

# NASA's space science ambitions looking costly

- Space station strains the budget
- Astrophysics seen as the key

## Washington

By its own admission, the Office of Space Science and Applications (OSSA) at the National Aeronautics and Space Administration (NASA) is in a period of transition. The exhilarating rapid-fire pace of the 1960s has given way to a period when missions are more complex, require more planning and place greater demands on resources.

To direct NASA's future course, Lennard Fisk, associate administrator for space science, has come up with a strategic plan that will "serve as the basis for OSSA program planning in the future". The plan, providing clear goals and means for achieving them, is still predicated on a difficult premise: that an increasingly chary Congress will continue to provide enough money to pursue continuing projects let alone start new ones.

The immediate future for space science at NASA is rosy. With a modicum of good luck, next year will see the launch of the Cosmic Background Explorer, the Magellan Venus radar mapper, the Hubble Space Telescope, the Astro Spacelab mission, the Galileo mission to Jupiter and the Voyager 2 encounter with Neptune. But after that, both new money and new directions will be needed.

Fisk's plan proposes the pursuit of world leadership in space science through an initiative in astrophysics. Fisk is proposing four 'Great Observatories' to give the United States observing capability in all major wavelengths. With the Hubble Space Telescope as the centrepiece, the spacecraft will include the already started Gamma-Ray Observatory, the Advanced X-Ray Astrophysics Facility, a new start in President Reagan's 1989 budget request to Congress and a Space Infrared Telescope Facility still on the drawing boards.

The observatories fall into the category of major missions that form part of the strategic plan. Other major missions would include the Comet Rendezvous Asteroid Flyby mission, the Cassini mission to Saturn, an Earth Observing System to

fly aboard the space station's polar platform, and a solar probe.

Fisk's hope is to start one of these major missions each year. But the plan also calls for starting at least one small mission each year. Such missions might include Earth probes such as the Magnetic Field Explorer and the Tropical Rainfall Measurement Mission or Lifesat, a reusable spacecraft for life sciences experiments.

These small missions "are particularly important for the training of the next generation of scientists and engineers", because they can be performed on a small enough scale to be managed by a single university and should take about the time needed to earn a graduate degree.

The plan also declares that "it is time to move aggressively, but sensibly" to develop projects to take advantage of the space station. Six pieces of equipment are specifically proposed: a furnace facility, a modular combustion facility, a fluid physics/dynamics facility, a modular containerless processing facility, an advanced crystal growth facility and a biotechnology facility. The plan also proposes strengthening NASA's research base over the next five years.

The Fisk plan attempts to provide rational priorities to a scientific programme, and many agree that it succeeds in that attempt. But reality may still force decisions to be made on a budgetary rather than a strategic basis. All the proposals are based on a planned growth in the NASA budget. But the costs of the space station are such that Congress will have either to provide NASA with substantially more than the approximately \$11,500 million it is requesting for this fiscal year or see other programmes, including space science, dry up.

Fisk's plan provides a statement of where NASA would like to find itself by the start of the next century. It is probably a necessary step to achieving the leadership role the plan seeks, but without money it will not be a sufficient one.

Joseph Palca

# Leaked report on Star Wars

## Washington

THE Congressional Office of Technology Assessment (OTA), after two years of study, has concluded that any system designed to fulfill President Reagan's vision of "Star Wars" defence against Soviet missiles would probably fail "catastrophically" should it ever be used. The two principal failings of the Strategic Defense Initiative (SDI), says the OTA, are that countermeasures can be easily be devised which are simpler and cheaper than the defensive system, and that battle coordination by computer would require software of such complexity that it could never be tested to assure the needed reliability.

The report was finished seven months ago, but since then has been mired in the declassification process at the Department of Defense (DoD). OTA staff members have not hidden their dissatisfaction with the delay. Last Friday, a copy of the summary chapter of the report's findings was circulated to OTA's Congressional board, and an unauthorised copy was obtained by the *Washington Post* in time for its Sunday edition.

Three chapters of the OTA report are still classified, although the remainder has been cleared by the DoD for public release. OTA still hopes to make the whole report public next month, but may decide to release only the nine chapters which have been cleared rather than put up with further delay. Last year's report by the American Physical Society on the feasibility of SDI beam weapons languished similarly (*Nature* 326, 815; 1987), and was then criticized by SDI supporters for omitting recent developments.

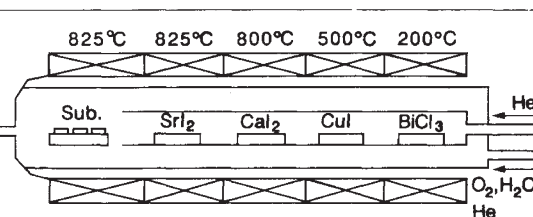
Neither the DoD nor the SDI Organization has made any specific response to the criticisms, saying they will have a full reply ready when the whole report is made public. But Secretary of Defense Frank Carlucci has said that the OTA report is tantamount to asserting, ten years before helicopters were invented, that helicopters were "doomed to failure".

Many critics have pointed to survivability and battle control as the weakest parts of SDI, but John Pike, of the Federation of American Scientists, believes the OTA report will carry special weight because it is the first comprehensive study of SDI as a complex system rather than a collection of gadgets. Little has been achieved in these crucial areas, and SDI research contracts have been numerous and small, an indication, says Pike, that many possibilities are being studied but few are showing promise. Coming at the end of President Reagan's term, the OTA report may be enough to shatter the Star Wars dream.

David Lindley

## Superconductor methodology

A method for cheap mass production of superconducting wafers may result from Fujitsu's new vapour deposition technique involving a temperature gradient. Substrate is MgO. See page 770 for details.



Nikkei Superconductor