Atlantic Test Ranges

The Atlantic Test Ranges (ATR) designs, develops, integrates, installs, maintains and operates all test range instrumentation, communications and digital data gathering and handling equipment at NAVAIR Patuxent River. Range instrumentation includes acquisition, surveillance and tracking radar, special purpose electronic combat emitters, videographic and photographic instrumentation, laser tracking systems and optical tracking systems. ATR provides flight test control and range safety functions, provides Mid-Atlantic Area Frequency Coordinator services and coordinates Patuxent River special-use airspace.

FACILITIES
The Atlantic Test Ranges are fully-instrumented and integrated test ranges that provide full-service support for cradle-to-grave testing and training. This support includes Research, Development, Test and Evaluation (RDT&E) of aircraft, and training for aircrew and integrated avionics and mission systems.

ATR manages over 2,700 square miles of restricted airspace from surface up to 85,000 feet in the Chesapeake Test Range operating areas, which consist of selected targets and airspace covering regions over the Chesapeake Bay, Maryland, Delaware and Virginia. Additional air and sea space is available in the Atlantic Warning Areas, located east of the Delmarva Peninsula over the Atlantic Ocean. Scheduling these offshore warning areas, where support is typically provided, expands that area to over 50,000 square miles. This includes warning areas W-72, W-105, W-106, W-107, W-386 and W-387.

The Telemetry Data Center provides real-time radio-link reception, translation, processing and display of test data using the Real-time Telemetry Processing System. This widely-used system provides real-time test information from up to nine separate in-flight aircraft to ground engineering personnel. Test teams operate the system from any of the nine Project Engineer Stations.

FOR MORE INFORMATION
(301) 342-1197 / 1170 / 3682 / 8640 / 3607 / 1181
23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
Atlantic Test Ranges

SURFACE TARGET AREAS
ATR controls an aerial firing range and three exclusive-use surface target areas in the Chesapeake Test Range restricted areas – Hooper Target, Hannibal Target and Tangier Island Target. Surface target areas are available in restricted airspace for tests using inert ordnance. Target areas provide a safe, controlled location where air-to-surface firing and weapon separation testing can be conducted.

WALLOPS FLIGHT FACILITY
ATR maintains a partnership with NASA’s Wallops Flight Facility (WFF), located on Virginia’s Eastern Shore. The Wallops airfield provides target launch facilities, refueling capabilities, and a communications and telemetry relay back to the ATR Range control room for easy data exchange and test monitoring. By partnering with NASA at Wallops, ATR effectively extends its range capabilities well out into the Mid-Atlantic operating areas. The WFF launch site provides supersonic target services for fleet training and T&E of weapons systems. ATR provides technical support and on-site program coordination for the scheduling and operation of East Coast aerial target presentations (VANDAL/MQM-8G/X, BQM-34, BQM-74).

TEST AND TRAINING SUPPORT
Patuxent River is the Navy’s principal RDT&E fleet support activity for Naval aircraft, engines, avionics, aircraft support systems and ship/shore air operations. ATR supports test and evaluation and training exercises:

RDT&E SUPPORT
- Component Test
- Weapon Separation
- Electronic Warfare
- Carrier Suitability
- Systems Safety
- Sensors
- Flying Qualities
- Stability/Control
- Performance

TRAINING SUPPORT
- Joint Task Force Exercises
- Mining Exercises
- Missile Exercises
- Strike Exercises
- Aerial Target Support
- Carrier Strike Groups
- Expeditionary Strike Groups

Chesapeake Test Range
Restricted areas R-4002, 4005, 4006, 4007, 4008
Surface to 85,000 feet

Atlantic Warning Areas
Warning Areas W-386, W-387 and W-72
Surface to unlimited altitude
The Fleet/Warfighter Support Office is a component of the ATR Special Projects Office and serves as the primary interface between the Atlantic Test Ranges (ATR) and the fleet/warfighter for readiness training support and long-range planning of joint and large-scale exercises. In addition to ATR's primary mission of providing the open-air test environment for NAVAIR Research, Development, Test and Evaluation (RDT&E), ATR's unique open-air range and ground test facilities located in and around the Patuxent River Complex have tremendous application for fleet/warfighter pre-deployment systems grooming and readiness training exercises. Fixed and transportable range instrumentation, emitter simulators and realistic target cues allows the support to be provided locally or at remote sites and may include the full spectrum of live, virtual and constructive (LVC) participation.

Readiness training is regularly supported across the various phases (basic, intermediate and advanced) of training involving units from the squadron level, through the Carrier and Expeditionary Strike Groups (CSG/ESG) and large-scale Joint/Coalition Task Force Exercises. These events and exercises are conducted locally as well as at remote locations and ranges:

- USN – JTFEX, USAF – Red Flag, USA – Roving Sands
- Navy Fleet – Composite Training Unit Exercise (COMPTUEX)
- USN/USAF – Aerial Mining Exercises (MINEX)
- Fleet Air and Surface Combatant Live and Track-Ex Missile Exercises
- Aerial Target Presentations
- Aerial Strike Warfare Training Exercises
- Surface Combatant Gun Fire Exercises
- Electronic Combat Exercises

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23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
The Fleet/Warfighter Support Office provides NAVAIR representation for the Joint Atlantic & Chesapeake Ranges Cooperative (JACRC). The JACRC is an alliance of DoD test and training ranges and facilities in Maryland, Virginia and Rhode Island. Through a Memorandum of Agreement, JACRC members agree to collaborate in supporting the RDT&E and interoperability requirements of DoD acquisition managers; to support and cooperate in all phases of warfighter Readiness training and Joint Forces warfare experimentation.

The Atlantic Targets and Marine Operations (ATMO) Division provides ATR with air, land and sea-based targets and maritime support vessels, which includes a wide range of support services, such as range clearance of hazard areas for safe operations, diving support and target delivery/tow services.

Typical services that are readily available for warfighter training from ATR and ATMO include:

- Participant range instrumentation for Time, Space, Position Information (TSPI) and sensor point-of-interest data for live monitoring and post-mission reconstruct and debrief/analysis
- After-action debriefing systems:
  - Personal Computer Debriefing System (PCDS)
  - Range Computation and Control System (RCCS III)
- Target presentations (fixed and mobile):
  - Opposition Forces and Blue Forces
  - Land
  - Air
  - Seaborne
- Fleet mobile sea range support:
  - Hunter and Hugo vessels
- Realistic Electronic Warfare (EW) signal environment used to simulate/stimulate sensors for EW defensive countermeasures and Intelligence, Surveillance and Reconnaissance (ISR) through:
  - SIGINT (SIGnals INTelligence)
  - COMINT (COMmunications INTelligence)
  - ELINT (ELECTronic INTelligence)

ATR and ATMO also work closely with the U. S. Joint Forces Command through the Joint Warfighting Center (J-7) and Joint National Training Capability (JNTC) to insert new technologies to provide improved training capabilities and scenarios for the warfighter. New capabilities include integrated targets for Opposition Force simulations and integrated threat emitters on targets.
The Joint Atlantic & Chesapeake Ranges Cooperative (JACRC) is an alliance of Department of Defense test and training ranges and facilities and federal agencies in Maryland, Virginia and Rhode Island. Through a Memorandum of Agreement, JACRC members agree to collaborate in supporting the Research, Development, Test and Evaluation (RDT&E) and interoperability requirements of DoD acquisition managers; to support and cooperate in all phases of Warfighter Readiness Training and Joint Forces Warfare Experimentation.

The JACRC works together to support service-specific test and training events and exercises – from small-scale, unit-level events to medium- and large-scale exercises. The large-scale exercises may be service specific or joint (JTFEX, Joint Red Flag), to include multiple armed services and/or combined with coalition participants and involve test, training and experimentation. These exercises typically cover large geographic areas, at distributive sites and involve live, virtual and constructive (LVC) participants in land, sea and air environments.

The JACRC partnership is comprised of the following organizations and commands:

1. Naval Undersea Warfare Center (NUWC), Newport, R.I.
2. NAVAIR Atlantic Test Ranges, Patuxent River, Md.
4. Joint Interoperability Test Command, Indian Head, Md.
7. U.S. Fleet Forces Command (N73), Norfolk, Va.
8. Fleet Forces Atlantic Exercise Coordination Center (FFAEC) Fleet Area Control & Surveillance Facility, Virginia Capes (FACSFAC VACAPES), NAS Oceana, Va.
9. NAVSEA Naval Surface Warfare Center (NSWC) Carderock Combatant Craft Division, Little Creek, Va.
10. NAVSEA NSWC Dahlgren Division, Dahlgren, Va.
11. NAVSEA NSWC, Dam Neck, Va.
12. NAVSEA Surface Combat Systems Center (SCSC), Wallops Island, Va.
13. Joint Forces Command (J84), Suffolk, Va.

www.navair.navy.mil/ranges/atr/JACRC
JACRC POINTS OF CONTACT

JACRC Operational Liaison
Virginia Beach, Va.
(757) 467-7871 | Cell: (757) 343-5405

Naval Underwater Warfare Center
Newport, R.I.
(401) 832-5797

Atlantic Test Ranges
NAVAIR Range Department
Patuxent River, Md.
(301) 342-1208 (DSN 342)

Director, Warfighter Directorate
Aberdeen Test Center
Aberdeen, Md.
(410) 278-4277 (DSN 298)

Joint Interoperability Test Command (JITC)
Indian Head, Md.
(301) 744-2681

NASA Wallops Flight Facility
Wallops Island, Va.
(757) 824-1955 or (757) 824-1394

Director, DPTMS
Fort A.P. Hill, Va.
(804) 633-8203 (DSN 578)

Fleet Forces Command (N73)
Norfolk, Va.
(757) 836-0085 (DSN 836)

FFAEC FACSFAC VACAPES
NAS Oceana, Va.
(757) 433-1219

NSWC Carderock Combatant Craft Division (CCD)
Little Creek, Va.
(757) 462-4136

NSWC Dahlgren Division
Dahlgren, Va.
(540) 653-4362

Force Integration and Interoperability
Dam Neck, Va.
(757) 492-6074

Surface Combat Systems Command (SCSC)
Wallops Island, VA
(757) 824-7105

Joint Forces Command (J84)
Suffolk, Va.
(757) 203-4025

Army National Guard
Fort Pickett, Va.
(434) 292-8605
Range Operations

The ATR Range Operations Division is made up of Test Management, Air Space Management, Range Safety, Test Communications and the Mid-Atlantic Area Frequency Coordination Office. These functional areas serve as the primary customer interface for planning, coordination and conduct of RDT&E, readiness training and experimentation using ATR and associated facilities at the Patuxent River Complex. This includes use of range facilities, sites, equipment, personnel, Special Use Airspace (SUA), assigned and approved frequency spectrum, as well as other non-Navy range resources and assets necessary for the safe conduct of operational missions.

MISSION PLANNING
Test Management serves as the direct customer interface responsible for the planning, coordination, cost estimation and scheduling of projects and provides mission control during conduct of operations. Pre-mission planning, coordination and scheduling needs should begin as far in advance as possible depending on the nature and complexity of the operation. Test Managers work closely with other branches and divisions within ATR and NAVAIR, as well as other external organizations, to prepare associated documentation and ensure that customer requirements are met over the duration of programs and projects.

An expanded version of the SureTrak Integrated Air Display module supports ATR's Military Radar Unit, BayWatch, and is used to monitor air traffic in Patuxent River's restricted and offshore warning areas.

TEST RESOURCE MANAGEMENT SYSTEM
TRMS is an integrated scheduling system that offers customers a streamlined process that incorporates planning for testing and training events, activity reporting and financial accounting. A daily range schedule is distributed by 1400 for the following day’s support. Real-time changes are made throughout the day, continuously adjusting the schedule to support as many customers and missions as possible.

FOR MORE INFORMATION
Test Managers
(301) 342-1197 / 1170 / 3682 / 8640 / 3607 / 1181
Test Communications
(301) 342-9551
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges

Range Safety
(301) 342-1184
Mid-Atlantic Area Frequency Coordinator
(301) 342-1532

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TEST COMMUNICATIONS
The Test Communications Branch is responsible for managing ATR’s microwave, fiber, network and radio frequency (RF) systems. Test Communications provides requirements analysis, design, installation and maintenance services, enabling ATR to fulfill its secure and non-secure video, voice and data communication needs. The Test Communications Branch supports assets at NAS Patuxent River, at various down range facilities along the Chesapeake Bay shoreline and on Maryland’s Eastern Shore.

RANGE SAFETY
Range Safety ensures that flight test and training events are conducted in a safe manner. The Range Safety Team analyzes, identifies and mitigates potential hazards associated with stores separation and launch and release testing, and ensures that test events progress within predetermined acceptable limits.

Final authority and accountability for all aspects of safety at the Patuxent River Complex rest with the Commander, Naval Air Warfare Center, Aircraft Division. In order to ensure that appropriate attention is focused on all aspects of range safety, certain responsibilities are delegated to the ATR Range Safety Officer. Policy guidance is provided in NAVAIR Instruction 3700.3 and procedures are provided in the Range Safety Manual. Additional procedures for fleet training are provided in a series of Standard Operating Procedures.

MID- ATLANTIC AREA FREQUENCY COORDINATOR
The MID-LANT AFC provides support and coordinates authorization for all use of the electromagnetic spectrum at Patuxent River and ensures interference-free operations through the location and identification of conflicting sources. The office monitors and reports the operational characteristics of transmitters and investigates and compares the effects on AM, SSB, CW and FM radio signals at various frequencies for the efficient use of the electromagnetic spectrum and to mitigate interference with test operations. Monitoring is performed from the ATR Cedar Point facility as well as from a mobile SCANVAN.
The mobile range capability of the Transportable Range Operations Center (TROC) enables ATR to provide remote range operations in support of testing and training at locations across the country for use by Unmanned Aerial Systems (UAS) and other RDT&E and training customers.

The TROC offers a fully-integrated, mobile platform to provide mission command and control, safety oversight and surveillance, and data acquisition. Configured as typical fixed-site, open-air range operations center, the TROC operations and range control center houses range instrumentation systems and equipment that enable it to operate autonomously or while connected to the Atlantic Test Ranges (ATR) through the Advanced Range Operations Network (ARON) or other RDT&E networks.

MOBILE RANGE CONTROL
Housed in a 53-foot trailer, the TROC can operate from networked remote instrumentation sites within the ATR Patuxent River Complex, or be taken to remote sites and operated in a stand-alone mode. Depending on the location and operational requirements, the TROC can import data from the ATR fixed-instrumentation infrastructure or function with transportable range instrumentation and operated in a remote, autonomous configuration. The system was developed to improve range support to the tactical UAS operations conducted at the Webster Field Annex; however this capability can be used to support a wide variety of customer requirements that need this type of flexibility.

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TROC FEATURES
• Segregated equipment area with 19-inch equipment racks
• 10 fully integrated workstations each with operator selectable mission-specific software applications
• Video switch
• Communications equipment (LAN, radio, voice)
• 42-foot telescoping mast
• Secure storage container
TRANSPORTABLE RANGE OPERATIONS CENTER

MISSION-SPECIFIC APPLICATIONS

The TROC’s combination of instrumentation and mission-specific processing and display systems allow for real-time mission command and control, safety and surveillance and data acquisition during a wide variety of operations in support of test and training events:

- Situational awareness/range safety
  - Range surveillance (SureTrak)
  - Flight termination (with transportable Flight Termination System – FTS)
  - Radio frequency (RF) monitoring and de-confliction
- Command and control
  - Range Computation & Control System (RCCS III)
- Post-mission debrief and After Action Reporting (AAR)
  - Personal Computer Debriefing System (PCDS)
- Time, Space, Position Information (TSPI) data acquisition
  - Command and control
  - Remote instrumentation slaving
- Real-time Telemetry Processing System (RTPS)
- Photogrammetrics (documentation and video scoring)
- Electronic warfare
  - Simulation and stimulation
  - Infrared signature measurements

System operators inside the TROC
The NAVAIR Range Department Sustainability offices at Patuxent River, Md.; China Lake, Calif.; and Point Mugu, Calif., ensure environmental compliance and manage (minimize) encroachment on operations conducted at NAVAIR Ranges at these three sites. The Sustainability Office (SO) at the Atlantic Test Ranges (ATR) supports fleet readiness by ensuring access to ranges, facilities and resources as well as public support for the test, training, evaluation and experimentation mission, through proactive involvement in the core areas of range management planning support, encroachment management, public outreach, comprehensive noise management, operational environmental planning and information technology support.

RANGE MANAGEMENT PLANNING SUPPORT
The SO leads and supports the development of management documents and programs associated with range sustainability. Examples include:

- Range Complex Management Plans
- Range Condition Assessments
- Water Range Assessments
- Encroachment Assessment Reports and Action Plans
- Air Installations Compatible Use Zones and Range Air Installations Compatible Use Zones Studies
- Environmental Assessments and other National Environmental Policy Act documentation

COMPREHENSIVE NOISE MANAGEMENT
The SO maintains a comprehensive noise management program to identify and mitigate noise impacts to the community by responding to noise disturbances reported to the Noise Hotline; analyzing flight and sonic boom data associated with noise disturbances; conducting airfield noise studies on operations; and providing feedback to installation commands and squadrons on how to minimize impacts to surrounding communities.

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ENCROACHMENT MANAGEMENT
The SO coordinates actions to address encroachment issues that may threaten the mission. The primary encroachment challenges at ATR include competition for air, land and sea space; availability of the frequency spectrum; and urban development. The SO addresses these issues by:

• Coordinating with Navy stakeholders through specialized local and regional teams and partnerships
• Establishing encroachment partnerships to create land preservation areas that are compatible with military operations
• Raising awareness of the Maryland Real Estate Military Noise Disclosure Clause
• Tracking local and regional project proposals that may have an impact on ATR operations and identifying mitigation strategies

OPERATIONAL ENVIRONMENTAL PLANNING
The SO implements environmental planning to ensure that ATR operations conducted in the PRC are compliant with environmental regulations and the PRC Environmental Impact Statement (EIS). The SO works closely with NAVAIR engineers and program offices to satisfy test planning requirements, educates aircrew on operational measures required to protect the environment and public, and prepares quarterly and annual reports to compare current operational tempo and trends to those previously analyzed.

PUBLIC OUTREACH
The SO conducts outreach to minimize and prevent encroachment and enhance support for the ATR mission. Using brochures, information exchanges, fact sheets and briefings, the SO focuses its outreach efforts on communities, local governments and non-governmental organizations in the areas surrounding the Patuxent River Complex (PRC). Primary outreach strategies include:

• Building positive relationships with communities to understand local and regional opinions or concerns
• Communicating the ATR mission, operations and encroachment challenges
• Developing key stakeholders that can be advocates for ATR

INFORMATION TECHNOLOGY SUPPORT
The SO provides customized tools and geospatial information system services, including mapping and analysis, to various ATR components. In addition, the SO:

• Analyzes Sonic Boom Monitor (SBM) data and maintains SBM systems deployed throughout the range
• Develops and implements specialized noise management applications such as the Sonic Boom Prediction Tool
• Evaluates reported noise disturbances and maintains a database to document aircraft events and disturbances
• Manages the Environmental Review Checklist, a web-based application used to evaluate operations against the EIS
The Atlantic Test Ranges Weather Office is a component of the ATR Test Management Branch and serves as the liaison between the Naval Aviation Forecast Center (NAFC), located in Norfolk, Va., and the fleet/warfighter for forecasting support and long-range weather planning to enhance mission effectiveness and test scheduling.

ATR provides the open-air test environment for the research, development, test and evaluation (RDT&E) of naval aviation acquisition programs. In order to accomplish the ATR mission, forecasters conduct a thorough assessment of the weather at Naval Air Station Patuxent River, Md., and in the Chesapeake Bay and Atlantic ranges used by aviators to provide products tailored to individual mission requirements.

Providing accurate weather data to aviators and test and evaluation engineers is essential to mission accomplishment. Cloud heights, wind, temperature and pressure data, along with in-flight hazards have a direct impact on the timing and execution of flight and ground testing processes. The mission of the forecasters is to provide accurate and timely weather information to support and enhance the ATR mission.

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23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
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Typical services provided by the ATR Weather Office include:

- Forecasts for test and evaluation (engineers, test managers and flight crews)
- Daily Mission Execution Forecasts (MEF)
- Three-day Military Operating Area Forecast (MOAF)
- 175-1 and verbal weather briefings
- Specialized mission briefings
- Command support briefings
- Instrument Ground School (IGS) briefings
- Collaboration with NAFC on watches, warnings and advisories issued for the Naval Air Station
- Climatological data requests
- Extended weather outlooks

The Weather Office is located in Building 103 at NAS Patuxent River and offers weather forecasting and briefing support during core flying hours. Weather Observers are available during airfield operating hours. Forecast team personnel are available for on-the-spot briefs, 175-1 briefs and specialized weather requests coordinated with the site lead.

A good weather forecast ensures safe flight operations.
The Atlantic Test Ranges (ATR) uses a Range Global Positioning System (RGPS)-based tracking capability designated as the Advanced Range Data System (ARDS). ARDS provides accurate Time, Space, Position Information (TSPI) under highly dynamic vehicle conditions. ARDS provides coverage of a large area comprised of air, land and sea; and multiple participant tracking capability. The ATR RGPS system is comprised of GPS-based participant pods or plate instrumentation and a ground-based Enhanced Data Link System (EDLS).

**RGPS PROJECT SUPPORT**
Real-time tracking support can be provided for data collection and for surveillance requirements. The ATR RGPS team supports local and remote operations across the country. RGPS personnel provide recommendations and assistance to customers to meet their objectives. The RGPS team has experience in instrumenting a wide variety of platforms ranging from “man-packs,” to boats, and high-performance rotary- and fixed-wing aircraft. Any vehicle or number of vehicles can be instrumented with RGPS packages that transmit real-time data. Most packages provide a recording capability.

**ENHANCED DATA LINK SYSTEM**
The Enhanced Data Link System (EDLS) manages the Time Division Multiple Access (TDMA) Radio Frequency (RF) network that supports real-time, extended area control of air, land and sea participants. EDLS uses multiple ground stations and relays to send uplink and receive downlink data, providing an expanded coverage area. It can accommodate up to 250 participants at a 1 Hz update rate, while update rates as high as 10 Hz can be selected for up to 25 participants. Real-time position data is displayed using relevant symbols overlaid on a digital map of the operating area. Displays can be tailored to provide additional information for project support.

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www.navair.navy.mil/ranges
ARDS TSPI MODULES
ARDs pods and plates provide highly-accurate position, velocity, acceleration and attitude data. TSPI updates can be provided at up to 10 Hz. Tracking is supported with vehicle dynamics of up to 10 gs. ARDS pods and plates are available for use on most DoD and commercial aircraft platforms. Expected accuracies are one meter horizontal and two meters vertical. Velocity accuracies are 0.8 feet-per-second horizontal and vertical, while attitude accuracies are 0.8 degrees for pitch and roll, and 1 degree for heading.

A compact, low-power GPS instrumentation package suitable for small, slow-moving participants is also available. This package is a Trimble Lassen GPS receiver integrated with either the ARDS-Lite (Freewave) or Iridium satellite data link and provides position data at 1 Hz. Expected position accuracies are nine meters horizontal and 18 meters vertical.

GAINR
The Global Positioning System-Aided Inertial Navigation Reference, or GAINR, is a Rockwell GEM IV, 12-channel GPS receiver integrated with a modified Honeywell H-764G to provide raw inertial measurements. GAINR data is processed using a custom software suite, MOSES, developed at Edwards Air Force Base, Calif. MOSES, or the Multi-Sensor Optimal Smoother Estimation Software, has demonstrated the ability to produce centimeter-level trajectory accuracies with quality measurements in typical local-area flight dynamic conditions.

CARRIER PHASE GPS
Commercial Off-the-Shelf (COTS) carrier phase receivers maintained by the GPS team are operated in stand-alone/not networked mode. At the completion of the test, the recorded data is differentially corrected using local Reference Receiver (RR) corrections. Custom TSPI parameters are provided as requested. Centimeter accuracies are typical for baselines of less than 35 kilometers.

The GPS team maintains an RR network made up of COTS GPS receivers. The RR network logs data continuously, and RR data is available for a local network from three different survey sites. The GPS team can deploy and maintain RR networks at remote sites. Analysis of the RR data is provided as required.
The Personal Computer Debriefing System (PCDS) is a Windows-based, user-friendly, stand-alone flight debriefing system. Data from various tracking sources can be recorded and replayed to provide the debriefer with a comprehensive operational capability. The state-of-the-art synchronized digital video replay capability makes PCDS the F-16 pilot's debriefing tool of choice for the Air National Guard (ANG), Air Combat Command (ACC) and European Participating Air Forces (EPAF), U.S. Navy and Coast Guard.

In addition to the 3-D graphic displays, PCDS also provides a user-configurable tabular display of parameter and pairing data. The default map set includes Europe, CONUS, Alaska and Hawaii. Tools for merging, reducing, converting and transferring PCDS recorded data files are also included.

Using the Live Monitor capability, as the real-time picture is displayed, PCDS can record data locally for replay and/or transfer to a remote site. Recorded PCDS data files are kept small and compact through the use of an efficient data packing technique and compression algorithms, thereby facilitating remote distribution via secure telephone units. The sources used for Live Monitor include Distributed Interactive Simulation (DIS), Test and Training Enabling Architecture (TENA), Computation and Control Subsystem (CCS) and Host Range Interface Protocol (HRIP).

Government owned and developed, PCDS is managed by NAVAIR, with the PCDS Software Support Activity (SSA) located at NAS Patuxent River, Md. Future enhancement requirements are gathered directly from the user communities; these requirements are prioritized at the annual Users' Conference.

FOR MORE INFORMATION
PCDS Software Support Activity, NAVAIR
(301) 342-1204
DSN 342-1204
pcds_helpdesk.fct@navy.mil

www.navair.navy.mil/ranges
CAPABILITIES

• Monitors, records and replays flight maneuvering Time Space Position Information (TSPI) data from multiple sources
• Networked playback enables user to drive multiple PCDS Debrief applications across a network in master/slave configurations
• Replays up to 16 channels of recorded audio (recorded on a range)
• Integrated ACMI, DVR and Electronic Warfare playback
• IRIG 106 chapter 10 audio/video playback
• Printable shot log provides timely shot and drop validation
• 3-D textured surface maps using National Geospatial-Intelligence Agency (NGA) data products including Digital Terrain Elevation Data (DTED) and Vector Smart Map (VMap)
• Displays multiple 3-D, video, EW, tabular and pairing views simultaneously
• Designed to play up to 1000 concurrent air, land, weapon and sea tracks, bomb impact points, threats and terrain (full capacity dependant on system processor power and memory)
• PCDS File Converter allows conversion of various formats to the PCDS format
• Interface with Falcon View to import map, overlay and threat data within PCDS
• Import of Joint Mission Planning System (JMPS) files, including steerpoints, threats, lines and destinations
• Joint Anti-Air Model (JAAM) integration provides accurate missile flyout simulation

DEVELOPMENT & APPLICATION

PCDS was initially designed to support Tactical Aircrew Combat Training System (TACTS) and Air Combat Training System (ACTS) training ranges. The aspirations of the development and support team led to a redesign using an object-oriented methodology. The result is an increasingly popular software application that is easy to use and deploy.

PCDS is currently

• Providing a “Virtual ACMI Range” capability for the F-16 Block 30/40/50 by merging data recorded onboard each aircraft’s Digital Transfer Cartridge (Mega-DTC) and integrated replay of recorded digital video
• Supporting several Joint National Training Center (JNTC) large-scale exercises to monitor and record training scenarios
• Used as a monitoring and engineering tool on board the Joint Strike Fighter (JSF) Cooperative Avionics Test Bed (CATB) and in the lab at Eglin AFB to support flight-testing operations
• Providing F-16 Aircrew Training Devices (ATD) Link Trainer Debriefing at Springfield ANGB, Ohio
• Supporting Air Combat Command (F-16, A-10, F-15, B-2) and European Participating Air Forces (M4.2/M5)
• Providing Digital Video Replay for the U.S. Coast Guard

REQUIREMENTS

Please note that these are the minimum system requirements to use PCDS. Please contact PCDS Technical Support for recommendations to suit individual system needs.

BASIC SYSTEM REQUIREMENTS

• Pentium 3 microprocessor
• OpenGL-compatible 64 MB graphics card with hardware acceleration
• Microsoft Windows NT/2000/XP
• 512 MB RAM

DIGITAL VIDEO CAPABILITY REQUIREMENTS (4 CONCURRENT DIGITAL VIDEO VIEWS)

• 3.0 GB Pentium 4 microprocessor
• OpenGL-compatible 256 MB graphics card with hardware acceleration
• Microsoft Windows 2000/XP
• Microsoft DirectX 9.0
• USB 2.0 Port(s)
• Firewire 800 (IEEE1394B) for IRIG RMMs
• 2 GB RAM
The Large Area Tracking Range (LATR) system is an integrated, off-shore, over-the-horizon (OTH), Time, Space, Position Information (TSPI) system for tracking surface and air participants in support of tactical training exercises at shore-based sea combat training ranges.

Using Global Positioning System (GPS) satellite tracking, LATR provides continuous real-time tracking of air and surface exercise participants up to 500 nautical miles from the Range Operations Control Center (ROCC) transmitting site at the Atlantic Test Ranges. LATR tracking information is collected at the ROCC, where it is combined with data available from other range systems (surveillance radar tracks, subsurface tracks, etc.) to form a total picture of the events occurring in the operational areas associated with the ROCC.

During an exercise, LATR provides real-time exercise data to the command ship. After an exercise, LATR can transmit selected exercise data to ships and remote land-based sites. The data can be replayed for shipboard training. At land-based sites, the data can be used for reconstruction and debrief purposes. LATR supports training requirements that range from single-platform, unit-level operations to complex, multi-platform scenarios typical of Fleet Readiness Exercises. LATR also supports multiple independent operations.

LATR has transitioned to the Navy Operations and Support phase. In-service support of LATR hardware and software is the responsibility of NAVAIR PMA-205 with assistance from the LATR System Support Activity (SSA) located at Patuxent River. The LATR SSA provides background information for logistics support to Naval Surface Warfare Center Corona.

FOR MORE INFORMATION
(301) 342-1197 / 1170 / 3682 / 8640 / 3607 / 1181
23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
GPS-BASED TRACKING SYSTEM
• GPS-aided inertial measurement provides full-state vector
• 124-player capacity
• 500-nautical-mile tracking range with line-of-sight plus 3 relays
• Aircraft interfacing and weapons real-time data collection
• Continuous operation
• Multiple simultaneous exercises and missions
• 433 MHz \( R^3 \) frequencies available

PARTICIPANT PACKAGES FOR FIXED-WING, ROTARY-WING AND SHIP PLATFORMS

DATA FUSION SYSTEM
• Integrates data from local ranges: radar, underwater tracking, TACTS, sonobuoy tracking

DEBRIEF SYSTEM
• Allows debrief at ROCC, remote land bases and aboard ship

LATR SYSTEMS SUPPORT ACTIVITY
• Established at NAVAIR Patuxent River in 1996
• Assumed role of ground software development and support from SAIC
• LATR is a CMM Level II Program
• Government managed and developed
• Systems, hardware, software engineering
• Configuration management and quality assurance
• Test and evaluation
• Independent verification and validation
• Diversity of services and products
• Rapid Application Development (RAD) process, reserved for emergency situations, ensures quick response to users
The Range Computation and Control System (RCCS) is an automated data visualization tool that provides range mission controllers at the Atlantic Test Ranges (ATR) with real-time aircraft Time, Space, Position Information (TSPI) data from various tracking sources and telemetry data from the Real-time Telemetry Processing System (RTPS). Range TSPI data is used by range controllers and range safety officers to safely conduct aircraft flight test in the Atlantic Warning Areas.

CAPABILITIES
The latest version of RCCS provides a Least Squares Fit filter (used in the slaving of various tracking instruments to the test vehicles), inner-track calculations, engineering unit (EU) conversion, time correlation of data, data parameterization, 3-D map, Outside Continental U.S. or OCONUS maps, whole-world coverage, DTED map format support, plus many others.

In addition to providing aircraft test project teams with parameter data for flight test evaluations, RCCS provides slaving data (pointing vectors) back to the various tracking instruments via the Advanced Range Operational Network (ARON) as required. This slaving data provides the tracking instruments with location information that tells the instrument where to look to acquire the aircraft under test.

Safety officers use the data displayed by RCCS computers to monitor safety-of-flight parameters, to keep the test area clear and abort test operations in the event of test area intrusion or other hazards as they appear.

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CAPABILITIES

WINDOWS, PC-BASED ARCHITECTURE
- Can run on a single station or multiple PCs
- ATR has six consoles, each consisting of one computational server and four data display PCs

ETHERNET NETWORK
- Uses new Range Data Distribution System (RDDS) Applications Program Interface (API) and Gigabit Ethernet (GigE) network
- TCP for guaranteed delivery of event marking

PLATFORM-INDEPENDENT SERVER
- Can be hosted on Windows, Unix or Linux
- Can be run on one PC/laptop if required

INDEPENDENT COMMON MAP
- Uses ATR common Map
- Can be run with or without Map function

FUNCTIONALITY INCLUDES:
- Aircraft ground control with 3-D aircraft models
- Assignment of tracking instruments
- Handoff from search to tracking radar
- Display of aircraft and Identification Friend or Foe (IFF) tracks
- Time history trails
- DTED maps with restricted airspace boundaries
- Landmarks
- User-generated geometric symbols and lines
- User-defined graphs, charts and reports

PRODUCTS TO CUSTOMERS

REAL-TIME AIRCRAFT TRACK AND CONTROL
USE/CONTROL OF RESTRICTED AIRSPACE
SAFETY MONITORING
- Dive plot display
- Pull up queue display
- Run-in line display
- Bin-fill display

WEAPONS SEPARATION
- Ballistics
- Bomb scoring

POST FLIGHT DATA
- Electronic media
- Formats – ASCII & Raw
- Reports

The original RCCS program, known as the Mission Control Data System (MCDS) was developed on Gould 32/77 and Adage 4185 computers. The Gould was used as the computational function (CF) and the Adage provided vector graphical functions (DF) with up to four different colors.

RCCS II (1994 – 2006)
The RCCS II system was written in ADA-83 on an SGI Unix platform and provided the user with a robust graphical user interface and function control panels. The CF was hosted on multi-processor SGI Challenges while the DF ran on SGI Indigo computers providing displays capable of 3-D graphical output and millions of colors.

RCCS III (2006 – PRESENT)
The latest version of RCCS was written to operate on a Windows PC-based platform using C++ applications. The Graphical User Interfaces (GUIs) and output displays were built upon Commercial Off-The-Shelf (COTS) components, where available (tabular, graphical displays, etc.), with the ability to use the new RDDS API for data ingestion. The new architecture supports a single-tiered implementation and can be run either as a team of PCs clustered to support multiple displays in a mission console, or as a stand-alone PC.
SureTrak is a multi-sensor, fully integrated, data acquisition and display system. SureTrak combines waterway, airspace and environmental monitoring systems in an open architecture, highly scaleable design that can be fielded on inexpensive Commercial Off-the-Shelf (COTS) platforms running Windows operating systems.

The SureTrak suite of integrated data systems incorporates an ever-increasing number of sensors, including a variety of air and surface surveillance radars, thermal and daylight cameras, GPS transponders, environmental monitors, Doppler radar and radio direction finders. With so much data available in a single system, the SureTrak development team has gone to great lengths to provide operators with the most intuitive and user-friendly interfaces.

SureTrak’s sophisticated alarm module and fully integrated database can be used to alert operators to developing situations or to immediate threats involving airborne aircraft or vessels afloat. With the network-centric data service, important tactical data can be disseminated via secure internet portals or wireless/local area networks to other agencies or forces in the field.

APPLICATIONS

- Maritime Domain Awareness
- Airspace and waterway management
- Range surveillance
- Homeland security
- Force protection
- Port and harbor security
- Environmental monitoring

Used by military, government and civilian agencies:

- Multi-sensor data integration
- GOTS/COTS
- Data fusion
- User-defined operating picture
- External interface compatibility
- User-defined decision aids
- Establishes system support activity
- Modular

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WHY CHOOSE SURETRAK?

• Affordable – Government-owned software
• Efficient – Dual-use technology
• Effective – Network-centric data distribution
• Compatible – Interfaces with other systems
• Expandable – Modular design; COTS components
• Supportable – Established system support activity
• Scaleable – Runs on laptops or numerous PCs
• Powerful – Fully digital record and replay capability

CAPABILITIES

• Displays ship and aircraft contact data from multiple tracking sources
• Displays surface radar image data; controls remote sensors
• Ingests and integrates environmental sensor data
• Exports track data to a command-and-control environment
• Provides automated camera slaving to radar tracks
• Digitally records and replays data for training or operational analysis

ENVIRONMENTAL MONITORING

• Infrasonic sensor, locally developed
• Captures and transmits infrasonic event data
• Integrates IFF track data
• Noise-complaint database
• Stores data for statistical analysis
• Remotely configurable

NETWORK DATA SERVER

The central data server uses all data types and is capable of providing real-time data, statistical data, historical reports and replays over LAN, WAN and wireless networks to:

• Neighboring facilities
• Base security
• Law enforcement
• Range boats
• Airborne aircraft
• Coast Guard

SURFACE SURVEILLANCE SYSTEM

• Furuno S and X band radar
• Terma radar
• PC-RP radar processors
• Wireless communications
• Integrated with thermal and daylight cameras
• AIS data integration

Features

• Multiple sensors and workstations
• Full sensor command and control
• Automated target detection and auto acquisition
• Track correlation processing with fuzzy logic
• Full alarms module for aircraft and vessels

AIR SURVEILLANCE SYSTEM

• ATC radar
• Military radar
• MATS RGPS network
• Precision tracking radar
• ADS-B/UAT
• Multi-lateration systems

Features

• Automated decision support
• Track correlation processing
• Data analysis capability for incident and airspace utilization or encroachments

INTEGRATED CAMERA SYSTEM

• Provides automated radar and video target detection and discrimination
• Automated cameras slave to track on alarm event
• Automated track following
• All weather, all light camera components
• Digital data distribution
The Tactical Combat Training System (TCTS) is an ACAT IV acquisition program replacing current Navy airborne training instrumentation systems for tracking of aircraft in support of tactical training exercises at various training ranges over land or at sea.

Using Global Positioning System (GPS) satellite tracking, TCTS provides continuous, live, real-time tracking of air exercise participants up to approximately 350 nautical miles (line of sight plus one relay) from any Remote Range Unit (RRU). Training ranges can be equipped with up to 20 RRUs to provide an expansive live coverage area. TCTS tracking information is collected by the RRU and relayed to the Ground Subsystem (GS), where it can be combined with data available from Link-16, Radar Acquisition Display System (RADS), Electronic Warfare Server (EWS), Ground Tracking System (GTS) and other systems to form a total picture of the events occurring in the training/operational areas covered by the RRUs.

TCTS can also be used in a rangeless mode, requiring no ground infrastructure at all. During an exercise, the same data that TCTS is transmitting on the data link is recorded on a solid-state Data Recording Device (DRD) inserted in the Airborne Subsystem (AS). After an exercise, TCTS exercise data can be debriefed from the live recording at the control center or at any other GS site that can read the DRDs. The ability to read and debrief from the DRDs gives TCTS a rangeless capability that is limited to Time, Space, Position Information (TSPI) and weapon simulations. TCTS supports training requirements that range from single-platform, unit-level operations to complex, multi-platform scenarios typical of fleet exercises. TCTS can also support multiple independent operations.

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Operational diagram

GPS-based tracking system:
- GPS-aided inertial measurement unit provides full-state vector
- 100 high activity player capacity and 100 low activity player capacity
- 350 nautical mile live tracking range including line of sight plus one relay
- Rangeless capability available for TSPI and weapon simulations
- Includes aircraft interface and real-time weapons data collection
- Continuous operation
- Multiple simultaneous exercises and missions
- Fixed-wing and rotary-wing aircraft can be instrumented

Participant packages for fixed-wing, rotary-wing and ship platforms
The Threat / Target Systems Department develops, constructs and modifies target systems for realistic threat simulation. Targets include aerial targets, land point targets, scored targets, seaborne targets and scuttled or afloat target ships. Aerial targets include subscale and full-scale subsonic and supersonic targets. Land-based targets include fixed target arrays, manned and remote controlled vehicles. The department provides range clearance and surveillance, diving support for test article recovery, real-time weapon impact scoring and target ship preparation and deployment.

AERIAL TARGETS
Aerial targets include subscale subsonic targets, full-scale missile targets and full-scale aircraft targets – all capable of remote operation.

• BQM-74E and BQM-34S (subscale subsonic recoverables)
• AQM-37 (subscale supersonic missile)
• GQM-163A Coyote and MA-31 (full-scale supersonic missiles)

LAND TARGETS
Land Targets include a broad selection of fixed, mobile, and antiradiation targets. Targets are also constructed to meet specific program requirements.

The Threat / Target Systems Department has created a process for the fabrication of threat realistic plastic targets. This process can produce a wide variety of plastic armored vehicles that are low-cost, durable, mobile and threat realistic. Targets can be outfitted with various options to include RF and IR systems and camouflage paint themes.

Many different types of full-scale, three-dimensional targets are currently produced: BRDM II Amphibious Scout Vehicle, SA-9 Gaskin, AT-5 Spandrel, T-72 Main Battle Tank, ZSU-23-4 Shilka, SA-6 Straight Flush, SA-6 Gainful, SA-20 Tombstone, 2S6 Tunguska, BTR-70, M2A2 Bradley and HUMVEE. Several two-and-a-half dimensional targets are also available. These 2.5-D targets are designed to be indistinguishable from a 3-D unit at a distance of 1,000 meters and at angles deviating up to 10 degrees from a direct line-of-site with the target. This department can also provide inflatable targets for test and training exercises that are mobile and visually realistic.

FOR MORE INFORMATION
Atlantic Targets and Marine Operations
(301) 342-1304

Pacific Targets and Marine Operations
(805) 989-5909

www.navair.navy.mil/targets
The Threat / Target Systems Department offers customers a comprehensive selection of threats and targets. A highly skilled technical work force develops, tests, evaluates, and provides life-cycle support for threats and targets and oversees their use during test and training exercises.

SEABORNE TARGETS
Seaborne targets include littoral and open-ocean targets.

- High-Speed Maneuverable Surface Target (40+ knots, can operate independent of ranges with a portable command-and-control unit)
- QST-35 Seaborne Powered Target (SEPTAR) (missile/launch threat)
- Mobile Ship Target (full-scale, remotely controlled, environmentally friendly)
- Aerial Target Launch Ship (full-scale vessel for remote launches of selected aerial targets)
- Improved Surface Tow Target (sled for direct-fire scenarios, towed by remote SEPTAR)
- Trimaran and Williams Sled (missile/gunnery target)
- Floating At-Sea Target (FAST) (gunnery/bomb target)
- HARM/IR (drifting barge target)

LIVE-FIRE TARGETS
The Threat and Target Systems Division supports Live Fire Test and Evaluation (LFT&E) programs that are designed to measure ship survivability against newly developed weapons or to validate ship survivability characteristics. The division manages the test platform from cradle-to-grave, ensuring that all customer, environmental and test requirements are met.

AUGMENTATION, SIMULATION SYSTEMS & RELATED CAPABILITIES

- Electronic attack systems (e.g., active jammers, chaff and flares) and radar simulator systems
- Scoring (scalar and vector)
- Radar and IR signatures
- Target command-and-control
- Location, navigation and identification services
The Atlantic Targets and Marine Operations (ATMO) Division, part of the NAVAIR Threat/Target Systems Department, supports test and evaluation and fleet training by providing land, sea and aerial target services. Five major East Coast activities in Maryland, Virginia and Florida provide the professional staff and state-of-the-art equipment and facilities to create realistic threat simulations in air, land and sea environments. Technical experts work closely with customers to design, develop and modify target systems and deploy a range of vessels to support unique maritime requirements.

ATMO technical capabilities include:

- Operation of maritime surface vessels
- Operation and maintenance of surface and aerial targets
- Design and fabrication of prototype land targets
- Preparation and planning for full-scale sea target hulks used in weapons effects testing
- Underwater and land test-article recovery operations

MARITIME SUPPORT VESSELS
ATMO operates manned, remotely controlled and towed watercraft to provide a wide variety of maritime support services. Vessels range in size from 10-foot jet skis up to a 600-foot decommissioned LPH ship. ATMO also operates three 200-foot offshore support vessels and an ocean-going tug. These vessels can be used for deploying and recovering aerial and surface targets, Unmanned Aerial Systems (UAS) and Unmanned Underwater Vehicles (UUV), sonobuoy support, and the deployment of explosives to support fleet shock trials.

Inshore support vessels are also available, offering crane and dive services and target command and control platforms. This includes small, Rigid Hull Inflatable Boats (RHIB), several “go-fast” boats, a 65-foot gun platform and multipurpose 100-foot support craft.

FOR MORE INFORMATION
Atlantic Targets & Marine Operations
(301) 342-1304
www.navair.navy.mil/targets

Realistic Operational Threat Environments
AERIAL TARGETS
Aerial targets carry a variety of internal and wingtip-mounted payloads in support of mission requirements. Payloads include passive and active radar augmentation, IR flares, electronic countermeasures (ECM), seeker simulators, scoring, Information Friend or Foe (IFF) and dual wingtip-mounted tow bodies.

The Integrated Avionics Unit, Air Data Computer and Global Positioning System (GPS) provide a highly accurate navigation solution. Recently incorporated Low Altitude Control Enhancement (LACE II) software allows the target to perform complex, programmable, three-dimensional maneuvers and operate at altitudes as low as seven feet.

Subscale, subsonic recoverable targets include BQM-74E and BQM-34S.

LAND TARGETS
ATMO provides a wide variety of land targets that include fixed, mobile and anti-radiation targets. ATMO also fabricates full-scale, three-dimensional plastic targets that are low-cost, durable, mobile and threat realistic. They can be augmented to provide an IR signature and can be mounted on a trailer or skid.

LIVE-FIRE TARGETS
ATMO supports Live-Fire Test and Evaluation (LFT&E) programs designed to measure ship survivability against newly developed weapons or validate ship survivability characteristics. The division manages the test platform from cradle-to-grave, ensuring customer, environmental and test requirements are met.
The mobile range capability of the Transportable Range Operations Center (TROC) enables ATR to provide remote range operations in support of testing and training at locations across the country for use by Unmanned Aerial Systems (UAS) and other RDT&E and training customers.

The TROC offers a fully-integrated, mobile platform to provide mission command and control, safety oversight and surveillance, and data acquisition. Configured as typical fixed-site, open-air range operations center, the TROC operations and range control center houses range instrumentation systems and equipment that enable it to operate autonomously or while connected to the Atlantic Test Ranges (ATR) through the Advanced Range Operations Network (ARON) or other RDT&E networks.

MOBILE RANGE CONTROL

Housed in a 53-foot trailer, the TROC can operate from networked remote instrumentation sites within the ATR Patuxent River Complex, or be taken to remote sites and operated in a stand-alone mode. Depending on the location and operational requirements, the TROC can import data from the ATR fixed-instrumentation infrastructure or function with transportable range instrumentation and operated in a remote, autonomous configuration. The system was developed to improve range support to the tactical UAS operations conducted at the Webster Field Annex; however this capability can be used to support a wide variety of customer requirements that need this type of flexibility.

TROC FEATURES

- Segregated equipment area with 19-inch equipment racks
- 10 fully integrated workstations each with operator selectable mission-specific software applications
- Video switch
- Communications equipment (LAN, radio, voice)
- 42-foot telescoping mast
- Secure storage container

FOR MORE INFORMATION

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MISSION-SPECIFIC APPLICATIONS
The TROC’s combination of instrumentation and mission-specific processing and display systems allow for real-time mission command and control, safety and surveillance and data acquisition during a wide variety of operations in support of test and training events:

- Situational awareness/range safety
  - Range surveillance (SureTrak)
  - Flight termination (with transportable Flight Termination System – FTS)
  - Radio frequency (RF) monitoring and de-confliction
- Command and control
  - Range Computation & Control System (RCCS III)
- Post-mission debrief and After Action Reporting (AAR)
  - Personal Computer Debriefing System (PCDS)
- Time, Space, Position Information (TSPI) data acquisition
  - Command and control
  - Remote instrumentation slaving
- Real-time Telemetry Processing System (RTPS)
- Photogrammetrics (documentation and video scoring)
- Electronic warfare
  - Simulation and stimulation
  - Infrared signature measurements
In addition to supporting operations within its warning areas and around the Patuxent River Complex, the Atlantic Test Ranges (ATR) also supports an increasing number of remote operations across the country. Personnel and mobile threat assets are regularly requested by other ranges and at contractors’ facilities to support test, evaluation and training events. Mobile electronic warfare (EW) threat emitter assets allow test platforms to fly in airspace across the country – using proven range systems. ATR fields a number of mobile EW threat systems that can be deployed anywhere in the world.

**BATTLEFIELD COMMUNICATIONS SIMULATION SYSTEM**

The BCSS provides automated communications simulations to support DoD training exercises. It is computer-controlled, with scripted voice and data messages. Featuring a transit case configuration for transportation and operation, BCSS can be remotely-controlled.

- Frequency range: 2 MHz - 2.4 GHz
- Output power: up to 100W
- Text-to-speech engine for scenario development
- AM, FM, CW and SSB analog modulation
- FSK, PSK, QAM, Pulse, TDMA and CDMA digital modulation
- Real-time audio inject
- Fixed, mobile, transportable
- Iridium satellite and GPS capabilities
- Desert camouflage vehicle configuration with onboard ECU and 10kW generator

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MOBILE REMOTE_EMITTER SIMULATOR AN/UPT-4(V)5

The MRES provides a mobile, high-power, ground-based threat EW simulator capability to support aircraft and ship electronic system testing and combat crew training. It uses Combat Electromagnetic Environment Simulator (CEESIM) software to define threats and run EW simulations. MRES provides additional radar emitter density and greater signal complexity, and creates a realistic electronic combat environment.

- Frequency range: 2 - 18 GHz
- Nominal ERP: 90 dBm at 2 GHz to 110 dBm at 18 GHz
- Signal density: up to 64 simultaneous emitters
- PRI range: 1 - 600,000 microseconds, with up to 1,024 stagger levels
- Multiple PRI modulation segment types include stable, jitter, discrete jitter stagger, switching, periodic and pulse bursts
- Pulse width range: 23 nanoseconds to 99 microseconds
- Multiple antenna scan types include steady, conical, sector, circular, raster, palmer, helical and spiral
- Capable of receiving active Electronic Countermeasures (ECM) transmissions

MOBILE THREAT EMITTER SYSTEM

The MTES systems simulate over-the-horizon threats and can be used in conjunction with targets to simulate coastal defense, cruise missile sites and high-interest surveillance emitters. Computer-controlled for multiple threat simulations, the MTES can be used as a stand-alone threat simulator or to augment threat density scenarios. The emitter is fully weatherproof for shipboard use and is easily portable, with a gas-powered generator for remote and field-use.

- Frequency range: 2.9 - 3.1, 4.9 - 5.1, 7.8 - 9.6 GHz
- Provides multiple threat bearings
- Selectable preloaded threat parameters
- Nominal ERP: 103 dBm

TRIPLE GROUND THREAT EMITTERS AN/UPQ-8(V)

Triple Ground Threat Emitters provide portable threat emitter simulations of hostile missiles, seaborne radar signals and ground radar sites in support of aircrew training, electronic support measures, operator training and fleet training exercises. Completely portable and computer-controlled, they are contained in lightweight, transportable, waterproof cases and can be configured as a single, dual or triple threat emitter. Antenna assemblies are mounted on a motorized tripod. Portable in a standard pickup truck, two-man setup of the emitters can be completed in less than 30 minutes.

- Capable of optical tracking and remotely-controlled slaving
- Simulates selected land- or sea-based acquisition, track and missile guidance emitters and various gun systems
- Provides multiple threat bearings and increases threat density
- Nominal ERP: 110 dBm
- Frequency Range: 4.5 - 5.3, 6.2 - 6.6, 7.8 - 9.6 GHz

PATUXENT RIVER INFRARED SIGNATURE MEASUREMENTS

The PRISM system conducts dynamic, surface-to-air and surface-to-surface infrared signature measurements of fixed-wing aircraft, rotary-wing aircraft, missiles, engines, boats and unmanned aerial systems (UAS). PRISM provides data in the short-, mid- and long-wave infrared bands (SWIR, MVIR and LWIR), for both moving and non-moving targets, using infrared spectrometers and imagers. The PRISM system is completely mobile and is designed to be operated either locally at the Patuxent River Complex, or at any off-site location.

- Kineto Tracking Mount (KTM) Optical System
  - IR cameras, IR spectrometer and video cameras
  - Can be remotely operated up to 75 feet from the trailer
- Environmentally-controlled, 48-foot trailer
Battlefield Communications Simulation System

BCSS is an exploitable and attackable opposing force command and control simulation system.

The Battlefield Communications Simulation System (BCSS) provides automated communications simulations to support DoD training exercises. This system supports real world events and the DoD transformation process, which satisfies the increasing need for joint force operations training in network warfare.

This system uses the Celerity CS6524RT-F Broadband Signal Recorder and Generator to provide a wide variety of base band analog and complex digital communications signals.

Opposition forces (OPFOR) requirements are met by multiple local and remote-controlled communications simulator systems provided by the BCSS. To achieve this, BCSS provides software generated audio streams through the Communications Simulator (ComSim) Software, developed by Cormac Technologies.

The system has been configured for mobile and shipboard operations, as well as installed at a fixed-site facility. For mobile operations, the mission equipment is installed in full-size GMC Yukon SUVs with roof-mounted antennas. For fixed-site installations, the equipment is installed in a single, standard 19-inch equipment rack and is accompanied by field-deployable antennas. The systems has also been installed in a mobile command center vehicle and aboard a training vessel for sea operations.

Potential applications include the following:

- Training
- Simulation
- Testing
- Signal disruption and jamming
- Foreign language transmission

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BATTLEFIELD COMMUNICATIONS SIMULATION SYSTEM

BASIC SYSTEM CAPABILITIES

• Fixed, mobile, transportable, shipboard operations
• 19-inch rack mount for multiple system configurations
• Simple and complex modulations
• Pre-programmed scenarios or real-time emissions
• User-controlled or scenario-driven RF generator
• Operates on 120 VAC, 60 Hz
• Frequency range 2 MHz to 2.4 GHz

SUBSYSTEM CAPABILITIES

SIGNAL GENERATOR SUBSYSTEM

• Signal generator subsystem generates low-level simple or complex modulated radio signals within a selected bandwidth
• Provides simple CW, AM, FM, USB and LSB modulations
• Provides complex CDMA 2000, EDGE, FSK, GSM, IS 136, IS 95, PM Tone Comb, PSK, Square QAM, Tone Comb and WCDMA modulations

SCENARIO DEVELOPMENT

• ComSim software designed to develop battlefield scenarios
• Text-to-speech engine allows scenario developers to type in voice content, select the voice gender, and control voice pitch and speed
• Live human voice can be input via computer microphone
• Waveform audio format (WAV) files can be imported for transmission
• Text messages with real intelligence can be transmitted via Morse Code, DTMF and a variety of FSK and PSK modulation types
• Other complex modulation types use either pseudo-random or pre-defined bit stream patterns

POWER AMPLIFIER SUBSYSTEM

• Four-band linear power amplifier
• CH1: 2 - 30 MHz, 200 W nom.
• CH2: 30 - 500 MHz, 75 W nom.
• CH3: 500 - 1000 MHz, 75 W nom.
• CH4: 1000 - 2400 MHz, 40 W nom.
• Variable output (up to 15 dB attenuation) to simulate lower-power threats

ANTENNA SUBSYSTEMS

• Fixed-site Antennas
  • 120-60 HF antenna system (2 - 30 MHz)
  • HP-3512/VRC VHF/UHF whip antenna (30 - 500 MHz)
  • DMA-324 discone antenna (500 MHz - 2.4 GHz)
  • 20-032 mobile receive-only scanner antenna
• Mobile Antennas
  • 120-49 HF vehicular antenna (2 - 30 MHz)
  • GD1813HP vehicular VHF/UHF antenna (30 - 500 MHz)
  • HP5250S/VRC vehicular antenna (500 MHz - 2.4 GHz)
  • 20-032 mobile receive-only scanner antenna

VEHICLE SYSTEM

• GMC Yukon XL, four-wheel drive, four-door, 2500 SLT equipped with 5 KW generator and 2 KW inverter
• Equipment mounted in two 20 U racks
• Roof-mounted antennas

BCSS field-deployable vehicle

BCSS installed as a Mobile Remote Operations Center (MROC)
The MANPADS Integrated Threat Simulator/Stimulator (MITSS) provides multipurpose threat simulation and training designed to support Developmental Test & Evaluation (DT&E) and Operational Test & Evaluation (OT&E) as well as increasing pilot awareness of foreign man-portable surface-to-air missile (SAM) systems.

The MANPADS Integrated Threat Simulator/Stimulator (MITSS) provides ATR with the capability to simulate “lock on” of threat missiles to trigger an aircraft’s ultra violet (UV) Missile Warning System (MWS). Successful “lock-on” engagement will employ the UV Mallina simulator/stimulator by emulating the UV signature of a Surface-to-Air-Missile (SAM) rocket motors, including shoulder-fired SAM’s and MANPADS. This directly supports tactical development programs against infrared (IR) threats, pilot electronic warfare training, and test and evaluation events.

The MITSS system consists of a Portable Air Defense System (PADS) IR missile launcher assembly and a UV Mallina stimulator, which, when combined create a real-time missile training system. The PADS is an instrumented SA-16 launch tube and seeker. In threat-realistic training it is a shoulder-mounted surface-to-air infrared missile launcher. The Mallina is a medium-range Electro-Optical threat emitter that has the capability to stimulate the UV MWS, a countermeasure system onboard aircraft that senses UV/IR signatures of threat weapons such as missiles.

The PADS-Lite scoring systems increases aircrew/aircraft survivability by providing military aviators the opportunity to learn the operational and performance characteristics of the threat system. By flying missions against the MITSS, effective threat evasion techniques can be refined.

The PADS-Lite also provides the capability to score and record mission data for pilot performance debriefing and after-action review. A VCR is used to capture and display real-time, mission-recorded video.

These two individual pieces of equipment – the PADS assembly and the Mallina emitter – work cooperatively when connected to interfacing software housed in a portable, ruggedized container.

MITSS provides a closed-loop system ideal for supporting the following:

- Tactics development against IR threats
- Pilot, electronic warfare training and combat training
- Test and evaluation of Missile Warning Sensors and associated hardware/software suites

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PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
Mobile Telemetry Assets

ATR supports detachments aboard aircraft carriers and land-based sites with personnel and portable telemetry handling systems that provide the same advanced features as the home system at the NAS Patuxent River Cedar Point complex.

At the Atlantic Test Ranges (ATR), the Real-time Telemetry Processing System (RTPS) transfers data from complex measuring instruments on test aircraft to flight test engineers located at any of nine Project Engineer Stations (PES). In addition to the fixed system at ATR, the Telemetry team has fielded a number of mobile systems that can be used by flight test programs across the country and around the world.

TELEMETRY ACQUISITION SYSTEM

The Telemetry Acquisition System (TAS) units consist of a pedestal, an antenna and a boresight camera. The TAS can be controlled manually or slaved to pointing vectors. The antenna supports data acquisition from dynamic flight profiles, while the boresight camera has a 30x zoom to provide the operator and test team with real-time situational awareness. TAS antennas are tuned to U/S-band (1.435 GHz - 2.395 GHz) and C-band (4.4 GHz - 5.150 GHz).

**TAS-90**

TAS-90s are positioned on and around airfields and at fixed off-base and temporary remote locations. With a 4-foot parabolic reflector, the TAS-90 provides coverage typically with a 50-mile radius.

**TAS-50**

The small size of the TAS-50 (occasionally called “miniTAS” or “TAS-lite”) allows it to be used on and around airfields, on board and around ships and at temporary remote locations. TAS-50s are installed on mobile systems at ATR and can be installed on other mobile platforms as required. The TAS-50 provides coverage typically with a 20-mile radius.

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MOBILE TELEMETRY VEHICLES

MOBILE TELEMETRY ACQUISITION VEHICLE (MTAV)
The MTAV supports short- and long-term remote site telemetry acquisition, and outfitted with an ATTAS antenna to collect telemetry data. The ATTAS, with a 6-foot reflector, is mounted on a scissor lift that can raise the antenna an additional 72 inches, allowing for maximum coverage above the vehicle enclosure. The MTAV is equipped with all-wheel drive for off-road access and an onboard generator.

BLUEBIRD MOBILE TELEMETRY VEHICLE
The Bluebird Mobile Telemetry Vehicle is a salvaged bus that was converted into a mobile PES. The Bluebird Mobile Telemetry Vehicle is available to support legacy programs that have yet to convert to the new RTPS Interactive Analysis and Display System (IADS) display capability. It is used in cases where the customer’s displays are designed to run on the Silicon Graphics system. It can also be outfitted with test-specific equipment.

MOBILE INTEGRATED TELEMETRY SYSTEM (MITS-12 & MITS-24)

MITS vehicles are designed to provide support for various remote site detachments in a comfortable, climate-controlled enclosure. These vehicles have all the RTPS IV tools and processing features, including IADS capability.

MITS vehicles are equipped with two 42-inch plasma displays and all telemetry control equipment that is normally associated with RTPS at ATR: an external tracking antenna, UHF communications system, recording devices, and analysis and display software with video display capability. Internal generators provide enough power for total independent operation of the vehicles at any location.

MITS vehicles differ only in the amount of seating available: The 43-foot MITS-12 contains 12 workstations and the MITS-24 is a 53-foot transportable trailer containing 24 workstations.
Automated Communications Test System

A fully automated open-air range C3I simulation transmission system.

The ACTS facility is part of the Atlantic Test Ranges (ATR) and provides radar tracking and aircraft controller support. ACTS provides test signals to stimulate threat warning receivers, RF direction finding systems and jammer systems aboard airborne platforms. The frequency range of ACTS is 2 MHz to 2 GHz. An extensive antenna farm is located adjacent to this facility, which contains omnidirectional and directional antennas that have unobstructed electromagnetic propagation paths over the Chesapeake Bay.

The ACTS facility uses fully programmable signal generators, 100W to 1,000W amplifiers, and highly accurate power meters to provide multiple test signals with accurate ERP. The ACTS is conveniently collocated with the other open-air range electronic warfare emitter facilities at ATR to provide full-spectrum emitter test signals from 2 MHz to 18 GHz.

The ACTS facility is uniquely located on the western shore of the Chesapeake Bay at NAS Patuxent River, with local access to both littoral and blue water restricted operations areas. The warning areas provide an off-shore flight environment, which includes the land-sea interface that would simulate many missions.

Additionally, the Chesapeake Bay provides a calm body of water to serve as a reflection surface for RF energy and allows accurate characterization of the reflecting multipath electromagnetic energy. As a result, the multipath effect is used to determine optimal antenna heights for mission scenarios.

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Automated Communications Test System

**ACTS EMITTERS**

**FREQUENCY COVERAGE:** 2 MHZ - 2 GHZ

**TRANSMITTER TYPES**
- AM, FM, CW & Pulse
- FSK, PSK, QAM, QPSK & SSB
- CDMA 2000, EDGE, GSM, IS 136, IS 95, Tone Comb, PM Tone Comb, WCDMA
- Text messages via Morse Code, DTMF, FSK or PSK

- 100W & 500W amplifiers
- 1000W HF transceiver equipped with ALE

**TRANSMITTER DENSITY**
- Up to 16 simultaneous emitters
- High-speed switching:
  - One frequency per second for 10 seconds
  - Four transmitters (each offset by ¼ second)
  - 40 total frequencies in each 10-second period
  - GPS-time synchronized

**TESTS & PROGRAMS**

**PROGRAMS SUPPORTED**
- EA-18G Growler
- EA-6B ICAP II, III & USQ-113
- EP-3 & P-3 Special Projects
- Army Aerial Reconnaissance Low-Multifunction (ARL-M SuperHawk)
- Fleet VP Training & JNTC Exercises
- British NIMROD
- BAC 1-11

**EIGHT TELESCOPING ANTENNA MASTS WITH POSITIONERS PROVIDE:**
- Height adjustment of antennas to minimize multipath
- Slaving of antennas to aircraft
- Automated adjustment between vertical and horizontal polarizations
Battlefield Communications Simulation System

BCSS is an exploitable and attackable opposing force command and control simulation system.

The Battlefield Communications Simulation System (BCSS) provides automated communications simulations to support DoD training exercises. This system supports real world events and the DoD transformation process, which satisfies the increasing need for joint force operations training in network warfare.

This system uses the Celerity CS6524RT-F Broadband Signal Recorder and Generator to provide a wide variety of base band analog and complex digital communications signals.

Opposition forces (OPFOR) requirements are met by multiple local and remote-controlled communications simulator systems provided by the BCSS. To achieve this, BCSS provides software generated audio streams through the Communications Simulator (ComSim) Software, developed by Cormac Technologies.

The system has been configured for mobile and shipboard operations, as well as installed at a fixed-site facility. For mobile operations, the mission equipment is installed in full-size GMC Yukon SUVs with roof-mounted antennas. For fixed-site installations, the equipment is installed in a single, standard 19-inch equipment rack and is accompanied by field-deployable antennas. The systems has also been installed in a mobile command center vehicle and aboard a training vessel for sea operations.

Potential applications include the following:

• Training
• Simulation
• Testing
• Signal disruption and jamming
• Foreign language transmission

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**BASIC SYSTEM CAPABILITIES**

- Fixed, mobile, transportable, shipboard operations
- 19-inch rack mount for multiple system configurations
- Simple and complex modulations
- Pre-programmed scenarios or real-time emissions
- User-controlled or scenario-driven RF generator
- Operates on 120 VAC, 60 Hz
- Frequency range 2 MHz to 2.4 GHz

**SUBSYSTEM CAPABILITIES**

**SIGNAL GENERATOR SUBSYSTEM**

- Signal generator subsystem generates low-level simple or complex modulated radio signals within a selected bandwidth
- Provides simple CW, AM, FM, USB and LSB modulations
- Provides complex CDMA 2000, EDGE, FSK, GSM, IS 136, IS 95, PM Tone Comb, PSK, Square QAM, Tone Comb and WCDMA modulations

**SCENARIO DEVELOPMENT**

- ComSim software designed to develop battlefield scenarios
- Text-to-speech engine allows scenario developers to type in voice content, select the voice gender, and control voice pitch and speed
- Live human voice can be input via computer microphone
- Waveform audio format (WAV) files can be imported for transmission
- Text messages with real intelligence can be transmitted via Morse Code, DTMF and a variety of FSK and PSK modulation types
- Other complex modulation types use either pseudo-random or pre-defined bit stream patterns

**POWER AMPLIFIER SUBSYSTEM**

- Four-band linear power amplifier
- CH1: 2 - 30 MHz, 200 W nom.
- CH2: 30 - 500 MHz, 75 W nom.
- CH3: 500 - 1000 MHz, 75 W nom.
- CH4: 1000 - 2400 MHz, 40 W nom.
- Variable output (up to 15 dB attenuation) to simulate lower-power threats

**ANTENNA SUBSYSTEMS**

- Fixed-site Antennas
  - 120-60 HF antenna system (2 - 30 MHz)
  - HP-3512/VRC VHF/UHF whip antenna (30 - 500 MHz)
  - DMA-324 discone antenna (500 MHz - 2.4 GHz)
  - 20-032 mobile receive-only scanner antenna
- Mobile Antennas
  - 120-49 HF vehicular antenna (2 - 30 MHz)
  - GD1813HP vehicular VHF/UHF antenna (30 - 500 MHz)
  - HP5250S/VRC vehicular antenna (500 MHz - 2.4 GHz)
  - 20-032 mobile receive-only scanner antenna

**VEHICLE SYSTEM**

- GMC Yukon XL, four-wheel drive, four-door, 2500 SLT equipped with 5 KW generator and 2 KW inverter
- Equipment mounted in two 20 U racks
- Roof-mounted antennas
In addition to supporting operations within its warning areas and around the Patuxent River Complex, the Atlantic Test Ranges (ATR) also supports an increasing number of remote operations across the country. Personnel and mobile threat assets are regularly requested by other ranges and at contractors’ facilities to support test, evaluation and training events. Mobile electronic warfare (EW) threat emitter assets allow test platforms to fly in airspace across the country – using proven range systems. ATR fields a number of mobile EW threat systems that can be deployed anywhere in the world.

**BATTLEFIELD COMMUNICATIONS SIMULATION SYSTEM**

The BCSS provides automated communications simulations to support DoD training exercises. It is computer-controlled, with scripted voice and data messages. Featuring a transit case configuration for transportation and operation, BCSS can be remotely-controlled.

- Frequency range: 2 MHz - 2.4 GHz
- Output power: up to 100W
- Text-to-speech engine for scenario development
- AM, FM, CW and SSB analog modulation
- FSK, PSK, QAM, Pulse, TDMA and CDMA digital modulation
- Real-time audio inject
- Fixed, mobile, transportable
- Iridium satellite and GPS capabilities
- Desert camouflage vehicle configuration with onboard ECU and 10kW generator

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MOBILE REMOTE EMITTER SIMULATOR AN/UPT-4(V)5

The MRES provides a mobile, high-power, ground-based threat EW simulator capability to support aircraft and ship electronic system testing and combat crew training. It uses Combat Electromagnetic Environment Simulator (CEESIM) software to define threats and run EW simulations. MRES provides additional radar emitter density and greater signal complexity, and creates a realistic electronic combat environment.

- Frequency range: 2 - 18 GHz
- Nominal ERP: 90 dBm at 2 GHz to 110 dBm at 18 GHz
- Signal density: up to 64 simultaneous emitters
- PRI range: 1 - 600,000 microseconds, with up to 1,024 stagger levels
- Multiple PRI modulation segment types include stable, jitter, discrete jitter stagger, switching, periodic and pulse bursts
- Pulse width range: 23 nanoseconds to 99 microseconds
- Multiple antenna scan types include steady, conical, sector, circular, raster, palmer, helical and spiral
- Capable of receiving active Electronic Countermeasures (ECM) transmissions

MOBILE THREAT EMITTER SYSTEM

The MTES systems simulate over-the-horizon threats and can be used in conjunction with targets to simulate coastal defense, cruise missile sites and high-interest surveillance emitters. Computer-controlled for multiple threat simulations, the MTES can be used as a stand-alone threat simulator or to augment threat density scenarios. The emitter is fully weatherproof for shipboard use and is easily portable, with a gas-powered generator for remote and field-use.

- Frequency range: 2.9 - 3.1, 4.9 - 5.1, 7.8 - 9.6 GHz
- Provides multiple threat bearings
- Selectable preloaded threat parameters
- Nominal ERP: 103 dBm

TRIPLE GROUND THREAT EMITTERS AN/UPQ-8(V)

Triple Ground Threat Emitters provide portable threat emitter simulations of hostile missiles, seaborne radar signals and ground radar sites in support of aircrew training, electronic support measures, operator training and fleet training exercises. Completely portable and computer-controlled, they are contained in lightweight, transportable, waterproof cases and can be configured as a single, dual or triple threat emitter. Antenna assemblies are mounted on a motorized tripod. Portable in a standard pickup truck, two-man setup of the emitters can be completed in less than 30 minutes.

- Capable of optical tracking and remotely-controlled slaving
- Simulates selected land- or sea-based acquisition, track and missile guidance emitters and various gun systems
- Provides multiple threat bearings and increases threat density
- Nominal ERP: 110 dBm
- Frequency Range: 4.5 - 5.3, 6.2 - 6.6, 7.8 - 9.6 GHz

PATUXENT RIVER INFRARED SIGNATURE MEASUREMENTS

The PRISM system conducts dynamic, surface-to-air and surface-to-surface infrared signature measurements of fixed-wing aircraft, rotary-wing aircraft, missiles, engines, boats and unmanned aerial systems (UAS). PRISM provides data in the short-, mid- and long-wave infrared bands (SWIR, MWIR and LWIR), for both moving and non-moving targets, using infrared spectrometers and imagers. The PRISM system is completely mobile and is designed to be operated either locally at the Patuxent River Complex, or at any off-site location.

- Kineto Tracking Mount (KTM) Optical System
  - IR cameras, IR spectrometer and video cameras
  - Can be remotely operated up to 75 feet from the trailer
- Environmentally-controlled, 48-foot trailer
Leaders in providing decision-quality data

December 2010

NAVAIR Public Release #10-1461
Approved for public release; distribution unlimited

Patuxent River Infrared Signature Measurements

The Patuxent River Infrared Signature Measurements (PRISM) facility at the Atlantic Test Ranges (ATR) conducts dynamic, surface-to-air and surface-to-surface infrared signature measurements of fixed-wing aircraft, rotary-wing aircraft, missiles, engines, boats and Unmanned Aerial Systems (UAS). The PRISM system is completely mobile and is designed to be operated either locally at the Patuxent River Complex, or at any off-site location. Whether located at Patuxent River or off-site, the integrated ATR facilities can provide real-time telemetry, tracking and range control.

PRISM SYSTEM

The PRISM system provides infrared signature measurements in the short-, mid- and long-wave infrared bands (SWIR, MWIR and LWIR), for both moving and non-moving targets, using infrared spectrometers and imagers.

The two major components of the PRISM system are the data acquisition and processing trailer and the Kineto Tracking Mount (KTM) Optical System. Data acquisition and processing for the PRISM system takes place in an environmentally-controlled, 48-foot trailer. The trailer contains a data acquisition workstation, a customer observation room, a lab/equipment storage room and a galley. The PRISM IR cameras, IR spectrometer and video cameras are mounted on the KTM positioner, which can be remotely operated up to 75 feet from the trailer. Both the PRISM trailer and KTM can be powered by either shore power or the PRISM 120 kW portable generator.

The PRISM team can also provide a smaller acquisition trailer (17 feet) and camera tracking system capable of autonomous data acquisition using up to two imagers and a spectrometer. This system can be used to accommodate tests with fewer requirements or tests which are constrained by physical space.

The PRISM lab facility is designed to provide any routine maintenance, calibrations, spectral responses and filter changes. A team of experts is fully trained in blackbody calibrations, instrument spectral response characterizations and camera filter removals.

FOR MORE INFORMATION

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23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
PRISM INSTRUMENTS
The PRISM infrared instrument suite consists of one short-wave, three mid-wave and one long-wave focal plane array infrared imagers, a radiometer, a FLIR microbolometer and two Bomem MR-304 spectroradiometers. In order to provide the customer with maximum flexibility for both target range and resolution, each of the IR imagers has several lenses, ranging from 25mm to 550mm. Target tracking and visual recording is accomplished using digital cameras and image intensifiers (night tracking). Target position is controlled real-time using either eye-safe laser range finders or the Advanced Range Data System (ARDS).

PRISM DATA PRODUCTS
The PRISM data product is provided in electronic format. IR imagery is usually provided as hot parts/plume, airframe and total vehicle signatures and presented as apparent effective intensity. Spectral data is usually provided as total vehicle signatures and presented as apparent contrast intensity. Local weather information (temperature, relative humidity, wind speed, wind direction and barometric pressure) is collected from the PRISM ground weather station as well as the National Oceanic and Atmospheric Administration (NOAA) Flight Operations office and is provided in tabulated format. When operations are performed at the Patuxent River Complex, weather aloft (up to 10,000 feet) can be provided throughout the test by ATR. All data is Inter-Range Instrumentation Group (IRIG) time-stamped.

SWIR IMAGER
320x256 InSb FPA
3 - 5 micrometers
Pixel size: 24 µm
Frame rate: 87 Hz

MWIR #1 IMAGER
640x512 InSb FPA
3 - 5 micrometers
Pixel size: 24 µm
Frame rate: 87 Hz

MWIR #2 IMAGER
640x512 InSb FPA
3 - 5 micrometers
Pixel size: 24 µm
Frame rate: 87 Hz

MWIR #3 IMAGER
640x512 InSb FPA
3 - 5 micrometers
Pixel size: 24 µm
Frame rate: 100 Hz

LWIR IMAGER
640x512 QWIP FPA
8 - 9 micrometers
Pixel size: 24 µm
Frame rate: 87 Hz

ALST LASER RANGE FINDER
Eye safe
1.54 µm
Detection range: 8 km
Pulse rate: 1 Hz
Resolution: +/- 2 meters

FLIR SYSTEMS SC2000
Microbolometer
320x256 InSb FPA
7.5 - 13 micrometers
Pixel size: 52 µm

BOMEM MR-304 Spectroradiometer
InSb/MCT Detectors
2 - 19.5 micrometers
34 scans/sec @ 4cm⁻¹ resolution

WEATHER/TM DATA
Time/ Wind Dir/Spd/ Visibility/ Sky/ Temp/Dew/Alt
0900L 33014KT 7SM SKC 12/M01 A3013
0915L 32013KT 7SM SKC 12/M01 A3013
0930L 33013KT 7SM SKC 13/M01 A3012
0945L 32012KT 7SM SKC 13/M01 A3011
1000L 32012KT 7SM SKC 13/M01 A3011
1015L 33011KT 7SM SKC 13/M01 A3011
1030L 33012KT 7SM SKC 13/M01 A3011
1045L 32012KT 7SM SKC 14/M01 A3011
1100L 33012KT 7SM SKC 14/M01 A3011
1115L 32014KT 7SM SKC 14/M01 A3010
1130L 32011KT 7SM SKC 14/M01 A3010

PRISM’s spectrometer produces an interferogram data product
PRISM’s Rtools® software display
Tabulated weather data
The MANPADS Integrated Threat Simulator/Stimulator (MITSS) provides multipurpose threat simulation and training designed to support Developmental Test & Evaluation (DT&E) and Operational Test & Evaluation (OT&E) as well as increasing pilot awareness of foreign man-portable surface-to-air missile (SAM) systems.

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The MITSS system UV Mallina simulator/stimulator

December 2010
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The Atlantic Test Ranges (ATR) operates four instrumentation-caliber tracking radar to provide precise and accurate Time, Space, Position Information (TSPI) for the Research, Development, Test and Evaluation (RDT&E) of fixed- and rotary-wing aircraft, as well as Unmanned Aerial Systems (UAS).

Radar can be used for real time tracking of cooperative (beacon) and non-cooperative (skin) targets. Beacon transponders that are provided, aligned and maintained by ATR radar personnel are used to provide cooperative tracking capabilities. Each radar is capable of tracking in skin, beacon or optical mode, and switching between modes when required. ATR radar are located at Cedar Point in the vicinity of the main ATR complex.

Radar measures the time-of-arrival and angle-of-arrival from emitted pulses to generate azimuth, elevation and range of a target. This data is published real-time to the Advanced Range Operations Network (ARON) data distribution network. ATR radar TSPI data is used as a final data product of an object’s position in space versus time. This same radar data is used for aircraft vectoring, safety monitoring and pedestal slaving information. Missions supported include Radar Cross Section (RCS) measurements, chaff measurements, and pointing of emitter or optical instrumentation.

ATR’s radar team also maintains five surveillance radar systems interfaced to the SureTrak surveillance system. These computer-based surface search radar are used to maintain range safety during flight test and to monitor shoreline security in accordance with Homeland Security and Chief of Naval Installations directives.

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RANGE INSTRUMENTATION RADAR
The three RIR-778 (Range Instrumentation Radar) are precision, computer-based, single-object-tracking systems that are designed to obtain continuous and highly accurate position of targets for flight test programs.

- X- and C-band, 8.5-9.6 and 5.4-5.9 GHz
- 250Kw peak power, magnetron based
- 0.25, 0.5 and 1.0 microsecond gated CW transmitted pulse width at 160, 320, 640 and 1024 PPS
- Output data rate (TSPI information), 100 Hz
- Auto acquisition using Raster scan or Circular scan
- Option of angle tracking with optical contrast tracker

MULTIPLE-TARGET INSTRUMENTATION RADAR
The Multiple-target Instrumentation Radar (MIR), AN/FPQ-17, incorporates an 8973-element, phased-array antenna which provides instantaneous beam pointing over 70 x 60 degrees. This permits precision tracking of multiple skin and beacon targets, up to 16 total, while simultaneously providing surveillance in two selected search volumes. The antenna array is mounted on an elevation-over-azimuth pedestal providing hemispherical coverage.

- C-band, frequency diverse, 5.4-5.9 GHz
- 150Kw peak power, coherent TWT final amplifier
- 0.25 and 2.0 microsecond gated CW, 100 microsecond 12 MHz LFM Chirp transmitted pulse widths
- 320 Hz fixed PRF, time-division-multiplexed to deliver 20, 10, and 5 Hz, up to 16 independent tracks simultaneously
- 2 independent, operator-defined, search/acquisition volumes
- Target acquisition can be automatic or manual
- Trajectory acquisition modes to acquire separating objects
- Capable of pulse-to-pulse frequency and pulsewidth agility
The Real-time Telemetry Processing System (RTPS) is recognized throughout the flight test community as an essential productivity and safety of flight tool. It has handled tens of thousands of flights for virtually every Navy test program since 1973. Telemetry, the invisible link between aircraft and ground station, transfers results from complex measuring instruments on test aircraft to a team of flight test engineers at any of nine Project Engineer Stations (PES).

**PROJECT ENGINEER STATIONS**

Real-time telemetered and calculated results are available in many formats on numerous devices. In the PES, flight test results are displayed on computer screens with latencies below the refresh rate of the screens (~20 milliseconds) and strip charts with latencies below one millisecond. Each PES room can handle an aggregate data rate of 1.8 mega samples per second. Multiple display and analysis applications have “every sample no redundant sample” access to the data. Laser printers provide report-quality hard copies.

All measurement routing definitions and application program assignments are interactively entered at the PES, usually in a preflight session. These may be permanently retained for future flights and/or playbacks. Definitions and/or assignments may be reviewed and changed during the flight.

The RTPS PES rooms also support the Interactive Analysis and Display System (IADS). IADS is the primary display and analysis tool for the F-35 Joint Strike Fighter program and will be available to all RTPS customers.

**REMOTE SITE SUPPORT**

ATR supports detachments aboard aircraft carriers and land-based sites, such as NAVAIR Lakehurst, with personnel and portable telemetry handling systems that provide the same advanced features as the home system at the NAS Patuxent River Cedar Point Complex.

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GENERIC APPLICATIONS SOFTWARE

RTPS applications software is customized for each project, no matter how varied the test requirements. The Telemetry Systems Branch has developed hundreds of computational functions, dozens of display types and many major specialty packages, most notably the highly sophisticated flutter analysis package. The current version, RTPS IV, increases the capacity for executing these programs substantially in multiple dimensions. The versatility of the system is further enhanced by IADS.

POST-FLIGHT DATA DISTRIBUTION

RTPS IV provides rapid turnaround of test results. The data recall capability available in the PES is also provided to post-flight users. A Desktop Data System provides tools for data handling and enhances the heavily used Web-based data access tools along with third party analysis tools such as MatLab and Omega Data Environment (ODE).

SYSTEM ARCHITECTURE AND DATA LINKS

RTPS consists of nine independent systems, or “streams,” configured in a loosely coupled network with a common file system. Each stream is composed of an L3 Communications 550 Telemetry System, Silicon Graphics and Intel-based PC servers and graphics workstations connected together via reflected memory network. Any of the streams can be disconnected from the network to run in a stand-alone configuration to accommodate classified operations.

Two PES rooms are located in the ATR Secure Annex, rated up to Top Secret. RTPS data can be routed to the Range Computation and Control System (RCCS) from any of the PES rooms to drive three-dimensional displays in the RCCS control room. The Presidential Helicopter program included two smaller PES rooms in their hangar that are extensions of RTPS.

Real-time data is available to and from other test facilities. A permanent 12-meter, C-band satellite earth station or alternate connectivity through the Defense Resource Engineering Network (DREN) can provide telemetry, voice, time and range data to any other facility with earth station access. Test data can concurrently be ingested from other facilities. Post-flight satellite communications of recorded data is also supported. Connections are available for data exchange with the Air Combat Environment Test and Evaluation Facility (ACETEF) and Manned Flight Simulator (MFS) at Patuxent River.

RTPS IV CAPABILITIES

• Nine independent 34’ x 32’ Project Engineer Stations.
• Capable of handling Secret and Top Secret projects
• Seating capacity: 40
• Four wall-mounted 50-inch, flat-panel plasma displays
• IADs compatible
• Computing power for complex analysis routines
• Data throughput for EU and derived measurements at 1.8 mega samples per second
• Pulse Code Modulation (PCM) transmission: 4 PCM Streams at 30 megabits per second
• External Links:
  • Air Combat Environment Test and Evaluation Facility
  • Manned Flight Simulator
  • Range Control Center
  • West Coast Ranges
• Recall of all telemetry and derived data at each workstation for in-depth inter-maneuver analysis.
• Fully compatible with remote site systems (e.g. carrier, Lakehurst)
• Video routing capability allows any room display or external video source to be viewed at any of the consoles
• Each workstation provides independent real-time analysis and display
• Ability to convert from one project to the next in a matter of minutes
• Handles more than 20 highly complex flight tests a day
Mobile Telemetry Assets

ATR supports detachments aboard aircraft carriers and land-based sites with personnel and portable telemetry handling systems that provide the same advanced features as the home system at the NAS Patuxent River Cedar Point complex.

At the Atlantic Test Ranges (ATR), the Real-time Telemetry Processing System (RTPS) transfers data from complex measuring instruments on test aircraft to flight test engineers located at any of nine Project Engineer Stations (PES). In addition to the fixed system at ATR, the Telemetry team has fielded a number of mobile systems that can be used by flight test programs across the country and around the world.

TELEMETRY ACQUISITION SYSTEM

The Telemetry Acquisition System (TAS) units consist of a pedestal, an antenna and a boresight camera. The TAS can be controlled manually or slaved to pointing vectors. The antenna supports data acquisition from dynamic flight profiles, while the boresight camera has a 30x zoom to provide the operator and test team with real-time situational awareness. TAS antennas are tuned to L/S-band (1.435 GHz - 2.395 GHz) and C-band (4.4 GHz - 5.150 GHz).

TAS-90

TAS-90s are positioned on and around airfields and at fixed off-base and temporary remote locations. With a 4-foot parabolic reflector, the TAS-90 provides coverage typically with a 50-mile radius.

TAS-50

The small size of the TAS-50 (occasionally called “miniTAS” or “TAS-lite”) allows it to be used on and around airfields, on board and around ships and at temporary remote locations. TAS-50s are installed on mobile systems at ATR and can be installed on other mobile platforms as required. The TAS-50 provides coverage typically with a 20-mile radius.

FOR MORE INFORMATION

(301) 342-1197 / 1170 / 3682 / 8640 / 3607 / 1181
23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
The Automatic Tracking Telemetry Acquisition Systems (ATTAS) at ATR are antenna systems that can be manually controlled by the operator, slaved to pointing vectors or automatically controlled by feedback from the conically scanning feed.

A transportable version of the ATTAS, installed on a 15-foot trailer, supports remote site projects with a long duration. These systems are equipped with either 8-foot solid parabolic reflectors or 10-foot reflectors with removable outer petals. Transportable ATTAS antennas are tuned to L/S- and C-bands. The antenna system is mounted on a scissor lift that can raise the antenna 72 inches in order to provide unobstructed coverage. The trailers have extendable down-riggers that provide stability and enable the system to be leveled.

The MTAV supports short- and long-term remote site telemetry acquisition, and outfitted with an ATTAS antenna to collect telemetry data. The ATTAS, with a 6-foot reflector, is mounted on a scissor lift that can raise the antenna an additional 72 inches, allowing for maximum coverage above the vehicle enclosure. The MTAV is equipped with all-wheel drive for off-road access and an onboard generator.

The Bluebird Mobile Telemetry Vehicle is a salvaged bus that was converted into a mobile PES. The Bluebird Mobile Telemetry Vehicle is available to support legacy programs that have yet to convert to the new RTPS Interactive Analysis and Display System (IADS) display capability. It is used in cases where the customer’s displays are designed to run on the Silicon Graphics system. It can also be outfitted with test-specific equipment.

MITS vehicles are designed to provide support for various remote site detachments in a comfortable, climate-controlled enclosure. These vehicles have all the RTPS IV tools and processing features, including IADS capability.

MITS vehicles are equipped with two 42-inch plasma displays and all telemetry control equipment that is normally associated with RTPS at ATR: an external tracking antenna, UHF communications system, recording devices, and analysis and display software with video display capability. Internal generators provide enough power for total independent operation of the vehicles at any location.

MITS vehicles differ only in the amount of seating available: The 43-foot MITS-12 contains 12 workstations and the MITS-24 is a 53-foot transportable trailer containing 24 workstations.
Electro Optical Tracking Systems

INSTRUMENTATION AND CAPABILITIES

The Electro Optical Tracking Systems Section develops, operates, maintains and sustains optical instrumentation at the Atlantic Test Ranges. This instrumentation is used to obtain Time, Space, Position Information (TSPI) data and documentary imaging data on manned and unmanned aircraft, weapon and ship system testing. ATR uses fixed and mobile assets in the visible and infrared (IR) spectrums locally, at remote locations and aboard ships and provides precision metrology and geodetic survey services, both locally and at remote locations.

IMAGING SYSTEMS

The core of optical tracking is imaging. A variety of imaging systems – from 30 frames per second (fps) to 500 fps and from visible to infrared (IR) – are employed to provide time-synchronized imaging data or documentary footage of a test event. Fixed, surveyed camera arrays can provide TSPI data of a particular target, or single- or multi-camera video systems can provide documentation of a test event. Imaging systems can be deployed anywhere in the field, including aboard ships and boats, to display and record test events.

Time-tagged standard video systems can provide footage from the visible to the near- and mid-wave IR spectrums. Near-IR sensors can detect laser emissions for designating, and mid-wave IR sensors can provide imaging in poor visibility, or of test phenomenon outside the visible spectrum. High-speed, high-resolution digital imaging systems provide time-tagged, high-frame-rate imagery of test events for engineering analysis and reporting. Camera systems are capable of full-frame imaging up to 500 fps, and can be deployed to any location to provide TSPI data or document a test event for qualitative analysis.

FOR MORE INFORMATION

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23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCAP@navy.mil
www.navair.navy.mil/ranges
**VIDEO CONTROL ROOM**

The ATR Video Control Room performs a variety of functions and provides capabilities to the test range and its customers. Video systems provide video routing, display, control, distribution, recording and editing of live and recorded video sources. Multiple video sources from around ATR are received and processed, including video from the Kineto-Tracking Mount and theodolite tracking systems, as well as radar and telemetry instrumentation systems. Video feeds from remote sources, such as offshore operations at Wallops Island, are also received, routed, displayed and recorded.

There is also a separate, secure video capability if a test requires the handling of secure video feeds from a test platform or instrumentation source. Four digital editing suites are available to assemble test footage immediately after a test flight, or to edit a large volume of footage from a remote deployment and produce a finished product for the customer. There is a separate editing system for processing secure video. Other services include dubbing, media transfer, editing, and final assembly and transfer to tape, CD or DVD.

**GEOMATICS & METROLOGY**

ATR provides 3-space measurement services ranging from precision localized industrial measurements to those on a global scale.

Geodetic surveying capabilities employ dual-frequency Global Positioning System (GPS) receivers, geodetic theodolites and automatic levels. These survey systems precisely locate instrumentation, calibration and target points for test support.

Metrological surveying capabilities include the measurement and modeling of aircraft, weapons and complex surfaces and objects that are under test. Coupled with spatial analysis software, metrological measurements are derived from articulated, temperature-compensated, mechanical measurement arms, theodolites and interferometer-based laser trackers.
Meteorology

Meteorology is a science that deals with the atmosphere and its phenomena and especially with weather and weather forecasting. The Meteorology Team consists of technicians and software developers who acquire, process and display meteorological data based on customer requirements. Meteorological data is acquired through ground-based and upper-air weather observations. The acquired meteorological data is then processed and displayed through Commercial Off-the-shelf (COTS) or custom software. Meteorological data allows flight test engineers to understand how meteorological conditions affect test articles, verify on-board meteorological sensors, monitor tests to ensure safety and enforce flight restrictions.

GROUND-BASED WEATHER OBSERVATIONS

Ground-based weather observations are recorded using fixed meteorological stations and portable meteorological stations. Both stations support compatible displaying and data recording options.

The MetPac is a fixed meteorological station that calculates and reports various parameters. MetPacs provide meteorological data at the MK-7 Arresting Gear and TC-7 Steam Catapult at NAS Patuxent River.

The Transportable Automated Meteorological Station (TAMS) is a compact, rugged, self-contained portable meteorological station designed for rapid setup and operation in the field. The case and system components are built to withstand rough handling and severe weather conditions.

GROUND-BASED METEOROLOGICAL SYSTEM PARAMETERS

- Mean wind speed
- Mean wind direction
- Standard deviation of wind direction
- Mean air temperature
- Instantaneous wind speed
- Instantaneous wind direction
- Instantaneous air temperature
- Relative humidity
- Barometric pressure
- Time of sample
- Wind gusts
- Minimum wind direction
- Maximum wind direction
- Dew point

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PAXR_ATRCONTACT@navy.mil
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UPPER-AIR WEATHER OBSERVATIONS

ATR offers upper-air weather observations at Patuxent River and remote test sites. The upper-air weather observation system consists of a helium-filled balloon that carries a rawinsonde into the upper atmosphere. Rawinsondes are meteorological devices that are used to measure temperature, humidity, pressure, wind speed and direction in the upper atmosphere.

During the ascension, the rawinsonde constantly transmits atmospheric temperature, humidity and pressure data to ground receiving equipment. This equipment, called a sounding system, processes and converts the data into meteorological weather messages. When the rawinsonde reaches an altitude of approximately 30 km, the balloon bursts and the rawinsonde falls back to Earth. A parachute slows its descent.

UPPER-AIR METEOROLOGICAL SYSTEM PARAMETERS

- Time of sample
- Altitude of sample
- Barometric pressure
- Air temperature
- Relative humidity
- Dew point
- Refractive index value
- Modified refractive index value
- Wind direction
- Wind speed
- Air density
- Ascension rate of rawinsonde
- Sonic speed
- Custom parameters and outputs

FUTURE GROUND-BASED METEOROLOGICAL SYSTEM PARAMETERS

Goals:
- Replace current MetPac and TAMS systems with a more reliable and functional system. Current systems contain mechanical wind sensors
- Increase functionality between ground-based and upper-air meteorological systems. Ground observations must be manually entered during radiosonde preparation

Plans:
- Acquire Vaisala MAWS 110 meteorological system to replace the fixed MetPac systems and the portable TAMS system

Benefits:
- Increased reliability – Vaisala MAWS 110 meteorological system contains ultrasonic wind sensors with no moving parts
- Increased functionality – Vaisala MAWS 110 meteorological system can communicate with the Vaisala upper-air system. Ground observations are automatically entered during radiosonde preparation

FUTURE UPPER-AIR METEOROLOGICAL SYSTEM PARAMETERS

Goals:
- Replace legacy upper-air system to increase reliability
- Track location of radiosonde

Plans:
- Acquire Vaisala DigCORAIII upper-air meteorological system to replace the legacy upper-air systems
- Create program to produce an output file containing latitude and longitude in time history format

Benefits:
- Increased supportability and reliability
- Increased safety
Photogrammetrics is a technique used to extract reliable measurements from video and/or film. ATR’s Photogrammetrics technicians, mathematicians and software developers reduce image data received from digital and high-speed video cameras, and also from cinetheodolites and other instrumentation sources. Targets placed on aircraft and stores are tracked frame-by-frame for precision analysis of image data. Projection geometry, nonlinear optimization, and other mathematical techniques are used to reconstruct the optimal 3-degrees-of-freedom (3-DOF: x, y, z) or 6-degrees-of-freedom (6-DOF: x, y, z, yaw, pitch, roll) trajectory that best matches the 2-D tracking data. In addition to the application areas described below, Photogrammetrics also provides analysis for overhead impact scoring, mishap reconstruction and other unique tests.

STORE SEPARATION
Photogrammetric techniques help determine the envelope for safe weapons release from an aircraft. A photogrammetric solution consists of a 6-DOF time history, from which velocities and rates can be computed. An important quantity that is derived from the 6-DOF time history is the miss distance, which is a time history of the closest point of approach between the surface of the moving store and the surface of another object, such as the aircraft’s fuselage or a fuel tank.

SHIP SUITABILITY
Using the Minilir portable laser/IR tracking mount, the team produces a near-real-time 3-DOF time history for the aircraft as it touches down and catches the wire. ATR also uses fixed cameras to determine the aircraft’s 6-DOF time history. From this information other parameters are calculated, including horizontal speed, sink speed, heading, pitch and roll rates, glide slope angle and g-force.

FOR MORE INFORMATION
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23013 Cedar Point Road
Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
www.navair.navy.mil/ranges
OPTICAL TSPI

Using four cinetheodolites strategically located at sites along the Chesapeake Bay, the 3-DOF trajectory of an aircraft and/or a store released from the aircraft is estimated using triangulation. The trajectory is then used to calculate velocities and accelerations. This data is used in applications such as ballistic trajectory calculations, weapons delivery accuracy and airspeed calibrations.

HORIZON

The current film and video analysis system, Horizon, is designed to automate the photogrammetric flight test data reduction and analysis process.

TRACKEYE SYSTEM INTEGRATION

- ATR-developed analysis procedures integrated into Image System’s TrackEye software

ACCURACY

For store separation data:
- 1 inch in X, Y and Z
- 1 degree in yaw and pitch
- 3 degrees in roll

For ship suitability data:
- 1 foot in X, Y and Z
- 1 degree in yaw, pitch and roll

BENEFITS

- Data quality assurance and integrity
- Automatic setup procedures to decrease procedural complexity
- Decreased image processing time
- Instant feedback on data quality
- Derived data and miss distance data produced immediately after 6-DOF
- Turnaround time less than three hours after a store separation flight

FUTURE: HIGH-SPEED PHOTOGRAMMETRY

GOALS

- Turnaround time for multiple events less than three hours after a store separation flight, and a matter of minutes for ship suitability tests
- Maintain or exceed current data accuracies

PLANS

Research and develop new techniques to improve:

- Acquisition and identification of targets in image sequences
- Auto-tracking of targets with increased reliability and accuracy
- Computation of 6-DOF and derivatives from target data

BENEFITS

- Improved data accuracies during dynamic multiple object releases
- Near-real-time results
The Weapons Impact Scoring System (WISS) provides pilot training for delivery of air-to-ground ordnance and ship's crew operational proficiency in the delivery of ship-to-shore gunfire.

WISS is an electro-optical training system designed to improve aircrew proficiency in the delivery of air-to-ground ordnance and ship's crew operational proficiency in the delivery of ship-to-shore gunfire. By computer processing impact video taken of the target area, the WISS determines the position of ordnance impacts relative to a known target location. The WISS is designed to accurately measure the impact location of air-delivered ordnance with respect to the target center. The system is adaptable to ordnance type (usually bombs, rockets and mines) and delivery method (air, surface or subsurface). The WISS is capable of scoring impacts on a variety of target types.

WISS system characteristics and capabilities include:

- Accurate bomb scoring
- Variation of weapons
- Variation of targets
- Manual scoring
- Real-time visual display
- Standardized database archival and retrieval
- Integrated facsimile transmission
- Asynchronous serial output (for data transfer)

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Patuxent River, MD 20670
PAXR_ATRCONTACT@navy.mil
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CAMERAS
The WISS consists of two eight-camera arrays that cover a designated one-mile by two-mile target area in the Chesapeake Test Range. Camera arrays are located at two instrumentation sites along the Chesapeake Bay shoreline: Bay Forest and Point-No-Point.

SCORING CONSOLE
A scoring console is located in the Range Control Center. The video data from the camera groups is multiplexed, sent to the scoring console and displayed on a video monitor. The display – a composite of video strips from the cameras – is electronically marked at each impact point by the operator.

With this data and the known range geometry (distance and angles) between the camera sites and target center, the miss distance and clock code from the target center is automatically computed and displayed. Scores can be radioed to the pilots. Printouts of the mission scores are also available.

MULTIPLE IMPACT SCORING
For typical aircraft weapons separation and weapons delivery accuracy tests, three or more high-speed tracking instruments – such as the cinetheodolites and Kineto Tracking Mounts (KTM) – are used in conjunction with a triangulation algorithm to provide precise and accurate Time, Space, Position Information (TSPI). While this method yields the highest degree of precision for impact scoring, it can only be accomplished for a single store at a time.

The WISS system complements this tracking instrumentation in instances where multiple simultaneous weapons are released, or when the stores are released in rapid succession. In these cases, the WISS provides a cost effective means of scoring multiple impacts to determine dispersion patterns and for scoring when higher accuracy test or training data is not required.
Electromagnetic Environmental Effects (E3) can dramatically increase costs, compromise national security information, and ultimately reduce system effectiveness. Because Electromagnetic Interference (EMI) is often mistaken for malfunctions or equipment failures, it needs to be identified early in a system’s design to ensure proper performance, prevent unsafe operations, and save valuable maintenance time and funds throughout the system’s lifecycle.

The Integrated Battlespace Simulation and Test (IBST) Department’s E3 facility is the center of excellence in aircraft E3 Research, Development, Test, and Evaluation. The facility specializes in a variety of capabilities, ranging from box level to complete system level testing. All E3 testing is supported at one convenient site, maximizing the efficiency and reducing the time and cost of E3 test programs.
**INTRAsystem Electromagnetic Compatibility**

Electromagnetic Compatibility (EMC) is the capability of systems to operate without degradation from Electromagnetic Interference (EMI). Electromagnetic Environmental Effects (E3) testing looks at the world inside the aircraft (intrasytem EMC) to examine the capability of subsystems to operate without interfering with each other. These tests determine if the operation of one or more systems within an aircraft causes degraded performance, unacceptable responses, or malfunctions in other aircraft systems. Each component is individually operated in a realistic mission scenario, while each of the remaining systems is monitored for evidence of EMI through engineering-the-cockpit and instrumentation, such as data buses monitoring. Various simulators and emulators are used to exercise each system or subsystem, providing full systems operation on the ground. When EMI is detected, investigations are conducted to determine degradation thresholds and path of EMI entry to correlate impact to mission performance. From the ground test results, an efficient flight test profile may be generated. Operational Test & Evaluation is conducted in-flight, in fleet exercises, or evaluated with combined ground and simulation testing. The intrasytem EMC tests to MIL-STD-464 evaluation capabilities.

**Intersystem EMC**

MIL-STD-464

Shielded Hangar

Anechoic Chambers (AATF/ASIL)

Determine electromagnetic compatibility of all aircraft systems and subsystems. Analysis and prediction of victim/source combinations of all systems and subsystems. Each system is operated according to its mission requirements and exercised individually and collectively as a source and/or victim of EMI.

**Intersystem Electromagnetic Compatibility**

Today’s military and civilian aircraft encounter higher effective radiated power from emitters, and the number and density of these emitters is increasing. These emissions range from search and air control radars, navigation aids, electronic jamming signals, AM and FM radio, and TV stations, and other sources. High powered emitters located throughout the world and sophisticated technologies are being integrated into aircraft avionics and control systems. These newer technologies and processing systems may be more sensitive to Electromagnetic Interference (EMI). Newer technology combined with the increasing use of composite materials increases intersystem susceptibilities unless proper intersystem Electromagnetic Compatibility (EMC) design and protection techniques are incorporated. Susceptibilities can range from system degradation to total loss of aircraft.

Interesystem EMC tests include, and are also known as, Electromagnetic Vulnerability (EMV), Electromagnetic Radiation (EMR), or High Intensity Radiated Fields (HIRF) testing. Testing can be conducted within the anechoic chambers and the shielded hangar, outdoors at the Naval Electromagnetic Radiation Facility (NERF). The combination of unparalleled test facilities and superior intersystem EMC engineering expertise enables complete evaluation of aircraft and their mission systems in any worldwide Electromagnetic Environment (EME).
Certain aircraft must be capable of functioning in a nuclear theater. The nuclear electromagnetic threat is a fast rise time, high-amplitude Electromagnetic Pulse (EMP) produced by a high-altitude nuclear detonation. EMP is a high-intensity free-field pulse. The EMP simulators are capable of producing full-threat levels defined in MIL-STD-464/2169. The coupling of the EMP onto the aircraft produces skin currents, which in turn may be coupled onto cable bundles and wires inside the aircraft. These currents can upset or damage the aircraft or weapons system electronics. The EMP simulators provide free-field environments and direct-drive cable bundles and trailing wire antenna injections to evaluate the effects of nuclear EMP. The free-field simulators are the Horizontally Polarized Dipole (HPD), Vertically Polarized Bounded Wave (VPBW), and Low-Level Continuous Wave (LLCW) EMP simulators. The direct-drive simulators are the Current Injection Direct-Drive System (CDDS) and the trailing wire antennas EMP direct-drive pulse. The EMP simulator facilities are used to conduct active and passive tests on avionics equipment and weapons system electronics. All test data and observations are stored in a highly flexible and interactive database – the NAVAIR Electromagnetic Analysis System (NEMASYS). NEMASYS provides user both on-site and “take home” data analysis and reporting capability on desktop computers.

**Horizontally Polarized Dipole EMP Simulator**

The Horizontally Polarized Dipole (HPD) simulates a high-altitude nuclear EMP environment. It is a free-field simulator that uses a 5 MV pulser to generate a double exponential, horizontally polarized field in the test volume. The EMP environment as described in MIL-STD-464 and MIL-STD-2169 can be achieved. The pulser is 100 feet above the 232-foot diameter test pad, and the antenna masts are 325 feet apart.

**Vertically Polarized Bounded Wave Simulator**

The Vertically Polarized Bounded Wave (VPBW) Simulator provides the threat level vertically polarized High Altitude Electromagnetic Pulse (HEMP) E1 environment specified in MIL-STD-464. The VPBW working volume supports testing of tactical sized aircraft and weapons systems, and Cockpit and Vertically Stabilizer (nose and tail) orientations of larger strategic aircraft. The simulator is based on a high-inductance variable output Marx generator with a transfer switch and a small distributed peaking capacitor circuit to obtain a fast rise-time and high output.

**Low-Level Continuous Wave**

The Low-Level Continuous Wave (LLCW) simulator consists of three network analyzers, two power amplifiers, a data acquisition computer, and the Ellipticus antenna. The network analyzers drive the two power amplifiers and will generate a swept signal from 300 kHz to 1 GHz. The system is programmed to skip certain frequencies to satisfy frequency allocation requirements. One of the two power amplifiers provides an input signal to the antenna from 300 KHz to 220 MHz. The second power amplifier provides an input from 300 MHz to 1 GHz. The data from the second power amplifier is combined with the first data to calculate transfer functions to help bound the stresses responses of aircraft under test using waveform combination techniques developed by the Navy. The data is combined with the high level pulse test data fully characterizing the system response to EMP. In addition, engineers can direct drive to determine the strength at established test points based on the test data. The approach of using a combination of stress data acquired during high level pulse and LLCW test with the strength data acquired during the direct drive tests forms the basis for a test approach for meeting the requirements established by DoD standards. The tow way and facility can accommodate up to a 747-sized aircraft.
Atmospheric Effects Testing

Military aircraft must function in all weather environments. The electromagnetic threats produced in such environments include lightning, Electrostatic Discharge (ESD) and Precipitation Static (P-Static). The effects caused by these threats include high-current transients lighting, high-voltage transients (ESD), and EMI (P-Static). These natural electrostatic effects can cause severe and unexpected degradation to aircraft and mission systems as well as hazards to crew personnel.

The Lightning Laboratory provides simulator capabilities that conduct full-scale aircraft and weapons systems tests. Full threat direct and indirect lightning phenomena can be investigated as required by MIL-STD-464.

A high voltage transient generator is used to evaluate coupling of ESD into the aircraft and weapons systems. Test capabilities include a standard 5 kV/25 kV human body ESD simulator and a 300 kV helicopter vertical replenishment ESD simulator.

A localized, high voltage static charge generator is used to evaluate P-Static EMI on aircraft receivers and instrumentation. The test equipment includes a portable P-Static generator test set and accompanying equipment to identify and investigate P-Static problems. The test set is used for both passive and active tests to determine EMI source locations and measurements of EMI thresholds. These tests are used to determine compliance with MIL-STD-464. The P-Static test set also provides a quick means to identify and correct radiated emissions on the aircraft.

Lightning Simulators

The lightning simulators are portable and range from large full-threat simulators to smaller moderate-threat simulators. Both direct and indirect lightning effects can be evaluated to meet user requirements. The simulators are designed to meet the requirements of MIL-STD-464 and FAA specifications. The simulators provide a significant range of tools to meet user requirements. The simulators provide a significant range of tools to meet user requirements. The simulators provide a significant range of tools to meet user requirements.

Near-Strike Lightning

The Near Strike Lightning (NSL) testing is conducted using two different test setups. The E-Field NSL pulser is a Marx stack capable of generating 2.5 mega volts (MV) and an open-air spark gap of approximately 1 meter to simulate fields generated by NSL. The H-Field NSL pulser is made up of a group of Marx generators designed to generate the proper waveforms and amplitudes. The NSL simulators also provide a means to simulate the proper waveforms and amplitudes.

Precipitation Static Simulator

The Precipitation Static (P-Static) simulator provides up to 400 kV, 1.5 ma charges to test items at high-voltage charging probes. The simulator is used to evaluate the “spraying” of the high-voltage charges into the test object. A portable VHF receiver and instrumentation equipment are used to measure and record the high rate of noise in the area. The P-Static simulator is typically used in the shielded hangar, but testing capabilities are available for the flight line.

Lightning

The Lightning P-Static ESD MIL-STD-464

Electrostatic Discharge (ESD) simulators mimic the full threat effects of the natural human body ESD environment. The simulator is used to inject MIL-STD-464/MIL-331 voltage waveforms into aircraft or weapons systems air launched ordnance. The 5 kV/25 kV simulator generates a waveform through a 500 ohm series resistance into a load of up to 5 microhenrys. A pulse can be produced every 3 minutes. The 300 kV ESD simulator is also available. The portable simulator produces the full threat effects of the natural helicopter vertical replenishment ESD environments. The simulator produces up to 300 kV through a 500 ohm series resistance into loads of up to 20 microhenrys.
Electromagnetic Interference

Electromagnetic Interference (EMI) is any electrical disturbance, signal, or emission which causes an undesired response or malfunction of a subsystem or component. Component level EMI testing is a low–risk acceptance criterion that identifies potential E3 problems before they occur at the platform level. EMI testing is becoming increasingly more important because of expanded spectrum usage, and reliance on communication and control, more densely packed and sensitive circuits, escalating demands for electric power and resulting noise emissions, increased use of composite materials, and use of Narrowband Data Integrator (NDI) and Commercial Off–The–Shelf (COTS) products. The EMI Lab is available to ensure the EMI integrity of DoD systems into the next generation of military systems.

The EMI laboratory provides Fleet support in areas of: EMC engineering analysis, component troubleshooting and correction, EMI consultation, document review, site surveys, EMCON assessments, measurement uncertainties and correlation of specifications and limits to continuously changing E3 environments.

Emission Control

Emission Control (EMCON) is unintentional and intentional electromagnetic emissions from aircraft that causes inadvertent detection of the aircraft. Various EMCON conditions are empowered by present detection. To ensure that the aircraft weapons systems meet these requirements, EMCON tests are conducted in the shielded hangar or in the anechoic chamber using specialized automated test instrumentation. The EMCON test determines the electromagnetic signature of the aircraft with mission systems operating in various EMCON scenarios. When intentional emissions are necessary, vulnerability assessments and probability of intercept are determined. When unintentional emissions are noted, their source is determined and corrective measures are investigated.

Safety–of–Flight

Whenever an aircraft is electrically modified, instrumented, or installed with new equipment, EMC engineers perform an EMC Safety–of–Flight Test (SOFT) before the first flight. The SOFT determines if the aircraft’s Safety–of–Flight system will be degraded due to EMI, thereby causing a safety–of–flight hazard. The SOFT is intended only to provide data for flight clearance and not a complete EMC evaluation.

Hazards of Electromagnetic Radiation to Personnel

Electromagnetic radiation from antennas fed by high–powered transmitters can potentially injure personnel in the vicinity of the radiating transmitters. Transmitters on aircraft, aboard ship, and at air stations are potential sources of harmful electromagnetic radiation. Radiation Hazard (RADHAZ) surveys are conducted to determine the RADHAZ distance and appropriate safety procedures to ensure personnel are not exposed to power intensities exceeding established safe limits.

Hazards of Electromagnetic Radiation to Fuel

There is a potential for accidentally igniting fuel vapors by RF–induced arcs during fuel handling operations close to high–powered radio and radar transmitting antennas. The facility conducts radiation surveys to determine if this hazard exists in fuel handling or fueling areas.

Hazards of Electromagnetic Radiation to Ordnance

Ordnance and other devices that contain Electro–Explosive Devices (EED) must function in their operational Electromagnetic Environment (EME) without inadvertent activation. To prevent the susceptibility of EEDs to radiated or conducted electromagnetic energy, Hazards of Electromagnetic Radiation to Ordnance (HERO) limits are imposed to ensure that the systems achieve HERO SAFE, HERO SUSCEPTIBLE, or HERO UNSAFE.
Naval Electromagnetic Radiation Facility

All aircraft must provide critical functions in high-intensity radiated fields encountered worldwide. It is imperative that Naval aircraft function in the most demanding electromagnetic environments and evaluative effects on an aircraft's critical functions, mission systems, and vehicle systems. The Naval Electromagnetic Radiation Facility (NERF) provides the world-wide and Fleet operational electromagnetic environments and evaluates effects on an aircraft's critical functions, mission systems, and vehicle systems. The NERF supports military and commercial aircraft, unmanned air vehicles, ground support equipment, and air-launched ordnance system testing. At Patuxent River, there are four test sites where NERF conducts testing: indoors on the deck of the shielded hangar, indoors in the anechoic chamber, outdoors on the NERF steel ground plane (100x240 feet) and outdoors on the shielded hangar parking apron on the embedded ground plane.

TEMPEST

TEMPEST surveys must be conducted on aircraft when processors or transmitters are added, relocated, or modified. This includes both hardware and software modifications. The TEMPEST survey is conducted to ensure that the aircraft can carry on its mission without compromising its security. TEMPEST personnel provide engineering analysis of proposed new options, airborne changes, and engineering change proposals to determine which TEMPEST specifications and/or countermeasures should be incorporated in the design to ensure security integrity.

National Security Information shall not be compromised by emanations from classified information processing equipment.

Conduct engineering investigations on classified information processing systems (CLIPS). Perform an instrumented TEMPEST survey (ITS) on the first type, model, series aircraft and report results/recommendations to user customers.

TEMPEST
MIL-STD-464

OPNAVINST 5510.93E
NSTISSAM TEMPEST/1-92
NSTISSAM TEMPEST/2-91
NSTISSAM TEMPEST/1-93
NSTISSAM TEMPEST/2-95
KAG-30A
NACSEM 5112
Aircraft Anechoic Test Facility (AATF)

- 100’Lx60’Wx40’H
- Designed for tactical size aircraft and helicopters
- Overall signal attenuation in the chamber is greater than 100dB over a frequency range of 140kHz to 40GHz

Advanced Systems Integration Laboratory (ASIL)

- Chamber Test Area: 180’Lx180’Wx60’H (32,000 square feet of floor testing area)
- The chamber can accommodate two tactical aircraft (up to 40 tons) or one E-6 or Boeing 707 sized aircraft.
- Chamber isolation (15kHz-40GHz) is specified as 100dB. Maximum reflectivity of the RAM varies from -3dB at 30 MHz, to -45dB at 37 GHz.
- “U-shaped” pit under the chamber floor for stimulation equipment; signal cables are passed through ports in the floor
- Preparation area between chamber door and weather door keeps temperature on chamber door steady to prevent warping and provides additional area for testing
- The Operations Control Center (OCC) provides an area where tests can be controlled and viewed and is accessible to networks, simulator displays and SUT cameras.

Electromagnetic Interference (EMI) Chambers

- 3 Full Anechoic Chambers
  - 20’ x 15’ x 10’
  - 24’ x 20’ x 10’
  - 34’ x 15’ x 10’
- Mode Stir Chamber
  - 20’x10’x10’

There are over 200,000 anechoic cones in the Advanced Systems Integration Laboratory (ASIL)
For more information please contact:

Naval Air Warfare Center Aircraft Division
Electromagnetics Environmental Effects Division
Shielded Hanger Brdg 144 suite 3B
48202 Standby Rd Unit 05
Patuxent River MD 20670-1910

NAVAIR Public Release 09-069 - Approved for public release; distribution is unlimited
ELECTRONIC COMBAT STIMULATION

ECSTIM

NAV AIR
The Electronic Combat Stimulation (ECSTIM) Branch supports installed systems testing in a warfare environment using state-of-the-art stimulation and simulation technology. ECSTIM has a combination of laboratories that offers risk-reduction, compliance check and system performance for aircraft, their systems, and the warfighter. Each laboratory in ECSTIM has the capability of interfacing with a system under test to provide a suite of fully-integrated and interactive systems on accurate and repeatable open-loop mission environments. The ECSTIM laboratories can work independently or collectively to provide varying levels of test, evaluation, and analysis capabilities.

All of the laboratories in the ECSTIM Branch are capable of interacting with a system under test located in the Advanced Systems Integration Laboratory (ASIL), and other facility assets at the Integrated Battlespace Simulation and Test (IBST) Department and the open air ranges. ECSTIM’s laboratories provide realistic open-loop and/or closed-loop multi-spectral environment stimulation to Electronic Warfare (EW), sensor, communications, navigation and identification systems during both developmental and operational testing.

The ECSTIM labs provide cost-efficient ground-testing capabilities for a multitude of programs across the DoD, commercial systems and aircraft. These labs include Electronic Warfare Integrated Systems Laboratory (EWISTL), Electro Optic Infrared Laboratory (EO/IR), Threat Air Defense Laboratory (TADL), Modern Communications Laboratory, Kathy S. Johnson Radar Laboratory, and the Communication Navigation Identification Laboratory (CNIL).
The Threat Air Defense Laboratory (TADL) provides realistic closed-loop simulations of threat air defense systems to stimulate aircraft’s Electronic Warfare (EW) systems during developmental and operational testing in order to provide hardware-in-the-loop countermeasures effectiveness data. The TADL is one of many laboratories in the ECSTIM Branch that supports EW testing in the Advanced Systems Integration Laboratory (ASIL). Each laboratory in this facility has the capability of interfacing with a System Under Test (SUT) located in the anechoic chamber and other facility assets via Radio Frequency (RF) to fiber networks.

TADL has the capability of running either stand-alone or in joint scripted scenarios by interfacing with the virtual warfare environment and other laboratory assets. The TADL provides test assets to verify the functionality of radar warning receivers, defensive electronic countermeasures, jamming decoys and standoff jamming against man-in-the-loop threat surface-to-air missile and early warning acquisition radar simulator systems.

The Kathy S. Johnson Radar Laboratory provides critical RADAR stimulation capabilities to the NAVAIR Enterprise. The RADAR laboratory hosts two primary simulators: the Universal Radar Moving Target Transponder (URMTT) Stimulator and the Advanced Radar Environment Simulator (ARES). The two open loop x-band free-space simulators are capable of providing radar targets to virtually any radar system operating from 8 to 12 GHz. The lab has the capability to produce targets that are indistinguishable from a real physical target and provide moving targets with independent RCS, range, velocity and acceleration that an aircraft radar can acquire and track.

### TADL SIMULATORS

**Early Warning Acquisition Radar (EW/ACQ)**
A closed-loop simulator that simulates 17 VHF/UHF and 14 C-band radars for systems effectiveness and Radar Warning Receiver (RWR) performance testing. It is a hardware-in-the-loop system combining radar receiver hardware and signal processing with target models, target generation hardware, coupled with antenna, and environment modeling.

**Reconfigurable Early Warning Acquisition Radar (rEW/ACQ)**
A closed-loop, high-fidelity threat simulator that simulates all modes and waveforms of the Target Engagement Radar (TER) of a long range SAM system. This is a hardware-in-the-loop system combining radar receiver hardware and radar threat computer hardware, environment models, and missile seeker models.

**J-Band Advanced Technology System (JBATS)**
A closed-loop, high-fidelity threat simulator that simulates the TER of two naval and four land-based Surface-to-Air Missile (SAM) systems as well as the associated command guided missiles.

**I-32**
A closed-loop, high-fidelity threat simulator that simulates all modes and waveforms of the Target Engagement Radar (TER) of a long range SAM system. This is a hardware-in-the-loop system combining radar receiver hardware and missile seeker hardware, signal processing side-lobe canceling, two-target models, two Stand-Off Jammer (SOJ) ports, target generation hardware, environment models, and missile seeker models.

**I-34**
A closed-loop, high-fidelity threat simulator that simulates all modes and waveforms of the TER of a long range SAM system. This is a hardware-in-the-loop system combining radar receiver hardware and signal processing side-lobe canceling, multiple target models, two Stand-Off Jammer (SOJ) ports, target generation hardware, environment models, and missile seeker models.

**Command and Control Laboratory System (C2LS)**
A threat software simulator system that outputs actual command control and status updates that can be used to control and respond to either threat simulations or real-world targets.

**Brand Advanced Technology System (BATS)**
A closed-loop high-fidelity, short-range point defense threat simulator that simulates the TER of two naval and four land-based Surface-to-Air Missile (SAM) systems as well as the associated command guided missiles.

### RADAR SIMULATORS

**The Universal Radar Moving Target Transponder (URMTT) Stimulator**
The URMTT is a portable open-loop, free space simulator capable of providing a radar target to virtually any radar system operating from 8 to 12 GHz. It can be configured to provide any target range to virtually any radar system, including all stand-off jamming targets.

**The Advanced Radar Environment Simulator (ARES)**
The ARES was designed from the ground up to be able to provide high fidelity target returns to state-of-the-art airborne radars such as the APG-73 and APG-90. The ARES uses DME technology to receive a pulse transmitted in free space from the radar under test and then retransmits it back to the radar with the appropriate time delay and amplitude. Additionally, it can provide complex radar signature modulation based on the target characteristics (e.g., RCS, scintillation, Doppler).

**KATHY S. JOHNSON RADAR LABORATORY**

The Kathy S. Johnson Radar Laboratory provides critical RADAR stimulation capabilities to the NAVAIR Enterprise. The RADAR laboratory teams two primary simulators: the Universal Radar Moving Target Transponder (URMTT) Stimulator and the Advanced Radar Environment Simulator (ARES). The two open loop x-band free-space simulators are capable of providing radar targets to virtually any radar system operating from 8 to 12 GHz. The lab has the capability to produce targets that are indistinguishable from a real physical target and provide moving targets with independent RCS, range, velocity and acceleration that an aircraft radar can acquire and track.
Advanced Multiple Environment Simulator III (AMES III)
The Advanced Multiple Environment Simulator Series III (AMES III) generates simulations of various multiple-threat radar environments to test and evaluate Electronic Warfare (EW) systems. The AMES III can produce real-time RF signals with pre-programmed high-fidelity threat characteristics, all within a simulated and controlled environment. AMES III can generate up to 2048 complex emitters, along with a pulse density (non-pulse Doppler) of up to 4 million pulses per second. Using dynamic signal simulation capability, the user can create various combinations of static and moving platforms (seven degrees of motion) containing pulse radars, Pulse Doppler (PD) radars, and Continuous Wave (CW) radars. The simulator features up to 30 ports of amplitude and phase RF outputs, updated pulse-to-pulse, covering 500 MHz to 18 GHz.

Pico Advance Multiple Environment Simulator (Pico AMES)
The Pico-AMES is an open-loop EW simulator that utilizes the latest in software and electronic circuit design technology. The Pico-AMES product line was developed to provide a portable and reliable EW simulator that fulfills most customer’s requirements. The Pico-AMES generates simulations of various multiple threat radar environments to test and evaluate Electronic Warfare (EW) systems. The Pico-AMES can produce up to 64 complex emitters, in increments of 16. The dynamic scenario simulation capability allows the user to generate various combinations of static and/or dynamic platforms containing pulse radars, Pulse Doppler (PD) radars, and Continuous Wave (CW) radars. The simulator features up to 16 ports of amplitude and phase RF outputs.

ELECTRONIC WARFARE INTEGRATED SYSTEMS TEST LABORATORY
This Electronic Warfare Integrated Systems Test Laboratory (EWISTL) provides realistic open-loop multipath environment stimulation to Electronic Warfare (EW) systems during developmental and operational testing in order to provide hardware-in-the-loop data. This data is used in a quantitative sense to test the performance of the system under test. These EW systems include radar warning receivers, electronic support countermeasures, defensive electronic countermeasures, stand-off and support systems, communications intercept and communications parameters, and integrated electronic counter-system suites.

EWISTL SIMULATORS

Modular Electronic Warfare Simulator (MEWS II)
The MEWS II (Second Generation Modular Electronic Warfare Simulator) threat simulator offers the latest integrated technologies for generating complex, realistic, and accurate radar signals. The MEWS II is an open-loop asset that provides four DF/phase ports from one RF channel and is capable of producing 64 simultaneous complex stimuli that can be controlled by computer software. The MEWS II is ideally suited for EW system test and evaluation applications.

Radio Frequency Environment Monitor (RFEM)
The RF Environment Monitor provides high-performance, High Probability of Intercept (HPOI), signal interception and recording capabilities to support Signal Intelligence (SIGINT), military EW testing, and tactical Electronic Signals Measurement (ESM) requirements. The RFEM is used for real-time Electronic Order of Battle (EOB), Electronic Emission Control (EMCON) compliance, RF test verification, general signal collection and characterization.

Vulcan Measurement System
The Vulcan Measurement System is a portable indoor/outdoor, high accuracy 3-D spatial measurement system. Laser transmitters emit infrared laser signals that create a measurement environment. The user determines the size of the environment by positioning the transmitters. The 3-D system can produce up to a measurement of 60 complex emitters, in increments of 15. The dynamic scenario simulation capability allows the user to generate various combinations of static and dynamic platforms containing pulse radars, Pulse Doppler (PD) radars, and Continuous Wave (CW) radars for an amplitude ADA system.
The Electro-Optical / Infrared (EO / IR) Laboratory provides realistic closed-loop Infrared (IR) and Ultraviolet (UV) scene projection of validated IR and UV threat images. These images stimulate installed sensor systems during developmental and operational testing providing feedback in-the-loop effectiveness data. The effectiveness data includes countermeasures detection, tracking and response, target acquisition and tracking, and Forward Looking Infrared (FLIR) navigational accuracy.

This laboratory provides test assets that verify the functionality and effectiveness of different types of IR / UV imaging sensors, such as Target Tracking and Navigational FLIR, Missile Warning Systems (two-color UV and Infrared), and Forward Looking Infrared (FLIR) systems. The laboratory is equipped with modeling and simulation, scene generation and stimulation capabilities that can be configured to operate with a single sensor or combination of sensors. Assets can be configured for simulation, or for joint scripted scenarios by interfacing with the virtual warfare environment and other ECSTIM laboratory assets.

**ECSTIM’s EO/IR sensor lab test instrumentation provides a reconfigurable, reproducible and repeatable full test environment for evaluating EO imaging sensor systems during the phases of concept and research, development, prototyping and test and evaluation.**

### EO/IR SIMULATORS

**IR Scene Projector (IRSP)**
- **Format:** 1024 x 1024
- **Frame Rate:** 200 Hz

**Large Format Resistive Emitter Array (LFRA)**
- **Format:** 1024 x 1024
- **Frame Rate:** 200 Hz

**Wide Format Resistive Emitter Array (WFRA)**
- **Format:** 768 x 1536
- **Frame Rate:** 100 Hz

**Mirage IR Scene Projector (IRSP)**
- **Format:** 512 x 512
- **Frame Rate:** 100 Hz

**Two-color IR Scene Projector (TIRSP)**
- **Format:** 1024 x 768
- **Frame Size:** 512 x 512
- **Frame Rate:** 50-400 Hz
- **Band 1:** 3.0 – 4.1 µm
- **Band 2:** 4.1-5.0 µm

**Two-color IR Scene Renderer (TISR)**
- **Format:** PC-based Linux-OS real-time two-color IR scene generation system. Two video channels of DVI imagery, one per IR band.

**UV Scene Projector (UVSP)**
- **Format:** 1024 x 768
- **Frame Size:** 512 x 512
- **Frame Rate:** 400 Hz (512 x 512), 200 Hz (768 x 1536)
- **Band:** 0.25-0.4 µm

**Two-color IR Scene Renderer (TISR)** is a PC-based Linux-OS real-time two-color IR scene generation system. Two video channels of DVI imagery, one per IR band.

**UV Stimulator**
A hardware-in-the-loop optical stimulator capable of providing high-fidelity in-band optical and near-infrared signatures for testing missile warning systems.

**UV Plume Generator**
A software component associated with UV Stim that provides the capability to produce real-time missile plume data in unlimited environmental conditions.

**Laser Stimulator**
- **Format:** 4 tripod mounted infrared laser sources with an operating wavelength of 904 nanometers.
- **Peak Output Power:** 7 watts
- **Pulse Width:** 1 microsecond
- **PRF:** Independently controllable.

**Multi-role Electro-Optical End to End (MEON)**
The MEON test set performs an end to end test by stimulating the missile warner (IR or UV), provides an IR source for lock-on by the DIRCM fine tracking system and then finally detects and measures the IR countermeasure.

**Reactive Plume Simulator (RPS)**
- **Format:** Reactor Scene Generator (RSG)
- **Form:** The RSG subsystem provides repeatable, radiometrically-correct missile engagements for supporting necessary test configurations for modern missile warning systems. It is used to effectively test all missile warning sensor and target DIRCM systems for Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) environments at the Air Combat Environment Test and Evaluation Facility (ACETEF).

**RPS Countermeasures Detector Evaluator (CDE)**
- **Form:** A multi-channel laser measurement subsystem synchronized with the RSG, that captures laser signature data up to 400 MHz in small (1-4) and large (16) configurations, and determines threat trajectory correction effectiveness based on received laser Jammer information.

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**EO/IR LABORATORY**

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**ELECTRO OPTIC/INFRARED LABORATORY**
The Modern Communications Laboratory (MCL) provides realistic open and closed-loop multispectral environment stimulation to Communications, Navigation and Electronic Warfare Systems during developmental and operational testing in order to provide hardware-in-the-loop data. This data is used to quantitatively assess the performance of the System Under Test (SUT). The MCL has the capability to produce over 100 communication signals at Radio Frequency (RF) in order to stimulate the systems on the SUT. These systems include communications intercept and communications jammer, IFF systems, and integrated electronic combat system suites. The MCL also has the capability to produce coherent communications inherent in enemy Integrated Air Defense Systems (IADS) in both an open-loop and closed-loop environment. The simulators in the MCL have the capability of running either stand-alone or in a joint scripted scenario. Interfacing with the Joint Integrated Mission Model (JIMM) allows control and interactions of a real-time dynamic scenario with other ECSTIM laboratories or the Air Combat Environment Test and Evaluation Facility (ACETEF) assets. MCL support areas include: the development, operation, and maintenance of EW scenarios, emitter descriptions, open-loop radar and communications simulators, data collection and analysis hardware and software, and special instrumentation. In addition, MCL supports configuration of test equipment for customer use, operation and knowledge of systems under test, threat signal and doctrine research.

**MCL SIMULATORS**

**Joint Communication Simulator (JCS)**

The JCS provides narrowband and wideband frequency range of 5 MHz to 18 GHz, free space dynamic stimulation of communication networks and signals. The simulator supports sensor development performance effectiveness evaluations through use of direct signal injection and calculation of non-processing performance. The JCS provides visibility of sensor development through the use of varied and tailored performance measures. The simulator contains a certified library of signals and is capable of producing over 100 voice, data, navigation and IFF signals.

**Joint Research Analysis and Assessment Center (JRAAC) Lite**

JRAAC Lite allows participation of BLUFOR platforms and OPFOR systems operating in a secure environment allowing classified technical and training exercises to be held. JRAAC includes coherent environments at the Air Combat Environment Test and Evaluation Facility (ACETEF) and Missile and Space Intelligence Center (MSIC) to include entity state, fire, detonate, emissions, communications and communications effectiveness. The simulator provides a unique environment for high-fidelity modeling of significant command, control, communications, computer, and weapon components of an IADS.
The Communication, Navigation, and Identification (CNI) Laboratory provides open and closed-loop simulation of friendly, foreign CNI and Electronic Warfare surveillance systems. The CNI lab is capable of running either standalone or in an agent scripted scenario. Interfacing with the Joint Integrated Mission Model (JIMM) allows control and interaction of a real-time dynamic scenario with other Electronic Combat Simulation (ECST) laboratories or the Air Combat Environment Test and Evaluation Facility (ACETF) assets.

**CNI SIMULATORS**

**Tactical Data Links**

**Tactical Data Links**

**Multi-Link System Test and Training Tool (MLST3)**

The MLST3 can provide full network simulation of Link-4A, 11, and 16 data links and has the capability to simulate any combination of the 3 Tactical Digital Information Links (TDLs), simultaneously. The system has the ability to communicate with surface and airborne systems, or land-based terrestrial systems using Link-4A, TADIL-A, TADIL-C, Link-11 (TADIL-A), and Link-16 (TADIL-J) for the system being interfaced with.

**Strategic Data Links**

**Strategic Data Link Simulator (SDLS)**

The SDLS provides support for TRAP, TIBS, and TADIXS-B. The simulator is capable of receiving and recording live message traffic, simulating data, running prescribed scenarios, and offers playback of previously recorded data.

**Inmarsat BGAN Emulator System (IBES)**

IBES is a functional implementation of the BGAN Access Stratum for the Radio Network Controller (RNC) and creates a suitable part of the Universal Mobile Telecommuni- cation System (UMTS) Core Network (CN) to allow BGAN terminals to connect to the network and access Packet Switched (PS) and Circuit Switched (CS) services. IBES supports T-channels, A-channels, Link-4A, Link-11, and Link-16, as well as the ability to simulate any combination of up to 3 forward sub-bands and 1 return sub-band. Universal Subscriber Identity Module (USIM) authentication, ciphering and integrity protection of user data and control connections is supported to allow IBES terminals, with a real USIM card inserted, to use the emulated networks.

**Identification Friend Or Foe (IFF)**

**Automated IFF Test Set (AITS)**

The AITS is an open-loop simulator that is capable of simulating the Selective Identification Feature (SIF) modes 1, 2, 3, C, and 4. The test set has two operating modes, interrogation mode and transponder mode. The AITS has two interrogation channels and two transponder channels that can be programmed independently.

**Advanced Radar Environment Simulator (ARES) IFF**

The ARES IFF unit is a customized Tel-Instrument TB2100 Test Set which provides combined IFF RF-Free-Space and IFF Free-Space and Digital Message Injection. As a standalone unit, it can be used for Distance Measuring Equipment (DME) testing, Mode S transponder testing with new capabilities included: Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS), Automatic Dependent Surveillance Broadcast (ADS-B), Traffic Information System (TIS). In addition, it has been enhanced to provide the same interoperability capabilities that AITS provides, including new modes 1, 2, 3, C, 4, and 5, all of which are supported. The ARES IFF provides for expansion to IFF modes 5 and S.

**Global Positioning System (GPS)**

**SPIRENT 7700**

With this equipment, the lab can simulate a constellation of up to 24 satellites in both L1 and L2 or up to 24 satellites in L1 only. This enables the ability to receive ranging signals for a total of 12 (24) signals at any time. With this, the system under test can be placed anywhere and at any time the operator wishes. The SPIRENT has interfaces for both the Honeywell and Litton EGI systems.
Aircraft Anechoic Test Facility (AATF)

- 100'Lx60'Wx40'H
- Designed for tactical size aircraft and helicopters
- Overall signal attenuation in the chamber is greater than 100dB over a frequency range of 140kHz to 40GHz

Advanced Systems Integration Laboratory (ASIL)

- Chamber Test Area: 180'Lx180'Wx60'H (32,000 square feet of floor testing area)
- The chamber can accommodate two tactical aircraft (up to 40 tons) or one E-6 or Boeing 707 sized aircraft.
- Chamber isolation (15kHz-40GHz) is specified as 100dB. Maximum reflectivity of the RAM varies from -3dB at 30 MHz, to -45dB at 37 GHz.
- "U-shaped" pit under the chamber floor for stimulation equipment; signal cables are passed through ports in the floor
- Preparation area between chamber door and weather door keeps temperature on chamber door steady to prevent warping and provides additional area for testing
- The Operations Control Center (OCC) provides an area where tests can be controlled and viewed and is accessible to networks, simulator displays and SUT cameras.

Facilities Specifications

“THINKING INSIDE THE BOX”

IBST operates a number of shielded and anechoic test facilities on the East and West Coast. These facilities keep what's inside in and what's outside out. They provide a secure uncontrolled RF environment to perform testing on installed avionic and handheld equipment. From a Boeing 787 sized aircraft to microchips, the facilities accommodate test vehicles at any size.

The Shielded Hangar provides a controlled secure and realistic test environment for system stimulation. The hangar accommodates multiple platforms and has access to three major runways.

Other Test Facilities

Shielded Hangar

- Built to accommodate multiple large aircraft.
- Wire mesh covered doors and walls enabling Electrostatic Discharge (ESD), Shock (15G at 15ms), Temperature (32°F to 95°F), and Humidity (10% to 90%RH) testing.
- Provides a secure and realistic test environment for system stimulation
- The Shielded Hangar has access to three major runways

Chambers

Electromagnetic Interference (EMI) Chambers

- 3 Full Anechoic Chambers
  - 20' x 15' x 10'
  - 24' x 20' x 10'
  - 34' x 15' x 10'
- 1 Mode Stir Chamber
  - 20' x 15' x 10'

There are over 200,000 anechoic cones in the Advanced Systems Integration Laboratory (ASIL)
For more information please contact:

WWW.NAVAIR.NAVY.MIL/IBST

(301)995-2400
IBST@Navy.MIL

Naval Air Warfare Center Aircraft Division
Electronic Combat Simulation Branch
48192 Switzer Rd
Building 2191 Suite J203
Patuxent River, MD 20670

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INTEGRATED BATTLESPACE ARENA
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<thead>
<tr>
<th>Position</th>
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<th>Phone Number</th>
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<tbody>
<tr>
<td>IBAR Director</td>
<td>William R. Harris</td>
<td>760.939.0545</td>
</tr>
<tr>
<td>IBAR Deputy</td>
<td>Bruce Lowry</td>
<td>760.939.3257</td>
</tr>
<tr>
<td>IBAR Networks</td>
<td>Troy McClain</td>
<td>760.939.4662</td>
</tr>
<tr>
<td>IBAR Security</td>
<td>Thomas Plough</td>
<td>760.939.5575</td>
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**Individual IBAR Labs**

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<tr>
<td>PEC</td>
<td>Darin Martin</td>
<td>760.939.8506</td>
</tr>
<tr>
<td>DLNIF</td>
<td>Bruce Lowry</td>
<td>760.939.3257</td>
</tr>
<tr>
<td>VPF and USF</td>
<td>John Auborn</td>
<td>760.939.2274</td>
</tr>
<tr>
<td>T-SPIL</td>
<td>Dennis G. McKinney</td>
<td>760.939.1139</td>
</tr>
<tr>
<td>HWIL and MESA</td>
<td>James Annos</td>
<td>760.939.2757</td>
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What is the IBAR?

The Integrated Battlespace Arena (IBAR) is a collection of networked facilities where weapon designers evaluate tomorrow’s weapons today, and warfighters exercise, rehearse, and refine CONOPS. Modelers at the IBAR blend interactive human-, hardware-, and software-in-the-loop components with authentic, in-the-fleet systems to create realistic environments for evaluating weapons at all levels of engineering and CONOPS at all levels of engagement. IBAR facilities, located at the Naval Air Station China Lake, include the —

- Precision-Engagement Center (PEC)
- Data-Link Network Integration Facility (DLNIF)
- Virtual Prototyping Facility (VPF)
- Unmanned Systems Facility (USF)
- Threat-Signal Processor in the Loop (T-SPIL)
- Hardware in the Loop (HWIL)
- Missile-Engagement Simulation Arena (MESA)

In the IBAR, a forward observer scouts for threat activity (right), a moving-target indicator (MTI) identifies potentially dangerous marine craft (far-right upper image), and an ISAR-sensor model silhouettes a ship (far-right lower image).
With more than a decade of success in fusing virtual and real-world environments, the IBAR offers a multifaceted "system-within-systems" approach using high-performance computing, sophisticated visualization of scientific and tactical concepts, mass archiving, high-speed networking, versatile environments, and hands-on experience. The IBAR can perform warfare exercises at all security levels, including multi-level classifications. IBAR physics-based M&S tools are particularly cost-effective for —

- Integrating command-and-control (C2) with joint fires (JF)
- Developing successful technologies and tactics
- Reducing technical and operational risks
- Evaluating mission effectiveness
- Analyzing threat variations
- Supporting acquisitions
- Defining requirements

IBAR models are flexible and designed to work individually or collectively on projects large or small. A single component can be inserted into a large virtual simulation to see how the component responds in different scenarios. Scenarios can be run hundreds of times – each with a slight variation – to optimize system performances. The uniqueness of our C2/JF integration capability lies in the union of authentic-in-the fleet C2/JF systems with IBAR M&S resources. If live assets aren’t available, the IBAR can simulate any aircraft, weapon, target, or terrain required. Information is networked or data linked through a variety of communications systems from any ground, air, or sea platform.

Local-area networks connect each IBAR facility to China Lake’s live test ranges. The Defense Research and Engineering Network (DREN) and other networks connect the IBAR to hundreds of DoD sites nationwide. These networks allow us to participate in complex, military exercises and distributed integrated simulations.
What is the PEC?

In the PEC, mission planning, reconnaissance data collection, C2 analysis, fires integration, and weapon delivery merge with aircraft, data links, pilots, and weapons in four specialized facilities —

- **Precision-Engagement Operations Center (PEOC)**, which represents a C4I planning-and-targeting facility using systems similar to those found onboard the aircraft CVIC. Inside the PEOC, developers integrate new concepts into existing fleet systems to create realistic system-within-systems test environments.

- **Imagery-Exploitation Laboratory (IEL)**, which offers a vast online library of national and tactical imagery and intelligence products including charting resources and geodesy data.

- **Integration and Development Laboratory (IDL)**, which integrates the latest 6.1, 6.2, and 6.3 prototypes into existing systems to support network-centric warfare.

- **Joint Networked Fires Center (JNFC)**, featuring 60 reconfigurable workstations and five overhead displays that allow customers to integrate computing assets and quickly exhibit data. The JNFC is ideal for rehearsing joint fires integration to determine adequacy of theater assets. For time-sensitive operations (TSO), C2 personnel can explore new ways to expedite information flow.

*During the Joint Unmanned Aerial Vehicle Joint Test and Evaluation TSO, the PEOC was transformed into a Joint Air Operations Center.*

*The annual Empire Challenge event uses the JNFC to improve data-distribution processes between U.S. military coalition partners.*
Using Authentic Fleet Systems, the PEC Supports —

- **Science and technology development** for Digital Precision-Strike Suite (DPSS), Kill-Assist All-Weather Targeting System (KAATS), automatic weapons, video exploitation, and automatic target recognition.
- **System engineering and integration** for Javelin.
- **Testing and integration** for Distributed Common Ground System-Navy (DCGS-N) 1.X, 1.0, and 1.1.
- **Imagery architectures** for Target Package Generator.
- **Naval afloat targeting and mission planning** for Tactical Automated Mission Planning (TAMPS), Joint Mission Planning System (JMPS), Portable Flight-Planning System (PFPS), and third-party targeting.
- **Joint development and rapid technology transition** for Precision-Strike Suite – Special Operational Forces (PSS-SOF), Rapid Attack Information Dissemination Execution Relay (RAIDER), Joint Expeditionary Forces (JXF), Joint Blue Forces Situational Awareness (JBFSA), and Enhanced Quality Imagery Search (EQUIS).
- **C2/JF integration** by offering collaborative-planning and decision-support tools; assured, networked, and interoperable C4ISR systems; common, relevant operational pictures with fused-combat identification; and immediate, automatic, effective offensive and defensive interoperability capabilities.

PEC Image Processing and Exploitation Includes —

- Fully automatic, contrast-invariant image registration for video mosaics, image stabilization, and passive MTI
- Contrast-invariant automated georegistration
- Enhanced wavelet compression
- National and tactical imagery
- 3D geometric extraction and mensuration from video
- Robust performance quality assessment
- Error propagation across modalities
- Automatic motion and change detection
- Target cueing
DATA-LINK NETWORK INTEGRATION FACILITY
What is the DLNIF?

The DLNIF supports tactical and simulated versions of data links relative to weapon, pilot, aircraft, strategic, and environmental interactions. Collective sharing of IBAR resources allows the DLNIF to offer an **all-inclusive kill-chain demonstration arena** that includes ground components; networking capabilities; intelligence, surveillance, and reconnaissance (ISR) and weapon-launch platforms; C2 – sensor integration for rapid-decision making; weapons; and targets. The DLNIF also features 60- and 100-ft antenna towers and mobile units for remote testing.

**Data links** include Link 16, Tactical Interoperable Ground Data Link (TIGDL), AN/AWW-13 Advanced Data Link (ADL), and Tactical Targeting Network Technology (TTNT). Link 16 uses the Joint Tactical Information Distribution System (JTIDS) and encompasses Class-2 terminal software and hardware. TIGDL is a common data link (CDL) interoperable surface terminal that receives sensor data from airborne platforms. TIGDL satisfies the CDL Class-1 specification, which mandates that a ground-terminal must support the full waveform of CDL communications data rates – surface to aircraft – and all three CDL return links – aircraft to surface. When coupled with radio communications, the DLNIF has CDL/RF communications capability with all military aircraft. TIGDL can also operate as a Flexible Image Dissemination System (FINDS) ground station and with the tactical CDL. AN/AWW-13 ADL is a communications link between the pilot and weapon. Electronics inside a pod carried on the aircraft allow the pilot to receive video images from the weapon and transmit command signals back to the weapon. The pod also contains a video recorder that transmits images en route as the weapon approaches the target. TTNT is a wireless communications system that works with emerging waveform technologies to quickly and accurately locate, identify, and target time-critical threats.

**Sensor links** include Advanced Tactical Forward-Looking Infrared (ATFLIR), Gunsite, Shared Reconnaissance Pod (SHARP), Rover, U2, and Walleye.

**Weapon links** include AARGM, Harpoon Block III, JASSM, JSOW, LOGIR, SLAM, SLAM ER, Spike, and Tomahawk.

**C2 interfaces** include Joint Range Extension (JRE), Air Defense System Integrator (ADSI), and RAIDER.
Communicating at the Speed of Battle. "When Rockwell Collins, Inc., encountered difficulties in testing their next-generation wireless TTNT communications system," Brent Nave, Navy Technical Representative for the TTNT program at China Lake, explained, "a capabilities study indicated we were the most cost-effective site to conduct the proof-of-concept demonstration. The IBAR offered the expertise and equipment needed to ensure the demonstration was completed successfully — within budget and on time — and China Lake’s vast land range offered all the free airspace Rockwell Collins needed to collect genuine flight data."

Rockwell Collins spent 13 days at the IBAR to field-test TTNT. The China Lake support team consisted of IBAR, range, airfield, and video-projects personnel. In addition to free airspace, China Lake offered three unique test assets: the DLNIF, Laurel Mountain south-range complex, and T-39 aircraft operated by the Weapons Test Squadron. IBAR tasks included installing TTNT terminals at each location, developing coverage plots to ensure a clear line-of-sight (LOS) from Laurel Mountain to the T-39 and DLNIF 100-ft antenna tower, compiling flight paths for the T-39, integrating TTNT equipment into the IBAR complex, and obtaining frequency clearances. The IBAR team also provided a mobile van at Laurel Mountain and support for the TTNT terminal inside the van.

"A lot of people contributed to this effort," Nave said. "The team that made this demonstration a success was as good as any I’ve seen in my 30 years onboard the station."

The DLNIF also features a variety of messaging formats and protocols, including Link-16 J3.X, Network-Enabled-Weapon (NEW) message/platform simulator, Variable Message Format (VMF), Digital Communications System (DCS), Air Force Applications Program Development (AFAPD), OPNET, Satellite Tool Kit (STK), and WARNET with Link 16, radar, and DIS range feeds.
What is the VPF?

The VPF is a collection of tightly integrated, modular simulations working in tandem with other IBAR or live assets. The facility is the brainchild of Star-Trek-generation engineers. Prior to the VPF, the U.S. Navy’s only option for evaluating a potential weapon design was to build and test each part separately; the only way to test the entire weapon was to fly it — a costly and time-consuming venture. Using high-speed computers and state-of-the-art virtual technology to simulate the entire function of a missile, the VPF allows the Navy to design, test, and evaluate existing and emerging weapons without firing up a single rocket motor.

The key component of the VPF is the flexible Reconfigurable Interactive Manned Crew Station (RMICS). The RMICS is rapidly reconfigured to emulate flight characteristics of a Harrier, Hornet, F-15, F-18, F-35, and Seahawk/Blackhawk.

RMICS features a hands-on-throttle, a rudder pedal, a 27-inch screen overlaying a helmet-mounted display, night-vision capability, and realistic sound effects.

Weapon models include AIM-9X, AARGM, AMRAAM, Common Missile, HARM, JDAM, JSOW, LOGIR, SLAM/ER, Spike, and Tomahawk. Terrain models can be created for any location on Earth. Forward Observer and Field Artillery models help ground forces determine the effectiveness of ground-support maneuvers.

Ship models feature more than 50 commercial and military vessels. Sensor models used with the simulated Automatic Identification System assess sea-going threats.
What the VPF Offers

The VPF can model any real or conceptual military platform, weapon, or terrain based on customer requirements. The expertise of VPF engineers lies in their knowledge of missile-seeker systems: how a missile locates — then is guided to — a target. Historically, M&S tools considered only the weapon’s terminal flight and sensor-guidance functions relative to final maneuvers.

Today’s smart weapons allow Blue forces to quickly and precisely pinpoint the location of a target before the weapon is even launched. Remote sensors onboard aircraft are linked to ground, air, or ship terminals where operators receive ISR data and prepare strike packages, which — in turn — are data linked for weapon deployment. To model and analyze this "system of systems," the VPF considers more than just the weapon: it considers the capabilities of the strike aircraft, sensors, and pilot.

Angel in the Cockpit Saves Lives. In 1999, the Crew Systems Department (CSD) at China Lake began developing Active Network Guidance in Emergency Logic (ANGEL) — a virtual copilot to eliminate the major cause of naval-aviation mishaps: aircraft-ground collisions. During development, the VPF worked with the CSD to develop and exercise algorithms for ANGEL. The study compared current and future aircraft positions with those on digital terrain maps. The algorithms proved valid for every aircraft altitude and terrain slope tested.

Lt. Col. Gregory Bass – Executive Officer of the Marine Aviation Detachment; Military Deputy of the Concepts Analysis, Evaluation, and Planning Department; F/A-18 pilot; and frequent flyer in the VPF – tests ANGEL algorithms inside the RMICS. "Nothing I’ve ever seen is this good," Bass says. "The image resolution is great, the cockpit can be rapidly reconfigured, and the wide screen adds degrees of realism. The VPF is like the ultimate video game but saves the Navy money."

High-resolution SAR image created for the Joint Strike Fighter Imagery for Lethality Design of Experiments.
What is the USF?

Using a variety of resources, the USF can simulate all aspects of unmanned aerial systems (UAS) in flight, including C2 – sensor integration. The facility is an ideal test bed to rehearse combat scenarios; refine processes for collecting, recording, and handling data; evaluate sensors and data links; and identify critical events prior to live testing. All USF models are HLA and DIS compliant and easily integrated with other IBAR or live assets. The backbone of the USF is the MUSE/AFSERS UAS suite — developed under the auspices of JTC/SIL at Red Arsenal — which simulates flight characteristics of most military UAS. MUSE also includes a control-station surrogate featuring maps, data links, and vehicle controls. Other USF models include —

- Weapons and weapon-control models
- Entity-generation and scenario models
- EO, IR, SAR, ISAR, and laser ESM sensor-payload models
- Firescout Vertical Takeoff Unmanned Aerial Vehicle Flight Simulator
- Virtual Broad-Area Maritime Surveillance (BAMS) UAS M&S Environment

The image in the background is a photograph of a ship; the USF entity-generation model created the 3D image of the same ship in the foreground.
Global Hawk Maritime Demonstration (GHMD). The Global Hawk community asked the IBAR to develop a virtual Global Hawk model for maritime missions. Modeling criteria included the capability to receive tasking from battle commanders at different sites and send data to multiple participants at different locations. The resulting GHMD model approximates Global Hawk flight characteristics and provides sensor products identical to those supplied by the authentic UAS, including EO, IR, and SAR spot images; ISAR low frame-rate video; maritime radar-search tracks; ELINT reports; health-and-status information; and LOS data.

BAMS UAS M&S Environment. In response to Prime Minister Howard’s request for "a maritime-surveillance package to secure Australian borders," the BAMS Program Office selected the USF to evaluate strengths and weaknesses of BAMS alternatives. To support Anzus Air 7000 objectives, the USF created a virtual BAMS M&S environment, consisting of multiple unmanned systems, targets, and critical communication links; radar and EO/IR sensors with sensor cross-cueing capabilities; automatic identification systems; a common ground station with mission-planning, data-collection, and analysis tools; C2/ISR dissemination architectures for real-world operations; tactical scenarios for CONOPS rehearsals; and visualization tools to demonstrate sensor- and data-link coverage limits in varying weather conditions.
THREAT-SIGNAL PROCESSOR IN THE LOOP
What is a T-SPIL?

The T-SPIL is a unique tool that represents a Man-Portable Air Defense System (MANPADS) in flight. A MANPADS is typically a shoulder-launched, short-range missile containing an IR seeker.

Each T-SPIL assesses the susceptibility of military and civilian aircraft engaged by a specific MANPADS. Using actual threat-signal processing electronics coupled to high-fidelity seeker and 6-DOF fly-out models, the T-SPIL "tricks" the threat by injecting a false IR image — generated by a computer — into threat-signal processing electronics. The threat assumes the false signal is real and responds accordingly. Each T-SPIL operates as a standalone field or laboratory system. T-SPIL capability can also be networked to operate as a "system within systems" to increase the scope of analysis. Because the simulation injects detailed-scene images into threat-signal processing electronics in real time with no moving parts, analysts can reuse the hardware to evaluate a wide range of targets in diverse scenarios using varied flight dynamics.

T-SPIL predictions of aircraft-missile-impact points.
T-SPIL

Why T-SPIL?
A T-SPIL allows analysts to see exactly how a specific MANPADS responds and gathers information required to model countermeasures against the threat. The T-SPIL assessment capability spans the entire missile-aircraft engagement envelope from threat search-and-acquisition through fly-out and terminal encounter.

T-SPIL Applications Include —
• Operational testing
• Airframe susceptibility
• Aircraft-signature analysis
• Countermeasures development
• Mission-performance assessment

T-SPIL Data Products Include —
• Hit location(s)
• Probability of hit
• Acquisition range
• Engagement envelope
• Flare-countermeasures effectiveness

Helicopter engaged by a threat MANPADS (upper image); T-SPIL prediction of missile-helicopter-impact locations (lower image).

Threat-Signal Processor in the Loop.
HARDWARE IN THE LOOP
**What is the HWIL?**

HWIL denotes a simulation capability that includes not only mathematical modeling but also hardware testing at a system level. HWIL efforts at the IBAR are an integral part of missile design and development and used to test actual missile hardware and software in environments that simulate a missile in flight. HWIL testing digitally verifies and/or simulates a preflight missile model. A post-flight analysis compares actual flight-trajectory data with HWIL models.

For more than four decades, HWIL testing at China Lake has helped demonstrate new missile designs and technologies as well as integrate hardware and software into the Agile, AIM-9X (left), ARM, HARM, Harpoon, LOGIR, RAM, Sea Lance, SLAM (right), Sparrow, and Spike weapons.

**HWIL Testing Makes Missile Development Faster and Cheaper.** In the 1960s, the U.S. Navy conducted 146 live-fire tests of AIM-9R en route to its final deployment at a cost of more than $1 million a test. These expensive ventures prompted China Lakers to search for less-expensive methods to evaluate missile technologies and designs. The result was HWIL testing, which reduced the number of live-fire tests for the latest version of AIM-9X to just 15. Not only is HWIL testing cheaper, it is faster. China Lake HWIL capabilities can perform more than 100 tests each day at a cost of < $100 per test. A further advantage of HWIL testing is — after problems are identified in the laboratory — redesign and retesting at the subsystem level occur rapidly. Expensive live-fire testing is now reserved for near-final designs and to validate HWIL models.
HWIL Facilities Include –

• **High Off-Boresight (OSB) Laboratory**, featuring a five-axis FMS and an OSB capability up to 130 degrees.

• **Dual-Mode RF/IR Laboratory**, featuring a three-axis FMS and anechoic chamber; the laboratory can display targets in a sophisticated fashion using a combined RF- and IR-signal presentation.

• **IR-Scene Presentation Laboratory**, featuring a three-axis FMS, integrated IR-scene projection capability, and three separate IR-scene projection systems.

• **RF Anechoic Chamber**, featuring a three-axis FMS and two-axis RF dual-target motion system.

• **Semi-Active Laser Target-Presentation System (SALTPS)**, featuring a three-axis FMS and capability to display multiple targets across a 100-degree field of view. The SALTPS also features integrated range simulation capabilities.

• **Multipurpose HWIL Facility**, which will be complete in 2012 and feature multiple anechoic chambers with RF phased-array target-presentation capabilities.
MISSILE-ENGAGEMENT SIMULATION ARENA
What is MESA?

The MESA is a cost-effective test facility to evaluate full-intercept engagement conditions in a secure, controlled environment at a rate of 60 runs per hour, 24 hours per day. MESA yields superior-quality data by using actual sensors or MESA instrumentation to emulate sensor systems. The facility consists of a high-bay simulation arena as well as secure offices and vaults.

The high-bay simulation arena is 150-ft wide, 405-ft long, and 90-ft high with interior surfaces that minimize and control background clutter. The bay’s target-positioning flexibility permits large-scale variations in target and sensor geometries. Geometric changes can occur in less than 60 seconds. MESA hardware includes a sensor transporter; a three-axis sensor positioner; instrumentation radar; mid- and down-range target supports; two controllers to position calibration spheres in two dimensions; and two overhead target supports, each with six control lines, six encoder lines, a main hoist, and two dedicated computers.

Personal Survival Pack (PSP) Drop-Testing. The Navy used MESA’s high-bay simulation arena for drop-testing a new PSP to heighten pilot survivability. The Navy performed the tests to ensure the pack, which incorporates a new CO₂-inflated life raft into the pilot’s ejection seat, would not interfere with seat/occupant–aircraft separation and the raft inflated automatically.
What MESA Offers

*MESA* is the only facility in the world that can evaluate sensor performance, determine platform survivability, validate sensor models, and predict live-fire results. The MESA also accommodates targets of opportunity testing, directed-energy weapons analyses, and electromagnetic environmental effects on platforms. The immense size of MESA accommodates actual, full-scale, reduced-weight targets.

**Ground-Truth Spectroradiometry and Imaging Measurements.** A unique feature of MESA is the black-and-white test pattern painted on its south wall. The pattern is an optical-edge target, containing vertical and horizontal edges between large uniform black-and-white areas.

**Sensor Measurements.** The Navy used MESA to characterize an unmanned surface vessel. The IBAR team modified the boat’s hull, integrated sensors into the platform, suspended the craft from the rafters, and collected more than 300 measurements each day.

**Interoperable Stabilized Imager for Situational Awareness (ISISA).** Because of its unique size, MESA’s bay was ideal for preliminary testing of ISISA — a rapidly deployable, small, lightweight, persistent-surveillance, situational-awareness, 24-foot blimp and ground station that provides warfighters with real-time target video in remote locations.
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<td>Network-Centric-Warfare Air Dominance</td>
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**WD’s IBAR: All the pieces of the puzzle in one place**
The Integrated Battlespace Simulation and Test (IBST) Department is the Naval Air Systems Command’s (NAVAIR) center of excellence and point-of-entry for simulation, stimulation and Live, Virtual and Constructive (LVC) testing of the integrated Battlespace environment. The Department is NAVAIR’s lead for the development and creation of synthetic and virtual battlespace environments in support of research, development, testing, training, systems evaluation and experimentation.

Within the department, the Integrated Combat Environments (ICE) Division provides various aspects of integrated battlespace environments, including Electronic Warfare, Weapons, Command and Control, and Electromagnetic Environmental Effects (E3). This division is geographically dispersed with major centers of technical expertise at the Naval Air Warfare Center Aircraft Division (NAWCAD) Patuxent River, MD, the Naval Air Warfare Center Weapons Division (NAWCWD) China Lake and Point Mugu, California. ICE performs and supports full spectrum, highly integrated/adaptive Research, Development, Test and Evaluation (RDT&E) of aircraft, weapon, ground and distributed systems testing using a suite of fully integrated simulation/stimulation laboratories. The ICE Division provides integrated, interactive, and repeatable synthetic environments in support of the warfighter, and reduces risk and cost for programs throughout their lifecycle by the use of simulation and stimulation tools, techniques, and technologies.

The stimulation of installed systems in a realistic warfare environment provides a deterministic approach to assessing the baseline performance of existing and future weapon systems. This process provides an important step in the evaluation of complex platforms, System of Systems (SoS) and Family of Systems (FoS) constructs within an environment that is controlled and understood.

The Division provides national leadership in the areas of electronic combat systems test, multi-spectral stimulation of aircraft/weapons, integrated component testing, missile engagement testing, E3 Test and Evaluation (T&E) support, and radar reflectivity measurements.
NAVAIR is at the leading edge of Electromagnetic Environmental Effects (E³) Research, Development, Test and Evaluation (RDT&E). Known throughout the nation as the E³ Center of Excellence, the facility specializes in a variety of capabilities, ranging from box-level to complete system-level testing.

The advanced facilities are designed to be flexible and adaptable using state-of-the-art technology to support emerging and changing integrated system E³ testing requirements.

With over 15 specialized facilities located at a single site with runways and complete aircraft support, E³ testing at these facilities dramatically reduces costs and ultimately enhances system performance and readiness. Detecting Electromagnetic Interference (EMI) early in a system’s design ensures proper performance, prevents unsafe operations, and saves valuable maintenance time and funds throughout a program’s life cycle.

E³ is a Major Range and Test Facility Base (MRTFB) facility. All E³ testing is supported at one convenient site, maximizing the efficiency and reducing the time and cost of E³ test programs. Additionally, mobile portable capabilities are provided for Electromagnetic Compatibility (EMC), Electromagnetic Vulnerability (EMV), TEMPEST, COMSEC, P-Static, Electromagnetic Pulse (EMP), Lightning, and current injection direct-drive. The E³ test facilities at Patuxent River were developed to provide test and evaluation of aircraft, weapon systems, and components. Therefore, the facilities provide aircraft electrical power, ground support equipment, testbeds, grounding, aircraft maintenance facilities, workspaces, classified storage, access to Naval aircraft technical libraries, customized test instrumentation stimulation/simulation, and data processing support.

NAVAIR’s E³ facilities are capable of testing items that range from microchips to Boeing 747’s. The E³ suite of tools include five fully operational anechoic chambers, a mode-stir chamber, multiple high level Electromagnetic Vulnerability (EMV), Electromagnetic Pulse (EMP), and lightning facilities, as well as a Radio Frequency (RF) shielded hangar. The system under test undergoes E³ testing while all of its avionics are immersed in a virtual flight environment. The system can further be immersed in a complex networked battlespace of the future.

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E³ is a Major Range and Test Facility Base (MRTFB) facility. All E³ testing is supported at one convenient site, maximizing the efficiency and reducing the time and cost of E³ test programs. Additionally, mobile portable capabilities are provided for Electromagnetic Compatibility (EMC), Electromagnetic Vulnerability (EMV), TEMPEST, COMSEC, P-Static, Electromagnetic Pulse (EMP), Lightning, and current injection direct-drive. The E³ test facilities at Patuxent River were developed to provide test and evaluation of aircraft, weapon systems, and components. Therefore, the facilities provide aircraft electrical power, ground support equipment, testbeds, grounding, aircraft maintenance facilities, workspaces, classified storage, access to Naval aircraft technical libraries, customized test instrumentation stimulation/simulation, and data processing support.

NAVAIR’s E³ facilities are capable of testing items that range from microchips to Boeing 747’s. The E³ suite of tools include five fully operational anechoic chambers, a mode-stir chamber, multiple high level Electromagnetic Vulnerability (EMV), Electromagnetic Pulse (EMP), and lightning facilities, as well as a Radio Frequency (RF) shielded hangar. The system under test undergoes E³ testing while all of its avionics are immersed in a virtual flight environment. The system can further be immersed in a complex networked battlespace of the future.

NAVAIR is at the leading edge of Electromagnetic Environmental Effects (E³) Research, Development, Test and Evaluation (RDT&E). Known throughout the nation as the E³ Center of Excellence, the facility specializes in a variety of capabilities, ranging from box-level to complete system-level testing.

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The Electronic Combat Simulation (ECSTIM) Branch supports installed systems testing in a warfare environment through the use of stimulation and simulation. The facility offers risk-reduction, compliance check and system performance for aircraft and their systems. ECSTIM has a combination of laboratories that offers risk-reduction, compliance check and system performance for aircraft, their systems, and the warfare. Each laboratory in ECSTIM has the capability of interfacing with a system under test to provide a suite of fully integrated and interactive systems in accurate and repeatable mission environments. The ECSTIM laboratories can work independently or collectively to provide varying levels of test, evaluation, and analysis capabilities.

All of the laboratories in the ECSTIM Branch are capable of interfacing with a system under test located in the Advanced Systems Integration Laboratory (ASIL), and other facility assets at the Integrated Battlespace Simulation and Test (IBST) Department and the open air ranges. ECSTIM’s laboratories provide realistic open-loop and/or closed-loop multi-spectral environment stimulation to Electronic Warfare (EW), sensor, communications, navigation and identification systems during both developmental and operational testing. The ECSTIM lab provides cost-efficient ground-testing capabilities for a multitude of programs across the DoD, commercial systems and aircraft. These labs include:

- Electronic Warfare Integrated Systems Laboratory (EWISTL)
- Electro Optic Infrared Laboratory (EO/IR/L)
- Threat Air Defense Laboratory (TADL)
- Modern Communications Laboratory
- Communication Navigation Identification Laboratory (CNIL)
- Joint Research Analysis & Assessment Center (JRAAC) Lite
- Joint Research Analysis & Assessment Center (JRAAC) Electronical Warfare Integrated Systems Test Laboratory (EWISTL)
- Radar Laboratory

**Electro-Optical / Infrared (EO / IR) Laboratory**

The EO/IR/Laboratory provides realistic closed-loop multispectral environment stimulation to Electronic Warfare (EW) systems during developmental and operational testing providing hardware-in-the-loop effectiveness data. This effectiveness data includes countermeasures detection, tracking and response, target acquisition and tracking, and Forward Looking Infrared (FLIR) navigational accuracy.

**Threat Air Defense Laboratory (TADL)**

The TADL is one of many laboratories in the ECSTIM Branch that supports EW testing in the Advanced Systems Integration Laboratory (ASIL). Each laboratory in this facility has the capability of interfacing with a System Under Test (SUT) located in the anechoic chamber and other facility test areas via Radio Frequency (RF) to fiber networks.

**Modern Communications Laboratory**

The Modern Communications Laboratory provides realistic closed-loop multispectral and multi-sensor environment stimulation to Electronic Warfare (EW) systems during developmental and operational testing providing hardware-in-the-loop effectiveness data. This data is used to quantitatively assess the performance of the system under test. These EW systems include radar warning receivers, electronic support countermeasures, defensive electronic countermeasures, standoff and support jammers, communications intercept and communications jammers, and integrated electronic combat system suites.

**Communication Navigation Identification Laboratory (CNIL)**

The Communication Navigation and Identification Laboratory (CNIL) provides realistic closed-loop multispectral environment stimulation to Electronic Warfare (EW) systems during developmental and operational testing providing hardware-in-the-loop effectiveness data. This data is used to quantitatively assess the performance of the system under test. These EW systems include radar warning receivers, electronic support countermeasures, defensive electronic countermeasures, standoff and support jammers, communications intercept and communications jammers, and integrated electronic combat system suites.

**Joint Research Analysis & Assessment Center (JRAAC) Lite**

JRAAC Lite provides participation of BLIFOR platforms and OPFOR systems operating in a secure environment allowing classified tactics and techniques to be used and provide collateral effects to be provided to the Warfighter. The capability includes coherent environments at both ACETEF and PMC to include entity states, fire, detonate, emissions, communications and countermeasures effectiveness in a simple TACSIT. JRAAC provides a unique environment for high fidelity modeling of significant command, control, communications, sensor and weapon components of an Integrated Air Defense System (IADS).

**Radar Laboratory**

This laboratory provides critical RADAR stimulation capabilities to the NAIRU Enterprises. The RADAR lab hosts two primary simulators the Universal Radar Moving Target Transponder (URMTT) Simulator and the Advanced Radar Environment Simulator (ARES).
SAIL is renowned as NAVAIR’s Interoperability Center of Excellence. Its mission: to reduce technical risk and cost for Navy aircraft and aircraft weapons systems through the use of simulation and stimulation during installed systems testing. SAIL incorporates experimental and operational airborne and surface systems in constructive, virtual and live environments to address current war-fighting challenges, providing a multitude of resources and capabilities which are used for Research, Development, Test and Evaluation (RDT&E) and Training in support of the systems development process and systems deployment.

SAIL maintains an abundance of Hardware-in-the-Loop (HIL) and Operator-in-the-Loop (OITL) test capabilities. The team stimulates, records, and analyzes data transferred between both operational and simulated systems. SAIL employs best practice engineering methods, live exercises, distributed synthetic combat environments, and a hybrid of the two by connecting actual shipboard equipment with real aircraft in-flight, on the deck, and in NAVAIR’s anechoic chambers. The Lab maintains strict scientific control over the systems and environment to ensure repeatable testing and consistent results, offering unique Verification, Validation and Accreditation (VV&A) for the Navy and acquisition communities.

SAIL is well prepared to meet the ever-changing air-sea interoperability needs of the Department of Defense (DoD) both today and in the future. The facility’s engineers and scientists bring over 250 years of experience in the areas of surface, subsurface and air warfare, creating unique and specialized test scenarios to recreate complex war environments. SAIL features testing technologies, methods and resources available nowhere else in the world. The team is continually developing new and innovative ways of testing, saving crucial time and costs for the customer. The Lab will continue to be a critical and relied upon Navy asset, exposing problems and eliminating risk as upfront and early on in the lifecycle process as possible. SAIL’s rare capabilities are available to all acquisition programs requiring air-sea interoperability and communications support.

The interoperability testing offered by SAIL ensures that solid products are delivered to the Fleet in order to meet the complex warfare challenges of the Warfighter.

The SAIL building features the actual aft ship mast from the USS Arthur W Radford (DDG 968), complete with antennas configured to accurately represent the topside of a Cruiser, Destroyer or Frigate. Using High Frequency (HF), Very High Frequency (VHF), Ultra High Frequency (UHF) and Satellite Communications (SATCOM) radios, as well as shipboard sensor systems, Common Data Links (CDL) and Tactical Data Links (TDL), the mast makes it possible for the facility to communicate with aircraft. Real combat and sensor suites found aboard Aircraft Carriers and Surface Combatants interact with one another just as they would in operation. On strategic Cedar Point and with the nearby Atlantic Test Range (ATR), the facility is able to use Radio Frequency (RF) to communicate with aircraft in-flight and support airship integration in representative maritime environments.

SAIL has access to many Department of Defense (DoD) networks, such as the Defense Research and Engineering Network (DREN), Secure Defense Research and Engineering Network (DREN), Defense Information System Network Leading Edge Services (DISN-LES), and Secret Internet Protocol Router Network (SIPRNET).

SAIL features three main shipboard combat systems suites: Nuclear Carrier Vessel (CVN), Guided Missile Destroyer (DDG), and Guided Missile Frigate (FFG). These platforms interface with various aircraft through voice and data links, providing programs with crucial early exposure to deployed technology.
The Radar Reflectivity Laboratory (RRL) is at the forefront of Radar Cross Section (RCS) measurements, RCS analysis and radar signature control technology. The laboratory is a unique national asset in the Department of Defense (DoD) providing monostatic and bistatic RCS characterization and full-signature diagnostics on a wide variety of test objects including full-scale cruise and ballistic missiles, U.S. and foreign air, sea and land vehicles; target drones; augmentation systems for target threat emulators; antenna systems; ship and submarine top-side features and components; and rotating propulsion systems.

RRL research engineers are internationally recognized for pioneering innovations in RCS processing and display technologies for comprehensive radar signature analysis and diagnostics critical to the design and evaluation of advanced military systems.

Among these are Inverse Synthetic Aperture Radar (ISAR) imagery, Global RCS, Global Range down-range profiles, RCS versus angle or frequency, and Glint/Doppler spectral processing of rotating propellers, rotors, and jet engine turbo fans. In addition to developing the analysis tools, the RRL engineers have developed processes in the use of the tools to derive maximum benefits for customers. These analysis tools and processes are used in the laboratory to solve technology requirements in a variety of ways, including low observable designs development, target and threat models for digital and hardware-in-the-loop simulations, and survivability and lethality analysis. The use of these tools has played a critical role in the development of advanced sensors, platforms, and systems.

The laboratory operates three indoor anechoic chambers, two of which are equipped with compact-range collimating reflectors that provide far-field measurements. The largest of the three chambers, called the Bistatic Anechoic Chamber, is designed for the measurement of both monostatic and bistatic RCS. This chamber is a DoD national asset because of its unique capabilities such as broad frequency coverage, large measurement quiet zone, wide-angle bistatic coverage in vertical and horizontal dimensions, and antenna performance testing. Vertical and horizontal bistatic RCS measurements produce the signature characteristics that represent correct engagement geometries that are critical in the evaluation of U.S. and foreign semi-active missile performance.

### Capabilities

- **Monostatic and Bistatic RCS Measurements**
- **RCS Specification Compliance Analysis**
- **Antenna Testing**
- **Glint and Doppler RCS Measurements**
- **Far-Field RCS (including Millimeter Wave)**
- **Frequencies: VHF, UHF, L, S, C, X, Ku, Ka, W**
- **Polarizations: VV, HH, VH, HV, CP**
- **Advanced Diagnostic and Analysis Software**
- **Portable RCS and Antenna Testing**
- **RCS Engineering Consultation**
- **Adaptable Measurement Facilities**
- **Secure Indoor Environment**

### Chamber Information

**Bistatic Anechoic Chamber**
- Size: 150 x 150 x 60
- Far-Field Quiet Zone: 30'(W), 20'(H), > 30'(L)
- Min / Max Frequency Coverage: 100 MHz to 100 GHz
- Weight Capacity: 10,000 lbs
- Instrumentation: Pulsed and Linear FM Radars

**Large Anechoic Chamber**
- Size: 100'(L), 40'(W), 40'(H)
- Far-Field Quiet Zone: 16'(W), 11'(H), >16'(L)
- Min / Max Frequency Coverage: 400 MHz to 100 GHz
- Weight Capacity: 6,000 lbs
- Instrumentation: Pulsed and Linear FM Radars
The Test Operations Support team (TOS) has the flexibility to create custom, real-time data displays to aid customers in getting the data they require from a ground test event.

- Monitoring/recording/decoding of:
  - 20 MIL-STD-1553 data busses
  - 8 channels of ARINC 429
  - PCM Telemetry
  - Chapter 10
- Monitoring/encoding/decoding/analysis of up to:
  - 288 discrete inputs (Parallel I/O)
  - 16 analog channels
- Fiber Channel monitoring
- Remote Video and Audio recording
- Copper to Fiber conversion for remote testing
- Simulation of navigation data

The TOS team simulates the onboard Embedded GPS/INS (EGI) via MIL-STD-1553 that enables a platform to virtually “fly” anywhere in the world. The Embedded GPS/INS (EGI) is a hybrid navigation system used on several DoD platforms. The GPS provides updates to the inertial navigation system that enhances the overall navigation of the platform. TOS simulates messages from this system on the MIL-STD-1553 bus in order to simulate flight. This capability is used in conjunction with JIMM-ACE to “fly” an aircraft through various flight patterns anywhere in the world.

TOS has the flexibility to create custom, real-time data displays to aid customers in getting the data they require from a ground test event. In addition, the team is often used in conjunction with other labs at the Integrated Battlespace Simulation and Test Dept. (IBST) to provide more robust test support. An advantage of instrumentation is the handling of multiple data streams and correlation of data between the system under test (SUT) and sensor stimulators.
IBST operates a number of shielded and anechoic test facilities on the East and West Coast. These facilities keep what’s inside in and what’s outside out. They provide a secure uncontaminated RF environment to perform testing on installed avionics and handheld equipment. From a Boeing 707 sized aircraft to microchips, the facilities accommodate test vehicles at any size.

Other Test Facilities

Shielded Hangar

- Built to accommodate multiple large aircraft
- Wire mesh covered doors and walls, enabling Electromagnetic Environmental Effects (E3) testing, TEMPEST and COMSEC certification, and electronic warfare suite integration
- Provides a secure and realistic test environment for system stimulation
- The Shielded Hangar has access to three major runways

Electromagnetic Interference (EMI) Chambers

3 Full Anechoic Chambers
- 20’ x 15’ x 10’
- 24’ x 20’ x 10’
- 24’ x 15’ x 10’

1 Mode Stir Chamber
- 20’ x 16’ x 10’

Chambers

Aircraft Anechoic Test Facility (AATF)

- 100’x60’x40’H
- Designed for tactical size aircraft and helicopters
- Overall signal attenuation in the chamber is greater than 100dB over a frequency range of 40kHz to 40GHz

Advanced Systems Integration Laboratory (ASIL)

- Chamber Test Area 180’x180’x60’H (32,000 square feet of floor testing area)
- The chamber can accommodate two tactical aircraft (up to 40 tons) or one E-6 or Boeing 707 sized aircraft.
- Chamber isolation (15kHz-40GHz) is specified as 100dB. Maximum reflectivity of the RAM varies from -3dB at 30 MHz, to -45dB at 37 GHz.
- “U-shaped” pit under the chamber floor for stimulation equipment; signal cables are passed through ports in the floor
- Preparation area between chamber door and weather door keeps temperature on chamber door steady to prevent warping and provides additional area for testing
- The Operations Control Center (OCC) provides an area where tests can be controlled and viewed and is accessible to networks, simulator displays and SUT cameras.

Facilities Specifications

“THINKING INSIDE THE BOX”

IBST operates a number of shielded and anechoic test facilities on the East and West Coast. These facilities keep what’s inside in and what’s outside out. They provide a secure uncontaminated RF environment to perform testing on installed avionics and handheld equipment. From a Boeing 707 sized aircraft to microchips, the facilities accommodate test vehicles at any size.

The Shielded Hangar provides a controlled, secure and realistic test environment for system stimulation. The hangar accommodates multiple platforms and has access to three major runways.

These facilities have surrounding labs that provide uninterrupted realistic signals to systems under test.

There are over 200,000 anechoic cones in the Advanced Systems Integration Laboratory (ASIL).
INTEGRATED COMBAT ENVIRONMENTS

E3
(301) 995-2400
Naval Air Warfare Center Aircraft Division
Electromagnetic Environmental Effects
Shielded Hangar Bldg 144, Suite 3B, 48202 Standley RD, Unit 5
Patuxent River, MD 20670

ECSTIM
(301) 995-2400
Naval Air Warfare Center Aircraft Division
Electronic Combat Simulation Branch
48192 Switzer Rd
Building 4191, Suite 203
Patuxent River, MD 20670

SAIL
(301) 42-3809
Naval Air Warfare Center Aircraft Division
Surface Aviation Interoperability Laboratory
2294 Cedar Point Rd
Patuxent River, MD 20670

RRL
(805) 989-9376
Naval Air Warfare Center Weapons Division
775 1 Ave, Suite 1
Pt. Mugu, CA 93042-5049

TOSH
(301) 342-6377
Naval Air Warfare Center Aircraft Division
Test Operation Support Branch
48150 Shaw Rd
Patuxent River, MD 20670

Electromagnetic Environmental Effects E3  Electronic Combat Simulation ECSTIM  Surface Aviation Interoperability Lab SAIL  Radar Reflectivity Laboratory RRL  Test Operations Support TOSH

Approved for public release; distribution is unlimited
The Research Development, Test & Evaluation (RDT&E) Infrastructure Division is responsible for the Naval Air Systems Command (NAVAIR) RDT&E computing infrastructure. The division provides oversight of the processes, architecture and physical implementation of the networks used by the NAVAIR RDT&E community for Information Technology (IT). As a major branch of the Integrated Battlespace Simulation and Test (IBST) Department, the RDT&E Division also develops and implements the architectural framework. This framework enables the integration of existing and new technologies into a network environment that supports all NAVAIR RDT&E capabilities and laboratories.

This division manages and operates all NAVAIR RDT&E Base Area Networks (BAN) providing cost-effective base-wide connectivity that supports RDT&E events and tasks, as well as access to Department of Defense (DoD) approved Wide Area Networks (WAN). The RDT&E Infrastructure Division's IT Service vision is to provide world-class infrastructure, quality RDT&E engineering services, and reliable value added solutions. In order to accomplish this vision, the division will continue to measure and track performance, continue process improvement, and maintain a skilled workforce.

The RDT&E Infrastructure Division is committed to providing excellent customer service by clearly explaining the services provided, implementing an understandable and appropriate pricing model, and illustrating how service value can be maximized. The division’s priority is to better understand and meet customer driven requirements.

The division will never consider this catalog a “finished product”, and will continue to improve the services by striving to make the catalog increasingly useful and accessible. If there are suggestions for improvement, please inform the division and it will be updated accordingly. Insights are greatly appreciated and will be used to build the RDT&E Infrastructure Division's commitment to customer service.
NETWORK ENGINEERING

Description:

The core mission of the Research Development Test and Evaluation (RDT&E) network is to provide network connectivity services to customers. The RDT&E Infrastructure Division maintains a staff of highly trained and experienced Network Engineers to support Network Operations and Special Projects. Supported networking protocols include Internet Protocol (IP), Synchronous Optical Network (SONET), and Asynchronous Transfer Mode (ATM) connectivity across Pax River/Webster Field and across the country. The division has extensive experience with Brocade Routers/Switches, Juniper Routers/Firewalls, Ericsson ATM and ViPr hardware, Cisco Optical Network Solutions (ONS), Cisco Routers/Switches, Solaris, Linux and Windows systems. This diverse experience creates a wide base of knowledge to provide solutions for any requirement.

What is Included?

Engineering Support is available for:

- Network Design and Installation
- Performance Testing
- System Tuning
- Security Solutions Design and Installation
- Multicast Design and Tuning
- Inside Cable Plant, Outside Cable Plant, and Installation
- Twisted Pair and Fiber Infrastructure including CAT 5, CAT 6, Single-mode, Multi-mode, and Air Blown Fiber Installation

Customer Responsibilities

- Obtain RDT&E Network Governance Approval if necessary
- Appropriate Information Assurance (IA) accreditation (Authority To Operate (ATO), Interim Authority To Operate (IATO), Interim Authority To Test (IATT)) from the NAVAIR RDT&E Designated Approving Authority (RDAA) before the solution can become operational

Availability

- This service is available to any RDT&E Lab (Non Navy Marine Corp Intranet (NMCI)).
- Services are available 24/7.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.
- For after hours issues, please identify the issue as a priority one. An RDT&E support technician will be called in to resolve the issue.

How do We Charge?

- The Network Engineering Support is a fee for service. Please contact the National Help Desk (NHD) and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
OUTREACH

Description:

Outreach is a Defense Research and Engineering Network (DREN) sponsored initiative to provide Commercial Class Internet access. At Patuxent River, this service is distributed over a dedicated infrastructure. The division delivers essentially the same type of Internet service you would get at any Wi-Fi hotspot or hotel. It is unfiltered Internet with no security rules applied. Patuxent River currently has a 20Mb/s connection dedicated to the Outreach initiative with capacity for future expansion. The Outreach service is available through wireless or hardwire Ethernet connection.

What is Included?

- Internet access for contractor systems, DoD road warriors, and other eligible non-accredited systems
- The division’s maintained and provided infrastructure
- 20 Mb/s dedicated connection
- Capacity for future expansion
- No OUTBOUND port/protocol restrictions
- Multiple solutions available for printing over Virtual Private Networks (VPN)
- Contractor accessibility
- Dynamic or Static IP assignment

Customer Responsibilities

- Approval from Program Sponsor, Contractor Security Officer (Facility Security Officer (FSO) in most cases), RDT&E Network Security Officer (NSO), and Pax River Information Assurance Manager (IAM).
- Acknowledgement that service does not circumvent standard DoD Certification and Accreditation processes
- Securing of connected systems
- Signature on Memorandum of Understanding (MOU)
- No publicly accessible servers or services

Availability

- This service is available to any eligible customer.
- Services are available 24/7.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.
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For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
The Research Development Test and Evaluation (RDT&E) Engineering and Laboratory Information Assurance (IA) Support team serves as a technical interface to NAVAIR and NAWC IA departments (7.2.6 community) for all IA requirements. RDT&E IA team can assist RDT&E laboratories in navigating the vast array of rules, regulations and mandates to ensure they are accredited and operating securely. The division can provide DoD 8570 certified specialists to assist laboratories that do not have their own IA support and/or resources. The goal is to reduce the impact of IA mandates on NAVAIR RDT&E labs allowing full concentration on Fleet-driven operational requirements.

**IA Support is available for:**
- Technical support (system hardening, Information Assurance Vulnerability Management (IAVM) compliance, vulnerability, scanning).
- Support lab managers and 7.2.6 to facilitate IA compliance requirements for acquiring and maintaining IA accreditation
- Develop required IA documentation (Defense Information Assurance Certification and Accreditation Process (DIACAP) Package, System Security Authorization Agreements (SSAAs)) as well as project management documentation including Plan of Actions and Milestones (POA&M) and Memorandum of Agreements (MOAs)
- Track and maintain inventory of lab IA compliance packages
- Notify lab managers of upcoming milestones, provide metrics and lessons learned
- Information Assurance Officer (IAO) Services
- RDT&E Platform IT (PIT) Services Support
- Customer Requirements Briefing (CRB) Support
- DIACAP Transition/Lifecycle Support
- Obtain RDT&E Network Governance Approval
- Completed Hardware and Support Inventory
- Assign IAO/System Administrator (SA) designee
- Assign Technical Lab Point of Contact

**What is Included?**

**Customer Responsibilities**
- Notify lab managers of upcoming milestones, provide metrics and lessons learned
- Information Assurance Officer (IAO) Services
- RDT&E Platform IT (PIT) Services Support
- Customer Requirements Briefing (CRB) Support
- DIACAP Transition/Lifecycle Support

**Availability**
- This service is available to any RDT&E Lab (non Navy Marine Corp Intranet (NMCI)).
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.

**How do We Charge?**
- The Engineering and Lab IA Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
Assist the Navy’s Research Development Test and Evaluation (RDT&E) labs in complying with the 2002 Chief of Naval Operations (CNO) mandate requiring the registration and management of its software portfolio. Engineering Application Portfolio Management for the RDT&E community will facilitate the following:

- Application visibility
- Configuration Management
- Registration of applications in the Department of Navy (DON) Application and Database Management System (DADMS) per CNO mandate

**Description:**

Portfolio Management Support is available for:
- Pursuit of Functional Area Manager (FAM) approval of applications (required for accreditation packages, IT Approval for procurements),
- Virtual System Command (VSYSCOM) Lab alignment to Navy Capabilities Structure
- Representation of the Navy’s RDT&E software interests and requirements to Assistant Secretary, Navy (ASN) and CNO leadership
- Portfolio Management services provided in support of applications that fall into the following functional areas:
  - Test & Evaluation (T&E) (Navy)
  - Scientific & Technical (S&T) (Navy)
  - Modeling & Simulation (M&S) (NAVAIR)
  - Information Operations (IO) (NAVAIR)

**What is Included?**

- Provide completed RDT&E Questionnaire for new submissions into DADMS
- Provide updates/changes as necessary
- Manage and Coordinate Software RDT&E Lab Reviews

**Customer Responsibilities**

- This service is available to any Navy Application Owners.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.

**Availability**

- Provide completed RDT&E Questionnaire for new submissions into DADMS
- Provide updates/changes as necessary
- Manage and Coordinate Software RDT&E Lab Reviews

**How do We Charge?**

- The Engineering Application Portfolio Management service is available at no charge.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
The High Performance Computing Modernization Program (HPCMP) provides the supercomputer services, high-speed network communications, and computational science expertise. This expertise enables the Defense Laboratories and Test Centers to conduct a wide range of focused research, development, and test activities. The partnership that has been created puts advanced technology in the hands of U.S. forces more quickly, less expensively, and with a greater certainty of success.

The HPCMP was initiated in 1992 in response to congressional direction to modernize the Department of Defense (DoD) laboratories’ High Performance Computing (HPC) capabilities. The HPCMP was assembled out of a collection of small high performance computing departments, each with a rich history of supercomputing experience that had independently evolved within the Army, Air Force, and Navy laboratories and Test Centers.

### Description:

The High Performance Computing Modernization Program (HPCMP) provides the supercomputer services, high-speed network communications, and computational science expertise. This expertise enables the Defense Laboratories and Test Centers to conduct a wide range of focused research, development, and test activities. The partnership that has been created puts advanced technology in the hands of U.S. forces more quickly, less expensively, and with a greater certainty of success.

### What is Included?

HPC Support is available for:
- Free use of HPC Super Computer Centers
- Networking/Defense Network Engineering Network (DREN) Access when utilizing HPC resources
- Productivity Enhancement, Technology Transfer and Training (PETTT)
- Software Applications Support
- Summer Internships for undergraduate students

### Customer Responsibilities

- Obtain Information Assurance Training Certificate
- Establish a user account on a HPC machine
- Utilize allocated hours on HPC resources

### How do We Charge?

- The High Performance Computing service is available at no charge.

### Availability

- This service is available to anyone in DoD.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
This service utilizes tools to provide the sharing of knowledge relevant to a variety of projects and services. Collaboration entails the systems and procedures that individuals use to work together on projects and goals in a variety of environments. Systems that allow both communication and collaboration range from e-mail systems, web and teleconferencing, document management and workflow as well as instant messaging and electronic whiteboards.

Collaboration tools and technologies provide critical capabilities for improving communication, social network interaction, workflow, employee productivity and organization of critical business information.

**Description:**

Communication Support is available for:
- Web Portals
- Intranets
- Extranets
- Document/Records Management

**What is Included?**

**Customer Responsibilities**

- Obtain RDT&E Network Governance Approval
- Attain appropriate Information Assurance (IA) accreditation (Authority to Operate (ATO), Interim Authority to Operate (IATO), Interim Authority to Test (IATT), Platform IT (PIT)) designation from the NAVAIR Research Development Accreditation Authority (RDAA) before the solution can become operational

**Availability**

- This service is available to any RDT&E Lab (non Navy Marine Corp Intranet (NMCI)).
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.

**How do We Charge?**

- The Communication and Collaboration Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
The Research Development Test and Evaluation (RDT&E) Infrastructure Division will provide a classified communications infrastructure compliant with all Department of Defense (DoD) guidelines. The classified network is dual homed with Secure Defense Research and Engineering Network (SDREN) and Secret Internet Protocol Router Network (SIPRNet) providing a broad range of accessibility.

- Access to SDREN and SIPRNet
- Certified and Accredited Protected Distribution System (PDS)
- Stratum-1 Time Source
- Enterprise Active Directory availability
- Windows Server Update Server (WSUS) and patch repository
- Host Based Security System (HBSS) Infrastructure
- Network Administration and Troubleshooting
- Network Performance Monitoring and Trend Analysis

**Description:**

**What is Included?**

- Obtain RDT&E Governance Approval
- Attain appropriate Information Assurance (IA) accreditation from the NAVAIR RDT&E Designated Approving Authority
  - Interim Authority To Operate (IATO)
  - Authority To Operate (ATO)
  - Interim Authority To Test (IATT)

**Customer Responsibilities**

- The RDT&E Classified Connectivity Services Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

**Availability**

- This service is available to any RDT&E Lab (non Navy Marine Corp Intranet (NMCI)).
- Services are available 24/7.
- The RDT&E Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST
- For after hours issues, please identify the issues as a priority one. An RDT&E support technician will be called in to resolve the issue.

**How do We Charge?**

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
UNCLASSIFIED NETWORK CONNECTIVITY SERVICES

Description:

The Research Development Test and Evaluation (RDT&E) Infrastructure Division will provide an unclassified communications infrastructure compliant with all Department of Defense (DoD) guidelines. The unclassified network includes access to NAVAIR RDT&E labs and Defense Research and Engineering Network (DREN).

What is Included?

- Access to DREN
- Security boundary including Firewall, Proxy Servers and Intrusion Detection Systems
- Internet Protocol Version 4 (IPv4) and Internet Protocol Version 6 (IPv6)
- Domain Name Service (DNS)
- Stratum-1 Time Sources
- Enterprise Active Directory availability
- Windows Server Update Server (WSUS) and patch repository
- Host Based Security System (HBSS) Infrastructure
- Network Administration and Troubleshooting
- Network Performance Monitoring and Trend Analysis

Customer Responsibilities

- Obtain RDT&E Governance Approval
- Attain appropriate Information Assurance (IA) accreditation from the NAVAIR RDT&E Designated Approving Authority
  - Interim Authority To Operate (IATO)
  - Authority To Operate (ATO)
  - Interim Authority To Test (IATT)

How do We Charge?

- The RDT&E Unclassified Network Connectivity Services is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

Availability

- This service is available to any RDT&E Lab (non Navy Marine Corp Intranet NMCI).
- Services are available 24/7
- The RDT&E Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.
- For after hour issues, please identify the issue as a priority one. An RDT&E support technician will be called in to resolve the issue.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
RDT&E SYSTEM ADMINISTRATION

Description:
The Research Development Test and Evaluation (RDT&E) Infrastructure Division can provide essential System Administration services to RDT&E customers. Support services include administration of server/workstation hardware and software, system hardening, Information Assurance Vulnerability Management (IAVM) and Computer Tasking Order (CTO) compliance and reporting. System Administrators are available for scheduled maintenance and issue response on most major platforms; these systems include Windows, Macintosh, Linux, and Unix. Administrators are certified and compliant with the DoD Directive 8570 training mandate.

What is Included?
System Administration Support is available for:
- Hardware setup and configuration
- Operating system installation, configuration and maintenance
- Software installation and support
- Active Directory management and integration
- Server backup and Recovery
- Performance monitoring including monitoring disk space, utilization, capacity and availability
- Security monitoring and maintaining security patches and updates
- Vulnerability Management and IAVM/CTO compliance and reporting
- Host Based Security System (HBSS) support
- System hardening per Security Technical Implementation Guide (STIG)/Gold Disk

Customer Responsibilities
- Obtain RDT&E Governance Approval if necessary
- Attain Appropriate Information Assurance (IA) accreditation (Authority to Operate (ATO), Interim Authority to Operate (IATO), Interim Authority to Test (IATT)) from the NAVAIR Research Development Accreditation Authority (RDAA) and before the solution can become operational

Availability
- This service is available to any accredited customer with connected or standalone systems.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.

How do We Charge?
The RDT&E System Administration Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
The Research Development Test and Evaluation (RDT&E) Infrastructure Division provides server, application, and web hosting services to the RDT&E community. Whether dedicated server hardware for intensive applications, or looking for shared costs by co-locating applications on Enterprise servers, the RDT&E Infrastructure Division offers two data centers of fault tolerant: highly available classified and unclassified network infrastructures. Support includes monitoring, software updates, reboots, security patches and operating system upgrades.

**RDT&E ENGINEERING APPLICATION HOSTING SERVICES**

**Description:**

The Research Development Test and Evaluation (RDT&E) Infrastructure Division provides server, application, and web hosting services to the RDT&E community. Whether dedicated server hardware for intensive applications, or looking for shared costs by co-locating applications on Enterprise servers, the RDT&E Infrastructure Division offers two data centers of fault tolerant: highly available classified and unclassified network infrastructures. Support includes monitoring, software updates, reboots, security patches and operating system upgrades.

**What is Included?**

Hosting Services are available for:
- Dedicated hardware when required
- Application and System monitoring and maintenance
- Fault monitoring and recovery
- Data security, backup and recovery
- Expandable storage to fit requirements
- Offsite retention of data for Disaster Recovery

**Customer Responsibilities**

- Obtain RDT&E Network Governance Approval
- All systems must meet Common Access Card (CAC) authentication requirements.

**How do We Charge?**

- The RDT&E Engineering Application Hosting Services Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

**Availability**

- This service is available to any RDT&E Lab (non Navy Marine Corp Intranet (NMCI)).
- Services are available 24/7.
- The Research Development Test and Evaluation (RDT&E) Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. to 5p.m. EST.
- For after hours issues, please identify the issue as a priority one. An RDT&E support technician will be called in to resolve the issue.

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
**Description:**

This service offers customers assistance with Navy Marine Corp Intranet (NMCI) implementation, order processing and continual on-site support. This service includes consultation and guidance on NMCI Operations as well as provides representation at bi-weekly command level NMCI Point of Contact (POC) meetings.

**What is Included?**

NMCI POC Support is available for:
- Email Account Coordination
- Computer Move, Add or Changes (including inventory management and initiating all MAC requests)
- Computer and Peripheral Ordering and Submission
- Software Ordering
- Tech Refresh Orders and Deployment
- Act as primary interface to NAVAIR Customer Technical Representative (CTR) and Assistant Customer Technical Representative (ACTR)
- Maintain asset and configuration management detail reports and publish monthly

**Customer Responsibilities**

- Attain approval from NAVAIR NMCI Customer Technical Representative (CTR).

**How do We Charge?**

- The RDT&E NMCI POC Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

**Availability**

- The RDT&E Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. through 5p.m. EST

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For more information please contact The National Help Desk; When calling the National Help Desk please identify yourself as an RDT&E customer

(301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
RDT&E ENGINEERING HARDWARE & SOFTWARE SERVICES

**Description:**

The Research Development Test and Evaluation (RDT&E) Engineering Hardware & Software Services will provide support to the RDT&E community in the preparation, compliance and liaison with the Naval Air Systems Command (NAVAIR) Command Information Office (CIO) Office to obtain IT Approval. This is mandatory for any IT hardware, software, maintenance, and IT training. This includes IT embedded in weapon systems, and any equipment within the NAVAIR RDT&E 4.0 and 5.0 competencies.

**What is Included?**

- Naval Air (NAVAIR) Systems Command Support and preparation of IT Approvals and Spend Plans
- Ensure all IT resources meet CIO compliance
- Liaison with the CIO Office
- Obtain approval for IT Spend Plan

**Customer Responsibilities**

- Obtain RDT&E Network Governance Approval
- Provide Description and Mission of IT Equipment

**How do We Charge?**

- The RDT&E Engineering Hardware & Software Support is a fee for service. Please contact the National Help Desk and request a representative from the RDT&E Infrastructure Division Support Team to contact you regarding pricing.

**Availability**

- The RDT&E Infrastructure Division Support Team is available on-site during normal business hours, Monday through Friday 7a.m. through 5p.m. EST

For more information please contact The National Help Desk: When calling the National Help Desk please identify yourself as an RDT&E customer (301)342-3104 or (888)292-5919 or https://homepages.navair.navy.mil/NHD
FUTURE RDT&E SERVICES PLANNED

- Cross Domain and Multi-Level Secure Systems and Interfaces
- Point-to-Point, Laboratory and Mobile Wireless Technology
- Network Storage and Backup
- Expanded Team Collaboration (Video, Audio and Data)