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THE AIRSHIP AS AN AIRCRAFT CARRIER

From the time that man first realized that he could build a machine that would fly, perhaps few other things have fascinated him with such persistency than the idea of operating aircraft to and from other aircraft in flight--of having something like an island in the sky. Today this desire manifests itself in rockets, satellites, and plans for space stations; forty years ago the effort was focused upon the possibilities inherent in lighter-than-air craft.

In the early days of aviation it was not uncommon for inventors to use balloons to hoist gliders, models of airplanes, and various contraptions which were supposed to fly, into the air for testing. In 1905 Professor John J. Montgomery of Santa Clara College launched a man-carrying glider from a balloon, and a year later Santos Dumont used one of his dirigible envelopes in an unsuccessful attempt to lift a full-size airplane into the air. But these were expedients, at most experiments, and showed no indication of an effort to advance beyond the immediate situation, toward a practical application of the idea. The development of utility in the airship-airplane combination does not appear until the catalyst of war was applied to the idea.

By the summer of 1915 the British had been smarting for six months from the intermittent Zeppelin raids. At that time the British airplanes were pathetically underpowered, and very often by the time they had struggled to the 12,000 foot operating altitude of the raiders, the Zeppelins had gone. And if they were still in the vicinity and an airplane succeeded in closing with one, the Zeppelin commander had only to dump ballast and soar to a few more thousand feet. Determined to find an answer to this climbing advantage of the Zeppelin's, Squadron Commander de Courcy W. P. Ireland of the Royal Naval Air Service prevailed upon Wing Commander Neville F. Usborne, commanding officer of the Kingsnorth airship station, to let him use the envelope of an S. S. (Sea Scout) type blimp to experiment with an idea he had. The S. S. type blimp used the fuselage of a B. E. 2c two-seater fighter as its motive power and control car; Ireland proposed to replace the fuselage with a B. E. 2c complete with wings and tail assembly, and arranged so that it could release itself and fly away from the envelope. His idea was that the envelope would be used to lift the airplane to the altitude of the raiders where it would operate as a blimp until the raiders were spotted; then the airplane would release itself from the bag and fly off to attack the Zeppelins.

In August, 1915, this composite aircraft was taken up and tested by Flight Commander W. C. Hicks, but because of weaknesses found in its controlling gear no attempt was made to fly a release. This was eventually remedied, but six months were to lapse before it was tried again. On February 21, 1916, Ireland, with Usborne in the plane's observer's seat, took the composite up for a test.

All went well until the craft reached 4,000 feet. A sudden loss of pressure in the envelope released the airplane's forward suspension. The plane fell away at the nose and into a side-slip, but still held by its after suspension, it swung crazily around on its back. And Ireland, without a parachute, was pitched out of his seat into the River Medway 4,000 feet below. For a moment the plane hung nose down by its tail moorings, then broke away. Usborne sat helplessly in the observer's seat, which had no controls, while the plane spun itself into a pile of splinters and torn fabric in a local railroad yard. All development of the airship-airplane composite died with its proponents.

The idea of the composite was dead, but not the combination, and by 1918 both the Germans and British were beginning to think that it might be a good idea to equip their hydrogen-filled rigid airships with a "built-in" fighter escort. In January, 1918, the Zeppelin L. 35 took off from its Jüterbog base with an Albatross D-III fighter slung beneath its hull. While the airship circled the base a pilot climbed down into the plane, tripped his release, the plane fell away and off to land. This was the first and last German experiment of its kind. Technical problems attending the operation and the strategic purpose of the idea were opened to question, no answers were forthcoming, and the idea was permitted to lapse.¹

There is nothing to indicate that the British were excited by the German experiment, but when the known effectiveness of the British wartime intelligence service is considered it is probable that they were aware of it. In any case, the summer of 1918 was to see a similar event at the Pulham airship base where the obsolescent rigid airship R. 23 was fitted with an arrangement for carrying a Sopwith 2F.1 Camel. In the first test an unmanned Camel with locked controls was carried up and released to glide off to a landing. Later, Lt. R. E. Keyes of the 212th Fighter Squadron at nearby Great Yarmouth flew another Camel in a release from the airship. It would seem that further development was lost in the Armistice and England's severe economic retrenchment after 1918, for this was the last experiment of its kind in England until 1925.

Interestingly enough, neither the Germans nor the British appear to have given any thought to having the airship retrieve the airplane. After giving combat to enemy aircraft, and presumably driving them off, the pilot of the plane was expected to find his way to a friendly airfield. When it is considered that these airships were to operate over the limited area of the North Sea and would never be too far from some land this does not seem an unreasonable proposition. And it might be assumed that had the arrangement become operational the pilots of the planes would have soon set about development of a hook-on arrangement, if only out of motives of self-preservation.

In the United States Lt. George Crompton, skipper of the blimp C-1 based at the Naval Air Station at Rockaway Beach, N. Y., had heard about the ill-fated Ireland-Usborne experiment with the composite, and in the summer of 1918 he

¹See Dr. Douglas H. Robinson, "The Airplane Carrying Airship: The First Experiment," American Aviation Historical Society Journal, Vol. 4, No. 4 (Winter, 1959), pp. 265-268.

became determined to try it with the C-1. The flying boats at the Rockaway station would have been too heavy and awkward for the blimp to lift, so Crompton sought an airplane partner in the Army's Air Service.

During November, 1918, Crompton designed a hook--essentially a pelican hook--for carrying and releasing the plane, and worked out the details of the operation with 1st Lt. A. W. Redfield, commanding officer of the 52nd Aero Squadron at Mitchell Field. A small problem grew out of doubts as to if the airplane's engine could be started in the air, but the Curtiss JN4 Redfield proposed to use was equipped with a compression release, and he found that after cutting his engine and releasing its compression he could dive the plane to get its propeller windmilling, then choke it to life.

On December 12, 1918, Crompton flew the C-1 to a rendezvous with four JN4's on a large field adjacent to Fort Tilden, N. Y. The lifting arrangement for the airplane had been worked into the car suspension of the blimp by attaching four cables to finger-patches numbers 3 and 5 on each side of the envelope. The four cables came together in a ring about six feet below the control car. One end of a 100-foot length of half-inch cable was attached to the ring; on its other end was the hook and tripping device which was to carry the airplane.

While Crompton carefully released ballast, the ground crew let the blimp rise about fifty feet and Redfield's plane was wheeled under the control car. The pelican hook was attached to a suspension point on the JN4's upper wing and the blimp was permitted to ascend to the end of the 100-foot wire. To compensate for the weight of the JN4, Crompton discharged 2,125 pounds of ballast which made him about 75 pounds light, and the blimp and airplane rose into the air statically. At 400 feet he started his engines and flew the blimp in wide spirals to about 2,600 feet where Redfield tripped his release and flew away. The first American effort at combining airship and airplane was a crude one, indeed, but it was to experience a considerable sophistication over the next fifteen years.

One man who was particularly fascinated by an airship-airplane combination was Lawrence B. Sperry, inventor, sportsman pilot, head of the Sperry Aircraft Company, and son of Elmer Sperry, whose name is synonymous with the gyrocompass. Sperry's ideas were to go far beyond the earlier experiments, however, for he was to develop the means for retrieving the airplane aboard the airship.

At a conference with officers of the Army Air Service at Bolling Field in September, 1921, it seems Sperry first discussed his idea with the purpose of pushing it toward realization. The logic of the concept was simple, for it would combine the best features of the slow but long-ranged airship with the short-legged but fast airplane. It was thought that in coast patrol the plane could be sent down to inspect suspicious looking vessels, thus preventing the airship from exposing itself to anti-aircraft fire; while over land the plane could be used as a courier or be sent down to arrange landing facilities for the airship where there were none. And Sperry had just the airplane for these experiments in his "Messenger," a small 1,000 pound biplane which would not over-impose on the useful lift of the Army's blimps.

On July 17, 1922, flying one of his Messengers, Sperry conducted some unofficial tests with 1st Lt. Max F. Moyer in the blimp C-2. Neither airship nor airplane were equipped with attaching apparatus; it was Sperry's limited

purpose to find out how his plane behaved when held down to the relatively slow speed of the blimp, and when flown within the area of turbulence created by the airship's bag. While Moyer piloted the blimp across the Aberdeen Proving Ground and into the smooth air over Chesapeake Bay, Sperry practiced bringing his plane up underneath the blimp's control car and proved to himself that he could come within eight feet of it and hold his course and speed with very little effort. His only trouble occurred when he flew within three feet of the control car; Moyer took alarm and released ballast to climb away from the plane, which doused Sperry with a couple of hundred pounds of water.

By late 1922 Sperry had built an apparatus--a trapeze--for landing the airplane on an airship, and in November he flew some tentative tests of the arrangement over Mitchell Field, New York. The 15-foot long trapeze was slung beneath a DH4 (No. 64553) flown by 1st Lt. Clyde V. Finter. It was arranged so that it was retracted against the underside of the plane while on the ground, but could be lowered and fixed in a vertical position once the DH4 was airborne. Sperry's Messenger (No. 64225) was fitted with a "contact stick" which was mounted vertically over the center section of the upper wing. This stick, about three feet long, had its lower end set in a pivot so it would not break upon striking the trapeze, and it was sprung to snap back to its vertical position when the pressure was removed. It was coated with lampblack in order to show where it had touched the trapeze.

On November 28, 1922, the residents of Mineola, Long Island, could look up and see two planes playing tag at extremely close quarters as Sperry pushed his Messenger after the DH4's trapeze. The air was very rough that day so he made no attempt to close with the trapeze, but spent his time making approaches. On the morning of December second Sperry met Finter over Mitchell Field for an hour of touch-and-go during which he made sixteen passes at the trapeze, none of which were successful. No matter how close he flew to the DH he could not seem to bring his contact stick against the trapeze bar. Later, after comparing notes with Finter and his observer, he figured out that this was due to the optical illusion of parallax. When the tests were resumed two days later Sperry was able to allow for this, and seven out of eight passes at the trapeze were a success, three of them resulting in contacts of several seconds. Sperry concluded from these experiments "that it will be a very simple matter to fly into the trapeze with a certain amount of very necessary practice, and that this ought to be easier to do than for a beginner to learn on the ground."

Nine months later the Army duplicated the Sperry-Finter experiments using a D-type blimp at Langley Field. On September 18, 1923, the blimp D-3, piloted by 1st Lt. Junius A. Smith, was in the air swinging a trapeze below its control car. The Messenger was flown by 1st Lt. Rex K. Stoner. Due to engine trouble the D-3 was unable to get its speed above 47 miles per hour, which was too slow for the Messenger. On Stoner's first pass he missed the trapeze; on his second he brought the contact stick against the trapeze bar, but with a 17 mile per hour differential which snapped the stick out of its shock-absorbing springs and ended experiments for that day. On September twenty-fourth, after the D-3 had been fitted with new engines, the tests were resumed and were an unqualified success. Stoner was able to fly the Messenger up to the trapeze and keep its contact stick against the bar for as long as a minute, and even fly the stick up and down the face of the bar.

During the summer of 1924 the Sperry Company delivered its skyhook for the Messenger to the Army, and it was put through a series of static tests at

McCook Field, Ohio. The hook had a very small aperture, and was mounted at the end of wooden guide bar which had its contact surface sheathed in metal. The trapeze was a simple structure fabricated from aluminum tubing, its only complex feature being its shock-absorbing system which was merely a set of Fokker landing gear shock absorbers modified for the purpose.

Almost three years had passed since the Bolling Field conference where Sperry had first proposed the hook-on development, and as yet no plane had even been lifted into the air by a blimp, much less hooked on to one. But by this time the pace of progress was quickening. On October 3, 1924, in a demonstration at the Pulitzer Air Races at Dayton, Ohio, the Army made its first airplane "drop" from an airship. The blimp TC-5, piloted by 1st Lt. Frank M. McKee, took off with a Messenger hanging from its trapeze. Clyde Finter was at the plane's controls. As McKee brought the blimp over the stands, Finter tripped his hook and flew off. The first hook-on was less than ninety days away.

In late November, 1924, the personnel of the Engineering Division at McCook Field (now part of the Wright-Patterson complex), were packing up their airship trapeze and dismantling the Sperry Messenger for transportation to the Army's lighter-than-air center at Scott Field, Illinois. Because the Messenger's range was very short and its skyhook prevented the installation of an extra gas tank, it had to submit to the ignominy of travelling by truck to the place where it was to score a first in aviation history. At Scott Field the trapeze was rigged to the blimp TC-3, the Messenger re-assembled, and by mid-December all was ready for the first hook-on efforts.

Monday, December 15, 1924, was a crisp, clear winter day and the mercury in the thermometer crouched at a point below freezing as Clyde Finter flew the little Messenger into the slipstream of the TC-3 for his second bout with the trapeze. His first try had been on Saturday, but the blimp had been flown 1,000 pounds light which proved to be inadequate ballast for steady flying, the air had been bumpy, and the airplane had been thrown up against the trapeze on which it shattered its propeller. There were no spare propellers for the Messenger at Scott Field, but over the weekend one was cannibalized from the blimp OA-1. Although this propeller reduced the performance of the Messenger, Finter decided to re-new the hook-on flights. Now, in the control car of the TC-3 Frank McKee--who had weighed-off only 250 pounds light this time--worked at the blimp's controls to keep it on a steady path. And while the blimp and airplane bobbed for position, freezing fingers pressed against the triggers of motion picture cameras tracking the experiment from an Army camera plane.

While the blimp held a steady 1,500 feet, Finter came in behind it, fought his Messenger through its propwash, and got his hook onto the trapeze bar. But instead of coming to rest on the trapeze, he kept right on going. The airplane's hook had been equipped with a pressure-impact safety feature which would automatically release the hook if the plane made contact with the trapeze at a differential of more than five miles per hour. It had worked too well. Finter discovered that when he got the plane's hook within a few feet of the trapeze bar that the blimp's propwash literally stopped his plane and that it was necessary to give the plane an extra burst of power to break through this turbulence to reach the bar. He discovered, too, that this power had to be applied delicately or it would prove to be too much, give the plane too much speed and force it "through the hook."

On his second try he again flew through the hook. On his third try he decided that, instead of approaching the trapeze on a level path from behind, he would come in several feet below the trapeze and then climb up to it. This way he would

remain outside the area of turbulence until the last minute. And on his third try he came in to become the first man to fly a hook-on landing on an airship. With the Messenger hanging underneath his control car, McKee turned the TC-3 back toward Scott Field where Finter slipped his hook and landed to a round of congratulations.

The Army's hook-on efforts were a success, but it would seem that success was to be an end itself. Subsequent to Finter's hook-on the trapeze was rigged to the blimp TC-7 for some flying with the Messenger, the details of which are not known. But beyond this there was no attempt to follow up the Scott Field success with any further hook-on development. This can probably be attributed to the Navy having been assigned exclusive responsibility for rigid airship development, and any airplane-carrying by the Army's blimps would have had to have been of a very limited scope. Lawrence Sperry was never to hear of the Scott Field success of the project he had initiated, for on December 13, 1923 he had been killed in the crash of one of his planes in the English Channel.

Hook-on interest in the 1920's was by no means confined to the United States. In England, where airship activity was experiencing a renaissance of sorts with the construction of the R.100 and R.101, a hook-on project was begun soon after the conclusion of the Army's experiments.

A trapeze was installed under the rigid airship R.33, and the small DeHavilland DH. 53 "Hummingbird" was pressed into service as a hook-on plane. The first try at a hook-on was made October 15, 1925, when Squadron Leader Rollo E. de Haga-Haig brought the tiny, 490 pound monoplane up under the airship to the trapeze suspended about thirty feet beneath its hull. But his approach was too fast, his hook was not equipped with a pressure-impact release, and the plane almost flew a loop around the trapeze. The plane finally came to rest on the trapeze bar, but in its wild oscillations its propeller had fouled and broken in the guy wires of the trapeze, weakening the trapeze and rendering the plane inoperable. Because of the uncertain condition of the trapeze Haig tripped his release and glided off to a landing.

Two weeks later Haig again flew the DeHavilland onto the R.33's trapeze, but again he hit it too hard. The plane lunged to one end of the trapeze bar, broke the supporting structure, and the plane fell off its perch. It was not to be until December fourth that a wholly successful hook-on was made; then Haig neatly put the DH on the reinforced trapeze, the trapeze and airplane were hoisted up against the hull of the airship, and Haig disembarked. These were the first and last British hook-ons, although in 1926 the R.33 was equipped with gear for carrying a pair of Gloster "Grebes," fighter planes of standard weight, and some experimenting was done in releasing the Grebes with the airship in flight. However the Grebes were never equipped with skyhooks and could not return to the airship. All British experimentation in this direction came to an end in November, 1926, when the R.33 was deflated and subsequently scrapped. The R.100 and R.101 were never equipped to carry airplanes, although there was some talk about doing it.

The hook-on story does not end in 1926. Quite the contrary. Months before the Army began moving its hook-on development toward its December, 1924 climax, a memorandum was being prepared in the Navy's Bureau of Aeronautics which urged the beginning of design work on a rigid airship of 6,000,000 cubic feet which would carry a half a dozen airplanes. This was the initiation of the Bureau's Design No. 60 which was to establish the specifications for the

Goodyear-Zeppelin Corporation's Project I, and which was to result in the ZRS4&5, better known as the Akron and Macon. Even while Clyde Finter was slipping his hook from the TC-5 at the Dayton demonstration, the Navy was in correspondence with the Army to gain all the technical data on the Army hook-on experiments. Thus while one chapter was closing another was quickly opening, for in 1925 the Navy opened conversations with Goodyear-Zeppelin about the design and construction of an experimental airship trapeze, the one which was to be installed aboard the Los Angeles in 1928, and which was to be the proving ground for the arrangements employed on the Akron and Macon, the world's first--and last--flying aircraft carriers.

Sources

Much of the information contained above was obtained from Record Group No. 72, Bureau of Aeronautics General Correspondence, and Record Group No. 18, Army Air Force General Correspondence, in the National Archives. For the details of Lt. Crompton's 1918 blimp-airplane release, I am indebted to Mr. Lee Pearson, Bureau of Naval Weapons Technical Historian. Many of the details of the Army hook-on development are due to Miss Esther Mueller of the Air Force Museum who made available the technical reports of the project; and to Mr. Paul W. Bigelow of the Sperry Gyroscope Co., who sent me copies of what Sperry had retained in its files. I am also indebted to Colonel Clyde V. Finter USAF-Ret for his recollections, and for reading the manuscript. In addition, quite a bit of material was culled from more available sources:

Bruce, J. M. British Aeroplanes 1914-18. London: Putnam, 1957, 742 pp., illus. Information on R.23 airplane release occurs on p. 588; on p. 587 is a photo of Camel installed aboard the airship inside the hangar.

Gamble, C. F. Snowden. The Story of a North Sea Air Station. London: Oxford University Press, 1928, 446 pp., illus. Reference to R.23 release occurs on pp. 419-420, with photo; the account of the Ireland-Usborne experiments pp. 141-142 and 169.

Haig, Rollo A. deH. "Large Airships as Aircraft Carriers," Aviation, March 28, 1927, pp. 611-614. Haig's account of his hook-ons. Excellent photos.

"Hooking an Airplane to an Airship," Air Services News Letter, March 3, 1925, pp. 2-5. Reviews Army hook-on effort, 1921-1925. Most of this item is taken from official correspondence as found in the National Archives.

"Hooking an Airplane to an Airship," Aviation, Vol. 18, No. 14 (April 6, 1925), pp. 378-379. Almost a verbatim reproduction of the Air Services News Letter item above.

Miller, Harold Blaine. "Navy Skyhooks." United States Naval Institute Proceedings, Vol. 61, No. 2 (February, 1935), pp. 234-240. A survey of hook-on flying up to 1933, by an Akron-Macon hook-on pilot. Includes several excellent photos.

_____. "Skyhooks Past and Present." Model Airplane News, December, 1933, pp. 6-8, illus. Not the comprehensive piece his later article is.

O'Neill, R. E. "Airship TC-5 Launches Sperry Messenger Plane."
U.S. Air Services, December, 1924, pp. 30-31, illus.

"Report on Static Test of the Messenger Airplane and Dirigible Trapeze,"
July 23, 1924, Serial No. 2382, War Department, Air Service,
Engineering Division, McCook Field, Dayton, Ohio, 12 pp., illus.

Sperry, Lawrence B. "Logs and Report on Flights with the Object of
Determining the Accuracy of Picking-Up a Dummy Trapeze; the Best
Method of Approaching and Attaching to a Device Suspended from
Another Aircraft," February 27, 1923. The Lawrence Sperry Air-
craft Co., Inc., Farmingdale, L. I., N. Y., 12 pp., illus.

Thetford, Owen. Aircraft of the Royal Air Force. London: Putnam, 1957
528 pp. Profusely illustrated. Information on the DH-53 used with
R.33 hook-ons, p. 483.

_____. British Naval Aircraft, 1912-58. London: Putnam, 1958,
426 pp. Profusely illustrated. Appendix B, pp. 409-414 devoted
to lighter-than-air in the Royal Navy.

American Bristol Fighters (Continued from p. 207)

Morris, Lloyd, and Smith Kendall, Ceiling Unlimited, Macmillan, New York,
1953.

Flight and Structural Test Reports, Air Force Museum, Wright-Patterson
AFB, Ohio (special thanks to Mr. Royal D. Frey, Chief, Reference
and Research Division).

File, "Official History of the Bristol Fighter Airplane," National Archives
and Records Service, General Services Adm., Washington, D. C.

The National Air Museum (Continued from p. 215)

be suppressed, for not everyone will have the opportunity to come to
Washington and visit this museum. Moreover, the National Air Museum can
not physically assimilate all significant aeronautical material. In fact when
we consider the need for an air-minded and air-educated nation, one might
say, "the more air museums the better."

The National Air Museum has assembled wonderful collections of aircraft,
engines and accessory equipment. Had it not been for that much derided
"old tin shed" into which everything selected was crammed--because that was
the only place available--those precious and priceless relics would not be
available today for exhibition in the building that is to be. The National Air
Museum should be congratulated and receive our praise and interest for the
marvelous work accomplished, on a pittance, to preserve for future genera-
tions our aeronautical heritage.
