Europe Seeks Joint Computer Research Effort

The future of an ambitious program to boost its microelectronics industry hangs in the political balance

Brussels. At the beginning of December, when heads of state met in Athens for a meeting of the European Economic Community (EEC), there was hope that they would endorse a major research project in microelectronics. The European Strategic Program for Research and Information Technology (ESPRIT) is envisioned as a 5-year, $1.3-billion venture in information technology that will be jointly funded by the EEC Commission here in Brussels and by private industry. But the Athens conclave failed to produce significant agreement on the major issues separating the ten member nations of the EEC, and ESPRIT did not receive its much hoped for endorsement.

Therefore, when the research ministers of the EEC subsequently met here on 13 December, they refused to give ESPRIT the green light that would have enabled it to officially begin on 1 January.

Commission officials who have spent the past 3 years drawing up the research program remain convinced that, even if initial funding levels have to be reduced in the light of the EEC's financial difficulties, such a program is essential to the future survival of the European electronics industry in the face of stiff Japanese and U.S. competition.

Nevertheless, the way that the unsuccessful bid for endorsement at Athens became entwined with the broader issues, ranging from the efficiency of French farming to the reform of the EEC's budget procedures, also illustrates the fact that the future of ESPRIT depends as much on the outcome of political struggles around the restructuring of Europe's economic and industrial base as it does on any judgment of its intrinsic scientific merits.

Three major difficulties face Europe's electronics industry as it tries to remain competitive in international markets by developing new state-of-the-art technologies: the problem of raising adequate funds for long-term research and development during a period of economic recession and falling sales; second, a home market which, unlike those enjoyed by its U.S. and Japanese rivals, is fragmented into a number of relatively small national units; and third, reluctance by some within individual countries to subsidize those who have historically been economic and political rivals.

ESPRIT has been designed to address each of these in turn. At the most obvious level, the program is focused primarily on research, designed to exploit the economies obtained by collaboration. Given in particular the financial crisis currently facing most European governments, "it is entirely reasonable to increase their joint research efforts," says Paolo Fasella, director general for scientific research with the EEC Commission here.

As ESPRIT is currently planned, projects selected for support will fall into one of five research areas: (i) advanced microelectronics, aimed at designing, manufacturing, and testing very high speed and very large scale integrated circuits; (ii) software technology, embracing what is described as "the management practices for information technology as well as the scientific knowledge underlying them"; (iii) advanced information processing, including the exploitation of VLSI; (iv) office systems; and (v) computer integrated manufacturing.

A research proposal submitted to the Commission for financial support must address recognized goals in one of these five areas, and must also involve at least two companies from separate EEC countries. Furthermore, in most cases at least half of the funding must come from non-Commission sources.

Confidence that these arrangements will prove attractive to industry has been confirmed by the fact that a 1-year pilot phase for ESPRIT, launched in the middle of 1983 with a budget of $20 million, funded 50:50 by the Commission and industry, attracted over 200 research proposals, from which only 36 could be selected for funding. EEC officials claim to have been "pleasantly surprised," not only at the scale of the response but also at the apparent willingness of companies to let their scientists work together with few restrictions.

EEC Commissioner Etienne Davignon, the main driving force behind ESPRIT, has already made it clear that he considers the program to be the top future priority of the Commission's $700-million-a-year research budget. Indeed he has warned publicly that if member countries do not provide him with new funds for his flagship program, he intends to find the necessary money by making cuts elsewhere, which could include other areas of EEC research, such as nuclear energy.

In return, the companies acknowledge that the promise of EEC funding has acted as a carrot to spur a search for collaborators on research projects. "It was certainly the trigger of the funding that helped to get us involved," says John Bass, director of research for the British company Plessey, which is participating in 7 of the 36 pilot research projects.

But money has not been the only—or perhaps even the major—incentive for companies to collaborate in ESPRIT. Although the most explicit focus of the program is on the research considered necessary to lay the foundation for European microelectronics in the 1990's, it is also being projected by EEC officials as an important step toward the rationalization of the European microelectronics industry, for example, by helping to catalyze the adoption of common standards and coordinated marketing strategies that will help turn Europe into a homogeneous marketplace.

"We hope that ESPRIT will contain the germs of tighter cooperation downstream from research, and that encouraging companies to talk together will lead to other joint actions," says Michael Carpentier, deputy director general of the EEC's energy directorate and head of the Information Technologies Task Force, which has been responsible for putting ESPRIT together.

The same point is made by Brian Oakley of Britain's Department of Trade and Industry in London, who heads a new directorate responsible for a separate $500-million, 5-year program set up earlier in 1983 by the Thatcher government to promote long-term microelectronics research to meet the needs of British industry (*Science*, 20 May 1983, p. 799).

While admitting that there is likely to be some overlap between the British research program and that currently conceived in Brussels—as well as possible

conflicts arising from the difficulties both are likely to face in finding sufficient qualified research staff—Oakley suggests that the two would be primarily complementary rather than competitive.

However, the precise division of labor between ESPRIT and national programs remains ambiguous. On top of the risks of duplication of effort and competition for scarce financial and personnel resources are the arguments heard in each country that microelectronics research is an important key to future political, as well as economic, strength which should not be casually shared with potential competitors.

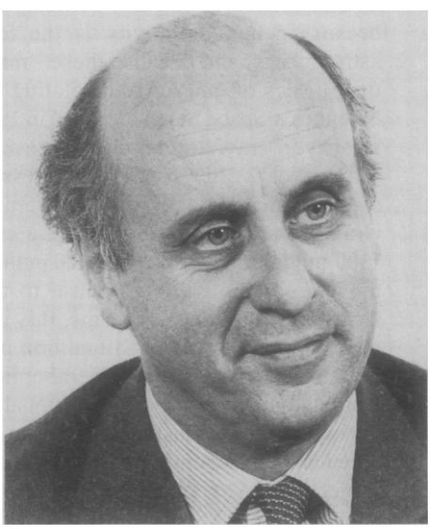
In the past, such political rivalries have blocked various attempts at international collaboration between electronics firms in Europe; in the mid-1970's, for example, France pulled the plug on the creation of a joint company called Unidata primarily for such reasons. Keen to avoid such problems in the future, the 12 major electronics companies supporting ESPRIT are hoping that the EEC Commission will help prevent such opposition from upsetting their plans for research collaboration.

"There are two conditions for participation in the program: it must be to the economic advantage of the various industrial partners, and there must be support from the political level," says Walter Heimann of the West German company Siemens, a member of the ESPRIT steering committee whose members are drawn entirely from the private sector.* "Davignon has shown national governments that he is supporting collaboration between companies, and that he does not expect the governments to oppose it. So far, therefore, the two conditions have been met; that has been Davignon's large success."

Davignon's techniques for achieving his objectives have ranged from quiet diplomacy to open arm-twisting. At the end of October, for example, when a French delegate to a meeting of European research ministers tried to cut ESPRIT's budget in half, Davignon publicly described the French position as "astonishing," encouraging a prominent news story in next day's *Le Monde* which pointed to the discrepancy between the French position and recent statements by President François Mitterrand about the need to encourage greater European cooperation in science and technology.

The ambiguity in the French stance seems to have reflected continued controversy within its own political circles over the appropriate balance between national and international research efforts. However, when the research ministers met again the following week, France had officially changed its position and approved the program with only a small reduction in the global budget; this time, it was Britain and West Germany who, by making it clear that they approved of ESPRIT in principle but intended to hold any formal endorsement hostage to the outcome of the Athens meeting, were made to appear the main source of obstruction.

Complementary to international rivalries are the difficulties raised by the need to establish the legal framework in which companies will be allowed to collaborate. At the Commission it is argued by Carpentier that, since ESPRIT is concerned primarily with long-term, "precompetitive" research, there will be no conflict with the antitrust rules that operate within the EEC and which, it is claimed, are intended to apply primarily to marketing strategies rather than product development. No one, however, has yet produced a clear legal definition of what is meant by "precompetitive." The general rule of thumb being used in Brussels is, as one official put it, that "precompetitive research is that which companies are prepared to collaborate on." Yet others feel this somewhat circular definition raises the deeper question of whether what individual companies consider to be in their interests necessarily coincides with the broader interests of the Community.



Etienne Davignon

The driving force behind ESPRIT.

Furthermore, some companies feel that, despite the conventional wisdom that research becomes more competitive the further it moves down the spectrum from basic science toward product development, the rapidly closing gap between scientific discovery and its commercial application is beginning to turn this formula on its head.

It is for this reason, for example, that three of Europe's largest mainframe computer manufacturers—Siemens in West Germany, International Computers Limited in the United Kingdom, and Bull in France—have recently agreed to jointly fund a new center in Munich for long-range research in the field of artificial intelligence and "expert systems." The research facility is expected to have an operating cost of about $7.5 million a year (roughly the same size as Japan's Institute for New Generation Computer Technology).

Although called the European Computer-Industry Research Center, the facility will initially exclude participation by other companies. "If you recognize the fact that you are in a competitive market, in which companies are fighting against each other, then you must accept that it is not of interest to offer all research results to everyone who might be interested in them, and that at least some projects will be of a character that will forbid the open publication of research results from the beginning," says Heimann of Siemens.

The overall situation, as Heimann sees it, is that "we do the abstract research on an international basis," where the balance between cooperation and competition should be determined by the rules of international commerce, and "market-like research" on a national basis, where individual companies can adopt the most appropriate strategies for their domestic political environment.

Not everyone agrees with this characterization; and competitors have challenged the new center as an act of protectionism by the sponsoring corporations.

But if tension continues between the ESPRIT partners over how much they will be prepared to share their research results, few doubts exist on two subjects at least: that the United States is, and promises to remain, far ahead in almost all fields of semiconductor and microelectronics research (Japan is seen as less of a threat here than in the sphere of marketing); and that U.S. complaints of excessive government subsidies in Europe are considered disingenuous in the light of the various forms of government support—such as that provided for research into fifth-generation computers by the Department of Defense—available to companies and universities.

Even in the civilian field, the argument

*The 12 companies represented in the ESPRIT steering committee are: GEC, ICL, and Plessey (United Kingdom); Nixdorf, Siemens, and AEG (West Germany); CII-Honeywell Bull, Thomson-CSF, and CIT-Alcatel (France); Olivetti and SET (Italy); and Philips (Holland).

that U.S. ventures in cooperative microelectronics research, such as the Semiconductor Research Corporation and Microelectronics and Computer Technology Corporation (MCC), are not subsidized is "somewhat superficial," says Oakley of Britain's DTI. "Look at the benefits offered by the state of Texas to attract MCC to Austin, or the tax benefits that have been granted by the Reagan Administration."

The new Munich center demonstrates how some companies are already building up a network of bilateral and multilateral research agreements independent of the EEC Commission's plans, in case a failure to resolve the general financial crisis within the Community means that ESPRIT has to be aborted.

In Brussels, there is a reluctance to talk about this possibility, not least because it would throw doubt on the importance of the political role of the Commission itself in the future organization of European research. "The program will get off the ground as planned, even if it takes longer than we had hoped and we have to work with less money than we would like in the early stages," one EEC official close to Davignon said last week.

Much will now depend on how France handles negotiations when it takes over the presidency of the Commission for 6 months on 1 January, the date on which ESPRIT officially comes into being. Publicly at least, the French government has become an enthusiastic promoter of European-level science in general, and ESPRIT in particular.

Furthermore, if it turns out to be successful, ESPRIT is likely to be used as a model for similar projects in other areas, in particular telecommunications and biotechnology. But, as shown by the failure of the Athens meeting on the one hand, and the controversy over the Siemens-ICL-Bull research center in Munich on the other, political and economic rivalries are not far beneath the surface and accord may have to come on broad issues before ESPRIT is fully backed.

Britain and West Germany just stated, for example, that they are not prepared to accept Davignon's suggestion that until the new money arrives, ESPRIT should be funded out of economies elsewhere in the research budget. "The lack of a decision on ESPRIT is not just a delay, but a missed opportunity," Davignon said after the meeting here; others point out, more philosophically, that it shows once again the difficulties of trying to short-circuit political realities in a continent that is still far from becoming the United States of Europe.

—DAVID DICKSON

Probe Wins Support the Hard Way

In what appears to be an effort to drum up scientific endorsements for a new satellite mission, deputy administrator Hans Mark of the National Aeronautics and Space Administration (NASA) has simply threatened to delete it from the agency's fiscal 1985 budget request. It is an unusual technique to say the least, but effective: the space science community is obliging him with protests, letters, and outraged statements of support for the mission.

Known as Gravity Probe B, the satellite would test the general theory of relativity—Einstein's theory of gravity—in a qualitatively new way. Previous tests have only measured the static effects of gravity, such as the deflection of starlight by the sun. Gravity Probe B would try to detect the gravitational analog of magnetism: namely, the precession of a gyroscope in the vicinity of a large rotating mass such as the earth.

The effect is extremely subtle, and the techniques required to measure it are just barely within the state of the art. Stanford University physicist C. W. Francis Everitt and his colleagues have already spent nearly 20 years developing the superconducting gyroscopes and detectors for Gravity Probe B, and launch is still not contemplated until the early 1990's. However, because general relativity is the foundation of modern cosmology and astrophysics, and because these "magnetic" effects are directly relevant to the physics of quasars and rotating black holes, the National Academy of Sciences's Space Science Board in 1981 named the experiment as its highest priority in gravitational physics research.

This year, after NASA's success with the cryogenically cooled IRAS satellite (*Science*, 25 November, p. 916), and after a major revision of Gravity Probe B had brought the estimated cost down from the $200- to $300-million range to some $120 million, the mission finally seemed ready to move from the planning phase to a more serious consideration of flight hardware. In budgetary terms, this would mean a boost in funding from $2 million a year to about $10 million in fiscal 1985.

Enter Hans Mark. In September he had the agency drop Gravity Probe B from its budget request. His rationale, apparently, was that the mission lay far outside the mainstream of space science and stood in dire risk of being eaten alive by scientists fearful that the money would come out of their own projects—*unless*, of course, the community came forward with such strong support that NASA could break loose new money.

Space Science Board chairman Thomas M. Donahue of the University of Michigan was outraged. In late November he got the board to issue a fresh and resounding endorsement of Gravity Probe B in general and the Stanford group in particular. The Stanford researchers, meanwhile, were out soliciting letters of support from six august physicists, of whom four are Nobel laureates. And at the White House, science adviser George A. Keyworth, II, has been professing *his* enthusiasm for the mission.

So Mark has gotten the kind of ground swell he wanted. But it does seem a strange way to proceed. In effect, scientists are being told that if they want to try very difficult experiments that strike off in bold new directions, and if they are willing to work very hard to get the costs under control—then they had better not trust NASA to go to bat for them.

Whatever happens to Gravity Probe B now, the episode seems certain to leave a residue of bitterness and suspicion toward Mark. But then, that has never bothered him before. In 1981 Mark was widely perceived as leading the effort to cancel all of NASA's planetary science (*Science*, 18 December 1981, p. 1322), an episode that spurred a thorough reexamination of the program by the planetary community and a renewed commitment by the agency—a commitment now happily endorsed by Mark.

In the case of Gravity Probe B he seems well pleased. "If we had just asked those Nobel prize winners for letters, we would have gotten one or two lines saying, 'Yeah, it's great,' " he says. "We wouldn't have gotten anything like the kind of support we have now." He thinks a compromise to get Gravity Probe B back on track can be worked out by early next year.

—M. MITCHELL WALDROP