

# **AEROSPACE: The industry that built the South Bay**

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Published in the Easy Reader on October 17, 2013

Very rarely did someone turn down his offer.

Beginning in 1982, Mark Forgea worked as a recruiter for TRW in Redondo Beach. In his search for the best and brightest minds, he had an appealing pitch: a job in an industry that was changing the course of history. The pay was high, the work was intriguing, and the office was a mile from the beach.

“I’d take these young people just out of college down to the beach and we’d sit with sunglasses on and we’d get burritos and watch The Strand go by, and it would be the middle of winter and everybody would be in a bathing suit,” Forgea said.

“We had perfect weather almost all year round. Plenty of the good life. The promise of the American dream. We hired so many people, so quickly.”

The South Bay’s aerospace industry boomed throughout the ‘80s. Local aerospace recruiters competed over the cream of the country’s engineering crop – coveted young talent companies could afford to heavily compensate.

“Companies could literally get the best and brightest recruits out of college because they had the money and because everybody wanted to work in space or on a space station,” said Dave Younkin, a TRW systems engineering manager who oversaw satellite design during the ‘80s.

Aerospace was, to that decade, what the dot-com business is to this one, and the South Bay was its Silicon Valley – a hotbed of jobs, innovation, new technologies, and visionaries.

“The best and the brightest in the world were attracted to this business [here] because of all the advancement and discovery and newness,” said Dave DiCarlo, who retired two years ago as sector vice president and general manager of space systems at Northrop Grumman.

Starting in the early 1960s, the South Bay began transitioning into what L.A. Economic Development Corporation economist Kimberly Ritter-Martinez has called the “brain trust of the aerospace industry.”

Within several decades it had become the epicenter of aerospace R&D, or research and development – a term that refers to those departments designing cutting-edge defense weapons, communications, and satellite systems. Their customers – the Department of Defense (DoD) and National Aeronautics and Space Administration (NASA) – were feverishly engaged in the Cold War and the Space Race. Demand for new aerospace technologies was limitless. Government money was pouring into aerospace R&D, jobs were multiplying, and the sleepy beach towns of the South Bay were beginning to stir.

The middle class grew. Property values rose. Hopes soared.

“It was really a golden age in the area,” Forgea said. “It was a pretty heady time. Looking back, no one thought things would ever slow down.”

But the industry’s history has always been cyclical, an ebb and flow determined by geopolitical tides. Three distinct booms occurred in the 1940s, 1960s, and 1980s, but there were also dramatic contractions. The South Bay’s economy, and even its culture, has long been closely tied to the aerospace industry and its response to events beyond its control – World War II, the Cold War, the race to space, the missile age, and the arms buildup that precipitated the end of the Soviet Union.

Aerospace was unquestionably the South Bay’s economic linchpin across a half-century. But over the last two decades, the industry’s employment throughout L.A. County has been cut in half, with further cuts looming due to federal budget sequestration. What has come into question is the industry’s future.

“We have access to a tremendous number of resources,” said Kevin Klowden of economic thinktank Milken Institute at a public forum in August, “but at the same time the reality is that since the aerospace industry peaked in California in the 1980s, we have continuously been fighting to maintain jobs.”

## **The rise of aerospace**

The term aerospace refers to a spaceflight industry that armed armies, sent men to the moon, and built airplanes. Its engineers conceived and created military aircraft, rockets, the space shuttle, missiles, satellites, and drones, and in the process spawned Global Positioning Systems (GPS), bar code scanners, automated teller machines (ATM), microwaves, cell phones, flat-screen TVs, medical imaging scanners, and countless other revolutionary technologies.

Aerospace was also the foundation of the early South Bay economy – an industry that propelled the growth of both the population and the average household income.

“It is responsible for the economic prosperity of the South Bay in a huge measure, more than any other industry or any other thing,” said Ed Lassiter, a Palos Verdes resident who started working for The Aerospace Corporation – a non-profit established to facilitate the industry – in 1962 and retired 33 years later as its senior vice president.

The industry goes back even further than the post-war boom that built much of today’s South Bay. Its roots in Southern California can be traced to the early part of the 20th century.

Los Angeles was an ideal incubator for the fledgling aircraft industry. Its climate was favorable for flying. It had, in 1910, hosted the country’s first aviation show, hailed by the L.A. Times as “one of the greatest public events in the history of the West.” It had research institutions like

California Institute of Technology and two gateways to the world – an international shipping port and Mines Field (now the Los Angeles International Airport).

So the manufacturers moved in, and within several decades, the national industry was “disproportionately concentrated” in L.A., said USC Professor Peter Westwick, who last year published a book called “Blue Sky Metropolis: The Aerospace Century in Southern California” and co-curated an exhibit at The Huntington Library by the same name.

This was the genesis of companies like Northrop Corporation (now Northrop Grumman), Douglas Aircraft Company (later McDonnell Douglas), TRW Inc. (now Northrop Grumman), Lockheed Corporation (now Lockheed Martin), North American Aviation (later Rockwell), and Hughes Aircraft Company (Raytheon and Boeing).

They built factories nearer to the beach, where land was cheap and there was lots of it. Some of the biggest firms in aerospace history grabbed land in El Segundo, Redondo Beach, Hawthorne, and Inglewood.

Prior to the industry’s arrival, the Beach Cities were largely unpopulated. Much of the land was under till, swaths of fields producing beans, strawberries, and corn.

My grandfather, Paul Schubert, recalls driving south on Sepulveda, into what’s now Culver City, to visit his grandmother during the 1930s.

“Sepulveda Blvd. just stopped at Culver,” he said. “It was all cornfields and beanfields past that. My grandma’s house was down a dirt road. You drove down a paved road, but then Sepulveda just stopped. I remember going with my brothers to pick strawberries and beans around her house – it was all open land.”

The first big boom came as a result of World War II.

The war effort produced an insatiable demand for fighter planes and bombers – North American Aviation, a company based in El Segundo, built 41,000 military aircraft during the war years alone – and the number of manufacturing jobs in South Bay factories skyrocketed.

Jobs were plentiful, and so were workers. For the first time, women were joining production lines. What’s more, soldiers from all over the country were streaming through the region into the Pacific Theatre, and for them the California dream – its palm trees, orange orchards, and year-round sunshine – was becoming real the way it had for gold miners a century prior. Many never left.

“Aerospace in particular, and defense in general, really drove a huge expansion of the middle class in Southern California, starting with World War II,” Westwick said. “Initially, it was a lot of blue-collar – fairly well-paying blue-collar – manufacturing jobs and only later did it really shift to more white-collar engineering jobs.”

When the war was won, manufacturing employment plummeted. Soon, though, aerospace companies made a powerful comeback. This time, they were looking in a different direction: straight up.

## The Space Age

In 1957, the Soviets launched the world's first low Earth orbit satellite. Sputnik, it was called.

“That caught the whole U.S., really the whole world, by surprise,” Lassiter said. “That was really an alarming thing because it showed that they were ahead of us. We were feeling like we were behind in the Cold War, and so then there's this national effort to put money into defense to help us catch up.

“We also thought there was a missile gap, so we started to put money into ballistic missiles in the late 50s. We had to keep up with how many ballistic missiles we thought they had, and where they were.”

Then, in 1961, President John F. Kennedy announced the U.S. would send a man to the moon and bring him back before the end of the decade. His administration had its sights set on space and a deadline for getting there: before the Soviets did.

“We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard,” Kennedy said later, in a speech that encapsulates the indefatigable optimism and exhilaration of the American Space Race. “Because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.”

In 1962, the U.S. Air Force purchased an old aircraft factory in El Segundo and converted it into the Los Angeles Air Force Base. The base had no aircraft and no landing strips; its purpose was to plan and procure the work that would propel the missile and space ages. Through the base, South Bay companies were contracted to create the missiles and satellites that ultimately catapulted the U.S. ahead of the Soviets in both in war and space.

Following Kennedy's declaration, a frenzy swept the South Bay aerospace industry that had been previously engaged in building long-range missiles.

It absorbed the challenge of space with relative ease. Already, aerospace engineers knew the science of terrestrial orbits and already, they had birthed satellite technologies. They knew how to work methodically and with precision; after all, they were in the business of creating machines worthy of war. Theirs were products outfitted with redundancy – duplicated backup systems activated in the event of a glitch.

Theirs were products that were not supposed to break down.

“Our game was: Don’t fail. Failure is not an option,” DiCarlo said.

This was a mentality that applied to both war and all branches of the emergent space industry – NASA-funded exploration; defense surveillance; and intelligence gathering.

Local firms landed big contracts, obtained a lot of money for research, and hired the top echelon of U.S. science and engineering graduates.

Aerospace became the lifeblood of an expanding South Bay economy. The area grew. The population of the three Beach Cities and El Segundo more than doubled between 1950 and 1970, from 60,000 to 125,000 people. In the same time period, the population of Palos Verdes Estates grew from 2,000 to 13,300.

“People just poured in here,” Lassiter said.

The South Bay started to show more urban markings: grocery stores and hospitals and schools and apartment buildings and post offices.

“It fueled the barber shops and the fast food and everything else, plus all of the subcontractors and the small businesses that supplied the large primary contractors,” Lassiter said.

A cottage industry of associated small businesses – examples include parts manufacturers, weather predicting agencies, and design reviewers – had begun to proliferate in the South Bay. They would support aerospace companies in the quest to design products that would ultimately win the Cold War, transform the way humans communicate, and land a man on the moon.

“It was all so exciting,” my grandfather said over lunch recently, and then he choked on emotion. “If I had to pick a more exciting industry in a more exciting time period, I couldn’t do it.”

## **Brain trust**

Then, sensitive as it was to the currents of global politics, the industry decelerated in the early 1970s with détente and the end of the Vietnam War.

“The war was sucking away anybody’s desire to be involved in anything ‘establishment,’” Forgea said. “Fewer and fewer programs were being funded. Work continued in satellites, but there was very little money compared with the late 1960s. Now people were scrambling to find jobs.”

Before long, though, the government’s priorities changed. In the early 1980s, President Ronald Reagan resolved to spend the Soviets out of the Cold War, and a huge influx of government money surged back into the Southern California aerospace industry.

Aerospace innovation caught a powerful second wind. It was amplified by the emergence of the digital revolution.

“All these technologies are developed in the 60s, but with the digital revolution, all of this stuff becomes technologically feasible where it wasn’t before,” Lassiter said. “Then we went into miniaturization – integrated circuits where you could get a whole GPS chip the size of your fingernail.

“As the digital age comes along and integrated circuits come along and digital computing comes along, it’s possible to build more and more sophisticated systems.

“They weigh less. You can package them smaller now. You can boost them into orbit because they don’t weigh like a locomotive freight train.”

A golden age of inventiveness dawned. A nearly unprecedented amount of resources was being devoted to engineering; scientists and engineers were being paid big money to design and develop technologies that, beyond their immediate military applications, would change the way human beings lived.

Companies kept their laboratories open 24/7 so employees would always be able to record new ideas, the way a writer might keep a notepad on a nightstand to document thoughts conceived in the middle of the night.

“It was all very exciting because everything was changing,” DiCarlo said. “You never knew what you could do until you actually did it... It was really exciting to see all of that unfold at a time, in the early 80s, when technology wasn’t really a household word.”

“It was just a real privilege to be part of it,” Younkin added. “And if you look back on it 50 years from now, the 80s and 90s were probably the heyday of the space program especially as participated in by the South Bay.”

The military buildup might have been opposed elsewhere for political reasons, but in the South Bay it was an uncomplicated boon.

“At that time everybody knew who the enemy was it was,” Buchanan said. “It was relatively black and white – there weren’t a lot of shades of gray. There wasn’t any guilt associated with the things we dove into. There was a lot of pride in the satellites that lasted years and years, decades longer than they ever should have.”

Cities were eager to accommodate this revived economic engine. Manhattan Beach gave TRW extra square footage in exchange for infrastructure improvements and city parks; Redondo Beach reconstructed Aviation Blvd. to free up more acreage for aerospace.

“We were moving so fast and the industry was exploding so quickly,” said Michael Jackson, who spent 27 years working for Hughes, TRW, and Boeing. “The community was really trying to help us do it. They couldn’t build buildings fast enough to accommodate the space and defense programs in the 80s.”

In the South Bay, there was an emergent demographic of aerospace employees who were making money and looking for ways to spend it.

They had high-paying jobs and, relative to previous decades and generations, more free time.

“There’s no question that aerospace drove the growth of the middle class and made possible the whole Southern California leisure culture of the last half-century,” Westwick said.

“We were living the Southern California dream,” Buchanan remembered.

Restaurants, nightclubs, and movie theaters opened to accommodate an expanding middle class and its growing appetite for leisure.

Aerospace workers joined clubs and played sports and took vacations. They socialized together.

“When you went out, almost everyone you met worked for one of the big [aerospace] companies,” Buchanan said. “It was like, ‘Hi, my name is so-and-so, which of the big three do you work for?’”

People were buying homes and starting their families in the South Bay.

These were the golden years, said Julie Mazor of Redondo Beach, who worked at Hughes for 21 years.

“We called those the country club days,” she said. “We had so many benefits and so many perks. I mean, I was able to buy a brand-new car for the first time in my life.”

## Top secret

People were having fun, but not too much fun.

They knew their lives were under a microscope.

The federal government, responsible for issuing security clearances, was – literally – digging through their trash, as were competitors within the industry.

“What we were very sensitive to was industry espionage,” Younkin said. “We had people from rival contractors going through our trash outside a proposal building, where we’re writing a proposal for a several hundred million dollar satellite and they’re going through the trash trying to get hints as to what our designs are. It was pretty cutthroat.”

Employees were subject to painstakingly thorough background checks in order to gain security clearance, or access to top-secret information. According to industry executives, the highest-level clearance for one person could cost a company upwards of \$100,000.

“We had to have clearances because a lot of the technology – even in an unclassified program like the space station – a lot of the technology was so industry competitive that you had to have great security on keeping it proprietary,” Younkin said.

To gain clearance, employees were required to submit reams of paperwork detailing their every movement since birth.

“You would get a phone call from someone you didn’t know, who would tell you to show up at an office building parking lot on Rosecrans Avenue, and to go into a doorway that was an alcove or ‘man trap,’” Forgea said of applying for security clearance.

“No desks, no people... just another door and a phone. You picked up the phone to let someone know you were there to pick up some paperwork and they would come to meet you. They would give you 24 hours to fill it in and return it.”

Federal investigators would personally visit the applicant’s listed references and scrupulously track his or her paper trail. The whole process could take up to a year.

“I filled out a form that asked everything I have ever done in my entire life, whether it was good or bad, and I mean everything... I was told to put it all down because they were going to find out anyway,” Jackson said.

He would learn that the investigators were precisely as scrupulous as he had been warned they were.

“There was this 80-year-old lady who lived up in the mountains – I have a cabin north of Yosemite – and I remember her telling me, ‘A man in brown shoes showed up at my front doorstep and said he was from the Air Force or something. He wanted to know what you did up here,’” Jackson said.

Employees with security clearances – a large portion of the population working in aerospace – were monitored closely.

“There was a careful watch on where you went, who you made contact with, and how long you were gone for... It was very serious business,” Forgea said.

“There was a car parked in front of our apartment, day and night,” Buchanan remembered. “I’d come home from work and there would be a guy sitting at the wheel reading the newspaper and I’d go for my run and wave to him, and come back from my run and he’d still be there.”

Two Palos Verdes natives made international headlines when they famously abused the privilege of security clearance. Christopher Boyce and Daulton Lee – the world now knows them as the Falcon and the Snowman – were convicted and imprisoned for stealing secrets from a TRW vault and selling them to the Soviets via their Mexican embassy.

The news of the Falcon and the Snowman hit close to home. Forgea said it “changed the way aerospace employees socialized” in the South Bay.

Years later, Buchanan brought up the incident with her TRW office mate.

“He looked at me all wide-eyed and got up and shut the door and said, ‘Rena, don’t ever bring that up,’” she remembered.

With the threat of Soviet espionage looming large, the South Bay became a NOFORN Zone – short for No Foreign Nationals, a place where “Russians and other Eastern Europeans were not supposed to be trolling bars or otherwise hanging out,” Forgea said.

“Very different times,” he added.

“We were very much warned against speaking to anyone at a bar that had a foreign accent and told to be cautious and aware that we might be recruited somehow, someday,” Buchanan said.

Aerospace employees were keepers of national secrets. They couldn’t talk about what they did at work with anybody.

“Let’s say you struck up a conversation in a Manhattan Beach restaurant or bar,” Younkin said. “You had to be careful about your conduct because there were people that were trying to get secrets from the U.S. So you just didn’t talk shop off campus.”

“You didn’t even think about going home and talking to somebody about it,” Jackson added. “It was like a sworn pledge... You were tied to it because of how proud you are to be part of the program. You just didn’t talk about it.”

Aerospace companies deliberately compartmentalized knowledge to further fortify their secrets against leakage. People working in one department were not to know what was transpiring on the other side of the wall.

As my grandfather, whose first year at North American Aviation was 1959, said: “We each saw part of the elephant, but very few of us could see the whole elephant.”

## **The peace dividend**

The aerospace industry had arguably won the Cold War. But the implications for the industry itself were hardly victorious – budgets were immediately and drastically cut, sending many companies into a tailspin. They’d bent themselves to a purpose that largely disappeared overnight.

This was perhaps not a surprise, as the possibility always loomed. What was different this time, though, was that the industry never fully recovered.

“We reached the end of the Cold War,” Forgea said. “The [Berlin] Wall came down. The Soviet Evil Empire, as Reagan called it, was gone. Nobody was going to hurt us and as a result the money spent on those projects, some of which had already been allocated, was gone. It was called the peace dividend. Factories that no longer had products to build started building golf clubs.”

Too many companies were competing over too few contracts. The industry tried switching gears and breaking into commercial markets, but quickly reality set in: aerospace companies were just not structured for mass production.

“In the commercial game... the objective is to design a product that you can sell and make a profit, so you never want to over-design it. You want to make it highly manufacture-able so you can mass-produce it. You want to do it fast,” DiCarlo said.

“That’s a much different set of operations and processes than going very carefully through design of a satellite that you don’t want to lose because it’s got to be there for a long time and the security of the nation depends on it – that’s a slow, methodical, expensive process. Making the transition from one to another was – is – a very challenging thing.”

Important work has, of course, continued. Satellite technology responsible for everything from monitoring our climate to cell phone communication originates in the South Bay. The space program, though diminished in scope from its heyday, is still very much derived from the work of local engineers – a Hawthorne-based firm, SpaceX, just won a \$440 million contract to develop a successor to the space shuttle. Our increasingly mechanized and intelligence-centric military operations are dependent on technological gains that still take place within the local aerospace industry. Drone technology, the vanguard of this new way of waging war, is partly designed in the South Bay.

But more drastic changes may loom. Automated federal budget reductions, called sequestration, call for more than \$500 billion in defense spending cuts over the next decade. The industry that built the South Bay through its powers of invention must reinvent itself once again. Some observers are more optimistic than others that this can happen.

“I think this is more a bump in the road than a catastrophe...,” Jackson said at a public forum in May. “We’ve been through it before so I think it’s a matter of just riding that wave.”

Regardless of the future, the industry’s influence on the South Bay remains pervasive in the present.

Its legacy manifests in street names like Aviation Blvd. and the now-defunct Aviation High School, and even in recreational activities and architecture.

“You see it in hot rod car culture,” Westwick said. “A lot of those guys who were tinkering with hot rods in their garages on weekends were aerospace engineers. You see it in surfing. A lot of the main surfing technologies over the course of the 20th century came out of aerospace... Those made surfing more accessible.

“Instead of lugging around a 100-pound redwood log, now you have a 20-pound foam and fiberglass board. I think because of aerospace, surfing became a lot more popular in California.”

Nobody who lives in the South Bay has been untouched by the impact of the aerospace industry.

“Everyone knows someone who worked in aerospace,” Jackson said of today’s South Bay.

Last year, campaigning for election to a seat on the Redondo Beach City Council, he was struck by the industry’s legacy.

“When I was knocking on doors, I bumped into so many people who were in aerospace,” he said. “I spent so much time rehashing history... We were just all part of the same culture.”

“This,” Buchanan said, “was Aerospace-ville.”

*This is the first in a series of aerospace stories we’re calling **The Aerospace Chronicles**. In the next, Rachel Reeves reports on the current status of the industry and efforts being waged by lawmakers and company executives to resuscitate it. To contact her, email [rachel@easyreadernews.com](mailto:rachel@easyreadernews.com).*