Woomera test ahead of scramjet flights

September 14 2004

University of Queensland scientists will fly a baby rocket at Woomera, South Australia in early October this year to test new systems ahead of next year's full-scale scramjet engine experimental flights.

The new flight, using a tiny, reusable payload weighing only 5.8kg, will be known as HyShot Zuni I (or HyShot ZI).

Members of the HyShot international program Dr Ross Paull and Mr Myles Frost will use the HyShot ZI payload, which will be attached to a 1.5m Zuni single stage rocket, to explore notions for controlling high-speed vehicles during the small-scale test.

HyShot ZI will pave the way for three scramjet experimental flights, two at Mach 8, or 8000km an hour, and one at Mach 10, or 11,000km an hour, to be held at Woomera next year.

The experimental flights are designed to further scramjet technology. Scramjets are air-breathing supersonic combustion ramjet engines. They are set to revolutionise the launch of small space payloads, such as communications satellites, by substantially lowering costs.

Dr Paull and Mr Frost said this year's small-scale flight of HyShot ZI was part of exhaustive preparation for next year's flights, which would also include shaker and thermal cycling tests.

The Zuni flight would simulate forces which scientists expected during higher scramjet engine speeds during next year's full-scale experiments

at Woomera.

Dr Paull, Mr Frost and mechanical engineering student Thomas Neuenhahn have designed the new hardware, software and control algorithms which will be tested in the prototype HyShot ZI payload.

Creating and manufacturing the miniature payload presented many design and engineering challenges for the researchers. The prototype is fitted with an array of computer sensors, web cameras, manoeuvreable surfaces and a new battery pack design, as well as a tiny parachute.

The 11-minute flight will see the ex-military Zuni rocket take off at a 70 degree trajectory, and burn for 1.2 seconds until it reaches a speed of Mach 3.1, or more than three times the speed of sound. (An F-111 aircraft can reach a speed of about Mach 2.2.)

At burnout, the tiny reusable HyShot ZI payload will separate at about 0.6km above the earth when the scientists will conduct several experiments using novel techniques to deliberately create instability and then regain control of the vehicle.

The mission will continue for about one minute until the HyShot ZI payload reaches a height of 6kms above the Earth when the parachute will be activated to bring the payload safely down.

The descent will take 10-minutes. The experiment has a backup data retrieval plan should in-flight systems malfunction.

Dr Paull is the computer and software engineer, and Mr Frost, a mechanical engineer and research officer for the HyShot program of UQ's Centre for Hypersonics. They both were part of the successful UQ-led HyShot II flight which demonstrated the world's first supersonic combustion in an atmospheric flight test at Woomera on July 30, 2002 at

speeds of more than Mach 8, or 8 times the speed of sound.

Dr Paull said the presence of onboard cameras would take data acquisition much further, providing additional reference points.

“We’re still analysing HyShot II data which was excellent and unexpectedly rich,” he said.

“Even two years later, we are gaining new insights and finding intricacies and subtleties which should assist us well in the future.”

The Australian Space Research Institute (ASRI) is the launch provider for HyShot ZI.

Source: UQ

Citation: Woomera test ahead of scramjet flights (2004, September 14) retrieved 24 April 2024 from https://phys.org/news/2004-09-woomera-scramjet-flights.html