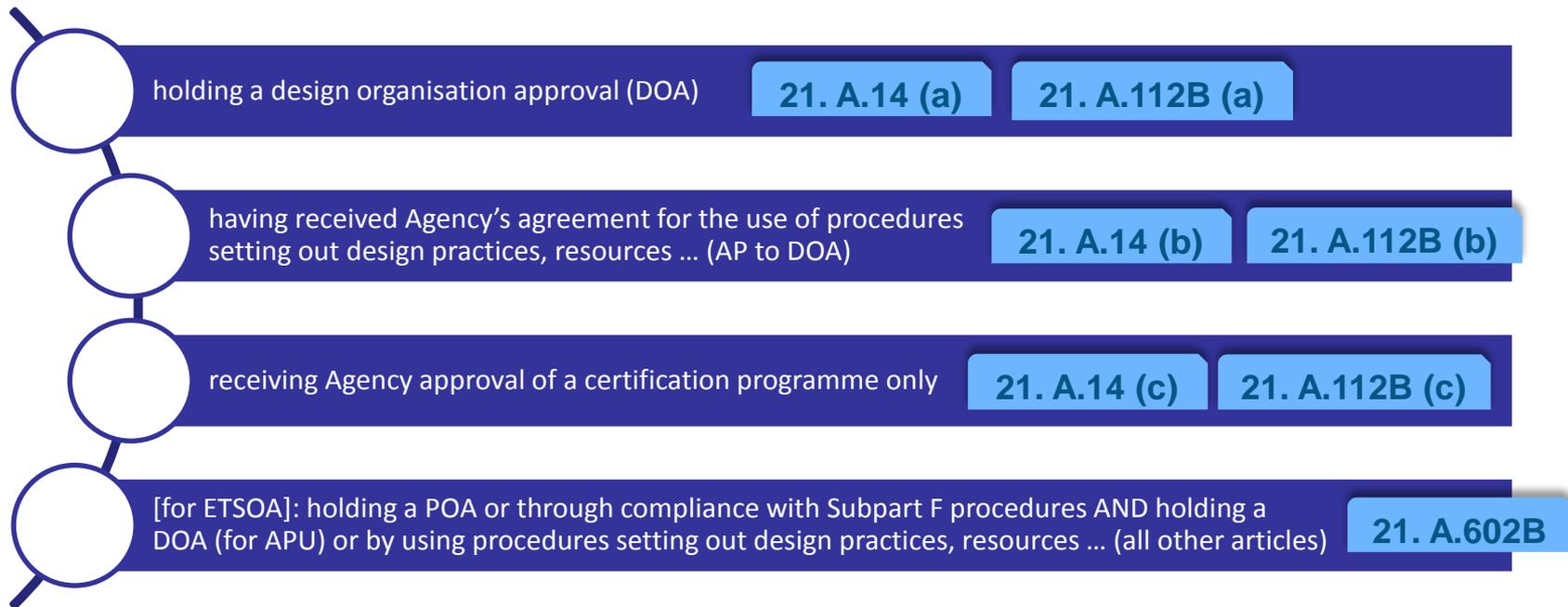
- Design
- Technology or associated manufacturing process
- Compliance demonstration (incl. test set up or analysis)
- Interpretation of results of compliance demonstration
- Interface with other technical disciplines or CDIs
- Requirements



# Criteria 3: Performance of the organisation



➤ Different approaches applied, depending on whether the organisation has demonstrated its capability by



➤ Details for each case are provided in the next slides



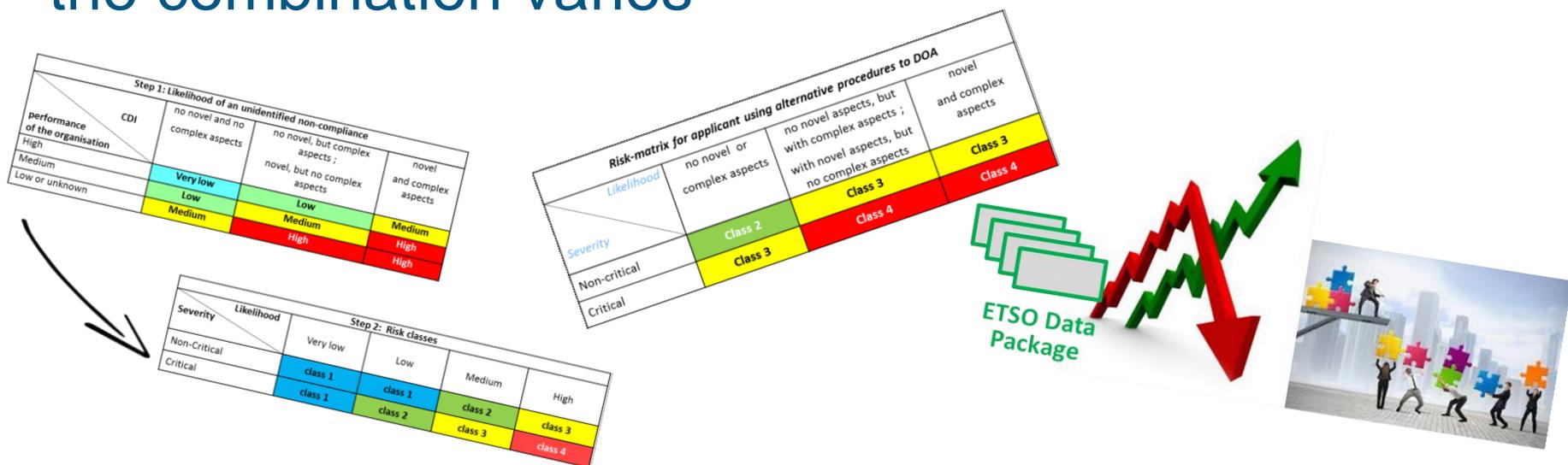
# Criteria 4: Severity

- Ratings: 
- Some criteria are derived from the GM 21.A.91
- Possible criteria for “critical”, where
  - failure effect classified as “hazardous” or “catastrophic” at aircraft / product level (e.g. 2x.1309)
  - appreciable effect on the Human-Machine-Interface
  - airworthiness limitations or operating limitations are established or potentially affected
  - the CDI is affected by an AD or occurrence(s) potentially subject to AD or by a Safety Information Bulletin.
- Where severity cannot be determined at early stage of the certification project, it shall be estimated conservatively; it can be adapted later.



# Defining the risk class

- To define the risk class, the ratings of the 4 criteria will be combined
- Depending on the way how the applicant demonstrates the capabilities of the organisation, the combination varies



- Details for each case are provided in the next slides



# From risk class to "retained/non-retained"

Applicant's compliance demonstration activities and data

Analysis

Tests

Audits

Description

Inspections

Qualification

etc.

➤ Agency's compliance verification activities as a consequence of the risk class determined



**Risk class 1: no further involvement**



**Risk class 2: review of few documents; low participation to compliance activities (tests, audits, etc)**



**Risk class 3: risk class 2 "plus" more documents/ participation**



**Risk class 4: risk class 3 "plus" more documents/ participation**



# From risk class to “retained/non-retained”

## ➤ Example (Panel 6 – Avionic System)

### Class 1

No specificities.

### Class 2

The involvement of the EASA experts on the project may comprise of:

- the review of the system certification plans, information summarising the main results of the compliance demonstration, and the AFM(S), and
- the review of a low amount of compliance data (e.g. SFHA, compliance demonstration to CRIs or AMCs and other important compliance demonstrations).

The expected number of certification meetings is likely to be limited and there should be no witnessing of test or inspections.

### Class 3

In addition to risk class 2, the involvement of the EASA experts may comprise of:

- the review of key certification data such as:
  - AFHA / (P)ASA / (P)SSA
  - Important analyses (PRA, ZSA, ...)
  - Important test plans and reports
- The witnessing of few selected tests and inspections may be performed, and
- Audits on the development assurance process may be conducted at one or two stages of the process.

### Class 4

- In addition to risk class 3, the involvement of the EASA experts comprises of the potential review of more compliance data.
- The witnessing of large number of ground, simulator and/or bench certification tests and/or inspections may be performed, and
- Audits on the development assurance process may be conducted at potentially all stages of the process.

*Extract from CM LOI,  
Attachment 6*



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# Criteria 3: DOA holder performance

➤ Ratings:



➤ Expected performance based on past experience

➤ Starting point

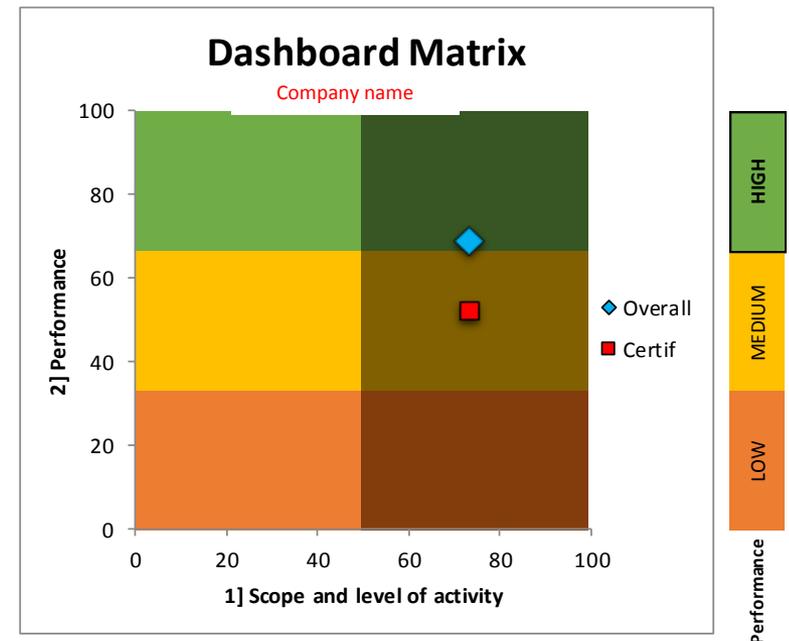
➤ DOA holder dashboard

➤ as available on (discipline),  
panel or organisation level

➤ deviations possible where  
more specific or more  
recent information is  
available



Panel 4 - Hydromechanical Systems  
Results shown for  
Panel 4 - Hydromechanical Systems



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Last update: 16.12.2016

Comments and analysis by the DOA Team

N/A

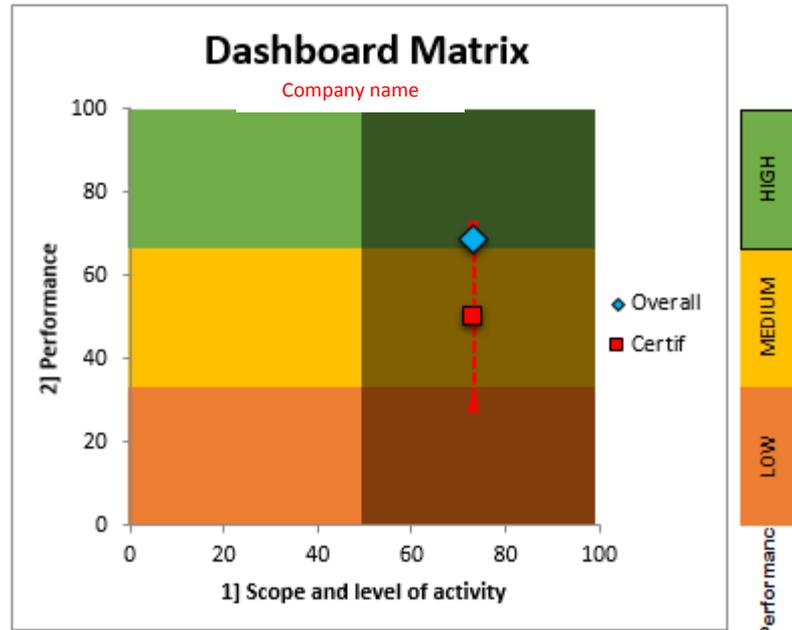


# Criteria 3: DOA holder performance

## ➤ Reading the DOA dashboard

Panel 9 - Noise, Fuel Venting and Emissions

Results shown for  
Panel 9 - Noise, Fuel Venting and Emissions



Template version - V.5.1

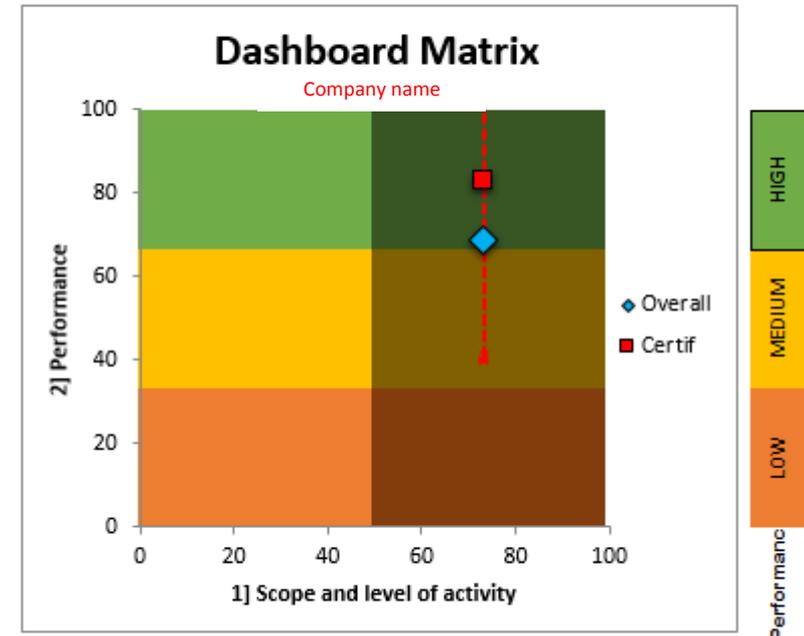
Last update: 16.12.2016

Comments and analysis by the DOA Team

N/A

Panel 10 - Software and Airborne Electronic Hardware

Results shown for  
Panel 10 - Software and Airborne Electronic Hardware



Template version - V.5.1

Last update: 16.12.2016

Comments and analysis by the DOA Team

N/A



# Establishing the organisation performance

Combined use of feedback from certification projects and DOA holder surveillance, incl. findings etc.

- For projects use of Technical Visa and Statement of Satisfaction
- Feedback provided by DOATL during annual meeting
- Detailed performance data for certification projects can be shared with DOA holders following signature of MoU to ensure “just culture”

*Note: System currently under review to assess possible shortcomings and to address upcoming changes in Part-21*



# Combining the criteria (DOA holders)

Step 1: Likelihood of an unidentified non-compliance			
CDI \ performance of the organisation	no novel and no complex aspects	no novel, but complex aspects ; novel, but no complex aspects	novel and complex aspects
High	Very low	Low	Medium
Medium	Low	Medium	High
Low or unknown	Medium	High	High



Step 2: Risk classes				
Severity \ Likelihood	Very low	Low	Medium	High
Non-Critical	class 1	class 1	class 2	class 3
Critical	class 1	class 2	class 3	class 4



# Consequences on Design Assurance System



TC/STC holders



## Application for significant changes

in the Design Assurance System to be submitted and accepted before a new certification project is launched (after the transition period)

The application shall cover the implementation of the new elements introduced by points 21.A.15 / 20

*Exceptions may be done for DOA holders already having LOI in their procedures*



Minor repair/changes

Where applicant holds no privilege to approve minor repair/changes



Application for significant changes in the Design Assurance System is **NOT needed**

DOA holders procedures may be adapted to incorporate the new LOI concept



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# Advanced application of LOI

Agency and some volunteering companies (DOA holders) have already started end 2016 to **test** the new LOI concept, in particular the draft guidance material



This test is expected to:

- ✓ identify **areas of improvements** and elaborate proposals
- ✓ identify **areas** in which the guidance material proves to be **already mature**
- ✓ **facilitate** the final application of the new LOI concept
- ✓ allow volunteering companies to already **prepare for the application** of LOI



# Participating companies

Airbus	Dassault Aviation	Lufthansa Technik	Airbus Helicopter	Diamond	Safran Hel. Engines
ATR	Scandinavian Avionics	Sabena Technics	Leonardo Helicopter	Tecnam	Rolls Royce
PMV Engineering					



System in place to collect feedback from volunteering companies



Industry feedback is also coordinated by ASD and shared via the LOI Steering Group



any other company interested + volunteering to apply LOI is welcome to approach us...



# Lessons learnt

**THANKS**



- Advanced application phase proved to be extremely useful to improve & further strengthen the guidance material
- In parallel, a lot of EASA internal discussion with PCMs, experts and DOATL took place and provided lessons learnt
- LOI concept was presented to wide audience on various occasion, e.g. public consultation of the draft LOI CM, ASD Airworthiness Meetings, STC Workshop, EASA/NAA meetings; feedback has been taken into account
- LOI is also being discussed with bilateral partners



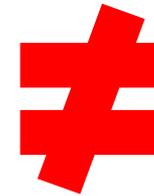
# Lessons learnt - Proportionality

A proportionate approach is needed for minor changes / repairs.

Compared to the process for approval of major changes / repairs:



- ✓ Risk-based approach for LOI determination
- ✓ Same criteria to be considered
- ✓ The Agency has to determine and notify LOI



- ✓ No LOI proposal from applicants required
- ✓ Risk assessment @ project level (“1 CDI”)
- ✓ Simplified risk matrix (only 3 risk classes)



# Lessons learnt – Proportionality

Simpler, lighter, better rules for  
General Aviation

G  
E  
N  
E  
R  
A  
L  
  
A  
V  
I  
A  
T  
I  
O  
N



Guidance already allows the use of proportionality when determining the LOI (mostly to differentiate between LA and GA)



More generic criteria have been extracted from the panel specific examples and added to the existing generic guidance. This will allow to define LOI on a broader range of products (which is the case of GA products)



Examples of LOI determination will be prepared by EASA for those GA projects with simple design and for applicants with low experience (young DOA, AP DOA, CP). These will be provided through the existing GA guidance on EASA website



# Lessons learnt – administrative burden

## In particular

- No need to justify rating of criteria in obvious cases
- Full flexibility for documentation of LOI (proposal)
- Provision of template certification programmes and LOI proposals
- Simplification of the criteria "novelty", "complexity" and "severity"
- More explanation on CDI and the creation of those
- Further harmonisation of the panel specific examples and transfer of some of them into the generic guidance
- Even though a slight increase of workload is expected in the first project(s) in order to get used to the new concept, compliance demonstration and verification gets more efficient through early notification of Agency involvement and predictability



LOI creates additional administrative burden ...

The guidance is too complex...



# Lessons learnt - Other

First project(s)  
require more  
effort

Process seems  
to be practicable

No significant  
delays in  
projects

Risk classes  
partly reduced to  
better meet  
expectations

Administrative  
burdens  
identified and  
reduced

Complexity of  
the guidance  
reduced

Sometimes  
request for more  
(detailed)  
guidance

More guidance  
necessary on  
CDI

CP breakdown  
into CDIs not  
always complete

Reflection of  
repetitiveness of  
compliance  
demonstration

Alleviations for  
derivative  
products

Need for  
transition phase

Need for more  
training /  
explanation

...



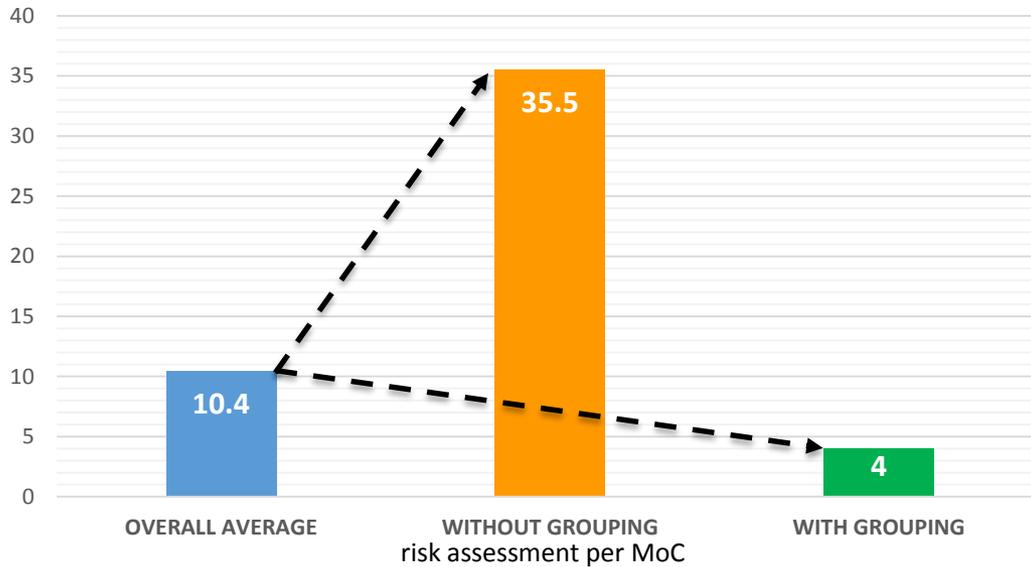


# Lessons learnt - Statistics

first 30 projects

(313 CDIs)

### # of CDIs per Project



**CDI: a tool to facilitate the risk assessment at a meaningful level !**





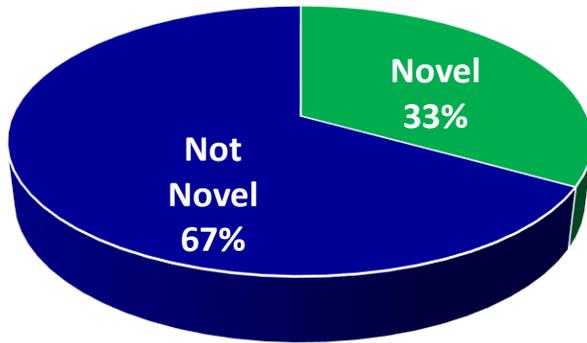
# Lessons learnt - Statistics

first 30 projects

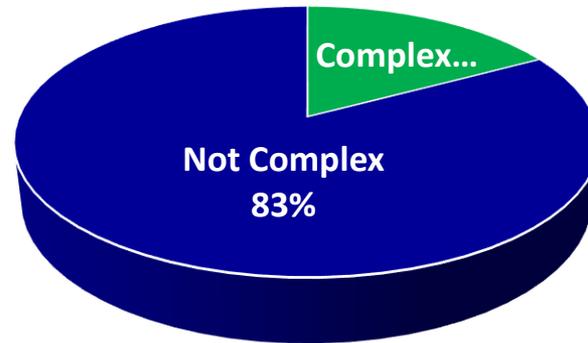
(313 CDIs)

*Classification of risk assessment criteria*

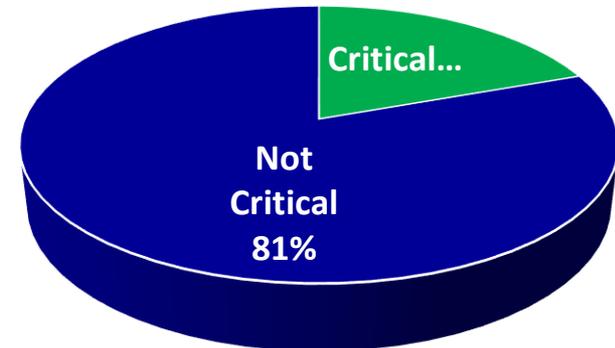
**NOVELTY**



**COMPLEXITY**



**CRITICALITY**





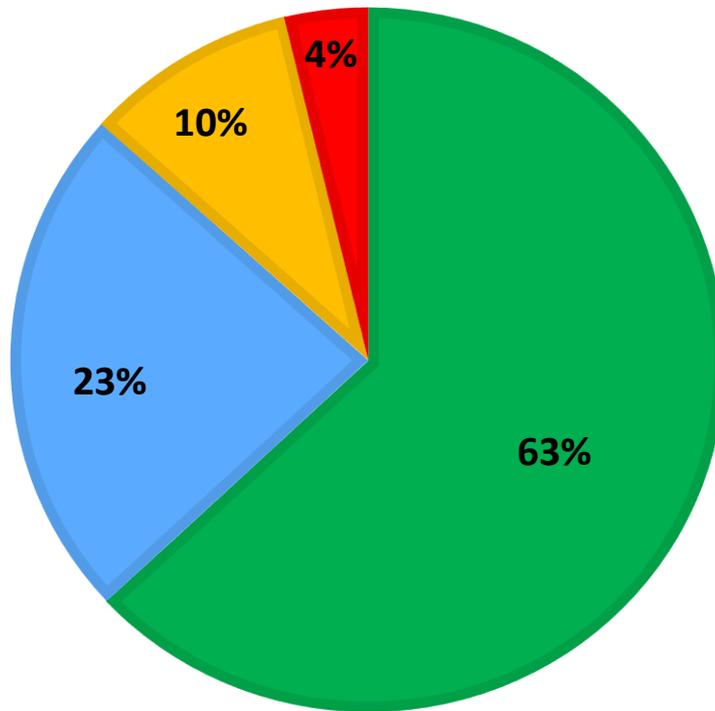
# Lessons learnt - Statistics

first 30 projects

(313 CDIs)

## RISK CLASS DISTRIBUTION

■ Risk class 1   ■ Risk class 2   ■ Risk class 3   ■ Risk class 4



overall – after an initial increase necessary to get used to the new concept – we see a slight decrease of Agency involvement in most of the advanced application projects





# Lessons learnt - environment

For Environment (Panel 9) application of the above criteria is not always obvious, but works. Focus: What is the environmental risk?

Examples for Novelty: New procedures for the acquisition of data, analysis and/or adjustment of measured noise/emissions levels to reference conditions (including new or novel hardware and equivalent procedures)

Examples for Complexity: Equivalent procedures not referred to in the ICAO Environmental Technical Manual;

Use of aircraft noise “family plan” methodologies

## Panel 9

Organisation performance: no specificities

Examples for Severity: commensurate with risk that a product might be certified with noise and/or emissions levels different to the levels that would have been certified if EASA had been fully involved;

Failure to manage this risk will lead to an uneven “playing field” in the context of operating restrictions and landing fees



# Lessons learnt - environment

- For a noise application the Attachment 9 was not taken into account and “correct” performance rating was not provided
  - “High” was assumed by the DO while “Medium” should have been applied
- The compliance demonstration for a major modification for an engine was based on an already existing certification report. However, a new requirement was in fact applicable
  - Correct application of the “novelty criteria” would have led to a higher risk class
  - Risk class was then revised



# Lessons learnt - environment

- EASA is working to continue and reinforce the exchange of information and experiences between DOA holder teams and Panel 9 Experts (Noise and/or Emissions) regarding DOA activities
- **Examples**
  - Data communication and availability
  - Participation of CT5 experts in DOA audits
  - Dedicated audits on environmental activities



# Your experience so far?

- Tecnam as an example for GA
- Other volunteering companies are invited to comment as well



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# Product Certification and Design Organisation Approval Workshop

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## EXPERIENCE OF TECNAM ON LOI

*Giuseppe Donnarumma, TECNAM Airworthiness Engineer  
22/11/2017, Cologne*



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**TECNAM**





# Table of Contents

- Pilot Projects overview
- **How LOI is introduced in** Certification Programme
- Some Statistics
- Challenges
- Advantages vs Disadvantages
- Suggestions for improvement





# Pilot Projects Overview

- Tecnam P2008JC
  - Metal wing and Horizontal Tail
  - Composite material fuselage
  - MTOW 650kg (2 seats)
- Three Major Changes
  - New Avionics
  - New Propeller
  - Fuselage Shape
- Proposed CM-21.A/21.B-001 Issue 01





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# Pilot Projects Overview (New Avionics)

- Primary Flight Information on Digital Instrument
- Touch screen showing flight, navigation and engine information (situational awareness)



Major Change Approval: on going...





# Pilot Projects Overview (Propeller)

- New three bladed Propellers instead of the standard two blade
- Improved flight and ground performances
- Lower Noise level



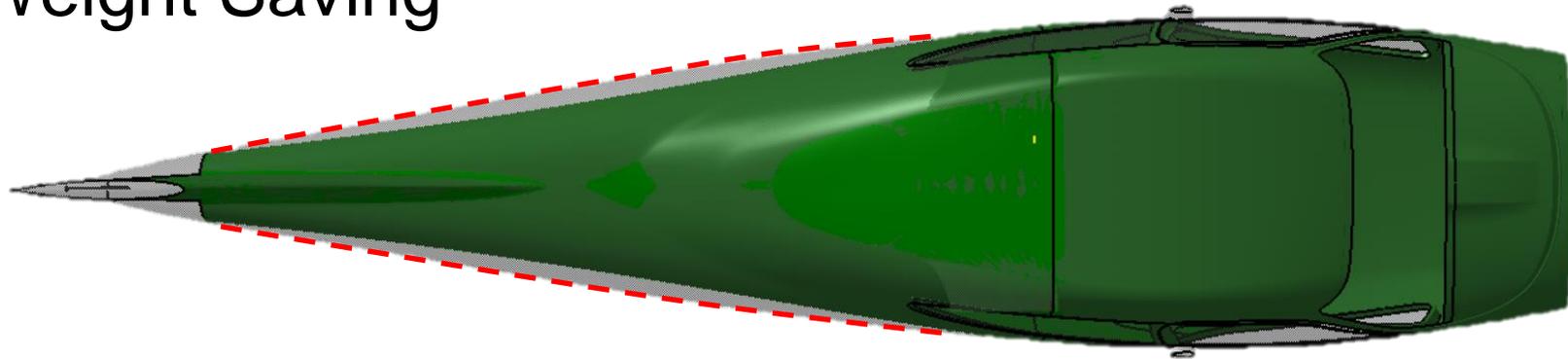
Major Change Approved!!!





# Pilot Projects Overview (Fuselage Shape)

- New Tail-cone shape
- Improved aesthetics
- Weight Saving



Major Change Approval: on going...





# How LOI is introduced in Certification Programme

- Compliance Check List with CDI

Paragraph	Title	ToR	MoC	Report	Compliance Demonstration Item
<b>1321</b>	Arrangement and visibility	6(P)	1	✓ Report No 2008/211 – Avionic System for MOD2008/037	✓ CDI2008/037_01 – Avionic System
		6(P)	1	✓ Report No 2008/212 – Avionics and Cockpit Layout, Design Criteria Validation and Verification for MOD2008/037	✓ CDI2008/037_01 – Avionic System
		1(P)	1	✓ Report No 2008/212 – Avionics and Cockpit Layout, Design Criteria Validation and Verification for MOD2008/037	✓ CDI2008/037_05 – Flight
<b>1331</b>	Instruments using a power supply	6(P)	1	✓ Report No 2008/211 – Avionic System for MOD2008/037	✓ CDI2008/037_01 – Avionic System
		5(P)	1	✓ Report No 2008/215 – Electric System for MOD2008/037	✓ CDI2008/037_02 – Electric System
<b>1351 (a)(b)</b>	General	5(P)	1	✓ Report No 2008/215 – Electric System for MOD2008/037	✓ CDI2008/037_02 – Electric System
		5(P)	2	✓ Report No 2008/216 – Electric Load Analysis for MOD2008/037	
		5(P)	5	✓ Report No 2008/221 – Ground Test Plan for MOD2008/037 ✓ Report No 2008/222 – Ground test Results for MOD2008/037	





# How LOI is introduced in Certification Programme

- Compliance Demonstration Item

<b>CDI No</b>	CDI2008/037_05
<b>CDI Title</b>	Flight
<b>Primary Panel(s)</b>	Panel 1/2 – Flight Test Panel 5/6 – EL/AV System
<b>Secondary Panel(s)</b>	-
<b>Requirements</b>	25(b), 29(a), 1301(d), 1303, 1321, 1431, 1581, 1589(a), CRI O-101 1381(a)(b), CRI O-101 773
<b>Approach</b>	<p>The showing of compliance will focus on MD302 installation impact on human-machine interface, arrangement and visibility on cockpit.</p> <p>This CDI will also focus on G3Xtouch device functioning excluded touch screen features that will be addressed in “CDI2008/037_06 – Touch Screen”.</p> <p>A Flight Test Programme will be released to define the test equipment and procedures for showing compliance by means of flight tests, including the Flight Test Matrix showing the entire scope of planned flight tests and pass/fail criteria. The software tool used for management and preparation of the Flight Test Programme is mainly FileMaker suite that is a cross-platform relational database application which integrates a database engine with a GUI-based interface (already shown to EASA team during P2008 JC certification). All tool used for flight testing management has been positively judged by the EASA specialists of Flight test panel during P2008 JC and P2010 type investigation.</p> <p>Effects on the weight and balance of the aircraft will be addressed in this CDI.</p>





# How LOI is introduced in Certification Programme

- CDI Risk Class determination

Criteria	Classification	Justification	Likelihood
<b>Novelty</b>	No	Avionic system is based on MD302 instrument which is already installed on P2010 and P2006T aircraft. G3X system is already installed on P2008JC: being its functions unchanged this CDI can be considered as not novel.	Low
<b>Complexity</b>	Yes	The showing of compliance will also focus on the HMI. In accordance with the “specific aspects of complexity” listed in ref.[2.8] Attachment 1.	
<b>DOA performance</b>	High	In accordance with DOA dashboard	

Criteria	Classification	Justification	Risk
<b>Criticality</b>	Yes	HMI is affected.	<b><u>Class 2</u></b>
<b>Likelihood</b>	Low	In accordance with table above	





# How LOI is introduced in Certification Programme

- Level of Involvement Proposal

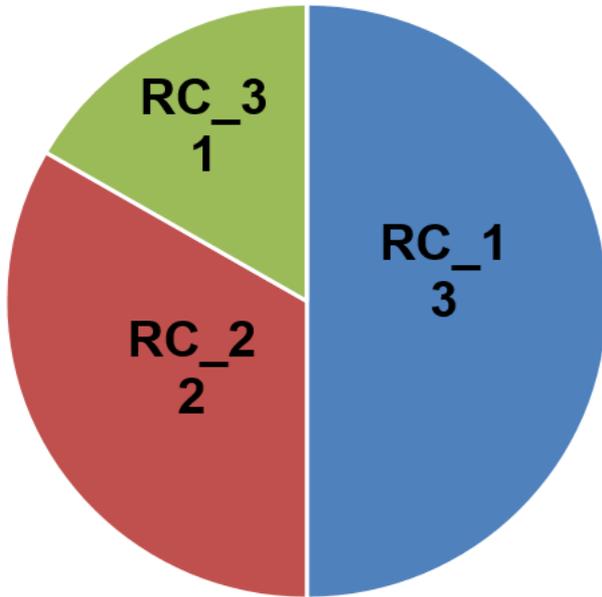
Report No	Title	Requirement	ToR	MoC	Ed.	Rev.	EASA Review	EASA Witnessing
2008/100-S8	AFM supplement for MOD2008/037	1581 1589(a)	1, 2, 5, 6	1	1	0	Yes	N.A.
2008/212	Avionics and Cockpit Layout Design Criteria Validation and Verification for MOD2008/037	1303 1321 CRI O-101 1321 CRI O-101 1381(a)(b)	1	1	1	0	No	N.A.
2008/223	Weight and Balance for MOD2008/037	25(b) 29(a)	2	2	1	0	No	N.A.
2008/224	Flight Test Programme for MOD2008/037	1301(d) 1431 CRI O-101 1381(a)(b) CRI O-101 773	1, 5, 6	6	1	0	Yes	No
2008/225	Flight Test Results for MOD2008/037	1301(d) 1431 CRI O-101 1381(a)(b) CRI O-101 773	1, 5, 6	6	1	0	No	No





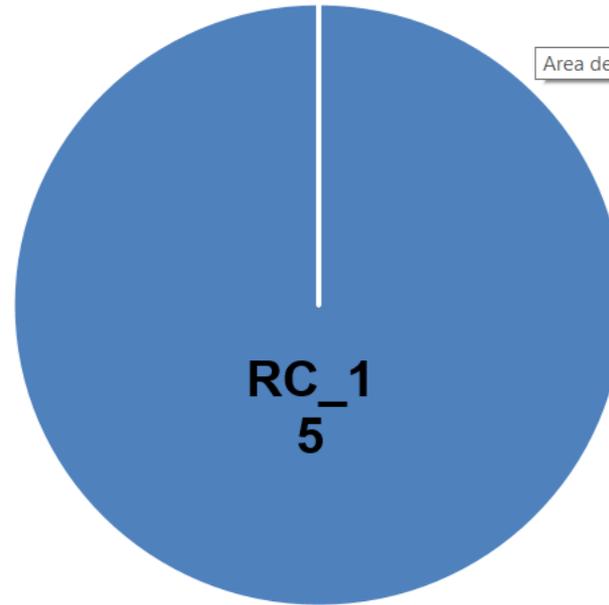
# Some Statistics

### New Avionics



Total CDI: 6

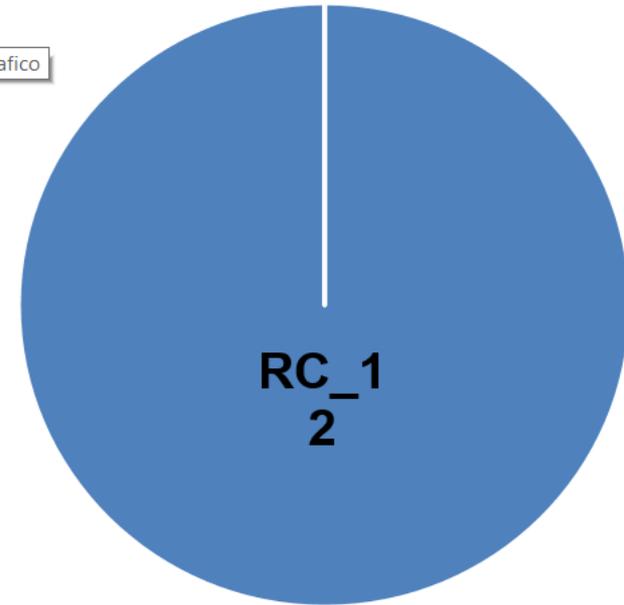
### Propeller



Area del grafico

Total CDI: 5

### Fuselage



Total CDI: 2



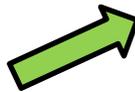


# Challenges

- CDI: not easy to define!!! A CDI may be linked to several panels, MOC, topics etc.
- Solution:
  - In each CDI Tecnam tried to reflect the panels structure;
  - When more panels were involved the specific aspects of each panel were considered, giving more relevance to the affected primary panel;
  - In some cases, CDI were further split to highlight specific topics which might require more detailed assessment (example: a CDI only for the Touch Screen aspects)

## CDI #1 - Avionic

- Primary flight instrument
- Situational awareness instrument (traditional controls)
- Touch screens aspects



## CDI #1 - Avionic

- Primary flight instrument
- Situational awareness instrument (only traditional controls aspects)



## CDI #6 – Touch Screens

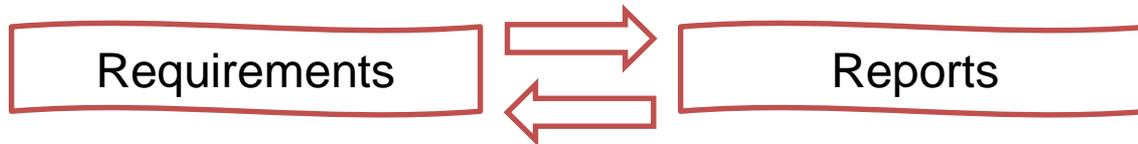
- Controls feedback
- Flight testing
- ...





# Challenges

- Link between CDIs, Reports and Requirements:
  - A report can demonstrate compliance to requirements of different CDIs
- Solution: Tecnam created a very simple database to manage the requirement-report-CDI links to be provided to the team





# Challenges

- Link between CDIs, Reports and Requirements: A report can demonstrate compliance to requirements of different CDIs
- Solution: Tecnam created a very simple database to manage the requirement-report-CDI links to be provided to the team.

### Database:

- ✓ Input: Compliance Check List
- ✓ Output link between CDI, Reports and Requirements

OUTPUT->Reports with Requirements and CDIs

Report:2008/245 Flight Test Data Reduction for MOD2008/086

Requirement	ToR	MoC	CDI
21 (a) (b) (c)	2P	2	CDI_02 - Performance
45	2P	2	CDI_02 - Performance
51	2P	2	CDI_02 - Performance
65 (a) (c)	2P	2	CDI_02 - Performance
77	2P	2	CDI_02 - Performance
1047	7P	2	CDI_01 - Powerplant
	2S	2	CDI_01 - Powerplant
1587 (a) (d)	2P	2	CDI_02 - Performance

OUTPUT->Reports per Compliance Demonstration Items

CDI:CDI\_06 Touch Screen

- >Report: 2008/100-S8 AFM supplement for MOD2008/037
- >Report: 2008/101-S6 AMM supplement for MOD2008/037
- >Report: 2008/212 Avionics and Cockpit Layout...
- >Report: 2008/224 Flight Test Programme for MOD2008/037
- >Report: 2008/225 Flight Test Results for MOD2008/037

OUTPUT->Requirements per CDI

CDI\_01 Avionic System

Requirements:  
 1301(a) (c), 1301(d), 1303, 1321, 1331, 1431, 1529,  
 1543(b), 1545, 1581, CRI O-101 1321, CRI O-101 1381(a) (b)





# Challenges

- Reports approval
  - If a report is linked to CDIs with different risk classes it might results in different involvement depending on the CDI (for example retained on CDI1, not retained on CDI2). In such cases it may be necessary to specify which parts of the report are retained.
  - For future projects a way to address this case could be to clearly identify which parts **of the report** are retained by EASA

<u>Requirement</u>	<u>Reports paragraph</u>	<u>ToR</u>	<u>MoC</u>	<u>CDI</u>	<u>EASA retained</u>
21(a)(b)(c)	?	?	2	2	Yes
45	?	?	2	2	Yes
51	?	?	2	2	Yes
65(a)(c)	?	?	2	2	Yes
77	?	?	2	1	No
1047	?	?	2	1	No
1587(a)(d)	?	?	2	2	Yes





# Advantages vs Disadvantages

## Advantages:

- Risk class determination and Lol proposal is based on well-defined criteria
- CDIs with risk class 1: the involvement of the Agency is limited to the Certification Programme
- Focus the attention of both teams on the initial phase of certification programme approval. This improves the management of the project.

## Disadvantages:

- Breaking the CP into CDIs leads to a higher workload
- CDI is an additional item to handle in case of changes/updates during the certification project
- Initial effort to implement a tool (database) to manage the preparation of CP and CCL
- Updating of Procedures and reports template
- Team to be trained





# Suggestions for improvement

- Guidance material for General Aviation for the determination of the Agency's Lol
- Guidance material for CDIs definition (practical examples)





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# Our journey this morning ...

- ✈ What do we intend to change, and why?
- ✈ Main milestones (past and present)
- ✈ Reminder of the main principles of LOI
- ✈ LOI in projects applied for by DOA holders
  - ✈ DOA holder performance
  - ✈ Risk assessment
  - ✈ Design Assurance System

- ✈ Lessons learnt during advanced application projects with DOA holders
  - ✈ Advanced Application Projects
  - ✈ Proportionality
  - ✈ Administrative burden & complexity
  - ✈ Other lessons learnt and Statistics
  - ✈ Lessons learnt environment
  - ✈ Your experience so far?
- ✈ Risk assessment in projects where capability is demonstrated through AP to DOA or CP
- ✈ Risk assessment in ETSOA projects
- ✈ Future milestones



# Organisations using AP to DOA or CP

- Applicants using alternative procedures to DOA (or presenting the certification programme only) to demonstrate their capability are also subject to the LOI

*Note: a different process applies for ETSOA applicants*

- The **only** difference is that, not having a DOA, their performance level is established as 'unknown'
- The risk matrix is therefore simplified as follows:

<b><i>Risk-matrix for applicant using alternative procedures to DOA</i></b>			
<i>Likelihood</i>	no novel or complex aspects	no novel aspects, but with complex aspects ; with novel aspects, but no complex aspects	novel and complex aspects
<i>Severity</i>			
Non-critical	<b>Class 2</b>	<b>Class 3</b>	<b>Class 3</b>
Critical	<b>Class 3</b>	<b>Class 4</b>	<b>Class 4</b>



# Organisations using AP to DOA or CP

- So far, advanced application phase was limited to DOA holders
- now that guidance material will become available, this may also be tested in projects where capability is demonstrated using an AP



any company interested + volunteering to apply LOI is welcome to approach us ...



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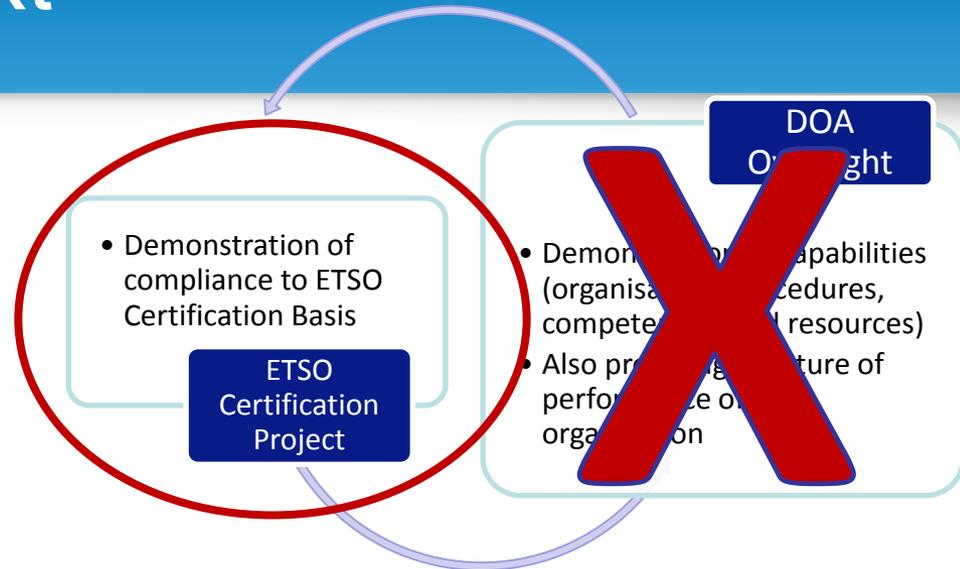


# The ETSO context

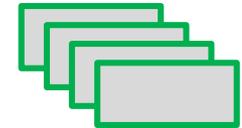
- ETSO applicant has no DOA (except if the article is an APU)
- ETSO applicant is not regularly assessed for its procedures & processes (no DOA audits)

- The data requirements are listed in point 21.A.605, means to demonstrate compliance to be set out by applicant

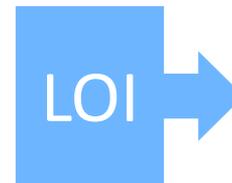
- Different Part 21 requirements => 21.B.100 (b)
  - ➔ different approach for Lol determination process for ETSO projects



Part 21.A.605



ETSO Data Package



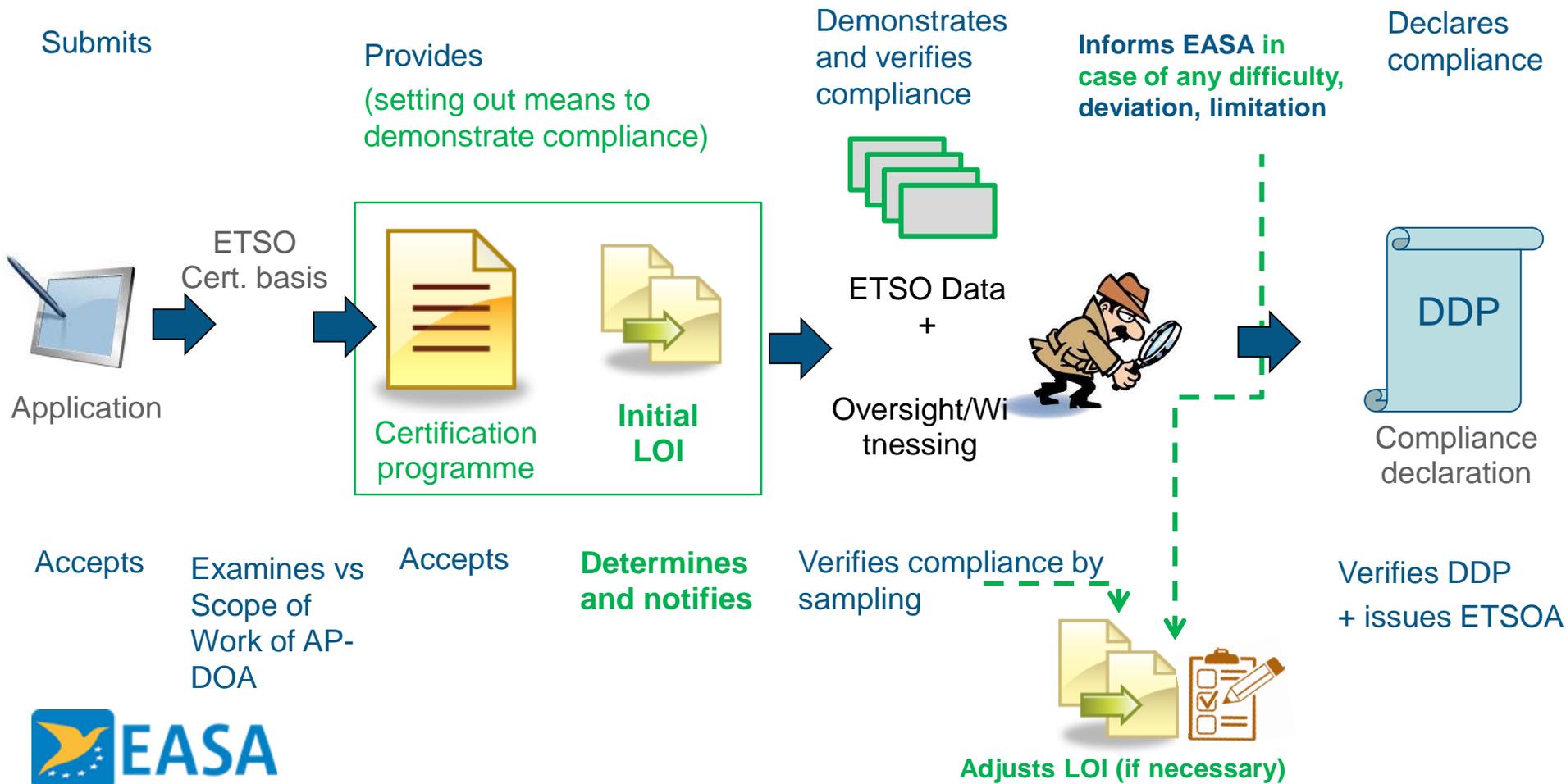
Part 21.B.100 (b)



# The 'new' Certification Process for ETSO

Changes in green..

## APPLICANT





# ETSOA - In conclusion

## ➤ For ETSO applicants:



Certification Programme to be submitted,  
and then continues with the usual process

## ➤ For EASA:

➤ EASA determines its initial Lol and notifies the applicant

➤ Initial Lol (depth of investigation) is defined consistently with EASA current practice

➤ Lol is adapted (reduced/increased) using a risk-based approach, project data and project evolution on the basis of the criteria provided in Part-21



# Lol determination principles

## ➤ Initial Lol determination is based on the following criteria:

- Applicant's experience in ETSO compliance
  - New AP-DOA, new APDOA scope of work, organization/ procedures changes...
- The ETSO applicant's level of performance in the ETSO scope of work/cert basis
  - Feedback from ETSO projects in the same scope of work, period since last EASA involvement...
- The use of novelties in the technology/design or in the means of compliance
  - Including new ETSO standards, new deviation, new limitation, new methodology/unusual means of compliance
- The complexity of the ETSO article
  - Design, architecture, technology....
- The criticality of the design





# Organisations applying for ETSOA

- So far, advanced application phase was limited to DOA holders
- now that guidance material will become available, this may also be tested in ETSOA projects



any company interested + volunteering to apply LOI is welcome to approach us ...



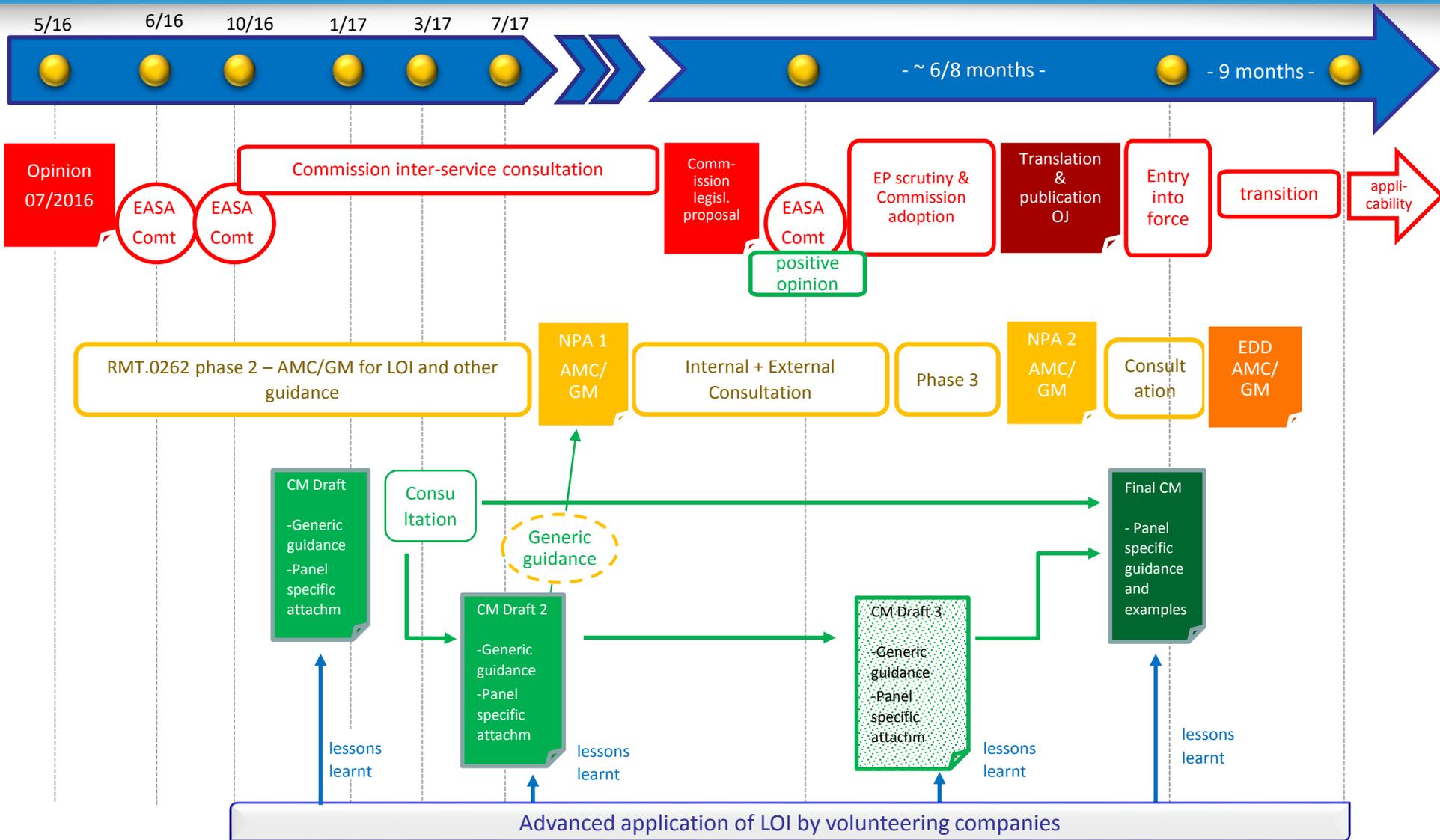
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# The Current LOI Roadmap





# Initiatives to support LOI implementation



WHAT	START	MAIN FIGURE	
Advanced application of new Lol	Oct 2016	13 volunteering DOAs	More than 50 cert projects

WHAT	START	MAIN FIGURE	
Training of EASA PCM, experts and DOATL	Dec 2016	18 sessions performed, more planned	Approx. 190 EASA trained so far
Training of NAA staff involved in EASA certification projects	Mid 2017	Approx. 40 colleagues trained so far	Further sessions in planning



WHAT	START	MAIN FIGURE	
Roadshows for the industry in EU	Q2 2018	Various sessions planned	Arrangements tbd





# EASA

European Aviation Safety Agency

# Thank you for your attention!

# Any questions?

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