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West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 12/82)

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WEST EUROPE REPORT

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CONTENTS

ELECTRONICS

FRENCH AERONAUTICAL INDUSTRY USES, PRODUCES GATE ARRAYS

Paris AIR & COSMOS in French 3 Apr 82 pp 37, 38, 41

[Article by Gerard Collin: "The Vogue of Gate Arrays"]

[Excerpt] Seductive

Prediffused arrays seem indeed very attractive: they truly appear to be the approach of the future, leaving the arena of specific integrated circuits solely to universal components (such as microprocessors and memories), and the few very large production circuits. Prediffused circuits thus encroach both on custom and on hybrids circuits; but they can also become specific components in hybrid microelectronics, with which they are compatible.

It should therefore not be surprising that the components industry is wide open for gate-arrays. In France, Thomson-CSF, through EFCIS, has installed in St. Egreve, near Grenoble, a unit to produce CMOS and bipolar gate-arrays, going as far as the characterization of circuits for the final user. Matra Harris, in Nantes, launched a family of CMOS gate-arrays with 400, 800, 1200, and soon, 2000 and 5000 gates in 1983. RTC as well, is launching a range of circuits (see p 41, this issue). Also in the running, are Eurotechnique, SINTRA, SOREP, and others.

This general trend of the national components industry will be followed with interest by equipment manufacturers.

It should be added that until now, such circuits were available only abroad, and mainly in the United States (in the Silicon Valley, of course!), an area in which a French company, Atac Diffusion, subsidiary of the Elf Aquitaine group, has already established some roots.

Atac Diffusion

Today, Atac Diffusion consists of 17 persons, and represents in France the American company Interdesign (which has itself become a subsidiary of Ferranti), which produces bipolar and CMOS gate-arrays. Atac Diffusion also represents Ferranti for ULA digital bipolar gate-arrays. And finally, Atac Diffusion has just reached an agreement with ZYMOS, a company which offers circuits presented as intermediates between gate-arrays and custom circuits, based on catalogs! For Mr Creugny, of Atac, these circuits represent a new step in the field of integrated circuits, coming closer to full custom but retaining the flexibility of gate-arrays. This should prove, as if proof were needed, that gate- arrays are evolving. According to Atac, the "catalog full custom" (a grammatically offensive name) is typically 50 percent larger in area than custom integrated circuits (and thus 50 percent more expensive in recurring costs), but two to five times less expensive in development: the lead time for delivery of the first circuits would be only two months according to Atac! The computer resources for moving from electrical circuit drawings to the design of interconnection masks are being developed at Atac, and should be operational by the end of May.

Atac already has the means to personalize gate-arrays, in the guise of Applicon CAD (computer-aided design) equipment. But Atac is also very open to different types of cooperation with equipment manufacturers: from supplying bare circuits to the delivery of finished ones, and including the training of customer engineers in the techniques of circuit personalization. Atac also expects to subcontract the production of circuits in France.

Atac has already established contacts with several French aeronautics companies, such as Sagem, Sfena, Dassault, Matra, Deutsch, and Thomson-CSF.

CAD

One of the important features of gate-arrays is that their personalization can be performed by the equipment manufacturers themselves. Indeed, the manufacturer can work on the arrays in his own plant, thus eliminating the need to deal with a microelectronics company and maintaining full control of his own components. This was the approach taken taken by Sagem, which today appears to be one of the French leaders in the use of gate-arrays, from circuit study to mass production.

Sagem has already installed, in Argenteuil, considerable resources for computer processing of gate-arrays through all their steps:

Translation of circuit diagrams by means of CAD. At this point in the process, an experienced engineer has already a fairly good idea of the gate-array which will ultimately be used. This is followed by a computer simulation of the electronic circuit's operation, which involves an electrical simulation (voltage and temperature variations), static and dynamic simulations, and verification of testing capabilities. In this respect, Sagem has already acquired extensive knowledge of, or experience with the programs known among specialists as DIANA, SPICE 1 and 2, ASTEC, LOC CAP, TEGA V, and SAGDYN (the latter having been developed by Sagem itself).

These programs are run on Sagem's computers, or at such firms as CISI or Control Data. At this level of the study, the engineers are practic lly sure of the choice of the final gate-array.

The next step is the mask design. Given the selected gate-array, and therefore the available grid, the interconnection circuit is designed to prepare the mask design.

Sagem is currently aiming for 70-75 percent rates, but higher ones are possible, particularly with sequential logic circuits.

The circuit is designed with interactive CAD (Applicon): the operator has access to a cell catalog, a library which is gradually enriched by the operator himself, who eliminates inevitable interconnection conflicts (crossings) by such means as taking advantage of underpasses provided in the gate-array.

Beyond this CAD, Sagem expects to install programs for automatic location and routing.

Once the implantation has been finalized, a timing analysis can also be performed by the computer, which in addition verifies that the rules of the art, such as spacing between connections, line widths, and so on, have been respected (design route check).

The remainder of the process is no less computerized: creating the magnetic tapes which will control mask design (pattern generator) and the tape for automatically testing the circuit, with definition of test programs and equipment!

To top it all, we should add that Sagem is installing means for qualifying samples, and for characterizing transistors and modelling their behavior!

For production itself, Sagem is installing facilities for mask personalization, primarily using, for the purpose, equipment and procedures already established for thin-film hybrids. These means are of course intended to assure the production of gate-arrays for Sagem's internal needs (aerospace, rockets, defense), but the company is already offering its know-how to outside customers: the lead times for availability of first tested samples are shorter than three months (including custom delays). It should be noted that Sagem has already obtained circuits that were good on the first try, with a single modification being the maximum required!

Sagem has thus created five new circuits in the last six months; typical of the gate-arrays that have already been fabricated for aeronautics are:

A frequency dividing chain for supplying gyroscopes and gyrometers;
Logic circuits for detecting and analyzing failures in redundant systems;
And incremental accumulators for strap-down components.

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ELECTRONICS

RTC INTRODUCES COMPLETE LINE OF ECL GATE ARRAYS

Paris AIR & COSMOS in French 3 Apr 82 p 41

[Unsigned article]

[Text] RTC has introduced a complete line of ECL-technology gate-arrays, called the ACE (Advanced Customized ECL) family.

ACE arrays are characterized by their speed (0.4 ns/gate); their factor of merit (1 pJ); and a computerized simplified design.

The line will include five ACE arrays that differ in the complexity of their logic: 600 (600 gates, 24 internal cells); 900 (900 gates, 36 internal cells); 1400 (1400 gates, 60 internal cells); 2200 (2200 gates, 100 internal cells); 1256 (1000 gates, 256 RAM memory points, and 48 internal cells).

ACE arrays are compatible with 10K and 100K ECL's, which then benefit from the same performances. Moreover, 1K and 4K RAM memories are equally 10K or 100K-compatible with the same performances.

Speed

For gates: propagation time is 0.35 ns for CML-technology internal gates, that is, gates without power transistors, used solely for ECL outputs;

For a flip-flop connected as divider, the input signal frequency is 400 MHz;

The rise or decay time of input and output gates is 0.75 ns. This speed gives the array a speed fully compatible with the 100K ECL.

Factor of Merit

(Product of consumption times speed, generally used to compare technologies with one another). For ACE arrays, the consumption per gate is 2-3 mW for a speed of 0.35 ns, which gives a factor of merit of one picojoule. As a comparison, and at the other end of the performance scale, one can consider a CMOS LSI circuit whose consumption per gate is about 100 mW for a speed of 10 ns, which is also of the order of 1 pJ.

ACE arrays have the following consumptions: 1.8 W for the ACE 600, 2.3 W for the ACE 900, 3.5 W for the ACE 1400, 5 W for the ACE 2200, and 3.5 W for the ACE 1256.

The consumption per gate is between 2 and 3 mW.

A standard 100K ECL circuit consumes 40 mW per gate. The consumption gain factor is of the order of 20.

Package

ACE 600 and ACE 900: 64 pins; ACE 1400, ACE 2200, and ACE 1256: 120 pins.

Availability dates: ACE 600 and ACE 900, available; ACE 1400, third quarter of 1982; ACE 2200, first quarter of 1983; ACE 1256, second quarter of 1983.

RTC has formed an "expertise center," whose function is to train and later assist customers during the whole design period, or to fulfill this function in their stead. In 1981, this center trained several customers in the use of ECL and ISL gate-arrays, in the areas of computers and telecommunications for civilian or military applications.

Improved design assistance tools (catalogs, design manuals, and so on) have been a second aspect of the center's activities.

Finally, RTC has completed its line of gate-arrays with the introduction of a LOCMOS 700-gate array.

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ENERGY

RHEINBRAUN DEVELOPS FLUIDIZED-BED GASIFICATION PROCESSES

Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Apr 82 pp 178-184

[Article by Dr Hans Teggers, Dr Karl-August Theis, Dr Lothar Schrader, Rheinische Braunkohlenwerke AG [Incorporated], Stuettgenweg 2, D-5000, Cologne 41: "Synthesis Gases and Synthetic Natural Gas from Brown Coal"]

[Excerpts] Rheinische Braunkohlenwerke AG (Rheinbraun) is developing two fluidized-bed gasification processes operating under pressure. On the one hand the High-Temperature-Winkler-(HTW-) Process for the generation of CO and H_2-rich Synthesis Gas and on the other hand the Hydrogasification of Coal (HKV) to generate Substitute Natural Gas (SNG). Building of commercial-scale plants are proposed for both processes. The first line of a HTW-Demonstration plant in a commercial scale is scheduled for operation in 1984. The plant with finally deliver 1 billion m^3/yr synthesis gas for methanol production by 1987. The HKV-Demonstration plant of the same capacity is scheduled for operation in about 1990.

1. Introduction

The generation of gases from coal for chemical syntheses and as energy source has been known already since the last century. During the 1960's, gas from coal in the chemical industry sector was displaced by synthesis gas from heavy oil, crude gasoline, or natural gas and from the energy sector by natural gas for reasons of economy. Since the start of the 1970's gas generation from coal has again been constantly assuming greater significance due to the constant rise in the cost of crude oil and natural gas. This applies above all to coal grades which are easy to mine and which have a high reaction capability, for example, in the FRG, brown coal from the Rhineland. The Rhineland brown coal plants follow a concept graduated in terms of time and content which features the development of two gasification processes, that is to say, first of all for the generation of synthesis gas and then for the generation of synthetic natural gas.

Due to the high reaction capability and the fine-grained aspect connected with the production process as such, both cases point to the use of fluidized bed methods. The development effort extends via the construction and operation of experimental and pilot plants--for whose promotion we would like to thank the BMFT [Federal Ministry of Research and Technology] at this point in this study --all the way to demonstration plants.

2. Synthesis Gas from Brown Coal: HTW Method

2.1. Development of High-Temperature-Winkler Method

Union Rheinische Braunkohlen Kraftstoff AG (UK [division] Wesseling), an affiliate of Rheinische Braunkohlenwerke, during the 1950's and 1960's operated a synthesis gas generation facility with two Winkler gasifiers each with 17,000 m^3 (i.N. [standard])/hr crude gas capacity.

On the basis of these experiences, this technology was developed further with the objective of improving the performance data and the gas quality through an increase in the pressure and the temperature. The higher temperature gave the process the name HTW (High-Temperature Winkler) method. Here are the main points in this improvement:

Gasification under pressure to increase the specific output and to reduce the compression energy for the subsequent chemical syntheses;

Gasification at higher temperatures to improve the gas quality and to increase the volume processed;

Increase in carbon processing rate through return of dust, expelled overhead into the fluidized bed.

The fundamentals of the method were developed in a technical testing facility at the RWTH [Rhine-Westphalian Technical College] in Aachen. This plant is still being used for basic research to check the applicability of the method for various other types of coal and carbon sources. In the middle of 1978, an HTW pilot plant was placed in operation on the grounds of the Frechen factory near Cologne. At this time, a demonstration plant for the generation of methanol synthesis gas on an industrial scale is being planned; its first line is to go into operation in 1984.

The HTW method furthermore can be used for the generation of:

Reduction gas for metallurgical purposes,

Hydrogen as chemical raw material and for hydration purposes,

Lean gas for burning purposes.

2.2. Description of HTW Experimental Plant

Here are the essential design data for the HTW experimental plant;

Coal processing rate	Up to 1,300 kg/hr dry brown coal
Gasification agent	Oxygen/water vapor or air
Gas production	Up to 2,200 m^3 (i.N.)/hr or 107 kmol/hr
Gasification pressure	Up to 10 bar
Gasification temperature	Up to 1,100° C
Completion	1978

Figure 1 shows a simplified flow diagram for the experimental plant. The charge coal for the plant is dry brown coal with 18 percent water content, such as it is used for briquette production. The water content, depending on the goal of the experiment, can be reduced further to 8-12 percent in a twist-tube drier.

The coal is brought to the reaction pressure of up to 10 bar by means of a system of locks and is introduced into the fluidized bed gasifier via a worm gear.

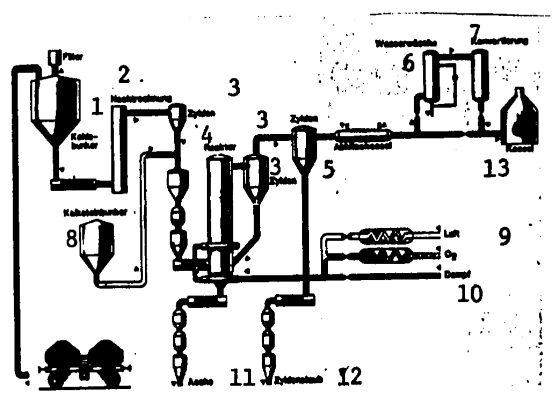

Figure 1. Flow diagram of HTW experimental plant. Key: 1--Coal hopper; 2--Secondary drying; 3--Cyclone; 4--Reactor; 5--Waste heat boiler; 6--Water washing; 7--Conversion; 8--Limestone hopper; 9--Air; 10--Steam; 11--Ash; 12--Cyclone dust; 13--Boiler.

In the gasifier, the coal reacts with the preheated gasification agent which can consist either of oxygen/steam or air and which is supplied on various levels of height.

Smaller coke particles leave the gas generator at the reactor head along with the raw gas. The coarser particles are separated in a first separator and are returned to the fluidized bed. Further separation of particles carried along from the raw gas takes place in the second separator; the ash developing at the foot of the reactor is evacuated by means of a cooling worm gear and pressure is removed by means of a lock system. In the experimental plant, the gas thus purified is cooled in a waste heat boiler and is them burned in the power plant.

3. SNG from Brown Coal: Hydrogasification of Coal

3.1. Main Development Points and Areas of Application

The production of artificial natural gas (SNG) offers special advantages from the angle of long-term marketing possibilities. For this purpose, hydrogasification of coal--likewise a pressure fluidized bed measure--was developed. Gasification with hydrogen leads to a particularly high primary methane content in the raw gas and is thus particularly suitable for SNG generation. The hydrogen can be supplied in two ways (Figure 10). In the first case, the residual coke from hydrogasification is gasified with the help of the previously described HTW method and the raw gas is converted into hydrogen in a corresponding, subsequently connected gas treatment plant. This combination process on the whole features a low oxygen requirement, a high carbon processing rate, and does not require any methanization step.

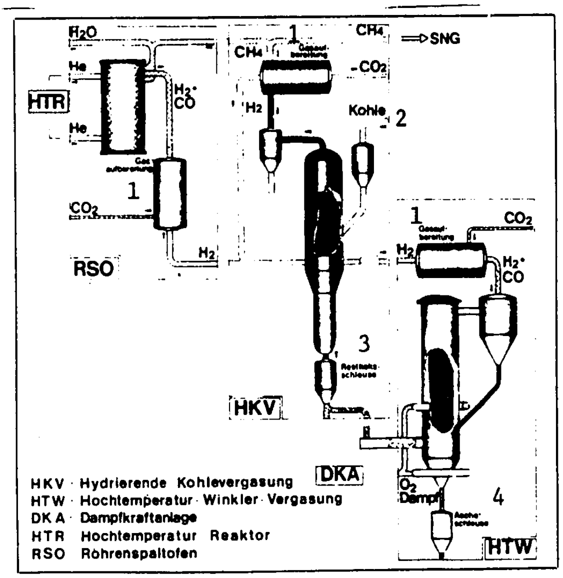

Figure 10. Combined method for brown coal gasification: HKV-RSO or HKV-HTW. Key: 1--Gas treatment; 2--Coal; 3--Residual coke lock; 4--Ash lock; HKV--Hydrogasification of coal; HTW--High-temperature Winkler gasification; DKA--Steam power plant; HTR--High-temperature reactor; RSO--Pipe fission furnace.

The energy supply in the form of steam and current can come from fossil or nuclear power plants. The second possibility of hydrogen preparation consists in connecting hydrogasification of coal with a high-temperature nuclear reactor. Here, a part of the methane generated is catalytically converted into a hydrogen-rich gas in a pipe fission furnace with the nuclear process heat. This combination process leads to a coal saving of up to 40 percent and furthermore, in long-range terms, also promises to yield economic advantages. The hydrogasification of coal method thus offers the special advantage that both conventionally a part of the energy requirement can be met from fossil or nuclear power plants and that complete energy supply is also possible through gas-cooled high-temperature nuclear reactors.

3.2. Description of HKV Experimental Plant

An experimental plant with a coal requirement of 0.4 t/hr has been in operation successfully since 1975 on the grounds of Union Rheinishce Braunkohlen Kraftstoff in Wesseling. This plant was built by the Lurgi Company of Frankfurt as engineering partner. The flow diagram of this experimental plant is illustrated in Figure 11. The predried coal is brought up to gasification pressure, as in the HTW method, via a system of locks and is then placed on the fluidized bed via a worm gear or it is inserted into the lower part of the fluidized bed via a slanting pipe. Hydrogen, the preheated gasification agent, is inserted in the lower part of the gasifier and at the same time serves as eddy medium. As in the case of the HTW method, the raw gas is taken off at the gasifier head, it is purified in a subsequently connected cyclone, and it is then cooled and burned. The plant was in experimental operation until the end of September 1981 for about 21,700 hrs, including almost 9,500 hrs under gasification conditions. During that time, almost 1,400 t of dry brown coal were processed at gasification temperatures between 820 and 1,000° C and gasification pressures between 55 and 95 bar. Here, a methane content in the raw gas of almost 50 percent by volume and C processing rates of up to 82 percent were obtained. The longest continuing experimental phase came to 31 days.

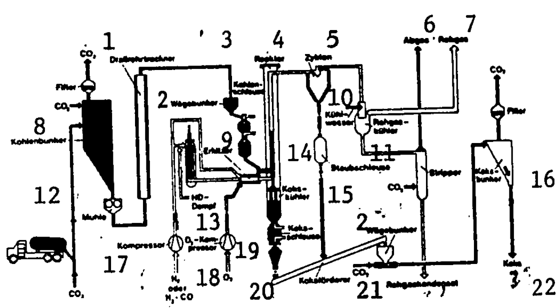

Figure 11. Semi-industrial experimental plant for hydrogasification of coal. Key: 1--Twist pipe drier; 2--Weighing hopper; 3--Coal lock; 4--Reactor; 5--Cyclone; 6--Waste gas; 7--Raw gas; 8--Coal hopper; 9--Heater; 10--Cooling water; 11--Raw gas cooler; 12--Mill; 13--High-pressure steam; 14--Coke cooler; 15--Dust lock; 16--Coke hopper; 17--Compressor; 18--O_2 [illegible] compressor; 19--Coke lock; 20--Coke conveyor; 21--Raw gas condensate; 22--Coke; oder--or.

3.4. Status of Work on HKV Pilot Plant

In the previously described experimental plant, all essential parameters--such as, for example, the degree of gasification, the raw gas composition, and the gasifier output--were determined and the foundation for the design of a larger pilot plant was thus worked out. This plant will have a raw coal requirement of about 25 t/hr and it will go into operation in 1982. In the experimental plant, the emphasis was only on the real gasification step; this pilot plant will contain all essential system components all the way to the finished product, that is, SNG. Figure 16 shows a rough process flow chart with the essential design data for this pilot plant which is likewise being erected on the grounds of the Wesseling UK at this time in the immediate vicinity of the HKV experimental plant.

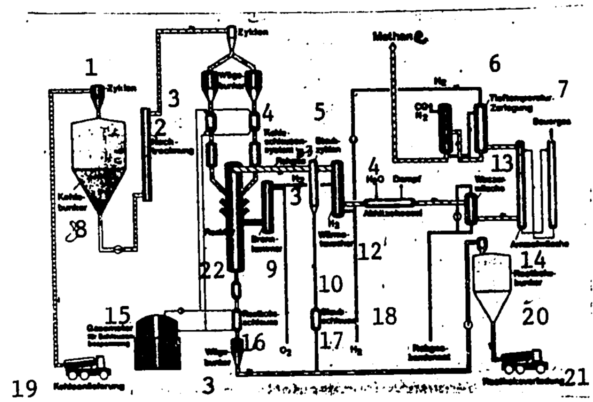

Figure 16. Hydrogasification of coal pilot plant. Key: 1--Cyclone; 2--Secondary drying; 3--Weighing hopper; 4--Coal lock system; 5--Dust cyclone; 6--Low-temperature decomposition; 7--[illegible in photostat]; 8--Coal hopper; 9--Combustion chamber; 10--Heat exchanger; 11--Steam; 12--Waste heat boiler; 13--Water washing; 14--[illegible]; 15--Gas meter for lock stressing; 16--Residual coke lock; 17--Dust lock; 18--Raw condensate; 19--Coal delivery; 20--Residual coke hopper; 21--Residual coke loading; 22--Reactor; 23--Raw gas. Gasification pressure up to 120 bar; coal processing rate up to 9.6 t/hr TBK_1; Gasification temperature up to 950° C; gas output up to 7,800 m^3 (i.N.)/hr.

To design the application of gas to the gas generator [gassing of the gas generator] and to cool the residual coke produced, comprehensive flow-mechanics investigations were again conducted here at the industrial chemistry institute of the University of Hanover.

After sufficient results are available from the operation of this pilot plant, plans call for operating a demonstration plant of a commercial size with an SNG output of about 1 billion m^3/yr with conventional energy supply by about 1990. Here again it will be possible to use the lessons learned from the operation of the HTW demonstration plant.

In a next step, in long-range terms, the tie-in with the high-temperature nuclear reactor can then take place if this reactor type is improved in keeping with its ultimate purpose.

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TRANSPORTATION

A 310: FIRST PERFORMANCE TESTS PROMISING

Paris AIR & COSMOS in French 24 Apr 82 pp 13, 60

[Article: "Airbus a 310: 26 Flight Hours in 7 Takeoffs and Landings"]

[Text] Commencing at Toulouse Saturday 3 April, flight tests of Airbus No, 162, in other words A 310 No. 1, continue with impressive regularity in the hands of Bernard Ziegler and Pierre Baud; two other pilots, Gilbert Defer and Gordon Corps, have also piloted the new plane.

On Tuesday 20 April, the A 310 totaled 26 hours 20 minutes of flight in 7 take-offs and landings. After its first flight on 3 April (duration: 3 hours 15 minutes), the plane completed the following ones:

--Flight No. 2 (8 April): 4 hours 45 min of flight;

--Flight No. 3 (10 April): 4 hours of flight;

--Flight No. 4 (14 April): 3 hours 40 min;

--Flight No. 5 (15 April): 3 hours;

--Flight No. 6 (17 April): 4 hours 5 min;

--Flight No. 7 (20 April): 3 hours 25 min.

The next takeoff (Flight No. 8) is scheduled for 24 April. As for A 310 No. 2 (plane No. 172), it will start its flight tests in early May, its first flight being scheduled for 7 May.

Bernard Ziegler confirmed to us Tuesday that up to now he has "every reason to feel satisfied with the results obtained in the course of these 7 flights." Testing is proceeding exactly on schedule; exploration of the flight domain has already justified reaching into the higher speeds, up to Mach 0.78/360 knots and Mach 0.82/380 knots (The next flight should permit going to Mach 0.84). The plane's behavior is "very sound"; in particular: "The test team has observed nothing in the plane's performance characteristics to date to warrant a departure from the original purity of its airfoil.*

Among the tests carried out, the following are worthy of note: Study of its maneuvering limits without buffeting at high altitude (35,000 feet), making it possible as of now to conclude that its maximum ceilings (a function of weight) can be substantially increased; stall performance tests in all flight configurations (stringer, slats and flaps out), showing that no modification is required; performance tests with one engine stopped, and reignition tests; automatic approaches with slats and flaps at 20 degrees; takeoffs at maximum weight (132 tons); and, of course, flutter tests, starting from the third flight and based on the use of flutter vanes, or aerodynamic exciters (one per wing), which permit the obtention at will of symmetric or antisymmetric excitations at controlled frequencies.

In sum, the performance tests carried out to date indicate that the A 310's efficiency over a type-hop could be improved by 5 percent over its calculated one. Decidely, at Toulouse as at Seattle (see page 15), the engineers are performing miracles...

* Which, in plain language, means that the A 310 will very likely be able to do without the conventional "vortex generators" that caused so much ink to flow a few years ago. We note in passing that the B 767 has them (see page 15); which does not mean, of course, that the wing of the American plane was incorrectly designed, to borrow from the expression so imprudently used with regard to the A 300 by a French deputy...

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CSO: 3102/272

TRANSPORTATION

AIRBUS: A 310 TESTS, PRODUCTION, EQUIPMENT

Paris AIR & COSMOS in French 30 Apr 82 p 12

[Article by J. M.: "A 310 Ahead of Schedule"]

[Text] Test flights of Airbus A 310 No. 1 are continuing at Toulouse with the same regularity. Last week (Tuesday 20 April), we were at 26 hours 20 min of flight time accumulated in 7 flights; this Tuesday 27 April, Bernard Ziegler brought us up to date again on the test program: The 10th flight had been completed that morning and the plane had at that time chalked up 35 hours 55 min of flight.

The most recent flights were devoted especially to flutter tests (which actually began with the third flight), still using "flutter vanes" (aerodynamic exciters), and to the calibration of the Air Data Computer (an anemometer system), on the proper functioning of which will depend the precision of performance measurements. Two other flights have been scheduled for this week; thus, over a period of 1 month, the A 310 will very probably have completed a good dozen flights and more than 40 hours of flight, which represents a net gain over its planned schedule (35 flight hour per month).

From the production standpoint, the coming off the assembly line of the first of the four A 300 B4-200's for China Airlines, equipped with Pratt and Whitney JT9D-56A engines, was reported on 13 April (see AIR ET COSMOS No. 902, p 19), and on that same date the maiden flight of the A 300 B4-200 (plane No. 188), equipped with CF6-50 engines, built for Air Tunis: These two planes had been scheduled for delivery in June. Tunis Air's plane has one distinctive feature: It (like the six A 300 B4's already delivered to Indonesia's Garuda company) is equipped with a double Crouzet OMEGA Type 300 installation for long distance flights outside of VOR-DME [Very-High-Frequency Omnidirectional Radio Range--Distance-Measuring Equipment] range. This system is characterized by its fully digital interface compatible with ARINC-700 avionics--specifically, it delivers a guidance signal to the SFENA [French Air-Navigation Equipment Company] Digital PA [automatic pilot]--and from this standpoint is unique on the market.

The control-box, or CDU [Central Data Unit], was the object of a special study made together with Airbus Industrie's pilots to achieve a perfect integration of the FFCC [Forward-Facing Crew Compartment] concept that characterizes the Airbus planes for Garuda and Tunis Air, so as to reduce the load on the crew. The CDU permits the simultaneous loading of both calculators, with preservation of all the navigational data on flight after flight. A "check" function enables immediate verification of the flight plan and facilitates the preparation and execution of diversion operations.

Optimization of the Omega signal processing software took into account the experimental data obtained on 5,000 hours of flight during which all navigational data was recorded. These flights were effected on a UTA [expansion unknown] DC 10, throughout the world, many of them in Southeast Asia where Omega coverage is particularly scant, pending the putting into service of the Australian station.

The performances obtained conform to RTCA [Radio Technical Commission for Aeronautics] standards in the Garuda operating zone where until then the use of the Omega network alone had not been deemed feasible for long distance navigation.

Crouzet has in hand 300 firm orders for its OMEGA system and currently produces 60 to 80 of them a year, which enables the company to envision new applications for its OMEGA that would integrate it into a complete flight management system.

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CSO: 3102/272

ERRATUM: This article is republished from JPRS L/10559, of 2 June 1982, No (FOUO 10/82) of this series pp 10-14 to correct certain terminology.

TRANSPORTATION

ERRATUM: SAAB-FAIRCHILD-340 PROJECT ENTERS PHASE THREE

Project Description, Schedule

Paris AIR & COSMOS in French 3 Apr 82 pp 15, 17, 64

[Article by Regis Noye: "Saab-Fairchild: An Effective Cooperation"]

[Text] Eight months after the prototype left the shop, the program of the American-Swedish SF-340 "commuter" plane, developed jointly by Saab-Scania and Fairchild Industries, has now come to maturity. Phase three of the design, properly speaking, has been underway since November, at which time all the characteristics of the apparatus were established and its principal systems and equipment chosen. Thus, the SF-340 is the most advanced of the five programs of commuter planes with seating capacity for more than 30 persons presently under development throughout the world, immediately followed by the Dash-8 of de Havilland Canada and the Brasilia of EMBRAER [Brazilian Aeronautics Company] (the other two being the ATR-42 and the Casa-Nurtanio-235). On the commercial level, despite a marked slowdown in sales felt for some months by Saab-Fairchild (as, moreover, by the competition) and attributed to the worldwide economic recession, the total number of orders has reached 116, of which 6 are options, or, according to the manufacturers, nearly 30 percent of the total sales obtained up to now by the 5 competitors (?). [Sentence as published]

In order to show the detailed progress of the work on both sides of the Atlantic, as well as the facilities developed in Sweden, Saab-Scania invited about 20 journalists of the international aeronautical press to Linkoping at the beginning of the week.

Let us first recall that the first agreement aimed at jointly developing a twin-propeller regional transport plane was signed by the two firms in June 1979 at the Bourget Exposition. The first phase of the program, consisting of the overall definition of the project during which the choice of motors was made, was completed in September 1980. The two parties had quickly agreed in their thinking and, a short time after a market study indicating that between now and 1994 there would be a worldwide need for 1,600 to 2,000 units of the chosen category, they decided on the official launching of the SF-340. Since then, the second phase, consisting of a detailed study of the equipment and necessary tooling, took a little more than a year, being completed last November when the first prototypes of the wings and fuselage made their appearance. Meanwhile, two important developments were made in June 1981: the choice of entirely digital standard avionics and rounding the bend on 100 orders. Since that time, the engineering mockup, constructed in wood at a scale of 1 to 1, has been serving only to finalize certain systems. It is to be noted that more than 60 percent of the general engineering of the equipment is attributed to Saab-Scania and that the two manufacturers are making considerable use of computer assisted techniques: 20 percent of the airframe and systems and 60 percent of the tooling were thus conceived.

The Saab-Fairchild-340 is noted for the importance attached to the economy factor resulting from the application of advanced techniques: modern General Electric CT7-5 motors (1,675 hp); three-bladed Dowty Rotol propellers made of composite materials; assemblage of parts by gluing (aluminum on aluminum for subassemblies of the airfoil and fuselage; aluminum on honeycomb for the flaps and stabilizers); the use of composite materials of sandwich construction (kevlar-kevlar for the engine naceller, the wing fillets, the ailerons, the movable surfaces of the empenage; glass on glass for the radome, air inlets and cabin floorboard); digital avionics (see page 19 of this edition) comprising five Collins cathode displays and a fuel management system. The economy factor is not only apparent in fuel consumption (45 seats per nautical mile per U.S. gallon* for 34 passengers, or at least 20 percent better than the old generation aircraft like the Fokker F-27-500), but also in maintenance. Thus, the SF-340 will be a craft which offers an extremely low DOC (direct operational cost), estimated, for example, to be less than 70 percent of that of the Gulf Stream 1, its principal competitor in the United States at present.

Let us recall at this time that the SF-340 is planned to appear in two versions: one called an "airliner" for the transport of 34 passengers (11 rows of 3 seats in front plus 1 row of 4 seats in the back at a distance of 30 inches); the other called an "executive" for business trips and having a capacity of 12 or 16 seats according to the chosen arrangement. Other versions are now being studied: for cargo or military use and with stretch-body configuration. Although Saab-Fairchild is not yet giving out any details on the latter, it nevertheless admits that its capacity will be limited to 50 passengers due to the chosen width of the fuselage (2.16 meters inside), permitting only 3 seats in front.

The performance and characteristics of the SF-340 have naturally changed since the beginning of the studies. Among the latter we note the following: a certain increase in weight (7,194 kg empty compared with 6,668 formerly; 11,794 kg on takeoff compared with 11,340), which means a slight decrease in the payload (3,239 kg compared with 3,311), and an increase in the length of the runway required for takeoff (1,175 meters compared with 1,082) and a lowering of the single engine service ceiling. On the other hand, the maximum cruising speed went from 480 km per hour to 507 km per hour and the range with 34 passengers and IFR reserve went from 1,520 km to 1,670 km.

*Or 22 seats per kilometer per liter of fuel.

Distribution of Manufacture

On the production side, the distribution of workloads is 50 percent for each, value-wise. Fairchild Industries is responsible for manufacturing the airfoil and engine nacelles as well as the tail assemblies; the American firm is also responsible for the fuel system and all that part of the hydraulic system which is integral to it, so that the fuel systems can come completely equipped from Long Island (New York). Moreover, they have assigned to their affiliate, Swearingen (Texas) the manufacture of the entire cabin arrangement and its components as well as their installation on the planes, which will be delivered to the United States. Saab-Scania, in turn, is building the fuselage assembly (divided in three sections) as well as the wing fillets. The final assembly will also take place in Linkoping. In this connection, the Swedish firm has invested 200 million Swedish krona in the construction of new installations with a surface area of 25,000 square meters, including a hangar 185 meters long by 35 meters wide by 12 meters high to house the assembly line comprising 12 work stations. Moreover, the new buildings house a machine shop, a surface-treatment shop and a gluing shop, the latter two having been operational since August. They have a large group of machine tools, representing 42 percent of the total investment, and many of which have numerical control. However, these new facilities might prove to be too narrow to house the preassembly bays (presently installed next to the Vari-Viggen assembly line) and the paint shop (not yet located). The first fuselage parts were manufactured in the underground facilities usually reserved for military programs....

First Flight in 10 Months

An initial series of 15 units has been under construction since November on one or the other side of the Atlantic. Although the upper and lower panels of the two initial fuselages are already waiting for final assembly, the side panels are in preassembly, while those of the following two (reserved respectively for static and fatigue tests) are being fastened together. The first tail assembly will arrive in Linkoping in May and the first airfoil in August, when the final assembly of prototype No 1 will begin; this prototype is scheduled to leave the shop in November, and the first flight will be at the beginning of next year, followed shortly thereafter by No 2. Moreover, the CT7-5A motor is to begin its trials in flight, with the Dowty propeller, in August at General Electric's flight-testing facility (a Gulf Stream 1). The construction of a series of 10 motors is already underway with 6 units to be delivered this summer (4 for the two prototypes and 2 spare units), the first sample of the series not to be sent to Saab-Scania until 1983.

Certification of the SF-340 calls for 1,000 flight hours, which will be completed on the two prototypes by the end of 1984. Swedish confirmation will first be granted by the LFV [Swedish National Civil Aviation Administration] European [JAR 25 norms), then the American (FAR 25). At this point we may note that the total investment in the Saab-Fairchild 340 program is estimated at $100 million and that the total number of people employed in the program comes to 1,500, divided equally between the two firms.

Half of the Break-Even Point

On the commercial side, the 116 orders now on the books represent more than half of the program's break-even point, estimated at 200 units sold. The prime objective is to reach this figure before the first delivery. To do this, the organization put together by Saab-Fairchild is the following: responsibility for the North American continent (United States, Canada, Mexico) is assigned to Fairchild Swearingen (58 planes ordered, half of which are of the executive version); for Australia and Southeast Asia to the distributor, Stillwell Aviation (Sydney); for the rest of the world to the joint Saab-Fairchild HB affiliate, whose administration is in Linkoping with headquarters in Paris (58 planes sold, 6 being optional). One last word on the subject of the unit's price: $4.75 million for the airliner version, $5.5 million for the executive version (according to economic conditions of November 1981).

Cockpit, Avionics

Paris AIR & COSMOS in French 3 Apr 82 p 19

[Article by G.C.: "SF-340: Only Model With Cathode Instruments"]

[Text] Elsewhere in this edition we have given a detailed picture of the SF-340's cockpit and avionics system.

Obviously, the cockpit is designed for two pilots without a third man. It has five color cathode displays (Collins); two in the pilot and copilot areas (electronic ADI [Attitude Director Indicator] and HSI [Horizontal Situation Indicator]) and a fifth (optional in a central panel; the latter serves for the general presentation of navigational information, checklists and so on.

It will be noted that Saab-Fairchild is no longer proposing an "electromechanical" version for the principal flight instruments: the advantages of the cathode system in terms of reliability and maintenance costs (cost of ownership) appear to be attractive enough to make all users renounce conventional instruments. This simplifies the task of the engineering departments of the aircraft manufacturers.

With regard to the avionics system, the four principal cathode displays are supplied by two symbol generators. These receive information from airspeed and control-mechanism sensors, particularly the attitude data generator which is of the connected-components type, also Collins.

The upper panel is in conformance with the generally accepted principle: "if all lights are out, all is well."

Pilot visibility is good, in fact better than that recommended by document SAE580B.

With regard to suppliers, we note that Collins has the lion's share in this plane, particularly with the cathode displays, the automatic pilot assembly and the flight control--digital--and the directional and vertical gyros with connected components.

Finally, it should be noted that Saab and Fairchild have retained certain French equipment suppliers for this plane:

--Sarma, which has just received a contract for cable voltage regulators for the first 50 units with an option on the next 150.

--Jaeger: first order of more than 10 million francs for panel instruments (altimeter, airspeed indicator, vertical speed indicator--primary and backup.

--Sfena: 3-inch horizon standby gyroscopes.

--Saft, an order for 30 batteries in connection with this program.

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