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Collapsible Boat

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SENIOR DESIGN PROJECTS
Professor Donald J. McAleece
SPRING 1984

COLLAPSIBLE BOAT

by

STEVEN D. JODER

THE COLLAPSIBLE BOAT

AN IET 497

SENIOR PROJECT REPORT

Prepared for

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by

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April 24, 1984

Descriptive Abstract

Presented in this report are the advantages of the collapsible boat and the design of the collapsible boat. Explained in this report are a technical description, design criteria, technical assurance with CAD elements, prototype fabrication, testing procedures, prototype cost, and estimated production cost.

Informative Abstract

The collapsible boat is the sportsman's answer to the four problems of portaging, transporting by vehicle, storing, and navigating primitive waters. The boat is small, light, and bouyant enough to support one person with gear. The collapsible boat has a full size and a collapsed position. The boat measures 11.25 X 39.25 X 72.25 in the full size position and 23 X 39.25 X 43 in the collapsed position. The collapsible boat is easy to change from full size to collapsed position or from collapsed to full size position. The collapsible boat has four major assemblies: fore section, hinge assembly, aft section, and seat assembly. The fore section is constructed from .050 inch 5052 H32 aluminum sheeting and has dimensions of 11.25 X 36 X 39 inches. The hinge assembly is constructed from 2.5 X 34 inches continuous hinge and connects the fore section to the aft section. The aft section is constructed from .050 inch 5052 H32 aluminum sheeting and has dimensions of 11.25 X 36 X 39 inches. The seat assembly has overall dimensions of 15 X 19 X 25 inches and consists of a folding seat, swival, and frame assembly. The collapsible boat design criteria are: 1) The boat must be able to support 300 pounds and have at least five inches of freeboard; 2) The boat must weigh less than ninety pounds; 3) The collapsed size of the boat must not exceed 40 X 44 X 24 inches (without wheels); 4) The full size dimensions must be a minimum of 72 X 36 X 6 inches to a maximum of 90 X 48 X 12 inches (without seat). To determine adequate design assurance, calculations were performed, with the aid of a computer program, to determine major component sizes and to ensure safe performance. The following results were obtained from the calculations: the locking pin diameter to be 3/8 inch; locking strap thickness to be 1/4 inch; locking strap bolt diameter to be 3/8 inch; continuous hinge size to be 2.5 X 34 inches with a 3/16 inch pin; bouyancy is 970.3 pounds; boat weight is 82 pounds; metacenter is positive; maximum boat speed is 3.81 miles per hour; pop rivet size for the continuous hinge is 3/16 inch diameter; and pop rivet size for the seat locator assembly is 1/8 inch diameter. A full scale prototype collapsible boat was constructed with the use of four facilities and six types of equipment. The boat was constructed from twenty-five types of materials. After the prototype was constructed, it was tested for compliance with design criteria. The boat successfully passed all tests. The results were: The boat supported 400 pounds and had five inches of freeboard; The boat weighed 82 pounds; The collapsed size was 23 X 39.5 X 43 inches; and full size was 11.13 X 39.5 X 72.25 inches. The prototype cost was \$266.30 in materials and \$150 in labor. Estimated production cost per boat for 100, 500, and 1,000 boats are \$145.32, \$133.91, and \$127.77 respectively.

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