



SpaceX SAOCOM-1A mission launch over Los Angeles , October 8, 2018 | Flickr

# SoCal in the Age of Commercial Space

by Chad McElroy '26

California has long been a global leader in the fields of space exploration, manufacturing, and scientific research. Home to three NASA Research centers, two out of the top three aerospace engineering universities in the world, and more aerospace engineers than any other state, California remains an indispensable contributor to America's spaceflight and aerospace endeavors. It hosts 25% of the country's aerospace market and is home to nearly one-third of all American space systems companies.

Southern California has been recognized as an aviation powerhouse for most of its post-WW II history and continues to play a significant role in some of America's greatest spaceflight initiatives. Historically, the region has played a prominent role in many of America's civil and military space programs. Some of America's first space launches took off from Vandenberg Air Force Base (now known as Vandenberg Space Force Base); the Apollo spacecraft and Saturn rockets were built in the region; and every Space Shuttle was constructed, tested, and initially landed at Edwards Air Force Base in Palmdale. NASA's Jet Propulsion Laboratory in Pasadena has designed some of NASA's most prominent robotic exploration missions, such as the Voyager spacecraft, as well as every major Mars rover. Today, multiple contractors across Los Angeles County and San Bernardino County contribute everything from insulation to welding in support of NASA's Artemis moon program. While its footprint has certainly decreased from its apex during the Cold War, the SoCal space industry remains a key player in America's spaceflight landscape.

Southern California is pivoting from a legacy aerospace manufacturing hub into a hotspot for the burgeoning commercial space industry. This transition can best be seen through relative employment changes in the greater aerospace industry. The Los Angeles County Economic Development Corporation conducted a study on the aerospace industry in 2016 and found that employment has been shifting towards the development and production of spacecraft and missile technology. From 2004 to 2014, employment in general guided missile and space vehicle (GM/SV) production rose from 16% to 21.5% of the industry total, and GM/SV parts production spiked from 6.6% to 35.9%. Notably, this increase has been due to

smaller businesses and startups rather than larger corporations or conglomerates. In 2014, firms of only 1-4 employees accounted for 20.7% of firms in the guided missile and space-related vehicle sector, up from 10% in 2004. Firms of 5-19 workers accounted for another 27.5%. Rather than signifying an end to Southern California's aerospace industry, this shift in the industry's composition may signify a reorientation towards the new commercial space industry in response to the shrinking influence of aviation. Furthermore, the growing prevalence of smaller businesses leading this charge is a positive sign for the region's future, as new space startups are bound to bring new attention, new breakthroughs, and new jobs.

### **Spaceflight Excellence: Local Players and New Developments in SoCal's Space Industry**

SpaceX has been the crown jewel of Southern California's space industry for the past decade, and its influence does not show any signs of slowing. The company has operated a 1M square foot headquarters facility in Hawthorne since 2008, which manufactures its flagship Falcon 9 reusable rocket, Crew and Cargo Dragon spacecraft, and the initial Raptor-series rocket engines for its next-generation Starship and Super Heavy boosters. Most recently valued at \$350B, SpaceX maintains a near-monopoly position in the American space launch, human spaceflight, and satellite internet industries. While its new Starship rockets launch out of the south Texas city of Starbase, SpaceX's flagship Falcon 9 rocket routinely launches Starlink satellites and commercial payloads from Vandenberg Space Force Base, launching a record 46 times from the Lompoc launch site in 2024 –almost one launch every week. In support of its increasing cadence, SpaceX expanded its operations at the Space Force base from 60 people to nearly 400 in recent years. It also plans to expand its rocket recovery facility in Long Beach from six acres to 15, reflecting California's continuing importance to the company.

While SpaceX has seen unparalleled success from its headquarters in Hawthorne, recent moves by its CEO Elon Musk hint at a potential restructuring. In July of 2024, Musk announced that the company would officially move its headquarters from Hawthorne to its Starbase, Texas facility in response to California legislation regarding gender identity and schooling, a move that appeared to threaten local jobs and the broader Southern California aerospace industry. However, much of SpaceX's core manufacturing and operations continue to operate out of Hawthorne and in the short term the move appears to be somewhat symbolic in nature.

Across the board, the SpaceX success cannot be overstated, as the company has been a major force in igniting this new age



SpaceX headquarters in Hawthorne | SpaceX

of commercial, governmental, and civil spaceflight. In addition, many other prominent or nascent companies continue to solidify Southern California's position as a leader in the commercial space industry.

While its role in the regional aviation industry may have faded, Boeing's Space businesses in Southern California remain strong. Boeing operates a 1M square foot satellite and spacecraft manufacturing facility in El Segundo, a result of acquiring Hughes Electronics' space business in 2000. One of Boeing El Segundo's flagship products has been the X-37B, an unmanned reusable mini-space shuttle operated by the Space Force. The shuttle, currently in space on its seventh mission in a novel high Earth orbit, conducts classified experiments and autonomous operations in support of research and orbital warfighting. Boeing's El Segundo facility also specializes in large spacecraft manufacturing for commercial and military users. In 2024, the company won a \$439M contract from the Space Force to complete the newest of its twelve-satellite constellation of WGS tactical communications satellites. The El Segundo facility also produces the O3b mPOWER series of broadcast satellites for the Luxembourg-based SES communications company, with the most recent launch of these spacecraft conducted in December of 2024. Boeing also has made moves to diversify its space operations in the Greater LA region. In 2018, it acquired El Segundo-based Millennium Space Systems, a company that manufactures small satellites for the Space Force. Millennium has secured multiple Space Force contracts in recent years, providing Boeing with a new, innovative arm in the national security space industry.

While Boeing's El Segundo operations remain successful, the broader Boeing Space business is facing significant headwinds. Repeated mishaps as part of Boeing's Starliner crewed spaceflight program have cost the company billions of dollars, and the company reportedly may sell off this portion of its business. The Starliner program is, however, unrelated to Boeing operations in El Segundo. Difficulties in matching the success of SpaceX in the launch industry are reportedly motivating Boeing to divest from the United Launch Alliance, a joint venture with Lockheed Martin to operate the Vulcan medium-lift rocket from Cape Canaveral and Vandenberg Space Force Base. Furthermore, Boeing's Space Launch System, which is the main rocket for sending humans to the moon as part of NASA's Artemis program, is in jeopardy of being cut under the new Trump administration, a move that may harm Boeing's overall space portfolio.

Aerojet Rocketdyne is another company with a strong legacy and continuing presence in the Southern California region. Originally a spin-off of North American Aviation, the then-named Rocketdyne corporation designed, tested, and manufactured nearly every liquid-fueled rocket engine for the majority of the US space program. This includes every propulsion system for the Apollo program's Saturn rockets, as well as the Space Shuttle main engines until 2002 – from its headquarters and manufacturing facility in Canoga Park. Now merged with Aerojet and recently acquired by defense conglomerate L3Harris for \$4.7B, Aerojet Rocketdyne continues to specialize in advanced rocket engine and missile propulsion systems for both civil programs and military weaponry. Today, Aerojet Rocketdyne operates a regional headquarters in El Segundo and a major propulsion manufacturing facility in Chatsworth. At its Chatsworth facility in the San Fernando Valley, Aerojet Rocketdyne is repurposing the former Space Shuttle Main Engines for use in Boeing's Space Launch System and NASA's Artemis Program. The company contributed to almost all major engine systems that flew on NASA's successful Artemis 1 mission. Within the military sector, Aerojet Rocketdyne produces engines for missile defense systems like THAAD, artillery such as GMLRS, hypersonic ramjets for NASA, and will soon produce rocket motors for America's Sentinel next-generation intercontinental ballistic missile. Aerojet Rocketdyne's contributions to both civil and military space programs position it to remain as a strong element of Southern California's spaceflight industry.

Rocket Lab is a relatively new entrant into the space industry, yet it has cemented itself as the second-most commercially successful company in the sector. Headquartered in Long Beach, the company specializes in small satellite launch services, in-house small and medium satellite manufacturing, spaceflight software, and a vast array of spacecraft-related components. The company manufactures its rockets in Long Beach and notably launches its flagship Electron small-lift rocket and HASTE hypersonic testbed primarily out of its launch pad in Mahia, New Zealand, and the NASA facility in Wallops Island, Virginia. Following its first successful launch in 2017, the company has delivered over 200 payloads to orbit for customers ranging from weather satellites for NASA, experiments for the National Reconnaissance Office, earth observation systems for the company Blacksky, and "internet-of-things" constellations for Kinéis.

Rocket Lab has gained an advantage in the industry by embracing vertical integration and diversification. Rather than relying on external manufacturers to build its satellites and engines, Rocket Lab designs, manufactures, and tests four separate types of spacecraft buses for commercial, scientific, and military customers in-house at its 11,000-square-foot manufacturing complex in Long Beach. In 2022, the company acquired a space-grade solar panel manufacturing company,



a move that made it eligible for federal funding as part of the CHIPS and Science Act in June of 2024. Rocket Lab has also made headway into the niche national security and hypersonics testing market, an area traditionally unexplored by commercial spaceflight companies. Following at least two acknowledged launches, Rocket Lab's Hypersonics Accelerator Suborbital Test Electron (HASTE) program recently won a five-year launch contract as part of a \$1.45B hypersonic technology development program led by the DoD's Test Resource Management Center. These initiatives combine to make Rocket Lab a powerful force in the Southern Californian region and the broader American commercial space industry.

Rocket Lab is not the only new space company catering to the defense industry. ABL Space Systems, founded in El Segundo in 2017, was recently rebranded as Long Wall in an effort to pivot towards the missile defense and hypersonic flight testing sectors. While ABL was originally seen as an emerging contender in the launch industry, two failed launch attempts and difficulties securing investor funding forced the company to leave the launch market and enter the defense industry. ABL's example underscores the interconnectedness of the defense and space industries, as rockets that can cater to commercial needs can often be easily adapted for military needs. ABL's pivot also highlights an important reality in the space industry: Giants like SpaceX and Rocket Lab have cemented their places after years of successes and government support, while smaller companies must fight to establish themselves in a growing yet still-volatile industry.

## LA County's Space Beach

Long Beach, colloquially known as Space Beach by local politicians and industry leaders, has become home to a vibrant commercial space startup ecosystem, one that has seen many successes and some setbacks in recent years.

Virgin Orbit, a spin-off of British billionaire Richard Branson's space tourism company Virgin Galactic, was founded in 2017 and headquartered in Long Beach. The company sought to specialize in air-launched small-lift rockets and launched six operational missions and two demonstration flights between 2020 and 2023. The company faced significant difficulties, however, in maintaining funding due to its low launch cadence. After a failed launch from the United Kingdom, it filed for bankruptcy and permanently ceased operations in May of 2023. Ironically, Virgin Orbit's Long Beach headquarters would



Falcon9 launch on its second stage burn captured from Los Angeles | Twitter@jgrff5

go on to become an expanded rocket engine manufacturing plant for Rocket Lab, reflecting the ever-evolving nature of the space industry in the region.

Relativity Space is another new commercial space entrant in the region. Founded in 2016, the company aims to utilize additive manufacturing and 3D printing to revolutionize the medium-launch market. It was the first to build and launch the world's first primarily 3D-printed rocket in 2022. In an effort to expand operations, Relativity purchased Boeing's former 1M square foot C-17 manufacturing plant in Long Beach in 2021, aiming to transform the plant into a "Factory of the Future" 3D printing and manufacturing facility for its Terran-series of rockets. Currently, Relativity is developing the Terran-R reusable medium-lift rocket in order to compete with SpaceX and other companies in the increasingly crowded commercial and military space launch markets.

The growing Southern California space industry is not limited to the commercial space launch market. Vast Space, founded in 2021, aims to build the next generation of crewed space stations in Low Earth Orbit, and is in the process of testing its Haven-1 crew module for launch no earlier than 2026. In 2023 the company established its 115,000-square-foot headquarters in Long Beach and aims to expand to nearly 700 employees by the end of 2027. Vast's operations reflect the increasing diversity of the commercial industry that can rely on the deep workforce base for expertise across the aerospace sector.

Space Beach is also attracting out-of-state space industry startups. True Anomaly, a space and defense startup headquartered in Colorado, announced in February 2025 that it will be opening a 90,000-square-foot facility in Long Beach dedicated to designing and manufacturing military-related space systems. The company aims to establish operations closer to the Space Force's Space Systems Command (SSC), the service's acquisitions division headquartered out of Los Angeles Space Force Base. True Anomaly's move illustrates that despite external factors such as California's high costs of business, the Greater LA region provides unique opportunities for the industry that make it a destination for aerospace.

## **Space Starts Here – Vandenberg Space Force Base and the Revival of America's Western Launch Range**

Vandenberg Space Force Base (VSFB), located in the city of Lompoc, Santa Barbara County, has grown in both regional and national importance due to its unique space launch-supporting capabilities. Originally established by the US Army as Camp Cooke in 1941, it became the prime launch facility on America's Western Launch Range during the Cold War, supporting both military and civil space initiatives from 1957. Vandenberg was home to multiple space industry "firsts," such as the first polar Earth-orbiting satellite in 1959 and the launch of the first GPS satellite in 1978 by the Air Force. Following a storied Air Force history, it was renamed Vandenberg Space Force Base in 2021, and its units were transferred to the new Space Force Space Launch Delta 30 (SLD-30). The key advantage of Vandenberg is its position on California's west coast. Rockets can launch on trajectories that travel west, south-west, directly south, and marginally south-east without flying over populated areas. This dramatically simplifies operations seeking to send spacecraft into special orbits that circle the Earth's poles or sun-synchronous orbits, which are trajectories that allow a satellite to travel over a given part of the Earth at roughly the same local time of day. The former capability is beneficial for Earth science research, supporting missions such as NASA and the French space agency's Surface Water and Ocean Topography (SWOT) mission, which launched in December of 2022. The latter capability is highly sought after by Earth observation satellites, both for civilian purposes and for military reconnaissance, as it allows day-to-changes to be easily observed and tracked. As such, Vandenberg was host to many of America's first military reconnaissance satellite programs such as Corona, Gambit, and Hexagon beginning in the 1960s. Cape Canaveral Space Force Base in Florida, home to NASA's legendary Kennedy Space Center, can support southern launches as well. These launches, however, can fly over Caribbean nations like the Bahamas, Cuba, and Puerto Rico, where failures could threaten property and lives downrange. Vandenberg's western orientation additionally makes it an ideal missile testing facility. Today, the Air Force frequently uses Vandenberg to test unarmed Minuteman III ICBMs on trajectories towards the Kwajalein Atoll in the central Pacific, with the most recent test occurring on February 19, 2025. Vandenberg additionally serves as a test range for more exotic systems, such as the Ground-Based Midcourse Defense anti-ballistic missile system, as well as Northrop Grumman's Minotaur rocket family, an orbital/suborbital launch system using repurposed ICBM components.

After experiencing a lull in military usage following the end of the Cold War, Vandenberg Space Force Base has rebounded to become the second-most popular spaceport in the world. In 2024, it hosted 51 rocket and missile launches, the highest number of launches at the base since 1974. This record number was led by SpaceX, which launched its Falcon 9 rocket



Launch of the NASA DART mission from Vandenberg on November 23, 2021 | Michael Peterson, DVIDSHUB

46 times from its leased launch pad at Space Launch Complex 4E (SLC-4E). Most of those launches were in support of the Starlink satellite internet constellation.

Vandenberg has seen a year-over-year increase in its contribution to the global space launch industry since 2021. According to the UN Office for Outer Space Affairs Online Index of Objects Launched into Outer Space, a total of 954 space objects were launched from Vandenberg in 2024, amounting to 37% of all objects launched into space across the globe that year. This represents a steady increase since 2021 (6%), 2022 (19%), and 2023 (33%). Last year's launch total represents a significant increase from one decade prior, which saw only four objects launched from Vandenberg in 2014, a mere 2% of the total that year.

Vandenberg's resurrection has brought with it new challenges, as well as some controversy. Sonic booms associated with SpaceX rocket launches and landings have become a frequent occurrence in local communities, with disturbances being heard along more than 100 miles of California coastline. In October of 2024, California's Coastal Commission voted down an Air Force Department-sponsored proposal to raise the number of total rocket launches from VSFb from 36 to 50 annually, with concerns remaining around the environmental impact of those sonic booms. The Coastal Commission cannot legally limit the number of launches from Vandenberg – VSFb is federal rather than state land -- and the Space Force ignored the launch limit. – Notably, the Commission cited concerns about SpaceX CEO Elon Musk's political support for then-candidate Donald Trump in the 2024 election in the context of denying the proposal to increase the number of launches. SpaceX filed a lawsuit against the Coastal Commission in late 2024 alleging political bias, a suit which is ongoing as of March 2025. Despite the recent controversy, the Coastal Commission would approve that increase in launches later in 2024, and the Air Force is in the process of conducting local environmental consultations related to raising launches to 100 annually.



Vandenberg’s increased importance has inspired regional investment and a push to revitalize California’s Central Coast. In 2018, the Hourglass Project was proposed to the Central Coast Coalition of Chambers calling for the alignment of local chambers of commerce and regional businesses in support of the Central Coast region of San Luis Obispo County and Santa Barbara County. Following an upswell in support, the initiative transformed into the Regional Economic Action Coalition (REACH) in 2019 with a narrowed focus on supporting increased federal and state investment into Vandenberg Space Force Base, attracting new commercial operators, and supporting increased job creation in the surrounding region. Today, the REACH coalition is led by the city of Santa Barbara, the California Governor’s Office of Business and Economic Development (GO-Biz), Cal Poly SLO, Space Force SLD-30, and Deloitte, and has published reports on increasing Vandenberg’s commercial competitiveness (VSFB Commercial Space Master Plan) as a spaceport as well as a 10-year economic action plan for the Central Coast (REACH 2030). REACH has already achieved successes related to initiatives outlined in these action plans. In 2022, the California Governor’s office created a Space Industry Task Force, which is focused on attracting new aerospace businesses, developing California’s aerospace industry workforce, and offering financial incentives to existing businesses, including the more than \$200M in tax credits delivered to aerospace companies via GO-Biz’s CalCompetes program. Additionally, REACH’s mobilization helped Vandenberg secure \$80M in federal funding for infrastructure improvements at the base, ensuring that the spaceport will be ready to match its increased usage in the coming decade.

Southern California is in the midst of a transformation from specializing in traditional aviation activities to incubating the next generation of commercial spaceflight innovators. Defense-related aviation has not fully disappeared from the region. Well-known conglomerates like Northrop Grumman and Lockheed Martin continue to achieve success in the region, and new disruptors like Anduril seek to usher in a new era of defense industry competition. The commercial space industry has found fertile ground, as companies such as SpaceX, Rocket Lab, and many others have come to call the Greater LA region home. Vandenberg Space Force Base has reasserted itself as the second busiest spaceport in the world, a title that comes with new attention, new investment, and some challenges for local communities. ♦



SpaceX Falcon 9 rocket launch from SLC-4E at Vandenberg on January 19, 2023 | SpaceX

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