

Squirt Gun on Hydrofoils

Boeing's improvised hydrojet craft may be a forerunner of a water-spouting ocean liner

SPOUTING A 30-foot stream of water from a pipe draped over the transom, Boeing's 2½-ton turbine-powered *Little Squirt* streaked across Seattle's Lake Washington on an overcast day in January and became the first boat to successfully combine hydrojet propulsion with a fully submerged foil system.

While it's hardly a thing of beauty, engineers hope that this one-of-a-kind research boat will provide them with valuable information on whether hydrojet propulsion might be used on large, ocean-going hydrofoils.

Power transmission, one of the toughest problems in any hydrofoil design, becomes even more difficult in the 100-ton-and-over range. The larger the boat, the greater the distance over which power must be transmitted.

Boeing's 20-foot Pump Jet (the *Squirt's* official designation) incorporates an ingenious solution to this problem. Water is scooped up through an intake located in the leading edge of the aft strut, accelerated by a centrifugal pump, then rammed through the U-shaped pipe which carries it over the transom and down again to be

ejected horizontally through a high-pressure nozzle. While still hullborne and gaining speed, the jet exhausts into the water. Once foilborne, however, it squirts water through the air like a fire hose.

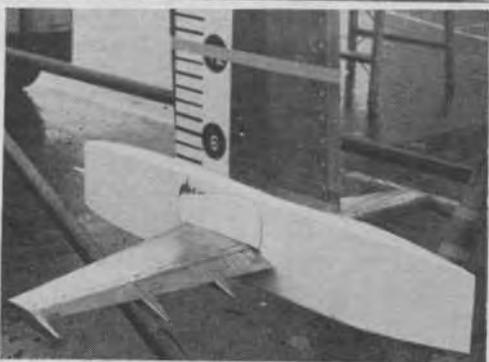
An air jet could be used in place of the hydrojet, but for full efficiency, such engines must operate at far higher speeds than those normally considered practical for a boat. (However, Boeing is developing a jet-powered hydrofoil test craft for the Navy in which performance will be emphasized rather than peak efficiency.)

The Pump Jet's foil system is operated by a combination of electronic and manual controls. The driver sets the basic angle of attack of the foils and controls the rudder (built into the aft strut).

An "autopilot" sets the trim of the movable flaps on each foil. It bounces a high-pitched sound off the water to measure the distance between hull and surface, tabulates this with data from accelerometers and gyros, then adjusts the flaps to maintain a level ride at a constant height. Whole operation is almost instantaneous, and controls can be set to fly boat at any height up to 2½ feet. ★★★



TEST JET UNIT is an industrial pump turned on end. Driven by a 475-hp. turbine, it pushes boat to 45 knots. If system shows any promise, special-built pump with through-transom exhaust will do away with extra plumbing hanging over transom. Below, note aileronlike flaps on rear part of the foil



TUNNEL HULL was designed and fabricated by Boeing just for this project. An air-lift hull was chosen because of extra boost it provides during acceleration before the boat rises on its foils. Jet intake (arrow) is located in aft strut below the rear foil so it is always well below the surface

