

Examining Physical Engines

Orientation:

Several engines are provided where you can examine engine components and their relationships, recognizing similarities and drawing distinctions between SI and CI engines. This experience will strengthen your ability to reverse engineer how engine systems function based on physical layout. Hands-on exploration with engines and their components is likely to help you construct simple thermo-fluid models in future homework assignments. **(portions of this activity part of HW 2 are shown in bold)**

Learning Objectives:

1. Identify major components of engines used for different applications.
2. Diagram the air/exhaust flow through various types of engines.
3. Describe the components used to create an engine cycle, and how they interact.

Targeted Skills:

Inquiring – asking key questions

Reasoning with theory – explaining data with accepted knowledge

Collaborating – working together for mutual benefit

Sharing knowledge – effectively presenting relevant facts and interpretations

Station 1: Cylinder Head (Cadillac 500 CID V8)

1. Identify the following components on the cylinder head
 - Spark plug location (either the plug, or the threaded hole for the plug)
 - Intake valve
 - Exhaust valve
 - Combustion chamber
2. Given a 1/2" valve lift, what is the cross-sectional area for intake and exhaust into and out of each cylinder? Which area is larger? Why? **(part of HW 2)**

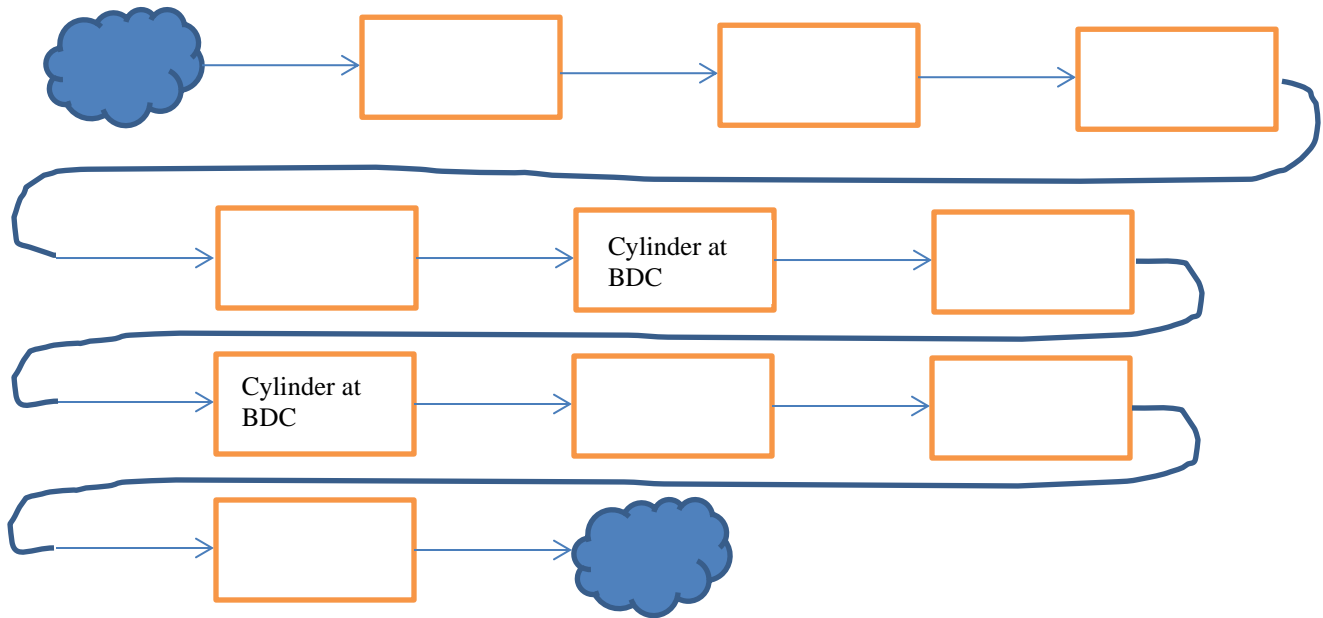
Station 2: 4-stroke SI engine (Cadillac 500 CID V8)

3. Identify the following components on the engine block
 - Intake manifold
 - Cylinder head
 - Pushrods
 - Exhaust Manifold
 - Starter motor
 - Oil pan
 - Carburetor

4. Fill in the flow diagram below using the components listed below. The process starts and ends at 'open atmosphere (the cloud shapes), and each box represents a component/region in of the engine that is being passed through. Above each of the arrows, indicate what is flowing (i.e. air, air/fuel mixture, or exhaust).

(part of HW 2)

Exhaust manifold	Exhaust valve	Exhaust tubing/muffler
Intake manifold	Cylinder at BDC	Combustion chamber (TDC)
Intake valve	Carburetor	Intake runner



Station 3: 2-stroke SI engine (Homelite Chainsaw)

5. Identify the following components

- Piston
- Intake port
- Exhaust port
- Carburetor
- Flywheel/clutch

6. Which ports open first? Which ports open second? Why? **(part of HW 2)**

7. Will a 2-stroke engine produce twice as much power as a 4-stroke engine of the same displacement? Why/why not? **(part of HW 2)**

8. On a separate sheet of paper, draw a flow diagram through the engine similar to what you did for the four-stroke engine. Make sure to include the following components: **(part of HW 2)**

Cylinder (after IPC)	Cylinder (after EVO)	Carburetor
Exhaust port	Transfer port	Crankcase
Combustion chamber (TDC)	Muffler/silencer	Exhaust pipe

Station 4: Turbochargers

9. Locate the following

- Compressor wheel
- Turbine wheel
- Bearings
- Wastegate

10. What limitations surround the selection of boost pressure? **(part of HW 2)**

11. How is the wastegate used to control boost pressure? **(part of HW 2)**