

Mission. Skytop conducts static test firing of solid-propellant rocket engines, gas generators, and ignition systems that are both fielded and developmental. Skytop evaluates rocket motors being qualified for future use in complete weapon systems and conducts aging or surveillance studies to ensure deployed motors are maintaining specific design capabilities. Verification of rocket motor susceptibility to failure is monitored during testing to identify and correct any failure points.

Unique Features. Skytop is one of only a few propulsion test facilities nationwide with no encroachment issues. The U.S. Navy controls the land as well as the airspace for miles around, and areas are set aside specifically for very high-hazard testing of large solid-fuel engines. The multidisciplinary technical team is highly trained. Full-scale all-up-round motor experimentation is conducted on weapon systems with up to two million pounds of thrust and up to 92 inches in diameter.

Combat Support. Developmental and production acceptance testing, as well as aging motor studies of the Navy's submarine-launched fleet ballistic missiles, have all been conducted at Skytop, ensuring the U.S. has the most reliable strategic deterrent system in existence. Skytop has been instrumental in the developmental testing of most tactical air- and surface-launched weapons currently in use by the Fleet today.

Cost / Time Savings Examples. Intercontinental Ballistic Missile (ICBM) Booster. In 2008, the Missile Defense Agency came to China Lake with an urgent requirement to test their candidate target ICBM booster. To perform this mission, Skytop personnel had to design and assemble a thrust vector control system as well as the calibration tooling and hydraulic system to support it, because the flight systems were unavailable. From a blank piece of paper in August 2008 to a successful firing in January 2009, the China Lake team pulled it off and turned the system around for an enhanced follow-on test in just two months, all the while supporting normally scheduled tactical developmental engine testing. **Long Range Anti-Ship Missile (LRASM).** In 2009, the LRASM program expressed interest in testing 20-year-old Supersonic Launched Aerial Target (SLAT) motors in flight-like conditions. In an eight-week in-house effort, an air storage capability and high-speed valving was designed, built, and installed in Bay 1 to provide air flow to mimic the dynamic conditions experienced on the forward end of the rocket motor in flight.

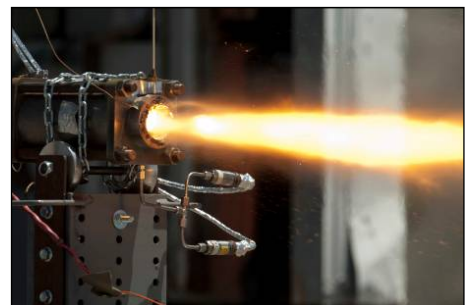


RDT&E. Production motors with thrusts up to one million pounds can be heavily instrumented and tested in any of several nozzle-down angles on a one-of-a-kind hydraulic tilt-table, and in the horizontal mode with thrusts to 1.5 million pounds. Developmental or other high-hazard engines with thrusts to 300,000 pounds can also be tested in one of two high-hazard test bays. Additional activities include machining of rocket motors for propellant aging studies.

Size / Description / Scope. The Skytop area consists of 1.5 square miles of land in the southeast corner of the China Lake complex, an isolated location enabling testing of large, high-energy, high-risk systems. Two facilities, Bay 2A and Bay 3, are about 8.4 miles from Main Site. The explosive limit is 205,000 pounds of the highest energy propellant and 300,000 pounds of the less sensitive propellant, both in NEW. **Annual Test Events:** 115. **Plant Value:** \$35M+.

Main Facilities. Encompass 30,000 SF of enclosed instrumentation, fabrication, test, and storage space. Facilities include a bunkered control room and four active test bays, with one common data reduction facility.

- **Main Control Room.** Connected via fiber-optics to all test bays and the data reduction center
- **Data Reduction Center.** Dual classified / unclassified data reduction computers
- **Bay I (Tactical High-Hazard Bay).** Capable of handling steady-state, horizontal rocket thrust to 100,000 pounds, vertical to 10,000 pounds, with temperature conditioning from -65 to 220°F
- **Bay-IIA (Tactical or Strategic High-Hazard Bay).** Capable of handling steady-state, horizontal rocket thrust to 300,000 pounds, with temperature conditioning in nominal ambient conditions
- **Bay-VI (Strategic systems Tilt Bay).** Capable of handling steady-state horizontal through vertical (in several angle steps) rocket thrust to one million pounds, with temperature conditioning in nominal ambient conditions
- **Bay-VII (Strategic Systems Horizontal Bay).** Capable of handling steady-state rocket thrust to 1.5 million pounds, with temperature conditioning in nominal ambient conditions



The original construction for Bay 1 and 2 occurred from 1959 to 1961 to evaluate the first generation of the Polaris fleet ballistic missile rocket motors. Bay 6 and Bay 7 were constructed for the Fleet Ballistic Missile Program and operational in March 1986.

Equipment. A state-of-the-art main control room documents test events. The telemetry system is fast and accurate based on the instrumented rocket motor. Temperature conditioning is available, and earth-covered camera stations provide for full photographic coverage. Customer needs for raw data in basic engineering units is available after every test. High-speed video cameras provide visual documentation. Multiple bridge and gantry cranes are available with up to 65-ton capacity, and custom-built test stands, quench / deluge systems, and engine controls (including thrust vector controls) are available in-house.



Instrumentation. All four test bays are capable of handling an array of modern test instrumentation including pressure, thrust, shock and vibration (piezo-electric as well as piezo-resistive), displacement, temperature, and command and feedback data. Data rates available run from 1 kilosamples-per-second-per-channel to 100 kilosamples-per-second-per-channel, with anti-alias filtering, digitized to 12-bits per sample. Aggregate data rates can run past 4 million samples per second, recorded in real-time on redundant RAID systems. All data reduction, even on very large instrumentation arrays (in excess of 100 channels), is completed the day of the test and usually within minutes after firing. Instrumentation arrays in excess of 250 channels have been successfully handled here on many occasions.

Interesting Facts. Lockheed Martin Space Division and China Lake rocket motor and nozzle design scientists have worked together since 1956 on the early development of the Polaris Submarine Launched Ballistic Missile Program. Another interesting fact is that the fleet ballistic missile motor railroad includes an umbilical road that connects the Center's northern and southern land areas. Railroad tracks are used to haul in the massive fleet ballistic missile motors, and specially built trucks carry the motors from the unloading dock to the X-ray building and then to Skytop. Tracks are owned by the Searles Valley Minerals, Inc., soda ash processing plant located nearby at Trona, California. This is one of only a few privately owned short line railroads remaining in U.S. operation.

Recognition / Awards. The Strategic System Programs Commander has issued many letters of commendation to the Ordnance Test and Evaluation Division for superior performance and support to the Fleet Ballistic Missile Program. Navy, Air Force, NASA, and other government agencies have also commended the professional work in propulsion testing. In 2009, Skytop fired two fleet ballistic missile C4 FS motors for the Missile Defense Agency. These tests were noted on Aviation Week's website.

Historical Significance. **Bay I:** Built in 1960 to support the Polaris program. **Bay IIA:** Built in the 1970s to support the fleet ballistic missile C4 program. **Bay VI and Bay VII:** Built in 1984 to support subsequent submarine-launched fleet ballistic missile programs. **Year Opened:** 1956.

Future Plans. Constant change places this facility in a prime position for next generation development in rocket motors. Bay I is undergoing an instrumentation and control upgrade, and it is anticipated that it will be regularly used by the Harpoon Ordnance Assessment and other tactical missile programs.