A History of Lockheed Aircraft Corporation

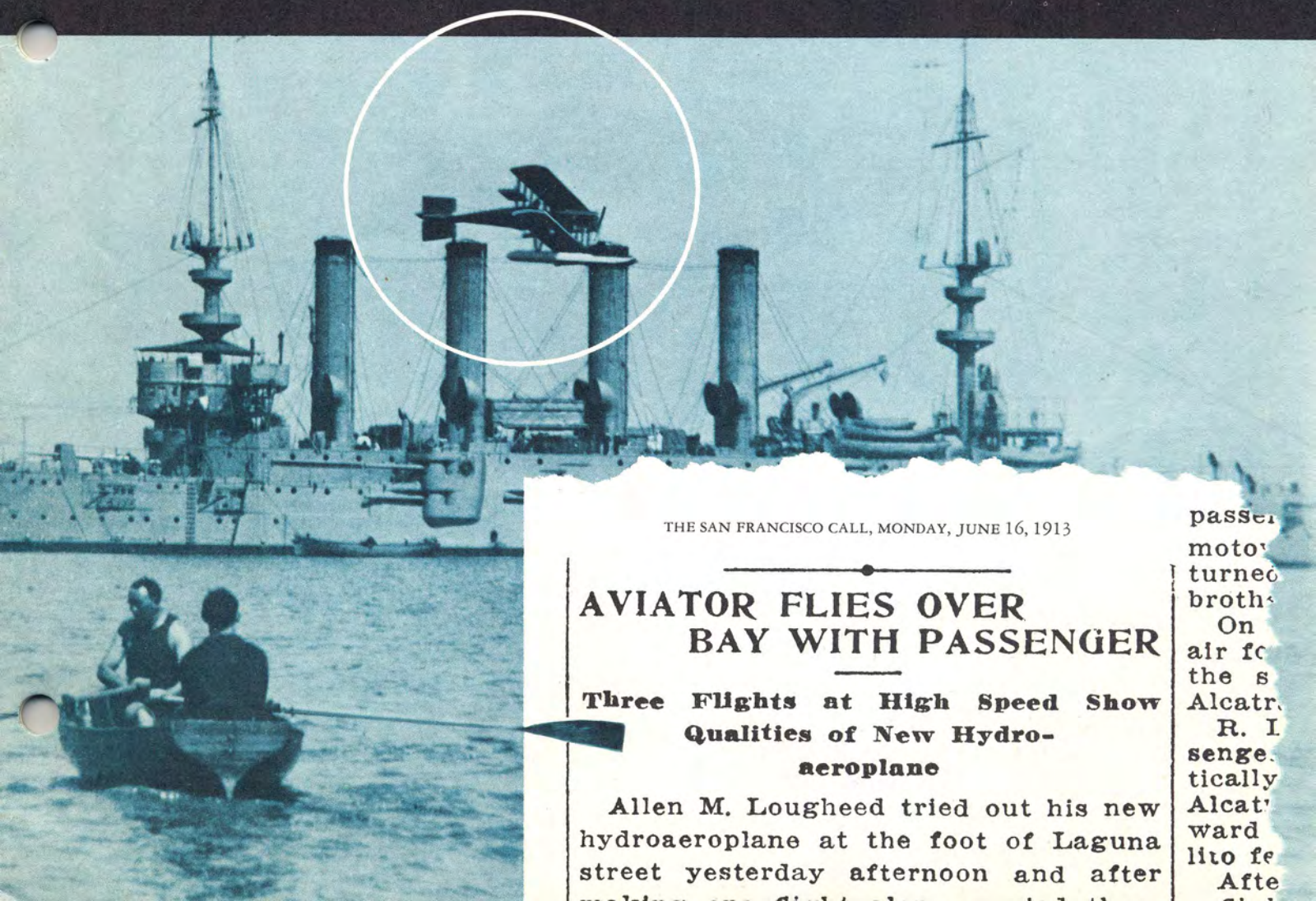
OF MEN AND STARS

April 1957

Chapter II ★ ★ ★

THE FIRST LOCKHEEDS:

BOX KITES, BARNSTORMING, AND FLYING BOATS



THE SAN FRANCISCO CALL, MONDAY, JUNE 16, 1913

AVIATOR FLIES OVER BAY WITH PASSENGER

Three Flights at High Speed Show Qualities of New Hydro-aeroplane

Allen M. Lougheed tried out his new hydroaeroplane at the foot of Laguna street yesterday afternoon and after

Victor Lougheed, first of Lockheed family to display interest in aviation, hit best-seller lists nearly half-century ago with scholarly discussions of aerodynamic theory and design.

When the Lockheed Aircraft Corporation's gleaming all-metal Electra took to the skies in 1934 and flew to world-wide fame, it carried a name actively linked with aviation's progress for a quarter century.

The Lockheed saga began in 1909, only a scant six years after Orville and Wilbur Wright proved at Kill Devil Hill that man-carrying, heavier-than-air, powered flight was possible. In its earliest years it spanned the range from scholarly dissertations on the science of aeronautics to death-defying barnstorming exhibitions in fragile kite-like machines. It encompassed design skill that evolved one of the world's first successful seaplanes and, later, the undisputed speed champion of its day. And it moved through years of high adventure when daring flyers placed their faith in Lockheed craftsmanship as they explored new frontiers of the limitless sky.

Victor Lougheed, an Illinois engineer with an impressive knowledge of aerodynamic theory, published two volumes that did much to popularize aviation. The first appearing in 1909 was *Vehicles of the Air,* followed by *Aeroplane Designing for Amateurs.* Widely read, they classified the author as an early "do it yourself" advocate.

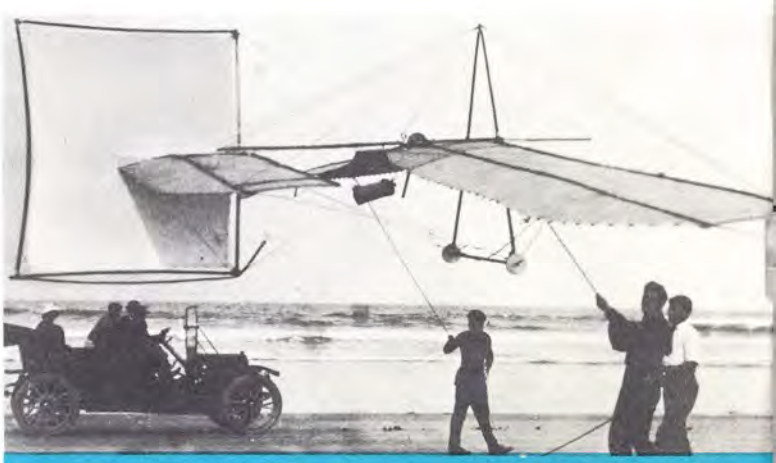
But far surpassing his accomplishments were the achievements of his two half-brothers, Allan and Malcolm Loughead, whose contributions to aviation's growth were prodigious.

The three were sons of Flora Haines Loughead—Victor by an earlier marriage, Allan and Malcolm by John Loughead, who adopted Victor and gave him the family name. That name, incidentally, underwent two transitions before arriving at its present spelling. Victor made the first change—he favored Lougheed when he wrote his aviation books and articles. And Allan and Malcolm used the subtitle, "Pronounced Lockheed," when their Loughead Aircraft Manufacturing Company undertook an advertising campaign shortly after World War I. Later the two younger brothers legalized the phonetic spelling.

Life on the Ranch

As children, Allan and Malcolm showed keen interest in design and operation of mechanical devices. Their mother, a college graduate and a remarkable woman, was a novelist and feature writer for the *San Francisco Chronicle.* The parents had separated when Allan was a small boy.

Malcolm was two years old when Allan Haines Lockheed was born on January 20, 1889, in Niles, California. His red hair showed his Scotch-Irish blood. As a boy he suffered from frequent colds and headaches. Although he never finished grammar school, he was tutored by his mother. Allan was in his early teens when he and his mother, brother, and sister became ranchers on 35 acres at Alma, 10 miles from the present Lockheed Missile Systems Division at Sunnyvale. Their income came from the mother's writings and the sale of grapes, prunes, and other crops.



James Montgomery's glider experiments exerted an influence on Allan Lockheed's interest in aviation.

While the Lockheeds were living there, James Montgomery, professor of mathematics at the nearby University of Santa Clara, was experimenting with man-carrying gliders dropped from hot air balloons. Allan did not meet Montgomery then but came to regard the professor's wood and paper machines as true pioneering efforts in the science of flight. Montgomery thus indirectly led him into aviation.

Allan Gets a Job

In 1904 Malcolm obtained a job in San Francisco as an engine repair test mechanic for the White steam car agency. Allan followed two years later and found employment in a hardware store at $10 a week. But he wanted to be an automobile mechanic like Malcolm and hounded Ivan de Jongh, proprietor of a small repair shop, for a job.

"Do you know how to solder?" de Jongh asked.

"You bet," said Allan—and proved it.

De Jongh hired him at $1 a day, six days a week.

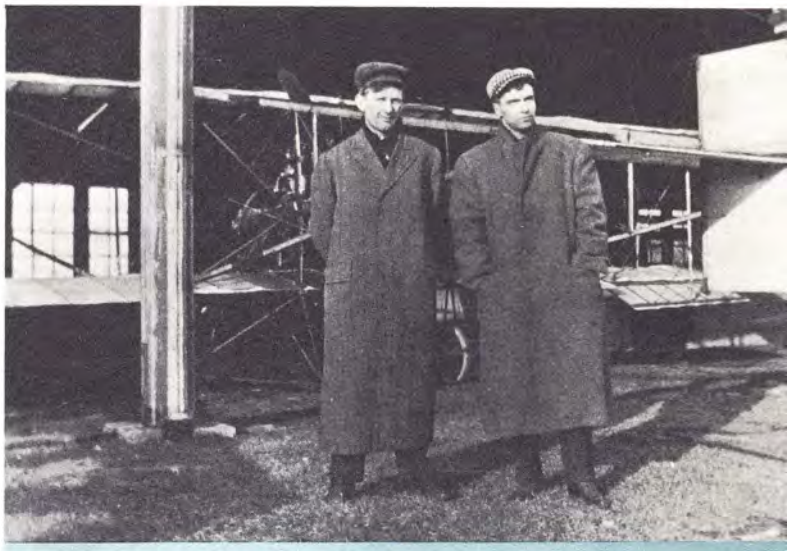
Before long the aviation bug bit Allan. He began reading everything he could find about flying. In 1909 his half-brother Victor returned to San Francisco as negotiating agent for James E. Plew, Chicago distributor of White automobiles and trucks. Plew wanted to get into aviation. He was interested in securing manufacturing rights to one of Montgomery's glider designs, a tandem monoplane, and adding power to it. Victor was successful in the Montgomery negotiations. Plew also bought a Curtiss-type pusher biplane in the east and shipped it to Chicago.

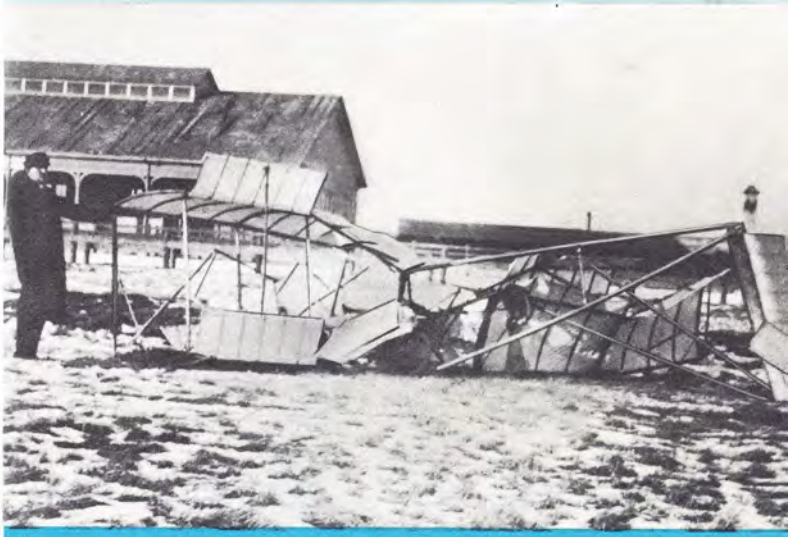
By 1910 Allan was working for the San Francisco agent for Corbin automobiles, piloting cars in hill-climbing exhibitions. On one occasion he raced a Corbin against Harris M. Hanshue, later president of Western Air Express, who won the event in a more powerful big-bore Apperson Jackrabbit.

Realizing a Dream

By now the Lockheed brothers were talking, thinking, and dreaming airplanes, but Allan still found time for romance. He fell in love with a young lady named Dorothy Watts, and they were married in Chicago in June 1911. Out of that marriage came a daughter, Flora Elizabeth, born in 1913, and a son, John Allan, born two years later. John, who inherits his father's mechanical aptitude, is now executive vice president of Century Engineers of Burbank. Mrs. Lockheed died in 1922.

There was little aviation activity in San Francisco, although in Los Angeles Glenn Martin was tinkering with one of his early flying machines. So when Plew offered to hire Allan as a mechanic on the Montgomery glider and Curtiss-type pusher he had purchased, Lockheed jumped at the chance. He sold his





Allan Lockheed began his barnstorming career in Chicago in 1910. Top photo shows him at left with Jack Hogan, a contemporary daredevil. Curtiss-type pusher in center snapshot was plane in which Allan taught himself to fly. At bottom, same fragile craft nosed down to spectacular crackup with Hogan at controls. Pilot emerged almost unhurt.

car to raise traveling expenses, then defended himself against jeers of his associates, who took a dim view of the airplane and its possibilities.

"I expect to see the time when aviation will be the safest means of transportation, at 40 to 50 mph, and the cheapest," Allan told them, "and I'm not going to have long white whiskers when that happens." The airplane, he predicted, would "take over land and water travel—flying has no barriers."

Lockheed Gets Off the Ground

Lockheed is one of the few remaining aviation pioneers who, like Martin and Glenn Curtiss, taught themselves to fly. His first journey aloft was in Chicago in the summer of 1910. A group of enthusiasts had formed the Aero Club of Illinois and prepared a field at 52nd Avenue and 22nd Street by the simple expedient of mowing down tall, marshy grass.

Here Allan met George Gates, the proud builder of a pusher biplane with a homemade 4-cylinder, 50-hp engine. Gates quickly discovered he couldn't fly it alone because the control system required manipulation of the ailerons, rudder, and elevators in three separate operations. He and Allan struck up an acquaintance and discussed the problem.

"Can you work the ailerons if I operate the rudder and elevators?" Gates asked.

Allan had never handled an airplane but was not lacking in self-confidence.

"Sure," he said.

They warmed up the engine. Allan climbed aboard the flimsy contraption, sat behind Gates, and wrapped rags around the aileron control wires to keep his hands from slipping. The plane took off, circled the field and landed safely, making probably the first dual control flight of its type in aviation history.

Accompanying Lockheed on barnstorming tour through Illinois was pretty bride, Dorothy.

As a mechanic for Plew, Allan subsisted principally on "padded expense money." Plew's staff also included Jack Hogan and Otto Brodie—the latter a nephew of the Steve Brodie of Brooklyn Bridge fame—who functioned as flyer-demonstrators of the Curtiss-type pusher Plew promoted and hoped to sell. It was Allan's responsibility to install a new 35-hp engine in the biplane.

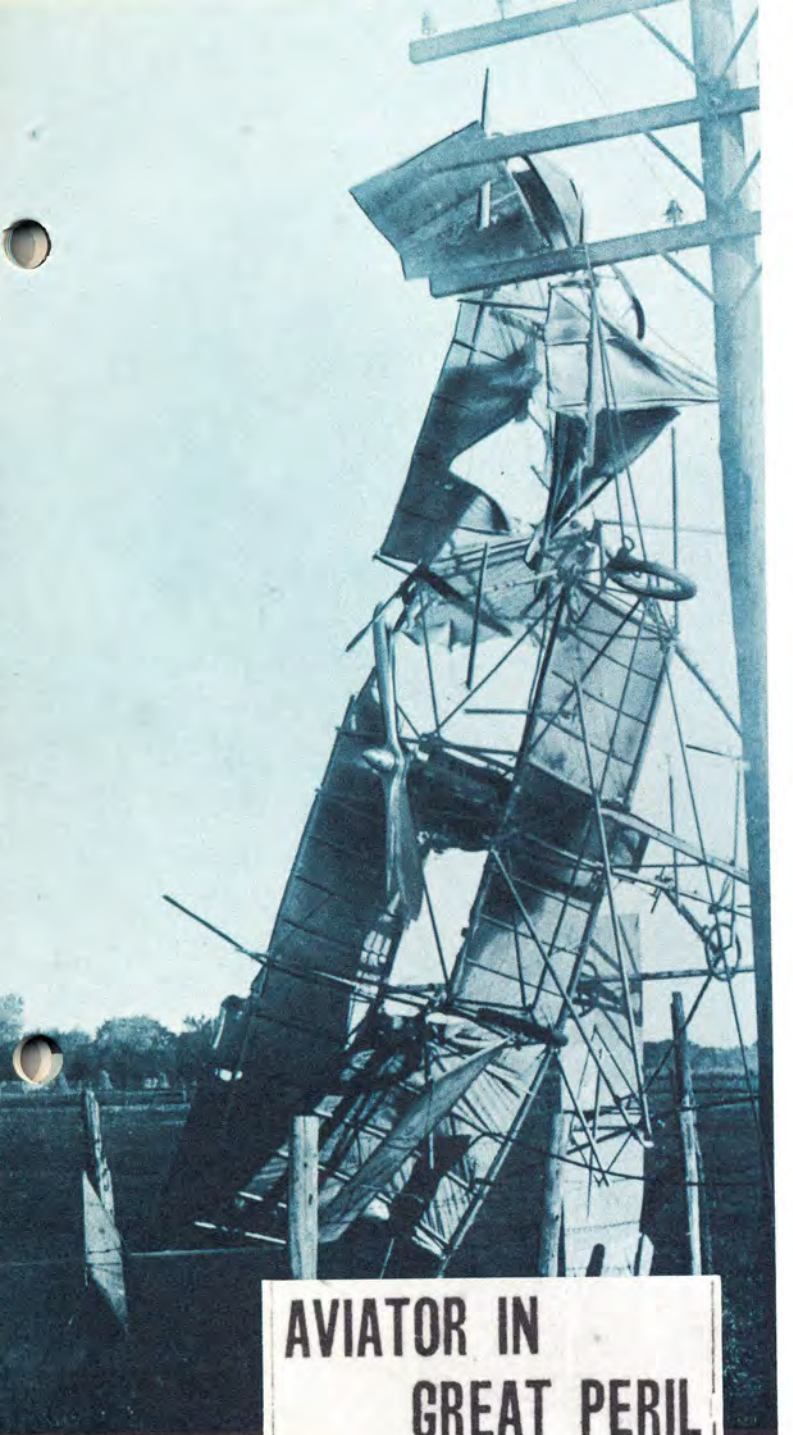
His First Solo Flight

They took the plane to the snow-packed infield of the Hawthorne race track on the outskirts of Chicago in December 1910. It had a tricycle landing gear, and its only shock absorbers were 1¾ inch bicycle tires. Allan arranged a deal whereby, if neither Hogan nor Brodie could fly the ship, he would have a chance.

Brodie took the first crack at it but couldn't get it off the ground. Then Hogan, some 40 pounds lighter, tried and failed. Discouraged, Plew announced he was going to cancel the exhibition flights he'd planned.

"Wait a minute," Allan said. "How about me?"

Curious spectators flocked by hundreds to grassy meadow in rural community in midwest and watched mechanics check out plane Lockheed used for exhibition tour.



Abrupt landing amid skein of telegraph wires convinced Allan he should quit perilous career of barnstormer. Crash was duly chronicled on front page of country paper.

AVIATOR IN GREAT PERIL

September 1911

BIPLANE CRASHES INTO TELEGRAPH WIRES AND MACHINE IS TOTAL WRECK.

BIRDMAN SLIGHTLY HURT

Aviator Loughead Has Miraculous Escape from Death in Flight Attempted After Darkness Had Fallen.

All that remains of the Curtiss-type biplane of the International Aeroplane Manufacturing Company is a mass of splintered woodwork, canvas planes torn to shreds and twisted wires. The remnants of the machine in which

He held Plew, Brodie, and Hogan to their bargain, then worked for two days on the biplane, re-rigging it, adjusting the carburetor and timing to get the engine up to full power, and realigning the stabilizer and elevator. Then he was ready to go.

"A quartering crosswind of about 10 to 15 mph was blowing," Allan recalled. "The ground was rough, and the west end of the track was marshy water."

Brodie and Hogan were skeptical. They doubted that Allan, who had flown only once previously, and then only as a co-pilot, could get the Curtiss into the air.

"I've got a $20 gold piece that says I'll make it fly," Allan challenged them. "I'm offering odds of three to one. Any takers?"

There were no takers.

The little engine began to roar, and Allan guided the plane down the field into the wind.

"I got it up," said Allan, "but the right skid stayed on the ground. I hadn't oriented myself to the controls, particularly the shoulder harness that operated the ailerons. I got cocky, though. That same day I took it off again and kept climbing. I had to circle to stay inside the track area, and believe me, I made some very jerky turns. But I landed in the infield without cracking up. It was partly nerve, partly confidence, and partly damn foolishness.

"But I was now an aviator."

Down Goes Hogan

Some weeks later Hogan insisted upon trying to fly the plane again. Allan, afraid Hogan would wash it out, pulled out a sparkplug wire on another wintry day at the Hawthorne track in an attempt to discourage him. But Hogan discovered the ruse and replaced the loose wire.

"If you can fly this thing, I can," he told Allan, and took off.

The Curtiss reached the dizzying height of 50 feet. Then, without warning, it nosed over and smashed itself into the ground. Allan ran nearly half a mile to the scene of the wreckage and arrived in time to hear a faint cry:

"Get me out of here!"

He pulled Hogan out. The pilot's clothing had been ripped almost off his body, and he was scratched and bruised but otherwise unhurt.

Plew ordered a second pusher of the same type rushed to completion, and Allan took it up on its first flight in January 1911.

"It was out of balance," he said. "The plane stalled and nosed in from about 30 feet. I was sitting in front of the engine, so I threw myself out of the seat to be out of the way in case the motor decided to crash on through. It didn't—I had installed it myself—and it stayed running." He emerged from

this mishap with nothing more than a bruised knee.

With two airplanes, his total inventory, thus wiped out, Plew had had enough for the time being. He closed down his aviation division for the winter, and Allan went to work as an automobile mechanic. Early in the spring he returned to Plew's employ to help rebuild both wrecked ships for the coming exhibition season. Allan successfully flew one of them, and a railroad engineer named Dan A. Kraemer, trying for his pilot's license, took the other one up at dusk on July 13. He was unfamiliar with the controls. The plane crashed and Kraemer was killed.

Penalized for Flight Daring

Plew sold the remaining Curtiss and withdrew from the flying business. But aviation was in Lockheed's blood to stay.

At a benefit meet staged by the Aero Club for Kraemer's widow, Allan was the victim of a bewildering turn of events. An account in the August 12, 1911 issue of *Aero,* published by the club, reported he took up a new Curtiss-type biplane. "With a machine which never had been put together," the story said, "with an engine which never had been turned over, and a propeller which never had been under strain, he got up and made a mile flight around the field in perfect style." His performance was so good that the field management suspended his flying

Horseshoe-shaped radiator and fragile crankcase were features of Model G's original power plant.

AVIATOR FLIES OVER BAY WITH PASSENGER

Three Flights at High Speed Show Qualities of New Hydro-aeroplane

Allen M. Lougheed tried out his new hydroaeroplane at the foot of Laguna street yesterday afternoon and after making one flight alone carried three passengers for rides. Warming the motor with a short spin, Lougheed returned to the beach and took his brother Malcolm aboard.

On this flight the hydro was in the air for fully 20 minutes, cruising along the shores of the Golden gate, over Alcatraz island and back to the beach.

R. L. Coleman was the second passenger and Lougheed followed practically the same course except near Alcatraz, where he headed to the eastward and flew over one of the Sausalito ferry boats.

After he had taken his mechanic for a flight the wind came up and the sea was running too strong to take the hydro out with safety, so Lougheed desisted. The new machine has a clean cut appearance and developed a speed of [illegible] miles an hour with a passe[illegible]er.

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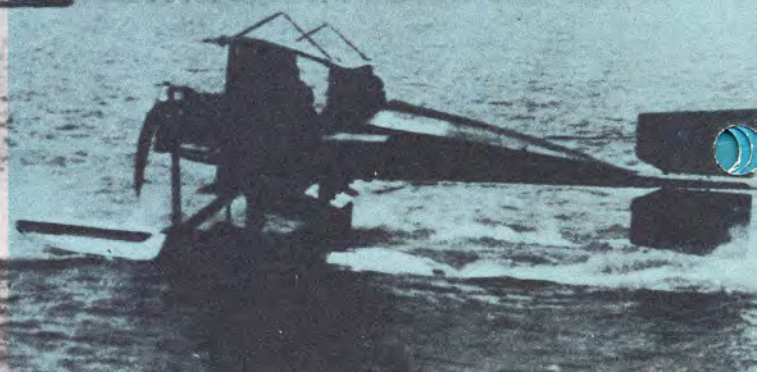
Cruiser Wisconsin, outgoing liner were in background as Model G, first plane to bear Lockheed name, skimmed waters of Golden Gate on early hop. Photo was taken at same time as picture on cover. At right, newspaper account of craft's initial flight, made on June 15, 1913.



privilege for five days because others "trying to emulate the feat might not be so well equipped."

After Plew abandoned aviation, Allan got a job with the International Aviation Company of Chicago as a flying instructor—even though he had only an hour and a half in the air himself—at the munificent sum of $25 a week. The company manufactured and sold airplanes and ran a flying school.

"There were no dual controls," Allan said. "Our instruction consisted of straight hops and taxiing. The planes were powered with all aluminum, two-cycle Roberts engines, very advanced for the time."

Business was not brisk, and when International tried to cut his salary to $15 a week Allan quit. But the company soon returned with another bid for his services. It had signed a number of exhibition dates at county fairs throughout Illinois. It found itself in a hole when one flyer was killed and another washed out three planes in three successive appearances. Would Lockheed fly the remaining dates for 25 per cent of the gross?

A Date With Death

Allan would—the prevailing rate was $500 for five minutes in the air. He made three successful appearances. On September 18, 1911 he reached the small Illinois community of Hoopston, unaware that before the day ended he would have made and broken an appointment with death.

The plane had been left out on a railway platform at Bloomington on the previous night and thoroughly soaked in a rainstorm. This loosened the glue, and Allan and his mechanics had to wrap the outriggers with fishing twine to keep them together. At dusk the water-soaked, underpowered craft was ready to take the air—or as ready as it would ever be.

Chronicling the adventure, the *Hoopston Evening Herald* described Lockheed as a "nervy little aviator" whose "machine darted southward... reaching a height of barely fifty feet" and flew out of sight of the spectators.

"Although they waited patiently for some minutes," continued the newspaper account, "he did not return, and it was concluded he had alighted in some field."

That conclusion was erroneous. True, Allan "alighted," but his landing was in a mesh of telegraph wires after he found the water-logged pusher was unable to gain altitude. The fragile plane nested gently, one wing wrapped around the pole, the engine still running. Allan, his forehead striped with slight cuts from the parallel wires, climbed through the maze and shut off the engine. Then, Tarzan-like, he swung hand over hand along the stays of one of the wings and jumped clear of a barbed wire fence that ran directly beneath.

Baby daughter Flora was major interest when Allan and Dorothy Lockheed posed in front of Model G in 1913. In photo below, the plane, carrying passengers at world's fair, boasted new V-8 engine.

Here the Lockheed flair for publicity got its start. Allan limped back to Hoopston and en route encountered a local resident who had seen the wrecked craft.

"Where's the aviator?" the citizen asked.

"I'm him," Allan said. "Know where I can locate a photographer?"

The Hoopstonian didn't, and it was not until the next day that the wreckage was recorded in a spectacular photograph. It was Allan's last exhibition flight and end of a career of daredevil barnstorming that taught him a great deal about flying machines of the day—especially what was wrong with them. After risking his life in planes then available, he know he could build a better one. And by the time he and his wife arrived back in Chicago, the design for a three-place, tractor-type seaplane was already churning around in his mind.

The Model G Takes Shape

He had a Chicago firm make some milled wooden parts, chiefly ribs. Then he and Dorothy returned to San Francisco and he resumed work early in 1912 as a mechanic. Malcolm immediately warmed to Allan's plan to build a seaplane and joined his brother in the new enterprise.

There was, perhaps, some psychological signifi-

cance attached to the aircraft's designation. They called it the Model G to convey the impression that they had built several previous planes. It took the form of a seaplane because they believed that hydroaeroplanes, then in the early stages of development, had good commercial possibilities among the many boating enthusiasts along the San Francisco Bay.

Embarking on manufacture of the Model G, the brothers worked during the day to eat, and at night to fly. Every evening and weekend for 18 months found them hammering, gluing, and stitching in a little frame garage at Pacific and Polk Streets on the waterfront.

Adventurous Malcolm Lockheed (sixth from left) kept one-plane Mexican air force in action as government battled Pancho Villa rebels in 1914.

The Lockheeds were energetic, they were mechanically inclined, and they had another asset indispensable in aviation's early days. When they ran out of money, they usually knew where to find more. To help underwrite the Model G they interested Max Mamlock, head of the Alco Cab Company of San Francisco, who assisted in organizing the Alco Hydroaeroplane Company. This company poured about $4000 into the venture, not a small sum in an era when board and room cost $1.50 a day, and Allan and Malcolm Lockheed invested their labor, tools, some materials, and design skill.

To power the plane the Lockheeds installed a Kirkham 6-cylinder water-cooled engine. This Kirkham had two distinguishing characteristics—a horseshoe-shaped radiator and a crankcase that split wide open after 15 minutes of runup time. Understandably vexed, the Lockheeds sent the power plant back for a refund they never received and retained the radiator, connecting it to a Curtiss 80-hp water-cooled V-8.

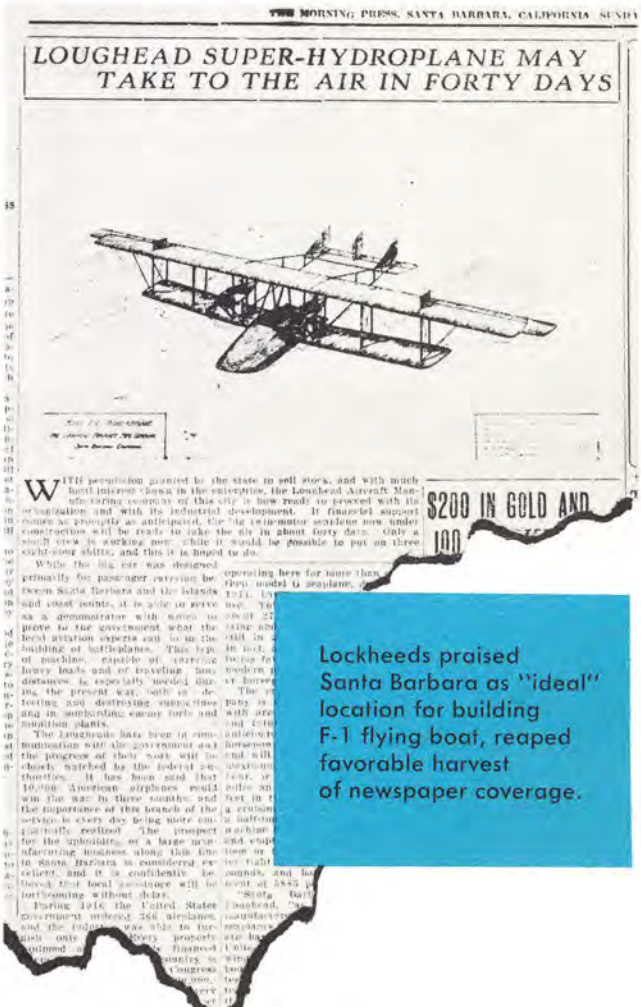
In appearance the Model G vaguely resembled some training planes of recent years. It was a wood and fabric biplane with the engine in front. Allan was convinced that was the place for it, based on his experiences flying with a heavy power plant behind him.

The First Lockheed Flight

Distinctive features were the location of ailerons as separate control units, attached midway between the wings and near the tips, and a "cruciform" tail, originated by the French, hinged on a universal joint so that the horizontal and vertical surfaces moved as a unit. The Lockheeds installed a three-in-one control arrangement whereby the wheel operated the rudder, and the "stick" to which the wheel was attached operated the elevators and ailerons. The equipment included a hand and foot throttle but only one instrument, a tachometer designed originally for a motor boat.

The plane for its time was a large one. The upper wing span was 46 feet, the craft was 30 feet long, it weighed 2200 pounds gross, and it carried a useful load of nearly 600 pounds.

Early on June 15, 1913, the brothers dragged their creation out of the garage. At the foot of Laguna



THE MORNING PRESS, SANTA BARBARA, CALIFORNIA SUNDAY

LOUGHEAD SUPER-HYDROPLANE MAY TAKE TO THE AIR IN FORTY DAYS

$200 IN GOLD AND 100

Lockheeds praised Santa Barbara as "ideal" location for building F-1 flying boat, reaped favorable harvest of newspaper coverage.

Pay as You Enter

To augment slender resources while building their F-1 flying boat in Santa Barbara, Lockheeds used Model G in passenger charter service that proved profitable.

Street near the mouth of San Francisco Bay they warmed the Curtiss engine before a small group of onlookers and scoffers. Allan, in the pilot's seat, cracked the throttle, and Malcolm helped guide the Model G down the ramp. Allan swung the craft into the wind and began to skim across the blue waters of the bay. After a short run the plane was airborne and began to climb steadily.

"It had very sensitive controls," Allan recalled, "and until we learned how to handle it, the ride was rocky."

After its takeoff next to the Army transport dock at Fort Mason, the Model G returned to the beach, and Allan took Malcolm aboard. On this flight the hydroaeroplane was in the air for 20 minutes. It covered some 10 miles, rounding Alcatraz, Nob Hill, and Market Street. From its takeoff point the G reached an altitude of 300 feet. Allan made two more hops that day. Then the wind came up and the sea began to run too strong for safe landings.

A newspaper account of the flights hailed the Lockheed ship as having "a clean cut appearance" and reported it "developed a speed of 60 miles an hour with a passenger."

A Lockheed Tradition Begins

By the time the Model G had proved it was airworthy, powered flight was no longer a novelty. A couple of other seaplanes had flown earlier. Henri Fabre made the world's first successful hydroaeroplane flight in March 1910 in France with a 1000-pound machine called the "Canard." And in January 1911, Glenn H. Curtiss flew a pusher seaplane off the bay at San Diego—the first time this was accomplished in the U.S.

But the Lockheeds' first airplane was remarkable on several counts. It was one of the earliest successful tractor tandem planes built, it was one of few aircraft capable of carrying more than one passenger, and it started a Lockheed tradition. It made money for its builders—and operators.

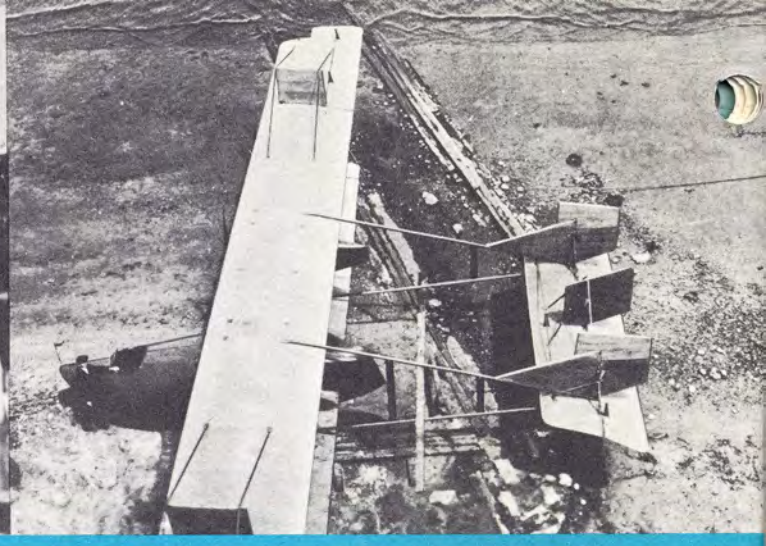
The flying boat suffered one mishap in 1913 when Allan, piloting Ferdinand Theriot, a San Francisco sportsman, to San Mateo to attend a society fair, hit a levee while landing. Damage was comparatively minor, but the crackup spoiled Allan's profit-making plans to take Theriot's socialite friends for rides. The G was brought back to San Francisco, where Allan designed and built a new propeller and replaced the horseshoe-shaped Kirkham radiator with a conventional type.

$10 for a 10-Minute Ride

For nearly two years the plane languished in storage. Allan and Malcolm prospected sporadically in the California gold country. They never struck it rich—Allan said they "made beans." In 1914 Allan resumed his old trade as an auto mechanic in San Francisco. When World War I broke out, Malcolm was en route to the Orient aboard a freighter, taking with him a Curtiss biplane that he hoped to use in establishing a sales and service agency in Hong Kong. Off the coast of China a British warship stopped the vessel, confiscated the Curtiss as contraband, and nipped Malcolm's business venture in the bud.

Little daunted, Malcolm returned to San Francisco, where he and Allan saw an opportunity to make money with the Model G at the Panama-Pacific Exposition. Advertising for a partner with capital, they found one in a man named Meyer, who became wealthy in Alaska as a baker and restaurant operator during the gold rush days. Meyer joined them in

Careful workmanship characterized F-1. Supervising construction crew were Allan Lockheed (third from left) and his brother Malcolm (second from right).



Constellation was not first Lockheed airplane that featured triple tail. Three vertical fins helped F-1, weighing more than 7300 pounds, handle easily.

buying the G from Alco Hydroaeroplane Company, which dissolved soon after.

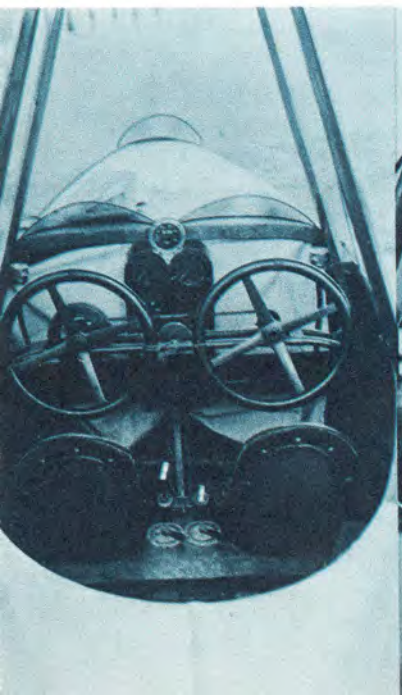
Money in the Bank

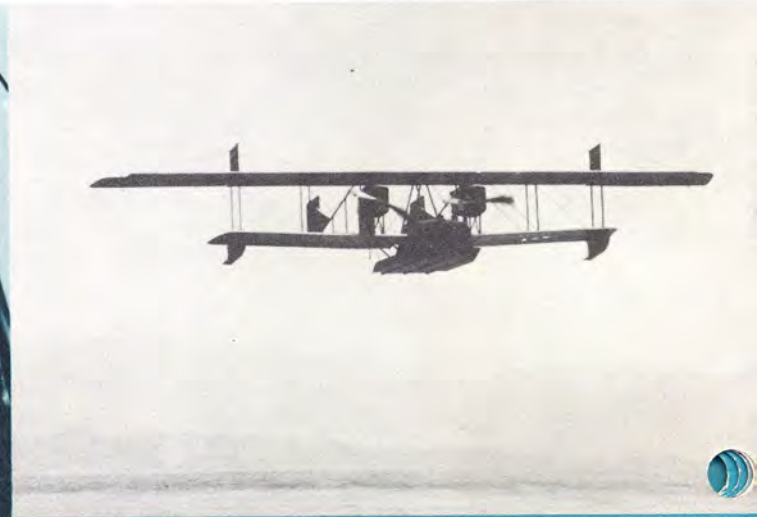
The exposition opened in February 1915. But the Lockheeds and Meyer, who bid for the passenger-flying concession, did not obtain it until September, since it was promised first to a noted aviator, Bob Fowler. Unfortunately for him, Fowler's plane cracked up on his first flight. He withdrew, and the Lockheed-Meyer partnership stepped in.

During 50 flying days they grossed $6000. Their charge was $10 for a 10-minute ride, but they frequently shortened the time if there was a lengthy waiting list of prospective passengers. The only accident was a dented wing tank, repaired at a cost of $1.60. In all, the Model G carried 600 passengers and netted its owners about $4000. It could carry two persons plus the pilot—if they weighed no more than 160 pounds each.

The exhibition flights were a big attraction at the exposition. Allan proved his skill as a pilot, the G proved its dependability, and the Lockheed name began to spread around the world as visitors returned to their homes singing the airplane's praises.

After the exposition closed, the Lockheed family





F-1 cockpit at left shows dual controls. Center, Lockheed brothers squint into sun as they warm up twin engines. Above, giant hydroplane takes off on mile-a-minute flight to San Diego for Navy tests.

moved back to Santa Barbara where they had once lived. Allan and Malcolm shipped the Model G down the coast in crates. They couldn't fly it that far because its fuel capacity was only eight gallons.

"We reassembled it on the beach and launched a charter business that quickly showed a profit," Allan commented later. "In fact, for a time it was the only thing that kept us going."

The G flew until 1918, when its builders—with a practical eye toward salvage value rather than sentiment—junked the airframe and sold the engine.

Loughead Company Formed

In 1916 the Lockheed brothers began writing the second chapter in their saga as pioneer airplane builders. They established the Loughead Aircraft Manufacturing Company in the rear of a garage near the Santa Barbara waterfront. Their finances were meager, but they were ambitious.

Berton R. Rodman, Santa Barbara financier and machine shop owner, was elected president, Allan first vice president, Malcolm secretary and treasurer, Norman S. Hall advertising and sales promotion manager, and Anthony Stadlman factory superintendent. A Czechoslovakian mechanic and engineer, Stadlman first worked with Allan in maintenance of the Curtiss pusher that Lockheed flew during his barnstorming in Illinois.

In midsummer of 1916 a 21-year-old garage mechanic and architectural draftsman, son of a prominent Santa Barbara contractor, became a frequent visitor at the factory on State Street. He knew the Lockheeds by reputation. He had seen their Model G at the Panama-Pacific Exposition the year before. And he wanted a job—anything at all, as long as it was connected with aircraft. The young man was the far-sighted John K. Northrop, one of the most talented designers in aviation history, whose contributions to the progress of flying include the celebrated Lockheed Vega and the famous Northrop Flying Wing bomber.

Giant Flying Boat

The Lockheeds hired Northrop and put him to work helping to shape the hull of their new airplane, called the F-1. A self-taught engineer, Northrop understood stress analysis. He designed and stressed the wings of the flying boat, world's largest seaplane at the time.

It was built to carry 10 persons, including pilot and co-pilot, and was of wood and fabric construction, with engine cowlings and fittings of metal. The upper wing spanned a monstrous 74 feet, and the 47-foot lower wing carried pontoons beneath each tip. Two 160-hp Hall-Scott engines hung between the wings on either side of the hull. It was a tractor

Washington or Bust

The Lockheeds displayed early flair for publicity in 1918 when they converted F-1 to land plane called F-1A, planning hop across continent. Movie star Mary Miles Minter lent touch of glamor to start of journey (top). Plane took off bravely on flight (center), but landed ingloriously on nose in Arizona after engine failure.

type craft, 35 feet long, with a gross weight of 7300 pounds, a useful load of 3100 pounds, a top speed of 84 mph, and a cruising speed of 70 mph.

Throughout it showed every evidence of practical design and careful workmanship. For example, wing struts were of steel, bolted top and bottom, and encased in streamlined wooden fairings. The Lockheeds also developed a rust-proofing process for metal parts that greatly increased their durability.

The F-1 was notable, additionally, because it inaugurated a design configuration that became famous years later on the Constellation—a triple-finned tail, mounted on metal booms attached to the hull and wings.

By this time the U.S. was on the verge of entering World War I. The Lockheeds offered to place their factory and "personal services as trained pilots" at the government's disposal "in event of trouble with any other foreign power." The *Santa Barbara News-Press* reported the company also planned to offer its F-1, then under construction, to the military. Work was rushed in hope of completing it by April 1917.

"With a little added equipment we could turn out each month two machines," the story quoted Allan. "We are patterning our new machine in line with government specifications and it would be available for immediate use for observation and reconnaissance work, to which it is especially adapted."

The Navy Tests the F-1

After the U.S. declared war on Germany and the Central Powers, the Navy—anxious to build up its air arm—displayed interest in the Lockheed F-1 and arranged for it to be flown to the North Island Naval Base near San Diego for testing. Allan first flew it at Santa Barbara on March 28, 1918. The formal launching followed what the *News-Press* described as an "impressive christening and dedicatory ceremony." First passengers were Mary Miles Minter, a noted silent screen actress who made a number of movies in Santa Barbara, and her sister.

On its trial hop the F-1 made a circular flight that demonstrated inherent stability although there was too much area in the counterbalanced ailerons. This problem was quickly solved, and a short time later the plane winged to North Island, setting a non-stop overwater mark—180 miles in 181 minutes.

Reconverted to flying boat after Arizona accident, F-1 resumed charter work. King and queen of Belgium were passengers in 1919.

First Military Order

During World War I Lockheeds won order to build two seaplanes using Curtiss HS2L design. Picture at right shows details of construction. Figure in doorway is John K. Northrop. Man with hat in hand in center photo is B. R. Rodman, president of company. Malcolm Lockheed stands in cockpit. At right, Allan Lockheed and Northrop. Colorful ceremony marked HS2L christening (lower photo).

Navy officials began a series of rigid flight and structural tests that spanned three months. These convinced them the Lockheeds knew how to build an airplane, but the craft was ruled out because of a design standardization policy. The government was concentrating production on specified aircraft types, and the seaplane design it chose was a Curtiss HS2L. Accordingly, the Lockheeds' first military contract was to construct two seaplanes patterned after the Curtiss. The trial order was on a cost-plus-12½ per cent basis, plus spare parts.

"We took a beating on the deal," Allan recalled later. "We invested between $4000 and $5000 in necessary alterations to the basic HS2L design and weren't reimbursed for our expenditures."

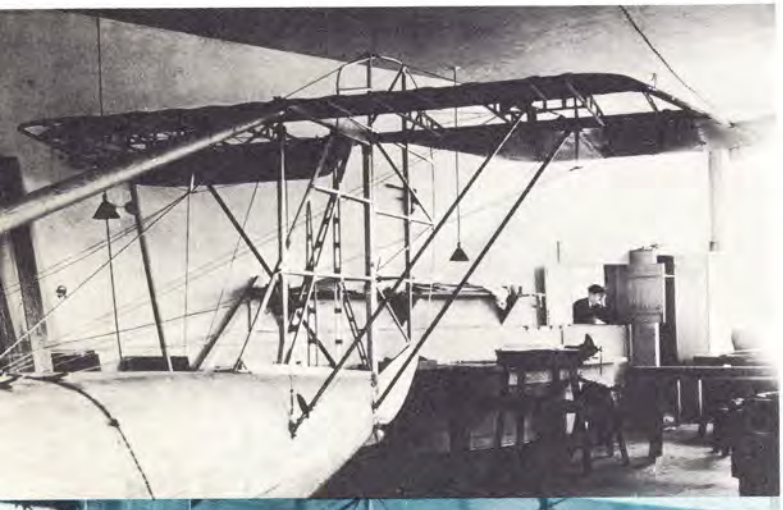
Employment Booms

At the peak of production, employment at the small Santa Barbara plant rose to 85 men. Northrop, then in military service at Camp Lewis, was furloughed and returned to Santa Barbara to help turn out the two planes.

Meantime, the Model G continued its successful career. Soon after the Lockheeds arrived in Santa Barbara, Allan used the plane to make the first crossing of the Santa Barbara channel by air, carrying

two passengers and completing the 60-mile trip in just one hour.

Even though the Navy had turned down the F-1, the Lockheeds remained convinced of its potentialities. After its return to Santa Barbara from the North Island tests in August 1918, the factory promptly rebuilt it at a cost of $10,000 into a land plane configuration with a landing gear arrangement that consisted of two main gears and a nose wheel.



Several drag-reducing refinements grew out of their crude wind tunnel experiments. Sample streamlined sections of wing strut fairings, formed in the shop, were placed in a large glass tube. The workmen blew cigar smoke into one end so the Lockheeds, Northrop, and the other engineers could study the action of the air as it flowed past the section being tested. As a result of these improvements the converted plane, called the F-1A, exceeded the seaplane's speed by 10 mph.

The Lockheeds formed an ambitious plan. They made arrangements to send the F-1A on a transcontinental flight from Santa Barbara to Washington, D.C., as an advertising and promotional stunt and to demonstrate to government officials that they had passed up a good bet by not ordering the plane for military service. Only a few days after the Armistice in November 1918 the F-1A winged into the skies, its destination Washington, with a crew of two, Aaron R. (Bob) Ferneau and "Swede" Meyerhoffer.

Government regulations against private flying had not yet been lifted. Under a wartime rule civilian aircraft could be fired upon without warning if on unauthorized flights. But the Loughead company gambled that the F-1A would not go down with a bullet hole through the fuel tanks.

Engine Failure Ends Flight

It was not a bullet, but engine failure that brought the proposed cross-country hop to an inglorious end. A broken valve spring in one engine forced the plane down at Tacna, Arizona, where the part was replaced. Fuel shortage necessitated another landing at nearby Gila Bend. Here, after refueling, the F-1A took off. But an engine conked out at 50 feet, and the ship plunged into a river bed.

Back to Santa Barbara went the F-1A—this time by rail. It was again rebuilt into the F-1 flying boat configuration, and the Lockheeds inaugurated a charter service for the tourist season in 1919. They did a brisk business that summer at $5 a passenger. But by September the public was losing interest in flying. Barnstormers—the air became full of them—cut prices as low as $1 a ride.

In October the F-1 and its builders basked briefly in the spotlight of international fame. King Albert and Queen Elizabeth of Belgium, then on a tour of America, spent a few days in Santa Barbara. The U.S. State Department chartered the flying boat to take the royal couple on a flight to the Channel Islands. With Allan as their pilot, the visiting rulers and their entourage made the hop to Santa Cruz Island and return on October 11. The king and queen were so impressed that Allan and Malcolm

received the Belgian Order of the Golden Crown.

For a time the F-1 was the only commercial aircraft on the west coast in which a movie camera could be mounted in the front cockpit and rotated to photograph the action of heroes, heroines, and villains in the rear seats or to the side for wing walkers. As a result, several studios chartered it for early-day motion picture work. The income was sizable—the Lockheeds charged $150 an hour in flight and $50 an hour as standby time. They also used the F-1 to give flying lessons. Eventually they sold it to a group that planned to use the plane in charter service to Catalina Island. But the syndicate ran out of money before the venture started. And the F-1, abandoned on the beach, served as an attraction for curious children until it fell apart.

The Trail-Blazing S-1

But before that happened the inventive talents of the Lockheeds, Northrop, and Stadlman combined to conceive the next Lockheed airplane. While only a single-engined, one-place open biplane, this S-1 represented a major advance over aircraft design thinking of the time.

The S-1 boasted the first successful monocoque (French: single shell) fuselage, in which strength came from the skin rather than a heavy, internally-braced structure. It was constructed by means of a plywood-molding process that Allan thought out and patented with Malcolm, Northrop, and Stadlman. The S-1 featured two other innovations—a lower wing that could be turned vertically to act as an air brake, and a system whereby, on the ground, both wings folded to the sides of the cockpit to save parking space.

Two half-elliptical cement molds were used to form the plywood fuselage. Originally Allan envisioned the S-1 as a two-place tandem craft, believing that would be more readily marketable, but his associates held out for the one-place design. To power it he, Stadlman, and others of the staff designed a 2-cylinder 25-hp water-cooled opposed engine. Tested at 2000 rpm, it developed within 1 hp of its specification.

From every perspective the S-1, with its cigar-shaped fuselage and elimination of unnecessary cables and pulleys, was a trail-blazing departure from flying boxkites of those years. The folding wings, incorporated to make the plane attractive to the average man, who could park it in a garage, were like those used later aboard aircraft carriers.

"We never did use the wing brake," Allan remarked. "The plane landed so slow as it was—25 mph—that we didn't need it."

The Brother Team Dissolves

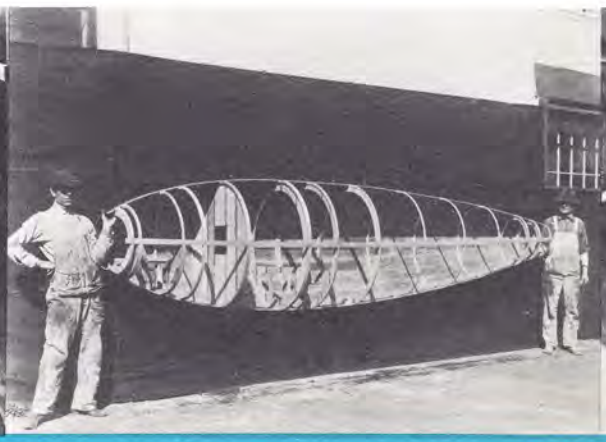
With completion of the S-1, the Lockheed brothers, who had worked together in aviation since 1912, went their separate ways. Malcolm, whose interest in flying was never so deep as Allan's, had been nurturing another dream. It was a four-wheel hydraulic brake system for automobiles, which he first conceived while working as a mechanic in San Francisco in 1904. Holed up in a mountain cabin a few years later, he used tin cans, cups and saucers, and bent sticks to work out a way of installing brakes on the front wheels, sketched the device and sent it to his brother for comments.

"It's a million dollar idea," Allan encouraged him. "Keep at it."

On and off Malcolm kept at it, even in the busy days of 1912 and 1913 when he and Allan put together their Model G. Before the Lockheeds operated their passenger-flying concession at the Panama-Pacific Exposition, he served as "chief engineer" of the Mexican "air force." This consisted of one battered

The S-1 ...Every Man's Plane

Lockheeds patented process that used concrete forms in molding plywood S-1 fuselage.



Its monocoque construction was radical departure, gave plane streamlined strength.

Lockheed staff designed and built economical 2-cylinder engine to power sport plane.

Advertising brochure sang S-1's praises but timing was bad. War surplus aircraft glutted market and sport model failed to sell.

biplane used by the Carranza government in its running battle with Pancho Villa and his rebels. Malcolm came out of that conflict with a bullet-torn Paige roadster that served the Carranzistas as a field car. He brought it to Santa Barbara and installed his hydraulic four-wheel brakes on it in 1916. They were a success from the first.

More convinced than ever that he had something, Malcolm left the Loughead Aircraft Manufacturing Company in 1919 and with other associates formed the Lockheed Hydraulic Brake Company, using the phonetic spelling of the name. He made Detroit, the automobile capital, his headquarters and attracted his first customer in 1923 when Walter P. Chrysler, then manufacturing Maxwell and Chalmers cars, signed a contract. Lockheed brakes appeared on the first Chrysler introduced in 1924.

That order put Malcolm and his company in the black. He quickly secured 32 more contracts. Malcolm sold out in 1929 at a comfortable figure, and the Lockheed Hydraulic Brake Company became part of the Bendix organization in 1932. Eventually it grew into a billion-dollar enterprise.

Good Airplane, Poor Market

Meantime Gilbert C. Budwig, later inspection chief of the U.S. Department of Commerce, aviation division, successfully tested the S-1 at Redwood City, California, in 1919. The plane weighed only 375 pounds empty, yet was stressed for a safety factor of six Gs. It had a top speed of 75 mph and handled well in the air.

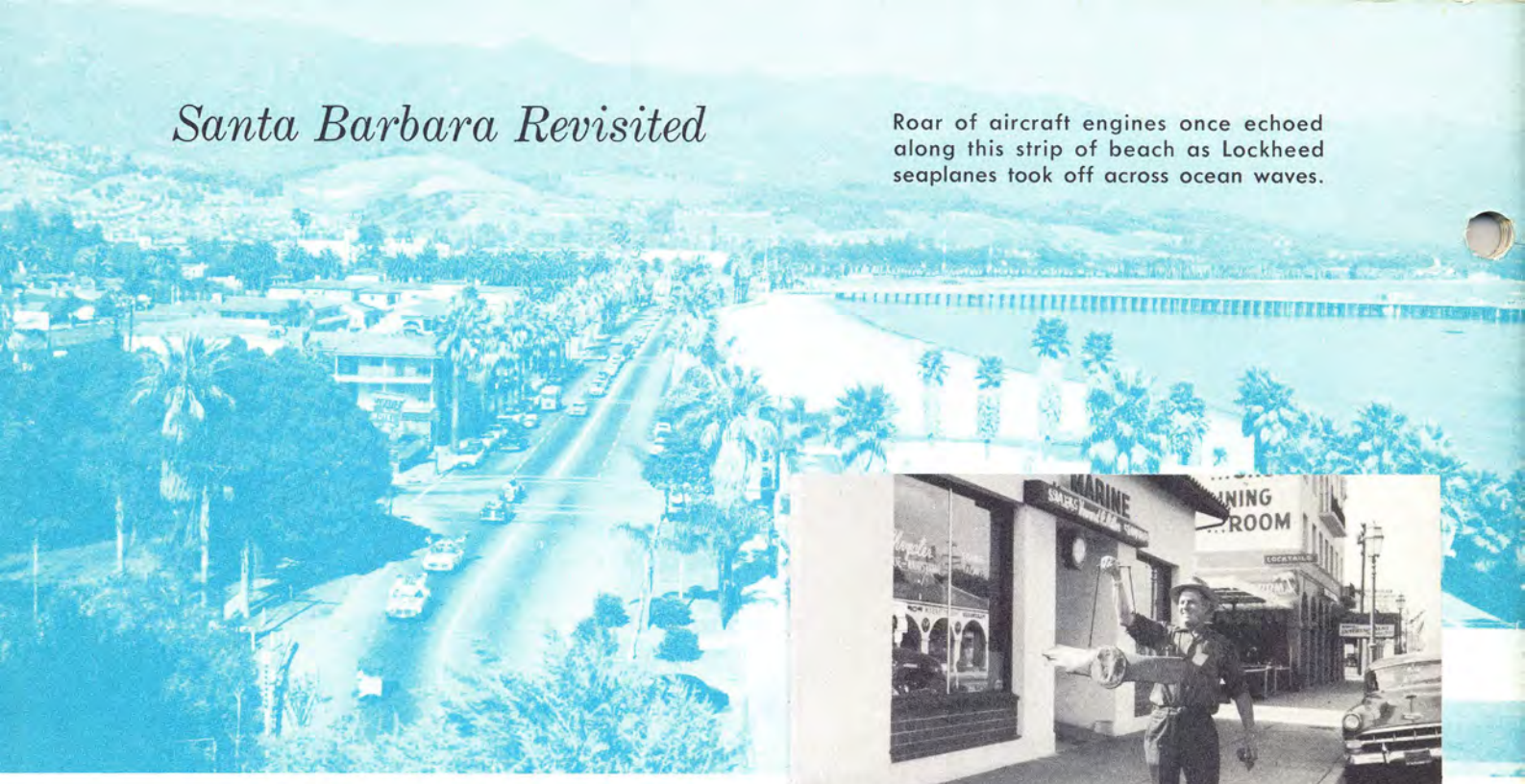
The S-1 won wide and favorable interest at an air show in San Francisco in 1919. Lieutenant—later General—H.H. Arnold was so enthusiastic over its potential that he dragged people over by the score to see the "poor man's airplane." Encouraged, the Lockheed group undertook an extensive—for that time—advertising campaign. They described the S-1 as "small, reliable, and economical" and "within the reach of every automobile owner."

On first flight S-1 proved airworthy, with 70 mph top speed. It landed at 25 mph.

S-1 wings folded so airplane could fit garage. Lower wing tilted for use as air brake.

San Francisco city hall was backdrop for 1919 publicity photo of S-1 with film star.

Santa Barbara Revisited



Roar of aircraft engines once echoed along this strip of beach as Lockheed seaplanes took off across ocean waves.

Howard Miller, who helped build F-1, holds propeller shattered in crash in 1918. He now operates marine hardware.

But after the Armistice national aircraft production collapsed. Although many companies bravely converted to peacetime models, they found their markets ruined by hundreds of war surplus Curtiss JN-4 Jenny trainers. These sold brand new—still in their crates—for $400 or less, and hundreds of De Havilland fighters, Liberty engines, and other equipment also were available at ruinously low prices.

It became painfully apparent that not enough automobile owners would look to the S-1 as a substitute for their earthbound transportation. The craft cost nearly $30,000 to develop, but not one single plane was sold. Rodman, who correctly foresaw no commercial market for it, resigned as president, and in 1921 the Loughead Aircraft Manufacturing Company suspended operations and was liquidated.

Since 1913 Lockheed skill and ingenuity had gone into building just five airplanes. Prospects when the Santa Barbara factory closed were not bright.

But the future was to bring success and fame far exceeding Allan Lockheed's early dreams. Six short years later the Lockheed name was to take to the skies again to chart a trail of adventure and achievement, tragedy and triumph.

Spanning nearly 50 years of Lockheed history are B. R. Rodman (left), Allan Lockheed, Robert Gross, John Northrop.

Coming Next Month...

In Chapter III, *Of Men and Stars* will span Lockheed's adventure-filled, boom-to-bankruptcy years late in the Roaring Twenties. It will relate the daring exploits of pilots who flew to fame with the Winged Star that graced the speedy Vega, the sleek Orion, and other Lockheed planes. It will tell how a company that proudly boasted "It Takes a Lockheed to Beat a Lockheed" was almost wiped out during the grim Depression.

Again we urge you to preserve the chapters of this history as they appear. You'll note that the booklets are punched to fit in a standard three-ring binder.

If for some reason you did not pick up Chapter I, "Gross Hitches His Wagon to a Star," get in touch with your public relations office.