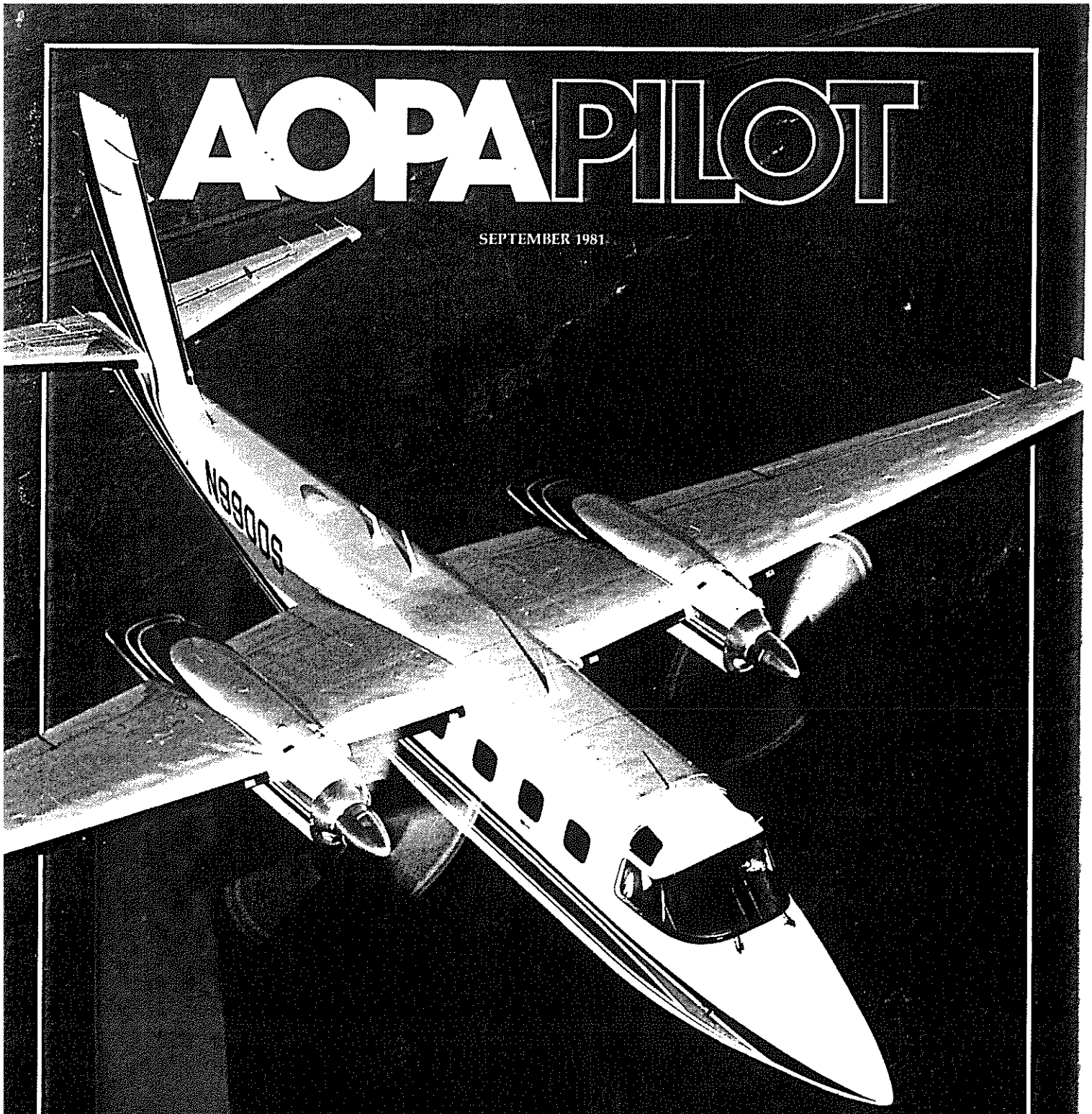
AOPA PILOT

SEPTEMBER 1981



COMMANDER 1000

GETTING READY FOR WINTER

USED MOONEYS

BETTING HEAVY ON LIGHTER-THAN-AIR

Return of the airship may be in the cards

BY LEE PAYNE

The airplane is so much a part of modern life that we tend to forget it is a relative newcomer to the skies. Man has been flying for nearly 200 years, yet the first flight of the first airplane took place within the memory of men living. Before that, however, we flew in airships.

The first airlines flew them. They were the first strategic bombers attacking London, Paris, Warsaw and Bucharest. They went twice to the North Pole and once all the way around the world. They pioneered commercial service across the Atlantic and the Pacific a decade before the airplane was able to carry a single paying passenger across any ocean.

But, it was more than 40 years ago when the last three Zeppelins were dismantled, and the last U.S. Navy blimp was deflated in 1962. Who, today, could be considering seriously the airship's revival?

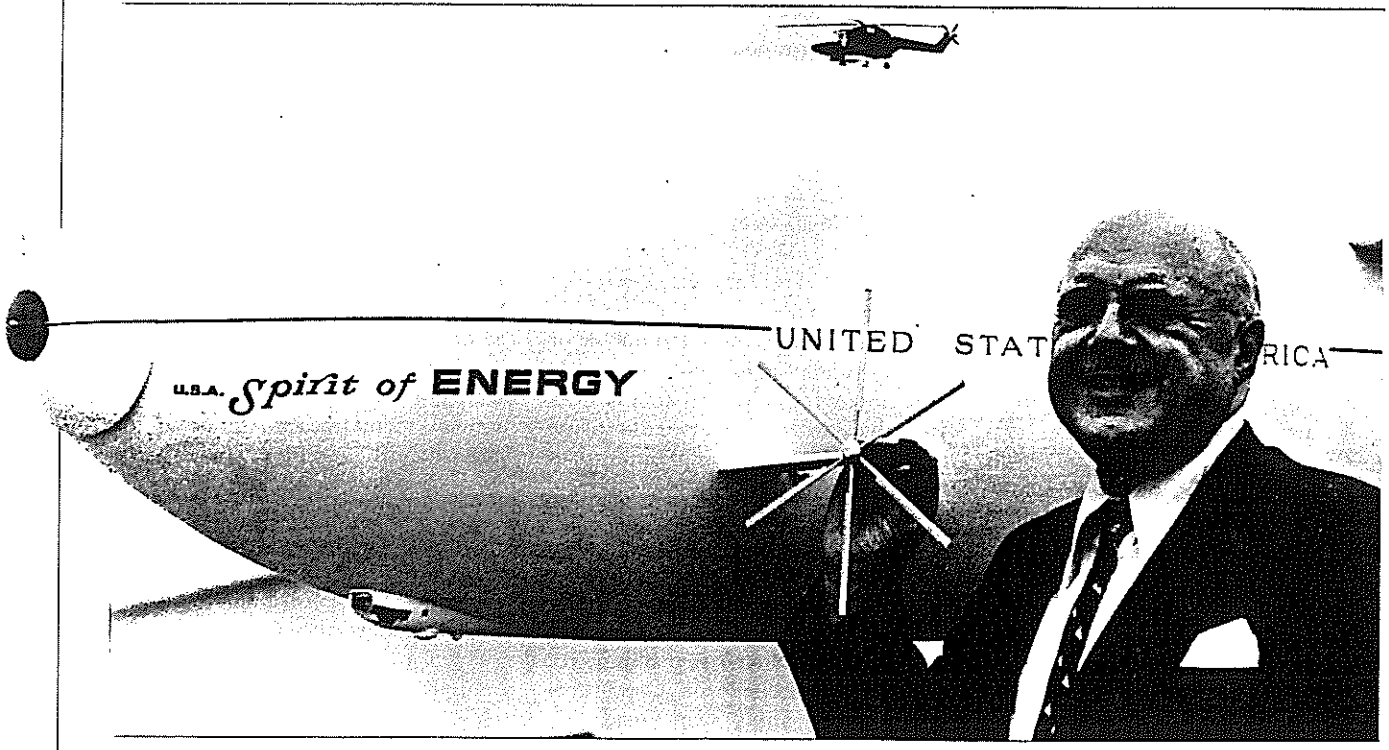
Lee Payne is the chief photographer for a California newspaper and the author of numerous magazine articles and books.

First, the British. Aerospace Developments Limited, with Venezuelan financing, has built the AD-500. This modern, eight-passenger blimp features a Kevlar nose on a French-built, titanium dioxide and polyurethane-coated polyester gas bag and twin Porsche engines with vectored-thrust propellers (which provide hover and vertical takeoff capabilities). The ship has completed several flights in England and is scheduled to be tested by the U.S. Navy.

With a new dirigible already in the air, Britain is ahead of Japan, where an airship program has government backing. In the fall of 1978, Japan's Ministry of International Trade and Industry embarked on a six-year, $75 million development project. By 1984, Japan plans to launch a heavy-lift ship capable of carrying a 20-ton payload. Kawasaki Heavy Industries Limited is preparing the design for a 120-passenger airship powered by four helicopter rotors.

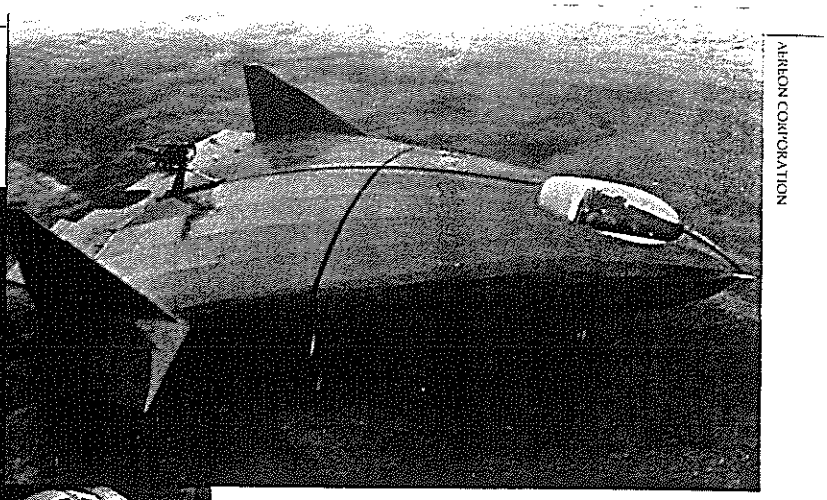
The new airship is called a helistat, a name and design conceived by the Piasecki Aircraft Corporation of Philadelphia, which called the original design Heli-Stat. Helicopters are attached to the bottom of a helium-filled bag, which lifts the weight of the ship. This leaves the thrust from the rotors available for the payload.

The first helistat to fly may well be the one now being built for the U.S. Forest Service by Piasecki Aircraft. Rather than construct an entirely new aircraft, Piasecki plans to use four surplus Army H-34 helicopters and a 20-year-old Navy blimp bag. Only the connecting framework and the control system will be new. With this approach, the Forest Service hopes to



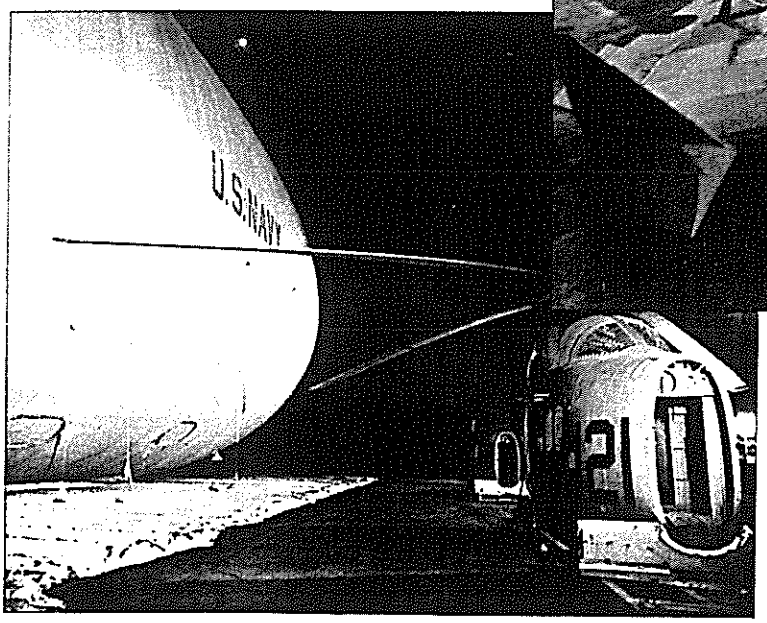
PIASECKI AIRCRAFT CORPORATION

Frank N. Piasecki poses with a model of his Heli-Stat and demonstrates how a main thruster nacelle rotates to the horizontal position for cruise flight. A vertical position is assumed for hovering lift and control.



AEREON CORPORATION

Dubbed the Deltoid Pumpkin Seed, the Aereon 26 is a full-scale hybrid of airplane and airship.



The first helistat to fly could be this one being built for a U.S. Forest Service contract.

acquire the ship in the shortest possible time, at the lowest possible cost. The contract, administered through the Naval Air Development Center, will cost close to $10 million by the time the completed airship is scheduled to be delivered in 1982.

Since 1959, the Aereon Corporation of Princeton, New Jersey, has been developing another new concept in airships. The Aereon 26, a scaled-down prototype of Aereon's proposed hybrid aircraft, was test-flown at the Federal Aviation Administration's National Aviation Facilities Experimental Center (now the FAA Technical Center) in 1971. Because of its triangular airfoil, the Aereon 26 was dubbed the Deltoid Pumpkin Seed. The Navy has done some studies of the Aereon, but the research and development work was funded privately and carried on by a dedicated group of theologians and professors from Princeton University and former Navy airship experts.

Aereon President William McE. Miller Jr. described the concept in a paper given at the American Institute of Aeronautics and Astronautics' Very Large Vehicles' Conference in 1979: "Basically, the installation of a buoyant gas within a very large deltoid, aerodynamically shaped lifting body will permit energy-economy together with enhanced operating capabilities. This vehicle is somewhat different from either airplane or airship, yet with an interesting blend of their features." The full-scale hybrid is designed to take off and land as an airplane does and use helium for buoyancy during cruise as an airship does.

The Aereon 26 test, Miller said, was to be "aerodynamic proof of concept of this vehicle, as a prerequisite to going farther with a large, truly semi-buoyant prototype. The test confirmed the predicted performance."

Miller envisions the Dynairship, a simple size-extrapolation of the Aereon 26, as a 600-foot-long, helium-filled airship that could operate up to 40,000 feet and hold for several days at high altitudes without refueling. Speed could range from 30 to 200 knots. Miller envisions the Aer/Lighter as a V/STOL (vertical and short takeoff and landing) version of the Dynairship.

Currently, Aereon Corporation is seeking funds for further studies.

Along more traditional airship lines was the Jordache Jeans advertising blimp, made by Airship Enterprises Limited at Lakehurst, New Jersey. The blimp crashed on its first flight last fall, near the site of the Hindenburg disaster.

Though the program was discontinued last November, Anheuser-Busch also employed two blimps for advertising, dubbed the Good Beer Blimps. The ships were made by World Balloon Corporation in Albuquerque and were called thermal airships because they used hot air, instead of helium, for buoyancy.

Why, after 40 years, has the world rediscovered the airship? Aside from the obvious advertising uses, the answer, as with so much else today, is oil. Unlike the airplane, which uses engine power to keep it aloft, the dirigible floats in the air and uses its engines only to drive it forward. A modern airship could carry as much as a 747 over the same distance while burning 70 percent less fuel. The jet flies five times faster; but as fuel prices continue to increase, high speed becomes less important than lower cost.

What could a modern airship do? The Forest Service has a very specific job in mind. Every year in our national forests, six billion board feet of lumber is lost to insects, disease and fire. It is lost because, without roads, there is no way to get the dying trees out. A few helicopters are being used in logging, but their fuel costs are high and many trees are too heavy for them to lift. Airships could carry heavier loads at lower costs. The Forest Service believes that it can salvage up to two billion board feet of lumber each year, which the agency projects would lower costs for home building, newsprint and paper products.

The Canadians also are interested in airships for heavy-lift industrial applications. Here again, it is oil—this time the search for it in remote regions—that is helping to rediscover

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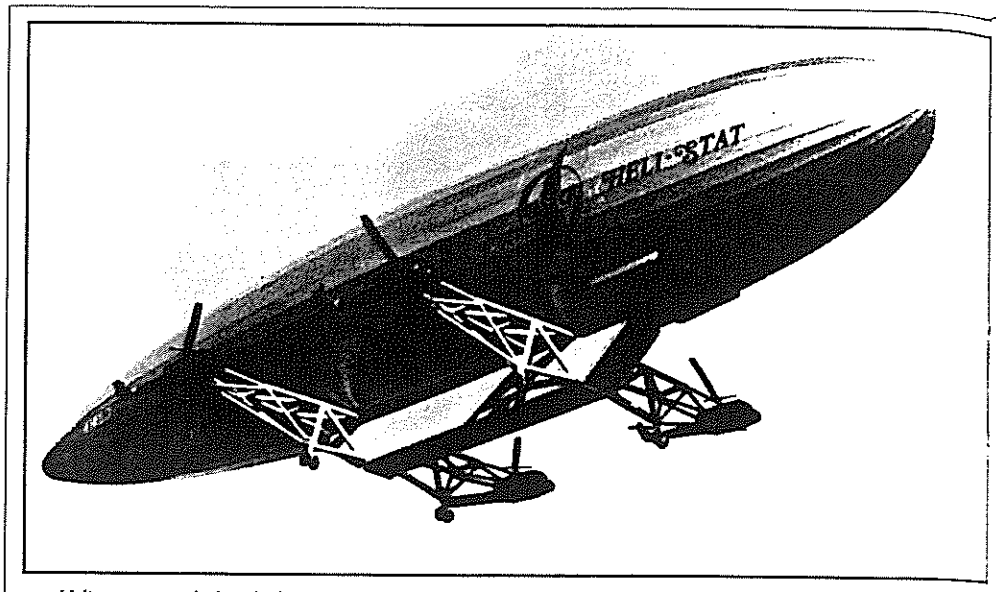

Helicopters attached to the bottom of a helium-filled blimp lift the weight of the Piasecki Heli-Stat.

the increasing value of the airship.

A recent study for Alberta Canada's Ministry of Transportation pointed out that the lack of a transportation network in the northern part of the province is hindering oil and other resource development. At the same time, it is the lack of development in the area that makes it difficult to justify the expense of building the transportation system. The airship could provide the interim service necessary to begin the projects that would, in turn, justify the construction of road and rail networks.

Syncrude I, the first refinery built on Alberta's Athabaska tar sands, is now producing 100,000 barrels of distillate a day. The problems encountered during its construction were formidable. Heavy equipment and building materials could be delivered only during the winter, when the muskeg was frozen hard enough to support the weight of trucks and large airplanes. Yet, the sub-zero winter weather severely lowered the workmen's efficiency. Bechtel Incorporated, the company that built Syncrude I, estimates that 20 percent of the next refinery's $5 billion cost could be saved by the use of heavy-lift airships in year-round construction support.

The oil drilling and pipeline construction on Alaska's North Slope is another example of the airship's potential. Fleets of barges were used to carry the heavy machinery in from Seattle during the few weeks of summer that the Arctic coast was relatively ice-free. Yet, deliveries to many of the construction and drilling sites could be made only in the winter, when the rivers and tundra were frozen solid enough to bear the weight of the trucks. The cost in delivery delays, alone, amounted to millions of dollars, enough to build the airships that could have flown the equipment and supplies to the construction sites year-round, not to mention the cost and ecological disruption of roads, bridges, airfields and port facilities that never would have been needed.

It is the airship's lower fuel costs, heavy-lift capacity and ability to function without extensive support facilities that make it increasingly attractive for work in remote areas and in underdeveloped countries where transportation networks do not exist. A 1978 study, by Booz-Allen-Hamilton Applied Research for the National Aeronautics and Space Administration's Ames Research Center, surveyed these potential heavy-lift markets and determined that they could support a total of 1,270 dirigibles of varying sizes.

The use of airships in overwater surveillance also is receiving considerable attention. Studies by the U.S. Navy and the Coast Guard have resulted in a Coast Guard operational requirement that will lead to a development program. Here the interest is in the airship's range and loitering ability rather than its capacity for heavy loads. With the responsibility for our country's new 200-mile-wide ocean frontiers, the Coast Guard needs aircraft that can respond quickly to a distant emergency and, then, either remain in the area for long periods of time to help monitor the situ-

ation or land and render assistance.

The Japanese, on the other hand, see the dirigible primarily as a low-cost, short-haul, high-volume passenger carrier. With 420 inhabited and often mountainous islands, Japan relies heavily on air transportation. Thirty million passengers a year currently are being flown on domestic Japanese airline routes, resulting in serious airport congestion, yet there is strong opposition to airport expansion. Many intercity routes are too short for proper utilization of jets, and new rail construction is too costly in the mountainous areas separating many Japanese cities. The answer, the government believes, is the airship, and it has committed $75 million to airship development.

Much faster than a ship, with greater range than a helicopter, able to remain on station for days and to land anywhere—only the modern airship fills the bill for all these markets.

The next question that naturally arises is, who still knows how to build an airship? Piasecki's Heli-Stat will have the benefit of that company's years of helicopter experience. Before the Forest Service contract was awarded, Piasecki was associated with the Goodyear Aerospace Corporation, the one company with more airship experience than any other. Since 1912, Goodyear has built 286 dirigibles of all sizes, from two-passenger, nonrigid blimps all the way up to 785-foot-long, rigid Zeppelins.

Goodyear and Piasecki recently ended their association, but both companies are continuing to develop their own helistats. According to Dale E. Williams, the company's modern airships program director, Goodyear's ship "is designed for short-distance transportation of payloads much heavier than can be carried by existing or projected helicopters."

Wind-tunnel tests tend to support Williams's suggestion that the helistat is essentially a short-range aircraft. It may be unsuitable for long flights at moderate or high speeds. To meet the Coast Guard's requirements, Goodyear may modify an existing airship, updating it with the most modern materials, modular cargo bays and vectored-thrust propellers.

The main problem in restarting the airship industry is lack of experience. Nobody has built a big airship lately. Except for the new blimp in England, a couple in Germany, Goodyear's famous fleet of advertising ships and a few stretched-out hot air balloons, everyone has to go back to the beginning. Nobody, anywhere, has built a large, rigid airship for nearly half a century. Even Goodyear's last Navy blimp, the 403-foot-long ZPG-3W, the largest nonrigid airship ever built, was launched 20 years ago.

This was one of the main points made by the Japanese government's study that initiated its current airship development program. The study's recommendation was based, in part, on the fact that, since no other country has an experienced airship industry, no other country is ahead of Japan.

Even if some of the old Zeppelin engineers, those with decades of experience, could be coaxed out of retirement, their designs would be out of date. The Hindenburg represented the ultimate in Zeppelin construction, but she would be no more modern today than her contemporary, the DC-3. Though technology has come a long way in the last four decades, experience always has been the key to success in lighter-than-air development. The trick is to combine the hard-won airship experience of the past with the latest in state-of-the-art aerospace expertise.

Few people have the experience *and* the expertise. One who did was Vladimir Pavlecka.

Pavlecka, who died last year, built his first airship in 1929. As chief of hull design for Detroit's Metalclad Airship Corporation, he worked on

Vladimir Pavlecka: He believed in the airship.

the ZMC-2, the world's first successful all-metal dirigible. The Navy flew it for 12 years, until 1941, when, too small for war patrols, it was melted down for scrap.

After the ZMC-2, Pavlecka took his skills in light metal fabrication to Douglas Aircraft where he helped design the metal structures for the DC-3. He was promoted to head Douglas's structural research department and later became chief of research at Northrop. Over the years, he had a hand in the development of the pressurized fuselage, tricycle landing gear, hydraulic folding wings for naval aircraft, hydropressing with rubber pads, flush riveting and Heliarc welding. He designed America's first jet engine, the Northrop Turbodyne, as well as the world's first production turboprop engines, the Allison T-39 and T-40. He also worked on the Apollo moon rocket, and his low head water turbine recently was tested by the Department of Energy, which found it to be twice as efficient as any other. After all that, Vladimir Pavlecka was ready to build his second metal airship.

"The rigid, all-metal airship was the creation of Ralph Upson, the first head of Goodyear's airship department," Pavlecka said before his death. "He tried to make an ordinary blimp out of metal instead of fabric, but then he realized that he could use the metal skin to create a true monocoque hull. When pressurized from the inside by the force of the lifting gas, it would create a structure of extraordinary strength and durability.

"It was a unique concept," Pavlecka said. "Upson and his friend, Carl Fritsche, secured financing from Edsel Ford, Charles F. Kettering and others in the automobile industry, and we built the ZMC-2 in Detroit for the Navy. It proved to be all we hoped it would, with more hours of flying time than all the rest of the Navy's prewar airships put together.

"Though we didn't realize it at the time, the ZMC-2 represented the last major technological advance in the long development of the rigid airship." After a 50-year hiatus, Vladimir Pavlecka decided it was time to continue that development. Modern techniques and materials, recently developed in the aerospace industry, could make it possible. Such things as aluminum-magnesium-lithium alloys, metal bonding, epoxy laminates, gaseous fuel turbines and boundary layer removal would allow the building of ships that only could be dreamed of in Upson's day.

In 1977, with the backing of Dr. Earl Kiernan, a former Strategic Air Command flight surgeon, Pavlecka and his friends (including John Roda, another of the ZMC-2's original builders) formed Airships International in Tustin, California. The company's goal is to design, build and test a modern metal airship.

Design and marketing studies are under way, and wind-tunnel testing is planned; but, efforts were set back by Pavlecka's death. Irv Culver, who worked as chief engineer in Kelly Johnson's Skunk Works at Lockheed, is now continuing Pavlecka's work as Airships' consulting engineer.

Presentations to the Coast Guard, the World Bank, the Forest Service and the Army Transportation Corps have been well received, and a great deal of interest has been found overseas. Discussions also have been going on for a year with the Canadian government. Members from Airships International have toured Syncrude I as guests of Alberta's provincial government. Members of the National Research Council in Montreal, Canada, and Airships International also have exchanged visits.

"At the Paris symposium [International Symposium on the Economics and Technology of Modern Airships, Paris, 1979], it was the consensus that it is time to stop talking about airships and start building them," said Dr. Kiernan. "We agree. Unlike most other dirigible concepts, our rigid metal design can be scaled up or down to fit lift requirements from seven to 260 tons. We have therefore decided to start with the MC-7, the smallest and least expensive ship we can build that will still prove our design principles. But it will also be large enough to perform a commercial function."

How much will it cost? Airship's International estimates that the MC-7 can be built for $37 million, not a bad deal when you consider that you are getting a brand-new transportation system for less than an airline pays for a single jumbo jet.

Will we ever fly in airships again? Now that the studies and the conversations are ending and construction has begun, it seems inevitable that sooner or later we must return to these fuel-efficient vehicles. □