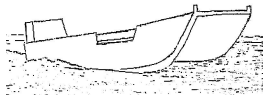

MEMBER
ABYC
Setting Standards for Safer Boating

Stability & Flotation Seminar

General

The course will cover the following standards:

ABYC H-5	Boat Load Capacity (?)
ABYC H-8	Buoyancy in the Event of Swamping
CFR 183.53	Subpart F – Flotation Requirements for Inboard Boats, Inboard/Outdrive Boats, and Airboats
CFR 183.53	Subpart G – Flotation Requirements for Outboard Boats Rated for Engines of More than 2 Horsepower
CFR 183.53	Subpart H – Flotation Requirements for Outboard Boats Rated for Engines of 2 Horsepower or Less

At the end of this class students should be able to:

- Identify the parts of each standard that apply to a given boat,
- Specify the proper type and amount of flotation to be installed in a boat in order to meet the standards, and
- Specify a test procedure that confirms that a given boat meets the standards.

A secondary goal is for students to gain an understanding of the physics behind the standards so that they can apply the standards to new, unfamiliar vessels.

The class format will be a mixture of lectures, demonstrations, in-class “homework” on a team basis, and laboratory experiments. There will be an in-class examination at the end of the second day (?).

Detailed Syllabus

1. Hull Geometry
    - 1.1 Basics
        - 1.1.1 Terminology (e.g., Station, Buttock, Athwartship)
        - 1.1.2 Principle Dimensions (e.g., L, LOA, LBP, D, T)
        - 1.1.3 Ratios and Coefficients (e.g., L/B, CB, CP)
        - 1.1.4 Offset Tables
    - 1.2 Estimating Areas and Volumes
        - 1.2.1 Simpson's Rule Applied to Areas
        - 1.2.2 Simpson's Rule Applied to Volumes
    - 1.3 Taking Lines Off a Boat, Measuring Techniques
2. Physics
    - 2.1 Mass, Weight, Volume, Density, Specific Gravity
    - 2.2 Fluid Mechanics
        - 2.2.1 Water Pressure
        - 2.2.2 Flow Rates
3. Statics
    - 3.1 Balance of Forces and Moments
    - 3.2 Center of Gravity (LCG and VCG), Center of Buoyancy
    - 3.3 Static Stability, Roll and Pitch Metacenters (GMt, GMl)
    - 3.4 Inclining Test to Find GMt
    - 3.5 Free Surface Effect (topping off tanks)
    - 3.6 Naval Architecture Curves of Form
4. Flotation
    - 4.1 Types of Flotation Material, Advantages and Disadvantages
    - 4.2 Positioning Flotation Material
        - 4.2.1 Keeping a Boat on the Surface
        - 4.2.2 Keeping a Boat Upright
5. Test Procedures

In-Class Homework and Laboratory Experiments

The following is a rough cut at some in-class assignments and demos.

1. Use Simpson's Rule to calculate Sectional Area from Offsets
2. Use Simpson's Rule to calculate Volume and Displacement from Offsets
3. Calculate Center of Gravity (LCG) of boat, machinery and gear
4. Calculate Center of Buoyancy of boat at given trim and draft
5. DEMO/LAB: Compare calculated displacement to displacement of model boat
6. DEMO/LAB: Find LCG of model boat using pair of slings and postage scales
7. DEMO/LAB: Compare water level in basin with model boat with heavy weight as cargo versus water level with model boat floating and heavy weight at bottom of basin.
8. DEMO/LAB: Flotation of equal volumes of common boat building materials: Douglas fir, aluminum, E-Glass, balsa, various types of flotation
9. DEMO/LAB: Inclining Test on model boat to determine transverse stability
    a. DEMO/LAB: Inclining Test on model boat containing tank with large free surface
    b. DEMO/LAB: Inclining Test on model boat containing tank with baffles (small free surface)