

PROBLEMS WITH THE FUEL SYSTEM

1. DETONATION:

Very rapid and violent burning of the fuel in the cylinder.

Causes overheating and damage to the metal of the engine

Signs:

- rapid rise in cylinder pressure, and
- rapid increase in cylinder head temperature.

Causes:

- incorrect fuel,
- overheating (lack of airflow), and
- the setting a mixture that is too lean.

Can be solved temporarily by making the mixture richer and permanently by using fuel of the octane rating specified by the engine manufacturer.

2. PRE-IGNITION:

Premature burning of fuel mixture due to glowing carbon particles or "local hot spots".

Often confused with detonation.

Experienced when attempting to start a hot engine and usually results in a backfire.

Can do severe damage including warped pistons and cracked cylinder heads.

3. VAPOUR LOCK:

Occurs in the fuel line.

Caused by high atmospheric temperatures, causing the fuel to vaporize and block the flow of liquid fuel in the line.

IGNITION SYSTEM

The function of the ignition system is to supply a spark to ignite the fuel/air mixture in the cylinders.

It Consists Of:

- two magnetos,
- two spark plugs per cylinder,
- ignition leads, and
- a magneto switch.

THE MAGNETO

If a coil of wire is rotated in a magnetic field, current will be induced in the coil.

This experiment demonstrates the inseparability of magnetism and electricity.

While the design of the magneto is slightly different from that discussed above, the principle is the same.

The magneto serves three functions:

1. generates a low tension current,
2. transforms this to a high tension, and
3. distributes the current to the individual spark plugs at the exact time it is desired to have them fire.

DUAL IGNITION

Modern aero engines are fitted with two spark plugs per cylinder and magnetos. One magneto fires one of the spark plugs for each cylinder, while the second magneto fires the second spark plug for each cylinder.

Purpose Is Two Fold:

1. **SAFETY:** if one system fails, the engine will still operate, and
2. **PERFORMANCE:** improves combustion.

MAGNETO SWITCH

The magneto switch has four settings:

1. Left,
2. Right,
3. Both, and
4. Off.

To check magnetos, pilot watches RPM's as he/she turns switch.

In the event of rough operation, the pilot can switch to the smoothest operating magneto.

SHIELDING

The parts of the ignition system are surrounded with a metal covering, which is grounded.

This design is known as **shielding** and is used to prevent interference with the radio.

IGNITION TIMING:

The timing of the magneto to fire the spark plug at the proper time.

Firing too early can result:

- in loss of power,
- pre-ignition,
- piston burning,
- scored cylinders, and
- broken rings.

ELECTRICAL SYSTEM

Includes everything that operates electrically, except the magnetos.

The ignition system is not connected with the airplane's electrical system.

Supplies power to start the airplane.

Also required to operate a multitude of controls including:

- flaps,
- undercarriage,
- all radios,
- lights, etc.

COMPONENTS

1. Storage Battery:

Stores electrical energy required for engine starts.

2. Master Switch:

Overall on/off switch for the electrical system.

3. Starter Motor:

Turns the engine over after it receives current from the battery.

4. Generator/Alternator:

Supplies current to the system and recharges the battery,
Driven by the engine,
Once motor is started, the alternator will take over and transfer the energy.

5. Voltage Regulator:

Prevents the system from being overloaded and the battery from overcharging.

6. Bus Bar:

Receives from the battery and the generator (or alternator) and distributes it to various circuits.

7. Circuit Breaker:

Prevents component damage resulting from system overloads.

8. Ammeter/Voltmeter:

Indicates current and voltage storage and drain of the system.

9. Generator Warning Light:

Indicates only of generator failure, and
Aircraft without ammeter/voltmeters have this.