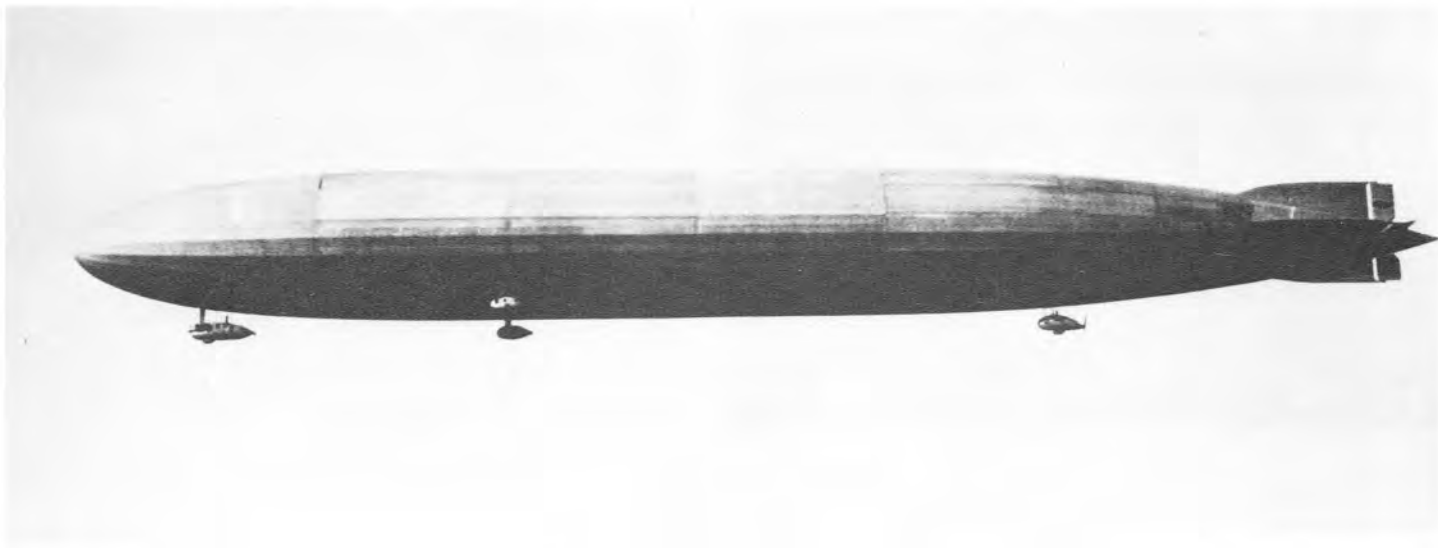
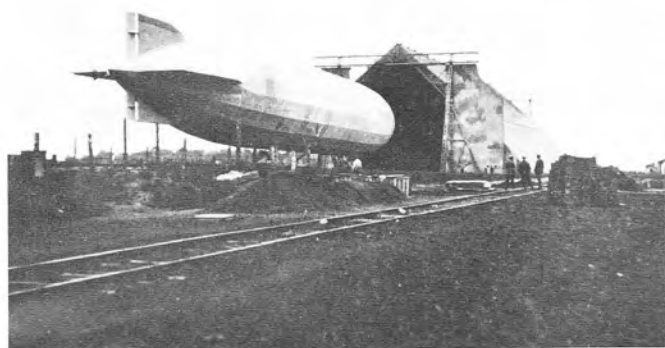




(Above) The German L 57 built to fly to Africa with supplies for German troops in Tanganyika. Photo: Lufschiffbau Zeppelin.



(Left) German LZ 98 at advance base, Namur, Belgium, 1916. Photo: D. Robinson.

(Below) The Graf Zeppelin at Mines Field, Los Angeles, 1929 during round-the-world flight. Harry Gann collection.

(Opposite page top) C 26, a British Coastal airship used for antisubmarine in 1915-18. Imperial War Museum photo.

(Opposite page below) The German airship base at Nordholz, 1918. Giant hangars in foreground were 853 feet long. Photo: Friedrich Moch.



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I agreed to the request to prepare this paper with an awareness that it would be difficult to find objective source material on the military effectiveness of the dirigible. The trained historian, viewing the literature, is obliged to regard practically everything produced up until recent years as propaganda and special pleading by the supporters and patrons of the airship, who at one time were the dominant majority in military aeronautics and even in more recent years have been a highly vocal and partisan minority in the aviation world. In particular, it is extremely difficult to obtain accurate information on damage done on the ground during airship bombing raids (except over England) and the reports of flight crews must be discounted, particularly in view of the navigational errors too easy to make at night. Parenthetically, airplane bombing crews were equally prone to lose their way at night and to exaggerate the effectiveness of their bombs. Further, it has proven extremely difficult to obtain from German sources information on the effectiveness of British and American blimps in antisubmarine warfare in both World Wars. My library contains the memoirs of both leaders of U-boats in World War I, Hermann Bauer and Andreas Michelsen; and of the Flag Officer, U-boats,

# THE EFFECTIVENESS OF THE DIRIGIBLE IN MILITARY OPERATIONS

By DR. DOUGLAS H. ROBINSON



Karl Doenitz in World War II. Reference to airships in the hands of their opponents is conspicuous by its absence.

It might seem that this paper will deny and degrade the military contribution of the dirigible, and indeed, less was accomplished by them than their enthusiastic supporters claims; but it was the misfortune of the dirigible, the first aircraft to possess military value, to be overtaken in all its capabilities by the heavier than air craft. Thus, the dirigible never enjoyed (except in Germany between about 1910 and 1918) a continuous and intensive technological development program based on a marshalling of all national resources. In other countries the airplane was the preferred weapon and funds were only grudgingly made available for the airship, except for antisubmarine warfare activities in wartime. I will divide my paper into three portions: (1) the dirigible in land warfare, subdivided into tactical and strategic reconnaissance, and tactical and strategic bombing, together with transportation; (2) the dirigible in sea warfare, subdivided into fleet operations and antisubmarine warfare; and (3) the dirigible in aerial warfare, as exemplified by the airborne early warning role in the post-World War II period. In each of these roles the airship had at one time an impressive capability, by virtue of its great range and endurance, large load carrying capacity, and ability to hover or operate at low speed. Successively it was driven from each role by heavier than air craft, which as they evolved eventually matched and then surpassed the airship in range, endurance, and load carrying capability, while at an early date they surpassed it in speed. The airplane was always less vulnerable than the hydrogen inflated airship, and until the post-World War II era was usually less expensive. Finally the helicopter supplanted the airship in the hovering mission. In many of the areas enumerated, it will be

observed, the airship was driven out promptly by the airplane before it had the time to be developed to a real level of technological sophistication. Of all the areas mentioned above, I feel that the airship, particularly the large rigid, might have the best return for the longest period of time in the fleet scouting role. Paradoxically, the Germans, obsessed with the bombing role of their Zeppelins, never developed a uniform doctrine for the use of their big rigids in fleet operations, and in any event few of these were undertaken by the High Seas Fleet. The United States Navy made many advances over the Germans in evolving a long range fleet scouting airship, but all efforts were abandoned after the loss of the "Macon" in 1935.

I do not intend to present a history of military rigid airships, but rather to offer an appraisal of their true effectiveness in the military roles I have outlined. I am aware that there may be sharp disagreement, particularly by friends whom I value. The opinions in any case will be my own.

### I — Dirigibles in Land Warfare

(a) Tactical reconnaissance: In this role the airship had been superseded by the airplane even before World War I. It should be remembered that the armies of France and Germany, which in the period before World War I set the pattern technologically and otherwise for those of the world, viewed the aircraft solely as a reconnaissance weapon. Such was the intended role of "La France," built and flown in 1884 by the French army engineers Renard and Krebs. Though "La France" was the first aircraft ever to return to her starting point, she did not represent a satisfactory military vehicle as she was powered by a heavy electric motor and batteries. After Santos-Dumont demonstrated the practicability of the light-weight gasoline engine in his small experimental airships in the early 1900s, both the French and German War Departments took up the small gasoline-powered airship as a means of tactical reconnaissance. The German Parseval was particularly intended to be demountable, its largest solid piece of structure being the rudder, and was to be carried on horse-drawn carts in a war of movement, inflated as needed from steel cylinders, and to make short range flights in daylight over the enemy armies. The rather larger contemporary semi-rigid Lebaudys in France were intended to play a similar role, though they were to be based in permanent sheds in the fortresses on the eastern frontier. Smaller French pressure airships were actually classified as *vedettes* and intended for tactical reconnaissance. However, the five French airships serviceable at the outbreak of war were larger *eclaireurs* and intended for strategic reconnaissance. In fact, in both the French and German service, the airship had been superseded even before August 1914 by the airplane in the tactical reconnaissance role. In September, 1912, the German War Ministry secretly decided to discontinue the procurement of the small Parseval pressure airships, and only two were in service with the Army on the outbreak of war. The airplane held an advantage already over the airship in the tactical role in that it made less demand on the supply system — there was no need for gas cylinders — and required less manpower, while being more constantly available and presenting a much smaller and less vulnerable target. Also, airplanes could be tied down in any open field, while the airship, vulnerable to even moderate winds, either had to be deflated or sheltered in a hangar.

(b) Strategic reconnaissance: Considering the short range and endurance of 1914 airplanes, both the French and German General Staffs were entitled to view the airship as the best weapon for strategic reconnaissance. In the event, the expectations far exceeded reality, availability was poor and staff officers who planned long daylight reconnaissance in the enemy's rear areas failed completely to foresee the airship's vulnerability to rifle and gun fire from the ground, while through lack of familiarity with the weapon, they grossly overestimated actual endurance and range.

The German Army, stimulated by the faith in the Zeppelin of the Chief of Staff, General von Moltke, had particularly ambitious plans for the use of the big rigids in strategic reconnaissance during the war of movement. In the West, Zeppelins based at Dusseldorf, Cologne, Trier, Frankfurt am Main, and Baden-Oos were to determine the concentration points of the enemy armies and their lines of advance to the frontier, the Dusseldorf ship further to reconnoitre the coast between Antwerp and Boulogne to discover possible landings by English troops on the continent. Other Zeppelins based in the East at Liegnitz, Posen, Königsberg, Thorn and Allenstein were similarly to discover the lines of advance of the Russian armies. Yet there was no centralized organization and leadership of the Army craft, scattered at individual bases and under the orders of the German High Command. This explains why none of the three airships in the East were ready when war broke out, while only one of the three in the West was inflated. Further, nobody at the High Command was specifically concerned with their employment. In the East the efficient Schutte-Lanz SL 2, commanded by the skilled and aggressive Hauptmann von Wobeser, made a remarkable but isolated flight which took her by day across the expected line of Russian advance into Galicia, and back to her base with an intermediate landing at Austrian Army headquarters at Przemyśl — 865 miles in 24 flying hours. Yet her reports did not prevent the Austrian First Army from being surprised and defeated by the Russian Fourth Army a day after SL 2's flight over the area. On the other hand, Z V, attempting a daylight raid on the junction at Mława during the battle of Tannenberg, was brought down by rifle and machine gun fire. In the West, there was undoubted discouragement when Z VI, sent out on the night of August 5 to bomb Liège, crash-landed short of her base due to rifle and machine gun damage to her gas cells. No flights were made in the West until August 21, when Z VII and Z VIII were sent out at dawn to search for French troops retreating from Sarrebourg. Flying low above the elevated terrain of the Vosges in daylight, both were riddled by rifle fire and destroyed after forced landings. In the case of Z VIII much of the damage was caused by "friendly" troops. No further attempts were made by the German Army Zeppelins to fly reconnaissance missions in daylight, and they turned to night bombing attacks.

The French had ambitious plans to use their pressure airships for strategic reconnaissance to determine the German routes of advance; yet they gave primary attention to the region between Verdun and Belfort in the south, while neglecting the actual German enveloping advance through Belgium. Further, though ten or fifteen airships were on the Army list, only five were flyable on August 5, 1914 — "Montgolfier" and "Dupuy de Lôme" at Maubeuge in the north, "Fleurus" at Verdun, "Adjudant Vincenot" at Toul, and "Conte" at Epinal. These were *eclaireurs* of about 320,000 cubic feet volume built by three different manufacturers, but with only two engines of 130 h.p. each and a multiplicity of drag-producing suspension wires and box rudders and elevators, they had a maximum speed of not more than 35 mph. The aggressively handled "Adjudant Vincenot" made 17 war flights between August and October 1914, the other fewer. Both "Montgolfier" and "Dupuy de Lôme" were brought down by friendly gunfire. Promptly the airships changed over to night reconnaissance which can have brought little information of value, and began to take bombs — or rather modified 155 mm shells — along on these missions. The longest of these flights was 12 hours 6 minutes and 268.75 miles, and the maximum altitude about 7500 feet.

The airships thus never succeeded in playing the role expected of them in strategic reconnaissance by day. It was a long time, however, before the airplane was able to assume this role. In the last year of the war the German Rumpler *Riibld* photo reconnaissance aircraft, flying at 22,000 to 24,000 feet with a super-compressed Maybach airship engine, performed strategic reconnaissance functions. Yet the Rumpler's endurance of 3½ hours precluded extensive penetration deep into France. True strategic



reconnaissance capability, with coverage of the whole of the enemy's country, came only with the fast, high-flying pressurized photo reconnaissance Spitfires, Mustangs and Lightnings of World War II.

(c) Tactical bombing: The dirigible never played this role in World War I, being too vulnerable. In the Tripolitan War fought between Turkey and Italy in Libya in 1911-1912 — the first war in which powered aircraft participated — the backwardness of the Turkish armed forces permitted the Italian non-rigids P 2 and P 3 to do some tactical bombing from a base in Tripoli. These airships were of 155,000 cubic feet capacity with a single Clement Bayard engine of 120 hp., a useful life of 3000 lb., ceiling of 5200 feet, and a speed of 32 mph. The bomb load must have been small, and the effect only moral.

(d) Strategic bombing: The German strategic bombing campaign with Zeppelins is well known, but will bear some critical review. Having failed in their intended role of daylight strategic reconnaissance, the Zeppelins of the German Army were obliged for lack of other employment to take up strategic night bombing. This had always been considered as a secondary mission, but initially artillery shells stabilized with strips of blanket were used, as proper bombs were not available until the end of 1914. From early night attacks on enemy fortresses, railway junctions and seaports there evolved a joint Army-Navy strategic bombing policy which aimed to destroy the enemy's armament factories, cripple his transportation, and force him to divert from the active front in France men, guns and airplanes for home defence. Further, there were exaggerated hopes and expectations that the terror of death from the skies would undermine home front morale and force the Allied governments to sue for peace. The emphasis on morale factors caused an excessive amount of effort to be directed against London and Paris. Though the Army was the first to bomb London, their efforts were spread over a large number of objectives in three theaters of war — the West, the East and the South-East. Damage to the enemy was exaggerated in German accounts, and cannot be documented except in the raids on England. The Western Front was an obstacle and a danger to the night raiding Zeppelins, and this was the reason that Paris was attacked only once in 1915, and twice in 1916. Misuse of the Zeppelins in the Verdun offensive in February 1916 in what was almost a tactical role — bombing of railway junctions immediately behind the Front — led to LZ 77 being shot down in flames by anti-aircraft fire and thereafter the Army Zeppelins were forbidden to cross the Front. After the Army Schutte-Lanz SL 11 was shot down in flames over London on September 2, 1916 — the first success for night flying British airplanes, though not the last — the Army rigids were withdrawn from the campaign against England. The few raids made thereafter in the West involved flights down-Channel and attacks on the ports of Boulogne, Rouen and Etaples. The last Army attacks were made against Roumania from bases in Hungary and Bulgaria in the latter part of 1916. With the reorganization of the German Army Air Forces in the autumn of 1916, Ernst von Hoeppner, the new commanding general of the Air Forces, concluded that the Army airships, bombing infrequently and increasingly circumscribed in their activities by improving defenses, were not worth the huge investment in men, money and material. A phase-out began in favor of bombing airplanes, and the Army airship service was disbanded in the summer of 1917. The bombing squadrons under the control of the High Command, equipped with two-engine Gotha, Friedrichshafen and A.E.G. bombers, and ultimately a few of the four and five engine "Giants," accomplished much more in the West in 1917-18 than the Army airships had done.

The Navy Zeppelins played the main role in the bombing campaign against England after the summer of 1915. Courageously and imaginatively led by Fregattenkapitan Peter Strasser, who throughout the war enjoyed the unreserved backing of the Fleet Commander, Admiral Scheer, the Zeppelins caused some \$4,000,000 worth of damage in England in 1915, and nearly \$3,000,000 in 1916, while exerting a considerable moral effect



(Top) The L70 on August 5, 1918 a few hours before she was shot down off coast of England. Photo: Marine-Lufschiffer-Kameradschaft.

(Above) The PL 25, German Parseval pressure airship used by Navy for coastal patrol. Photo: Friedrich Moch.

(Below) USS Macon at NAS, Sunnyvale, California. The nose is attached to a stub mast, and tail and a broad stern beam rides on rails. Photo: U.S. Navy.



on the British public, which cried in vain for retaliation. The bomb loads were greater than those ever carried by airplanes of the World War I period, the Zeppelins put in service in the summer of 1916 carrying over 4 tons of bombs in raids on England. Yet the raids were sporadic, carried out only in the dark of the moon, and far too often miscarried because of faulty navigation. Only once could they have appeared as a real threat to the war effort, when Heinrich Mathy alone in L 13 set fires in London which caused \$2,500,000 worth of damage. In the autumn of 1916, night-flying British aircraft firing incendiary ammunition shot down five airships in flames in attacks on England, signalling the end of the hydrogen-filled lighter than air craft as a strategic bombing weapon. Strasser with characteristic determination, had the Zeppelins drastically lightened to achieve altitudes of 16,000 to 20,000 with war load; but London was not again attacked, and infrequent raids on the Midlands and the north caused insignificant damage. In the last attack of the war, on August 5, 1918, Strasser himself was killed when his flagship, L 70, was shot down in flames before reaching the Norfolk coast. It may be doubted if the damage toll in England equalled the expense of building the Zeppelins and their supporting facilities; yet for the Navy craft, the bombing raids were a secondary mission. They certainly did much to elevate German morale until the defeat in the autumn of 1916; while they contributed to the exaggerated fear of aerial bombardment which caused the British Cabinet to react hesitantly from the Italian invasion of Ethiopia in 1935 through the Munich crisis of 1938 and after.

French non-rigid airships carried on a less spectacular strategic bombing campaign from April 1915 to March 1917. As previously noted, the night reconnaissance in the autumn of 1914 involved a certain amount of bomb dropping; on the other hand, so many of the French craft were shot up by their own infantry, despite the use of recognition flares, that all operations were stopped from December 1914, to April 1915. It was hoped that a new class of large 800,000 cubic foot non-rigids with two gondolas would be available, but these proved to be technical failures; rebuilt, some appeared in the autumn of 1915 as 500,000 cubic foot ships. The attacks were on railroad junctions not too far in the rear of the German armies, the old "Adjudant Vincenot" flying the majority of these from a base at Crevecoeur north of Beauvais. Four of the new non-rigids joined her, able to carry 3,300 lb. of bombs to a ceiling of 9000 feet, which increased to 12,000 feet on the homeward journey. Yet in spite of flying on dark nights the French pressure airships were brought down one by one by artillery damage which would not have been fatal to the compartmented rigids — "Commandant Coutelle" on September 23, 1915, "Alsace" on October 2, "Champagne" on May 21, 1916, finally the five-year-old "Adjudant Vincenot" herself on June 2. It was increasingly clear that the French Army non-rigids were incapable of maintaining the offensive even by night against increasingly practiced German anti-aircraft gunners, and in March 1917 they were transferred to the Navy — though not before the "Pilatre de Rozier" caught fire accidentally and was destroyed on February 23, 1917, with the loss of 9 men — the only French army airship crew to be killed in the war. Again, no information is available on the effectiveness of the French attacks on railroad junctions.

It is not generally known that the Italian Army throughout the war employed semi-rigid airships in strategic bombing raids. These, based behind the active front in northern Italy, were used to bomb Pola, Trieste, Monfalcone, Fiume, and other industrial cities across the northern Adriatic, as well as bridges and railroad targets behind the Austrian lines. The circumstances of their employment were quite unusual, and accounted for the fact that the Italian Army used airships for land warfare long after the French and German armies had given them up.

The Austrian air force was unenterprising and there were no losses from airplane attacks; on the other hand artillery fire caused losses even at night, and maximum ceiling was important, causing weights to be minimized at every point. Since distances were short, the endurance did not need to be great, while speeds

could be low as high winds rarely prevailed in Italy. The "M" type was most widely used for bombing raids, at least 17 being built, semi-rigids with a flat articulated keel of steel tube girders along the bottom taking compression loads; this permitted a lower internal pressure of gas than in the purely non-rigids, permitting the envelope to be made of lighter fabric. Length overall was 290 feet, the diameter 59 feet, and envelope volume was 431,000 cubic feet. The ballonnet when filled to capacity displaced 197,000 cubic feet, as was necessary in a high altitude craft. Two Itala Maybachs of 225 hp gave a maximum speed of 46.5 mph (streamlining was very poor), but the ceiling was 17,000 feet with a crew of five. A ton of bombs could be carried. Again, objective information from Austrian sources about the effectiveness of the raids is lacking.

(e) Transportation: Although Count Zeppelin envisaged his rigid airships playing a major role in transporting military person-



(Above) Curtiss F9C-2 Sparrowhawk assigned to USS Macon pictured at USNR Base, Long Beach, California. From Dustin Carter collection.

(Opposite) USS Macon designed specifically for long range scouting has belly hangar to carry five Curtiss Sparrowhawks. From Harry Gann collection.

nel and high priority cargo, the dirigible was not consistently used for this purpose. In November 1915, following Bulgaria's entry into the war but before a ground route had been opened from Austro-Hungarian territory, the Army Zeppelin LZ 81 carried a party of high officials from the base near Temesvar, Hungary, to Sofia, the Bulgarian capital. During the unusually severe winter of 1916-17, solid ice around the East Frisian islands prevented boats from getting through the mainland. On February 8, 1917, the naval Zeppelin L 16 landed on the island of Juist with food and mail.

The well known attempt by the naval airship L 59 to fly from Jamboli in Bulgaria to German East Africa with a 15 ton cargo in November 1917, had other motives besides carrying medical supplies and ammunition to General von Lettow-Vorbeck. The Zeppelin, and the German Navy generally (aside from the U-boat arm) were being increasingly discredited by the public, and even at Great General Headquarters which was dominated by the Army. Not only Strasser, but also the Naval Staff and the Admiralty, hoped that a spectacular success by L 59 would generate favorable publicity. The flight failed to reach its goal and the mission was classified secret: civil air transport, rather than military, benefited in the end.

Familiar as I am with the German literature on the wartime Zeppelins, I am surprised that no suggestion was ever made that they be used for a paratroop raid on some vital objective. Evidently the services were unable to see them in any offensive role except as bombers.

## II – Dirigibles in Sea Warfare

(a) Fleet operations: Of the 161 rigid airships ever built and flown, 60 served with the Germany Navy in World War I. Yet the German Naval Airship Division never evolved a coherent doctrine for their employment in a Fleet operation. Partly this was due to the fact that the inferior High Seas Fleet left port in strength relatively infrequently, and only two major battles took place with the Grand Fleet in the North Sea. In the first, the Dogger Bank action, a Zeppelin, L 5, was actually on the scene, but felt obliged to cover the rear of the retreating German battle cruisers rather than directly observing the enemy. Had she done the latter, the advancing German fleet might have been enabled to overtake and sink the badly damaged British flagship "Lion," which was proceeding slowly home in tow. Another consideration is the extreme timidity of Admiral von Phol, the Fleet commander

should have been able to reconnoitre the Grand Fleet base at Scapa Flow. I contend that this could have been done in daylight in 1916 though not later, and his three newest Zeppelins, L 30, L 31 and L 32 of 2,000,000 cubic foot capacity, had the range.

The last Zeppelin had however been commissioned only 11 days earlier and the capabilities of the type were still being worked out.

Otherwise the German Navy's Zeppelins performed valuable service on their own side of the North Sea in offshore patrolling, searching for mines, and covering their own mine sweepers, as well as a certain amount of antisubmarine work. They were not out every day as is often stated; their War Diaries show they patrolled on an average of only one day out of four. This was mainly due to bad weather, fog or low cloud. After mid-1917,



through 1915. Possessed of a unique long range scouting weapon that could reach right across the North Sea without hindrance from the British, von Pohl instead used his Zeppelins defensively in a ring within visual distance of the Fleet. At Jutland the weather was so thick that the Zeppelins saw nothing of the fighting, though on the following morning one of them, L 11, accurately located the British battle cruisers and several of the battle squadrons – information misinterpreted by Scheer. The Sunderland operation which nearly led to a pitched battle between the fleets on August 19, 1916, showed Scheer's ideas on using the Zeppelins (together with U-boats) for strategic reconnaissance: eight were out on that day, four in a line across the northern North Sea to intercept the Grand Fleet as it came south, four more along the east coast of England to report local forces issuing from the Forth, the Tyne, the Humber, the Thames, or the Channel. Four more Zeppelins were to have relieved the eight on August 20: they might better have been committed on the first day. The northern airships patrolled in vain, for the Grand Fleet, forewarned, had passed through their area a day earlier. Some of the other airships sighted Jellicoe's dreadnoughts, but Scheer refused to believe they were present. L 13, the most southerly, reported a force of light cruisers and destroyers as including battleships, leading Scheer on a wild goose chase which at least took him away from an encounter with the Grand Fleet in which he might have been worsted. World War II experience suggests that Scheer should have had a much larger force of airships to patrol the North Sea over several days. Above all, he

when several were shot down by flying boats sent across the North Sea, they had to patrol at higher altitudes and their usefulness was much diminished. By the autumn of 1918 the Fleet Command planned to use flying boats for offshore patrol, and only seven Zeppelins would have been in "Front" service in 1919.

Considering that the German Navy staked everything on the unrestricted U-boat was against Allied shipping, it is remarkable that no use was made of the large, fast 1917 and 1918 Zeppelins in searching for convoys west of the British Isles. Martin Dietrich, who commanded L 71 and earlier ships, and other former commanders were enthusiastic about the possibility of flying such missions, and the British at that time had no means of driving them away from the convoys. Yet they were misused instead in occasional and ineffective bombing raids on the north of England.

The British – and later the Americans – were greatly impressed with the possibilities of the large rigid airship in fleet operations, the British particularly, exaggerating the capabilities of the Zeppelins, reaching the pessimistic conclusion that the aerial scouts were watching them continually and would prevent any surprise of the German surface ships. After Jutland and the Sunderland Operation, the Royal Navy, which previously had neglected the rigid, put in hand a grandiose program for building 11 or 16 copies of the German L 33, which had fallen in England more or less intact. As a stop-gap, 13 examples of the "North Sea" class of pressure airship were built in 1917-18 for service with the Grand Fleet; with an envelope volume of 360,000 cubic





feet and a full speed of 50 knots, they still proved incapable of meeting the needs of the Fleet mainly because of trouble with unduly complicated propeller drives. Meanwhile the first rigids of the 1916 program were not completed until the spring of 1919.

The American Navy, with the world's second largest fleet in the 1920s and 30s, and two large oceans to watch over, attempted over a 15 year period to go beyond the German example of scouting at sea with large rigid airships. At first, senior admirals including the prestigious General Board favored the development of the scouting rigid, but it progressively fell into disfavor, largely due to prejudice in favor of the carrier in the Navy Department and the Bureau of Aeronautics. The high cost of the rigid in comparison to the airplanes of the day was also a serious disadvantage in an era of stringent economy. The first two American rigids, "Shenandoah" and "Los Angeles," had no real military utility and served to accumulate experience and train personnel. The next two, the sisters "Akron" and "Macon," were the largest airships in the world when built, and designed specifically for long range scouting according to American ideas. An innovation was a belly hangar designed to carry five fighter airplanes. In scouting exercises with the Fleet, neither was given a chance to show what she could do in strategic scouting; in crowded tactical exercises both were "shot down" with predictable regularity, even though helium inflated, to the delight of their numerous opponents. It soon became clear that with high performance airplanes going to sea aboard carriers, the German scouting procedure, with the airship making contact and tracking the enemy surface ships, was suicidal. The counter was to use the "hook-on" airplanes for scouting while the airship "carrier"

remained in the background. In a more favorable atmosphere the U.S. Navy might have started the war against Japan with a fleet of a dozen or so "Akron"-size airship aircraft carriers, which certainly would have had a greater range than the flying boats which superseded them. They probably could not have survived for long in contact with a strong carrier force, but neither could the PBYs and PBMs. Able to range as far as the Japanese home islands from Hawaii, they might have given us valuable information on Japanese fleet movements over and above what was obtained from decoded radio intercepts.

An interesting might-have-been of the latter years of the American program was the ZRCV project — not a scouting craft but an attack airship carrier of nearly 10,000,000 cubic feet and carrying nine high performance dive bombers. None were ever authorized. Projecting the ZRCV into World War II, it may be imagined that a large force of these airships, operating under one command, might have substituted for a carrier surface force. On the other hand, even if the ZRCV squadron had carried its own combat air patrol of fighters, it would almost certainly have been worsted by a surface force of Fleet carriers with anything like the same number of aircraft.

(b) Antisubmarine warfare: That genius to which Britain owed so much early in the present century, Admiral of the Fleet Lord Fisher, not only faced up to the menace of a German submarine war against British trade long before his more gentlemanly colleagues, but as early as February 1915, with the start of the first U-boat campaign against merchant shipping, he saw the airship as an antidote. Fisher's demands resulted in the



(Left) The USS Macon cruises lazily above San Pedro harbor, California. From Harry Gann collection.

(Right) Sparrowhawk scouting for USS Macon. Photo: Radm H.B. Miller USN (Ret).



(Above) A ZPG-2W U.S. Navy pressure airship at NAS, Lakehurst, 1956. Height finding radar extends top of bag. U.S. Navy.

(Right) USS Macon with F9C-2's on extended trapezes, 1934. From collection of Radm. H.B. Miller USN (Ret).



development of the Sea Scout type, originally a small non-rigid (the nickname "blimp" was first applied to these craft) of 60,000 cubic foot volume whose gondola was an ordinary airplane fuselage without wings or tail. A total of 121 were built and commissioned during the war. A larger type of 170,000 cubic feet, the Coastal, a clumsy looking affair of Astra-Torres trilobe design, had two engines and a crew of three. Twenty-seven of these were procured and perhaps six of an improved Coastal of 210,000 cubic feet, the C Star. It is hard to imagine Britain today as having been ringed by airship bases, but in the latter part of the war these were dotted all round the British Isles — on both sides of the Channel, on the Irish Sea, on the east coast of Scotland and down the east coast of England to Pulham in Norfolk. The program was slow getting started, with ships and bases not being available until mid-1916, but the blimps were ready for the intensive unrestricted U-boat war starting on February 1, 1917. Generally speaking, the small Sea Scout ships carried out most of the anti-submarine patrols, while the bigger Coastals manned the east coast bases at Pulham, Howden and East Fortune. By the end of the war, 213 non-rigids had been built in England, 23 being delivered to France, Russia and the United States forces; 103 were still in service on November 11, 1918. Two were lost to enemy action — both the C 17 and C 27 out of Pulham being shot down in flames in the southern North Sea in 1917 by fast seaplanes from Zeebrugge. A tremendous amount of flying was done — 53,554 hours in 1918 up to the Armistic, for instance, mostly in escort of convoys. As might be expected, the slow airship was not itself an attack weapon (in fact only one U-boat was sunk by an airship bomb during World War I). Many claims

of submarine sinkings were made on behalf of the airships, but they played only an indirect part in sinking three U-boats: the SSZ-29 directed surface ships to drop depth charges on UB 31 in the Dover Barrage on May 2, 1918; the SSZ-1 directed drifters to an oil patch off Cape Criz Nez with fatal results for UB 103 on September 16, 1918; and the rigid R 29, escorting a convoy, sighted an oil slick and directed destroyers which put an end to UB 115 off Sunderland on September 29, 1918. The airships certainly acted as a deterrent, having a much greater chance of sighting U-boats submerged than surface craft, and being able to direct the latter in attacks with depth charges. Timid U-boat commanders were certainly persuaded to lie concealed as convoys passed by; on the other hand, bolder ones might have homed onto convoys over the horizon by the airships in the sky. Michelsen, the Leader of U-boats from June 1917 to the end of the war, writes of the English airships:

The airships used against the U-boats were of the smallest type and of the non-rigid system. Offensively they accomplished little, but proved very useful for observation; in this role they informed other forces, which then took up the pursuit of the U-boat, or the convoys, which with their assistance in many cases were able in good time to avoid the U-boat danger. In evaluating their performance one must consider that they as well as all other airships were fair weather craft, and thus could not ascend very often. Certainly the airship in World War I was not the deadly antisubmarine weapon that the airplane was in World War II, many of the 603 German U-boats sunk in that war being the victims of aircraft bombs and depth charges.



The French airship effort in antisubmarine warfare generally paralleled the British, but on a smaller scale. Probably about 50 pressure airships were built for this service, by Zodiac, Astra-Torres, and the government works at Chalais Meudon. Others were taken over from the Army in March 1917. The British supplied a number of Sea Scouts and one Coastal. As early as 1916 there were four airship bases in France and one overseas near Bizerte: in 1918 there were 14 bases with 22 hangars providing for patrols in the Channel and Bay of Biscay, as well as at Algiers, Oran and Corfu in the Mediterranean. The Americans were to man four of the Biscay bases, but had only Paimboeuf in operation by the Armistice, using French equipment. (Successful American designs for antisubmarine pressure airships, the B, C and D classes, were used only in the United States). More fortunate than the British, the French airship service destroyed one submarine by bombing — the Brith D-3!

In World War II the U-boat was once again a grave menace to the Western Allies, yet none of the European belligerents attempted to employ airships against it. American, on the other hand, being blessed with helium and not having to operate in close proximity to enemy air bases, completed a large number of pressure airships for antisubmarine patrol and convoy escort during the war.

It was not the fault of the airship that it was not ready when most needed. During the doldrums that followed the loss of the "Macon," the Navy's last rigid airship, only Lakehurst was operating as a base, and only 10 airships were on hand, four of them being small training types, on the day of Pearl Harbor. Forty-eight more had been voted by Congress on June 15, 1940, but these were not in service until 1943. Meanwhile Doenitz' undersea fleet had struck one of the deadliest blows of the entire war against trade: between January and July 1943, over 360 merchant ships grossing two and a quarter million tons were sunk off the American coast and in the Caribbean, for the loss of only eight U-boats to the unpracticed, uncoordinated and inadequate defensive forces.

More ships, more aircraft and better organization thereafter improved the loss rate, as shipping was organized in convoys and adequately escorted. The blimps of the United States Navy participated in this expansion: during the war, 168 helium-filled pressure airships were built and delivered (all by the Goodyear Company). Thirty of these were training craft; four completed at the end of the period were large M class ships of 725,000 cubic feet, intended for transatlantic convoy escort; the majority were of the K class, later versions of which were 425,000 cubic feet in volume with two 425 hp engines, cruise speed of 50 knots, and a useful life of 7975 lb. (increased to 9975 lb. by using dynamic lift in a "heavy" takeoff). At the same time there was a great expansion in personnel and in base facilities. Firstly, Moffett Field near San Francisco was reclaimed from the Army Air Corps as the first base on the Pacific Coast. Subsequently a chain of bases was erected on the east coast, down into the Caribbean and around the bulge of Brazil, the southernmost United States airship base being south of Rio at Santa Cruz, where the South American flights of the "Hindenburg" and "Graf Zeppelin" had terminated. There was a similar expansion on the West Coast. Maximum operating strength was 111 airships organized in thirteen squadrons and five Fleet Airship Wings. By far the largest amount of work accomplished by the airships was in escort of convoys, and it was their boast that no ship was ever sunk from a convoy escorted by them. In addition, they spotted mines, performed rescue missions, and transmitted shipping directions without breaking radio silence. All the splendidly detailed low altitude aerial view in U.S. Navy ship recognition manuals were taken from blimps. Particularly in the early part of the war, the airships enjoyed certain advantages over the airplanes, in that they were not grounded by fog or so limited by darkness, and with their large lifting capacity they could initially carry more equipment. Thus, the blimps were fitted early with radar, and in particular, made use of magnetic airborne detection gear. This was first installed in an airship at Lakehurst in December 1941, and

became standard in the K ships before it was used to any extent in airplanes. The blimps sank no submarines and were not intended to do so; one, the K-74, was shot down on the night of July 18, 1943, by the U-134 which she was attacking; the U-boat suffered some damage from .50 caliber machine gun bullets.

Thanks to the U.S. Navy, the airship had a second change at submarine warfare in the European Theater. Beginning in June 1944, six K ships of Squadron 14 flew the Atlantic to be based at Gibraltar and in the Western Mediterranean, primarily to use MAD gear to detect U-boats passing through the Straits submerged by night. It so happened, however, that the U-boats made no further attempts to enter the Mediterranean after May 1944. When the *Schnorchel* U-boat working inshore, once again posed a serious threat to trade around England in the autumn of 1944, plans were made to send the eight airships of Squadron 42 from Brazil to bases in southwest England. At the time they would undoubtedly have been more effective against the *Schnorchel* submarine than heavier than air craft; but VE Day arrived before Squadron 42 could cross the Atlantic.

I have been unable to obtain any German comments on the effectiveness of the American pressure airships in antisubmarine warfare. A friend in Germany closely involved in writing the history of the U-boats in World War II could not come up with any first hand opinions, and observed "seemingly the blimp was considered no more and no less effective than other aircraft, with the advantage that it could not be so easily heard."

After 1945 the American Navy airships hung on in the anti-submarine warfare role for another sixteen years. K-type airships were modified, and a number of new articles were purchased under the K designation, reminiscent of the Old Navy subterfuge whereby old sailing men of war were "reconstructed" by taking the name and building a new ship under it. Ten ZPG4Ks were delivered in 1955-6, and seventeen or eighteen ZP5Ks in 1957-8, distinguished by the inverted Y tail. In 1951 a ZPG-1 airship was delivered, followed by twelve series production ZPG-2 airships delivered in 1953-57. These large craft had a nominal volume of 975,000 cubic feet, a useful lift of 15,100 lb. increased by 6,000 lb. of dynamic lift in a "heavy" takeoff, two 800 hp Wright engines installed inside the gondola with cross-connected drive so that both propellers could be driven by one engine at low speed, a cruise speed of 40 knots, and an endurance of nearly two days at cruising speed. The crew numbered 14 and comfortable sleeping and living quarters were arranged in the upper part of the car, which was actually inside the bag. The X tail surfaces facilitated dynamic takeoff, as did the retractable tricycle landing gear. For attack purposes the ZPG-2 could carry two homing torpedoes plus two depth charges, MAD gear, "dunking" sonar which could be towed at low speed, sonobuoys and electronic counter-measures gear. In March 1957, one of these craft set a non-refueling endurance record of 264 hours 12 minutes. It is hard to believe that the helicopter, which (with the P2V Neptune and P3 Orion) has supplanted the airship in the antisubmarine warfare role, is more efficient, though it is certainly cheaper.

### III — Dirigibles in Aerial Warfare

During the late 1940s and early 1950s the Department of Defense understandably felt primary concern over a surprise attack by Russian long range bombers carrying thermonuclear weapons. The DEW radar warning line across Canada was designed to detect aircraft approaching the northern border of the United States, but the problem remained of detecting aircraft coming in over the oceans. One line of development involved heavier than air craft, and this led to the procurement between 1949 and 1955 of a series of modified Lockheed Constellations carrying long range radar, and used by both the Navy and Air Force for patrols off the Pacific and Atlantic coasts.

Five modifications of the ZPG-2 antisubmarine warfare airship were delivered by Goodyear between 1955 and 1957. In these ZPG-2Ws, the big search radar antenna was effectively streamlined by being mounted inside the gas bag, the fabric of which was transparent for radar emissions. In addition, a height finding radar was installed atop the hull, reached by a climbing shaft from the control car. These ships operated only in the Atlantic, lighter than air operations having ceased at Moffett Field in September 1947. The final development of the Early Warning airship was the ZPG-3W, the largest non-rigid airship ever built, with a volume of 1,516,300 cubic feet, a useful lift of 22,907 lb., and an additional dynamic lift of 10,500 lb. The two engines of 1525 hp were however mounted outside the gondola. Four were procured between June 1959 and March 1960. One, however, was damaged and accidentally deflated at South Weymouth, and on July 6, 1960, another based at Lakehurst fell in the sea drowning 18 of the crew of 21.

This unfortunate accident, reminiscent of the "Akron" disaster occurring in the same waters 27 years earlier, not only led to grounding of the three remaining ZPG-3Ws, but also discredited the airship so widely that its opponents in the Bureau of Aeronautics, the Navy Department and the Department of Defence were able to bring about its demise. The last Fleet Airship Squadrons, operating 10 ships, were decommissioned on October 31, 1961.

Thus ended the 77-year history of the military dirigible. Yet while we mourn its passing, let us realize also that the airplane is being phased out of certain areas of military activity in which it superseded the dirigible. Painfully high losses in tactical bombing in Viet Nam indicate that even the supersonic Republic F-105 cannot operate in the face of heavy concentrations of modern anti-aircraft guns. Similarly, the Boeing B-52 has been superseded

in the strategic bombing role by the missile, while the supersonic B-58 Hustler, vulnerable to surface to air missiles, is going onto the scrap heap. Like the airship, they were supreme in their day, and like the airship, they have been surpassed in performance by the steady advance of weapon technology. The next reconnaissance and bombardment vehicle will be the orbiting space satellite, and the end is not in sight.



#### ABOUT THE AUTHOR

Dr. Douglas H. Robinson is a physician practicing in Trenton, N.J., who has been contributing articles to the Journal since 1959. He is an authority on lighter than air, with two major books on the subject, *The Zeppelin In Combat*, a history of the German Naval Airship Division, first published in 1962 and now in its third printing, and *Giants In The Sky*, a history of the rigid airship first published in 1973. Also in 1973, he published *The Dangerous Sky*, a history of aviation medicine. Other books by Dr. Robinson are *LZ 129 "Hindenburg"* and *The B-58 Hustler* in the "Famous Aircraft" series. He has written articles for *Cross & Cockade*, the *United States Naval Institute Proceedings*, the *Purnell History of the First World War*, etc. Among the societies of which he is a member is the *Marine-Luftschiffer-Kameradschaft* of Hamburg, made up of veterans of the German Naval Airship Division in World War I.

Dr. Robinson holds private power and glider licenses and flies his own Cessna 170B and Schweizer I-34 sailplane. He holds the Silver C Soaring badge.

## NEWS and Comment from our MEMBERS

#### Editor's Note:

QUANDOQUE BONUS DORMITAT HOMERUS  
(Good Homer nods occasionally)

Good editor Martin Cole nodded occasionally when he repeatedly misspelled Henry A. Liese in photo captions of Charles Willard story, Fall Journal. Also belated credit is given Mr. Liese for his generous help in providing background information.

#### CHINESE AF ADDENDUM

Ray Wagner, San Diego, California

Since submitting the Chinese Air Force, 1931-40 article, I've located an important bibliographical addition in the *Pacific Historical Review*, Vol. 38 (1969) pp. 447-462. William M. Leary, Jr., in "The Jouett Mission to China", details the arrangements, as well as the conflict between the attitudes of the U.S. Department of State, which feared offending Japan, and the Department of Commerce which wanted to stimulate exports. A footnote on p. 453 gives the correct names of pilots Christopher Mathewson, Jr., W.C. Kent, Mr. R. Knight, R.L. Sansbury, and T.L. Taylor. Apparently Harvey Greenlaw was the pilot added after their arrival in Shanghai.

#### HAWTHORNE AIRFIELD ADDENDUM

Ed Leiser, San Diego, California

In Vol. 19, No. 2, page 124 there is a request for identifications of the airplanes in panoramic photo. They are (l to r) OX5 Jenny, OX5 Jenny, Merrill C.I.T. 9 (See AAHS Journal Vol. 14, No. 2, page 138), Ryan Brougham, General Aristocrat, and OX5 Jenny.

#### MORE HAWTHORNE AIRFIELD ADDENDUM

Merle Smith, California City, California

Upon receiving my summer (1974) Journal I turned at once to your Forum of Flight. I was astonished to see the panorama picture of my old airport at Hawthorne, California. My mother, Twyla J. Kelly was owner and operator. I was Chief Pilot, Instructor, Mechanic and Janitor.

Now, for the planes. The third from the left was designed by Professor Albert Merrill, Dean of Aeronautics at California Institute of Technology, Pasadena. It was supposed to be a foolproof plane anyone could fly. It had no effective elevator control. The fuselage remained level whether climbing or diving. This was accomplished by changing the angle of incidence and position of the wings to each other. The upper wing hinged at point of attachment and the lower one moved forward or back on a track. This movement was controlled by a wheel on the side of the cockpit. The rudder was the only other control except the throttle. The angles were recorded on a degree meter and change of angle plus change of engine RPM controlled rate of climb or descent. I was the test pilot. The first flights were failures due to lack of power. We replaced the three cylinder Anzani with a Kinner and it flew.

The next plane was our Ryan Monoplane identical to the Spirit of St. Louis, except seats for passengers. The next monoplane at the hangar entrance was built by some Douglas Aircraft employees, and designed by an engineer named Mark Campbell.