HIGH-ENERGY PHYSICS

Thrashing Out a Compromise on the LHC

After 6 months of tough financial bargaining over the fate of the Large Hadron Collider (LHC), officials at CERN, Europe's particle physics center, were cautiously optimistic earlier this week that its member countries would approve the SFr2.6 billion ($2 billion) project today. A decision had been due since June, when CERN's Director General Christopher Llewellyn Smith put the proposal to the center's council. But tight financial conditions in Germany and the United Kingdom led to acrimonious discussions over costs and contributions. Now an agreement looks to be in sight for today's council meeting. "We are converging on a proposal," says physicist Maurice Bourquin of the University of Geneva, one of Switzerland's representatives on the council.

The final agreement may be a bitter pill for high-energy physicists to swallow, however. Germany has stipulated that it will only take part if a very strict ceiling is imposed on CERN's budget for the duration of the project. And member countries have also insisted that CERN not include hoped-for contributions from nonmember countries such as the United States and Japan in the budget calculations. Under those constraints, it may take until 2008—5 years longer than predicted—to complete the giant accelerator, which should provide a glimpse of physics beyond the currently accepted Standard Model of fundamental particles and forces.

The LHC originally looked like a bargain. Because it would use an existing 27-kilometer tunnel, CERN management proposed building it without any budget increases except those needed to match inflation. To eke out the budget, however, management planned to cut some other programs and secure $370 million in contributions from nonmember countries.

This proposal stalled when Germany and the United Kingdom argued that France and Switzerland, which will host the lab, should make additional payments totaling more than SFr250 million over and above their normal subscriptions to CERN because they gain more from employment and industrial contracts than other member countries do. In mid-November Germany raised another hurdle by proposing that inflationary increases in CERN's budget be frozen until 1998, after which they should not exceed 1% per year, and that CERN should make deeper cuts in current programs. But at the same time, Germany relaxed its demand for additional payments from France and Switzerland to a total of SFr170 million.

These new conditions led to a flurry of activity over the past month, and as *Science* went to press, national delegations were involved in the final hectic round of discussions prior to the council meeting. "It seems the German conditions cannot be avoided," says Maurice Jacob, adviser to Llewellyn Smith on member state affairs.

But some compromises were in the air. CERN sources say that France and Switzerland were offering SFr140 million in additional payments, and while Germany was holding out for SFr160 million, many participants thought the issue was close to resolution. Germany also looked likely to win some form of ceiling on CERN's budget, which CERN sources say might entail cuts in technology R&D programs and in services to visiting scientists from member countries.

The budget ceiling will take a toll on the project, however. "It can still be built under these constraints ... but it will be harder, and it will take longer," says University of Heidelberg physicist Klaus Tittel, a former council member.

To lessen the scientific impact of the 5-year slowdown, CERN management is thinking of building the accelerator in two phases. The plan would have two thirds of the superconducting bending magnets in place by 2003, achieving a beam energy of 10 teraelectron volts (TeV). The remaining hardware would be installed by 2008, bringing the machine to its full power of 14 TeV. But the wait would still be painful, because many physicists think that the full beam energy will be needed to achieve one of the LHC's main goals: finding the postulated Higgs boson, which should help explain why particles have mass.

There is some light at the end of the tunnel, however. Under the scheme now on the table, any money received from nonmember states will go toward speeding up construction. And that puts extra pressure on today's council meeting to approve the project. Otherwise, says Jacob, "the U.S. and Japan may lose interest; they have programs of their own. We have to move fast."

–Daniel Clery

U.S.–RUSSIAN SPACE EFFORTS

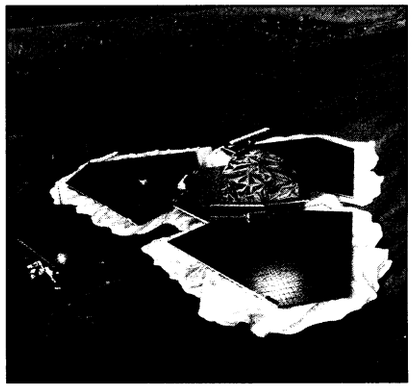
To Mars, But Not Together

A coordinated scientific assault on Mars, planned for the latter half of the decade, has been promoted by Russian and U.S. politicians as a sign of growing cooperation between former enemies. But if the status of Mars Together, as the mission has been dubbed, is supposed to mirror relations between the two countries, then perhaps U.S. Vice President Al Gore and Russian Prime Minister Viktor Chernomyrdin should just wave to each other from across the table when they meet this week in Moscow. The reason? Officials from both sides say the two nations have quietly decided to shelve plans for an ambitious joint mission in 1998 that was to be the start of Mars Together and instead go their separate—and cheaper—ways for at least the next several years.

"The program will be postponed, maybe to the beginning of the next century," says one Russian diplomat. "We don't have the money to finance two projects at once." Russian space scientists have proposed a variety of astrophysics missions, he says, and "our financial problems are so severe that the Russian Space Agency cannot fund both."

Scrambling to put the best face on an unhappy situation, Robert Clarke, chief of international relations for the National Aeronautics and Space Administration (NASA), says a revamped joint program could come in 2001 or later. "It was becoming clear that budgetary pressures in Russia were calling into question the Mars Together program. But we still see a lot of room for a joint program" after the turn of the century, Clarke said shortly before leaving earlier this week for Moscow. In the meantime, he notes, Russian scientists could serve as co-investigators or even principal investigators for NASA missions.

The original plan was to launch a series of U.S.–Russian spacecraft to Mars, starting in 1998, carrying Russian rovers and sophisticated U.S. scientific instruments aboard large Russian rockets. But some Mars watchers say it is too soon to sound the death knell for the joint effort. "I think they are jumping the gun," says Louis Friedman, executive director of Pasadena's nonprofit Planetary Society, which is involved in the proposed mission. Friedman was especially concerned about the possible impact of the statements by U.S. and Russian officials on a parliamentary review this week of the Russian Space Agency's budget. He added that



NASA/JPL

All alone. NASA still plans to have a compact rover explore the Martian surface.