



EASA

European Aviation Safety Agency

ETSO workshop 2018

Update on Software & Airborne Electronic Hardware

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Agenda

- Background on CS-ETSO and Software & Airborne Electronic Hardware
- EASA & FAA Harmonisation context & strategy
- Presentation of the resulting material
 - Software (SW) guidance - **AMC 20-115D**
 - Airborne Electronic Hardware (AEH) guidance - **AMC 20-152A**
 - Open Problem Report management guidance - **AMC 20-189**
- Effects & Benefits for ETSOA articles



CS-ETSO and Software & Airborne Electronic Hardware

- 21.A.606 (b) Applicable ETSO
 - Unless explicitly excluded by the ETSO standard, CS-ETSO subpart A applies to all ETSO standards
 - The applicable Subpart A is the latest one at the time of application.
- Subpart A (current) requirement for SW & AEH
 - 2.2 Software
 - Refers to latest revision of AMC 20-115
 - 2.3 Airborne Electronic Hardware
 - Refers to ED-80/DO-254 for complex electronic hardware
 - 2.4 Failure Condition → DAL allocation



EASA & FAA harmonisation - Context



- Supported by a joint ASD, AIA, and GAMA request, EASA and FAA started a joint harmonisation effort to:
 - Revisit the Software guidance
 - Increment AEH (Hardware) guidance
 - Create common OPR guidance with the goal of harmonizing their content as far as practicable.
- On EASA side this has been done under RMT.0643 (Regular update of AMC 20).



EASA & FAA harmonisation - Strategy

- **Working group with 3 major industry associations (ASD, GAMA and AIA)**
 - Drafting by EASA and FAA teams
 - Working sessions with industry to gather inputs/feedback/comments
 - Allowed to reach a good maturity before public consultation
 - Within a defined schedule.
- **Novel way of working for EASA and FAA : joint public comment phase**
 - Use of EASA CRT tool to gather common comments (1 tool for both FAA and EASA)
 - EASA and FAA processed comments jointly to avoid misalignment until final publication.
- **Resulting in fully harmonised AMC and AC material**



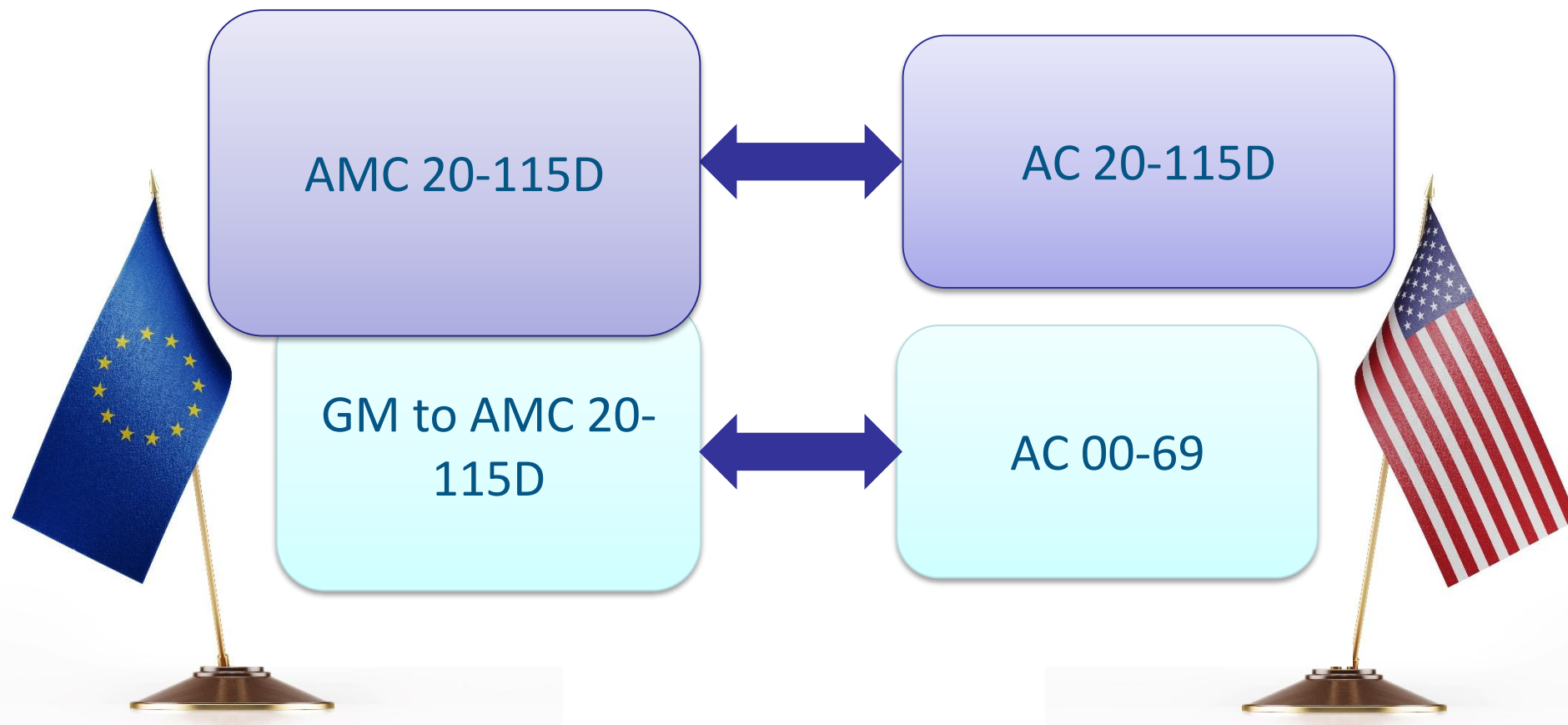


Software AMC 20-115D - Challenges

- Identical software standards ED-12C/DO-178C however...
- Differences between AC and AMC 20-115C triggered need for further harmonisation:
 - Different approach for using existing ED-12B/DO-178B processes
 - Different conditions when modifying/reusing previously approved Software
 - Differences in guidance for TSO and ETSO
 - Lack of guidance regarding tool qualification in AMC 20-115C.
- An additional challenge was the attempt to include all the necessary guidance in a “one-stop shop” AMC
 - In order to avoid raising CRIs on any known topics.



Software AMC 20-115D - Resulting Material





Software AMC 20-115D - Highlights

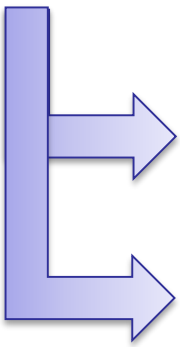
► Technical content of AMC 20-115D and AC 20-115D fully harmonised

Section 5 defines when existing ED-12B/DO-178B processes can be used for new development

Section 8 contains guidance for FLS* and UMS* as it applies to software developers

Section 9 harmonises conditions for developing legacy software using existing processes

Section 10 harmonises guidance on tool qualification



Allows use of ED-12C/DO-178C PDI* guidance with existing ED-12B/DO-178B processes

Allows use of MBD*, OOT*, or FM* for legacy development, provided processes were evaluated and found to be acceptable by EASA

(*) see slide 21



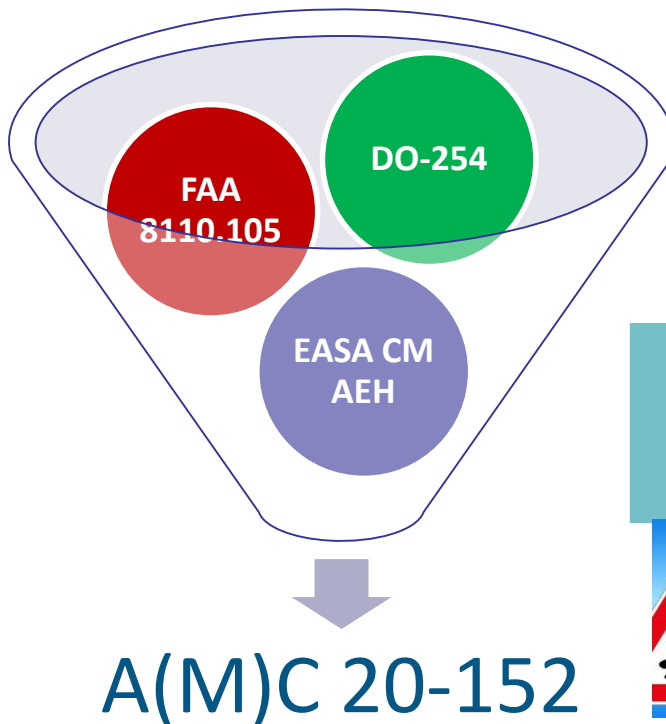
AEH AMC 20-152A - Context and Scope

➤ Context

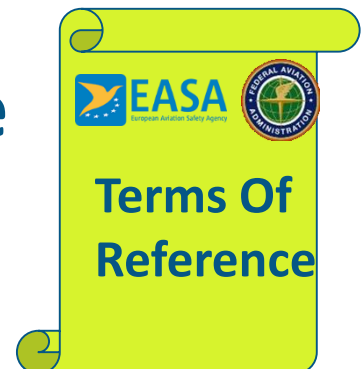
- ED-80/DO-254 (year 2000) : good fundamentals but new challenges of hardware development assurance was supplemented by

- EASA Cert Memo, perceived as prescriptive

- FAA order 8110.105, intended for FAA personnel and not covering some topics as use of COTS device



➔ FAA & EASA A(M)C 20-152A, a joint effort





AEH AMC 20-152A - Chosen approach



➤ Streamlined guidance – Objectives oriented wording

- Focus on WHAT to achieve
- Allow industry flexibility on the HOW
- SMART Objectives :
Specific/Measurable/Achievable/Realistic/Tangible

➤ AMC 20-152 joint working group with EASA/FAA/industry

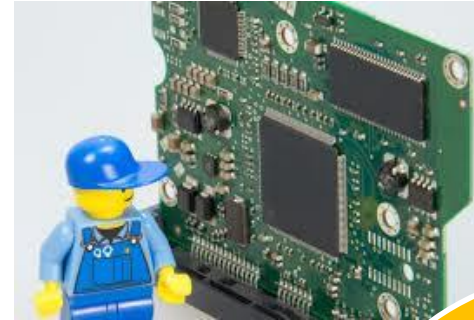
- 15 participants
- 1 year
- Intense discussionsbut constructive





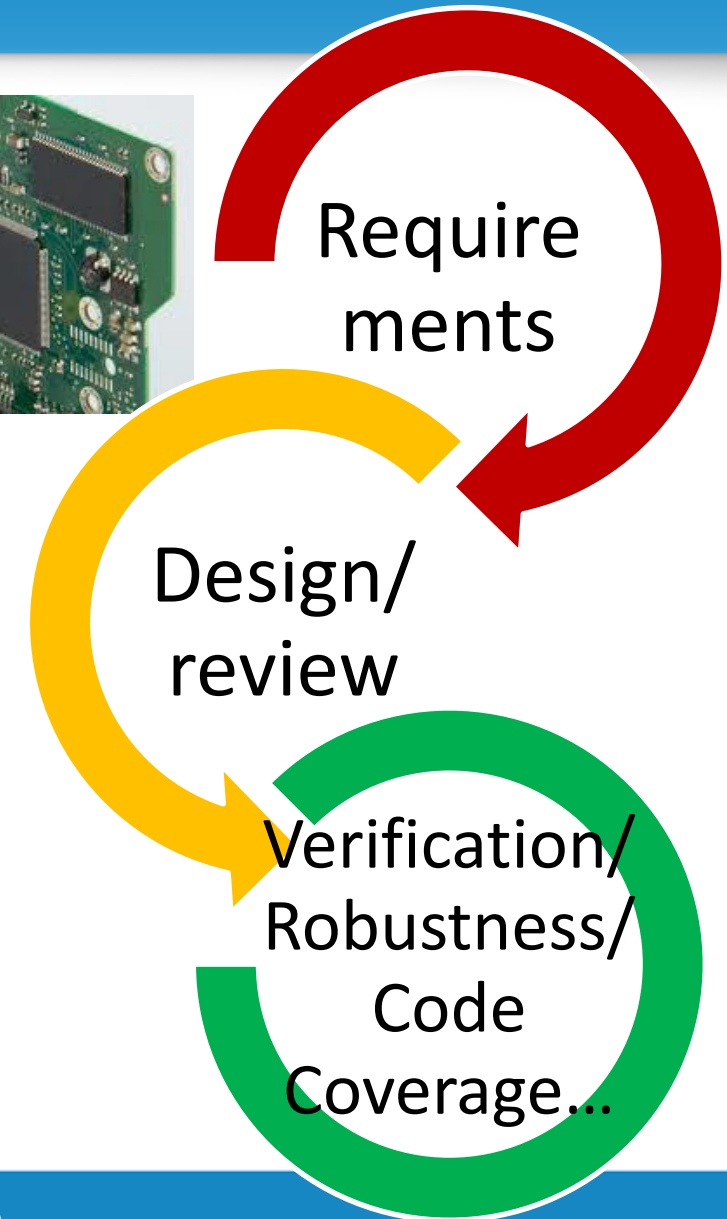
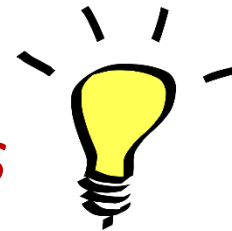
AEH AMC 20-152A – Highlights (1/3)

- Development of custom devices
FPGA/PLD/ASIC
=developed by applicant/suppliers



- Recognize ED-80/DO-254
- Supplement ED-80 gaps with key objectives
focusing on programmable AEH + ASIC
- Simple \neq Complex

→ *Objectives for clarifications*

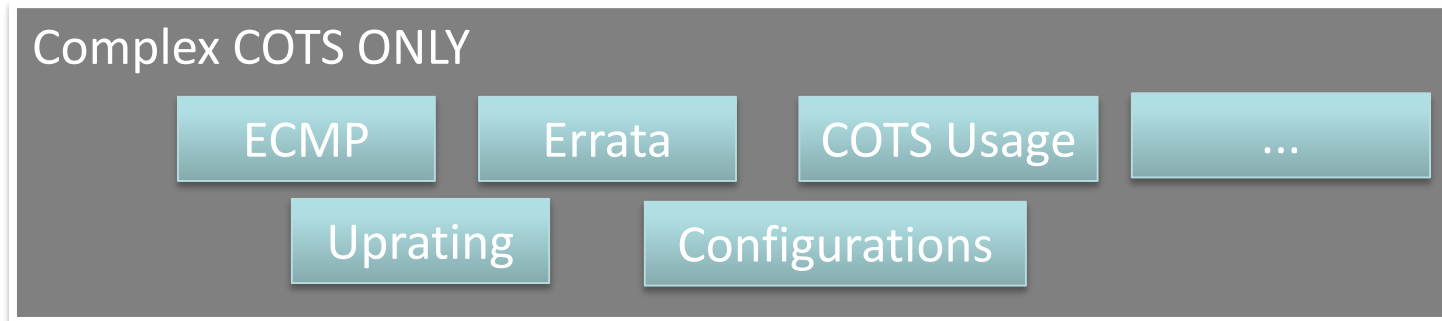




AEH AMC 20-152A – Highlights (2/3)

➤ Use of COTS devices

- COTS devices = Commercial-Off-The-Shelf device fully developed by semi-conductor industry
- Focusing on usage aspects ...
- Topics of interest : only Complex COTS!



➔ *Guidance is now « objectives oriented »*

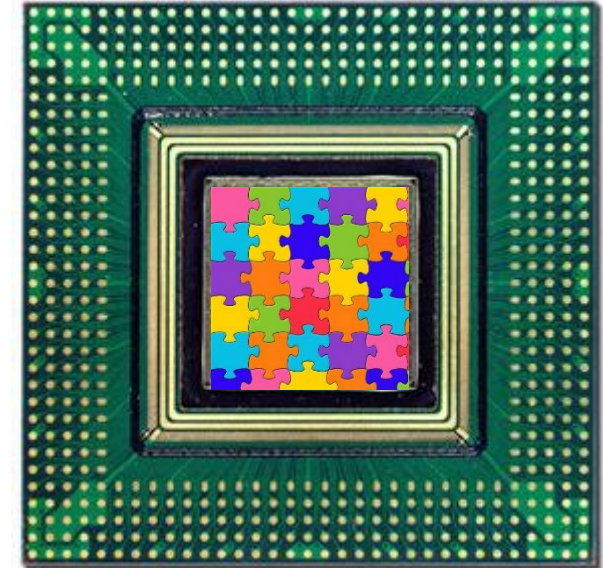


AEH AMC 20-152A – Highlights (3/3)

...between COTS device and custom device

➤ Use of COTS Intellectual Property (COTS IP) in custom devices

- Commercial IP : piece of hardware are not developed according to ED-80/DO-254
- To be implemented inside custom device, design/implementation still to be completed



➔ *COTS IP objectives = Novel guidance !*



OPR AMC 20-189 - Background

- So far guidance for Open Problem Reports was not harmonised...
- AMC 20-189 will provide guidance addressing simultaneously three domains: **System, Software and AEH**
 - Reference material include ARP4754A/ED-79A, DO-178C/ED-12C and DO-254/ED-80
 - Goal to create a stand-alone document, not implying the use of a given standard
- **Supporting inputs**
 - DO-248C/ED-94C DP#9
 - Lessons-learned from certification projects
 - GAMA report 15-63: « *Industry Recommendations on management of OPR* », October 14, 2015





OPR AMC 20-189 - Highlights

➤ Definitions:

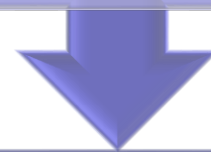
Open Problem Report (OPR) – A problem report that has not reached the state 'Closed' at the time of approval.

Closed – A resolved problem report that underwent review and confirmation of effective resolution of the problem.

➤ AMC 20-189 content in a nutshell:

Section 5 : PR management guidance

Minimal guidance fostering good practices in PR management



Section 6 : OPR management guidance

Minimum classification
scheme for OPRs

Assessment of OPRs

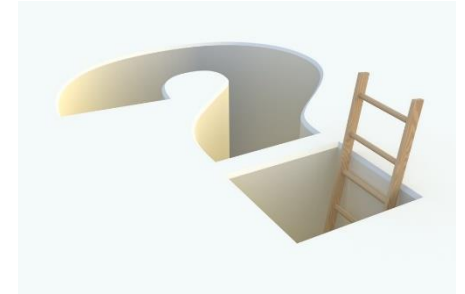
Disposition for unmitigated
'Potential Safety' OPRs

OPR reporting



OPR AMC 20-189 - what is expected from ETSO applicants ?

- **Manage Problem Reporting during your development**
- **Classify and assess OPRs at time of ETSO approval**
 - Accounting for all mitigations under your control
 - Anticipating the potential worst-case effect of the OPR
 - Identifying any functional limitations or operational restrictions at equipment level
- **Report to installers 'Potential Safety' and 'Functional' OPRs**
 - For ETSOA, 'Process', 'Documentary' and 'Other' OPRs do not need to be included in the report to installers but should be available upon Authority request.
- **Finally, ETSO holders should have:**
 - A means to record and manage problems reported by installers/operators
 - A means to transmit new PRs relevant for airworthiness to installers/authorities.





Effects on current guidance and on CS-ETSO



- AMC 20-115D is currently applicable in CS-ETSO subpart A, as well as on new TC/STC
- Existing Software/Hardware Certification Memo is/will be cancelled but remain available on the EASA website to further support existing projects
- AMC 20-152A and AMC 20-189 will be applicable through an update of CS-ETSO subpart A



Benefits for ETSO projects

➤ Reduction in number of EASA Software and AEH CRIs for TC/STC

- No Software & AEH CRIs will be needed on top of AMC 20-115D/20-152A/20-189
- Only technological CRI, at present time, is the Multi-Core Processor (MCP) CRI

➤ AMC and AC materials are fully harmonised

- Reduces « certification basis » differences when installing ETSO articles in TC/STC certification projects, as well as in TC/STC validation projects.

➤ For installation of FAA TSO equipments, new ACs are currently applicable to only new released FAA TSO standards.

- FAA is currently evaluating an equivalent way to apply new ACs on all TSOs !





Outlook : next harmonisation steps

- **Harmonisation of guidance material almost achieved**
 - AMC 20-115D has been published on 24th October 2017
 - A(M)C 20-152A and A(M)C-189 drafts have been published on 24th august 2018 – open for public comments until 5th october 2018
 - Final publication expected by Q2 2019.





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Thank you for your attention!

Any questions?

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