

Building a Multipurpose Boat for Adriatic

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Abstract - This report presents the idea for revival of boat building on Croatian Adriatic coast supported by governmental funds. The scope of the contract among the Ministry, Faculty and cooperating shipyard Punat on island of Krk, the main particulars of the boat and the appropriately illustrated design and production of the boat are part of this report.

Keywords - Boat building, Boat design, Governmentally supported project, Croatia

1. INTRODUCTION

The Ministry of science, education and sports decided to add impetus to the revival of shipbuilding on Adriatic coast and islands. Therefore one of the governmentally supported projects contracted in the year 2003. was the building of a prototype of a multipurpose boat of generic hull form. The background motivation was found in the fact that boat building on the Adriatic coast has a very long tradition inheriting different types of specific old-time boats. Numerous very specific and well known boats pertinent to local conditions have been developing through centuries. During the last decade or so, many activities, including boat building badly suffered due to the war on the territory of the Republic of Croatia. The idea of revival of the boat building combining modern international trends and local tradition, supported by experience in maritime research and new technologies, was ignited by the ever increasing interest towards nautical tourism on the Croatian part of the Adriatic coast and islands.

2. THE SCOPE OF THE CONTRACT

The contract obligates the involved parties to participate on a joint project including conception, research, development, design, production and marketing of a boat whose maritime characteristics are particularly suited to Adriatic Sea and service conditions in the Croatian coastal region. The principal points in the contract were the following:

- Development of a conceptual design of a multipurpose boat for personal, heavy duty works and public services, using former broad experience on similar vessels.
- Design of a family of boats with same hull and three virtual digital models in order to facilitate design, production and marketing.
- Establishment of a common platform for a generic boat hull using earlier research and experience in towing tanks and on sea.

- Building and testing of a prototype boat in shipyard Punat on island of Krk.
- Supporting the builder in his international marketing efforts of the new boat.
- Supporting the builder for implementation of a series and modular production in his yard with his own skills and workmanship.

3. DESIGN FEATURES

The general arrangement plan of the boat is shown in Figure 1. The arrangement is based upon a number of considerations including aesthetics appeal, operational requirements, habitability and equipment maintainability.

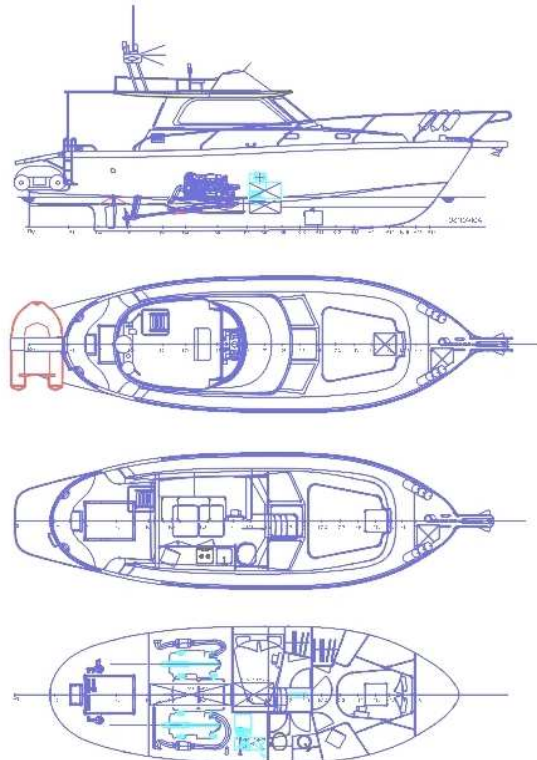


Fig. 1. General arrangement plan of the boat

The maximum speed of the craft is planned 24 knots and the range 300 Nm at 21 knots of cruising speed providing good seakeeping and maneuverability. The GRP hull is divided into three watertight compartments: fore peak, crew compartment and machinery compartment.

The hull is of the round bilge form with a fine forward entry, flat run aft and oversized innovative integral swim platform. The hull is moulded using a combination of chopped strand matt and woven rovings and stiffened by a system of girders, frames and stringers. The cockpit is integrally moulded as a part of deck and is watertight and self draining. The lids to the seat/lockers are laid with teak and the sole is fitted with a teak grating. A GRP weathertight cockpit hatch gives access to the stowage space beneath. Machinery room and crew watertight compartment are equipped with an independent electric bilge pump operated by level switch. A hand operated diaphragm pump is fitted and connected to a valve chest with suction points to each bilge compartment.

The wheelhouse/saloon contains the helm position to starboard with full engine controls and instrumentation and a crew seat to port. Situated aft of the helm/crew positions is a dining table and seating to port and the galley to starboard. Windows to the wheelhouse/saloon are fitted with temper glass and entrance to wheelhouse/saloon is through aft sliding door, see front and end view on Fig. 2.

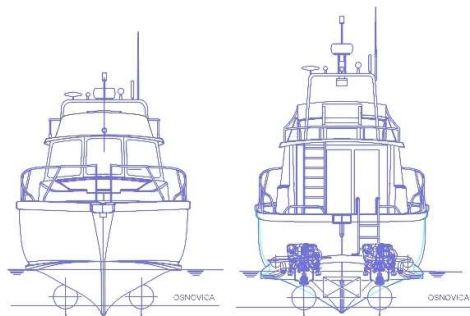


Fig. 2. Front and aft view of the boat

Wood finished are in classic cherry, cream leather upholstery and Cerock galley worktop. Deck equipment includes hydraulic passerelle with remote control, reversible electric anchor windlass, 16 kg anchor with 40 m chain, foredeck sun cushions and bimini top to flybridge. Flanking the steps down from the saloon are fore and port cabin and starboard toilet. Cabins are equipped with double berths, shelves and lockers. Skylight/escape hatches are fitted to the fore-cabin.

The machinery compartment houses main propulsion engines consisting of two high speed marine diesels each developing appropriate power for the pertinent boat usage at approximately 2600 rpm coupled via flexible couplings to the reverse reduction gearbox. The exhaust system is of the wet type with GRP mufflers and transom outlets. The

steering gear in wheelhouse and open bridge are hand hydraulic. The vessel is fitted with a soil holding tank to the toilet with facilities for pumping out to either shore or overboard.

The main boats system is 12 volt DC supplied by four heavy duty lead acid batteries arranged in two banks of two batteries each. A parallel switch is fitted for emergency engine starting. The 12 volt DC system is supplied via a distribution panel fitted with DC rated circuit breakers. The vessel is wired for AC shore supply and includes a 40A battery charger. The boat is fitted with marine quality light fittings including overhead lights throughout, reading lights to the berths in side and aft cabins, bulkhead lights to the engine compartment and external lights to the cockpit and open bridge. The main particulars of the boat are listed in Table 1.

Table 1. Main particulars of the boat

Length, over all	11,95 m
Length, waterline	10,25 m
Breadth	3,50 m
Draft	0,87 m
Depth	2,28
Material	GRP
Passenger	10
Cabins	2
Power	2 x 315 KS
Electric systems	12 V DC / 220 V AC
Speed, max	27 knots
Speed, cruising	22 knots
Fuel tanks	650 l
Holding tank	88 l
Water	215 l

4. DESIGN AND PRODUCTION

Since the contract was signed by all parties, intensive work was carried out. The activities performed with respect to research, development and design are listed and illustrated in the sequel.

Conceptual design development in several steps accounting for relevant expert suggestions, Fig.3.



Fig. 3. Conceptual design

Comparison with recent international trends detected on international fairs, Fig. 4.



Fig.4. Recent trends in boat design

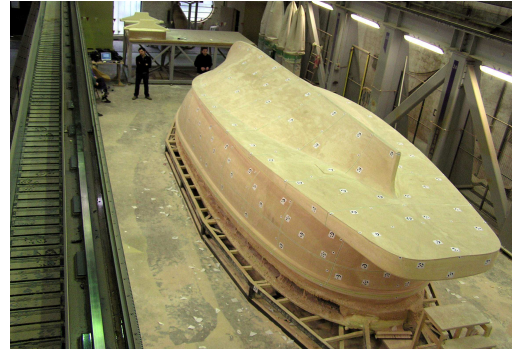


Fig.8. Full scale physical model

Completion of technical documentation, Fig. 1. and 2, followed by the marketing presentation virtual 3D and animated model. Fig. 5.



Fig. 5. Marketing presentation model

Photogrammetry testing of the hull form indicates high accuracy in model preparation, Fig. 9.

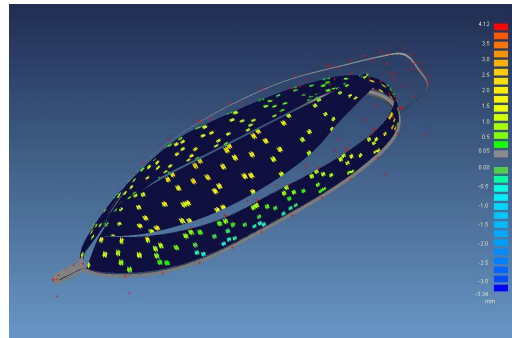


Fig. 9. Photogrammetry checking of the shape

Completion of the digital model for CNC model preparation, Fig. 6.



Fig. 6. Production digital model

Significant time was spent in survey and completion of the technical documentation together with the shipyards's technical staff, as well as in purchasing of outfit, equipment and engines.

The activities with respect to production included first the transportation of the full scale model to the shipyard and finishing of the model, Fig. 10.

The preparation for production involves first the preparation of a 1:10 test model, Fig 7.

Completion of the full scale model on CNC equipment was the next step, Fig 8.

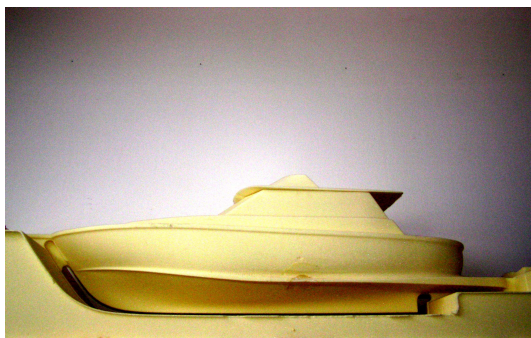


Fig.7. Physical model in scale 1:10

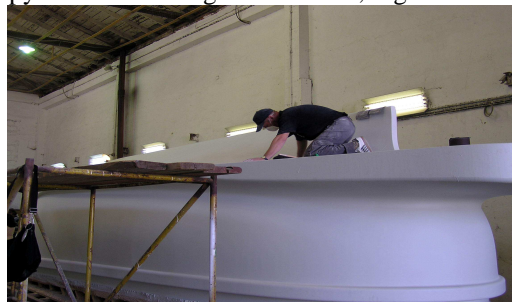


Fig. 10. Finishing of the model

Completion of the moulds were done in shipyard Punat using their fabrication facilities, Fig. 11.



Fig. 11. Completion of the moulds

Production of the prototype structural elements in Punat, Fig. 12. and fitting the parts together, Fig. 13.



Fig. 12. Production of the prototype hull



Fig. 13. Hull and deck prototype

The design, virtual presentation and production documentation for the boat's interior arrangement is carefully revised, Fig. 14.



Fig. 14. Interior design

Virtual models provide useful guidelines for interior arrangement, Fig. 15.



Fig. 15. Virtual view forward from the cabin

The works to be performed to completion of the project are the following:

- Production of the interior elements
- Final outfitting of the boat
- Engine room, electrical and other systems mounting and testing
- Trials in harbour and sea conditions
- International certificate *CE* achievement
- Marketing, advertising, participation on domestic and international fairs
- Preparation for series production

5. CONCLUSION

The idea of governmental support of complex project involving investigation pertinent to academic community as well as research institutes, together with the cooperating production industrial companies, may be a successful model of development at present and in the future. Such an integrating model may provide a solid background for revival of industrial activities in earlier known industrial sites, wherever exists traditional and production capacities. During the two years of project duration vivid interest and enthusiasm were encountered in achieving a higher level of production practice and standards in employment of new technologies available in addition to former tradition in boat building.

ACKNOWLEDGEMENT

The authors wish to acknowledge the support of the Ministry for Science, Education and sports. The works on 1:10 and full scale models were performed on CNC facilities by Seaway, Bled - Slovenia.

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