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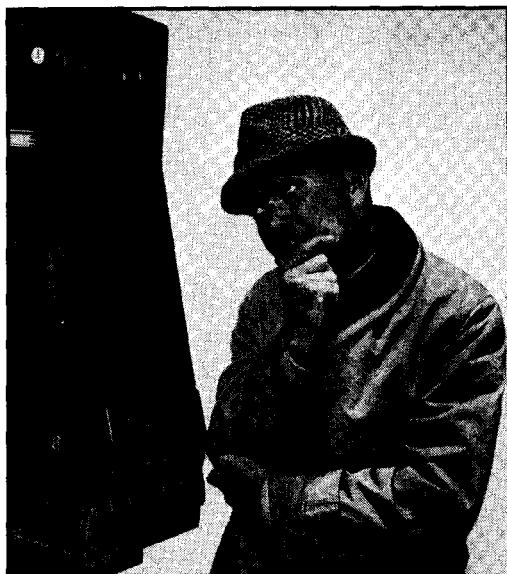
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The Biggest, Fastest

It's 212 feet long and displaces 300 tons, but when it goes up on "stilts" it skims across the water — even heavy seas — at better than 40 knots. It's the Navy's latest in a new breed of hydrofoils.

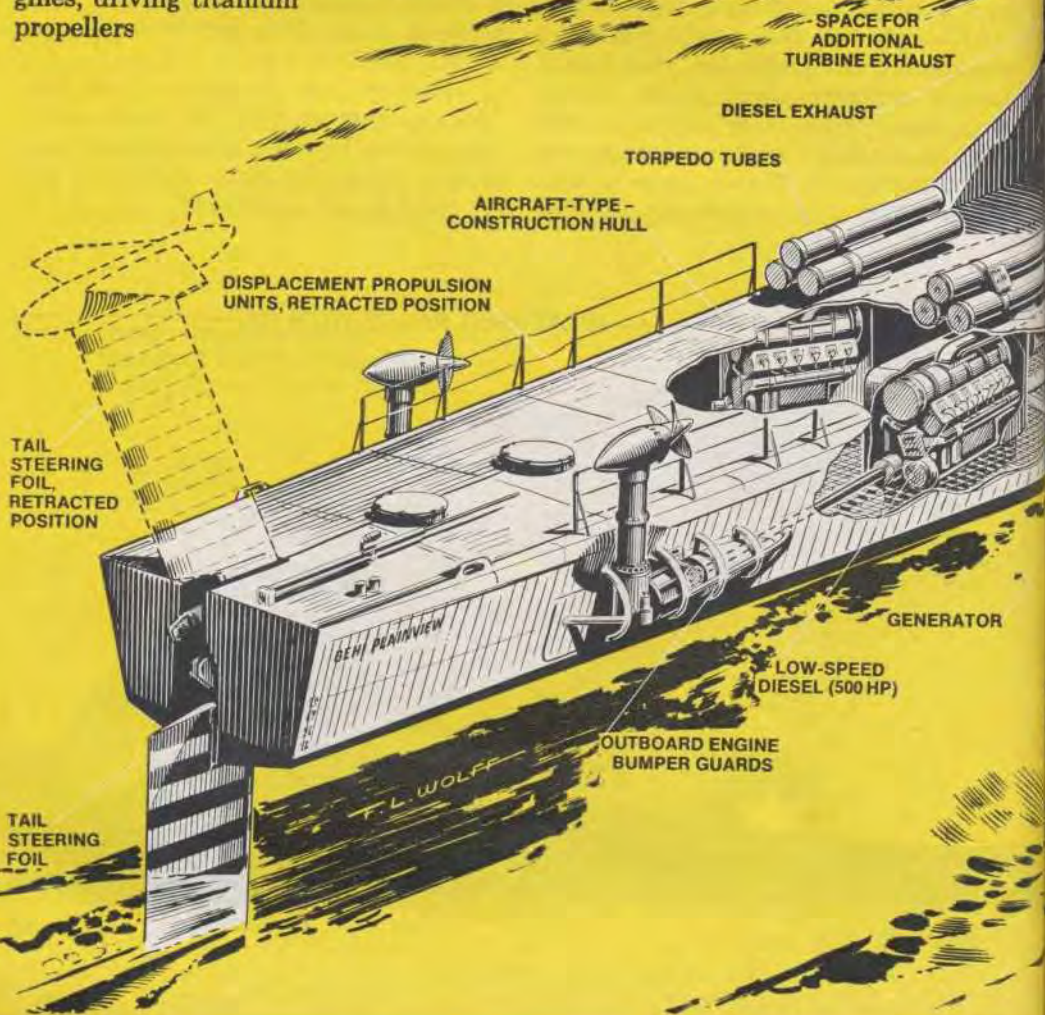
By **BOB ZIMMERMAN**

Technical Art Concept by Fred Wolff

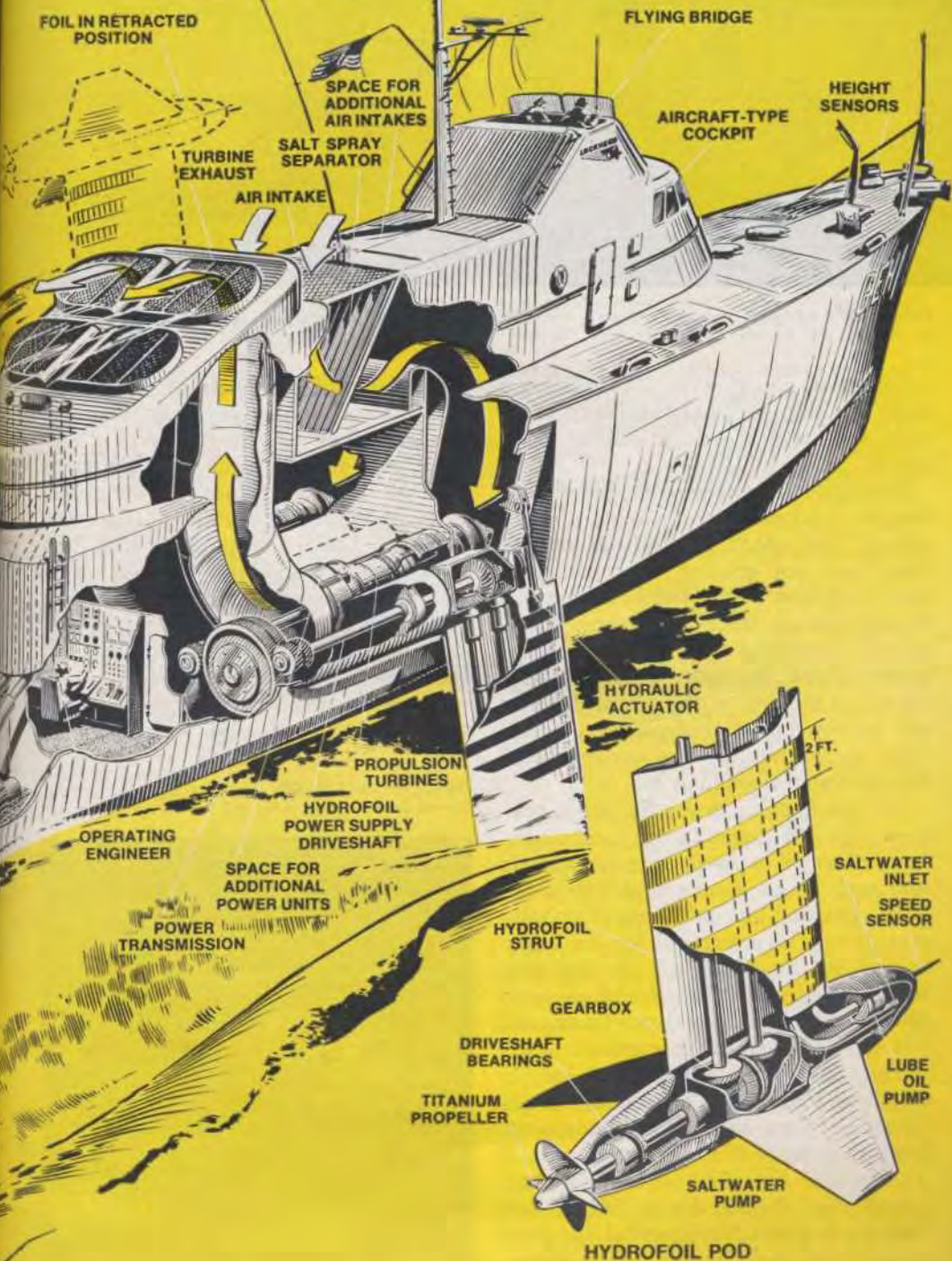
PICTURE A DESTROYER bristling with guns and torpedo launchers skimming at 50 knots or more over the surface of a stormy sea. You can see daylight under the hull. The ship is flying — literally. Its wings are hydrofoils, knifing through the water on struts.

An admiral's pipe dream? Not quite. The new USS *Plainview*, just beginning a test program with the Navy, may be the forerunner of a fleet of such high-flying sub-chasers.

The *Plainview* — 212 feet long and displacing 300 tons — is the largest hydrofoil ship ever built. A pair of aircraft turbine engines, driving titanium propellers



'Flying' Boat Yet!





PLAINVIEW'S COCKPIT looks like jetliner's, and men in charge are known as "pilot" and "co-pilot"

submerged along with its foils, can push the ship to what the Navy modestly says is a speed "in excess of 40 knots."

How much in excess is classified. But smaller hydrofoil craft have already proved that speed possibilities on the high seas are greater than mariners ever imagined. Hydrofoil boats can hit 65 mph before their foils begin "cavitating" (creating an air cavity in the water behind the foil), a limit of performance similar to the sound barrier met by conventional airplanes. A craft with experimental "supercavitating" foils has been clocked at 80!

The *Plainview*, made by the Lockheed Aircraft Corp., is the most ambitious effort yet to put oceangoing vessels into such speed ranges and free them of the bucking and buffeting of choppy seas. It will be a test bed for the Navy to find out how such a hydrofoil ship will handle in all weather and sea conditions and how it would meet demands put on an active modern warship.

This aluminum-hulled wonder is only one blossom on a suddenly fruitful vine of Navy hydrofoil development. Two new hydrofoil gunboats, named *Tucumcari* and *Flagstaff*, have just joined the Pacific Fleet. While the *Plainview* is still experimental, the gunboats are full-fledged combatants. They are scheduled for combat trials to



RESTING PLAINVIEW gives some indication of its size (note crewmen amidships). Three hydrofoils, two

take place off the coast of California.

The principle of hydrofoils is simple enough: They use the water as a medium of flight the same way airplanes use the air. Hydrofoils are winglike surfaces mounted on struts under the hull of a boat or ship. They look like airplane wings and have the same cross section—a curved upper surface and a flat lower surface. Water flowing over and under the hydrofoil produces lift the same way an air current does.

Arrival of the huge *Plainview* on the scene means hydrofoil technology is

GUNBOAT TUCUMCARI, built by Boeing, features canard configuration, with one foil forward, two aft





forward and one aft, are in retracted position, displaying their winglike construction. *Plainview*, the largest hydrofoil ever built, is 212 feet long, displaces 300 tons and is intended to perform the duties of a destroyer

well out of the nursery and into long pants.

The world inhabited by the *Plainview* crewmen—it takes 20 to run the ship—is a strange blend of forecastle and flight line. The ship's wheelhouse, if that's the word, looks more like the cockpit of a jet airliner. The "pilot" and "co-pilot" are surrounded by instrument panels—overhead, in front and between seats. In the engine room are two marine-type J-79 jet engines, the same kind used in the supersonic F-104 Starfighter.

GUNBOAT FLAGSTAFF, built by Grumman, has conventional configuration, two foils forward, one aft



Actually, the *Plainview* has two powerplants. To taxi away from a pier through a crowded harbor, with foils retracted, it is driven by two 600-hp General Motors diesels. Power goes to two outboard propellers mounted on swivels on either side of the hull about 50 feet from the stern. Propeller pods can be turned left and right to steer the ship.

In this configuration, the *Plainview* is a slow, gawky, flightless bird, its forward struts and foils raised out of the water like clipped wings, its stern strut and foil sticking up like a tail.

For flying, the struts go into the water and the diesel propeller units lift out. Then the *Plainview* can run up its turbines, preparing for takeoff.

Power from the turbines is transmitted through an intricate system of gears and shafts to the four-bladed, 62-inch titanium propellers submerged at the tip of the two forward struts. These same struts carry the ship's main foils, each with a "wingspan" of 26 feet.

Takeoff speed is about 30 knots. "If you're down in the hull," says a hydrofoil crewman, "you hear a gurgling sound, and in 20 or 30 seconds you're foilborne."

As if at the command of a magician the *Plainview's* 300 tons rise gently

(Please turn to page 210)

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BIGGEST 'FLYING' BOAT YET

(Continued from page 91)

from the water, her keel as much as eight feet from the surface. The ship seems to ride on three stilts. The stern strut and foil is now the ship's rudder and stabilizer.

Men at the controls have some of their work done by an automatic pilot. Ultrasonic height sensors at bow and stern make continuous readings of the rise and fall of the wave contour passing under the hull. This is fed directly to the foil control system to produce a smooth ride, regardless of surface conditions. Some hydrofoil craft control height by use of flaps on their foils. On the *Plainview*, this is accomplished by movement of the entire foil, changing its angle of attack.

Hydrofoils are getting major attention in antisubmarine warfare. A hydrofoil destroyer could become the only surface ship that can outrun and outmaneuver a nuclear submarine. It would be large enough to carry sophisticated detection and tracking gear and torpedo launchers. In a foil-borne chase, it would be immune to the bouncing and tossing that can interfere with the accuracy of weapons systems in a conventional ship traveling at high speed.

Other promising areas are mine warfare, reconnaissance missions, amphibious assaults, short-haul transportation of personnel, and oceanography.

Probably the most obvious place to put hydrofoils is on a gunboat—used to move a concentration of light firepower along coastlines or across major inland waters. It's no surprise the first Navy hydrofoil craft designed and built for use in combat were gunboats—the Boeing *Tucumcari* and Grumman *Flagstaff*.

Aside from general statistics—they're about 70 feet long and weigh about 60 tons—they demonstrate that with hydrofoils there is more than one way to fly. The *Flagstaff*, like the *Plainview*, has what engineers call the "airplane" configuration—two main foils forward, a single foil aft. The *Tucumcari*'s configuration, called "canard," has the main foils aft.

Propulsion systems differ, too. For slow cruise with hull in the water, the boats use diesel-driven water-jet propulsion. On foils, the *Flagstaff* switches to a propeller on its rear strut, powered by a Rolls-Royce "Tyne" gas turbine. The *Tucumcari* stays with water jet propulsion using a Bristol Proteus gas turbine.

The *Plainview* and the gunboats are making hydrofoil enthusiasts out of their sailors. "Sure the old PT boats were fast," as one of them says, "but they'd

(Please turn to page 214)

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HOW TO GET A GOOD BODY JOB

(Continued from page 82)

to see that the car sits level. Crawl around a little bit and ask questions. It's your car."

Threlfall says that one simple check involves a couple buckets of water.

"Pick a level spot and throw the water so it wets an area as wide as the car," he says. "Then back through it slow and straight so the tires get wet. Then drive straight ahead and get out and check; if the front and rear-wheel track marks aren't straight and in line, then the frame's off kilter."

Both Threlfall and Bristow agree that a good auto body man is somewhat like a good family doctor.

"You don't need him until you need him, but then you need him bad," Threlfall points out. "And like finding a family doctor, you have to go by the man's reputation. You wouldn't buy a cancer cure off a pushcart, but, believe me, a lot of people will buy body work from a guy who works out of the trunk of his car and drives around looking for banged-up cars. He says, 'For \$30, I'll fix it right here, Mister.' It's an out-and-out clip, but people fall for it every day.

"If you need body work, shop around for estimates. Most good shops will charge you for them, but it's worth it just to give you a better idea of what's involved. Usually the shop that gets the job will subtract the cost of its estimate from the finished job price.

"Above all," Threlfall says, "do a little preplanning. Figure that one of these days you're going to need some body work, so ask questions and poke around. Take a little time and visit a few shops. Tell the owner or manager right out what you have in mind, that you're lining up a body shop just in case you may need one someday. Any legit guy, if he has the time, will be glad to show you his shop, his equipment, the type of work he does and how he does it. Honest, it pays."

It does, too.

★★★

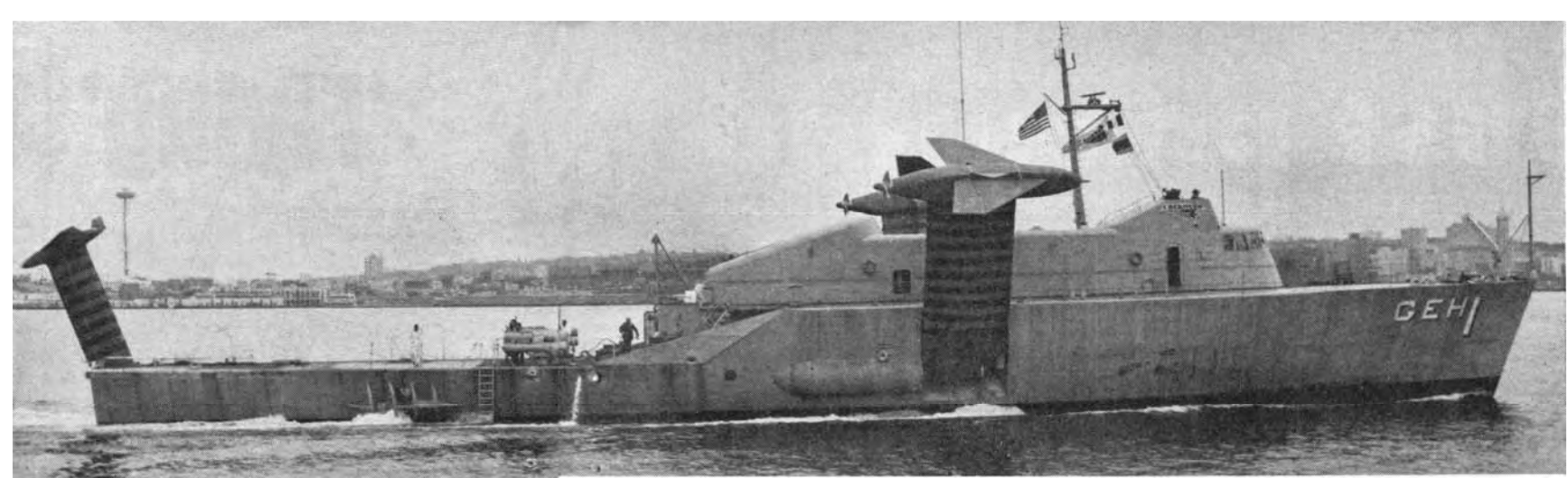
BIGGEST 'FLYING' BOAT YET

(Continued from page 210)

knock themselves to pieces doing 40 knots in the kind of water we fly through."

General enthusiasm among hydrofoil technicians is high. One predicts that the next step will be a hydrofoil ship of 1000 tons! "I'm convinced," he says, "that the hydrofoil is going to change the look of the Navy in the next 10 years. Wait and see."

★★★



The Biggest, Fastest

'Flying' Boat Yet!

It's 212 feet long and displaces 300 tons, but when it goes up on "stilts" it skims across the water—even heavy seas—at better than 40 knots. It's the Navy's latest in a new breed of hydrofoils.

By BOB ZIMMERMAN

Technical Art Concept by Fred Wolff

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