



JSF Software Safety Process: Providing Developmental Assurance

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SEAL Refresher

- **Why create SEAL?**
 - *JSF program has unprecedented international visibility*
 - *Huge amount of Safety-related airborne software*
 - *JSF is developing this software world-wide; a single software safety process requirement was necessary*
- **What is SEAL?**
 - *SEAL: Safety Evidence Assurance Level*
 - *SEAL Level 1: Similar to “Safety Critical”*
 - *SEAL Level 2: Similar to “Safety Significant”*
 - *SEAL Level 3: No significant contribution to system safety*
- **JSF Air System Software Development Plan (AS SDP) defines SEAL process**
 - *Developed by International JSF Team; based upon several established software safety standards from FAA (DO-178B), UK (Def Std 0056), USAF (Mil-Std-882)*



SEAL is defined: What's next?

1. **SEAL has been created and defined in the AS SDP**
2. **Software products have received their SEAL assignments from System Safety**
3. **Product level SDPs have been reviewed and approved by JSF Software Management Team**

Question: How does JSF ensure software development teams are using SEAL correctly?



How is SEAL Implemented?

- **Process requirements consist of four primary areas**
 - ***A formalized review process for each of the software design phases: requirements, design, coding, and unit testing***
 - ***Conducting unit test activities with robust testing methodologies***
 - Invalid inputs, range checking, array index testing, etc.
 - 100% test coverage
 - Object code for SEAL 1, source code for SEAL 2*
 - ***Verify requirements traceability***
 - ***Configuration Management***
 - Ability to show Change Request documentation, review records, etc. to a given software unit



Software Safety Assessments



- **On-site assessments are conducted at each site that is developing SEAL 1 or 2 software to ensure compliance with SEAL-required process definitions**
 - *Goal is to assess each development team's ability to develop required evidence for release for flight*
 - *Ensures a consistent body of SEAL evidence prepared and shortfalls identified*
 - *Software QA conducts assessments on SEAL 3 products*



What Does an Assessment Do?

- **A Software Safety Assessment examines evidence of compliance with safety requirements levied on a given software product**
 - *A standardized checklist, based upon the Air System Software Development Plan and JSF System Safety Program Plan, is used to assess each product*
 - *Action items are written documenting process non-compliances*
- **Software Safety Compliance Manager conducts each assessment**
 - *Maximizes consistency between individual assessments*
 - *Brings “lessons learned” into the assessment process*
 - *Is an independent 3rd party*



What Has Been Accomplished

- **All First Flight software products were assessed**
 - *Total of 81 products*
 - *227 Action Items generated; 226 Closed*
 - 1 Open item has workaround in place to support Flight Test
 - *Assessment checklists, plus action items, are maintained in JSF Development Library*
 - *This data becomes part of the safety certification package for each SEAL 1 or 2 software product*
- **Assessments conducted at Developer's location to minimize impact to development team**
 - *27 different locations in 4 countries*
- **Future work will be supporting new products being incorporated into JSF Air Vehicle**
 - *Re-assessments on existing products are not conducted unless software development process is changed*



Acronyms

Acronym	Definition
AS SDP	Air System Software Development Plan
SEAL	Safety Evidence Assurance Level
QA	Quality Assurance



Next Topic



Monday, June 18, 2007, track 2

- **2:40-3:25 – JSF Software Program**
 - *Overview and Status (Branyan/Willis)*
 - *Tracking Program Wide Software Progress (Evers/Willis)*

- **3:35-4:20 – System/Software Design**
 - *Implementing F-35 System Architecture using UML (Claus)*
 - *Deploying C++ For Use In International Safety-Critical Applications (Carroll)*

- **4:20 – 4:35 – Break**

- **4:35 – 5:20 – JSF Software Safety Process**
 - *Deploying Safety Critical Standards Internationally (Eccles)*
 - *Providing Developmental Assurance (Bridges)*

- **5:30 – 6:15 – Software Quality Improvements /JSF Software Sustainment**
 - *Focused Software Quality Improvements (Robb)*
 - *F-35 Software Life-cycle Planning: Performance-Based Software Sustainment (Novak)*