



## *A CAP Aerospace Education Moment*

Did you know?

During World War I (1914-1918) many of the engines that powered the fighter aircraft were rotary engines. When looking at a World War I fighter in a museum or even seeing an engine displayed on a stand near the airplane, it is easy to conclude that it is an ordinary air-cooled radial engine, albeit an older model. However the rotary engine was unique. A normal engine is attached to the airplane and the propeller is connected to the crankshaft through a system of gears. With a rotary engine, the crankshaft is solidly fixed to the airplane and the engine rotates around it. The propeller is solidly fixed to the engine so both are turning together at the same revolutions per minute.

The advantage of the rotary engine was its weight to power ratio. Being air-cooled, it was not encumbered with a heavy liquid cooling system. Since the engine, itself, rotated, there was no need for a heavy fly wheel to smooth out its running. They were ideal for their time, powering small, peppy airplanes in dogfights.

The rotary engines had certain peculiarities. For example, the fuel/air mixture that went into the cylinders also contained the lubricating oil which was castor oil because as a plant-based oil it would not be dissolved by the gasoline. The rotary engines did not use exhaust pipes. The exhaust valve opened and out went the exhaust accompanied by any un-burned castor oil coating the plane and pilot with this oily mess. The scarf that Snoopy wears while flying his dog house in pursuit of the Red Baron is an authentic piece of World War I pilot equipment. It was used to wipe the oil film off his goggles. There were also other problems caused by the pilot breathing in all these castor oil fumes. Because of this lubricating system, the rotary engines consumed an excessive amount of oil.

Airplanes with rotary engines were somewhat tricky to fly. The mass of the spinning engine acted like a gyroscope resisting the pilot's control efforts; at other times enhancing them. Many people were killed just trying to learn how to fly these planes.

The most well-known rotary engines were the *Gnome*, the *Le Rhone*, the *Clerget*, and the German-built *Oberursel* which was very similar to the *Le Rhone*. There were variations of each type; improvements over previous models. Most had 9 cylinders. The cooling fins were rather small, but that didn't seem to matter much because the fact that the engine was spinning circulated the air. The cowling on many of the planes was cut-away at the bottom in order to deflect the castor oil downward and away from the plane. It also allowed more air to be available to cool the engine. Toward the end of World War I, improvements to liquid cooled engines particularly by Rolls Royce and Hispano-Suiza would signal the upcoming end of the usefulness of the rotary engine.

Many museums, now, have a display that shows a mock-up of a rotary engine with a button to press or a crank to turn that will allow the visitor to observe an engine and propeller spinning in unison.