

Cruise Missile Bill of Materials

CONSTRUCTION METHOD: The hull is a "one-off" composite structure built using vacuum bag methods over a solid surface male mold. The upper limit of the hull mold is to be the sheer line. The inner skin of the sandwich laminate is hand-laid over the male mold surface and the core vacuum bagged to this. The outer laminate is then hand-laid over the core. The deck is a separate molding which can be built with either female or male mold methods as long as the core is vacuum bagged to the initial skin. The deck mold outer lower limit is the sheer line with borders formed by the coaming and bulkhead at Ring Frame 'C'. Other components (cockpit sole, ring frames, internal structure, interior joinery, etc.) are installed as individual components that can often be prefabricated outside the boat. It is critical to assure maximum glass fiber content and minimum residual resin content throughout all laminating procedures. Air entrapment must be kept to a minimum. A minimum of fairing filler is to be used on final surfaces. Install all longitudinal internal members and laminates before those going transversely. All areas where a subsequent bond will be located (surfaces for secondary bonding) are to be protected with "peel-ply" material. Surfaces where secondary bonds are made must be carefully prepared, clean, and not smooth.

MATERIALS - RESINS: All resins should be marine-quality vinylester or epoxy used carefully per the instructions of the manufacturer. Over-catalyzation must be avoided to prevent shrinkage and distortion.

MATERIALS - FIBERGLASS: All fiberglass (abbreviated as FRP once combined with resin) is to be non-woven type except for fiberglass cloth and for mat/woven roving used on the transom. All fiberglass materials are preferably "S"-grade; "E"-grade is acceptable where "S"-grade may not be available for a given reinforcement. All materials must have sizing compatible with the resin to be used. Materials are defined as follows: Unidirectional (UDR) material has all strands running in one direction or lengthwise. Biaxial ("biax") material has fibers running both lengthwise and crosswise. Double-bias ("DB") material has fibers oriented on the bias or diagonally both ways. Proper application and orientation of fiber direction is important to the integrity, strength, and durability of the vessel.

MATERIALS - CORES: All structural cores are to be rigid PVC (polyvinyl chloride) of marine grade in the approximate density specified per cubic foot - never use a lighter density. Certain types of polyurethane core can be used for non-structural joinery use such as "Clark Foam". Other types of foam core are not recommended, and friable types must be avoided. Contour-type foam is

recommended over sheet type. If sheet type foam is used, bleed holes must be punctured through the foam at close intervals for proper vacuum bag bonding.

MATERIALS - FILLERS: Fillers can be proprietary (such as those provided by companies manufacturing the foam), or made from microsphere syntactics mixed with resin. Such fillers are used to bed cores to underlying laminates, for fairing purposes, etc. Fillers are to be used at all inside corners and similar areas as required to form fillets and/or canted areas to assure that a subsequent laminate will conform to the surface, and not lift and entrap air.

FIBERGLASS MATERIALS ESTIMATES: Figures include approximations of structural reinforcing materials required to build hull. Materials for non-structural joinery members not included due to possible variables. Options resulting from powering variations are not considered.

- PVC FOAM:
 - 12 LB DENSITY - 3/4" THICK = 75 SQ FT
 - 5 LB DENSITY - 1/2" THICK = 550 SQ FT
 - 4 LB DENSITY - 1/2" THICK = 400 SQ FT
 - 3 LB DENSITY - THICKNESS OPT. = 25 CU FT
- BIAX FABRIC:
 - 10 OZ PER SQ YD = 350 SQ YD
 - 12 OZ PER SQ YD = 50 SQ YD
 - 18 OZ PER SQ YD = 50 SQ YD
- DOUBLE BIAS FABRIC:
 - 12 OZ PER SQ YD = 25 SQ YD
 - 24 OZ PER SQ YD = 20 SQ YD
- UNIDIRECTIONAL FABRIC:
 - 5 OZ PER SQ YD = 100 LIN FT 12" WIDE
- RESIN:
 - VINYLESTER OR EPOXY LAMINATING RESIN = 800 LBS