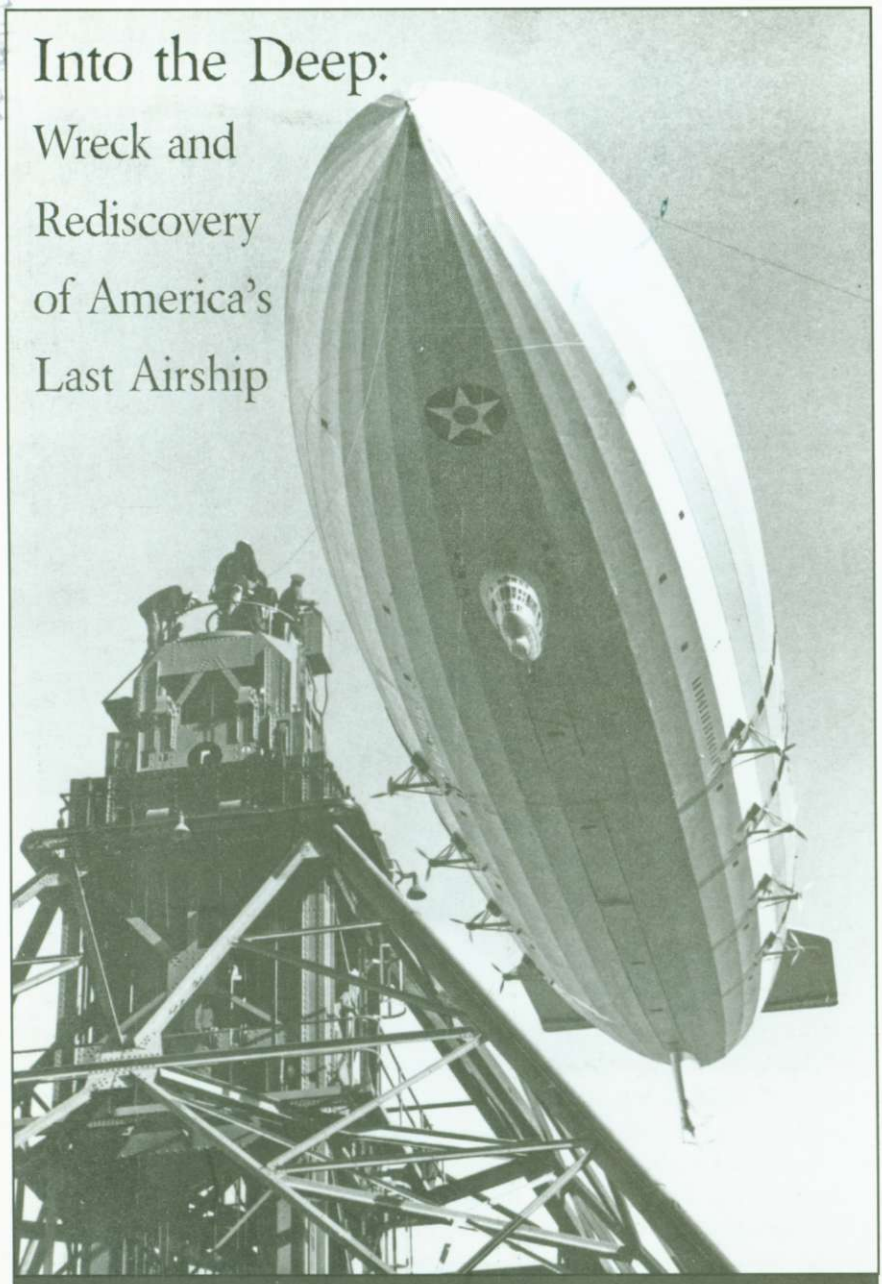
$10

Into the Deep:

Wreck and Rediscovery of America's Last Airship

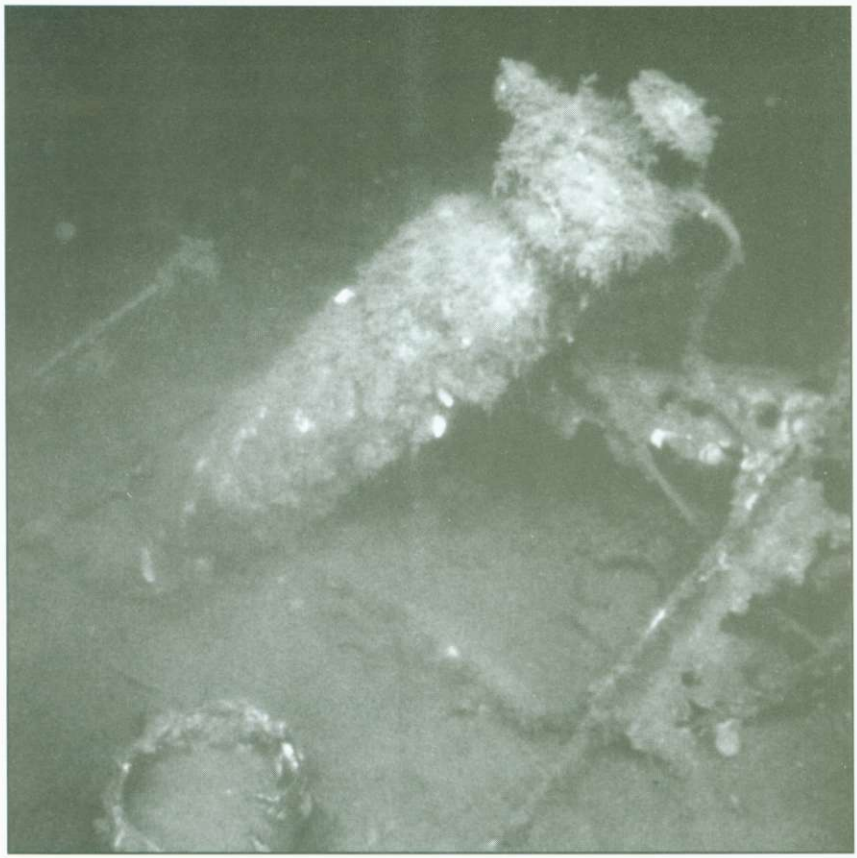


Noticias de Monterey

Monterey History and Art Association

Front cover: Tethering the USS Macon. *Photo courtesy of the Naval Post-Graduate School.*

Back cover: Video-mosaic of three Sparrowhawk bi-planes resting on the ocean floor National Geographic Society/MBARI photograph; pilots' logo: "The Men on the Flying Trapeze."



Above: A fire-extinguisher from the USS Macon *rests amid other debris off the coast of Pt Sur. Over the past two decades, inter-agency cooperation, technological advances and preserverance have made possible the location of the wreck, its photographic documentation, and the recovery of some of the objects. The crash site will soon be considered for inclusion on the National Register of Historic Places. MBARI photograph.*

Special thanks to Maritime Historian Tim Thomas for arranging supplementary funding for this issue, and to John Sanders of the Institutional Advancement Office, Naval Post-Graduate School, who provided a large selection of high-quality images.

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Noticias de Monterey

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National Oceanic and Atmospheric Administration

The USS *Macon*: Also a Monterey Story

Tim Thomas and The Editor

The scheduled lead in the evening edition of the *Monterey Herald* for February 12, 1935 was "Carmel Pioneer at 90 Remembers Seeing Lincoln." That story ended up being pushed down the page because the airship USS *Macon*, "Pride of the American Navy," crashed and sunk off Point Sur just after 5:30 that very afternoon.

Today, when I look at that old front page, I am still drawn to the Lincoln story. Here was a man living in 1935 who remembered seeing and hearing Abraham Lincoln, assassinated in 1865. Sometimes we are closer to history than we realize. But I am also struck by the story of the USS *Macon*, which is truly a part of Monterey history. I have met a number of people who remember seeing the *Macon* flying over Monterey, a few who rode in it, and one who was actually holding the rudder when the great airship was hit by the mighty crosswind that caused it to sink into the Pacific.

The *Macon* was a scout ship equipped with up to five small Sparrowhawk bi-planes. These lightweight aircraft were designed to ride inside the hull, depart mid-air on scouting missions, and return to hook onto an "arrester" device and be pulled back into the belly of the ship. No wonder these ace airmen, with their unblemished performance record, proudly dubbed themselves "the men on the flying trapeze." *(See their logo on back cover.)*

The USS Macon *in flight over lower San Francisco Bay, its Moffett Field hangar at center right. NPS photograph.*

A Sparrowhawk bi-plane hooked onto its "arrester" and suspended from the retractable trapeze. The tiny shadow of the airship, at center right, suggests the Macon*'s height during this intricate manoeuver. NPS photograph.*

The *Macon* made her maiden voyage on April 21, 1933. On October 16th, a crowd of thousands gathered to welcome her to her permanent base at Moffett Field in Sunnyvale, California, built specifically for her in an unprecedented multi-community effort. There she began a rigorous program of deployments off the Pacific coast, designed to test her abilities for fleet scouting and other long-range reconnaissance in the days before radar.

During these exercises, the *Macon* would often fly over the Monterey Peninsula. I try to imagine how people would have reacted when they first glimpsed that 800-foot behemoth in the skies above Monterey. It must have been like seeing a *Titanic*-size ocean liner sail over your house.

The *Macon*'s frequent passes over Monterey are documented in countless family photo albums. Even more intriguingly, the great airship shows up in photos when she could not possibly have been part of the scene depicted. In 1933, for example, the USS *Constitution* made a West Coast tour to raise funds for her restoration. Photographer A.C. Heidrick captured a stunning panorama of "Old Ironsides" entering a fishing-boat-filled Monterey Harbor with the *Macon* flying overhead. The catch was that the *Macon* had not yet arrived on the west coast when the old warship visited Monterey.

Anticipating the manipulations of the digital age by half a century, Heidrick also superimposed an image of the *Macon* onto a staged shot of golfers at the Pacific Grove course.

When I first came to work for the Maritime Museum fifteen years ago, I met a watchstander named Gordon Wiley. A retired Navy flier known as "Scroggie," he was the son of Captain Herbert Wiley, second and final commander of the USS *Macon*. It was Scroggie who first told me about the *Macon*, recalling how he got to ride in it as a boy, and how eerily silent it was.

EXTRA

Monterey Peninsula Herald

MONTEREY TIDES

VOL. XLV, No. 57. MONTEREY, CALIFORNIA, TUESDAY, FEBRUARY 12, 1935. DAILY FIVE CENTS

MACON CRASHES OFF PT. SUR LIGHT

NEWS COMMENTS

Tokyo Won't Glove U. S. Given Notice What Is Italy Doing? Remember Abdul-I Krim

COUNTY AND CITIES MAP BIG PROGRAM

This Area Prepared to Get Full Share of Huge Federal Fund

Improvements of Permanent Value Sought Under New Program

Disaster Overtakes Navy's Queen of Air

The U. S. Dirigible Macon, reported a mass of Wreckage in the Pacific Ocean off Point Sur, is shown in the upper photo as she appeared soaring majestically through the skies, and I ribs lower as she backed up to the mooring mast at Moffett Field, her home station, near Sunnyvale.

CARMEL PIONEER AT 90 REMEMBERS SEEING LINCOLN

LINCOLN LAUDED BY CLUB SPEAKER

$38,000,000 IS ASKED FOR NAVY

Mathiot Cleared By Court Ruling

WASHINGTON, Feb. 12 (UP)—The U. S. S. Macon, flagship of the naval Akron was the second dirigible constructed for the navy by the Goodyear-Zeppelin corporation, Akron, Ohio.

The hull has a gas capacity of 6,500,000 cubic feet and was 785 feet long, 132.5 feet in diameter, with an overall height of 146.8 feet. She was equipped with eight motors developing 4,480 horsepower with a maximum speed of 72 miles per hour.

Other statistics:

Cost: $5,375,000.

Construction authorized in the five year aviation program of 1926.

Construction started 1931. Accepted 1933.

Shortly after its arrival at the Sunnyvale base the Macon was turned over to Commander H. V. Wiley, a survivor of the Akron disaster, who continued in command when the ship took off on its last flight.

In general appearance the Macon was virtually a replica of the Akron. However, there were more than 100 Macon changes designed after experience with the Akron had indicated where greater efficiency was possible.

Both ships were 785 feet in length, 132 in diameter at their widest points and both had an overall height of 146.8 feet. Each ship had 12 huge gas cells with a total capacity of 6,500,000 cubic feet of helium.

Each carried eight engines developing a total of 4,560 horsepower mounted in engine rooms inside the hull.

Many improvements were made in the Macon's ballast recovery system, where exhaust gases from the engines were condensed into water ballast.

This system kept the ship from growing lighter as it used up its fuel.

Improved operational features were made possible on the Macon through changes in radio equipment, telephones on the Akron were of the manual type, while on the Macon were dial operated which facilitated faster communication and lighter equipment.

The U. S. Dirigible Macon, pride of the American navy, was struck with disaster tonight and plunged, a mass of wreckage, into the Pacific ocean off Point Sur, about 30 miles south of Monterey Peninsula.

First inkling of the Macon's plight came shortly before 8 o'clock when Keepers Nelson of Point Pinos light station ad the Herald that the keeper of Pt. Sur light had just told of seeing the Macon in evident distress about three hours before.

The Point Sur light keeper told the Herald, when a hurry call was put through to his station, that he had seen the Macon near the water and that she had then appeared to rise above the fog an drass no longer visible.

The message from the Associated Press at San Francisco reported that naval headquarters had received no SOS call from the dirigible.

From that time forward reports came in from many sources, some of them in direct conflict, until it became certain that the first report was correct.—Ed.—Wasp down.

Her location was said to be about five miles off shore, half way between Point Lobos and Point Sur, but low flying fog obscured the view from shore, so that definite information was unavailable.

A radio message from the Coast Guard Cutter Tahoe said that the U. S. S. Pennsylvania had started a search along the coast for additional survivors.

There was no unconfirmed rumor that an explosion had ripped the entire tail off the Macon.

Aviatrix reporters pointed out that while the Macon was frequented throughout, and used helium, a non-inflammable gas, her eight engines were located inside the giant hull. The Macon was the first lighter than air craft to have her engines placed inside the rigid hull. Like the Akron, Los Angeles, Graf Zeppelin, Shenandoah and other rigids the engines were suspended from the hull.

SAN FRANCISCO, Feb. 12 (UP).—The first boat load of survivors picked up from the wrecked dirigible Macon, contained 11 men, naval headquarters announced tonight.

Among those in the boat was Lieut. Commander H. V. Wiley, commander of the Macon it was said. Wiley was one of three survivors of the U. S. S. Akron who also crashed, and who escaped death in the thunderbolt.

Lloyd Knowerthy also was one of the men in the boat, it was said.

The men were picked up by the U. S. S. Concord south of Point Sur, the radio advices said.

Others in the boat with Wiley were reported as follows:

Chief Aviation Officer Francis.

W. M. Leeuwer, aviation machinists mate.

R. H. McArdle, aviation machinists mate.

C. L. Adams, boson's mate.

W. F. Farrelin, aviation machinists mate.

L. F. Gentle, coxswain.

J. R. Connelly, coxswain.

H. H. Ashcraft, seaman.

A. P. Clewsack, seaman.

WASHINGTON, Feb. 12 (UP).—Seven lifeboats filled with survivors of the ill-fated dirigible Macon were located seven miles southeast of Point Sur, Calif., tonight.

Admiral Joseph M. Reeves, commander in chief of the U. S. fleet wirelessed the navy department at 10:49 p.m. EST., that he was rescuing the survivors and continuing the search for other survivors.

Reeves' message said:

"Macon survivors in seven lifeboats located 18 miles southeast of Point Sur. Rescuing same an discontinuing search for other survivors.

"Will keep you informed upo nreceiving further details."

The seven lifeboats were presumed to be those from the U. S. S. Augusta which, earlier in the day, had reported it had seven lifeboats filled with survivors close to the ship.

Commander Senn of the 12th naval district estimated there were 80 men on board the Macon.

The U. S. S. Pennsylvania, in a message heard by Mackay Radio Station, reported it had rescued the wreckage.

She advised all commercial ships their assistance in the hunt was no longer needed.

While a flotilla of naval vessels combed the vast expanse of Pacific off Point Sur tonight, in search of the ra ucked dirigible Macon, two score people in the solarium of Hotel San Carlos perpetrated the thrills of participating in the search.

Connected be two way radio telephone with the Monterey purse seiner Western Maid, which was in the midst of the naval vessels, the banqueters thrilled hearing Skipper Joseph Giannona's vivid description of the powerful searchlights sweeping the waters and the passage, at frequent intervals, of the warships as they ploughed back and forth in the search.

The Western Maid was scheduled to aid in a demonstration of the new ship-shore radio telephone for the benefit of the dinner guests of R. D. Mare Greene, Reuben S. Tice and J. C. Bassford, of the Fish Exploration company. The boat had started for the fishing grounds when the Macon's plight was learned and the Western Maid was immediately ordered to head south, at full speed, to render all assistance possible in locating the wreck and aiding survivors.

For the next three hours the diners were in frequent communication with the Westar official, until she was undistressed by the naval vessels and further effort was useless.

"Old Ironsides," the larger 3-masted vessel at left, visits Monterey Harbor in 1933. Photographer A.C. Heidrick embellished his panorama by inserting the USS Macon *above the breakwater. PHCV photograph #86-16-01.*

Perhaps my favorite of Scroggie's stories described how, returning from a day's exercises, his father would fly over the family home, lean out of the control car, and drop his hat into the backyard—his way of letting his wife and kids know that he was on his way.

Seventy years after it made its 54th and final flight, the story of the *Macon* continues to fascinate. In the spring of 2005, the Monterey Maritime and History Museum inaugurated a multi-faceted exhibit dedicated to the *Macon*. Its centerpiece is the remotely operated vehicle *Ventana*. Later generations of this ROV are still being used by the Monterey Bay Aquarium Research Institute (MBARI), which offered this ROV on long-term loan to Monterey Peninsula College through Marine Advanced Technology Education (MATE), a "school-within-the-school." MPC, in turn, loaned it to the Maritime Museum for public display.

Over the past fifteen years, MBARI has been the lead partner in a series of collaborative exploratory efforts to discover, document and recover artifacts from the *Macon* crash site. The important September 2006 dive is the

Fifty years before Photoshop, A.C. Heidrick staged this shot at the Pacific Grove Golf Course, then superimposed the USS Macon *in the laboratory. PHCV photograph #90-52-2.*

impetus for this issue of Noticias de Monterey, which is generously co-sponsored by the National Oceanic and Atmospheric Administration.

Designed to offer in-depth information from key protagonists of this fascinating chapter in the history of both US military aviation and underwater recovery technologies, this issue begins with marine archaeologist Bruce Terrell, who traces the history of airships from their mid-19th century European origins to the "controlled crash" of the *Macon* in 1935. A late-life interview with William Clarke, who was at the forward helm on the day the *Macon* went down, provides first-hand recollections of the wreck and rescue operation. Finally, ROV pilot Chris Grech recounts successive research expeditions to the *Macon*'s long-elusive resting place off the coast of Point Sur (and under more than 1000 feet of seawater), sharing some of the fruits of a challenging inter-agency effort that periodically—and very deservingly—moves to the forefront of local and regional news.

Sources of Photographs and Illustrations

The Editor gratefully acknowledges the following individuals, archives, and institutions for contributing images to this publication. The source of each captioned image is identified by the following abbreviation:

CCLK: Central Coast Lighthouse Keepers

HVW: Captain Herbert V. Wiley Collection, gifted by Gordon Wiley to the Monterey Maritime and History Museum

MBARI: Chris Grech, Deputy Director, Marine Operations, Monterey Bay Aquarium Research Institute

NGS: National Geographic Society

NPS: John Sanders, Institutional Advancement Office, Naval Post-Graduate School

PHCV: Pat Hathaway, California Views Photograph Archive

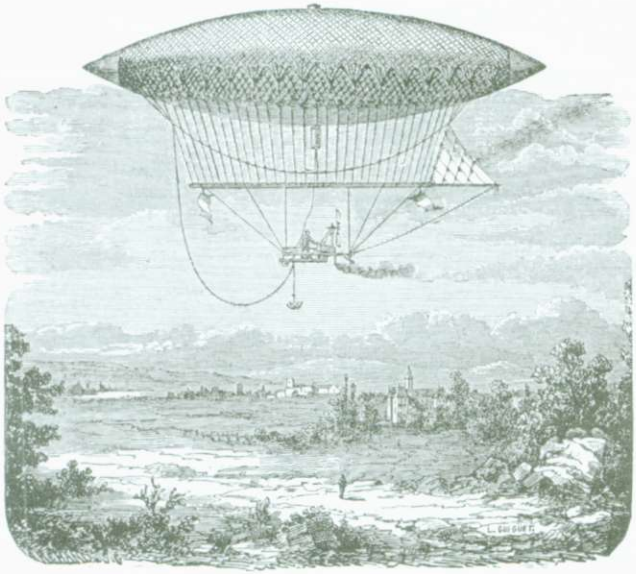
A Brief History of Airships:
From The Rise of Hydrogen Balloons to the Demise of the USS *Macon*

Bruce G. Terrell, Senior Archaeologist
National Marine Sanctuary Program
National Oceanic and Atmospheric Administration

The dramatic demise of the USS *Macon*, the Navy's last airship, off the rugged coast of Big Sur on the night of February 12, 1935 marked the final chapter in attempts by the United States armed forces to define a military application for rigid airships. Heralded in their day as portents of the future, the *Macon* and its sister ship the *Akron* might be more accurately viewed at the ultimate refinement of a technological dead-end.

Lighter Than Air

During the 19th century, experimentation with the levitational possibilities of hydrogen and helium—gases that were "lighter than air"—held the promise of finally realizing humankind's long-cherished dream of flight. The Frenchman Henri Giffard initiated powered air flight in 1852 when he affixed a steam-powered propeller to an elongated balloon—as depicted in this engraving of his airship, the first dirigible.



Throughout the late 19th century, inventors sought better ways to propel these cigar-shaped balloons using light gasoline engines. Notable among these innovators was Brazilian-born Alberto Santos Dumont (1873-1932). The first to construct and fly a gasoline-motored airship, he went on to build several lighter-than-air craft during his thirty-seven years in France and also established the first airship base at Neuilly in 1903.

"Dirigibles" (French for "steerable") quickly captured the imagination of the public. These giant sky-ships were the largest man-made objects of their time, and their stately silence as they drifted overhead must have made them awesome to behold. Writers of what is referred to today as science fiction, including the great Jules Verne, incorporated airships into their stories, newspapers featured fanciful illustrations, and a rash of airship "sightings" began to be reported in remote places like the American west, where no such craft were known to exist.

During the Victorian and Edwardian eras, the industrialized nations were all engaged in expansions into weaker territories that were rich in natural and human resources. Predictably, these highly competitive imperialist regimes perceived the nascent airship technology as a platform with enormous military potential.

In the 1890s, German Count Ferdinand Graf von Zeppelin (1838-1917) began to experiment with airship design. Having acted as an international observer during the American Civil War, where he witnessed the role played by observation balloons, he recognized the military potential of lighter-than-air craft. In 1900 he invented the first rigid, motor-driven airship. Six years later, he built one that could attain the speed of 30 miles per hour. At Friederichshafen in 1908, he established the Zeppelin Foundation for the

Types of Airships

Non-rigid airships—*hot air balloons* and later *blimps*—had no frame; their shape was maintained by pressurized lifting gas, usually flammable hydrogen.

Semi-rigid airships—called *dirigibles* (French for "steerable")—had constructed keels that supported an inflated gas bag.

Rigid airships—called *zeppelins* after Count Ferdinand von Zeppellin of Germany—had integral lightweight metal girder frames that held gas-tight cells; these frames were covered by a gas-tight skin.

development of aerial navigation and the manufacture of airships. By 1910, the Zeppelin Company inaugurated the first commercial air service. His became a household name throughout Germany and the word "zeppelin" spread far and wide, becoming synonymous with "airship" throughout the world.

World War I demonstrated both the utility and the vulnerability of airships in military applications. German bombings of London and Paris revealed these airborne giants to be highly effective as terror-inducing weapons. They turned out to be poor bombing platforms, however. Once fighter planes were developed that could reach the high altitudes where the airships operated, their gasbags quickly succumbed to the encounter with incendiary bullets.

The Navy's Lighter Than Air Program

Throughout the 1920s and 1930s, the entire western world was caught up in aviation fever. At the end of World War I, several European countries had lighter-than-air (LTA) programs that incorporated both rigid and non-rigid aircraft. Germany's program was the most successful.

Airships had unique capabilities that made them attractive for both civilian and military operations. Self-contained and capable of extended periods of flight, they were viable for both passenger and cargo transport as well as exploration. Italian Umberto Nobile's semi-rigid *Norge* just missed being the first aircraft over the North Pole, losing that distinction to Americans Richard Byrd (1888-1957) and his copilot, who successfully flew over the Pole on May 9, 1926, just three days before their Italian rival. The determined Nobile flew the airship *Italia* across the Pole again in 1928 only to crash onto the ice. Thrown out of the airship on initial impact, Nobile and six other crew members were eventually saved, one died on impact, and the remaining six men, trapped on the drifting airship, were lost.

Although the United States had a fledgling non-rigid program during World War I, it had not yet developed rigid airships. The buyers' market created by the post-war economy encouraged both the Army and Navy to begin investigating the potential military applications of these craft. Realizing the sophistication requisite to the construction of these giant airships, the US Congress appropriated funds in 1919 for the purchase of one rigid airship from a European nation experienced in rigid-type technology, and for the domestic construction of a second.

The Army purchased the semi-rigid *Roma* from Italy for the bargain price of $165,000 in 1921. Based at Langley Field in Hampton, Virginia, the *Roma* operated for a mere four months before coming to grief in nearby Norfolk in

February of 1922. When she collided with power lines, the resulting fireball killed thirty-four of her forty-five crewmen. This catastrophe ended the Army's interest in rigid LTAs.

The Navy, which had begun working with non-rigid airships just prior to America's entry into World War I, authorized the construction of a rigid airship in 1917. By the end of the war, it was operating several such craft in France for coastal patrols and anti-submarine fleet escort.

The Navy resolved to use helium in its airships. While slightly less efficient than hydrogen as a lifting gas, helium had other benefits. It was inert and non-flammable, a distinction learned at horrible cost during the Great War. Its greatest appeal, however, probably had to do with the infamous Congressional tradition of "pork-barrel spending."

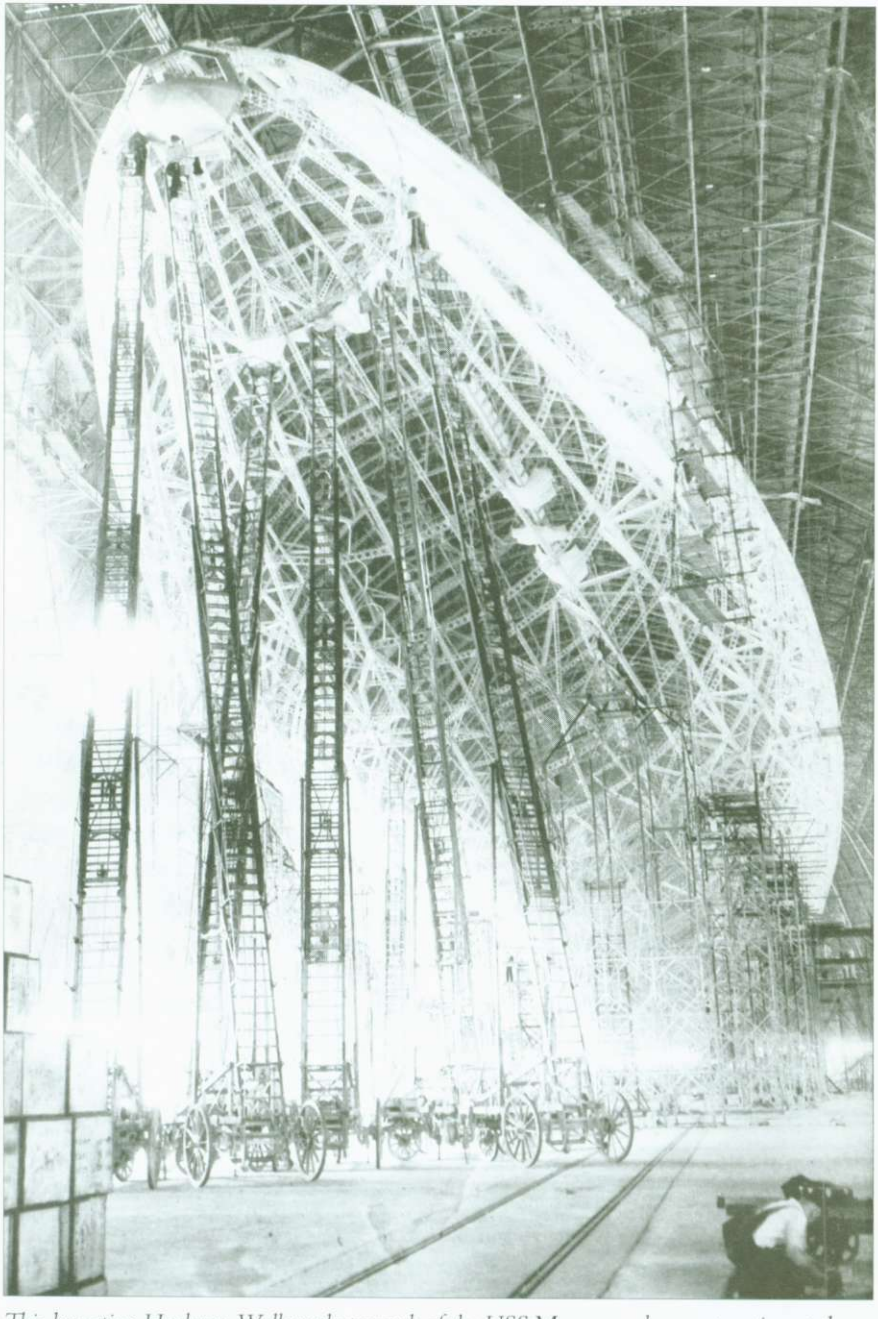
The principle sources of helium in the 1920s were gas fields in Texas, Utah and Colorado. Commercial rates of ten cents per cubic foot meant a potential cost of approximately $300,000 to fill each ship. By 1925, heavy government subsidies of the helium industry had reduced costs to the military to just one cent per cubic foot of helium, or a mere $30,000 per ship.

The 1921 Rear Admiral William A. Moffett was appointed the Navy's first Chief of the Bureau of Aeronautics. This was a significant development for that service's rigid airship program because Moffett, impressed by the enthusiasm of airship officers and crewmen, was to become a staunch champion of the "sky cruisers."

The first airship to be completed was the one manufactured abroad. Built in England as R38 and redesignated ZR2 (Zeppelin Rigid 2) in the United States, it used hydrogen gas instead of helium. Although based on a German design, it failed to incorporate all the structural integrity that made Zeppelin's craft superior. On a test flight in 1921, it exploded and crashed over the Humber River, killing 28 British crewmen and 16 Americans.

The ZR1, named the *Shenandoah*, was fabricated in 1923 at the Naval Aircraft Factory in the Philadelphia Navy Yard and assembled at Lakehurst Naval Air Station in New Jersey. This 195 foot long airship, with its five engines, served as a "test bed" for helium lifting gas in future rigid airships and as a training ship for naval airmen, pending the manufacture of more advanced airships. It operated until September of 1925, when a severe storm caused it to break up in flight over Ohio; 12 crewmen were lost and 29 survived.

While the *Shenandoah* was being put through her paces, the Navy contracted for the construction of the ZR3 from the German Luftschiffbau Zeppelin Company as part of German war reparations. The primary mission of this airship, named the *Los Angeles*, was to prepare airmen for the giant airships planned for the future. The *Los Angeles* pioneered the use of synthetic



This haunting Hepburn Walker photograph of the USS Macon *under construction at the Goodyear Zeppelin Plant in Akron, Ohio is featured in the Monterey Maritime Museum's display; it appeared in the January, 1992* National Geographic Magazine *and is reproduced by permission of* NGS.

materials for gas cells and was also a testing platform for airplane hook-on operations, anticipated for the larger airships. The only rigid Navy airship not to meet a violent end, the *Los Angeles* was retired in 1939.

With Admiral Moffett championing rigid airships, a mission was established for the pilot models: they would be tested to evaluate their potential for spotting and shadowing enemy fleets. "Parasite" fighter bi-planes would be carried inside these "flying aircraft carriers" both to protect the mother ship and to extend her scouting range.

In 1928, the Navy contracted with the Goodyear Company to develop two massive airships— the ZRS4, named the *Akron*, and the ZRS5, named the *Macon*. Both were designed to be 785 feet long and 132.9 feet in diameter. Their hulls had a lower and an upper inverted "V" keel and 36 longitudinal girders as well as 12 mainframes, 10 of which were stiff triangular "deep rings."

The airships' aerodynamics were improved by placing their engines inside aboard the lateral keels. Eight Maybach 560 horsepower engines, placed four on a side, drove three-bladed propellers mounted on pivotal external brackets. These pivoting propeller assemblies assisted in vertical takeoff and landing.

Twelve gas calls made of cotton, gas-proofed with gelatin latex, provided lift. The airships had elevator and rudder controls in both the main control car and the auxiliary control section in the lower aft fin. Thirty-caliber machine gun emplacements were located along the upper keel, on top of the ship, in the tail, and in both control cars. The design also featured a "spy car" or "reverse periscope" that could be lowered to see beneath cloud cover.

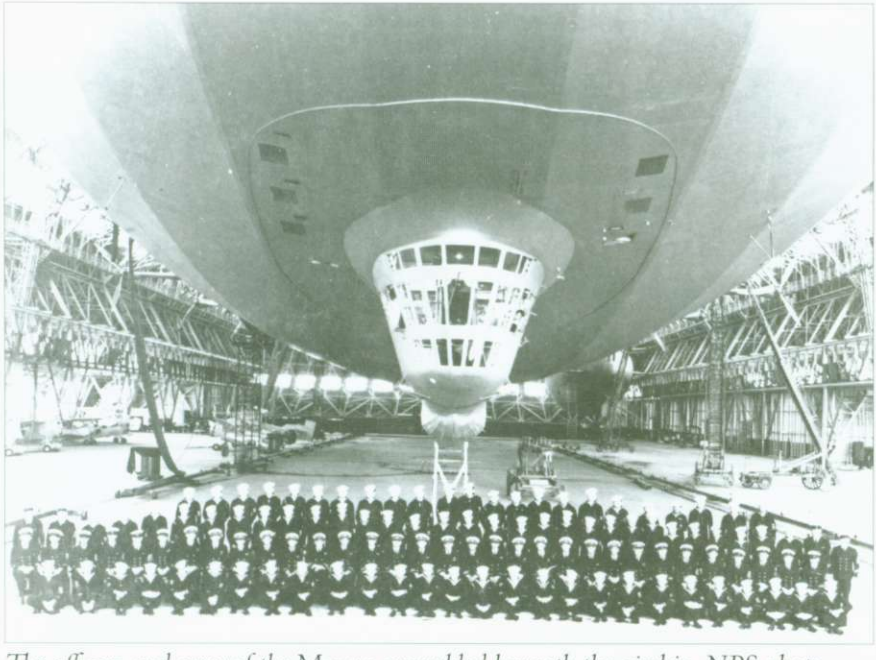
The *Akron*, stationed at Lakehurst, New Jersey in the shed originally built for the ill-fated ZR1, was launched in 1931. The *Macon*, which followed in 1933, was to be housed in a special 8-acre hangar at an air station created for it in Sunnyvale, California. Events surrounding the commissioning of this 1,000 acre property forty miles south of San Francisco were shadowed by news of the destruction of the *Akron* on April 3, 1933. Caught in a storm off the New Jersey coast, the *Akron* had crashed into the Atlantic, killing 73 of its 76 man crew—including Admiral Moffett, who had impulsively joined the flight as an observer. Two weeks after opening, the Sunnyvale Naval Air Station was renamed Moffett Air Field in his honor.

The *Macon*, the nation's only remaining military airship, was assigned to the Pacific Fleet for exercises and extensive assessment. At 785 feet, it and the *Akron* were the largest rigid airships ever built. They were also the fastest, capable of making 75 knots. It began its operational career within days of the *Akron* tragedy. By this time, understandably, the rigid airship program was under intense scrutiny from both Congress and the Navy hierarchy. Five million Depression-era dollars had been invested in the *Akron* and the *Macon*, so a great deal was riding on the surviving airship's

performance. Executive Officer Lieutenant Commander Herbert Wiley, one of the three airmen to survive the *Akron* disaster, was the second commanding officer assigned to the *Macon*. Through no fault of his own, he would also be the last.

In 1934, seven years before the surprise Japanese attack on Pearl Harbor, Commander Wiley was demonstrating the potential of rigid airships to carry a fighter contingent under simulated war conditions. Long before radar was developed, he showed that the *Macon* far exceeded fixed-wing, carrier-based fighters in scouting ability. In July of that year, he found a dramatic way to display that unsurpassed scouting ability to superiors and general public alike. Successfully locating the cruiser *USS Houston* 3,500 miles out in the Pacific, Commander Wiley lowered the *Macon* down through the clouds for all aboard to marvel at, and then sent a Sparrowhawk to drop a bundle of mail and a morning newspaper to one of the cruiser's passengers, Franklin Delano Roosevelt. Narrowly escaping a formal reprimand from the Navy brass for this unauthorized stunt, Wiley garnered instead the delighted congratulations of the President of the United States.

Barely six months later, on the afternoon of February 12, 1935, the *Macon* was returning to its Sunnyvale berth, having successfully completed routine manoeuvres over the Channel Islands. Just off Point Sur, the airship was hit by a powerful crosswind that tore off the upper fin, which had been damaged



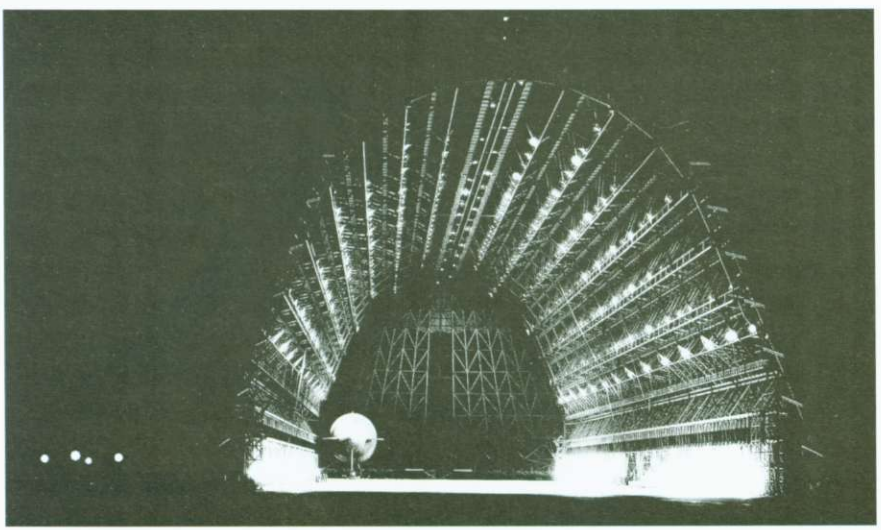
The officers and crew of the Macon *assembled beneath the airship. NPS photo.*

a year earlier. Broken pieces punctured the protective skin, causing two of the helium cells to deflate.

What ensued was a "controlled crash." Over the next forty minutes, the *Macon* gained and lost altitude, jettisoned ballast, descended unevenly, and finally settled into the Pacific, tail first. Only two of the 83-man crew lost their lives that night. The rest were picked up from rocks and life rafts by the crews of two nearby Navy cruisers that had been part of the manoeuvres.

With Admiral Moffett dead, the *Los Angeles* retired, and the last of the great airships destroyed, the Navy's rigid airship program had become indefensible. Although the non-rigid LTA program continued into the 1950s, the era of the zeppelin was doomed. Its final chapter would close in 1937 when the *Hindenburg*—the largest and most luxurious airship ever built—burst into flames while landing at Lakehurst, New Jersey, killing 35 of the 97 transatlantic passengers and crew. The imminent furor of World War II would render the *Macon* a quaint memory of a bygone age, although it should be noted that blimps continued to play an important and untroubled military role until the 1960s and are still used today for surveillance.

Depending on one's point of view, it is either ironic or vindicating that the recently discovered remains of the *Macon*, with her cargo of four intact Sparrowhawk planes, has become a field for the cooperative application of technologies unimagined when the great airship went down seventy years ago—and consequently the focus of renewed official interest and public enthusiasm.



The Macon's empty hangar with orphaned training blimp on the night of February 12, 1935. The California Preservation Foundation has recently mounted a campaign to save Hangar 1 at Moffett Field from destruction. HVW photograph.

The USS *Macon* Site as a Heritage Resource

The submerged remains of the USS *Macon* are protected and managed by a partnership between the National Oceanic and Atmospheric Administration (NOAA), the Monterey Bay National Marine Sanctuary (MBNMS, which is supervised by NOAA), the United States Navy Historical Center, and the State of California, owner of the seabed where the remains of the airship rest. Like the remains of all sunken warships, however, the *Macon*'s are owned and controlled by the Navy in perpetuity.

The Monterey Bay National Marine Sanctuary was designated a federal reserve in order to preserve and protect the unique bounty of sealife within its deep waters and the nutrient-rich upwelling which attracts and supports that abundant life. Working in coordination with the State of California, the Sanctuary's management and staff are responsible for overseeing natural and archaeological resources. The mission includes a mandate to inventory and assess archaeological resources within the Sanctuary, and to make knowledge about them available to the American public through education and outreach programs. With the goal of documenting the deepwater remains of the USS *Macon* as fully as possible, the MBNMS staff have coordinated the partnership between the three primary agencies mentioned above while also enlisting the participation of local museums, universities and community groups.

An agency must know the extent and condition of a resource before it can make decisions about access, protection, and the interpretation of that resource to the public. With this motive, NOAA, the State of California, and the US Navy Historical Center decided to combine resources for additional exploratory dives at the *Macon* crash site in May 2005 and September 2006.

This effort—funded by grants from NOAA's Office of Ocean Exploration, the Maritime Heritage Program of the National Marine Sanctuary Program, and California State Parks—utilized the research ship *Western Flyer* and the remotely operated vehicle *Tiburon*, both property of the Monterey Bay Acquarium Research Institute (MBARI). The goal of the expeditions has been to explore and document the features of the debris fields as the semi-final step in the preparation of high-resolution photo-mosaics of the crash site.

Since the initial discovery of the *Macon*'s remains in 1990, advancements in digital imaging technology have created opportunities for detailed study of deepwater sites, permitting on-site research without resorting to expensive research submarines. But navigating an unmanned robotic vehicle above a wreck without damaging fragile aluminum remains is no easy task, so NOAA and MBARI have partnered with the Aerospace Robotics Laboratory at Stanford University. Their advanced robotic navigation system—also used as the basis of unmanned planetary rovers—was incorporated into the September 2006 expedition in order to achieve 100% coverage of the area for the first time.

The photomosaic process has also benefitted from recent advances in digital technology. The challenge of combining still images into a comprehensive mosaic has been to eliminate hard-edge boundaries and to minimalize lighting variations, visual interference from fish and biota in the water, and distortion caused by a camera tracking over its subject. The Center for Coastal and Ocean Mapping at the University of New Hampshire will assemble the final video-mosaic by digitally blending component footage.

The resulting photo-mosaic—equal if not superior to the one featured below—is expected to aid NOAA's interpretation of the structural remains of the airship's wreckage. On the same dive, additional high-definition videography will allow close-up examination of specific site features. The combined results will aid in the assessment of the site's archaeological integrity and contribute to determining its eligibility for the National Register of Historic Places. A successful nomination will in turn raise the public profile of this uniquely significant site.

A crucial component of the National Marine Sanctuary Program's mission involves creating opportunities for public partipation in and access to the program's efforts to manage resources. The Sanctuary's education team planned several outreach activities concurrent with the 2006 expedition to the *Macon* site. These have included a project-specific website, a live satellite uplink, a "teacher at sea" charged with developing curriculum for wide use, a public lecture series, and this issue of Noticias de Monterey.

HTTP://montereybay.noaa.gov/research/Macon/2006.HTML
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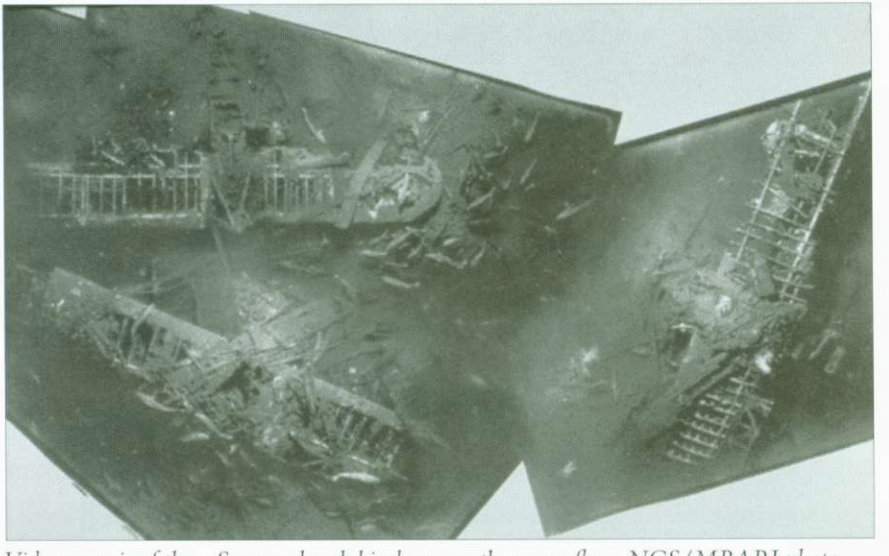


Video-mosaic of three Sparrowhawk bi-planes on the ocean floor. NGS/MBARI photo.

At the Helm of the USS *Macon* on February 12, 1935

Former US Navy Helmsman William H. Clarke
Interviewed by Robert Llewellyn

Q: You were the rudderman of the USS *Macon* on the afternoon of February 12, 1935, when a freak weather incident precipitated its sinking of the coast of Point Sur. What was the rudderman's job?

A: My job was to steer the airship directionally, starboard and port. There was another crew member whose job was to manage the altitude via what we called the elevators.

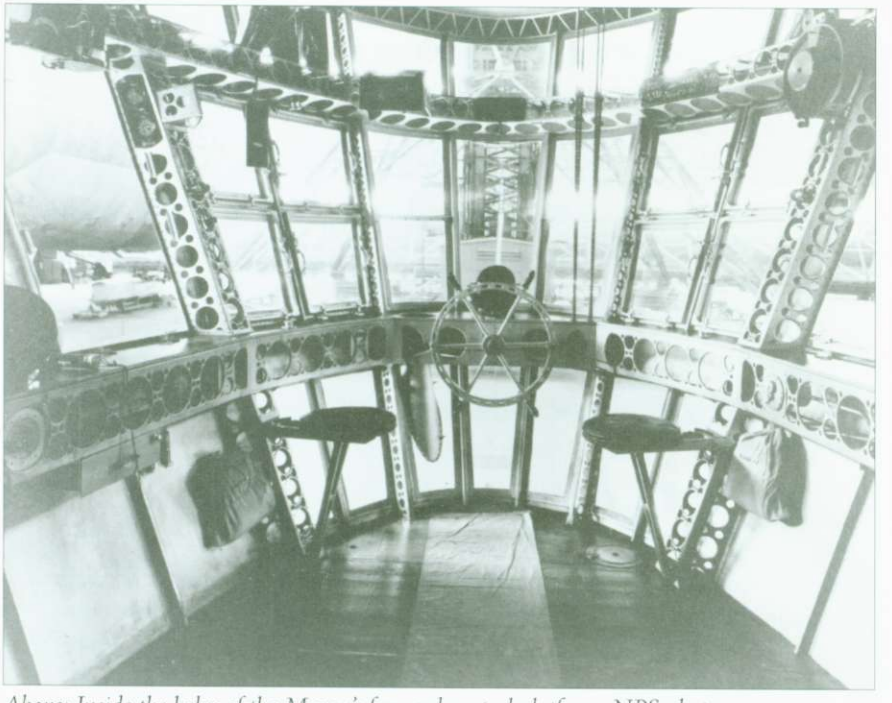
Q: How did you communicate from one section of the airship to the other?

A: By telephone, just a regular dial telephone. We had a couple of them up and down the keel.

Q: How was the weather that afternoon as you were cruising north from the Santa Barbara area?

A: The weather was good until that gust of wind popped up. Then, of course, all hell broke loose. It wasn't the previously damaged frame that caused the destruction of the *Macon*, despite what many people later said. I think it was the doggone fins, the way they were constructed. They should have followed the German model, what was called the "cruciform ring," where the fins went from the top rudder all the way through the bottom rudder, and the same with the horizontal stabilizer. That design was much stronger, but the American engineers didn't use it because they were trying to save weight.

William A. Clarke at Point Sur Light Station on September 9, 1996, the occasion of this interview. CLK photograph.



Above: Inside the helm of the Macon's forward control platform. NPS photo.
Below: Looking aft from the forward control platform; note telephone at left. NPS photo.

Q: Did the impact take the wheel right out of your hands?

A: Yeah, just pulled it loose.

Q: What happened to the engines?

A: They had to be cut back because of the danger of over-heating. The ship was gaining altitude, so we left the engines idling and there was consequently very little forward motion.

Q: Were you ever able to get control of the steering operation again?

A: No. They tried to shift the steering operation to the stern, but as I just said, we were making very little headway and, under those condition, the steering operation has little impact.

Q: Did the crew have any trouble keeping their balance when the ship rose to 5000 feet?

A: Oh, yeah, you had to hang on. At that altitude, the air bag valves started automatically releasing gas.

Q: Was Commander Wiley in the control room the entire time?

A: Yeah, he was in the control car. Almost everybody stayed there until the end. But once the tail went into the water, there wasn't much more to do except look out for yourself.

Q: One print source says that the *Macon* was descending at the rate of 750 feet per minute, and that Captain Wiley ran the engines in an attempt to slow the rate of descent.

A: That could be.

Q: Could you see the surface of the water coming toward you?

A: Well, it was pretty dark by then, but we knew we were getting real close.

Q: Did the ship hit the water with a jolt?

A: More like a surge. It lurched a bit, but other than that it was just a landing,

Interior of a cabin on the USS Macon*; note the use of duraluminium girders on both desk and bunk bed. HVW photograph.*

without any great breaking up of the structure or anything like that. When we heard the breaking up was when she started to sink.

Q: Did she stay in that "nose attitude" for long?

A: Yeah, the rest of the ship sunk first; the nose section was the last to go down.

Q: How did you get out of the control room?

A: I went back up inside the ship and climbed frame #170 up to about midway. Then I cut the outer cover loose and just stood there, waiting to see what was going to happen. You know—waiting to see if it was going to settle further so I wouldn't have to jump so far.

Q: Did a lot of the crew exit the same place you did?

A: Yeah, quite a number. One fellow who was right next to us jumped early, and he was one of the two fatalities—RM1 Ernest Dailey, a first class radio man. One of our mess boys, Florentino Edquiba, was further up in the nose, and I don't know what happened to him, except that he didn't make it either.

Q: Were you wearing a life jacket?

A: Yeah, we all had life jackets on, the kind you blow into.

Q: Did the men keep good order when they evacuated?

A: I don't remember anybody who didn't go about it in an orderly manner.

Q: When did you decide to jump into the water?

A: When the ship settled down far enough that the distance to jump was only about 15 or 20 feet.

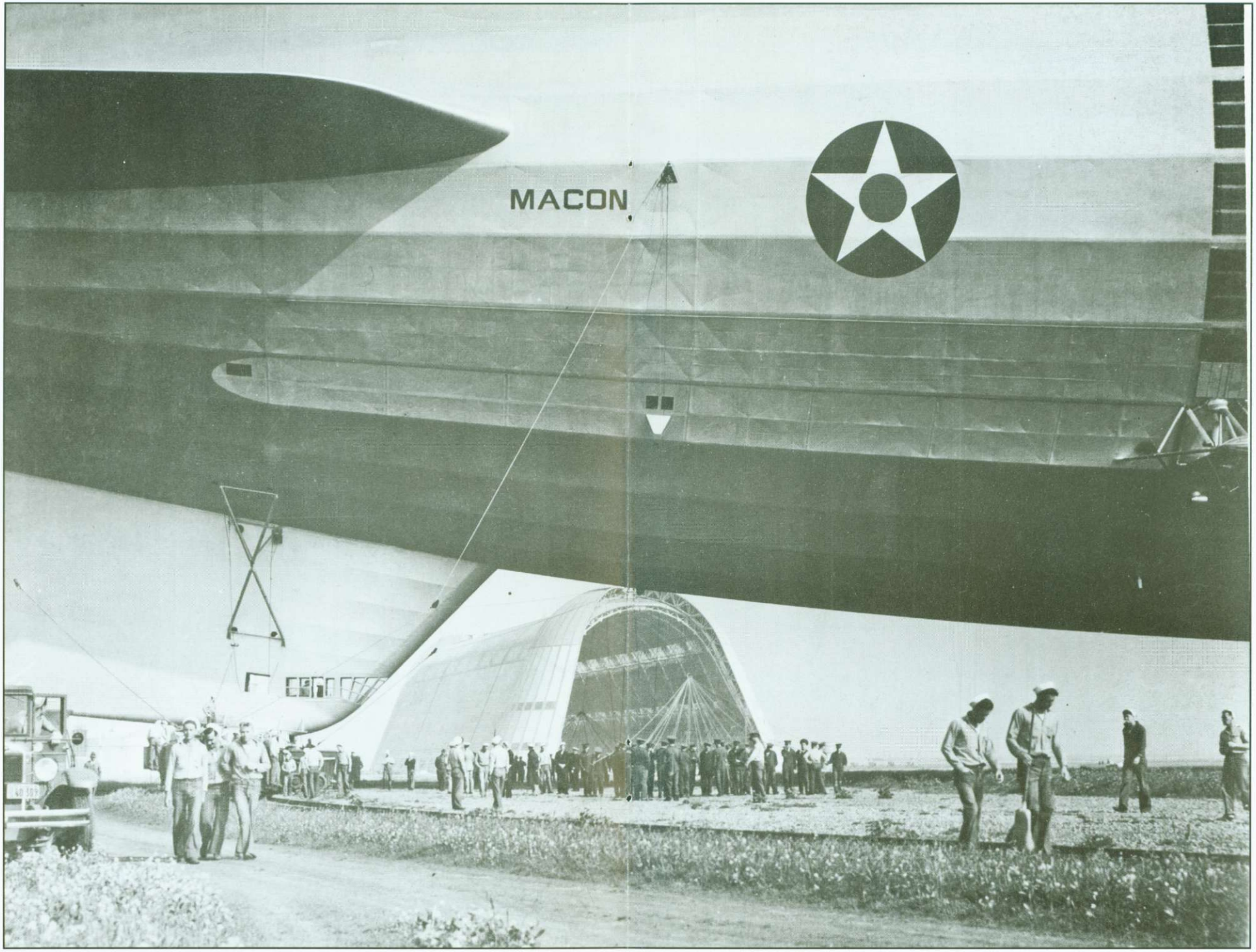
Q: Who picked you up?

A: We all swam out to the life raft and clung to that—some on the outside and some on the inside, taking turns, because the water was warmer than the air—until the lifeboats from the cruiser came for us. There were two Navy cruisers nearby, and they were picking up people all over the place.

Q: What happened after you were taken aboard the cruiser *Richmond*?

A: They gave us some dry clothes. I think the doc broke out a little refreshment—a shot or two of alcohol in the water they gave us to drink.

Q: Were there many people hurt? I mean with broken limbs or other injuries?



Navy sailors stroll below the aft cabin of the USS Macon, *with Hangar 1, Moffett Field in the background. NPS photograph c.1934.*

A: The only one I remember is a fellow named Gilmore, who had been out on one of the engine outriggers. He burned his hands pretty bad when he slid down the rope, so he had to be all bandaged up.

Q: Where did the *Richmond* take you?

A: We were on the ship overnight and arrived at the Navy Pier in San Francisco the following day. They brought us ashore in a motor launch, then took us down to Moffett Field, where they sent us to sick bay for the doctors to look us over. When we were finished, they lined us all up for the photograph reproduced here.

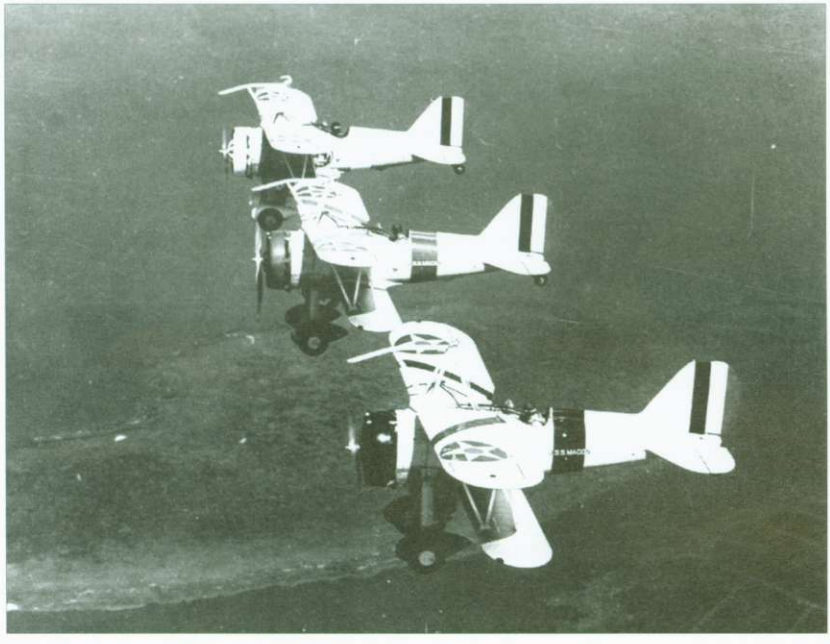
Robert Llewellyn interviewed William H. Clarke at the Point Sur Light Station on September 9, 1996, when Mr. Clarke, then of Hemet, California, was 87 years old. The following day, Mr. Clarke shared another pertinent memory with Maritime Museum Historian Tim Thomas: "When the Macon *crashed, two of her large helium bags burst open, releasing all that helium, and for hours after that, the surviving sailors talked like Donald Duck." Selections from the Clark-Llewellyn interview were made by Tim Thomas. The Editor has added supplementary portions and, in the interest of greater clarity, extensively reworked the chosen segments. Above photograph courtesy of Moffett Field Historical Society.*

Eighteen Years and Counting:
Locating, Mapping, and Recovering the Remains of the USS *Macon*

Chris Grech, Deputy Director, Marine Operations
Monterey Bay Aquarium Research Institute (MBARI)

Researchers have been interested in locating the underwater resting place of the USS *Macon* since the late 1980s when new technologies made deep-water exploration possible. Locating the remains of the *Macon* promised a veritable time capsule of naval aviation history. The *Macon* had come to be regarded as one of the most significant wrecks along the treacherous central California coast, and attempts to identify its location intensified with the passing years.

It was known that the unidentified seabottom resting place of the last military airship also contained four of the Sparrowhawk bi-plane "parasitic" fighters it had been designed to carry within its hold. Only eight of these Curtiss F92-Cs were ever produced. A composite replica, once part of the Smithsonian collection, is on view at the Naval Aviation Museum in Pensacola, Florida.



Three Sparrowhawks in flight formation. NPS photograph.

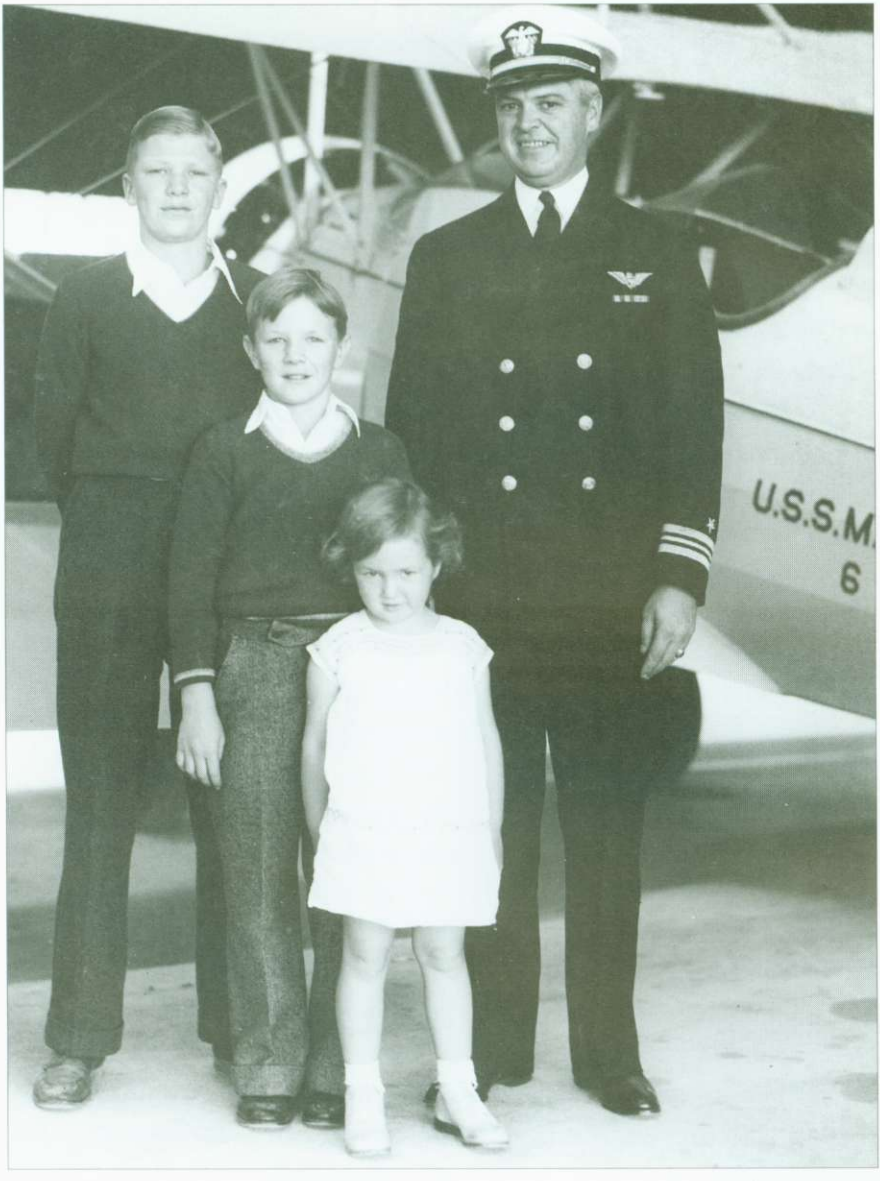
By the 1980s, airship historians from California had accumulated extensive background data from ships logs, Point Sur Lighthouse Keeper records, and the locations where *Macon* survivors had been picked up by the cruisers *Richmond* and *Concord*. This combined information was the catalyst for the first expedition to search for the resting place of the *Macon*.

In March of 1988, using both United States Navy and private corporate resources, a group was mobilized on the Motor Vessel *Independence*, operated out of Port Hueneme. As they spread their knowledge of the history of airships in general and the *Macon* in particular, the historians infected the rest of the members of this rather hastily formed expedition with their enthusiasm. The group conducted sonar surveys over a portion of a proposed 2-mile x 3-mile grid off the Big Sur coast, but failed to find a definitive sonar signature. However, this first effort did prove that the wrecked airship was not lying at her recorded sinking location, and it also brought back images of possible secondary debris from the wreck.

Shortly after completion of this expedition, two of the team members relocated to the Monterey area. They decided to regroup and devise another strategy in order to pursue their search for the *Macon*. I was one member of that pair; Steve Kopenik was the other. Armed with the sonar records and backed by the resources of our new employers—the Monterey Bay Aquarium Research Institute (MBARI) and the Naval Post Graduate School (NPS), respectively—we succeeded in enlisting the interest of both Dick Sands of the National Museum of Naval Aviation Foundation in Pensacola, Florida and David Packard, founder of the Monterey Bay Aquarium and its affiliated Research Institute. The "*Macon* Expeditionary Group" was thus made up of representatives from MBARI, NPS, and the Naval Aviation Museum. It also included Gordon Wiley, known as "Scroggie," elder son of the last commander of the *Macon*, Herbert V. Wiley.

As a pilot of remotely operated vehicles (ROVs), I was asked to head up another expedition to the crash site with the goal of examining some of the sonar anomalies recorded on the 1988 trip. The plan for the May 1989 expedition, underwritten by Dave Packard, was to use the MBARI research vessel, the *Point Lobos*, which was equipped with a deep-diving ROV, the *Ventana*.

The mission was limited to a single day because the vessel had no accommodations and the site was five hours away from the home port of Monterey. In addition to the ROV pilots and essential ships crew who staffed the 110-foot vessel, a lengthy guest list developed that included Mr. Packard, founder of the Hewlett-Packard Corporation as well as MBARI, who remembered seeing the *Macon* overfly Palo Alto during his early days at Stanford University. The *Ventana* conducted a systematic search of the seabed



Commander Herbert V. Wiley with Gordon ("Scroggie"), Herbert Jr., and Marie. HVW photograph c.1934.

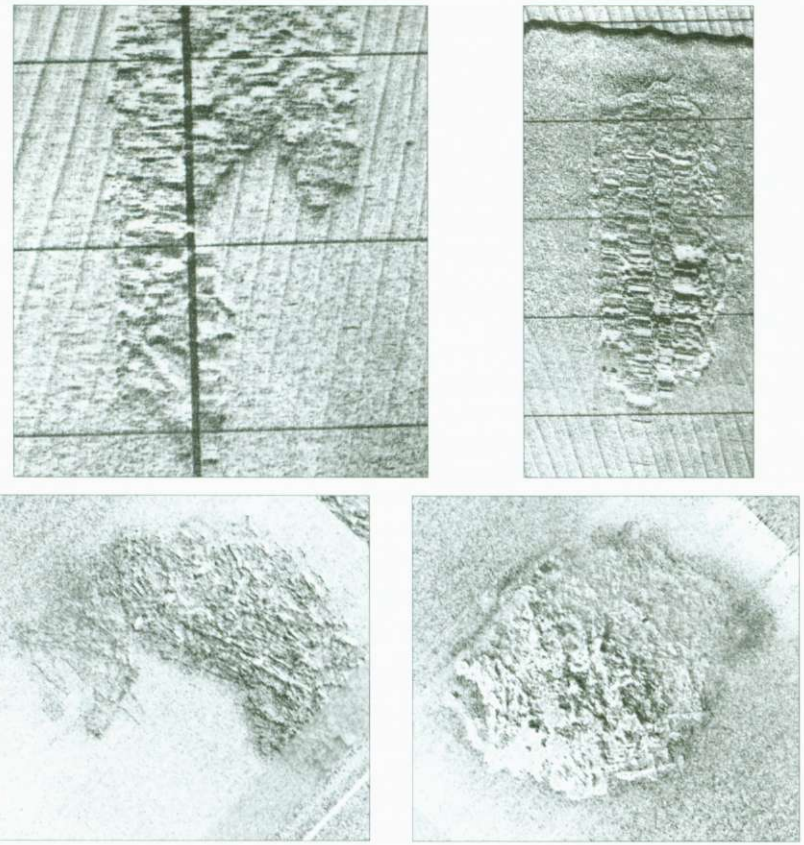
Navigation Acoustics and Sidescan Sonar

In the days before global positioning technology, locating a wreck like the *Macon* required Loran or other special radio systems to fix vessel positions in coastal areas. These systems were used in conjunction with basic undewater acoustics devices to find the location of the ROV. Acoustic systems transmitted and received signals between the surface vessel and the submerged ROV, using Ultra Short Base Line (USBL) techniques. Navigation systems like these can resolve ROV position within ten meters.

Other acoustics instruments located on the ROVs include altimeters, Doppler velocity logs, high frequency/short range locator beacon receivers, and forward-looking sonars, used to extend the restricted range of the camera systems. Even with thousands of watts of lighting, visibility performance underwater falls off after approximately thirty feet. Sonar is used to "see" beyond this limited visual range.

Sidescan sonar is used to produce images of the seabed covering large areas. It captures acoustic returns that are later processed into images. The device, which must be towed, is deployed from a surface ship that runs parallel survey lines in a process known as "mowing the lawn." The sonar is positioned meters above the seabed at a specific altitude, using ships speed and cable out to maintain consistent depth. This type of acoustic technology has been used to search for and investigate the *Macon* site on three separate occasions.

In the late 1980s, analog electronics technology was typically used in sonar systems that recorded on wet paper. Recently, digital systems have changed the methods for processing and recording this kind of data. In January of 2005, for the first time, a digital system was used to investigate the *Macon* site. This search was designed to achieve more comprehensive coverage of the wreck site in order to locate additional debris from the *Macon*.



Top pair: analog images of the Macon *crash site.*
Bottom pair: digital images of the Macon *crash site.*
These two pairs of images of the Macon *bow and mid-section represent a 14-year gap between processing methods. Due to the resolution limitations of both devices, neither result clearly shows details of the interior as recognizable airship debris. However, the digital mode provides a superior image because the dimensional distortions are minimized and there is a finer level of target detail.*

based on the sidescan sonar results, which eliminated insignificant areas. Unfortunately, only a limited amount of the target region could be covered within the seven on-site hours, and the group had to return to port without locating the primary wreckage. However, some small debris targets were successfully investigated during the dive.

On the return trip, participants resumed a discussion begun earlier by expedition member Gordon "Scroggie" Wiley regarding a possible piece of the *Macon* girder structure, reportedly mounted on the wall of a Moss Landing restaurant called Jennie B's. Marie Wiley Ross, Scroggie's sister, had dropped

in one day for a meal and immediately recognized the duraluminium girder structure based on childhood memories of her father's airship.

Dick Sands and I followed up on this lead. Sure enough, the wall in question boasted a fragment of aluminium girder, mounted on a wooden plaque by the fisherman who had found it several years before and gifted it to the restaurant owner. The fragment featured the linked circle pattern visible in countless photographs of the *Macon*'s interior.

Dick and I believed that if the fisherman was still alive, and if we could track him down, he might be able to reveal the actual location of the *Macon* wreckage. Moss Landing's fishing community, as closely guarded as any other, was initially reluctant to respond to our requests for information. Two months later—after interviews with two different restaurant owners and a pair of fishing brothers, Freddie and Stormy Harmon—we learned who had retrieved the piece of debris. When we met at last with Dave Canepa, he opened an old logbook containing his location records and was able to pinpoint the site.

Armed with this new information, we developed a plan to coordinate a third dive. As it happened, the United States Navy was scheduled to visit the Monterey Bay area for tests of its three-man deep-submersible vehicle DSV-4, the *Sea Cliff*. This presented an excellent opportunity, since the Navy had a demonstrated interest in locating the airship. In fact, this same Navy group had been approached in the 1980s by the airship historians who were the catalysts for the first expedition. A few days after I laid out our new evidence to LCDR Alan Weigel, Commanding Officer of the *Sea Cliff*, he received permission from the Navy to dive the site. The team departed on June 24, 1990 on the support vessel *Laney Chousets*.

The Western Flyer *entering Moss Landing Harbor. MBARI photograph.*

The Point Lobos *at Moss Landing. MBARI photograph.*

Vessel Technology

Capable support vessels are a key asset in conducting offshore operations at remote locations like the *Macon* site. Ships used at this site have ranged from the 110-foot *Point Lobos*, mother ship of the *Ventana*, to the 384-foot *Laney Chouset* that supported the *Sea Cliff*. *(See also images on page 32.)* Most of these vessels feature conventional steel construction and mono-hull designs.

Advances in vessel technology are probably most apparent on MBARI's research vessels, since heavily integrated ROV capability is built in, which typically means that ROV control rooms and handling gear are part of the superstructure. This added level of integration affords operators increased performance when launching and recovering in unfavorable weather conditions.

The most technically advanced MBARI vessel is the *Western Flyer*, built in 1996 and featuring a "swath" (small water area twin hull) design that improves the performance of the vessel by reducing overall motion. Another innovation is that the ROV is launched and recovered through the center of the main deck, minimizing pitch and heave motions.

Dedicated ROV support vessels like the *Western Flyer* also incorporate dynamic positioning systems (DPS) that use global positioning systems (GPS) combined with special computer programs to automatically keep the vessel stationed over the target location, a significant advantage in conducting deep submersible operations.

Above: Control room of the Ventana.

Left: Control room of the Tiburon.

Below: The Laney Chousets *recovering the* Sea Cliff.

We were now armed with a new fix of the location as well as a large ship with a state-of-the-art submersible. This voyage down the coast had a different mood than the others—a mixed mood that included a heightened nervousness absent from previous attempts. Was Canepa's location reliable? Or were we about to get snookered for the third time? There were still plenty of nagging questions, and some on the vessel speculated about another wild goose chase.

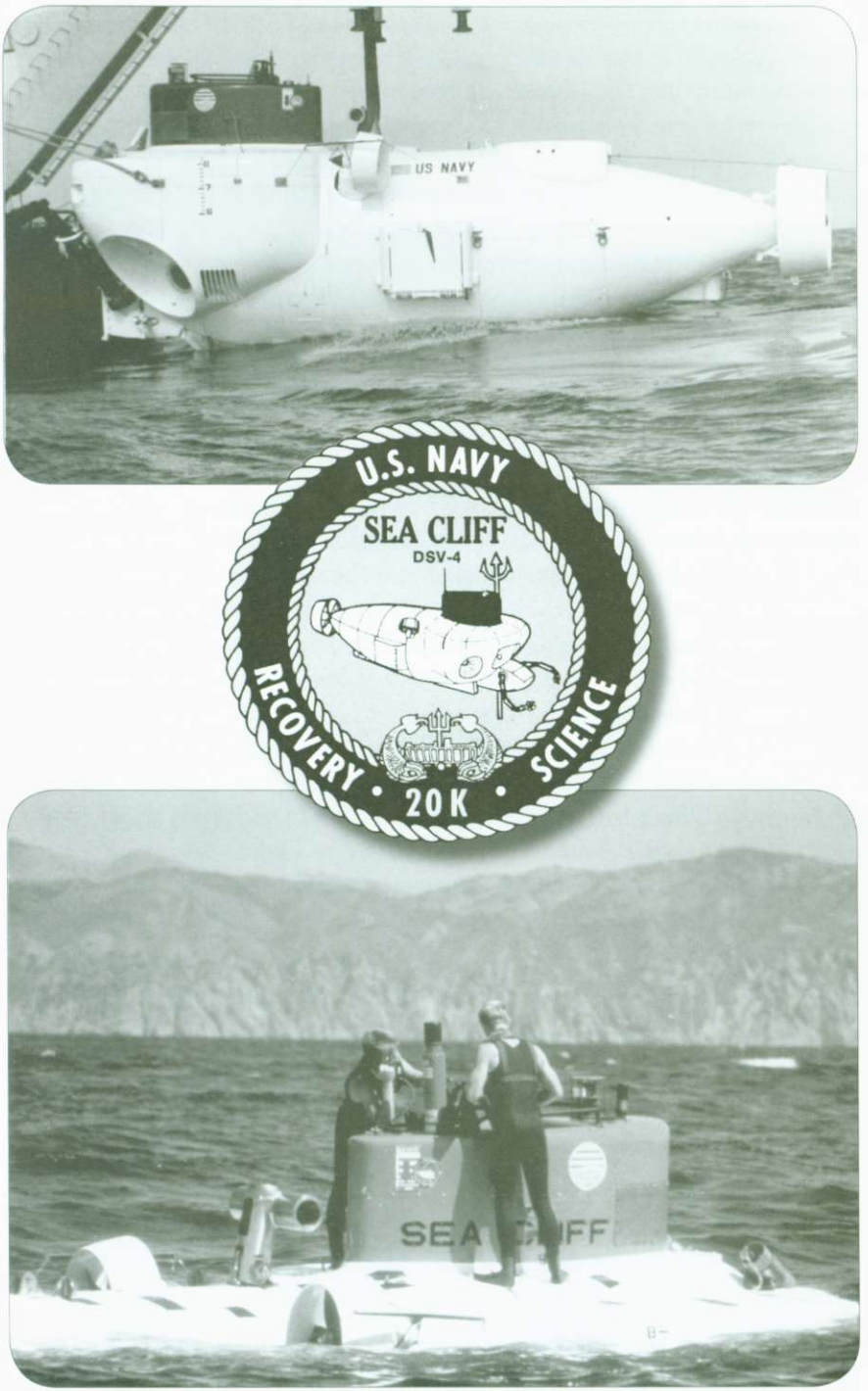
My job was to coordinate the search and operate the communications station that linked the vessel to the submersible. The underwater vessel was to be commanded by Lieutenant Pat Scanlon, who was to conduct a training dive with two other Navy personnel. Once the *Sea Cliff* reached the bottom, they would be guided to the wreckage using their sonars and my navigational direction.

Amazingly, within just ten minutes, the trio was able to identify some wreckage. They continuously fed back data and descriptions of what they were seeing. It became evident that they had truly reached the last resting place of the *Macon* when they informed us that they had located the Sparrowhawk bi-planes. I could tell from their voices that they were ecstatic at their find. My own feelings tended more toward relief mixed with pride and gratitude toward the airship historians who had inspired others to undertake this daunting search.

During that five-hour dive, the *Sea Cliff* recovered several artifacts from the site and collected a low-quality but definitive image of a Sparrowhawk arrester hook. This new evidence would enable the investigators to generate interest in follow-up missions to the *Macon* site in order to document it more thoroughly using the rapidly evolving new technologies.

Lieutenant Pat Scanlon with recovered items from the Macon.

US Navy image from the Sea Cliff *of Sparrowhawk skyhook on seabed. Photographs by Chris Grech.*



These NPS images include a view of the Sea Cliff *off Big Sur.*

Deepwater Recovery Technology

After the USS *Akron* sank off the New Jersey coast in 1933, the Navy was able to recover large sections of the airship using hardhat salvage divers because the wreck had settled at a relatively shallow depth. When her sister ship sank two years later, no technology existed that would allow the Navy to locate or view, let alone recover, the *Macon*'s wreckage because it was submerged in over 1,000 feet of seawater.

The 1970s saw the development of advanced systems that enabled deeper penetration of the ocean depths through robotics and small manned submersibles. By the late 1980s, robotic systems were the tool of choice for deep-water operations. These systems, called remotely operated vehicles (ROVs) were widely embraced, including by commercial oil and telecommunications companies, because they could go much deeper than divers could and for longer periods. They were not power-limited like the small manned submersibles.

Marine science organizations started adopting these systems into their core operations to improve their ocean-access capabilities. The Monterey Bay Acquarium Research Institute (MBARI) was on the leading edge of this process. Two of MBARI's advanced ROVs, the *Ventana* and the *Tiburon*, have brought different levels of technical capability to the investigation of the *Macon* site.

Capable of deep operating ranges, both systems are the size of small automobiles, weighing about 7000 pounds in air. Incorporating heavy manipulators, multiple cameras and six thrusters, both are considered work-class ROVs. Specialized "tool sleds" or "tool packages" can be attached to the platforms and are typically customized for mission-specific tasks. *(See photo on page 39.)*

When the *Ventana* performed a series of dives at the *Macon* site in the early 1990s, it used the same three-chip Beta video cameras that many news stations were using at the time—in conjunction with 1000 watts of incandescent lighting—to document the wreckage. Currently, both the *Ventana* and the *Tiburon* utilize state-of-the-art HDTV cameras along with approximately 2000 watts of high-tech ballast lighting. This more advanced imaging system has significantly enhanced the quality of the sub-sea images that constitute the basis of MBARI's underwater operations.

Research Dives at the *Macon* Site

With the discovery phase of the *Macon* finally complete, it was time for the researchers to regroup and assess plans for on-site investigation. The limited images from the *Sea Cliff* provided definitive evidence of the *Macon* and Sparrowhawk locations, but little information about the condition of the planes and other objects that the Navy, museums, and independent researchers were after. It was clear that a systematic ROV survey would be required to bring back high-quality information about the characteristics of the site.

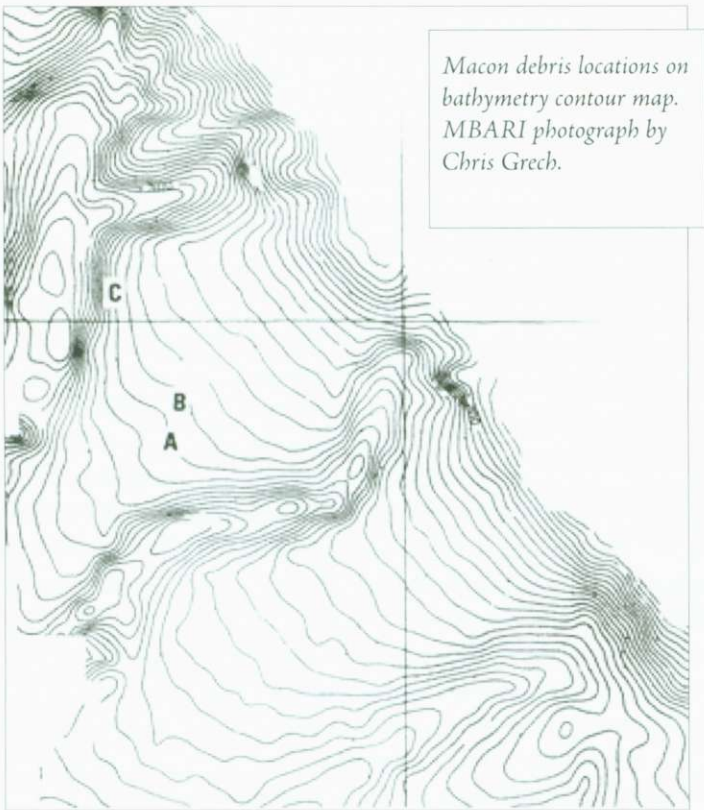
An additional sonar survey of the newly discovered wreckage areas was needed to reveal the extent of the debris fields before another submersible dive could be considered. I approached the Navy's Submarine Development Group once again to solicit their expertise in deep sonar operations. The result was a collaborative mission in January of 1991 on the MBARI vessel *Point Lobos*.

This trip had to contend with severe weather that made the deployment of the sonar equipment marginal. The sailors valiantly perservered even though many were sick to the point of being unable to work. In spite of the unfavorable conditions, the underwater sonar images revealed two significant oval-shaped debris areas, separated by 400 meters, as seen in the first pair of photographs on page 29.

The sonar data provided just the information the research team needed. The *Macon* appeared to be located in two well-defined locations, A and B. The sonar investigation located another target area (C) on the northern slope, at some distance from the two primary locations. After the results of the sonar were charted onto contour maps of the area, it became evident how fortunate it was for posterity that the *Macon* debris came to rest on a plateau when they might just as easily have ended up in one of the gaping marine canyons flanking the slope.

With the dimensions of the wreckage area now defined by the sonar, I worked with MBARI to coordinate a multi-day effort once again using the *Point Lobos* and their research ROV *Ventana*. In addition to the evaluation of scientific aspects of the sites, a core component of this fifth expedition was gathering partners who would collaborate in the study, documentation, and distribution of recovered artifacts.

The assembled research team included local scientists, national airship experts, and Navy aviation representatives. Because the numbers of participants quickly outgrew the limited space available on the vessel, MBARI decided to expand the operation by using microwave transmission technology to broadcast its underwater operations to a shore-based station



Macon debris locations on bathymetry contour map. MBARI photograph by Chris Grech.

in real time, a technique MBARI had already perfected for ongoing research operations in Monterey Bay. David Packard offered his family ranch at Big Sur–conveniently located near the offshore site of the *Macon*–for onshore participants.

To enhance our group's ability to document the wreck site and distribute image content, I managed to convince *National Geographic Magazine* to join the growing research team. They agreed to send experienced airship writer Gordon Vaeth along with staff photographers Emory Kristopf and Jonathan Blair. The ROV pilots worked with the *National Geographic* photographers to set up still cameras in order to compile photographs that would later be used to build a complete video-mosaic of the airship hangar. *(See page 16.)*

MBARI returned to the site in February of 1991 to videotape the *Macon* remains using the ROV *Ventana*. The team located the A and B debris fields, including the corroded girders, fuel tanks, nose-mounted mooring assembly, control car, and German-made Maybach engines. MBARI was also able to record windows, chairs, chart tables, and chart dividers. All four Curtiss F92-C Sparrowhawk hook-on bi-planes were also located, revealing their aluminium frames along with some still intact–if deteriorated–wing fabric.

The 1990-1991 surveys definitively recorded the bow and mid-section debris fields. However, photo-compositions of the wreckage indicated nothing of the tail section. Its successful location would continue to challenge subsequent expeditions.

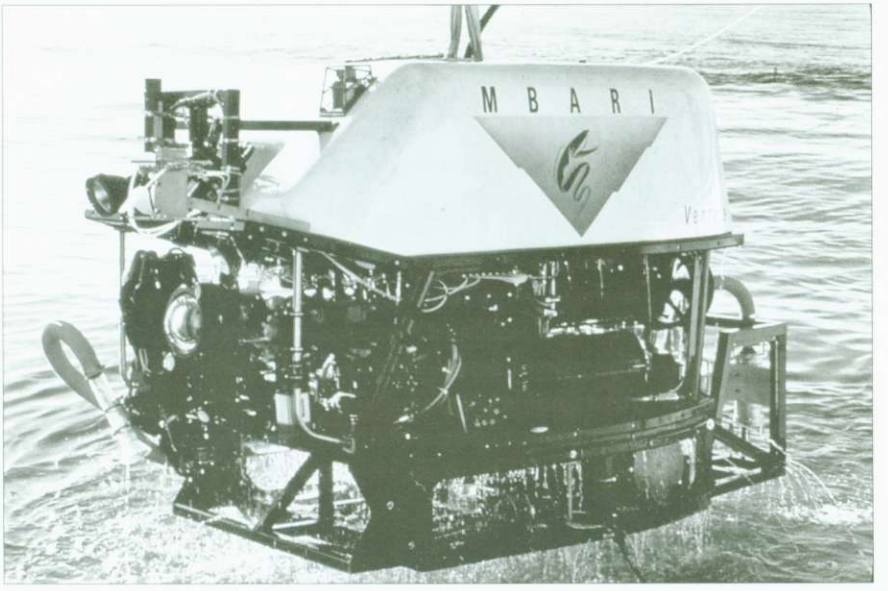
While underwater operations were underway, the shore team had gathered at Packard's ranch house to participate in the expedition through a video monitor and radio link to the vessel. This group tracked the progress of the survey effort as I relayed information about the site, commenting on the images as they were transmitted to the onshore monitors. That night, while the vessel team languished offshore, an onshore party was taking place, as was made apparent by the sound of the player-piano, broadcast to the boat via the microwave signal. The vessel team interpreted David Packard's manifest enjoyment of the research effort as a sign that they had done well.

After the mission was concluded, a member of the research team turned to me and said, "Do you know what day it is?" The answer was February 12, 1991, the 56th anniversary of the sinking of the *Macon*. That realization was a fitting coda to our expedition as we sailed back to Moss Landing with boxes full of video, film, and artifacts collected at the site.

Those recovered artifacts were later transferred to various local and national museums, using the Pensacola Naval Aviation Museum as the coordinating agency. The arrester hook from one of the Sparrowhawks was conserved at East Carolina University. Examples of the "beetleware" galley dishes were sent to the Museum of Naval Aviation in Pensacola. Additional artifacts were distributed to the Monterey Maritime Museum and to Point Sur Light Station as part of permanent exhibits dedicated to the wreck and rediscovery of the *Macon*.

Left: Recovered items from the Macon.

Below: Beetleware on display at the Naval Aviation Museum in Pensacola. MBARI photographs.



From Manned Submersibles to ROVs

Small manned submersibles made a significant leap in technology and numbers in the late 1960s, when many different systems were being designed by various commercial companies. The origins of the *Sea Cliff* date back to this period. These systems shared much of the instrument technology built into the MBARI remotely operated vehicles (ROVs) like the *Ventana (above)* while also including a life-support system, typically for three persons.

The most significant operational difference between an ROV and a manned submersible like the *Sea Cliff (see photos on page 34)* is the operators' ability to see the underwater site in three dimensions—a great advance, since ROVs supply images exclusively through video cameras and are therefore limited to two-dimensional imaging. The added visualization element enhances the *Sea Cliff* users' ability to investigate objects firsthand. Another significant difference is that manned submersibles lack the umbilical cable that connects the remote underwater vehicle to the mother ship. This added freedom of movement has its own built-in limitation: only three people can be viewing at one time. Another limitation is the "power budget," since the *Sea Cliff* is powered by batteries.

Two subsequent dives were performed, once again using the *Ventana*, in order to capture additional photographs for the *National Geographic* story, which ran in the January, 1992 issue. In addition, the Navy made a return visit with the *Sea Cliff* in 1991. This dive, a coordinated effort with MBARI, gave me an opportunity to search for evidence of the elusive tail section. The principle mission, however, was further investigation of the intriguing sonar targets that appear near the top edge of a slope in the first Navy sidescan survey. Using their onboard sonar, the researchers started in a deep canyon and worked their way up the slope. Unfortunately, the area was covered with rocky outcrops and the location of the *Macon*'s tail section remains a mystery.

Fourteen years later, under the oversight of MBNMS and NOAA, and in collaboration with MBARI, a new effort was undertaken involving the *Macon* site. In May of 2005, a sidescan sonar mission was conducted to document the *Macon* debris fields and surrounding areas more thoroughly. This mission utilized the NOAA vessel *MacArthur* with a United States Geological Survey towfish. Just under three square miles were covered with this advanced sonar technology, the most extensive survey to date of the area. The two primary debris fields were successfully located as well as a scattering of secondary smaller debris that will be investigated in future expeditions.

The debris fields of the USS *Macon*, which continue to be the property of the United States Navy, are now part of a federally-designated marine sanctuary. The submerged wreckage of the last military airship represents a singular and significant cultural heritage site within the boundaries of the Monterey Bay National Marine Sanctuary. The September, 2006 dive with the *Western Flyer* as support vessel promises discoveries of equal interest.

Prototype of video-mosaic technology to be used on follow-up expeditions to the Macon. *MBARI photo by Steve Rock.*

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This c.1934 photograph of the USS Macon over the port of San Francisco is part of the Commander Herbert V. Wiley Collection, gifted to the Monterey History and Art Association by former watchstander Gordon "Scroggie" Wiley.

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At the height of the Great Depression, local communities banded together to raise nearly $500,000 for purchase of the 1000-acre Rancho Inigo on lower San Francisco Bay. They offered the undeveloped land to the US Navy for the symbolic fee of $1 and the Navy in turn invested more than $2,000,000 in its development as the future Moffett Air Field. Efforts are currently underway to preserve Hangar 1, built for the USS *Macon*, from destruction.

LT. COMDR. H.V. WILEY

Above: This example of a greeting card made for the USS Macon*'s commander shows a view of Moffett Air Station, home base of the naval airship, taken from aboard the* Macon*. At left is the 8-acre Hangar 1. Highway 101, completed for the 1933 opening of the air station, is at right. H.V. Wiley Collection, Monterey History and Art Association.*

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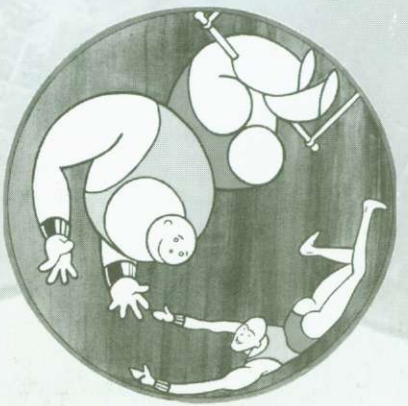

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