

## Back to the Future, Part Two!



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On November 16<sup>th</sup>, 2004, Jansen's Aircraft Systems Controls (JASC), proudly participated in a major milestone for the aerospace community as the Hyper-X Research Vehicle (X-43A) streaked out over the Pacific Ocean at nearly 10 times the speed of sound. After getting a ride from a B-52 to 40,000 feet, the Pegasus booster rocket accelerated the 12-foot-long unmanned X-43A supersonic combustion scramjet vehicle from Mach 0.6 to a speed close to Mach 10. At an altitude of 110,000 feet, the test vehicle traveled at a speed of nearly 7,000 mph (approximately Mach 9.8).

This accomplishment is truly a milestone for the aeronautics community - and the world. It is the second time that an airframe-integrated scramjet (supersonic combustion ramjet) engine was demonstrated in free flight. The initial successful flight, in which JASC also participated, occurred on March 27<sup>th</sup>, 2004, where the test vehicle flew at a speed of Mach 7 at an altitude of 95,000 feet.

JASC designed and developed the electromechanically-actuated, electronically-controlled ignitor and fuel control valves for the scramjet engine. After the vehicle was jettisoned from the booster and achieved stable flight at nearly Mach 9.8, the vehicle's engine cowl door opened, allowing air into the engine. The JASC silane ignitor valve was then actuated, followed by the JASC hydrogen fuel valve to sustain and regulate combustion in a process analogous to lighting and keeping a match lit in a hurricane!

The two successful flights were the culmination of over 40 years of effort to demonstrate successful air-breathing hypersonic flight. This is proclaimed to be "the Holy Grail of Flight" by veterans in the aerospace engine community. Both of these X-43A flights superceded the previous record holding air-breathing engine flight of Mach 3+ by the SR-71 Blackbird, and eclipses the X-15 record of Mach 6.7 which used a rocket powered engine.

In addition to the X-43A fuel control effort, JASC is pioneering the development of high temperature, hydraulically actuated control valves that will allow hydrocarbon fuels to be used in scramjet combustors. The ultimate benefit lies in allowing for low cost, repetitive, high-speed flights for both military and commercial purposes.

*JASC founder and president, Harv Jansen, is a true aerospace industry pioneer. He was involved as an engineer on the development of the SR-71's J-58 engine and the world's first liquid hydrogen/liquid oxygen rocket engine designated the RL-10. The J-58 engine was as innovative as the SR-71 airframe. To this day, the J-58 remains a state of the art engine in aircraft propulsion. It was the first and only dual-cycle aircraft engine, transitioning from a conventional turbine engine to a ramjet engine at ~Mach 2. It was the first engine to use fueldraulic controls, and the first to use metal seals on tubing joints. Many materials and fluid advancements in use today were spawned from the J-58 engine development program.*

**More Information:** Dryden Flight Research: <http://www.dfrc.nasa.gov>

Langley Research Center: <http://www.larc.nasa.gov>