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8 November 1985

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT
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FRENCH PECHINEY'S CERAMIC STRATEGY

Paris L'USINE NOUVELLE in French 20 Jun 85 p 33

[Article by Philippe Lanone: "Pechiney's Ceramics Offensive"]

[Text] Pechiney is carrying out its ceramic strategy by creating a new company, Xeram, and by subsequently consolidating it with Criceram and Céramiques Techniques Desmarquest within a new division: Pechiney Céramiques. The objective is to be well ahead when the market begins to expand.

In association with Eurofarad the Pechiney group has just set up a new company, Xeram, which will produce multi-layer ceramic substrates for the manufacturing of integrated circuits. This new subsidiary will be consolidated with Pechiney's other subsidiaries active in the field of ceramics, i.e., Criceram and Céramiques Techniques Desmarquest, within a new division, Pechiney Céramiques. This will be attached to its metals and new materials branch.

Thus, Pechinay is putting itself in position to "be in the starting blocks at the beginning of the next decade" because the ceramics market is expected to expand very rapidly then, explains Roland Cauville, manager of Pechiney Céramiques. On a worldwide scale fine ceramics are expected to represent a 19 billion dollar market by 1995!

In 1983 the Pechiney group set up a new company, Criceram, for the production of ultra-pure powders, the raw material for ceramics. Nowadays aluminum and zirconia powders are being commercialized. Sialon and Alon powders, aluminum and silica nitrides are under development now. These products have a very high added value: 1 kilogram of aluminum powder for ceramics costs about Fr 900; for the production of aluminum this powder costs Fr 1.50.

Unlike Rhône-Phoulenc, which has voluntarily limited itself to the production of powders, the Pechiney group wanted to be present in all areas of the ceramic elements market, i.e., thermomechanical and electronic elements.

For thermomechanical ceramics this was realized by buying back Céramiques Techniques Desmarquest in 1984. Last year's turnover of this subsidiary amounted to Fr 60 million, 40 percent of which was for export.

In the field of electronics , the French group is attacking a highly competitive market, with a strongly felt Japanese presence where Kyocera is the incontestable leader. Rather than entering the existing markets on an equal footing with other manufacturers, Pechiney preferred to establish itself in a market with a very high potential for expansion and where competitors are still not numerous (the only European producer is Hoechst), i.e., the multi-layer substrates market which concerns the production of very dense connections in advanced electronics.

In this field Pechiney has obtained the patents and acquired the know-how from Eurofarad, a manufacturer of condensers; this cooperation has resulted in the setting up of Xeram, a general partnership, with Pechiney holding 95 percent of the shares. A pilot plant will be built at Trappes where some 20 persons will be employed between now and the end of 1986. The objective is to cover 60 percent of the French and 30 percent of the European market by 1990, which by then will represent some 300 to 500 million francs. This year's total turnover in the ceramics division will amount to some Fr 110 million; research expenditure will receive 15 percent of this total turnover.

Nevertheless, their ambitions go even further. The division's product range may be very good, the geographic coverage, however, remains deficient. By 1990 Japan will represent 60 percent of the ceramics market and the United States will account for 30 percent. As a consequence negotiations are being held in these countries since the specificity of the products requires a local base. This will be realized "either by acquisitions or by joint ventures," explains Roland Cauville.

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AUTOMOBILE INDUSTRY

PEUGEOT'S POISSY PLANT MODERNIZATION DESCRIBED

Paris L'USINE NOUVELLE in French Supplement to 19 Apr 85 Issue pp 18-19

[Article by Jean-Paul Le Guern: "Poissy: robots arrive, men change"]

[Text] It cost 1.2 billion francs to modernize the production tools, 60 million of which was devoted to training of personnel. Poissy definitely looks towards the future.

During the month of June, the first C28's (the code name of the newest Peugeot) will roll off the assembly-lines at Poissy. Each one of the 12,000 employees will then judge what has been accomplished since December of 1983--a period marked by 1,900 lay-offs and physical confrontations inside the factory. An investment of 1.2 billion francs, 60 million francs of which was dedicated to employee training, was unprecedented for that factory.

The C28 provided the opportunity, but the effort invested goes beyond the mere necessity linked to the launching of a new model. The purpose of this effort is to optimize production costs and quality control while adding some lines to the PSA standards for more flexibility.

The general-purpose sheet metal fabrication line is without doubt the main attraction of the modernization plan. It cost 630 million francs--more than half of the total investment. Thanks to 134 robots, chassis for three basic models and their derivatives will soon begin to move through the "pipeline" production line. The line can produce 1,000 cars a day.

Upstream from the sheet metal works, the press unit is getting 280 million francs. The major part is going for the special tooling required for the new car. But some technological improvements are being made. Last month a new triaxal stamping line with two presses and one automatic conveyor was put into operation. It can produce 960 parts (of 14 different kinds) per hour instead of the 400 parts produced by five presses previously.

One hundred thirty million francs are going to the assembly unit to mechanize handling and to improve working conditions. The three lines are now 9.50 meters apart instead of only 2 meters as before, which allows bilateral feed from mini-stands and does away with all vertical stacking. On top of that, overhead conveyors are no longer needed, and the environment (sunlight, bright colors) has been redesigned.

The mechanical department has received 90 million francs, 60 million of which is devoted to the setting up of two automatic front and back axle lines.

The painting department is receiving 70 million francs for the transition from iron phosphating to zinc phosphating and for the setting up of electrostatic mini-basins controlled by a programmable robot.

All these technological improvements have required some 100,000 hours of training, 40,000 of which were dedicated to the general-purpose sheet metal works alone. It is in this department, in fact, that the massive flood of robots demanded the most extreme redeployments. For instance, 922 hours were required to train the original operators of the plant's mechanical systems. Overall, 850 people will have gone, in 1985, to the robot training center. This center was created last year and provided with various equipment--among other things, nine classrooms, three workshops, two mini-computers, eleven micro-computers and their peripherals, two robots, etc.--the whole costing 2.5 million francs.

85,000 Information Hours

But the training plan goes far beyond the adjustment to new technologies. The launching of the new model--which affects the 12,000 employees of this factory--justified carrying out specific actions. "Especially since we wanted to avoid a rupture in the working community," explains Daniel Eymery, director of personnel and labor relations. "We wanted to allow the workers the least affected today by the technological evolution to feel reassured about their ability to adjust when necessary."

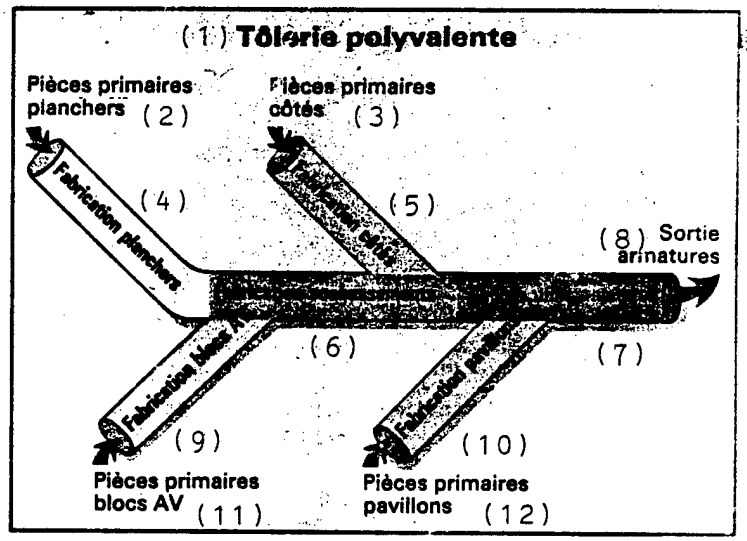
No fewer than six programs have therefore been designed from the simplest (four hours) to the most ambitious (800 hours). Some are strictly professional, intended for certain categories of personnel: production professionals, OPHQ, foremen, adjusters. Others are thematic, open to the majority of people: quality-control training and industrial organization, personnel development, and economics. All the programs together represent a total of nearly 323,000 hours.

But this is not all. Some 85,000 hours are also devoted to an information training day in which 10,000 people will participate. The day will close with a tour of the factory.

Although logically the effort grows bigger as D-Day approaches, it started a long time ago. Since 1983 a series of actions such as polls of the immigrants, improvement groups within the managerial staff, etc. designed to get to know the factory population better, have taken place. At the beginning of 1985, 3,000 managerial staff members gathered at a seminar for a day and a half at the Poissy City hall.

The objective was a general mobilization at the dawn of the decisive year as well as the official launching of a new chain-of-command procedure. Each month since then, management has gathered eighty executives of the hierarchy and given them information to pass along. Two weeks later the personnel office checks with about thirty employees to be sure that the message has indeed come down.

We could mention a lot of other initiatives--such as workers being trained by foremen--that demonstrates that nothing has been neglected in this successful transformation process. "The game is worth the candle." With a production of 1,000 cars a day, the equivalent of a quarter of the total production of Peugeot in France, isn't it likely that Poissy may tomorrow be the equal of Mulhouse, the jewel of the firm symbolized by the lion?



Key:

1. General-purpose sheet metal works
2. Primary floor parts
3. Primary side parts
4. Floor production
5. Side production
6. Sub-frame production
7. Chassis production
8. Chassis output
9. AV block production
10. Roof panel production
11. Primary AV block parts
12. primary roof panel parts

Caption:

No intermediate stocks, reduced handling, faster launchings: such are the advantages of "pipeline" production; diagram of the new general purpose sheet metal works at Poissy which is entirely automated.

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AUTOMOBILE INDUSTRY

REVOLUTIONARY NETHERLANDS GEAR FIRM FACES LAWSUIT THREATS

Ford, Fuji Named

The Hague ANP NEWS BULLETIN in English 1 Oct 85 pp 2-3

[Text] Tilburg, October 1--Car manufacturing giants Ford and Fuji could sue the Van Doorne's Transmissie (VDT) concern here for tens of millions of guilders, Labour MP Arie van der Hek said last night.

Ford and Fuji may make large claims for damages incurred because VDT is more than a year behind schedule with deliveries of a revolutionary new automatic transmission system for which the two car firms have placed orders.

The threat of a major lawsuit is now hindering negotiations to save the firm from collapse, Van der Hek revealed.

The Second Chamber standing economic affairs committee is discussing the problem behind closed doors today. Van der Hek, the committee chairman, said questions on Ford and Fuji's position will be put to Economic Affairs Minister Gijs van Aardenne.

The new difficulties are the latest in a string of troubles, which have plagued VDT for over a year.

U.S. transmission giant Borg Warner dealt the company a major blow last November by announcing it was selling its share in VDT, which had run into difficulties at the production stage for the new system.

Last-Minute Rescue

The Dutch Government stepped in at the last minute to save the firm, taking over Borg Warner's 24 percent stake. However, as the Dutch state already held 12.5 percent in VDT, it planned to resell the Borg Warner shares as soon as possible to avoid becoming a majority shareholder.

Negotiations have been going on since then between the other two partners Volvo Car (39.5 percent) and Fiat (24 percent) with a potential buyer for the state share of the Maatschappij voor Industriele Projecten (MIP).

The MIP reached an agreement in principle on purchase of the shares, but is now unwilling to close the deal without an assurance that Ford and Fuji will not sue. VDT is meanwhile again running out of funds.

Van der Hek, responding to press reports that the state is felt to have kept too much to the sidelines in the affair, said it was 'normal' that the economics ministry should not directly participate in contract negotiations between VDT and Ford and Fuji.

The important issue was that the American Ford and Japanese Fuji firms should reach agreement with the current shareholders Fiat and Volvo Car, and with the future shareholders, he said.

Fiat Named, Ford Disclaims

The Hague ANP NEWS BULLETIN in English 2 Oct 85 p 7

[Text] The Hague, October 1--Economics Minister Gijs van Aardenne confirmed today that two major car companies were seeking compensation from Van Doorne's Transmissie (VDT) for failure to deliver car transmission systems on schedule.

Replying to questions in parliament, Van Aardenne named the companies as Fiat of Italy and Fuji of Japan. Reports yesterday said that Fuji and U.S. auto giant Ford planned to sue VDT.

A Ford spokesman in Amsterdam said today his company had no plans to sue VDT and had every confidence that the company would deliver transmission systems ordered by Ford on schedule.

Van Aardenne said negotiations between Fiat, Fuji and VDT were making progress, but warned that where VDT was concerned 'one should not count chickens before they are hatched.'

He said he was confident VDT could start production at the end of this year and start deliveries in February or March.

The Maatschappij voor Industriele Projecten (MIP) which has agreed in principle to buy the 24 percent stage in VDT taken over by the Dutch state from U.S. car giant Borg Warner last year, will not proceed until the prospect of a damages suit had been removed.

Reprieve Won

The Hague ANP NEWS BULLETIN in English 10 Oct 85 p 4

[Text] Tilburg, October 10--Car transmissions manufacturer Van Doorne's Transmissie (VDT) appeared yesterday to have won a reprieve from the latest threat to its survival.

Fuji Heavy Industries of Japan has agreed to drop a claim for compensation from VDT for failing to deliver transmissions on schedule, a lawyer acting for Fuji said.

The lawyer, J.E. van der Does-Willebois, said documents still had to be signed, but that Fuji had agreed to drop its damages claim in return for a conditional production licence from VDT.

He said it had been agreed that if VDT fails to start manufacturing its revolutionary continuous shift variable transmission system by January 1, production rights will pass to VDT shareholders Volvo Car and Fiat.

Production Rights

If Volvo Car and Fiat proved unable to deliver the transmissions to Fuji, then the Japanese company would itself gain production rights, he said.

The lawyer said that a similar agreement had been reached between VDT and U.S. automobile giant Ford.

The threat of a major damages suit against VDT has stalled the takeover of a 36.5 percent government shareholding in the company by the MIP venture capital company (itself 57 percent state-owned).

At present the other VDT shareholders are Fiat (24 percent) and Volvo Car (39.5 percent). The Dutch state has a majority stake in Volvo Car and a minority stake is held by Volvo of Sweden.

VDT's continuous shift variable transmission system has been hailed as revolutionary, but the company has repeatedly hit snags in moving from the development stage to mass production.

CSO: 3698/76

BRIEFS

FRENCH INRA, CEA SIGN ACCORD--In the beginning of July 1985, the INRA [National Institute for Agronomic Research] and CEA [Atomic Energy Commission] signed a global agreement for a 3-year period to pursue joint research programs. This cooperation is mainly focused on three themes: plant biotechnologies, radiobiology applied to animal production and separative techniques for basic products in agriculture. In addition, the INRA shortly afterwards signed a similar cooperation agreement with the ministry of agriculture's education and research department. [Text] [Paris BIOFUTUR in French Sep 85 p 25] 25004

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CIVIL AVIATION

CERTIFICATION GRANTED TO FRANCO-ITALIAN ATR 42

Neuilly-sur-Sein REVUE AEROSPATIALE in English Oct 85 pp 10, 12

[Text]

The fruit of exhaustive marketing and engineering research, the ATR42 was granted type certification on September 24 as expected. Now ready for commercial service, it will be delivered to its first customer next month. The market for new regional transports into the year 2000 is estimated at about 2200 30/50-passenger aircraft and over 100 in the 50/70-seat category. The first of a potentially rich new family, the ATR42 should get a generous share of this market.

Behind the origins of the ATR42 are two manufacturers: Aerospatiale and Aeritalia. Independent, rigorous studies confirmed to them both that a profitable and durable market existed, and in fact also confirmed others carried out by independent bodies, competitors and engine manufacturers. The findings of these surveys were that some 2200 30/50 and more than 1000 60/70-passenger aircraft would be required by the next century — an attractive market indeed for whoever happened to have the right product.

Market surveys were made so as to define the right product. A detailed questionnaire was sent to more than 120 airlines, and the answers gave a good idea of what their needs would be for 1980/1985 in terms of capacity and cabin space.

At the time, the immediate need was for a 30/35-seater — the minimum increment beyond 19 seats that could cover the extra costs generated by the need for a cabin attendant and FAR 25 and FAR 121 operational requirements. At the same time, however, the growth being enjoyed by regional airlines encouraged them to consider 40/45-place aircraft for 1985.

As a result, since the chosen technology and the latest engines made it possible, 42- and then 46-seaters were chosen as the basic configuration.

This was a good choice that contrasted sufficiently with lower-capacity commuters yet did not exclude growth to beyond 60 places.

The choice of the cabin cross-section, for its part, was made for technical reasons. Experience showed that the most successful aircraft were those with a cabin section that was the best compromise between passenger comfort, freight carrying needs (existing containers), and a potential for generating military versions.

Having chosen a four-abreast configuration as the best compromise between aerodynamic qualities and develop-

ment potential, the choice of a twin-lobe fuselage section, including a floor width compatible with 88"-wide pallets, was the obvious one. And since a cabin height of 1.91m meant that 97% of the planet's population could walk through it without stooping, this virtually settled the question of fuselage dimensions.

A wide aisle was provided to permit easy passenger movements and a high standard of service. From the freight standpoint, the fuselage section was compatible with the LD3-type containers which widebodies like the Airbus and the Boeing models carry in their cargo bays.

Finally, the market surveys carried out served to guide the other choices or compromises, by setting performance levels and imposing maintainability and accessibility objectives which have all culminated in a rugged and self-sufficient aircraft.

The path which ultimately led to a product geared to regional airline needs proved to be a winding one. The idea of a simple, uncomplicated aircraft prevailed throughout the genesis of the ATR42.

In reality, it was the first customers who showed the design bureaus a potentially richer definition for the aircraft, discarding for example, once and for all, the need to offer two different versions, equipped with conventional flight instruments and cathode-ray tube displays respectively.

For cost reasons, there could be no question of including the ability, on this type of aircraft, to display the systems' status on CRTs as on the A310 and the A320. Hence the role of the CRTs was confined to copying the information available on electromechanical instruments. This led to the idea, at the outset of the ATR42's development, that electronic flight instrument systems (EFIS) would interest only a small number of customers. The fact that EFISs are part of the ATR42's basic definition today merely reflects growing customer realization of the value of this new technology in terms of reduced maintenance costs and greater operational flexibility in ultimate cockpit definitions.

Most customer airlines opted for the autopilot, and all of them were anxious to be able to offer more sophisticated onboard service than what is at present available on smaller-capacity aircraft. These improvements were therefore included in the ATR42's basic definition by its manufacturers.

The other basic choices were made jointly by the design departments from the outset of the project: a low empty weight for good performance and low maintenance costs, an aerodynamic design that was simple yet gave good performance, and special emphasis on ensuring a low noise level in the cabin so as to offer customers the standard of comfort normally associated only with widebody jets. Another requirement was for a simple, reliable flight control system, and this was implemented exclusively with mechanical linkages and natural aerodynamic balancing devices.

Many other choices were made at system architecture level so that malfunction situations that could keep the aircraft on the ground for safety or passenger comfort reasons should be reduced to a minimum. All these choices have resulted in a simple, reliable and competitive aircraft and have been validated now that the latter has been granted type certification.

So what about the competition? Their own design criteria naturally led to aircraft which differ from the ATR42. Consider the case of manufactuer X, who opted for a cruising speed of nearly 300 kts TAS (555.6 kph). This relatively high speed was chosen in order to be competitive on the market for business aircraft, which tend to fly much longer average stage lengths. For regional transport airlines, however, this represents a permanent handicap since their own stage lengths usually average 150-200 nm (277.8-370.4 km) on their route network. And in terms of block time, the difference with the ATR42, which cruises at 260-270 kts TAS (481.5-500.1 kph) vanishes because the ATR42, which climbs and descends more rapidly, is able here to make up for what it loses in cruising speed.

Nevertheless, it is important that the ATR42 should have a high cruising speed at least 20 kts (37 kph) higher than that of previous-technology aircraft. Beyond this figure, any increase in speed would not make operational or economic sense — about as much sense as using a Formula 1 car for shopping in town.

Next, take the case of manufacturer Y who opted for a STOL (short takeoff and landing) design, compelling him to adopt sophisticated flight controls (including low and high speed spoilers) and artificially limited weight figures and hence payload capacity.

The technical and aerodynamic choices made for the ATR42 mean that, for given runway and temperature conditions, the ATR42 has a higher payload capability for a given stage length than rival Y thanks to much more efficient flaps, without the complexity of a STOL configuration.

Let us now take a look at competitors who have opted for either smaller or larger capacities.

Those who elected for a smaller capacity had three reasons for doing so. First, they chose a compromise between regional transport aircraft and business aircraft (which in many cases require a smaller capacity). Secondly, they chose a powerplant that ruled out the ATR42's capacity. And finally, they were not confident in the growth of the regional transport industry.

As for those who elected for a larger capacity, it should be noted that they entered the market after the advent of the ATR42 and selected the latter as the target to achieve in terms of operating cost per seat.

The best response from the ATR42's manufacturers to its rivals is their concept of a family of ATRs, of which the ATR42 is the first offspring, with the ATR42 to follow.

In point of fact, these four years of work which preceded certification of the aircraft have been years of continual dialogue with customers. For example, customers have been able to express, either individually or collectively, their desire to see the airframe and engine manufacturers develop what they call the "hotel mode" to ensure self-sufficiency of the aircraft. (The "hotel mode", through the use of a brake which prevents propeller rotation, allows air conditioning of the cockpit and the passenger cabin without recourse to ground support facilities, such as the costly and cumbersome solution involving an auxiliary power unit (APU).)

This customer/manufacturer dialogue, extended also to include government services as part of the MSG 3 (Maintenance Steering Group) scheme, has made it possible to set up a minimum maintenance program with ambitious objectives. This method, which is used on widebody aircraft, has been smoothly adapted to the ATR42 and has led in the process to big improvements in terms of inspections. Thus, the first scheduled inspection will take place only every 48 hours, which represents a considerable saving from the operator's point of view. In addition, end-users have modeled certain details of the ATR42 maintenance schedule so as to be able to satisfy all forms of utilization and all types of organization. As a result, the ATR42 will be able to merge with the fleets of large airlines just as easily as with the smaller ones of regional carriers. □

Simmons Airlines Advances ATR 42 Deliveries Becomes Launch Customer For ATR 42

Simmons Airlines announced on September 3 that it has advanced its delivery of four 46 passenger ATR 42 aircraft from 1987 to 1986 and has optioned an additional four ATR 42 for delivery in 1987.
Citing enormous traffic increases since becoming a Republic Express carrier at Detroit on April 28, 1985 and its recent agreement with American Airlines to become an American Eagle carrier at Chicago on October 1, 1985. Simmons determined that it needs the new-generation ATR-42 early in 1986. Simmons also became the launch customer in the United States for the 66 passenger ATR 72. The company has optioned six ATR 72 aircraft to be delivered in 1989.
Joel Murray, chairman and CEO of Simmons commented.
"This order, potentially worth over $120 million to the consortium of Aerospatiale and Aeritalia, manufacturers of the aircraft, demonstrates Simmons belief that the ATR family of aircraft will be the most technologically advanced new-generation turboprop airliners in the world. Beeing the ATR 42 and its competition at the recent Paris air show convinced us that the ATR 42 is the winner among the new-generation 30 to 50 seat aircraft, and the ATR 72 promises to be even more outstanding from the standpoint of performance and economics».
Simmons currently operates a fleet of 29 aircraft serving 26 cities in Michigan, Illinois, Wisconsin, Ohio and Minnesota.

In the current highly competitive air transport context, the ATR42 represents the best compromise between capacity and operating costs.
In terms of direct operating cost (DOC) per seat-kilometer, the ATR42 is the most economical aircraft in the 30/70-seat category. Direct operating cost is compared directly to the fares and consequently indicates the potential operating revenue.
In terms of DOC per stage length, the figure for the ATR42 is no higher than that for lower-capacity (30-36-seat), new-technology aircraft, and is much lower than that for upgraded higher-capacity turboprops. In other words, the ATR42 is in effect at the intersection point of regional airline requirements, which are (a) to minimize stage length costs on low-traffic routes, and (b) to maximize revenue on heavy-traffic routes thanks to the aircraft's low DOC per seat-kilometer.
In addition, the ATR42 offers a large transport capacity on very high density routes because of its ability to handle higher frequencies. Operating economics of this kind mean that airlines choosing the ATR42 need have only one 'capacity module' to satisfy the requirements for regional routes on which annual traffic can be anything between 15,000 to over 120,000 passengers on stages ranging from 100nm to 300nm (185.2 to 555.6 kph).
Beyond these annual passenger traffic figures, the ATR72 version will be a convenient way of keeping up with an airline's growth since it will offer maximum commonality with the ATR42.

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ATR 42 PRODUCTION WORK IN FRENCH, ITALIAN PLANTS DETAILED

Neuilly-sur-Seine REVUE AEROSPATIALE in English Oct 85 pp 16, 18, 20, 22, 27

[Text]

Like its cousins in the Airbus family, the ATR stems from European cooperation - though only bilateral (France and Italy) in this case. The Aerospatiale plants at Nantes, St Nazaire, Méaulte and Toulouse are involved in the program, and their counterparts are the Aeritalia plants at Pomigliano d'Arco, Casoria and Capodichino on the other side of the Alps.

NANTES

Aerospatiale (Nantes) is in charge of manufacturing the composite wingtips and the control surfaces and fairings equipping the ATR's wing.

Although manufacture of the box members and other light alloy elements is routine work to which this plant has been accustomed for years, certain new techniques had to be introduced. For example, the substructure is assembled from ribs supplied ready-drilled, enabling them to be fastened to the spars with blind rivets. Other automatic machines are being installed, including a numerically-controlled machine which is used among other things for the work of facing, drilling and final reaming of the wing-root used to join the wings to the wing center section.

Aerospatiale's Nantes facility, a leader in the manufacture of composite elements, is prime contractor for all such items on the ATR42.

The principal elements made of composite materials are the leading and trailing edges, the flap edge fairings and the wing fillets made of Kevlar and honeycomb sandwich material, the carbon ailerons and the flap and engine nacelle panels made of carbon and honeycomb sandwich material.

As well as having deployed all its resources so as to be able to implement this ambitious program and meet all deadlines without cost overruns, Nantes is already in a position to manufacture any composite articles that might be required from it for new versions of the ATR. A 'Job Mark 16' robot is being installed for use in facing, countersinking machining and drilling composite materials. A draping machine is also planned in the near future. Such machines can automatically drape the carbon-fiber or other material being used for the end-product and can then cut it out to a pattern determined by numerical control.

SAINT-NAZAIRE

Assembly, integration and testing of the wing are all subsequently carried out at the Aerospatiale facility at St Nazaire, on the basis of subassemblies delivered by the Nantes, Méaulte and Toulouse plants and the wing center section which is manufactured entirely at St Nazaire.

The most advanced techniques are used here also, especially for the wing center section:

- **The 9.50m-long skin panels** are defined using CAD and machined under numerical control. They are formed on a 600-metric-ton ACB Loire press under the control of a programmable automaton which ensures the proper sequence of operations.
- **The ribs are cut out and drilled** on a Trumatic machine, shaped on a 1000-bar fluid-cell press and automatically riveted.
- **The separate elements** can then readily be assembled thanks to the precision achieved with this equipment.
- **The facing and reaming operations** to permit mating to the outboard box members are carried out at a work position where two numerically-controlled milling and boring machines and eight drilling and reaming units ensure rigorous interchangeability of the wing center section.

St Nazaire, which specializes in metal piping (light alloys, stainless steel, titanium) and laminated Kevlar or resin-impregnated glass filament products, then carries out general assembly of the whole wing and installs all the subsystems.

The next stage consists in carrying out the various tests to ensure compliance with specifications and to shorten the terminal cycle on the assembly line at Toulouse. A multifunction (electric and hydraulic power generation, fuel system) test-bench enables these tests to be conducted as if the wing were already mated to the fuselage. The test sequence is programmed by a computer which processes the measured parameters to check that they meet the standards. A screen allows interactive communication between the operator and the computer, and the results are furnished in the form of printouts for subsequent use by the quality assurance people.

The fully-tested wing - an assembly measuring 24 meters long - then goes to the paint shop, after which it is dispatched to Toulouse by special road convoy and rejoins the Italian-supplied fuselage and tail surfaces. □

MEAULTE

Aerospatiale's Méaulte plant, 150 km north of Paris, whose premises include a number of historic hangars built back in 1924 by Henri Potez, is the place where the engine nacelles are manufactured.

Well known for the responsibilities it has assumed notably for the Airbus A320, the Méaulte facility only recently delivered the first bottom portion of section 13/14 for the first of these aircraft. This factory, with its 1200-strong workforce, located in a rural setting and surrounded by meadows and ponds, has its own share of responsibility in the Franco-Italian ATR regional transport aircraft. Next to the ultramodern hall where these bottom sections for the A320 are built, Méaulte also manufactures the bottom sections and the edge boxes for the nacelles containing the Pratt & Whitney 120 turboshafts slung beneath the aircraft's wings. Although the manufacture of basic duralumin, stainless steel and titanium parts is still the reponsibility of Toulouse, Méaulte will be taking on the task beginning with the seventeenth aircraft. Méaulte also produces the composite nacelle fairings and the Kevlar radiator inlets.

Another concern of this Aerospatiale facility is passenger comfort, for the plant also manufactures the baggage racks, involving molding, decorative trim, equipping the subassemblies, and final assembly. An ATR42 can have anything from 15 to 17 baggage racks, depending on the customer's version.

In addition, complete toilet modules equipped with all their thermoformed plastic elements (washbasin, toilet bowl and seat) are manufactured at Méaulte

and then delivered to Toulouse for installation on the aircraft.

All these cabin furnishings made of Kevlar and honeycomb material are produced in the composite materials shop at Méaulte and meet all weight and strength requirements. □

NAPLES

In Italy, as in France, the most sophisticated production tools have been mobilized for the manufacture of the complete fuselage and the tail unit - the parts of the ATR42 made by Aeritalia. The assembly lines are located at the Pomigliano d'Arco, Casoria and Capodichino plants on the perimeter of Naples. This production work represents 30% of total Aeritalia activity in the first of these plants and 10% in the second.

Things have changed a lot since we first visited Aeritalia in 1984 (see *'Aerospatiale'* No.10, June 1984) and saw the first elements being assembled at Pomigliano d'Arco. In the large ATR assembly hall adjoining the production line used for the G222 light military freighter, the five different fuselage sections of No.19 ATR are on the final assembly jigs, and already the fuselages for Nos.17 and 18 aircraft are on the final assembly line. A keen eye might also discern elements of No.25 aircraft in the subassembly stage, and No.20 aircraft is beginning to take shape.

The Casoria plant is responsible for assembling the fins, and also produces the basic sheetmetal elements for all ATR parts manufactured by Aeritalia. A somewhat tricky manufacturing process (based on experience gained by the Italians as a result of other international cooperation ventures), involving an advanced bonding technique (resin-impregnated Kevlar and carbon filament), is a cause of intense activity at the Casoria facility.

The fuselages fully assembled at Pomigliano are fitted out at Capodichino, only a few minutes away. Aircraft Nos.15 and 16 are currently undergoing final equipment tests. All the vital organs (flight controls, oxygen, hydraulic, anemometer, deicing and pressurization systems) are installed at Capodichino. The cabins are lined with thermo-acoustic insulating material and equipped with the air-conditioning system. And the same facility is responsible for installing the Messier-Hispano-Bugatti landing-gear and for testing it for proper extension and retraction.

At present, an average of two fuselages and two tail units come off the Aeritalia assembly lines each month, after which the whole package - which French technicians aptly call the 'cigar', as opposed to 'feathers' for the wings - has to be shipped to Aerospatiale's Toulouse plant for the final assembly line.

The process of moving Italian-made ATR elements into France runs like clockwork. The fuselages leave Capodichino for Naples on a special truck/trailer road convoy and are then loaded on a ship for Marseille, from where they are transported to Toulouse by road once more.

Total travel time for the fuselages is about four days, whereas the tail units make the whole journey from Naples to Toulouse by road in two days.

By August 23 Aeritalia had already delivered the fuselage for No.14 aircraft, while that for No.15 ATR42 was expected to leave Naples sometime during the second half of September and to be in France by the time these lines appear in print.

It should be noted that Aeritalia is in charge of certain major structural and laboratory tests — including fatigue tests

— on the ATR42, in addition to fabrication work proper. Testing of a complete airframe began last January at Pomigliano d'Arco; it should spread over two years and enable the aircraft's design fatigue life to be attained before the stress parameters are taken beyond the theoretical maximum values.

By late July, Aeritalia, which was ahead of schedule, had already simulated 20,400 flights (the certification requirement is 20,000 flights).

Ongoing tests of the entire airframe have been satisfactory, and fatigue testing will therefore be continued. It should be recalled that they are required to cover 140,000 flights - twice the figure of 7000 flights required of manufacturers, the aim being to ascertain the true life of an aircraft, over a period of many years in the hands of different operators and under widely differing maintenance conditions... No price can be set on safety! □

Production Under Way

This month, a visitor to Aerospatiale's Toulouse plant would already be able to see the fifteenth production aircraft taking definitive shape on the ATR42 final assembly line. This is in accordance with the timetable. Like its predecessors, this aircraft naturally incorporates the latest modifications which were decided upon after the last flight tests and which led to certification of the ATR42 on schedule.

Toulouse represents the last stage in the manufacture of this Franco-Italian regional transport, for this is where all the aircraft's component parts converge - tail surfaces and fuselage from Naples, wings from St Nazaire, engine nacelle sections and toilet units from Méaulte, cabin furnishings from Toulouse-Blagnac and Rochefort, and A/C equipment from various suppliers.

All these elements enter the plant from the road end, while completed aircraft are rolled out from the side facing the runway. The first thing that strikes a visitor entering the hangar is the low noise level, for even the compressors can barely be heard. This is the result of applying a strict nuisance control policy, achieved by isolating electrical generating sets and hydraulic generators in soundproofed cages and by eliminating riveting operations at this particular stage.

To the man in the street, work there seems to be going on in a random, haphazard way. In fact, however, this has been an illusion for quite some time already. Two main considerations presided over the design of this assembly line: ergonomics and safety.

Thanks to experience gained with the Airbus, the ATR assembly line has not been 'dehumanized'; in fact, it operates in record time with just the number of personnel required: the sections arrive already equipped, and the operations involving the installation and later removal of work platforms and the like around the aircraft, as well as hoisting devices, are automated. In addition to this, the use of work surfaces on autonomous work platforms for specific tasks results in maximum flexibility as the work proceeds.

The 'chaining' of aircraft can be accomplished to suit requirements, especially those of new versions. The ATR72, for example, will be able to go into production without disrupting the existing installation.

This has been achieved by organizing the facility into an independent operational unit that includes an initiating department, a production sequencing and launching department, work distributors, skilled technicians, foremen and special testing units.

This settles the dual problems of having to deliver aircraft rapidly and at the same time ensure a congenial environment for the unit's personnel. It may be of interest to note that the French word 'compagnon', which was used to denote the skilled cathedral builders of a bygone age, is also employed in this sector of activity where it is felt that a beautiful aircraft is also a work of art - especially one which is the fruit of two nations reputed to excel in artistic taste.

Operational management also implies follow-up by the manufacturer of the various sections to ensure the planned production rate of four aircraft per month.

As Jean-Pierre Vrancken, production chief for the ATR42 program, puts it, *"Because we have to anticipate at all stages and not take things as they come, we have set up what we call an 'input buffer'. By having a complete shipset of fuselage sections, we can cope with possible problems"*.

The work starts at station 45. Here the fuselage, mounted on an assembly jig, receives the previously equipped wings which are lifted by an overhead traveling crane and correctly registered with the fuselage, then mated to it at eight attachment points. This operation is carried out by a programmable automaton controlled from a console.

This and the operation of mating the tail surfaces are particularly impressive operations. The assembly jig, which grips the aircraft and has its work platform at the same reference level as the floor, has about 20 m² on which all the necessary tools and components are placed to avoid unnecessary comings and goings. The electricians then take over the aircraft and install the wiring harnesses in the cabin and the cockpit.

Resting on four supporting legs, the ATR then rises on its landing-gear before the jigs are moved away mechanically.

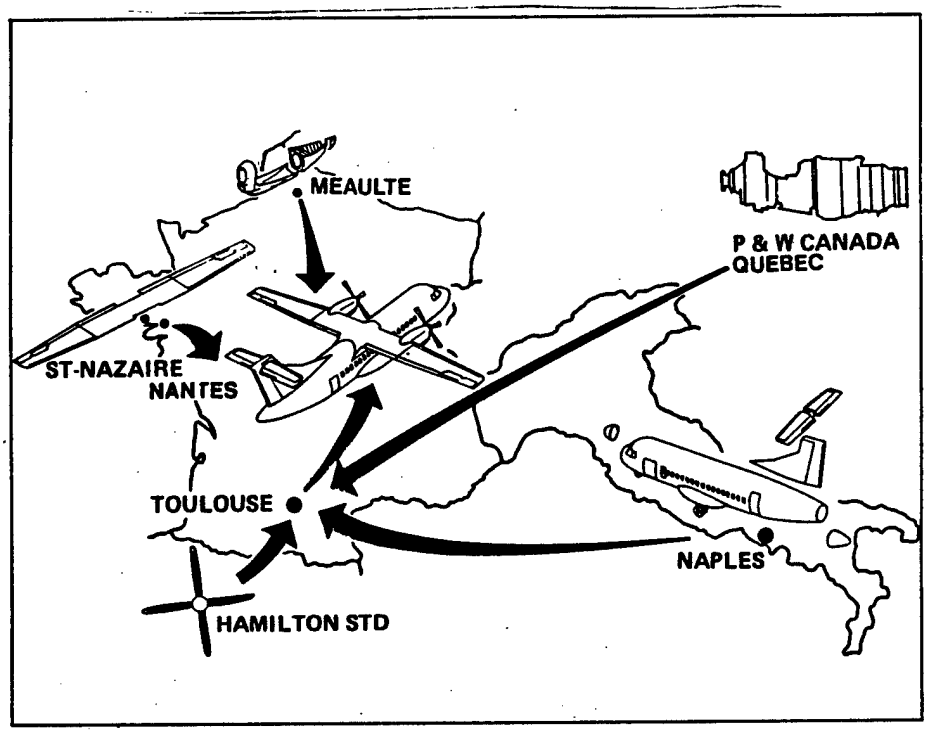
The aircraft is then rolled up to station 40 where it is clamped in other jigs, and electricians and fitters install the instrument panels.

After this task has been completed, the aircraft is released from the jig and moved to station 25 where it is electrically energized. This is where preliminary testing of the electric circuitry (generating system, deicing, fuel systems, air conditioning, etc.) is carried out.

Next the propellers and engines, which have been prepared in the engine shop, are moved to station 24 on an air-cushion dolly. The intermediate section of this dolly slips onto the jig and makes it possible to raise the engine or the propeller to the required height, after which the engine fitters install the PW 120s and the Hamilton Standard propellers.

The last two stations - Nos.22 and 23 - are those where the final tests, including that of the landing-gear, are performed before the cabin furnishings are installed. For greater safety during these tests, the so-called 'critical areas' of the aircraft, such as the space in which the landing-gear extends and retracts, are carefully monitored using video cameras and a video monitor under the direct control of the testing technician.

Finally, the aircraft goes to the paint-shop to receive its assigned customer's distinctive livery, after which it undergoes a final quality control test before being turned over to the runway technicians for the final obligatory test flights prior to delivery to the customer □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CSO: 3698/53

FRENCH INTEGRATE COMPUTERS INTO SCHOOL SYSTEM

Paris AFP SCIENCES in French 5 Sep 85 p 40

[Article: "'Data-Processing For All' Program Implemented in Schools as Scheduled']

[Text] Paris--Data processing is for the future... This is no longer true in the education sector as the new school year is about to begin: data processing is already present, even omnipresent.

The "data processing for all" program launched by the prime minister in January 1985 and whose goal it was to equip all schools with hardware and software in time for the school-year start in September went on as scheduled. Therefore, the computer inventory, which was 35,000 last year and was initially expected to rise to 100,000 by the end of 1988, soared to a total of 155,000 and extended its network practically everywhere.

As a result, 33,171 elementary schools consisting of only one class or a small number of students now each have a microcomputer; 11,733 larger elementary schools and 2,733 secondary schools possess an extensible "nano-network" consisting at present of one professional-type microcomputer connected to 6 work stations (with a potential for 30 later on). Finally, 500 lycees are equipped with a similar nano-network, but connected to 8 work stations, and they also have each have 3 professional-type microcomputers for independent use.

Hardware does not work without software. Therefore, FF 200 million were allocated to provide each school with a "package" covering all types of use: tutorials, games, training, and professional software.

Finally, close to 110,000 teachers were trained to use the data-processing tools. They attended two series of training sessions during their vacations: 12,000 during the spring vacation and 95,000 during the summer.

Apart from their beautiful brand new hardware, French schools are equipped with a large inventory of audiovisual equipment: 80,642 tape recorders, 64,439 projectors, 42,414 overhead projectors, 37,702 record players, 11,260 TV sets and 2,716 cameras, for a total of close to 300,000 pieces of equipment or 100,000 more than 10 years ago.

9294
CSO: 3698/21

EC INVESTMENT IN OPTICAL COMPUTER RESEARCH

Paris AFP SCIENCES in French 12 Sep 85 p 31

[Article: "1.8 Million ECUs for a European Optical Computer"]

[Text] Brussels--The European Economic Community invested 1.8 million ECUs [European currency units] ($1.5 million) in research on an "optical computer" which, in a few years from now, could considerably accelerate data processing, a publication of the EEC Commission reported.

The optical computer, on which 19 scientific research teams are working at 18 European universities and research institutes, "could remove many technological roadblocks" for, according to the report, data-processing hardware development "will soon encounter physical and technological obstacles that will be hard to overcome."

The originality of this computer of the future lies in that it will use light (photon beams) instead of the electrons that are commonly used. The fastest optical components known today react about 1,000 times faster than traditional electronic computers, thus achieving speeds of the order of one thousandth of one billionth of a second (one picosecond), the EEC document indicated.

In addition, the optical computer would make it possible to process data simultaneously rather than sequentially (one by one), which would considerably increase its computing capacity.

The problem, however, is that it is still too soon to say with certainty that this "optical computer" can actually be made. "As yet, no one can say how far we can go," the publication stated, and research should continue for a few years. Indeed, materials that could be used and would be durable enough are not yet known with certainty and "mathematicians are just beginning to consider the bases of parallel data processing," the publication went on.

The principle is based on an analogy between the optical properties of certain materials ("optical bistability") and traditional electronic data processing, which should make research easier, EEC experts pointed out. A laser beam is used to cause various crystalline materials, said to be "optically bistable," to change "lightning-fast" from an opaque to a transparent state, thus providing the two figures 1 and 0 used by the binary system and therefore the logic propositions "yes" and "no," the report explained.

9294
CSO: 3698/21

TIMO KOSKI, HEAD OF FINLAND NOKIA FIRM PROFILED

Helsinki SUOMEN KUVALEHTI in Finnish 27 Jan 85 pp 14-15

[Article by Martti O. Hosia: "Timo H. A. Koski is Nokia's Guided Missile"]

[Text] At any rate Koski will have 6,000 subordinates at the beginning of April. Last year, Nokia Electronics' business volume was 1.8 billion markkas this year the amount will rise to 2.3 billion.

The four production units of Electronics -- communications, information systems, Nokia Data and industrial automation -- manufacture telephone exchanges, car telephones, computers, work stations, communication networks, computer programs, etc.

Showier indicators than this cannot be found at the top of the high-tech industries in Finland.

Koski's arrival in a great rush directly from the Salora board meeting into the conference room of the central offices reinforces in itself the "high flyer" impression. An American Express label swings from the handle of a carry-on-size bag.

"There is no end to exaggerate one's station; it is better to concentrate on doing the work. This is no solo dance exhibition. Results are obtained in the units and their branch companies," Koski commented on the complaints raised by his promotion.

Koski's appraisals of his guided-missile flight path, which up to now has headed straight up, are similar.

Koski received his engineering degree in 1971 with information processing as his major subject. The studies took four years.

"It wasn't because of genius, but because I got married. The studies had to be gotten out of the way quickly. Besides, I got quite interested in ADP," says Koski.

Next year Koski was an assistant professor of information processing at the Technical Institute, from which position he left for the army.

Even before his stint in the army, Koski noticed that he wasn't really cut out to be a researcher. This observation and a newly kindled interest in the French language caused Koski to apply to the INSEAD Institute, the Harvard of France.

The MBA degree took one year.

After this, the man was taken on by Finland's Siemens OY and then by its parent company Siemens Ag.

In 1982, after 4 years of priming, Kurt Wikstedt, deputy manager of Nokia, talked Koski into planning the internationalization of Nokia Electronics.

A few months later, Koski was instructed to form a new production unit, Nokia's information systems, and to get the unit going. Last spring the planning of the electronics enterprises became his area of responsibility.

In this phase, Koski was already, according to his own definition, "Wikstedt's right hand and left foot."

Now Wikstedt, 64, is retiring, and Koski, 37, is starting. The period of activity remaining until mandatory retirement at age 60, set for the members of the directorate, is 23 years -- "if they don't kick me out before then."

Two Tasks

Koski has two main tasks at Nokia Electronics: to follow how the four production units reach their goals and think of a direction in which the group should advance.

The production units, which function as their names indicate, get more money and permission to hire more personnel from the staff led by Koski. Non-producing units, at Nokia as in other companies, will get the ax before long.

The trail-blazing, "strategic planning" is perhaps a more difficult task. To a layman Nokia Electronics seems to resemble an electronics variety store more than anything else.

Nokia's success products up to now include, among others, Mobira, which makes car telephones, the computer Mikro-Mikko II, plus bank and data transferral systems. Mobira's growth goal for this year is 100 percent.

"It is truly a wonder that such competitive products have been achieved in Finland. One can find garages here as well as in Silicon Valley, and innovations are not dependent on population masses. But when one opens

the garage door in Silicon Valley, the world's largest markets open up before one. In Finland, you are facing 2 meters of snow.

"The distance from the markets is the biggest problem. In Finland, Silicon Valley is Halikon Valley," Koski reminds us of Mobira's and Salora's home base.

"First, I'll strive for maintaining our base area, safeguarding our competitiveness," Koski explains his future strategy.

"Another goal is to raise the international level significantly. During the next few years we have to gain an even stronger position in the Scandinavian markets."

So what Koski promises is more international marketing and corporate ventures.

"The way to advance according to the textbook is to export first, then service, begin assembly and finally carry on production development itself abroad. Another way to internationalize is through corporate ventures. If an interesting company appears in the strategy area, then..."

The world of course has many multifunctional companies, but not so many of those that would combine the manufacture of cables, trade and consumer electronics. The third goal is to enhance the synergy of the entire field of expertise -- as Koski describes the plusses of the variety store.

High Technology or Washing Machines?

The orientation to other countries does not mean that one's own country would be neglected.

One example is Micronas, which will begin manufacturing silicon chips in about a year.

"We started from the assumption that Finland has to have the capability to design special circuits. This immediately raised another question: should we also possess the capability to manufacture these circuits? The answer was yes. If one wants to remain in the picture, one has to have a manufacturing line," says Koski.

Not all editorial gurus out there are any longer as interested in electonics.

Hans Werthen, the chairman of the Swedish Electrolux, which recently bought the Italian Zanus, declared that electronics was the worst sector, in which products grew smaller and smaller along with their funds. According

to Werthen the profitable products are those that are geared to human measurements, such as Zanus washing machines and Electrolux stoves. In Finland this ideology is represented by Kone, which manufactures elevators.

"I read Werthen's interview twice," Koski claims with astonishment.

"My first comment is that even the telephone is geared to human size. The distance from the mouth to the ear will remain the same. And even the computers require a keyboard.

"A more serious reminder is that all sectors of industry have high-tech features. Information technology is the offering of tools to other areas.

"If not, we would have to be making manual washing machines."

Training as a Bottleneck

Nokia intends to produce even more electrotechnology under Koski's direction -- if enough trained personnel can be found.

"The worst obstacle to growth is in finding enough personnel who have the exprtise in information technology. This affects the academic as well as other personnel. The annual intake of personnel at Nokia Electronics is about 600-700 individuals, half of them academics," as Koski describes his priority problem.

According to Koski, schooling is needed at the top level where the designers of new products are to be found; on the middle level, where the adapters put the devices to use; and, finally at the level of the man on the street, where each one of us eventually sits down at some display terminal.

For all to get education, it is necessary to educate the educators.

"The question is of maintaining the international competitiveness of Finland's stature as a high-tech country over a long period. If we were to seize the matter forcefully, it should be made into a national project," says Koski.

"At the same time the schools and institutions of the country should be filled with Mikro-Mikkos, but that's another matter. Idis is the turning of a long axle, extended from the bottom upward to a new position. Usually the decision-making process does not function in this manner. This is what they did in Japan," says Koski, as he takes his case and prepares to leave.

Ahead lies a trip to Janan, South Korea and the United States. In April a car telephone factory run by Nokia's Mobira and the American Tandy firm will be started in Korea.

"This is exacting and difficult work, learning never ends, nor the need for staying with the times. Movements occur at the center of the work markets. One has to be where things are happening," says the high flyer on his way out.

12989
CSO: 8117/0119

NEW DIGITAL CIRCUITS AT THOMSON SEMICONDUCTOR IN FRANCE

Paris ELECTRONIQUE ACTUALITES in French 15 Mar 85 pp 1, 22

[Article by JP Della Mussia: "Thomson Semiconductors Introduces 4,200-Gate CMOS Gate Arrays"]

[Excerpts] DCS, Thomson Semiconductors' Semi-Standard Circuits Department, has just announced a CMOS gate array with up to 4,200 gates, standard cells (available sometime within the next two months), and a unique 900-component, 3 GHz linear gate array. All of Thomson's gate arrays are supported by Daisy, Valid and Mentor workstations. These are the first fruits of a reorganization begun several months ago to distance the department from the actual design and manufacture of integrated circuits, making it more of an orchestrator among customers, workstation manufacturers, independent designers and the various Thomson Semiconductors divisions.

Thomson Semiconductors' "silicon" sales based on DCS contracts totaled 25,000,000 Francs in 1984. This figure should be double in 1985. Thomson Semiconductors plans to offer 120 new integrated circuits this year, twice the number available in 1984. At the same time, the Munich design center and the American subsidiary, VSI, should open new markets in 1985, bringing exports to an estimated 30 percent of sales.

Two CMOS Families

Thomson Semiconductors now markets two families of CMOS gate arrays. The first, of Thomson design, is an economical 3.5 ns family which is now well established and covers the range from 360 to 1,400 gates. The second, a new family, is designed by Oki and includes 1,400-, and 2,000-, and 4,000-gate models.

Both families are 3 μm gate arrays. The new family's 3.2 ns propagation time is similar to that of the old one. Unlike its predecessor, however, it has two levels of metallization for interconnections, a feature that is in fact indispensible for easy design of circuits with more than 2,000 gates. For the time being, Thomson is limiting itself to a 4,000 gate version; the corresponding chip measures 86 mm^2, and in Europe it is almost impossible to advance any further without serious problems in manufacturing yield. (Oki does have more complex models which DCS will probably market at a future date.)

The new family of gate arrays offers an additional advantage in that it will be compatible with a new denser 2 µm 2.2 ns (70 MHz) family, which will be introduced next November, again as an Oki second source. (In this context, compatibility means being able to use an almost-automatic reduction program to go from an old 3 µm design to a new 2 µm design. According to current plans, the new family should consists of a 4,000 gate model and a 6,000 gate model. DCS no longer designs CMOS digital gate arrays per se. However, it is working on complements to Oki cells and it studying the possibility of integrating cells and memory. The department began some designs based on Oki circuits several weeks ago, but for the present, they are being distributed only in Japan. French manufacture should begin next June.

The first 3 GHz circuit

In the field of digital bipolar gate arrays, DCS is continuing to manufacture 500 and 1,000 gate 180 MHz chips of AMcc origin. Last November, it also introduced 1,200 and 1,700 gate models designed by its American subsidiary, VSI (see ELECTRONIQUE ACTUALITES, 15 February). Based on Thomson's HBIP II technology, these circuits run at up to 200 MHz and use only 1 mW per gate. They are function-compatible.

The next chip in this family will be a 3,000 gate design which should be announced next November.

As concerns linear gate arrays, Thomson is still producing its 126-transistor Polyuse A and 212-transistor Polyuse G chips with NPN transition frequencies of 500 MHz. It is also getting ready to launch a Polyuse K design, based on HF IIC technolgy (similar to the 60% oxide-isolated 2.5 um HBIP II technology). The Polyuse K has an NPN transition frequency of 3 GHz at 15 V (5 MHz for lateral NPNs). This 7 mm^2 chip contains 900 components, including 216 transistors, with SO packaging preferred (16, 24 and 28 pins). It is laid out in 6-transistor cells, each of which is suitable for forming amplifier (a 500 MHz video, for example) or a comparator.

Three gate array families?

Thomson is already distributing the Polyuse K for testing purposes. In theory, determination of its characteristics in July, and standard function custom cell chips should be available next November.

Lastly, sometime within the next two months, DCS could announce three internally designed standard cell families currently still undergoing field testing. The so-called "HC1PA" family consists of 3 to 5 um 20 ns 5MHz chips that support up to 1,000 gates and allow simultaneous analog and logic functions. DCS has already designed 12 chips (including several converters) for this as-yet-unannounced family, and the first prototypes will be tested in April. For the logic portion, the library is the same as for DCS's simple gate arrays, plus 150 TTL equivalents (using the same technology as previously announced programmable filters).

The second family, "HC1P-H" is designed for low-cost, purely digital applications. It is based on a 1-metallization-layer 3 µm 5 ns technology which will allow up to 4,000-gate chips. It will use the same library as the "HC1PA." Design of the first chips in this family began in February: the first prototypes are scheduled for testing next June. Thomson has already decided on a marketing approach for this family, unlike the other two.

Thomson is also planning to market a third family of high performance digital chips, the so-called "HC2N-2," based on Thomson's own 2 µm HCMOS II technology (not Oki-compatible). This 3 ns 50 MHz technology is suitable for fabrication of circuits with up to 8,000 or 10,000 gates. Design of the first chips is to begin in April, with the first prototypes scheduled for September. The library would contain 40 macrocells as well as RAM, ROM and 25 TTL/MSI functions.

13014
CSO: 3698/600

CNET OF FRANCE USES ORGANO-METALLIC EPITAXY FOR LASER

Paris ELECTRONIQUE ACTUALITES in French 22 Mar 85 p 26

[Excepts] CNET's Bagneux laboratory has just determined the characterisitcs of the first 1.3 μm GaInAsP laser chips produced by means of organo-metallic epitaxy on InP at atmospheric pressure.

The results of the first complete wafer test (pulsed threshold current density of 1,200 A/cm^2 at room temperature for a laser 100 μm wide and 500 μm long; low feature dispersion, high quantity yield) are encouraging. They seem to indicate that with appropriate structures (for example, embedded ribbon lasers), it may be possilbe to construct direct current lasers that function at room temperature with threshold currents of 30 to 100 mA.

The results are among the best in the world (CNET's threshold current is only 40% greater than the Thomson record achieved with a reduced-pressure organo-metallic epitaxial method) and are comparable to those recently published by Bell Labs (3,600 A/cm^2 at 1.36 μm), the first to have determined the characteristics of lasers made using the same method.

Under development at the Bagneux laboratory since 1982, CNET's method is unique in its use of atmospheric pressure and its substitution of trimethylindium for triethylindium sources, until recently much more widely used. This method is potentially easier and cheaper to use in a manufacturing environment than the reduced-pressure organo-metallic epitaxial method that allowed Thomson-CSF to obtain the world's best results for 1.3 μm, InP--and which is also used by the Japanese. The Americans and CNET seem to have adopted the same appraoch, which also probably provides total compatibility with organo-metallic epitaxy on GaAs.

Working together with a small French company, CNET has developed not only a manufacturing technique but also a complete industrial process, from the purification and synthesis of trimethylindium (currently, there is only one source for trimethylindium--in the United States) to the development of an organo-metallic epitaxial reactor that can be used either at atmospheric or reduced pressure.

CNET still has several tasks before it. It must complete the characterization of its direct current lasers, continue its work in improving the reproducibility of the method, and develop lasers for other wave lengths, such as 1.55 μm.

13014
CSO: 3698/600

MICROELECTRONICS

LEP OF FRANCE ACHIEVES LOW-ENERGY CONSUMING SRAM

Paris ELECTRONIQUE ACTUALITES in French 13 Sep 85 p 34

[Unsigned article]

[Text] Philips' electronic and Applied Physics Laboratories (LEP) has built a gallium arsenide static RAM which is neither the most dense (it integrates 1024 bits on a 2.5x2.5 mm-square chip) nor the fastest (it has an access time of 3 ns) ever produced; but it is among the lowest energy consumers. This makes it possible to foresee the production of higher density memories to compete against ECL SRAM devices.

It consumes 90 mW at ambient temperature, compared to 370 mW for NTT devices accessible in 1.5 ns, and to 290 mW at 77 degrees K for the slightly slower Fujitsu SRAM (3.4 ns accession time). Gigabit Logic is also expected to soon market a 1K GaAs SRAM accessible in 1 ns, whose consumption however has not yet been disclosed.

What is more, LEP's memory is the first to be manufactured in Europe, since the 4K or 16K models that have already been announced were all developed in Japanese (NEC, Fujitsu, NTT) or American laboratories.

According to its producers, it is also unusual for its simple fabrication, which allows good reproducibility with correct operation of all memory points; a complete wafer could be processed in eight days with this technique.

Just like NTT for its 1K, 1 ns SRAM, LEP uses a DCFL logic with buried grid normally pinched-off transistors, and 3 mu lines.

The active layer is obtained by ion implantation on dislocation-free GaAs substrates fabricated by LEP. The absence of dislocations in the substrate is reflected in pinch-off voltage dispersion reductions of a factor of five at the microscopic level, which leads to a good operation of 100 percent of the memory cells with reasonable yield (NTT supposedly obtains only 98 percent). Fujitsu uses an HEMT technique whose optimum operation is at 77 degrees K and which is much more complicated to produce.

11,023
CSO: 3698/6

THOMSON ANNOUNCES STANDARD GALLIUM ARSENIDE IC'S

Paris ELECTRONIQUE ACTUALITES in French 27 Sep 85 pp 1, 18

[Article: "Thomson Semiconductors Announces Standard GaAs Integrated Circuits"]

[Text] Thomson Semiconductors (Hybrid and Microwave DCM [expansion unknown] Components Division) just published specification sheets for digital and microwave GaAs integrated circuits that it recently started manufacturing for the free market.

Although these simple circuits are available in stock, we should be aware that gallium arsenide is of the utmost interest as far as speed is concerned only when all of the function to be fulfilled for the system contemplated is integrated on a single chip. If SSI [small-scale integration] circuits are associated to fulfill a function, this will result in additional propagation delays at interconnections and interfaces. The ideal, therefore, is to order standard cells to be made, and these are also offered by Thomson (for the time being only in digital form) and are also covered by a family of specifications.

85 ps/4.4 mW per Gate

These standard-cell specifications are also representative of the performance of GaAs integrated circuits obtained with Thomson's 1-micron BFL [expansion unknown] technology with 2 interconnection levels. Two trade-offs between speed and consumpton are available: 105 ps/2.5 mW per gate or 85 ps/4.4 mW per gate, typically, with an input/output factor of 1. Compared with the best ECL [emitter-coupled logic] circuits, the gain of speed is therefore about three or four. On the other hand, the clock frequency can be as high as 2 GHz, i.e. about 5 times better than with ECL circuits.

Unfortunately, the low complexities possible with GaAs circuits offer a drawback that is also found in the circuits offered by Thomson: at most 500 gates can be integrated; that is enough to solve a speed problem on an interface, but, for complex circuits, this leads to consider a mixed GaAs + silicon solution at system level, possibly on a hybrid circuit; a complex STL [Schottky transistor logic] or ECL bipolar circuit, for instance, can then fulfill the essential part of the function, with additional GaAs chips

helping it to solve punctual speed problems. This mixing will be made easier by the ECL input and output compatibility of the cells offered.

Seven Original Circuits

The specifications published by Thomson show the importance of input/output factor and interconnection problems. Thus, with an input and output factor of 3, we must count on a trade-off of 158 ps/4.4 mW per gate. Keeping the same parameters, but with an additional 1 mm of interconnection on the chip, the trade-off becomes 164 ps/19.6 mW typical per gate.

Among the possible cells, apart from the mere standard cells, we should mention 75-ohm or 50-ohm inputs/outputs, an additional clock generator and master-slave RSTT flip-flops.

Thomson is offering several standard logic functions in SSI form, plus seven original circuits, essentially of the analog type:

- The PH 15-1/2 is a narrow-band analog phase-shifter providing a maximum phase shift of 90° at 7 GHz or 45° at 9 GHz, with a maximum insertion loss of 2 dB (0.5 dB typical).

- The PH 36-1/2 is a wide-band analog phase-shifter with phase shift of up to 90° between 8 and 12 GHz or between 6 and 8 GHz.

- The PH 34 series is a series of oscillators that can be varactor-tuned over 1.3 GHz maximum in the 10-11.5 GHz band. The frequency stability is 100 ppm/°C, the output power exceeding 5 mW. The chip measures 1 mm^2.

- The PH 37 and PH 47 are Wilkinson divider-couplers operating between 2 and 8 GHz with insertion losses of 0.5 dB (a solution superior to 15 dB).

- The PH 14-1/2 is a variable 2-18 GHz attenuator with a dynamic range of 10 to 30 dB and a standing-wave ratio of 2 maximum.

- The CDA 1002X and CDB 1002 GC are frequency halvers in BFL technology with ECL-compatible outputs. The input signal, an alternating signal without a continuous component, must be applied through a 50-ohm adapted line. The propagation time is 600 ps at chip level and the rise/fall time is 150 ps.

- The CDA 1003X and 1003 GC are rank-5 or rank-6 programmable frequency dividers operating between 0.3 and 2.5 GHz and whose performance is similar to that of the above-mentioned dividers.

Finally, the logic circuits available are four-input AND, NAND, XOR, NXOR, D-flip-flop circuits; they should be followed in a few days by four-input BINOR, OR and NOR circuits.

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EUROPEAN SILICON STRUCTURES PLANS CUSTOM CHIPS IN 15 DAYS

Paris ELECTRONIQUE ACTUALITES in French 6 Sep 85 pp 1, 16

[Article by J.P. Della Mussia: "Full-Custom Chips in 15 Days: The First Europe-Oriented Microelectronics 'Startup'"]

[Text] The first truly European microelectronics "startup," European Silicon Structures (ES2), is now being created. Its goal is unique:

- to supply or operate all the data-processing resources, in particular silicon compilers, required to design quickly full-custom circuits (exclusive of gate arrays and standard cells) from Paris, London and Munich, by January 1986;

- to sample the corresponding circuits in 2 weeks, using the tooling tape, for only $10,000, and then to produce them internally in series of up to a few ten thousand parts.

Its resources will be commensurate with its ambitious program: $65 million to start, or $100 million over 5 years for a full setup.

This is an entirely private initiative and, to a large extent, it is the work of three men: Jean-Luc Grand-Clement whose idea it was and who, among other things, was Eurotechnique general manager before that company was "nationalized"; Robert R. Heikes, among other things former NS [National Semiconductors] vice-president and general manager for Europe and Latin America; Robert W. Wilmot, president of STC International Computer and ICL [International Computers Limited].

The financing they are putting together to launch the operation consists essentially of private funds (we say essentially because a nationalized company might become a minority shareholder). The funds will be provided by venture-capital companies, financial institutions and large European electronics groups, none of which will be allowed to hold more than 5 percent of the stock, in order to prevent any ulterior pressures.

None of these groups has signed yet, but most European leaders are interested (apart from Ericsson which is now setting up a similar operation on its own, within its Rifa subsidiary, essentially to cover its own needs).

Several factors make the ES2 project an exceptional one:

- full-custom circuits are becoming increasingly interesting compared with gate arrays and standard cells; since the degree of success of these full-custom circuits for small series will depend on how fast high-level silicon compilers become available, ES2 will not hesitate to set up a team of 80 to develop the most advanced tools in this field, thus getting every chance of being among the world leaders in the field;

- at present, the market for full-custom CMOS circuits is growing very fast. According to ES2, it might grow from $210 million this year in Europe to at least $670 million in 1988 and $1.44 billion in 1991. For full-custom circuits (excluding gate arrays and standard cells), it would grow from $120 in 1984 to $1 billion in 1991, including 50 percent for prototypes and small-volume production. ES2 will attempt to cover at least 20 percent of these 50 percent, i.e. a market of $110 million in 1991:

- the European market is strongly oriented toward professional, industrial and specialized data-processing electronics requiring circuit series of only a few thousand parts, if possible with very short design and manufacturing times to ensure that good ideas are marketed as soon as possible. According to ES2, 80 percent of all European equipment is manufactured in series of less than 5,000 parts. The company thus intends to meet exactly this specific need, U.S. and Japanese companies being more oriented toward large series. Speed of design will have to come from expertise in state-of-the-art silicon compilers; speed of prototype and small-series manufacturing will come from the existence of a large-output electronic masker at the manufacturing plant, a method that makes it possible to dispense with the expensive and time-consuming development of the 10 or so masks required to manufacture a circuit;

- the project is truly European in all its aspects: ES2, incorporated in Luxemburg, will have its headquarters in Germany, in Munich; its research on silicon compilers will be done in Great-Britain, near London and at the University of Edinburgh; and its plant will probably be located in France.

Its shareholders will be distributed all over Europe. Design centers will be created simultaneously in Paris, Munich and London (then, in 1986, in Milan, Stockholm and Edinburgh), thus automatically providing the linguistic interface required for the operation. Therefore, for the first time, a European startup will start with the same or nearly the same chances as a U.S. startup as far as the size of the geographic market targeted is concerned. In addition, $65 million represents an amount that is not a trade-off. Already the first $45 million will make it possible to set up the "ne plus ultra" of what can be imagined for such an operation.

$10,000 for 2 Wafers

Apart from all these exceptional factors, one basic question still has to be answered: even though small-series full-custom circuits obtained by electronic masking are theoretically warranted in many applications, will users ask for them now rather than using gate arrays or standard cells? Apart from what theoretical market studies say, is the market ripe? Will users want to

rely on these silicon compilers which are said to work well only in simple cases? We wrote for the first time in 1972 that the concept of arrays was extraordinary; but the market actually took off in France only around 1980.

We shall therefore come back on this subject and explain why we are on the eve of a profound change in the field of custom circuits. The creation of ES2 is actually a blessing for the European electronics industry which, for once, will not have to jump on the bandwagon two years after it has left.

ES2 will also have convincing arguments: powerful means will be available, and if users do not want to design their own circuits, ES2 will do it for them in its design centers, at a price and within a time agreed upon. For instance: for a 2,000-gate circuit consisting solely of traditional logic functions, ES2 will charge $5,000 and will take one week. What a competition for gate arrays! For those who hesitate, ES2 will train the designers of client companies and help them in their work. Finally, for those who want to go ahead, ES2 will provide its design tools. In all cases, using the tooling tape, ES2 will provide two 125-mm wafers within 2 weeks at a cost of $10,000 in 2-micron dual-level technology, regardless of circuit complexity (but, of course, a wafer will support many more small circuits than large 100,000-transistor type circuits, and the proportion of good chips is much higher in the first case). ES2 will also offer a packaging and testing service. Note that the "diffusion" service will be offered for any circuit supported by the tooling tape, even if it was not designed with ES2 or ES2-type designing tools.

Service Available in January 1986

Where does ES2 stand today?

For the time being, $4 million have been provided by the two leading European venture-capital companies, Advent in London and Techno-Venture Management in Munich, as well as Alpha Associates in France, Advent in Belgium, Orange-Nassau in Holland and Four Seasons in Sweden. If all goes as expected, the remaining $61 million will be provided, in equal amounts, by industrial investors and financial institutions from 6 European countries, to the exclusion of any non-European source. The former have already given their tacit agreement and are in sufficient number. Their names will be disclosed late in October. Consultations with the latter will begin next week.

The capital structure should, in principle be as follows: 25 percent for the founders and the personnel; 15 percent for venture capital; 30 percent for large manufacturers; 30 percent for "institutions."

The management team is now operational: apart from the chief executive officer, there will be a manager of finance and administration, a manager for Central Europe, a manager for Southern Europe, a manager of design automation (the present founder and manager of Lattice Logic, John Gray, whose company is now being acquired by ES2 to serve as a basis for its silicon compiler projects), a manager of technology and, finally, a manager of manufacturing. The first three design centers mentioned should in principle

open in January 1986. The design tools will be those of Lattice Logic for simple circuits (integration of boards based on TTL [transistor-transistor logic]-type logic circuits); for mid and high-end circuits, ES2 is negotiating an agreement with one of the U.S. companies specialized in silicon compilers (it should be signed within a week) until it can use the tools it will have developed on its own, in about 2 years from now.

In a first stage, the circuits will be designed for a CMOS 2-level 2-micron technology (this is a trade-off between performance, price and habits) that will be acquired from a European semiconductors company in exchange for a non-exclusive subcontracting agreement that will let it manufacture circuits when the quantities required exceed 50,000 parts. (Actually, 100 wafers, as there can be far fewer circuits if they are complex). Indeed, this figure is the practical limit that ES2 has set to its own production of circuits through electronic masking. In principle, there should be two possible second sources in Europe.

The plant, which could well be located in the south of France, should be started in November 1985 and become operational early in 1987. Its most remarkable piece of equipment should be the latest Aeble-150 electronic masker made by Perkin-Elmer, with a masking capacity of 9 to 30 levels per hour, depending on circuit complexity. This output corresponds to a production of about one to three completed wafers per hour.

In a transition stage, ES2 will lease part of an existing California plant to start production already in April 1986. Among other advantages, this will make it possible to run in the brand new Aeble-150 less than 40 km from its supplier. Until 1987, the delivery time for 2 wafers will thus be 3-4 weeks.

Production of 1.25-micron circuits is expected to start in about 18 months.

By the end of 1986, ES2 should employ 300 people. This number should be increased to 1,000 by 1990. For the time being, the company is not linked to any major EEC operations, like ESPRIT [European Strategic Program for R&D in Information Technology], as it wants to go ahead fast, avoiding any red tape.

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BRIEFS

SWEDEN JOINS ES2 PROJECT--Two Swedish enterprises are joining a new large European chip manufacturing project for the computer industry, etc. The European Silicon Structures group is to enter into competition with the American and Japanese giants in this area, reports VECKANS AFFARER. Together in this effort are the Saab-Scania subsidiary Combitechgruppen and the risk capital firm of Four Seasons, which is owned by Alfa-Laval, the Fjarde AP Fund, SPP and others. The Four Seasons firm is about to present the project to a number of financers investment groups in Sweden, including Folksam and Aktiv. [Text] [Stockholm DAGENS NYHETER in Swedish 2 Oct 85 p 10]

NEW CHIEF AT MATRA DATA SYSTEMS--Charles Picasso, director for Europe at Prime Computer, becomes director of Matra Data Systemes, replacing Yves Leclerc, who is assuming other functions in the company. Mr Picasso's task is to upgrade this area of the group, which last year lost 106 MF with revenues of 80.4 MF, according to Matra. His job will not be made any easier by the hesitations and signal changes that have occurred in the group, to the point where for the past three years each Sicob has announced its own strategy in this field. The potential on which Mr Picasso will be able to rely is essentially the company's scientific minicomputer activity, following the distribution agreements reached last year with Norsk Data, which since then have been reinforced with a development agreement for a vector processor. On the other hand, the microcomputer situation of the group is less clear. The old Alice consumer models are no longer being manufactured, while the future of the new models, which have not been included in the "Computers for All" plan, appears to be compromised. These disappointing results have led to layoffs for nearly 80 people at the Wintzeinheim plant, where these machines were being built. The group's position in professional microcomputers has suffered seriously from the hesitations, errors, and counter-decisions which over the years have prevented the company from obtaining its share of administration contracts, leaving the advantage to its competitors. At this point it can rely on a distributor network, but this profession is now undergoing a serious crisis with repercussions even on the sales of some large manufacturers. [Text] [Paris ELECTRONIQUE ACTUALITES in French 20 Sep 85 p 9] 11,023

FRENCH RESEARCH CENTER IN CHINA--An agreement for France to supply China with a microelectronics research center was just signed by Mr Hirel, director of cabinet for Mr Mexandeau, minister of PTT. This agreement was negotiated as part of the program for French-Chinese cooperation in telecommunications, a program which last January resulted in the signing of the first contract for Alcatel-Thomson to supply 10,000 telephone lines to the city of Peking. The agreement for the microelectronics research center, which responds to China's technology transfer needs (see ELECTRONIQUE ACTUALITES of 5 April), should facilitate the progress of the general program for telecommunications cooperation between France and China. This program is expected to continue with an order for an additional 500,000 telephone lines, and to be followed by more industrial production. [Text] [Paris ELECTRONIQUE ACTUALITES in French 13 Sep 85 p 23] 11,023

THOMSON 1985 GROWTH STRATEGY--"Thomson shall develop a strategy of growth within the framework of a return to equilibrium in 1985." So stipulates the preface to the operating plan of the French government and the nationalized company, signed last March 18 by Mrs Cresson, Minister of Industrial Redeployment and Foreign Trade, and Mr Gomez, President of Thomson. Remember that Thomson's 1983 losses (1.3 billion Francs) were already down as compared to 1982 (2.2 billion Francs). The results for 1984, to be figured next month, should confirm the current upswing (losses will supposedly have been cut to a few 100 million Francs). The preface to the operating plan states that Thomson is nearing the end of a stage of administrative reform and industrial restructuring, characterized notably by a refocusing on basic business areas which led to the transfer of its telephone activities to CGE). Thomson's 1.3 billion Franc capitalization (in addition to the approximately 470 million Francs already agreed upon under the terms of conversion will allow the company to increase its investments in components (with the goal of covering 3% of the world market by 1990), professional hardware (with an eye to achieving an annual growth rate of 7% in constant Francs), consumer goods and medical equipment (where CGR is to complete its imaging product line). Thomson will also be increasing investment in manufacturing and engineering. [Text] [Paris ELECTRONIQUE ACTUALITES in French 22 Mar 85 p 2] 13014

JAPANESE IC TECHNOLOGY TO FRANCE--Tokyo--The Japanese company Oki Electric Industry Co has supplied the French firm Thomson Semiconducteurs with the technical means to produce large scale integrated circuits, announced an Oki spokesman on 16 September. The Japanese company indicated that this information was given as part of an agreement binding it with the French semiconductor manufacturer, which is a division of Thomson CSF. The spokesman added that further details about this technology transfer could not be given, because the agreement includes a confidentiality clause. According to industrial sources, Oki has provided the technical means to produce 256 kilobits microchips of dynamic peripheral memory (RAM), a transfer whose cost is estimated at 5 billion yen ($20.8 million). The 256 kilobits peripheral memory is an advanced version of the large scale integrated circuit. [Text] [Paris AFP SCIENCES in French 19 Sep 85 p 49] 11,023

NETHERLANDS TECHNOLOGY CENTER--The Hague, September 25 - The Dutch government said today it will invest 38.6 million guilders in a new technology centre to develop equipment to produce micro-chips. The centre will be built by the Advanced Semiconductor Materials International (ASM) concern, Europe's largest supplier of equipment for micro-chip production, near its headquarters at Bilthoven in the central Netherlands. The economic affairs ministry said in a statement the centre would make an important contribution to new developments in this field, and strengthen ASM's market position. The Netherlands would benefit from the opportunity to reinforce its expertise in this branch of micro-chip technology, the ministry said. The centre will provide jobs for 150 highly-skilled academics. [Text] [The Hague ANP NEWS BULLETIN in English 27 Sep 85 p 8]

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REPORT ON FRENCH PROPOSALS, FUNDING FOR EUREKA

Paris ELECTRONIQUE ACTUALITES in French 6 Sep 85 p 2

[Article signed R.V.: "France Will Devote FF 1 Billion to it in 1986; 17 European Countries Join to Launch Eureka"]

> [Text] Officially, Eureka was born. But this new European technological cooperation program should not be actually operational before next November. However, France has already announced that, in 1986, it will devote FF 1 billion to Eureka (FF 350 million provided by the PTT [Post and Telecommunications Administration], FF 350 million by the Ministry of Research, and FF 300 million in loans from the Industrial Modernization Fund). As a basis for negotiations, it also presented a first list of possible projects. And Mr Yves Sillard, formerly at CNES [National Center for Space Studies] and now president of the French Institute for Research on Ocean Development, will be responsible for Eureka coordination on the French side; contacts between the authorities and interested manufacturers, preparation of draft agreements between companies, etc.
>
> "Depending on how fast the program takes off, the French government will adjust its financial support," Mr Mitterrand pointed out on 17 July, at an international conference that brought together in Paris the ministers of 17 European countries and marked the official creation of Eureka. As is known, the project was first proposed by Mr Mitterrand last April.

A second Eureka conference, to be attended by the research ministers of these 17 countries, will take place on 5-6 November 1986 in Hanover (FRG); after the kickoff given in Paris, the November conference will further outline the program: organizational structures, financing conditions, working methods, initial project inventory, etc. In addition, during this month of September, a meeting more particularly devoted to financing problems of future Eureka projects will be held in London.

These projects, all related to high technologies, will have to be concrete civilian projects (although, as is acknowledged, due to its technological

character Eureka will have some military fallout). "Adaptable," "flexible," Eureka will not lead to the creation of a new agency. For each project--needing probably the support of at least three countries--a mini-secretariat could be created. The projects would be financed case by case, each with a well-defined financial package, objectives and time limits. Public funds will represent only part of the Eureka financing, the remainder being provided by the manufacturers themselves and probably also by financial institutions.

The Eureka projects will have to lead to commercial applications, the French Ministry of Research pointed out. By comparison, ESPRIT [European Strategic Program for R&D in Information Technology] finds itself "further upstream of the market," it was added.

The French Proposals

In their current discussions with other European countries, French negotiators rely on a document that France presented at the 17 July meeting. Entitled "The Technological Renaissance of Europe," the document was established by CESTA (Research Center for Advanced Systems and Technology) on behalf of the government. It proposes a (non-exhaustive) list of finalized projects, in particular in the fields of data processing, telecommunications, robotics and materials. For each of these projects, this official working document lists a number of possible partners, companies or research organizations.*

Among other projects, France is proposing the development of: a large 30-gigaflop vector computer; a data-processing machine with a high degree of parallelism and a power in excess of 10 gigaflops; and a synchronous-architecture multiprocessor machine. These three projects would be completed by 1992.

As far as mass memories are concerned, France is suggesting the development of large storage disks with very large capacities.

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* We should mention in particular the following: DGT [General Directorate of Telecommunications], Bull, Thomson, Siemens, INRIA [National Institute of Data-Processing and Information Research], CNET [National Center for Telecommunications Studies], CNRS [National Center for Scientific Research], Inmos, GEC [expansion unknown], LETI [Electronics and Data-Processing Technology Laboratory], CEA [Atomic Energy Commission], BASF [Baden Anilin and Soda Factory], Aerospatiale, Cap Gemini, EDF [French Electricity Company], ICL [International Computers Ltd.], Philips, AEG [German General Electricity Company], CGE [French General Electricity Company], CGEE-Alsthom, Copernique, ESD [expansion unknown], MATRA [Mechanics, Aviation and Traction Co.], Framentec, Olivetti, Norsk Data, SAGEM [Company for General Applications of Electricity and Mechanics], Plessey, ASEA [Swedish General Electric Corporation], G3S [expansion unknown], Sodeteg TAI, Renault Automation, Alsthom, CILAS [Industrial Laser Company], FRAMATOME [Franco-American Atomic Construction Company], Ferranti, CIT-Alcatel, Italtel, Nixdorf, La Sep, SAT [Telecommunications Company] and Cables of Lyons.

Other proposals: the creation of a European software engineering center; the development, over 10 years, of a family of symbolic processors (maximum power: 1 gigalips [logical inferences per second]) and associated software; the study and development of tools to develop expert systems; the development of a multilingual information system (database in various natural languages, with text, images, voice, etc.); the development, by 1990, of systems to aid in the control of large industrial processes, integrating diagnostic, forecasting, decision-making and intervention follow-up.

As far as components are concerned, the CESTA document also proposes: the development, for the next decade, of a high-end flexible submicron-technology microprocessor "that could lead to the creation of a standard"; the development of memories of up to 64 megabits (by 1995).

The study also wishes for the creation of two additional European plants, one for gallium arsenide circuits (in the next five years), the other specialized in "customer" circuits.

In computer-integrated manufacturing, the government document mentions the development of various third-generation robots (agricultural robots and civil-safety robots) as well as that of a plant integrating functions of product design, management, production, etc.

The CESTA also proposes to develop high-power lasers for industrial uses.

In the field of telecommunications, France is proposing the creation of data-processing networks to be used by European researchers. In addition, in the context of the future wide-band digital network, it proposes to develop: a European digital public switching system; communicating data-processing and office-automation equipment adapted to this network; long-distance transmission means (optical fibers, satellite payloads).

Finally, another suggestion of the CESTA is to develop structural materials in order to make a high-output industrial turbine. All these proposals were submitted to our European partners and are now being discussed.

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CESTA ON EUREKA PROJECT--The Eureka program for the "Technological Renaissance of Europe," of which CESTA [Study Center for Advanced Systems and Technologies] has just published a summary, includes five Finalized Priority Action Programs, one of which is dedicated to artificial seeds and biomedical engineering. For each separate project, the prospective participants in France and in Europe are listed. CESTA: 1 rue Descartes, 75005 Paris. Telephone: (1)634 33 78. Telex: 250 795. [Text] [Paris BIOFUTUR in French Sep 85 p 25] 25004

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