EUROPEAN SPACE SCIENCE

Scientists Ponder New Cluster Mission and Uncertain Future

At two emotional meetings last week, Europe's space scientists debated how best to salvage the Cluster mission to study Earth's magnetosphere, which was destroyed when Europe's first Ariane 5 launcher veered off course earlier this month. Delegates faced the prospect of compromising other prized goals if they are to save Cluster's scientific objectives. To compound their troubles, scientists fear that a proposed internal reorganization at the European Space Agency (ESA) may see the popular science directorate disbanded altogether. "People are very unhappy," says Lodewijk Woltjer, chair of the agency's Space Science Advisory Committee (SSAC).

In spite of the distractions, Woltjer's committee strongly recommended that existing spare parts be assembled into a spacecraft for flight next summer and that efforts be made to fly the core instruments of the Cluster mission by the year 2000. But when the Science Program Committee (SPC), composed of delegates from ESA's 14 member states, considered how that recommendation could fit into Europe's existing space science program, it was stymied. Although SPC delegates expressed support for Cluster researchers, they decided after lengthy deliberations that they needed another week to consult their home governments, and a recommendation is not now expected until early July. The committee's unenviable task is to recommend an option that balances the aspirations of the member states, the needs of the space science community, and the financial and technical capabilities of the agency. SPC Chair David Southwood, a physicist at London's Imperial College, told *Science*: "If Cluster is to be salvaged, something will have to give."

Cluster forms half of the first large "cornerstone" mission in ESA's ambitious 20-year space science plan—Horizon 2000. Scientists around the world were poised to analyze the coordinated observations of the solar observatory SOHO, launched in December, and the four Cluster spacecraft. The four elements of Cluster, each carrying identical instruments, would fly in formation to acquire a three-dimensional (3D) view of how events unfold in the magnetosphere, the shroud of charged particles surrounding the Earth, which deflects the solar wind around the Earth.

France's scientific community is keen to see the whole mission reflown. At last week's SPC meeting, the French delegation refused to endorse the SSAC's recommendation that the fifth spacecraft be flown immediately without a commitment to reflying the whole mission. Gerard Brachet, director of program planning and industrial policy for the French space agency, CNES, says that the cheapest way to salvage the whole Cluster mission is to build three new spacecraft, reassemble the spare, and fly these four in formation. He says that he does not understand the SSAC's recommendation to fly a single satellite now and core instruments later. "I am hearing conflicting stories from the French scientific community and from the SSAC," says Brachet.

At the SPC meeting, however, Southwood was a bullish supporter of the SSAC plan. "The advantage is that it would keep the management and technical teams together. If we vacillate these teams could be disbanded," he says. While a single spacecraft could not achieve the unique 3D measurements that four satellites could, the spacecraft's orbit would take it to a part of the magnetosphere not visited for 20 years. Consequently, some of the joint observing programs planned with other both ground-based and space-based facilities could go ahead.

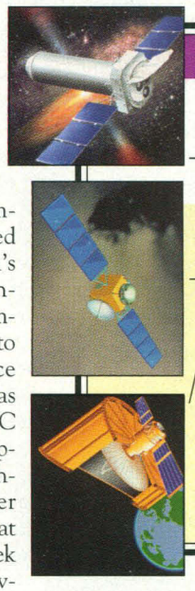
Roger Bonnet, head of ESA's science directorate, has been seeking other ways of fulfilling the goals of Cluster almost from the moment it was destroyed. His directorate is discussing options with other groups and nations that think they have spacecraft and instruments that could help. The Russians, for example, have spacecraft planned for magnetospheric work, but complex technical issues would have to be solved, such as modifying the spacecraft to maintain position in a Cluster-like orbit.

In the end, however, the issue essentially boils down to the question of who will pay for a new Cluster mission. Since the meeting of government ministers from ESA member states in Toulouse, France, last year, which froze the science budget at about $460 million a year until 1998, the science directorate has been desperately seeking ways to save money. The Cluster disaster is one more large and unwelcome problem.

David Dale, head of the scientific projects department at ESA's technical facility, ESTEC, at Noordwijk in the Netherlands, says reflying a complete Cluster mission would cost the agency about $465 million, including a launch, while assembling and launching the fifth spacecraft alone would cost about $40 million if the launch were free. Funding for the instrumentation would have to come, as is ESA's usual practice, from the member states. Whether governments can fork out the needed sums is one of the issues that the SPC's delegates will be assessing in the coming weeks. And this week Bonnet is seeking financial help for building the spacecraft at a meeting of ESA's ruling council.

If there is no new money, the only option would be to delay or cancel a future mission. A likely casualty, as it has not yet received final approval from the SPC, would be COBRAS/SAMBA, a mission to map the cosmic microwave background radiation with unprecedented accuracy. There is speculation that the mission could be postponed from 2003 to 2006, which in turn would displace an as-yet-unselected planetary mission slated for launch in 2006. Another less popular option would be to delay the launch of Rosetta, ESA's third cornerstone mission, which is scheduled to rendezvous with comet Schwassmann-Wachmann in 2010. "There was very little support for that idea," says Dale, because a rendezvous with another later comet would be technically tricky.

Two other future missions, the Integral gamma-ray observatory and X-ray Multi-Mirror astronomy mission, seem secure for



PHOTOS BY ESA

ESA MISSIONS AFTER CLUSTER

1997 Huygens probe to Saturn's moon Titan (part of NASA/ESA Cassini mission).

1999 X-ray Multi-Mirror (XMM) astronomy mission (second cornerstone)

Uncertain Dates

2001 Integral gamma-ray observatory (Medium mission)

2003 Rosetta mission to comet Schwassmann-Wachmann (third cornerstone)

2005 Far-Infrared and Submillimeter Space Telescope (FIRST) (Final cornerstone of Horizon 2000)

2006–2016 Three proposed cornerstone missions for Horizon 2000 Plus:

Mercury probe

Interferometric astronomy mission (visible or infrared)

Gravitational wave observatory

Medium missions

Italian Space Agency Head Ends Term With a Bang

VENICE—With only days to go before his term as special administrator in charge of Italy's space agency, ASI, comes to an end, engineer Silvano Casini has stirred up a hornets' nest by presenting a 10-year plan for ASI to a parliamentary technology committee in Rome last week. Casini's plan flies in the face of recommendations made in February by a government-appointed panel headed by physics Nobelist Carlo Rubbia, calling for expanded support of international collaborations such as the space station—exactly where the Rubbia panel suggested cutbacks. It also drew a sharp rebuke from the research ministry, ASI's paymaster, headed by newly appointed Luigi Berlinguer. In a statement, the ministry expressed "amazement" at the release of such a detailed proposal by "an administrator whose mandate expires by law in the next few days."

The plan is the latest twist in ASI's tortuous career since it was spun off from the National Research Council in 1988. Under the leadership of Luciano Guerriero, it earned a reputation for mismanagement and waste. Since 1993, the agency has twice been placed under a special administrator. Over its 8-year life, ASI has run up vast debts—more than $650 million at the end of last year—and has suffered a number of mishaps, such as the loss of the tethered satellite flown earlier this year on the space shuttle and this month's failure of the first launch in the Ariane 5 program (*Science*, 14 June, p. 1579), in which Italy has a 15% stake. Such incidents "haven't helped the agency's image," says ASI spokesperson Leonardo Gagliardi. And starting this week, nine former ASI officials, including Guerriero, face trial for corruption, accused of channeling excess funds to industry and consultants and striking private deals.

The Rubbia panel, which looked at ASI's national and international projects, gave more ammunition to ASI's critics. The five-strong panel, which included Antonio Ruberti, a former research minister and European Union research commissioner, recommended that support for international collaborations be tapered off in favor of national programs that would support Italian industry, such as a small-payload launcher. It even suggested that some international collaborations such as the logistics module, which Italy is building for the international space station, be funded by the ministry of foreign affairs, given that "the Italian commitment to the space station is principally a response to the requirements of foreign policy."

Planning for the long-term future was not part of Casini's mandate when he was appointed for 1 year to build up the ASI executive after the management board was dismissed. Nevertheless, he set about preparing a 10-year plan for the agency. Although the long-awaited plan does follow some of the Rubbia panel's suggestions, it gives much more positive support for international projects, in particular the space station, about which Casini is very enthusiastic. The plan calls for increased collaboration with both NASA and the European Space Agency; expansion of the telecommunications program; a new small launcher; and a temporary cutback on contributions to ESA while ASI maintains strong support for the space station. While ASI has been running on a static budget of just under $600 million annually for several years, Casini wants this stepped up to $1 billion by 2000.

Staff members at ASI have been talking up Casini's plans. "The Italian contribution to the station remains a priority," says Cesare Sodi, director of the ASI plan. Giovanni Rum, head of the space station and scientific missions department, adds that the logistics modules are still on schedule to be delivered to NASA in early 1998.

And despite Berlinguer's criticism of Casini for overstepping his mandate, Casini's proposals may get a friendly reception. Elected a month ago, the new minister has already declared his support for space research, saying that the current level of funding is "insufficient" and promising more cash and more support for international collaborations. According to Casini, this support had better arrive soon, as the agency is nearing financial collapse. "We have [$4 million] in the coffers," he says. **–Susan Biggin**

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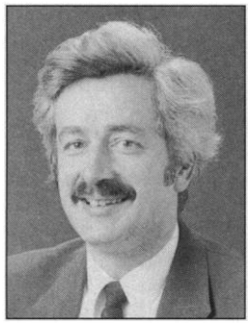
now. Industrial contracts have already been signed, and tinkering with either could end up costing more than it would save.

Significant as these deliberations were, they were overshadowed by fears that the science directorate might be disbanded or weakened during a reorganization of ESA's management structure. The directorate is widely admired for running scientific missions efficiently, and scientists are worried that its skills will disappear if science is subsumed into a new structure.



Man with missions. SPC Chair David Southwood.

Scientists were first alerted to possible changes in ESA's structure in late May, when *Space News* wrote about the director-general's plans for reorganizing ESA. The agency wants to improve efficiency and work within tighter budgets, but the discussions have been held "in very great secrecy," says Woltjer, and that "has very much irritated the scientific community." Woltjer says that scientists fear a move from a so-called vertical structure to a horizontal one. This would mean that in place of directorates such as science or Earth observation, which are responsible for projects from inception to implementation, one section would be responsible for planning all projects and another for implementing them. Telephone requests from *Science* for interviews with senior ESA officials have not been returned.

Southwood, Woltjer, and others acknowledge the need for change but think there is a case for excluding science. "Science is the best bloody directorate in the agency," a senior figure in the European space industry told *Science*. During last week's SPC meeting, France and Germany, two of ESA's largest contributors, instructed their delegates not to speak on the issue. "Our position is very simple. It is not the business of the SPC to discuss this issue; it has not yet been discussed by the council. They are trying to interfere in the internal organization of ESA," says CNES's Brachet. But the issue was discussed nonetheless, says Southwood, and "the meeting was very emotional."

Meanwhile in French Guyana, ESA engineers are trudging through the swamps looking for clues to the cause of the disaster and possible pieces of salvageable wreckage. "Dropping flight hardware in a swamp is not a great idea, but we are seriously investigating what might be saved," says Southwood. Europe's space scientists are also wondering whether they will soon be picking up the pieces of their much-loved science program.

–Helen Gavaghan

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