JPRS L/9684

23 April 1981

West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 3/81)

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000300100047-6

JPRS L/9684

23 April 1981

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

(FOUO 3/81)

CONTENTS

INDUSTRIAL TECHNOLOGY SWEDEN

WORLD INDUSTRIAL ROBOT MARKET, SWEDEN'S ROLE IN IT VIEWED

Stockholm VECKANS AFFARER in Swedish 26 Feb 81 pp 30-33

[Article by Carl-Olof Johard: "Crisis in Costs Has Brought Forth a New Hit Product: The Industrial Robot"]

[Text] Swedish industry is quietly in the process of working its way into a new rapidly-growing branch of the world's economy: industrial robots. For example, Asea recently received a large order from General Motors which could open the door for still further business. Also Electrolux, Atlas Copco, and Kaufeldt are well along in development. The high-cost situation has made Sweden the world's most robot-dense country. But competition is growing. International electronic giants such as IBM are in the starting blocks to go in the robot business.

The western industrial world stands before a dramatic change of scene, where the main role will be played by industrial robots. The International Survey Institute reports an annual growth of industrial robots of over 30 percent, and a sales potential in 1990 of up to 20 billion kronor.

The increase of orders is growing at such a rate that during 1981 the robot industry will be forced to year-long delivery times. In Japan the government authorities have invested large amounts to automate industry and further improve the country's ability to compete. The large international firms are preparing for production with limited manpower. Among others, America's General Motors is planning a large reorganization program, which will halve the firm's workforce of 37,000 people by means of industrial robots.

Several leading electronics firms, such as Digital Equipment, Texas Instruments, and IBM are considering going into the robot market with expected price reductions as a result. At the same time an entirely new generation of sensor-equipped process robots (meaning robots that can "see" and "feel") are under development.

These robots are expected to be able to take over almost 75 percent of today's industrial work.

"The background for this entire robot boom is naturally in the economic profits which industry can make through increased productivity. Besides, the repayment period for

investment capital is relatively short, and businesses can very easily solve the manpower shortage in especially boring, monotonous, and unhealthy work situations," said John-Peter Ryott, marketing manager for the Swedish industrial robot firm Electrolux Industrial Systems.

In Sweden the high-cost situation has caused unusually fast development. Sweden leads the world today in robots installed and robots produced.

Of the fully 3,000 industrial robots which were manufactured during 1981 in the west, the four Swedish firms Asea, Electrolux, Kaufeldt, and Atlas Copco accounted for nearly 800.

Asea was the first among the Swedish firms to enter the robot market at the beginning of the 1970's, to meet their own needs. Today most of their output is sold outside the firm. Asea's annual production today is fully 500 robots, and the volume of business is about 200 million kronor.

Asea's largest markets outside Sweden are West Germany and the United States. In Western Europe Asea is the third largest firm with 16 percent of the market, and in the United States it is the fifth largest with 5 percent of the market. The reason for Asea's international progress is explained by the chief of the electronics sector, Bo Hermansson, who said, "We began early, and launched the most advanced robot on the market. We have since been able to hold our technological lead. We sell on our proficiency and our quality, and expect good growth in the future in spite of the increasing competition."

Asea produces advanced so-called process robots primarily for the automobile industry. Recently Asea received its largest United States order ever for 20 robots from General Motors.

At the same time GM bought, in a test order from the Gothenburg firm Selcom, the new optocatorn--a new system for free-position measuring. It is GM's intention to combine optocatorn with Asea's industrial robots.

Optocatorn is now being tested at GM and we expect a still larger follow-up order from GM during the spring," said Sven-Erik Pettersson, marketing manager at Selcom.

Asea counts itself today as one of the three largest robot manufacturers in the world. "The manufacture of robots is an interesting and rapidly expanding branch on the Asea tree. An indication of the importance of industrial robots is a decision which we recently made to create a robot division with Bjorn Weichbrodt as chief. The new robot division is going to be an increasingly important leg for Asea to stand on in the future," said Asea's managing director, Percy Barnevik.

Electrolux Industrial Systems, which since its beginning in 1970 has delivered about 500 industrial robots, has today an annual production of 120 robots and a volume of business of fully 30 million kronor.

Large parts of the production go to Scandinavia, England, and Italy, but West Germany and Australia are also growing markets.

Customers are mostly the automobile industry and its subcontractors. Since 1972 Electrolux is also the Swedish general agent for the world's largest industrial robot manufacturer--American Unimation.

"Through cooperation with Unimation we have been able to concentrate on simpler and cheaper types of working robots," said John-Peter Ryott.

Furthermore, last year Electrolux signed a cooperative agreement with the expanded new American firm Automatix. This agreement gives Electrolux access to Automatix research and development, at the same time as the American market is opened for Electrolux robots.

"The agreement includes manufacture of our MHU-robots under license in the United States. This cooperation gives us a better high-technology profile and will without doubt serve to promote a new generation of MHU-robots," said John-Peter Ryott.

Kaufeldt--earlier owned by Monark--has since the first delivery in 1967 sold over 350 robots within and outside the country. For the present Kaufeldt is moving forward and production is over 100 robots per year. Important purchasers are in West Germany, Holland, and Switzerland. In the United States the goal is to reach a one percent share of the market in the near future.

Kaufeldt manufactures pneumatic-powered working robots and customers are found primarily in the plastics, workshop, and foundry industries. In these areas Kaufeldt leads the market.

Since the present management took over from Monark in 1978 the volume of business has grown from 3.8 to 10 million kronor (1980).

"We have experienced a constantly increasing demand during recent years, and we therefore expect an annual growth in the future of about 30 percent," said the sales manager, Bjorn Lindstrom.

Atlas Copco is the newest member of the Swedish robot club, with its two years in the robot market. During this time the firm has marketed only one model--a surface-finishing robot. In spite of this they have succeeded in capturing 0.5 percent of the Western European market. About 50 robots per year are sold.

"But we are now developing a spray-painting robot," said Hans Bjorklund, chief of Atlas Copco's robot division.

Atlas Copco is responsible for marketing the surface-finishing robot, while Retab, owned by Bonnier, develops and manufactures the electronics parts, and Hiab-Foco takes care of the hydraulics.

Wamac Machinery is a firm in Smaland which has world-wide sales rights for a medium-sized Japanese manufacturer, Dainishi robots. Rate of production is about 50 robots per year, of which 80 percent are exported.

Wamac has primarily specialized in graphic robots, where they are the market leaders in Western Europe without competition. The volume of business in robots is about 50 million.

The largest competitors of the Swedish robot industry are naturally in the most highly robotized countries. In Western Europe that includes the Norwegian spray-painting specialist Trallfa, West German Volkswagen and Kneller & Knappich (KUKA), and in the United States the two dominant giants Unimation and Cincinnati-Milacron.

Unimation, which is the largest in the world, has about 35 percent of the American market and 23 percent of the Western European. Through its general agent Kawasaki the firm even has a dominant position in Japan. Unimation is far ahead on the development side and expects to begin series production of seeing process robots.

Cincinnati-Milacron is the United States largest machine tool producer, and they have 35 percent of the industrial robot market in the United States. Cincinnati-Milacron is investing heavily in the 1980's, and has built a large robot factory in South Carolina.

"We have staked out a clearly realistic goal and that is that we will be the market leaders, even in Europe, in 5 years," said Bertil Runsten, office manager of Cincinnati's daughter company in Stockholm.

In spite of Japan being a dominant robot country there are few Japanese manufacturers who sell outside their country. Japan's Ministry of International Trade and Industry (MITI) has developed a government support program for Japanese industry which will enable even small and medium businesses to be automated and robotized--in order to further strengthen the competitive international position of Japanese industry. Therefore practically all domestic production is swallowed up by the Japanese market.

Of Japan's approximately 20 registered manufacturers of industrial robots, it is only Dainishi (via Wamac) and Fujitsu-Fanac (via Siemens) which sells abroad. Fujitsu-Fanac is, together with Hitachi, Kawasaki, and Mitsubishi, one of the largest manufacturers in Japan.

Besides the more well-known giants there are several new businesses on the way to making their name in this very lucrative market. In Western Europe the French firm Acma Cribier, the English firm Hall Automation, and the Italian firm Olivetti are expected to grow in importance during the 1980's. And in the United States more than a half-dozen new production centers have been started during the last 2 years, including Electrolux's partner Automatix Inc.

In addition, the leading American computer giants Digital Equipment, IBM, and Texas Instruments are seriously considering entering this buzzing hornets' nest. All three have developed and manufactured sophisticated robots for their own use. It is also a matter of time before the Japanese electronic firm Hitachi leaves Japan with its sights set on Western Europe and the United States.

The electronic giants' sudden appearance on the scene threatens consequences in the form of mass production and depressed prices. Bjorn Lindstrom of Kaufeldt is, however, skeptical of such a development.

"We are now selling not only simple basic robots, but the entire systems with installation, accessories, and service. And such applied skill is not acquired easily.

Therefore it is more probable that some of the firms will buy up less established industrial robot manufacturers rather than investing in manufacturing robots themselves."

"I do not believe that there will be a movement toward sizeable decreases in prices. The market is so broad and extensive that increased competition will only lead to further segmentation and specialization," said Christian Areskiold, chief of the robot division at Trallfas.

In the United States, however, they are convinced that mass production, lowering prices, a strongly developed market potential and accelerated technological development will take place in a short time. The American manufacturers believe it is fully possible for the price of today's 250,000 kronor robot to drop to 50,000 kronor.

The American consultants Frost and Sullivan, which have been utilized repeatedly by the robot industry for market analyses, are more moderate in their prognosis.

"Costs and prices are not going to fall, but on the other hand more capacity and advanced technology will be available for the corresponding funds."

Price competition is already appearing to a certain extent today.

"The United States has an entirely different price structure than Western Europe. Because of the sharp competition there, manufacturers have started price competition in the entire robot system," said John-Peter Ryott of Electrolux.

In Sweden Wamac is considering launching a new Japanese process robot, which will be half the price of a corresponding unit. Wamac's robot is furthermore equipped with a unique bubble memory.

Of the fully 11,500 robots which today work around the world, 4,500 are installed in Japan, 3,500 are installed in the United States, and over 3,000 are in Western Europe. And of the Western European robots, 80 percent are concentrated in Scandinavia, West Germany, and Italy. In Sweden alone there are 1,100 industrial robots.

Although Sweden has the overwhelmingly highest robot density per capita in the world, the largest number of working robots is in Japan. Japanese industrial mobilization is also a strongly contributing cause of the growing rate of automation in the western world.

Japan is preparing. Billions have been spent to robotize industry quickly in the country. Extensive government resources have been invested to build a government subsidized leasing program for industrial robots, which will be used by small and medium businesses. During 1980 alone the Japanese robot manufacturers increased their volume of business by 153 percent to 1.5 billion kronor.

The Japanese threat has caused organized international labor not only to defend, but also by pressure to try to expedite robotization.

"It is vitally important that we increase investment in new technology and that we try to learn improved production techniques if we are not to be run over by the Japanese," said Christer Asplund, chief of analysis at the European Professional Analysis Institute (ETUI) in Brussels. Birgitta Frejhagen, who has been conducting analyses of the consequences of computerizing and robotizing for LO [Trade Union Confederation] since 1976, is of the same opinion.

"Certainly new technical jobs will be eliminated, but the risk is that we will lose even more jobs if we do not use industrial robots. In the long run it is a matter of creating firms with the ability of competing internationally. Thereforw we must further develop our already advanced knowledge in the industry."

The relations of the robot industry with the unions are therefore good, but they are more worried about other obstacles such as leaders of industry who are unwilling to reorganize, and unknowledgeable politicians.

Christian Areskiold of Trallfa said, "Compared with Japan, United States, and various Western European countries' investments, it is really fantastic how little government resources are devoted to the new technology in Scandinavia. If we want to retain our competitive ability it is now high time for the politicians to acquire knowledge of what is happening with industrial robots around the world. We are in a critical period, and our industrial politicians to acquire knowledge of what is happening with industrial robots around the world. We are in a critical period, and our industrial politicians must wake up now!"

[redacted] [redacted]

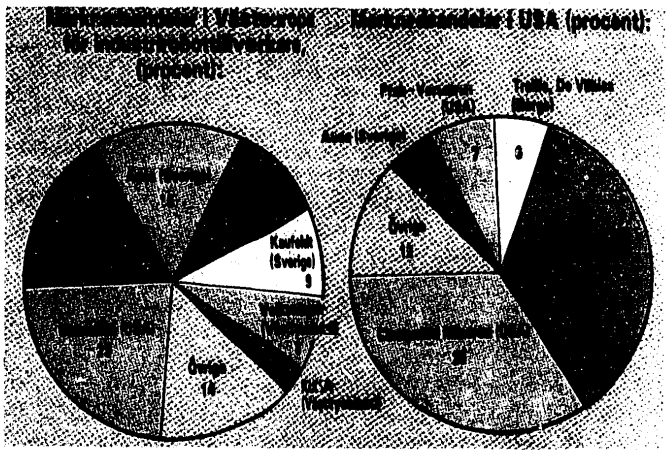


Figure 1. Of the fully 3,000 industrial robots which the western world's industry will manufacture during 1981, four Swedish firms, Asea, Electrolux, Kaufeldt, and Atlas Copco will manufacture nearly 800. The largest is Asea, which is the world's third largest manufacturer in size. The market shares in the diagram above [some illegible] relate to the number of robots sold during 1979-80. (Source: Frost and Sullivan.)

Key: 1. Marknadsandelar i Vasteuropa for industrirobottillverkare (procent):-
Market shares in Western Europe for industrial robot manufacturers (percent)
2. Marknadsandelar i USA (procent):-Market shares in the United States (percent)
3. Vasttyskland-West Germany
4. Ovriga-Other

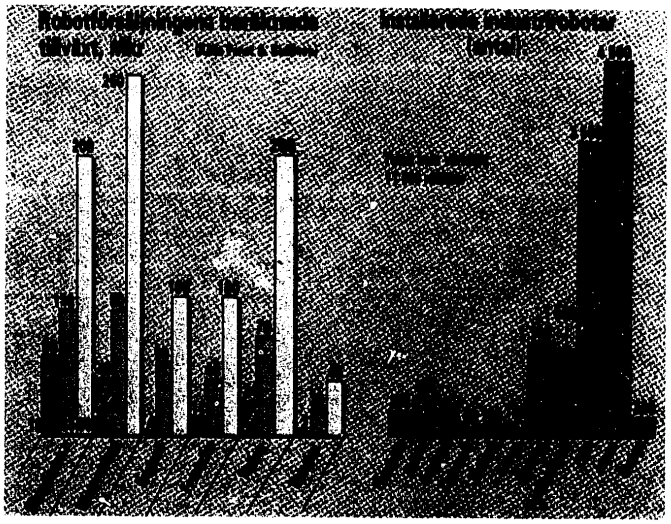


Figure 2. Sweden has the highest number of robots per capita of the entire world. In numbers Sweden is third after Japan and the United States. Against that background the Swedish market is expected to show saturation tendencies at the end of the 1980's. Important markets will then be West Germany, Italy, and England. [some details of graph illegible].

Key: 1. Robotforsaljningens beraknade tillvaxt, Mkr-Estimated growth of robot sales (millions of kronor)
2. Installerade industrirobotar (antal)-Installed industrial robots (number)
3. Totalt hela varlden: 11,500 robotar-Total for entire world: 11,500

On the Way to Being Decision Makers

Industrial robots are today moving in on more and more work places. Now there are robots which can pluck chickens, shear sheep, clean fish, wash dishes, and clean house. Hospital robots are even being developed which can lift patients while they are being bathed.

History's first industrial robot was put in use by Unimation as late as 1966, after four years of development and fabrication. It was a manipulation robot with a very simple pattern of movement. During the 1970's industrial robots have increased in complexity, and have become process robots which can do more sophisticated work such as spot welding, painting, glazing, and buffing.

The next development phase, which is occupying researchers today, are robots which can entirely take over the assembly work in factories.

"It is in that market in which the largest growth is expected to take place in the future. In Sweden we are far behind in this development. Typically it is Linkoping University which has gone the farthest with automated assembly robots. But the area is very difficult," said Bjorn Lindstrom, sales manager at Kaufeldt.

The development of sensor-equipped robots is proceeding parallel. The sensors, which can give the robots rudimentary vision, hearing, and feel, have kept researchers busy for many years, but following the rapid advance in microelectronics the development got a boost and today it is only a question of time before the first sensor-equipped robots are available on the market.

"We can expect commercial use of the sensor-equipped robots within this decade," said Tomas Silwander, sales manager at Wamac.

"Seeing robots equipped with TV cameras will be here before 1985," said John-Peter Ryott, chief of marketing for Electrolux Industrial Systems.

Seven years ago a robot was already built at Waseda University in Japan which could both see and hear. Since then the industry has taken the initiative, and sensor research is today world wide. The leading firms are Hitachi, Texas Instruments, IBM, GM, and Renault. GM has developed an advanced robot--called Consight--with an electronic camera, and Renault's TV-equipped robot can simultaneously identify 200 different objects, and select one of these, and carry out an operation. The American firm Lockheed Missiles and Space Co. has developed robots with three-dimensional vision.

The problem with today's laboratory robots is that they are still too sluggish for industrial production. That problem has been partially solved, however, by the American firm Hughes Aircraft, which has developed a robot for military purposes which by means of digital sight can operate in one-thousandth of a second.

Other senses such as feel also interest the researchers. Lord Corp. in Pennsylvania expects within 5 years to have a robot equipped with "fingertip feeling."

The next development phase will be to integrate the sensors with computers so that the robots can thereby make limited decisions. A long step in that direction has been taken by Hitachi with its developed control program, in which the robot itself can think out the most effective way to carry out a certain task.

MIT in Japan has constructed a robot which can observe someone build an arrangement of toys, and thereafter independently build a duplicate of it.

Researchers seriously predict industrial robots which gradually will be able to make logical decisions and carry out unprogrammed logical movements.

The unmanned factory is therefore not a utopia, and development toward it is proceeding very rapidly. Hitachi, Renault, Messerschmitt and Olivetti are making

rapid progress in this area, and within the automobile industry it is believed that wholly robotized factories will be a reality before 1990. Japan's government is trying hard to create the world's first unmanned factory before 1985.

9287
CSO: 3102

INDUSTRIAL TECHNOLOGY

STATE OF THE ART, FUTURE TRENDS OF ROBOTICS IN FRG

Hamburg CAPITAL in German Mar 81 pp 188, 190-191

[Text] Robotics is still in the beginning stage. However, with the automobile industry leading the way, the work automats are penetrating other branches of industry to an ever greater extent.

What till now only science fiction illustrators have sketched in their dreams is taking on concrete form on the drawing boards of industrial engineers--robots that can hear, see, feel and speak. "In the mid-eighties," prophesizes Prof Hans-Juergen Warnecke, robot designer at Stuttgart University's Fraunhofer Institute, "sensor controlled manipulating robots will have reached production maturity."

Because of their universal availability, robots will appear more and more frequently on the preferred equipment list in setting up new production facilities. For, in addition to electronic intelligence, contributed by Digital Equipment of Siemens for instance, it develops electrically driven forces which no human worker can measure up to. Thus, the job for robots is the hardest of labor.

With their power and programed capability, these machines are frequently stationed where working conditions are no longer considered suitable for human workers according to present standards. At the Jena Glass Works Schott & Gen. in Mainz for instance, industrial robots produce TV picture tubes in the presence of high temperatures from the furnaces. With a precision beyond the capability of human workers, they are already welding together body parts in numerous automobile factories.

Often the automobile firms also place spray pistols in the grippers of robots since, in consideration of the worker's health, one can no longer expect him to breathe the powder-fine paint particles. "Even while holding reservations toward robots, one still has to concede that they are a beneficial instrument for humanizing the world of work," expresses Stuttgart Professor Warnecke in defense of the spread of the agile automats into the dirty and taxing workplaces.

Volkswagen AG is the greatest employer of robots in Germany with just under 300. VW operates its own robot factory, which produces robots equipped mainly for spot welding. Spot welding is in first place in robot application with 27 percent followed by painting with 12 percent. Since these two work processes occur with great frequency in automobile construction, most robots are used in this industry.

Of course, VW attempted to sell its robot models on the open market, but this met with little success. Other automobile companies are obviously reluctant to recognize the accomplishments of a competitor.

When Daimler-Benz AG hired the first spot-welding robots, the Stuttgart firm employed the U.S. specialty company Unimation. The latter's Unimates, which took their stations on the Mercedes assembly line in 1971, had a design weakness which allowed the then still rather heavy welding claws to droop, Daimler-Benz called in the Augsburg firm Keller & Knappich (Kuka), a branch factory of the Industrie-Werke Karlsruhe Augsburg (IWKA) to help strengthen the fragile unimates. "In that year," describes Burkhard Wollschlaeger, IWKA chief responsible for robot technology, the birth of a new Kuka product "we began to develop our own robots."

Today Kuka, from its origins specialists in welding machines and garbage trucks, is probably the most ambitious German robot producer. Years of development work was recently rewarded by a large contract from BMW for 120 welding robots valued at close to DM 30 million. The work automats from Bodensee are primarily designed for transporting loads from one machine to another. Their job is to load heavy work pieces onto lathes and planing mills. ZF manager Prof Dr Ing Johannes Looman expresses amazement: "Industry still uses to some degree very antiquated methods of transportation between machines.

However, the present robots which can only blindly grab upon computer command will soon belong to the old guard. A new robot generation will in the future--at least conceptually--be able to see, hear and feel. "Herein is fulfilled the desire of many users to employ robots in serial production without having to scrap the entire assembly line at each model change," which, according to Hans-Juergen Warnecke of the Frauenhofer Association in Stuttgart, is a main objective of industrial automation. That the robot designers cannot release their model workers for factory

That the robot designers cannot release their model workers for factory installation before the mid 1980's is due to the computer people. Although they are improving their computers at a rapid pace, they are still not fast enough to, for instance, get instant response from a verbal command or to process a video picture as fast as desired. Yet a robot with installed film camera can already today distinguish light and dark, yes even shades of grey, but not yet colors. It can already, though at a snails pace, select mating parts from an unordered pile without being dependent on a human computer.

Warnecke's Stuttgart Institute has developed and sold to the Bosch Company a functional gripper sensor. Assembly work is simple for a robot when its iron gripper is provided with a type of feel. "Without sensors," admonishes automation scientist Warnecke in pushing for the refinement of manipulating automats, "a robot too often becomes confused when, for instance, a bolt or screw does not fit. But he does help himself by trying another screw."

9160
CSO: 3102

TRANSPORTATION

AIRBUS INDUSTRY: UPDATE ON PRODUCTION RATE, SALES

Paris AIR & COSMOS in French 14 Feb 81 p 18

[Article: "Iberia, 23rd User of the Airbus"]

[Text] The number of Airbus units in service as well as the number of users is increasing steadily each month.

It should be pointed out that by 31 December 119 Airbus aircraft (44 of the A-300-B2 type and 75 of the A-300-B4 type) are being used by 20 companies, including Air France and Lufthansa (who were the first to use this aircraft) and Eastern Airlines with 17 units (nine B2-100 and eight B4-100/200), 10 units (five B2-100 and five B4-100) and 19 units (two B2-200 and 17 of the B4-100 type) respectively. During the month of December alone, six A-300's had been delivered: one A-300 B4-200 to Alitalia, one A-300 B2-300 (with JT9D engines) to SAS, two A-300 B2-200 to Eastern and two A-300 B2-200 to TDA.

On 8 January, Laker Airways took delivery of the first of its six A-300 B4-200 aircraft which had left the ground for the first time on 18 November at Toulouse. The second Airbus assigned to Laker first flew at the end of December and will be delivered at the end of this month to the British company which has become its 21st user. It should be noted that the Airbus had received the British CAA certificate on 2 December.

The 19th of January was the departure date from Toulouse, bound for Singapore, of the first of 12 (6 + 6) A-300 B4-200 earmarked for Singapore Airlines, the 22nd user. The second aircraft for this company is being delivered this month, the third in March, the next two at the beginning of 1982 and the sixth at the beginning of 1983.

The 23rd company to place the Airbus in service will be Iberia (next month), which has ordered nine of the A-300 B4-100 type with JT9D engines (thus, it will be the second user, after SAS, of Pratt and Whitney engines). The first A-300 of Iberia Airlines made its first flight from Toulouse on 13 January. The next companies to joint the parade this year are Air Afrique (24th user) and Trans Australia Airlines (25th user). In May, Air Afrique will receive an A-300 B4-200 with CF6-50 engines which will fly by the end of this month. TAA will receive the first of its seven (4 + 3) A-300 B4-100's in June.

The production rate of the Airbus industry was 3.6 aircraft per month in December. It will be four per month by mid-1982, 6.5 by 1983 and eight per month by 1984. The 400th Airbus will leave the assembly line at the beginning of 1985.

7619
CSO: 3102

TRANSPORTATION

AIRBUS ASSEMBLY LINE TO PRODUCE TEN CRAFT PER MONTH BY 1985

Paris AIR & COSMOS in French 21 Mar 81 pp 35-36

[Article by Gerard Collin]

[Text] The rapid and considerable increase in the rate of Airbus consumption has required the installation of appropriate means of production.

This production effort can be better understood by noting that: on one hand, it involves an assembly line that will make it possible to assemble two types of aircraft: the A.300 and A.310 and not a single model as is usually the case, although these two aircraft do have extensive fuselage components in common; on the other hand, this assembly line will attain a monthly production rate of seven planes by 1983 and then eight, nine and 10 planes by the end of 1985.

Now no manufacturer, and this is a basic feature, has ever produced large transport aircraft at such a rate on a single assembly line. Boeing attained a rate of seven planes per month in the case of the B747 (AIR & COSMOS No. 842, p. 19), but two parallel lines were used!

Thus we can better gage the effort made by SNIAS [National Industrial Aerospace Company] and the dominant role of OES (Special Machinery and Equipment Company), commissioned to design and build the new assembly line and whose function, in relation to SNIAS, is also more or less that of a combined engineering-outfitting group.

This assembly line has thus been completely reexamined to satisfy productivity requirements and also to achieve greater versatility (equal handling of the A.300 B2-B4, A.310 and A.300-600).

Simply stated, the assembly line is comprised of a series of stations as follows: station 45 -- nose cone assembly; stations 42 and 43--equipment installation; station 40--airfoil/fuselage assembly; station 35--overall assembly; station 25--finishing work before exit to painting hangar.

The effort of SNIAS and OES was initially concentrated on station 35. A new station was set up in July 1980 and has been in operation since 1 August, when it joined together A.300 aircraft number 123. OES thus installed 150 tons of equipment in 3 weeks! This new station is mainly characterized by: --direct hoisting of the aircraft to a height of 6 meters. Formerly, the "plane" was brought in at a height

of 4.3 meters and then raised to 6 meters for installation of the undercarriage. Now the aircraft is raised to 6 meters as soon as it moves into the station, which means that time is saved. --mechanization of equipment by combined jacks along the three axes.

Altogether, the equipment thus has six degrees of freedom (three axes on each side of the aircraft). This is therefore a highly mechanized frame that opens: within 5 minutes. The components move along rails attached to the floor and alined with great accuracy. The main component, the airfoil and fuselage, is moved to the platform and positioned. Related components (front, rear undercarriages) are then positioned by "mechanical gaging," which means that the equipment itself is used as a gage. Accuracy: 1/10 mm, or a very fine alinement considering the dimensions of the parts in question.

The operation of installing the various equipment, and thus the aircraft components, is carried out in less than 1 hour. Following assembly, the frame opens within 5 minutes. This is the "withdrawal" of the aircraft, which is thus released so that it can move to the following station, number 25.

OES and SNIAS later made plans to improve work station 40, i.e., the station for fuselage-airfoil assembly. The new equipment will facilitate the work of operators (for on-the-spot machining in particular) and the walkways over the wing sockets may possibly be mechanized as well. Station 40 will also then be able to handle the A.300 and A.310, although the latter's airfoil is new in comparison to the A.310.

Also under study is the improvement of station 25 (equipment installation, finishing and testing, installation of tail fin and PHR [expansion unknown]).

Other Ideas

Over the longer term, OES is studying new techniques which can be applied to assembly lines to improve the design of the line or its operation: mockups on a scale of about 1/10, making it possible to realistically simulate the line in operation; movement of airframe components by equipment on air cushions and positioning by automatic gaging with pressure cutoff; positioning control by lasers and automatic position control systems.

Such developments will definitely require even closer cooperation and coordination between the partners, going far beyond the ordinary technical services usually required of subcontracting companies.

OES: Specialized Aeronautical Equipment Outfitter

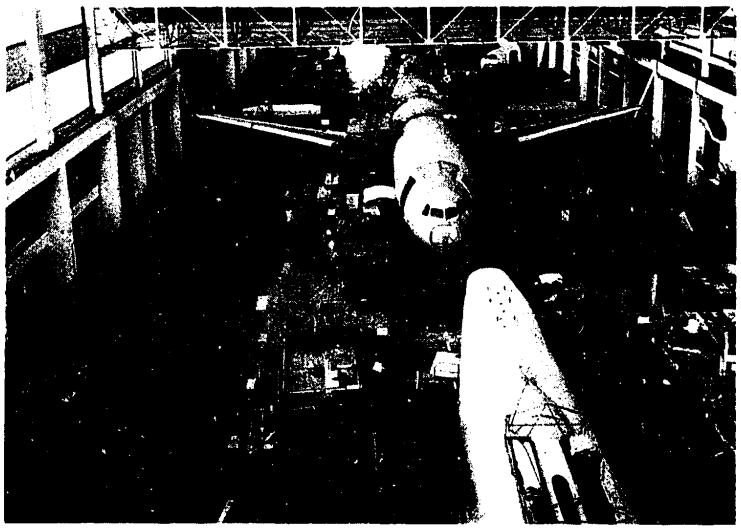
The Special Machinery and Equipment Company, OES, at Epinay-sur-Seine in the Paris area employs about 380 people, including 50 engineers and professionals. It has specialized in the supply of equipment for 20-25 years, mainly for the automobile and nuclear energy sectors and then aeronautics and space technology. More than 40 percent of the company's operations are concerned with the latter area, with current peaks of 70 percent.

Besides SNIAS, among its other aerospace operations we should also mention Dassault Electronics (Mercure, Mirage F1 ...) and Thomson-CSF [Thomson-General Radio Company],

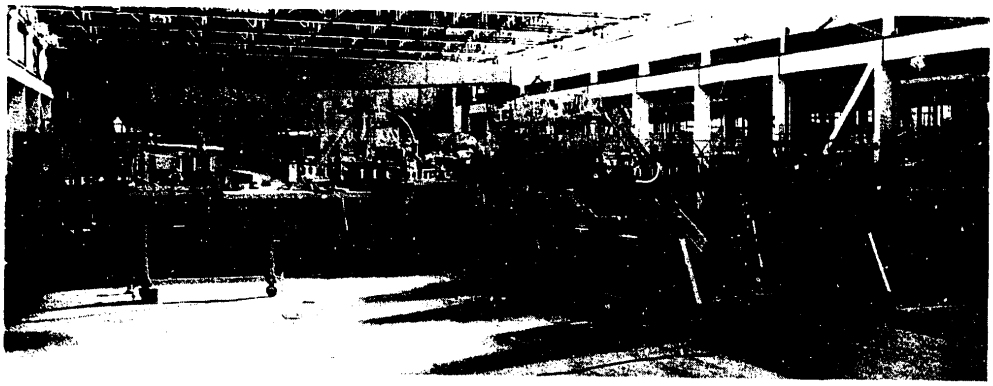
the first stage of the Ariane rocket, SNECMA [National Aircraft Engine Design and Construction Company] and CEP/Saclay.

Through its automobile operations, OES believes that it has acquired experience with high production rates, which "mass production" aeronautics can utilize. Obviously, there is no possibility of the same production rates, but rather a matter of mechanizing and automating the Airbus production line on the basis of the same concepts.

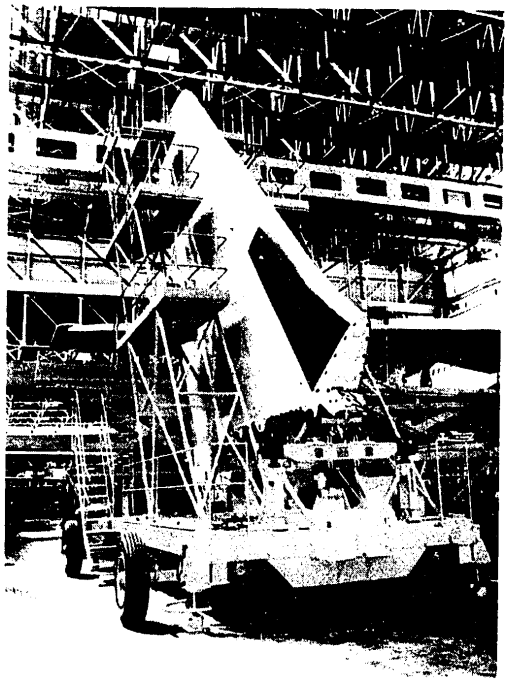
In the case of the Airbus, the company believes that the close complementarity of the knowledge and experience of OES and SNIAS has initially produced highly detailed coordination which has led the airframe manufacturer to organize the assembly line on the basis of special equipment, their control systems and their operational possibilities. This new approach to the problem in itself constitutes an innovation, for which the equipment outfitter is responsible, in developing the respective machinery: analysis of work stations, design of plant, assembly and control equipment, mechanical or laser gaging, formulation of technical jargon needed for communication.



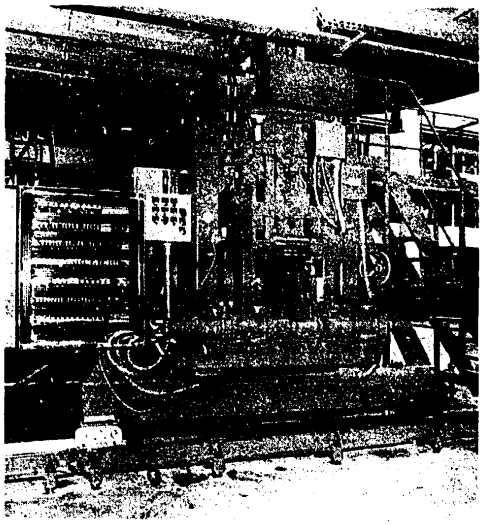
In the process of withdrawal, automated release of aircraft at station 35.



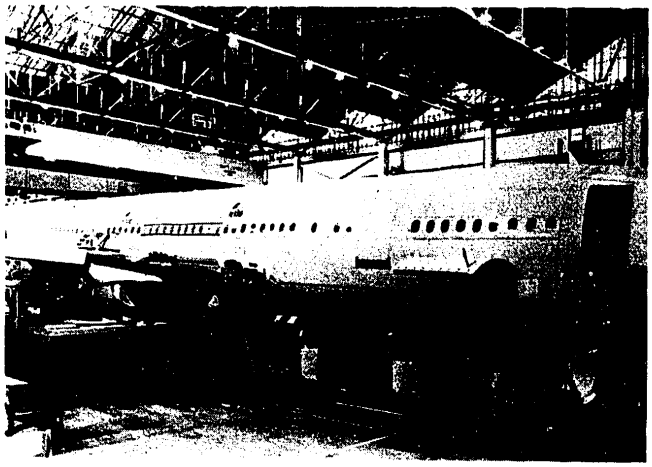
A.300 B2-B4, A.310 and A.300-600 assembly line being installed. Detail of supporting components and movable supporting and positioning components.



Automatic turning and positioning system for A.300 and A.310 tail fin.



Detail of positioning and gaging by automated trolleys.



General view of assembly station 35.

11915
CSO: 3102

TRANSPORTATION

BRIEFS

LPG TO FUEL VEHICLES--BP of Germany has opened its first "autogas" pump in the Schwabengarage in Stuttgart. In coming months a total of 20 BP filling stations in major German cities are expected to offer liquid gas for fueling suitably equipped vehicles, a service that is already widespread in other European countries, particularly Italy. "Autogas" costs 89 pfennigs per liter at the pump, currently about 40 pfennigs per liter less than premium grade gasoline. However, because of its lower thermal value, liquid gas consumption is about 1 to 20 percent higher than with gasoline. Although the cost of converting a vehicle to operation on liquid gas is between DM 1,500 and DM 2,000, BP of Germany estimates that liquid gas can take a 6-percent share of the market in the next 5 to 7 years. Based on current gasoline consumption of about 24 million tons/year, that means a volume of 1.5 million tons/year of liquid gas, which would be available over the long term (c.f. October issue, p 489). This prognosis will come true sooner, if--as is under discussion in Bonn--the present mineral oil tax rate on liquid gas for road traffic is lowered from 33 pfennigs/liter. [Text] [Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Jan 81 p 3] 9581

ELECTRIC VEHICLE TESTS IN BERLIN--The second test phase (1980 to 1982) of the high-priority project "Alternative Energies for Vehicular Transport," which is being sponsored by the Ministry for Research and Technology (BMFT), has begun. Following the delivery of the first automobiles and light-duty trucks for operation on methanol fuel in Berlin, electric vehicles were prepared for testing in inner-city traffic, also in Berlin. The purpose of this DM 15 million project is to establish the best areas of application among those contemplated for the electric vehicle, taking energy and environmental concerns into consideration. VW is participating in the vehicle test with 50 electric light-duty trucks. They are equipped with a compact DC motor, which has a continuous output of 17 kW and a maximum output of 33 kW at 144 volts. The vehicle accelerates from 0-50 km/hour in 12 secs. Its range on a single battery charge is about 50 kms. The 6-volt modular construction lead-acid batteries weigh about 750 kgs, load capacity is about 800 kgs. Daimler-Benz is sending 18 electric light-duty trucks and 1 electric passenger car. In this instance the shunt-wound DC motor has an output of 50 kW. Using this battery, which is rated at 180 volts, the truck has an operational radius of 65 kms at a constant 50 km/hour with a load capacity of 1.45 tons. There are plans to use a newly developed nickel-iron battery in the passenger car, with about double the capacity of a similar lead battery. Maximum speed is about 100 km/hour. The project is being supervised by the Rhineland office of the TUeV FRG automobile inspection. [Text] [Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Jan 81 p 3] 9581

SHORTS 360 PROGRESSING--The initial flight of the prototype of the Shorts 360 aircraft is now planned for the month of December (instead of September as had been previously announced) and the certification is scheduled for October 1982. The first deliveries will be made in November of the same year. Assembly of the principal parts is due to begin in March. The initial rate of production will be three aircraft per month. Many subcontractors have been designated. Fokker and British Havercraft will participate in the manufacture of the airfoil (the extreme portion by Fokker, the same as for the Shorts 330 airplane). Dowty Rotol will furnish the landing gear. The firm of C. F. Taylor will build the fuel tanks as well as the fairing of the aircraft. Six airplanes of the Shorts 360 model have already been ordered by two local American companies (three by Suburban Airlines and three by Chautauqua Airlines) which have already been operating the 330 model. Its price was $3.25 million in 1980. [Text] [Paris AIR & COSMOS in French 14 Feb 81 p 18] 7619

CSO: 3102 END