REDSTONE TEST CENTER

Redstone Arsenal
Huntsville, Alabama

rtc.army.mil

U.S.ARMY

Redstone Test Center

Aviation Flight Test Instrumentation

RTC provides support in the design, development, installation, integration and operation of aviation flight test instrumentation. Our electrical and mechanical engineers design, fabricate, install, integrate and calibrate a variety of pulse code modulation based instrumentation systems.

RTC engineers also integrate non-standard test articles and developmental aircraft subsystems into Army rotary and fixed-wing aircraft platforms. RTC data capabilities include the collection of flight test data, time-space-position information, differential global positioning systems, and high definition video. RTC can also provide aircraft instrumentation cockpit displays, telemetry decommutation and display, open air environment data collection, and ground station digital communication testing.

A RTC key capability is the state-of-the-art flight test control center which provides real-time display of telemetered flight test data and flight test data storage. RTC can also collect and process real-time and post-mission airframe and systems flight test data in locations across the CONUS with our mobile assets. Once non-standard systems are installed, RTC creates airworthiness substatiation documentation used to support airworthiness approval for RTC airworthiness releases and AED airworthiness releases.

CORE COMPETENCIES

- Airborne data acquisition
- Real time flight test data monitoring for data quality and safety of flight
- Software development for unique data processing and analysis
- Wireless Rotating Instrumentation Package for rotating parameter measurement
- Structural design and analysis for test item and instrumentation installation
- Experienced workforce that can support all instrumentation and data reduction activities for all developmental flight testing activities

CAPABILITY HIGHLIGHT

RTC utilizes a wireless rotating instrumentation package (WRIP) to collect data on rotating components located on or above the main rotor system. The WRIP design allows collection of structural data on the aircraft rotating components without the use of slip rings, transmission modifications, or standpipes. The WRIP design reduces data transmission latency and supports aggressive test schedules.

Flight Test Data Collected (2013)

680 Data Flight

610+ Telemetry Hours

Parameters Collected per Test

6000 Total

3300 Measured | **2700** Bussed

TM Ground Stations

5 Total

2 Fixed | **4** Mobile

Instrumentation

6000+ Items

$27M+ Value

Redstone Test Center

Aviation Flight Test

For years, the team at the U.S. Army Redstone Test Center's Aviation Flight Test Directorate (AFTD) has provided an expert workforce and technologically advanced test equipment to conduct the rigorous testing necessary for U.S. Army acquisition and airworthiness decision makers to equip our Soldiers with mission-effective and safe aviation equipment. The directorate comprises a diverse, multi-disciplinary workforce of pilots, engineers, and technical personnel who work with a fleet of aircraft to provide government and commercial customers complete developmental flight test and test support services.

The AFTD team totals nearly 400 military, Department of Army civilian, and contract personnel with multi-service backgrounds, and includes 50 U.S. Naval Test Pilot School graduates and 40 flight test engineers. More than 260 contract engineering and technical personnel support operations.

While much of RTC aviation flight test operations are conducted at Redstone Arsenal, AFTD executes test activities at remote locations throughout the United States to include Yuma Proving Grounds, Arizona, Eglin Air Force Base, Florida, and Duluth, Minnesota, when specific capabilities or climatic conditions are required.

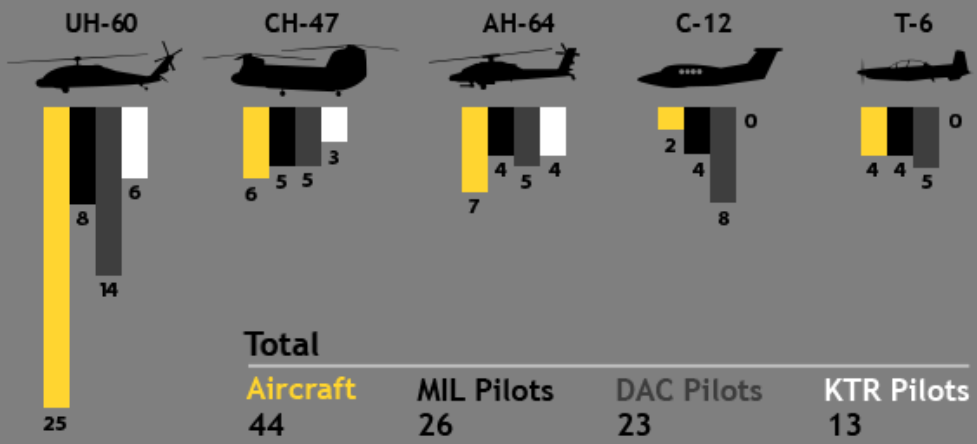
CORE COMPETENCIES

- Aircraft Survivability Testing
- Unmanned Aircraft System & Manned-Unmanned Teaming
- Targeting/Pilotage Sensors
- Navigation/Communications/ Avionics
- Aircraft Platform Interoperability
- Software Regression
- Aircraft Performance
- Handling Qualities
- Aircraft Icing Testing – Natural & Artificial

CAPABILITY HIGHLIGHT

The JCH-47D helicopter icing spray system (HISS) aircraft is an airborne spray tanker that uses water from the 1,800-gal capacity tank to create an artificial icing cloud used in qualification testing.

Aircraft/Pilots



Total Aircraft	MIL Pilots	DAC Pilots	KTR Pilots
44	26	23	13

Redstone Test Center

Aviation Systems Test and Integration Lab

The Aviation Systems Test and Integration Laboratory (AvSTIL) offers an innovative approach to aviation system and subsystem testing by fully immersing aviation platforms in a controllable, repeatable and synthetic testing environment, allowing engineers the ability to fine tune scenarios, produce more precise test and evaluation results, reducing overall program risk to project managers prior to flight test. The AvSTIL serves as the only U.S. Army installed systems test facility for tactical hardware installed on aircraft, which eliminates some of the uncertainties commonly attributed to bench-level component testing.

The AvSTIL is capable of hosting all current aircraft survivability equipment on Army aircraft. The AvSTIL is also capable of simulating aircraft 1553 bus traffic (to include EGI) and pitot-static and radar altimeter data for the AH-64D/E, UH-60M and CH-47F. The AvSTIL houses a test control center equipped with all necessary instrumentation to plan, execute, and report on advanced flight tests up to a SECRET classification level.

CORE COMPETENCIES

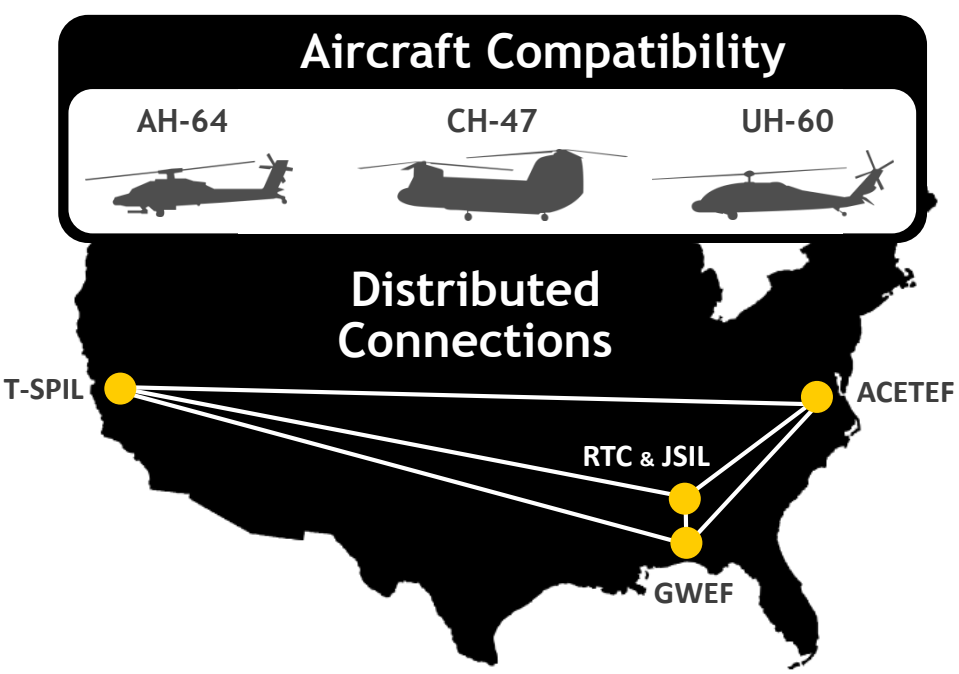
- Integrated Aircraft Survivability Equipment Testing
- Unmanned Aircraft System & Manned-Unmanned Teaming
- Navigation Testing
- Software Regression
- Aircraft Platform Interoperability
- Pre-Flight Confidence Testing
- Integration Check-Out

CAPABILITY HIGHLIGHT

Multispectral test capability for integrated testing of installed ASE (CMWS/ICMD, APR-39 RSDS, AVR-2B LDS), with growth capability for CIRCM

Enhanced projection capability for providing simulated missiles to CMWS during aircraft virtual flight

Provides AH-64E simulated manned unmanned teaming protocols for simulated UAS payload control during levels of interoperability two, three and four in an LVC-DE



TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Climatic Testing

RTC's Climatic Test capability serves a wide variety of test customers and commodity areas, specializing in missiles and aviation component, subsystem and system-level testing. Facilities include those designed both for explosive and non-explosive test items.

Basic Climatic Test capabilities provide natural environments that include, but are not limited to, altitude, extreme temperature, temperature shock, solar radiation, humidity, and combinations of temperature, altitude and humidity. Other specialized environments include salt fog, freezing rain and ice, blowing rain and dripping rain, blowing sand and dust, and settling dust and contamination by fluids. Test engineers and technicians also perform field services that include life cycle, environmental, profile development; field conditioning and instrumentation; and test-specification development.

CORE COMPETENCIES

MIL-STD-810 Testing
- Test Chambers (37)
- Temperature Extremes (-100˚F to 350˚F)
- Chamber Volume (8 ft3 to 18,000 ft3)

Non-Destructive Testing and Metrology
- Full Metrology (Weight, CG, & Moments)
- Radiography (2D X-Ray / Computed Tomography (CT)
- Dynamic Spin Balance
- CMM (2m X 4m X 1.5m)

Munitions and Ordnance Testing
- Ordnance Modification
- Prototype Missile Assembly
- Missile Telemetry Kit Installation
- Missile Modifications
- Component Removal and Replacement
- Explosive Prototype Development
- Flash X-Ray and Detonation Velocity
- Missile Systems Exploitation
- Warhead Jet Characteristics

CAPABILITY HIGHLIGHT

System Level Environmental Test Facility

Two Drive-In Chambers with the Following Specifications:
- Size: 25 ft. x 25ft. x 25ft.
- Temperature Range: -100˚F to 185˚F
- Relative Humidity: 20%-95%
- Temperature Rate of Change: 35˚F/min
- Load Capacity: 12,000 lb/ft^2

Environmental Chamber Types and Quantities

- Temperature (17)
- Temperature Humidity (9)
- Temperature Altitude (1)
- Contamination By Fluids (1)
- Temperature Shock (13)
- Temperature Altitude Humidity (3)
- Blowing Rain (1)
- Dripping Rain (1)
- Salt Fog (2)
- Blowing Dust (1)
- Settling Dust (1)
- Icing / Freezing Rain (1)
- Immersion (1)
- Blowing Sand (1)

Redstone Test Center

Component Testing

RTC engineers and technicians perform a variety of component-level tests including dimensional inspection, mechanical function, structural loading, and pressure/flow. Test capabilities include first-article testing, quality verification, lot-acceptance testing, vendor-qualification testing, failure analysis, life-cycle testing, engineering evaluations, research and development testing, stockpile-reliability testing, and engineering-investigation projects.

Facilities/equipment capabilities include an environmentally-controlled laboratory which houses a variation of standard and specialized high-accuracy dimensional metrology equipment; electrical and optical component test labs; a wide range of static and dynamic structural-load test stands, hydraulics and pressure-test laboratories, and multiple high-bay facilities that can accommodate large test items.

Although missile and aviation systems components and repair parts are the majority of the items tested, full-system performance evaluations can be performed with an array of test equipment, instrumentation and data acquisition equipment available.

CORE TEST COMPETENCIES

- Dimensional Metrology
- Pressure/Flow
- Hydraulics/Filter
- Static/Dynamic Structural Loading
- Fatigue Structural Loading
- Rotational Dynamic Loading
- Materials/Metallurgical Analysis
- Non-Destructive Inspection
- Transportability Testing
- Engineering Investigations
- Electronics/Electrical/Cable
- Electro-mechanical Component
- Electrical Components
- Multi-Physics Engineering Analysis

CAPABILITY HIGHLIGHT

State-of-the-art Material Analysis Laboratory

Scanning electron microscope for high-magnification imagery and chemical composition analysis

Test Activities and Typical Number of Projects Performed Annually

Aviation Component: 313	Repair Parts: 313	Stockpile Reliability Program Component: 9
Hellfire Launcher Rail Test Program: 5	Mechanical/Load Functional Testing: 15	Dimensional Metrology Lab: 309

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Distributed Tests and Modeling & Simulation

RTC's distributed testing and modeling & simulation capability is centered around the Distributed Test Control Center (DTCC). The DTCC is RTC's central point for connecting distributed systems. For test events both internal to RTC and with outside organizations, the DTCC serves as the RTC command and control, communication, data acquisition, and visualization center.

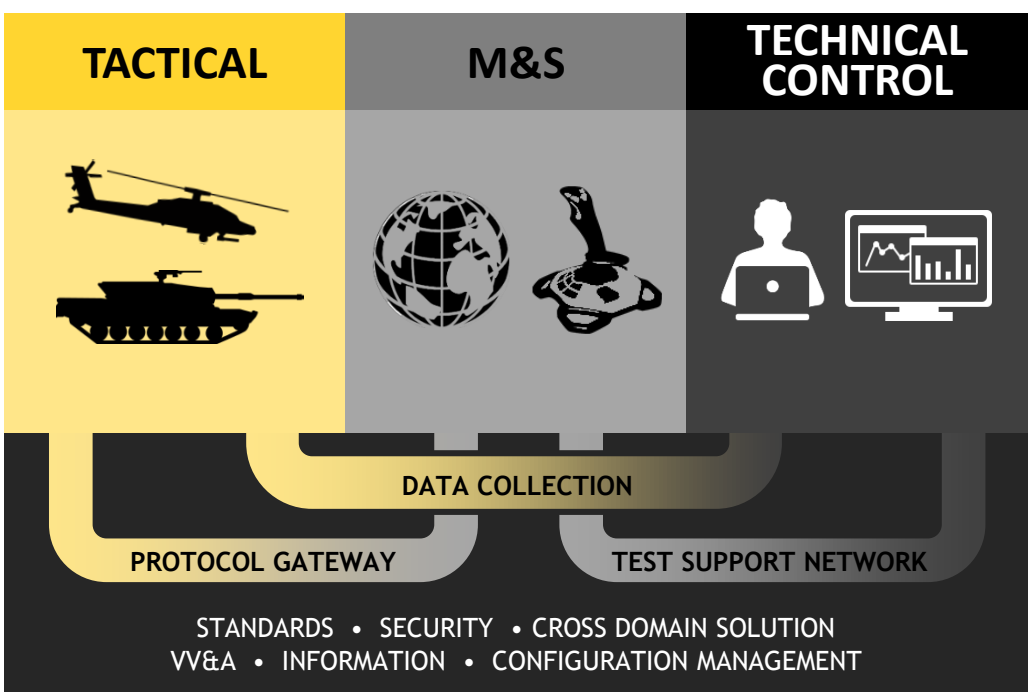
The DTCC operates globally at various classification levels on multiple distributed test networks. This state-of-the-art facility serves as the hub connecting all RTC ranges and labs through reliable, robust and high-capacity connectivity. It is the central access point to and from RTC assets and other organizations around the world. DTCC engineers and computer scientists provide subject matter expertise for networks and simulation architecture as well as for RTC's High Performance Computer asset, which resides in the DTCC and provides computational power for the center.

CORE COMPETENCIES

- Distributed Test Networks
  - DREN, SDREN, JIOR, JOIN, CFBLNet, Cross Domain Solutions
- Modeling & Simulation Suite
  - OneSAF, ExCIS, MATREX, UAS Sim, EO/IR Sensor Sims
- Man-in-Loop Interfaces
  - Reconfigurable RWA simulator
  - Small Arms Threat Sims
- JSTEN
  - Link-16, Blue Force Tracker
  - Standard Common Data Link
  - Mode 5, WNW, SRW
- High Performance Computing
  - Unclassified / Secret
  - Coalition Computing Resources
- Data Acquisition
  - NSITE
  - JMETC tools
  - MAK tools

CAPABILITY HIGHLIGHT

The JSTEN combines parallel computing resources with a scalable, high fidelity network emulation and a computer-generated forces model to represent, in a virtual space, tactical networks, force movements, interactions, and communication loads to live systems under test. This network emulation allows interfacing real hardware with virtual components to produce operationally realistic numbers of network nodes.



TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Dynamic Testing

RTC provides expertise in dynamic testing for missile, aviation and vehicle subsystems and components. Shock and vibration tests of hazardous items can be conducted at temperature extremes. RTC plays an active role in developing standards for multi-exciter/multi-axis excitation as an improved test methodology that provides 6 degree-of-freedom motion, supplementing current single-axis excitation. A unique vibro-acoustics facility, including a large reverberation chamber containing a 6-DOF excitation system offers the ability to generate realistic motion combined with high-intensity acoustic energy.

Other laboratory test capabilities include: mechanical shock, pyro-shock, sustained acceleration (centrifuge), loose cargo, pendulum impact, and drop tests. The fuze/safe and arm device test facility combines dynamic test capabilities with precision measurements and controls required for operational and functional testing of S&A devices.

RTC conducts field testing of air and ground vehicles in various environments to characterize installed weapons/equipment dynamic exposure. A wide variety of specialized tests on various road surfaces exists for wheeled/tracked vehicles as does comprehensive testing of Unmanned Ground Vehicles focused on challenging the test article's sensor systems and artificial intelligence. Other field test capabilities include rail impact testing, mobile data acquisition, modal analysis, and signal analysis in support of laboratory vibration test schedule development. Analytical tools include finite element based modal, response dynamics, and fatigue analysis.

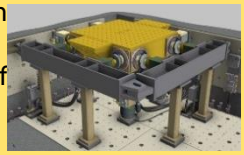
CORE COMPETENCIES

- Aviation / Missile Dynamics
- Vibration Testing
- Shock Testing
- 6 DOF Vibration Testing
- Dynamic Analysis
  - Finite Element Analysis
  - Modal Analysis
- Safe and Arm Fuze Testing
- Pyro-shock Testing
- Ground Vehicle Dynamics Characterization
- Road Course Testing
- Rail Impact Testing
- Pendulum Impact and Drop Testing
- Acoustics and Vibro-acoustics Testing

CAPABILITY HIGHLIGHTS

Large Capacity 6-DOF

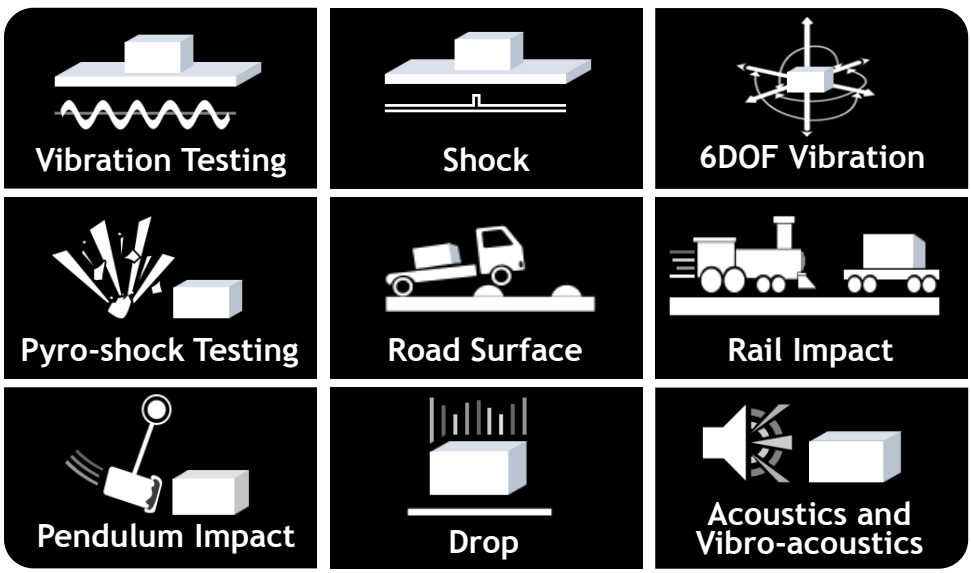
RTC's Large Capacity 6-DOF servo-hydraulic has a standard footprint of 8 ft x 8 ft, 200k lb vertical axis force rating, 120k lb horizontal force rating, three-inch dynamic stroke, and ±6 degrees of angular motion.



Vibro-Acoustics

RTC's vibro-acoustics facility consists of a 13,000 ft^3 reverberant acoustic chamber capable of obtaining 162dB SPL. Included within the chamber is a 6-DOF servo-hydraulic excitation system capable of 14k lb-f per DOF.

Types of Tests Performed



Redstone Test Center

E^3 Testing

RTC has a comprehensive Electromagnetic Environmental Effects test capability for aviation and missile systems. This test capability includes: Electromagnetic Radiation-Operational; Electromagnetic Interference MIL-STD-461F; High Intensity Radiated Fields; Hazards of Electromagnetic Radiation to Ordnance, Personnel & Fuel; Electromagnetic Vulnerability, Compatibility & Pulse; Helicopter and Personnel borne Electrostatic Discharge; Direct and Near-Strike lightning effects; Precipitation Static; DO-160E (pin-injection lightning, bulk-cable injection); MIL-STD-704A-F (power quality/compatibility); and Emissions Control.

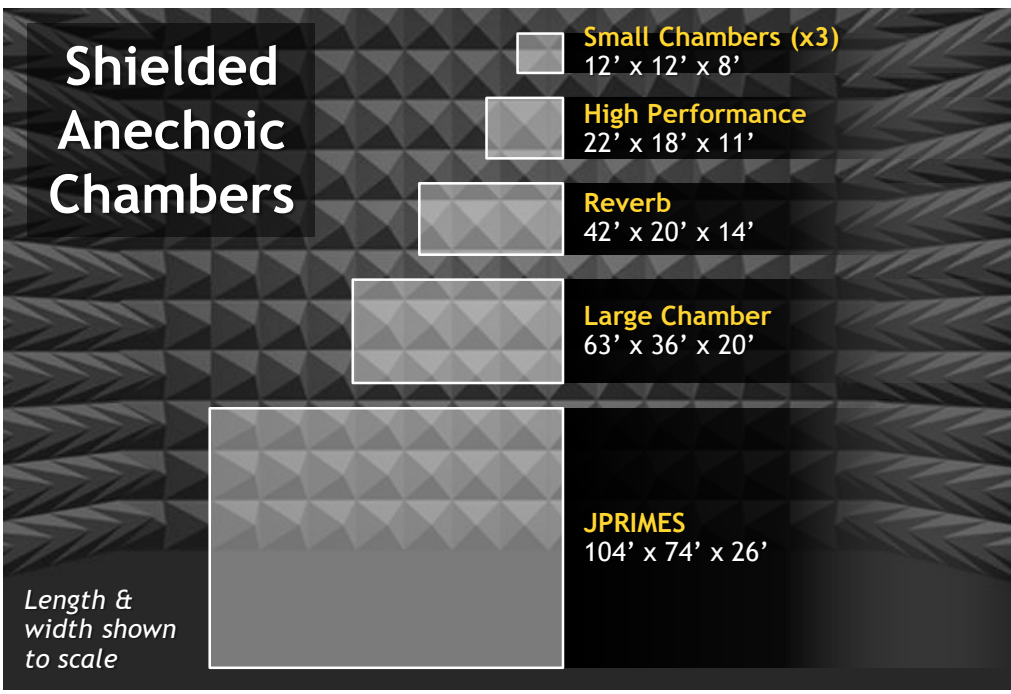
RTC's engineers also provide antenna pattern measurements and evaluate shielding effectiveness. Other services include: electromagnetic engineering expertise/support; aircraft ground station support; and telemetry ground-station support. Specialized capabilities include high-fidelity instrumentation design, development, and fabrication; DoD unique live ordnance lightning effects and ESD testing; transportable lightning effects and ESD testing; full MIL-STD-464A and ADS-37A-PRF RF test levels; large reverberation chamber; counter IED test and evaluation; and Radiation Hazards surveys and assessments.

CORE COMPETENCIES

- Electromagnetic Interference Radiated Emissions
  - Radiated Susceptibility
  - Conducted Emissions
  - Conducted Susceptibility
- Transients
  - Personnel ESD
  - Helicopter ESD
  - Direct / Near Strike Lightning
  - Electromagnetic Pulse
- Electromagnetic Compatibility
  - Source / Victim
  - Noise Floor
  - Power Quality
  - EEDs
- Electromagnetic Vulnerability External RF EME
  - EMRO
  - HERO

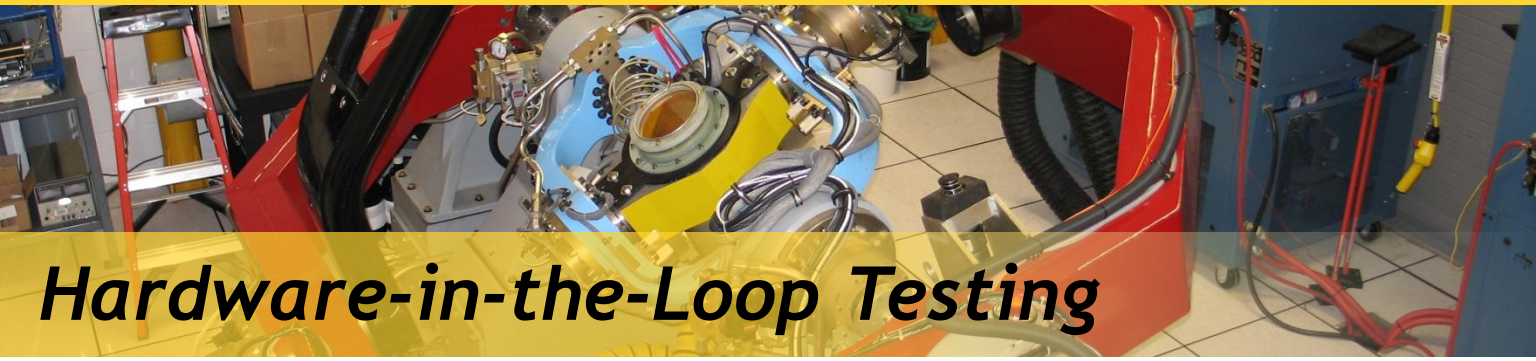
CAPABILITY HIGHLIGHT

The USAF 96th Test Wing's partnership with RTC combines Army and Air Force test expertise to provide critical E3 testing to meet military and commercial needs. The Joint Preflight Integration of Munitions and Electronic Systems (JPRIMES) anechoic chamber, as an installed systems test facility, provides testing of air-to-air and air-to-surface munitions and electronics systems on full-scale aircraft and land vehicles prior to open air testing. Through simulation and modeling, vast amounts of performance data can be obtained at a fraction of the time and cost of conventional flight test programs alone.



TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center



Hardware-in-the-Loop Testing

RTC has a suite of Hardware-in-the-loop capabilities including three operational facilities that provide performance assessment and production acceptance testing of millimeter wave, IR and SAL missile seekers and all-up rounds.

These facilities are supported by subject-matter expertise in combining T&E with M&S to support simulation-based acquisition. The HWILs include: the Longbow Simulation Test and Acceptance Facility used to provide non-destructive test of all-up-round Longbow missiles for production and stockpile reliability; the Electro-Optical System Flight Evaluation Lab (EOSFEL), used to test seekers, control sections, command launch units and other components (adaptable to test semi-active laser seekers); and the Advanced Multispectral Simulation, Test and Acceptance Resource which provides a performance test bay for tri-mode seekers that utilize any combination of mid-wave IR, SAL and KA band millimeter wave-seeker technologies. HWIL capabilities also include ad-hoc and component test capabilities, such as FLIR HWIL and dynamic fin loading.

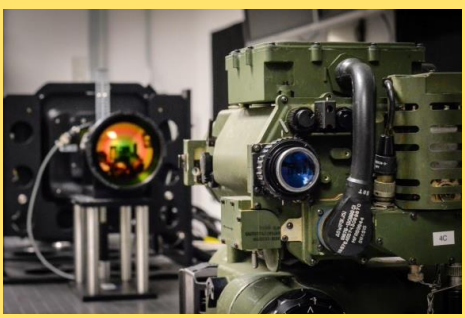
CORE COMPETENCIES

EOSFEL
- Component and system-level testing
- Can include climatic effects
- Repeatable testing across entire system performance envelope
- Cost-effective characterization of tactical hardware and software at all stages of the acquisition cycle

STAF
- Can immerse the Longbow missile in a virtual world
- Real-time millimeter wave (MMW) scene generation and projection system
- 3-axis flight table to simulate roll, pitch, and yaw of the round
- A specialized test interface is used to inject capabilities that are not simulated such as accelerations and fin responses

CAPABILITY HIGHLIGHT

EOSFEL quickly developed an entire closed-loop simulation for the TOW AN/TAS night sight allowing a private industry customer a validation tool prior to LFT&E.



	EOSFEL	STAF
Year Opened	1997	1997
Current Missiles per Year	22	350
Total Missiles Tested	230	2800
Simulated Flight Tests	46,000+	11,200+

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Insensitive Munitions Testing

Insensitive Munitions Testing at RTC is conducted (IAW MIL-STD-2105) at Test Area 4.

Our engineers and technicians obtain data for hazards classification and safety assessments of rocket motors and explosive components.

Insensitive munition testing includes multiple caliber bullet impact testing, fragment impact, live munitions drop testing, slow and fast cook-off tests, warhead arena tests, sympathetic detonation, shaped charge jet and spall impact, and vulnerability and survivability tests.

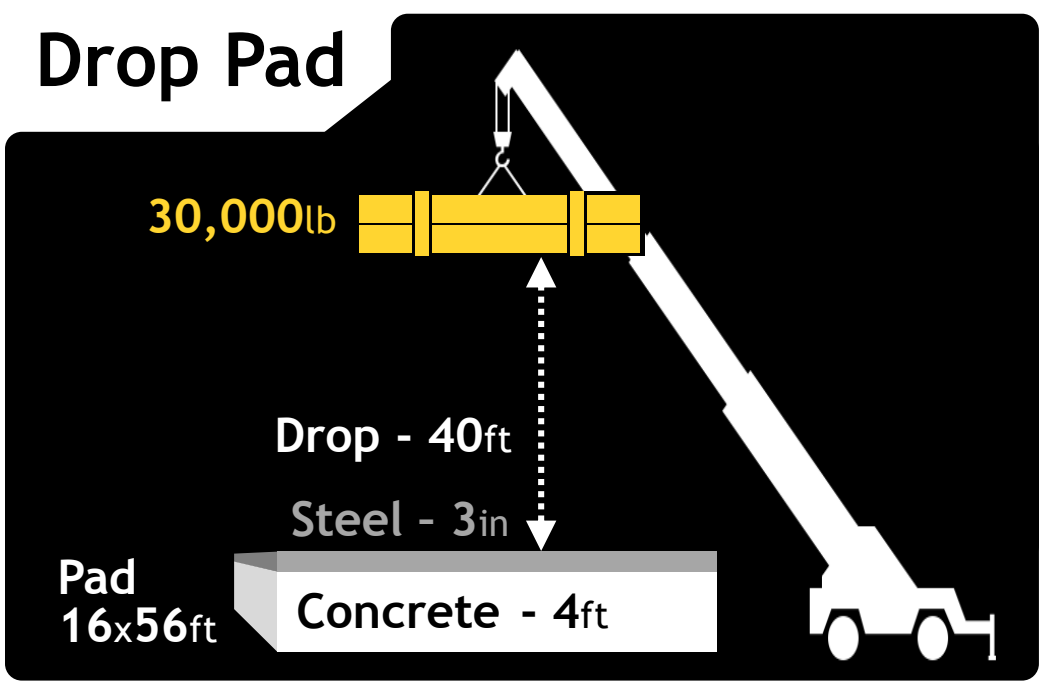
Five test pads are remotely located in the test area supported by an equipped blockhouse with high-speed digital control and data acquisition systems. Test pads are configured to ensure maximum safety for tests.

CORE COMPETENCIES

- Slow Cook Off Testing
- Fast Cook Off Testing
- Bullet Impact Testing
- Fragment Impact Testing
- Shaped Charge Impact Testing
- Sympathetic Detonation (confined and unconfined)
- 40ft Drop Tests
- Arena Testing
- All other Hazard Classification and Insensitive Munitions (IM) testing

CAPABILITY HIGHLIGHT

Fast Cook Off – TA4 has the largest permanent fast cook off pan in the Department of Defense. The pan is 50ft x 70ft and encompassed by a concrete retaining wall that allows us to surround the pan by water to keep it cool during testing which allows it to be reused. Currently we have conducted tests with up to 30,000 gallons of JP8.



Drawing not to scale

Redstone Test Center

Laboratory Sensor Testing

RTC provides laboratory sensor test and evaluation capabilities with subject-matter expertise on assemblies, subassemblies, and components of Electro-Optic/Infrared systems, such as Forward-looking Infrared, Direct-view Optics; hyperspectral sensors; laser designators, pointers, and rangefinders; acoustic sensors, and radar components for the U.S. Army and other customers within and external to the DoD.

Sensor test capabilities include instrumented data acquisition, laser scoring, image analysis, and radar/antenna measurement systems. Other Lab capabilities exist for acoustic, seismic, thermal night vision sight test, and missile-seeker systems. Specific sensor lab testing includes EO/IR sensor characterization (Minimum Resolvable Delta Temperature, Noise Equivalent Delta Temperature, Modulation Transfer Function, field of view, resolution, noise, boresight, target location error, and other parameters); laser beam parameter characterization (pulse energy, pulse width, PRF code, pulse-to-pulse time stability, missing pulses, beam divergence, boresight error); testing of FLIR, DVO & Day TV, laser, biometric, and hyperspectral sensor systems and subsystems at temperature extremes; calculations of probabilities of detection, recognition, & identification from lab or field data; interoperability testing; precision focusing, distortion mapping, non-uniformity measurement and correction; seeker/radiometer calibration; and target paint reflectivity measurements all in conjunction with extensive modeling and simulation tools.

CORE COMPETENCIES

- Leader in sensor lab testing methodologies
- Target acquisition sensor measurements (boresight, MRTD, NEDT, MTF)
- Expertise with FLIR , DVO & Day TV and LRF systems
- Laser beam characterizations
- Seeker/radiometer calibration, image processing, target paint reflectivity measurements
- Non-Uniformity Correction of IR sensors, Large Format Resistive Arrays scene projectors arrays & projector systems

CAPABILITY HIGHLIGHT

LASER Test Capabilities

- Power/Pulse Energy
- Wavelength
- Pulse Duration and Response Rate
- Laser Beam Profiles
- Near Field or Far Field Beam Divergence
- Probability of hit (P_H) – Use lab and field data Laser Designator Weapon System Simulation (LDWSS) model to determine P_H

Test Labs

- Electro Optical/ Infared (x2)
- LASER Lab
- Visible Sensor
- Hyperspectral Sensor
- Mobile IR Scene Projector
- RADAR Near Field Ranges (x2)
- Acoustic Chamber & Speakers
- Non-Uniformity Correction

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Material Analysis Testing

The RTC Material Analysis Laboratory analyzes materials of U.S. Army aviation and missile system components in order to ensure the samples have the correct material properties for a given application. This capability supports a variety of test efforts and investigations related to material failures or deficiencies.

The RTC Material Analysis Laboratory utilizes equipment such as high-magnification Scanning Electron Microscopes, destructive and nondestructive Spectrometers for chemical composition analysis, tensile and torsional test systems, x-ray analysis for residual stress measurements, micro-hardness and macro-hardness testers, coating removal system and optical microscopes for fracture and grain analysis. The RTC Material Analysis Laboratory supports test programs such as Aviation Product Quality Deficiency Reporting, Aviation Component Structural Testing, Condition Based Maintenance, Production Lot Testing, Repair Parts and Engineering Investigations.

CORE TEST COMPETENCIES

- Scanning Electron Microscopy
- Chemical Composition Analysis
- Tensile/Torsional Testing
- Residual Stress Analysis
- Grease and Oil Analysis
- Hardness Testing
- Sample Preparation
- Optical Microscopy
- Metallography
- Coating Removal

CAPABILITY HIGHLIGHT

Scanning Electron Microscope

High-Magnification Imagery and Chemical-Composition Analysis

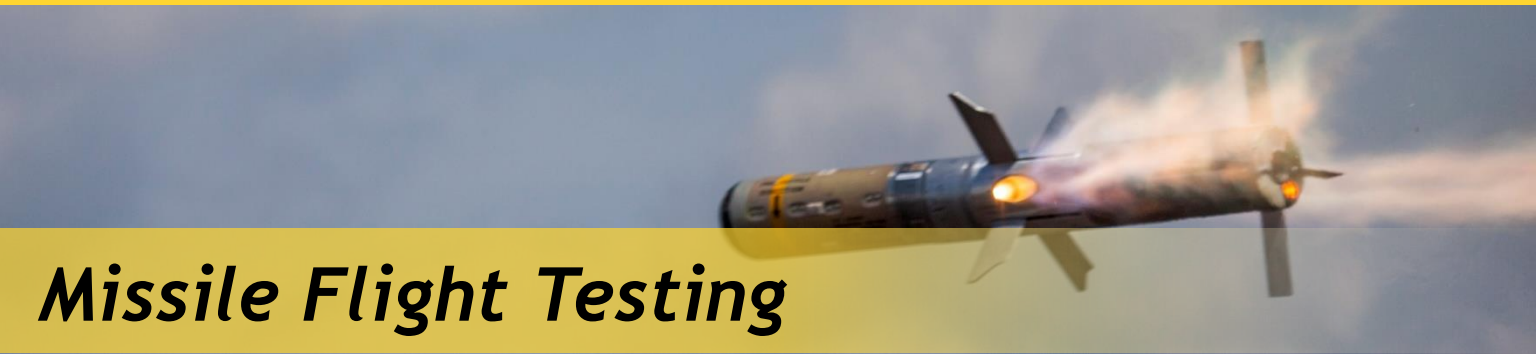
Test Programs & Number of Tests Performed*

Product Quality Deficiency Reporting	Repair Parts: Defense Logistics Agency	Production Lot Testing
PQDR	DLA	PLT
114	8	29
Aviation Component Structural Testing	**Repair Parts: AMCOM Logistics Center**	**Engineering Investigations**
ACST	ALC	EI
8	6	4

* Number of tests performed over 4 quarters

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center



Missile Flight Testing

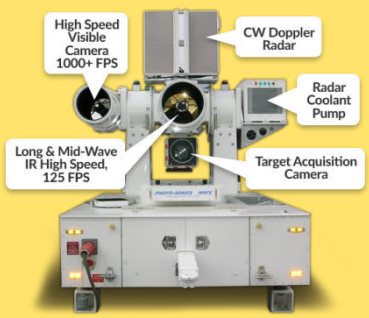
RTC's missile flight test activities largely occur on Test Area 1, a fully-instrumented, eight-kilometer range, located on 9,800 square acres with smaller, satellite ranges customized for R&D testing of weapon system technologies. Flight test capabilities are designed for remote or man-fired testing of tactical guided missiles, rockets, and machine guns from both ground and aviation platforms against stationary or moving targets. Test capabilities are also available for aviation weapons systems integration & testing that combines gun, rocket, laser, and sensor testing from various Army aviation platforms.

Target tracking capability includes time-space position information and velocity data collection through optical, acoustic, and radar systems, such as Weibel doppler radar, Oehler acoustic arrays, and the new Mobile Multi-sensor TSPI System. The ranges include state-of-the-art, high speed digital imaging used for launch, target, and warhead data collection, as well as data reduction and other imaging and documentation capabilities. All instrumentation is enabled by complete instrumentation infrastructure including fiber based (TENA capable) and/or wireless instrumentation needs for data collection.

CORE COMPETENCIES

- Medium Range, Remote/Man-Fired Missile/Rocket Flight Tests Against Stationary or Moving Targets
- Aviation Weapons & Survivability Testing
- Ground Vehicle Weapon Platform Integration & Testing
- Gun & Ballistics Testing
- Foreign Missile Exploitation
- Advanced Instrumentation Design & Development
- Fiber-Based (TENA-Capable) Deployable Architecture for Centralizing Range Instrumentation & Sensors during Testing at CONUS Test Ranges
- Advanced Optical and Radar Target Tracking
- High Speed Videography
- Brick, Masonry, & Adobe Target Wall Construction
- Meteorological Data & Forecasting

CAPABILITY HIGHLIGHT



Mobile Multi-sensor TSPI System

- **Tracking range** 10 km
- **Max target velocity** Mach 6+
- **Min target height** 2 m AGL nominal
- **Accuracy (real-time)** 10 m @ 10 km
- **Accuracy (post-processed)** 1 m @ 10 km

Instrumentation / Data Producers

Radar | LOCAITS* TSPI | Range Camera | High Speed Camera | Met Station

Test Control | SUT Instrumentation | Other Instrumentation | Witness Board

TENA::Track | TENA::Platform | RTC::AMO | RTC::Weather Station | RTC::Fire Countdown

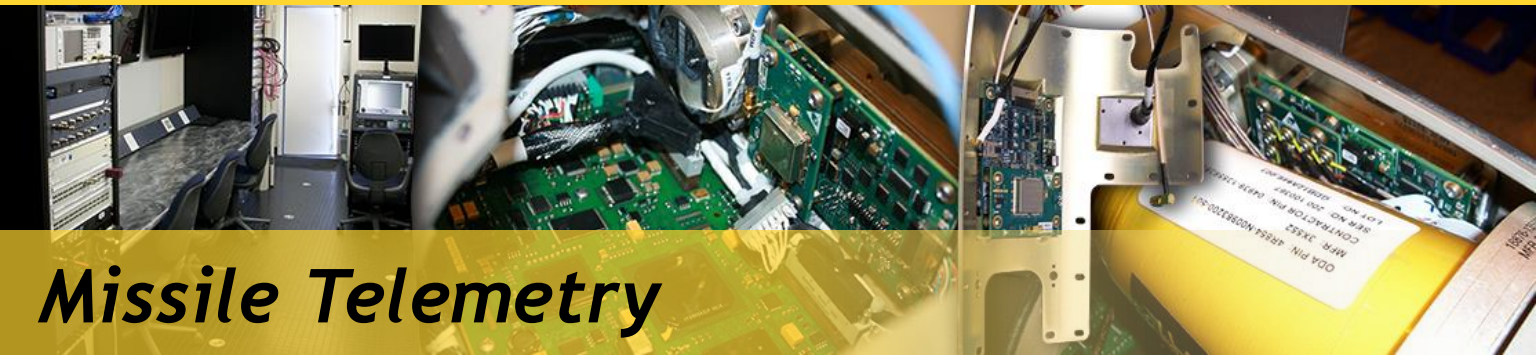
SIMDIS w/ TENA Plugin | Real Time Monitor | Data Analysis SW | Database | Slaved Camera Mount

Visualization / Data Consumers

*Low-Cost-All-Purpose, Instrumentation Tracking System

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center



Missile Telemetry

RTC engineers and technicians design, build, test and support custom telemetry systems for a multitude of research and development and fielded Department of Defense weapon systems. Specialized requirements are compiled in order to design and deliver a custom solution to meet every customer's unique needs.

After the system design phase, RTC manufactures and tests the systems using a rigorous assembly and test process to ensure functionality and quality.

RTC's mission isn't complete, however. Once built and tested, RTC installs the telemetry package into the host system and supports data collection during functional and flight tests using state-of-the-art fixed and mobile-ground station facilities locally or at remote destinations.

RTC engineers serve as subject matter experts for the Army and DOD in weapon-system telemetry and flight-termination hardware and applications and serve as technical liaisons between customer, testing activity, and data evaluators.

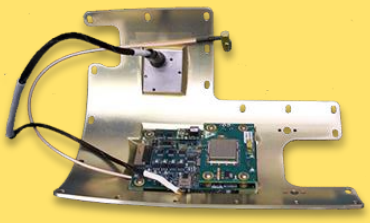
Missile Telemetry capabilities include dedicated design, test, and production labs, automated test capabilities, data simulation, high dynamic GPS integration, flight termination, and a complete processed data package formatted for compatibility with customer evaluation toolset.

CORE COMPETENCIES

- Telemetry System Design & Development
  - Custom Designs
  - Electronics and Mechanical Host Interfacing
  - Custom Firmware and Software
  - Telemetry Frame
  - Technical Data Package
- Telemetry System Production
- Telemetry System Support
  - State of the Art Fixed and Mobile Telemetry Ground Stations

CAPABILITY HIGHLIGHTS

Custom Telemetry Design



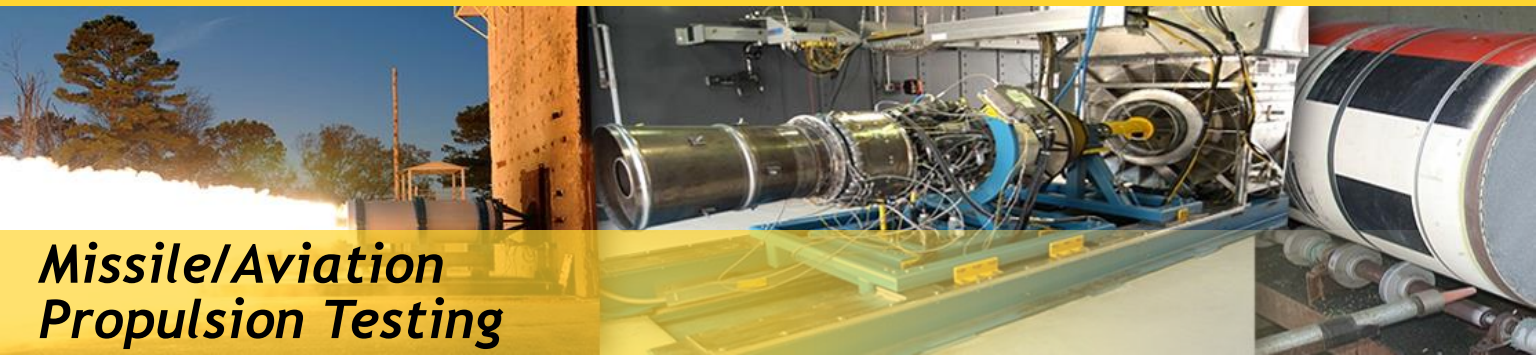
Mobile Telemetry Ground Station

Last 5 Years

- 01111010 **800+** *Telemetry Flights*
- **20+** *Flight Termination Systems*
- **700+** *Missile Flights*
- **50,000** *Lines of VHDL Code*
- **20Mb/s** *Data Rate*

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center



Missile/Aviation Propulsion Testing

RTC provides the Army's largest test facility staffed with experienced engineers and technicians with unique specialized, certified skills for static testing of liquid, solid and hybrid rocket and missile propulsion systems. This test capability includes five static test stands with nine test positions for both horizontal and vertical testing. These stands have thrust test capabilities up to 10,000,000 lbs of force, up to 250,000 lbs of propellant and includes unique capabilities to test with hypergolic fuels and oxidizers.

Test capabilities allow for exhaust plume attenuation and signature testing. The test area also includes a recently updated and renovated control facility and fully-instrumented blockhouse along with capabilities for ammunition storage. In addition to static test firing, RTC engineers and technicians are certified for rocket motor dissection up to 50,000 lbs of propellant.RTC static test facilities provide a "cradle to grave" test capability for propulsion testing from early concept development through recycle and demilitarization operations.

In addition to missile propulsion testing, RTC offers environmental testing for the conduct of explosive atmosphere, altitude and rapid decompression testing of developmental and fielded DoD and commercial assets. Finally, the Redstone Aviation Propulsion Test and Research (RAPTR) facility houses three bays for testing helicopter engines and various aircraft components.

CORE COMPETENCIES

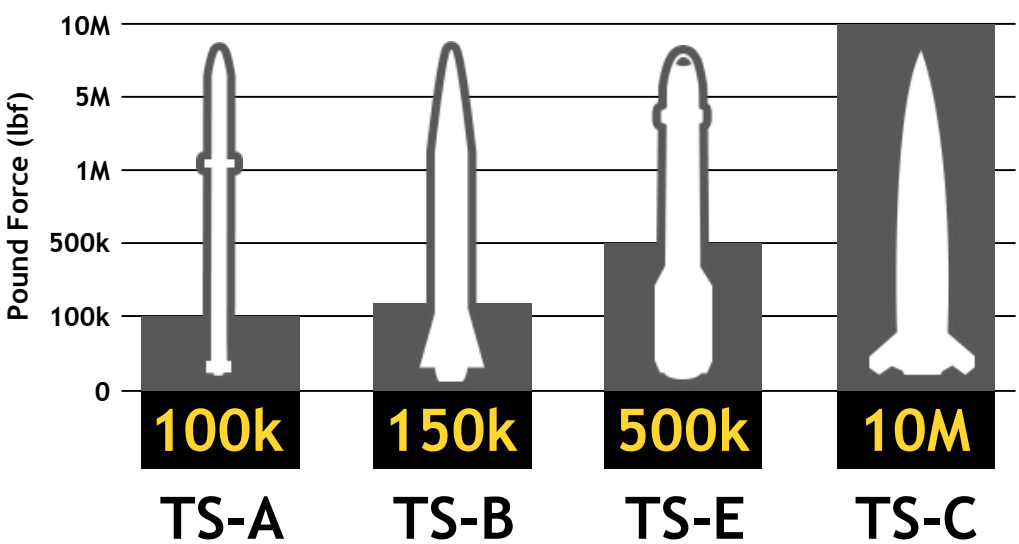
- Rocket Motor and Warhead Dissection
- Exhaust Plume Attenuation and Signature Testing
- Six Degrees of Freedom Motor Firings with Thrust Vector Control Systems
- Testing With Hypergolic Fuels and Oxidizers
- Mobile Liquid Propellant Action Response Team
- Ground Testing of Helicopter Engines
- Safety of Flight Testing (Explosive Atmosphere)
- High Altitude and Rapid Decompression
- Aircraft and Aviation Propulsion Components and Condition Based Maintenance Testing

CAPABILITY HIGHLIGHT

The Redstone Aviation Propulsion Test and Research Facility's three major test capabilities:

- Ground testing of Helicopter Engines (air-breathing turbo-shaft) and UAS Engines (turbo-prop)
- CBM Studies: Low Cycle Fatigue, Seeded Fault Integration, Component Testing (APU, ECU, Driveline)
- Facility offering development, acceptance, checkout testing for the current fielded Army aviation engine diagnostics system, Flexible Engine Diagnostic System.

Capacity of the Major Test Stands



Redstone Test Center

Sensor Testing in Open Air Range

RTC provides testing for sensors on Redstone Arsenal open air ranges and with safari test capabilities worldwide. Primary test mission areas include ground and airborne testing of seeker and sensor systems in an open air field environment.

RTC performs Sensor and Seeker field tests in the following areas:

- Captive-Carry Testing using the Stabilized Electro-Optical Airborne Instrumentation Platform (SEAIP)
- Ground based sensor testing
- Spectral characterization of targets and environments
- Testing of detection, acquisition and recognition systems
- GPS tracking test support with the Low-Cost, All-purpose, Instrumentation Tracking System (LOCAITS)
- Ground and aerial target support

Test Area 3 at Redstone Arsenal provides an open air instrumented range environment that serves as the primary range for field sensor test operations. The range encompasses more than 2,000 acres, with elevated pads ranging in height. Test Area 6 offers integration facilities and limited fabrication and machining capabilities. The Hatton Mountain Sensor Test Facility provides a 8.7 Km line-of-sight to the end of Test Area 3. RTC has an inventory of over 15 types of obscurants & countermeasures that are available for field sensor and seeker testing, signature measurement, etc.

CORE COMPETENCIES

- Primary Operations Center for TMO tactical vehicle testing
- 30+ Years Field testing sensor systems
- Execute field testing of cutting edge technologies for all DOD efforts
- Quality testing environment for DOD and non-DOD customers
- Excellence in providing air/ground obscurant testing
- Premiere range site for flare effectiveness testing
- Full Scale FOB Outdoor Entry Control Point facility for testing

CAPABILITY HIGHLIGHT

Field Signature Capabilities

- Infrared Signatures
- Thermal Contrast (ΔT)
- Spectral Radiometry
- Reflectance
- Laser Tracking/Scoring
- Field Calibration
- Ancillary Data

SEAIP

POINTING ACCURACY	PAYLOAD	AIRSPEED
35μrad	80lbs	180mph

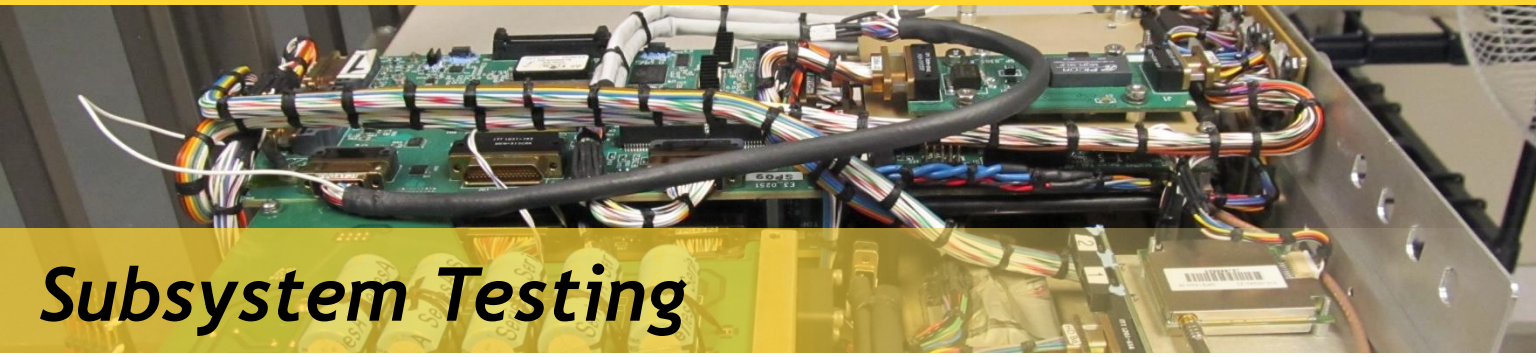
FIELD OF REGARD	OPERATING RANGE
+/-130°AZ; +65°/-115°EL	-40°C to +70°C

LOCAITS

TIME ACCURACY	VELOCITY	POSITION
20ns	0.03m/s	2cm CEP

TRANSMIT DATA RATE	ON-BOARD COLLECTION RATE	ATTITUDE
20Hz	200Hz	0.07°

Redstone Test Center



Subsystem Testing

RTC's workforce specializes in rapidly developing test instrumentation, set-ups and processes to support our customer's unique requirements. Subsystem knowledge and test capabilities are often combined with environmental capabilities to provide testing of assets while in extreme environments.

Regular testing includes avionics and other aviation subassemblies. RTC's expertise in testing missile seekers, guidance systems, and control systems can be traced back to the early days of Army tactical missiles. Customized test equipment developed internally at RTC, to include missile and aviation test sets, are used throughout a system's life-cycle and all over the world. RTC has a proven track record of providing affordable, in-depth data recording and visualization that provides our customers a real-time, independent look at system performance.

By providing expertise in testing, test equipment and in the systems tested, RTC maximizes our customers' return on funding.

CORE COMPETENCIES

- Embedded and application software coding in LabVIEW, C, C++, C#
- Programmable Logic development in VHDL and Verilog
- Printed Circuit Board design, fabrication, and testing
- Test set design, fabrication, and support
- Custom cable fabrication
- Data collection and analysis in support of numerous missile and aviation systems
- Subject matter expertise in RF reception and transmission

CAPABILITY HIGHLIGHT

RTC developed the Modernized HELLFIRE Universal Test Set to test all variants of all-up-round HELLFIRE missiles. MHUTS are used regularly at the HELLFIRE Production Facility; the Anniston Army Depot; on RTC Surveillance Test Vans; and at Climatic and Dynamic test facilities at RTC. MHUTS includes the ability to stimulate SAL and MMW seekers and is currently being adapted to support the upcoming dual-mode missile.

Test Sets

	Production Plant	Environmental Test Facility	Test Lab	Flight Range
HELLFIRE	4	5	6	-
Javelin	-	3	3	1
Stinger	-	-	1	-

	Surveillance	Depot	Marines
HELLFIRE	4	4	-
Javelin	2	-	2
Stinger	1	-	-

Redstone Test Center

Surveillance Testing

RTC conducts surveillance testing on Army and Foreign Military Sales throughout the world on major weapons systems to identify deterioration of components and to gather data to predict remaining shelf life and reliability.

Evaluation includes long-term storage effects for HELLFIRE, Longbow, Javelin, and Stinger missiles. World-wide surveillance testing is accomplished by subject matter experts with state-of-the-art mobile test vehicles. Engineers working with these systems provide evaluations; non-destructive functional testing; and electrical, mechanical, optical, and physical inspections. Surveillance testing increases readiness and war-fighting capability, and local commanders benefit by receiving current status on weapons and storage conditions.

CORE COMPETENCIES

- Missile Surveillance Testing
- State-of-the-Art Vehicles for World Wide Test Capability
- Safely test live tactical hardware
- Evaluation of long-term storage effects
- Non-Destructive Functional Testing
- Electrical/Mechanical/Optical /Physical Inspection

CAPABILITY HIGHLIGHT

- System safety, reliability, and shelf life of fielded missile hardware is determined from parametric test data results.
- Testing identifies and purges unserviceable hardware from inventory.

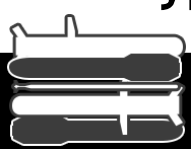
Missile Surveillance Test Vans

4 HELLFIRE

2 Javelin

1 Stinger

Typical Annual Activity



2,581 Missiles Tested

17,150 Miles Driven

12,050 Miles Flown

TEDT-RT-ATT(6L) (256) 876-3552 rtc.army.mil

Redstone Test Center

Warhead System Testing

Warhead System Testing at RTC evaluates lethality and performance using both dynamic and static test techniques. Two monorail rocket sled tracks of 1,000 ft and 2,000 ft are used to conduct dynamic warhead system tests against a wide array of armor or masonry targets of various construction as well as range and custom-built, special-purpose targets.

Static testing includes penetration tests against rolled homogenous armor plates and arena tests to evaluate fragment velocity & dispersion properties. Additional specialized test equipment and facilities include an 8-in Air Gun delivery system and Supersonic Rocket-on-a-Rope for warhead assessments. Each of these capabilities provides a controlled and repeatable delivery method at known angles-of-attack and accelerations/velocities. All testing is supported by state-of-the-art instrumentation including high-speed digital imagery, flash radiography, and digital instrumentation.

CORE COMPETENCIES

- Warhead Lethality & Performance via Dynamic Monorail Sled Tracks
- Static Warhead Penetration
- Static Warhead Arena Testing
- Air Gun Warhead Effects
- Supersonic Rocket-on-a-Rope for S&A/Fuze and Sensor Testing
- Reverse Ballistics Testing
- Behind Armor Debris Tests
- Advanced Instrumentation Design & Development
- High Speed Videography
- Custom Targets to Include Brick, Masonry, & Adobe Target Walls and RHA Armor Plates
- Meteorological Data & Forecasting

CAPABILITY HIGHLIGHT

Rocket-on-a-rope

A new capability available at the RTC is the implementation of a controlled-trajectory delivery method utilizing high-strength dual ropes and air-breathing, mini turbo-jet engines. This new delivery capability can propel a 50-lb payload at controlled speeds up to 100 m/sec along a range of up to 600 m. The system can be used to effectively evaluate warhead components and sensors.

Warhead Tests per Year

TOW 6	Hydra 70 39	HELLFIRE 64
Longbows 20	STINGER 9	R&D 7

MAILING ADDRESS

Redstone Test Center
Building 4500, Martin Road
Redstone Arsenal, AL 35898

WEBSITE

rtc.army.mil

EMAIL

rtc.contactus@mail.mil

> **Email Response Policy:**
> Our policy is to respond to emailed questions or requests within two working days. If it will take us longer to give you a complete response, we'll email you within those two days with an estimated date for the complete response.

PHONE

(256) 876-3552

Redstone Test Center
Redstone Arsenal
Huntsville, Alabama

/RTCUSA

/RedstoneTestCenter1