



United States Army Redstone Test Center

Commander - Colonel Patrick H. Mason
Technical Director - Mr. T David Byrd

The Redstone Test Center is a United States Army Test and Evaluation Command tenant activity on Redstone Arsenal, Ala. Our mission is to provide superior technical expertise and state-of-the-art facilities and capabilities to plan, conduct, analyze and report the results of test on aviation, missile and sensor systems, subsystems and components.



RTC is a customer-oriented organization that provides an unmatched value proposition through a combination of technical edge, expertise, service and integrity. RTC's strength lies in a highly skilled and dedicated workforce that is proficient in both testing and in the systems under test. Test services are provided to support a product through its entire life-cycle, from developmental test to production and stockpile sustainment.



Our highly skilled workforce is dedicated to the mission of providing the safest and most effective weapons systems possible to the Soldiers in the field.

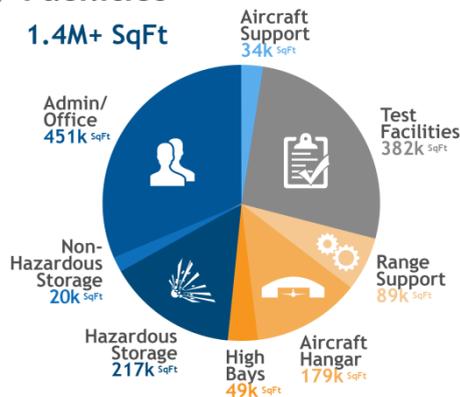
Financial



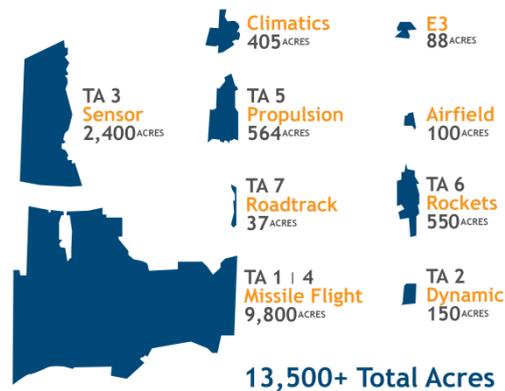
Customer Reimbursable

Facilities

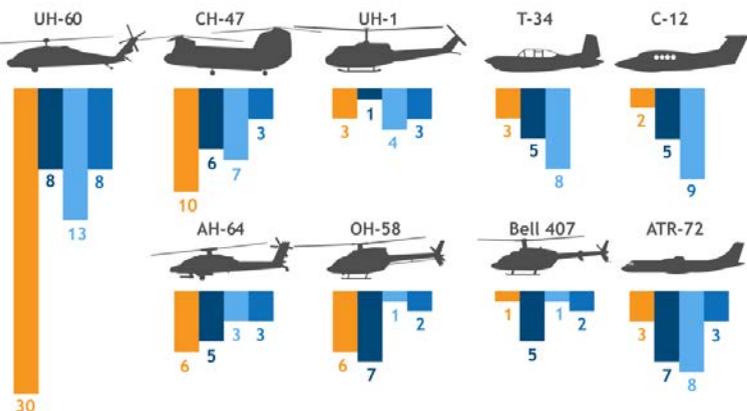
1.4M+ SqFt



Test Areas



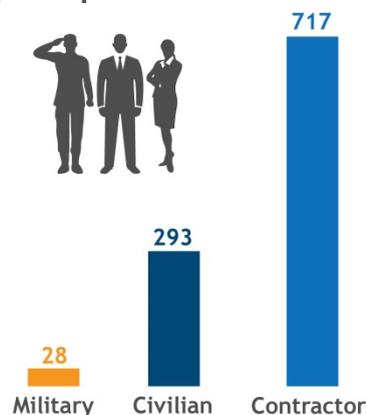
Aircraft/Pilots



Total

Aircraft
64
MIL Pilots
25
DAC Pilots
23
KTR Pilots
17

People



Areas of Expertise

- Aviation Flight Test Instrumentation
- Aviation Flight Test
- Aviation Installed System Testing
- Climatic Testing
- Component Testing
- Live, Virtual, Constructive Distributed Environments
- Laboratory Sensor Testing
- Sensor Testing in Open Air Range
- Surveillance & Stockpile Reliability Testing
- Hardware-in-the-Loop
- Subsystem Testing
- Instrumentation Development
- Electromagnetic Environmental Effects Testing
- Dynamics Testing
- Insensitive Munitions Testing
- Missile and Rocket Flight Testing
- Missile Propulsion Testing
- Missile Telemetry
- Warhead Testing



Redstone Test Center



Aviation Systems Test and Integration Lab (AvSTIL)

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

The AvSTIL is capable of simulating all current aircraft survivability equipment, aircraft 1553 bus traffic (to include EGI), as well as pilot static and radar altimeter information. The AvSTIL houses a test control center equipped with all necessary instrumentation to plan, execute and report on advanced flight tests and is collocated with a suite of Army aircraft to include the AH-64D/E, CH-47D/F, UH-60A/L/M, OH-58D and RQ-7 Shadow UAS.

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

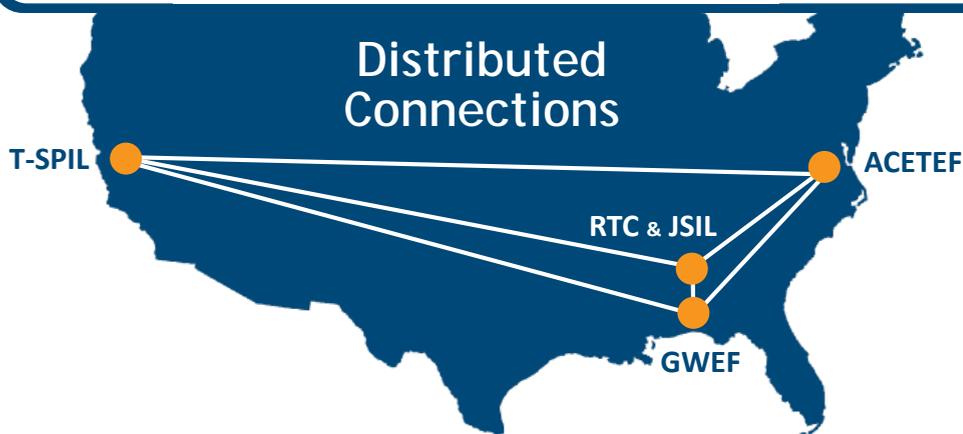
Capability Highlight

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

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

Provides AH-64D/E simulated manned unmanned teaming protocols for simulated UAS payload control during levels of interoperability two, three and four.

Aircraft Compatibility





Redstone Test Center



Aviation Flight Test

Redstone Test Center provides 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. Our Aviation testers are comprised of diverse and multi-disciplined 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.

To support the fleet of aircraft and more than 5,000 hours of flight testing performed each year, RTC maintains a maintenance and logistics capability, over 140 thousand square feet of hangar space, a flight operations center and a flight test control center.

While much of RTC aviation flight test operations are conducted at Redstone Arsenal, on many occasions test activities are executed at remote locations throughout the United States to include Yuma Proving Grounds, Ariz.; Eglin Air Force Base, Fla.; and Duluth, Minn. when specific capabilities or climatic conditions are required.

Core Competencies

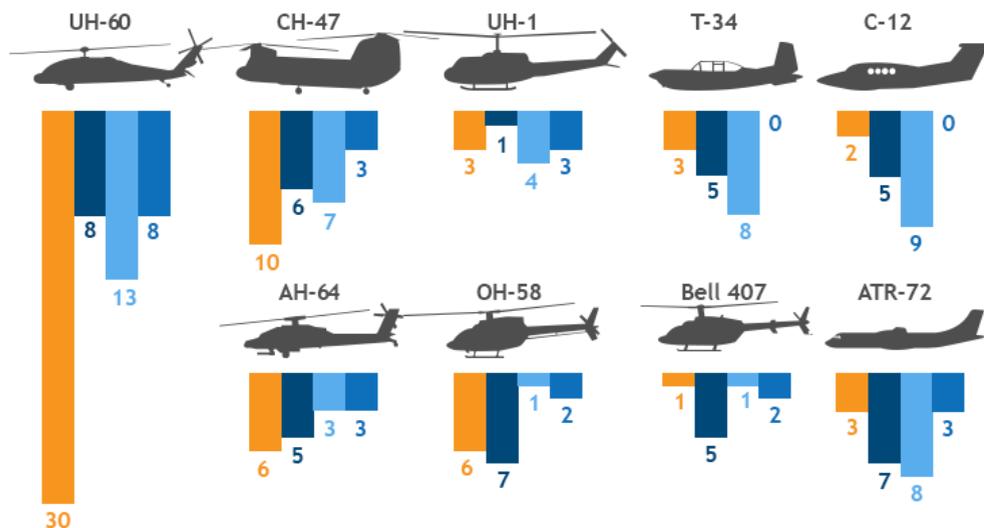
- Aircraft Survivability Testing
- Unmanned Aircraft System & Manned-Unmanned Teaming
- Targeting/Pilotage Sensors
- Navigation/Communications/Avionics
- Aircraft Platform Interoperability
- Software Regression
- Aircraft Performance
- Handling Qualities
- Aircraft Icing Testing - Natural & Artificial

Capability Highlight

The JCH-47D helicopter icing spray system 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: 64 Aircraft 25 MIL Pilots 23 DAC Pilots 17 KTR Pilots



Redstone Test Center



Aviation Flight Test Instrumentation

RTC provides support in the design, development, installation, integration and operation of aviation flight test instrumentation. Our engineers design, fabricate, install, integrate and calibrate various types of instrumentation systems. We provide collection and processing of real-time and post-mission airframe and systems flight test data at any location across CONUS. RTC electrical and mechanical engineers support the integration and installation of non-standard systems and subsystems into existing Army aircraft platforms. We provide airworthiness release data that supports airworthiness approval from RTC and AED flight releases. A key capability is the state-of-the-art flight test control center which provides real-time display of flight test data and flight test data storage. We also utilize wireless rotating instrumentation package to collect structures data on rotating components. The wireless rotating instrumentation package eliminates the need for legacy slip ring technology. Our capabilities encompass flight test instrumenting, data acquisition and recording, attitude measurement collection, global positioning system collection and processing, video recording and playback, flight test control, instrument systems calibration, instrumentation cockpit display, telemetry decommutation and display, open air environment data collection and ground station digital communication testing.

Core Competencies

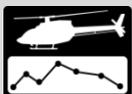
- Airborne data acquisition
- Real time flight test data monitoring for data quality and safety of flight
- Software development for unique data processing and analysis
- Wireless Rotating Instrumentation Package for rotating parameter measurement
- Structural design and analysis for test item and instrumentation 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 to collect data on rotating components located on the aircraft. The design allows the collection of structural data on the aircraft rotating components without the use of slip rings, which improves measurement accuracy and reduces data latency. The package supports significantly accelerated test schedules because the wireless system is essentially maintenance free.



Flight Test Data Collected (2013)



454 Total Hours

270 Telemetry Hours

Total Instrumented Parameters Across the Fleet



5700 Total

3000 Measured

2700 Bussed

TM Ground Stations



6 Total

2 Fixed

4 Mobile

Instrumentation



7000+ Items

\$27M+ Value



Redstone Test Center



Surveillance Testing

RTC routinely 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. Surveillance testing is done on state of the art mobile surveillance equipped test vehicles. Subject matter experts provide a world wide test capability. Engineers working with these systems provide evaluations of long term storage effects; non-destructive functional testing; and electrical, mechanical, optical, and physical inspections. Surveillance testing increases readiness and war fighting capability. 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



2,581*

Missiles Tested



17,150*

Miles Driven



12,050*

Miles Flown

* Number of tests completed in 1 year



Redstone Test Center



Subsystem Testing

RTC has a broad expanse of knowledge testing subsystems for aviation, missiles and sensors. Our workforce specializes in rapidly developing test instrumentation, set-ups and processes to support our customer's unique requirements. Our subsystem knowledge and test capabilities is often combined with our environmental capabilities to provide testing of assets while in extreme environments.

Some of our regular testing includes microwave and millimeter wave radar assemblies, subassemblies and components. We often test avionics, processors, and aviation subassemblies. And 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 systems life-cycle and all over the world.

By providing both expertise in testing, test equipment and in the systems we test, we maximize our customers' return on their 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 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



Hardware-in-the-Loop Testing

RTC has a suite of Hardware-in-the Loop facilities that include 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 that is used to provide non destructive test of all-up-round Longbow missiles for production and stockpile reliability; the Electro-Optical System Flight Evaluation Lab which is 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.
- Repetitive 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.
- Acutronics 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.



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



Redstone Test Center



E³ 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. Our engineers also know how to provide antenna pattern measurements and evaluate shielding effectiveness. Other services we provide 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.

Shielded Anechoic Chambers

 **Small Chambers (x3)**
12' x 12' x 8'

 **High Performance**
22' x 18' x 11'

 **Reverb**
42' x 20' x 14'

 **Large Chamber**
63' x 30' x 17'

 **JPRIMES**
104' x 74' x 26'

Length & width shown to scale



Redstone Test Center



Dynamic Testing

RTC provides world class expertise in dynamic testing for missile, aviation, and ground vehicle subsystems and components. Shock and vibration tests of hazardous items may be conducted at temperature extremes. RTC is developing new standards for multi-exciter/multi-axis excitation as an improved test methodology that provides 6 degree-of-freedom motion, supplementing current single axis excitation capabilities. Unique acoustics and vibro-acoustics facilities that include a large reverberation chamber containing a 6-DOF excitation system provide the ability to generate realistic 6-DOF motion combined with high intensity acoustic energy. Other laboratory test capabilities include: pyro-shock, acceleration (centrifuge), fuze/safe and arm device functional testing, loose cargo, pendulum impact, and drop tests. 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 courses exist for mobility of wheeled/tracked vehicles and comprehensive testing of Unmanned Ground Vehicles focused on challenging the system's sensor systems and artificial intelligence. Other field test capabilities include rail impact testing, mobile data acquisition, and signal analysis in support of laboratory vibration test schedule development. Analytical tools include finite element and modal analysis, rigid and flexible body vehicle dynamics, terrain induced vehicle vibration effects and vibration applications to elements in distributed LVC environments.

Core Competencies

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

Large Capacity 6-DOF

RTC's Large Capacity 6-DOF system is servo-hydraulic based with a standard footprint of 8 ft x 8 ft, 200k lb vertical axis force rating, 120k lb horizontal force rating, 3 inch dynamic stroke, and ± 6 degrees of angular motion.



Actuator Force



Pounds	Exciters
80k	1
55k	2
50k	5
40k	6
20k-30k	8
<20k	5

Table Size



Inches	Tables
144x48	2
96x96	1
60x60	8
48x48	3
36x36	3
30x30	2
Custom	7

Vibro-Acoustics

RTC's vibro-acoustics facility consists of an approximately 13,000 ft² reverberant acoustic chamber capable of obtaining 162dB SPL. Included within the chamber is a 6-DOF servo-hydraulic excitation system capable of 14k lb per DOF.

Displacement



Inches	Tables
6	2
5	1
3	7
2	12
<2	5

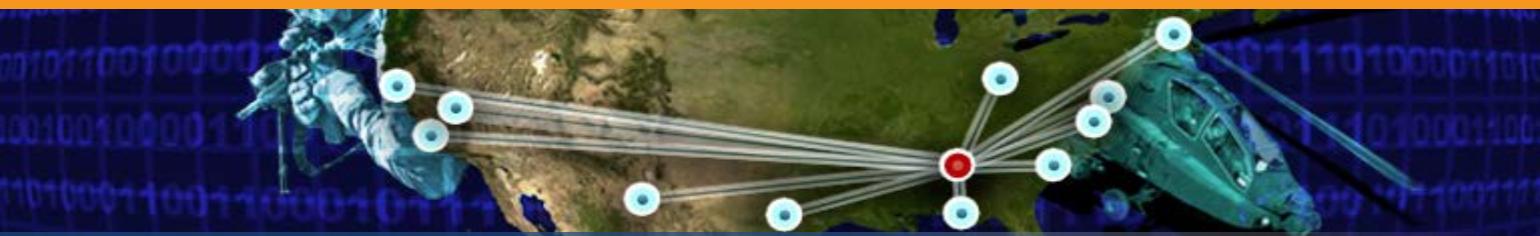
Degrees of Freedom



DOF	Tables
1	26
2	5
6	3



Redstone Test Center



Distributed Tests and Modeling & Simulation

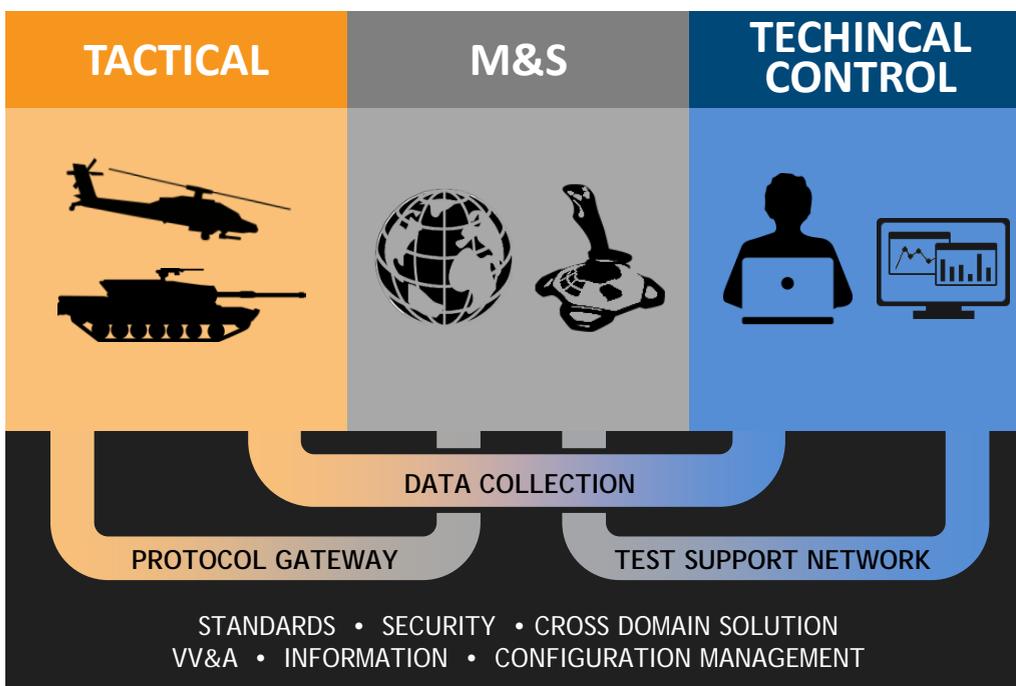
RTC's distributed testing and modeling & simulation capability is centered around the Distributed Test Control Center located in building 4500 on Redstone Arsenal. The DTCC is RTC's central point for integration in connecting distributed systems. For test events both internal to RTC and with outside organizations, it 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

Joint Scalable Tactical Emulation Network

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.





Redstone Test Center



Component Testing

RTC engineers and technicians perform a wide variety of component level tests that include 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 environment controlled laboratory which houses a wide variety of standard and specialized super high accuracy dimensional metrology equipment; electrical and optical components 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 very 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 a wide range test equipment, instrumentation and data acquisition equipment available.

Non-Destructive Test Capabilities include Metrology (Weight, CG, & Moments), X-ray (High Energy/Low Energy, Film, Digital Radiography, Computed Radiography and 3-D Computed Tomography), Radiographic Interpretation, Dynamic Spin Balance, and Coordinate Measuring.

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
- Optical 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 Number of Tests Performed



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

* Number of tests performed over 4 quarters



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 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. Test engineers and technicians also perform field services that include life cycle environmental profile development; field conditioning and instrumentation; and test specification and development.

Core Competencies

MIL-STD-810 Testing

- Test Chambers (42)
- Temperature Extremes (-100°F to 350°F)
- Chamber Volume (8 ft³ to 18,000 ft³)

Non-Destructive Testing

- Full Metrology (Weight, CG, & Moments)
- X-ray (Film, Direct Digital, CT)
- Dynamic Spin Balance
- CMM (2m X 4m X 1.5m)

Munitions and Ordnance Testing

- Missile/Ordnance Modification
- Inert Certification
- Explosive Prototype Development
- Missile Systems Exploitation
- Flash X-Ray

System Level Environmental Test Facility

Two New Drive-In Chambers with the Following Specifications:

- Size: 25' x 25' x 25'
- Temperature Range: -100°F to 185°F
- Humidity: 20%-95%
- Temperature Rate of Change: 35°F/min
- Load Capacity: 12,000 lb/ft²

Environmental Chamber Types and Quantities



Temperature Altitude (1)



Temperature Altitude Humidity (3)



Salt Fog (2)



Icing / Freezing Rain (1)



Temperature (17)



Contamination By Fluids (1)



Blowing Rain (1)



Blowing Dust (1)



Immersion (1)



Temperature Humidity (9)



Temperature Shock (13)



Dripping Rain (1)



Settling Dust (1)



Blowing Sand (1)



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 such as 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 tests such as Low-Cost, All-purpose, Instrumentation Tracking System (LOCAITS)
- Ground and aerial target support

Test areas at Redstone Arsenal provide 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. Also 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 35 μ rad	 PAYLOAD 80lbs	 AIRSPEED 180mph
 FIELD OF REGARD +/-130° AZ; +65°/-115° EL	 OPERATING RANGE -40°c to +70°c	

LOCAITS



 TIME ACCURACY 20ns	 VELOCITY 0.03m/s	 POSITION 2cm CEP
 TRANSMIT DATA RATE 20Hz	 ON-BOARD COLLECTION RATE 200Hz	 ATTITUDE 0.07°



Redstone Test Center



Missile/Aviation Propulsion Testing

RTC provides the Army's largest static test facility staffed with experienced engineers and technicians with unique specialized, certified skills for 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 include 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, our engineers and technicians are certified for rocket motor dissection up to 50,000 lbs. of propellant. Our 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, we offer environmental testing for the conduct of explosive atmosphere, altitude and rapid decompressions testing of developmental and fielded DoD and commercial assets. Finally, we have the Redstone Air Propulsion Test and Research (RAPTR) facility that houses three bays for testing helicopter engines and various other aircraft components. See capability highlights below for additional RAPTR information.

Core Competencies

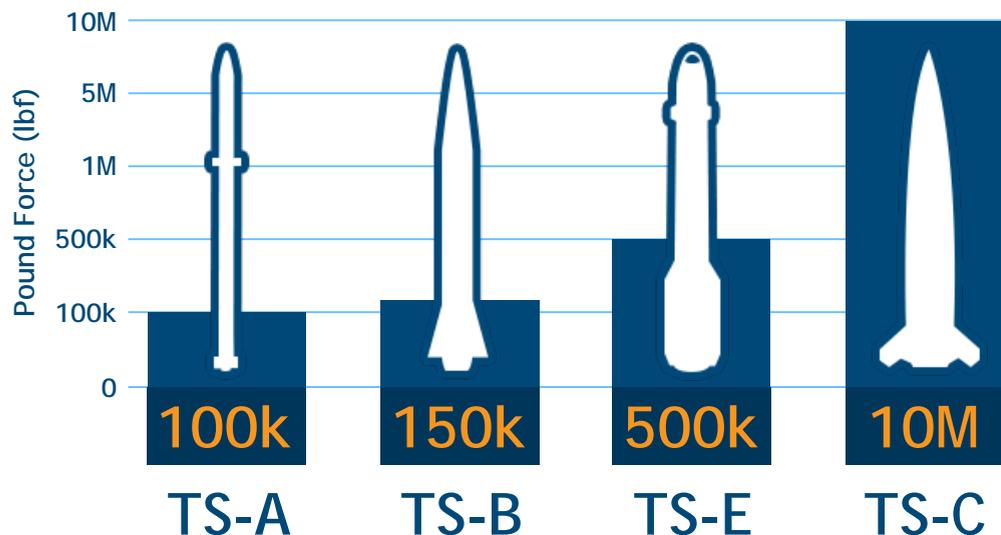
- Rocket Motor and Warhead Dissection
- Exhaust Plume Attenuation and Signature Testing
- Six Degrees of Freedom Motor Firings with Thrust Vector Control Systems
- Testing With Hypergolic Fuels and Oxidizers
- Mobile Liquid Propellant Action Response Team
- Ground Testing of Helicopter Engines
- Safety 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

Missile Telemetry

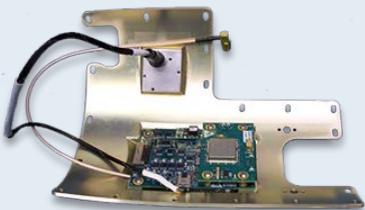
RTC engineers and technicians design, build, and test custom telemetry systems for R&D and fielded DOD weapon systems. This includes custom telemetry and FTS systems for R&D programs and telemetry systems for fielded or modified production weapon programs. RTC also maintains and operates state-of-the-art mobile and fixed telemetry ground station facilities in support of telemetry data acquisition on Redstone Arsenal and elsewhere. The Redstone Arsenal capabilities include multiple fixed telemetry sites whereas our telemetry vans and vehicles provide a capability to provide rapid response support at remote test locations worldwide. RTC engineers serve as subject matter experts for the Army and DoD in weapon system telemetry and flight termination hardware and application and also serve as a technical liaison between instrumentation research programs and actual Army/DoD weapon system needs. Test areas, facilities, & other capabilities include: a 15,000 Square Foot telemetry design and system development laboratory; telemetry ground station facilities; and mobile telemetry capabilities.

Core Competencies

- Telemetry Design to include:
 - Telemetry Formatting
 - Custom Printed Circuit Board Design and Assembly
 - FPGA Design
 - Custom Mechanical Packaging
- Telemetry and Data Movement Subject Matter Expertise
- Telemetry Ground Station Support
 - Local (Redstone Arsenal)
 - Mobile

Capability Highlight

Custom Telemetry Design:



Mobile Telemetry Ground Station:



Last 5 Years



800+ Telemetry Flights



20+ Flight Termination Systems



700+ Missile Flights



50,000 Lines of VHDL Code



20Mb/s Data Rate



Redstone Test Center



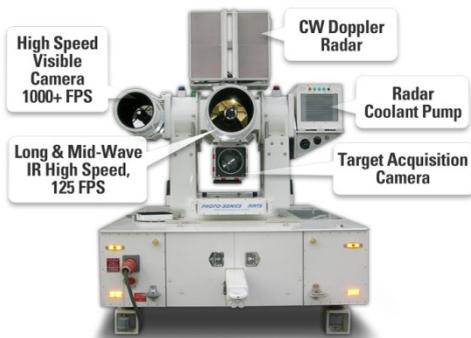
Missile Flight Testing

RTC's missile flight test capabilities center around Test Area 1, a fully-instrumented, 8km long range, located on 8,000 square feet with smaller, satellite ranges customized for R&D testing of new weapon system technologies, as well as project-managed systems at the system, subsystem and component level throughout the system's lifecycle. Flight test capabilities are designed for remote or man-fired testing of tactical guided missiles, rockets, and machine guns from 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 positioning information and velocity data collection through optical, acoustic, and radar systems such as Weibel doppler radar, Oehler acoustic arrays, Mobile Optical Tracking System, and the 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 optic 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

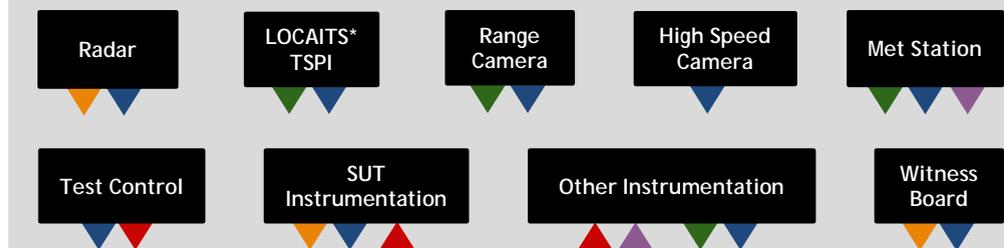
Capability Highlight



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



Visualization / Data Consumers

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



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 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. Some 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/ Infrared (x2)



LASER Lab



Visible Sensor



Hyperspectral Sensor



Mobile IR Scene Projector



RADAR Near Field Ranges (x2)



Acoustic Chamber & Speakers



Non-Uniformity Correction



Redstone Test Center



Inensitive Munitions Testing

Inensitive 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. Inensitive 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.

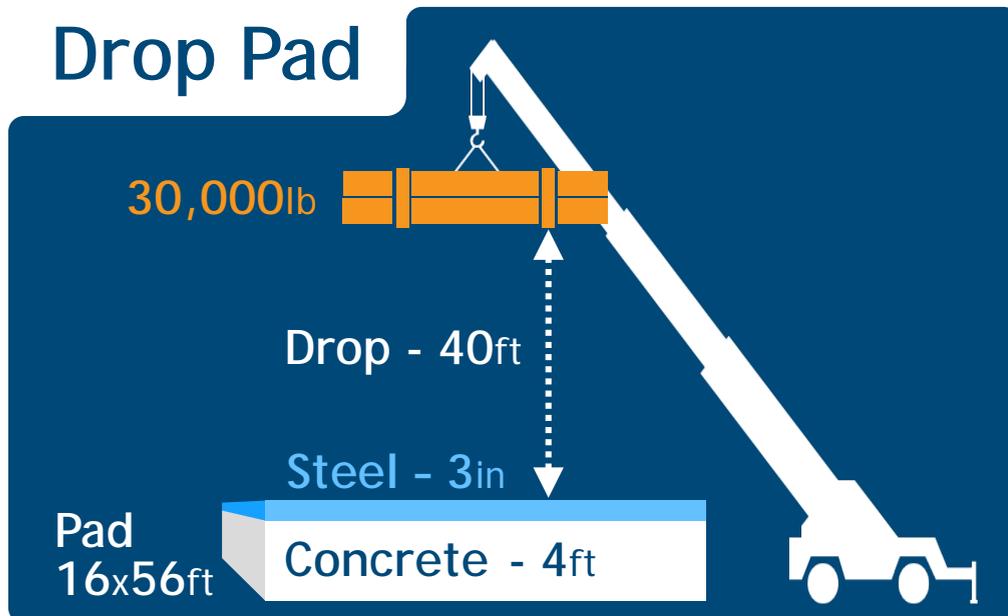
Core Competencies

- 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 Inensitive Munitions (IM) testing

Capability Highlight

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

Drop Pad



Drawing not to scale