TECHNOLOGY

Ships of the Future

Wingless boats that can fly, ships with wings that speed through the waves and pod-shaped submarines racing on the ocean floor, Lillian Levy reports.

➤ WEIRD WINGLESS BOATS that actually can fly and climb mountains, winged ships that skim at high speeds through the waves, pod-shaped nuclear powered vessels riding swiftly on the ocean floor, submersible carriers . . . these are some of the ships of tomorrow under development today.

They may sound like the creations of science fiction, but many of them are real. In fact, the U.S. Maritime Administration already has contracted for a 100-ton wingless "surface-effect" ship or hydroskimmer, 142 feet long, that will fly on a cushion of air at more than 100 miles per hour carrying 46 tons of cargo. This is more than double the speed of the fastest cargo or luxury liner of similar size.

Hydrofoils, ships with underwater wings that ride with their hulls above the waves at high speeds, free from pitching and heaving even in the roughest seas, now are operational.

In 1963, the first deep-diving submarine, the 50-foot Aluminaut developed by the Southwest Research Institute of Texas, will descend three miles into the ocean depths, penetrating many times deeper than any conventional submarine.

The Savannah, the world's first nuclear-powered merchant ship, will begin full operation sometime this year. It will be capable of operating three years without refueling.

Nuclear-Powered Subs

Nuclear-powered submarines that can remain submerged for months and travel tens of thousands of nautical miles without refueling are already a reality. All these are merely the forerunners of bigger and better vessels to come.

The 100-ton hydroskimmer, now being developed for the Maritime Administration by the Vehicle Reasearch Corporation of Pasadena, Calif., with Douglas Aircraft of El Segundo, Calif., as the main subcontractor, will be used to provide light cargo and passenger service between coastal cities and offshore areas. If development is as successful as anticipated, it will be the forerunner of much larger "surface-effect" ships, capable of carrying hundreds of tons of cargo and passengers, The 100-ton craft is designed to fly over water, hover over land and water, climb beaches or ramps, and settle at will in water or on dry land. Maritime experts consider the hydroskimmer concept extremely practical, able to satisfy the most "demanding commercial conditions." They believe it will fill the widening transportation gap between conventional ships and aircraft.

Smaller hydroskimmers already have been tested and developed successfully by the U.S. Navy. One five-ton model, designed for rescue operations, can carry a crew of six men and has a cruising speed of 80 miles an hour.

The potential of the hydrofoil is just beginning to be realized both for commercial use and for purposes of national defense. The advantage of the high-riding ships is the smooth travel they provide at greater speeds with far less horsepower than conventional craft of the same size. The wings or foils attached to the lower portions of the ship provide the speed and comfort. A foil is a surface that produces a lift when it is immersed in a moving fluid. An airfoil, such as the wing of an airplane, produces lift in the air. The hydrofoil produces a similar lift in the water.

Hydrofoil Principle Used

The principle of hydrofoil vessels is actually more than 50 years old. During World War II the Germans worked to develop fast PT boats and tank carriers. The Canadians have also done extensive pioneer work. The Soviet Union last October launched the Cosmos, its first seagoing passenger hydrofoil, on the Black Sea. It can carry 350 passengers, has a range of 350 miles and can go about 45 miles an hour. But the most advanced hydrofoil craft in operation, developed by the Navy, was shown at The Hague last year at a symposium on hydrodynamics.

Designed to travel up to 80 miles an hour, its retractable foils allow it to operate in little more than two feet of water. But more important, it demonstrated a new hydrofoil that overcame the problem of cavitation, a phenomenon occurring at very high speeds that destroys the efficiency of hydrofoils. This development now makes possible hydrofoil ships that can maintain stability while traveling at speeds above 100 miles per hour without requiring high-powered engines.

Hydrofoil Research Ship

The Navy is evaluating proposals for a 250- to 300-ton hydrofoil research ship with a speed of 40 to 55 miles an hour. It will later be converted to operate at 80 to 95 miles an hour. Adapted for commercial use, such ships could be used as ocean liners, providing speed and comfort to a degree unknown and unrealized today, even in the most luxurious liners afloat.

On the drawing board for future construction are several submersible vessels, including a submersible aircraft carrier and an amphibious-type ship that can beach like an LST or approach the beach submerged, thus escaping detection.

Still another new ship is the amphibious transport dock, being developed by the Navy. Such dock-type ships would carry hydroskimmers that could debark from the mother ship and land troops and equipment well upon or behind the beach. The great advantage of this ship is that troops and equipment are not separated and thus the loss of any one ship would not upset the essential balance of men and equipment. Eventually the dock ship will replace both attack transport and attack cargo ships, Rear Admiral Ralph K. James, USN, chief of the Bureau of Ships, has predicted.

Computer Techniques for Subs

Future submarines will operate through centralized computer techniques for greater efficiency with a considerably smaller crew. A submarine integrated control (SUBIC) system, for operational use in 1964, is currently under development at the Electric Boat Division of General Dynamics Corporation, New London, Conn.

With the new system, a path-like representation of the ship's course will appear on a screen in front of the pilot. When the ship is exactly on course, the "pathway" will stretch like a ribbon in front of the pilot, just as a road appears when driving a car on a straight highway. When the pilot is off course, the pathway will appear distorted above or below him. Controls to coordinate with the screen will make it possible for a pilot to make the submarine respond instantaneously and precisely to changing situations in the ocean environment.

One Will Do Work of Eight

In the past, eight men have been required to maintain control of submarines. With SUBIC, only one man will be needed for routine control. When fully operational SUBIC will make it possible to reduce the present average 100-man crew of an atomic-powered submarine to 12 men. By adding new sounding devices, equipment and thick glass panes, submarines will also be used for oceanographic studies.

As science and technology advance, the future may one day see a machine that can rise from the bottom of the ocean and fly into the far reaches of outer space and return to land.

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Around 1903 *rabbits* were released on the mile-square Lisianski Island, a part of the Hawaiian chain, and by 1913 the vegetation was completely destroyed and only a few rabbits were found alive.

Nitrogen is taken from the air to produce fertilizer to give new life to overworked soil.