

17.1 Induction System Icing

- Ice can form in the engine's induction system, restricting airflow and causing a loss of power.
- ☐ Types of Icing:
 - Carburetor Icing: The most common and dangerous type. It is caused by the temperature drop from fuel vaporization and the pressure drop in the venturi⁹⁴. This can cool the moist air enough to form ice on the throttle plate and venturi walls, even with outside air temperatures as high as +22°C.
 - Impact Ice: Forms on air filters and bends in the induction system in visible moisture and freezing temperatures⁹⁵.
 - Fuel Icing: Water dissolved in the fuel freezes at the low temperatures in the carburetor⁹⁶.
- ☐ Indications of Icing:
 - For an aircraft with a fixed-pitch propeller: A gradual drop in RPM⁹⁷.
 - For an aircraft with a constant-speed propeller: A gradual drop in manifold pressure⁹⁸.
- ☐ Corrective Action: The pilot must apply carburetor heat. This directs hot, unfiltered air from a shroud around the exhaust manifold into the carburetor intake, melting the ice⁹⁹.
 - When heat is applied, a drop in RPM or manifold pressure will be observed initially because hot air is less dense. If ice was present, the power will then gradually increase back to normal or above normal as the ice melts.
 - Using carb heat causes a richer mixture and a loss of power (approx. 15%) and should not be used during takeoff or at power settings above 80% due to the risk of detonation¹⁰⁰¹⁰⁰¹⁰⁰¹⁰⁰.

17.2 The Ignition System

- Aircraft piston engines use a dual magneto ignition system for redundancy and improved engine performance.
- ☐ Dual Ignition: Each cylinder has two spark plugs, and each set of plugs is powered by a separate, independent magneto¹⁰¹. This provides redundancy in case one magneto fails and

- also promotes more complete and even combustion by igniting the mixture from two points¹⁰².
- ☐ Magnetos: A magneto is a self-contained, engine-driven electrical generator that produces the high-voltage spark for the spark plugs¹⁰³. It requires no external power source (like a battery) to operate once the engine is turning.
- ☐ Ignition Switch: The ignition switch in the cockpit does not switch the magnetos "on." Instead, in the "OFF" position, it grounds the primary circuit of the magneto, preventing it from producing a spark¹⁰⁴¹⁰⁴¹⁰⁴¹⁰⁴.
- This is why a broken ground wire can lead to a "hot mag" that is live even when switched off.
- ☐ Spark Augmentation: At the slow cranking speeds during engine start, a magneto does not turn fast enough to produce a strong spark. To overcome this, a spark augmentation system is used:
- Impulse Coupling: A mechanical, spring-loaded device that momentarily spins the magneto at a high speed to produce a strong spark and also retards the timing for starting¹⁰⁵.
- Booster Coil: An external electrical coil that supplies a high-energy spark for starting¹⁰⁶.

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