

JOVIAL - Boeing - ALCA - ITAP

The Boeing Company

ALCA (Advanced Light Weight Combat Aircraft)

ITAP (Integrated Tactical Avionics Programs)

JOVIAL to C++

History: The L-159 Advanced Light Weight Combat Aircraft (ALCA) is based on the proven airframe design and aerodynamic configuration of the L39 Albatross and L59 family of basic and advanced jet trainers. ALCA incorporates a high-performance military turbofan engine, advanced avionics and sensors. The operational capabilities of the aircraft include close air support, tactical reconnaissance, air defense, counter insurgency, border patrol, anti-ship missions, lead-in fighter and weapons training. In April 2002, the Boeing Company, minority shareholder of Aero, successfully obtained export authorization for the L-159 aircraft after completing a series of upgrades to attain defense export standards.



Challenge: TSRI was asked to assist The Boeing Company in modernizing the ALCA Integrated Tactical Avionics Program (ITAP). ITAP, originally a real-time embedded J73 JOVIAL program, required transformation to modern C++. The transformed version of ITAP needed to exhibit real-time performance equal to or better than the original system with platform independence. By converting the J73 JOVIAL into C++, Boeing reduced future maintenance costs with the availability of modern software development environments and greater flexibility in its choice of hardware upgrades.

J73 JOVIAL is an advanced version of a 1960's 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.

Results: TSRI undertook the ITAP modernization project for Boeing in two phases. Phase-1 was a pilot project where TSRI transformed a small, self-contained, ITAP bomb-drop module. The transformation involved the conversion of J73 JOVIAL into C++ and the successful execution of this module using test data provided by Boeing.

Following this successful pilot, Boeing contracted with TSRI for Phase-2, a transformation of the ITAP J73 JOVIAL into modern C++. This comprehensive transformation included the Head-Up Display, Head-Down Display, Multi mode pulse Doppler Radar, Radar Warning Receiver, and Countermeasures Dispensers.

The transformation that TSRI delivered to Boeing was a 100% accurate error free transformation of ITAP J73 JOVIAL into C++, which compiled and linked cleanly. Because of the accuracy of the proof-of-concept pilot from the bomb drop module and the exotic requirements for the pre-flight test environment, Boeing completed the testing and deployment phases of the modernized C++ version of ITAP without further assistance.

By transforming ITAP from J73 JOVIAL into C++, Boeing achieved a new version of this mission-critical avionics software package to support its foreign military fighter aircraft sales. The modernized ITAP system is capable of running on the most modern high performance hardware available. Further specifics on this project are not releasable.