The Five DO-178C Pre-Project Documents: Foundation for Certifiable Airborne Software

In the world of safety-critical airborne systems, software development must follow a highly structured and regulated process to ensure the reliability and safety of flight-critical functions. DO-178C, *Software Considerations in Airborne Systems and Equipment Certification*, is the guiding standard for software certification in civil aviation. Before any development work begins, **five essential pre-project documents** must be prepared. These documents establish the framework for compliant software development, verification, quality assurance, and configuration management throughout the lifecycle.

These documents are:

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)**

Each of these plays a distinct, critical role in ensuring that the software project meets DO-178C objectives. Let's explore each one in detail.

1. Plan for Software Aspects of Certification (PSAC)

The **PSAC** is the cornerstone document that outlines how the software development and assurance processes will satisfy the DO-178C objectives based on the system's **Design Assurance Level (DAL)**.

Purpose:

- Define the certification strategy
- Establish communication with the certification authority (e.g., FAA, EASA)
- Identify the plans and standards used in development and verification

Contents typically include:

- Project overview
- DAL rationale

- Lifecycle models
- Overview of plans (SDP, SVP, SCMP, SQAP)
- Tool qualification needs
- List of life cycle data to be produced
- Third-party software handling

The PSAC is submitted before development begins and forms the basis for the first **Stage of Involvement (SOI #1)** audit with the certification authority.

2. Software Development Plan (SDP)

The **SDP** defines how the software will be developed. It outlines the processes, methods, standards, and tools that the development team will follow.

Purpose:

- Document the software lifecycle model (e.g., waterfall, iterative, agile)
- Define how requirements, design, and code are created and managed
- Establish guidelines for low-level and high-level requirement development

Contents typically include:

- Lifecycle model and rationale
- Requirement, design, and coding standards
- Programming languages and tools
- Reuse and legacy software handling
- Change and anomaly management during development

The SDP ensures consistency and discipline in software development across the project, especially important in multi-team or multi-supplier environments.

3. Software Verification Plan (SVP)

The **SVP** outlines how the software will be verified to ensure it meets its requirements and safety goals. This includes test strategies, review processes, and coverage analysis methods.

Purpose:

- Ensure the software satisfies all defined requirements
- Define test coverage objectives and structural coverage analysis levels
- Document how verification independence is maintained

Contents typically include:

- Verification environment and tools
- Requirements-based testing strategy
- Structural coverage goals (e.g., MC/DC for DAL A/B)
- Test data and expected results
- Peer review and analysis processes
- Qualification plans for verification tools

The SVP is especially critical for high-DAL projects (A/B) where thorough structural coverage and independence must be demonstrated.

4. Software Configuration Management Plan (SCMP)

The **SCMP** describes how all project artifacts—requirements, code, test cases, documents—will be controlled, versioned, and protected throughout the development lifecycle.

Purpose:

- Maintain integrity and traceability of software artifacts
- Manage baselines, changes, and version history
- Control access and ensure reproducibility of released builds

Contents typically include:

- Configuration item identification and labeling
- Change control process
- Version control system usage
- Baseline management (development, test, release)

- Audit and status accounting procedures

Proper configuration management is vital in avoiding certification setbacks due to uncontrolled changes or unverified software builds.

5. Software Quality Assurance Plan (SQAP)

The **SQAP** defines the processes that will ensure compliance with DO-178C and internal standards through independent oversight, reviews, and audits.

Purpose:

- Ensure that development and verification activities conform to plans
- Identify roles and responsibilities for quality assurance
- Define methods for tracking issues and corrective actions

Contents typically include:

- SQA organization and independence from developers
- Audits (internal reviews, external SOIs)
- Issue tracking and non-conformance reporting
- Assessment of compliance to other plans (SDP, SVP, SCMP)
- Criteria for SQA approval of artifacts

Quality assurance underpins the credibility of the certification process. For DAL A/B projects, the independence of SQA from development is mandatory.

Why These Documents Matter

Collectively, these five plans:

- Provide transparency and structure to complex development projects
- Enable early engagement and alignment with certification authorities
- Ensure every aspect of DO-178C compliance is addressed proactively
- Lay the groundwork for successful SOI audits and final certification

Poorly prepared or incomplete plans often lead to delays, rework, or failed audits. Therefore, these documents must be developed with care, reviewed thoroughly, and maintained throughout the project.

Conclusion

The five DO-178C pre-project documents—PSAC, SDP, SVP, SCMP, and SQAP—form the blueprint for producing safe, certifiable airborne software. They set the tone for disciplined engineering, clearly outline roles and responsibilities, and provide regulators with the confidence that software is being developed in accordance with stringent safety standards.

By investing time and expertise into these planning documents at the outset, organizations set themselves up for a smoother path to certification, reduced risk, and higher assurance in the performance and safety of their avionics systems.