**DO(DOcument)-178B** is a software standard that is used in the development of safety-critical software for airborne systems and equipment certification.

It was developed by the Radio Technical Commission for Aeronautics (RTCA) and is recognized by the Federal Aviation Administration (FAA) as well as other regulatory bodies around the world.

The purpose of DO-178B/ ARP(Aerospace Recommended Practice)-4754 is to provide a framework for the development and certification of safety-critical software used in airborne systems.

It covers the entire software development life cycle, from planning to testing, and requires strict adherence to specific processes and standards.

The DO-178B standard is divided into several levels, with each level having specific objectives and requirements that must be met in order to achieve certification.

The levels are determined based on the criticality of the software, with Level A being the most critical and Level E being the least critical.

The DO-178B standard defines several key processes that must be followed in order to develop and certify safety-critical software.

These processes include:

**Software planning**

**Software development**

**Software verification**

**Software configuration management**

**Software quality assurance**

**Certification liaison**

Each process has specific objectives and requirements that must be met in order to achieve certification.

For example, the software planning process is used to define the scope of the software development effort, while the software verification process is used to ensure that the software meets all of the specified requirements.

In addition to the processes, the DO-178B standard also defines specific requirements for documentation, testing, and traceability.

For example, all software requirements must be traced to specific software design elements, and all software tests must be traceable back to the original software requirements.

Overall, the DO-178B standard is a comprehensive and rigorous framework for the development and certification of safety-critical software used in airborne systems. Adherence to the standard is essential for ensuring the safety and reliability of these systems.

**Differences between DO178B and DO-178C**

DO-178C is an update to DO-178B and provides additional guidance on software development processes. The following are some of the key differences between DO-178B and DO-178C:

DO-178C introduces new objectives and activities that were not present in DO-178B.

DO-178C provides more detailed guidance on the use of tools in the software development process.

DO-178C provides more guidance on the use of formal methods and model-based development.

DO-178C provides additional guidance on the use of software reuse.

**Benefits of Transitioning**

Benefits of Transitioning

**Transitioning from DO-178B to DO-178C can provide several benefits, including:**

Greater re-usability of software components, leading to lower lifecycle costs.

Decreased maintenance costs due to the use of formal methods and model-based development.

Faster hardware integration due to the use of more detailed guidance on the use of tools.

Greater portability of software components due to the use of formal methods and model-based development.

In addition, DO-178C is aligned with the SEI CMMI (Capability Maturity Model Integration) and provides a more structured approach to software development. This can lead to higher quality software and reduced risk.

Overall, transitioning from DO-178B to DO-178C is a necessary step for the aviation industry to continue to improve the safety and reliability of airborne systems. By following the transition criteria provided in DO-178C, organizations can ensure a smooth transition and reap the benefits of the updated standard.

**DO-178C is a standard or guideline?**

DO-178C/ED-12C is a guideline document for the civil aviation software community. Technically, it’s not a standard. However, even though DO-178\* was written as guideline document focused on software development of aviation software, it became the informal standard within the aviation standard.

**What Are The Do-178b Benefits?**

In addition to being important for flight products, DO-178B benefits consist of: verifiable software first-class, higher reliability, consistency, greater re-usability, decrease lifecycle fees, decreased upkeep fee, quicker hardware integration, and greater portability.

**Can You Apply Do-178b Reverse Engineering To Your Existing Software?**

Yes, whilst DO-178B applies principally to new, custom software program, there are provisions to apply DO-178B opposite-engineering to previously evolved software, retaining maximum of the already completed work.

**What Is Do-178b Tool Qualification?**

Software improvement calls for many equipment consisting of design equipment, code generation tools, compilers/linkers, libraries, check tools, and structural insurance tools. DO-178B device qualification relates to development and testing equipment. Different qualification standards practice to every and most gear do NOT need to be qualified. When required, DO-178B device qualification makes use of a subset of DO-178B.

**What Is Do-178b Gap Analysis?**

DO178B Gap Analysis is an assessment of your modern-day avionics software program engineering system and artifacts as contrasted to the ones required with the aid of DO-178B. While DO-178B become principally written to cowl unique, custom developed avionics software, there's recognition that previously advanced software can be DO-178B licensed. In many cases, specifically military avionics software, DO-178B Compliance is used as opposed to DO-178B certification.

DO-178B Compliance is near-certification however does now not require FAA involvement and several of the formal DO-178B necessities are lessened. DO-178B Gap Analysis is normally achieved via skilled DO-178B specialists or Designated Engineering Representatives. The resultant DO-178B Gap Analysis RoadMap assesses all of the software program techniques and artifacts. It presents information for filling the gap to fulfill DO-178B compliance or certification requirements.

**What Is Mc/dc?**

The respectable definition of MCDC, Modified Condition/Decision Coverage) is Every point of entry and go out inside the application has been invoked at least once, every condition in a choice inside the application has taken on all feasible effects at the least as soon as, and every condition has been shown to have an effect on that decision final results independently. A condition is proven to affect a decisions outcome independently via various just that choice even as holding constant all different viable conditions.

The key to a hit, and correct, MCDC trying out is to research every sourcecode assemble for capability MCDC applicability after which broaden sufficient test instances to make sure that each circumstance in that assemble is independently verified in keeping with the aforementioned MC/DC definition. Today, most MC/DC checking out is achieved with the help of DO-178B certified structural insurance tools, particularly MCDC gear.

**What Is Avionics Dead Code?**

DO-178B dead code is executable (binary) software on the way to by no means be performed throughout runtime operations. D0178B commonly does not permit for the presence of useless code: it should be removed. Dead code does not hint to any software requirements, hence does now not carry out any required functionality. Note that unreferenced variables or functions which are not referred to as (therefore are unreferenced) elsewhere within the program are normally removed via the compiler or linker. Since they may be no longer gift in the binary executable load picture, they're not dead code per DO-178B.

**What Is Avionics Deactivated Code?**

DO-178B deactivated code is executable (binary) software program to be able to no longer be achieved all through runtime operations of a selected software version inside a selected avionics box; but the code may be executed all through upkeep or special operations or be performed within a different or destiny model of the software within a one of a kind configuration or avionics container. Unlike lifeless code (see above), deactivated code can be left within the supply baseline. Special DO-178B deactivated code elements should be observed. These are completely defined in our member's DO-178B training;

**What Is Do-178b Requirements Traceability?**

D0178B necessities traceability relates to the correlation of man or woman necessities to the design, code, and take a look at elements affiliated with implementing and verifying each requirement. Requirements traceability may be many-to-one, and one-to-many. Requirements traceability needs to be from pinnacle-to-backside (requirements to design to code, and necessities to check). This proves that each one necessities have corresponding design elements, sourcecode, and checks. Requirements traceability additionally wishes to be bottom-to-up (exams to requirements, code to design, and layout to requirements). This proves that all code, layout, and check factors are essential and feature necessities which they enforce or affirm.

Checklists are used to examine and track DO-178B compliance. DO-178B checklists are to b**What Is A Do-178b Checklist?**

e had from public area information when you have the time to collect it (no such checklist is without a doubt proprietary or alternate-markable), or from private sources who have simply assembled public area statistics;

**What Is Do-178b Independence?**

DO-178B independence is the attribute of separate development and evaluate authority carried out to different DO-178B lifecycle process steps. Development refers to origination of a DO-178B required artifact (requirements, layout, code, check, etc). Review authority refers to an individual tasked with the specified DO-178B compliance overview of that artifact. The tables inside the returned of DO-178B describe which artifacts should be reviewed. The tables additionally cite the level of DO-178B independence to be applied to every review. These independence levels are dictated by means of the criticality degree associated with each overview protocol.

**What Is A Do-178b Criticality Level?**

There are 5 D0/178B criticality degrees, with DO-178B Level A being maximum essential and DO-178B Level E being least critical. The DO-178B criticality level is primarily based upon the contribution of the related software to capability failure situations. DO-178B failure conditions are decided by using the FAA machine protection assessment manner. Each avionics gadget has one described criticality degree (and ought to be approved via the FAA); but different additives inside that device can have differing criticality degrees subject to certain guidelines. The better the DO-178B criticality level, the extra the amount of software program improvement effort required. Our DO-178B Training offers additional info on DO-178B criticality degrees and a way to decide, observe and optimize.

**What Is Do-178b Level A?**

DO-178B Level A software program is software program whose anomalous behavior, as shown by means of the machine protection assessment method, could purpose or make contributions to a failure of gadget feature ensuing in a catastrophic failure circumstance for the plane. Failure of DO-178B Level A software program could be typified by total loss of existence. Approximately 20-30% of avionics structures and forty% of avionics software code should meet DO-178B Level A standards.

**What Is Do-178b Level B?**

DO-178B Level B software program is software whose anomalous behavior, as proven by using the device safety evaluation procedure, could motive or make contributions to a failure of gadget feature ensuing in a unsafe/severe-principal failure situation for the plane. Failure of DO-178B Level B software program will be typified by means of some loss of lifestyles. Approximately 20% of avionics systems and 30% of avionics software code need to meet

**What Is Do-178b Level C?**

DO-178B Level C software is software whose anomalous conduct, as shown with the aid of the system protection assessment system, would purpose or contribute to a failure of device characteristic ensuing in a prime failure circumstance for the aircraft. Failure of DO-178B Level C software might be typified through extreme accidents. Approximately 25% of avionics structures and 20% of avionics software code have to meet DO-178B Level C standards.

**What Is Do-178b Level D?**

DO-178B Level D software program is software program whose anomalous conduct, as shown through the system safety assessment method, could motive or contribute to a failure of device feature ensuing in a minor failure circumstance for the aircraft. Failure of DO-178B Level D software program may be typified via minor injuries. Approximately 20% of avionics systems and 10% of avionics software program code need to meet DO-178B Level D standards.

**What Is Do-178b Level E?**

DO-178B Level E software is software program whose anomalous conduct, as shown by means of the gadget protection evaluation procedure, might purpose or make contributions to a failure of system function and not using a impact on aircraft operational capability or pilot workload. Failure of DO-178B Level E software could haven't any impact on passenger or aircraft safety. Approximately 10% of avionics structures and 5% of avionics software code need to meet DO-178B Level E standards (note but that the amount of DO-178B Level E sourcecode is increasing due to passenger leisure and net communications subsystems which can be presently distinct Level E; it's miles deemed in all likelihood by way of us that the criticality levels of these systems will boom due to integration with different, extra critical, avionics structures).

**What Is Avionics Software Structural Coverage?**

RTCA/DO-178B structural coverage necessities pertain to the proof that formal software verification take a look at cases absolutely included the relevant software program systems (situations and paths). DO-178B structural insurance isn't always required for Level E and Level D software program; it's far required in increasing degrees for Level C, Level B, and Level A software program. DO-178B assertion insurance is needed for Level C; this essentially requires each code announcement to be carried out by way of formal take a look at cases.

DO-178B choice condition coverage is needed for Level B; this basically calls for each code department to be completed by means of formal check instances. DO-178B changed circumstance choice coverage is needed for Level A; this essentially requires each situation inside every selection declaration to be independently validated for its impact on that declaration. DO-178B structural coverage is complicated and is a primary fee motive force on avionics venture. DO-178B structural insurance gear exist from many companies to help in verification.

**What Is Do-178b Certifiability?**

DO-178B Certifiability is the designation of an avionics component to satisfy a defined subset of the DO-178B certification necessities, with the last certification requirements to be performed eventually. DO-178B certification relates to individual structures, therefore calls for all software components of a system to be completed, with every aspect, and the system, completely meeting all DO-178B necessities. However, within the absence of a finished device, an person software program element (RTOS, portraits library, communications protocol, and so on) may be special certifiable by subjecting that element to all DO-178B necessities.

**What Is Do-178b Compliance (do-178b For Military)?**

Military DO178 is a subset of DO-178B. Until these days, aerospace and navy software program requirements emphasised documentation consistency in preference to the modern-day software lifecycle attributes related to avionics software program protection (SEI CMM and CMMI). Led via the U.S. Military, there was sluggish adoption of DO-178B to emulate the commercial aviation industry. However, Military DO-178B does now not require FAA and Designated Engineering Representative involvement, and certain DO-178B requirements are lessened.

**What Are The Top Ten Do-178b Certification Risks?**

Specific dangers are:

insufficient DO-178B low-degree software program requirements  
vagueness within the five key DO-178B system plans prior to initiating the ones lifecycles  
inadequate independence of DO-178B reviews  
inadequate DO-178B checklists for evaluations  
inadequate DO-178B traceability between components  
insufficient advance FAA coordination/approvals  
incomplete DO-178B structural insurance for choice condition and MCDC insurance  
over doing DO-178B device qualification  
no longer applying DO-254 to hardware  
avionics outsourcing without a clean DO-178B Project Plan protecting details for the avionic outsource team

**What is the major difference between Level A and Level B software?**

Level-A software is required to satisfy the following objectives, where as Level-B software do not require to achieve these:

1. 100% MCDC
2. Source to Object code verification.

**Explain the structural coverage objective for each software level?**

There are five different sw levels mentioned in DO-178B/C. Each software level is required to cover a certain type of structural coverage.

1. Level A: Modified Condition Decision Coverage (MC/DC) + Level B
2. Level B: Decision Coverage + Level C
3. Level C: Only Statement coverage is required.
4. Level D: Not needed
5. Level E: Not Needed.
6. Level A-C: Data and Control Coupling is required.

**What is Test Coverage Analysis?**

Test Coverage Analysis consists of two different processes:

1. Requirement based coverage Analysis
2. Structural coverage Analysis

Requirement based coverage analysis ensures that the requirement based test cases cover all the requirements.

**What is Structural coverage analysis and why is it performed?**

Structural coverage analysis helps to reveal the code structure that was not exercised by the requirement-based test procedure execution.

This is very important activity since the uncovered code could add additional unintended functionality which could eventually affect the safety margin of the system. If any gap is found during structural coverage analysis, additional activities need to be performed for a particular software level.

**Can you explain the software requirement process?**

Objectives:

1. Developing high level requirement
2. Defining derived high level requirement

Inputs:

1. System Requirements
2. Safety Requirements
3. System Architecture
4. Hardware Interface
5. Software Development plan[SDP]
6. Software Requirement Standard

Outputs:

1. Software Requirements Specifications[SRS]
2. Establishment of traceability to system requirements.

**What is the Software Design Process?**

Objectives:

1. Developing Software Architecture
2. Developing Software Low-Level Requirements
3. Defining Derived low-level requirements

Inputs:

1. Software Requirement Specification[SRS]
2. Software Development Plan[SDP]
3. Software Design Standard[SDS]

Output:

1. Design Description
2. Trace Data

**What is Software Coding Process?**

Objective:

1. Developing Source Code

Inputs:

1. Software Development Plan[SDP]
2. Software Architecture
3. Software Low-level requirement
4. Software Coding standards

Outputs:

1. Source code

**What is Integration Process?**

Objective:

1. Creating executable Object Code

Inputs:

1. Source Code
2. Software Architecture

Outputs:

1. Object code
2. Executable object code
3. Parameter Data Item File
4. Compiling, Linking and Loading Data.

**What is Derived Requirement?**

Normally the high level requirements are broken down into low-level software requirements. But, sometimes software engineers need to write low-level requirements which are not traceable to the high-level requirements. These kinds of requirements are called derived requirements. As per DO-178C, the derived requirements are needed to send as feedback to the system process as well as system safety Assessment process.

Can you name all the planning documents?

1. Plan for software aspects of certification [PSAC]
2. Software Development Plan[SDP]
3. Software Verification Plan[SVP]
4. Software Configuration Management Plan[SCMP]
5. Software Quality Assurance Plan[SQAP]

**What is SOI?**

SOI stands for “Stages of Involvement”. There are four steps for an SOI audit

1. SOI-1: Software Planning Review
2. SOI-2: Software Development Review
3. SOI-3: Software Verification review
4. SOI-4: Final Certification Review.

**What is Data coupling and Control Coupling?**

Coupling can be identified as a degree of interdependence among different software components.

**Data Coupling**: “The dependence of a software component on data not exclusively under the control of that software component”

**Control Coupling**: “ The manner or degree by which one software component influences the execution of another software component”.

**What is Requirement Traceability?**

DO-178 suggest having bi-directional traceability. Therefore, requirement traceability should be performed in both the approach -Top-Down approach and the Bottom-Up approach.

The Top-Down requirement traceability ensures that the requirements are traced to design and then to code and also the requirement to test. This ensures that all the requirements have the corresponding design,code, test cases and procedures.

On the other hand, the Bottom-up requirement traceability (code to Design, design to requirements, test to Requirements) ensures that the code, design and test are important and necessary to have in place to implement and verify the requirement.

