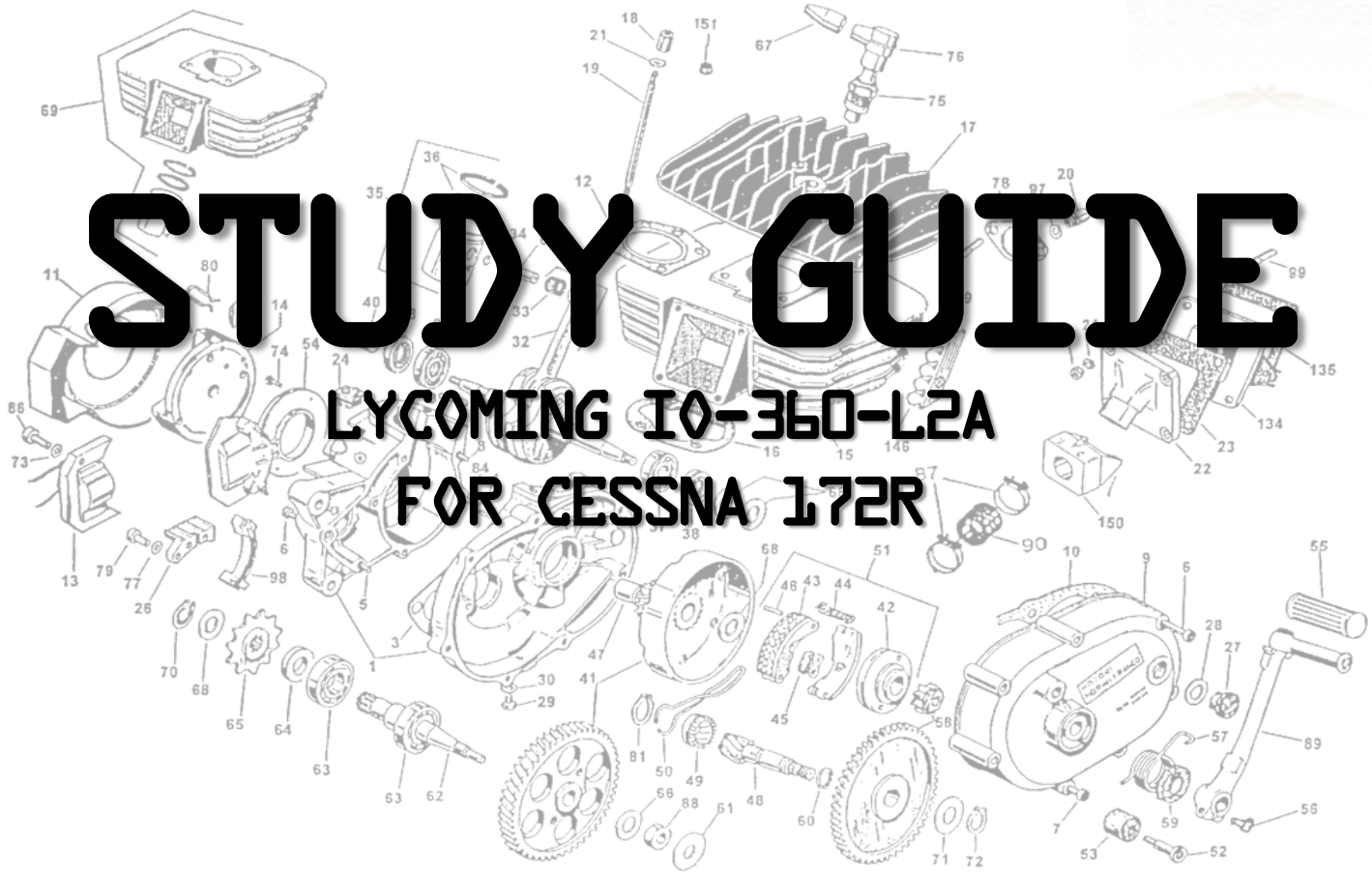
Cessna

LYCOMING
A Textron Company



STUDY GUIDE

LYCOMING IO-360-L2A
FOR CESSNA 172R

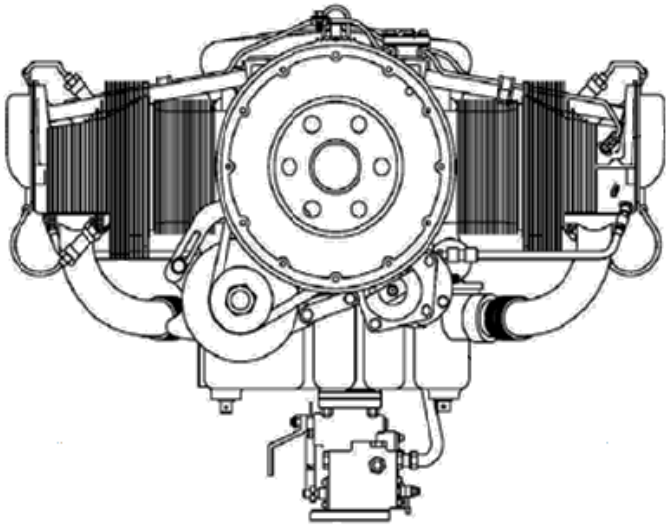
SIA COURSE 155
SIA COURSE 156

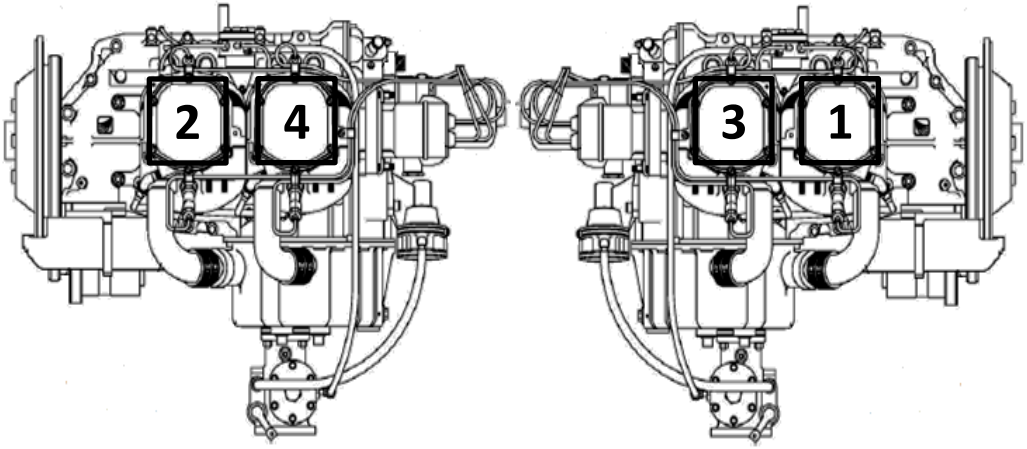
SINGAPORE FLYING COLLEGE

LYCOMING
A Textron Company

GENERAL SPECIFICATIONS

Manufacturer ……..Lycoming Textron
Model……..……IO-360-L2A
Type……Normal Aspirated
Air Cooled
Horizontally Opposed
Port Fuel Injected
Displacement……361 Cubic inch
Derated Power……..……160hp
Derated Speed, RPM……2400
Bore……5.125 inch
Stroke……..……4.375 inch
Compression Ratio……8.5:1
Firing Order……..…1-3-2-4
Fuel……..……100LL
Oil…….……8 quarts (Sump)
9 quarts (Total)
Weight…..……..…..300lb approx.
Height.....……...24 inches
Width……....33.4 inches
Length…..……...32.8 inches
Propeller……McCauley Propeller Systems
2 Blades
75 inches Diameter
Fixed Pitch





LYCOMING
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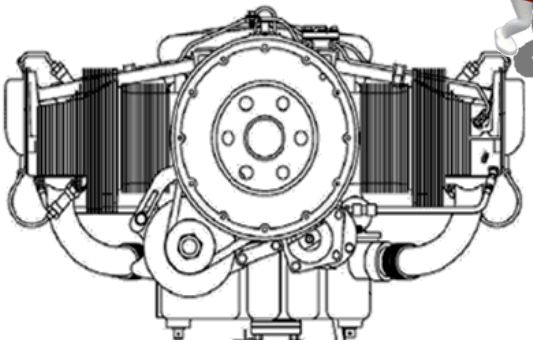
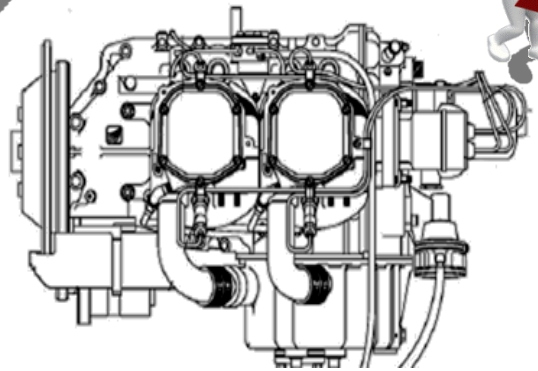
RECOMMENDED ORIENTATION

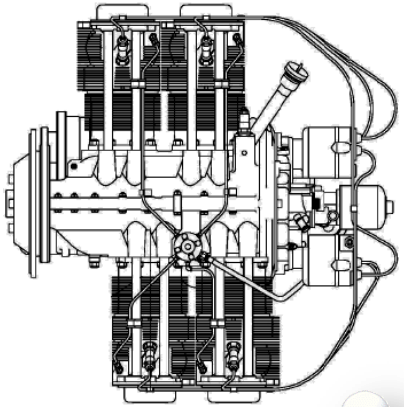
1 - Front View



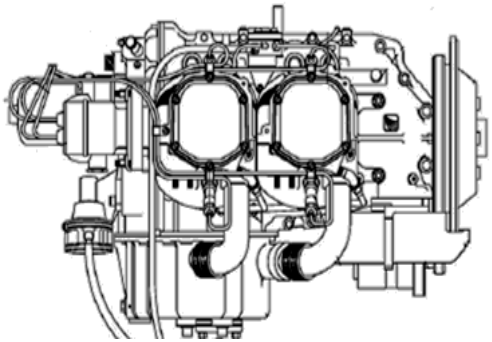
2 - Left View



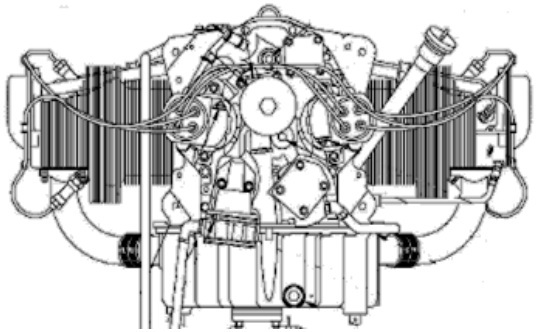
3 – Top View



4 - Right View



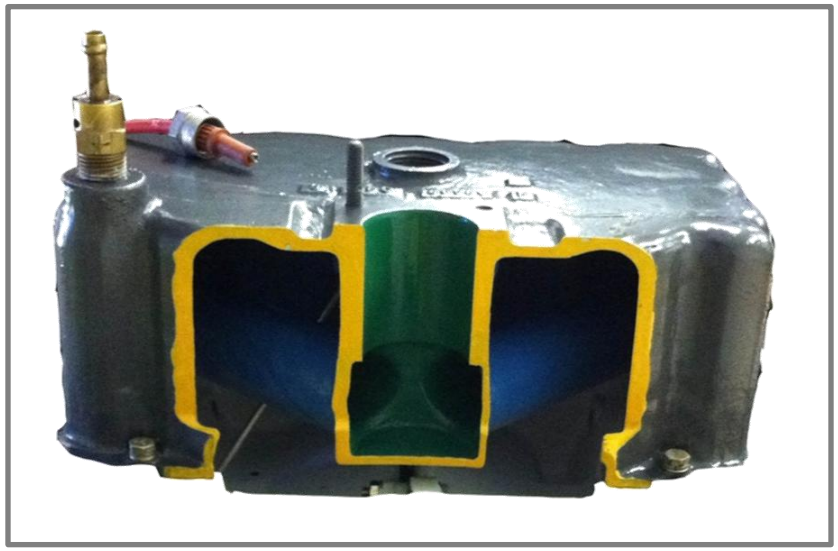
5 – Rear / Misc View



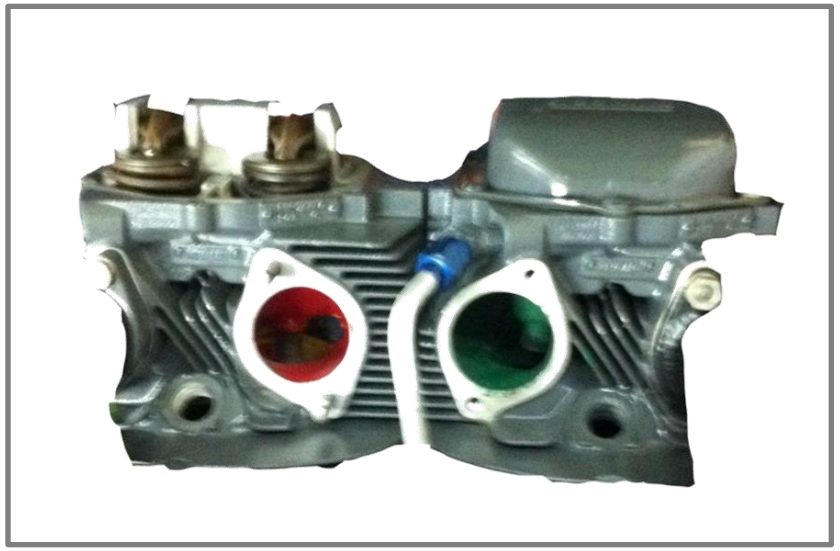
COLOR CODING

Color Coding

Throughout this learning experience on the cut-out specimen of Lycoming IO-360-L2A, you will discover that several parts on the engine have been painted in 3 different colors. This is merely to distinguish the different mixtures / byproducts, circulating within the engine during an actual operation.



Oil Sump – Bottom View



Cylinder – Bottom View

Blue – Depicts parts of the engine where ***Engine Oil*** circulate

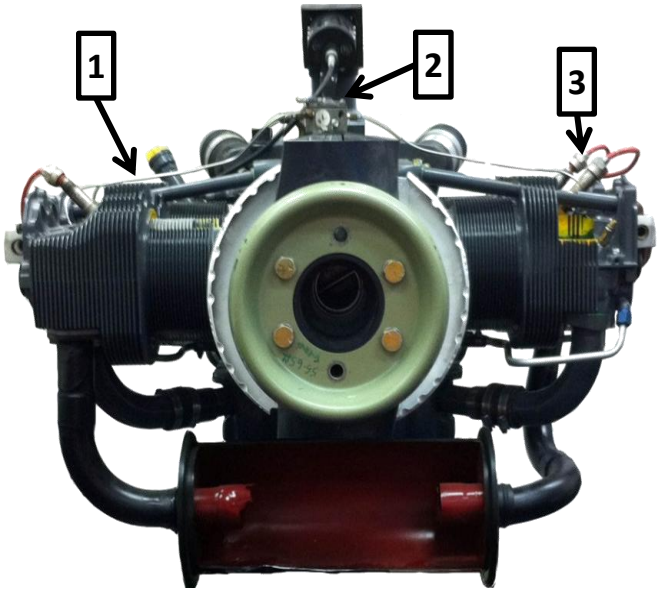
Red – Depicts parts of the engine where ***Exhausted Byproducts*** circulate

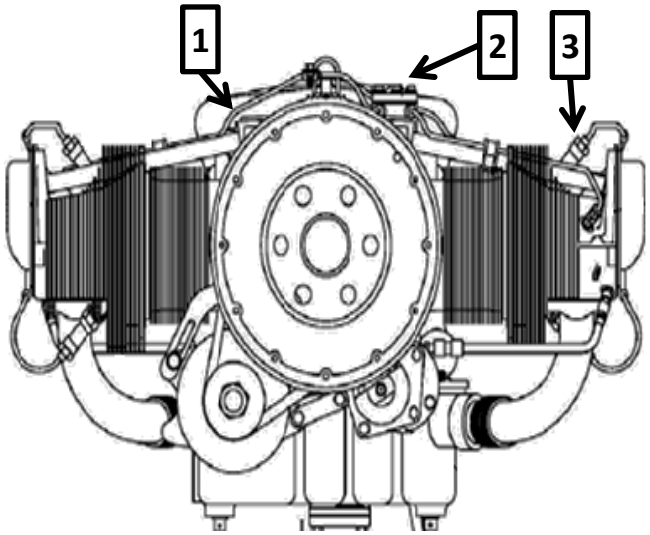
Green– Depicts parts of the engine where ***Air / Fuel Mixture*** *or* ***Positive Charge*** *circulate*

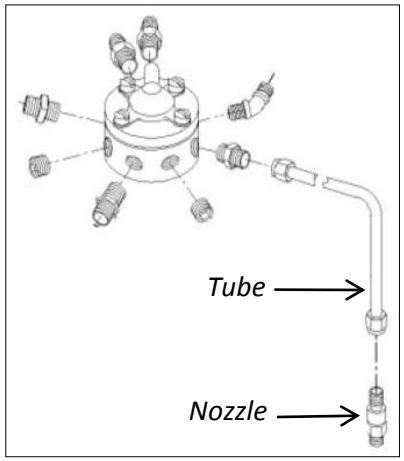
Yellow – Depicts parts of the engine which have been cut-out for learning purposes

FRONT VIEW

1……. Fuel Injector / Tube / Nozzle
2….Fuel Injection Manifold
3……Spark Plugs







Fuel Injection System

1 & 2 - Fuel Injection Manifold / Tube / Nozzle

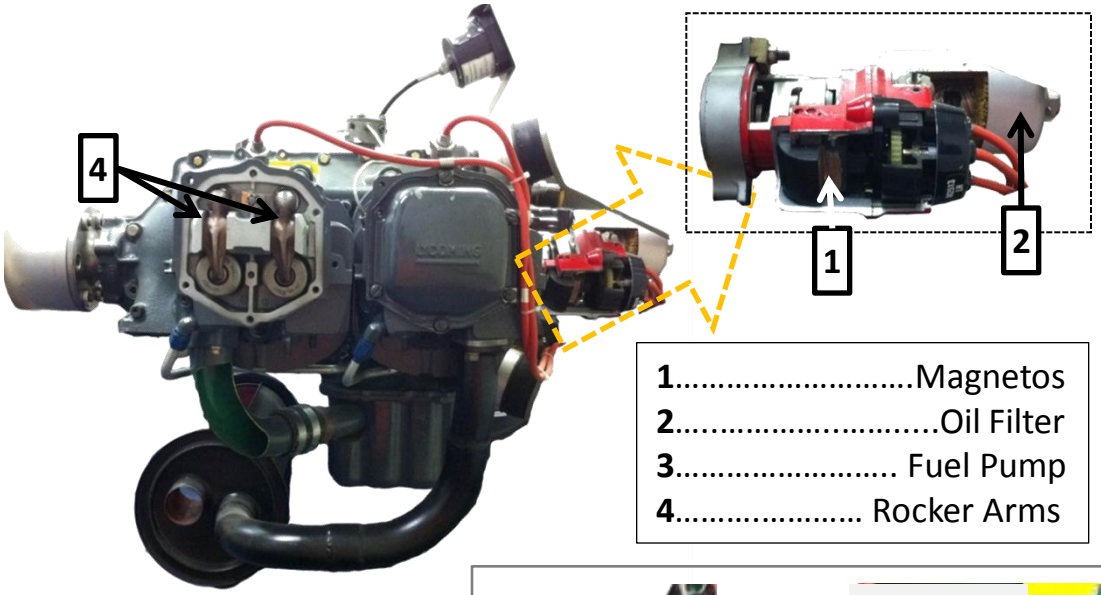
In contrast with the *Carburettor System*, the *Fuel Injection System* generally increases fuel efficiency and is less susceptible to Throttle Icing . It accurately distributes air/fuel mixture to all cylinders, churning greater power output than the Carburettor system. *Fuel Atomization* i.e. producing fine air/fuel mixture based on *Venturi Effect*, takes place at the *Nozzles*.

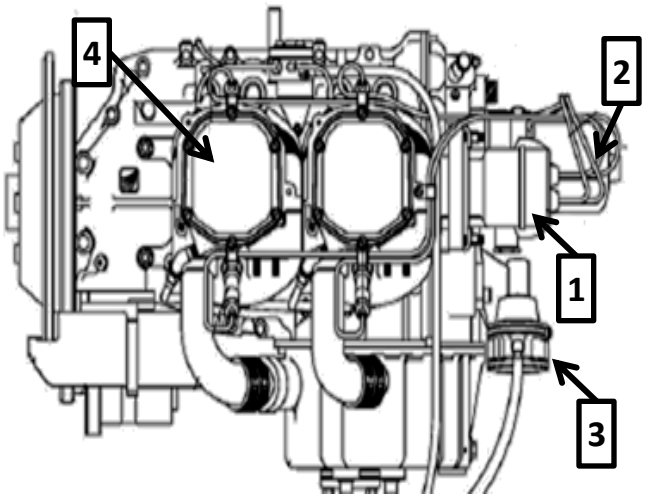
3 – Spark Plugs

The *Spark Plugs* supply the spark that ignites the air/fuel mixture so that combustion can occur. The spark must happen at just the right moment for things to work properly. In this *Textron Lycoming IO-360-L2A*, there are a total of 8 spark plugs, two for each cylinder.

Electrode Aviation Spark Plug

LEFT VIEW





1.....Magnetos
2.....Oil Filter
3..... Fuel Pump
4..... Rocker Arms

1 – Magnetos

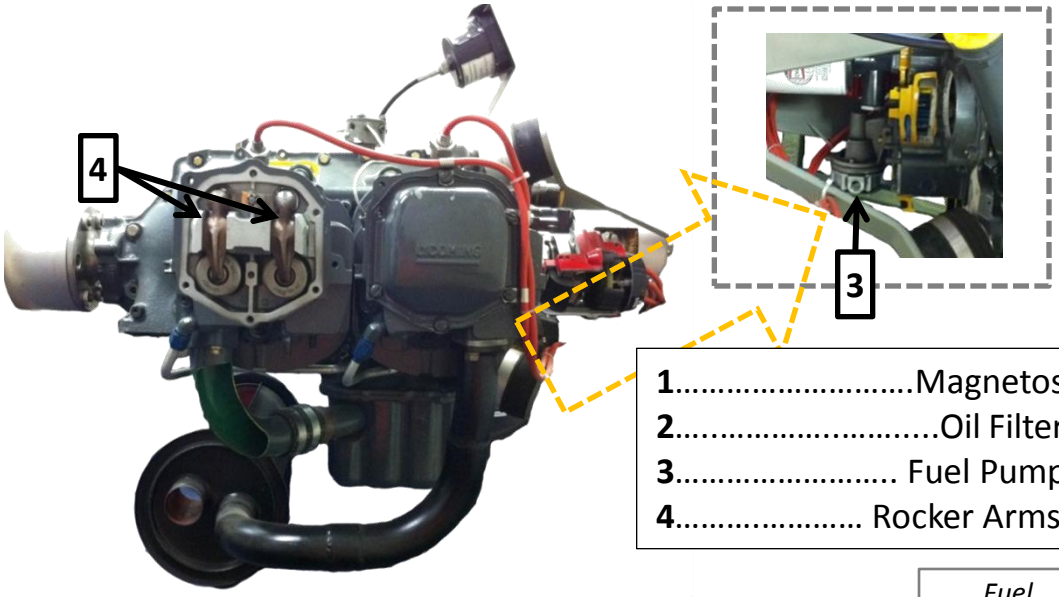
Lycoming IO-360-L2A utilises 2 engine driven *Magnetos* which provide alternating current to the spark plugs. Main parts of a *Magneto* are a *Permanent-Magnet Rotor*, a *Primary Winding*, a *Secondary Winding*, a *Circuit Breaker*, and a *Capacitor*. The process generally involves the collapse and reversal of magnetic field in the windings which send current to the spark plugs. Being driven by the *Main Gear (connected to the Crankshaft)* via the *Accessories Gear,* the Magnetos do not require battery for their operation.

Engine Driven Magnetos – Bottom View

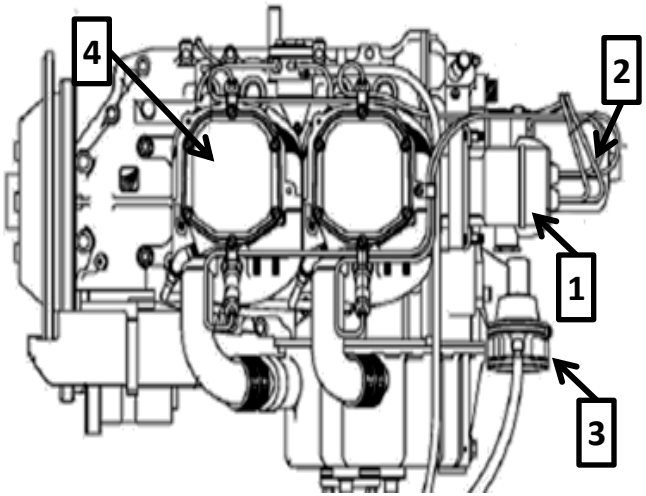
2 – Oil Filter

Oil Filter removes contaminants from the engine oil, circulating in the engine, which can shorten the lifespan of the engine. The filter also has an over-pressure mechanism that will allow oil to flow through it even when the filter has been clogged up by sediments.

LEFT VIEW

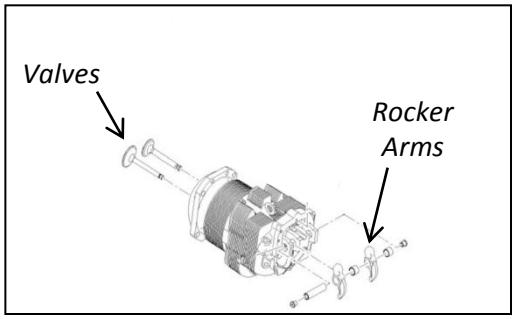


1……Magnetos
2……Oil Filter
3…… Fuel Pump
4…… Rocker Arms



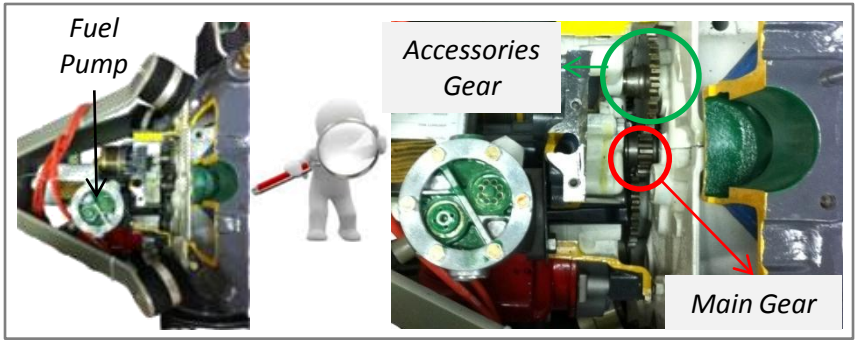
4 – Rocker Arms

Rocker Arms are a vital component in an *Internal Combustion Engine.* They are acted on by the C*amshaft* and precisely push open either *Intake* or *Exhaust Valves.*



Rocker Arms Assembly

This allows fuel and air to be drawn into and expelled from the *Combustion Chamber* during *Intake* and *Exhaust Stroke* respectively.

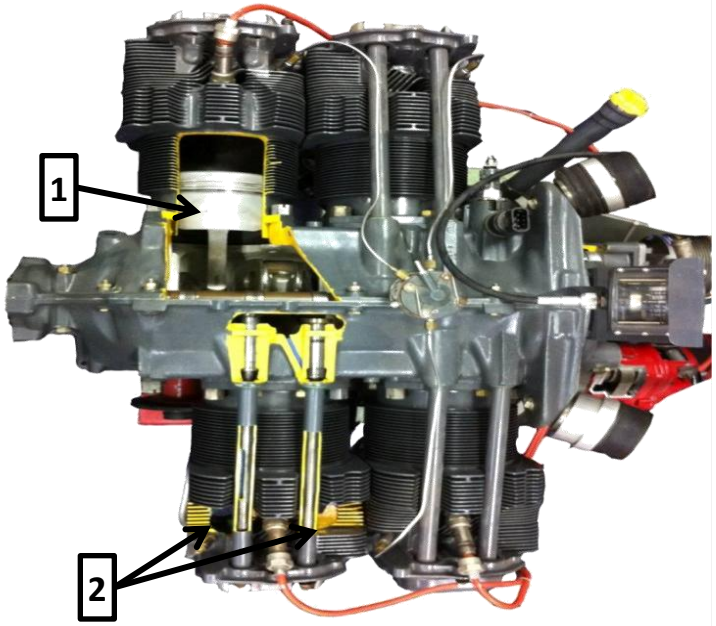


Engine Driven Fuel Pump – Bottom View

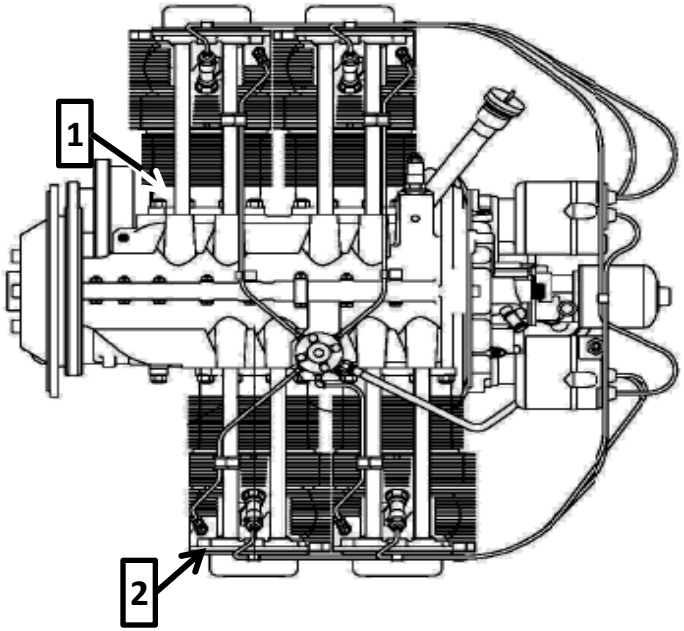
3 – Fuel Pump

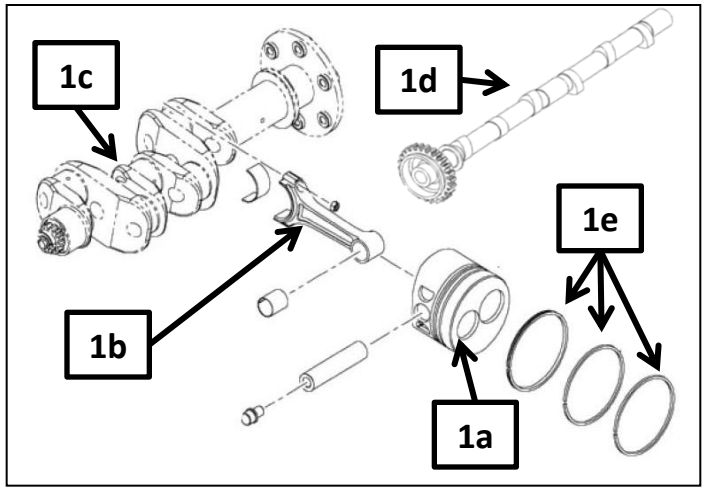
Similar to the *Magnetos,* C172R is equipped with an engine driven *Fuel Pump* and an Auxiliary Pump. A faulty *Fuel Pump* may lead to fuel starvation but can be resolved by activating the Auxiliary Pump.

TOP VIEW (A)



1.....Piston Assembly
1a.....*Piston*
1b.....*Connecting Rod*
1c.....*Crankshaft*
1d.....*Camshaft*
1e.....*Piston Rings*
2.....Intake & Exhaust Valve





Piston Assembly

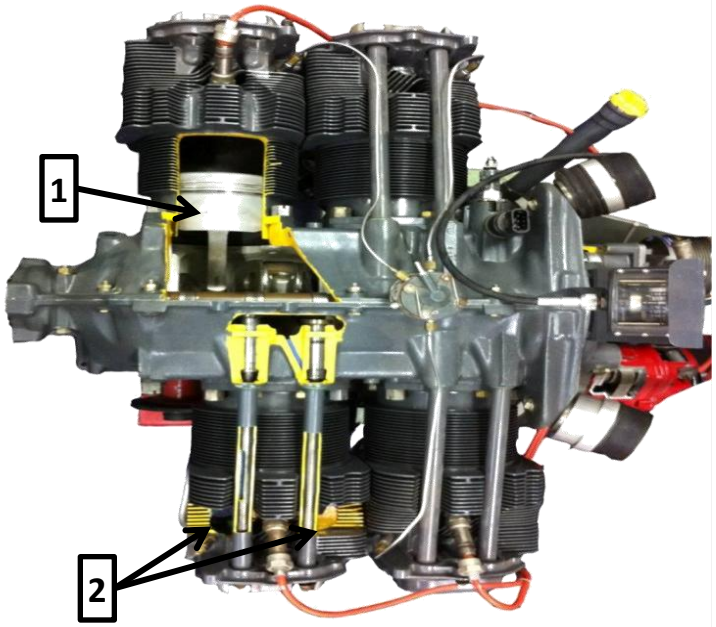
1 – Piston Assembly

A *Piston* ***(1a)*** is a moving component of reciprocating engines that is contained by the cylinder. The cylinder is made gas-tight by 3 *Piston Rings* ***(1e)***. The top two *Piston Rings* are C*ompression Rings*. The lowest ring is the O*il Control Ring, w*hich lubricates the piston skirt and the compression rings.

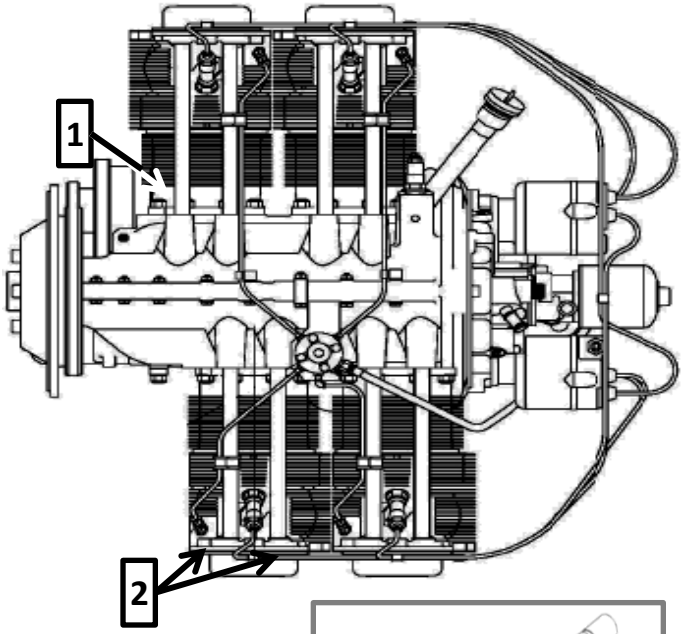
1c – Crankshaft

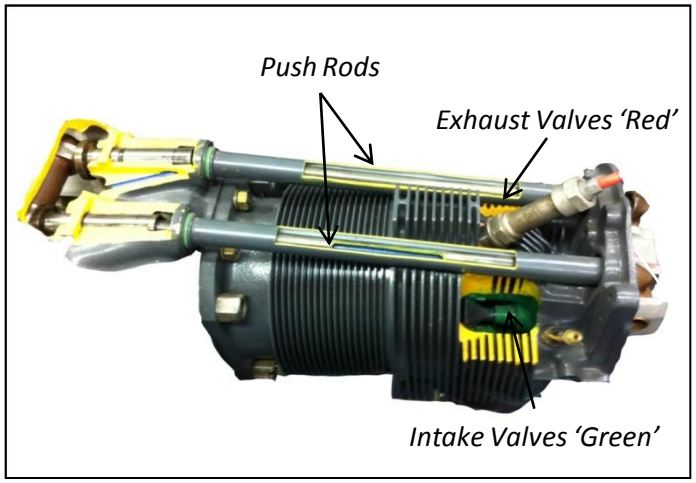
The *Crankshaft* translates reciprocating linear piston motion into rotational motion by means of "*Crank Throws*", which are connected to the pistons via the *Connecting Rod* ***(1b).*** This in turn drives the propeller of the Cessna 172.

TOP VIEW (B)



1.....Piston Assembly
1a.....*Piston*
1b.....*Connecting Rod*
1c.....*Crankshaft*
1d.....*Camshaft*
1e.....*Piston Rings*
2.....Intake & Exhaust Valve

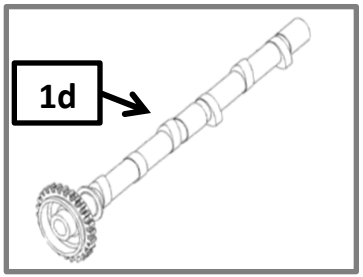




Intake & Exhaust Valve

1d – Camshaft

The *Camshaft* uses lobes to assist in opening and closing the *Intake* and *Exhaust Valves*. The camshaft is geared to the crankshaft and rotates at half its speed.

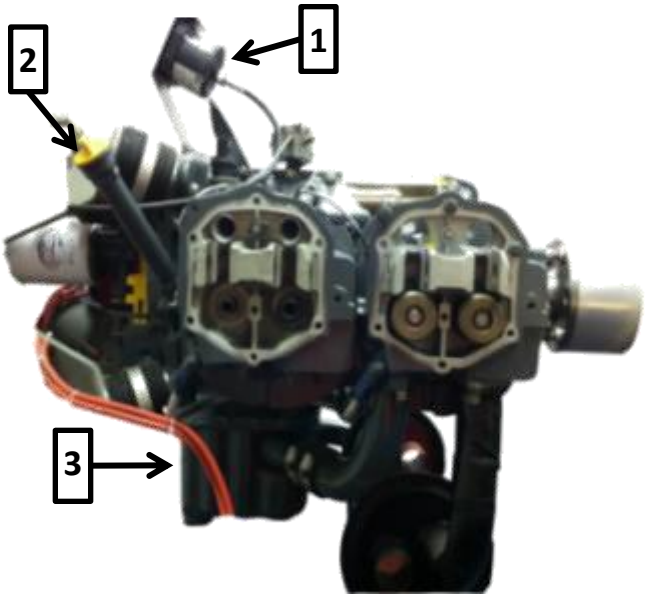


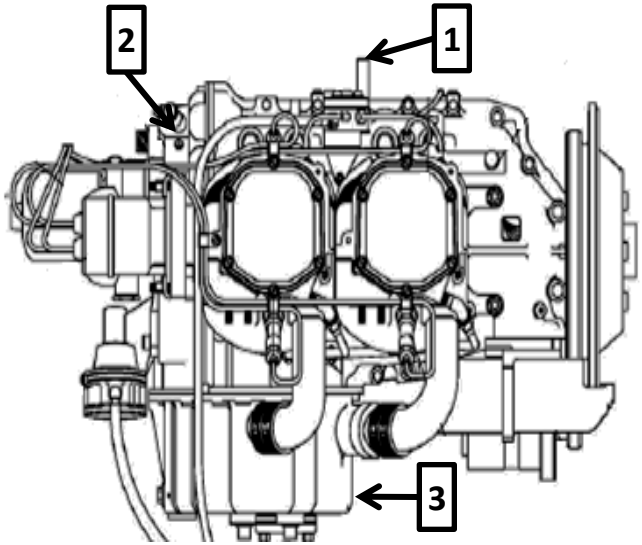
Camshaft

2 – Intake & Exhaust Valve

The *Intake Valve* opens during the *Intake Stroke* for the air-fuel mixture to be drawn into the combustion chamber prior to the *Compression Stroke*. The *Exhaust Valve* opens subsequently, allowing for exhaust gases to be expelled from the combustion chamber during the *Exhaust Stroke*. Both of these valves are precisely controlled by the C*amshaft* via the *Push Rods* and Rocker Arm.

RIGHT VIEW





1…….Tachometer Module
2…….Oil Dip Stick
3…….Oil Sump

C172R Tachometer

1 – Tachometer

Tachometer is an instrument used to show the rate of rotation of the engine's crankshaft measured in revolution per minute. There are ranges that are set in place for safe operation of the aircraft which should be adhered to by the pilot. *"Redlining"* may generate excessive heat or over-stress the engine's internal components.

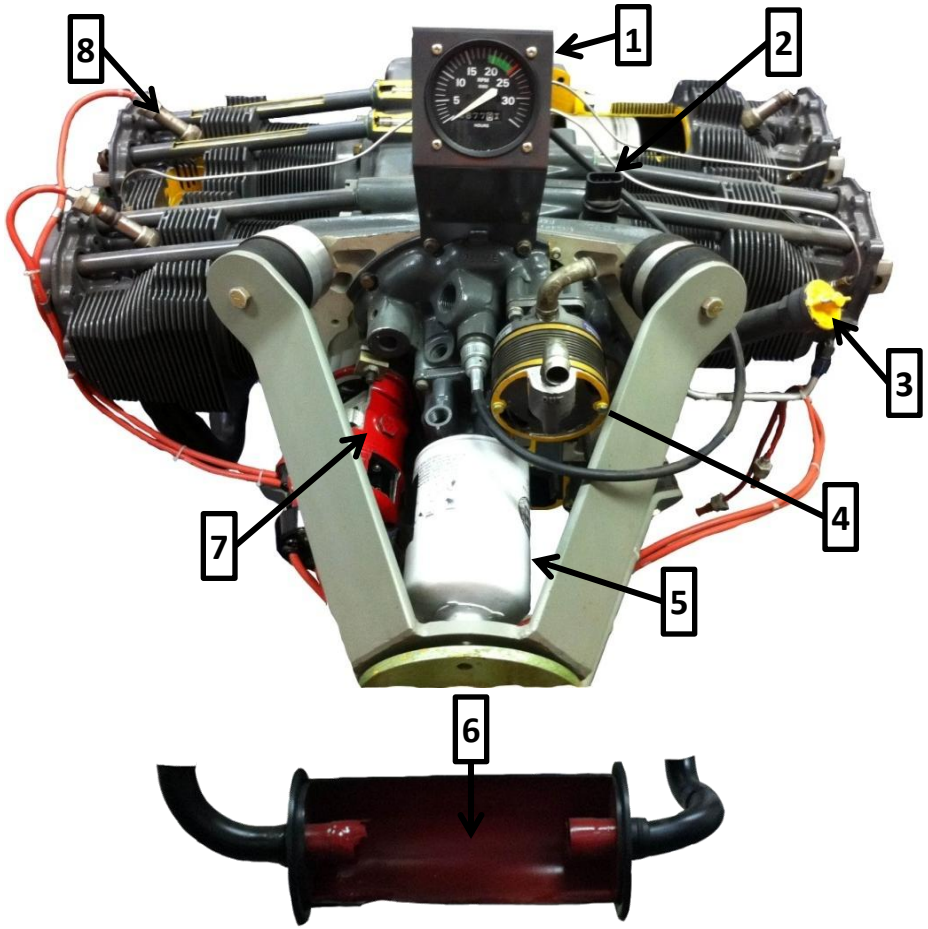
2 – Oil Dip Stick

Oil Dip Stick is used to measure the quantity of oil in the sump, located at the bottom of the engine, by removing the stick and then checking the extent that it is covered by the oil. Recommended to be at *6-8* quarts.

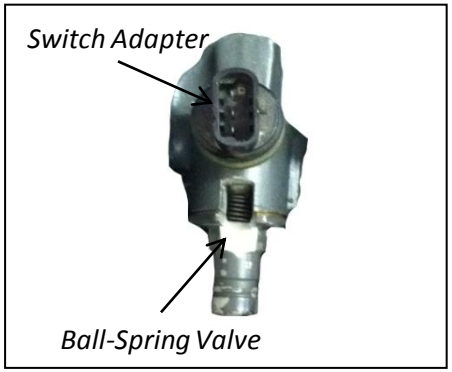
3 – Oil Sump

Being a *Wet Sump* system, the engine is lubricated by oil which is pumped from the reservoir (sump) into various moving parts such as bearings and pistons. Thereafter it is allowed to drain back to the sump, at the base of the engine, under gravity.

REAR / MISC VIEW



1…….Tachometer Module	**5**……Oil Filter
2…Low Oil Pressure Switch	**6**…… Exhaust Muffler
3…… Oil Dip Stick	**7**……..Magneto
4……Vacuum Pump	**8**……Spark Plugs



Low Oil Pressure Switch

2 – Low Oil Pressure Switch

Connected to the cockpit central *Warning Annunciator*, the *Low Oil Pressure Switch* will prompt the pilot if the oil pressure within the engine is below the pre-determined set value (**80psi @ 180°F**). Engineers may vary the value to a desired safe operating range via the *Ball-Spring Valve*.

4 – Vacuum Pump

2 engine driven *Vacuum Pumps* provide constant air supply to all essential ***Air Driven*** gyroscopic equipment on board C172R i.e. *Directional Indicator* and *Artificial Horizon*. Particular attention is given to the *Pump Vanes* during maintenance servicing which will indicate the physical running condition of the pump.

6 – Exhaust Muffler

Exhaust Mufflers are normally installed as part of the exhaust system of an internal combustion engine to suppress the exhaust noise to a acceptable level thru *"Destructive Interference",* which essentially uses resonating exhaust noises to cancel each other. This is achieved by a series of chambers and passages within the *Muffler*.

REFERENCES

Package Vetted and Approved by ……xx/xx/xxxx
Subsequent Review……_____
Subsequent Review……_____
Subsequent Review……_____

**Vantage Engine O-360 & IO-360 Overhaul Manual*
**Textron Lycoming IO-360-L2A Technical Datasheet*
**Cessna SkyHawk C172R Information Manual*