



California's Space Economy

The Launchpad for Innovation

A GO-Biz overview on California's space economy ecosystem, space infrastructure assets, and opportunities for the commercial space sector to grow and thrive.

State of California

Governor's Office of Business and Economic Development

Gavin Newsom

Governor

Dee Dee Myers

Director

Emily Desai

Chief Deputy Director



Building a Community-Led,
Climate-Forward Economy

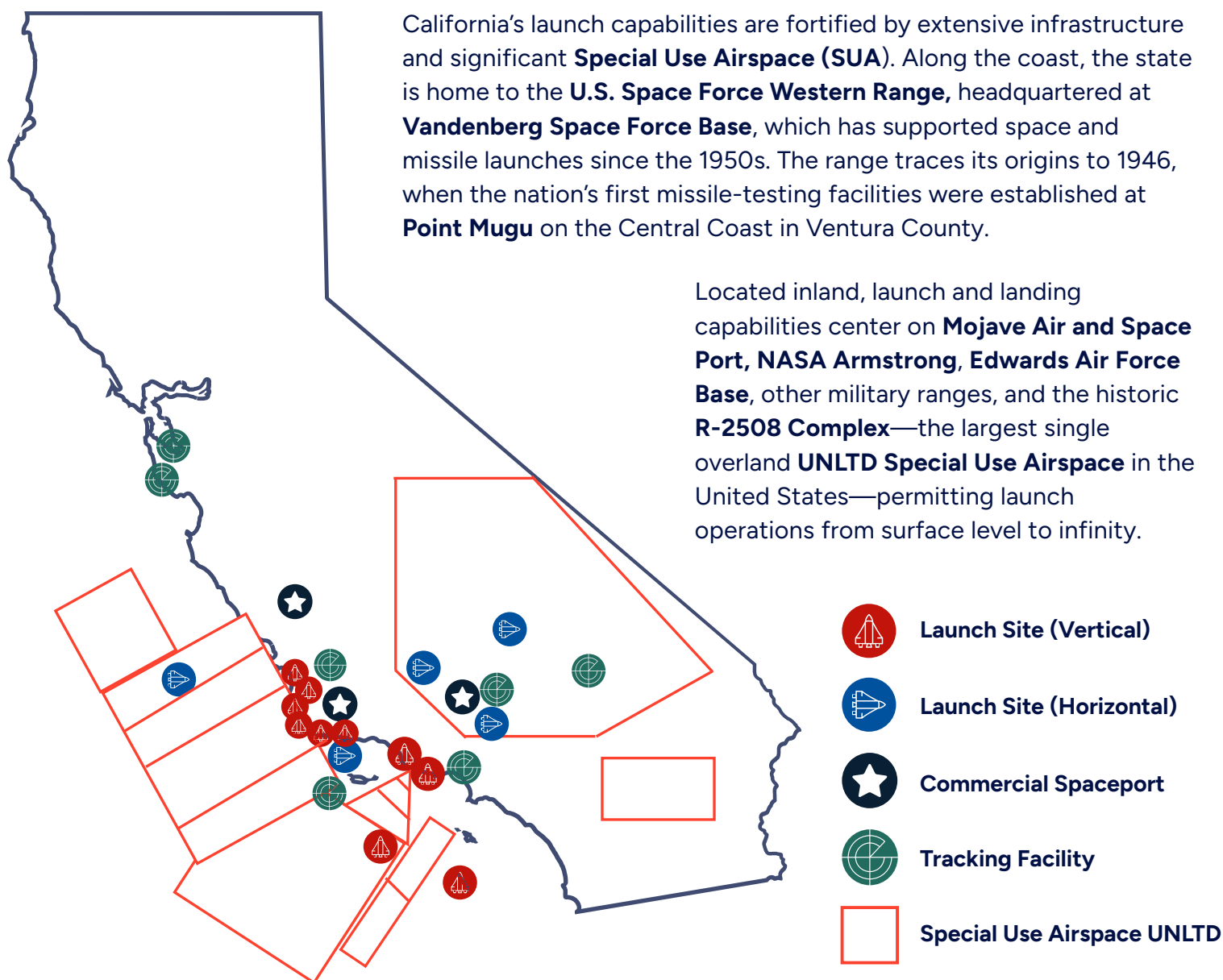
California's Space Economy

Spaceport and Launch

California's launch capabilities are unmatched, with over 2,000 launches to date—1,000+ to orbit. California was the launch site for **Discoverer 1** (world's first polar-orbiting satellite), **Navstar 1** (world's first GPS satellite), and **SpaceShipOne** (first privately developed human spaceflight). The state holds two active commercial licensed spaceports—**Vandenberg Space Force Base** and **Mojave Air & Space Port**—with another spaceport site in development and more under consideration.

California's launch capabilities are fortified by extensive infrastructure and significant **Special Use Airspace (SUA)**. Along the coast, the state is home to the **U.S. Space Force Western Range**, headquartered at **Vandenberg Space Force Base**, which has supported space and missile launches since the 1950s. The range traces its origins to 1946, when the nation's first missile-testing facilities were established at **Point Mugu** on the Central Coast in Ventura County.

Located inland, launch and landing capabilities center on **Mojave Air and Space Port**, **NASA Armstrong**, **Edwards Air Force Base**, other military ranges, and the historic **R-2508 Complex**—the largest single overland **UNLTD Special Use Airspace** in the United States—permitting launch operations from surface level to infinity.



Launch sites include both active and historical locations where rockets or spacecraft have successfully achieved suborbital apogee. **Spaceports** are designated facilities that hold an FAA or federal launch license or are nearing certification for operational status. **Special Use Airspace** refers to regions where the FAA has designated the atmospheric upper limit as UNLTD (unlimited), indicating operational capability from ground to infinity..

California's Space Economy

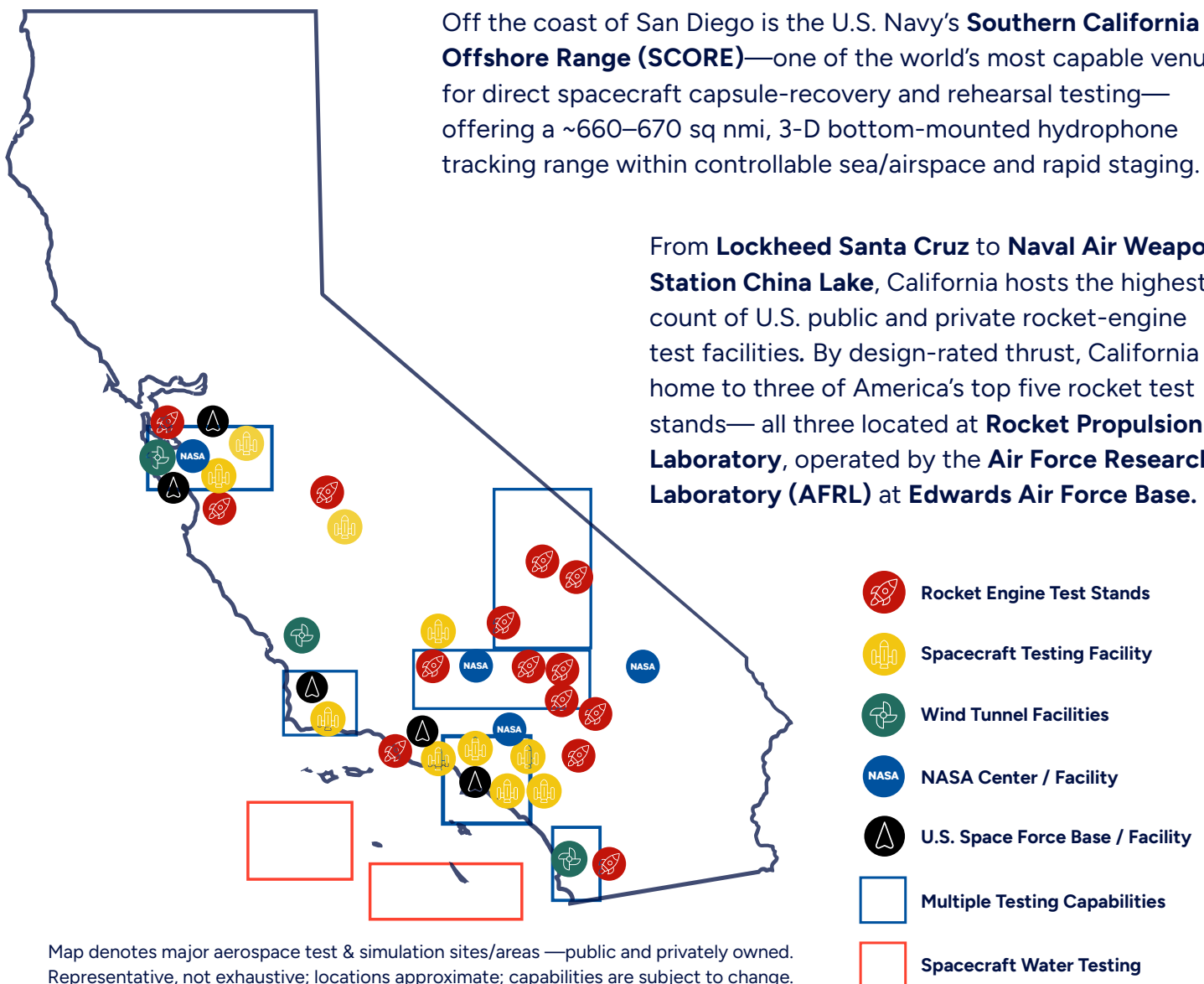
Testing and Simulation

Beneath California's skies lies the world's most complete aerospace testbed. This integrated network lets companies test engines, materials design, and recovery concepts all in one state. California NASA facilities host assets such as the **National Full-Scale Aerodynamics Complex (NFAC)**—the world's largest wind tunnel; the **Arc Jet Complex**—the nation's highest-powered hyper-thermal test facility; the **Vertical Motion Simulator (VMS)**—the world's largest motion-based flight simulator; and the historic **25-foot Space Simulator**—the world's first spacecraft deep-space thermal-vacuum chamber.

Beyond NASA, spacecraft qualification is also performed across the state at world-class, privately owned facilities such as **Lockheed Martin's Sunnyvale Campus (Sunnyvale)**, **Northrop Grumman's Space Park (Redondo Beach)**, and **Boeing's Space Environment Test Facility (El Segundo)**.

Off the coast of San Diego is the U.S. Navy's **Southern California Offshore Range (SCORE)**—one of the world's most capable venues for direct spacecraft capsule-recovery and rehearsal testing—offering a ~660–670 sq nmi, 3-D bottom-mounted hydrophone tracking range within controllable sea/airspace and rapid staging.

From **Lockheed Santa Cruz** to **Naval Air Weapons Station China Lake**, California hosts the highest count of U.S. public and private rocket-engine test facilities. By design-rated thrust, California is home to three of America's top five rocket test stands—all three located at **Rocket Propulsion Laboratory**, operated by the **Air Force Research Laboratory (AFRL)** at **Edwards Air Force Base**.



California's Space Economy

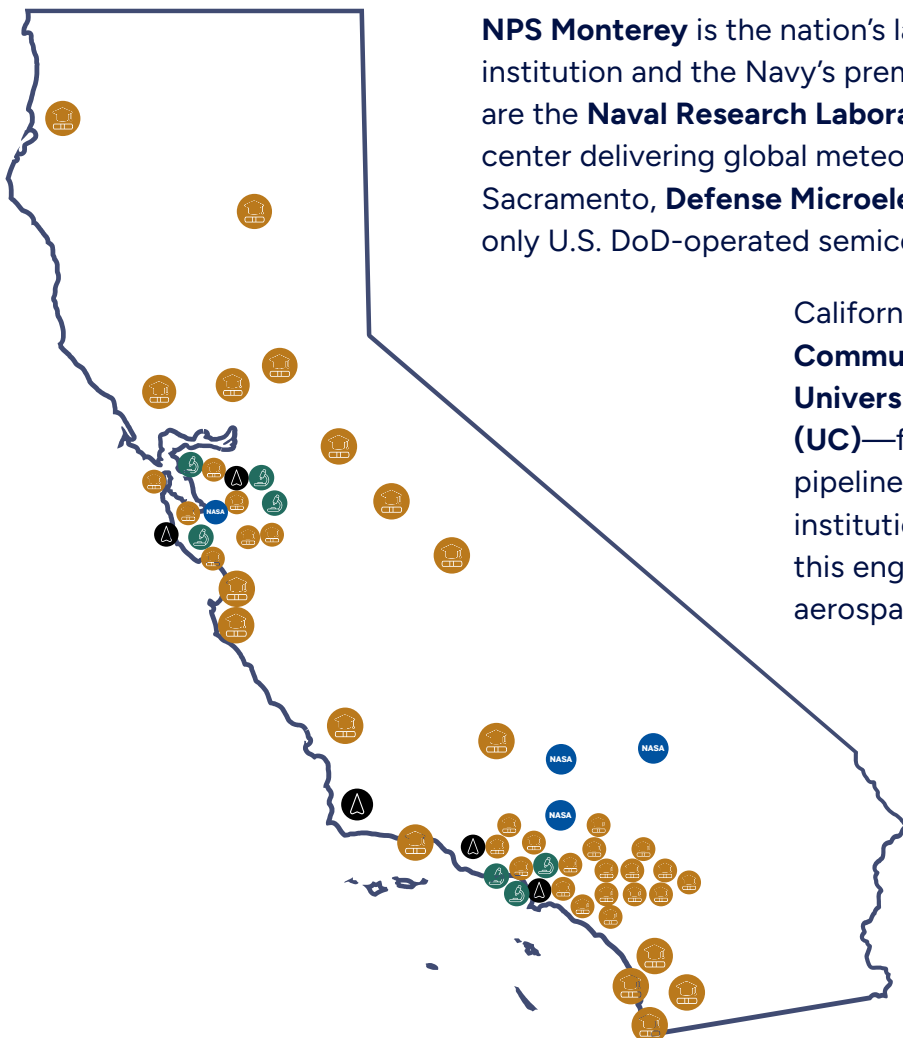
Education, Technology Transfer, and R&D

California ranks **#1 in NASA science funding**, **#1 in corporate aerospace R&D spending**, and **#1 in space-technology venture capital**. Together, these reflect the nation's highest concentration of aerospace talent, with California alone accounting for roughly **40% of all U.S. space-technology patents**.

This ecosystem includes leading NASA centers and facilities (**Ames, Armstrong, Goldstone, JPL**), four DOE national laboratories (**Berkeley Lab, Livermore Lab, Sandia, SLAC**), and major DoD R&D procurement hubs (such as **AFRL, SpaceWERX, NIWC Pacific, NAVWAR**). The **Defense Innovation Unit (DIU)**—the military's innovation and emerging tech arm—is HQ'd in Silicon Valley. California also hosts the nation's largest number of FFRDCs, including **The Aerospace Corporation** and three RAND-operated centers: **Project AIR FORCE**, the Army's **Arroyo Center**, and the **National Defense Research Institute**.

NPS Monterey is the nation's largest single military graduate-education institution and the Navy's premier space-education institute. Near NPS, are the **Naval Research Laboratory** and **FNMOC**, a supercomputing center delivering global meteorological support to all U.S. forces. In Sacramento, **Defense Microelectronics Activity (DMEA)** operates as the only U.S. DoD-operated semiconductor fab and microelectronic foundry.

California's higher education engine—**California Community Colleges (CCC)**, **California State University (CSU)**, and the **University of California (UC)**—forms the nation's most productive public pipeline for aerospace talent. Alongside private institutions such as **Stanford, USC**, and **Caltech**, this engine helps California produce more aerospace engineers than anywhere in the U.S.



University w/ Aerospace



National Lab / FFRDC / UARC



U.S. Space Force Base / Facility



NASA Center / Facility

Depicted universities are California institutions with aerospace/space relevance, including degree programs and labs in aerospace/astronautical engineering. **National Labs/FFRDCs/UARC** include only those listed by the U.S. National Center for Science and Engineering Statistics.

California's Space Economy

Observation, Communication, and Tracking

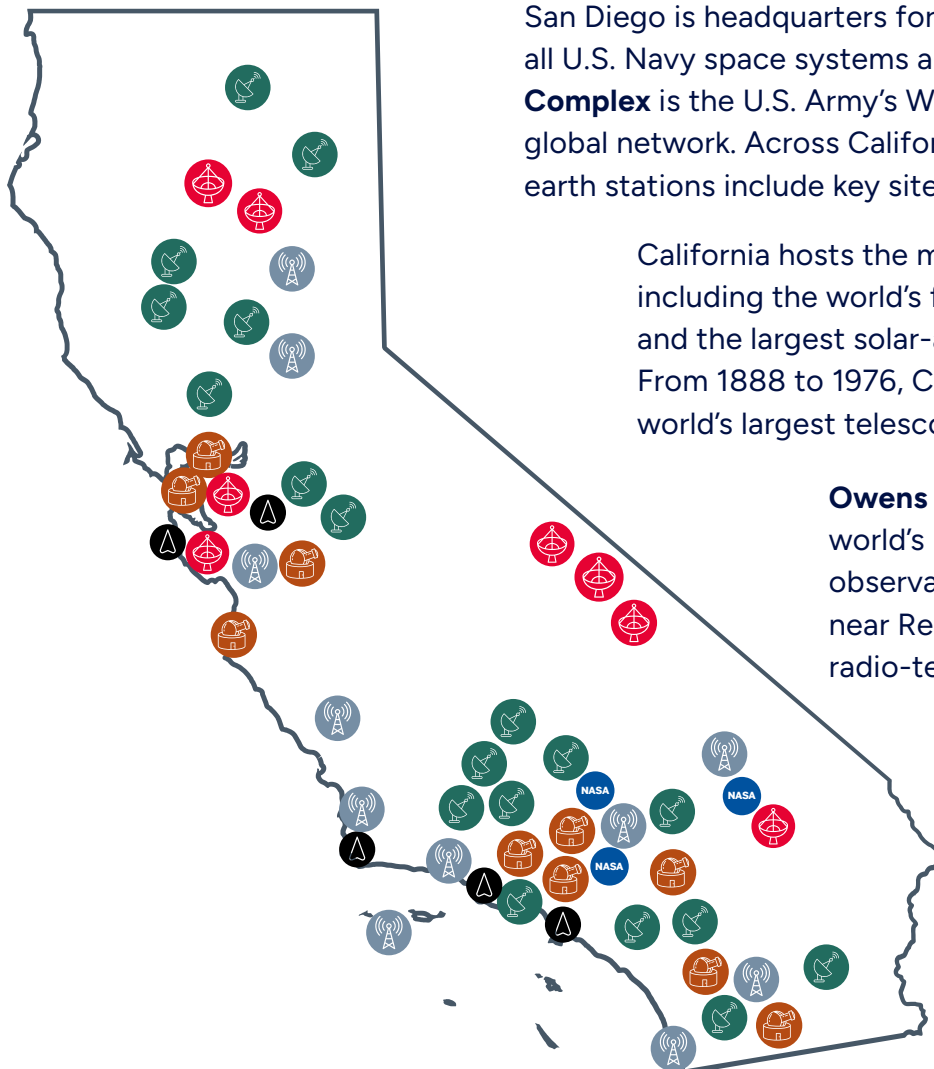
Often overlooked, California quietly anchors the nation's space observation and telecom backbone. California is home to NASA's **Goldstone Deep Space Communications Complex** in the Mojave—the heart of the **Deep Space Network (DSN)**, the world's largest scientific telecom system. Goldstone communicates for NASA's interplanetary missions, including **Voyager 1 and 2** (both also built in California), the most distant human-made objects in the solar system. California also hosts **NASA's Table Mountain Observatory (Wrightwood)** and **NASA's Monument Peak Station (San Diego County)**.

Vandenberg SFB is the headquarters of **U.S. Space Forces - Space (S4S)** and **Combined Space Operations Center (CSpOC)**. The base manages the **Space Surveillance Network (SSN)**—the world's largest space-tracking system—monitoring more than 45,000 cataloged, human-made objects in Earth orbit. Other Space Force sites include **Laguna Peak**, **Camp Parks Satellite Complex**, and **Pillar Point**.

San Diego is headquarters for **NAVMAR**, the technical command for all U.S. Navy space systems and SATCOM. **Camp Roberts Satellite Complex** is the U.S. Army's West Coast SATCOM on-ramp to the global network. Across California, company-owned teleports and earth stations include key sites for **Intelsat**, **SpaceX**, and **COMSAT**.

California hosts the most U.S. space research observatories, including the world's first mountaintop observatory (**Lick**) and the largest solar-aperture observatory (**Big Bear**). From 1888 to 1976, California observatories housed the world's largest telescopes (**Lick**, **Wilson**, **Palomar**).

Owens Valley Radio Observatory is the world's largest university-operated radio observatory. **Hat Creek Radio Observatory** near Redding hosts the world's only radio-telescope array purpose-built for **SETI**.



Map includes only major astronomical and radio observatories. **Communications Complexes** are those operated by U.S. military, with the exception of USSF facilities which are denoted.

-  **Astronomical Observatory**
-  **Communications Complex**
-  **Radio Observatory**
-  **Teleport / Ground Station(s)**
-  **NASA Center / Facility**
-  **U.S. Space Force Base / Facility**

California's Space Economy

Defense Infrastructure and Logistics

The space economy in California is bolstered by a century of defense leadership and a statewide lattice of military assets. No state fields more military bases—or more uniformed personnel—than California.

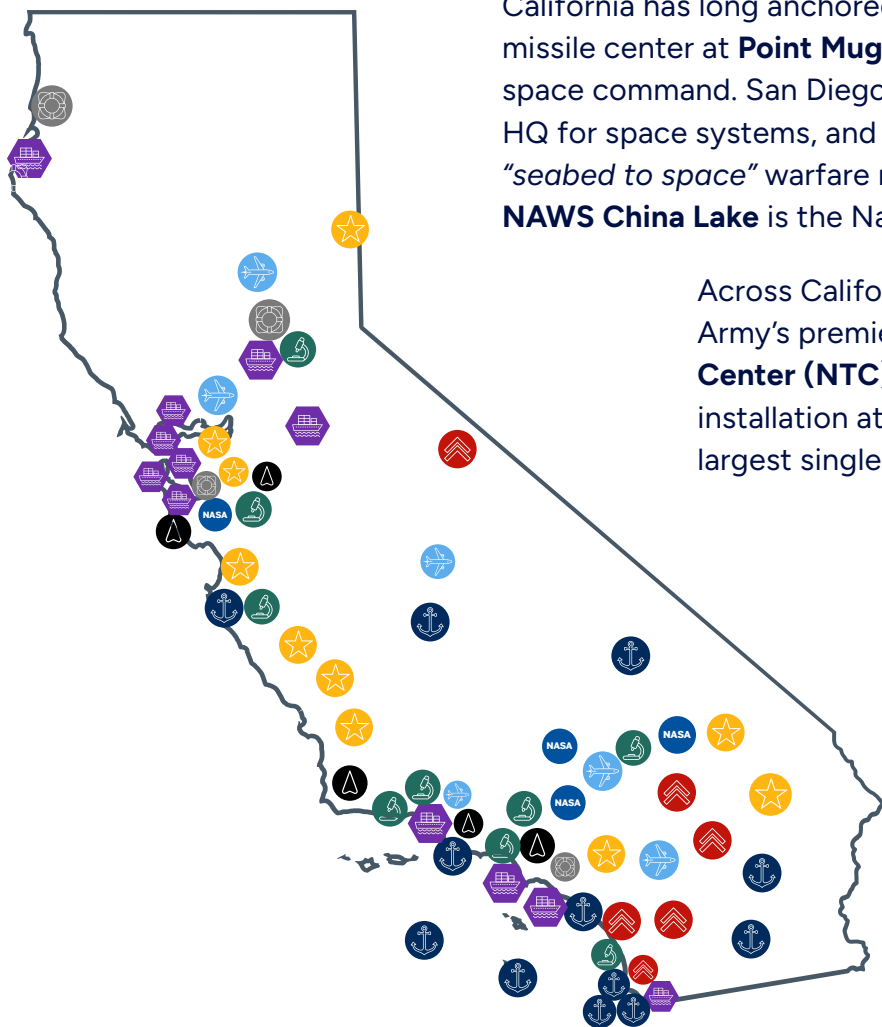
Los Angeles AFB hosts **Space Systems Command**, the Space Force's space development HQ, and **SpaceWERX**, the service's innovation arm. **Vandenberg SFB** is the U.S. West Coast launch hub. To the north, **Beale AFB** houses one of the two PAVE PAWS radars, critical for global missile warning and space object tracking. **Travis AFB** is the Western U.S. air mobility hub and routinely moves space payloads.

Edwards AFB is the military's primary aerospace innovation testbed and features the world's longest military runway. The base also hosts the largest U.S. military rocket engine R&D complex, managed by **AFRL**. **Edwards AFB** together with **Fort Irwin (Army)** and **NAWS China Lake (Navy)** manage the **R-2508 Complex**, the largest overland and the preeminent military test airspace complex in the country.

California has long anchored Navy space activity, from the first U.S. missile center at **Point Mugu** to **NAVSOC**, the world's first military space command. San Diego hosts **NAVWAR**, the Navy's acquisitions HQ for space systems, and **NIWC Pacific**, which leads the Navy's entire "seabed to space" warfare mission from R&D through fielded support. **NAWS China Lake** is the Navy's largest weapons and rocket test range.

Across California, other services run marquee bases—the Army's premier maneuver range at the **National Training Center (NTC) Fort Irwin**, the Army's largest Reserve installation at **Fort Hunter Liggett**, and the Marine Corps' largest single base at **MCAGCC Twentynine Palms**.

All benefit from California's logistics backbone: twelve deepwater seaports (include the Western Hemisphere's largest port complex, **San Pedro Bay**), over 5,000 miles of railroad, and more than 55,000 miles of highways.



Defense R&D Facility includes only those directly owned and operated by the military. Military facilities and bases include Reserve. Locations and facilities are representative, not exhaustive.



California's Space Economy: Origins (1880s–1960s)

1888	1910's - 1930's	1923	1926	1936	1939	1940's - 1960's
Lick Observatory near San Jose opens as the world's first permanent mountaintop observatory, housing the world's largest refracting telescope. It is operated by the University of California. Three years later, in 1891, the precursor to Caltech is established in Pasadena.	Companies such as Martin (1912), Lockheed (1916), Kirkhill (1919), Douglas (1920), Ryan (1922), Convair (1923), North American Aviation (1928), LeFiell (1930), Hughes (1932), and Northrop (1932) are founded in California - many serve as the bedrock of the aerospace industry.	Edwin Hubble, using the Mount Wilson Observatory in the San Gabriel Mountains above Los Angeles, discovers the existence of the universe. He then proves galaxies exist beyond our Milky Way and that the universe is expanding.	Caltech, in Pasadena in Southern California, establishes the Guggenheim Aeronautical Laboratory (GALCIT). A decade later, it becomes the first university-based rocket research center in the United States.	The GALCIT Rocket Team conducts the first rocket-motor tests in the Arroyo Seco in Pasadena. Caltech begins building Palomar Observatory near San Diego—home to the world's largest telescope.	Ames Research Center in the Bay Area is established by the National Advisory Committee for Aeronautics. The National Academy of Sciences funds Caltech's GALCIT, marking the nation's first government funded rocket research.	Rohr (1940), Aerojet (1942), Marquardt (1944), RAND (1948), Grand Central (1952), VACCO (1954), Rocketdyne (1955), General Atomics (1955), Precision Aero (1956), Aerospace Corp (1960), Teledyne (1960), Votaw (1963) and TRW (1965), are all founded in California.
1944	1946	1947	1950	1957	1958	1959
Jet Propulsion Laboratory (JPL) launches in Pasadena. The U.S. Navy establishes China Lake for advanced weapons testing. During World War II, California hosts 140+ military installations and 60–70% of the U.S. aerospace industry.	Flight Research Center (FRC) is established by NACA at Edwards Air Base. The U.S. Navy opens the nation's first missile test center and facilities at Point Mugu. Stanford Research Institute is established in the Bay Area and begins space research.	The WAC Corporal—made by JPL and Douglas in Long Beach—concludes testing at White Sands, becoming the first U.S. sounding rocket to reach space. The U.S. Air Force (USAF) is formally established. At Edwards Air Base, the sound barrier is broken.	Rocket Propulsion Laboratory (AFRPL) is built by the USAF near Mojave - becoming the largest U.S. rocket engine test complex. Lockheed, Douglas, TRW, UTC, Marquardt, Aerojet, and Rocketdyne all build rocket engine test complexes in California.	The USAF Ballistic Missile Division is HQ'd at Los Angeles Air Base. San Diego's Convair builds the first U.S. ICBM, Atlas. California begins manufacturing Titan, Thor, Agena, Vanguard, Centaur, and Polaris rocket systems.	Explorer 1—made and led by JPL in Pasadena—becomes the first U.S. space satellite. NASA is formally established, and Ames, FRC, and JPL are transferred over to NASA. Cooke Air Base is renamed Vandenberg AFB and hosts its first missile launch.	Discoverer 1 launches from Vandenberg as the world's first polar-orbit satellite; Pioneer 4 escapes Earth's orbit; Explorer 6 returns the first Earth photo. All three are manufactured in California by JPL and Douglas. UC Berkeley founds the Space Sciences Lab.

California's Space Economy: Commercial Rise (1960s–1990s)

1960 North American in Downey wins the prime contract for the Apollo Program. In Los Angeles, Rocketdyne builds the F-1, the most powerful liquid rocket engine in history. TRW opens Space Park in Redondo Beach.	1963 In Mojave, X-15 achieves the first human-piloted spaceflight. Near Barstow, NASA Goldstone becomes the world's largest deep-space communications complex. At Point Mugu, NAVSOC stands up as the world's first military space command.	1964 Hughes in El Segundo builds the world's largest satellite factory, producing the world's first geostationary and geosynchronous satellites. It is later owned by Boeing. Ranger 7, built by JPL in Pasadena, achieves the first successful U.S. Moon mission.	1966 Surveyor 1—manufactured by JPL and Hughes—achieves the first U.S. moon landing. Debuting as the most powerful rocket ever, Saturn V is built almost entirely in California (Los Angeles, Downey, Long Beach, Sacramento, Seal Beach, Huntington Beach)	1969 Apollo 11, launched via a Saturn V, marks the first time humans land on the surface of the Moon. Nearly the entire Apollo spacecraft is made in California (Los Angeles, Azusa, Downey, Moorpark, Goleta, Redlands, Ventura, Redondo Beach, Sacramento).	1970's - 1990s Aerovironment (1971), NTS (1975), AMRO (1975), Scaled Composites (1982), Swift (1983), Microcosm (1984), AMROC (1985), Viasat (1986), SSL (1990), Globalstar (1991), Sea Launch (1994), DirecTV (1994) SpaceDev (1997), XCOR (1999), are all founded in California.	1973 The first U.S space station, Skylab, is built in Huntington Beach and launched atop the last Saturn V. Pioneer 10 and 11, built in Redondo Beach by TRW and NASA Ames, launch. The Pioneers become the first spacecraft to explore our outer solar system.
1976 NASA's Viking 1 lander, manufactured and flown by JPL, transmits the first photo from the surface of Mars. Rockwell's Palmdale assembly plant unveils the Space Shuttle Enterprise—the cornerstone of U.S. spaceflight for 35 years.	1977 The twin Voyagers 1+2—built, tested, and managed by JPL—are launched, marking one of the greatest achievements for human space exploration. They achieve the first 'Grand Tour' of the outer planets and, decades later, become the first human objects to enter interstellar space.	1978 The USAF launches Navstar1—the world's first GPS satellite—from Vandenberg; it is designed and manufactured by Lockheed Space Systems in Sunnyvale. In Los Angeles, Rocketdyne begins testing the RS-25 for the Space Shuttle; the RS-25 becomes the world's first reusable rocket engine system.	1983 Space Shuttle Challenger—assembled by Rockwell in Palmdale—lifts off with California native Sally Ride, making her the first American woman in space. At Vandenberg, the Infrared Astronomical Satellite (IRAS) —the world's first infrared space telescope—is launched.	1989 Galileo—built and operated by JPL in Pasadena—launches via Space Shuttle Atlantis (built by Rockwell in Palmdale). Galileo becomes the first spacecraft to pass an asteroid and the first to orbit an outer planet (Jupiter); it deploys the first probe there—built by Hughes and NASA Ames.	1990 Hubble Space Telescope—built by Lockheed Space in Sunnyvale—launches via Space Shuttle Discovery (built by Palmdale's Rockwell) At Edwards AFB, Pegasus launches as the world's first privately developed orbital space launch vehicle.	1991 Keck Observatory—built and led by UC and Caltech—begins operating the world's largest optical reflecting telescopes. TRW in Redondo Beach completes the manufacturing of the Compton Gamma Ray Observatory, which launches via Space Shuttle Atlantis.

California's Space Economy: Global Hub for Space (1990s–Present)

1996	1997	1999	2000's - 2020's	2002	2004	2008
Vandenberg AFB becomes the world's first commercial operating spaceport. The military announces that Clementine—a spacecraft launched from Vandenberg and led by the U.S. Navy with JPL and Lawrence Livermore—discovered water ice on the Moon's surface.	NASA's Pathfinder mission—and its rover Sojourner—both built and led by JPL in Pasadena, land on Mars and deploy the planet's first rover. Lawrence Berkeley Lab discovers dark energy. JPL's Cassini becomes the first spacecraft orbiter of Saturn.	Researchers at Cal Poly San Luis Obispo develop the CubeSat Standard. TRW's Chandra X-Ray Observatory—built in Redondo Beach—launches aboard Space Shuttle Columbia, which Rockwell built in Palmdale.	SpaceX (2002), Masten (2004), Virgin Galactic (2004), Planet Labs (2010), Rocket Lab (2013), Spinlaunch (2014), Relativity Space (2015), Astranis (2015), Astra (2016), Capella (2016), ABL (2017), Varda (2020), Vast (2021), Impulse (2021) True Anomaly (2022), Apex (2022) are all founded in California.	NASA Ames founds NASA Research Park at Moffett Field in the Bay Area. SpaceX is founded in El Segundo. The Mobile Base System—built by Northrop in Carpinteria—is delivered to the International Space Station.	Mojave Air and Space Port receives the first FAA spaceport license; there, SpaceShipOne makes the first privately developed human spaceflight. Spirit and Opportunity—two Mars rovers built and led by JPL in Pasadena—launch via a Delta II (built by McDonnell Douglas, Huntington Beach).	Falcon 1—designed and built by SpaceX in Hawthorne—becomes the first privately developed liquid-fueled rocket to achieve orbit. The Kepler Space Telescope—led by NASA Ames—launches and conducts the first large-scale survey for Earth-like planets.
2012	2015	2021	2021 (cont)	2022	2023	2024+
JPL's Voyager 1 becomes the first human object to enter interstellar space. Curiosity—another rover built by JPL—lands on Mars. Dragon—built by SpaceX in Hawthorne—becomes the first commercial spacecraft to dock with the ISS.	Falcon 9—built by SpaceX in Hawthorne—becomes the first reusable rocket via a vertical landing on a pad. Virgin Galactic designs and builds VSS Unity in Mojave. In Redondo Beach, Northrop begins final assembly of the James Webb Telescope.	Vandenberg Space Force Base is established. Los Angeles AFB becomes HQ of Space Systems Command. On Mars, JPL's Perseverance rover flies Ingenuity—built in Simi Valley by Aerovironment. Ingenuity becomes the first aircraft to fly on another planet.	SPACEWERX—innovation driver for the Space Force—is HQ'd at Los Angeles AFB. Lawrence Livermore National Laboratory founds the Space Science Institute. Vandenberg celebrates its 2,000th launch and mission	San Diego's coast becomes a key spacecraft recovery area. Artemis I—the inaugural flight of SLS and Orion—concludes successful recovery there. Rocket Lab of Long Beach achieves its 25th launch. The State designates Antelope Valley as Aerospace Valley.	UC Berkeley unveils the Berkeley Space Center. Vandenberg becomes HQ of the Space Force's Space Component Field Command. Deep Space Optical Comms—led by JPL—transmits the first video from deep space to Earth via laser technology.	Europa Clipper—led by JPL—is launched via a Falcon Heavy built by SpaceX in Hawthorne. Falcon becomes the most flown U.S. rocket family. Every Falcon is manufactured in California. Vast—in Long Beach—unveils Haven-1—the world's first commercial space station.