# The Infrastructure Road to Recovery— Let's Build Our Way Out of the Depression!

## Conquering Space

*by Marsha Freeman*

For the past year, the most challenging and promising international science and engineering project ever attempted has been orbiting 250 miles above our heads. With the participation of 16 nations, the International Space Station is becoming the first world-class science and technology laboratory in space. Crews made up of astronauts and cosmonauts have been living aboard the station since November 2000, and have opened the era of permanent manned presence in space.

Armadas of unmanned spacecraft are already at, or will be heading toward, Mars, for the rest of the decade, paving the way for manned missions in the decades to come. Other unmanned probes are exploring the mysterious outer planets of the Solar System.

New, revolutionary space launch vehicles, including hypersonic planes, are under development, to make access to space safer and cheaper than it is today. If the cost of launching a kilogram of payload into Earth orbit can be lowered by an order of magnitude, it will be possible for non-astronaut scientists and citizens to fly in space, for industry to develop new materials and processes, and for universities and scientific institutions to test basic theories of physical principles, in this unique environment.

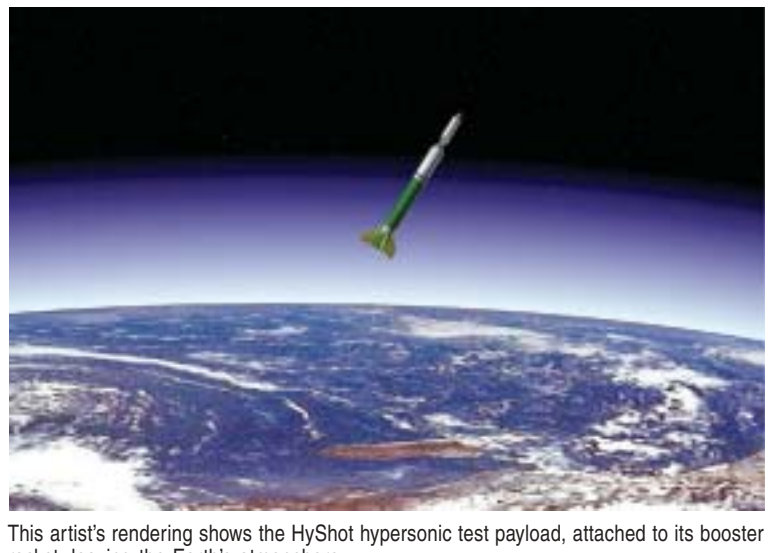
It is time for Australia to get into space!

Australia was one of the first nations in the world to be involved in space technology, with the establishment of the Woomera test range launch facility soon after the end of the Second World War. British and American rockets were test flown up through the 1970s at this expansive facility, for the military development of ballistic missiles, to evolve commercial launch vehicles, and for science experiments above the Earth's atmosphere.

But throughout that time, and since, Australia has failed to take advantage of its excellent geographic location, its scientific and engineering talent, its industrial base, and its political affinity with other space-faring nations, to make its contribution to space exploration.

The political disease of globalisation, with its founding principle that only activities that are "commercially" viable (that is, make a short-term profit) should be pursued, has meant that Australia has made little investment in space infrastructure, leaving such to the "free market."

Now, with Australia, and most of the rest of the world, finally facing the end of the era of a zero-growth, anti-technology, speculation-based monetary system, there is the opportunity, and necessity, to turn to an economic policy of investment in the great infrastructure projects of the 21st century. And the greatest great project facing mankind is the exploration, and colonisation, of space.



This artist's rendering shows the HyShot hypersonic test payload, attached to its booster rocket, leaving the Earth's atmopshere. Photo: University of Queensland

### An Abandoned Early Start in Space

During the 1960s and 1970s, more than 2,000 American, British, and European rockets were launched from the Woomera Prohibited Area. It was established in 1948 as a military test range, encompassing 127,000 square kilometers in the northwest part of the state of South Australia, 500 kilometres from Adelaide. Woomera occupies 13% of the land area of the whole state.

The British government tested its Black Knight and Blue Streak rockets at Woomera, and the U.S. Redstone rocket was used to test reentry phenomena from the range. During the 1960s, suborbital sounding rockets, including the UK's Skylark, and NASA's Aerobee, conducted early launch tests and experiments. The tenth Redstone launch, on November 1967, put the first Australian-built satellite into orbit, the Weapons Research Establishment Satellite, (Wresat), which had been built at the University of Adelaide.

In 1962, leading European nations formed the European Launcher Development Organisation (ELDO). Australia was a full member, and ten ELDO Europa rockets were test flown from Woomera, from 1964, with the last one in June 1970.

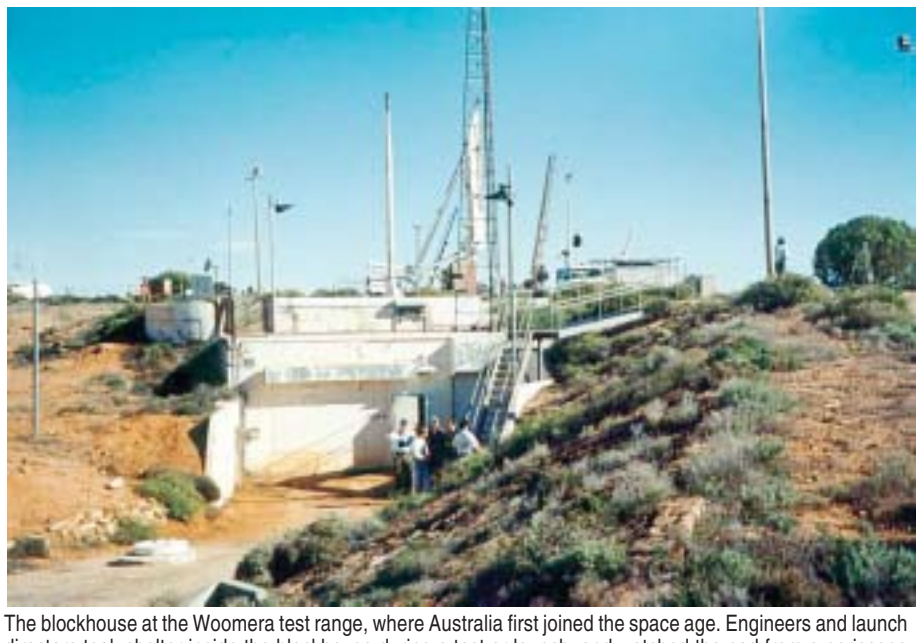
But Australia did not join in when Europe created the European Space Agency in 1974 which replaced ELDO, to carry out a broad range of space programs, and France, then and still dominant in ESA's rocket development efforts, preferred a launch site in French Guyana at Kourou, to the existing facility in Australia.

Woomera, far from the equator, was not the optimal launch site for commercial satellites. In addition, for satellites that had to reach geostationary orbit, launching from Woomera would have meant flying over populated areas of eastern Australia. In 1976, Britain finally announced its withdrawal from the test range, and operations at Woomera basically came to an end.

It would have been quite possible for Australia, in the mid-1970s, to develop a second launch facility at Cape York, in Queensland, which is near the equator, at 12 degrees South latitude, and is well-suited for launching commercial geostationary satellites. But this was not pursued aggressively by the government.

In terms of significant government investment in space projects, Australia has suffered an hiatus of more than two decades. Except for the relatively short period between 1987 and 1996, Australia has not had a central, federal government agency for developing and carrying out a national, long-term space program, comparable to America's NASA.

Instead, since the mid-1980s, the government has only focused its effort on trying to bring other nations to use its potential launch sites as paying customers, at Woomera, Cape York, and nearby Christmas Island. The commercial space market was flourishing in that period, and with the 1986 loss of the Space Shuttle *Challenger*, it was clear more expendable launch vehicles would be needed, worldwide, to meet the need for satellite communications.



The blockhouse at the Woomera test range, where Australia first joined the space age. Engineers and launch directors took shelter inside the blockhouse during a test or launch, and watched the pad from a periscope inside. Photo: Australian Space Research Institute

But two commercially-sponsored attempts in 1989, and 1991, to establish launch services to low Earth orbit at Woomera, failed. An attempt to create a commercial launch site at Cape York went bankrupt.

In 1994, the Australian Space Council was established, to promulgate a five-year plan. Its major goal was to develop and launch two rockets for small satellites, and two payloads. But the funding allocated was only A$9.3 million, and the proviso was that the projects had to be commercially justified. The program was never implemented.

With great fanfare, in 1998 the Space Activities Bill was passed by the Parliament, but this was strictly to establish a regulatory framework for commercial space activities, dealing with safety, licensing, and liaibility issues, for using foreign rockets to launch satellites.

Current agreements, with U.S. and Russian rocket companies to launch satellites from Australia, may or may not succeed, especially since the past year's collapse in the telecommunications, Internet, and other "new economy" sectors have greatly reduced the need for new satellite systems.

But Australia does have developed capabilitites in rocket development, Earth remote sensing, and participation in international space science programs, which is a foundation from which it can move ahead to join the world space community.

### Where Australia Stands Today

Over the past 20 years, Australia has developed capabilities in remote sensing of the Earth, ground-based astronomy, telecommunications, space biology and science, and hypersonic flight, along with a fledgling space industry, that could, with the proper government investment, lay the basis for an impressive contribution to international space exploration projects.

As a large nation, with much undeveloped land, surrounded by oceans, Australia has cultivated capabilities in the development of sensors and data processing for Earth observation. The Australian Centre for Remote Sensing receives images at its Alice Springs station from a multitude of satellites, and processed images are provided for mapping agencies in all capital cities.

Australian scientists and engineers have been involved in the development of remote sensing scanners since the 1980s, and contributed the Digital Electronics Unit for one of the instruments aboard the European ERS-1 satellite, which was launched in 1991.

An Australian-designed supercomputer, the Fast Delivery Processor, allows images to be produced from the ERS-1 radar data in just two minutes, rather than hours. This capability is especially important for military surveillance, and in disaster relief situations.

While the Australian government has made only false starts at developing an Australian rocket launch capability, enterprising engineering students at Monash University in Melbourne have developed, and flight tested, the AUSROC series of suborbital sounding rockets. In 1999, the non-profit Australian Space Research Institute in Adelaide proposed a 10-university AUSROC IV launcher, and all of these amateur projects have helped create the technical expertise and experience for more ambitious ones.

By the mid-1980s, experts in the Australian scientific community were anxious to take advantage of the new manned, U.S. Space Shuttle capability, and began to design experiments, and lobby the government for the funding, to participate.

Early on, Australian scientist Ken McCracken had designed one of the cosmic ray detectors that flew on the American Pioneer-6 and 7 spacecraft, and in 1980, Australia decided to develop a photon-counting detector for the Canadian-U.S. STARLAB ultraviolet astronomy satellite. Although STARLAB was cancelled by the Canadian government, it was decided to continue to develop the Australian Endeavour ultraviolet space telescope. Endeavour is the most sophisticated space payload ever built in Australia, and was flight-qualified during its 1992 Shuttle mission.

Two groups at the University of Sydney have also flown biomedical experiments on board NASA's Shuttle and the Russian Mir spacecraft. One, led by Dr. Leopold Distenfass, was the Aggregation of Red Cells experiment, which flew on a January 1985 Shuttle mission. The results, which allowed discrimination between healthy and diseased blood, was considered so important by NASA, that the experiment flew again in 1988.

Australia has also been a leader in hypersonic flight research, dating back to the days at the Woomera test range. Unique hypersonic wind tunnels, with airflows between 10 to 25 times the speed of sound, have been developed for this research.

Recently, the University of Queensland has led the HyShot program, to test a scramjet in flight, as a payload on a rocket. While a recent test was not successful, as a result of a failure in the rocket launch and not the scramjet, the work is continuing. It will contribute to NASA's Hyper-X program, and similar international hypersonic flight research projects.

There is also movement afoot to finally establish at least one of the commercial space launch facilities that Australia has been so well-suited for since the beginning of the Space Age.

After all of the false starts, at Woomera and Cape York, the commitment by the Russian government, through its Aviation and Space Agency and its rocket-building industrial enterprises, may indeed finally result in a launch site on Christmas Island.

An international consortium, termed the Asia Pacific Space Centre, which includes participation from Australian and South Korean private investors, garnered a commitment from the Australian government in June 2000 to contribute $52 million to the project, to upgrade the transport and infrastructure on the island.

The Russian government is interested in Christmas Island due to its proximity to the equator, which allows heavier payloads to be launched into geostationary orbit. It plans to launch its new Aurora vehicle from the Australian spaceport. The only crimp in this plan is the contraction of commercial satellite launches over the past year, due to the overall collapse of economies, in both the developing and industrialised nations.

While the Australian government has never made a serious commitment to implement a long-range, and wide-ranging space program, which would help develop the educational, industrial, and scientific capabilities of the nation, there is a lot to build on.

In his Foreword to a 1993 book titled, *Space Australia*, Dr. Paul Scully-Power, the first Australian-born person to fly in space, stated that Australia has a great space heritage. "The challenge now," he wrote, "is to take the next step. Let it not be another lost opportunity."