



## *A CAP Aerospace Education Moment*

Did you know?

During World War II, the Germans built and used an unmanned aerial vehicle which they called the V-1 "Vengeance weapon 1" and sent them against London and other sites in England and against Antwerp, Liege, and Brussels in Belgian. They were generally called "buzz bombs" because of their noise or "doodle bugs" by their victims. This pilotless aircraft was a mid-wing monoplane without ailerons. Its engine, a pulsejet, was mounted above the aircraft aft of the wing and extended beyond the tail. The engine, itself, was about 11 feet in length while the whole aircraft was approximately 29 feet long with a wingspan of a little over 17 ½ feet and weighed over 3600 pounds. It was launched from an inclined ramp by a steam catapult.

The pulsejet engine was a simple steel tube, wide at the intake and tapering to a long narrow tube behind. The intake had a grid of valves that were like shutters or little doors. Air entered, drew in fuel (Bernoulli's principle like the venturi in a carburetor), which when ignited slammed the little doors shut and provided thrust through the tailpipe. The length of the tailpipe compared to its diameter was a key part of the design because the exiting gases were still hot enough to ignite the incoming fuel-air mixture which repeated the cycle. For initial starting, an ordinary automobile spark plug was used. Any grade of gasoline could serve as the fuel.

The guidance system was pre-set. It had a magnetic compass linked to an auto pilot consisting of three gyroscopes which provided input to the flight controls. A pendulum provided pitch stability. Two spheres, filled with compressed air, armed the bomb, powered the gyroscopes, and provided the power to activate flight controls. Altitude was controlled by an aneroid barometer pre-set in atmospheric pressure. A small propeller on the nose, turned by the oncoming relative wind, drove a counter that would determine when the chosen destination was reached based on the number of turns of the little propeller. On reaching its destination, the flight controls would be locked, and spoilers deployed causing the unmanned aircraft, or cruise missile as some choose to call it, to dive.

The British gave V-1's that crashed without exploding to the United States and the Soviet Union. Both countries reverse engineered the V-1. In America, it was accomplished at Wright Field (now Wright-Patterson AFB). Airframes were built by Republic Aviation and power plants by Ford Motor Company. The V-1's, seen in most museums today, are these reverse-engineered ones. However, the Smithsonian is certain that its V-1 is an original because, when they were restoring it, they found German inscriptions on parts implying that it was not an American copy.

### **SOLAR IMPULSE 2 HAS RESUMED THE ROUND THE WORLD JOURNEY**

After a long layover in Hawaii. The Swiss team that flew a solar-powered aircraft from California to New York in 2013 will attempt to do it again as part of their Round the World Trip in their newer bigger and better solar powered aircraft. Last time, they brought their aircraft, Solar Impulse 1 to California in a Boeing 747 cargo

plane. This time pilot Bertrand Piccard flew solo from Hawaii in 62 hours. They started this epic journey in March 2015 from Abu Dhabi, United Arab Emirates and expect to return there to complete the trip.

They had experienced difficulties that caused delays. The major one involved the solar-charged batteries that ran their engines which were overheated and destroyed. New ones had to be built and installed.