

JOVIAL - US AIR FORCE - DECIS

US Air Force (F-16)

Data Entry Cockpit Interface (DECIS)

J3 JOVIAL to C++

History: JOVIAL is a legacy 3GL computer language developed in the 70s that is gradually being replaced across the Air Force as weapon systems are modernized. The Computer Resources Support Improvement Center (CRSIP) directed the transition and adoption of technologies for the Air Force. CRSIP also provided software engineering support to acquire, develop, manage, and support mission-critical software systems.

The CRSIP office selected Data Entry Cockpit Interface Set (DECIS) as an ideal candidate for comparing the effectiveness of Automated Software Modernization (ASM) technologies with manual modernization methods in mission-critical systems. Roughly 50,000 lines of JOVIAL code from DECIS Block 30 had been modernized by an Air Force contractor. Cost data was available for this manual effort that took over a year to complete. CRSIP, in coordination with the YPVO F-16 Program Office, contracted with TSRI to perform a pilot program for the automated transformation of this same block of DECIS J73 JOVIAL into C++. The purpose was to provide a direct comparison of automated to manual software modernization processes.



Challenge: J73 JOVIAL is an advanced version of a 1960s era 3rd Generation Language (3GL) developed by the United States Air Force for embedded systems with real time requirements and tight hardware tolerances, (limited memory and radiation hardened computers). JOVIAL language complexities include dynamic overlays of data structures, bit-sizable fields, bit-level operators, flexible macro processing and embedded sub-languages, including 1750 assembly. Modernization of diverse JOVIAL dialects containing 60-bit and 36-bit word lengths needed to target modern hardware platforms. CRSIP contracted with TSRI for an "integrator-ready" transformation of the DECIS J73 JOVIAL code into modern C++.

Results: TSRI delivered the modernized DECIS C++ to the YPVO F-16 Program Office. This deliverable was 100% accurate and compilation and link error free. On this pilot, TSRI's demonstrated the reduced schedule time and high software quality associated with automated modernization processes.

During each transformation project, TSRI continuously improves the language efficiency of its transformation tools, subsequently providing reduced cycle times for similar future projects. This was dramatically demonstrated with the automated transformation of a 2nd block of DECIS code (Block 50), similar in size and complexity to the control Block 30 pilot code. An accurate transformation of DECIS Block 50 was automatically completed in less than 15 minutes by one TSRI engineer without tool adjustment. These results can be compared with the project time for a manual modernization of Block 50, estimated by the CRISIP office at several man-years. At the conclusion of the pilot, qualitative evaluations of the automatically generated DECIS C++ code were very favorable. However the most impressive findings were the projected time schedule reductions implied by the transformation of the 2nd DECIS J3 JOVIAL subsystem in quick succession.