The International Space Station: a project with enormous scientific potential

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On November 20 and December 4, the first sections of the International Space Station (ISS) were launched into orbit, beginning what will be the largest and most complex single engineering project ever undertaken.

The Zarya Control Module was carried into orbit in November enclosed in the nose fairing of a Russian Proton rocket launched from the Baikonur Cosmodrome in Kazakstan. Zarya (Sunrise), which is the main propulsion and command module for the space station, weighs about 20 tonnes and is 14 metres long.

The Unity module transported into orbit in December on board the Space Shuttle Endeavour is 5 metres long and 7 metres in diameter. A mechanical arm on Endeavour was used to grab Zarya and manoeuvre it into position. Unity was then docked and, in a series of three space walks, connected to Zarya. The mission control centres in Houston and Korolev will monitor the systems over the next five months to ensure all is working according to plan.

These are the first of 45 planned launchings aimed at completing the project in 2004 at the cost of $US40 billion. Once assembled the International Space Station will consist of more than 100 different sections with a mass of 455,865 kilograms or 456 tonnes. It will measure 108.6 meters by 79.9 meters--equivalent in size to an American football field including the end zones.

When complete the ISS will be able to carry a crew of up to seven astronauts in living conditions of a far higher standard than currently exist on the largest existing space station--the Russian built Mir. A series of laboratories will greatly enhance the ability of scientists to conduct sophisticated experiments in space, including:

* Research into the psychological and physical effects on the human body during extended periods in space. The work is vital to any plans for extended space flights, for instance to the planet Mars.

* Medical research assisting in the development of new drugs to combat diseases. NASA is building a bioreactor to culture cells over long periods. By observing the growth of tissue, both healthy and cancerous, in space, scientists hope to gain new insights into the nature of cell formation.

Already experiments carried out on the Mir space station have shown that protein crystals grown in space are far superior in crystal formation than anything produced on earth. Such research has provided important clues about the molecular structure of cells and the development of new and more effective types of drugs.

* Experiments aimed at developing new industrial materials and technologies. The ISS will be equipped with a series of furnaces to monitor the behavior of different alloys in space. New materials that are transparent but simulate alloys will be tested to determine their fluidity and other characteristics.

International cooperation and rivalries

The scientific potential of the International Space Station is enormous. Such is the magnitude of the project that its construction and assembly will involve the combined efforts of space agencies and engineering firms in 16 different countries--the US, Russia, Canada, Japan, Brazil, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.

On the surface, the International Space Station appears to be a model of international co-operation--the unified effort of mankind as a whole to penetrate into the great mysteries and potentialities of space research and travel. But as with most scientific research under capitalism, the project is fraught with national rivalries and the calculations of private profit. It is an open secret that the space station may never be completed and its designers have planned the project to enable limited use of a partially finished construction.

In 1996, Russian space officials told the US that it would scale back its involvement in the ISS and signalled, as on previous occasions, their intentions to upgrade and continue with the Mir station. Why should Russia have to bear the considerable costs of sharing a space station with the US when it already had one of its own? Vice president Al Gore was forced to intervene to ensure that Russia would maintain its agreements. Without Russia and its considerable expertise gained from Mir, the International Space Station would have been impossible.

Frictions have also emerged with the European Space Agency (ESA). Under the existing agreements, the ESA is not permitted to send their own astronauts to the space station until one of their own modules is in space, which is not due to take place until 2002. The ESA is now negotiating with NASA and the RSA for inclusion of its astronauts in the construction process of the space station.

The ESA has voiced concerns about the predominance of the US in the project. The ESA spelled out what lies behind its complaints in one of their statements. Under the section 'Why is Europe participating in the International Space Station?' the ESA states,

'The Space Station is the largest space program that has ever been undertaken on the basis of international cooperation. All major space-faring nations are concentrating their efforts on this program and no other space station is likely to be built in the foreseeable future.'

With the advent of telecommunications and other commercial satellites, space research and exploration is rapidly becoming a highly profitable concern. All of the main participants in the ISS project have their own space launch facilities and programs, and are competing against one another for commercial business. None of them could afford to construct and operate such a space station alone. But they cannot afford to be excluded from the potential scientific and technological advances, and from the commericial and even military advantages that may result--thus provoking tensions as each seeks to exploit the project to their own advantage.

The origins of the ISS

Plans for the space station first emerged under the Reagan administration in the mid 1980s. Its Cold War origins were epitomised by its name-- Space Station Freedom. Other nations were invited to take participate but the then USSR was excluded. The project was part of a US attempt to assert its domination in space and was linked to Reagan's announcement in 1984 of the Star Wars program, one of the main planks of the Strategic Defense Initiative.

The aim of the 'Initiative' was to develop the means for completely neutralising any Russian nuclear missile attack on the US and thus completely alter the existing military balance of forces. The purpose of the Star Wars program was to develop the capacity to destroy missile attacks from space using lasers. A long-term manned presence in space was clearly an important requirement in such plans.

Yet the US lagged behind the Soviet Union in important areas of space technology and spacecraft. From the early 1970s, the USSR began launching the Salyut 1 to 7 manned space vehicles as well as the Almaz space stations which were designed for military purposes.

Soviet efforts culminated in the construction and launching of Mir space station in 1986 which was extended over the next ten years through the addition of four other modules bringing its total mass to about 120 tonnes. The establishment of Mir gave the USSR a formidable advantage in space research. The US, even with its Skylab program during the 1970s, had been unable to gain experience in the mounting of long term manned space flights.

However, US plans for Space Station Freedom as well as the Star Wars Program changed drastically with the collapse of the USSR in 1991. The breakup and economic crisis throughout the former Soviet Union has provided the US and other major powers with extraordinary opportunities to buy up its scientific achievements, research establishments and scientists at bargain prices.

Russia's prestigious space research program is no exception. Faced with chronic economic difficulties, the Russian Space Agency is increasingly reliant on US government money to keep operating. Only recently the Clinton administration passed an emergency bill for $US600 million to keep the Russian space program from going bankrupt. But as the US began to pay the bills so it influenced the directions of Russian space research.

In 1993 the Clinton administration called for the long-planned international space station to be redesigned to reduce costs and advance the construction dates. The proposal was only possible as the US was able to draw on the expertise and resources of the Russian space agency. For instance, Zarya, the first of the space station modules, was paid for by Boeing and NASA and built in Russia at a far lower cost than would be possible in the US using existing Russian infrastructure and technology.

From 1994, the US gained considerable knowledge through joint operations on the Mir space station but insisted that the Russian program be subordinated to its plans for the ISS. Having spent 12 years in space, seven years more than originally planned, Mir has been plagued by system failures, a fire and a collision by a supply vessel. The troubled space station has now been earmarked for destruction by mid 2000.

The ISS has not been without its critics in the US. NASA and its research programs, like other major scientific research areas, has been subject to considerable government cutbacks to its funding. In the end, the ISS project may face the same fate as the giant US Super Collider project which was completely scrapped on the basis that it served no immediate useful, that is, profitable purpose.

Space research promises to open up vast new vistas for humanity as a whole and is one of the areas of scientific and technological endeavour which cries out for a planned and international co-operative effort. The tensions underlying the International Space Station illustrate the incompatibility of such an obvious approach with a social system based on private profit and rival nation states.

See Also:
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