SW&AEH TASK FORCE
"ABSTRACTION LAYER"

REPORT #3

Issue 3

Phase II Recommendation 2 & 3

"How to consider the Abstraction Layer within the current regulatory framework of EASA and FAA"
&
"Framework for recognition of alternate standards assessed using the Abstraction Layer"

Revision History

Revision	Description	Date
Issue 1	Initial issue of the document to the COB	22nd June 2023
Issue 2	New Paragraph 9.3 "Framework for recognition of alternate standards assessed using the Abstraction Layer"	January 18, 2024
Issue 3	Comments from the TF on various chapters	January 29, 2024

Table of Contents

Executive Summary

This report is one of the three reports delivered by the Task Force “Abstraction Layer” (TFAL), created in June 2019 to develop means to assess other standards to the ED-12C/DO-178C and ED-80/DO-254 standards.

This report describes the EASA and FAA regulatory framework, proposes a way to use the Abstraction Layer (AL) within the current regulatory framework of EASA and FAA and covers the “Framework for recognition of alternate standards assessed using the Abstraction Layer”.

As an outcome of its work, the TFAL proposes to publish the AL as a standalone document. The document is based on the final comprehensive report provided to the COB, containing the AL material with a User Guide describing how to use the AL material when assessing standards.

To collect inputs from stakeholders and from organizations that did not directly participate in the TFAL, another proposal is to organize a workshop with the objectives to:

- Describe the AL,
- Explain how to conduct an assessment using the AL, and
- Provide details on how the AL may be used.

1 Introduction

The Task Force "Abstraction Layer" (TFAL) was created in June 2019 to develop a means to assess other standards or methodologies. This Task Force (TF), co-chaired by EASA and the FAA, is composed of representatives from EASA, FAA, and industry representatives from Software and Airborne Electronic Hardware (SW&AEH) domains nominated by GAMA, ASD, AIA.

The initial delivery from TFAL to EASA and the FAA was the 30th of June 2021 Issue 1 Final Report titled "Criteria for accepting alternative standards to ED-12C/DO-178C and ED-80/DO-254" (hereafter referred to as the "June 2021 Report"). The June 2021 Report includes a set of twenty criteria defining goals for development assurance in the SW and AEH domains, known as the "Abstraction Layer" (AL). Each criterion describes one intent of an overall development assurance process and was developed with the intent to be SMART[1] and process-centric (e.g., "the process encompasses, ensures, allows, …").

As a possible way forward, the TFAL recommended in the June 2021 Report the following:

- Recommendation 1: Allow trial of the use of Abstraction Layer criteria on the automotive standard ISO 26262,
- Recommendation 2: EASA and FAA to publish the Abstraction Layer and explain how to consider Abstraction Layer in support of the current regulatory framework,
- Recommendation 3: Framework for recognition of alternate standards assessed using the Abstraction Layer, for use into Avionics certification projects.

In June 2021, the COB agreed to proceed with the recommendations listed above and in December 2021, ASD and GAMA endorsed the Abstraction Layer (AL) and recommendations for continuation of the work.

The TFAL agreed to the work plan II for the Phase II (Revision 2.0– 22/04/2022) detailing the work necessary to address the recommendations. Essentially, the following steps and tasks were agreed to address each recommendation:

- Recommendation 1 "Trial of the use of AL criteria on the automotive standard ISO 26262"
  1. Define ISO 26262 scope and learn about the automotive standard and practices.
  2. Use the Abstraction Layer criteria, rationale, and evaluation items to perform an analysis of the automotive Standard ISO 26262 within the constrained scope.
  3. Document any gaps or insufficiencies detected in the assessed ISO 26262 standard.
  4. Highlight any recommendations on areas of improvement to the Abstraction Layer criteria, rationale, or evaluation items.

- Recommendation 2 "Publish AL & guide"
  1. Authorities-only activities, brainstorm and discussion on future plans for AL material.

[1] SMART: Specific, Measurable, Achievable, Realistic, Tangible

2. Authorities to present to the Task Force Industry members the proposed “future plans” (and collect feedback) explaining “how to consider Abstraction Layer in line with the current regulatory framework”.
3. TFAL to finalize the reports for publication. Consider the feedback from Recommendation 1 and work on an update to the June 2021 Report. FAA & EASA (COB) to support decision for co-publication.

- Recommendation 3 “Recognize Alternate Standards”
  1. Assess and define the best format to document the recognition of the alternate standards or public methodologies.
  2. Assess and define how to address the gaps detected through the assessment of alternate standards or public methodologies.
  3. Authorities to propose best way to recognize the alternate standards and identified gaps into regulatory framework.
  4. TFAL to review and agree on the proposed best format to recognize the alternate standards and identified gaps into regulatory framework.

This report, TFAL Report #3, addresses recommendations #2 and #3 above. The report describes the EASA and FAA regulatory framework, proposes a way to use the Abstraction Layer (AL) within the current regulatory framework of EASA and FAA, and covers the “Framework for recognition of alternate standards assessed using the Abstraction Layer”.

The decision to publish this report when finalised shall be taken by EASA and FAA management (Certification Oversight Board or COB).

2 Expected Usage of the Abstraction Layer

The Abstraction Layer provides a means to assess other standards or methodologies and helps create a framework for their use in aviation and, in particular, the certification of products.

Beyond the current common approach for SW & AEH development assurance, the Aviation industry may have potential and interest to use alternate standards or public methodologies. Emerging technologies and novel techniques may require other standards or methodologies. These new or alternate standards/methodologies need to be assessed prior to acceptance as an acceptable means for safety critical systems and equipment.

The objective of the TFAL was to develop an AL, extracting the key concepts from ED-12C/DO-178C, ED-80/DO-254, EASA & FAA A(M)C 20-115D, and EASA & FAA A(M)C 20-152A, and formulating criteria. This AL is intended to be a ‘bridging tool', a set of criteria to assess potential alternate standards used in other industry domains (different from Aviation). It will also facilitate introduction of novel technologies by enabling the assessment of other development assurance standards.

The AL includes aspects that are not specifically addressed in the standards ED-12C/DO-178C and ED-80/DO-254 but are necessary when taking into consideration the fundamental aspects of the domains (i.e., EASA & FAA A(M)C 20-115D, EASA & FAA A(M)C 20-152A, SAE ARP-4754A).

The AL criteria apply to a standard or methodology that deals with the development process of hardware or software items, or collection of items.

The AL is not intended to serve as a new alternative standard. It does not intend to invalidate or put at risk the current development assurance practices. It does not mirror what the currently acceptable standards already define.

3 Targeted Products

As a result of its work, the TF has delivered a set of twenty criteria, defining goals for development assurance in the domain of Software and Airborne Electronic Hardware.

The scope of the AL is therefore "limited" to SW&AEH for airborne systems and equipment in product certification or EASA and FAA Technical Standard Order (TSO) authorisation or (E)TSOA. SW&AEH may be installed on all types of aviation products ranging from UAS/VTOL to Large Transport aircraft.

For a given Failure Condition classification, the allocation of development assurance level (DAL) to SW/AEH items is tailored depending on the targeted aviation product (UAS to Large Transport).

4 Who will use the Abstraction Layer

It is anticipated that the following organisations could use the AL as proposed by the TFAL:

- Standardisation Bodies (SAE, EUROCAE, …)
- Organisation's representative of the industry (ASD, AIA, GAMA, …)
- Recognised working groups making the outcome of their work available in the public domain (Authorities, industry, ….)

The use of the AL by the Authorities in the context of specific product certification is not envisaged as it may lead to a non-standardized assessment and outcome.

5 EASA Regulatory Framework

The EASA regulatory framework is gradual and pyramidal. With the basic regulation on top, the implementing rules, and the soft laws including the certification specifications and the acceptable means of compliance.

The Basic Regulation (BR): The BR has general application. It is binding in its entirety and directly applicable in all Member States. For that purpose, the BR confers on the European Commission the power to adopt implementing and delegated acts which detail how to comply with the essential requirements of the BR and regulate the subject matters included in its scope, in particular airworthiness, aircrew licensing, environmental compatibility related to products, aircraft operations including third-country operators, Air Traffic Management/Air Navigation Services (ATM/ANS) including air traffic controllers licensing, aerodromes and ground handling, and unmanned aircraft.

The Implementing Rules (IRs): are binding in their entirety and used to specify a high and uniform level of safety and uniform conformity and compliance. IRs detail how to comply with the essential requirements of the BR and regulate the subject matters included in its scope. Detailed implementation aspects are included as Certification Specifications or Acceptable Means of Compliance.

Certification Specifications (CSs): are non-binding technical standards adopted by EASA indicating means to show compliance with the rules (BR, IR). CSs can be used by organisations for the purpose of certification to establish the certification basis (CB) of products. As part of an agreed CB, the CS become binding on an individual basis to the applicant.

Applicability of the main CSs:

CS-22	Sailplanes and Powered Sailplanes
CS-23	Normal, Utility, Aerobatic and Commuter Aeroplanes
CS-25	Large Aeroplanes
CS-27	Light Rotorcraft
CS-29	Large Rotorcraft
CS-E	Engines
CS-ETSO	European Technical Standard Orders

Acceptable Means of Compliance (AMC): are non-binding standards and serve as a means by which the requirements contained in the BR, IRs and the CSs can be met. The AMC illustrate a means, but not the only means, by which a requirement of a rule can be met. It is a way to facilitate certification tasks for the applicant and the competent authority.

The AMC-20 provides General Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances. AMC-20 groups airworthiness requirements for various systems that can be installed on aircraft of different categories. In particular, the AMC 20-115D and 20-152A describe, respectively, acceptable means for showing compliance with the applicable airworthiness regulations regarding the SW&AEH aspects of airborne systems and equipment.

Guidance Material (GM): is non-binding explanatory and interpretation material on how to achieve the requirements contained in the BR, IRs, CSs, and AMCs. GM contains information, including examples, to assist the user in the correct understanding and application of the BR, IRs, CSs, and AMCs.

Certification Review Items (CRIs): are a formal administrative means within the certification process and provide a structured means of recording subjects and issues regarding the certification basis and its interpretation throughout a certification project. The nature of a CRI is dependent on the item applied to the project. Within EASA, several different items for application to the project are possible, the main CRIs being:

- SC: Special Condition prescribe special technical specifications for a product if the related certification specifications do not contain adequate or appropriate safety standards
- ESF / ELOS: Equivalent Safety Finding / Equivalent Level of Safety, records if the applicable certification specifications or special condition literally cannot be complied with, either in part or fully, but the safety intent of the requirement can be met by compensating factors
- Deviation: records that the level of safety targeted by the essential requirements of the Basic Regulation is achieved through mitigating factors although the proposed design does not comply with the certification specifications or special conditions, neither literally nor with its intent
- Reversion: used to record when an applicant may revert to an earlier amendment of the applicable certification specification
- Elect to Comply: used to record when an applicant may elect to comply with a later amendment of the applicable certification specification than the amendment that was in force at the date of application
- IM / MoC / AMC: Interpretative Material / Method or Means of Compliance / Acceptable Means of Compliance (including the use of a certification memorandum)

SCs, ESFs / ELOSs, Deviations, Reversions, and most Elects to Comply are formally part of the Certification Basis.

Certification Memoranda (CMs): clarify the Agency's general course of action on specific certification items. They are intended to provide guidance on a particular subject and, as non-binding material, may provide complementary information and guidance for compliance demonstration with current standards. CMs are provided for information purposes only and must not be misconstrued as formally adopted AMC or GM. CMs are not intended to introduce new certification requirements or to modify existing certification requirements and do not constitute any legal obligation.

6 FAA Regulatory Framework

FAA Title 14 CFR Regulations: FAA regulations are contained in Title 14 Code of Federal Regulations (CFR) Part 21, Certification Procedures for Products and Articles, and the airworthiness standards are contained in 14 CFR Parts for specific products including Parts 23, 25, 27, 29, 33, and 35.

FAA Advisory Circulars (ACs): FAA ACs are intended to provide an acceptable, clearly understood method for complying with a regulation. However, an AC is not mandatory and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the applicable airworthiness regulations.

The AC number relates to the CFR subchapters and parts, and when appropriate, to the specific sections of the regulations. The first part of the number identifies the subject matter area of the AC. In the context of this report, the relevant ACs are aircraft level 20-series ACs. The FAA equivalent to an EASA GM is found in general 00-series ACs. These are considered industry "best practices" only.

FAA Issue Papers (IPs): FAA IPs provide a structured means for describing and tracking the resolution of significant technical, regulatory, and administrative issues that occur during the type

certification and type validation processes. Type certification includes projects for Type Certificates (TCs), amended TCs, type design changes, supplemental type certificates (STCs) and amended STCs. For FAA approvals such as 14 CFR 21.8(d), TSOA, and Parts Manufacturing Approval (PMA) projects, IPs can be used, with discretion, to document and resolve compliance issues where FAA Policy and Standards Division guidance is required.

FAA Policy Statement: FAA policy statements are used to disseminate guidance to FAA employees or to the public. A policy statement contains guidance on a single topic or issue. It gives guidance or acceptable practices on how to find compliance with a specific FAA regulation. Policy statements do not create or change the regulatory requirements and do not add or relieve requirements imposed by the CFRs. Although policy statements include a connection and reference to the CFR, policy statements contain guidance and, on their own, are not legally binding on the public.

7 Industry Standards

Appropriate use of standards developed by standardisation organisations ensure a uniform application of technologies and best practises. Industry Standards are extensively used during the certification of a product, and they are referenced in several AMC / AC and GM's.

The industry standards are produced and controlled by Standardisation Bodies (SB).

The main SBs in the field of aeronautical products are:

- ASD-STAN & CEN (CEN/ CENELEC/ ETSI)
- ASTM
- ARINC
- EUROCAE
- IATA
- IBAC
- IEC
- OSTIV
- RTCA
- SAE

Various kinds of Industry documents exist, the main types can be summarised as follows:

- Operational Performance Specification: specific performance requirements used for design standards, parts standards, minimum performance standards, quality and other areas conforming to broadly accepted engineering practices for a material, product, process, procedure, or test method.
- Process Specification & Recommended Practices: documents for practice, procedures, and technology that are intended as guides to standard engineering practices.
- Information Reports: compilations of engineering reference data, historical information, or educational material useful to the technical community.

8 ED-12C/DO-178C and ED-80/DO-254 in the Authority Framework

Development assurance for SW&AEH has become the common methodology for certifying the complex and integrated systems and equipment used on aircraft. The processes in ED-12C/DO-178C and ED-80/DO-254, as well as aspects of ED-79A/ARP-4754A, are the current industry standards and recommended practices that development teams and certifying authorities typically rely on to ensure the confidence that is necessary for the level of safety for aviation products. The level of rigor used is associated with the risk level of the systems and equipment installed in the aircraft.

ED-12C/DO-178C and ED-80/DO-254 are referenced respectively in EASA & FAA A(M)C 20-115D and EASA & FAA A(M)C 20-152A as acceptable standards for airborne systems and equipment in product certification or in EASA ETSO/FAA TSO.

9 Use of the Abstraction Layer: Framework and Process

9.1 Where to Place the AL in the Authority Regulatory Framework

The AL has been defined by extracting the key concepts from ED-12C/DO-178C, ED-80/DO-254, EASA & FAA A(M)C 20-115D, and EASA & FAA A(M)C 20-152A.

The scope of the AL is therefore “limited” to SW&AEH embedded in airborne systems and equipment in product certification or EASA ETSO/FAA TSO.

The AL consists of criteria, formulated as goals, with associated evaluation items which state the expectations of what constitutes satisfying a criterion. As such, the AL is not a standard itself and doesn’t detail a set of activities to develop SW&AEH. With such a high-level definition, the purpose of the AL is not to be placed in one EASA CS/FAA 14 CFR Part or accepted as a Means of Compliance (MoC) for a certification product(s). Consequently, the AL position is outside of the regulatory framework but is available as a tool to assess alternative standards that could ultimately be introduced as MoC in the regulatory framework.

The Authorities intend to keep control (and copyrights) of the AL and follow-on updates. It is therefore not proposed to transfer control of the AL to other organisations (i.e., Standardization Bodies).

The AL shall be used with guidelines on how to use the AL material in order to support a common understanding of the material. The experience of the TFAL on conducting the assessment of ISO 26262 was very successful and efficient. With the support of the authorities, industry members of the TFAL agreed to lead the drafting of the User Guide on “how to assess a standard using the AL criteria”. This has been done using the experience gained and recorded by the TFAL during the trial use of the AL on the ISO 26262 (ref. TFAL Report #2). This User Guide is not binding guidance in any way but represents consensus best practices.

It is proposed to publish a standalone document prepared by the TFAL. The document is based on the final comprehensive report provided to the COB (“TFAL Report #1”), containing the AL material and the guidelines on how to use the AL material.

After the publication, a workshop could be organized (and can be announced at the time of publication) with the objectives to:

- Describe the AL,
- Explain how to conduct an assessment using the AL, and
- Provide details on how the AL may be used

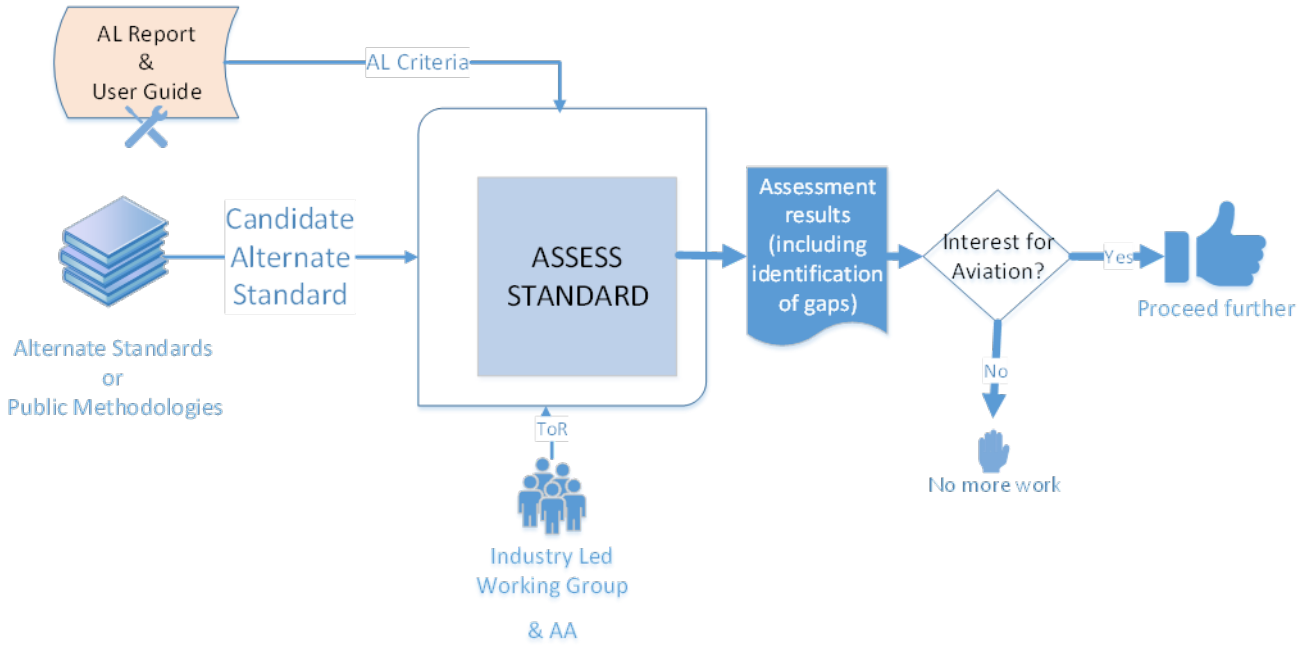
Inputs from our stakeholders and from organisations that did not directly participate in the TFAL will be captured at that time.

Based on the feedback received during the workshop, the Authorities may decide to use the separately published AL document to create a specific document within the Authorities' respective frameworks such as a Certification Memo / Policy Statement.

9.2 Framework for using the Abstraction Layer

The AL is a tool to assess alternate standards for their potential use in aviation.

The AL contains criteria and evaluation items and is accompanied by a User Guide to support the assessment. The following figure illustrates the usage framework of the Abstraction Layer.



The assessment process overview can be summarized through the following steps:

Step	Who	Output
Designate an alternate public standard or methodology	Industry	Candidate standard for assessment
Creation of working group to assess alternate standard using Abstraction Layer	Industry + Airworthiness Authorities (AAs)	Terms of Reference, with participants identified
Assess alternate standard against the AL criteria	Industry + AAs	Results for candidate standard assessment + identified gaps
Decision to proceed (or not) for next steps	Industry + AAs	Decision

9.2.1 Designate an alternate public standard or methodology

Industry, having interest in using an alternate standard in the domain of airborne electronic hardware and/or software development assurance, conducts initial coordination with Aviation industry representative bodies to designate an alternate standard or public methodology as a potential candidate for future use in aviation.

This pre-coordination is essential to structure resource allocation on a potentially suitable candidate alternate standard(s) and avoid a multi-directed dissipation of effort. Having established sufficient interest, industry representative bodies (e.g., GAMA, ASD, AIA) coordinate and designate the alternate standard.

9.2.2 Creation of working group to assess alternate standard using Abstraction Layer

Industry representative bodies coordinate to define working group membership and governance. Interested authorities (EASA/FAA/TCCA/ANAC) define involvement with this assessment of the candidate alternate standard. As a result, this working group is led by industry, who proposes Terms of Reference to all stakeholders.

Some further considerations to establish the working group and its composition may be found in TFAL Report #1 appendix on User Guide section 1.2.

9.2.3 Assess alternate standard against the AL

The assessment of the alternate standard is performed using the AL criteria and their respective evaluation items and assesses how these are met by the alternate standard processes. Section 3 of the User Guide provides a framework for starting and implementing the assessment work.

The outcome of the task is a report showing the results of the assessment of the alternate standard against the AL criteria, precisely identifying what criteria are met / not met/ partially met, and thus identifying possible gaps.

9.2.4 Decision to "proceed"

Based on the assessment results, stakeholders should perform a preliminary estimation to determine if there is sufficient interest to use the alternate standard, and if the gaps can be addressed in a practical manner.

Depending on this anticipated estimation of benefits and the possibility to overcome the gaps, the industry, in coordination with AAs, proposes to proceed further, identifying the specific scope of applicability of the alternate standard in the aviation domain (e.g. applicable DAL, AEH, software, etc.).

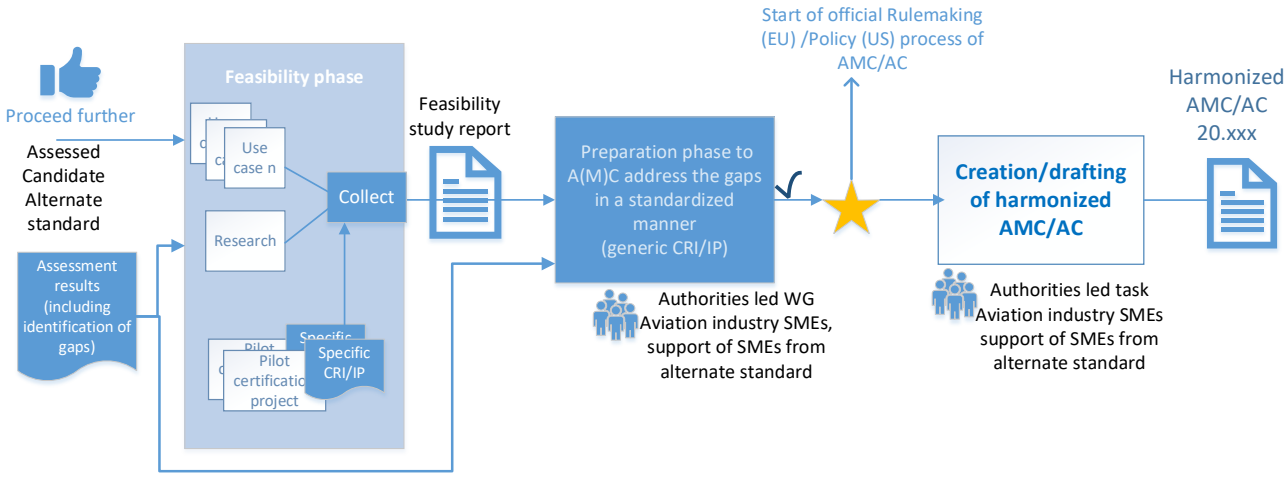
9.3 Framework for recognition of alternate standards assessed using the Abstraction Layer

9.3.1 Introduction

Once an alternate standard has been assessed using the AL, and a decision has been made to proceed with further assessment for its use in aviation, steps are necessary to investigate in depth the usability of life cycle data and process from the alternate domain, and before launching a rulemaking activity to formally and openly recognise the alternate standard into the Aviation regulatory Framework. These steps are described in the following sections.

9.3.2 Process steps to enable recognition of alternate standard(s)

The following figure introduces two phases: A Feasibility phase and Preparation phase to address any gaps identified within the alternate standard and to gain practical experience.



9.3.2.1 *Feasibility phase*

This phase is essential before deciding to recognize the alternate standard formally and openly within the Aviation regulatory Framework for use in certification projects.

9.3.2.1.1 Purpose

The purpose of the Feasibility phase is to become familiar with the alternate standard and the life cycle (process and data) typically performed in the alternate domain, in order to obtain more confidence in the use of the Software and/or Airborne Electronic Hardware items in the Aviation domain. Furthermore, this familiarization should allow for an exchange between aviation industry and Airworthiness Authorities (AA) to obtain mutual understanding and reach agreement on the way forward.

The Feasibility phase is needed in order to:

- Evaluate/understand in a concrete manner the challenges of using SW&AEH components developed according to the alternate standard in the Aviation context
- Understand the benefits, the obstacles, and the artifacts produced
- Understand the Development Assurance methods and foresee/evaluate solutions to address gaps.
- Confirm that the solution to use the alternate standard is cost effective/ beneficial for the aviation industry.

9.3.2.1.2 Objectives

The Feasibility phase consists of a combination of activities with the following detailed objectives:

- Understand how the alternate standard is used in actual practice for development of SW and/or AEH components to drive the process and its outputs.
- Understand how the alternate standard can be applied to the Aviation context, confirm where the alternate standard meets the AL criteria and evaluation items, and how, or whether, confirmably feasible ways to mitigate the gaps can be described in order to meet the AL. This activity is aimed at finding answers to the following questions:
    - Is an assessed gap acceptable without finding mitigations?
    - Understand and evaluate what methods might mitigate an identified gap, with what expected evidence? Is it still beneficial and cost effective to the Aviation context?
    - Are there assessed gaps for which no mitigation can be identified?
    - Is the solution to use the alternate standard along with the gap mitigations beneficial and cost effective to the Aviation context?
- Confirm the scope of application of the alternate standard in the Aviation context (DAL/ hardware / software).
- Share feedback on gained experience among the aviation industry and AA working group members to learn together and consolidate the understanding for the next step.

9.3.2.1.3 Inputs

- Assessment results of the alternate standard (including identification of gaps)
- Aviation industry members have confirmed an interest for the alternate standard after its assessment against AL

- Preliminary scope of application of the alternate standard in the Aviation context (DAL/ hardware / software)

9.3.2.1.4 Activities

To meet the above objectives, a feasibility study is performed by the AA and Aviation industry in a coordinated manner. The feasibility study is an investigation to collect all shared experience and lessons learned from the application of the alternate standard and actual practice in the alternate market. The feasibility study may take different approaches. Some of the possible approaches are as follows:

- Use Case: Aviation industry member(s) propose use cases to share with the AAs. Experience from these use cases is used in an anonymous manner to collect inputs for the feasibility study. See below for more detailed activities of this approach.
- Research Project: Aviation industry member(s) propose a research project or request for information (RFI) to augment the experience in concrete usage of the alternate standard, as well as to confirm the benefit/gaps as identified in the assessment of the alternate standard against AL.
- Pilot Project: Pilot projects in a certification context, where the primary AA raises a specific CRI/IP paper to document a certification approach (including addressing the gaps) in a given project context. See below for more detailed activities of this approach.

Regardless of the feasibility study approach, the phase includes a sharing forum where all stakeholders share their lessons learned, experience gained in practical development assurance process, artifacts, gap mitigation from the use cases and/or pilot projects.

In the feasibility phase, the aviation industry may collaborate with SMEs from alternate standards, as necessary, to substantiate life cycle data pertaining to fulfilled criteria and to confirm any gaps or criteria that are not fulfilled. SMEs from alternate standards could also be a support to define mitigation means to address gaps.

Feasibility Phase Approach based on Use Cases

Aviation industry members of the working group are the key contributors of the Feasibility phase investigating in depth the application of the alternate standard in practice.

One or more Aviation industry members propose to its authority use case(s) of software or airborne electronic hardware item(s) developed and expected to be compliant with the alternate standard, for the purpose of learning together.

> *Example: An aviation industry member proposes a Graphical processor SW driver used in the automotive industry that was developed following the ISO26262 standard.*

The aviation industry members should coordinate to obtain sufficient use cases, with sufficient diversity, in an agreed timeline to:

- Cover the preliminary scope of application of the alternate standard (DAL/ hardware / software).
- Experience different SW/AEH component providers.

Example: All use cases should not come from the same automotive provider.

As part of a use case, an aviation industry member may identify one or more means to mitigate gaps and agree these mitigation means with its authority.

Example: This mitigation might be done with the help of other alternate standard(s) already used by that alternate domain or by identifying a thorough specific activity that would be proposed in addition to the alternate standard.

Experience from these use cases is used in an anonymous manner to collect inputs for the feasibility study report (see 'Outputs' paragraph).

The aviation industry member shares with the entire working group its lessons learned, experience gained by development/review of practical evidence from the use case, discuss their experience in addressing the gaps, etc.

The aviation industry member provides a proprietary report to its authority for each use case covering the entirety of or a portion of the feasibility objectives. See detailed objectives above.

<u>Feasibility Phase Approach based on Pilot Projects in a Certification Context</u>

Alternatively, an applicant may intend to initiate the use of the preliminary assessed alternate standard in the context of a certification project. In such a case, it is expected that the primary AA would raise a specific CRI/IP to document the certification approach and means to address the gaps. While it is understood that CRI/IP are project-specific and cannot be shared in their entirety to the stakeholders' forum, experience gained in addressing the gaps could support the feasibility study.

9.3.2.1.5 Resources and roles

- Aviation industry members propose use cases/pilot projects and invite their authority in this study process.
  - Note: SMEs from alternate standards might work in support of the aviation industry during this phase, but would typically not be responsible for a feasibility step.
- Authorities follow feasibility study cases and collect experience in a study report.

9.3.2.1.6 Outputs

- Feasibility study report: The authorities collect the experience from the use cases/pilot projects, applied life cycle process and data, lessons learned, etc. in a report with the intention of sharing with all aviation stakeholders. The expectations of the report are as follows:

- Provide feedback on the objectives of the feasibility study, including confirmation of the AL assessment results for each criteria, and confirmation of the scope defined at the start of feasibility study.
- Draw conclusions about the usability in aviation of the applied lifecycle process and life cycle data from the component development. The report should summarize the experience with addressing the gaps. If the feasibility study is based on a pilot project in the context of a certification with CRI/IP, the usability is described in an anonymized way to avoid revealing specific project related details.
- Be published jointly by authorities that participated in the working group.

9.3.2.2 ***Preparation phase of AMC/AC to address the gaps in a standardized manner***

9.3.2.2.1 Purpose

The purpose of the Preparation phase is to develop guidance material to use the alternate standard, based on the experience gained from the Feasibility phase. The assessment of the alternate standard using the AL might have identified gaps, further elaborated through gained experience from the Feasibility phase. The purpose of the Preparation phase is to prepare for a future AMC/AC addressing the gaps in a standardized manner.

9.3.2.2.2 Inputs

- Feasibility study report
- Assessment results of the alternate standard (including identification of gaps)

9.3.2.2.3 Description

The Preparation phase consists of the following:

- Develop initial AA material, as a generic EASA CRI/FAA IP, to recognise the alternate standard and define ways/activities to address any gaps.
  - To ensure consistency, during this step, AA engages with SMEs from alternate standard to discuss means to address gaps
- Gain experience and collect lessons learned with the process (alternate standard + additional gap mitigating activities) through pilot certification projects.

During this phase, it is expected that aviation industry members will already engage in some aviation certification projects with the AA where developed initial AA guidance material (CRI/IP) could be used.

This phase helps to mature the developed material (CRI/IP) benefiting from the gained experience, with the assessment results continuing in maturation and generalization.

A sufficient number of different projects should be run until EASA and FAA have gained sufficient confidence to create an AMC/AC.

9.3.2.2.4 Resources and roles

- Authorities-led task
- Aviation industry SMEs
- SMEs from alternate standard

9.3.2.2.5 Outputs

- Mature AA material for the use of an alternate standard with standardized manner for addressing gaps
- Determination of whether AA material is mature enough to initiate EASA rulemaking task & FAA Policy task for creating a joint AMC/AC material

9.3.3 Recognition of alternate standard(s) - creation of EASA AMC/FAA AC 20-xxx

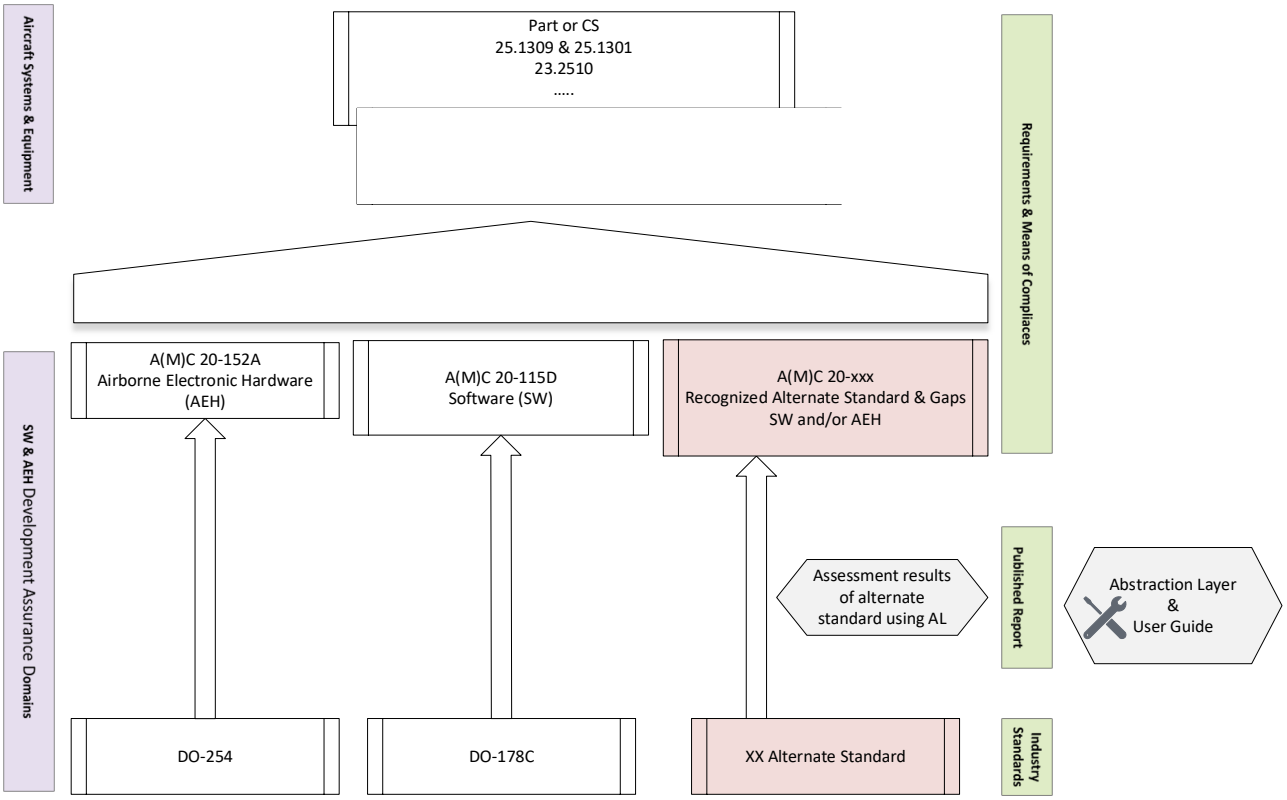
When the AA material and its associated practice in certification projects is considered mature, EASA and FAA expert teams propose to jointly launch an EASA rulemaking task and an FAA Policy task(*) to develop an A(M)C.

The proposal is that this AMC would be a new A(M)C-20-xxx providing General Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances.

The decision to launch an EASA rulemaking task and a FAA Policy task follows the usual respective EASA and FAA process.

AMC-20 groups airworthiness requirements for various systems that can be installed on aircraft of different categories. The new AMC 20-xxx would have a similar position to the EASA/FAA A(M)C 20-115D and EASA/FAA A(M)C 20-152A which describe, respectively, acceptable means for showing compliance with the applicable airworthiness regulations regarding the software and electronic hardware aspects of airborne systems and equipment. See following figure for illustration.

(*) Note that EASA and FAA have already jointly developed fully harmonized and equivalent EASA AMC and FAA AC material in the domain of Software and Airborne Electronic Hardware.



Recognition of alternate standard(s) in our regulatory framework

APPENDIX I: Acronyms

AA	Airworthiness Authorities
AC	Advisory Circular (FAA)
AEH	Airborne Electronic Hardware
AIA	Aerospace Industries Association
AL	Abstraction Layer
A(M)C	Reference to harmonized EASA AMC & FAA AC documents
ARP	Aerospace Recommended Practice, SAE document
ASD	Aerospace, Security and Defence Industries Association
COB	Certification Oversight Board
CRI	Certification Review Item (EASA)
DAL	Development Assurance Level
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
GAMA	General Aviation Manufacturers Association
GM	Guidance Material
IP	Issue Paper (FAA)
MoC	Means of Compliance
SME	Subject Matter Expert
SW	Software
TF	Task Force
TFAL	Task Force Abstraction Layer
ToR	Terms of Reference
TSO	Technical Standard Order
UAS	Unmanned Aircraft System
VTOL	Vertical Take-Off and Landing

APPENDIX II: References

Ref.	Name	Title
1.	TFAL Report #1	"Criteria for accepting alternative standards to ED-12C/DO-178C and ED-80/DO-254" (with User Guide within its appendix)
2.	TFAL Report #2	Phase II Recommendation 1 "Abstraction Layer Trial on ISO 26262"
3.	TFAL Report #3	Phase II Recommendation 2&3 "How to consider Abstraction Layer within the current regulatory framework of EASA and FAA and framework for recognition of alternate standards assessed using the Abstraction Layer"
4.	EUROCAE ED-80	Design Assurance Guidance for Airborne Electronic Hardware
5.	RTCA DO-254	Design Assurance Guidance for Airborne Electronic Hardware
6.	EUROCAE ED-12C	Software Considerations in Airborne Systems and Equipment Certification
7.	RTCA DO-178C	Software Considerations in Airborne Systems and Equipment Certification
8.	EUROCAE ED-79A	Guidelines for Development of Civil Aircraft and Systems
9.	SAE ARP 4754A	Guidelines for Development of Civil Aircraft and Systems
10.	ToR	Terms fo Reference of EASA and FAA SW & AEH Task Force
11.	Work plan	SW & AEH Task Force "Abstraction Layer" Work Plan
12.	Work plan II	SW & AEH Task Force "Abstraction Layer" Work Plan, Phase II
13.	EASA AMC 20-115D	Software Considerations for Certification in Airborne Systems and Equipment
14.	FAA AC 20-115D	Airborne Software Development Assurance Using EUROCAE ED-12() and RTCA DO-178()
15.	EASA AMC 20-152A	Development Assurance for Airborne Electronic Hardware (AEH)
16.	FAA AC 20-152A	Development Assurance for Airborne Electronic Hardware (AEH)
17.	ISO 26262	Road Vehicles – Functional Safety