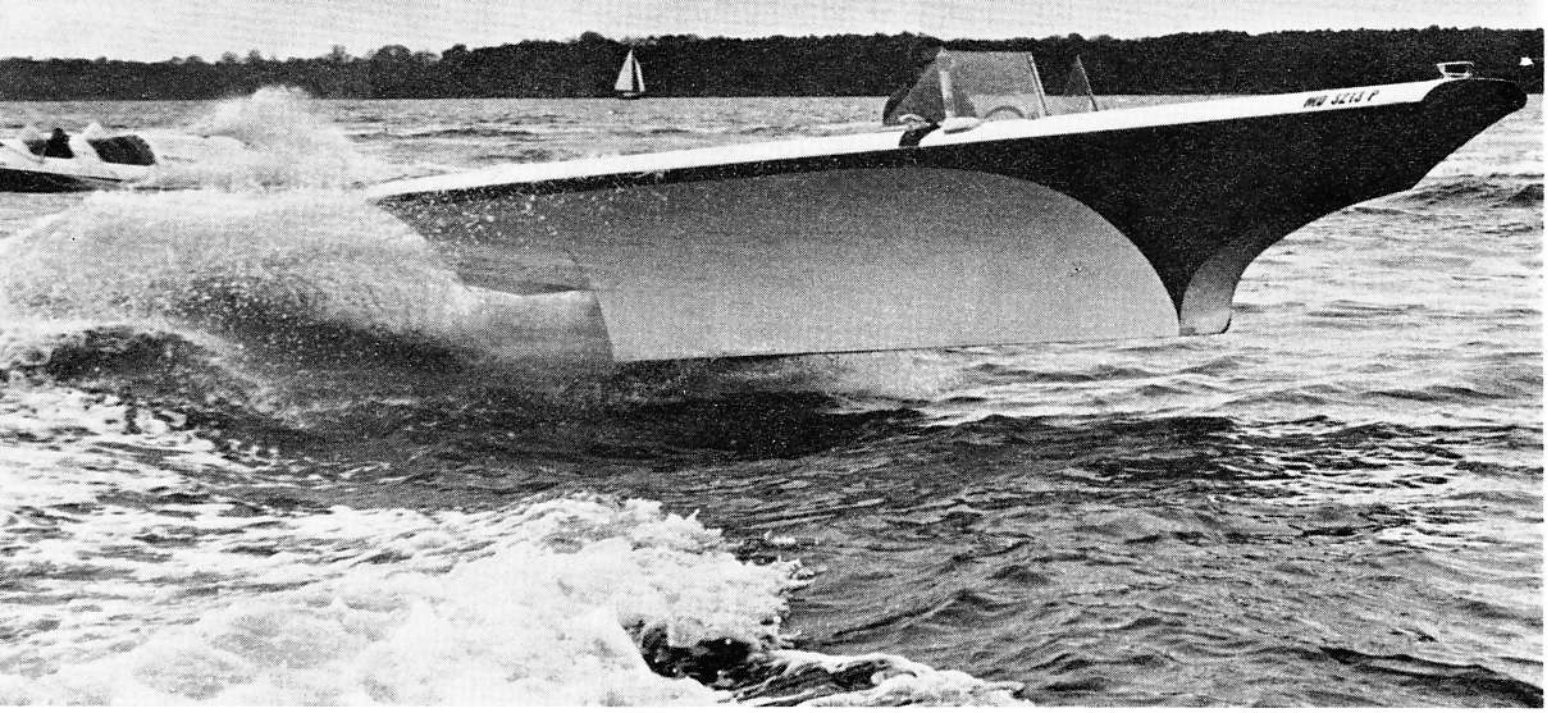


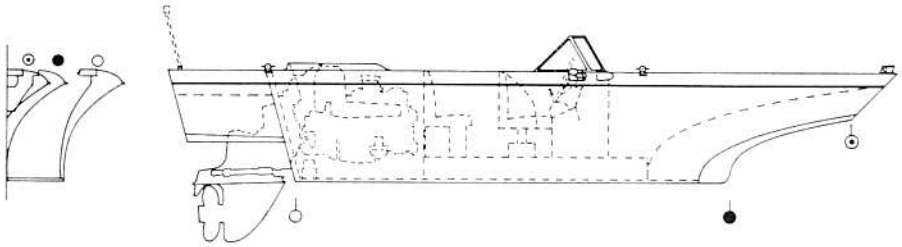
Introducing SEA KNIFE

BOAT OF THE FUTURE?

Sea Knife is an entirely new kind of high-speed, water-borne vehicle developed and built by Blade Hulls Inc., of Rockville, Maryland, U.S.A. It incorporates a blend of hydrofoil, aircraft, and planing hull technologies and cruises smoothly at between 50 and 70 mph, depending on the size of engine installed, on calm water or in steep 4 ft waves. Its ride is not just "better" than conventional boats; it can maintain maximum speed in waves which might cause a conventional boat of its size to founder. Unlike other fully submerged hydrofoils, it is inherently stable, so that no autopilot is required. Because it banks perfectly into a turn (so that gravity balances centrifugal force), the *Sea Knife* can "turn on a sixpence" like an aerobatic aircraft, in calm water, in regular waves, or in broken and confused seas.

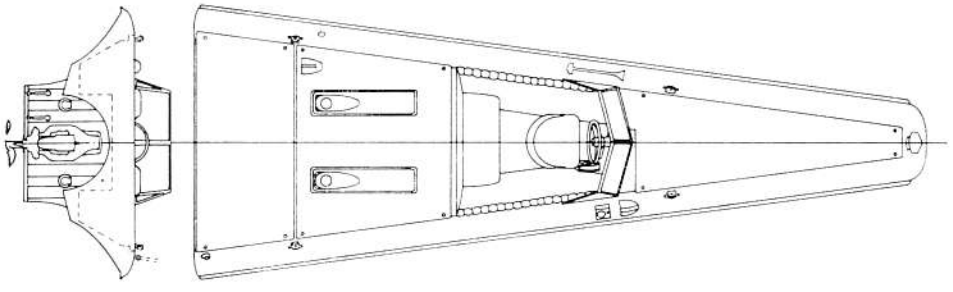
It is claimed that the *Sea Knife* cannot "flip" or otherwise evidence aerodynamic instability even in the strongest winds and roughest seas, because it is designed to be aerodynamically stable, like a delta-winged aeroplane. Because it displaces water like a planing hull, it does not have the characteristic "hump drag" problem of the hydrofoil. Indeed, the *Sea Knife* appears to be outstandingly safe in rough weather, at all speeds of operation. The prototype has made comfortable voyages across and round Chesapeake Bay when small craft warnings have been in effect, and only a few large sailing craft, heavily reefed, have been able to venture out.

The high-strength marine aluminium structure of the *Sea Knife* may be regarded as a "boat within a boat". A completely watertight inner shell is mounted within the exterior hull, and the space between completely filled with foam. This foam, which is hermetically sealed by the structure which envelopes it, represents nearly twice the reserve



General arrangement of the 21 ft. 9 in. *Sea Knife* **showing some of her unique design features and the stern-drive installation**

With grateful acknowledgements to RUDDER Magazine



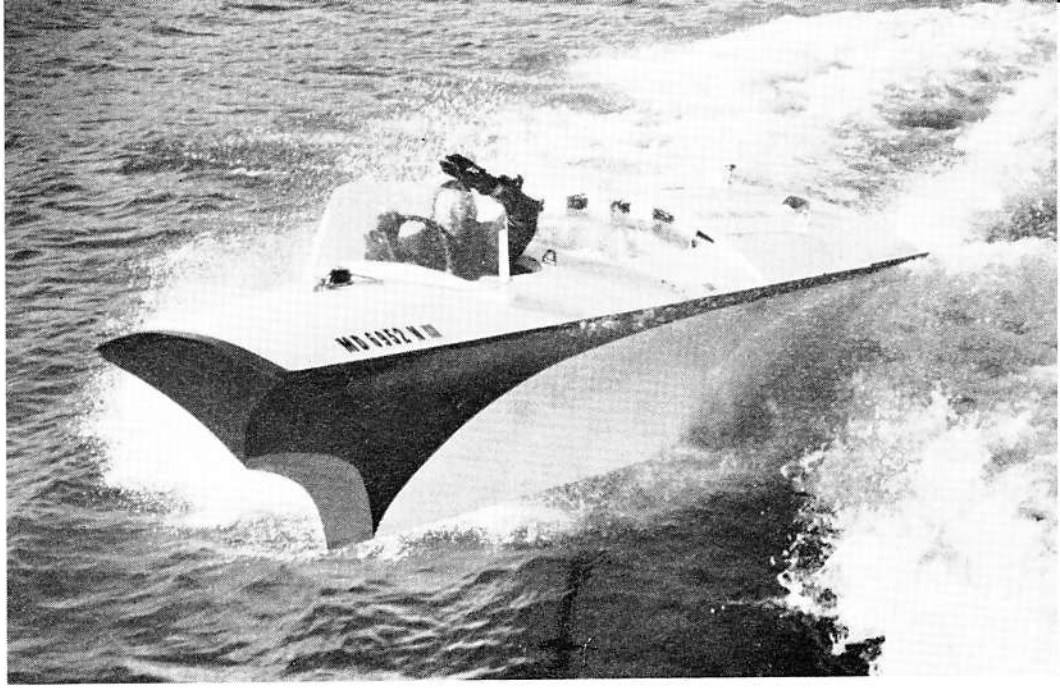
buoyancy normally recommended. Further, the centre of buoyancy of the flotation material is high in the boat, so that even if it is swamped, it will not capsize. If inverted, it is self-righting.

Mechanical fastenings are used throughout the structure in order to take full advantage of the strength of the highest available tempered marine alloys, and their corrosion resistance. Critical joints are bonded in rubber, with screwed-through fastenings. All mechanical joints in the boat are urethane rubber bonded, irrespective of whether they can be wetted or not. The bottom of the boat is armoured with nearly one inch of glass-reinforced epoxy plastic, which, for practical purposes, is indestructible.

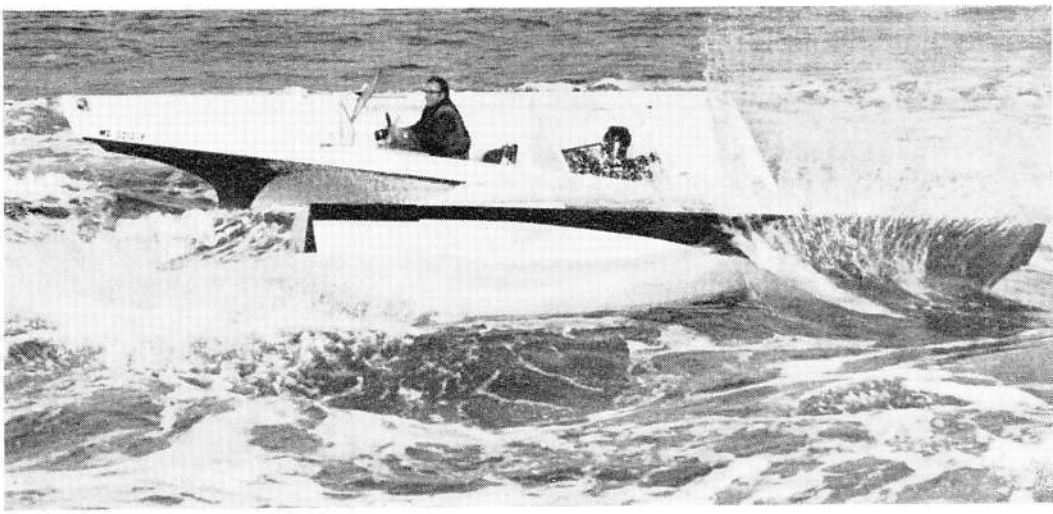
To match the revolutionary hydrodynamic and structural aspects of the *Sea Knife* the designer has tried to provide outstanding accommodation. Recognising that no single layout is suitable for all owners, or even for the various uses to which one owner might wish to put his boat, a system has been developed in which all seats are readily removable, and can either be left ashore or stowed in the forepeak. Thus, the *Sea Knife* owner can operate his boat with three passengers seated in addition to himself, or use an alternative configuration with a single bucket seat in the control position and passengers behind him. If he is going fishing, he can remove all seats and operate the boat in a standing position, if this best fits his needs.

The inboard deck surface of the *Sea Knife* is covered by three removable hatch covers. Being foam-filled, these are buoyant and will each support the weight of a swimmer. If all these hatches are removed, then the craft becomes an open boat with a control console midway along its length. Owners who install additional equipment on their engines may want to leave off the engine hatch only. In this connection it should be noted that the bulkhead between the engine compartment and the passenger compartment is easily removed, permitting walk-through access to the engine compartment, and that everything on the engine is readily accessible. When using the *Sea Knife* for fishing, or as a workboat, owners may wish to take off all three covers in order to realise the full versatility of the open boat; or to take off only the forward and aft hatches, leaving the engine hatch in place.

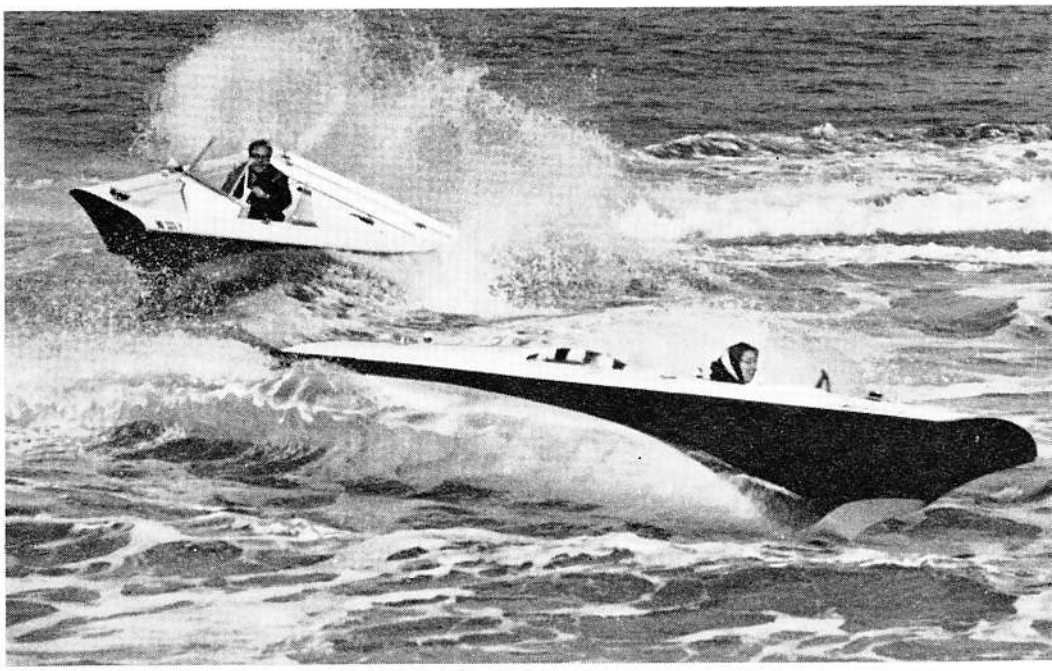
POWERBOAT, February



(Above) The designer's wife Sylvia drives the 18 ft. prototype *Sea Knife* through the wake of a chase boat

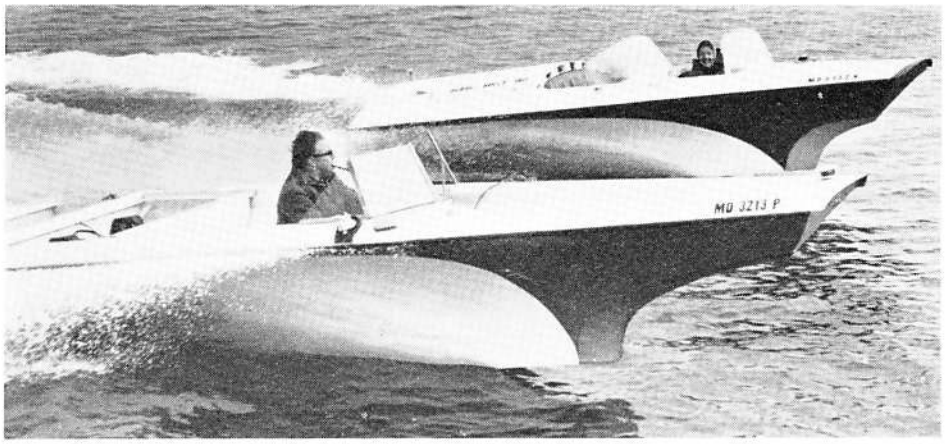


An incredible shot (above) showing the prototype being banked to turn sharply across the stern of the first production *Sea Knife*, from which the hatch covers have been removed

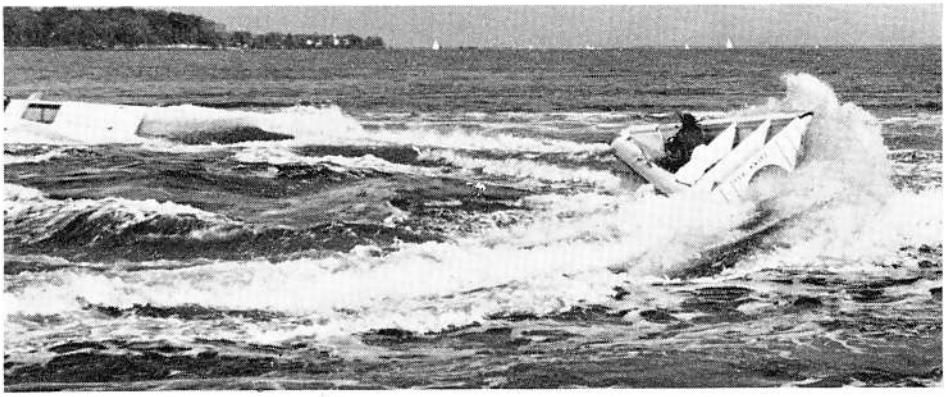


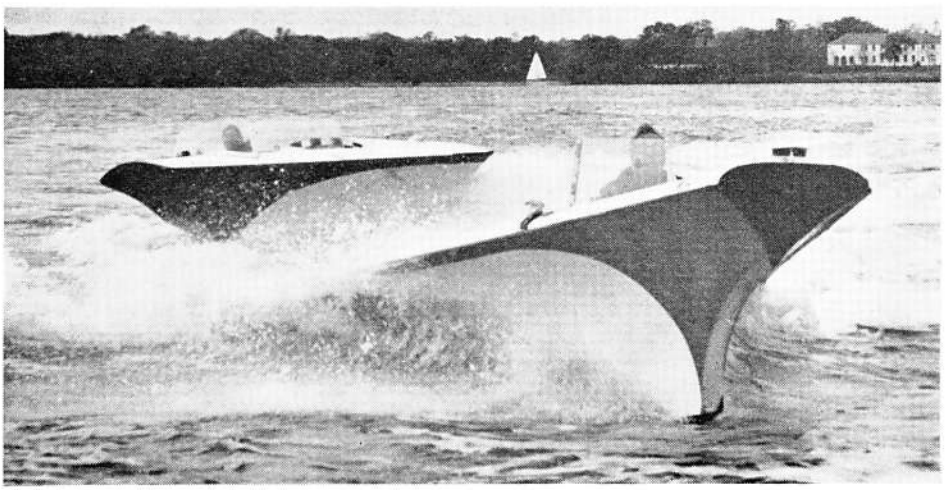
To summarise, everything about the *Sea Knife* is new and revolutionary. Only the materials used are conventional, and even here, some have been selected from aerospace technology, without regard to cost, rather than rely on those traditionally used in boat manufacture.

Peter R. Payne, President of Blade Hulls Inc., is the originator of the *Sea Knife* concept, and was responsible for the design and development of the experimental prototype. Alastair Anthony made major contributions to the structural design of the production boat, together with Harry E. Dean and members of his staff. Peter Payne worked in the United Kingdom, Canada, and U.S. aerospace industries for the first 23 years of his professional life. For many years he was a helicopter designer. He is the author of the book "Helicopter Dynamics and Aerodynamics" and some hundreds of technical reports and papers published in various scientific journals. He founded his own company in 1964. Mr. Payne is a keen sailor, and regularly races his sloop *Pottage*. He has been experimenting with high speed powerboat hulls for seven years, his most important models being the *Ficat* supercritical displacement catamaran in 1965, the *Gayle* boat supercritical planing catamaran in 1967 and, of course, the *Sea Knife* in 1971.



The first production *Sea Knife* (nearest camera, above) against the prototype, clearly showing the modified bow





Of his latest design Mr. Payne says, "The *Sea Knife* gives a pretty steady ride in 4 ft waves, when they are taken head on, or at any angle on the beam up to about 50°. When in close to beam seas, the *Sea Knife* will roll like any other boat, of course, although with less amplitude. If the waves are from the rear quarters, it starts to move around and must be treated with consideration by the helmsman. Any boat has natural frequencies in its six degrees of freedom (*Pitch, yaw, roll, heave, surge and sway. Ed*) the one of most interest on the *Sea Knife* being pitch. Most boats are stiff in pitch when planing, implying that they respond quickly to waves; hence the pounding. The *Sea Knife* has a much lower natural frequency, and is "seismic" to normal frequencies of encounter. Technically, we say that the *Sea Knife* is "supercritical", while conventional hulls are "subcritical". In other words, the resonant frequency of the *Sea Knife* is lower than the frequencies at which waves are normally encountered, while the resonant frequency of a conventional boat is higher than the frequency of wave excitation. It is almost always bad news to operate any kind of boat at resonance, when the frequency of encounter coincides with the natural frequency. All sailors know this, and in bad weather when the ship starts to pitch too violently, it is traditional to "ease her" by cutting back on the throttle, in order to reduce the frequency of encounter. On a supercritical hull, paradoxically, the reverse is true. If the boat starts to pitch too much the solution is to open the throttle, hence increasing the frequency of encounter, and resulting in less response of the boat. However, in order to do this, one must be able to go sufficiently fast through the water; that is, have a big enough engine to stay "supercritical".

(Some further technical information on supercritical hulls will be published in the March issue of POWERBOAT & WATERSPORT. Ed.)