LAB #8

PROPELLERS

Instructions

1. This lab is conducted in the Hydromechanics Lab on the ground floor of Rickover Hall.

2. Prior to arriving in the Hydro Lab, read through the lab procedure so that you are familiar with the steps necessary to complete the lab.

3. Bring this handout and a calculator to the lab.

4. The lab is to be performed as a class. Your instructor will provide submission instructions for the completed lab.

5. Follow the stages of the lab in consecutive order. The lab follows a logical thought pattern and jumping ahead without completing the intervening theory questions will limit your understanding of the concepts covered.

6. For full credit, all work must be shown on the lab. Show generalized equations, substitution of numbers, units, and final answers.

7. Wear hearing protection (provided by the lab staff) while the water tunnel is in operation.

Student Information:

Name(s): ______________________________________________________

Section: __________

Date: __________

Note: This lab does not have a Pre-Lab.
Part 1: Propeller Description

Propeller Nomenclature

1. Label all of the following propeller parts on each of the two views provided in Figure 1. Only one blade has been drawn for clarity.

<table>
<thead>
<tr>
<th>Propeller Hub</th>
<th>Blade Root</th>
<th>Blade Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing Edge (TE)</td>
<td>Leading Edge (LE)</td>
<td>Propeller Radius</td>
</tr>
</tbody>
</table>

Figure 1  Stbd and Stern Views of a Propeller Blade

2. What is meant by propeller pitch? ___________________________________________

________________________________________________________________________

3. List two ways pitch can be measured.
   a. ________________________________________________________________
   b. ________________________________________________________________

3. Why are propellers twisted from hub to tip? ___________________________________

________________________________________________________________________

4. If a racing boat and a tug boat had the same powertrain, which would need more pitch in the propeller? __________________________________________

________________________________________________________________________
5. What is meant by a controllable pitch propeller (CPP)?

______________________________________________________________________

6. What advantage does CPP have over a fixed pitch propeller? (consider the whole drive train in your answer)

______________________________________________________________

______________________________________________________________________

7. Considering a skewed propeller:
   a. What are its advantages?

      _____________________________________________

      ___________________________________________________________________

   b. What are its disadvantages?

      _____________________________________________

      ___________________________________________________________________

8. Sketch a highly skewed propeller and a propeller with no skew. **Ensure you show the direction of propeller rotation.**

9. Name 2 advantages provided by placing a propeller in a ‘nozzle’?
   Advantage 1: ______________________________________________________
   Advantage 2: ______________________________________________________

10. What type of ships are often fitted with nozzles?
    ________________________________________________________________
Part 2: Circulating Water Channel Questions

Cavitation

11. Sketch the cavitation pattern caused when blade tip cavitation is created.

12. Describe two problems created by cavitation.
   Problem 1: ______________________________________________________________
   Problem 2: ______________________________________________________________

13. What can the ship driver do to prevent the cavitation?
   ______________________________________________________________________
   ______________________________________________________________________

14. One type of cavitation could not be demonstrated in the circulating water channel.
   a. Name this type of cavitation. _________________________________________
   b. What is it caused by? _______________________________________________
   c. How can it be prevented? ____________________________________________

Ventilation

15. What is ventilation? ______________________________________________________
    ______________________________________________________________________

16. Give two ship conditions that could cause its propeller to ventilate.
    Condition 1: __________________________________________________________
    Condition 2: __________________________________________________________