

France's Aero Export Industry

by James Hay Stevens,
A.F.R.Ae.S.

FROM UTTER RUIN and chaos in 1945, the French have built up their aircraft industry to a major export factor in the country's economy. Although, technically, progress was continuous, the real strides have been made during the first "five-year plan" of General de Gaulle's constructive act of 1960, *La Loi-Programme d'Équipement Militaire*, which established a stabilised credit for the planning, development and equipment of the armed forces on the basis of the French independent deterrent. This scheme also provides (repayable) finance for selected research and civil types with good export prospects—it has also been used to prune some uneconomical projects. The government and industry committee, *le Comité National d'Expansion de l'Industrie Aéronautique*, which reviews the general scene is a strong one, composed of men of high experience and the decisions are, on the whole, remarkably sound.

Before turning to detail, it may do no harm briefly to explain how the French aerospace industry operates. It was in 1936 that the disastrous neo-communist *Front Populaire* government nationalised most of the sprawling, semi-bankrupt aircraft companies, which were adept at making prototypes but poor at production. When France was overrun by the Germans this hotch-potch of a private and nationalised industry did have some better production than before and the enemy did try—pretty ineffectually—to force it to work for them. At the end of the war factories were destroyed, equipment worn out and personnel both widely dispersed and out of touch with developments; yet this did not prevent the French from holding a vigorous *Salon* at the Grand Palais in 1947.

The multiplicity of prototypes continued for a decade, but some first-class aircraft were made and sold in quantity as the industry settled down with the large nationalised concerns and private companies side-by-side. The overheads of the state-owned monsters made them unprofitable and they were eventually whittled down to two airframe and one engine company. Survival of the private firms, with the continued fall of the franc, is something of a mystery, although those with high quality technical teams designed the advanced aircraft and received government contracts—so long as the production



G. A. M. Dassault's export successes started with their first jet fighter, the *Ouragan* (far background), supplied to India and Israel as well as the French A.F. Thereafter, in the order shown here, came the: *Mystère IVA* (French A.F., India, Israel), *Super Mystère B.2* (French A.F., Israel), *Etendard* (French Navy), two *Mirage III* variants (French A.F., Australia, Israel, Switzerland, South Africa), and the *Mirage IVA* bomber

work was shared with one or more *sociétés nationales*.

This system has worked well, since it spreads the available brain power, under various leaders and in manageable teams, while concentrating labour and production facilities. The stultifying effect of large organisations on initiative is avoided and there is healthy competition at the relatively inexpensive design stage.

The strict sifting of projects and good intelligent decisions by the military customers under the *Lois-Programmes* has consolidated a position which the stabilised credits have turned into steady production of a satisfying range of aircraft, engines, equipment, missiles and rocketry. The home expenditure is difficult to unravel; but for the past two years a labour force of about 85,000 has been earning more than £100 million annually from foreign countries.

Statistics are always tricky, as there are so many ways of compiling figures, but the French aircraft industry is today doing well by any standards; while an export effort of something like £1,200 per annum per man is good—wages are comparable with our own.

The trade association, the *Union Syndicale des Industries Aéronautiques et Spatiales*, recently issued some interesting figures for aviation export orders in 1964. The net total, after deducting the value of imported equipment (very largely Rolls-Royce Avons for Caravelles), was 1,444,365,000 F—which is significantly over £100 million,

though less than the 1,589,000,000 F of the previous year. In fact, during the five years of the *Lois-Programmes*, 1960–64, the aero exports exceed £500 million sterling.

The breakdown of sales for last year is interesting:

Aeroplanes and spares	580,853,622 F
Helicopters	142,294,884 F
Powerplants	201,883,677 F
Missiles	370,409,271 F
Equipment	128,766,324 F
Airborne electronics	83,276,053 F

From this is deducted 63,119,020 F for re-exported items and it should also be noted that three major international projects—the Sud-BAC Concorde, the Transall C-160 and the Breguet Atlantic—are not included as exports. There is also the fact that these U.S.I.A.S. figures are based upon orders confirmed rather than upon deliveries completed, as are those of the S.B.A.C., and the industry does expect export business to decline somewhat over the next two years as current orders are fulfilled and the present types become obsolete and unable to attract further orders. In fact, there is already concern in France that sufficient is not being provided for the R. & D. needed to ensure the next generation.

In April, a leading Paris aviation magazine, *Air & Cosmos*, published a reasoned, hard-hitting appeal by Ingénieur Général Louis Bonté, for an immediate review of the funds allocated, which the writer felt were inadequate to provide the necessary exportable products for 1968–70. In French

French exports . . .

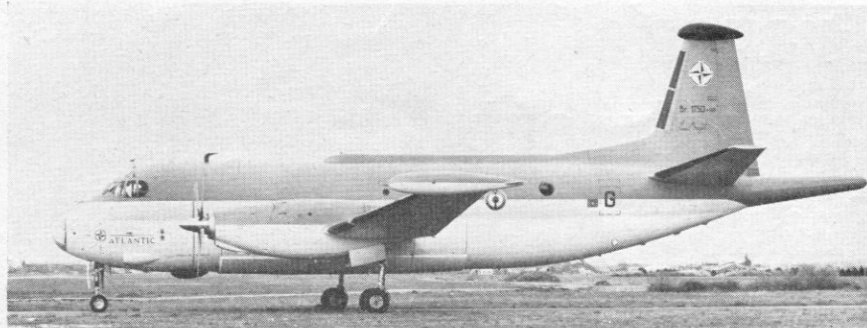
eyes their aerospace industry is "no longer merely a defence industry, but has become a key factor in the country's economy and in the balance of payments. . . . It is not possible, either, to draw a distinction between the civil and military sectors, for the aerospace industry is an integrated whole. . . . Many people may consider these efforts to be too great, yet the results to be expected from them are out of all proportion to the development effort required."

The success of the relatively small French industry, a bare third the size of our own, in the past five years has been due to careful selection of products with a world market—the right articles made at the right time. Government support is given for the development of the most promising projects, and then they get on with the job, without fear of cancellation at the wrong time.

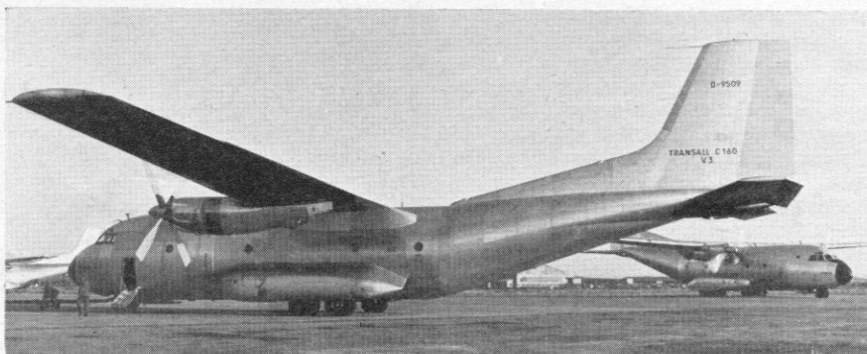
The government of de Gaulle considers that its investment in development is rewarded by foreign currency earned in production. It is teamwork using intelligent choice of products which, wherever possible, fit into unfilled gaps in the market. In the review of current products which follows this aspect will be quite clear.

Military sales

Three-quarters of French aero exports are for military equipment and the lion's share of this must be credited to Générale Aéronautique Marcel Dassault and the superb Mirage III. Orders for this versatile Mach 2 general-purpose fighter now exceed 650, of which 350 had been delivered by the beginning of this year. It is in service in France, South Africa, Israel, Australia and Switzerland, with licence manufacture in the last two countries. Both Nord and Sud participate in Mirage manufacture. Development continues with



Winner of a NATO competition for a Neptune replacement, the Breguet Atlantic is being supplied to the French and German Navies



Another example of international co-operation, the Franco-German Transall C-160 is being built for the Air Forces of those two countries

the IIIV (which could become an export) VTOL version which has Rolls-Royce RB 162 lift engines. The scaled-up Mirage IV Mach 2 nuclear bomber is not yet an export, but deliveries of sixty-two to the *Armée de l'Air* are being made.

The co-operatively produced Breguet Atlantic and Transall C-160 are, in a way, exports as well as remarkable examples of international liaison. Both types have

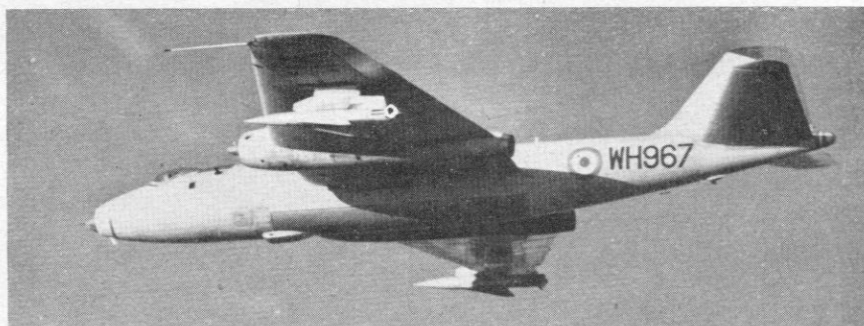
prospects of sales to NATO and friendly nations—so long as the market is not spoiled by cut-price offers of obsolescent U.S. types built on fully amortised tooling.

Missile sales have brought Nord-Aviation into second place as an aero exporter. By developing weapons which had been rather neglected by the Americans a very lucrative market was tapped—which brought in dollars as well as other currencies. As a result, Nord-Aviation is the largest missile maker in Europe, with a total production of nearly $\frac{1}{2}$ million rounds. The Nord range of command-guided missiles is unique and, because they form a logically related family, the experience from one is built into the next, so that they are thoroughly practical operational weapons.

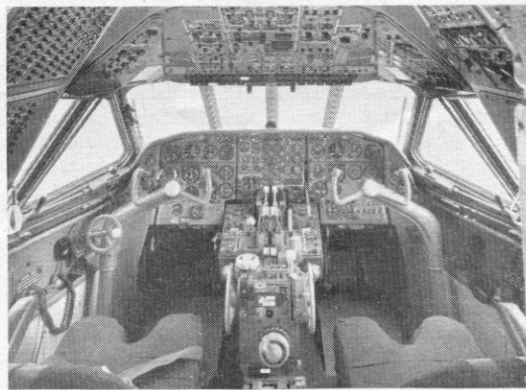
The first was the SS.10, a weapon based on German World War II experiments with teleguidance and this, after initial vicissitudes and hard-won environmental experience, was widely exported as an "infantry" anti-tank weapon. This success was followed by the export of thousands of SS.11 rounds, which are still being supplied. Then, a couple of years ago, Nord undertook the large-scale manufacture of a replacement for the SS.10, the ENTAC developed by the government arsenal DEFA, thousands of which have been bought by Australia, Canada and the U.S.A. The SS.11 is used as an air-to-surface weapon up to 250 m.p.h.—the R.A.F. fires it from Twin Pioneers and helicopters, the R.N. from commando helicopters—but the larger AS12 and the

The pressurised Potez 94 Super Magister trainer/light attack aircraft (two Marboré VIs) derived from the highly successful Magister





Missile exports include (LEFT) Matra R.530s for U.S. Navy Crusaders and (RIGHT) Nord AS.30s for R.A.F. Canberras



An outstanding civil success has been the Caravelle whose sales are nearing 200. LEFT: A Super Caravelle for the Danish Sterling Airways. RIGHT: Flight deck of the 10R. Both types are Pratt & Whitney powered

faster AS20 and AS30 are the air-to-surface weapons for naval patrol and fighter attack duties. The AS20 is a standard NATO weapon for the G91, while the AS30 is in NATO use and has been bought by the R.A.F. for the Canberras in the Middle East.

Nord has also done good export business with its range of radio-controlled targets. First, the pulse-jet C.T. 10, evolved from the V-1 of World War II and used by the R.N., Sweden and other countries. Second, the turbojet Mach 0.85 C.T.20, supplied to the U.S. forces in Europe and to Sweden—where Saab is developing it as a naval bombardment GW. Thirdly, the twin ramjet Mach 2.7 C.T.41 missile target which is on order experimentally for the Ministry of Aviation under an agreement between Nord and Hawker Siddeley Dynamics.

Sud-Aviation has not exported any weapons, but has made a trio of sonde rockets, of which the 80/110-mile ceiling Centaure and 225/285-mile Dragon are

built under licence in India and Pakistan respectively.

Engins Matra, makers of the R.511 and R.530 for the French forces, have exported many rocket packs and other armament with the Mirage III.

Etablissements Henry Potez continue to export the CM 170 Magister trainer and these orders should continue with the more powerful Marboré VI version, already being built for the *Armée de l'Air*, and yet further developments.

Civil aircraft

First place in the export field is held by Sud-Aviation because of the Caravelle and the Alouette, which were mainly responsible for the company's 1964 export orders of 390,633,958 F—nearly £30 million. The Caravelle, first airliner to have rear engines, after a prolonged study of all possible positions by Monsieur Pierre Satre and his team, is still being ordered and has reached a total of about 200. Although early sales were hindered by

resistance to the then unorthodox layout, it has since been much flattered by imitation—accompanied by patent royalties. Completion of the Concorde will result in considerable export revenue to share with BAC.

Sud is the largest producer of helicopters in Europe, with over a thousand Alouette IIs in service in thirty-one countries. Latest developments are the faster and heavier, 870-h.p. Alouette III, of which 340 had been ordered by the end of last year by twenty-three countries. The cannon and missile armed Alouette III Armée is following and is an obvious export. The large three-engined Super Frelon and the SA.330 twin-turbine helicopters have good performance and should prove exportable on the basis of Alouette reliability.

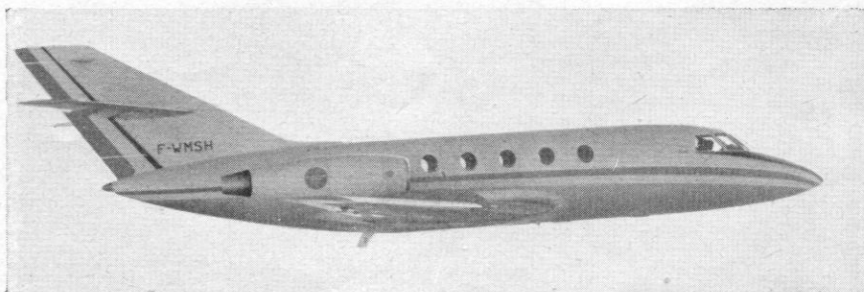
Nord-Aviation is also in the civil aircraft export business with the 26/29-seater Nord 262 twin, which the American F.A.A. considers to be the nearest thing yet to the DC-3 replacement. Work on this pressurised development of the Super Broussard started on 24th December 1962 and the first of four went into service with Air Inter last July. Lake Central Airlines has ordered eight with an option on thirteen, and Japan Domestic Airways two with an option on another—both airlines will start getting deliveries this summer. Prospects of further sales are good after a highly successful tour of tropical Africa, where the aeroplane coped well with rough strips under hot and high conditions.

Générale Aéronautique Marcel Dassault

FRENCH AEROSPACE PRODUCTION 1960 - 1963

	Home deliveries	Export deliveries	Export orders
1960	2,400,000,000 F	628,000,000 F	1,150,000,000 F
1961	2,670,000,000 F	980,000,000 F	1,709,000,000 F
1962	3,040,000,000 F	1,086,000,000 F	1,475,000,000 F
1963	3,450,000,000 F	1,237,000,000 F	1,755,000,000 F

Approximately 14 francs to £ sterling



The Dassault Mystère 20, which is marketed in the U.S.A. by Pan Am as the Fan Jet Falcon. Orders had reached sixty-eight by January

French exports . . .

made a dramatic re-entry into civil aviation—the pre-war Bloch airliners were among the best of their time—with the Mystère 20. Adopted by Pan Am's Business Jet Division as the Fan Jet Falcon, the order book at the beginning of this year stood at sixty-eight plus 106 options, and to meet these exports production is being increased from four to five a month.

Following the company's remarkable ability to re-use basic designs by scaling them up or down, GAMM is going ahead with the Mystère 30 small jetliner—one of which has been ordered by the Aga Khan—though, at the time of writing, this is expected to be merged with a similar Sud project and will become the Mercure 24/30. Like the Mystère 20, this aeroplane would be able to operate from the runways of second-class aerodromes.

Etablissements Henry Potez has also

entered the civil export business with *éclat* and is already selling the fast, graceful Potez 841/842 to Germany and America, at the same time opening a production plant in Eire. This aeroplane makes an attractive executive with a range of 1,600 n.m. at 260 kt. and a snappy take-off to 35 ft. of about 750 yd.—which could make it a useful outback feederliner despite a rather slim cabin. Potez is also making and selling the Morane-Saulnier MS. 760 Paris light jet executive through its subsidiary S.E.E.M.S. and a few have been exported. This work is soon to be passed over to Sud-Aviation.

Breguet's work on the STOL *aile souflée* Br 941 has been supported by military funds, as is the initial order for four, but this transport has such obvious civil applications that one feels it is an export of high potential. There is a pressurised version already designed, the Br 942, which would cost about the same as a Viscount if sufficient were ordered. It

would carry forty-sixty passengers at 230 kt. on medium stages from 400-yd. strips. Both this and the original military freight model with rear-loading ramp offer something outstandingly useful to bush operators.

Smaller aeroplanes for export

There are two light executive turboprops which could well sell abroad. The SFERMA Marquis conversion of the Beech Baron powered by two Turbomeca Astazous and the SIPA S.2150 Antilope, both of which have been built in small batches.

The French government supports private flying through the clubs and by assistance to private owners who undertake to fly a minimum number of hours over a three-year period. This latter subsidy is increased, on a points system for the technical qualities of the light aeroplane—e.g., variable-pitch airscrew, starter, blind-flying instruments—and so the private owner is encouraged to buy a good aeroplane and to get a better one in three years. This helpful attitude has not cost the taxpayer much, but it has kept a few thousand people employed in putting the French light aeroplane ahead of the world. It has also resulted in a remarkable total of production, a considerable portion of which has been sold abroad.

The all-metal Morane-Saulnier Rallye, under the auspices of Ets. Henry Potez, reached its 500th delivery in March, with exports to forty-four countries. Despite this good business, the makers got into financial difficulties and the S.E.E.M.S. subsidiary was formed by Monsieur Potez to effect a rescue. Now negotiations are

Part of the Sud range of helicopters: (TOP) an Alouette III for Mexico and (RIGHT) the Alouette III Armée with 20-mm. cannon; (BOTTOM) a French Navy Super Frelon coming aboard the helicopter-carrier Jeanne d'Arc and (RIGHT) the SA.330 twelve-seat assault helicopter, which made its first flight on 15th April





The Gardan Horizon which is now being built in quantity by Sud's light aircraft division

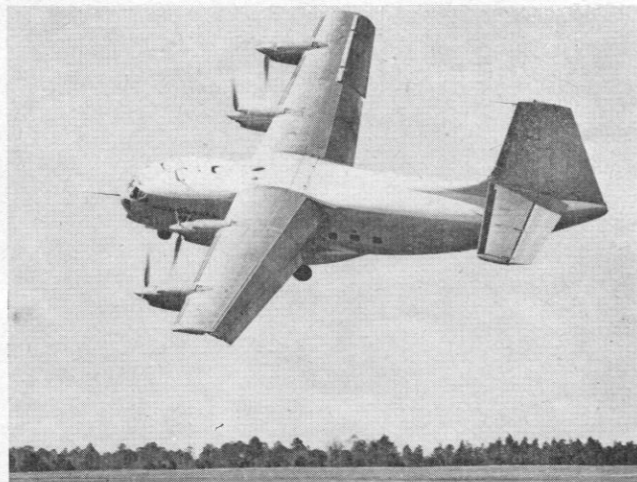


The "push-pull" Moynet Jupiter is also to be manufactured by Sud

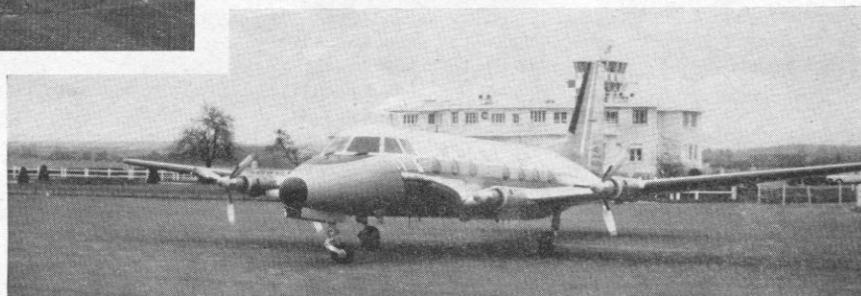
under way to pass the Rallye, with its small design team, over to Sud-Aviation, where it will form part of the light aircraft division which is already building and exporting the Gardan Horizon in quantity. This unit is also preparing production of the "push-pull" Moynet Jupiter developed by Matra.

Such a concentration of effort by a nationalised company on metal light aeroplanes gives power to some significant opposition to U.S. domination of the market, though it will inevitably affect adversely the business of the small companies producing wooden aeroplanes.

The post-war French light aeroplanes are so well known abroad that to comment on their exportability is superfluous. The Jodel developments, like the Centre Est Aéronautique Sicile Record and DR.250 or the SAN Mousquetaire and Ambassadeur, are delightful aeroplanes with a first-rate performance, and have sold well in France and abroad. Other good light plane exports are the Scintex Super Emeraude (an air-test of which appears in this issue) and that smart four-seater, the Wassmer Super IV. Manufacture of these light types totals several thousand over the past decade and hundreds have been exported.



Back from a tour in the U.S.A., where it is being offered as the McDonnell 188, is the STOL Breguet 941



The Potez 840 with Astazou engines and standard single-wheel main undercarriage

Gliding is also encouraged by the sportingly inclined French government and there are half a dozen active manufacturers of high-performance sailplanes. Of these, the most significant are probably the makers of the Merville SM31; Siren, producers of the C.30 Edelweiss; and Wassmer-Aviation with the Super-Javelot and Bijave. Breguet developed two good types, the Br 905 Fauvette and the Br 906 Choucas, but these are now made by another works. There have been fair foreign sales of French sailplanes.

Aero-engines

The largest engine company is the nationalised SNECMA which, until now, has concentrated upon making turbojets for the French armed forces. In this role it has made a considerable export con-

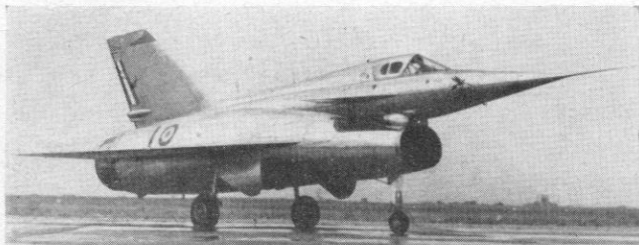
tribution in the Mirage III. The doyen of French engine makers, Hispano-Suiza, was side-tracked by the government policy of concentration on the Atar, but has re-entered the business as the co-ordinating contractor for the European production of Tynes for the Atlantic and Transall programmes—so this remarkable company is in a way in the export business here, just as it is with the manufacture of the Caravelle's undercarriage and SEPR rockets for the Mirage III.

It is, however, the private enterprise Société Turbomeca which is the outstanding aero-engine exporter with 15,000 engines in use in forty-five countries. These compact turbines, designed in a range virtually without competition and developed on a unique design with interchangeable "Meccano" units, hit a bare spot in the aero turbine market which resulted in real quantity sales and licence manufacture in five countries.

Much of this production has gone into ground and airborne APU's, where the Artouste, Pallas and Astazou have been utilised as air compressors and to drive generators. The Marboré turbojet has been exported in the Magister trainers and Nord C.T.20 targets and has been built in the U.S.A. to power drones and as a take-off booster. The Artouste has travelled worldwide in the Alouette II and III. The

Morane-Saulnier Rallye Commodore 180





The Mach 2.2 Nord Grifon is being used for research under a contract from the U.S. Air Force Systems Command

French exports . . .

Astazou is now following suit in the Potez 841/842, Short Skyvan, SFERMA Marquis, Pilatus Turbo Porter, SIPA Antilope and Sud Alouette II-Astazou—though the quieter Canadian United Aircraft PT-6 is now offering tough opposition in the turbo-prop applications. The Bastan has become a significant export in the Nord 262 and has also been delivered to Argentina for the DINFIA Guarani II. The new 1,540-lb.-thrust Aubisque by-pass turbojet is already an export in its own right, as it is being built in quantity for the Saab-105 twin-jet attack/trainer.

Nord-Aviation is an engine exporter in an unusual way, since it has a valuable development contract from the U.S. Air Force Systems Command for the application of the know-how gained from the Mach 2.2 Grifon to advanced forms of turbo-ramjet propulsion using by-pass turbo-jets.

Said and Done

A monthly commentary

SOME THINGS SAID and done are best regarded as done with. But some will not lie down. Others need prodding to be kept alive. TSR-2 as such is dead but its uneasy ghost will long remain to impose rancour on the relations between technician and politician. Technically, it is to be hoped that, even at the cost of proving the most expensive flying test-bed in the world, the TSR-2 which has been flying so much better than anyone had the right to expect will be retained to prove the engines for the Concorde.

THAT "PRESENTATION TEAM" touring Britain (see May issue, p. 140) will certainly persuade a lot of people that the sailors have reason for saying that "The Fleet Air Arm is on the way up and the R.A.F. on the way down". Even eminent past-members of the R.A.F. seem to be having their doubts. Dr. Noble Frankland, a former navigator in Bomber Command, in his new book *The Bombing Offensive Against Germany* attributes the concept of strategic bombing to the Royal Navy. It is of course a fact that the Handley Page O/400 was designed to a Naval specification.

STUDENTS AND GRADUATES of the Royal Aeronautical Society have introduced a considerable degree of turbulence into the smooth flow destined by Labour planners

In addition to the airframe, engine and missile companies, there is an ancillary industry of some sixty companies, either specialised in aircraft components or aero divisions of large industrial concerns. These companies are making equipment, electronics and instruments as advanced in design and high in quality as any in the world, though they are as yet less familiar than their British and American rivals. However, as French aircraft exports become more and more widely distributed, so their excellent instruments and accessories gain in reputation, thereby offering further export opportunities to the accessory industry.

In another way, too, the export situation is expanding. With increasing numbers of French aircraft, engines and missiles in service abroad, there is a steadily rising spares requirement and the U.S.I.A.S. says that nearly one-third of the 1964 orders were for spares, which shows the significance of this aspect of the business.

for the transition of talent from the aircraft industry to those other industrial activities in the country, so much in need of new skills. The aircraft technicians have not only made it clear [see p. 191] that they are in aviation because they love it but that they love it so much that they are prepared to emigrate to where their skills are appreciated. Could it be that individuals still like to make their own decisions and are not prepared to accept direction from "above"—at least not from those temporarily set in authority over them by the electorate?

THE TRADES UNION CONGRESS has done its best to ensure that what it has said about the aircraft industry to the Plowden Committee shall become known to as many people as possible. It released for publication the entire fourteen foolscap pages of its evidence. Only the briefest of précis have appeared. But, bikini-like, those briefs have been revealing. "There is room . . . for only one large airframe group, formed from H.S.A., B.A.C., Short Brothers and Harland, and Handley Page. The main task is to weld together the present unwieldy structure into a rational whole. Only a public corporation would be likely to succeed in such a task. There would be strong grounds for taking such a monopoly airframe group into public ownership." Once again the glorious assumption that "Big Brother" Government knows best. It would all be so much more convincing if anyone were able to produce any Government-designed and -produced success in the export market.—"Puffin."

British Airlines Postscript

by A. J. Jackson

SINCE THE PRESENTATION of the British airline survey in the April issue, a number of companies have been making last-minute fleet adjustments before the inclusive tour season really gets under way. Such changes are detailed below together with some amendments to, and details of firms not included in, the original article.

Aircruise Ltd.

Cessna 172B, for G-ARFX read G-ARFK.

Autair International Airways Ltd.

It was announced on 15th April that the company's entire share capital had been bought by Court Line, the London shipping firm. The resultant Autair expansion will include fleet additions; Viscounts, H.S.748s and Dart Heralds have been mentioned. Dakota 3 G-AMNV newly acquired from Tyne-Tees, left Luton for Manila on 30th March.

Aviation Charter Enterprises Ltd. (Ace Freighters)

Add Lockheed 749A G-ALAL recently acquired from Britannia Airways.

B.E.A. Helicopters Ltd.

The third Sikorsky S-61N, G-ATBJ, has now been delivered.

B.K.S. Air Transport Ltd.

B.K.S. introduced services between London and Tees-side on 2nd November, 1964, and this year plan routes from Tees-side to Belfast, Dublin, Ostend, Jersey, Amsterdam and Düsseldorf, plus two new international routes: Newcastle-Paris, commencing 9th April; and London-Biarritz, commencing 4th June. 1965 operations include an extensive increase in turboprop operations with H.S.748, Viscount and Britannia aircraft, and the company has negotiated an agreement to lease Viscount capacity from B.E.A.

Dakota 3 G-AIWD has been reduced to spares and Freighter 31 G-AMLJ will be out of service for some months.

British Eagle International Airways Ltd.

Britannia 312 G-AOVE "Talisman" remains with British Eagle and the ex-United Arab Viscount 732 G-ANRS was delivered at L.A.P. on 11th March and went to Cambridge for service and repainting on the 14th. The Viscount remaining on lease from Channel Airways will be G-AMOO "City of Birmingham".

British Midland Airways Ltd.

The second Dart Herald is understood to be G-APWA.

British Overseas Airways Corporation

It should be noted that although B.O.A.C. has withdrawn from the South

AIR PICTORIAL