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FRENCH ELECTRONIQUE SERGE DASSAULT'S ACTIVITIES, RESULTS ANALYZED

Paris ZERO UN INFORMATIQUE in French 20 May 86 p 6

[Article by Jean-Louis Cousin: "Orders Booked for 2 and 1/2 Years of Work"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Excerpts] One year after the company's listing on the stock exchange, the management of Electronique Serge Dassault [ESD] is optimistic about the future. This is true for the aeronautical and space activities as well as for automation--one-fifth of the total.

The man Serge Dassault is satisfied with the group Serge Dassault, as evidenced by a comment made in response to an indiscreet Swiss interviewer during the recent presentation of the company's results to financial analysts: "We are very satisfied with our stocks and have absolutely no intention of selling them."

The family share in the capital of ESD is currently about 67 percent, with the public holding slightly more than 20 percent. Shares issued on the Second Market about 1 year ago at an initial offering of Fr 380 were quoted at Fr 515 as of 10 May 1985, and today float at more than Fr 1,000.

Announcements made by Serge Dassault and Bertrand Daugny, vice managing director, should contribute to the stock's continuing strong position. Growth in turnover in 1986 is not expected to be astronomical: It should reach approximately Fr 3 billion exclusive of taxes), compared to Fr 2.7 billion in 1985, constituting an increase on the order of 11 percent. Net profits increased by only about 2 percent in 1985 compared to the preceding year and totaled Fr 110.9 million. In 1986 net profits should witness a marked improvement because of the fall of the U.S. dollar and better internal cost management.

But it is especially the order book that looks promising. At the end of last year, orders reached no less than Fr 7.7 billion and should reach Fr 8.8 billion by 31 December 1986, which is equivalent to about 2 and 1/2 years of turnover. At this rate ESD management expects a 1989 turnover (inclusive of all taxes) of about Fr 5 billion (Fr 3.5 billion this year).

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SWEDISH DEFENSE INSTITUTE TESTS 'APPETIZERS' FOR OIL-EATING BACTERIA

Stockholm FOA TIDNING in Swedish No 2, 1986 pp 14-16

[Article by Olle Sundstrom]

[Text] There are bacteria in nature that can break down oil. Perhaps they may be used to clean up oil spills in the sea. But they eat the oil too slowly. It takes too long. The solution may be to give them nutrients so that they become more "gluttonous." FOA (Defense Research Institute) has tested "appetizers" for bacteria.

Oil spills in the sea, intentional or unintentional, have become a greater and greater threat to the environment throughout the world. Oil platforms, seabed pipelines, and supertankers will guarantee that this threat remains during the foreseeable future.

In a body of water the size of the Baltic Sea, it must be assumed that the greater part of an oil spill will eventually be washed ashore.

What can be done? Are we defenseless against the floating oil or can its harmful effects be eliminated? Can it simply be made to disappear?

One thing is certain: at the present time, there are no effective methods for rendering spilled oil completely harmless. There are only attempts to reduce the damage: encircle the oil, pump it up, make it heavier with additives so it sinks to the bottom, clean up oil-damaged beaches by hand, etc.

FOA has long been interested in these questions and has found, among other things, that microbial technology may solve the problem.

STU Project For Combatting Oil

All types of oil are subject to microbial breakdown. How fast and how completely this occurs depends on many interrelated factors: water temperature, nutrients in the water, the composition of the oil, and others.

On commission by STU (Board for Technological Development) FOA has studied how oil is normally broken down by microorganisms. The institute has also looked into how the process can be accelerated. FOA microbiologists have used field studies to test how additives in the oil can help speed up its breakdown and make the microorganisms more "gluttonous." Some of the results are promising.

Oil Broken Down To Carbon Dioxide And Water

"Oil consists primarily of various hydrocarbons. They can be altered and broken down by bacteria and microscopic fungi to form soluble solutions," said Anders Edlund at the Division of Environmental and Biological Technology. These compounds are then broken down to form simpler compounds and, in the best possible case, to form carbon dioxide and water. Such a "clean" process is a promising method of combatting oil, of course, but unfortunately it is far too slow to be directly applicable. We have attempted to use certain nutrient additives to accelerate the breakdown."

Spilled Oil Changed

Oil that is spilled into the water undergoes a number of changes. These changes are physical, chemical, and biological. With these changes in the composition of the oil come changes in its properties.

Just after a spill, the oil is changed physically in that volatile components evaporate. This evaporation makes the oil more viscous and heavy--so heavy that it can even sink to the bottom. Soon after the spill, however, microorganisms begin to break down the oil.

The composition of the oil can be changed to a greater or lesser degree depending on how long it takes for the oil spill to be discovered or wash ashore. In addition, various petroleum products--gasoline, heating oil, asphalt, crude oil--differ chemically. This also has an effect on how oil is broken down and how much influence microorganisms have, compared to other processes of change.

Beached Oil Tested In Karlskrona Archipelago

To gain an understanding of how oil is actually broken down--with or without extra additives--a test was run in Karlskrona Archipelago. FOA, in cooperation with IVL (Institute of Water and Air Protection) selected two types of beaches--one subjected to wind and waves and one leeward beach--in a deep bay.

"IVL examined evaporation and penetration into the soil, while we concentrated on microbial breakdown," Anders Edlund said. "We selected three different oils: heating oils 1 and 5 (thin and thick heating oils, respectively) and the crude oil Arabian Light. The latter is somewhere between the two heating oils when it comes to its composition of hydrocarbon compounds. These are the three oils that are normally transported around our coasts.

"The oils spread out over various test surfaces in the selected regions, after being held for 4 days to simulate the time spent at sea before being washed ashore. Nitrogen and phosphorus were added to some of the test surfaces. We wanted to study how these nutrients would influence the microbial breakdown of the oils."

1 Year Of Sampling

Samples for analysis were then taken from each surface on seven different occasions for 1 year. During the test period, certain changes could be observed by the naked eye. Vegetation on surfaces coated with heating oil 1 soon suffered major damage, probably because the low-viscosity oil penetrated into the ground and damaged the roots of the plants. The vegetation had partially recovered by the end of the test year, especially on the surfaces with extra nitrogen and phosphorus additives.

Vegetation on test surfaces covered with the other two oils showed signs of recovery after 1 month. After 1 year they were almost identical to their surroundings. Even after 1 year, however, large quantities of oil could still be found on the ground.

Two primary methods were used in the analyses. These included microbiological (radiorespirometric and others) and chemical (gas and adsorption chromatographic) methods. The microbiological analyses were made 1 day after the samples were taken. The remaining samples were frozen and chemical analyses were made later. The analyses were intended to show how many living bacteria and microscopic fungi there were in the oil, how much carbon dioxide was formed, and how rapidly that occurred at various points in time.

Faster Breakdown With Nutrient Additives

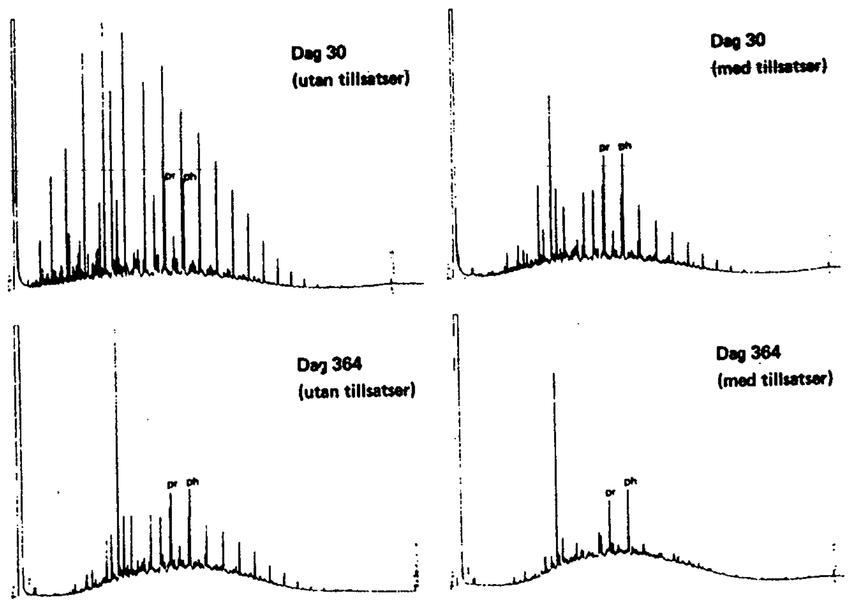
It was found that the number of bacteria was unchanged on all the test surfaces during the initial phase. There were considerably more after 1 month and this condition was still present after 1 year. The nitrogen and phosphorus additives did not result in more bacteria, but the bateria became much more active. The number of microscopic fungi was consistently lower than the number of bacteria before, during, and after the tests.

The increased number of microorganisms shows that microbial breakdown of the oil began rapidly, but it reached a high rate only after nitrogen and phosphorus were added. These additives led to a stronger effect and, by the end of the test year, heating oil 1 was almost completely broken down. On the test surfaces that were covered with heating oil 5 and crude oil, the residues that remained probably consisted of asphalt and other heavy fractions.

Other Factors Influence

It is not only nutrients that effect the microbial breakdown of oil, but certain environmental factors also enter the picture.

After a spill in the sea, the microorganisms that break down the oil act primarily in the interface layer between oil and water. The spread of the oil in the water determines how accessible it is to microorganisms. It might seem paradoxical, but the more a certain quantity of oil spreads out, the better the situation is. High temperatures, for example, make an oil less viscous. It spreads out over a larger area and more microorganisms come into contact with it. A higher temperature also increases the activity of the microorganisms. Tests have shown that the breakdown rate at a water temperature of +15°C is four times higher than at +5°C.



1. Diagrammet ovan visar resultat av gaskromatografisk analys av en oljefraktion i provytor 30 resp 364 dygn efter utspridning av eldningsolja 1. Kromatogram t v visar kvarvarande föreningar utan tillsats till provytan av kväve och fosfor, t h kvarvarande föreningar med tillsats av kväve och fosfor. Lägg märke till att i provyta med sådan tillsats har efter 30 dygn ungefär lika mycket olja brutits ned som i provyta utan tillsatser efter ett år.

The diagram above shows results from gas chromatographic analysis of an oil fraction on test surfaces 30 and 364 days after heating oil 1 was spread on the surface. The chromatogram on the left shows the residual compounds with no nitrogen or phosphorus additives on the test surface. The chromatogram on the right shows residual compounds when nitrogen and phosphorus are added. Note that, after 30 days, about as much oil has been broken down on the test surface with the additives as after 1 year on the test surface without additives.

Key:

1. Day 30 (without additives)
2. Day 30 (with additives)
3. Day 364 (without additives)
4. Day 364 (with additives)

The salt content of the water is also important. Microorganisms tolerate salt to various degrees. This means, for example, that the complex relationship of salt content in the Baltic Sea may place them under salt stress, which reduces their ability to break down the oil.

Oxygen is needed for microbial breakdown. In a low-oxygen environment, the decomposition can be hindered and, in extreme cases, it can cease completely.

Oil that has sunk to the bottom probably is broken down extremely slowly and can remain for long periods of time. High pressure also reduces the decomposition rate which, consequently, takes place more slowly at a greater depth.

"Supermicrobe" On Wish List

Microorganisms that break down oil are common in nature. Of the bacteria and microscopic fungi that have been isolated, over 200 can break down hydrocarbons. Every one of these species has proven capable of altering and breaking down one or more hydrocarbon compounds, from the simplest to hydrocarbons with over 40 carbon atoms.

This may be the solution to the difficult problem of oil spills. Top on the wish list of many researchers is an oil-eating "supermicrobe" that could render any type of oil harmless. Such a "supermicrobe" must have the following characteristics:

- It must be able to break down most components found in oil;
- It must be able to reproduce rapidly after storage;
- It must be able to grow in the environment in which it must work;
- It must be able to compete with microorganisms found naturally in the environment for the necessary nutrients;
- It must not produce toxic intermediate or final products.

Bacterial Team Solution

"It probably will be impossible to find a single organism with all these characteristics," Anders Edlund said. To destroy spilled oil successfully, researchers must attempt to create a mixture of complementary microorganisms that break down oil. Each must be chosen for its ability to break down specific oil compounds. Together, they must have the characteristics mentioned above. The microorganisms in the mixture must also work in a parallel manner and not attack one another.

The difficulty in finding such a "supermixture" is demonstrated by the fact that oils contain thousands of different chemical compounds. There are also great differences in chemical composition between various types of oil, especially among crude oils from various parts of the world and among refined oils. What is needed, in fact, is a "team" of bacteria--a special blend--for each individual type of oil. For the preparation of such blends, a large number of microorganisms that break down oil must be isolated and catagorized.

Much more research will be needed in order to find microorganisms that are compatible with one another and that can be combined to form effective teams of oil eaters.

9336
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EUROPEAN-AMERICAN AIRCRAFT COMPETITION, FINANCING ANALYZED

Paris L'EXPANSION in French 18 Apr-2 May 86 pp 170-177

[Article by Vincent Beaufils: "Airbus's Real Accounts"]

[Text] No matter what Boeing says, the European program can become profitable... 10 years from now.

Ten billion dollars. A trifle! According to Boeing, this is the amount sunk into the Airbus program since it was launched by European governments and aircraft manufacturers. Although it is by far the dominating power on the market, the Seattle giant--which again scored 60 percent of the 650 aircraft ordered in 1985 (compared with barely 15 percent to Airbus Industry)--is becoming increasingly impatient with the breakthroughs of the European aircraft. "Airbus salesmen are spreading paranoia among us," the head of the Boeing sales division raged no later than last year, angered by the loss of the Indian Airlines contract when the A320 beat the Boeing 757 by a short wing after a cascade of rebates negotiated on both sides. In the past few months, having probably become aware of the consortium's intention to expand its line with two additional aircraft that cannot fail to make new inroads into Boeing's market, the U.S. aircraft manufacturer then developed an underground strategy: files lacking only the signature "From Boeing with love," are going about, with apocalyptic graphs and traumatizing figures, forecasting that European taxpayers will have to pay an Airbus bill that could amount to $18 billion in the 1990's! The campaign was thought serious enough for European administrations to propose "friendly talks" with the U.S. trade representatives, which started a few weeks ago. This is the right time to try and shed some light on the accounts of Airbus Industry. And to measure the chances that the European program (already an undeniable technical success and a confirmed commercial success) will become a financially profitable operation.

Do not try to find information in the columns of some annual report: there is none; Airbus Industry, an economic interest group with no stock and no factory, is accountable only to its partners. Of these, neither Aerospatiale nor British Aerospace publish specific accounts concerning their "Airbus" activities, following in that the example of Boeing which does not give any information on its profitability per product line. As for Deutsche Airbus, a buffer company between the economic interest group and Messerschmitt-Boelkow-Blohm (MBB), its answer to any question is "nein."

Their discretion, of course, does not mean that they have anything to hide. But in an industry which requires titanic investments and where it is common for the last aircraft of a given line to be delivered over 25 years after the line was launched, the profitability of a program can be assessed only over a very long period. And it is only seldom achieved: a survey by Wolfgang Demisch of the First Boston Bank, one of the most highly respected analysts of the sector, revealed that only 2 of the 28 aircraft programs carried out throughout the world since 1945 have achieved positive financial results (the Boeing 707 and 727), while 3 are beginning to earn money (the Boeing 747 whose first unit was delivered 15 years ago, and the Boeing 737 and DC9 families with their recent variants).

How can Airbus hope to be profitable when the 10 European programs that preceded it ended in cumulated losses of over $20 billion (1985 value)? Let's take the example of the most recent member of the Airbus family, the A320, a 150-seat aircraft currently under development and whose first unit will be delivered in 1988. The initial investment (research, prototype, flight tests, mold fabrication, etc.) amounts to $2 billion. None of the partners of Airbus Industry has adequate resources to finance its share of such launching costs. As a result, every manufacturer--whether nationalized companies (like Aerospatiale or Casa in Spain), semi-public company (like MBB) or fully privatized company (British Aerospace)--will turn to its government to obtain funds. These funds are repaid by turning over to the state part of the returns on each new aircrfaft sold. "Such a commitment of governments to bear the industrial risk is obviously essential, as we could not expect similar support from the financial establishment," Yves Barbe, general manager of Aerospatiale, acknowledged. Repayment terms, too, are a good deal: based on the current lowest assumption (600 aircraft sold in 15 years), the French Administration assures that it can recover all the amounts advanced with 6.5 percent interest. The German federal government is even willing to be content with 1.8 percent, as it expects inflation to remain very low. Margaret Thatcher was the only one to prove relatively firm and the British crown will be repaid with "a positive real interest rate." But we should add that British Aerospace is getting the smallest proportion of government advances compared to the total investment (see graph [caption reproduced at the end]).

The governments will therefore recover their stakes to a variable extent. What about the manufacturers? At MBB, it was confirmed that the magic number of 600 aircraft sold does indeed represent the profitability threshold. At Aerospatiale, Yves Barbe was more precise: "Based on the depreciation method chosen for our share of the launching cost, we shall earn money starting with the 450th or 600th aircraft delivered. But, obviously, it will all depend on the sale price we can get, on the rate of the dollar (the reference currency in the aeronautical industry) and also on the aircraft production rate." However, not only is the U.S. currency falling, but sales prices are not good either: they are said to be about 10 percent below the expected $30 million per aircraft.

These rebates, which are normal in the case of the airlines launching the A320 (Air France, AirInter, British Caledonian, etc.) may unfortunately tend to become the rule, due to pressure from the competition: for instance, the price of the Boeing 737-300 is said to have dropped by over 20 percent in 18 months. To counter such offers without drowning in an ocean of losses, they must make a risky bet: they must give themselves the means of securing at least 30 percent of the market (i.e. 1,000 aircraft over the next 20 years) in order to increase series and reduce production costs. "These will drop by 20 percent every time you double the number of aircraft manufactured," Hartmut Mehdorn, head of the MBB aircraft division, acknowledged.

Do sales prospects warrant such a determined strategy? Yes, Airbus salesmen assure, and the sooner the better. One of the most successful Airbus salesmen commented: "The market is revving up, especially in the United States where major airlines are beginning to renew their fleets of old Boeing 727, order in lots of 100 aircraft or so, and require strong production capacities."

Between these shock salesmen who fantasize about assembly lines of 10 aircraft per month--as at Boeing!--and the manufacturers who must account for their monies and who never exceeded a production rate of 4 Airbus per month, discussions are sometimes tense. One thing is certain, though: 2 years before the first delivery, firm orders or options have already been received for 263 Airbus A320. An authentic record! The fateful threshold of 600 aircraft is therefore not just a dream. Better still, it might be reached well before the expected term of 15 years, so that government advances would be repaid much faster, and therefore at a more decent rate. "We have learned our lessons, we shall not make another Concorde," Michel Lagorce, head of Civilian Aeronautical Programs, assured. And he added: "This program is launched with the prospect of a reasonable recovery of the investment made, as is also recommended in the GATT code of good behavior. What is it, then, that Boeing pretends to blame us for?"

Unfortunately, although, thanks to the A320, the future is effectively arguing in favor of the Airbus profitability, the past presents a rather embarrassing testimony. Indeed, the European consortium did not take off painlessly: only 40 aircraft were delivered during the first 4 years of the A300, the first aircraft in the Airbus family; a model that aged prematurely, in 1978, after the introduction of a fearsome competitor, the Boeing 767; a program, therefore, that had to be enriched by developing the A310; launching costs ($3.5 billion in current dollars) 70 percent above those of a normal project since two aircraft had to be designed to meet the needs of a single market segment, that of the short and medium-haul jumbo jets; and of course prospects of breaking even that recede in time.

Yves Barbe is cautious: "I prefer not to comment on the chances of Aerospatiale to achieve profitability of the A300-A310 programs. Of course, since last year our industrial operations have been making money. Not enough, however, to expect recovering soon the mass of capital that we invested at the start." Actually, Aerospatiale estimates its cumulated losses on the Airbus at Fr 3 billion in current francs. This should be compared with the DM 1.8 billion that MBB invested in the European aircraft and which Hartmut Mehdorn does not expect to recover until 870 A300 or A310 have been sold. An unlikely goal since fewer than 400 aircraft have been ordered until now. And especially considering that sales prospects for jumbo jets are not very exciting: Boeing's very conservative projections (1,000 medium-haul jumbo jets to be sold over the next 20 years) are certainly not unimpeachable, but those of the Airbus Industry marketing department (3,300 units) are overly optimistic and obscure a recent phenomenon: in the United States--one half of the world market--airlines tend to choose frequency (smaller aircraft used on many flights) over capacity.

European aircraft manufacturers are aware of this and are quietly getting used to considering all or part of the amounts invested until now as their entry ticket on the world jet market. "We could afford this ticket because, thanks to its other divisions, Aerospatiale is not generating losses," Yves Barbe noted. "For us, this adventure would obviously be meaningless if it were not that, as we go, we can see that we are catching up with the Americans and that profitability is on the horizon."

As far as States are concerned, the bill for the A300-A310 will vary for each consortium member country. Her Majesty should get off scotfree, since the British wisely waited until the A320 project to lend government money. In the FRG, the State is still owed DM 2.5 billion (1985 DM). It is conservately estimated that these advances might be repaid by 1992, but Deutsche Airbus's obvious discomfort when the subject is brought up incites us to the most elementary caution.

The French situation is more clear: Fr 7 billion (1985 francs) in public funds were invested in the A300 program, and Fr 4 billion in the A310. Until now, less than 15 percent have been repaid. But payments continue: in 1986, Aerospatiale will make out a check for about Fr 500 million to the order of the Treasury. Under the administration's most favorable assumption (350 A300 and 450 A310 sold, although orders and deliveries to date amount respectively to only 279 and 117 aircraft), the bill to the taxpayer will still amount to close to Fr 5 billion.

Is that a cause for concern? "We had to learn the trade," civil aviation people will tell you. "These amounts must be considered as an investment, to be compared with the Fr 40 billion (1985 francs) sunk into the Concorde, and to be brought into perspective with the 600 KC135 refueling aircraft which the Pentagone bought from Boeing, an order that suddenly gave our competitor the financial basis that is so long to achieve in the aeronautical industry."

Actually, this chase after cash flow is Airbus Industry's major problem. If we add up government advances and manufacturers' losses to date, is is about $5 billion (and not twice that amount as Boeing claims) that have been injected into the first A300 and A310 programs. Development of the A320 will require at least an additional $2 billion in financing. And now there is some talk of expanding the family with two new models--the A330 and the A340--that will require a starting investment of $2.5 billion.

The A340 is what Airbus needs to tease Boeing on the long-haul market segment and to prevent McDonnell from launching the MD11, another version of the DC10. But the market is narrow: no more than 400 aircraft. Fortunately, if we take the same aircraft and replace its four small jet engines with two big ones, we get the A33Ø, an aircraft that perfectly complements the Airbus jumbo jet lines over the medium range for which the A31Ø is not quite right. Commercial surveys for these two models are in the completion stage. That leaves the thorny question of launch financing for companies that are not Boeing and do not have 3 billion available in cash. There are three possible solutions:

Expanding the Consortium

This common sense method not only makes it possible to reduce everybody's share, but it will often yield a captive clientele. Therefore, Airbus Industry is already planning to reserve 2Ø percent of the next program workloads to possible new partners. Unfortunately, there are not that many, as Yves Barbe explained: "The Japanese are bound to Boeing and have no desire to work with us; the Canadians are too expensive; the Italians are already subcontractors for the Americans, which does not make it easy to reach an agreement; the Brazilians can do good work, but they are already overloaded. That leaves China, with which we are cooperating on the ATR42." Opportunities, therefore, seem to be very few.

Having Recourse to the Financial Market

The partners are already resorting to it to finance part of the investments, as the amounts they must contribute increase with each program (Ø percent for the A3ØØ, 25 percent for the A32Ø, 4Ø percent for the latest version of the A31Ø in France, 2Ø percent on the average in the FRG). For the first time, a pool of 2Ø French banks headed by Paribas will assume a truly industrial risk with the A31Ø project, since repayment dates will not be fixed but directly linked to aircraft sales. However, the credit line will not exceed Fr 5ØØ million, not much compared with the Fr 7 billion (current francs) required by Aerospatiale to finance the A32Ø. In addition, the organizator of this package at Paribas--a former employee of the Morgan Bank--made sure that all banks would be repaid, with reasonable interest, as soon as the first 1ØØ or 15Ø aircraft are sold (the figure may vary depending on production rates), and before the Treasury even gets one red cent! As can be seen, the banking system alone cannot provide the missing link.

Turning to the State

It is obviously the best lender. The partners are well aware of it, even if Deutsche Airbus, like the others, assures that "our goal is to become independent from the government." That won't happen just yet. "We are in an industry with a very long financial cycle, where you must wait 15 to 2Ø years (roughly the lifetime of an aircraft) to achieve adequate profitability," Yves Barbe concluded. "Until then, that is true, the State is providing us with cash, but it does not pay our monthly bills." Can Boeing make this distinction?

[Box, pp 174-175]

Jean Pierson: "We Need 25 Years"

Jean Pierson, who became chief executive officer of Airbus Industry just one year ago, took off with his new job. The former head of the Aerospatiale aircraft division regrets that he is no longer responsible for the factories--they remain the province of each of the economic interest group's partners--but he is taking advantage of his past position to give up the forced shyness of many men in the industry. He is a colorful and passionate advocate of the Airbus.

[Question] When will Airbus Industry become profitable?

[Answer] For Airbus partners to make a profit, both as shareholders and as contractors for the economic interest group, they must fulfill three conditions that are perfectly interdependent: roll out aircraft at a good production rate to mop up the massive overdraft resulting from the very long cycles of our industry; offer our clientele a complete line in order to promote synergistic effects among them; and acquire a share of the world market of at least 30 percent. To date, we have reached 17 percent after starting from scratch in 1970. So, let's wait and see where we are in 1995. We need 25 years, like Boeing, but with the difference that we are in a challenger position, not in a position of near-monopoly like Boeing today.

[Question] What is your reaction to the U.S. Administration's charges concerning your commercial methods?

[Answer] All this, of course, has been strirred up by our competitor which is always looking for some new fabrication: first, Boeing said that we did not know how to make an aircraft, then that we would not know how to sell it. Yet, when I was invited to Seattle in 1979, I saw a map entitled "Airbus's Silk Road," on which Boeing was planting flags for each new airlines we would catch in Asia. And then we launched an aircraft, the A320, with a backlog of orders never equalled at the same time before an aircraft was placed in service; and with the A340 project we are trying to break the monopoly of the 747, on which Boeing is making a substantial profit per aircraft. So, the people in Seattle want a respite, they do all they can to ensure that Airbus will not offer a full line and they play on the susceptibilities of the U.S. Administration. But if the latter raises the issue of taxpayers' aids under the pretext that we are receiving repayable advances, we in turn shall mention, among other things, aids to research and development (NASA, etc.) and tax relief, e.g. the $393 billion tax exemption granted to Boeing--which caused it to be called "the worst taxpayer in the United States."

[Question] Boeing charges that you are receiving financing at reduced or zero rates...

[Answer] Zero rates, no; but favorable rates, yes, although the inflation slowdown is minimizing this asset.

[Question] ... and that you do not have to make a profit to launch new programs...

[Answer] That is true, but on the other hand we do not benefit from military contracts yielding profits of about 20 percent, which were at the origin of the creation of Boeing's present line. Let's not forget that components of the 707 are also used in the manufacturer's other aircraft.

[Question] ... and that you manufacture "white tails," i.e. aircraft that you cannot sell.

[Answer] That argument is not reasonable. Boeing, too, has manufactured some 757, and now some 767, which ended up as "white tails." And among these A300--which have now been sold--there were for instance aircraft intended for Libya and that could not be delivered because we did not have the engines. You know as well as I do that the Americans have placed an embargo on shipments of equipment to that country.

[Question] Are you not dumping your aircraft?

[Answer] Listen, like everywhere else, prices are dictated by the one who enjoys a dominant position on the market. That is not us. Nor even Douglas whose silence where we are concerned is also quite revealing. Boeing is lowering its prices because it wants to retain 60 percent of the market at all costs.

[Question] Fifteen years after the program was started, you are still asking for repayable advances...

[Answer] That is the ultimate effort. In 1995, when all massive investments have been made, when sources of returns multiply, we shall be in a position to finance our new developments. In this long marathon, I must admit, the last lap requires still another effort. This one, however, is essential to enable us to cross the finish line and get on the podium.

PHOTO CAPTIONS

1. p 172. How to Find $2 Billion

This is the amount required to launch the A320. The partners must finance it, not in proportion to their shares in the Airbus Industry capital (Aerospatiale 37.9 percent; Deutsche Airbus 37.9 percent; British Aerospace 20 percent; Casa 4.2 percent), but in proportion to the workloads allocated to them under the program. Each manufacturer will then negotiate the amount of the public-fund loans with its government and will itself contribute a share of the investments that will vary according to the country.

Country	Total Financing	Breakdown	
France	Fr 5.3 billion	State: Aerospatiale:	Fr 4 billion Fr 1.3 billion
Germany	DM 1.8 billion	State: FRG industry:	DM 1.4 billion DM 0.4 billion
Great-Britain	437 mil. pounds	State:	250 mil. pounds 187 mil. pounds
Spain	13 bil. pesetas	State and Casa	

2. p 173. A Market in the Clouds

Here are the prospects for the next 20 years as assessed by Airbus Industry: 3,750 narrow-fuselage aircraft; 3,300 medium-haul jumbo jets; and 1,150 long-haul aircraft. If these sales projections prove true, and if Airbus, which is represented on all 3 market segments, manages to capture 30 percent of the market, the consortium will make money.

9294
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WEST EUROPE/CIVIL AVIATION

HIGH TECH'S ROLE IN AIRBUS CONSTRUCTION OUTLINED

Paris L'USINE NOUVELLE in French 8 May 86 pp 56-62

[Article by Michel Defaux: "Airbus A32Ø: the Offspring of Data-Processing"]

[Text] The arrival of the A32Ø is marked not just by many technological innovations, but mainly by a new way of designing and building an aircraft. No industrial process has ever been so thoroughly dominated, all over Europe and all the time, by the allmighty computer. Aircraft manufacturers are not the only ones to have an interest in the experiment.

In a few weeks, people in Toulouse will celebrate the completed assembly of the first unit of the new Airbus A32Ø. An aircraft which sharply contrasts with the previous models of the Airbus line through its many technological innovations: new cockpit, integration of considerable data-processing resources, adoption of fly-by-wire controls, increased use of composite materials, etc. But, far more than these "revolutions" in the product, what is striking is mainly the new way of designing and building such a machine.

In recent years, an aircraft has become just another industrial product. It must be innovative, more reliable, easier to pilot and less costly to operate in order to convince increasingly demanding airlines.

The aircraft must also sell for a reasonable price on a highly competitive world market; it must be delivered on schedule and reach the market very fast. These constraints seem to have been met since, with 9Ø orders received, the Airbus A32Ø is already assured of a commercial success equal to that of the A31Ø.

The reason? The use of computer-aided techniques (CAX) throughout the industrial process, for the first time to such a wide extent. The allmighty computer was present from the aerodynamic definition, shape and parts design and structural analysis, to quality control, the preparation of technical literature, testing, automatic sequence generation, NC machine programming and robotized wiring.

"The Airbus A32Ø is the first aircraft 8Ø percent of which were designed with computer-aided design and manufacturing (CAD/CAM) tools. A considerable progress over previous models. Only 2Ø percent of the A31Ø and 5Ø percent of the ATR42 were designed with CAD," Claude Terrazzoni, head of the engineering department of the Aerospatiale aircraft division, pointed out. "For the next Airbus, we hope to achieve 100 percent. The frame of reference will be a computerized database instead of paper. A stage that Boeing reached 1 year ago."

1975-1985: Aerospatiale Invested Fr 1.2 Billion in Data Processing

The battle between aircraft manufacturers is a tough one. The winner will be the first one to implement the concept of computer-integrated manufacturing, i.e. integrated production automation. From now on, the goal is to federate individual data-processing applications in corporations in order to constitute a structural whole hinged around a single database. "The A320 program gave us an opportunity to stress CAD/CAM. Our end goal is to integrate the whole process and use a single database to link programming, tool design, production, etc., all the way to control and after-sales," Jean-Claude Chaussonnet, head of the industrial management department of the Aerospatiale aircraft division, went on.

That approach has been adopted not just within the company, but also outside. Subcontractors complete increasingly complex tasks and are now participating in engineering and production. Hence the actual connection of several subcontractors, such as Latecoere, Labinal or Hurel-Dubois, to the database of the Aerospatiale engineering department.

The other contractors of the A320 program also make much use of data processing. British Aerospace, a CAD pioneer in the 1960's, is using Anvil 4000 software for NC machining and to design and draw tools for wing parts; it uses an internally developed program to draw all the wiring diagrams. MBB is making intensive use of CAD/CAM to design and manufacture the fuselage central and rear sections, the fin and the inside furnishings. Using CADAM, CAD software running on an IBM computer, the goal is to produce all of the mechanical files and wiring diagrams.

At Aerospatiale, CAD/CAM started in 1973-1974. Since then, each program has provided another opportunity to develop it. Thus, they started by studying shapes, then layouts and, more recently, electrical circuits. Now it is the turn of group technology (GTAO), which will lead to automatic procedure preparation and to the production of drawings including parameters. For these applications as a whole, the Aerospatiale aircraft division invested Fr 1.2 billion in data processing over the period 1975-1985. There are now 300 graphics work stations in Toulouse, and close to 100 stations used by subcontractors for the A320.

A Revolution in the Design of Electric Systems

The major change brought about by this new aircraft is in the design of electric systems. The adoption of fly-by-wire controls, which multiplied the number of cables, required the definition of two CAD software packages using the same computer system: Circe for wiring-diagram design, and SAO for equipment specification. These tools can be used by all manufacturers facing major wiring problems. For instance, over 150 km of electric wires are used in an Airbus, in hundreds of components and instruments. Designing, manufacturing and then maintaining systems will require creating, managing and distributing a considerable number of diagrams (1300 wiring diagrams for each version) and listings of all kinds (lists of wires in an electric loom, connectors, contacts).

The Circe software (Computerized and Rationalized Design of Electric Wiring) developed by Aerospatiale was used to design all of the A320 circuits. This software is primarily an aid and a means of control of completed wiring diagrams, to be used by the designers and draftsmen in charge of the electric file. It is also a way of making all existing data and documents available to all users concerned (production, maintenance, after-sales). For instance, these data will be used in aircraft system testing equipment at the end of the Toulouse assembly line. The same data will also be used for the definition of the wiring diagrams used by airlines for maintenance purposes... It is still the same approach leading to integrated production automation.

The draftsmen sitting in front of their 16 consoles are preparing layout diagrams, calling on the graphics database which contains 800 symbols, drawing variable components and connecting circuits. After making these functional drawings, the draftsman adds installation components (cut-off connectors) and the cable numbers that will be used later on, at the production stage. For the time being, the cable length is not determined by the engineering department, but computed on a mockup. This will be possible when 3-D displays are used. That solution will become truly operational only with the future A330 and A340. The data stored are then used in production, to cut cables to the required length, print references and connect the various components. Formerly, operators used to work with a listing. For the A320 wiring, these data, which are updated in real time, reach the workshop on a computer terminal. It indicates the electric equipment and references to be used.

The results are impressive. First, with respect to quality, because redundancies are abolished and the data consistent. There is less than 1 percent of errors on a total of 30,000 cables. Then, with respect to productivity, as Andre Saint-Paul, in charge of the CAD resource department, explained: "Task automation enabled us to reduce our staff. We needed only 65 draftsmen to complete the A320 electric file, compared with twice as many for the A300. Cycles were reduced from 1-1/2 year for the electric definition of the A310 to 1 year for the A320."

These CAD stored data pave the way for automated wiring design and electrical loom production; a result of the adoption of fly-by-wire controls for the wings. At British Aerospace, these tasks are done by hand for the time being. Over 1,000 electric wires per wing have to be cut to the right length, stripped and insulated, and then fitted with connectors, adaptors, etc. to produce looms that are 21 to 27 m long. This task accounts for 10 percent of all manual work done on the wings and requires 6 people working for 10 days. As the production rate of the aircraft increases--they are talking about 66 to 72 aircraft per year by 1990--these operations will have to be automated. In a first stage, now in progress, assistance will be provided to assemblers. Rotating storage units will present component sets to the operator and guide him with a synoptic chart. This, once again, means doing away with paper.

Construction of a Robotized Looming Station in Filton

The management is looking further ahead, with a view to the A33Ø and A34Ø. Hence the current construction in Filton of a huge building where the wings will be assembled and tested, an investment of Fr 45 million. One of the original features of this production center, which should be operational late in 1986, is a robotized electric loom design station. According to company officials, the project is still top secret and they will therefore not open the "automatic looming" file for us. "Boeing is also working on the same project," Norman Ellis, planning engineer, admitted, indicating that this work is closely followed by other industries, such as shipbuilding and railroad manufacturing.

Such a unit could include two different robots. Its originality would be that it would separate the wire preparation operation from the removal cycles, thus doing away with dead time. For instance, a small robot, like an IBM 7545, would measure and cut the wires, while a large-size gantry-type robot would assemble the looms. The goal is to increase productivity by about 5Ø percent and to reduce lead times to 3 or 4 days. The quality? It does not require any improvement. If you look at competing aircraft, you would almost wonder whether the high quality we achieve is really necessary. Rather, robotization will make it possible to agree on a quality standard and maintain it."

6 Color CRTs in the Cockpit

In the new hall, the management also intends to implement computer-aided testing. Seven wing assembly and equipment stations are planned, and each is to be connected with the central test computer. Several different software programs will check the electric, hydraulic and pneumatic programs and deliver data in real time. Listing printouts, which are very long to analyze, will thus no longer be necessary. Mainly, it will be possible to make corrections while the wing is still at the assembly station. After the corrections, a new test will be made. "The goal is to deliver fully completed and 1ØØ-percent tested wings to the Toulouse factory, via the Super-Guppy jumbo jet."

Another new CAD tool: computer-aided specifications or CAS, required for the new-generation cockpit equipped with digital avionics. "We are responsible for the cockpit and we must complete a number of tasks within a very short time, e.g. definition and specifications of the system, equipment and associated software, follow-up of suppliers' as well as ground and flight tests, alterations resulting from these tests and, finally, preparation of the certification files," Roger Bergoend, head of the drafting section of the engineering department, in charge of the definition of the A32Ø nose section, pointed out.

A difficult task, as the 35 on-board computers, including over 1ØØ processors and over 1 million software program lines, must be defined down to the most minute details. For instance, an automatic pilot specification will require over 3,ØØØ pages of diagrams and text. In addition, it will go through nearly 1,ØØØ changes or different configurations (variable options, depending on the airlines) during the development and debugging stages (approximately 5 years). In this case, too, time is of the essence: "The first computer hardware will be delivered around mid-1986, i.e. 2 years after the project was launched. That will leave us only 6 months to integrate everything into the cockpit. Deadlines first!"

CAS has three types of users: designers who create specifications; equipment manufacturers who increasingly receive these data in the form of programs; and, finally, testing teams. Applications include the construction of logic boards and the definition of graphic symbols. One example: one of the innovations of the Airbus A320 is the installation of six color CRTs in the cockpit instead of the traditional electromechanical indicators of the instrument panel. At the Toulouse systems software department, designers are using CAD displays to define in actual size all the color symbols that will be used: speed and altitude data, automatic piloting mode, etc.

Data Exchange Among Partners

Other panels display the systems operation. For hydraulic systems, the operator defines the circuits, positions the pumps, choses a graphic representation, describes the different conditions (failure, operational), and simulates operation, all in color. After that, the picture can easily be validated to take into account the pilots' opinion, and changes can be made rapidly.

All this information is stored in a database and made available directly to equiment manufacturers in the form of computerized instead of paper specifications. A sign of the times: this widespread digitization of on-board electronic equipment has led manufacturers to create software workshops. For the time being, this tool, which is still little known--Aerospatiale introduced it at the latest MICAD show in Paris, last February--is also of interest to other aeronautical companies, including SNECMA, but it has not yet been adopted outside the aeronautical sector.

Simultaneously to this all-out CAD approach, another tool is beginning to be used for equipment consisting of so many parts: computer-aided group technology (CAGT). It consists in coding parts so as to classify them in families according to manufacturing process or morphodimensional characteristic criteria.

Many industrial sectors, e.g. shipbuilding, are eagerly awaiting the first results of this experiment. The goal is to achieve a reduction in the number of parts (knowledge of what exists and standardization for the engineering department) and the automatic generation of machining procedures. "We are now implementing computer-aided drafting," Roger Bergoend pointed out. "For instance, for a simple part like an angle iron, the draftsmen will define a morphodimensional code and query the database. Using several angle irons differing only by a chamfer will finally become a thing of the past." At present, the system is operational for simple parts and it is beginning to be used for formed sections and floor beams...

The A320 program required 33,000 parts; classifying them by family reduced their number to a few hundreds. "Using the drawing package of this aircraft, we coded the first parts. In the next few months, we will code the next parts," Jean-Claude Chaussonnet indicated. "But it is a complex operation. We directed our effort first to mechanical parts. We are now tackling the composite sector."

In the workshops, CAGT has brought about a reorganization of production units around the main families. It is being implemented progresively in Saint-Nazaire where frame manufacturing required that large milling machines be moved.

One of the main problems to solve for the A320 program was the exchange of data among the partners. Aerospatiale, which manages 39 percent of the development costs, is more particularly in charge of the fuselage front section, the wing-spar box, engine integration and systems definition. MBB is in charge of the fuselage central section, the panels and the fin. The task of British Aerospace is to make the wings; that of Casa to make the horizontal stabilizers... This industrial work sharing has required the transfer of much data: scientific data on the one hand (aerodynamics, flight quality); specific data on the other (geometric interfaces between sections). Not to mention archiving problems: the lifetime of an aircraft is 25 to 30 years and data must be stored in a form that must be accessible to all. With the A310, these data were exchanged on paper and on microfilm.

Regrouping Data for Improved Consistency

Now that the partners of the program are making considerable use of CAD, new problems have emerged. Each partner has chosen systems suitable for its own problems, so that data are not consistent. For instance, British Aerospace is working with the Anvil 4000 and Cadam software to draw and machine mechanical parts, and with BCAWD for wiring diagrams; Aerospatiale is using Circe to design its diagrams; and Casa is using CADDS4 to draw parts... As a result, they are looking for a neutral language. The performance of Iges, the U.S. standard, was still inadequate; PDES, another standard, was not ready: they would have had to wait 5 or 6 years for an interface.

The European partners then tested the SET (Exchange and Transfer Standard) initially developed by Aerospatiale for its internal use. After conclusive tests in 1985, the standard was adopted for the exchange of drafts of computer-aided controls for the A320 program.

"Since then, over a 7-month period, hundreds of CAD drawings have circulated among the partners, without any major problem," Jean-Francois Gaillard, CAD coordinator of the A320 engineering group, concluded. "These were only drawings of interface parts, and they mostly showed that, if need be, it is now quite possible to exchange entire CAD drawing packages in a very short time."

This standard is most valuable for clients and subcontractors in all sectors of the industry, since it will make it possible to transmit data between CAD/CAM systems that until now were considered incompatible. For instance, between the drafting system of the engineering department and the NC-machine programming department, or a subcontractor's workshop. Especially since over 10 interfaces have now been developed and are available on the market: Catia (Dassault System), Strim (Cisigraph), Safi (Assigraph), Intergraph (SGN).

French automobile manufacturers have also agreed to support this standard and to try to impose it internationally. An experimental standard has already been published by Afnor and represents the French contribution to the ISO for the definition of the future international Step standard (Product Definition Exchange Standard), which will become effective in 1990.

An identical concern is at the origin of the Apex program (Advanced Project for European Information Exchange) in the context of Eureka. In a strong position because of their work, the participants--Aeritalia, Aerospatiale, British Aerospace, Casa and MBB--want to develop these themes and apply them to all industrial products. They are confident that they can obtain concrete marketable results within the next five years.

[Box, p 58]

First Flight in March 1987

The latest model of the Airbus line is also the smallest (36.8 m long and 33.9 m wing span). It belongs to the short and medium-haul (3,200 to 5,000 km) twin-jet family, and has 150 seats (a single aisle and 3 seats in a row). It is designed to compete with, or replace older-generation derived aircraft, such as the B-727, the B-737 and the DC9. Its fuel consumption per seat/passenger is said to be 30 percent less than that of its competitors.

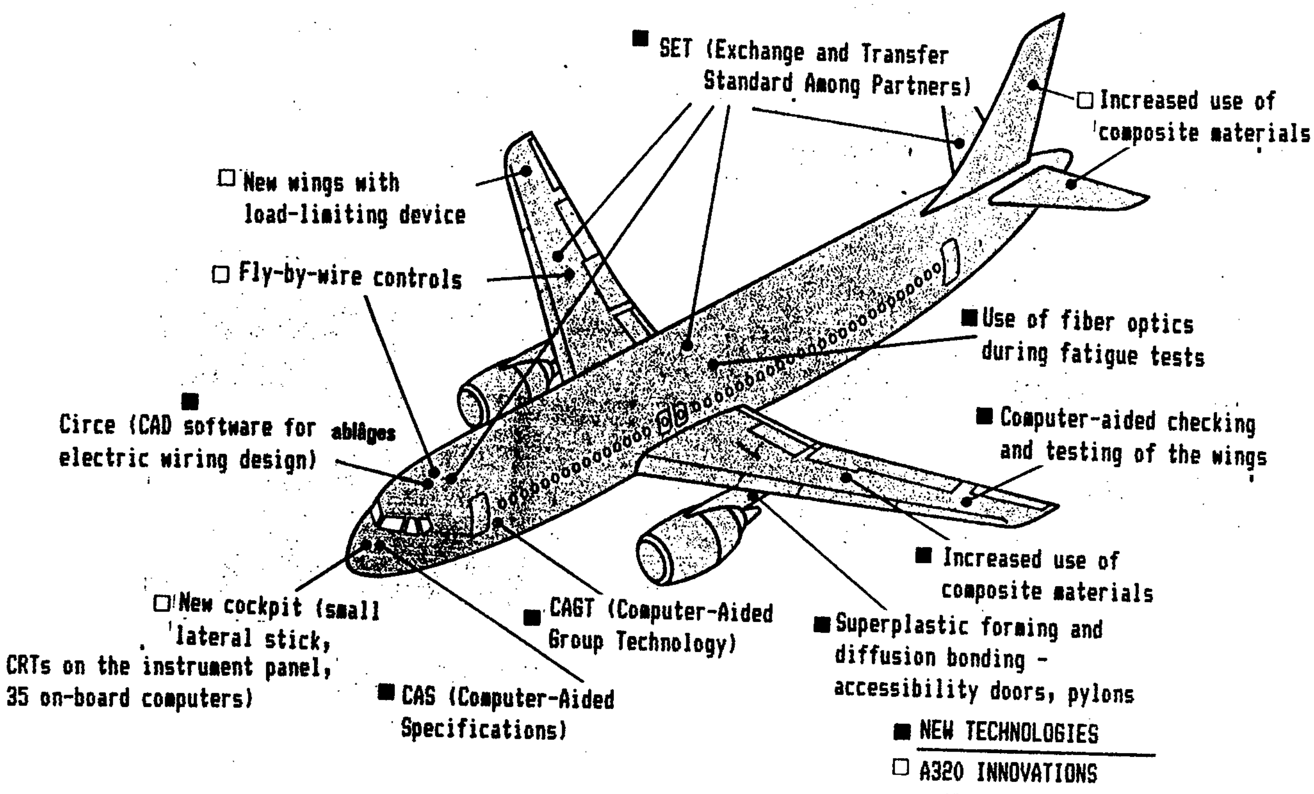
Launched in March 1984, the A320 is, for the time being, following its development schedule to the letter: this month, the final assembly of the first aircraft will be completed. Engine delivery is scheduled for the end of the year, and the first flight was announced for March 1987. One year later, the A320 will be certified and placed in service. It will have taken 4 years from the launching of the program to the delivery of the first aircraft to an airline. Compared to the A300, the development period was reduced by 25 percent. "Engineering and production cycles are very short and quite competitive with Boeing's," Roger Bergoend, head of the drafting section of the engineering department, in charge of the definition of the A320 nose section, pointed out.

The products that will follow are already on the drawing board. In 1987-1988, specialists are expecting to launch the A330 (medium/long-haul 310-seat jumbo twin jet) and the A340 (very-long-haul 260-seat 4-engine jumbo jet) which will use some of the components of the A320.

[Box, p 59]

Real Innovations in the A320

At the request of airlines, aircraft manufacturers are rivaling one another in ingenuity to introduce new, more efficient and more reliable aircraft which



While the Airbus A320 is contributing an impressive number of novel solutions (see box below [box, p 59]), the new technologies used are bringing the aeronautical industry to the threshold of the 21st century.

will cost less to operate. And to do so within the shortest possible time and at the most attractive selling prices.

The A320 is contributing its share of novel solutions to meet these rigorous specifications:

- Use of fly-by-wire controls (except for the rudder and elevator which retain mechanical controls), which provides for weight reduction, simpler piloting procedures and increased reliability. Spinoffs from the Concorde program.

- A new generation of cockpits. We first notice that the traditional control stick is obsolete, and pilots will therefore use small lateral sticks. CRTs have arrived on the instrument panel (which used to be electromechanical). Intensive use is made of data processing for flight control, systems control and monitoring. Computers optimize aircraft control, engine thrust and fuel flow rates, and they detect failures.

- The increased use of composite materials which are now found on primary structures (stabilizers)--an innovation on a civil aircraft of this size--and on secondary structures (panels, doors and fairings). Toray, which will supply the carbon fiber, mentioned that Airbus's consumption of composites might double. Until now, the consortium used from 500 to 1,000 kg of carbon fibers per aircraft.

- New wings with a load-limiting device which reduces the effect of turbulence, so that wings can be lighter. "A first on a civil aircraft," British Aerospace engineers pointed out.

[Box, p 60]

Fiber Optics: Toward Real-Time Control

Delivering "zero-defect" parts has led MBB in Lemwerder (FRG) to develop crack detection in metallic and composite structures by means of fiber optics.

Very thin fibers (30 to 200 micron in diameter) are glued to the surface of metallic components. As soon as a crack occurs, the fiber breaks and the lack of light transmission indicates the origin of the failure. During the Airbus fatigue test, this technology made it possible, for instance, to monitor a row of rivets on the fuselage outer wall. Fibers 30 micron in diameter were arranged around the riveting holes of the first row, the most vulnerable, between the two assembled parts.

"We are now using this technique for composite materials such as reinforced plastics, glass or carbon fibers, which are increasingly used in aeronautics," Bernd Hofer, in charge of new technologies and structural testing at the MBB testing department, indicated. It is even used on structural parts made of plastic reinforced with glass fibers, designed for the future German very-high-speed train. In that case, what was needed was a tool providing simple and rapid monitoring during product use. "The only method applicable was tomography, but it is costly and time-consuming." Fibers 3 m in length are inserted between the different layers during manufacturing. Checking could not be simpler: you illuminate one side of the structure and check for the presence of light points at the other end.

This technique could also be used on the future Airbus, as important parts of their fuselage will be made of a composite reinforced with carbon fibers. These materials imply new control methods during the aircraft lifetime. The idea is to integrate many optical fibers into all vulnerable or inaccessible parts, and to interface this system with an on-board computer. It is the "Fons" (fiber optical nervous system), i.e. a system which will provide real-time information on the location of the failure and the extent of the damages.

[Box, p 61]

Tremendous CIM Knowhow

Several automated production tools have long been introduced in the factories of the Airbus program partners. Although we can hardly use the term "new technologies," it would be unfair to ignore the tremendous computer-integrated manufacturing knowhow now available.

- Numerical control: all kinds of records, with the largest 5-axis NC-panel milling machine installed at the British Aerospace Chester factory (66 m long, 8,5 m wide) and the direct link connecting 20 NC machine-tools in the Aerospatiale Nantes plant. In addition, direct-NC projects in Chester, which will soon use fiber optic links, might lead to new products (British Aerospace and GEC have signed a joint-venture type agreement on this subject).

- Assembly: for riveting, all partners are using NC machines which perform all the operations: clamping, drilling, rivet introduction and flattening. The Aerospatiale Meaulte plant, in Picardy, went one step further with a machine equiped with an 8-position orientable riveting head for the A320 door frames and panels: it takes only 7 seconds instead of 25 to install the rivet in hard-to-access places and flatten it. Progress was also made on bolted assemblies when a Hi-Loc screw which is 13 percent lighter was used for the first time.

- Robotics: research and a wide range of uses and, at Filton (Great-Britain) honeycomb cutting test. In Nantes, a gantry-type robot designed to install seal beads on the Airbus panels is now reaching the production stage. The seven-axis robot can move over a 6 m x 8 m area and has a repeatability of 0.05 mm. Subsequent CAD programming is contemplated. Other developments are in progress, like the robotized connector assembly station in Toulouse, in which the robot cuts to the desire length, crimps the lugs and provides quality control.

[Box, p 62]

Superplastic Forming for Difficult Parts

Superplastic forming and diffusion bonding, developed in the workshops of Aerospatiale in Saint-Nazaire and British Aerospace in Filton, near Bristol, are used for hollow parts or parts that are difficult to form. "The process dates back to the late 1960's and took off in production in 1981. Since then, we have perfectly understood all phenomena and mastered all parameters," David Stephen, in charge of development at British Aerospace, indicated. "It took over 20 years for the process to be used outside the aeronautical industry. At present, we have many demands from companies working in the chemical and offshore industries."

In Great-Britain, 14 A320 parts, mostly accessibility doors, are made that way. The process consists in placing two aluminum or titanium sheets in a forming tool (6 to 8 parts simultaneously, depending on the size), and then injecting a neutral gas (argon) under pressure between the two sheets while preheating them in a press (950 C for titanium and 450 C for aluminum). The parts undergo a very slow elongation and deformation (8-hour cycle) and assume intricate shapes that are practically impossible to obtain with traditional forming.

In Filton, the operation is preceded by chemical milling of the sheets to obtain, in the final stage, a reduction of about 40 percent on the parts weight. Some of the advantages are: the deformation time, which depends on the shape rather than on the size of the parts. A part formed with this process can replace several others. At British Aerospace, they are showing with pride one of the largest parts thus made, a door of the 125 business aircraft. Using traditional methods, it would consist of 19 different parts and close to 1,000 assembly components. Using superplastic forming, there are only 4 parts made of titanium sheets, resulting in a 30-percent cost saving.

The diffusion bonding technique used to ensure parts adhesion requires two clean surfaces. It is based on the principle of atomic diffusion. With highly-reactive titanium, superplastic forming and surface bonding take place at the same temperature and are thus achieved during the same cycle. With aluminum, the operation is more difficult. A pretreatment must be used to prevent oxide formation and, in theory, the operations are not carried out simultaneously. Research goes on, and British Aerospace is expecting to achieve soon superplastic forming and diffusion bonding of aluminum parts in a single cycle. These processes are licensed or are about to be licensed.

In France, the ACB have signed a license agreement with Aerospatiale. As for British Aerospace, it is even contemplating the creation of an outside company.

9294
CSO: 3698/A621

FRENCH INVESTORS, GOVERNMENT, BUSINESS COOPERATE IN AI

Paris ZERO UN INFORMATIQUE in French 12 May 86 p 76

[Article by Michel Barreau: "Bull Participates in Cognitech Capital"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] Two years and two months after its founding, Cognitech, one of the French leaders in the field of expert system development, has just acquired considerable equity capital totaling Fr 54 million. Bull's participation in this comes to 18 percent of the capital.

When Cognitech was founded in February 1984, 10 individuals collected Fr 250,000 for a slightly bizarre project: the creation of a business entirely dedicated to artificial intelligence. To begin with Cognitech dedicated itself to the development of an expert system in plant pathology on behalf of the National Institute for Agronomic Research (INRA). INRA is still the main customer of Cognitech. Tom--as the system is called--has been developed in 25 versions, corresponding to the 25 overall varieties of plants grown in Europe. According to Jean-Michel Truong-Ngoc, Cognitech sales manager, "The whole development cycle of an expert system takes about 3 years; consequently, we are reaching in the final testing phase with Tom. This summer INRA will deliver several hundred Toms to users."

Tom may be consulted by a standard Minitel or by one connected to a video disk. It is also available on Sun or Apollo workstations, or through teleprocessing on Digital VT-100 consoles.

During 1985 Cognitech showed a turnover of Fr 8 million (vs. 2.5 in 1984) and also witnessed a very large expansion of the company's industrial business. Its customers, now totaling 53 (including the 25 versions of Tom), include Pechiney (the Calumet system for diagnosing casting defects), Dumez (the Penelope system for the planning of building sites), the RATP [Autonomous Authority for Paris Transport] (the Rufus system for coach maintenance for the RER [Regional Express Networks]), and the European Space Agency (responsible for charging and discharging a satellite's batteries). All these systems, as well as a certain number in the medical and military fields, are being developed.

The Strength of Cognitech's Projects Give Hope of Leadership on the French AI Market

The introduction of two applications aimed at a broader customer base are also noteworthy: The first gives export advice to small- and medium-sized businesses (customs and tax regulations, foreign exchange, etc.) and was developed in cooperation with the National Expert School; the second helps make data processing choices (hardware, software, and service) and is being developed in collaboration with CXP and ADI.

With its 25 employees, including 15 knowledge engineers (about 15 more will be hired this year), Cognitech feels that this "portfolio" of projects will permit it (despite the other specialists including Framentec, ITMI [Industry and Technologies of Intelligent Machines], and Amaia) to take the lead in the French AI market.

"We anticipate very strong growth and we must now develop the means to remain the best," confirms Liliane Stehelin, Cognitech chief executive officer. That explains an ambitious 5-year expansion plan accompanied by very substantial increases of equity capital, which, a few days ago, after incorporation of a part of the 1985 profits still did not exceed Fr 850,000....

The search for financial partners has just finished and Cognitech's new composition was outlined for us last week by Liliane Stehelin. The company's founders retain 42 percent of the shares, while a group of outside investors, led by Paribas Technology, provides 58 percent of the capital. Apart from Paribas (whose participation is 18 percent), this group comprises Bull (18 percent), Epicea (CEA [Atomic Energy Commission] venture capital fund, 8 percent), Innolion (of the Credit Lyonnais group, 8 percent), as well as two other investors whose identities were not revealed.

In total these new partners bring in Fr 17 million, of which 6 million is in the form of share warrant bonds. The operation is expected to evolve naturally into Cognitech's registration on the Stock Exchange, probably before the end of the 5-year plan.

It is appropriate to mention that Bull is already one of Cognitech's principal clients. Bull participates through training courses managed by Bull since 1985 for transfer of AI know-how and technology awareness for most of Bull's engineers. Thus in 1986 Cognitech will provide several hundreds of days of instruction on Lisp and Prolog products for employees of this national manufacturer.

In addition to the Fr 17 million in venture capital, Cognitech will also benefit from a Fr 7 million grant (repayable) for innovations from ANVAR [National Agency for the Implementation of Research]. The grant is enhanced by a Fr 30 million long-term bank credit. All this adds up to a total contribution of Fr 54 million for Cognitech. Barely one month ago Alsys raised Fr 42 million for developments on the Ada language. Advanced technologies in the software field no longer appear to frighten financial institutions. We can only be pleased.

25044/12947
CSO: 3698/A163

BELGIAN INDUSTRY, UNIVERSITY IN AI RESEARCH

Brussels INDUSTRIE MAGAZINE in French Jun 86 p 10

[Text] As of this year a budget will be provided for launching a multi-year R&D program on artificial intelligence, according to Guy Verhofstadt, minister for the budget, science policy, and planning. Eight universities from both language communities could be involved in the government program which will relate to software engineering, man-machine communication, natural language processing, as well as knowledge representation and processing.

The minister referred to this at the signing of collaboration agreement in the field of artificial intelligence between Brussels University [ULB] and the Sperry company.

Under this collaboration, Sperry will donate hardware and software as well as personnel training to IRIDIA (Institute for Interdisciplinary R&D in Artificial Intelligence) which was established by the ULB. ULB students will also have the opportunity of joining the Sperry research teams. Finally, the data processing company will allow university and industry representatives to work on solving problems peculiar to certain industries.

IRIDIA announced that it would focus on natural language processing, database inquiries, inference devices adapted to various methods of processing imprecise and uncertain information, voice processing, medical diagnosis, production planning, and computer aided education.

25037/12947
CSO: 3698/A158

SIEMENS PROPOSES 'SINEC' COMMUNICATIONS NETWORK FOR CIM SYSTEMS

Rome LA REPUBBLICA in Italian 15 Jul 86 p 37

[Article: "Integrated Automation and Communications;" first paragraph is LA REPUBBLICA introduction]

[Excerpts] SIMATIC programmable controllers--a proposal for automation "made in Lombardy" using CIM distributed intelligence.

CIM (Computer Integrated Manufacturing) is the method whereby integrated automation is implemented in the factory under the control of a computer. Processing power, instead of being centralized, is distributed over all areas of the factory. At a functional level, the factory is not configured as a mechanism regulated by a single central "brain" but is organized on the principle of the coordinated operation of a number of decentralized "brains". This means that, within certain limits dictated by the relevant level of intelligence, even the individual machines in the manufacturing process can be given decisionmaking capabilities.

The key premise for implementation of a system of this kind is communications because, if a number of intelligent units are to be able to work in coordination, they have to be capable of communicating between each other. There can be no integrated automation without a communications network, and if this network is to be capable of responding to the requirements of flexibility, easy expandability, and cost effectiveness throughout the whole company, the only possible method is through implementation of a bus LAN (Local Area Network) arrangement.

The Siemens proposal for distributed intelligence in CIM is a system of programmable controllers (SIMATIC) which can be linked in a communications network known as SINEC. This network complies with the ETHERNET standard (IEEE 802.3) and, as such, is a LAN which has already been tried and tested in the information sector, and whose components have now been optimized for industrial applications.

In parallel to this, Siemens is also working on the development of an open communications network which will make it possible to access systems of different manufacturers. This is being done through the company's active participation in the General Motors program for developing a universal dialog protocol known as MAP (Manufacturing Automation Protocol), based on the OSI model (Open System Interconnect) of the ISO (International Standards Organization).

In fact, Siemens was the only European company to make the necessary financial contribution to the initial stages of this "transatlantic" initiative.

And, despite the original trademark, the SIMATIC has now become an authentic Italian product or, to be more precise, a product "made in Cavenago Brianza." Cavenago Brianza, located on the outskirts of Milan, is the site of the Siemens ACF production plant. For a number of years now, this plant has been manufacturing, side-by-side with traditional electrical products, highly successful electronics products for industry--products such as the SIMATIC programmable controllers. The SIMATIC system has established itself as a leader on both the Italian and European markets, and can be regarded as a high prestige offering "made in Lombardy" for the distributed intelligence systems required for factory automation.

[Box, p 37]

Siemens Looks to the Future With Its "SINEC" Communications Networks for Factories

A modern method of implementing a factory automation system is to define an architecture for the management and control systems of the factory, starting with the producton flow and going all the way to the decisionmaking level.

The "backbone" of this architecture is the communications system linking the automation units making up the system:

-horizontal communication between units of the same level in order to integrate the automation functions;

-vertical communications between the various hierarchical levels; data is transmitted from below and decisions from above.

The automation pyramid proposed in figure 1 is the theoretical model on which the Siemens proposal for the factory of the future is based.

The figure shows:

-the automation/process dialogue;

-the unit-to-unit communication in any one area of automation (SINEC L1);

-full communication in the pyramid from the manufacturing to the planning levels (SINEC H1);

-and, finally, the communications network based on MAP protocol which makes problem-free dialogue between equipment from different suppliers possible.

SINEC L1 for Communication Between Programmable Controllers in Any One Area:

SINEC L1 was developed for the purpose of communication between the SIMATIC S5 controllers in any one area of automation.

SINEC L1 is suitable for communication scenarios in which the quantity of data to be transmitted is not large nor the speed of transmission great. This is a bus system for the serial transmission of data using the master-slave principle. In addition to controllers, the SINEC L1 local network consists of CP 530 communications processors, as well as BT 777 bus terminal boards and bus cable (screened cable with four conductors). The CP 530 communications processor of the master computer directs the data traffic and monitors it automatically, relieving the CPU of this function. A maximum of 30 slave computers can be linked to the master computer over a maximum distance of 30 km and with a transmission speed of 9600 bit/sec.

The sequential interrogation of the slave controllers by the master is user-defined. Slave-to-slave communication is also possible.

SINEC H1 Full Communication Between the Manufacturing and Planning Levels:

The SINEC H1 is a local network based on the ISO model with decentralized bus control; it provides communication both between various areas of any one level of automation and between different system levels. The SINEC H1 has a high transmission speed (10 Mbit/sec.) and it links (fig. 2) the programmable controllers (SIMATIC S5), the numerical controllers (SINUMERIK), the robot controls (SIROTEC) and the process computers (SICOMP).

SINEC H1 is a standard bus system based on ETHERNET (IEEE 802.3). It has a segmented structure; data are transmitted via coaxial cable and the various segments are interconnected by means of repeaters. The maximum length of each segment is 500 meters; a maximum of 100 partners can be linked to each segment; the maximum number of units in a SINEC H1 network is 1,024.

SINEC and the MAP Project:

The MAP project defines the protocol for all ISO levels, and today the SINEC H1 network already satisfies the greater part of this requirement.

When the final version of the MAP becomes available, Siemens will be in position to use the architecture of SINEC networks for connection to the MAP structure. For example, all the programmable controllers in today's SIMATIC family will be capable of working and communicating with all MAP-compatible equipment and systems manufactured by third parties.

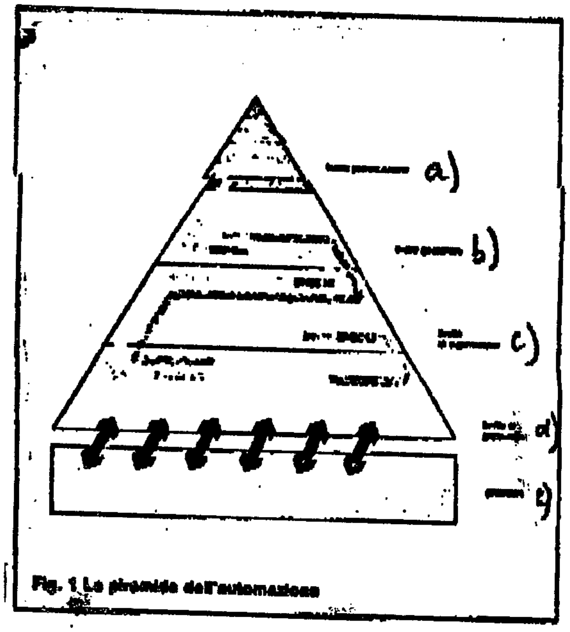


Fig. 1 La piramide dell'automazione

Fig 1 - The automation pyramid

Key:
a) planning level
b) management level
c) supervisory level
d) manufacturing level
e) production flow

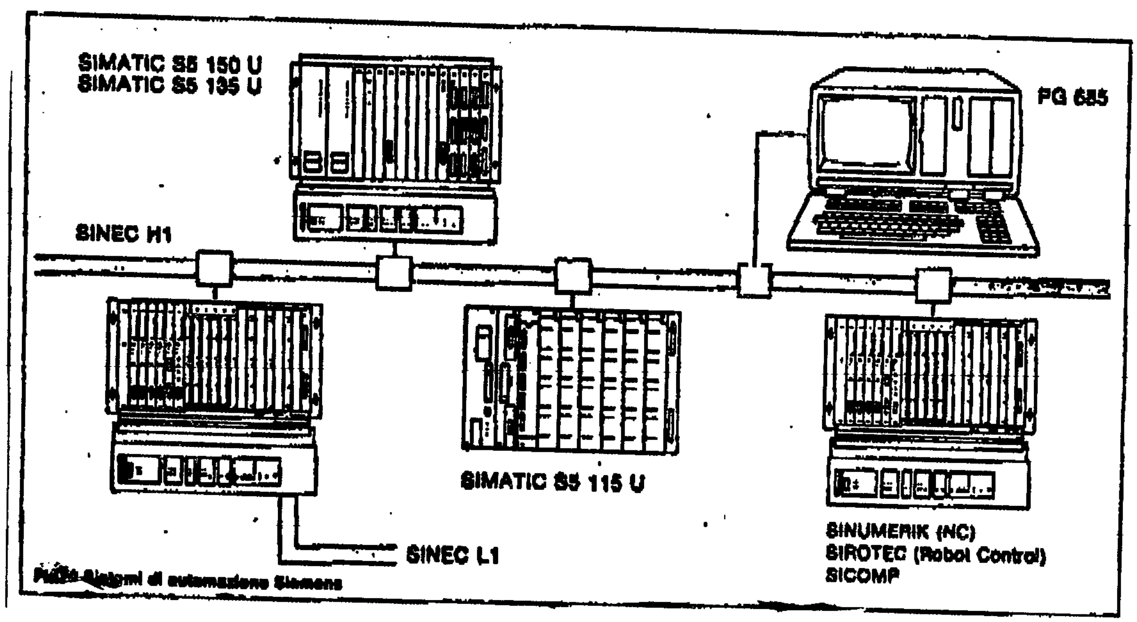


Fig 2 - Siemens automation systems

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CSO: 3698/M211

FRANCE: THOMSON, LETI TO COLLABORATE ON ADVANCED CCD'S

Areas of Cooperation

Paris ELECTRONIQUE ACTUALITES in French 27 Jun 86 pp 1, 22

[Article by S. Dumontet]

[Text] Grenoble--In order to be ready against the international competition of the 90's on the CCD [charge-coupled device] market with high-resolution charge-transfer devices (CTD), the Electronic Tube Division of Thomson (DTE) and LETI (Electronics and Technology Laboratory for Data Processing), each of which has complementary experience in this field, have decided to combine their know-how and their resources.

By the terms of this agreement, a common DTE-LETI team (which in fact has already been formed and presently includes 15 persons) located in a LETI shop in Grenoble will be in charge of developing, between now and the end of 1988, a 1.5-pm technological process on 4-inch substrates, after which the process will be industrialized.

For strategic reasons Thomson and LETI think that it was necessary that France should have available a working process in the field of detection of infrared and visible-light radiation. Thomson anticipates that its strategy is aimed solely at the high-tech professional niche and in no case the general public (cameras, electronic photography) although the "established bases" could be used for other applications.

At present, Thomson Tubes has annual revenues of 100 million francs in the field of charge-transfer devices with 10 percent of the world market in the high-tech professional equipment niche. (The entire electronic-tube division, which includes power tubes: Devices and tubes for hyperfrequencies, pictures, and solid-state devices represented 1.4 billion francs in 1985, of which 50 percent were exported). For the charge-transfer devices Thomson's goal for 1990, still in the specific high-tech industrial field, is a revenue of 275 million francs (on a world market estimated at 2,000 million francs).

The CTD market is therefore one whose revenue is not proportionally very great, according to Thomson's own terms, although each sale of a device is followed by some accompanying circuits (video interface sequencer, memories, etc.) but the company thinks that infrared will be considerable at medium term, hence the requirement for being present. In addition, it thinks that it is necessary to act very quickly to take forst place on foreign markets. However, this market requires enormous investments, too heavy to be borne by Thomson alone, since present technology (3-um design requirements) cannot be used for the advanced markets of the 1995 outlook (submicronic technology). Thomson and LETI will purchase equipment jointly, which results in cutting investments in half; each will bring its know-how, LETI its experience in surface-transfer CTD's in the infrared field and Thomson its technology in volume-transfer CTD's for applications in the visible-light field as well as its industrial experience. The proximity of the two firms, Thomson DTE and LETI, both located in Grenoble should facilitate the cooperation: The CTD field (where Thomson knows how to make 576 by 720 pixel formats with 13-um dot pitch) is furthermore an activity of very great difficulty (large areas without defects, perfectly uniform etchings). In addition, LETI and Thomson already have the experience of a joint venture in the field of MOS circuits.

Lastly, although for the time being there is no European collaboration in the field of CTD's, Thomson replies: "Yes, why not?"

Funds, Manpower Involved

Paris AFP SCIENCES in French 26 Jun 86 p 34

[Excerpts] This cooperation covering electronic devices capable of transforming light into electronic signals, such as aboard the earth observation satellite SPOT, will permit "keeping a date in the 90's by having available the most advanced semiconductor possibilities, particularly in matters of detection of infrared and visible-light radiation," according to the two companies.

In general, the application of this research involves the space, military, medical, and scientific sectors and particularly concerns a new phase in circuit miniaturization: The etching used for their processing will have a fineness of 1.5 microns whereas the products presently on the market use a fineness of 2.5 microns, as was explained to AFP by Daniel Woehrn, in charge of this activity at Thomson.

The new structure will work essentially in the professional field by temporarily leaving the general public applications to the foreign competition so as to overtake the delay encountered by France in this field. The agreement leads to the creation of 160 jobs, including 36 engineers and 60 technicians. An investment of 40 million francs is contemplated (in this sector Thomson has devoted 400 million francs to research-development in 10 years, and is aiming for a 30-percent part of the world market whereas today it occupies 10 percent with an annual revenue of 100 million francs).

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CSO: 3698/608

FRANCE EVALUATES SENSOR RESEARCH SUCCESS

Paris ELECTRONIC ACTUALITES in French 20 Jun 86 p 19

[Text] The "Sensors" Committee, whose mission is to report to the minister concerned with research items covered by an aid request, has just published the results of its third Symposium-Statement. Organized every 3 years, it took place this year on 23 and 24 April, at the Grande-Motte near Montpellier. The analysis of the aid files showed that 30 percent had reached their scientific goals and had resulted in an industrial and commercial prolongation.

More than 50 scientific, industrial, and governmental experts attended this symposium. The purpose of the symposium was, on the one hand, to define the balance sheet of the sensor actions engaged in France by the various interested partners (ANVAR [National Association for the Implementation of Research], CIAME [Interministerial Commission for Electric and Electronic Measuring Instruments], DIELI [Directorate for the Electronic and Data Processing Industries], SYMECORA) and, on the other hand, to examine the scientific results and the industrial and economic impacts of the contracts supported by the Committee during the period 1981-1984. A member of the Academy of Sciences and the general secretary of CADAS (Academic Committee of Science Applications of the Academy of Sciences) also followed the work of the symposium so as to write a situation report in the field of sensors.

The scientific balance sheet, which covered 60 research subjects, corresponds to an amount of granted aid on the order of 16 million francs.

The distribution of the aided subjects displays the great technical and technological orientations of today which are giving or will give birth to new generations of sensors; basically it is a question of applying microelectronic techniques (silicon sensors, thin and thick films), of using fiber optics and material like PVDF [polyvinylidene fluoride] which has the interesting physical peculiarity of being piezoelectric and pyroelectric.

In answer to the needs of the chemical and oil industries or the fight against pollution, a large number of subjects involved sensors for gas and electro-chemicals.

Realizing the importance of the agrofood industries and the requirement for their automation and the product quality control, the Committee gave its backing each time that good proposals were offered for subjects that could result in new sensors capable of resolving certain problems raised by these industries.

Of course, the part reserved for mechnical and thermal measurement sensors (pressure, flow, temperature, humidity) proved to be significant.

The analysis of the results revealed that among the aid files:

--Thirty percent had reached their scientific goals and resulted in an industrial and commercial prolongation. For example, a contract awarded to CEA/LETI for a humidity detector enabled the Societe Coreci to produce and sell 23,000 probes in 1985, of which 85 percent were exported. At the region level, another contract was awarded to improve certain characteristics and should further broaden Coreci's commercial possibilities.

--Thirty percent had reached their scientific goals but could not be followed up by an industrial application. For example, SAT [Societe Anonyme de Telecommunications] perfected a special infrared detector which could find numerous new and original applications in the field of gas analysis. The development problem resides in the component's cost which is still too high. A technical-economic study will be started so as to better appreciate the possible applications and the scope of the market. An increase in the quantities would result in a lowering of the costs.

--Forty percent were considered by the Committee to be failures. However, the idea of failure can be quite relative. Scientific failures, very natural, were noted when certain risks had been taken at the research level, but we have classified in this category those scientific successes which will not have an industrial follow up for multiple reasons (market size, investments too large, no interested manufacturers, etc.).

The balance sheet also permitted identifying research laboratories which have shown themselves to be competent and motivated for conducting studies in the field of sensors:

--Sensors for gas, one of the most developed themes within the framework of the Committee, are benefiting from the services of an industrial research laboratory particularly well equipped for characterizing the various detection devices coming from the research teams aided by the Committee. The activities of this laboratory of the CERCHAR [Design Center of the Coal Mines of France] should facilitate technology transfers to the supply industry.

--Those responsible for another theme, bearing particularly on future sensor generations--detectors using microelectronic techniques (micromachining of silicon, thin films)--envision the creation of a scientific group integrating certain competent laboratories so as to master the various basic disciplines and technologies required for research in this field.

In the field of fiber-optic sensors the Committee believes that the studies on the subject will lead to some original applications and that they will result in resolving certain problems looking for a solution (sensors distributed along a fiber or on a fiber in difficult environment). The effort undertaken on this theme will be pursued and developed in function of the means granted to the Committee. To accompany this effort the creation of a club is envisioned; among other things, it would facilitate the dialogue with the foreign partners and, more particularly, Great Britain.

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SGS LAUNCHES R&D STRATEGY TO IMPROVE MARKET PENETRATION

Milan L'ELETTROTECNICA in Italian No 4, Apr 86 pp 364-365

[Excerpt] With a sales volume of 572 billion lire in 1985 (exactly the same as in 1984), SGS Microelettronica S.p.A. has again proved itself to be among the leading companies in the international microelectronics industry.

According to Dataquest, when the world semiconductors market went through the most serious crisis in its history in 1985, SGS--whose sales volume for 1985 totaled $306 million ($335 million in 1984)--was able to hold its decline within 9 percent, less than half the drop shown in dollars on the market itself, thus improving its market penetration for the fifth consecutive year.

Particularly in the integrated circuits sector, the most advanced and dynamic in the microelectronics field, SGS gained a solid two positions in the world classification system in comparison with 1984: it jumped to the 17th position in 1985 from No. 22 in 1980. In this field SGS is Europe's second largest producer.

In the overall European semiconductors market, SGS has gained two positions, now holding eighth place in the classification system with a sales volume of 380.7 billion lire ($203.7 million) and a growth of over 9 percent (expressed in dollars) compared with the previous year.

With a sales volume of 112.6 billion lire, SGS has shown a growth of 12.6 percent in a domestic market which is static, if not declining, thereby confirming its leadership in the Italian classifications.

SGS has decided to intensify its presence in the Italian market even though it firmly believes that an ever growing internationalization is an essential strategy to amortize the high costs of research and to reach the volume necessary for a large-scale economy. The company actually believes that, in addition to competing in a world market where the competition between the U.S. and Japan is becoming stronger and stronger, it also has to assure its own country's technology and development.

With this in mind, SGS has developed a series of propositions grouped together under the same name of "Objective: Italy." There are four main strategies:

-- In the commercial and marketing strategy, operative interventions include a more complete and thorough market coverage. This will be possible through a strong increase in local sales staff, and of technical assistance to customers as well as the distribution network. Particular attention will be given to strengthening the internal information system through the direct connection between major customers and distributors, and the company database.

-- The products portfolio strategy is expected to reach the commercial targets in terms of market share through an expansion of the market itself which can be served by the company's range of products. In order to achieve this goal, besides intensifying the products portfolio at a general level a more aggressive action has been planned for the domestic market in the custom, semicustom, and second source sectors of some well established products on the Italian market.

-- Controlled access to technology is essential to guarantee SGS and Italy an active presence in the microelectronics field, and represents a channel for the transfer of the technology and know-how of systematics acquired by the company thanks to its presence on the international market.

For this purpose, a direct connection between research laboratories, universities, and major customers, and the company

CAD center will be promoted as it has been in the past. There were already nine operating connections at the end of 1985 and this number will increase in the near future.

In order to guarantee the medium and small customers controlled access to technology, a network of regional design centers will be established and dedicated in particular to custom circuits. Local public organizations should be involved in this project to ensure that these centers can establish an infrastructure of great importance for industrial growth and development.

In addition to specific equipment and structures for the training of outside users, some design centers will have reserved space for customers involved in direct design, as well as an experimental laboratory. Within the next 3 years, SGS is expected to cover the major industrial centers in Italy with a network of at least six "dedicated" regional design centers which will join the research and development headquarters of Agrate, Castelleto, and Catania.

-- Individual interventions in the area of the information and communications strategy are expected to improve users' knowledge of SGS products and technologies and of the possible applications in all sectors of advanced electronics.

For this reason, specialized seminars will be organized for customers and generally for all technicians in the sector; scholarships for university students, visits to the factories, and participation in conferences also will be offered.

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FRENCH PREMIER ON NATIONAL POLICY FOR ELECTRONICS INDUSTRY

Paris ZERO UN INFORMATIQUE in French supplement to 12 May 86 pp 23-24

[Interview with French Premier Jacques Chirac by ZERO UN INFORMATIQUE on its 20th anniversary: "It Is Less a Question of Doing More Than Doing Differently"; date and place not given]

[Text] 01: Twenty years ago General de Gaulle made data processing one of the main strategic axes of our industry by endowing France with the first "Computation Plan." In 1986 how would you position data processing among the various industrial branches of a great nation?

Jacques Chirac: It is rather pointless to attempt to make comparisons between industrial branches. I can, however, tell you that data processing in all its aspects--managerial, scientific, industrial, and automation--will continue to occupy a choice position in the total range of sectors, components, professional and military electronics, and telecommunications.

It is a sector which, beyond its own economic weight, is vital to the development of a nation like ours. It is the source of improvement in the competitiveness of every industry and of the services sector.

It is strategic from both a military and a civilian viewpoint.

01: Until now primary emphasis has been given to the national production of computers or associated equipment.

Do you not think that the French software industry, said to be second in the world, deserves more attention from the national authorities? Why is there no French software program?

JC: A development program is necessary even for a high technology sector if it is of strategic interest for France, if French industry is weak in the area, and if international competition is distorted by foreign government aid to their respective industries. This was the case for data processing with the "Computation Plan:; it is the case for microelectronics with the successive components plans.

I do not think that the French software industry, which is second in the world, needs a large-scale structured plan for its development; this would, in fact, impose restrictions upon it. Furthermore, I do not think that the profession is asking for such a plan.

However, the software industry is by no means an orphan. There are departments well known to you, particularly at the Ministries of Industry, Postal Services and Telecommunications, and Tourism, which are working to create conditions favorable to the software industry's development. Moreover, this industry benefits from spin-offs from other development programs of the electronics and data processing industries, and it participates in the European ESPRIT and EUREKA programs within a competitive environment where it can once again demonstrate its dynamism.

01: The state is currently Bull's largest shareholder, but our national company has been placed by your new government on the list of companies to be returned to the private sector. To what extent and when will this take place?

Do you really think that investors will be interested in a company which will not be profitable without government aid? If you yourself were going to make an investment, would you not prefer IBM to Bull shares?

JC: Privatization is a complex operation which will be conducted with all due deliberation. We are now working on enabling legislation. You can therefore easily understand that I am not going to reply today to your questions about the details of the Bull operation.

01: At its different stages (CII [International Data Processing Company], CII-HB [Honeywell-Bull]) Bull has always received, apart from subsidies or capital participation, indirect state aid, either official (pledge to purchase by the 1977-1981 authorities) or more or less secret.

Do you think that this policy must be continued even if Bull becomes a totally private industry or, on the contrary, should the total freedom of public institutions and administrations in a competitive market be reestablished?

JC: I do not think the expression you are using is appropriate. The French authorities, like those of any other country, have a purchasing policy which must take into account user requirements and industrial policy constraints. For several years now this purchasing policy has developed toward more competitive opportunities and this trend will grow in the future because it is stimulating for all parties. This will be coordinated among all the industrialists concerned. The role of the various organizations participating in this policy ought to be redefined now.

01: Do you think that in 1986 the development of data processing in a given country is an essential factor in its economic development?

JC: The development of data processing, as I mentioned in reply to your first question, is a very important factor in the development of the entire economy. One merely has to look around to see all the gains in productivity and competitiveness resulting from data processing. An industry which does not computerize is destined to disappear. This is not only true for large industrial groups; it is also true for small- and medium-sized businesses which are increasingly using microcomputers.

That said, technology has advanced. The development of data processing alone is not enough; for an economy to continue its development in worldwide competition, it must have a dynamic electronics industry, a telecommunications network, and services adapted to its requirements.

01: France is the only country in the world to have made the unique endeavor of developing the Minitel and distributing special terminals among a considerable part of the population. Will this also lead to a dead end, like the 815-line television standards or SECAM [color TV system]?

JC: It is true that France is ahead of the rest of world in videotext services and that this development was made possible both by the wide distribution of Minitel terminals and by the capabilities of our telecommunications network. The services based on this mode of communication now appear to be rapidly developing in a healthy competitive atmosphere. The overall economy of the support network is healthy. Therefore, I do not see why this should lead to a dead end. The telecommunications authorities are already thinking about future Minitel versions with memory and interaction capabilities.

It remains true, however, that in this field the technical standards governing terminals vary from one country to another and in order to export this French success competitively, our industry will have to adapt its equipment to make it more versatile and suited to the requirements of a varied clientele. This is true for many other sectors and is certainly not an insuperable problem.

01: Last summer your predecessor launched the Data Processing for All plan in primary and secondary schools. Do you intend to continue this endeavor along the same lines?

JC: From a technical point of view, the Data Processing for All Plan is proceeding as designed. However, the problem which now arises is using the equipment installed. We have to develop the pedagogical aspects, learn how to manage the computer better, develop suitable educational software, and extend computer access throughout the educational system.... You see, there is still work to be done to achieve a long-lasting pedagogical success via this operation.

01: Computerization involves a risk of undermining our basic freedoms, as you yourself emphasized in this periodical in 1984. In 1986, in an era of terrorism and insecurity, is this not an obsolete consideration?

JC: In the government's eyes, as you know, it is a matter of top priority that questions affecting insecurity and terrorism must in no way lead to questioning fundamental guarantees granted to each and every citizen of this country. This applies in particular to the protection of the individual and his or her private life against the dangers which could arise, if care is not taken, from the uncontrolled development of files and computerized information networks.

01: Computerization widens the gap between industrialized nations and developing countries. What thoughts does this problem inspire in you?

JC: I am not convinced that computerization widens the gap between nations. Just look how countries which a short while ago were considered "developing countries"--I am thinking particularly of the Far East or the larger countries of Latin America--have managed to use all the data processing tools to build efficient industry.

Furthermore, inexpensive microcomputers which can be purchased by countries with limited financial resources are arriving on the market.

01: You predecessors conducted an active policy favoring data processing (nationalization Frenchification of Bull, development of the electronics sector, and the Data Processing for All plan). Do you intend to give new impetus to a more ambitious program, or will you be satisfied with ensuring continuity?

JC: It is precisely the active policy followed for the last 20 years which made possible the birth of the French data processing industry. Our industry must now remain in the race of international competition. At a time when our main competitors are aided by their governments--Pentagon contracts in the United States, fifth-generation computer programs in Japan, etc.--France must certainly not be an exception to the rule. However, that is not the main point. Support must not consist solely of financial aid, even for R&D. It is less a question of doing more than doing differently.

The creation of an environment favorable to the development of our data processing companies presupposes the prior development of the entire electronics industry and above all of the components sector; without these there is no independence. Subsequently, the links between public and private research must be strengthened through the development of cooperative research and the training of manpower, which is the most valuable asset of this industry. Then the standardization effort has to be increased to make the equipment interoperational among competitors. Finally, well-conceived joint international projects must be conducted.

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REVIEW OF PONIATOWSKI'S BOOK ON EUROPEAN HIGH TECHNOLOGY

European Response to SDI

Paris L'USINE NOUVELLE in French 8 May 86 p 29

[Review by Marc Chabreuil of book "Les Technologies Nouvelles: La Chance de l'Homme" [New Technologies: An Opportunity for Mankind] by Michel Poniatowski, Plon, 334 pages, Fr 100: "New Technologies: An Opportunity for Mankind"; Poniatowski is "rapporteur" or special investigator on the EEC's commission for energy, research, and technology]

[Text] Several months ago, Michel Poniatowski dropped a real bombshell in the forum of the European Parliament. With his characteristic taste for hard-hitting language, he did not hesitate to talk about the risk of technological Europe joining the ranks of the Third World. A cry of alarm intended to make governments realize the "loss of industrial competitiveness in the high-technology area over the past 20 years." As rapporteur on the commission on energy, research, and technology, he then drafted some 40 proposals intended to bridge this gap by 1995.

Today Michel Poniatowski renews his attempt. But this time, it is the general public that he wants to convince through his book "New Technologies: An Opportunity for Mankind." Clearly writing for the layman, which does not at all detract from the impact of his remarks, he draws a truly worldwide map of technologies, which he groups around four poles: information technology and electronics, biotechnology, advanced materials, and new forms of energy. The whole forms a global system which is modifying economic structures with unprecedented speed. "The quantitative machines of the 19th century will be succeeded by the qualitative machines of the 21st century," he writes.

Apart from the thinning of the ranks of medium-sized enterprises (about 500 people), the concentration of industries, and the decentralization of decisionmaking authorities, Michel Poniatowski predicts a growing autonomy of multinational companies in relation to the structure of nation states. Controlling the technologies of the future, they will have to be able to freely transfer "the civil and military technologies, which are interchangeable," he affirms, while reproaching the Socialist government for having opposed participation of certain French enterprises in the Strategic Defense Initiative (SDI) program. Although he sees dangerous isolation from a flow of discoveries, he admits that the Washington-imposed restrictions on technology transfer could prevent Europe from deriving significant benefits from this program.

After noting Europe's dramatic absence from the world of computer manufacturers and the weakness of its components consumption, Poniatowski questions the vigor of the European software industry: a colossus with feet of clay, whose production increases less rapidly than world output. The ESPRIT program should rekindle this sector's vigor, just as the RACE program should in the telecommunications area. In contrast to robotics, where efforts are scattered, certain energy sectors (breeder reactors, fusion...) as well as the space sector can stand the test of international comparison: There, "Europe is a winner because it is united."

The Americans currently regard Europe as no more than an interesting market for their products. The Japanese regard the Old Continent on the one hand as a field for market conquest but also for industrial conquest through takeovers. Henceforth, attention is focused on Korea, Taiwan, Hong Kong, Singapore, Malaysia, and even Brazil--potential competitors for the United States and a zone of economic domination for Japan. Meanwhile, "Europe is playing technological 'follow the leader.' One after another, we miss our appointments with advanced technologies," writes Michel Poniatowski. Not for lack of skills--as proven by the success of Concorde, Ariane, and Super Phenix--but for lack of conviction. Europe does not know how to mobilize its men, and its organizations are still too Taylorist. Above all, "Europe has no great technological projects to propose to its peoples, no dreams to offer." No catalyzers like Apollo or SDI.

According to a recent OECD report, Europe will increasingly supply the rest of the world with food products, raw materials, and low-technology manufactured goods. Can the Old Continent, then, still take up the technological challenge? Yes, answers Michel Poniatowski, who rejects loudly and clearly both the "Euro-pessimism" of those who think this situation is irreversible, and the "national optimism" of those who judge that the European countries, taken individually, are not doing so badly in the area of advanced technologies. Admittedly, Poniatowski proposes "traditional" solutions: a unified European market, closer links between enterprises and laboratories, the streamlining of bureaucratic structures, the establishment of a real research strategy.... Above all, however, he recommends moving beyond the excessive fragmentation of EUREKA and the sectorial aid of the Commission of the European Communities.

For a real response to SDI and to the Japanese, Michel Poniatowski advocates defining objectives and large-scale projects achievable in the medium or long term: a European supercomputer and videocommunications network, a solar energy station in space, high-speed commercial aviation, the train of the future, an automatic written interpretation and simultaneous translation system....

This is in his opinion the price Europe must pay in order to avoid becoming "the continent of lost opportunities."

Europe's High Tech Potential

Paris ZERO UN INFORMATIQUE in French supplement to 9 Jun 86 pp 87-94

[Review of book "Les Technologies Nouvelles: La Chance de l'Homme" by Michel Poniatowski, Plon, 334 pages, Fr 100: "New Technologies"]

[Excerpts] At present our corporate system is generally portrayed as a pyramid with crowds of small companies at the base and ending in very large, mostly multinational companies at the top. This distribution is bound to develop into an "anvil" structure with more small production companies (50 to 100 employees) and more large companies whose chief characteristic will be transnationality rather than size. This schema would reduce the role of medium-sized companies (500 wage-earners), which must either rise to the higher level or split into various independent units in order to adapt themselves to good use of advanced technologies.

Arguments supporting this evolution are related to the demands of new technologies. Even though multinationals control the exploitation of these technologies as a whole, they nevertheless have tó rely on an entire network of small companies corresponding to the great diversity of techniques and production methods.

These small companies also suit production or research adaptability and flexibility, which are much easier to achieve within small entities.

Silicon Valley and other modern technopolises have demonstrated that small- and medium-sized companies which spring up like mushrooms out of new technologies are ephemeral. They correspond to a specific production method, product, or research type. Because of the fast discovery rate, they live and disappear with their support or product. Therefore, their mortality rate by far exceeds the average for traditional industries. There is nothing negative about this necessary dynamic, provided a company closure does not mean lasting unemployment for its staff or personal failure for its directors.

This demand for extreme vitality is apparently easier to meet in small companies, which also have the advantage of needing little capital. It is easier for them to mobilize venture capital, which is mostly granted for a single completely identifiable project whose financial return can be better assessed.

Setting up a small company is an opportunity for a student at the end of his studies who wishes to implement an idea or for the management of a large company which is cultivating a distinct project. This often requires an initial research and implementation stage before proceeding to mass production and acquisition by a bigger unit. Production units by nature "stick" to possible applications of new technologies. Just a look around in Europe is enough to demonstrate that technological proliferation is only made possible by small independent units. In 1973 the first microcomputer in France and in the world, the Micral, was developed not by the large computer companies but by the small R2E company. Likewise, companies with fewer than 50 people such as Brunet-Cicap and Plastiremo, are the spearheads of the high-performance composite materials sector in France.

Other illuminating examples of small companies being the vital forces behind new technologies could be found in other European countries and the United States. (Footnote 1) (Japan is an exception, its small companies generally being subcontractors, but the Japanese economic system itself is driven by a different economic philosophy.)

Apple's transition is a magnificent example of how a small company created by two students, Steven Jobs and Stephen Wozniak, can develop into a multinational without passing through the stage regarded until recently as natural maturation, i.e, the medium-sized-company stage. New technologies require both "small" and "very large" companies.

Multinationals are a necessity in light of the globalization of economies, the importance of marketing networks, economic structures, and research conditions, and the often substantial funding required.

Perhaps it would be better to replace the misleading word "multinational"--too evocative of a heterogenous grouping of companies for capitalistic purposes alone--with the word "transnational."

The difference is not merely linguistic: It is inherent in the nature of the companies. Though profitability is their driving force, it does not constitute the ultimate goal of transnational companies swept along by the whirlwind of technological developments. Profit is only a regulating mechanism, a financing source. Their mission lies elsewhere. It lies in the growth and transfer of their knowledge and in the expansion of their production, which cannot occur on a strictly national level. Their nature and production cannot survive within one border. This is true not only for European countries but also for the United States and Japan. Every day this becomes increasingly evident. Their function in the technological revolution lies in their ability to mobilize enormous amounts of capital and to bring together the brain power indispensable for development of specific technological projects. Certain stages of the technological process or certain objectives can only be reached with the participation or under the direction of large companies. They are the hard and stable nuclei of the technological revolution functioning in symbiosis with their environment of small companies, some of which provide them with research elements while others work on new application and development possibilities.

Thus, the large transnational structures become the flexible framework of constantly developing technological ensemble.

If Europe wishes to rise to the technological challenge, it must either abandon or modify its overcrowded infrastructure of medium-sized companies, generally referred to as "nationals."

Too rigid to adapt, too restricted in scope, financially weakened, drained of the necessary brainpower to face a truly international and competitive environment, the medium-sized companies will be the Paleolithic monsters of the future; in a way their decline is inevitable. This lesson is still to be learned by the FRG and Scandinavia, which tend a little too much to congratulate themselves on the success of their large national companies.

Thus, transnational companies emerge at the highest level while on the regional or local level there develop small businesses, whose quality depends on the links they create with universities, research centers, and local authorities.

Europe thus seems to be well adapted to new technologies by offering these two dimensions naturally and better than others can.

One can certainly criticize the "stateless" character of transnational companies and their aptitude for becoming anti-European at one time or another. This risk is not imaginary, but neither is it certain. I am astonished to note that large companies such as IBM, but also Philips and British Petroleum, remain thoroughly attached to their country of origin, and this has nothing to do with mystery or affection. The parent company, despite becoming increasingly dependent upon interntional contingencies, remains attached to its country of origin by its legal system, its shareholders, and its financial links. More strictly political reasons may strengthen the fidelity of transnationals even more. This is the case with the United States, which imposes strict and precise regulations on all its companies regarding foreign relations, in particular with Eastern countries.

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SWEDISH COMPANIES PARTICIPATING IN EUREKA

Factory Automation, Computers, Semiconductors, Turbines

Stockholm NY TEKNIK in Swedish 10 Jul 86 p 4

[Article by Sverker Nyman]

[Text] The Eureka Program is now taking off. The Eureka Program includes 62 new technological research and development projects: everything from cleaning up the water of the Rhein to microelectronics. The decision was made last week in London.

Sweden is included in seven of the projects, most of which revolve around electronics. In addition, Sweden will be the host country for the next 6 months.

Eureka is a cooperative European forum for technological development. The goal is to bring together various European companies and research institutes to create European solutions to technological problems and, finally, to strengthen the position of Europe in the development of technology.

Beginning last week, Sweden became the host country of Eureka and will hold that position for the next 6 months. This means that, to a great extent, the Eureka projects will be run from Stockholm.

This does not apply to those aspects that will be dealt with by the secretariat that was established recently. It will be located in Brussels and will serve as a kind of clearing house for various projects.

Iceland was accepted as a new member-nation. This means that all the Nordic countries are included. Yugoslavia was not permitted to join. The reason was that Yugoslavia does not have a market economy.

Since Eureka was founded only 2 years ago, it has sponsored just 10 research projects. As stated above, there will now be an additional 62 projects.

Swedish companies that are involved, apart from the Prometheus Project, include Saab Combitech which, as part of the ES2 firm, will help produce tailor-made electronics circuits with new technology.

Volvo Flygmotor will study the use of ceramics in gas turbines. Telelogik will produce a library of program modules for software development.

Context Vision of Linkoping will produce image-processing systems. Svensk Karnbranslehantering of Studsvik is part of a project involving electron beam welding and Asea is helping develop high-power semiconductors.

Prometheus, 7-Part Car Project

Stockholm NY TEKNIK in Swedish 10 July 86 p 4

[Article by Sverker Nyman]

[Text] The largest and most spectacular of the 62 new projects is the Prometheus Project. It is an 8-year project that is intended to give the European car of the future a number of new technological aids that will help the driver manage better in traffic. Prometheus has seven subprojects and Saab and Volvo are involved in most of them.

Pro-Car will examine the relationship between man and car. The purpose is to adapt the car to what is called the human factor. For example, if the car skids on an oil slick, the car itself should be designed to eliminate as much of the skid as possible.

Pro-Net deals with the relationship between vehicles. The car should tell the driver if the distance to the car in front is too short. The system will also detect a car approaching from the side. This is a kind of collision warning system. There will also be equipment to indicate how long a car has been waiting in a line of cars. There will be a communications network from car to car.

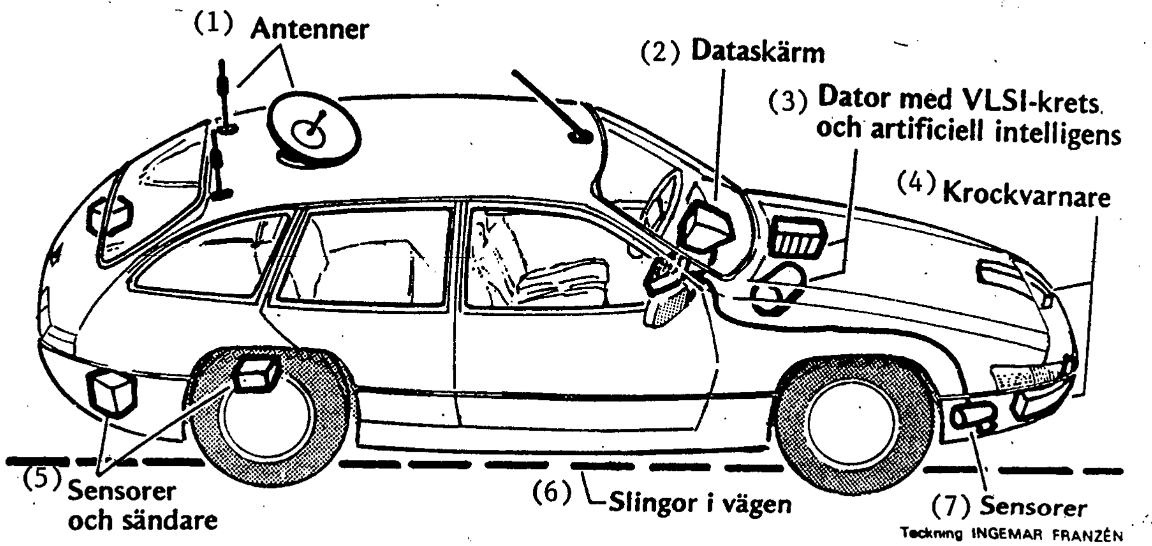
Fastest Way

Pro-Road will deal with the relationship between the vehicle and the road. As an example, an information panel will be developed that will indicate the fastest way between two points in a city (see article below).

Pro-Chip will develop electronic hardware for the automobile industry. A gigantic market will open up if every automobile in the future contains a VLSI chip. It must be able to process all the impulses that come from the various sensors.

Pro-Art will deal with artificial intelligence. Electronic equipment will be used to build an experience factor into the car. If, for example, a driver is somewhat slow in reacting but, instead, slams down hard on the brakes when he sees something, the effects of this behavior can be reduced if an electronic system acts on the brakes. The car will learn to take the peculiarities of driver into account.

Pro-Com will deal primarily with getting sensors into cars and into the road. It will also develop communications equipment. Doppler systems will warn



A car that is designed to help the driver overcome his weaknesses: it is hoped that the Prometheus Project will make the European automobile industry more competitive.

Key:

1. Antennas
2. Computer screen
3. Computer with VLSI circuit and artificial intelligence
4. Collision warning system
5. Sensors and transmitters
6. Coils in road
7. Sensors

against the danger of collision. Automobiles will communicate with one another, with the road, and with the surroundings. Information will be received from satellites.

Pro-Gen will deal with the overall systems technology. The goal is to help traffic flow as smoothly as possible.

The program will begin in October and last for 8 years. According to plans, a proposal will be developed by that time for European standards for sensors, transmitters, receivers, and frequencies. It is hoped that this European standardization will help the European automobile industry gain a stronger position on the world market.

After all, the purpose of Eureka is to strengthen European industry. For this reason, European subsidiaries of non-European auto manufacturers are not allowed to participate. Opel, Ford, and the European divisions of the Japanese automobile companies have been excluded from the Prometheus Project.

"This is an important project that is designed to get 'old Europe' moving again," Rutger Friberg of Volvo said.

"In the past, the European auto industry often just reacted to trends elsewhere. Now we are acting."

Is this not an extremely futuristic system that is being designed?

"Yes, but the basic technology for the system already exists. In this sense, it is not futuristic. The new traffic system can also function with an old fleet of cars. As a result, there will be no dramatic change in the traffic system."

Pro-Road Versus Carin

Stockholm NY TEKNIK in Swedish 10 Jul 86 p 7

[Article by Carina Persson]

[Text] In 3 years you will be able to purchase the computerized map reader.

An electronic voice in the car speaker will tell you when to turn, how much gasoline there is in the tank, and where the closest filling station is located.

You can also obtain information on hotels and tourist attractions along the way.

Philips' Carin (Car Information and Navigation) is a computer system consisting of a car stereo with a compact disc player and a computer with a monitor and keyboard. The car's odometer and speedometer, an electronic compass, and a satellite-controlled position-finding unit are also connected to the system. The gas gauge can also be connected.

The map is located on a compact disc (CD). There is room for all the Nordic countries, with special maps for the larger cities, on a single disc. The disc has a storage capacity of 600 million bits, which corresponds to about 150,000 type-written 8.5 x 11 sheets of paper. An area of 12 times 14 km takes up 0.03 percent of the memory on the disc. The map covers 80 percent of the populated areas.

Voice Speaks

How is Carin used?

You type in your location on the keyboard. The computer then asks you where you want to go and you answer. Carin calculates the shortest route and the electronic voice tells you which roads to take.

If you wish, Carin will tell you where there is a hotel of the price range you choose and what tourist attractions are located along the way.

Avoids Road Construction

You can follow your car's progress on a map that appears on the screen. The position-finding unit keeps track of the car's location. Information from the odometer and speedometer is combined with signals from three or four satellites. The location of the vehicle can then be determined to within 5 meters.

Traffic information from RDS (Radio Data System) is also connected to the system. RDS is already being tested in Sweden today. This is a method of providing motorists with recent traffic information by means of radio waves. Carin receives the radio waves and, in this way, can avoid traffic jams and road construction.

One problem with Carin is that a compact disc cannot be erased or provided with new information. The map becomes outdated. On the other hand, as soon as you turn off the indicated road, a new route is selected.

"We intend to produce new maps every other year," said Leif Strahle, Nordic production chief of Philips' auto stereo division.

Philips, in cooperation with governmental authorities and map publishers, will produce the map discs. Discussions are now being held with Disc-Navigation in Skania, a company that is already producing computerized nautical charts.

Commercial Traffic Target Group

But who will use Carin?

"We are thinking primarily of trucks and tourist buses, but in the long run we believe in a broader target group that will include private motorists," Leif Strahle said.

Several auto manufacturers, including Renault, have already expressed interest in Carin. The Telecommunications Service and the Postal Service have also contacted Philips. Two test vehicles are now being used in Eindhoven, the Netherlands.

Philips estimates that Carin will be introduced in Europe in late 1988 or early 1989. At that time, the satellites that will be used to determine a vehicle's position will be in place.

The system will cost about 30,000 kronor and each map disc will cost about 250 kronor.

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[Text] A Journal of the Hungarian Academy of Sciences

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CSSR COMMENTARY ON POLISH COMPUTERS

Prague NETTO in Czech No 3, 1986 pp 32-33

[Text] The Polish small computer industry is characterized by the difficulty of summarizing the diverse types which are offered by the most varied suppliers, including private manufacturers and engineering offices. An example of the extent to which the different makers of this equipment are involved is the MK 830 microcomputer developed and produced by the Unitra Diora plant, which traditionally has been devoted to broadcasting equipment, electroacoustics, and, to some degree, measuring equipment. The Polish computer industry utilizes not only the domestically produced MCY 7880 microprocessor system (which corresponds to the 8080 A), but also the U-880 system from the GDR.

The Mera 60 small computer produced by Meraster Katovice belongs to the second generation of small electronic computers. Functionally, it is fully compatible with the LSI-11 and its software, according to the manufacturer, agrees in its basic features with the PDP-11/03 of the Digital Equipment Corporation. For external memory, magnetic tape cassettes and floppy discs come into consideration and CAMAC, Unibus, and V.24 connections are available for external devices. The standard peripherals include the control panel and a perforated tape station. The Mera 60 computer is utilized mainly in laboratories, for local data processing, in communications systems, and in automation equipment. The Mera 6100 intelligent terminal, which is supposed to correspond to the DEC VT 52, can be hooked up to the central unit. The monitor screen displays 24 lines of 80 characters each and the character set includes 128 alphabetic and numeric and 32 semigraphic characters. A V.24 connections are available for external devices. The standard peripherals include the control panel and a perforated tape station. The Mera 60 computer is utilized mainly in laboratories, for local data processing, in communications systems, and in automation equipment. The Mera 6100 intelligent terminal, which is supposed to correspond to the DEC VT 52, can be hooked up to the central unit. The monitor screen displays 24 lines of 80 characters each and the character set includes 128 alphabetic and numeric and 32 semigraphic characters. A V.24 connection with a maximum transmission speed of 9600 bauds serves for data transmission.

The Elwro Wroclav firm is bringing the Elwro 600, which has an Emos 1.0 operating system oriented to diskettes and is compatible with CP/M 2.2, on to the computer market. In addition to the Assembler language, it uses Basic and ZIM. The ROM memory has 8 KBytes and the RAM memory 64 KBytes. The computer has two 8-bit channels for input and output, while the keyboard prints ASCII characters. The diskette station provides a selection of two or four disc units and the record format corresponds to the IBM 3740. For instruction, an Elwro 700 microcomputer is planned which will work with the UB 880 D microprocessor from the GDR. It will be programmed in Basic and the QWERTY keyboard has fixed functional keys in addition to the special Polish characters. The screen can show 24 lines of 32 characters. It will be manufactured in three models: the Elwro 701 for economic and semigraphic tasks (8 KB ROM and 16 KB RAM), the Elwro 702 for full graphics (12 KB ROM and 32 KB RAM), and the Elwro 703 which works as an intelligent terminal (16 KB ROM and 48 KB RAM). The modular construction of the Elwro 800 microcomputer system makes it possible to change the processing width from 8 to 16 bits and is accomplished with single-processor or multiprocessor modules. In the multiprocessor systems, communications takes place through Multibus I. Because the Elwro 800 is one of the small electronic computers, it is possible to use the corresponding JSEP and SMEP peripheral systems (matrix and disc printers, monitors, and memory devices) in addition to the special peripheral equipment. The programming languages are Pascal, PL/M, Fortran, and Basic. The D-100 E matrix printer produced by Mera Blonie, which is supposed to be compatible with the Epson FX-80 and has a printing speed of 100 characters per second is used specially for connection to microcomputers and personal computers.

The Meritum I microcomputer of Mera Elzab works on the basis of a U 880, to which can be connected a black and white monitor and a cassette recorder for data storage, as well as a dot printer, such as the D-100 E, or a printer with type wheels. The ROM capacity is 12 KB and the RAM capacity is 32 or 48 KB. In addition to the usual adapters, another for connecting to the ZX 80 is being offered. To support the software programming, the manufacturer provides supplemental cassettes with Pascal compiler, Basic compiler, Z-80 Assembler and a program for implementing the ZX-81 programs on the Meritum I. A further developmental type is the Meritum II which has available two 5.25-inch diskette units. Both types of Meritum computers are mutually compatible and can be coupled together through an 8255 integrated connection. The ComPAN-8 personal computer produced by Mera Elzab likewise operates on the basis of the Polish MCY 7880 microprocessor system, with its operation oriented toward floppy discs and utilizing the Mera 7900 monitor unit as a display. In addition to displaying alphanumeric characters (24 lines of 80 characters each), it is possible to operate also in the graphics and semigraphics modes. The screen can be moved vertically or horizontally and inversion, marking, and underlining can be performed. It uses CP/M as an operating system and can accomodate the Basic, Forth, Fortran, and Pascal programming languages.

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