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)
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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
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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
- AC-115C
- AMC-115C

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

TCCA
- DO-178C
- If acceptable
  - DO-178B

TCCA CMs
EASA CMs
FAA IPs
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”.
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.
Custom Device

| Section 5.1 and 5.2 provide applicability guidance on Simple /Complex classification for custom devices |
| Section 5.4 Development Assurance of Simple Custom Devices |
| Section 5.5, 5.6, 5.7 Clarifications for DO-254 Validation and Verification Process |
| Section 5.8 Clarifications for ED-80/DO-254 Tool Assessment and Qualification |
| Section 5.9 Previously Developed Hardware |

- CD-1
- CD-2
- CD-3, CD-4, CD-5, CD-6, CD-7, CD-8
- CD9, CD10
- 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, IP-5, IP-6

Section 6 Use of commercial-off-the-shelf devices
Only Complex COTS

COTS-1, COTS-2
COTS-3, COTS-4
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
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IMA (E)TSO

2002
FAA TSO C-153

2003
FAA AC 20-145

2005
RTCA DO 297

2010
FAA AC 20-170

2016
EASA ETSO 2C-153

2018
EASA AMC 20-170

2019 ...
FAA TSO C-153A

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

RTCA DO 297

FAA AC 20-145

FAA AC 20-170

EASA ETSO 2C-153

EASA AMC 20-170

FAA AC 20-170A
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:

<table>
<thead>
<tr>
<th>Class RH</th>
<th>Racking House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class PR</td>
<td>Processing</td>
</tr>
<tr>
<td>Class DS</td>
<td>Data Storage</td>
</tr>
<tr>
<td>Class GP</td>
<td>Graphical Processing</td>
</tr>
<tr>
<td>Class DH</td>
<td>Display Head</td>
</tr>
<tr>
<td>Class PS</td>
<td>Power Supply</td>
</tr>
<tr>
<td>Class IF</td>
<td>Interface</td>
</tr>
</tbody>
</table>
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
IMA ETSO 2C-153 (IMA Module)

Appendices:

1. General
2. MPS
3. Data
4. Environmental

Data required for the user described in 8 chapters

- User Guide concept
- Clear covered/not covered aspects
- Transfer of ‘safety’ aspects for further safety analysis
- Installation Manual
IMA ETSO 2C-153 (IMA Module)

- IMA Platform or Module
- ETSO C-214
- ETSO 2C-153
- AMC 20-170 (DO-297)
- TASK 1

Under a TC approval

Equipment manufacturer
Airframe manufacturer
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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

- AMC 20-170 (DO-297)
- TASK 2 and 3
- TASK 1

Equipment manufacturer

Airframe manufacturer
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Questions?
Thank You!
Acronyms

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