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The rocket reaches its maximum altitude 342km above the earth.

Lift-off for UQ HyShot project

The University of Queensland will lead an international project to flight test the supersonic combustion process used in a scramjet for the first time in the world.

Scramjets are air-breathing supersonic combustion ramjet engines. They are set to revolutionise the economical launch of small space payloads, such as communications satellites, by substantially lowering costs.

The University's Centre for Hypersonics in the Mechanical Engineering Department will launch two Terrier Orion rockets fitted with hypersonic air-breathing engine (scramjet) experiments at Woomera, 500km north of Adelaide, in June 2000.

Vice-Chancellor Professor John Hay said as Australia's leading university in aerospace research, UQ had instigated the HyShot Program to underscore Australia's position at the forefront of hypersonic technological research.

Professor Hay said the project had been supported by Defence Minister John Moore, who had been pivotal to the rocket testing program proceeding at Woomera.

"The objectives of the HyShot program can be equated to breaking the sound barrier in flight, but for HyShot it will be the combustion sound barrier that is broken," he said.

The \$1 million program is supported by an international consortium presently including UQ, US firm Astrotech Space Operations, DERA (the UK Defence Evaluation and Re-

search Agency), NASA Langley Research Center, the DSTO (Department of Science and Technology Organisation), the DLR (German Aerospace Center) and Australian Space Research Institute (ASRI).

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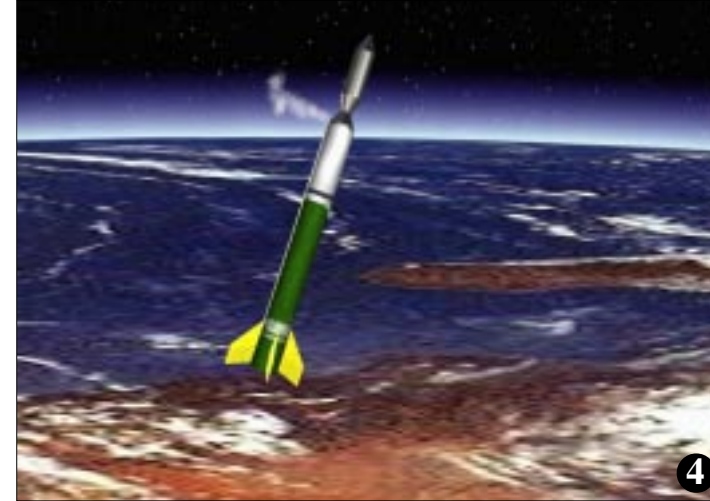


Dr Paull (left) and Professor Hay at the HyShot project launch



Left: Technician Neil Griffiths makes components for the HyShot program in the mechanical engineering workshop.

Right: HyShot team members (from left) PhD student Judy Odam, Dr Mee, Dr Paull and chief engineer Dr Hans Alesi with the scramjet model



Sky no limit for scramjet technology

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Australian firms, Alesi Technologies, AECA, Luxfer Aust. and British Aerospace Australia will assist by providing operational and logistic support. Funding has also been secured from the Department of Industry, Science and Resources and assistance and support from the Ministry of Defence.

The HyShot program will use the rockets to propel scramjet experiments 350km above the Earth. On re-entering the atmosphere, UQ scientists will measure the pressure rise produced in scramjet combustors from burning hydrogen injected at the entrance to the combustor. Tests will be made at speeds of approximately 8600km/hour and at altitudes between 35 and 23km before the rockets crash to earth.

Data will be captured from a radio signal transmitted from the rockets.

In addition, a computer package will record the data and be ejected before impact to be recovered by ground teams when it lands 130km from the launch site.

The flight data will be correlated with measurements obtained from UQ's T4 shock tunnel, one of the few wind tunnels in the world which can test at earth orbital speeds.

The flight data will have wider use because its information can be used as general benchmark data for supersonic combustion. Benchmark data can not only be used for verifying wind tunnel tests, but also to validate computer simulations.

By combining wind tunnel testing with computer simulations engineers can begin developing airbreathing engines, allowing a reduction in the number of expensive flight tests.

For the past 16 years UQ has been developing scramjets with funding from Australian, US, Japanese and German sources. Development has been possible through the use of the T4 shock tunnel designed by Australia's first professor of space engineering at UQ, Emeritus Professor Ray Stalker.

The UQ scramjet activities took a new direction in 1993 when Dr Allan Paull, with Emeritus Professor Stalker and Dr David Mee, "flew" a complete scramjet prototype in the T4 shock tunnel and showed it was possible to generate more thrust than drag with these engines — the es-

sence of any propulsion system. HyShot research team leader and senior research fellow Dr Allan Paull said the turning point in the program's development was when US company Astro-tech Space Operations (ASO), offered the rocket motors and launch support at no cost to UQ.

During a fact-finding trip to Australia in October 1997, Astro-tech was put in touch with UQ to flight test an experimental configuration which had been tested in the T4 shock tunnel.

The HyShot program will demonstrate ASO's suborbital rocket capabilities to Pacific Rim countries

and support the scramjet technology program.

"Other consortium partners will combine their expertise with the UQ researchers to help design the many components which will be needed

for the tests," Dr Paull said.

Professor Hay said although extensive in-house testing had been performed, no field tests were previously possible to correlate data, an important stepping stone to maintain hypersonic technology development and to further develop scramjet technology.

"The mission objectives are first and foremost scientific," he said. "Successful HyShot flights will be a

major engineering achievement. And even though the goals are more far reaching, just getting the payload to the launch pad will be an achievement and a well worthwhile exercise in itself."

He said a successful outcome from the HyShot program would make UQ the only institution in the world that had undertaken extensive scramjet testing and now had a shock tunnel calibrated against flight for supersonic combustion.

"The HyShot program will open new but related fields of research in hypersonics for UQ researchers, with a minimum of 18 research topics arising from the program this year for all levels of staff and students in the Departments of Mechanical Engineering, Computer Science and Electrical Engineering, and Physics," Professor Hay said.

'The HyShot program will open new fields of research...'

