DELEGATES CONFERENCE 2018 - EEDA
Recent/Harmonized Advisory Material and Standards

Electronic Equipment Design Assurance - National Aircraft Certification
Victor Lopes, Senior Engineer
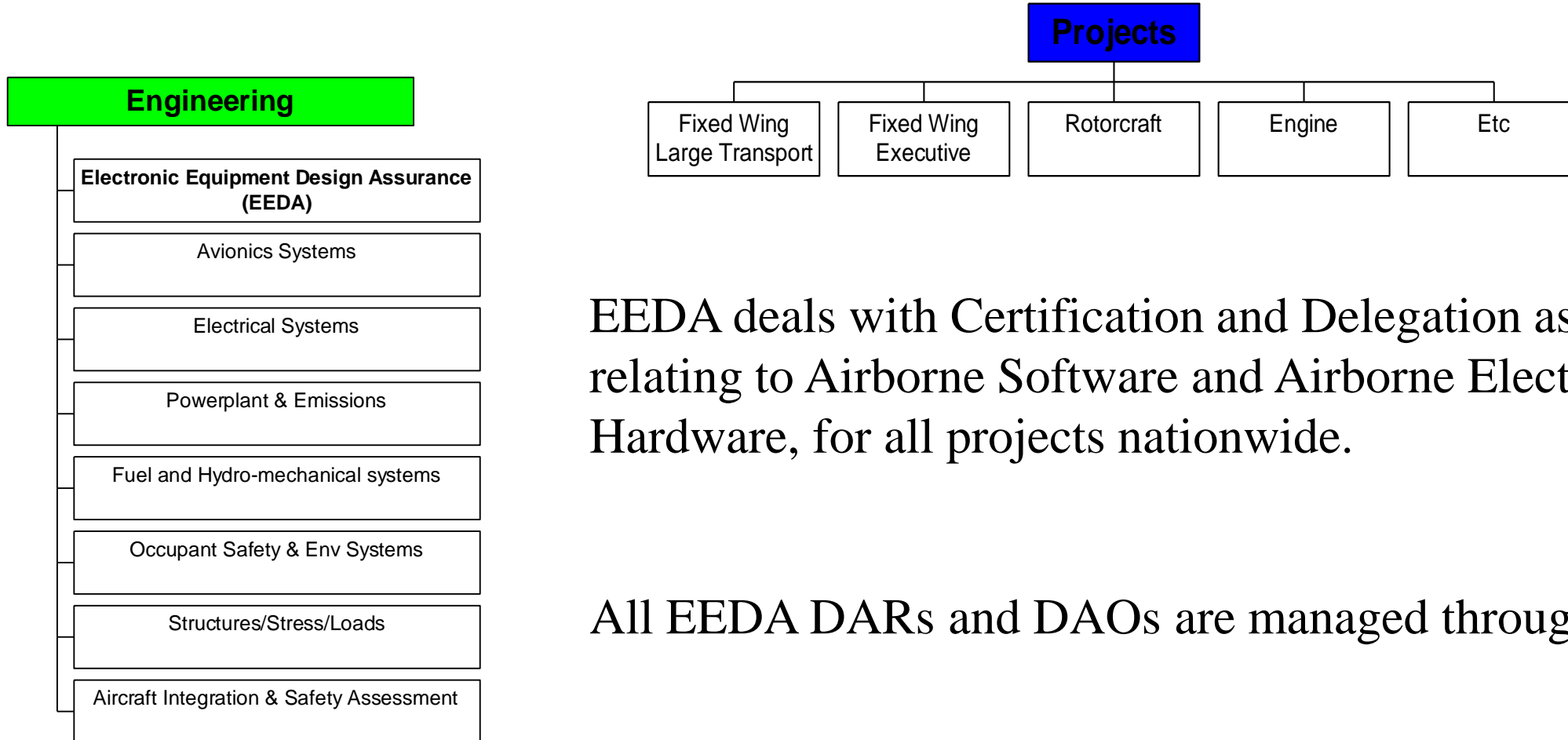
Outline

- ➢ TCCA Organization and Oversight (EEDA)
- ➢ Recent/Harmonized Advisory Material
  - ➢ A(M)C 20 115D (Software)
  - ➢ A(M)C 20-152A (AEH)
  - ➢ A(M)C 20-189 (OPR)
- ➢ IMA ETSO 2C-153 (IMA Module)
- ➢ IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)

Outline

- **<u>TCCA Organization and Oversight (EEDA)</u>**
- Recent/Harmonized Advisory Material
  - A(M)C 20 115D (Software)
  - A(M)C 20-152A (AEH)
  - A(M)C 20-189 (OPR)
- IMA ETSO 2C-153 (IMA Module)
- IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)

TCCA Organization and Oversight
NAC Certification Resources – Matrix Org

Projects

Fixed Wing Large Transport	Fixed Wing Executive	Rotorcraft	Engine	Etc

Engineering

- **Electronic Equipment Design Assurance (EEDA)**
- Avionics Systems
- Electrical Systems
- Powerplant & Emissions
- Fuel and Hydro-mechanical systems
- Occupant Safety & Env Systems
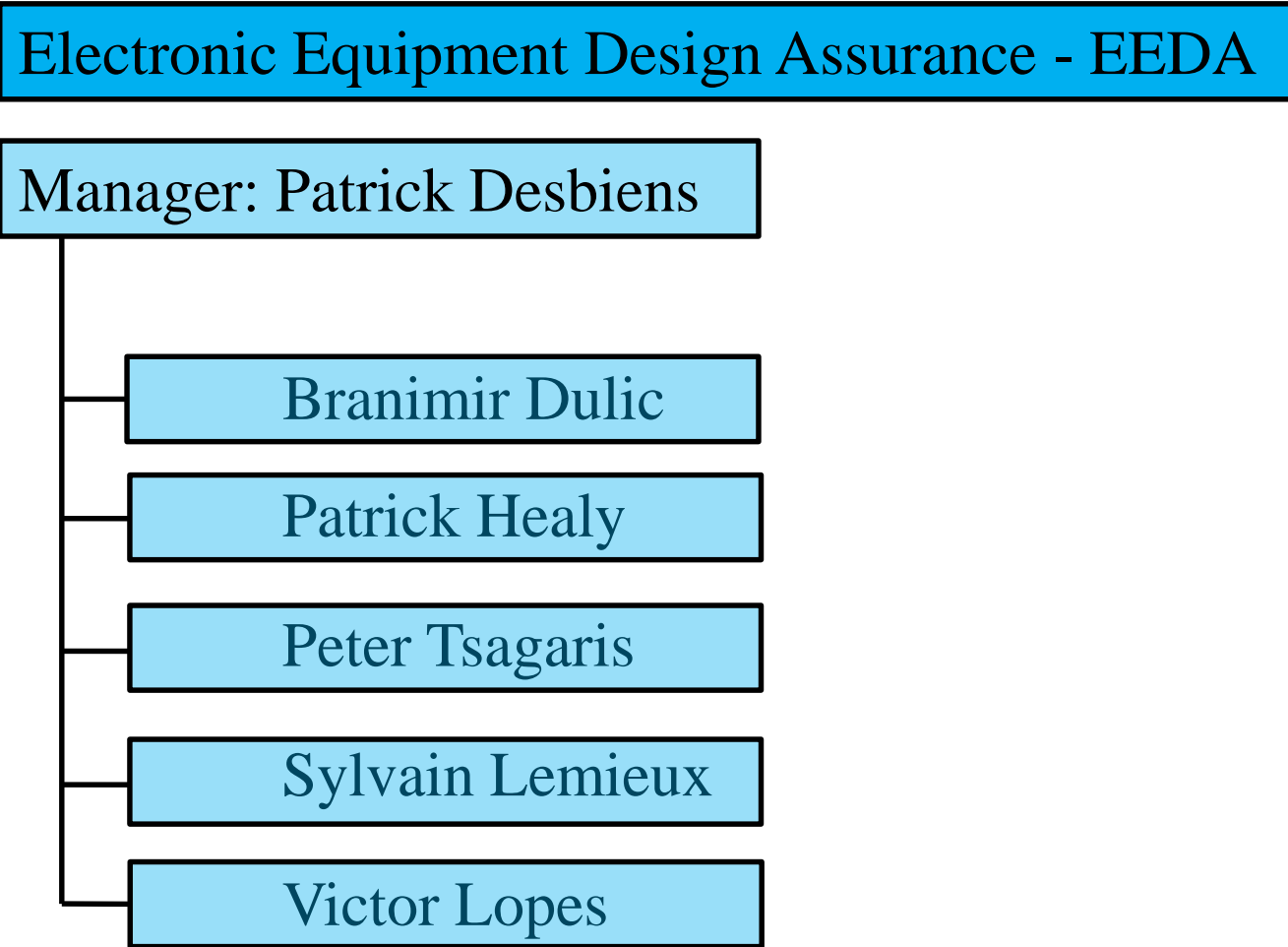- Structures/Stress/Loads
- Aircraft Integration & Safety Assessment

EEDA deals with Certification and Delegation aspects relating to Airborne Software and Airborne Electronic Hardware, for all projects nationwide.

All EEDA DARs and DAOs are managed through HQ.

TCCA EEDA Organization
Resources – Matrix Org

Electronic Equipment Design Assurance - EEDA

Manager: Patrick Desbiens

- Branimir Dulic
- Patrick Healy
- Peter Tsagaris
- Sylvain Lemieux
- Victor Lopes

Outline

- ➤ TCCA Organization and Oversight (EEDA)
- ➤ **Recent/Harmonized Advisory Material**
  - ➤ A(M)C 20 115D (Software)
  - ➤ A(M)C 20-152A (AEH)
  - ➤ A(M)C 20-189 (OPR)
- ➤ IMA ETSO 2C-153 (IMA Module)
- ➤ IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)

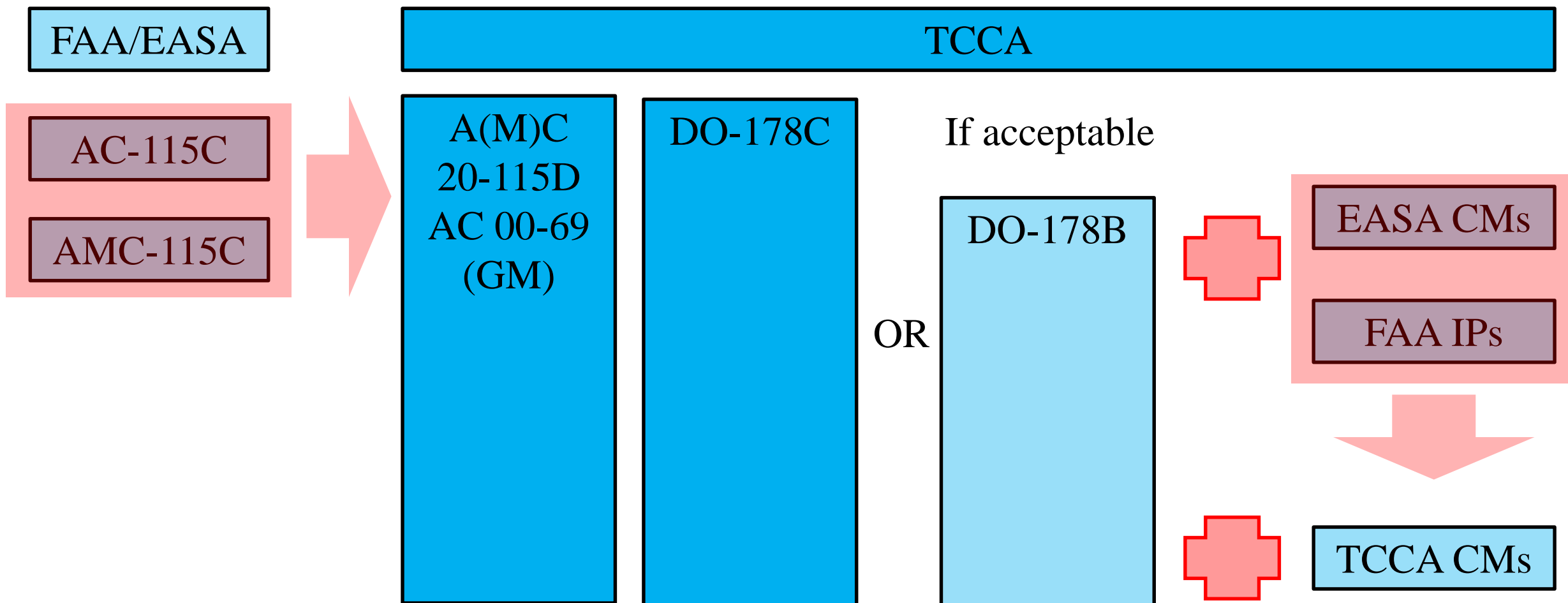# Recent/Harmonized Advisory Material

- Supported by an industry request EASA and FAA started a joint harmonization effort to:
  - Revisit the Software guidance
  - Increment AEH (Hardware) guidance
  - Create common OPR guidance

- FAA and EASA are working with 3 major industry associations (ASD, GAMA and AIA) before public consultation.

- FAA ACs are considered acceptable by Transport Canada, except when specifically excluded in Appendix C of the Airworthiness Manual Advisory (AMA 500-00).

Recent/Harmonized Advisory Material

- A(M)C 20-115D, GM/AC 00-69 (SW Best Practice)
  - FAA/EASA Published in 2017

- A(M)C 20-152A, GM/AC 00-72 (AEH Best Practice)
  - FAA/EASA NPA 2018-09

- A(M)C 20-189, GM/AC 00-71(OPR Best Practices)
  - FAA/EASA NPA 2018-09

Software guidance - A(M)C 20-115D

FAA/EASA

TCCA

AC-115C

AMC-115C

A(M)C
20-115D
AC 00-69
(GM)

DO-178C

If acceptable

DO-178B

OR

EASA CMs

FAA IPs

TCCA CMs

Software guidance - A(M)C 20-115D

Section 5 defines when existing DO-178B processes can be used for new development

Section 8 contains guidance for FLS and UMS as it applies to software developers
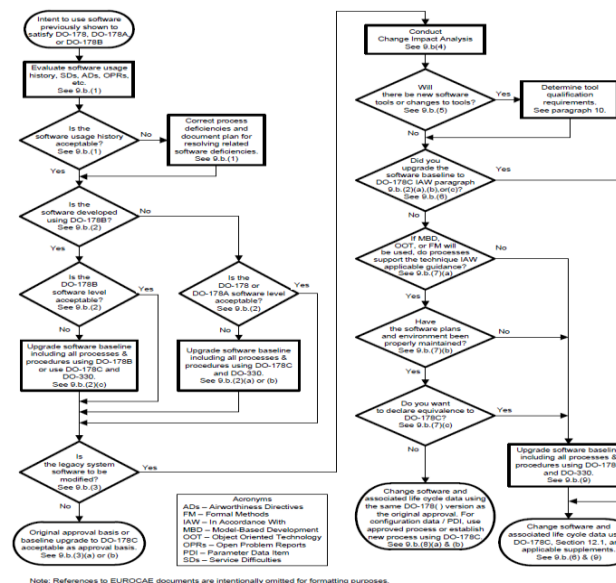
Section 10 harmonizes guidance on tool qualification

Considers the use of ED-12C/DO-178C PDI guidance with existing DO-178B processes

Considers the use of MBD, OOT, or FM for new development, provided processes were evaluated and found to be acceptable by Certification Authority under specific "CM/CRI/IP".
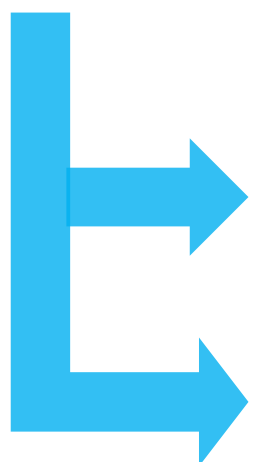
Software guidance - A(M)C 20-115D

GM/ AC 00-69 (Best practices):

➢ Data coupling/control coupling clarified, based on EASA CM-SWCEH-002

➢ Scope & content of change impact analysis (CIA) clarified

➢ Error handling at the design level, based on EASA CM-SWCEH-002

Airborne Electronic Hardware guidance A(M)C 20-152A

- Streamlined guidance –Objectives oriented wording
  - Focus on WHAT to achieve
  - Intends to provide more flexibility to industry on the HOW

- Objective identifier:
  - For the development of custom devices, the identifier is CD-i,
  - For the use of COTS IP in custom devices, the identifier is IP-i,
  - For the use of COTS devices, the identifier is COTS-i.

Airborne Electronic Hardware guidance A(M)C 20-152A

Custom Device

Section 5.1 and 5.2 provide applicability guidance on Simple /Complex classification for custom devices

CD-1

Section 5.4 Development Assurance of Simple Custom Devices

CD-2

Section 5.5, 5.6, 5.7 Clarifications for DO-254 Validation and Verification Process

CD-3, CD-4, CD-5, CD-6, CD-7, CD-8

Section 5.8 Clarifications for ED-80/DO-254 Tool Assessment and Qualification

CD9, CD10

Section 5.9 Previously Developed Hardware

CD-11

Airborne Electronic Hardware guidance A(M)C 20-152A

IP and COTS

Section 5.11 Use of COTS IP in Custom Design Development
    Development Assurance for COTS IP (Planning, Selection, IP assessment)
    Requirements for the COTS IP Function and Validation
    Verification

IP-1, IP-2, IP-3
IP-4, IP5, IP6

Section 6 Use of commercial-off-the-shelf devices

    Only Complex COTS

COTS-1, COTS-2
COTS-3, COTS4
COTS-5, COTS-6
COTS-7, COTS-8

Airborne Electronic Hardware guidance A(M)C 20-152A

GM/AC 00-72 (Best practices):

➢ Custom devices (CD-1, CD-2, CD-6, CD-8, CD-9, CD-10, IP-2, IP-4, IP-5)

➢ COTS devices (COTS-1, COTS-2, COTS-3, COTS-6)

➢ Electronic Hardware Assembly Development

OPR management guidance –A(M)C 20-189

➢ Will provide guidance addressing simultaneously three domains: System, Software and AEH.

➢ Reference material include ARP4754A, DO-178C and DO-254.

➢ Goal is to create a stand-alone document, not implying the use of a given standard.

➢ Supporting inputs: DO-248C DP#9, Lessons-learned from certification projects, Industry Recommendations

Outline

- ➢ TCCA Organization and Oversight (EEDA)
- ➢ Recent/Harmonized Advisory Material
  - ➢ A(M)C 20 115D (Software)
  - ➢ A(M)C 20-152A (AEH)
  - ➢ A(M)C 20-189 (OPR)
- ➢ **IMA ETSO**
  - ➢ IMA ETSO 2C-153 (IMA Module)
  - ➢ IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)

IMA (E)TSO

2002	2003	2005	2010	2016	2018	2019 …
FAA TSO C-153	FAA AC 20-145	RTCA DO 297	FAA AC 20-170	EASA ETSO 2C-153	EASA AMC 20-170	FAA TSO C-153A
			FAA AC 20-145		EASA ETSO C214	FAA AC 20-170A

IMA HW Module

IMA Based on TSO C-153

Incremental approval
Breakdown of Tasks
Req. modularity (incl. Partitioning)

DO-297 TASK1 Module/ Platform

DO-297 TASK2 - Hosted Application Development

DO-297 TASK3 - System Level Development

18

IMA ETSO 2C-153 (IMA Module)

➢ Published by EASA in 2016 as part of the IMA incremental process. (FAA TSO C-153A, public comments ends 14th Nov)

➢ Allows platform providers to get an approval independently of the installation.

➢ Covers the DO-297 Task1, Platform/Module acceptance covering ALL components:

    ➢ Hardware + Core Software and Tools

    ➢ Includes Health Monitoring features

    ➢ User Data (User Guide) identifying User's constraints/performance

IMA ETSO 2C-153 (IMA Module)

➢ Defines classes of shared resources, with process and Minimum Performance requirements for each class.

➢ Requires to characterize resources to the user for each class, if present in the platform:

Class RH	Racking House

Class PR	Processing

Class DS	Data Storage

Class GP	Graphical Processing

Class DH	Display Head

Class PS	Power Supply

Class IF	Interface

20

IMA ETSO 2C-153 (IMA Module)

➢ Appendices:

1. General

2. MPS

3. Data

4. Environmental

MPS= Performance + Characterization

2.1	Common
2.2	Racking House
2.3	Processing
2.4	Data Storage
2.5	Graphical Processing
2.6	Display Head
2.7	Power Supply
2.8	Interface

21

IMA ETSO 2C-153 (IMA Module)

➢ Appendices:

1. General

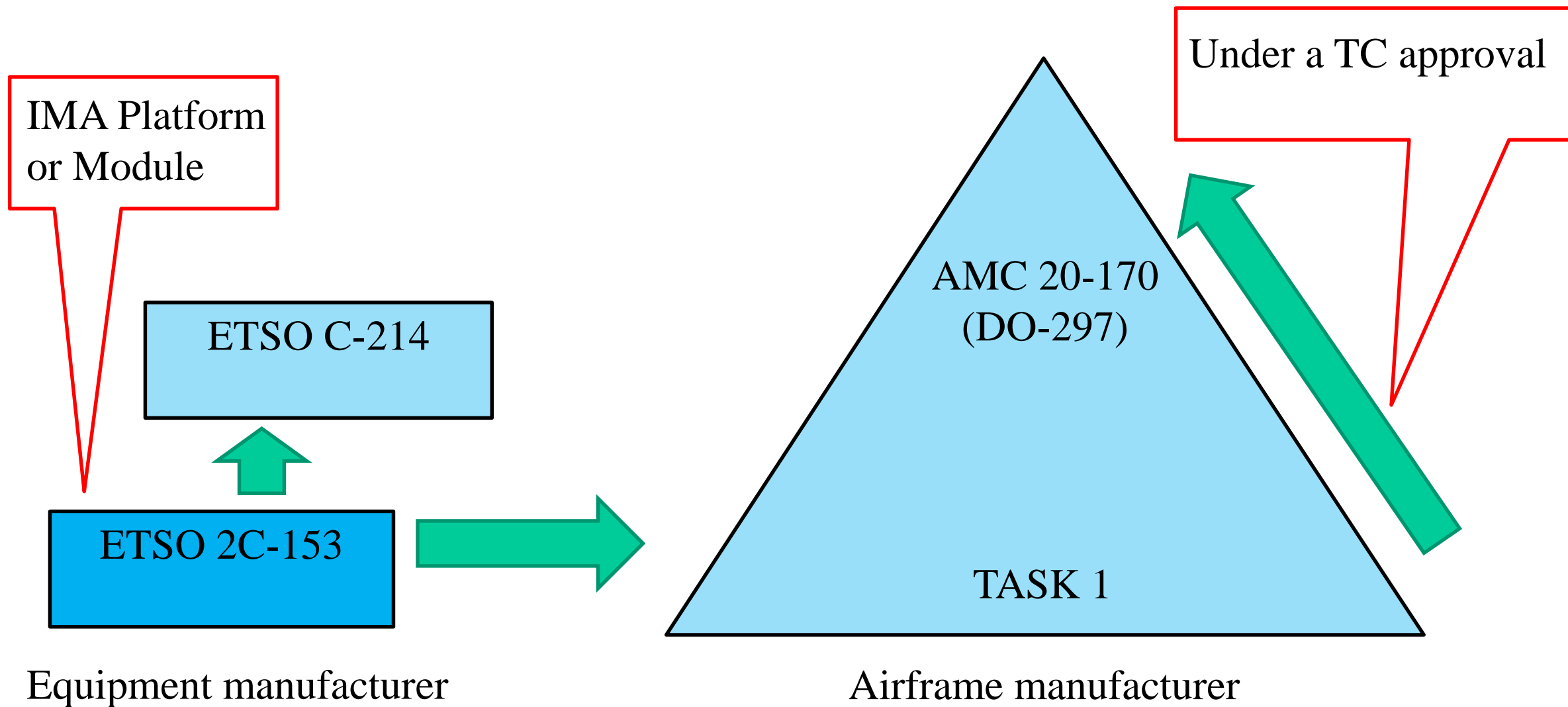Data required for the user described in 8 chapters

2. MPS

3. Data

User Guide concept

Clear covered/not covered aspects

Transfer of 'safety' aspects for further safety analysis

Installation Manual

4. Environmental

IMA ETSO 2C-153 (IMA Module)

IMA Platform or Module

Under a TC approval

ETSO C-214

AMC 20-170
(DO-297)

ETSO 2C-153

TASK 1

Equipment manufacturer

Airframe manufacturer

23

Outline

➢ TCCA Organization and Oversight (EEDA)
➢ Recent/Harmonized Advisory Material
  ➢ A(M)C 20 115D (Software)
  ➢ A(M)C 20-152A (AEH)
  ➢ A(M)C 20-189 (OPR)
➢ IMA ETSO 2C-153 (IMA Module)
➢ **IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)**
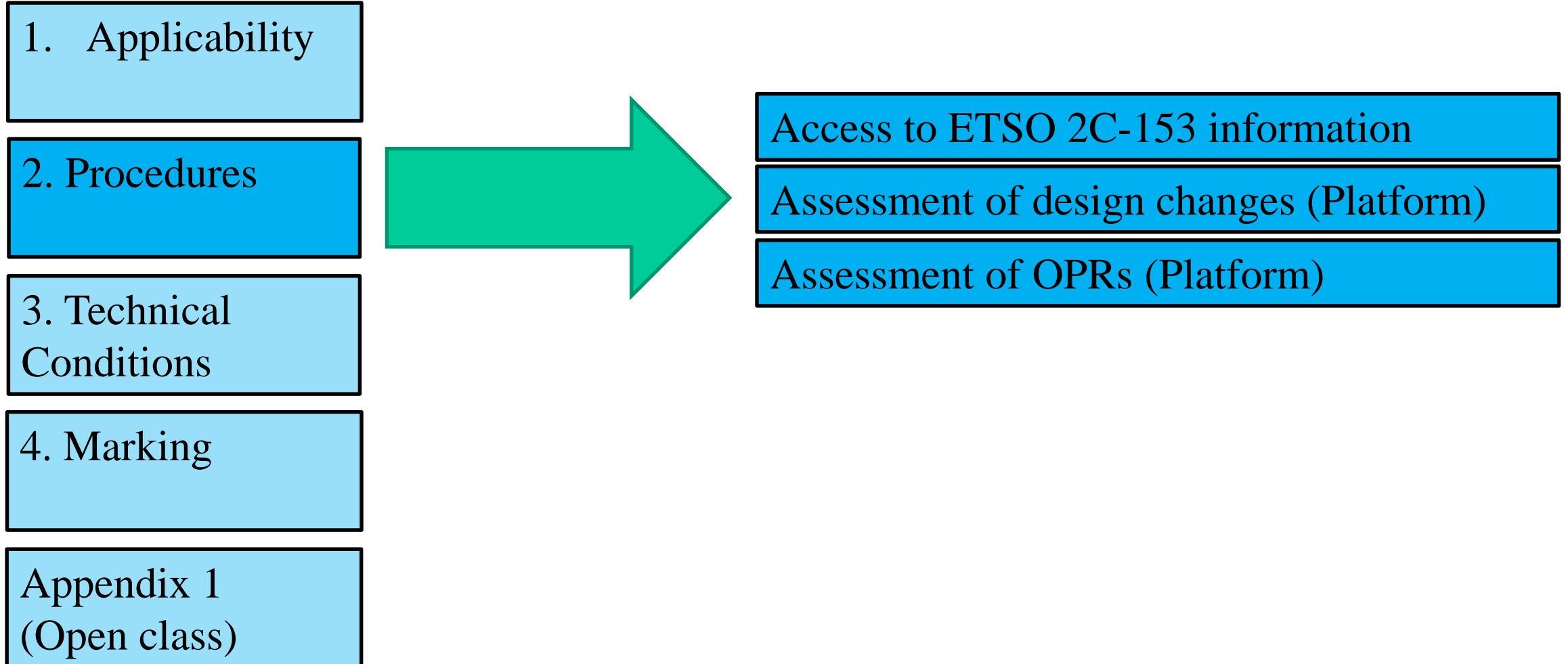
IMA ETSO C-214 Functional ETSO equipment using an ETSO-2C153 authorized IMA Platform Or Module

➢ Published by EASA in 2018 as part of the IMA incremental process.

➢ Applicant seeking certification of a functional ETSO based on a previously ETSO-2C153 authorized IMA platform/module.

➢ Application to ETSO-C214 needs to be associated to an application to functional ETSO standard.

  ➢ ETSO-C214 MPS are additional to the ETSO function MPS

  ➢ ETSO-C214 addresses the development and integration aspects in an IMA context

➢ Covers DO-297 Task 2 and Task 3.

IMA ETSO C-214 Functional ETSO equipment using an ETSO-2C153 authorized IMA Platform Or Module

➢ Defines 2 classes ETSO of C-214 : Closed and Open

➢ Closed: The applicant doesn't aim at any further 'IMA development' (no new function/application)

➢ Open: The applicant is aiming at further 'IMA development', by same applicant or by a user of the F-ETSO'd equipment (new application in another free partition, new function using spare resources)

➢ Considerations for: Health Monitoring/Fault Management, Tools and configuration aspects.

IMA ETSO C-214 Functional ETSO equipment using an ETSO-2C153 authorized IMA Platform Or Module

1. Applicability

2. Procedures

3. Technical Conditions

4. Marking

Appendix 1 (Open class)

Access to ETSO 2C-153 information

Assessment of design changes (Platform)

Assessment of OPRs (Platform)

IMA ETSO C-214 Functional ETSO equipment using an ETSO-2C153 authorized IMA Platform Or Module
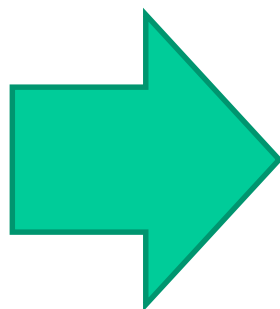
1. Applicability

2. Procedures

3. Technical Conditions

4. Marking

Appendix 1 (Open class)

Minimum Performance Standard
    SW App development (Task 2)
    SW/HW integration with ETSO 2C153 (Task 3)
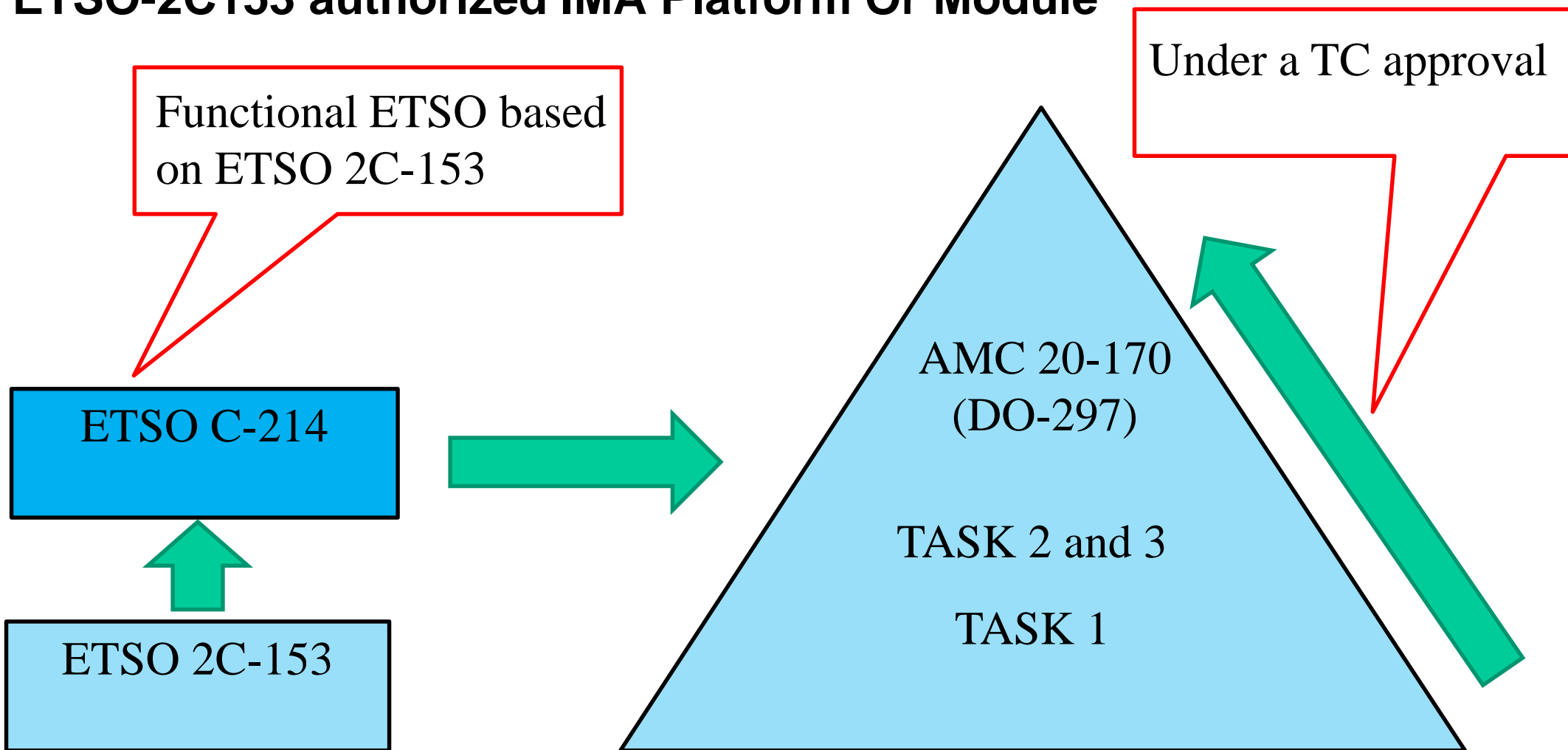   Health monitoring and fault management
    Tools and configuration data (AMC 20-170)

Environmental standard

Installation Manual and

Safety Assessment

IMA ETSO C-214 Functional ETSO equipment using an ETSO-2C153 authorized IMA Platform Or Module

Functional ETSO based on ETSO 2C-153

Under a TC approval

ETSO C-214

ETSO 2C-153

AMC 20-170 (DO-297)

TASK 2 and 3

TASK 1

Equipment manufacturer

Airframe manufacturer

29

Outline

- ➢ TCCA Organization and Oversight (EEDA)
- ➢ Recent/Harmonized Advisory Material
  - ➢ A(M)C 20 115D (Software)
  - ➢ A(M)C 20-152A (AEH)
  - ➢ A(M)C 20-189 (OPR)
- ➢ IMA ETSO 2C-153 (IMA Module)
- ➢ IMA ETSO C-214 (Functional ETSO equipment with ETSO 2C-153)

Questions?

Thank You!

Acronyms

- GAMA: General Aviation Manufacturers Association
- ASD: Aerospace and Defense Industries Association of Europe
- AIA: Aerospace Industries Association