



FAS Topic Paper (FTP)		
TITLE	REVISION	REVISION DATE
FTP1051 Alternative Development Approaches	1	03-Dec-2020
ABSTRACT/PURPOSE:		
<p>DO-178C/ED-12C and the associated entire document suite are aerospace objective-based standards recognized by certification agencies. These documents’ objectives are generally presented in the order of a classic Waterfall life cycle. This paper serves to explain that various life cycle development approaches are acceptable and can satisfy these aerospace software objective-based standards. These standards provide life cycle independent objectives but ordered in a Waterfall-like life cycle manner as simply a reasonable way to list the objectives and not in any way meant to imply applicants must follow the Waterfall developmental approach.</p>		
RELATED DO/ED DOCUMENTS:		
<p><input checked="" type="checkbox"/> DO-178C/ED-12C: SW Airborne Sys & Equip <input checked="" type="checkbox"/> DO-278A/ED-109A:SW (CNS/ATM) Systems <input checked="" type="checkbox"/> DO-248C/ED-94C: Supporting Information <input checked="" type="checkbox"/> DO-330/ED-215: Software Tool Qualification Considerations <input checked="" type="checkbox"/> DO-331/ED-218: Model Based Development & Verification Supplement <input checked="" type="checkbox"/> DO-332/ED-217: OO Technology and Related Techniques Supplement <input checked="" type="checkbox"/> DO-333/ED-216: Formal Methods Supplement <input type="checkbox"/> Other</p>		
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FAS Team Definition and Goals:

The FAS user group monitors and exchanges information on the application of the following “software document suite” that was developed by joint RTCA/EUROCAE committee SC-205/WG-71:

- DO-178C/ED-12C - Software Considerations in Airborne Systems and Equipment Certification
- DO-278A/ED-109A - Software Integrity Assurance Considerations for Communication, Navigation, Surveillance and Air Traffic Management (CNS/ATM) Systems
- DO-248C/ED-94C - Supporting Information
- DO-330/ED-215 - Software Tool Qualification Considerations
- DO-331/ ED-218 - Model Based Development & Verification Supplement
- DO-332/ED-217 - Object Oriented Technology and Related Techniques Supplement
- DO-333/ ED-216 - Formal Methods Supplement

The goals of the FAS user group are as follows:

1. To share lessons learned in the use of the RTCA/EUROCAE “software document suite” and to encourage good practices and promote the effective use of RTCA’s and EUROCAE’s publications.
2. To develop FAS Topics Papers (FTP) relative to RTCA’s and EUROCAE’s publications or other related aeronautical software industry topics. These FTPs may include clarification to the “software document suite” or a discussion on a new topic.
3. To identify and record any issues or errata showing the need for clarifications or the need for modifications to the “software document suite”.

The FAS user group does not have the authority to change the content of any approved RTCA/EUROCAE documents. Any publications of the FAS user group may be taken into consideration by a future RTCA/EUROCAE working group.

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Abstract / Purpose of the FAS Topic Paper:

DO-178C/ED-12C and the associated entire document suite are aerospace objective-based standards recognized by certification agencies. These documents' objectives are generally presented in the order of a classic Waterfall life cycle. This paper serves to explain that various life cycle development approaches are acceptable and can satisfy these aerospace software objective-based standards. These standards provide life cycle independent objectives but ordered in a Waterfall-like life cycle manner as simply a reasonable way to list the objectives and not in any way meant to imply applicants must follow the Waterfall developmental approach.

FTP Discussion:

The following are some, but by no means all, of the various types of Software Development Life Cycle (SDLC) models:

- Waterfall
- V-Shaped
- Evolutionary Prototyping
- Rapid Prototyping
- Spiral Method
- Iterative and Incremental Method
- Agile development(including Scrum, Kanban and it's other frameworks)
- Test Driven Development
- Commercial-Off-The-Shelf (COTS) Life Cycle
- Reverse Engineering

SDLC models provide a workflow definition that covers software development phases, models, processes, and methodologies. Typically, SDLC models identify phases of development and workflow for activities including requirements, design, coding, verification/test and maintenance. These phases may be addressed in a different order. The workflow order and relative timing of the execution of these phases is captured and identified within the SDLC.

In aerospace software development, identified objectives are required to be met to satisfy software development guidance. However, the guidance is specifically designed to be independent of any particular SDLC model. The objectives are not required in a specific order; however, transition criteria between software development activities that are captured in the plans should establish approaches that define how the work flows through the life cycle phases. One type of life cycle may be used for the whole product or a combination of life cycles may be used.

Additional information on SDLCs can be found in Section 3 of DO-178C/ED-12C and DO-278A/ED-109A, and each of the supplements. Information on SDLCs can also be found in Section 5 of the Software Tool Qualification Considerations document DO-330/ED-215.



Whatever SDLC model(s) are selected for the life cycle phases, the plans should consider, at a minimum, the following list of topics. Consideration of these topics may lead to other development or verification approaches for compliance:

- Relationship between the system life cycle and the software life cycle. This may affect the timing of information exchange and required validation at the system level.
- Effects of the software life cycle on hardware-software interface, integration and identification of incompatibilities.
- Planning various transitions for the specific life cycle(s) and specification of appropriate transition criteria (i.e., minimum conditions to enter a process or a process step).
- Planning for the integrity of life cycle data even though the data may have been produced and updated as a consequence of multiple iterations.
- Coordination of integral processes within the chosen software life cycle(s). An integral process according to DO-178C/ED-12C and DO-278A/ED-109A is a process which assists the development process and other integral processes. For example, verification, re-verification, and regression testing should be planned according to the verification steps in the life cycle that is used.
- Partitioning design considerations. The technique for providing isolation between software components should be addressed by the life cycle processes.