

American Institute of
Aeronautics and Astronautics
HISTORIC AEROSPACE SITE



**American Institute of
Aeronautics and Astronautics**
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Bell Aircraft Company
Wheatfield, New York



THE AIAA HISTORIC AEROSPACE SITES PROGRAM

For over 75 years, the American Institute of Aeronautics and Astronautics (AIAA) has served as the principal society of the aerospace engineer and scientist. Formed in 1963 through a merger of the American Rocket Society (ARS) and the Institute of the Aerospace Sciences (IAS), the purpose was, and still is, "to advance the arts, sciences, and technology of aeronautics and astronautics, and to promote the professionalism of those engaged in these pursuits." Today, AIAA has more than 35,000 individual members worldwide, and nearly 100 corporate members.

In addition, AIAA sponsors many technical conferences, seminars, and short courses every year, and publishes *Aerospace America* and seven archival technical journals. The Institute also publishes conference papers and proceedings, technology assessments, position papers, many books, and a variety of career-related educational materials. The Institute conducts a rigorous public policy program and works closely with other societies and with governments in broad areas of mutual concern.

AIAA established the Historic Aerospace Sites Program in January 2000 to promote the preservation of and to disseminate information about significant accomplishments made in the aerospace profession. In addition to the Bell Aircraft Company site, among the many other sites recognized by the committee are the NASA Langley Research Center; the Travelair Manufacturing Company in Wichita; Oakland Municipal Airport; and the site of the first balloon launch in Annonay, France.



A Bell P-63 over Niagara Falls.

Cover: Bell P-63 airplanes on the assembly line at the company's Wheatfield, New York plant.

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From top to bottom: An XP-77, an experimental fighter made of wood; a P-39; a P-63; and a P-59A – America's first jet fighter.

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All photographs courtesy of The Niagara Aerospace Museum.

American Institute of Aeronautics and Astronautics HISTORIC AEROSPACE SITE

Bell Aircraft Company
WHEATFIELD, NEW YORK



For most people, it was an ordinary Tuesday in October. The sky was clear in a remote corner of Kern County, California, located several hours north of Los Angeles. Muroc Airfield, in the Mojave Desert, was a scene of anxiety and hope, as a B-29 bomber appeared on the horizon. As it flew closer, it dropped not a bomb, but a bullet-shaped airplane. Spectators watched as the small plane zoomed across the sky, and suddenly they heard a new sound, one that had never been associated with an airplane: a quick double boom. It was October 14, 1947, and the Bell Aircraft Company's X-1 had just become the first airplane to break the sound barrier.

Bell employees were ecstatic, particularly at the company's Wheatfield, New York plant; their years of research and development had resulted in an amazing scientific achievement. The company was at that point only 12 years old, having been founded in 1935 by Larry Bell after he left the Consolidated Aircraft Corporation to start his own business.

Bell's first military contract came in 1937, when the Army Air Corps was looking for a heavily-armed super fighter capable of destroying bombers. The airplane was to have a new designation, FM – for “Fighter, multi-place.” The company's model, the YFM-1, was called the Airacuda. It incorporated groundbreaking technology for the time, but only 13 Airacudas were ever produced, and these saw only limited service with the USAAC before being retired in 1942.

Despite the Airacuda's limited success, the company was growing by leaps and bounds. At the end of 1935 the company had 56 employees, but by the end of 1936 it had 642, and had to lease additional buildings nearby to get the 145,000 square feet of floor space it needed. Bell enjoyed much success the following year with the development of the single engine P-39 (P for “Pursuit”).

The P-39, called the Airacobra, was famous as a ground-support aircraft, although ultimately the Soviet Air Force used it successfully in an air-to-air role, where they found it excellent as a front-line fighter against the Luftwaffe. Its 37-millimeter cannon, firing through the propeller's spinner, could destroy tanks, railroad trains, or seagoing ships. Their first order was for \$9 million for two hundred P-39s (designated the P-400 as modified for European specifications). Ultimately the company produced almost 10,000 of them.



Bell Airacuda.

In order to meet the order, the Bell Company quickly built another plant in rural Wheatfield, New York, adjacent to the Niagara Falls Airport. This boosted the company's floor space from 475,000 square feet in 1940 to more than a million square feet a year later. Builders worked through the winter of 1940 and the first employees moved in during April of 1941. The assembly lines had to quickly start work, as Larry Bell had promised that the plant would produce five Airacobras a day.

But everything changed on December 7, 1941, with the Japanese attack on Pearl Harbor. A current shipment of P-400s, supposedly bound for Britain, was redesignated for use by the U.S. Army Air Corps, and a squad of army troops, bayonets at the ready, surrounded the plant to guard against saboteurs. Expansion of the company was unbelievable. In January, 1940, Bell had 1,170 employees, but by

Bell also designed the Lunar Module (LM) ascent engine, which lifted all twelve astronauts who walked on the moon back into lunar orbit to begin their journey home. Arguably the most critical component of the Lunar Module, the ascent engine had to work. If the descent engine failed during landing the ascent engine served as a backup to return the astronauts to lunar orbit. But once on the moon, if the ascent engine failed when it was time to leave, the astronauts would have been stranded.



Neil Armstrong and the Bell LLRV.



The Bell 47/H-13 in Korea.



A Bell Model 47.

Anyone who has seen the television show *M*A*S*H* has seen the Bell 47 at work (known as the H-13 for the military version). It was the first certified civil helicopter, the first to be used by all branches of the U.S. military, the first to cross the Alps, to carry a U.S. president, and to spray crops. It was used by NASA as a training aid for the Apollo astronauts. Although the Bell 47 is no longer in production, there are still over 1,000 flying worldwide.

Its simplicity ensured its continuing popularity. The rotor system is lightweight, easy to maintain, reliable, and relatively inexpensive to repair. Although it does not fly particularly fast, the Bell 47 is a reliable workhorse. In Korea, as shown on *M*A*S*H*, modified 47s were used to carry wounded soldiers. President Dwight Eisenhower's pilot even chose the Bell 47 as the first Presidential helicopter, although it was soon replaced because there was only room for one Secret Service agent, and “the Bubble” was too warm in the summer to be comfortable without taking off the doors.

The Bell 47 even starred in its own TV show, “The Whirlybirds,” which ran from 1957 to 1960.

– from “Ode to the Bubble” by Mark Huber, *Air & Space Magazine* Vol. 27, No. 5, November 2012.



The first site of the Bell Helicopter division.



Arthur Young, standing facing the camera, and colleagues testing the Model 30.

the most recognizable helicopters in the world, which is still in use today. After a series of successful helicopter designs, the UH-1 Iroquois became the most noted helicopter of the Vietnam War. Originally designated the HU-1, it acquired the nickname "Huey." Bell Helicopters still designs and manufactures helicopters today.

Textron purchased the Bell Aerospace part of the corporation in July 1960. Bell Aerospace was composed of three divisions of Bell Aircraft, including its helicopter division, which had become its only aircraft-producing division.

Bell Aerospace Textron played a significant role in the manned space program. Bell designed and built the Reaction Control system for Project Mercury's Redstone command module, and a similar system was incorporated into the North American X-15 space plane.

NASA selected Bell to develop and build the Lunar Lander Research Vehicle (LLRV) and the Lunar Lander Training Vehicle (LLTV), five of which were delivered in the early 1960s to train the Apollo astronauts to land on the moon. These vehicles used a gimbaled jet engine mounted vertically to cancel out 5/6ths of the earth's gravity, accurately simulating the dynamics of the Lunar Module flying over the surface of the moon. Apollo 11 commander Neil Armstrong said his mission would not have been successful without extensive training on the LLRV and LLTV.

Larry Bell was born in Mentone, Indiana on April 5, 1894, the youngest of ten children of Isaac Evans Bell, who operated a small lumber mill, and Harriet Sarber Bell. Bell ancestors had arrived from Germany, Scotland, and Ireland 100 years before and slowly drifted west. Harriet Bell, a schoolteacher, encouraged her children to leave Mentone to find greater opportunities. By 1907, several of the children had moved to California, and Isaac and Harriet closed the lumber business and moved to Santa Monica to be closer to their children, taking 13-year-old Larry with them.

Bell's fascination with aviation began soon thereafter, in 1910, when he attended an airshow in Long Beach with his older brother, Grover. Although Larry was still in high school, Grover, much older, soon began to work for an aircraft manufacturer, the Glenn L. Martin Company in Los Angeles (he found the company's number in the phone book under "Amusements.") Glenn Martin himself taught Grover to fly, and Grover worked for Martin as an exhibition flyer and instructor, teaming with some of the greatest exhibition pilots of the time, including Lincoln Beachey. Larry could barely wait to join them, and he traveled with the exhibition team as a grease monkey, until Grover died in an exhibition accident in 1913. Bell gave up all thoughts of aviation for several months, until a friend talked him back into it and he went to work officially for Glenn Martin.

He was an immensely hard worker and became shop foreman at age 20. Not long after, when the company superintendent's job was vacant, Bell asked for it but Martin turned him down, claiming that Bell did not have enough experience or engineering knowledge. Bell reluctantly agreed to interview the man he would be working for, a young MIT graduate named Donald Douglas. However, Martin made the decision to promote Bell to superintendent and made Douglas the company's chief engineer. Douglas did not stay long, however.

Bell also left the Martin Company a few years later, and ultimately ended up working as a salesman for Consolidated Aircraft in Buffalo, New York. Although he was successful, he yearned to build a company of his own, but knew he could not compete with Consolidated. Luckily, the owner of Consolidated, Ruben Fleet, decided to move the company to San Diego, and was willing to lease the Buffalo facility to Larry Bell. Thus, in 1935, Bell Aircraft was born.

In 1944, the Institute of the Aeronautical Sciences, a predecessor of AIAA, awarded Bell the Daniel Guggenheim Medal for "achievement in design and construction of military aircraft and for outstanding contributions to the methods of production." He remained president of his company until September 1956. Shortly after he retired from the company, he died of a stroke, on October 20, 1956.



Lawrence Dale (Larry) Bell, 1894-1956.



Larry Bell in his office.

mid-1942 the company was adding nearly that many new employees every week; at its wartime peak in 1944, Bell employed more than 50,000 people. A new Georgia Division had opened, as well as the Ordnance Division in Burlington, Vermont. Working at Bell during the war was to be part of an important cause, and many employees worked overtime seven days a week. The company provided newsreel theaters, recreation societies, and frequent rallies and gatherings.

Camp Cataract, the training center for army mechanics, moved to new barracks near the Wheatfield Plant. By the time it closed, it had graduated 7,432 P-39 and P-63 mechanics. The Wheatfield Plant also included the Bell Modification Center. P-39s destined for northern routes were fitted with a special rapid-service oil drain cock that let crewmen drain the oil before sub-zero temperatures could congeal it. Other modifications included special radios, cameras, and equipment needed for other missions on airplanes such as the P-40 Warhawk and the Beechcraft C-45 (C for “cargo”) transport. A large batch of P-51 Mustangs was fitted with extra-large fuel tanks; employees later recognized these planes in newsreels being used in the fighter protection of U.S. bombers over Germany. Larry Bell recognized the importance of the versatility of the techniques and skills used in these modifications, and knew that these skills would come in handy after the war, when military aircraft would most likely be modified for civilian needs.

In addition to traditional propeller-driven airplanes, the company also began to experiment with jet engines. Bell was approached by General Henry “Hap” Arnold in September 1941 to discuss the use of a new engine invented by an RAF officer, Frank Whittle, that was already being used by the British and that had been given to General Electric to reproduce for U.S. use. The project was carried out in extreme secrecy, not just because of wartime issues but also because of the postwar value of Whittle’s invention. The airplane using the new engine was designated the P-59 Airacomet. Parts were manufactured with fake names; for example, an engine exhaust pipe manufactured at the Wheatfield plant was marked “heater duct.”

The P-59 was the first American jet aircraft to fly. Originally intended as a production aircraft, the P-59 instead became an important experimental testbed for jet technology, providing invaluable data for development of later jet airplanes. A number of records were set using the P-59, including one by Bell test pilot Jack Woolams, who reached an altitude of 47,600 feet in December of 1943. The P-59 stayed in active service until 1949.

The last P-39 rolled off the assembly line in 1944, and soon after, the P-63 was announced. Bell also built heavy bombers under license from other aircraft companies at a factory near Marietta, Georgia, just northwest of Atlanta, including Consolidated B-24 Liberators and Boeing B-29 Superfortress bombers. Starting in mid-

1944, Bell’s Marietta plant concentrated on producing B-29 bombers, producing 668 of them by the time the contract expired in the fall of 1945.

As the postwar defense industry downsized, Bell consolidated its operations at the Wheatfield plant. The aircraft factory in Marietta later became the property of Lockheed Corporation.

Perhaps Bell Aircraft’s most important contribution to the history of fixed-wing aircraft development would be the design and construction of the experimental Bell XS-1 (X for “experimental,” S for “sonic”), later known as the X-1, the world’s first airplane to break the sound barrier, and of its follow-on, the Bell X-2 Starbuster.

During the war there were reports of aircraft breaking apart in power dives. Pilots who survived talked about a



Chief test pilot Jack Woolams, first to fly the X-1, who died in a practice flight for a race in August 1946. He was known for wearing a gorilla suit while test flying the secret P-59, creeping up on unsuspecting pilots in the suit, waving a cigar, and then accelerating to jet speeds.

“sound barrier” that included shock waves and loss of control. They felt as though there was a barrier similar to an rpm barrier, the speed at which a wheel would fall apart, with similar destruction. Larry Bell felt there was a need to research the supposed sound barrier more closely, and was able to convince George Lewis, the head of the National Advisory Council on Aeronautics (NACA), the predecessor of NASA, that the project was worthwhile.

Engineers at the Wheatfield Plant met and decided that the aircraft would have to fly at a minimum of 800 mph for two to five minutes at 35,000 feet or higher, and carry five hundred pounds of equipment to record flight data. The result was the shape of a 50-caliber bullet and just as rugged. It was powered by a 6,000-pound thrust rocket engine developed by Reaction Motors, Inc. in New Jersey. After a series of glide tests, the plane was dropped, and the pilot (Slick Goodlin at first, and subsequently Chuck Yeager) ignited the engines, going faster and faster with each flight. On October 14, 1947 Yeager actually reached Mach 1.06, which at 43,000 feet was 700 miles per hour (the speed of sound, or “Mach 1,” is variable depending on altitude; at sea level Mach 1 is 760 mph). Yeager had to look at the Mach meter, though, to know that he had done it – in fact there was no “barrier.” It was considered the greatest step in aeronautical research since the first flight of the Wright Brothers, and Larry Bell, Chuck Yeager, and John Stack from NACA received the Collier Trophy, presented by Harry Truman, for their work.

Bell went on to design and produce several different experimental aircraft during the 1950s. These helped the U.S. Air Force and NACA explore the boundaries of aircraft design, paving the way for the founding of NASA and the exploration of outer space. The X-2 Starbuster achieved Mach 3 (2,100 mph) and a height of 126,000 feet in 1955, blazing a technological trail for the development of spacecraft.

Bell played a crucial role in the development of rocket propulsion after World War II, spearheaded by some of the most brilliant minds in rocket science, such as Walter Dornburger, an engineer who had worked on rocket development in Germany during the war. In 1957, Bell developed the first nuclear-tipped air-to-surface missile, the GAM-63 Rascal. Bell’s crowning achievement in the realm of rocketry was the Agena rocket engine, considered to this day to be one of the most reliable ever built. Starting in the late 1950s, 360 units were produced, and by the 1960s they had helped launch the majority of American satellites.

Airplanes were not the only product of the Bell Company. After Larry Bell met with Arthur Young in Washington, he set Young up in a small building in Gardenville, New York, near Buffalo, to develop helicopter concepts. The first operational model, the Bell Model 30, first flew in 1943. One of Larry’s requirements was autorotation, so that the rotor would continue to turn even if the engine quit, assuring a safe descent. A two-seat improvement on the Model 30 led to the Bell 47, one of



Bell test pilot Chalmers “Slick” Goodlin.



Chuck Yeager and the Bell X-1, named the “Glamorous Glennis” for Yeager’s wife.



Bell GAM-63 Rascal missile.