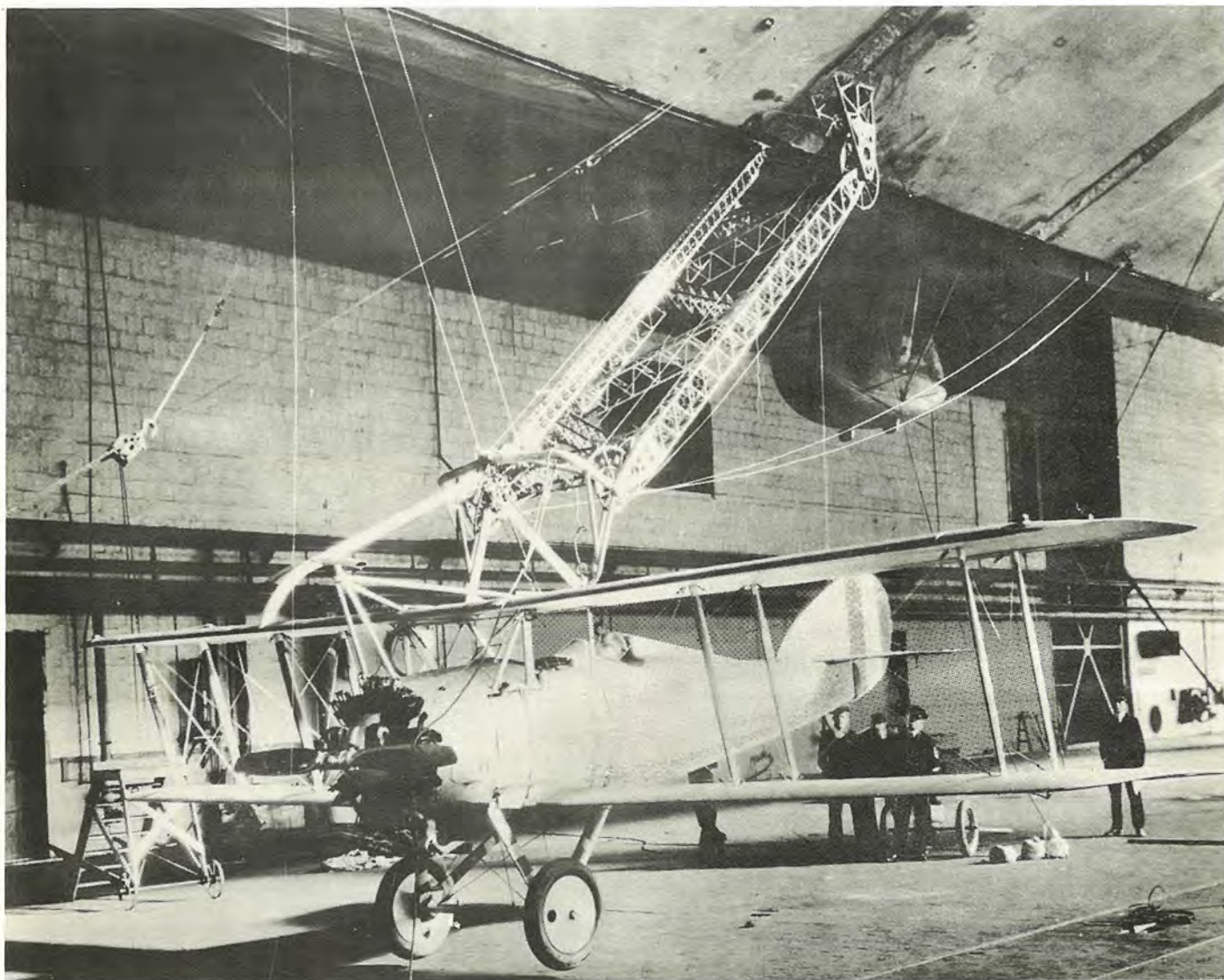


THE NAVY'S FIRST SKYHOOK

by Richard K. Smith



December, 1928. The Vought OU-1 is tried in a hangar test on the U.S.S. LOS ANGELES. The trapeze bar has been swung up and engaged in the lock at the end of the "third pole", and the steadying arms (only one visible in this photo) are engaged in the auxiliary hooks on the airplane's wings. Thus the plane and trapeze were ready for hoisting against the hull. At this date the first hook-on flight was more than six months in the future. (U.S. Navy photo No. LH2072)

It is generally known that the Navy's airships U.S.S. AKRON and U.S.S. MACON carried five fighter planes which could be launched and retrieved while the airships were in flight, and the airships' brood of Sparrowhawk fighters have been the object of some in-

tensive investigation. (1) But relatively little is known, and probably even less is remembered, of the airplane trapeze experiments conducted by the U.S.S. LOS ANGELES -- which was the Navy's first "skyhook." Its development began in 1926.



The Navy's first hook-on airplane, Vought UO-1 No. A-6615, warms up on the field at Lakehurst, N.J. The pilot is unidentified, but is believed to be LCdr. Charles Nicholson. (Photo courtesy of RADM Calvin M. Bolster, USN.)

Shortly after the World War of 1914-1918, even before the SHENANDOAH was completed, the Navy was contemplating a large scouting airship of five or six million cubic feet, which would carry airplanes. In March, 1924, a memorandum was prepared in the Bureau of Aeronautics' Lighter-Than-Air Design Section which gave a general description of what the proposed design should consider. Except for its preference for a size of 5,000,000 cubic feet, this memo provided the essence of the AKRON/MACON design. In early 1925, tentative specifications for the design were compiled in BuAer Design Memo No. 45, and thereafter the projected airship became officially known as Design No. 60.

The SHENANDOAH disaster of September, 1925 plunged lighter-than-air development into a moment of crisis, but it was out of this crisis that the Navy's so-called

Below - another view of the UO-1 being adjusted to the hook-on gear of the LOS ANGELES at Lakehurst, December, 1928. (Photo- U.S.Navy LH2073)



Five Year Aircraft Program emerged. And it was this program that authorized the construction of the AKRON and MACON. While design and construction work proceeded on the airships, the Bureau of Aeronautics also developed some of the novel features which were to go into the AKRON/MACON design. The LOS ANGELES was the Navy's work horse in this regard, and one of the most important aspects of her performance as an airship-of-all-work was the platform she provided from 1929 to 1931 for developing the airship trapeze.

During the early 1920's, the Army developed an airplane-airship hook-on scheme, and in December, 1924 flew the first successful hook-on. (2) Even before the Army's experiments were a success, the Navy had obtained all the Army's technical data, but the Navy's trapeze was not a direct follow-up of the Army's experiences. The Navy's trapeze was a wholly different creature. The Army's trapeze was a simple, lightweight affair used with small blimps, and had been designed for use by the Sperry "Messenger", a tiny, 1,000 pound biplane; the Navy's trapeze was a rugged structure of duralumin girders designed to receive service-type airplanes of three to four thousand pounds. The Navy did use the Army's Sperry-designed hook, but it was not long before even this was discarded.

In early 1926, the Bureau opened discussions with the Goodyear-Zeppelin Co. of Akron, Ohio, about the design and construction of the trapeze to be installed aboard the LOS ANGELES. But work in this direction proceeded slowly, and the trapeze was not installed aboard the airship until December, 1928. In the meantime, on June 11, 1927, Lt. (j.g.) DeLong Mills, in a hook-less Vought OU-1 (No. 6491), flew a series of passes under the hull of the LOS ANGELES, trying approaches to the anticipated location of the trapeze. Mills concluded that no unusual pilot skill was needed to maintain a plane in a steady course within ten feet of the airship's hull, and that flying a hook-on should be reasonably simple. But actual hook-ons were two years in the future.

Shortly after midnight, in the small hours of July 3, 1929, the LOS ANGELES took off from her Lake-

hurst base for what was more than just another routine training flight. In retrospect, it is appropriate that LCDr. Herbert V. Wiley was the airship's skipper on this flight. Wiley was an airship man; he had no experience with airplanes, but in the years immediately ahead, his appreciation of the airplane proved him the most successful of the Navy's airship captains. This was the result of his active cooperation with the AKRON/MACON hook-on pilots in the creation and implementation of some highly imaginative scouting tactics. Wiley is the only airship captain who appears to have been of the early conviction that if the big rigid airship was to be a military success, that its success would have to depend upon the performance of its hook-on airplanes. And now Wiley was flying the LOS ANGELES to her first hook-on.

A few hours later, as the summer's early daybreak spread across the New Jersey coast below, a Vought OU-1 (No. 6615), flew out of the still darkened western sky. At 0415 Wiley ordered Lt. George F. Watson, officer of the deck, to bring the airship about into the wind. (3) In the cockpit of the Vought, Lt. A. W. "Jake" Gorton swung in under the tail of the LOS ANGELES and lined up the skyhook on his upper wing with the yoke of the trapeze suspended from the airship's frame 100. Six minutes later, after a great deal of aggravating "fishing" with his hook, Gorton succeeded in putting the hook over the trapeze yoke. But only for a moment. The hook's design had incorporated a pressure-release feature used in the Army's skyhook. It was a safety measure which provided for the hook flipping open and releasing the plane if the hook was brought against the trapeze with a speed differential of more than three miles per hour. Now the safety feature was working too well. Gorton was scarcely onto the trapeze when he was off. When he finally got the Vought onto the trapeze, his hook experienced a structural failure, and the plane fell off. The day's tests ended with only four out of fifteen approaches resulting in a contact with the trapeze, and one abortive hook-on.

Jake Gorton was no novice to experimental flying work. For three years he had been a member of the Navy's Schneider Cup team, and most of his career had been spent as a test pilot, flying various experimental developments, including participation in the first night carrier landings, which were made aboard the U.S.S. LANGLEY. After the first day's disappointment, some voices claimed that maybe the trapeze idea was wrong. But Gorton didn't think so. He told Lt. Calvin M. Bolster, Lakehurst's experimental officer and one of the primary figures in the trapeze project, that he thought the existing gear was good, and that he could make a successful hook-on with it. But the pressure-release feature in the hook would have to go.

Gorton also felt that a change in his flying approach to the trapeze was necessary. In his efforts of July 3rd, he had made his approaches level with the trapeze, and "fished" with his hook. This called for delicate stick and rudder control, which was complicated by air turbulence created by the LOS ANGELES' hull and propwash. To avoid this, and the frustrations of "fishing," he suggested what he called a "reverse carrier approach." In a landing approach to a carrier's flight deck, a plane descends in a stalling attitude, and stalls out on the carrier's arresting gear; he would reverse this and approach the trapeze from below, climb to the trapeze in a stalling attitude, and stall the plane onto the trapeze yoke. A few of the airship men objected to this very loudly. They were afraid Gorton might not stall out on the trapeze, that he might fly on into their airship -- and the LOS ANGELES was the only rigid airship that they had. But Jake Gorton had been flying airplanes too long to be deterred from a good idea by mere "gas-bag" men.

Before Gorton could try another hook-on, LCDr. Leslie C. Stevens came up from the Bureau and he

wondered if the trapeze might be too complicated, perhaps even backward in its principle. Instead of having the plane hook onto the airship, maybe the airship should have the hook and the plane a small, trapeze-like fitting. Stevens suggested that the plane fly up under the airship and the pilot reach out and grab a hook trailed on a cable from the airship; he would put the hook through an eye on the plane, cut his engine, and be hoisted aboard the airship. This was essentially the method used to retrieve catapulted float-planes from the water alongside cruisers. On August 15, flying a Vought O2U, Stevens was bobbing around in the slipstream of the LOS ANGELES, trying to grab a small sandbag trailed from the airship in an effort to prove his hypothesis. It was futile. Some talk was spent on the idea of using a bight of cable to engage the plane's hook, but it appears as if everyone was happy to retreat to the relatively well-known quantity of the existing trapeze.

On the morning of August 20, Gorton was back under the LOS ANGELES with the OU-1, trying out his reverse carrier approach. The pressure-release feature had been removed from the Vought's hook, and his first pass resulted in a successful hook-on. The next day, Gorton was back for another landing on the trapeze, and then turned over the Vought to LCDr. Leslie C. Stevens from the Bureau, who had no troubles in flying his first hook-on. Then LCDr. Charles A. Nicholson, who had been handling the Bureau end of the trapeze development, took the plane up for a hook-on. From this point on, there no longer was anything tentative about the airship trapeze; from here on, all work was directed toward its refinement and simplification.

On August 28, 1929, the LOS ANGELES gave the first public demonstration of her hook-on evolution at the National Air Races in Cleveland. The 100,000 persons in the stands that afternoon had seen Col. Charles Lindbergh performing aerobatics with two pilots of the Navy's High Hat Squadron, Amelia Earhart doing spins in a glider, and Professor Juan de la Cierva perform in his novel autogiro, but when the LOS ANGELES plodded down the field, escorted by a swarm of insect-like planes and a pair of Goodyear blimps, she stole the show with her trapeze act.

As the LOS ANGELES came over the field, Gorton climbed into the Vought, flew up and hooked on to the trapeze. Inside the airship, seamen cranked away at the trapeze-hoisting mechanism which swung the trapeze up against the airship's hull. (4) Then Calvin Bolster, without a parachute, climbed out of the airship into the 45-knot slipstream and onto the Vought's upper wing, and swung himself into the front cockpit. The trapeze was lowered, and Gorton slipped his hook and flew off to land Bolster on the field -- the first passenger to be disembarked from an airship in an airplane. The demonstration had its stunt value, but its purpose was to prove that the airplane had actually "landed" on the airship, and that such a transfer of personnel was a relatively simple procedure.

The day after the LOS ANGELES' trapeze act at Cleveland, the German GRAF ZEPPELIN flew into New York City to complete its sensational around-the-world flight, a flight which seemed to signal a bright future for the rigid airship as a vehicle of commercial air transportation. And an enthusiastic press superimposed Bolster's transfer from the LOS ANGELES to the Vought upon the GRAF'S globe-girdling performance to predict that hook-on planes would ferry passengers and cargo to and from the big super Zeppelin air liners of the future.

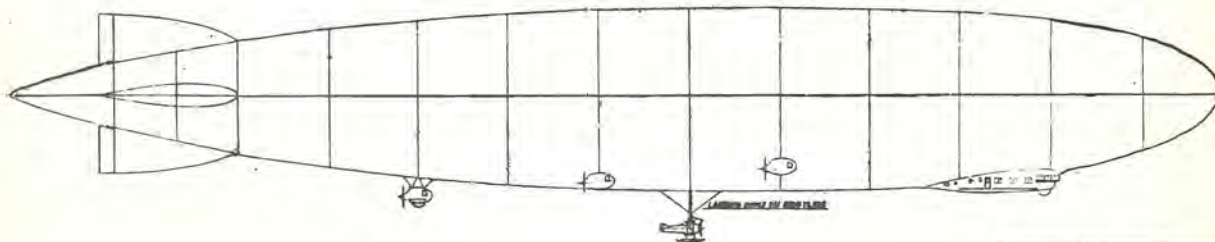
Trapeze operations were resumed October 8, 1929 when Chief Boatswain E. E. Reber, a pilot from the Naval Aircraft Factory, flew the Vought through a series of hook-ons; and the next day, Chief Aviation Pilot J. J. O'Brien, also from N.A.F., tried his stick work on the trapeze. Until the spring of 1931 when

the first of the AKRON'S regular hook-on pilots was ordered to Lakehurst, O'Brien flew most of the experimental trapeze work.

Between her trapeze acts, the LOS ANGELES had a brief affair with a glider. In the fall of 1929, Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics, became interested in the idea of using a glider as a means for transporting a mooring officer from an airship to the ground, and he called in Lt. Ralph S. Barnaby to discuss a glider launch from the LOS ANGELES. Barnaby had for long been a prominent figure in American circles; (5) in July, 1921 he had carried out a series of experiments in launching unmanned target gliders from the Navy's Italian-

built blimp O-1, and in 1929 he was putting the finishing touches to his book "Gliders and Gliding."

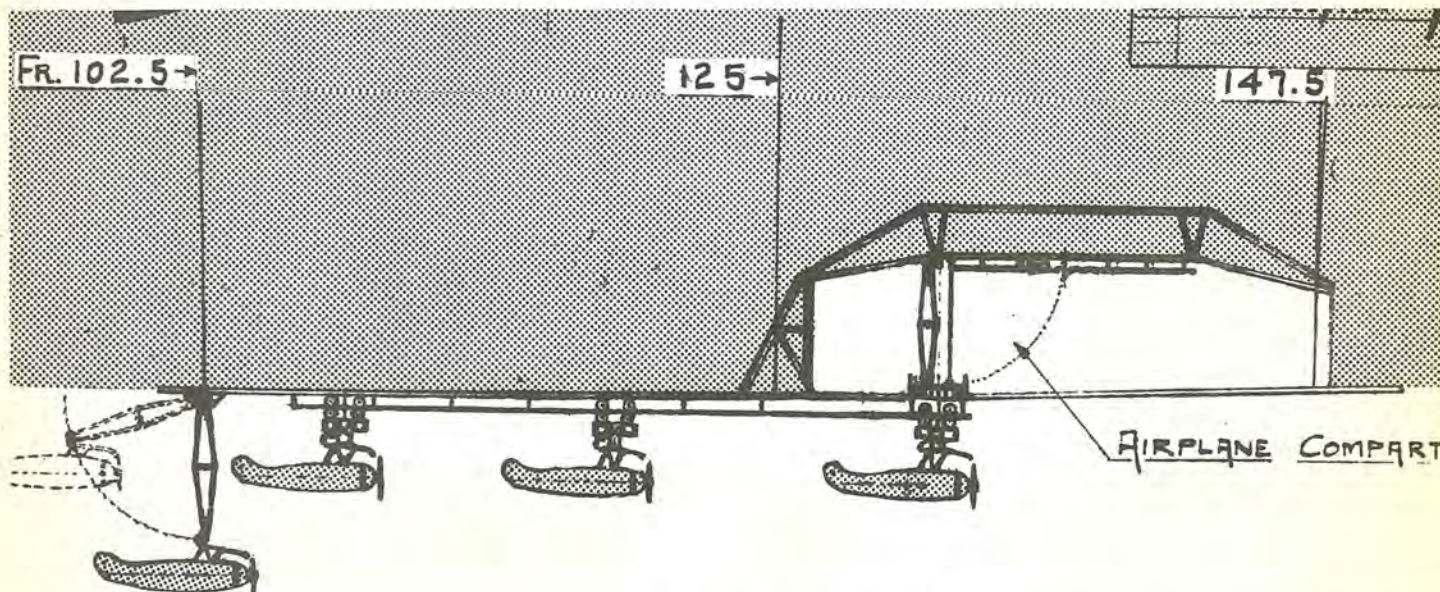
Barnaby told the Admiral that the idea was practicable, and suggested that the Bureau procure a Pruffling glider, a type he had become familiar with at the American Motorless Aviation Corporation's glider school at Cape Cod. Thus, on January 31, 1930, the LOS ANGELES was towed from her hangar, 196 pounds of Pruffling glider were attached to special fittings at frame 100, and the airship took off. While the LOS ANGELES circled the air station, Barnaby climbed into the glider, pulled his release, and soared away to hold the air for 13 minutes before skidding the aircraft in on the snow-covered Lakehurst field. The glider launch was a success, but



SCALE - 1:250

Des. No.	Y.L. 99
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BY	
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LOCATION IN THE AIRPLANE LANDING	Y.L. 99
APPROVED FOR THE LOS ANGELES	

The above drawing, made in 1926, shows the anticipated location of the trapeze on the LOS ANGELES. A Goodyear-Zeppelin Corp. drawing, YL-99, 1:250 scale, it shows a seaplane on the trapeze, since it was then thought that the AKRON class airships would utilize airplanes similar to the TS-1 or TR-1 (N.A.F.), or the stillborn Vought UF-1.

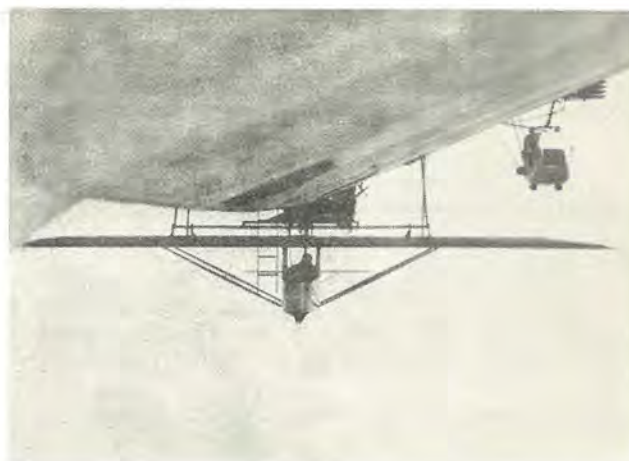


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Unless otherwise specified dimensions are in inches and limited to be within:				FAVRE	SANDER	M	W
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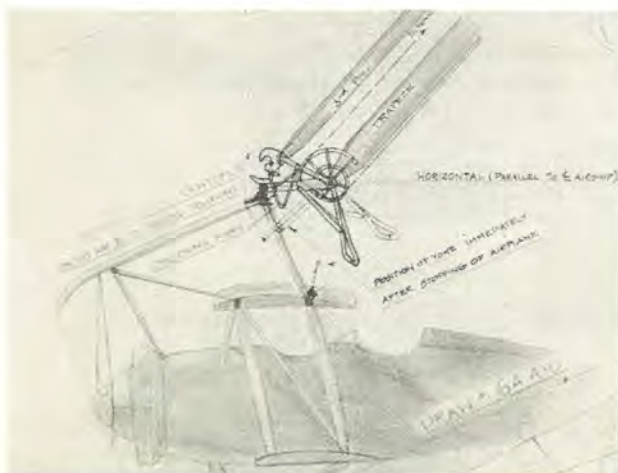
The arrangement of the Harrington-Bolster scheme for outside storage of the AKRON'S hook-on planes on a monorail and trolley system. It would have supplemented, not replaced, the Airship's internal hangar. It would have served as a "flight deck" from which three or four airplanes could take off immediately instead on one-at-a-time. Also, it was anticipated that standard carrier-type fighters, whose wing spans were too large to pass through the hangar door, could be equipped with hooks and operate from this outside track. This is 1:200 scale drawing made of the arrangement at Lakehurst in March 1931, approved by C.M. Bolster.



In the vicinity of Lakehurst, 31 Jan. 1931, Lt. Barnaby pulls the release and glides away from the LOS ANGELES. (Photo courtesy of Capt. Ralph S. Barnaby, USN, Ret.)



Lt. Settle prepares to release from the LOS ANGELES near Anacostia, May 1930. At right is the Airship's No. 2 engine car. (Photo courtesy of RADM Calvin M. Bolster.)



Sketch shows trapeze and airplane in hoisting sequence, copied from Goodyear-Zeppelin Corp. drawing. In this view, the plane's hook is about to lock into the "third pole", while the trapeze steadying arms move down to engage lifting points on the wing. Later, the device installed on the AKRON was replaced by a more simple centering and hoisting system.

its value for conveying an officer to the ground was found questionable, and the glider experienced only one more flight from the LOS ANGELES.

The LOS ANGELES was a very busy airship with her trapeze act during the final weeks of May. On the 20th, she gave a demonstration at a Presidential review of the fleet off the Virginia Capes, and a week and a half later, on Memorial Day, she flew to Washington, D.C., to put in an appearance at the Curtiss Marine Trophy race. On this flight, the glider was in new fittings at frame 120, but Barnaby was not aboard to take it down. At the last minute, he had been unable to make the flight and Lt. T. G. W. Settle volunteered to fly the glider.

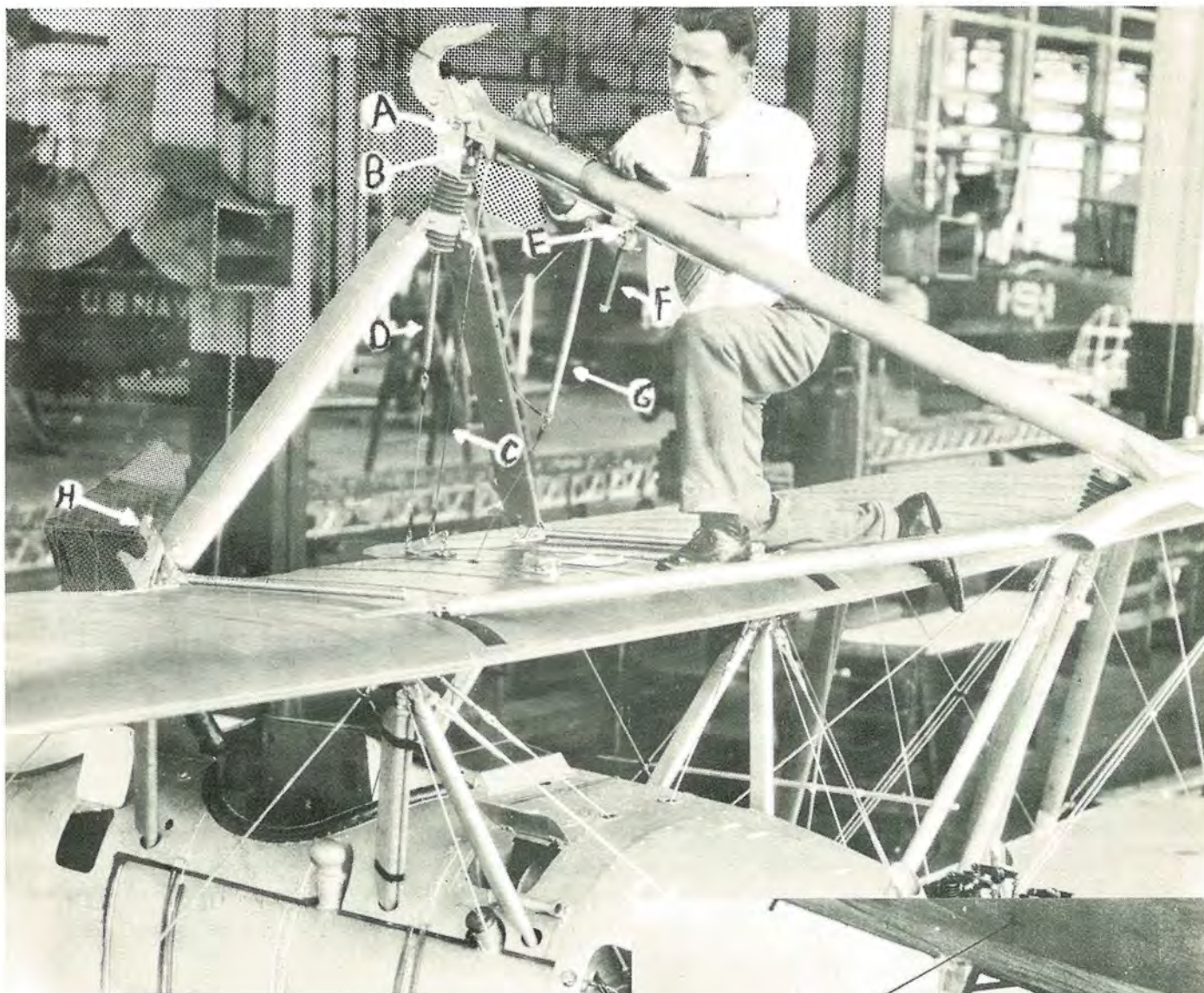
Settle was a lighter-than-air man, and one who, by 1930, had become well-known for his free balloon exploits, (6) but he was not disinterested in heavier-than-air matters. In the 1920's, he applied for airplane duty, but those were the days when Naval Aviation operated on nickels and dimes, and he was told that the Navy could not economically afford to train people for both fields. So he got a civil pilot's license. In 1930, he was in charge of the Navy's inspection force at the Goodyear-Zeppelin plant where the AKRON was under construction. While there, he had been introduced to glider flying by Dr. Wolfgang von Klemperer, one of Goodyear's engineers and who had been an authority on gliders in Europe.

In the cockpit of his Prüfling Glider, Lt. Ralph Barnaby waves for the benefit of newspaper photographers. At the right, his glider is shown attached to the LOS ANGELES before the airship's takeoff on 31 Jan. 1931



(Photos-copied from New York Times)





The Vought OU-1 is prepared for static test of the sky-hook at the Naval Aircraft Factory. This photo is from N.A.F. Technical Report No. 718, dated 10 July 1928. The alphabetical keys were on the original print. See box on Page 97 for technical description of its operation.

An N2Y hangs on the LOS ANGELES' trapeze. The vertical girder between the outer main legs of the trapeze is the "Third pole", a part of the hoisting mechanism. The Right Hand steadying arm, which swung downward in an arc to engage the wing's auxiliary hook, can be clearly seen pointed aft above the pilot. (Photo - U.S. Navy #652061)



Ten miles south of Anacostia, Settle climbed into the glider and was away for ten minutes of soaring over the Bolling and Anacostia airfields. But the 15,000 spectators on the ground could not watch his glider very long. As soon as he fell away, LCDR. Nicholson flew in with the Vought for a series of hook-ons. It was a big day for all. Capt. Arthur Page of the Marine Corps took the Curtiss Trophy, and a special trophy put up by Assistant Secretary of the Navy David S. Ingalls was won by Lt. D. Ward Harrigan. That day at Anacostia was the first time Ward Harrigan had witnessed the airplane-airship trapeze act. It was not his last. Thirteen months later, he was at Lakehurst flying hook-ons himself, and until the fall of 1933 he was the squadron leader of the AKRON/MACON "trapeze artists."

Prior to the arrival of Ward Harrigan at Lakehurst in February, 1931, hook-on flying had been almost wholly concerned with the elementary technology of the equipment and the art of flying to the trapeze. This work had been done on a part-time basis by pilots from the Naval Aircraft Factory. With the arrival of a full-time pilot who anticipated using the trapeze in daily military operations with the AKRON hook-on flying took on a new and personally vital complexion. This became more apparent in the summer of 1932 after the rest of the AKRON'S hook-on pilots had joined the unit, for each made a contribution to the advancement of the trapeze evolution. Another fresh factor was that Harrigan had been with Fleet aviation aboard the carrier LEXINGTON and his concern was as much with the future tactics and military employment of the hook-on planes and the practicability of the trapeze gear in serving the airship's military mission as it was with technology.

When Harrigan arrived at Lakehurst, the old Vought was on the field and there was a Consolidated N2Y-1 trainer (No. 8605) which had recently been fitted with a Skyhook, but there was nothing to hook onto. The LOS ANGELES was in Panama, on maneuvers with the Fleet. To lighten her load for the flight to Panama, the trapeze had been removed from the airship in December, 1930, and

it was not reinstalled until June 8, 1931. In the meantime, for lack of anything to hook onto, Harrigan busied himself by getting acquainted with the Curtiss XF9C-1 (No. 8731), the "Sparrowhawk" prototype which was being tested at the Naval Aircraft Factory. He also went through Lakehurst's lighter-than-air course and qualified as a pilot of free balloons and blimps.

Harrigan was broken into trapeze work by J. J. O'Brien; he made his first hook-on to the LOS ANGELES July 17, 1931, and had no trouble in running through a series of ten. He was surprised to discover that it was easier to hang the N2Y on the airship's trapeze than it was to set a plane down on a firm concrete runway, much less on a heaving carrier's flight deck. There came to be a consensus among the hook-on pilots that a landing on the trapeze was, on a whole, unusually simple compared to a conventional landing: the airship and airplane were moving in the same medium, their relative speeds were approximately zero, and the pilot's only concern was getting his hook onto the trapeze yoke. In a conventional landing, however, the concrete runway was a fixed surface and the carrier's flight deck was a surface in motion relative to the sea, while the airplane's motion was always relative to the air in which it was moving. On the trapeze, there was no problem of an icy or wet runway, nor of missing the carrier's arresting gear. If a pilot stalled out in his approach to the trapeze, he usually had 1,500 feet of altitude in which to recover -- a luxury in short supply and great demand during a stall in a conventional landing.

In the summer of 1931, the AKRON was rapidly approaching completion. (7) At Lakehurst, Harrigan had become acquainted with her blueprints, and with the full-scale wooden mockup which the Lakehurst engineering staff had made of the AKRON'S internal airplane compartment and its plane-handling facilities. He came to feel that the internal stowage of the hook-on planes would impose serious limitations upon their military effectiveness. Taking his troubles and ideas to Calvin Bolster in order to get an engineer's point of view, he found Bolster interested. They worked up an arrangement by which, in a General Quarters condition, the hook-on planes could be hung outside the AKRON'S hull where they could be kept on standby and, in an emergency, all released at once -- instead of having to be lowered out on the trapeze, one by one from the AKRON'S airplane compartment.

The Harrigan-Bolster scheme for a more versatile airplane stowage proposed a 100-foot-long monorail along the airship's underside, immediately aft of the hangar door. The planes would land on a trapeze at the after end of the monorail. This trapeze would swing the plane up to the track where the plane would be transferred to a trolley on which it would be slid forward to make room for the next plane. Refueling connections would be spotted along the monorail, and ladders to facilitate the exchange of pilots. If a plane needed extensive servicing, it would taxi along on its trolley to the forward end of the monorail where another trapeze would swing it up into the airship's hangar.

All extensive flight operations would be carried on from this external track. The internal hangar would be used only for independent flights, and for repairs and storage. The external track would also allow airplanes from ashore or from surface carriers to be equipped with temporary skyhooks which would permit them to operate to and from the AKRON'S trapeze and thus supplement -- in fact, almost double -- the airship's regular airplane scouting force. The larger dimensions of these airplanes would not be an obstacle to their operating from the airship, because they would not have to be brought through the airship's hangar door. (8)

The external monorail idea was received with enthusiasm in the Bureau, and Cdr. Garland Fulton, (9) Chief of the Lighter-Than-Air Design Section, recommended that an experimental installation of the outside track be

The early model of the skyhook shown on Page 96 was mounted at the end of a telescoping tube and had a relatively small bearing surface for engagement to the trapeze. The point where the hook's movable tube fitted into the main guard tube can be seen at the engineer's left hand. As the hook contacted the trapeze, the airplane's flight momentum caused the aft section of the hook tube to be drawn out, rearward. If movement of the hook exceeded a pre-set maximum of 6.5 inches a cam at (B) automatically released the hook. Upon automatic release, the hook flipped in an arc around point (A). When the pressure was off of the hook a spring returned it to its "armed" position.

It was this automatic feature, and the small bearing area of the hook, which bedeviled Gorton's first hook-on attempts. After the airplane was engaged on the trapeze, the pilot could release his hook manually with a lever in the cockpit, acting through control wire (D). If the hook, of this early model, was manually released it was necessary to descend to the ground and re-set the mechanism before flying to the second hook-on. The next model was fully automatic.

Items (E) and (F) adjusted the travel of the hook tube. A lever at the cockpit, acting through wire (G) upon (E) permitted the pilot to lock the telescoping tubes. Item (H) was the steadying point or "auxiliary hook", one on each wing. After the plane landed on the trapeze a pair of arms were lowered from the trapeze to engage the open jaws of these hooks. This arrangement provided a three-point grip while the airplane was being hoisted against the airship hull. Between 1929 and 1935 the skyhook underwent three major redesigns and several modifications.

made aboard the LOS ANGELES. In the fall of 1931, work was initiated toward the fabrication of such a system for the LOS ANGELES, but the project was temporarily lost in the press of work which swamped Lakehurst's small staff of engineers after the delivery of the AKRON and all her teething problems. It was finally lost when the LOS ANGELES was decommissioned in the summer of 1932.

Although the elaborate outside hangar track system was not installed on the LOS ANGELES nor on the AKRON or MACON, a compromise was realized in the "perch". This was a small, auxiliary trapeze which accommodated one airplane on the aft section of the airships' outer hull. But even the perch was not fully developed. It was anticipated that three or four perches would be spotted along the airships' undersides, but neither the AKRON nor MACON ever had more than one.

In the summer of 1931, Harrigan was joined at Lakehurst by Lt. Howard L. Young, the second charter member of the AKRON'S hook-on club. On August 18, Harrigan and Young were in the air, each in an N2Y, taking turns at the LOS ANGELES' trapeze, and Young had no trouble in running through eight hook landings. This was also the first test of a new skyhook design worked up by Calvin Bolster, and Harrigan found it to be a real charm.

One of the most vexing problems which the early hook-on pilots had to contend with was keeping the hook on the trapeze yoke during the first second of contact. The skyhook installed on the Vought OU-1 had been shaped similar to a shepherd's crook; it was shallow in depth, its internal plane was designed for level approaches to the trapeze, and its forward end curled upward. The shallow depth of the early hook did not allow sufficient hook surface for the airplane bouncing backward in the first second of contact; the internal plane of the hook, which was parallel to the airplane's axis, made hook-ons from a stalling attitude difficult; and the hook's up-turned end, which was intended to lead the hook over the trapeze yoke, in practice served to frustrate hook-ons by providing a surface on which the airplane too frequently bounced off the trapeze.

Shortly after Gorton's experiments, the hook was modified, which made hook-ons somewhat easier; but it was not until Bolster's redesign that the "perfect" hook was realized. This hook was large and rugged; it offered about 200 degrees of opening between its jaws, and achieved its hooking action by its forward end being canted down toward the airplane's axis. But most important, when the airplane was approaching the trapeze in a nose-up attitude, the internal plane of the hook was parallel to the axis of the airship -- which permitted the pilot to literally slide his hook onto the trapeze yoke.

By the end of September, Harrigan and Young decided that it was time to find out how hooking-on worked at night. The N2Y trainers had yet to be equipped with navigation lights, so they carried flashlights with them in their cockpits in order that, from time to time, each could flash the other an idea of where he was in the darkness around the trapeze yoke. To illuminate the trapeze, the mechanics in the LOS ANGELES' Nos. 2 and 3 engine cars were given flashlights to aim forward at the trapeze yoke. Aboard the AKRON, a scavenged Model-A Ford headlight provided illumination of the trapeze; but with the LOS ANGELES on this night of September 29, it was hook-ons by flashlight. Except for the obvious shortcomings of their lighting system, the pilots discovered that night trapeze operations were little different from those in daylight. In fact, they were a bit easier for the night air conditions made for smoother flying.

In October, Harrigan went to the Naval Aircraft Factory and picked up the Curtiss XF9C-1, which had just been fitted with its skyhook, and October 23, he and Young put the fighter through its first paces on the trapeze. The fighter gave Harrigan no trouble in

his five landings, but when Young took it up, he discovered a new "bug" in the hook system. Young went through two landings nicely, but on his third hook-on, he was pained to discover that he couldn't get the plane off the trapeze! The XF9C was equipped with the same hook system as the N2Y trainers, but the fighter was a heavier machine, and under the strain of its weight the actuating cable between the pilot's release lever in the cockpit and the hook mechanism had stretched -- only a fraction of an inch, but enough that the mechanism could not be pulled through its complete action. (10)

The LOS ANGELES could not easily land with the airplane hanging on its trapeze, so the plane had to be removed. For 35 minutes, she circles Lakehurst while Young struggled with the distorted mechanism as much as he dared. Aboard the airship, Lt. George Calnan decided that the only way the plane was going to get off the trapeze was for someone to go down and knock it off. While the LOS ANGELES' skipper, Cdr. Alger Dresel, slowed the airship, Calnan slipped a wrench into his back pocket and climbed down the lattices of the trapeze girders to a position over the yoke. After ten minutes of Calnan's pounding, the fighter's hook flipped open and the plane fell free.

When the XF9C-1 landed, a new release wire was installed and Harrigan took off with it to meet the LOS ANGELES over Jersey City's municipal airport where a three-day air meet was in progress, and where the Navy Department had scheduled a hook-on exhibition. Three days later, he was again in the air with Curtiss fighter, pushing it toward western Georgia to keep an appointment with the LOS ANGELES for a Navy Day exhibition over Atlanta. And while the AKRON was being groomed for her commissioning that evening in Lakehurst, he flew the fighter to two hook landings aboard the LOS ANGELES.

These were the last hook-ons made to the LOS ANGELES' trapeze, and they were the last hook-ons made anywhere for the next seven months. The AKRON did not have her trapeze installed until the last week of January, 1932, and did not receive any of her planes aboard until the first week of May.

During the months which remained in 1931, the LOS ANGELES had her trapeze cannibalized to provide parts for the AKRON'S trapeze. This was a temporary expedient, but the nation was moving deeper into the Great Depression, and in June, 1932, the LOS ANGELES was decommissioned as a government economy measure. The decommissioning, too, was "temporary," but the LOS ANGELES never flew again except at a mooring mast. During the next eight years, the LOS ANGELES continued to perform for the Navy as an airship-of-some-work, by acting as a guinea pig in a variety of hangar tests and structural and mooring mast experiments. In December, 1939, it was decided that she had reached the end of her usefulness and she was dismantled -- the last of the Navy's rigid airships and the longest-lived rigid airship in the world.

During her 15 year life, the LOS ANGELES provided the Navy with a training instrument for more than half of its lighter-than-air flying personnel, and among them were the officers and men who were the nucleus of the World War II blimp squadrons. She provided a flying laboratory for testing a wide variety of radio equipment which, at that time, was too bulky, heavy or delicate for an airplane to carry; for a program of engine experimentation, and the development of what was at that time new aerial navigation technique. And she was the only rigid airship to land on the flight deck of an aircraft carrier. One summer day in 1926, while moored to Lakehurst's high mooring mast, she chose to stand on her nose and blatantly announce to the world that the high mast had had its day; and she helped to develop the low, mobile, stub mooring mast, and Calvin Bolster's mechanical ground handling equipment which was vital to the op-

erations of the AKRON and MACON. But certainly the most dramatic function the LOS ANGELES served was that of being the Navy's first skyhook.

The rigid airship vanished from the face of the earth in the spring of 1940, and a saga of aeronautics came to an end. It might seem that the LOS ANGELES' experiments were for naught, but it would be wrong to dismiss them so off-handedly, for they all contributed to aeronautical knowledge. When her trapeze experiments in particular are examined in the light of their ultimate conclusion, the U.S.S. AKRON and U.S.S. MACON -- the world's first and last flying aircraft carriers -- they become part of a fascinating epoch which is unique in the history of aeronautics, and which is unique to United States Naval Aviation.

SOURCES

The bulk of the information herein was obtained from the logbook of the U.S.S. LOS ANGELES, Record Group 24, National Archives, and Bureau of Aeronautics Correspondence, Record Group 72, National Archives.

I am indebted to Rear Admiral D. Ward Harrigan, USN-Ret, for several lengthy interviews, supplemented by the loan of his flight logs, other personal papers, and for his comments on the original manuscript. To Rear Admiral Calvin M. Bolster, USN-Ret, for his painstaking explanations and sketches of the trapeze development. To Captain Garland Fulton, USN-Ret, whose comments contributed valuable perspective. To Captain A. W. Gorton, USN-Ret, for the details of his early hook-on work. To Vice Admiral T.G.W. Settle, USN-Ret, Rear Admiral Charles A. Nicholson, USN-Ret, and Captain Ralph S. Barnaby, USN-Ret, for information on their parts in the early hook-on story, and for their comments on the original manuscript.

Mr. Lee Pearson, Bureau of Naval Weapons Technical Historian, provided some items which provided further perspective, and Miss Esther Mueller of the Air Force Museum came through with the loan of an old Naval Aircraft Factory report on the OU-1's skyhook which was of vital import.

Source material on the LOS ANGELES' trapeze experiments is very sparse in the ordinary public record; however, the New York TIMES, as always, was helpful in all instances, if only for background information. The aviation magazine press was remarkably poverty-stricken on this interesting development. The only comprehensive item I was able to find in the public record was H. B. Miller, "Navy Skyhooks", U.S. Naval Institute PROCEEDINGS, Vol. 61, No. 2, (February 1935), pp 234-240, illustrated.

Richard K. Smith

FOOTNOTES

(1) See Willis L. Nye, "Genealogy of the Curtiss 'Sparrowhawk' Dirigible Fighters," and John C. Mitchell, "A Chronological History of the F9C-2 and Its Uses on the AKRON and MACON," A.A.H.S. JOURNAL, Vol. 3, No. 1 (April-June, 1958), pp. 70-109.

(2) See Richard K. Smith, "The Airship as an Aircraft Carrier," A.A.H.S. JOURNAL, Vol. 5, No. 3 (Fall, 1960), pp. 220-228.

(3) During the initial hook-on experiments, there was an obvious imitation of surface carrier landing technique. It was soon discovered that because the airship and airplane were moving in the same medium that this was not necessary.

(4) Due to the nature of the LOS ANGELES' construction which never anticipated airplane hook-ons, she could not have an internal hangar like the AKRON and MACON. And due to the experimental nature of her trapeze, she did not have an electric trapeze hoisting winch.

(5) For a comprehensive portrait of A.A.H.S. member Barnaby, see Soaring, Vol. 23, No. 5 (August, 1959), p. 5 ff. Also, A.A.H.S. JOURNAL, Vol. 6, No. 1, (Spring, 1961), p. 22.

(6) In 1929 Settle, with Ens. Wilfred Bushnell as co-pilot, won the National Balloon Race; in 1932 he and Bushnell won the Gordon Bennet International Race, setting a free balloon distance record which remains unbroken to this day.

(7) The AKRON was christened August 8, 1931; made her first flight September 23, 1931; completed her builder's trials October 16, 1931; was delivered to Lakehurst October 21, 1931; and was commissioned on the evening of October 27, 1931.

(8) The T-shaped hangar door on the AKRON and MACON imposed a limit on hook-on plane dimensions of a 30' wingspan, 24' overall length, and a tailplane span of 10'. The Curtiss F9C-2 hook-on fighter had a wingspan of 25.5'. By way of contrast, the Boeing F4B-4's span was 30'; the Curtiss F11C-2, 31.5'; and the Grumman FF-1, 34.5'.

(9) Now Capt. Garland Fulton, U.S.N. (Ret), and A.A.H.S. Member.

(10) This cable system continued to give trouble on the F9C's until the fall of 1932 when it was replaced with a "solid" system of link rods and bell cranks which proved to be very satisfactory.

ABOUT THE AUTHOR

Richard K. Smith needs no introduction to the group of aviation historians concerned with lighter-than-air development, and he continues here the theme begun with his "The Airship as an Aircraft Carrier", J-AAHS, Vol. 5, No. 3 (Fall 1960), pp. 220-228. He contributed also the comprehensive, annotated bibliography of articles about LTA subjects in the U.S. Naval Institute PROCEEDINGS in the preceeding issue of this JOURNAL (Spring 1960). At the present time he is working on a bibliography of the "big five" of LTA engineering in the United States, the men behind the design of airships. Contributions to other aviation magazines have also begun to appear, compiled from his research for these articles in the A.A.H.S. JOURNAL. And this month he received a scholarship to the University of Chicago for Ph. D. work.

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