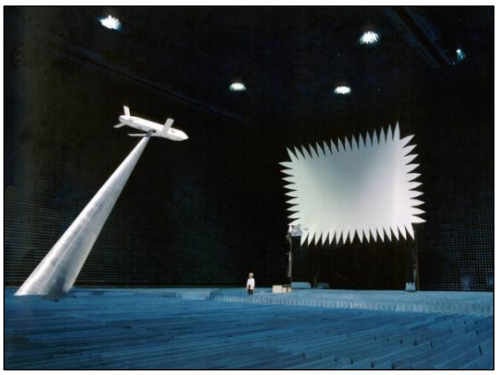
NAWCWD Quick Facts
China Lake & Point Mugu, CA NAVAIR

Radar Reflectivity Laboratories (RRL)

Bistatic, Large, and Small Monostatic Anechoic Chambers

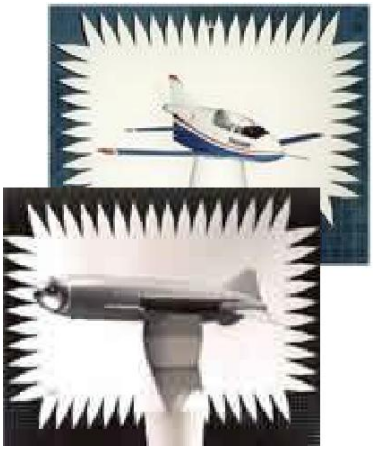


Mission. The RRL operates the indoor RCS test complex for measuring and analyzing far-field monostatic and bistatic RCS and antenna patterns over a wide range of frequencies, aspect angles, and polarizations.

Unique Features. The RRL is the DoD's premiere indoor RCS test center having far-field measurement capability over the widest frequency range of any test facility in the U.S. Furthermore, it is one of only a few DoD test centers capable of bistatic RCS testing. The RRL is staffed with nationally recognized experts in RCS measurements and analysis who are renowned for inventing high-resolution RCS imagery and algorithms. All facilities are approved for use at the top secret level. For these reasons, the RRL is in high demand by many DoD programs and regarded as a DoD national asset.

Combat Support. RCS engineers routinely work on optimizing the performance of platform signatures and sensor systems of major DoD programs across the Tri-Services. Recent activities have included RDT&E on new ballistic missile interceptor technologies and IED sensors for use in foreign combat theaters and homeland defense.

Cost / Time Savings. Indoor test capabilities provide high efficiencies for performing vast measurements in very short periods of time because the test item is immediately accessible for repositioning in the compact range test zone as compared to outdoor facilities, which require the test item to be separated from technicians by several miles. The indoor test environment provides cost efficiencies and high precision accuracy with all-weather secure test operations.



RDT&E. The RRL supports major DoD programs, including stealth (low observable) systems, advanced sensors, ship and aircraft systems, missiles, re-entry vehicles, drone targets, and unmanned vehicles. Examples include the Missile Defense Agency ballistic missile defense development programs such as the Patriot Advanced Capability Missile (PAC-3) and antenna development for the U.S. Air Force Advanced Space Global Position System.

Size / Description / Scope. All three chambers and additional laboratories provide over 40,000 SF of facility space located at Point Mugu. RCS measurements are accomplished by irradiating targets with a high-speed, wide-band radar while rotating the target in azimuth at various roll and pitch orientations. This approach yields RCS data for all desired angles for all frequencies within the operating range of the radar. The indoor environment provides secure, low-cost, precision, weather-independent measurements 24 hours a day. **Annual Test Events:** 80+. **Plant Value:** $30M+.

Main Facilities

Bistatic Anechoic Chamber. Dimensions are 150 feet wide x 150 feet long x 60 feet high, compact range far-field test zone size of 30 feet wide x 30 feet long x 20 feet high, measurement frequency range from 100 MHz to 100 GHz, bistatic angular coverage from 0 degree (monostatic) to 180 degrees in the horizontal plane, and 0 to 90 degrees in the vertical plane. Targets up to 10,000 pounds can be tested. There is no other facility like this in DoD or private industry.

- **Equipment.** The compact range reflector is mounted on eight 50-foot deep pylons that provide a highly stable measurement field. The chamber is equipped with a retractable 5-ton overhead bridge crane providing safe handling and mounting of a variety of test items in the test zone. The chamber is equipped with three electric-powered bucket man lifts and one electric-powered scissor man lift for elevating technicians while mounting test items in the test zone.

Large Monostatic Anechoic Chamber. Dimensions are 40 feet wide x 100 feet long x 40 feet high and compact range far-field test zone size of 16 feet wide x 16 feet long x 11 feet high. Measurement frequency range from 300 MHz to 100 GHz. Targets weighing up to 6,000 pounds can be tested.

- **Equipment.** The compact range reflector is mounted on six 30-foot deep pylons that provide a highly stable measurement field. The chamber is equipped with a retractable 3-ton overhead linear track crane. The chamber is equipped with an electric-powered scissor man lift.

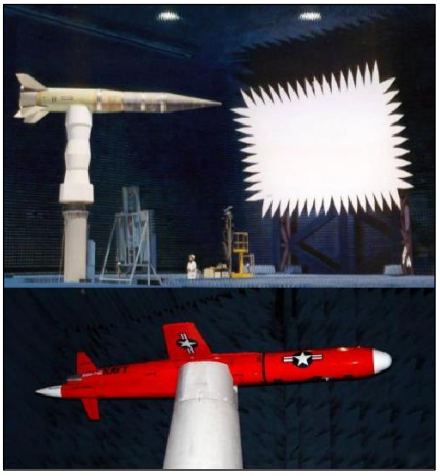
Small Monostatic Anechoic Chamber. Dimensions are 27 feet wide x 72 feet long x 17 feet high and direct illumination test zone size approximately 10 feet wide x 10 feet long x 5 feet high. Measurement frequency range from 900 MHz to 100 GHz.

- **Equipment.** Includes a retractable 1.5-ton overhead linear track crane providing optimal safe handling and mounting of a variety of test items in the test zone.

Instrumentation. All three anechoic chambers are equipped with state-of-the-art, pulsed, high-speed instrumentation radars. Each chamber is equipped with a variety of feed antennas for any required frequency and polarization as well as a variety of RCS and antenna calibration standards. The RRL machine shop support areas include a variety of metalworking machines. The Styrofoam shaping areas include three computer-controlled, high-precision hot wire foam-cutting machines.

RCS data products include high-resolution inverse synthetic aperture radar (ISAR) images, RCS versus frequency, RCS versus azimuth, medianized signature data, statistical signature analysis, down-range RCS, global range, global RCS, range-Doppler plots, glint and range-Doppler spectra, jet-engine modulation, N-point scatterer target signature, and background / clutter modeling.

Unique or Historic Tests. The RRL improved the guidance system of the Extended Range INTerceptor (ERINT), which was an Army ballistic missile defense research effort in parallel with PAC-2 upgrade efforts in the early 1990s. During a major proof of performance fly-off test at White Sands Missile Range in 1993, the ERINT was the only successful system with a direct hit on the ballistic missile target. This success, which was anchored on the RRL contributions, led to ERINT becoming the PAC-3 interceptor, which is now widely deployed with U.S. and allied military forces around the world.



Recognition / Awards. The RRL is recognized for stellar performance in stealth fighters and ships, ballistic missile defense, and sensors for early warning and advanced guidance systems. RRL has more than 20 U.S. patents in advanced devices and RCS processing algorithms. Technologies are widely published in technical symposia and journals, such as the Institute of Electrical and Electronics Engineers (IEEE) and the Antenna Measurement and Techniques Association (AMTA). RRL engineer, Dr. Dean Mensa, is internationally recognized for his two books on high-resolution RCS imagery. The Chief of Naval Operations highly commended the RRL technical team for their significant contributions to improving stealth ships for Navy survivability. Likewise, the Missile Defense Agency has highly commended the RRL technical staff for contributions towards improved interceptor missile systems for theater and continental U.S. defense.

Historical Significance. By the late 1970s, the RRL began testing low-observable systems. Dr. Dean Mensa invented high-resolution ISAR RCS imaging, which provided a breakthrough for stealth system design and modification, because for the first time, a test item's reflection sources could be precisely mapped to their physical locations on the vehicle.