

Naval Architectural Engineering Examination 98-Nav-A1

National Exam December 2002

98-Nav-Fundamentals of Naval Architecture

Duration 3 hours

NOTES

1- If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper a clear statement of any assumptions made.

2- The format of the examination is "OPEN BOOK" exam any calculator is permitted.

3- Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.

4- All questions are of equal value.

EXAM QUESTIONS FOR
98-Nav-A1, Fundamentals of Naval Architecture

PLEASE ANSWER 5 OF THE 6 QUESTIONS BELOW

1- Figure 1 and Figure 2 show the ship geometry and the curves of form for that ship. If the draft marks are 6.5 meter forward and 7.5 meter at aft and the draft marks are located on the perpendiculars calculate:

- 1- The displacement of the ship in salt and fresh water.
- 2- The location of the center of buoyancy from keel and the transverse meta center.
- 3- Tonnes per cm immersion.
- 4- Location of the center of floatation.
- 5- Moment to change trim by 1 cm.

2- The cross curves of stability for a ship are given on Figure 3. Obtain the general stability curve for this ship at a displacement of 15 000 tons.

If the value of KG is reduced to 5.8 meter, plot the resulting general stability curve. Obtain the value of GM.

If the center of gravity is not on the line of symmetry but off centered by 0.5 meter to the port side, plot the general stability curve for this condition. What is the resulting GM now.

3- For the ship in problem 1 with the same forward and aft drafts, a weight of 50 tons is added at Station 3 and on the center line. Calculate the resulting

Displacement

Forward and aft draft mark readings.

4- By an inclining experiment, the ship in question 1 is observed to have a metacentric height of 3 feet. While sailing, the ship is damaged below the waterline and floods a compartment 25 feet in length and 14 feet athwart ship with 65 tons of salt water in free communication with sea. The center of gravity of water is 14 feet above the keel and 8 feet starboard of the center line. Calculate :

KM, KG, as a result of weight alone of water.

Free surface effect

Free communication effect.

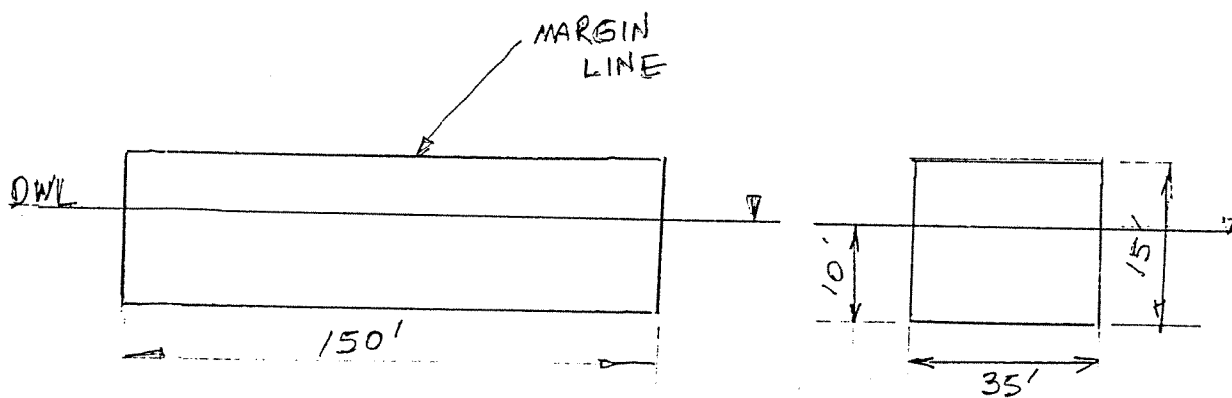
Final metacentric height after flooding

List due to flooding.

5- The ship in problem 1 runs aground on an even keel while sailing at the design waterline. The point of contact is on ship's centerline and at midships. The inclining experiment before leaving the port placed her center of gravity at 24 feet above the keel. The sand bar is located 10 feet below the water surface at low tide. With the tide ebbing, calculate if she will become unstable at low tide conditions.

What kind of measures can you suggest to the captain of the ship, to save the ship.

6- Calculate and plot the floodable length curve for the rectangular barge shown below. Assume a permeability of 0.75 throughout. Explain the methodology you are using. You may calculate a limited number (2-3) to plot the floodable length curve.



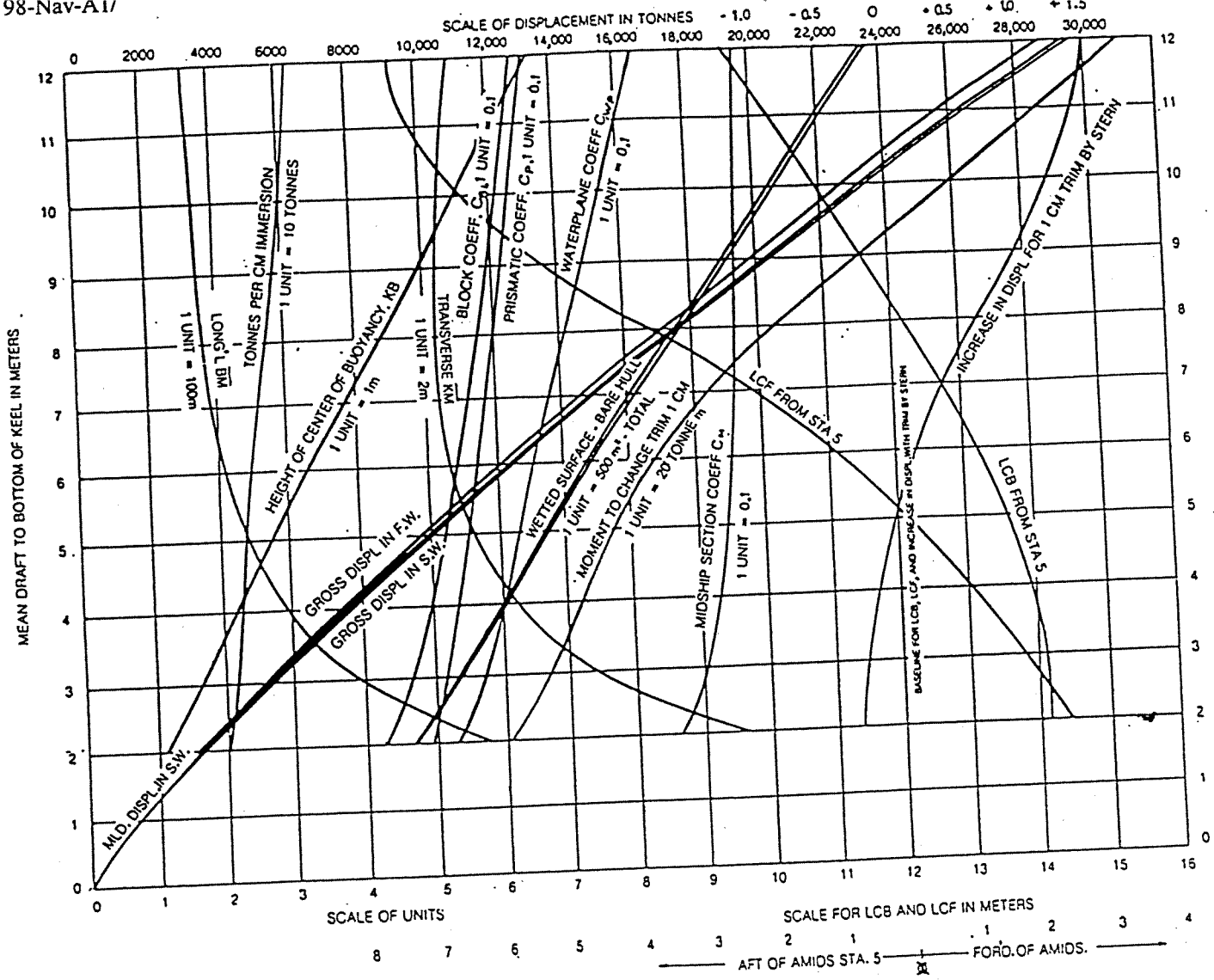


Figure 2

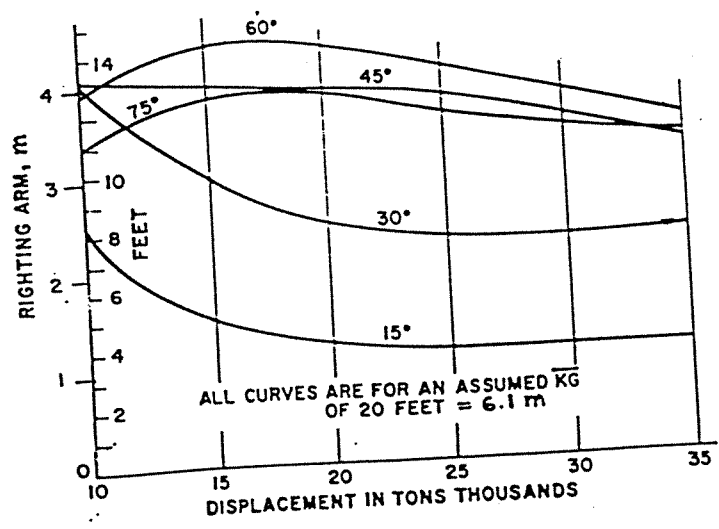


Figure 3

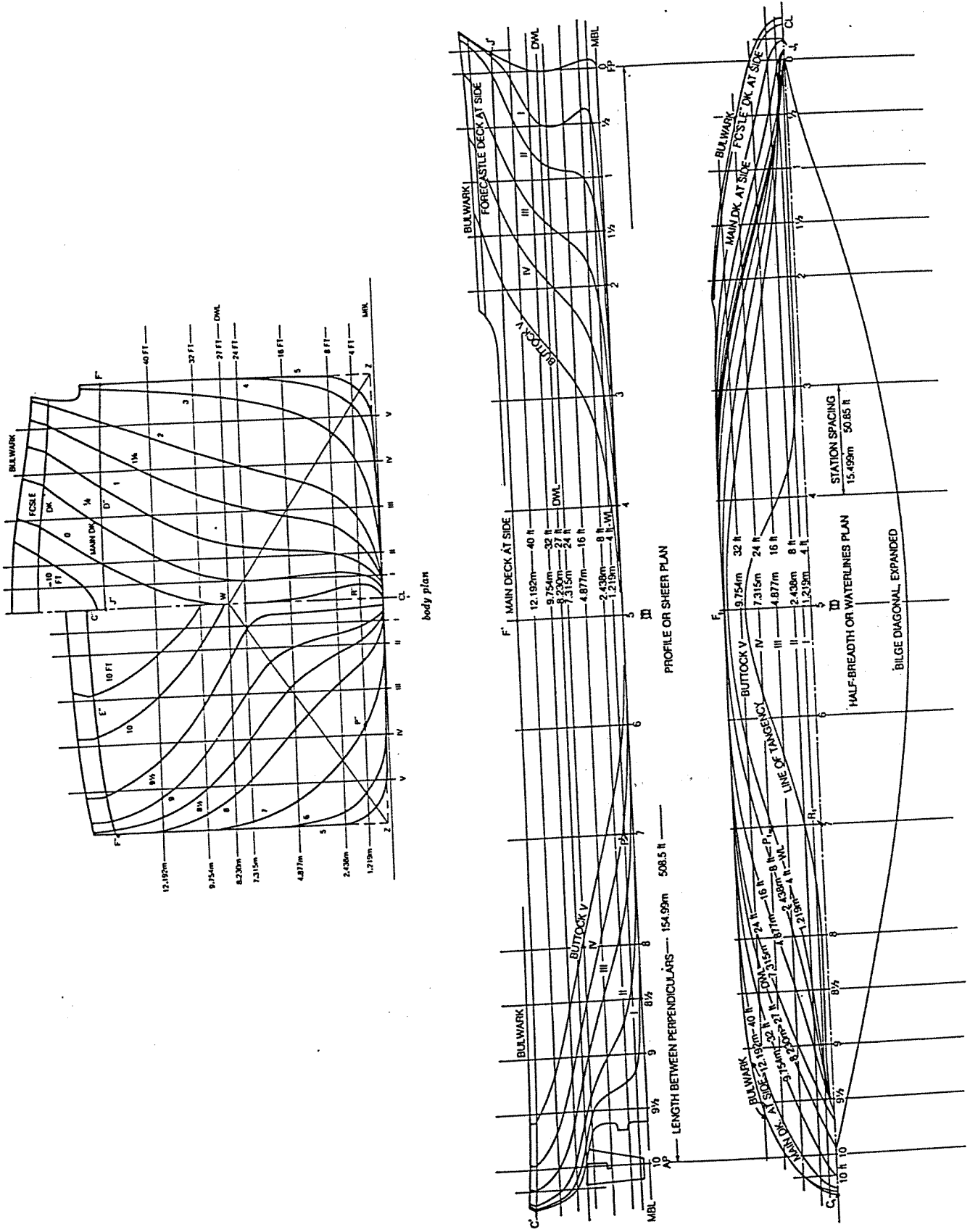


Fig. 1 Lines drawing