NAWCWD Quick Facts
China Lake & Point Mugu, CA NAVAIR

Electronic Combat Simulation and Evaluation Laboratories (ECSEL)

Aircraft Survivability Equipment Laboratory, Advanced Threat System Simulator, Strike Laboratory

Mission. Evaluate active and passive EW systems and associated embedded software. Investigate new systems and concepts during developmental T&E and perform in-service engineering support for EW systems software, both mission data files and operational flight programs. ECSEL also performs EW suite integration and pre- / post-flight checkout and troubleshooting.

RDT&E. ECSEL incorporates actual EW system hardware interacting with the threat simulator. The threat simulators operate in real-time at actual frequencies and receiver power levels.

- **Open-loop.** RF environment simulators provide high signal densities that model emitter characteristics of threat system such as airborne, land based, and shipboard radars, as well as active command guidance signals for missile systems.
- **Closed-loop.** Simulators provide high-fidelity replication of complete radar-directed weapons systems to measure the effectiveness of active jamming response. Closed-loop simulations also include missile hardware simulation for semi-active threat systems.

Advanced Simulations. A scenario control computer incorporates realistic flight dynamics allowing the EW system to be “flown” in laboratory scenarios that represent the electromagnetic environment encountered in actual combat, stressing the EW system to its limits. ECSEL tests many kinds of EW receivers within the frequency ranges of 50 to 18 GHz and millimeter-wave and can model receiver antennas and directly inject signals into receivers. It evaluates both amplitude and phase interferometer direction finding systems as well as digital receivers using delta time of arrival or rotational Doppler direction finding techniques. ECSEL models radars using the Advanced Multiple Environment Simulator (AMES) systems and can simulate over 400 threat systems with over 750 modes. All modes are defined with traceability to intelligence data. A revision history along with simulation limitations and user alerts are provided.

Size / Location. 10,000 SF of high security RF shielded space at Point Mugu.

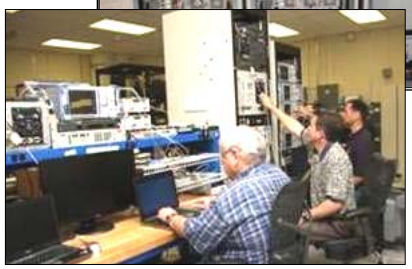
Main Facilities

Assault Aircraft Survivability Equipment (ASE) Laboratory. Provides test benches for the AN/APR-39, AAR-47A/B(V)2, AAQ-24A(V)25, and ALE 47 to support suite testing of multiple assault platforms. Suite testing consists of both mission data file (MDF) and operational flight program (OFP) development and testing. Test benches interface with an AMES for RF simulations, the Multi-Spectral Environment Facility (MSEF) for IR simulations, commercial test equipment, and other instrumentation such as data bus readers. A critical element of the MSEF is the Sensor Front-End Processor (SFEP). The role of the SFEP is to process IR video imagery generated by the Electro-Optical Sensor Digital Simulator (EOSDS). The combination of EOSDS and SFEP provides a capability to inject threat missiles, using an accredited flyout model, with the proper IR signatures. The EOSDS and SFEP combination provides the means to test realistic threat missiles in a dynamic scenario.

Strike Laboratory. Provides test benches for the AN/ALR-67 (V)2 and 3, the AN/ALQ-126B, AN/ALQ-162, AN/ALQ-165, AN/ALQ-214 V3 and V4, and AN/ALE-47 and -50. The test benches are configured to form the current suites for the F/A-18C/D, F/A-18E/F, and the AV-8B. Suite testing consists of both user data files (UDFs) and operational flight programs (OFPs) development and testing. The test benches interface with AMES simulators for RF threat testing. An F/A-18 mission computer emulator is available for realistic integration testing.

Advanced Threat System Simulator (ATSS). ATSS is a HWIL closed-loop system capable of testing EW systems, including jamming techniques through all stages of development. Through M&S, the ATSS provides realistic RF to test systems representing real world values. The ATSS is capable of modeling two different target tracking radars and is supported by both a missile unit and associated acquisition radar. The ATSS has the ability to model up to two aircraft carrying onboard countermeasures / jammers and up to two standoff / supporting aircraft. The acquisition radar has the ability to model up to two, carrying onboard or off-board countermeasures / jammers.

Unique or Historic Tests. For example, in March 2006, the ECSEL performed an Integrated Defensive Electronic Counter Measure (IDECM) Block 3 test for COMOPTEVFOR. It consisted of the ALR-67 V3 RWR, the ALQ-214 RFCM Jammer, the ALE-47 Dispenser, and the ALE-55 Fiber-Optic Towed Decoy (FOTD). Approximately six months was required to prepare the ECSEL for this test. Dynamic scenarios were developed and programmed into AMES. The test consisted of 10 multiple emitter dynamic scenarios covering 70 emitters. Two scenarios were run at four different emitter density levels to fully stress test the IB3 suite. The last two scenarios also had multiple early warning and acquisition radars in the background to provide a more dense pulse environment. All scenarios run had the AMES radar simulator and system under test (SUT) events collected and time stamped with IRIG time code as well as videotaped for customer analysis. Real receiver antenna patterns for the RWR and jammer provided the most accurate direction of arrival (DOA) data possible. Real navigation data of the lead aircraft was also provided.



Significance. This was one of the most complex and dense open-loop scenarios ever tested in the ECSEL. COMOPTEVFOR used ECSEL because they could not get the type of emitters or the density of emitters anywhere else. This represented the first time that ECSEL's open-loop simulator was accredited by COMOPTEVFOR and that the ECSEL's HWIL data were used to support operational evaluation (OPEVAL) data.