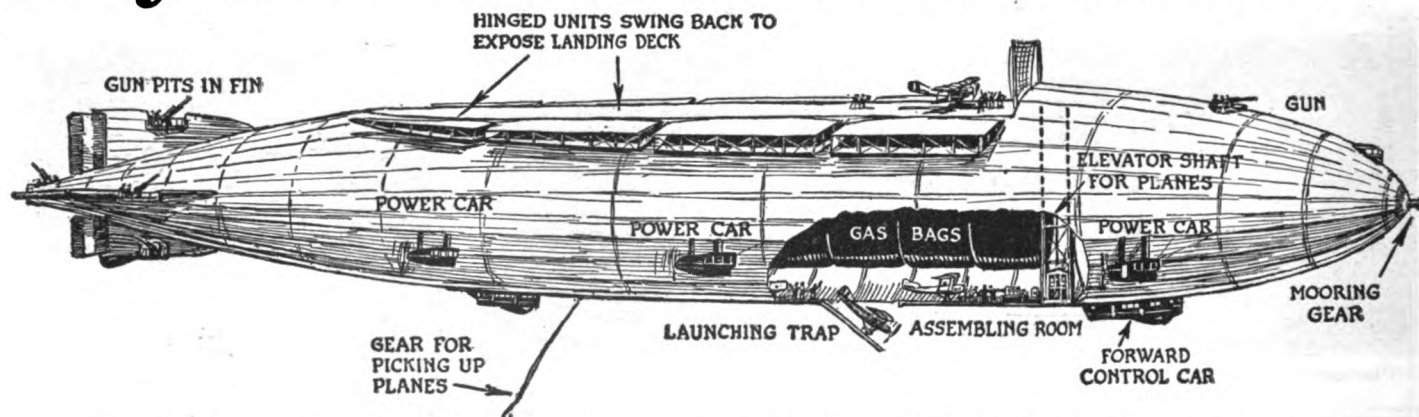


Sky Leviathans of Tomorrow



Above is a diagrammatic representation of a possible monster plane-carrying airship of the future. In the accompanying article Rear-Admiral Moffett predicts airships more than

900 feet long. Notice how hinged cover units are swung back to expose a spacious landing deck for airplanes. Alighting, the planes would be lowered into the body of the ship

By Rear-Admiral William A. Moffett

Chief of the Bureau of Aeronautics, United States Navy

SHIPS of the sea have built empires, altered the destinies of nations, and exerted a profound influence on history through uncounted centuries. With the dawn of the twentieth century, ships of the air have come as a new challenger of time and space, and their influence upon the trend of world events is today one of the most potent factors in world progress and development.

Yesterday we crossed an ocean, today a continent; tomorrow we circle the globe. New routes for commerce open up by way of the polar air routes. London and Tokio are drawn together as by magic, and man, creeping on the earth, looks to the sky and reads there the story of a new era.

It requires no great tax on the imagination to picture some of the developments of air transportation which we may expect to see even in our brief span.

Larger Dirigibles to Be Built

The Navy has built at Lakehurst, N. J., the first rigid airship ever constructed in the United States—the ZR-1. It has been called a giant ship of the air—over 2,000,000 cubic feet of gas will be required to inflate it. It is as large as ocean-going steamers. It can carry a useful load of 35,000 pounds, exclusive of crew and supplies, and withal is mediocre in size and inferior in performance to similar ships that may be expected to follow.

Consider a ship of 5,000,000 cubic feet. Such ships now are being planned abroad. They would equal the size of the *Leviathan*, with a length of 900 feet and more and a diameter greater than the beam of that great vessel. They will carry a weight in fuel and other useful loading of more than 60 tons and could cruise halfway around the earth without a stop. Airplanes could be carried on them as are lifeboats on ocean-going vessels. These planes could land on a deck on top of the airship and be launched from it, carrying passengers for wayside destinations. They could be designed to carry a regiment of troops, and a fleet of them could transport an army to the ends of the earth, in time that could be reckoned in hours.

Imagination—but not too much of it.

Airplanes already have been carried by airships, launched from them, picked up by

them. Polar air routes for short cuts by air commerce are considered the most logical development of dependable aeronautics. This assertion we have from such practical men of science as the noted explorer, Vilhjalmur Stefansson. And England will weld together her empire overseas with giant airships, capable of traveling 10,000 miles and equipped with passenger accommodations comparable to those of the finest transatlantic steamships.

In the light of what has been done by airships operating with airplanes, this development rivals in interest anything that has gone before in aeronautics. The future airship, developed for naval use, will carry a sting that will make it one of the most formidable contenders for supremacy of the air, sea, and earth that has ever been conceived. Allowing 60 tons of useful load to our air giant, we may set aside one half of this for fuel, which will leave 30 tons for planes, landing gear, guns, ammunition, and bombs. Superior types of fighting planes now in service use weigh less than a ton each. Other types of planes have been developed which weigh less than 1000 pounds.

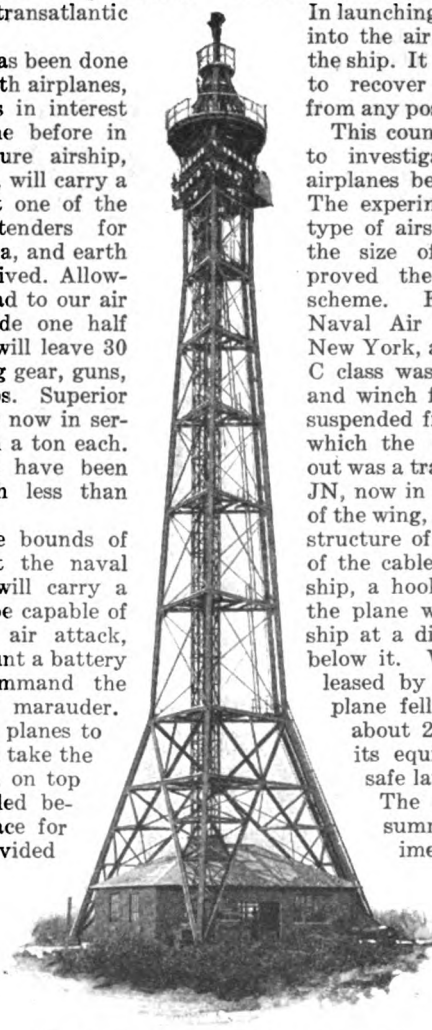
It is well within the bounds of reason to predict that the naval airship of the future will carry a dozen planes that will be capable of defending her against air attack, and in addition will mount a battery of guns that will command the respect of any enemy marauder. Means of returning the planes to the parent airship could take the form of a landing deck, on top of the ship or suspended beneath it. Stowage space for the fighters could be provided in the body of the ship along the keel line. The launching of them is merely a matter of pushing the planes off into space, where they can recover themselves with the ease of a bird thrown into the air.

One of the problems involved is that of keeping the ship's center of gravity below the center line of the envelope. Any extensive structure on the top of the airship involving weight would affect the stability and performance adversely. To offset this obvious difficulty, planes once landed could be quickly disassembled and the fuselage and wings quickly passed through a well in the body of the ship to the stowage space.

In launching, they would be dropped into the air from the under side of the ship. It is no trick among airmen to recover equilibrium in flight from any position.

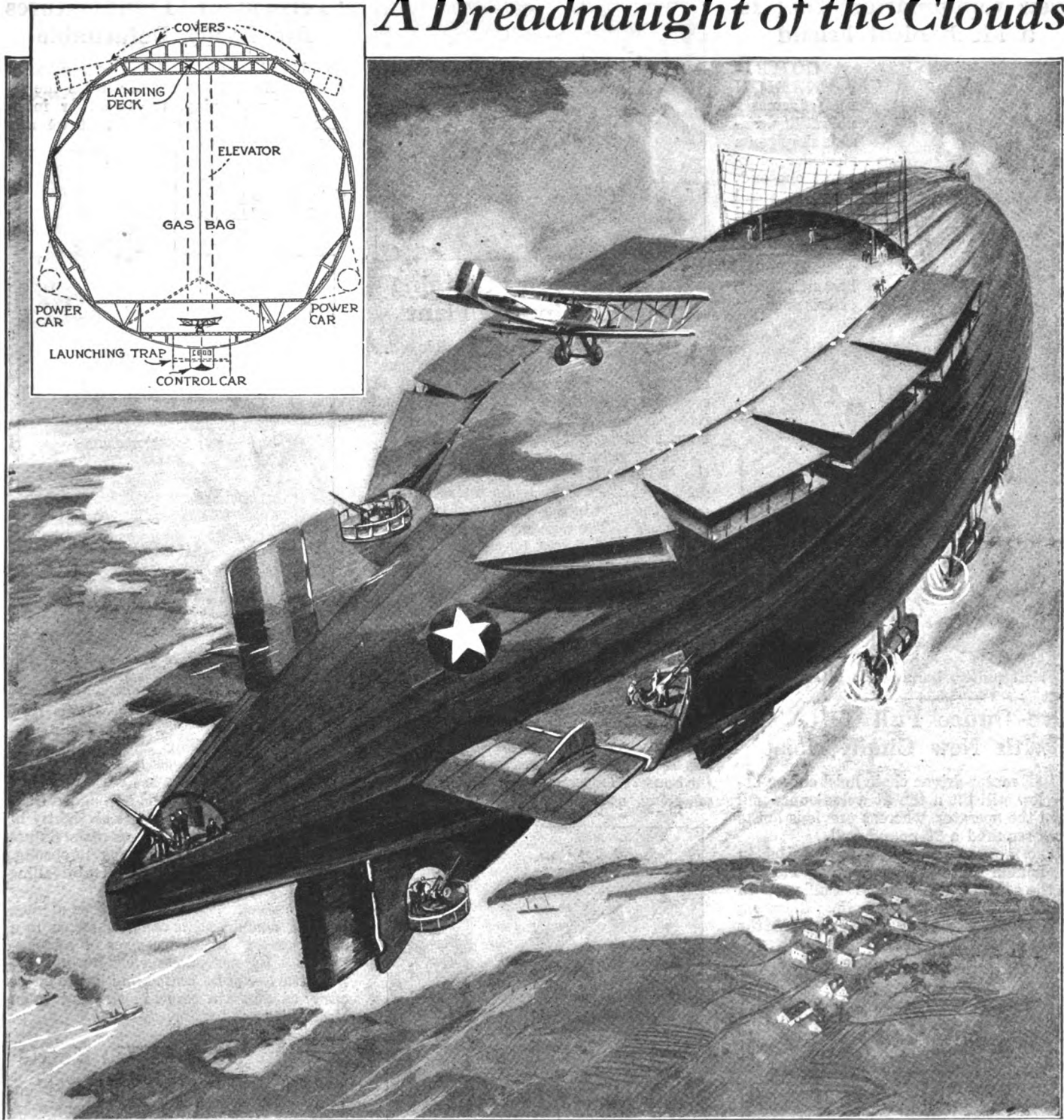
This country was among the first to investigate the possibility of airplanes being carried by airships. The experiment, conducted with a type of airship less than one tenth the size of those now building, proved the practicability of the scheme. Four years ago at the Naval Air Station in Rockaway, New York, a non-rigid airship of the C class was equipped with a cable and winch for carrying an airplane suspended from it. The plane with which the experiment was carried out was a training type known as the JN, now in service use. On the top of the wing, a ring was secured to the structure of the plane. On the end of the cable let down from the airship, a hook engaged the ring and the plane was suspended from the ship at a distance of about 50 feet below it. When the hook was released by a tripping device, the plane fell a vertical distance of about 200 feet, then recovered its equilibrium and flew to a safe landing.

The following year, in the summer of 1920, these experiments were carried further by the British. The R-33, a sister ship of the one that made a round trip from England to the United States in 1919, carried out experiments in releasing, carrying, and picking up an airplane by means of a



This towering mooring mast, has been constructed recently at Lakehurst, N. J., to anchor the first American-made dirigible the ZR-1

A Dreadnaught of the Clouds



Our artist's conception of the aerial war-ship of tomorrow, described by Admiral Moffett. Diagram shows cross section

cable let down from the airship. These tests were similar to those carried on at Rockaway the previous summer, but were more extensive.

The plane, a Sopwith Camel, was fitted with a bridle terminating in a ring that extended above the top wing of the plane two or three feet. When the airship picked up the plane, the speeds of the two were approximately the same and it was a simple matter to engage the ring on the plane with the hook at the end of the cable. The plane was released by tripping the hook and the pilot dived, started his motor and flew away.

Until now one hazard in airship operation always has stalked like a specter at the heels of this development. Hydrogen-inflated ships carry with them the ever-present danger of fire. Many aerial disasters have been traceable to this.

The United States, possessing as it does

the only extensive helium supply in the world, is particularly favored by nature. Helium, an inert gas, is not inflammable. It has but little less than the buoyancy of hydrogen and can be produced at a cost which, though higher than that of hydrogen, is inconsequential compared with the safety and dependability gained.

We Must Conserve Helium Supply

However, we cannot afford to be as prodigal with this gift of nature as we have been with others. A well considered program of conservation of this valuable product is essential to our national welfare, from a commercial standpoint as well as from that of national defense.

The helium airship will make this form of travel safe to a degree never before possible. It will insure low insurance rates on merchandise carried by airships.

From a military point of view, helium has placed a new complexion on the airship-airplane controversy. The airship filled with helium and defended by guns and airplanes, will be in effect a battleship with the sky as a limit. As the battleship is subdivided into watertight compartments, so the airship is made up of a number of gas cells. When a watertight compartment is punctured, the ship does not sink. This method of construction has saved ships even against the destructive effect of torpedo explosion. So the puncturing of a gas cell in the airship will not spell disaster. We may see these battleships of the air, riddled with shells, still fighting gallantly on to victory.

As a basis for the future of airship development in this country, the Navy, in constructing the ZR-1, is building wisely and well. America should be in a position to point the way to the world.