US space sciences

Martian base planned within forty years

Washington

DEVELOPMENT of new space vehicles to allow exploitation of lunar resources and place a manned base on Mars before the year 2025 is recommended in a report to be published shortly by the US National Commission on Space. A final draft of the commission's proposals, which have now been sent to the White House, describes an ambitious programme for manned and unmanned exploration of the inner Solar System supported by spaceports in low Earth and lunar orbits; manned bases would employ self-sustaining life support systems and use on-site materials. The first lunar outpost would be operational within 20 years.

The commission, appointed by President Reagan in March 1985 to formulate a long-term civilian space agenda, believes that manned exploration, prospecting and settlement of the near Solar System is feasible if the United States (and in particular the National Aeronautics and Space Administration, NASA) improves long-term planning. Establishing manned lunar bases will, the commission believes, spur development of technology that could later be adapted for use on Mars.

The commission recommends that the proportion of NASA's budget devoted to its "technology base" be increased from the present 2 per cent to 6 per cent, and that space programme budget planning be shifted to a five-year cycle. Multi-year procurement contracts should replace year-by-year contracts, while budget approval should be only every two years. The cost of the proposed space programme would increase from \$7,300 million per year (NASA's current budget) to around \$40,000 million by 2025 (1986 dollars); the commission points out that if (as it predicts) the US economy sustains a 2.4 per cent annual growth rate, the proportion of US gross domestic product being spent on space would remain less than half of the peak during the Apollo programme for a landing on the Moon.

The commission endorses foreign collaboration in space exploration and suggests that the United States should lead coalitions of participating nations. But it says that US commercial interests should be respected and stresses that the private sector should play an important role, especially in designing launch vehicles. Cooperation with the Soviet Union should be subject to special controls to prevent transfer of technology that might damage military security.

Anticipating future political battles over access to space resources, the com-

mission argues against the creation of new international organizations or new treaties to regulate broadly the use of space resources, believing that the four United Nations treaties to which the United States is party provide an adequate framework. It argues against US ratification of the "Moon treaty" dealing with natural resources on other celestial bodies, arguing that international regimes such as that envisaged in the treaty could inhibit US enterprise in space.

The commission lays much stress on the importance of maintaining continuity of launching services and of reducing space transport costs. Three new phased transport systems will be needed within the next 15 years: a cargo transport to reduce the cost of placing payloads in low Earth orbit to \$200 per pound, a low-Earth orbit passenger transport and a transfer vehicle operating from near-Earth orbit that could move payloads and crews over lunar distances and be piloted remotely to land on the Moon.

The passenger transport could be either an advanced reusable rocket or an air-breathing aerospace plane (NASA and the Department of Defense recently announced plans to develop an aerospace plane that would utilize supersonic combustion ramjet (scramjet) engines). Transfer vehicles would use hydrogen/oxygen fuel; for long interplanetary journeys, electric ion beam or mass-driver propulsion would be needed.

A major basic research effort is recommended to support exploration of the planets and asteroids. The planned space station now being developed would be followed before the year 2000 by a spaceport in low-Earth orbit, and a variable-gravity laboratory shortly thereafter. The commission stresses that much prospecting of the Solar System will have to be carried out remotely at great distances, and so recommends the development of exploring vehicles with substantial artificial intelligence for sample/return missions. And much research is still needed on the effects of prolonged weightlessness and exposure to radiation in space. Nevertheless, the commission is optimistic; Moon rocks might be used for shielding. The first crew would arrive on Mars by about 2010; later, the commission foresees continuously-cycling spacecraft in an energy-minimizing trajectory between Earth and Mars. The commission asks the administrator of NASA to prepare a five-year plan in response to its report by the end of this year.

Tim Beardsley

AIDS research

French virus in the picture

Washington

THE announcement in last week's *Science* that one of the key early papers on the AIDS (acquired immune deficiency syndrome) virus from Dr Robert Gallo's group at the National Institutes of Health includes an erroneously labelled composite electron micrograph will do nothing to help Gallo's group in its battle with the Institut Pasteur of Paris over patent rights to AIDS blood tests. The error can only be described as acutely embarrassing: electron micrographs in a paper by Schüpbach *et al.* (*Science* 224, 503; 1984) that are identified as HTLV-III isolated by Gallo's group in fact show samples of lymphadenopathy associated virus (LAV) supplied to Gallo's group in 1983 by Luc Montagnier at Institut Pasteur. Montagnier's lawyers argue that the photographs provide evidence that Gallo in some way benefited by using the Pasteur virus to make his own patent claim.

According to Gallo, the mistake was made by a technician at Frederick Cancer Research Center, which performed electron microscopy for Gallo after September 1983, and was discovered only recently. The photographs in question were sent to Gallo's laboratory in December 1983. Gallo has long maintained that he never succeeded in achieving more than transient growth of LAV, and that the blood test he developed was based on one of his own isolates; nevertheless, when a good micrograph of budding AIDS virus particles was called for in the Schüpbach paper, the picture selected was of LAV.

Gallo says the scientific content of the paper is unaffected by the use of the wrong photograph and insists that his group can prove conclusively that they had other good electron micrographs of HTLV-III together with evidence of reverse transcriptase activity (and negative tests for HTLV-I and HTLV-II) dating from as early as February 1983, before Montagnier's first publication of a photograph of LAV. These photographs, which were taken at a different laboratory, are shortly to be submitted for publication in a recognized journal in an attempt to lay to rest the suggestion made by Montagnier's lawyers that Gallo used LAV simply because that was his best source. Gallo points out that photographing the virus supplied by Montagnier was normal scientific practice provided for in the agreement accompanying the exchange to use the virus for research. Gallo lists in a letter to *Science* explaining the error (232, 307; 1986) three other papers (two in the same issue of *Science*) that included correctly identified HTLV-III.

Tim Beardsley