

# Communication, Navigation & Identification Laboratory

AIR COMBAT ENVIRONMENT TEST & EVALUATION FACILITY

## Overview

The Communication, Navigation and Identification Laboratory (CNIL) provides open- and closed-loop simulation of friendly, foreign and hostile CNI and electronic warfare (EW) surveillance systems. This allows evaluation of friendly CNI systems as installed in aircraft and EW systems as related to threat CNI recognition and exploitation. In addition to shielded hangar and anechoic chamber testing, CNI supports limited flight testing with transmitted data links. CNIL capabilities are linked to the Air Combat Environment Test and Evaluation Facility (ACETEF) architecture by the Shared Memory Network. The Global Positioning System Test (GPST) Environment Stimulator, Multilink System Test/Training Tool (MLST<sup>3</sup>), Communications Environment Simulator (CES) and Strategic Data Link System (SDLS) are fully integrated with the Simulated Warfare Environment Generator (SWEG) for real-time dynamic scenario control and interaction.

## Global Positioning System Test Environment Stimulator

The Global Positioning System Test (GPST) Environment Stimulator provides the system under test the same radio frequency (RF) and digital inputs that exist in any navigational operational condition. The GPST is capable of simulating 10 GPS or 5 dGPS satellites out of the 32 GPS satellite constellation at L1 and L2 frequencies using course/acquisition (C/A) and/or precision (P(Y)) codes. The GPST also provides auxiliary navigation models, such as Inertial Navigation System (INS) altimeters. GPS unique data extraction/reduction can simulate and receive information across a wide variety of data buses.

## Wide-Area Augmentation System (WAAS) Receiver Test Tool (WRTT)

The WRTT provides GPS and WAAS satellite signals to test any WAAS-capable receiver. The WRTT uses two Stanford Telecom 7200 satellite signal generators capable of simulating 10 GPS satellites out of the 32 GPS satellite constellation at L1 and L2 frequencies using C/A and/or P(Y) codes. The WRTT uses two 7201 single-channel satellite signal generators to produce the two geostationary WAAS signals. Since the WAAS is still in a developmental stage and not fully implemented, this allows the CNIL to test any WAAS-capable receiver in a controlled and repeatable laboratory environment.

## Multilink System Test/Training Tool

The MLST<sup>3</sup> is an open architecture real-time simulator of tactical data links for Link-4A/TADIL-C, Link-11/TADIL-A and Link-16/TADIL-J. It also monitors TADIL-B and N-series messages and acts as an external sensor simulation unit using distributed interactive simulation compliant packet data units. It is a standard test tool used to certify that platforms comply with joint publications and Navy operational specifications for interoperability.

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## Strategic Data Link System

SDLS is a multifunctional data link system. The SDLS is capable of transmitting and receiving Tactical Receive Equipment and Related Applications, Tactical Data Information Exchange System-Broadcast, Tactical Information Broadcast System, Officer in Tactical Command Information Exchange Subsystem, Global Broadcast System, secure imagery (Taco II format), secure voice (Advanced Narrowband Digital Voice Terminal and KY-58) and secure teletype. The SDLS has a fully functional user interface that allows the operator to develop scenarios for transmission, data collection and analysis. SDLS is currently being upgraded to an easily transportable reconfigurable message processor.

## Communications Environment Simulator

The Communications Environment Simulator (CES) is a complex RF signal generation system capable of creating a realistic, simulated environment of hundreds of simultaneous CNI signals on hundreds of platforms. It provides open-loop simulation of up to 240 independent emitters. The signal's sources are independently programmable to vary by signal type, bandwidth, signal strength, operating frequency, modulating data and data rate. The CES can simulate military and civilian communications and radio traffic. Various digital and analog, internal and external modulations can be simulated in a realistic, dynamic environment. The CES also creates effects due to relative motion with respect to other simulated platforms, including path loss, carrier Doppler, antenna directivity variations, and angle-of-arrival (AOA) amplitude and phasing.

## Automated IFF Test System

The Automated IFF Test System (AITS) is capable of stimulating various IFF equipment. It has been used in fielded system testing to measure performance in the presence of interference, as well as determining basic functional suitability. The AITS tests IFF systems through a controlled series of test events, acting as either an interrogator or transponder or as a controller of two external systems.

## Joint Communication Simulator

The Joint Communication Simulator (JCS) is a complex RF signal generation system capable of creating a realistic, simulated RF environment comprised of thousands of CNI emitters on thousands of platforms. The JCS architecture provides a programmable RF source for up to 2,000 CNI emitters operating at frequencies from low HF to microwave. The JCS signal sources are programmable to vary by signal type, bandwidth, signal strength, operating frequency, modulating data and data rate. Using these signal sources, the JCS architecture is capable of simulating scenarios involving up to 2,000 platforms (400 of which may be mobile platforms such as aircraft and ships), each emitting several different RF CNI signals. The JCS architecture will allow external hardware linked through RF and trigger/data connections to the JCS to be "flown" coherent with the scenario. The JCS operates stand-alone with platform and emitter dynamics controlled internally by operator-generated scenarios input or externally by a real-time executive.