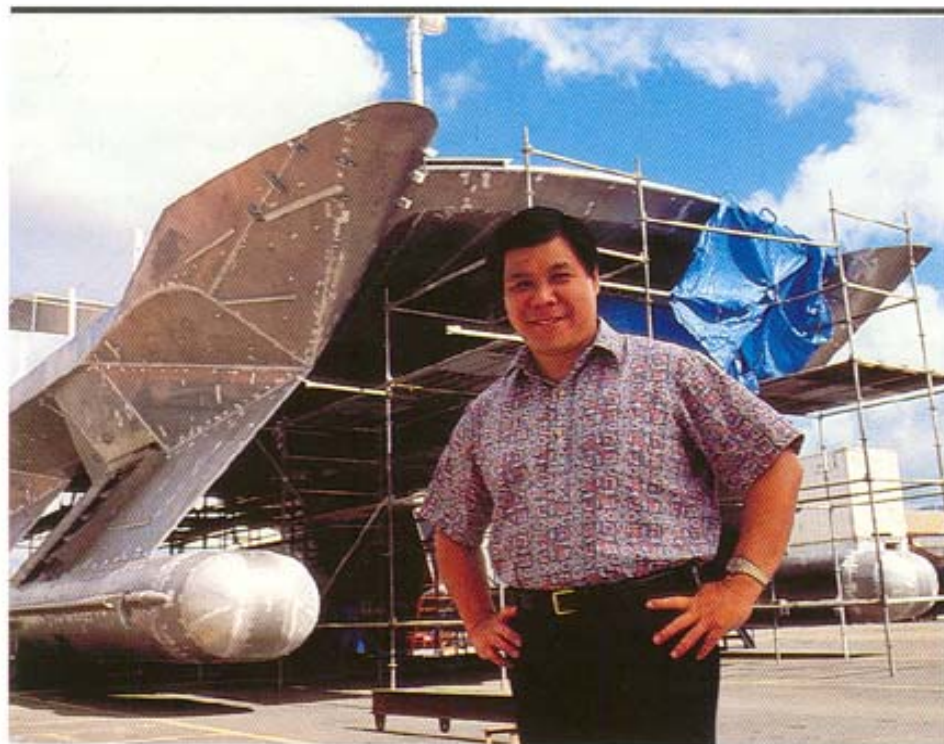


Ever see a ship moving along on stilts? Steven Loui has already built two of them and has plans for lots more.

Reinventing the boat

By Neil Weinberg



David Friedman

THE WORLD IS FULL of inventors and promoters who spend, often waste, their lives searching for the financial backing to take advantage of some radical new technology. Thus did King Gillette spend six years perfecting his disposable-blade safety razor, before an MIT-educated machinist finally took him seriously. More recently, Alexander Kalina, a Russian-born inventor, tried in vain for many years to get power equipment builders to listen to him when he said he had a breakthrough in generating power from a steam boiler. Only in the last year has the industry realized that he was really onto something (FORBES, Apr. 12).

Steven Loui is a 42-year-old Stanford-educated engineer who, for the

Steven Loui of Pacific Marine & Supply
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past 16 years, has been captivated by an equally improbable scheme. He wants to build boats that ride on stilt-like struts above submerged hulls. Like Kalina, Loui spent years courting bankers, venture capitalists and anyone else who'd listen. Nobody would.

But Loui is no monomaniac, no kook. He is a smart businessman, who owns and runs a very successful mini-conglomerate that grew out of his father's ship repair business in Hawaii. Eventually, that business turned up enough profits that Loui was able to

become his own venture capitalist. And his kooky ship, which nobody would finance, has proven a commercial success.

Swath—acronym for "small water plane area twin hull"—was conceived in the late 1800s and first patented in 1942. Loui discovered it in the 1970s while exploring what is credited as the first modern Swath vessel, the U.S. Navy's *Kaimalino*, which underwent testing in the turbulent Hawaiian waters and received repairs at his father's shipyard.

The Swath design sharply reduces the ill effects of heavy seas on ships and their passengers by minimizing contact with the ocean's choppy surface. This is achieved with dual torpedo-shaped hulls submerged well below the waves, a superstructure suspended above them, and thin connecting struts.

Loui describes his reaction to his first Swath ride: "The clincher came when I rode it and braced for the impact from waves that never came. Afterward I said to my employees, 'Well, gang, do we bet the company on this, or what?'"

The answer was a partial yes.

Loui teamed up with Ludwig Seidl of the University of Hawaii's ocean engineering department and had a patented design by 1979.

For six years he sought in vain for financing, meanwhile building his deceased father's business, Pacific Marine & Supply Co., into Hawaii's top ship repair, day cruise and environmental services outfit. Sales rose from \$3 million when he took over in 1973 at 21 to \$56 million last year.

By 1986, disgusted with begging for money and still sold on Swath, Loui sank \$6.5 million into building *Navatek I*, a 141-foot, 370-ton displacement Swath. *Navatek I* has two submerged hulls attached to a giant picture-frame-like structure above water with a forward bridge. The hulls contain a variable ballast system and house the ship's engines to cut noise and vibration and increase deck space. The skeletal design had another advantage: Loui waited until after testing it to bolt on the superstructure that then looked most commercially viable.

Navatek I was ready for testing in April 1989, and Loui's crew piloted it

on the 2,743-mile run from Portland, Ore. to Honolulu. On their way, the crew confirmed that at 17 knots in 4-foot to 8-foot seas, *Navatek I* has the same pitch, roll and heave characteristics as a monohull ship roughly three times its length. That, in turn, cuts the incidence of seasickness from roughly 10% of passengers to 0.5%, Loui says. *Navatek I* also maintained nearly 100% of cruising speed in seas where conventional ships must cut back 30% or more.

An intensely practical dreamer, Loui decided to milk some income from the craft while continuing to demonstrate its prowess. He attached a luxurious superstructure and started regular cruises from Honolulu to Koko Head along Oahu's scenic Gold Coast, where seas typically run 4 feet to 6 feet. Last year *Navatek I* grossed

of the Stealth bomber. Lockheed's marine systems division developed the *Sea Shadow*, a radar-eluding Swath that the Navy unveiled in April.

Pooling their technologies, Lockheed and Loui produced a new design for a *Navatek II*. Its hulls bulge at the ends and are wider apart fore than aft; and struts angle 35 degrees from the hulls toward the ship's center, rather than rising vertically. This reduces the ship's motions and cuts down on water resistance.

Now being built at Loui's Honolu-

able horsepower by making ships longer. This is far from an optimum solution. It forces the U.S. Navy, for example, to build ships at least 500 feet in length in order to reach 25 knots efficiently at sea.

Speedboats and hydrofoils overcome this speed barrier by exerting enough horsepower at high speeds to virtually eliminate their bow waves. They then face only about half as much drag from the hull rubbing against the water. The negatives: small payloads, high fuel use and a slow, unstable ride in high seas.

Lockheed engineer Terry Schmidt has proposed making the length of Swath ships' hulls so short that they, too, outrun their underwater bow waves at high speeds. Buoyancy would come from the width, not the length, of transversally mounted, wing-shaped hulls. "Lockheed has done research to confirm the design as viable," says Schmidt, who termed the design Slice.

Navatek, Ltd., as Loui calls his Swath design company, and Lockheed are seeking funding for a prototype Slice ship under defense conversion programs. Loui is counting on Slice technology to make the inter-island ferry feasible. Lockheed hopes to sell the government on applications, such as stable helicopter carriers and Coast Guard interdiction ships able to cruise at high speeds in high seas, says Schmidt.

They are not the only ones pressing ahead with similar designs. Mitsui Shipbuilding has already put several Swath ferries into service in Japan. Swath International, Ltd. of the U.K. is delivering a casino ferry next June, which will run on the turbulent route between Fort Lauderdale, Fla. and Lucaya, near Freeport, Bahamas, where catamarans and hydrofoils have failed.

C. William Hayes, head of Swath International's U.S. office, expects the demand for Swath ships to increase in congested coastal areas where new surface transportation is extremely costly and nearby waters rough. Loui foresees the day when high-speed Swaths run routes like the English Channel and China-Taiwan, and already has licensed a Malaysian company rights to market his designs in Asia.



ABOVE: Navatek II hull design

LEFT: Navatek I

Loui's combination of engineering and entrepreneurial skills is opening up cruises in lucrative waters where competitors can't follow. Inter-island ferries may be next.



over \$11 million from charging more than 150,000 tourists \$30 to \$140 apiece for cruises that last around two hours.

But *Navatek I* has a major drawback. Its hulls create so much water friction that in calm seas it can't top 17 knots—three-quarters the speed of a similar-size monohull vessel. Thus, while it can outperform a conventional ship in choppy seas, it underperforms in calm waters. That makes it too slow for many uses, including Loui's dream of running an inter-island ferry service, which Hawaii has lacked since 1949.

Pure horsepower is one answer, but comes at a high cost in fuel. Loui found a more elegant solution 2½ years ago at Lockheed Corp., maker

lu shipyard, *Navatek II* will be ready early next year. The \$3 million, 82-foot ship will cruise at 20 knots, 33% faster than its predecessor's 15 knots. Loui plans putting it into service in the rough winter waters between Maui and Lanai, and in summer along Molokai's secluded north coast (FORBES, Mar. 4, 1991).

Now Loui and Lockheed are pressing ahead with yet another radical, high-speed concept. Any ships that displace water, Swaths included, are slowed as they cut through their bow waves and their sterns fall into the trailing trough. Since the speed at which a ship hits maximum bow-wave drag increases with the length of its waterline, designers have achieved higher cruising speeds with accept-