

tion of key measures and total abandonment of weapons systems such as cruise missiles that cannot be easily verified; a prohibition on space weapons; inclusion of intermediate- and short-range nuclear weapons in the disarmament process; reduction of non-nuclear forces; and a complete ban on chemical and biological weapons.

Among those who endorsed the program are A. P. Alexandrov (USSR), Hannes Alfvén (Sweden), Carlo Bernardini (Italy), Paul J. Crutzen (Federal Republic of Germany), Hans-Peter Dürr (FRG), V. Goldanskii (USSR), Serge Kapitsa (USSR), Thomas W. B. Kibble (UK), Klaus von Klitzing (FRG), A. M. Prokhorov (USSR), Rotblat, Sagdeev, Salam, Jack Steinberger (Switzerland), Velikhov, von Hippel and Victor F. Weisskopf (US).

FAS letter to Reagan. Not long before the international group of scientists met in Hamburg and denounced, among other things, cruise missiles, the Federation of American Scientists sent Reagan a letter applauding "the Administration's readiness to negotiate a nuclear disarmament treaty that would, among other things, dismantle all ballistic missiles."

"Critics are wrong in believing that such an agreement would undermine US security," the letter said, because "the US strategic bomber force, armed with cruise missiles, is an even more formidable deterrent now than it was in the late fifties." At the same time, the letter said, "none of us want to see dramatic reductions in . . . ballistic missiles turned into a charade in which the missiles are simply replaced by even more cruise missiles." The letter was

signed by Jeremy Stone, director and chief executive officer of the FAS, John P. Holdren, its chairman from 1984 to 1986, and von Hippel, its chairman from 1980 to 1984.

While the FAS letter may have raised questions about consistency, von Hippel says that the main point was to let the President know that if he is willing to put himself on the line politically for serious reductions in any category of nuclear weapons, the federation will be willing to consider his ideas seriously as a component of an arms control or disarmament accord.

FAS-Soviet agreement. A significant byproduct of the Moscow conference was the renewal of an agreement between the research arm of the FAS and a group called Soviet Scientists for Peace and Against the Nuclear Threat (see *PHYSICS TODAY*, February 1984, page 18). Velikhov signed for the Soviet group, Stone and von Hippel for the FAS.

The agreement provides for a joint study of "the organization of a military-industrial complex and the various ways of verifying in depth the compliance of this complex with a model agreement containing quantitative and qualitative limits on nuclear weapons systems." The agreement anticipates visits by US and Soviet scientists to some "relevant facilities" in each country.

The agreement also provides for continued semiannual meetings of US and Soviet scientists for five more years. Such talks started four years ago and have been a forum for discussion of deep cuts in nuclear weapons systems.

—WILLIAM SWEET

shuttle using Centaur upper-stage rockets, are delayed, though they are being redesigned for launch from the shuttle using an inertial upper-stage rocket that relies on a less dangerous propellant than the Centaur does. The Gamma Ray Observatory is scheduled provisionally for launch in 1990; ROSAT is in limbo. The uncertainty about these missions and a squabble about Pentagon plans for increased military use of the proposed space station are among the major factors that have put US-European space relations into sudden disarray.

Ulysses is primarily a project of the European Space Agency, West Germany is the main sponsor of ROSAT, and the Galileo mission to Jupiter relies on a German penetrator. In addition, ESA and NASA were planning several joint Explorer projects, but last fall the Europeans withdrew from the program. ESA science director Roger Bonnet said that the Europeans had to be independent and no longer could rely on the United States, AAS Executive Officer Peter Boyce reports.

Two major problems require immediate attention, AAS leaders believe. First, the current NASA budget request contains no funds for expendable launch vehicles. Second, the Explorer program desperately needs added funds just to get back to where it was at the time of the Challenger accident.

Because of the accident, Boyce says, the Explorer program will have to absorb \$140 million in extra expenditures—some \$70 million for a vehicle to recover the Solarmax satellite, \$30 million to buy a Delta for the COBE mission and \$40 million in miscellaneous expenditures to maintain teams and programs.

The AAS resolution specifically calls upon NASA to:

- ▶ Pursue the development of a mixed fleet of launch vehicles including both expendable launch vehicles and shuttle-derived expendable launch vehicles and the shuttle orbiter

- ▶ Substantially augment the Explorer program to complete quickly the missions in preparation

- ▶ Initiate a program of major missions in space astronomy, planetary exploration and solar astronomy.

The preamble to the resolution complains that no planetary missions have been launched in nearly a decade, and Boyce believes it will be 1992 or 1993 before there are any new program starts.

The unprecedented resolution, the first AAS ever has adopted on a political issue, was drafted by its public policy committee under the chairmanship of Robert D. Gehrz, an astronomer at the University of Minnesota. Minor

AAS adopts resolution on space science

Meeting in Pasadena on 4 January, the council of the American Astronomical Society adopted a resolution on the state of US space science that calls upon NASA to come to terms with the consequences of the Challenger disaster and make a plan to get the US program moving again.

"It is clear that one year after the accident, NASA has not been able to come up with a plan," says AAS President Bernard F. Burke. "One would have thought that an agency with a reputation for excellent management could have risen to the occasion."

Little is to be done, Burke concedes, about the Hubble Space Telescope and the ASTRO, SHEAL and SPARTAN missions, all of which must be launched on the space shuttle. Giving credit where credit is due, Burke says that NASA has done a good job of minimizing the

delay in the Cosmic Background Explorer mission by making plans for COBE to be launched by a Delta rocket in 1989. But Burke is unhappy that no extra money has been budgeted for COBE, so that it will cut into other projects, many of which are in extreme jeopardy.

Because of lost flight opportunities and increased costs, scheduled missions such as the X-Ray Timing Explorer and the Extreme Ultraviolet Explorer are severely delayed. In still greater danger are major missions that have passed peer review but await authorization and funding. These include AXAF (the Advanced X-Ray Astrophysics Facility), SIRTf (the Space Infrared Telescope Facility) and the High Resolution Solar Observatory.

Galileo and Ulysses, both of which were to have been launched from the

revisions were made at the AAS meeting in Pasadena, which was marked by sharply rising interest in public policy questions among the society's membership.

—WILLIAM SWEET

Military uses and rising costs jeopardize space station

Two years ago, when the members of the European Space Agency, Canada and Japan agreed to join in planning for the space station project despite reservations about subordinating themselves to US technology and objectives, it seemed a triumph of President Reagan's personal diplomacy and a striking vote of confidence in NASA's technical prowess (PHYSICS TODAY, May 1985, page 77). That was before the Challenger disaster and before the Iran-contra affair, and it was before the Pentagon began to drastically escalate its claims on the space station.

In mid-December, when negotiations about design and construction of space station components were beginning to pick up momentum, the Pentagon asked NASA to delay talks until it could be determined whether any proposed agreement would preclude military use of the platform. About the same time, Defense Secretary Caspar Weinberger gave President Reagan a briefing in which he urged the President to approve a plan for early deployment of a missile defense system based on rocket interceptors.

In all previous negotiations military use of the space station had been carefully finessed. Top NASA officials said off the record that they took it for granted that the Strategic Defense Initiative Organization would want to get aboard once the platform was built, and in negotiations they took pains to inform foreign partners that the Pentagon was a potential user of the station. At the same time, the actual agreements with foreign partners said that the station would be used only for peaceful purposes, and ESA's charter restricts the organization to peaceful activities.

When negotiations resumed in February this year following a US interagency review of a draft intragovernmental agreement, the State Department endorsed a statement that there had been no change in the US position toward the space station since Reagan issued his invitation to foreign countries in 1984. The statement, signed by representatives of the United States, Canada, Japan and the 12 ESA member states participating in the project, said: "All partners confirm their intention that the space station should

provide the opportunity to establish a long-term mutually beneficial relationship for the exploration and use of outer space. They further confirm that the space station will be developed and used for peaceful purposes."

All parties are thought to be eager to see a final agreement reached by September, when the two-year conceptual design phase is scheduled to end and Phase C-D—design and construction—is scheduled to begin. Pryke stresses that real negotiations are taking place now—that talks have gone well beyond the preamble phase.

If the question of whether the Pentagon is to use the space station has been resolved, the answer is not publicly known and still must be considered, in detail, by the foreign partners. One report indicates that the Pentagon withdrew its request to use the station for Star Wars research and tests; another indicates that the President has signed a classified decision finding on how DOD will use the station.

Cost escalation. Independently of that issue, NASA Administrator James C. Fletcher conceded in testimony this winter that the space station might cost the United States \$12-13 or \$14-15 billion rather than \$8 billion as originally estimated. The latest internal NASA estimates are rumored to be well above \$20 billion.

The changed estimates may be of little direct concern to foreign partners, whose contributions are fixed. But they do concern Congress, which warned, when it originally authorized the space station, that cost overruns would not be tolerated. One measure of the space station's sudden vulnerability is the ad campaign launched by aerospace contractors to save it. During the winter full-page ads favoring the project were placed in leading newspapers and magazines by companies such as Boeing and Lockheed. "Space research is this generation's call to greatness," the ad from Boeing said.

At this writing, leading Administration officials have just gone to the President with a recommendation to proceed with a smaller version of the space station that would cost about \$4 billion less. The plan reportedly has been endorsed by James C. Miller, director of the Office of Management and Budget, National Security Adviser Frank C. Carlucci, Presidential science adviser William R. Graham and Fletcher. Fletcher's office would not comment on the report.

Apparently the plan calls for a smaller power supply that would support less modules and equipment. It remains to be seen whether the new version still could accommodate all the

equipment that Europe, Canada and Japan want to deploy.

Other issues. Plans for Columbus, the name given the European program for the space station, have become increasingly complicated as various national interests have been accommodated on the European side. The current agreed-upon plan for Columbus includes a permanently attached laboratory module and a polar satellite that is to complement an identical NASA satellite. The Europeans have proposed, in addition, a separate but co-orbiting platform for experiments with sensitive instruments and an astronaut-tended free flyer that could become the basis for an independent European station.

Whether the Columbus flotilla turns out to have two, four or some other number of vessels, it probably will not have three and it clearly will not make it to the new New World by 1992, in time for the 500th anniversary of Christopher Columbus's voyage, as originally hoped. The latest target date seems to be 1995.

—WILLIAM SWEET

AIP will start a new magazine, Computers in Physics, in 1988

Robert R. Borchers, associate director for computation at Lawrence Livermore National Laboratory, will be the editor of *Computers in Physics*, a new magazine-journal that AIP plans to start publishing next year. Borchers was recommended for the position by a search committee headed by Howard J. Voss of Arizona State University.

Borchers will edit *Computers in Physics* at Livermore, relying on a board of associate editors who will select scholarly articles on the basis of assessments from referees. The editor's job is part-

BORCHERS

