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FINAL REPORT
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BY
ABLE BOAT, INC.
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TITLE:
SEACOASTER ADVANCED MARINE VEHICLE

SUBJECT:
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FEDERAL PROGRAM NUMBER: DE-FG01-97EE-15667

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SEACOASTER ADVANCED MARINE VEHICLE

INTRODUCTION AND BACKGROUND:

The SEACOASTER invention promises to reduce fuel usage by 40 percent when applied to marine vehicles traveling at moderate to high speeds. A commensurate reduction in environmental impact--exhaust pollution, engine size, etc.--will also be realized. The invention has extensive United States patents, four issued to date plus two more recently allowed, plus a number of foreign patents issued and pending. The inventor, Donald E. Burg, has granted an exclusive worldwide license to Air Ride Craft, Inc. (ARC), Miami, so that ARC is now the LICENSOR of the patents and technology. ARC is a privately held company with 13 investors.

SEACOASTER combines the high efficiencies of Surface Effect Ships (SES) with simple catamaran hull construction. It has blower pressurized air cushions that support some 80-90 percent of displacement and hence the high efficiencies. However, unlike the SES, there are no expensive and high maintenance flexible seals. Each catamaran sidehull has a simple recess molded or built into its underside. Powered blowers direct pressurized air into such recesses and thereby create lifting air cushions. There are no flexible seals of any kind and there is no air cushion between the sidehulls. Figure 1 compares the SEACOASTER technology with other hull types.

Extensive towed model tests were conducted from 1992 to 1994 that showed the viability of the invention. Data derived from these model tests is presented in Figure 2. As a result, ABLE BOAT, INC. (ABI) was granted a license by the patent licensor, Air Ride Craft, Inc. (ARC), in late 1994 to build and sell SEACOASTER boats of fiberglass construction up to 65 feet long. In return, ABI was required to build, test, and demonstrate a R&D prototype SEACOASTER boat. ABI started construction of a 48 foot demonstrator in 1995. After completing much of the hull, work was temporarily suspended due to lack of funds. ERIP funding of \$97,999 that is the subject of this report was received in 1996. This DOE funding allowed further progress on the project but most significantly keep the project alive and viable. It is probable that the project would not have survived without the DOE funding in 1996.

DEMONSTRATOR FUNDING:

In the summer of 1997, HVIDE Marine, Inc., Port Everglades, FL (HMarine on the NASDAQ) advanced \$120,000 toward the project initially and has recently added another \$40,000 so their total investment is now \$160,000. This was done with the stipulation that the demonstrator be lengthened to 65 feet so that it would make a better model of a 160 X 56 foot class of crew/supply boat SEACOASTERs that HMarine wants to service offshore oil rigs. It is of interest that this 160 foot class of SEACOASTER has a value of about \$4.5 million and can transport 250 long tons (560,000 lbs) of deck cargo. HMarine has some 280 vessels most of which service the offshore oil field market worldwide. In return, HMarine received an option on a

license for exclusive use of SEACOASTER boats from 110 to 220 feet long to service offshore oil rigs in the Gulf of Mexico and the Arabian Gulf. The SEACOASTER boats for HMarine would be able to operate at 35-45 knots which compares to 15-20 knots for present day technology boats servicing the same market. When it is realized that almost all new oil rigs in the Gulf of Mexico are between 100 and 200 miles from port it is easy to see the value of SEACOASTER in this market. HMarine will do an evaluation of the 65 foot SEACOASTER demonstrator once it has completed its development cycle. That is expected to occur later this year at which time they are obligated to sign their license or cancel same. From preliminary reports it would certainly appear that they intend to sign the license option for long term

Support was also received from Caterpillar, Inc. in the form of three diesel engines supplied by its distributor, Pantropic Power Products, Inc., Miami, and from Twin Disc, Racine, WI, who supplied the gearboxes and drives. The combined value of the diesel engines, gearboxes, and drives is approximately \$250,000. The builder, Lauderdale Yacht & Ship Builders, Inc. (LYS) has contributed approximately \$260,000 in materials and labor. The owner and Licensee, ABI, has invested about \$180,000 to date. Therefore, the total amount invested in this R&D demonstrator SEACOASTER boat to date approaches \$1 million.

DEMONSTRATOR SEATRIALS:

The 65 foot SEACOASTER R&D demonstrator was launched in March, 1998 and was first seatrialed in April. It is shown in the water in Figure 3 and in the water with its blowers operating in Figure 4. It is interesting that it raises about 18 inches dockside with the blowers on. The 65 foot SEACOASTER is shown at launch in Figure 5 and when running at 40 mph in Figure 6. Figure 7 presents the machinery arrangements.

Rough water, performance as evidenced during operation in 10 foot seas in the Gulfstream off of Ft. Lauderdale, is outstanding and far exceeds expectations. High speed performance was shown to require improvement. As a result, several enhancements to the hull shape have been made. All have had positive results and demonstrated speeds to date are over 40 mph at a displacement of 68,000 lbs. The attached video shows the 65 foot open demonstrator SEACOASTER underway at approximately 40 mph.

Further enhancements to the hull design are currently underway that are expected to increase speeds to the 50 mph area. These include addition of full 6 inch wide spray deflecting rails at the chines on both sides of each sidehull--this adds up to an addition of about 160 feet of these spray rails--plus an enhancement to the design of the air cushion stern seal. Note that this stern seal is an integral part of the hull itself. Further, an aluminum hydrofoil that spans the distance between the hulls forward of midship has been designed and is being fabricated for evaluation. This hydrofoil will add further to the already exceptional stability of SEACOASTER technology plus it will carry about 20 percent of displacement while demonstrating very high efficiencies. It is expected that these efforts will be complete in the fall of this year. It has been and remains a firm goal of Air Ride Craft, Inc. and Able Boat, Inc. to have the SEACOASTER technology fully developed before offering it for sale. The potential is too great to do otherwise.

MARKET POTENTIAL:

There is a solid market for the SEACOASTER technology as is evidenced by sales contacts to date. First, a contract was signed in late 1997 by LYS with an offshore gaming boat operator for a 105 X 36 foot SEACOASTER offshore gaming vessel. The owner recognized the value of SEACOASTER as it could get his patrons 10 miles offshore quickly and then offer extreme stability when on station when gaming is going on. This vessel was designed and construction started in early 1998. Unfortunately, the owner was not able to secure his full funding so, after paying a significant down payment, the project was put on hold. Currently, mold tooling and all components for the sidehulls have been completed. These items are in storage awaiting further funding from the owner. There is interest from other parties for this same vessel as a high speed passenger ferry and discussions for such a sale are currently underway. In such case, some accommodation with the gaming boat owner would, of course, be made. The value of this boat as a high speed ferry is in the \$3 million area.

Other current projects include a 125 foot high speed SEACOASTER ferry to run offshore the west coast of the United States that has a value of about \$3.6 million, a project to build and then operate SEACOASTER ferries, including terminals and docks, in the San Francisco Bay area that would have an overall value approaching \$100 million, a very serious client who presently operates a 130 foot catamaran ferry on Long Island Sound and would need several 40 knot 125 foot passenger/freight SEACOASTERs, and significant interest by the Navy in using the SEACOASTER technology for vessels ranging from small \$500,000 patrol craft to \$200 million SeaLift ships and large military combatants. It is probable that ARC and ABI will receive funding by the Navy for test and evaluation of the SEACOASTER technology. Some typical arrangements of SEACOASTER in patrol boat configurations are presented in Figures 8 and 9.

SUMMARY AND CONCLUSIONS:

Work to date and operation of the 65 foot SEACOASTER demonstrator have proven the viability of the concept and exposed an extensive potential market. Enhancements to the hull design of the 65 foot R&D demonstrator are ongoing and will result in significant improvements to an already successful design. Investments in the 65 foot SEACOASTER demonstrator will exceed \$1 million before the R&D of that boat is complete.

Market potential in the United States alone would appear to be in the \$40 million per year area for high speed passenger ferries. Note the attractive styling of latest high speed SEACOASTER ferries as is evident from examination of Figure 10. Attached as Appendix A is a current two page brochure that describes the SEACOASTER technology as applied to high speed passenger ferries. Sales to the offshore oil crew/supply boat sector appears secure with the interest that HMarine is showing. Their naval architects, engineers, and owner have had the opportunity to ride the 65 foot SEACOASTER demonstrator in its current configuration and are all quite impressed. They are withholding a final commitment until after all enhancements to the hull are made but have started the actual design of the 160 X 56 foot SEACOASTER crew/supply boat which is a very good sign.

Potential sales to the military is, of course, unknown; however, that could be a large market also. Sales of SEACOASTER to the pleasure boat market will follow only after establishment in the high speed ferry and other commercial markets. This is because the pleasure boat market is very conservative by nature and takes years to accept new technology.

Sales potential on a worldwide basis are tremendous as other areas of the world are vastly more attuned to use of high speed passenger vessels than is the United States. That is because of the United States commitment to passenger cars. However, that is changing as evidenced by ferries in service in: Boston, New York, west coast of Florida to Key West, Los Angeles to Catalina Island, San Francisco Bay, and Seattle. All of these offer are very strong potential where SEACOASTER ferries could dominate over existing boat technology.

ARC and ABI are committed to continued development and sales of the SEACOASTER technology on a worldwide basis. The development of the technology has taken years and millions of dollars. The hardest part of the process was raising funds for each step of the way. The DOE grant was essential to save the project in 1996. It is probable that without the DOE grant that the SEACOASTER technology would not exist at this point. It is expected that full success will be realized in the next two years.

End:DOE.

COMPARISON: CATAMARAN, SEACOASTER, AND SURFACE EFFECT SHIP (S.E.S.)

POSITIVE FEATURES

CAT

- Simple and Moderate Cost

SeaCoaster

- Simple and Moderate Cost.
- Only requires half the power and fuel of CAT or monohull.
- No Flexible seals
- 35% less "Hump" drag than SES.
- Inherently strongest structure.
- Very stable in rough seas.

SES

- Only requires half the power and fuel of CAT or monohull.

NEGATIVE FEATURES

CAT

- High power requirements.
- "Heave" motions in rough seas.

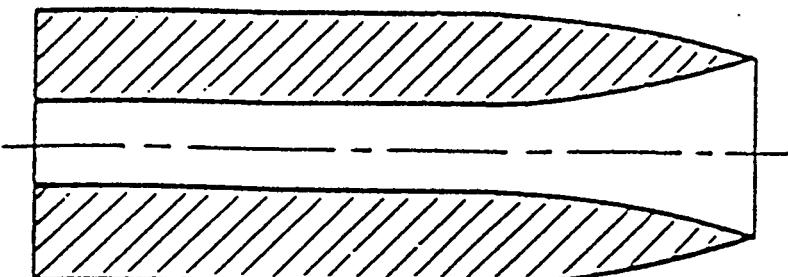
SeaCoaster

- Minimal blower system maintenance.

SES

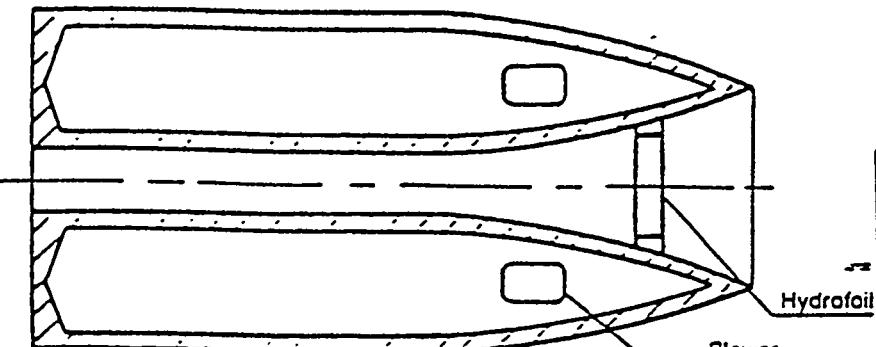
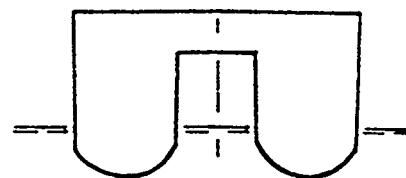
- Blower system maintenance.
- Flexible seal maintenance.
- Air cushion bounce.
- Poor stability in rough seas.

WATER "FOOTPRINTS"

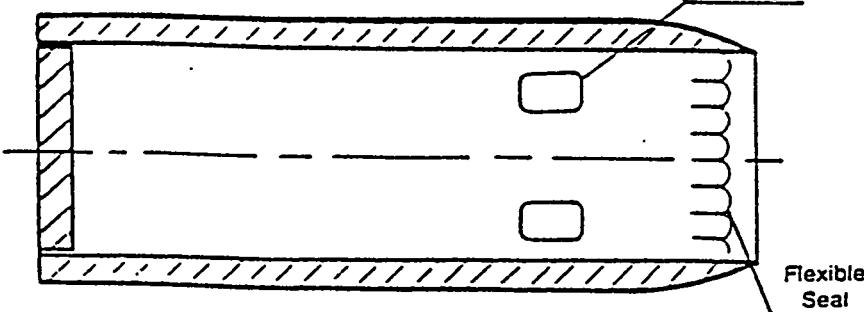
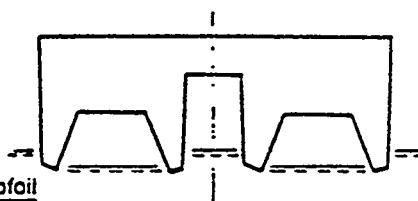


MIDSHIP SECTIONS

CAT



SEACOASTER



SES

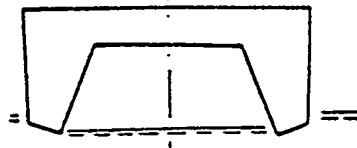


Figure 1 ~ Comparison of Catamaran, SEACOASTER, and SES.

RESISTANCE CHARACTERISTICS OF VARIOUS MARINE CRAFT

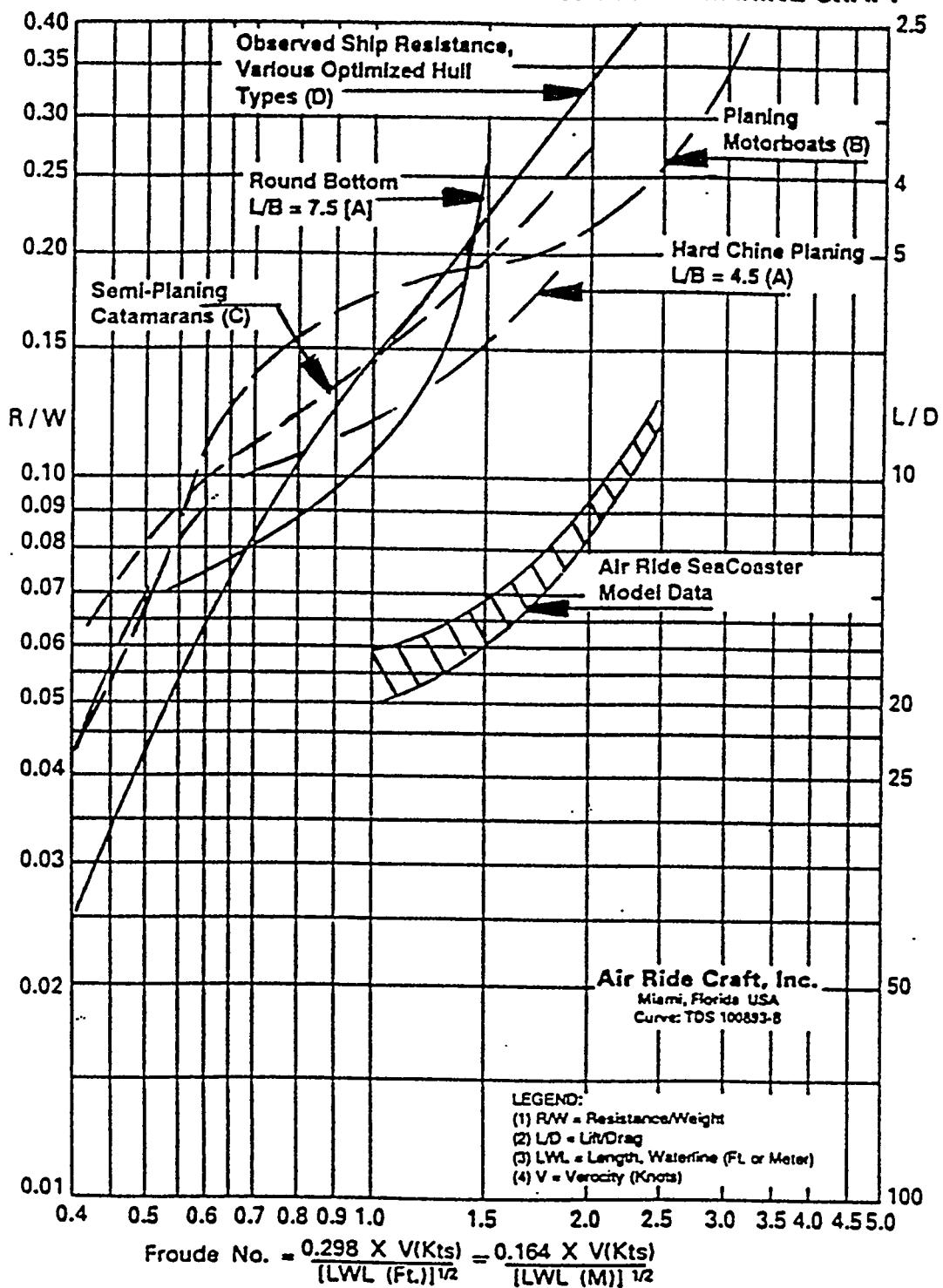


Figure 2 ~ Resistance Comparison of SEACOASTER and other marine craft.

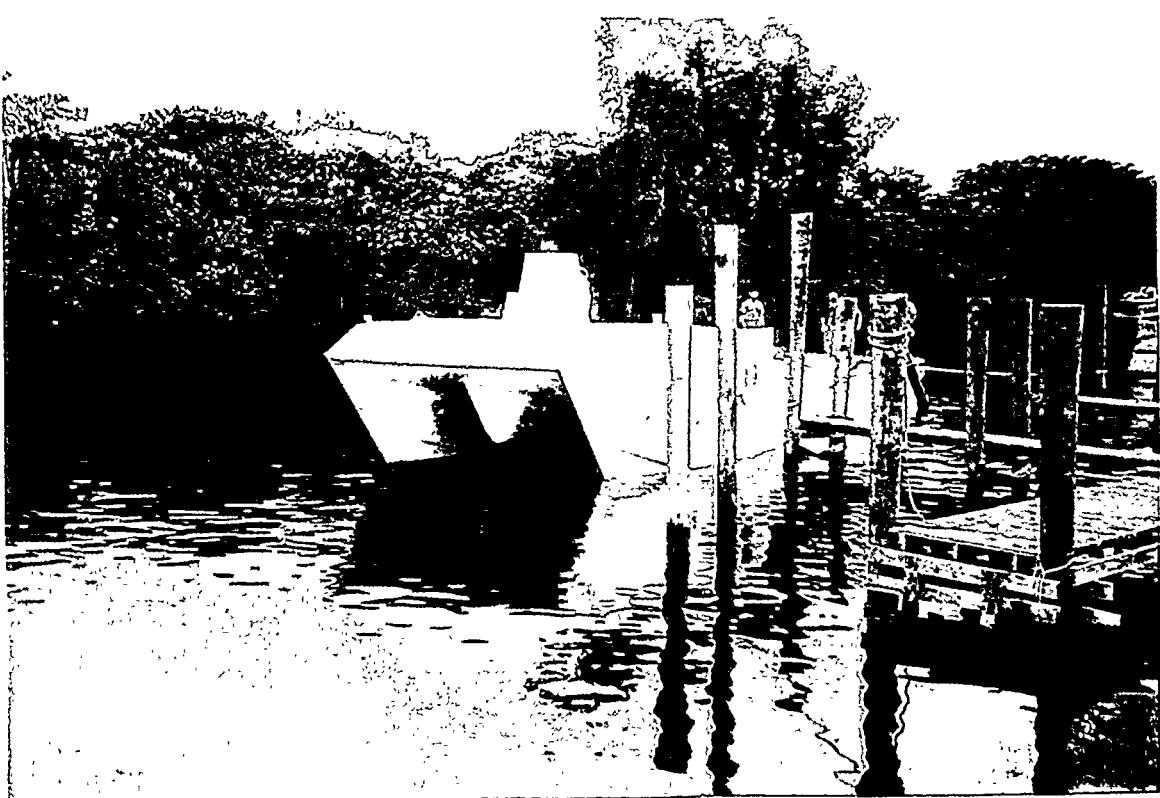


Figure 3 ~ 65 Foot SEACOASTER with blowers OFF.



Figure 4 ~ 65 Foot SEACOASTER with blowers ON.

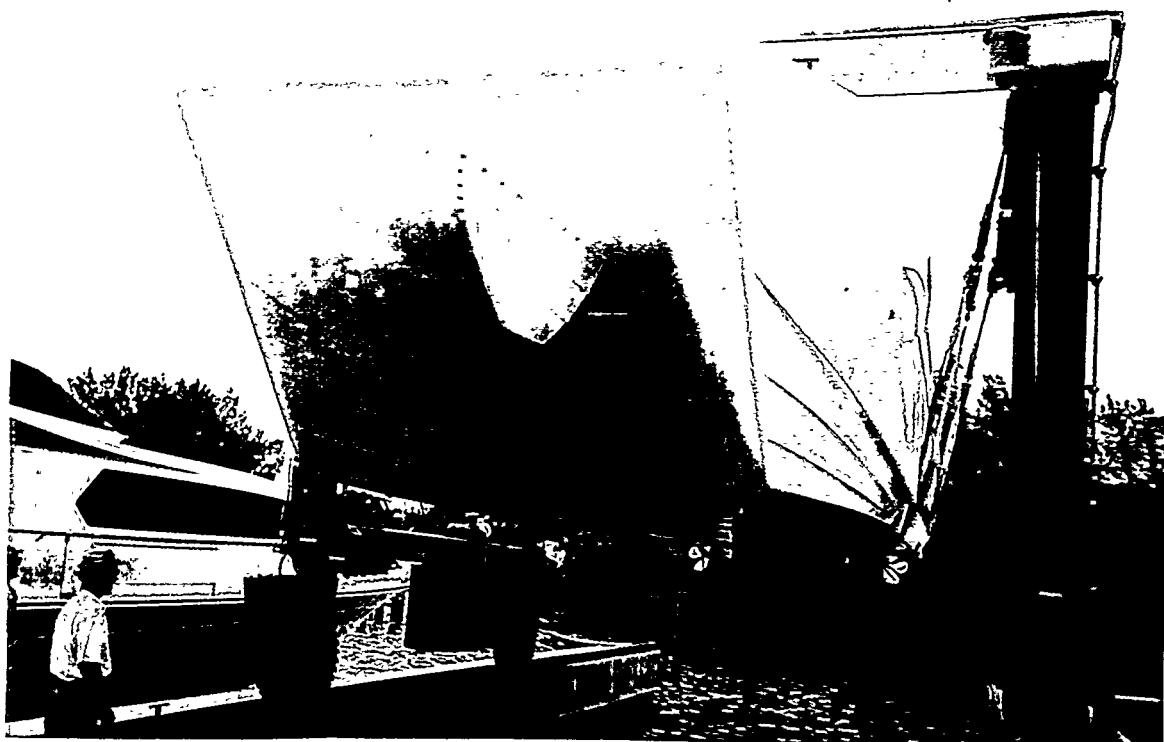


Figure 5 ~ 65 Foot SEACOASTER at Launch.

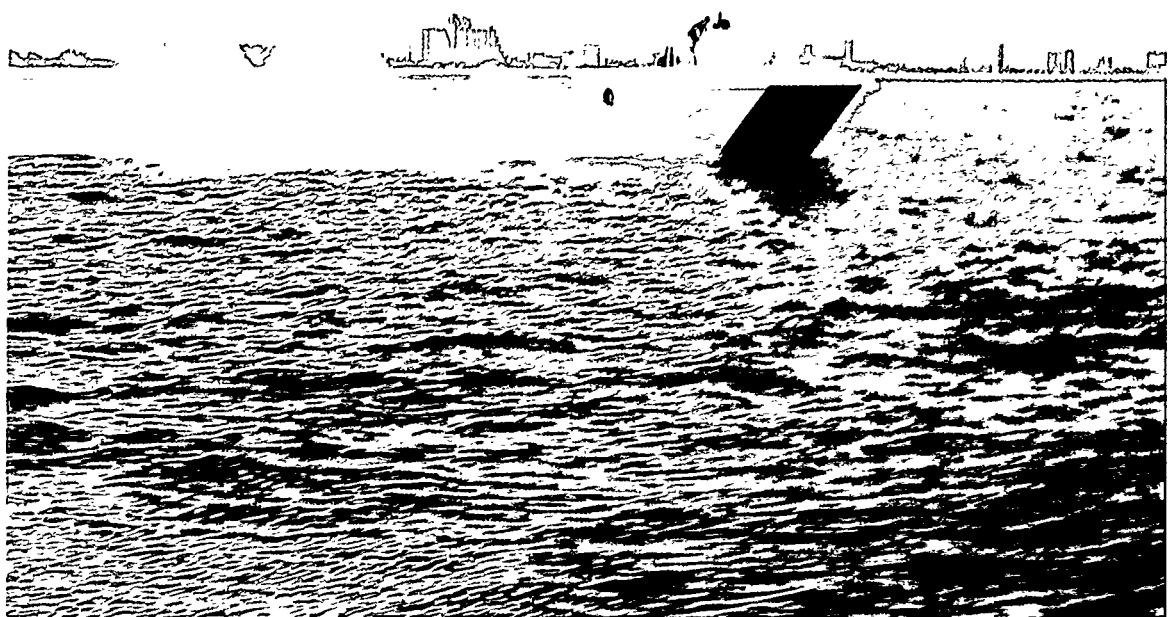


Figure 6 ~ 65 Foot SEACOASTER first Seatrial.

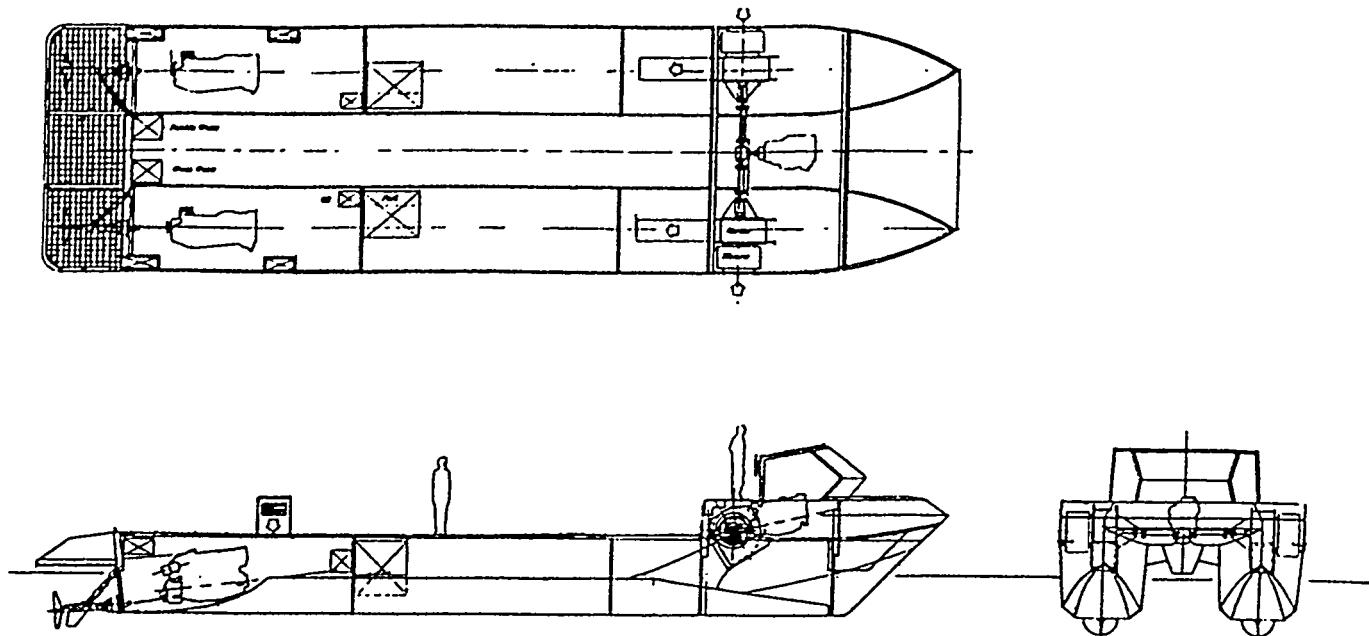


Figure 7 ~ 65 Foot SEACOASTER Machinery Arrangements.

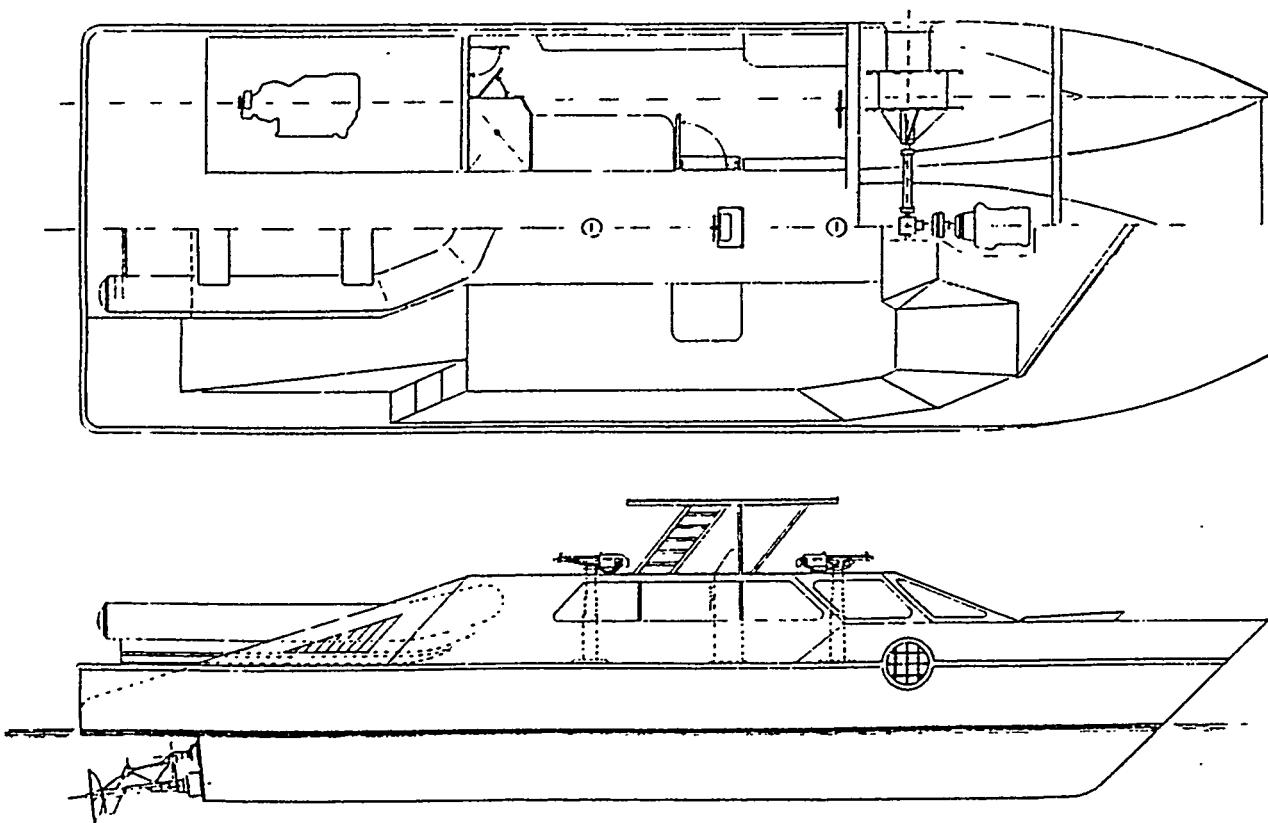


Figure 8 ~ 52 Foot SEACOASTER 60 Knot Patrol Boat.

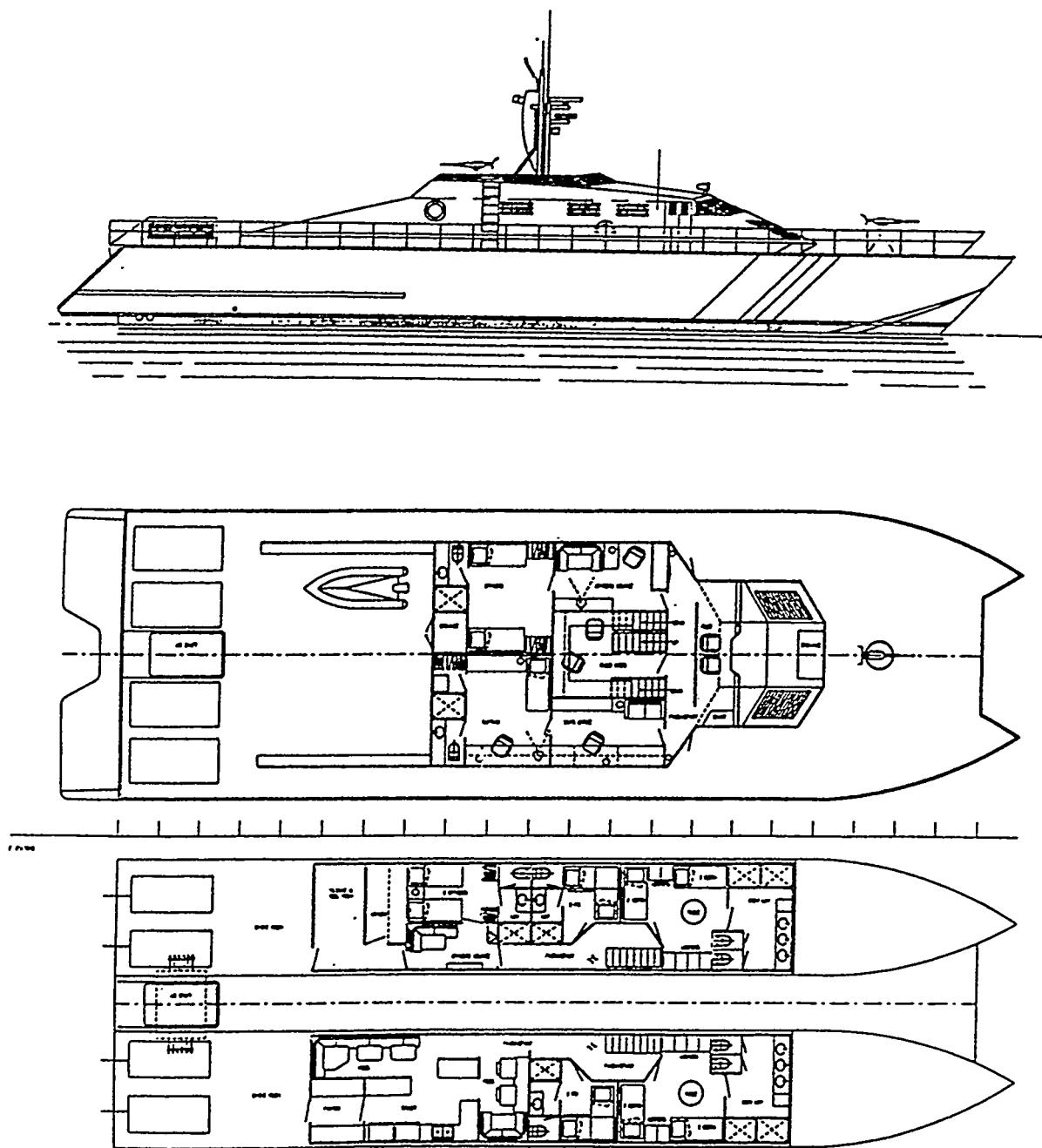
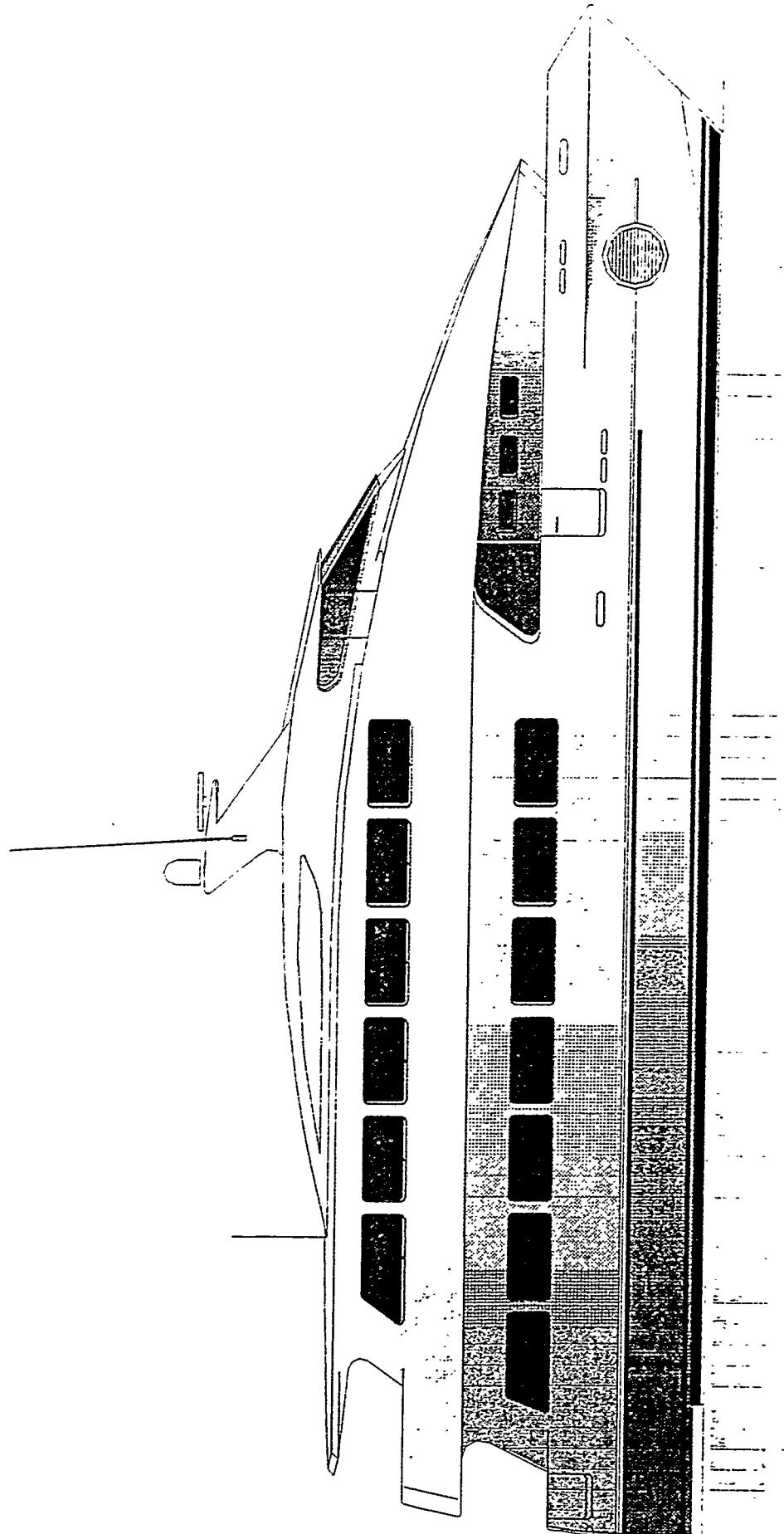


Figure 9 ~ 110 Foot SEACOASTER 60 Knot Patrol Boat.



SeaCoaster

HIGH SPEED PASSENGER FERRY

Figure 10



SEACOASTER: the affordable and practical high speed craft

The new internationally patented SEACOASTER advanced marine vehicle, developed by Air Ride Craft, Inc., Miami, is a true breakthrough in marine craft technology yet it is affordable and practical. SEACOASTER offers the simplicity of a catamaran combined with the tremendous efficiencies of the Surface Effect Ship (SES). Each sidehull has a very fine entry wave slicing bow and a blower pressurized air cushion recess in its underside. The recess enlarges going aft from the bow for maximum efficiency and optimum ride qualities. The blower pressurized air cushions support 85 to 90 percent of displacement thereby dramatically reducing wetted area and resistance. There are no flexible seals. There is no air cushion between the sidehulls. Therefore, SEACOASTER has the appearance of an attractively designed catamaran from above the waterline.

The customer enticing appearance of a typical SEACOASTER is evident in Figure 1 that shows a 40-50 knot 33 meter (108 foot) ferry. That hull can also act as a 149 passenger offshore gaming boat where it offers high speed to get offshore quickly and extreme stability when on station with its blowers off and the sidehull recesses filled with water. One of these 33 meter ferry/gaming boats is now under construction for a customer who wants it as an offshore gaming boat in season with the ability to easily convert it to a high speed ferry at other times. Also, a 19.8 meter (65 foot) 45 knot SEACOASTER is available for demonstrations. After demonstrations it will be finished as a 99 passenger ferry.

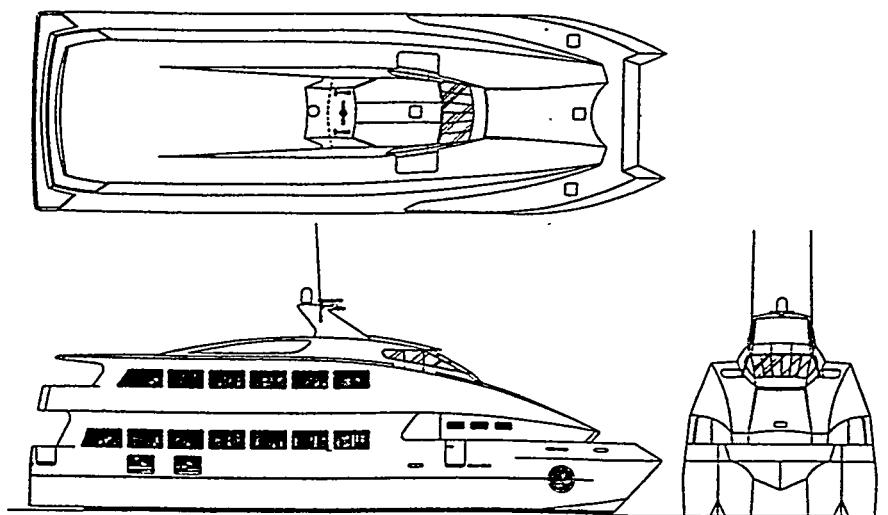


Figure 1~33 meter SEACOASTER ferry/offshore gaming boat.

Appendix A

Figure 2 depicts an underwater view of SEACOASTER's hull and Figure 3 shows a typical midship section. Both views are with the blowers operating and the air cushions pressurized. Note the small amount of wetted area which is a major reason for SEACOASTER's high efficiencies. The unique patented design of SEACOASTER's sidehull recess stern seals results in tremendous stability both when underway or at rest. These recess stern seals, as well as everything else bounding the air cushion recesses, are simply part of hull structure. Again and importantly, there are no flexible seals of any kind.

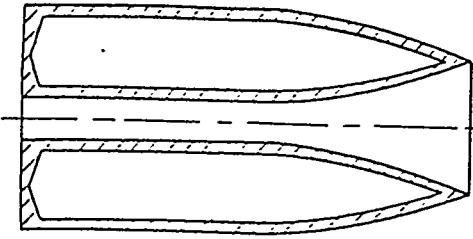


Figure 2~Underwater View.

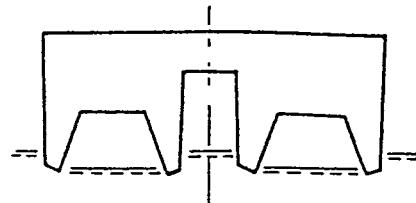


Figure 3~Midship Section.

Larger SEACOASTERs have been designed with the realization that efficiencies increase further with size increase. A 60 knot 100 meter (328 foot) SEACOASTER vehicle and passenger ferry is presented in Figure 4. An advantage of SEACOASTER when docking is that it can raise and lower dockside by simply altering blower power settings. This can be as much as a meter (3.28 feet) or more in the case of a 100 meter ferry.

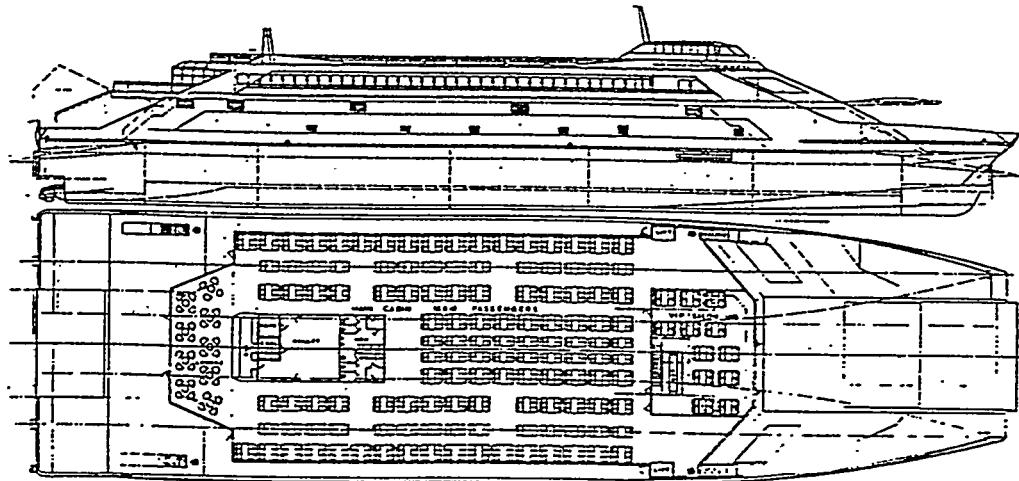


Figure 4~100 meter 50-60 knot SEACOASTER ferry.

If you have serious interest in a high speed marine craft that can carry heavy loads, requires 40 percent less fuel and engine size than monohulls or catamarans, is extremely seaworthy, and is very competitively priced; please visit our facility in Ft. Lauderdale. We would be pleased to show you progress on the 33 meter (108 foot) hull and to take you for a demonstration ride on the 19.8 meter (65 foot) SEACOASTER. Please contact: Don Burg, President, Air Ride Craft, Inc., 15840 S.W. 84 Avenue, Miami, FL 33157 USA Tel: (305) 233-4306 ~ Fax: (305) 233-1339 ~ Email: Seacoaster@aol.com.

End.