

Understanding the DO-178C PSAC: The Plan for Software Aspects of Certification

In the development of airborne software, compliance with **DO-178C** (*Software Considerations in Airborne Systems and Equipment Certification*) is essential for achieving airworthiness certification. One of the foundational documents in the DO-178C lifecycle is the **PSAC**, or **Plan for Software Aspects of Certification**. This document serves as the cornerstone of communication between the applicant (typically the software developer or system integrator) and the certification authority (such as the FAA or EASA), laying out the framework for how software will be developed, verified, and shown to comply with the stringent requirements of DO-178C.

What is the PSAC?

The PSAC is a planning document required by DO-178C that defines how the software development and verification processes will satisfy the relevant objectives based on the system's **Design Assurance Level (DAL)**. It describes the overall approach, scope, processes, and tools to be used for a specific software project, ensuring a mutual understanding between the certification applicant and the regulatory authority from the outset.

The PSAC must be submitted early in the software development process—typically before the software requirements phase begins. It provides the basis for the **Software Certification Plan**, helping the certification authority determine whether the proposed software development and assurance strategies are sufficient for the level of safety required by the application.

Purpose of the PSAC

The PSAC has three main purposes:

1. **Planning and Process Definition**

It defines the plans, processes, and life cycle models that will be followed during development. This includes identifying which DO-178C objectives apply, based on the assigned DAL, and how those objectives will be met.

2. **Agreement with Certification Authority**

It provides a foundation for early engagement with certification authorities, promoting alignment and reducing risk. The PSAC is used to conduct the **Stage of Involvement (SOI) #1 audit**, the first of several formal reviews by the authority.

3. **Roadmap for Certification Artifacts**

It outlines the software life cycle data to be produced and submitted, providing traceability to each DO-178C objective.

Key Elements of a PSAC

A comprehensive PSAC typically includes the following content areas:

- **Program Overview:** A brief description of the aircraft system, the role of the software within that system, and the certification context.
- **Software Level (DAL):** A clear statement of the assigned DAL (A through E) based on system safety assessment results, often accompanied by rationale and references to the system safety analysis.
- **Life Cycle Models:** The software development and verification models to be used (e.g., waterfall, V-model, or incremental), along with rationales for their selection.
- **Development Plans:** Identification of applicable plans such as the Software Development Plan (SDP), Software Verification Plan (SVP), Software Configuration Management Plan (SCMP), and Software Quality Assurance Plan (SQAP). These plans are either embedded in the PSAC or referenced as separate documents.
- **Verification Strategy:** Description of how requirements-based testing, reviews, analysis, and coverage will be performed, including the approach to Modified Condition/Decision Coverage (MC/DC) for DAL A and B systems.
- **Tool Qualification:** Any tools used to automate or support software processes must be listed, with an indication of whether they require **Tool Qualification** under DO-330.
- **Software Life Cycle Data:** A list of all documents and data items to be produced throughout the project, such as requirements documents, design specifications, source code, test cases, traceability matrices, and structural coverage reports.
- **Problem Reporting and Change Management:** The approach for identifying, tracking, and resolving software problems during development and after certification.
- **Third-Party Software and COTS Usage:** If commercial off-the-shelf (COTS) software or previously developed software is used, its treatment and assurance strategy must be outlined.

Certification Authority Review and SOI Audits

The PSAC is reviewed by the certification authority during **SOI #1**, which focuses on software planning. Approval or acceptance of the PSAC at this stage is critical before full

development and verification activities begin. If concerns are raised, they must be addressed and the PSAC revised accordingly.

Additional audits—**SOI #2 (requirements and design review), SOI #3 (verification review), and SOI #4 (final certification review)**—are based on the plans and strategies laid out in the PSAC. Any deviation from the approved PSAC may require justification and re-approval.

Common Challenges and Best Practices

Creating an effective PSAC can be challenging, especially for new applicants or those unfamiliar with DO-178C. Common issues include:

- Incomplete or vague definition of processes
- Lack of rationale for the selected DAL
- Missing or incorrect mapping of objectives to plans
- Undefined tool qualification needs

To avoid these issues, best practices include:

- **Engage Early with Certification Authorities:** Early dialogue helps resolve ambiguities and builds trust.
- **Tailor the PSAC to the Program:** Avoid copying generic templates; the PSAC should reflect the actual development environment, tools, and team practices.
- **Ensure Consistency Across Plans:** All referenced plans (SDP, SVP, etc.) must align with the PSAC and with each other.
- **Maintain Traceability:** The PSAC should clearly trace each objective to the process or artifact that satisfies it.

Conclusion

The PSAC is a foundational document in the DO-178C process and plays a vital role in ensuring that airborne software development proceeds in a structured, certifiable manner. It lays out the roadmap for achieving compliance, provides confidence to certification authorities, and mitigates risk by establishing expectations early in the development life cycle. A well-crafted PSAC not only facilitates smoother certification but also helps ensure that the software is safe, reliable, and fit for its mission-critical role in modern aviation.