

EM2007 Errata – Instructor’s Manual

26 July 2007

Replace referenced paragraphs and homework questions with the following:

Chapter 1
Slides 25-26

<i>Control Units</i>	Control the direction and movement of the boat <ul style="list-style-type: none">• Rudder – used by sailboats and boats with inboard engines• Engine steering mechanism – used with outboards, I/Os, and jet drives.	<i>Slides 25 - 26</i>
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Chapter 1
Homework Question 4

4. The bore of an engine is the:
- a. length in inches of the stroke.
 - b. taper of the cylinder bore.
 - c. **diameter of the cylinder bore.**
 - d. flange area of the intake manifold.

Chapter 1
Homework Question 9

9. The compression of air in a modern four-stroke cycle diesel engine causes:
- a. the temperature to decrease.
 - b. the pressure to decrease.
 - c. air flow in the intake manifold.
 - d. **the air temperature in the cylinder to rise to approximately 1000° F.**

Chapter 1
Homework Question 10

10. The three basic methods of installing internal combustion engines to their drive systems are the:
- a. **outboard drive system, the stern drive system, and the inboard drive system.**
 - b. stern drive system, the inboard/outboard drive system, and the outboard drive system.
 - c. inboard drive system, the inboard/outboard drive system, and the jet drive system.
 - d. outboard drive system, the jet drive system, and the inboard drive system.
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Chapter 1
Homework Question 11

11. The outboard drive system is unique because it:
- a. can use a larger propeller than the inboard drive system.
 - b. is contained in one compact housing.**
 - c. can develop greater horsepower than the stern drive system.
 - d. is the only drive system with a lower unit.

Chapter 1
Homework Question 13

13. The stern drive system is unique in that:
- a. it is always powered by 2-stroke cycle engines.
 - b. it endows an inboard engine with the maneuverability of an outboard drive system.**
 - c. the engine is always mounted on the stern of the boat.
 - d. the power transmitting shaft never pierces the hull of the boat.

Chapter 1
Homework Question 14

14. Propeller size is determined by:
- a. diameter and engine rpm.
 - b. diameter and pitch.**
 - c. number of blades and pitch.
 - d. number of blades and diameter.

Chapter 1
Homework Question 15

15. Increasing a propeller's pitch will:
- a. increase the engine's rpm.
 - b. increase the boat's maneuverability.
 - c. decrease the engine's rpm.**
 - d. decrease the boat's maneuverability.

Chapter 2
Slide 4

PRESENTATION <i>Engine Components</i>	A compressed fuel/air mixture is ignited Burning mixture increases in temperature and pressure Expansion of gas is converted to linear piston motion Crank converts linear motion to rotary motion	<i>Slide 4</i> <i>This is repeated from chapter 1.</i>
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	<p>1. Engine Block</p> <ul style="list-style-type: none">• largest single component of an inboard spark ignition engine• principle purpose is to enclose the cylinders and provide support for the crankshaft• may be either Inline, Vee, or Opposed in design	<i>Slide 5</i>
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	<p>1. Characteristics of Oil</p> <ul style="list-style-type: none">• Viscosity and Detergency<ul style="list-style-type: none">○ viscosity is the oil's resistance to flow○ changes with temperature○ SAE numbers: the lower the number, the thinner the oil• Detergency is the oil's ability to clean<ul style="list-style-type: none">○ change oil while warm to remove contaminants• Foaming – trapped air bubbles in the oil<ul style="list-style-type: none">○ reduces lubrication effectiveness○ major cause is overfilling of crankcase	<i>Slides 33 – 34 Foaming due to overfilling is caused by the crankshaft dipping into the oil in the oil pan. This can sling oil up onto the cylinder walls (beneath the piston) resulting in burning and piston ring sticking. It can also cause air to enter the lubrication chain, which can collapse within the bearings and cause wear and overrevving of the engine.</i>
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<i>Cooling Systems</i>	<p>Properly Maintained, It is Generally Trouble-Free Principal Maintenance Includes:</p> <ul style="list-style-type: none">• maintaining circulating pumps in good operating condition• preventing corrosion• reducing the formation of scale in water jackets and heat exchangers• preventing leaks in the system	<i>Slide 8</i>
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Chapter 3
Slides 17-18

<i>Electrical and Starting System</i>	1. Batteries <ul style="list-style-type: none">• most common cause of failure is owner neglect• maintenance includes:<ul style="list-style-type: none">○ keeping terminals free of corrosion○ ensuring cables are tight○ cells are topped off with distilled water Discuss use of multimeter	<i>Slides 17 – 18</i> <i>With the multimeter, set it to read DC voltage, and then test the battery in an open-circuit condition. Don't use the current setting, as this will blow the fuse in the device.</i>
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Chapter 3
Slides 29-30

	1. Ignition System Problems <ul style="list-style-type: none">• indications<ul style="list-style-type: none">○ engine stops abruptly• check the coil wire (if your engine has a distributor ignition system)<ul style="list-style-type: none">○ is it loose at either distributor or coil end?○ check distributor cap for cracks○ check the rotor inside the distributor cap○ check the points – are they burned or pitted?• check spark plug wires<ul style="list-style-type: none">○ make sure wires are tight at both distributor and spark plugs• solid state ignition systems<ul style="list-style-type: none">○ normally have very few problems○ require a trained technician for service	<i>Slides 29 - 30</i>
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Chapter 4
Homework Question 1

1. The compression of air in a diesel engine causes the:
 - a. temperature to decrease.
 - b. exhaust valve to open.
 - c. temperature to rise.**
 - d. exhaust valve to close.
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Chapter 4
Homework Question 4

9. Diesel fuel injection systems can be divided into two basic systems, the:
- indirect and distributor pump systems.
 - direct and distributor pump systems.
 - indirect and direct injection systems.**
 - rail and unit injection systems.

Chapter 5
Slide 4

PRESENTATION <i>The Diesel Engine</i>	1. Routine Maintenance <ul style="list-style-type: none">Fuel systemPrimary filterSecondary filterBleeding the system	<i>Slide 4</i>
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Chapter 6
Slide 3

PRESENTATION <i>Drive Systems</i>	2. Reduction Gearing <ul style="list-style-type: none">Optimizes engine speed and propeller speedTypically 1.5:1, 1.9:1, 2.1:1, etc. Example <ul style="list-style-type: none">2.1:1 means engine is running at 2,000 rpm while propeller is turning at 1,000 rpmLower speed means higher torque	<i>Slide 3</i>
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Chapter 6
Homework Question 1

1. The device which allows the engine rpm to match the load of the propeller is the:
- flywheel.
 - distributor.
 - skeg.
 - reduction gear.**

Chapter 6
Homework Question 2

2. If an engine with a reduction ratio of 2:1 is running at 2000 rpm, at what speed does the propeller turn?
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- a. 4000 rpm.
 - b. 2000 rpm.
 - c. 1500 rpm.
 - d. 1000 rpm.**
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Chapter 6
Homework Question 7

7. As a general rule, the number of blades on a propeller:
- decreases as power and weight of a boat increase.
 - has no discernable effect on a boat's design.
 - increases as power and weight of a boat increase.**
 - is strictly a matter of personal preference.
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Chapter 7
Slides 11-12

<i>I/O Drive Systems</i>	3. I/O Characteristics <ul style="list-style-type: none">• Inboard engine• Outboard drive system• Generally, pierces the transom, not the hull	<i>Slides 11 – 12</i>
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Chapter 7
Homework Question 14

14. In an outboard mechanical shifting transmission the engagement between the clutch and forward or reverse gear results in:
- positive and smooth load transfer.
 - time lag between forward and reverse motion.
 - slippage or power loss in the transmission.
 - sudden shock and impact loads in the transmission.**
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Chapter 8
Slide 2

OBJECTIVE	Upon completion of this chapter, the student will have: <ul style="list-style-type: none">○ knowledge of throttle controls used to regulate the speed of the boat○ an understanding of transmission controls used to put the boat into motion○ an understanding of how the various instruments and alarms available at the helm are used to monitor performance of the engine and the various associated systems	<i>Slide 2</i>
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Chapter 8

Homework Question 2

2. The most basic throttle control on small boats is the _____ system:
- a. electrical
 - b. hydraulic
 - c. **lever and rod**
 - d. push-pull cable
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Chapter 8

Homework Question 12

12. Visual alarm signals should be mounted:
- a. near the throttle interlock switch.
 - b. away from the helm station.
 - c. **in the skipper's line of sight.**
 - d. next to the radio controls.
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Chapter 9

Homework Question 3

3. Steering gear stuffing boxes:
- a. are fixtures holding oil for lubrication of steering systems.
 - b. **require frequent inspection to check for leakage.**
 - c. are best to repack when the boat is in the water.
 - d. should be adjusted to prevent the packing from rubbing on the shaft.
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Chapter 10

Slides 5-6

	<p>4. Symptoms</p> <ul style="list-style-type: none">• Did it Sputter-Run-Sputter-Run-Quit?• Did it Gradually Lose Power?• Did it Stop Instantaneously?• Knowing Symptoms Can Assist in:<ul style="list-style-type: none">○ determining the cause of common problems○ helping you suggest realistic repairs to a mechanic	<p><i>Slides 5 – 6</i></p>
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	<p><i>It is Important to Maintain a Regular Lubrication Maintenance Schedule</i></p> <ul style="list-style-type: none">• Check engine oil before start of each engine operation• Check oil at every refueling• Change engine oil at regular intervals• recommended oil changes every 100 hours of operation or every three months• Refill with correct amount and type of oil• Replace the oil filter at every oil change	<i>Slide 13</i>
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<i>Diesel Engine</i>	<p>1. Fuel System Problems</p> <ul style="list-style-type: none">• greatest problem with diesels• usually clogged filters<ul style="list-style-type: none">○ change/clean/drain filters• air trapped in system will keep engine from operating<ul style="list-style-type: none">○ bleed air from the system when filters are changed• bacteria can grow in diesel fuel<ul style="list-style-type: none">○ fuel tank must be purged and cleaned	<i>Slide 20</i>
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14. What is the first thing you should do if your engine has stopped because it overheated?
- a. Call for help.
 - b. Let it cool down, then determine why it stopped.**
 - c. Arrange to replace it.
 - d. Call for a tow.
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