AMERICA'S LARGEST AIRSHIP

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Back in 1869 on the burning wastes of a Utah desert the driving of a golden spike into a railroad tie celebrated the joining of two oceans by a pair of iron rails—the inception of the first transcontinental railroad. On November 7, 1929, in Akron, Ohio, the driving of a little gold rivet, about as large as one's smallest finger and commercially worth about seven dollars, commemorated the beginning work on America's largest airship, the Navy's newest and greatest dirigible, the ZRS-4.

The fastening of this rivet into the master ring or biggest rib of the giant ship was the object of a special program prepared by the Goodyear officials and took place in the huge dock at the Goodyear airport. This colossal dock which will house the ship and in which all construction work is to be carried on, a masterpiece of engineering work, is in itself a structure the building of which is an unprecedented achievement in the engineering world. The duraluminum frame in which the rivet was placed lay at one end of the building. It was 50 ft. long and 10 ft. high and just one arc of the "keel ring," 133 ft. in diameter, which is to mark the central section of the ship. A rope marked off the circumference of the completed ring and enclosed a space large enough to accommodate some 400 people.

The honored guests and speakers of the occasion took their places on the platform within the ring, while the music of several bands resounded throughout the vast enclosure. Paul W. Litchfield, President of the Goodyear Zeppelin Corporation, gave a brief address explaining the purpose and the nature of the ceremony. Read Admiral W. A. Moffet of the U. S. Navy and Chief of the Navy's Bureau of Aeronautics, then gave the dedicatory address and placing the little rivet in the proper position fastened it securely. The bands once more struck up and concluded the program with the "Star Spangled Banner." A group composed of Dean Hitchcock, Professors C. T. Morris, Shank, and Large of the College of Engineering faculty here at Ohio State University, and Assistant Director Weed of the Engineering Experiment Station witnessed the ceremony and was favored in being allowed to mount the speaker's stand to examine the rivet and inspect an actual model of the ship which was suspended behind the platform. In the interim, movie men cranked away, and reporters scribbled hastily into little notebooks.

The Navy's newest pride, of which the gold rivet is now an integral part, is the largest dirigible in the world. It was designed by Doctor Karl Arnstein, who came from Friedrichshafen, Germany, at the request of the Goodyear Zeppelin Corporation to act as their chief engineer. His design of the ZRS-4 and her sister ship the ZRS-5, won for him first prize in the world-wide competition held by the Navy's Bureau of Aeronautics for two military rigid-airships. The Goodyear Zeppelin Corporation at Akron received the contracts last year and preparatory work began. The most important part of the pre-construction program was the building of the huge dock at the airport. It was nearly completed at the time of the gold rivet ceremonies, and now stands as a gigantic aeronautical laboratory in which are being built these marvelous leviathans of the air.

Most of us are acquainted more or less with the physical proportions of the Graf Zeppelin and Los Angeles. The new craft dwarfs these ships somewhat, since in cubical content it will be 50 per cent larger than the Graf and about 250 per cent larger than the Los Angeles. Here are some of the comparative sizes and characteristics:

Name	Los Angeles	Graf-Zeppelin	ZRS-4
Nominal Gas Volume, Cu. Ft.....	2,470,000	3,700,000	6,500,000
Length Overall, Ft.....	658.3	776	785
Maximum Diameter, Ft.....	90.7	100	132.9
Height Overall, Ft.....	104.4	113	146.5
Gross Lift, Lbs.....	153,000	258,000	403,000
Useful Lift, Lbs.....	60,000	.....	182,000
Number of Engines.....	5	5	8
Total Horsepower.....	2,000	2,750	4,489
Maximum Speed, Knots.....	64.5	80,MPH	72.8
Range without refueling at 50 knots Cruising Speed, Land Miles.....	4,000	6,125	10,580

It will be noted that the ZRS-4 is only 15 feet longer than the Graf, and hence on first sight will appear to be only slightly larger, even though it will have twice the gas capacity. In diameter the Goodyear ship will be 34 feet greater. This gives the craft a shorter and fatter appearance and eliminates somewhat the pointed profile. The longer and slender type construction, which was prominent in dirigibles manufactured during the war, of which the Los Angeles and Graf are examples, has evolved into that represented by the newer American ship. This will then be about six times as long as it is thick.

The ZRS-4 differs from the smaller blimps in that it is fully rigid. That is, instead of employing a single layer bag, held in shape only by the pressure of the gas inside it, it will be entirely and solidly constructed of a duraluminum framework. To this framework are fastened twelve gas compartments and the whole is covered with a taut fabric specially treated to protect it against wind and rain. Hence all strains due to load, lifting power, and the various dynamic and aeronautical forces are evenly distributed throughout the rigid unit. This framework is composed mainly of gigantic transverse rings, in the shape of 36-sided polygons, connected by longitudinal girders from nose to tail and diagonally braced by means of wires and cord nettings. The ring girders are large enough to form corridors whereon crew members may be able to climb entirely around the circumference. This arrangement facilitates inspection and repair. Three triangular-shaped corridors or gangways extend throughout the greater length of the ship.

Since a gas expands and contracts with changes in altitude, temperature, and barometric pressure, allowance is made for undue expansion in the gas cells by means of automatic overpressure valves located in the corridor at the top of the ship. In case of emergency these valves may be operated from the control car. This control car, which is

located forward, projects below the streamline of the lower half and is built as an integral part of the structure. It is large enough for the crew to carry on comfortably its operation in managing the craft. All the latest devices known for the efficient control and navigation of the ship are located here. The radio room and living quarters of the men are situated entirely within the hull.

The fact that helium is used as a lifting gas instead of the inflammable hydrogen permits all the eight power plants as well as the most comfortable living accommodations for one hundred persons to be located within the ship. Hence no external cars are necessary and air resistance is consequently reduced to a minimum. These eight power plants are marvels in themselves, being of the latest and most advanced design. They are placed four on each side of the ship. A most important feature of these new units is that each propeller may be turned in a vertical direction by tilting its axis through 90°. This will greatly facilitate starting and landing maneuvers. Another important factor in the ingenious manner in which the lost weight due to the expenditure of fuel is recovered. Each exhaust is fitted with a condenser which transforms the waste gases into water. The ship is, therefore, in a constant state of equilibrium even though a great amount of fuel is used up.

The design of this New Navy ship is such that it may easily be adapted to commercial use, such as the carrying of passengers and mail overseas. Up to one hundred passengers may be accommodated easily and comfortably, depending upon the amount of fuel required for a definite cruise. Spacious compartments and promenades, the lack of noise and odors and seasickness, and the speed of travel are some of the many advantages to be enjoyed by future travelers. These were never before possible in the hydrogen inflated ships as all quarters needed to be carried in cars outside the hull.

Perhaps the most unique feature of the ship is the accommodation made for five fully equipped airplanes in a special storage compartment about 75 ft. long by 60 ft. wide located about one-third the ship's length from the bow. These planes can be raised or lowered during flight through collapsible doors on the bottom of the ship by means of trapezes. A great safety factor is thereby introduced since the scouting value of the airship is greatly increased.

Every element of safety has been introduced in the construction of this dirigible. Most noteworthy are: the great structural strength, which is in great excess of all previous ships; a multiplicity of means as exemplified in the triple layer hull, the division of gas cells, and the eight separate power plants; the elimination of fire risk through the use of the non-inflammable helium, adequate insulation of the various compartments, and dissipation of lightning charges throughout the entire frame; finally, the feature of accessibility outstandingly kept in view during construction. There is no doubt but the safety factor long recognized in the Zeppelin will greatly increase with the rapidly growing science of dirigible construction. In modernness, the ZRS-4 will be foremost in the world.

AUTHOR'S NOTE.—The photographs and part of the material for this article were made available through the courtesy of The Goodyear Zeppelin Corporation.