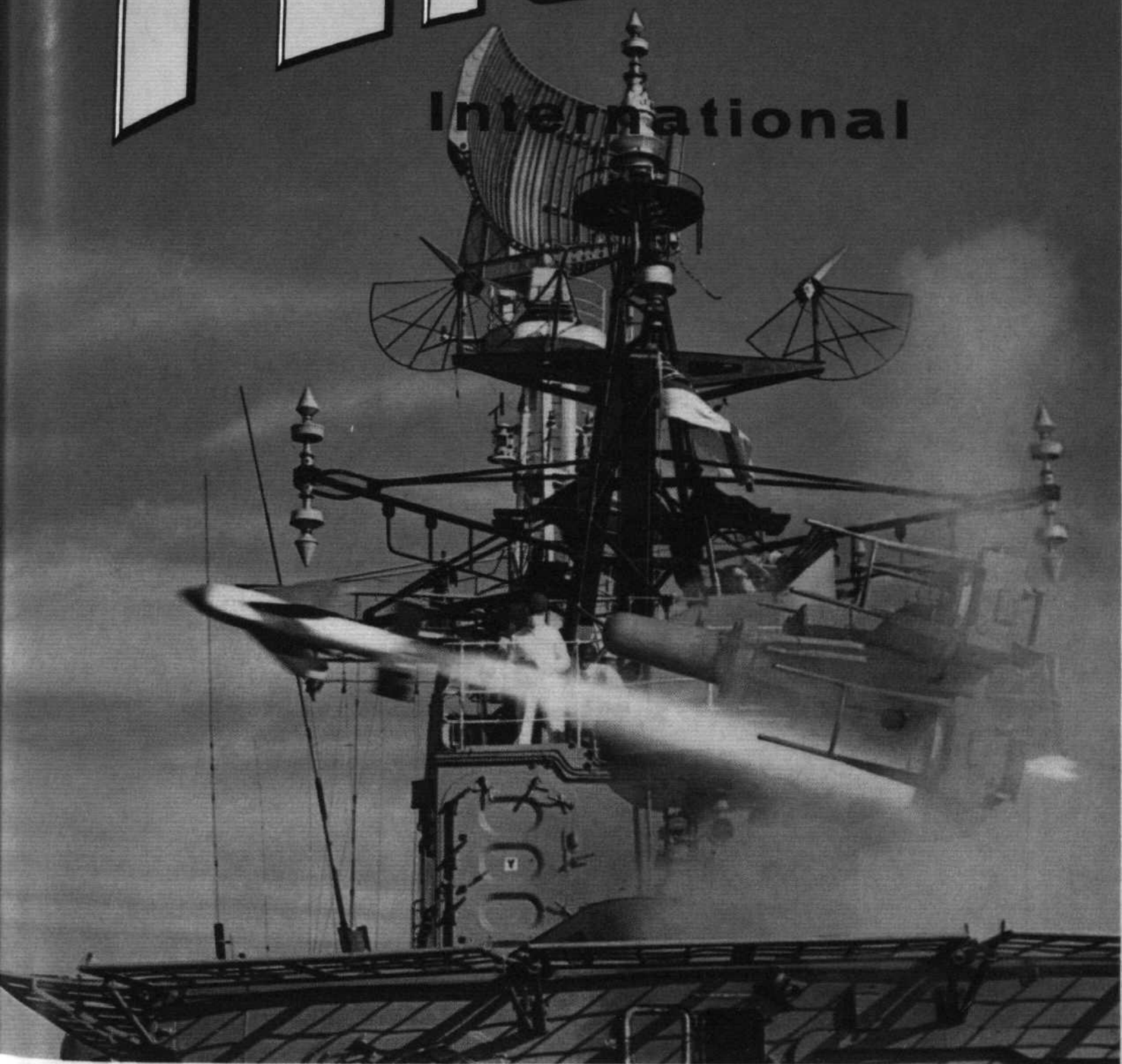


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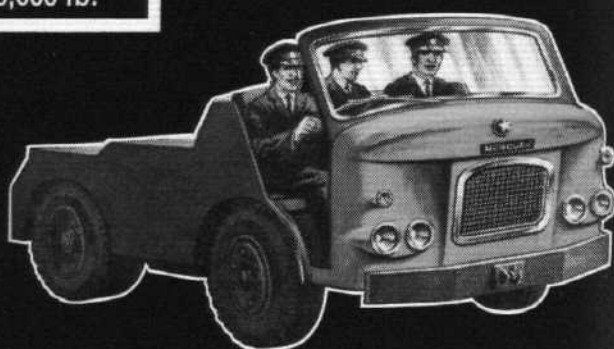


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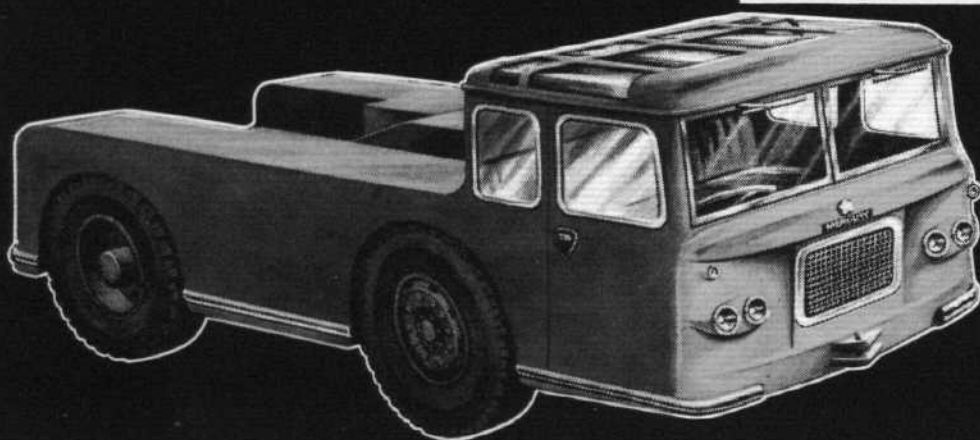
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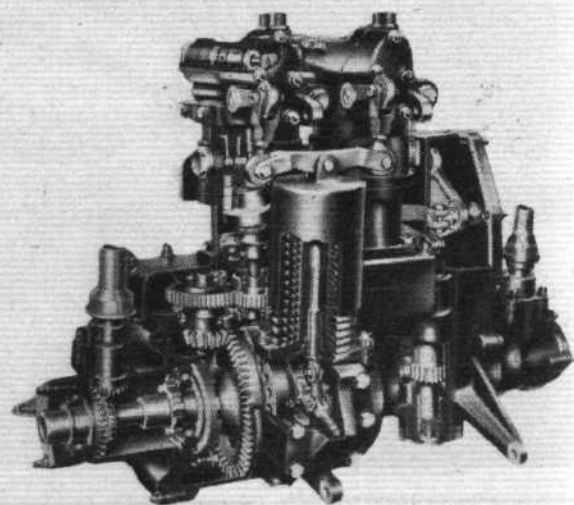
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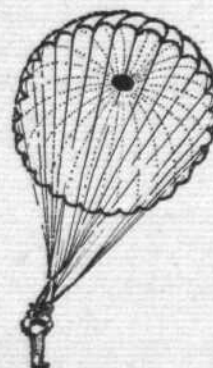
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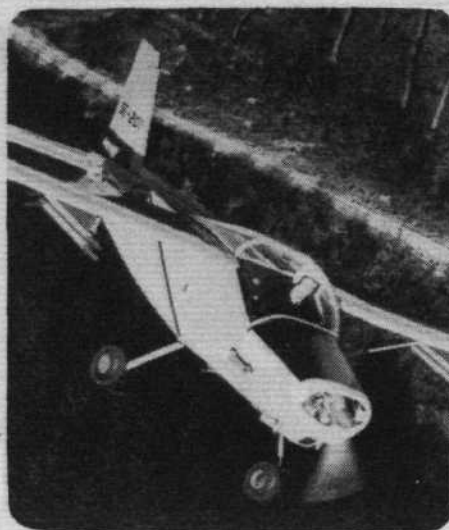
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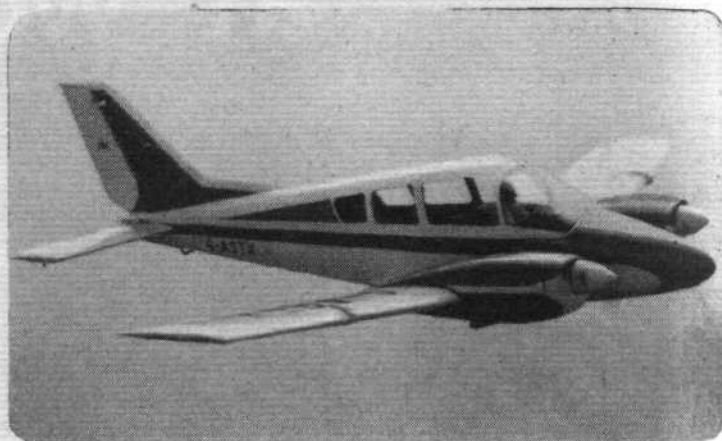
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The New Air Transport Policy

LAST November the independents asked the new Minister to state his air transport policy. They asked for it, and last week they got it. It is a policy entirely consistent with Labour doctrine over the past 20 years: scheduled services are the preserve of BOAC and BEA.

Mr Jenkins has not changed the legal position, which is that private airlines can apply to the Air Transport Licensing Board for scheduled services. But his new "guide lines" (pages 278-279) effectively repeal the 1960 Licensing Act. He is "not convinced that the national interest is, in general, served by more than one British carrier operating on the same [international] route . . . While . . . the independent airlines may continue undisturbed to operate their present limited frequencies on [domestic] trunk routes, I do not think it right to offer them the prospects of an unrestricted or extended frequency in the near future."

Those three words "or extended frequency" have caused British Eagle promptly to suspend their limited-frequency services linking London with Glasgow, Edinburgh and Belfast, which since November 1, 1963, they had operated in competition with BEA. The message for all the independents is clear—no more scheduled services of any consequence.

Such is the power of Aviation Ministers that without reference to Parliament the air transport system can be radically changed to conform with a political ideology. Some future Tory minister will probably kick the football back again. This is no way to run an airline industry.

The Interests of the Passenger

Politics aside, big air transport nations like the USA, Australia, Canada, Japan and Brazil recognize that the best interests of the passenger, who is more important than *anything* else, are served by regulated parallel competition. Nobody has ever advocated unregulated competition. Mr Jenkins has apparently interpreted British Eagle's rather wild advocacy of unrestricted domestic frequency as a bid for unrestricted competition. "The question which I have to decide," he says, "is whether to move from here to a position of unrestricted competition on these domestic routes." Whoever has been advising Mr Jenkins—and it was not the ATLB, who were disdainfully not even consulted—has got this completely wrong. There was not the remotest chance that British Eagle would have persuaded the ATLB to allow them unrestricted frequency.

Nor is there any evidence that British Eagle's modest limited frequency has harmed BEA. There is plenty of evidence that it has improved service. The Minister says not; but BEA found it possible to introduce trickle-loading, seat-selection and meals when British Eagle did.

BEA may rejoice, but bitter are the uses of monopoly. We do not mean the Minister's decision to appoint a BEA board member to pay "especial attention to the interests of the domestic passenger"—which begs some pretty humiliating questions. We mean that there is a strong public allergy to monopoly. However hard it tries, a monopoly is forever a prey to the grumbler. This saps morale, and cynicism can be more of a problem for management than competition. There is nothing to beat competition, with a strong, professional, *independent* board to discipline it. We cannot understand why BEA oppose it so fiercely. It is the mark of progressive and efficient air transport nations, and Britain will have to accept it one day.

Meanwhile BEA should be given a chance to prove, as they insist, that monopoly is better for the public than competition. This means early air shuttle services, lower load factors, and lower fares. A good start has been made by the withdrawal of proposed trunk-route fare increases.



WORLD NEWS

GO-AHEAD FOR BOEING 737

Late last week Boeing announced its decision to go ahead with the production of the projected 737. At the same time Lufthansa announced in Cologne a decision to buy 21 of these short-haul jets and five more 727s.

The Boeing statement said that "the decision to place the 737 in production was made only after we were convinced that we had a design clearly superior to those already being offered in the short-range jet market. By delaying our decision until this time, we have gained the advantage of additional technical development which will make the 737 the most economical, practical and profitable airplane of its type."

The 737 represents a return to earlier design philosophies (see *Flight*, December 10, pages 995-996) and has wing-pod powerplants. These will be P & W JT8Ds as used in the 727, and the 737 will also have the 727's high-lift devices. It will be designed to operate over stages up to 700 miles with full payload. The passenger cabin will be of the same width as in larger Boeings, permitting up to six-abreast seating.

Pre-production engineering of the 737 is on schedule and the plant at Renton, Wash, is now being organized for immediate production. The first aircraft will be rolled out in November 1966 and the first delivery of the certificated aircraft will, according to Boeing, be made in December 1967.

FERRANTI INQUIRY SEQUEL

Civil Servants blamed by the Minister of Aviation for errors in estimating the costs of Bloodhound 1 components—ten of them have received letters of reprimand—have reacted strongly to his criticisms. In a letter to Mr Roy Jenkins, released for publication last weekend, the Institution of Professional Civil Servants said that staff were being held responsible for "a corporate failure of the Department."

The criticisms had been contained in a written parliamentary reply on February 10, in which Mr Jenkins reported on the results of the departmental inquiry into the excessive prices paid to Ferranti Ltd.

The inquiry had confirmed that the excessive payments arose primarily from an over-estimate by the technical costs staff

of the direct labour required, Mr Jenkins stated. The prior assessment of production costs in this field was inevitably difficult, and some inaccuracy was almost inevitable. But in this case the margin of error was very large: "I consider that the estimates represented a standard of work much lower than that which the technical costs staff can reasonably be expected to achieve."

The opportunity of cross-checking these estimates with information available to the Ministry's accountants was exceptional. Nevertheless, Mr Jenkins continued, "The accountants should have recognized the special significance of the figures which they had produced and should have drawn to the attention of the contracts staff the possibilities of cross-checking which they presented. Their omission to do so amounted to a failure to show the initiative which should normally be forthcoming from the Government's professional staff. The officers concerned have been so informed."

ROLLS-ROYCE and TURBOMECA

A joint announcement by Rolls-Royce and Turbomeca indicates that the companies are co-operating in developing a new high-bypass turbofan engine to be called RB.172-T260. There will be three versions suitable for trainer/strike aircraft, light and medium transports and executive aircraft. Initial cold thrust will be 4,200lb, to be increased to 6,200lb. Engine weight is reported to be 835lb. Afterburning will be available.

BS and SNECMA

Under an agreement signed on January 1, but only published incidentally in the SNECMA house journal over a month later, Bristol Siddeley and SNECMA are co-operating in the design of the M.45 Mars family of engines. The basic M.45A is a twin-spool turbojet incorporating a transonic 1-p compressor based on SNECMA work for the Atar, an h-p compressor based on Bristol Siddeley work on the Olympus 320 and the medium-powered BS.116. Thrust of the M.45A is about 4,400lb and weight about 880lb.

From the M.45A, the following engines are to be extrapolated: M.45B with reheat and 6,600lb thrust; M.45F turbofan, also of 6,600lb thrust; M.45G reheated turbofan, which will achieve nearly 10,000lb thrust and have a high-gain afterburner.

Possible applications include the M.45A for the Mystère 20, M.45B for the initial Ecat trainer/strike type, M.45F for the HS.136 and Mystère 30 and M.45G for the Anglo-French variable-geometry Ecat follow-on type.

The new agreement (the existence of which was noted by "Sensor" a fortnight ago) greatly extends existing BS-SNECMA co-operation on the Concorde powerplant, but leaves SNECMA still tied to Pratt & Whitney by financial participation and development of the TF-106 series of front-fan engines.

RAeS CENTENARY

The Duke of Edinburgh has honoured the Royal Aeronautical Society by consenting to be its honorary president for 1966—the Society's centenary year.

To commemorate its foundation in London on January 12, 1866, the RAeS will hold celebrations throughout next year, beginning with a *conversazione* at the Science Museum on Wednesday, January 12. Other activities so far planned are: May 5, a luncheon for members of the various committees and for officers of the divisions and branches (it is hoped that past presidents of the Society will also attend); June 19, a garden party at the College of Aeronautics, Cranfield; and September 12-16, an international centenary congress.

During the year, also, many of the Society's branches—of which there are 29 in the United Kingdom—and its overseas divisions will be organizing special functions and activities.

CONVAIR CONSOLIDATION

On February 15 the Convair and Astronautics divisions of General Dynamics Corporation at San Diego, Calif, were reconstituted as a single operating division that retains the name Convair.

Making this announcement, Mr Roger

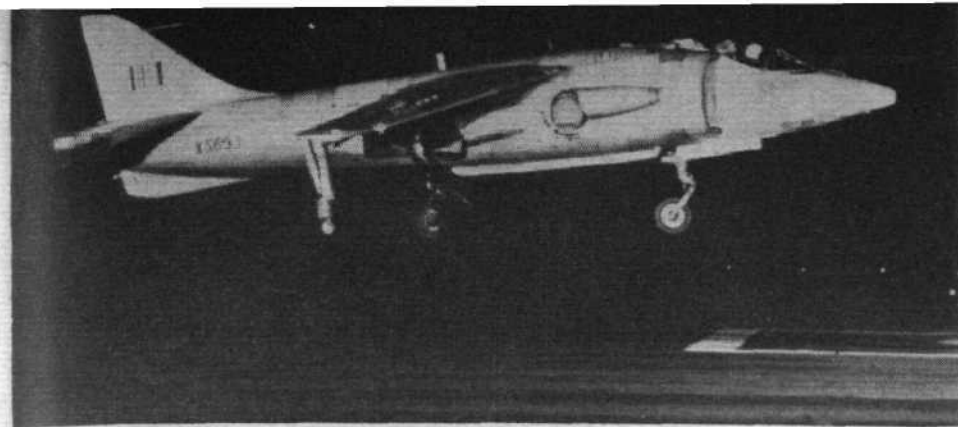
GOVERNMENT'S NEW AIRLINE POLICY
Air Transport, pages 278-280

RANGER AND PEGASUS SUCCESSES
Spaceflight, pages 303-304

KESTREL ORDER PLACED
Defence, page 300

Concorde Talks took place in London last week between (l to r) M Jacquet, French Minister of Transport, Mr Roy Jenkins, UK Minister of Aviation and Mr Najeeb Halaby, Administrator of America's Federal Aviation Agency (see "Press," page 277)





Night Hawk Night trials of the Hawker Siddeley P.1127 Kestrel V/STOL fighter have begun at Dunsfold and are being flown by test pilots Bill Bedford and Hugh Merewether. The Kestrel's inflatable intake lips have been replaced by cambered metal intakes; in this picture of a Kestrel hovering they appear to be of fixed geometry. The British/US/West German evaluation squadron will begin work with nine Kestrels at RAF West Raynham in April. (Order Placed: page 300)

Lewis, GD's president, recalled the establishment of the Astronautics Division in 1956 to develop the Atlas programme. "Its success attests to the fact that the decision was a wise one," he said. "Today, however, with the increasing maturity of rocket technology, with new developments in the aircraft field and with the advent of manned spacecraft, it is again practical to combine the effort of these two divisions better to meet present and future needs of our customers."

ABSORBING REDUNDANCY

Brighter prospects for some of the aircraft workers likely to be made redundant by the production cut-back were hinted at in news reports last week. A Rolls-Royce spokesman said that the company had nearly 1,000 vacancies for skilled staff, adding that contact had been made with the personnel officers of aircraft companies likely to be laying men off; and Sir Roy Dobson, Hawker Siddeley chairman, said in Sydney that there was a shortage of skilled men in the Australian aircraft industry. Also from Australia came a report that Ansett-ANA are needing engineers, and that a senior representative of the airline would shortly be flying to London to study the possibilities of a recruitment programme.

JOCK BRYCE'S NEW POST

Mr G. R. (Jock) Bryce, chief test pilot of British Aircraft Corporation until the end of last year—after aggravation of an old back injury had compelled him to stop flying—has been appointed to the post of sales manager (operations). Giving this

news, BAC also announces the appointment of Mr R. F. (Bob) Dunlop as sales manager (commercial). Both will be responsible to the director in charge of civil aircraft sales, Mr G. E. Knight, who has named Mr D. J. Lambert, technical sales manager, as his deputy for all civil aircraft sales matters.

Jock Bryce was appointed BAC's chief test pilot in 1961 following ten years in a similar capacity with Vickers-Armstrongs Aircraft. Bob Dunlop joined the Bristol Aeroplane Co in 1952 and for three years managed the sales of the company's American subsidiary.

"SCIENCE JOURNAL" APPEARS

The first issue of *Science Journal*, an important new Iliffe monthly, appeared yesterday, February 24 and is now on sale. As related in these pages last week, the new publication covers the whole field of science and technology.

GUILD HONOURS TRUBSHAW

For the second time in his career as chief test pilot of BAC (Weybridge), Brian Trubshaw is to receive the Derry and Richards Memorial Medal of the Guild of Air Pilots and Air Navigators. The award made annually by the Guild "for outstanding test flying contributing to the advance of aviation," reflects Mr Trubshaw's work with the VC10 throughout its test programme, with the Super VC10, and with the One-Eleven, including investigation of its stall. He previously gained the award in 1961 in recognition of his flight testing of the Valiant.

Other Guild awards for 1964 go to Captain Frederick Ladd, of Auckland, New

British Debut for the Australian Victa Airtourer, seen here at Staverton, Glos. Imported by Victa (UK) Ltd, the little aerobatic two-seater has been assembled by Glosair Ltd, who will shortly be preparing five more



SENSOR

Bristol Siddeley have a 2:1 by-pass ratio engine of about 25,000lb thrust in the project stage. It is a candidate for the Air Bus and for the "super Super VC10."

Development of an engine for the proposed Anglo-French light attack/strike trainer (either R-R/Turbomeca RB.172-T260 or SNECMA/B-S M.45 Mars) will give impetus to the baby jet feederliners like the HS.136 and the Dassault Mystère 30C. These have been languishing for want of a firm engine programme—among other reasons (this column January 14). In the present Anglo-French co-operative mood a joint effort between the designers of the HS.136 and the Mystère 30C would seem appropriate.

The SBAC has ordered for submission to the Plowden Committee a detailed report on the value of aircraft industry "fall-out" to British engineering as a whole. It may be assumed that the SBAC would like to hear of examples.

A project designated AJ 168 was mentioned in the context of Anglo-French collaboration by a questioner during the House of Lords aircraft industry debate last week. Lord Shackleton, the RAF Minister, did not rise to the bait, but AJ 168 is understood to be an alternative designation for AS.37, the TV-guided air-to-ground missile, with a range of tens of miles, which Engins MATRA and Hawker Siddeley Dynamics are developing jointly.

Designation of the twin-RB.178 "BEA Air Bus" development of the Trident, referred to in this column on February 4, is HS.132. Maximum seating capacity is about 165.

The Minister of Aviation's decision not to restrict inclusive-tour air services by independents (page 278) has been well received by these airlines. But his request to the Air Transport Licensing Board that IT procedures should be "simplified and expedited" seems unfair to the Board, which cleared all 400 applications for 1965 ITs, in accordance with the airlines' wishes, by October 31 last.

Club pilots' clamour against the increased landing fees imposed by the Aerodrome Owners' Association has had an effect. The AOA has agreed to negotiate reduced landing fees for members of ABAC clubs.

The Ministry of Aviation is expected soon to introduce an "IMC rating" for instrument flying and compliance with ATC instructions. It is believed that the new rating will be mandatory for "special VFR" clearance in controlled airspace in less than VMC conditions. Flight has long advocated such an intermediate instrument rating, which could also be applied in the lower airway levels and would greatly facilitate operations with moderately equipped aircraft.

WORLD NEWS...

Zealand, who receives the Brackley Memorial Trophy for his flying of small amphibians, especially on mercy missions in remote areas, and to Captain C. W. C. Hamilton, of Airwork Services Training, who gains the Pike Trophy for outstanding services in aviation training.

The Cumberbatch Trophy for an outstanding contribution to air safety is awarded posthumously to Mr John Wright Gibbs, former chairman of the UK Flight Safety Committee, who died last November.

FOUR SCORE

Capt Laurence Pritchard, secretary of the Royal Aeronautical Society from 1925 to 1951, celebrates his 80th birthday today, February 25. In good health, he is writing a history of the Society.



IIIV in the Z Axis: René Bigand, Dassault chief test pilot, making the first vertical take-off in the Dassault Mirage IIIV at Melun-Villaroche on February 12, also marks the first lift-off of the Rolls-Royce RB.162 engine. Propulsion engine is here an early SNECMA TF-104, to be replaced soon by the first TF-106 recently delivered to Melun. The definitive TF-306 will be fitted late this year for supersonic flying. Both the Mirage IIIV and Balzac may be at the Paris Show. The IIIV will become the third VTOL to exceed Mach 1, but the first operational VTOL with level supersonic performance. Its gross weight is approximately 26,500lb. Noteworthy are the efflux deflector doors for ground-running and short take-offs.

SECOND MoA PRICING REPORT

Sir John Lang's second report on MoA defence contracting "to recommend whether any changes in organization or procedure are necessary to ensure a better assessment of prices for . . . contracts in the future"—following his first report on the Ferranti profit from Bloodhound Mk 1 sales—has been published as white paper Cmnd 2581 and is obtainable from HMSO at 2s 6d. The first report was Cmnd 2428 of July 15 last year.

The report deals with production—not development—contracting and makes many detailed recommendations on exact methods and procedures for determining prices, costs and profits, and the sharing of profit or loss. Most of the recommendations are practical and reasonable, but the report stresses the need to protect the privacy and interests of the manufacturer.

On the desirability of competitive tendering it says that "The Ministry and the Treasury have, however, pointed out to us the difficulties of extending competitive tendering. The Services' requirements for major new equipments often necessitate the first production order being placed before the development of the equipment has been completed. This generally means that it is necessary to place the first production order with the development contractor . . . Once a firm has obtained the first production order, acquired the necessary jigs and tools and overcome the initial 'learner' problems of manufacture it has often established itself in a position which would make it uneconomic for other sources of supply to be introduced. . . . We have come to the conclusion that it would be unrealistic to count upon an extension of competitive tendering as a means of securing fair and reasonable prices on production contracts that are at present let on a 'price to be agreed' basis."

The other factor involving a company's rights to privacy is defined by observations on "equality of information" when determining costs. The report says "We think that 'equality of information' is an apt

term to describe the relations that should, in our opinion, exist between the Ministry of Aviation and its contractors up to the time when prices (or target costs) are fixed. . . . In the term 'equality of information' we would also include access by the Ministry to details of the manufacturing facilities and production plans actually employed by the contractor on a previous contract for like stores on which prices have already been fixed, but we do not use it to include access to the times taken or costs incurred on such a previous contract.

"We recognize that when a second or subsequent production order is being priced the Ministry's knowledge will not be fully equal to the contractor's if the Ministry does not have the access, which the contractor will always have, to all the times and costs on the previous contract. To extend 'equality of information' to meet this situation, however, would be to come too close to post-costing the previous contract.

"... we consider that there is great importance in the principle that a fixed price is an agreed price and that the sanctity of an agreed price should not lightly be disturbed. We would therefore deprecate the introduction of post-costing into Ministry of Aviation fixed price contracts and it is partly for this reason that we attach so much importance to the principle of 'equality of information' designed to ensure that the Ministry will know more about the factors likely to influence production cost."

The summary of conclusions makes the overall observation that "We regret that we have not been able to recommend any measures that would ensure that there could never be a repetition of what occurred in the pricing of the guided weapon contracts that led to our appointment. Perhaps this is not surprising because the problem of fixing fair and reasonable prices for non-competitive contracts has been examined before by many persons with expert knowledge. Estimating the cost of production, particularly of new equipment, is

not an exact science. Instances may well recur where the estimators on both sides form an exaggerated view of the likely costs of production when they are dealing with equipments involving novel techniques. Our recommendations are designed to minimize the risks inherent in this situation: the risks cannot be eradicated—except by the adoption of 'cost-plus' contracts, a measure which could bring other disadvantages in its train and which nobody could wish to see adopted as a general policy for production contracts.

"Our main conclusions on the positive measures necessary to ensure a better assessment of prices are fourfold.

"First, excessive profits and losses are most likely to arise on large value first production contracts for new and complex equipments, especially if they involve novel production techniques. Accordingly the method of pricing these contracts should be determined with caution: fixed prices based on estimates of cost will generally be inappropriate.

"Second, when fixed-price contracts are appropriate—and this will be in the majority of cases—the Ministry should put itself into the position of being able to know more than at present about the relevant factors affecting the prices that it is agreeing. . . . Although we have referred to the possibility that contractors might take advantage of the Ministry's lesser knowledge of the facts of production in order to earn higher profits we have no proof that they generally do so. But, as 'price to be agreed' production contracts of the order of £200 million per annum are involved, we do not think that the opportunity should be allowed to exist.

"Third, continuing attention should be paid to the planning, harmonization and control of the activities of the Ministry's contracts, technical cost and accountancy staffs.

"Fourth, adequate staff must be provided to enable prices to be agreed expeditiously and carefully."

parliament

KENNETH OWEN

The Commons had discussed the aircraft industry; now it was the Lords' turn. On Wednesday, February 17, Pugin's magnificent chamber, rich in tradition, heard talk of technological spin-off, strategic scenarios, sophisticated and de-sophisticated weapons systems, cost-escalation and cost-effectiveness. Compared with the Commons the pace was cool, the debate urbane.

The scope of the debate was wider, too, with two bishops, an ex-Hunter pilot, a journalist and an eminent scientist adding their thoughts to the more predictable views of Ministers and ex-Ministers. The lines of argument were familiar, the leading speakers on both sides reshuffling the cards used in the Commons the week before—yet dealing them in a patrician manner.

Technological change was here (and not only in the aircraft industry), but were we keeping pace with the sociological implications of this change? The Bishop of Coventry thought not. Without responsible arrangements for people's security, mobility of labour would be hard to achieve. Without mobility of labour, we could not

respond effectively to industry's needs.

Lord Morris of Kenwood began his aviation career in an Air Training Corps squadron in Loughborough, following this with 2½ years as an AC2 flight mechanic. But it was as an ex-Hunter pilot with 247 Squadron that he addressed the Lords, concentrating on the operational aspects of RAF aircraft rather than on economics. Already the Hunter was no match for supersonic aircraft employed by several minor countries, he said; this was an intolerable position.

Light relief was supplied by Lord Francis-Williams. The previous administration, he pointed out, had scrapped no less than 26 projects—and had scrapped Defence Ministers at almost the same rate. Lord Watkinson, he suggested, must be quite glad to be out of a rather overcrowded profession.

Lord Shackleton interrupted the debate to read out the Minister of Aviation's statement on civil aviation policy. From the opposite front-bench Earl Jellicoe commented that, for the usually brief and pithy Mr Jenkins, this seemed one of his rather more indigestible pieces of literature. Two men squatting on the steps of the throne at the end of the chamber, looking rather like schoolboys playing truant, grinned broadly. One was Roy Jenkins from Abersychan County; the other was Denis Healey from Bradford Grammar. They were exercising their privilege as Privy Councillors to sit on the steps of the throne (Rather a gimmick, one noble Lord suggested later over tea; they would have been

a lot more comfortable in the gallery).

Beware the so-called advantages of spin-off, warned Lord Wynne-Jones in his maiden speech. The first aeronautical manufacturer, Dædalus, might have claimed a technological spin-off when Icarus proved that wax was melted by the Sun, and this might have had a considerable effect on materials technology. But more recently the US National Aeronautics and Space Administration, in proclaiming the advantageous developments stemming from the vast expenditures on aerospace research, has cited (a) strengthened support-straps for brassières, and (b) a new method of producing lemon-squeezers. Four thousand million dollars per annum, Lord Wynne-Jones suggested, was a rather high cost for such products.

The Commons plays itself in each day with almost an hour of oral answers by Ministers. First to bat at question time on Monday, February 15, was Mr Healey (see page 300). On Thursday, February 18, the Prime Minister told Mr Eric Lubbock, Liberal aviation spokesman, that only the first nine aircraft were included in the £300m R and D estimate for TSR.2. Mr Austen Albu, recently appointed Minister of State at the Department of Economic Affairs, replied to Mrs Shirley Williams (Labour, Hitchin) on the question of alternative employment for redundant aircraft workers. One of the objects of the recent aircraft cancellations, he averred, was "to get a transfer of resources into industries where they would make some money." (*Lords' debate report, page 291*)

press

ROBERT BLACKBURN

London, February 19

After the meeting between M Jacquet and Mr Jenkins on February 16 a communiqué was issued. Of the Concorde, it stated that the two Ministers had "noted with satisfaction the excellent technical progress being made, and reaffirmed their intention of pressing on with the programme." The *Express*, *Telegraph* and *Sun* reported that the meeting had taken place but did not quote the official statement. The *Mail* angled its story on the presence, at a separate meeting on the same day, of Mr Najeeb Halaby, who "said after talks in London that the US will not join a partnership on the Concorde airliner and that America hopes to have her own supersonic passenger jet within ten years." The *Mail* added that "The revised Concorde plan will mean that the super-jet cannot be in service before 1973."

Revised plan? According to the *Financial Times*, "the programme is going ahead on the original basis, with two prototypes being built in each country, and production lines

also being built up eventually. Suggestions that only prototypes will be built are denied." The *Telegraph*, did not refer to "satisfaction" or "excellent progress" but found space to requote Mr Jenkin's Commons reference, last month, to the doubts retained by the Government about economic aspects of the Concorde.

The second paragraph of the Ministers' communiqué said they had "exchanged views on the possibility of Anglo-French collaboration in the design and development of a subsonic passenger transport for shorter routes and decided to study the matter further." This revelation was promoted to the lead item in most papers' accounts of the meeting, thus enabling sub-editors to make full use of the vogue-word "airbus." A misleading word, incidentally: surely "airtrain" is more appropriate for things seating 150 people or more.

In fact, Fleet Street adds spice to the language of aviation, though sometimes it is applied over-liberally. One can forgive Angus Macpherson, however, for saying "jump-jet" six times in one short article last week; after all, he coined the phrase.

The week's safest prophecy was made by the *Guardian's* defence correspondent, who said of the Kestrel: "It does not seem likely that this excellent aircraft can be developed into any sort of commercial role."

Leader-writers reacted slowly to the Government's anti-independent airline policy announced on February 17. The *Express* and *Financial Times* were first to spot the weakest chink in Mr Jenkins's

armour—the proposal to protect BEA consumers' interests by the appointment of an extra member of BEA's board. "No device of this kind," roared the *Express*, "can ever be a substitute for the discipline and the spur of competition." The *Mail* delivered a powerful and effective attack on the "sterile, out-of-date ideology" which has put British Eagle out of business on the domestic routes.

From the *Economist* of February 13, this elegant addendum to Roger Bacon's Conversational English in Aviation Politics: "Mr Jenkins has inherited a ripe load of British rubbish."

By Sunday it was clear that Mr Jenkins could expect little Press support for his policy. Even the *Observer* called it "disappointing" and advocated pooling between BEA and Eagle as a better arrangement.

Boeing's decision to build the 737 was apparently triggered by Lufthansa's announcement on Friday that it intended to negotiate for 21. The news was prominently reported, especially in Saturday's *Express* under the headline BRITAIN FLIES GERMAN. The *Express* coupled Lufthansa's 737 choice with the unhappily coincident news that the German airline had been awarded five charter flights to the Far East by the Ministry of Defence. But while Lufthansa's preference for the 737 was widely interpreted as an anti-British move, new US orders for British products—two more One-Elevens for Mohawk and two Westland hovercraft for Bell Aero-systems—were reported less emotionally.



AIR TRANSPORT

Independents and the New Policy

FIRST and immediate effect of the air transport policy statement by Mr Roy Jenkins, the Minister of Aviation, in the House of Commons on February 17 was the announcement by Mr Harold Bamberg, chairman of British Eagle, of this airline's decision to cease competitive operations over the trunk routes between London and Glasgow, Edinburgh and Belfast. The last of these services were operated on the evening of February 19.

In summary the new Government policy "guide lines" mean that only one British carrier will in future be allowed to operate over the same international or domestic route, but that the development of entirely new services and of inclusive-tour charters will be encouraged and supported. Existing parallel operations will not be interfered with, but there will be no prospect of increased frequencies for a competing independent carrier. In the absence of competition necessary to produce a better service on the domestic routes, the Minister proposes to appoint to the board of BEA a kind of Ombudsman member to look after the interests of the travelling public.

At a press conference immediately after the Minister's announcement Mr Bamberg said that, with no prospect of increasing the frequency of British Eagle's domestic trunk services to a required economic minimum of three a day, there was no hope of making these profitable. British Eagle would not, he said, take part in the domestic fares hearings being held by the Air Transport Licensing Board this week (on February 23 and 24). At these hearings British European Airways has asked for fare increases; British Eagle had intended to object strongly to these increases with, it is understood, a disclosure of the airline's complete operating-cost breakdown to demonstrate its belief that such increases were unnecessary.

Operation by British Eagle of the Liverpool - London and Liverpool - Belfast services—which are not in competition with BEA—will be continued at the increased frequencies already planned. The ATLB recently approved unlimited frequencies on the London - Chester - Liverpool route.

Although Mr Bamberg did not say so at the conference, British Eagle and British United were shown the Minister's statement for the first time on the very morning of the announcement. There had been no opportunities for discussion of the proposed policy.

Significantly, Mr Jenkins said in reply to a question after his policy announcement in the House that the independent airlines had sent him a statement but that "the policy of the Government . . . is not determined by . . . memoranda of this kind."

When *Flight* asked whether the Minister had consulted the Air Transport Licensing Board about his decision, we were told that he had not done so. Asked why not, a spokesman said: "The formation of Government policy on civil aviation, no less than in other fields, is a matter for the Government. As far as the ATLB was concerned, the Minister of Aviation has always had the benefit of the board's views, and he took full account of these views as expressed generally and in recent appeal cases. The chairman and deputy chairman of the board were told of the Government's intentions sufficiently in advance for them to have commented if they had so wished." It is believed that in fact they were told of the decision only the afternoon before.

The Minister's statement was:—

The Civil Aviation Licensing Act, 1960, provides for the Air Transport Licensing Board to grant licences, subject to a right of appeal to the Minister, to operate specified services. I do not propose, at this stage, to ask the House to make a change in this legislative framework. I nevertheless believe that it would be in the public interest to lay down some guide lines to the Government's views of the objectives of licensing policy.

Three main types of operation are concerned: inclusive-tour charter

services; scheduled services overseas; and internal services within the United Kingdom.

In general, it is not, in my view, desirable to apply restrictions to the inclusive-tour charter services on holiday routes. The growth of such services has been made possible by an agreed European policy of licensing liberally applications by reputable operators of each other's countries. This traffic may have some effect on scheduled carriers, but to attempt to deal with this problem by restricting licences would prevent some members of the public who want inclusive tours from booking them and, in addition, might tilt the balance of trade within the restricted market against British operators.

I have accordingly asked the ATLB if its procedures for dealing with the applications of British operators for this type of service can be simplified and expedited. The two corporations are, of course, free to compete in the inclusive-tour charter market.

So far as scheduled services on international routes are concerned, I am not convinced that the national interest is, in general, served by more than one British carrier operating on the same route. No other European country attempts to insert two of its carriers on any single international route and I believe that a continued British attempt to do so is likely not only to be harmful to the established British operator, but to bring no net gain to British civil aviation as a whole. I do not, therefore, propose to re-open with foreign governments those cases where the ATLB has licensed parallel international services by British operators and it has so far proved impracticable to secure the necessary traffic rights on acceptable terms.

Directives to the ATLB

I shall also be ready to use my statutory power to direct the board to refuse applications when it appears to me that foreign rights cannot be obtained without detriment to an established service or to the British share of the traffic as a whole. At the same time, any British operator, public or private, who wishes to provide a genuinely new service or open up some fresh market for British aviation will have my full support.

On some trunk routes in the United Kingdom independent companies are now operating services of limited frequency alongside BEA. The ATLB has not so far thought it right to allow them to operate at anything approaching an unrestricted frequency. That accords with my own view. In the short run, unrestricted competition might produce a better service to passengers, but probably at the cost of all the operators serving the routes in question doing so at a loss. The longer-term results could well be to force up fares, or to lead to a lower frequency after one operator had been eliminated. The benefits to the passenger would be likely to be short-lived. While, therefore, so far as rests with me, the independent airlines may continue undisturbed to operate their present limited frequencies on these domestic trunk routes, I do not think it right to offer them the prospect of an unrestricted or extended frequency in the near future. In these circumstances it will be for these companies to consider whether they wish to continue as at present, or to withdraw completely from these routes.

Should they choose the latter alternative, BEA will revert to being the sole operator. I therefore propose to institute special measures to ensure that BEA pays particular regard to the consumer interest. I shall seek an early opportunity to appoint to BEA's board a member who will be charged with paying special attention to the interests of the domestic passenger. I also propose to strengthen the terms of reference of the Regional Advisory Committees for Civil Aviation, with particular emphasis on the quality of service and convenience of timings to meet local needs. I am sure that BEA will not wish to fall down on their national responsibilities in any of these respects.

On other internal routes there may be a case for more enterprising development of air services by independent airlines and for giving them reasonable security of tenure of licences. The Government's eventual policy must naturally have regard to the study of the co-ordination of the transport system which Lord Hinton has undertaken to conduct.

These general statements of policy intention, which must be subject to exception in some cases and which are, of course, without prejudice to the duty of the board and of myself to give full attention to evidence

and argument in particular cases, will, I believe, offer reasonable security and a good prospect of growth both to the air corporations and to the independents. Both types of operator have an important part to play in the rapidly expanding future of British civil air transport. In the view of the Government they need not achieve this at each other's expense.

In the debate following his statement, Mr Jenkins stressed at least three times the wish of the Government to prevent "unrestricted competition." No one commented that there never had been (and probably never would be) such competition—though Mr Jenkins himself remarked that there had not been "anything approaching" unrestricted competition rights under the previous administration.

The Minister said that he had seen representatives of the two main independent airlines [British United and British Eagle] before making the statement. He also said that he had been "under considerable pressure from one of these airlines to make the statement as soon as possible." He was also, he said, meeting the British Independent Air Transport Association to discuss "general matters" with them.

BIATA is Subdued

Reactions from the independents were strangely subdued. British United's Mr Freddie Laker, who more than anybody might have been expected to kindle the fires of protest, made no comment. This was probably because he was in Gambia. The independents representing BIATA called a press conference in London on the evening of the following day, February 18. No strong expressions of dissent was made by the president, Wg Cdr L. B. Elwin of Cambrian ("we agreed with the Minister to disagree"), and the conference was curiously off-hand. It started half-an-hour late because Wg Cdr Elwin was being interviewed by television; and the man whom most correspondents wished to hear talk, Mr Harold Bamberg of British Eagle, left immediately afterwards for the BBC television studios. At this conference BIATA distributed copies of a two-page report, *British Air Transport Policy*, which they had given to the Minister on February 1, though they did not publish it at that time. At about the same time Mr Bamberg had circulated copies of his own report to the Minister to the Press as background. Comparison of the two statements shows that they are broadly similar, though differing in certain important details (see later). Mr Bamberg's statement was as follows:—

- (1) In broad terms, the best policy to adopt is one which provides the maximum possible expansion of British air transport, even if this results in increased competition. In theory this has been the objective of the Air Transport Licensing Board, but it has not been achieved in practice.
- (2) The main benefits of such a policy would be: (a) Better and more adequate service to the public; (b) improved industrial expansion and a better distribution of industry throughout the British Isles; (c) increased use of British aircraft and equipment and, consequently, less redundancy and a better chance of technical progress; (d) following on (c) there would

be better chances of sales of aircraft and equipment in the export market. (3) It should be made clear by the Minister that the independents are an integral and permanent part of British air transport, and will continue to enjoy Government support. They must be encouraged to expand as part of the general growth, and it is not in the national interest that they should be unduly curtailed by the corporations.

(4) The Government should promote the formation of a Chamber of Air Transport, with a wide and representative membership and in which both the corporations and the independents should play a part.

(5) The Minister should take immediate and direct action to establish the following points: (a) As a general principle all domestic routes with an annual traffic potential of more than 200,000 should be operated by two separate carriers, each with unlimited frequency; (b) the ATLB should be directed only to apply frequency limitations to regular services in very exceptional circumstances; as a general rule, frequencies should be unlimited; (c) licences for regular services should be granted for periods of at least ten years to encourage operators to buy and use new British equipment; (d) the corporations must not be permitted, through either the ATLB or the appeal procedure, to obstruct the development of inclusive-tour charter traffic; (e) although the decision has been taken to permit the corporations to tender for troop transport contracts, the transfer of any contracts to them should be delayed until the Air Transport Advisory Committee (see below), has had an opportunity of studying the matter as part of an overall policy.

(6) Because it is virtually impossible to devise a complete and constructive policy in a short time, and it is something which warrants very serious study, the Minister should set up, as quickly as possible, a new central Air Transport Advisory Committee, consisting of a full-time chairman and four part-time members with the same qualifications as those required for the proposed British Airports Authority. This committee should be charged with the task of producing a long-term, progressive and flexible policy for British air transport, giving special attention to the following points: (a) The expansion in terms of routes and services which should take place during the next 15 years; (b) the national airport requirement necessary to meet this expansion; (c) the respective roles of the corporations and the independents in terms of achieving the optimum expansion; (d) the need for the independent operators to develop on a sound economic basis; (e) the possibility of allotting to the independents certain areas and activities (such as cargo), which they might be responsible for developing to the national advantage; (f) the changes which may be necessary in licensing policies and procedures to obtain optimum growth; and (g) the types of transport aircraft which may be required during the period under review.

(7) The committee would take evidence from all interested parties and would make recommendations to the Minister. It would also be responsible for up-dating the policy in the light of changing conditions and technical development.

(8) The action recommended in paragraph 5 is essentially that required to make survival for the independent carriers possible. It is suggested that the action proposed in paragraphs 6 and 7 is the best method of dealing with the future.

Main differences between this statement and that of BIATA are:

- (1) BIATA made no reference to unlimited frequency competition (para 5a and b of the Bamberg statement above).
- (2) The BIATA

The first of two Handley Page Heralds for British Midland Airways at Birmingham Airport during a crew-training flight



AIR TRANSPORT...

statement, while not intending "to cast any aspersions on the work or ability of the Minister's advisers," did not believe that "a future policy can be effectively devised by individuals who are burdened with day-to-day administration."

On television on February 17 Mr Harold Bamberg said that the BEA's application to increase fares was to have been opposed by British Eagle [at ATLB hearings on February 23-25] and he said that competition was the only thing that would lead to better service and lower fares. Mr Roy Jenkins, on television on February 18, expressed himself "surprised" that Mr Bamberg had decided to pull off domestic routes so soon; this had not been his intention, he said. Mr Anthony Milward, chairman of BEA, said he was sure that Mr Harold Bamberg was "the happiest man in Britain tonight," having lost so much money on domestic routes.

DC-7B CRASH EVIDENCE CONFLICTS

THE possible cause of the Eastern DC-7B crash near New York on February 8 was last week still the subject of disagreement about whether or not there had been a near-miss incident (see *Flight* of February 18, page 238). The FAA has said that evidence showed that the departing DC-7B and the arriving Pan American 707—the crew of which reported a near-miss—were separated by 3-4 miles laterally and 1,000ft vertically when they passed just before the crash.

On the other hand the published transcript of the words of the 707 crew includes references to a near-miss and to apparent avoidance manoeuvres by the DC-7B. Part of this transcript records a pilot of the 707 saying that the DC-7B "was well over the top of us and it looked like he went into an absolute vertical turn and kept rolling."

NYA RELIES ON DECCA

FOR the first time the FAA has recognized the Decca navigation system as a primary aid—in this case to enable New York Airways to operate their Boeing-Vertol 107 helicopters in the greater New York area when *en-route* weather limits are below VMC. Both NYA and another big city-centre helicopter operator, Los Angeles Airways, regard all-weather operations as the key to profitability and eventual independence of Federal financial subsidy.

The New York chain of Decca ground stations has been operational, primarily for shipping, since January 1958. However, NYA have successfully used the system on an experimental basis for many years during VFR operations. As well as boosting the expected number of winter schedules completed from 75 per cent to over 95 per cent, the use of Decca should make for faster and

Gen Hamid Tawfiq, the director-general of Iraqi Airways, which has three HS Trident 1Es on order, flies the first of this variant during a test from Hatfield



more economical helicopter operations. Whereas the helicopters would otherwise have had to follow the beacon system laid out for conventional aircraft, they can now follow more direct routes.

In the Los Angeles area, where there is no Decca chain, LAA's-61Ls rely on VOR for *en-route* navigation and on ILS for approaches to conventional airports. In addition to the dual Mark 8 Decca installation with twin Flight Logs, the NYA 107s also have VOR and ILS for conventional airport approaches. Both helicopter operators still require VMC for VFR approaches to downtown heliports.

The Proposed Boeing 707-820, one of the two stretched 707 variants, will, says *Aviation Week*, be powered by 21,000lb-thrust Pratt & Whitney JT3D-5A engines.

Crash in Miami An all-cargo C-46 operated by Aerolineas El Salvador crashed after take-off from Miami International Airport on February 13. Two crew members were killed.

Two More One-Elevens have been ordered by Mohawk, since page 284 of this issue went to press. This brings their order to seven, and an option has been taken on a further three.

Luton - Midlands - Belfast Service Approved The ATLB has approved an application from British Midland Airways for a service between Luton (optional), East Midlands (Castle Donington) or Derby and Belfast.

748 for Caribbean Leeward Islands Air Transport Services has ordered an HS.748 for delivery in the spring and has taken an option on a second aircraft. Until delivery, LIAT is operating a 748 on lease.

Mr D. F. Fairbairn has been appointed chairman of Central African Airways in succession to Sir Robert Taylor. Mr Fairbairn served in the RAF during World War II and has held various positions with the Commonwealth Development Corporation since 1949.

In-Flight Entertainment Discussion A top-level meeting of the presidents and chairmen of North Atlantic IATA-member airlines is to be held in Paris on February 27 to discuss in-flight entertainment (see *Flight*, February 11, pages 199-200).

Manston Vehicle Services Air Ferry, now an Air Holdings (BUA) company, will start scheduled vehicle-ferry services from Manston to Ostend and Le Touquet on April 5. Initially Bristol 170s will be used; ATL-98 Carvairs will be introduced later.

Good London - Blackpool Traffic During the first seven days of February a record 700 passengers were carried on Autair International's daily service with Ambassadors between London and Blackpool. During the first year of operation 11,000 passengers travelled on the service which was started by Autair in October 1963.

Green Light for Invicta The ATLB has granted the great majority of the inclusive-tour licences sought by the newly formed independent airline Invicta (*Flight*, February 11, page 200). The airline last week took delivery of its first DC-4 from British Eagle and operations are expected to begin on April 1.

Development of the Boeing 733 supersonic airliner design continues. The company recently submitted the 733-290 (290th configuration investigated by Boeing engineers since SST studies began in 1952) to the FAA's evaluating team. This has a longer and wider fuselage for seating up to 200 passengers and the gross weight is around 500,000lb. The overall swing-wing configuration appears to be substantially unchanged.

The LAN Chile Accident Seven crew members and 80 passengers were killed in the accident to the LAN Chile DC-6B on February 6 (see *Flight*, February 11, page 200). The aircraft hit the 19,130ft San Jose volcano in the Andes at a height of about 12,000ft. The captain had obtained ATC permission to re-route because of cloud in the El Volcan Pass normally used by piston-engined aircraft.

FAA Report on Sonic Boom Effects

TWO volumes of a five-part report on sonic boom problems were issued by the US Federal Aviation Agency earlier this month. They deal with "community response" to the Oklahoma tests (a study prepared by the National Aeronautics and Space Administration) and with meteorological aspects (completed by Boeing under FAA contract).

The NASA study, entitled "Sonic-boom Exposures During FAA Community-response Studies over a Six-month Period in the Oklahoma City Area" summarizes sonic-boom overpressure levels and other shock-wave characteristics. These were measured during the programme by means of specially modified microphones, tuning units, amplifiers and oscillograph recorders. Booms were measured inside and outside three of the test houses. In addition, multiple arrays of microphones were set up at selected locations to obtain information on the sizes of areas effected by given levels of ground overpressure.

Among the findings and conclusions of the NASA study were:—

(1) If the aircraft speed, weight and altitude are held absolutely constant and the atmospheric conditions are constant, the overpressure values would, it is believed, be equal for all flights. The overpressure values from one flight to another are not constant, but vary in amplitude over a considerable range. These differences may be due to such factors as small variations in aircraft flight conditions, measuring-technique and instrument inaccuracies, and weather. For the data obtained, the weather effects are judged to be dominant.

(2) Overpressure recordings taken at a ground station under the boom-generating aircraft's flight track indicated that about 80 per cent of the measurements for this particular condition were lower in amplitude than would be predicted and only about 20 per cent equalled or exceeded the predicted value. There is a probability of about one per cent that the measured value will equal or exceed the predicted value by 50 per cent.

(3) Overall, in like manner, one per cent of the measured overpressures equalled or exceeded the predicted values by a factor of about 1.5 to 3.0 depending on the distance relative to the ground track. The larger factor was associated with the larger distances and with the lower predicted value.

(4) Measured pressure "signatures" inside a building were lower in amplitude and longer in duration than the corresponding outside pressure signatures and were dominated by frequency components corresponding to the principal vibration modes of the building.

The Boeing study, "Meteorological Aspects of the Sonic Boom," was concerned with the influence of atmospheric temperature,

pressure and wind on boom levels. Findings and conclusions—based both on Oklahoma City experience and analytical investigation of "model atmospheres"—included:—

(1) Variations in temperature, wind and pressure can influence the boom strength on the ground.

(2) Variations in temperature and wind can influence the lateral distribution of the boom to the side of the flight track.

(3) Variations in temperature and winds can cause anomalous propagation such as complete cut-off (no boom heard on the ground), focusing (local intensification of boom strength), or extreme lateral spread (no cut-off to the side of the flight track).

(4) For flight at Mach numbers above 1.3 the largest influence of changing meteorological conditions on the sonic boom overpressure is generally no more than about ± 5 per cent from that generated in the still (no wind) standard atmosphere. For flight at Mach numbers between 1.0 and 1.3 the meteorological conditions between the aircraft and the ground may result in more significant variations in the overpressure.

(5) For Mach numbers of less than 1.3 temperatures lower than standard at the ground generally reduce the overpressure, while higher temperatures generally increase the boom. This variation may be as much as ± 5 per cent at Mach 1.2.

(6) For Mach numbers of less than 1.3 headwinds generally increase the boom, while tailwinds and sidewinds decrease it. Winds may cause variation in the overpressure from that in a still atmosphere (no wind) of as much as ± 20 per cent at Mach 1.3.

(7) The influence of local turbulence seems to be that of a distorting mechanism which deforms the incoming pressure signature on its way to the ground. Present indications are that interactions of the shock waves with certain turbulent eddies result in a scattering of small portions of the incident wave energy to other parts of the wave. This process would lead to rounded signatures at some points on the ground and spiked (or very sharply peaked) signatures at others.

(8) Statistical analysis of overpressure signatures from F-104 boom flights at Mach 1.5, altitude 28,000ft, with three-tenths cloud cover indicate that the important scattering parameters (factors causing irregularity in a sonic-boom overpressure pattern) are the angle of the path of propagation of the shock wave (primarily a function of aircraft speed) and the time of day (as related to the turbulence intensity). The data indicate that the upper and lower bounds of the overpressure of the front shock of a deformed (irregular) pressure signature are respectively 2.0 and 0.3 times that for the un-deformed (regular) measured signature.

AIRLINERS FOR THE ENTENTE

TEMPERED optimism was the keynote of the talks in London last week between the British and French Government heads of civil aviation. This was the first meeting between the Minister of Aviation, Mr Roy Jenkins, and his French opposite number M Marc Jacquet, Minister of Public Works and Transport, since the January 20 decision of the British Government to support a substantially unchanged Concorde programme. Object of the February 16 talks was to review Concorde progress. Afterwards the Ministers noted "with satisfaction" the excellent technical progress being made and reaffirmed their intentions of pressing on with the programme.

The Anglo-French meeting also ranged over the question of possible collaboration between the industries of both countries for the building of a new large medium-haul airliner. A number of projects are known to exist: studies have been under way for over a year on the 200-seat twin-engined Sud-Aviation Galion, while Hawker Siddeley is believed to have a similar design based on the Trident. Power for the short-haul "air bus" would be turbofans in the 25,000-30,000lb thrust class and both Bristol Siddeley and Rolls-Royce are active with proposals. The Rolls-Royce engines are presumably versions of those being studied for installation in bigger and longer-range developments of the VC10. The Ministers decided to study further the matter of a combined venture with a short-haul transport.

In the afternoon of February 16 the two Ministers were joined in

their talks by Mr Najeeb Halaby, the administrator of the Federal Aviation Agency, when the subject under discussion became the problems of introducing SSTs into service in the 1970s. Mr Halaby was in London participating in one of the regular series of meetings held between the FAA and the MoA aimed at keeping under review the development of air traffic control systems, navigation aids and air safety. The three heads of civil aviation commented favourably on the co-operation already achieved between their respective departments in formulating SST operating requirements.

ONE-ELEVEN DEMONSTRATED IN SPAIN

THE "proving" BAC One-Eleven, G-ASJI, was recently demonstrated to the management of Iberia and Aviaco in Spain. The aircraft was flown from Madrid to Barcelona and back, returning to Gatwick the same day. Aboard the One-Eleven during the Madrid-Barcelona demonstration was a strong BAC sales team headed by Messrs Geoffrey Knight and Derek Lambert.

The One-Eleven is reported to have acquitted itself well, using slightly less fuel and covering the two-way journey 2min faster than the estimated time quoted in BAC's route analysis. Iberia and Aviaco operate 16 and five Convair 440s respectively, and thus represent a good potential market—estimated at 15 aircraft—for the One-Eleven or DC-9. It seems too early to predict which way the decision may go.



The first Fokker F.27 Series 400 combination passenger-freighter was handed over on February 8 to Condor Flugdienst, the Lufthansa subsidiary which operates charters and scheduled services for the national flag airline. Condor has a second F.27 on order

AIR TRANSPORT...

Forthright Words by CAB Chairman

MR Alan Boyd, chairman of the US Civil Aeronautics Board, said some fairly drastic things about the International Air Transport Association in the course of an "extemporaneous" talk to the International Aviation Club in Washington at the end of last month. The gist of his criticisms was summarized in *Flight* of February 11, page 201. They were part of a series of remarks covering air cargo, the SST and international traffic rights as well as his views on IATA. Here are his words.

IATA is a very fine organization. It includes the best airlines in the world—and the worst. It has a fine staff of competent people. The only thing I've found they lack is persuasive power. IATA and the CAB have had a number of communications over recent years, and we have said with utter sincerity that we do not want to see the demise of IATA. We have also said that, in our judgment, IATA has a great responsibility to the travelling public—but we have not been very persuasive in this area.

We have been told from time to time that IATA is an absolutely essential organization, that there would be chaos without it, and at times IATA will not be able to reach agreements but that we should be patient because these things can be worked out. This is our hope and belief.

I should say that right now—and I'm speaking personally—IATA members have been unable to agree for so long a time that they need to take a pretty hard, long look at themselves. They should not live in what may be a fool's paradise, thinking that the United States Government, or other governments of the world, are going to sit on our hands while the membership of IATA spend their time in-fighting without reaching any conclusions. If they can't do the work for which they were established, I think the sovereign governments of the world can do it for them.

Now, we don't want to do it and I'm sure I speak for most governments when I say this. The US Government doesn't want to do it, but we are not going to have, for the burgeoning industry of international air travel, a situation where a group of some self-centred, selfish, short-sighted and narrow-minded air carrier representatives are unable to reach agreement on either basic or unimportant items.

I, for one, would like to say to them publicly and specifically they had better get something done to resolve the international rate situation, and do it soon, or it will be done for [them]. This is about as clear as I know how to be. If these folks don't get the message, we'll try in some other manner to communicate with them. So much for IATA. I wish them well.

* * *

Much of the remainder of Mr Boyd's talk was obviously designed for an American domestic audience and he took a line which, to people on the other side of the Atlantic and elsewhere, must appear somewhat "holier than thou." When discussing traffic rights, for

instance, he said that the US carriers and the US Government obviously had a primary interest in the welfare of these flag carriers. But, he added, "we also have an interest that is just as primary in the travelling public and its ability to move freely and at the lowest reasonable rates and fares possible. Some of our fellow contracting parties on bilateral agreements have a different approach—which is that its great for traffic to grow, but that its great only if the national carrier gets one passenger out of every two.

"And this is what is known in some areas as reciprocity. Now we have not accepted that; we do not accept it; and I don't see how we could accept it. I don't think that reciprocity involves splitting the market down the middle. We have been opposed to revenue pooling in our aviation policy. We feel very strongly that within reasonable limits competition in the long run will serve the interests of the travelling public, the governments and the carriers better than any form of collaboration in the movement of passengers.

"I think we can make," Mr Boyd continued, "an extremely strong case that our policy has been exactly right in this regard. I think the fact that the United States was in a strong position after World War II, and was able to fill the skies with airplanes for carrying passengers, can be demonstrated to have been the primary reason for bringing about the tremendous amount of travel that we have today—and all of the benefits that have flowed from that travel, not only in terms of understanding but in terms of foreign exchange. However, we have been unable to persuade many countries on the wisdom of this policy and, there again, what we are doing and what we will do is to try to educate the people that we are not trying to run other carriers out of business. What we are trying to do is to see that the public gets the best possible deal."

On air cargo Mr Boyd said that the technical difficulties—the provision of suitable aircraft and adequate ground facilities—were being overcome but that development was now being restricted by political problems.

"This business of restriction on cargo flights," he said, "is a frustrating thing. It's something that is temporary and will pass. In the meantime we're going to have some bitter arguments with some of our friends whose different philosophies are just as sincere as ours. One thing that I think we sometimes tend to overlook is that they are generally very sincere in their beliefs and generally very sincere in their fears of the commercial power that the United States has spawned in the way of flag carriers.

"When you get to see our US flag carriers as we see them you find that they are not really as lethal or as tough as they sometimes appear to a competitor. But, in any event, I think we have to appreciate the honest motives of those who differ with us on our approach to the development of aviation. In air cargo, particularly, we have a responsibility and a great opportunity to try to educate others to the wisdom of our own philosophy."

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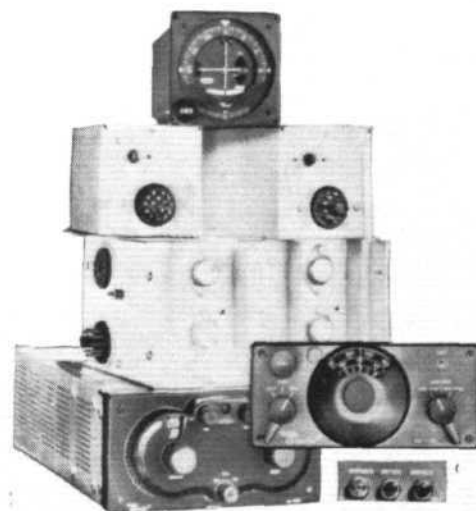
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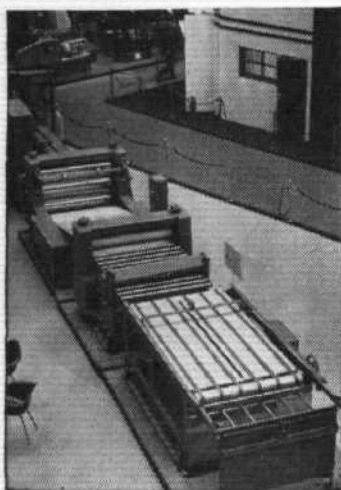


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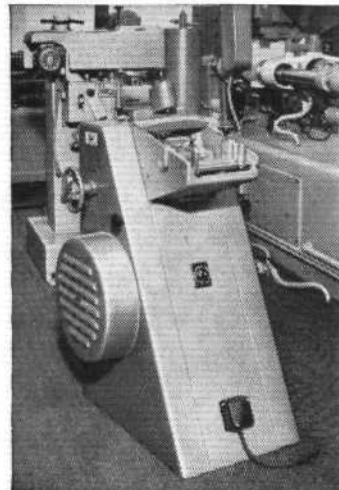
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AIR TRANSPORT...

ONLY TAKE-OFF ACCIDENT INVESTIGATED

THE report of the commission of inquiry into the Orly take-off accident was published in the French Government *Journal Officiel* on January 17. At about 1134hr GMT on June 3, 1962, an Air France Boeing 707-328 (F-BHSM), on a charter flight from Paris to Atlanta and Houston via New York, crashed after an abandoned take-off at Orly Airport. All the 122 passengers (a US cultural group from Atlanta) were killed; and of the ten flight and cabin crew members only two stewardesses survived.

The commission believes that the accident was caused by the simultaneous occurrence of (a) a large (pitch-axis) out-of-trim causing considerable stick forces at Vr (rotation speed) and VLOF (lift-off speed) which may have seemed prohibitive to the captain, Cmdt R-P. Hoche; and (b) a fault in the control system of the electric trim motor which prevented Cmdt Hoche from adjusting the incorrect position of the tailplane and, therefore, from reducing the stick force.

These two factors led the captain to decide to abandon the take-off, but it was too late for the aircraft to be stopped on the runway or even for the speed to be sufficiently reduced at the moment of passing the end of the runway.

The commission noted that trials carried out at the Istres test base after the accident showed that Cmdt Hoche could have overcome the stick force and achieved the take-off without compromising the continuation of flight, even if no trim adjustment was possible. But the results of the trials significantly modify the information on stick forces which had been published and notified to Air France when the accident occurred and, because of this, Cmdt Hoche did not have all the facts necessary for a decision which had to be taken in a few seconds.

Evidence available to the commission did not allow it to arrive at a positive conclusion concerning the conditions in which the attempt to abandon the take-off was made. The commission is convinced that no manoeuvre could have altered the outcome.

Other pertinent facts mentioned in the report of this most meticulous investigation were that a SFIM trace recorder was on board the aircraft and that the trace was read. This, combined with witnesses' accounts, indicated that the aircraft reached Vr in a normal time and distance; made an "embryonic" rotation, in which the nosewheel may or may not actually have left the ground; and then began hard braking after 2,600m (8,530ft) total ground run and at an indicated airspeed of 179kt. Sabotage, engine or electrical failure, flap mishandling, instrument error, pilot incapacitation and spoiler malfunction were excluded as possible causes by the commission.

Normal take-off setting of the tailplane would have been 3.7 "units" nose-up. Evidence suggested that the actual setting was 1.5 "units" nose-up. At its take-off weight (137,300kg) and in the existing conditions, the planned rotation speed was 158kt i.a.s., and this was reached in a normal 48sec and a run of 1,800m (5,900ft).

STATUS OF AMERICA'S SST PROGRAMME

THE question of whether the US Supersonic Transport Advisory Board will recommend a go-ahead for the American programme appears to depend to a large extent on the findings of a comprehensive economic study which is being prepared by the Commerce Department. Dr Herbert Holloman, Assistant Commerce Secretary for Science and Technology, has recently said that this report will attempt to forecast total long-distance air transport requirements to 1990 for more than 100 major city-to-city routes. This study will cover the requirements for the possible civil version of the C-5A heavy transport as well as those for the SST. It will also look at the effects of possible sonic-boom routeing limitations on SST operating costs.

The final question which this study will try to answer is whether the SST can offer a return on the required investment. According to *Interavia* Dr Holloman said that "the SST is a commercial venture and must be judged on this basis as well as prestige. The US is competing with the rest of the world and it must go to the market with its product at the right time to advance at an optimum pace. To offer the SST too soon would be wasteful—too late and the US would risk capture of the market by foreign products."

The study is also considering the Concorde as an alternative to



The flight crew of the Ghana Airways VC10 on the inaugural London - Accra service which left London Heathrow Airport on February 15 (see last week's issue, page 235). From left to right are T. Agyare, co-pilot; T. Smith, chief engineer; A. Weedall, chief navigator; and Flt Capt W. G. Daggett

the American SST. With a maximum passenger capacity of 118, the general feeling among specialists in America, says *Interavia*, is that it may prove uneconomic. If the study supports this belief, much of the urgency for the early development of the American SST will disappear and the Supersonic Transport Advisory Board may modify its recommendations accordingly.

No specifically new funds for the American SST had been asked for by President Johnson in his budget for fiscal year 1966 and the amount appropriated so far (\$91m) for design studies will be exhausted by the middle of this year. However, the President left the door open for a supplementary request for SST development funds if action becomes necessary later this year.

Meanwhile, Boeing's president, Mr William M. Allen, has called for the construction of an SST prototype as soon as the Government has completed its evaluation process. There was, he said, a limit to the gains which could be made in the windtunnel and on paper. The need now was for hardware. Mr Allen also said that it would be a mistake to try to determine now the financial basis for the production stage of the undertaking. The first step was to get a prototype or prototypes—but this did not mean that the US Government and industry were in a crash SST programme prompted by the challenge of the Anglo-French Concorde.

Speaking of Boeing development work Mr Allen said that from the start his company's SST design teams had been given two clear goals—to produce a practical aircraft capable of day-to-day operation and one for which the cost and earning potential were acceptable to the airlines. Since the first Boeing proposals made in January 1964 the SST team had "concentrated heavily" on economics; design changes had, he said, improved the prospective payload by 50 per cent with no more than a 17 per cent increase in gross weight.

Speaking of the projected C-5A Mr Allen said that even if a commercial version of this aircraft was assumed there would still be economic justification for building the SST. In any case the C-5A was essentially a military aircraft and its future did not rest on any possible later commercial application. The relationship between the SST and the C-5A was, he said, based on three inter-related trends in air transport development—increased speed, greater economy and continued traffic growth. Improved economy had so far come from increased capacity, as traffic warranted this, and speed. The possible adaptation of a C-5A-type aircraft to future commercial operation was an extension of the quest for economy by increased capacity.

CAA'S ONE-ELEVEN PLANS

WHILE on its tropical trials BAC One-Eleven G-ASJA was taken on a "whistle-stop" tour of the centres which Central African Airways' two aircraft will later serve. The One-Eleven put up some good times; it took 74min, for instance, to cover the 610 st miles between Johannesburg and Salisbury.

CAA's One-Elevens will not, it is understood, take over the services at present operated by their Viscounts. Instead, they will be used for supplementary flights and it is possible they will be used to fly over a circuit linking Salisbury, Blantyre, Ndola, Lusaka and Bulawayo. One new service that is likely to be introduced with the One-Eleven is Salisbury - Nairobi, though details of this have still to be worked out.

More Air Transport news on pages 289-290

A Report on British United's Inaugural Plans, British Aircraft Corporation's Test Programme, and the Market Prospects of the Aircraft

BY J. M. RAMSDEN



ONE-ELEVEN ENTERS SERVICE

B RITAIN's eighth new turbine-powered airliner since 1945 makes its debut in public service on March 16. It differs from its predecessors in two major respects: it has been sponsored by an independent airline; and it has already been bought by seven other airlines, three of them American.

British United Airways, the premier patron, will receive the first deliveries. Two are due to be handed over on March 7, and their total fleet of ten aircraft will be in their commission by July. The story of British United's engineering and operational planning for the One-Eleven was told in our issue of December 3. Since then their commercial plan has been decided.

After initiation on the London-Genoa route on March 16 the aircraft will take over from Viscounts the scheduled routes as shown on the map (opposite page) on the following dates:

Rotterdam	March 17
Amsterdam	March 18 (new route)
Gibraltar	March 22
Malaga	April 5
West Africa (Las Palmas, Accra, Freetown, Bathurst)	April 6
Palma	May 4
Seville	May 14 (new route)
Lourdes	May 17
Ibiza	May 18 (new route)
Barcelona	May 18

In addition British United will be using One-Elevens for 1965 summer-season inclusive-tour holiday flights to European and Mediterranean destinations, as shown on the map. The airline's One-Eleven utilization in 1965 will be approximately 5,000 hours on scheduled services and 5,000 hours on ITs. A further 4,000 hours are expected to be available, and it can be assumed that the One-Eleven is a candidate for the airline's high-frequency Government trooping shuttles between Britain and Germany at present operated by Viscounts.

In 1966 British United's One-Eleven programme calls for up to 25,000 hours of One-Eleven utilization, an average of 2,500 hours per aircraft throughout the year.

The Manufacturer's Test Programme Since the first One-Eleven, G-ASHG, flew on August 20, 1963, a total of 12 One-Elevens have been flown. Up to February 16 more than 1,900 hours in more than 1,250 flights involving nearly 2,200 landings had been clocked up. When the Air Registration Board and the US Federal Aviation Agency set the seals of their airworthiness certificates on the One-Eleven, as it is expected they will do in the next week or two, BAC's flight-test department will have completed, under the direction of chief test pilot Mr Brian Trubshaw, perhaps the most extensive

test programme in the history of British civil aircraft production. The history of this programme is best illustrated in the following table:

BAC One-Eleven Flight-test Programme *

Aircraft and type	First flew	Flights	Hours	Landings	Remarks
G-ASHG 200	20.8.63	53	82	78	BAC-owned prototype. Preliminary performance and handling. Crashed while testing deep stall behaviour 22.10.63 with loss of all seven crew
G-ASJA 201	19.12.63	284	453	638	BUA's first aircraft. Systems testing and performance
G-ASJB 201	14.2.64	20	39	30	Written off following a landing accident at Wisley, 18.3.64. No injuries
G-ASJC 201	1.4.64	206	269	392	Handling throughout speed range. Powered elevator (August 1964). High speed resonance. Took over 'JD's work
G-ASJD 201	6.7.64	39	48	63	Handling. First to have powered elevator. Crashed on stall tests 20.8.64.
G-ASJE 201	5.5.64	140	238	154	Systems and overseas demonstrations
G-ASJF 201	28.7.64	118	113	231	Systems and overseas demonstrations
G-ASJG 201	31.10.64	96	166	226	C of A acceptance
G-ASJH 201	17.9.64	1	1	1	Production aircraft
G-ASJI 201	22.12.64	126	259	165	200hr route-proving
N1541 203	9.6.64	164	242	212	Braniff's first aircraft. Air-conditioning, autopilot, Braniff special equipment, e.g., radio. Originally G-ASUF
N1542 203	30.10.64	1	1	1	Production aircraft
N1543 203	10.2.65	6	6	8	First for Braniff acceptance and delivery, probably end of February

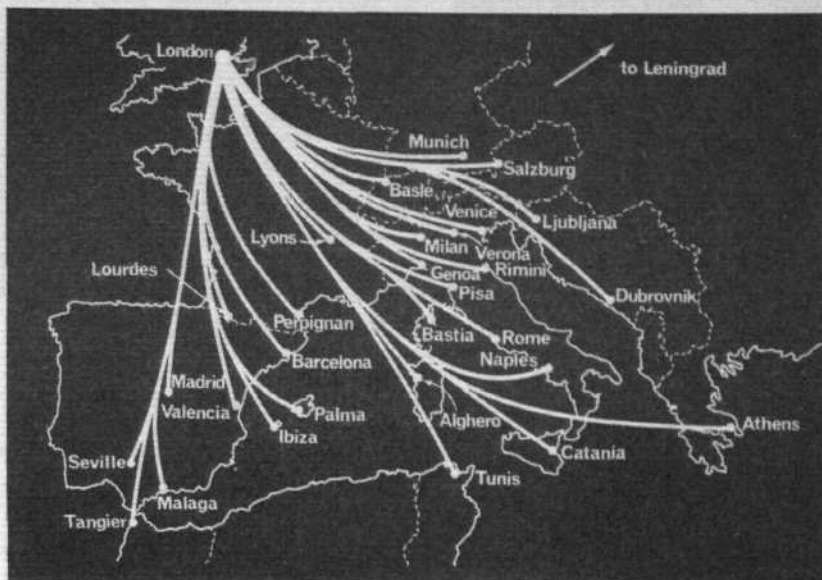
* Up to February 16, 1965.

The final 200 hours of proving was completed on Sunday, February 14, on British United's routes. Commenting on the proving programme, the airline's managing director, Mr F. A. Laker, said: "After minor teething troubles in the hydraulic system during the first few days, which were quickly rectified by the manufacturers, the aircraft has behaved immaculately. It was operated at an average utilization of 8.7 hours a day which is equivalent to 3,175 hours a year—a utilization rate 30 per cent higher than we would normally demand from this type of aircraft in regular service. Our

crews and engineers are extremely enthusiastic about the One-Eleven."

In addition to the flight test programme, structural tests on two complete airframes have been carried out at BAC Filton. Static-strength tests on a complete production specimen were completed in July 1964. The fatigue specimen has so far done the equivalent of 30,000 flights, and a further 100,000 "flights" will be made from now until the end of 1967. About 70 per cent of the structural testing of detail components has been completed. At Weybridge the main landing gear specimen on fatigue-test has made 40,000 "landings" and the programme calls for a further 240,000, the equivalent of 60 years of service. Structural testing, as had been hoped, has revealed reserves of strength which last June enabled BAC to increase payloads of the Series 300 and 400 aircraft by 21 per cent. Last month a similar increase in Series 200 payload was announced. Rigs at Weybridge pounded the hydraulics/flying controls systems for some 1,500 hours over 18 months, and the automatically cycled tests continue to determine wear rates and reliability. Rig-testing of the electrical system was completed last July after a year-long programme; and individual electrical components including generators and constant-speed drive/starter were run under airline conditions for 8,900 hours. On another rig the air-conditioning system, including the auxiliary power unit, has clocked up 1,400 hours.

Rolls-Royce Spey testing now amounts to something like 60,000 hours in service and on the bench. Total Trident hours to date, included in this total, amount to about 25,000 since April 1964. Time-between-overhauls on the Spey 2 reached 1,000 hours after nine months in Trident service and Rolls predict for the Spey 25 a 2,000-hour TBO by the end of next year. One of the test-bed programmes carried out by Rolls-Royce at Hucknall was a 1,000-hour



British United's One-Eleven will be serving all these scheduled and inclusive-tour destinations this year. The scheduled routes are listed in the text on page 284

First of six American customers for the One-Eleven is Braniff Airways of Dallas, Texas. Their first aircraft is due to be delivered before the end of this month. The new sharper radome (see heading picture opposite), standard on all One-Elevens, reduces drag and improves appearance





ONE-ELEVEN ENTERS SERVICE

test schedule of a Spey 25 simulating American Airlines operations. Altogether 1,057 flights were made.

One-Eleven Market Prospects Announced orders, so far, amount to 74 for 11 operators, with options on a further 16. New orders are in immediate prospect. The sales position, unique for a British aircraft at this stage in its career, is as follows:—

British United	Ten Series 201 (Spey 2 to 2W standard)
Braniff	14 Series 203, with an option on 12 (Spey 2)
Mohawk	Five Series 204, with an option on two (Spey 2)
Aer Lingus	Four Series 208 (Spey 2)
Central African	Two Series 207 (Spey 2W)
American	30 Series 401 (Spey 25)
Philippine	Two Series 402, with an option on one (Spey 25)
Kuwait	Three Series 301 (Spey 2W)
Executive customers	Three Series 200 and one Series 400

BAC can offer 12 months' delivery to new customers, i.e., in February next year. Training aircraft could probably be made available in October of this year. Douglas, the main competitor, are also offering 12 months' delivery of the DC-9 and in fact the two competitors are, in this respect, now neck and neck. Neither manufacturer is yielding a day or an hour on delivery quotations to new customers. BAC have great respect for the DC-9 and the claims made for it, though their sales engineers place considerable emphasis on the unmatched experience amassed in the flying and testing of 13 One-Elevens. By the time new customers can take delivery the One-Eleven will have been in service with eight operators, including American Airlines, one of the world's four biggest.

Two of the US big four, Eastern and United, are in the market for large fleets of aircraft in this class (TWA, the other, has decided on the DC-9) and are obviously the biggest sales plums in prospect. BAC are selling against not only the DC-9 in the USA, and indeed

everywhere else, but also against two other competitors. One is the Boeing 727 which, although a larger aircraft, overlaps in certain markets. The other is the Boeing 737. This aircraft, of course, is still a project; but it has the name Boeing behind it, and that in itself has been enough to give pause to potential One-Eleven clients and DC-9 customers too. It is also now clear that the 737 has not only interrupted One-Eleven and DC-9 sales, but has done so to the benefit of the Boeing 727.

British Aircraft Corporation have never had any doubt that they would have the short-haul jet market to themselves; Sir George Edwards said exactly this in May 1961 when the project was launched. But the company cannot have expected to be up against three competitors within three years. BAC would not disagree with Douglas that the total market in the next 20 years or so is about a thousand aircraft, with about 40 per cent of which they would probably be satisfied. The danger is that the market may become too thinly spread among too many manufacturers, all of whom would get scant pickings and production runs falling short of break-even. Another competitor is of course the Fokker F.28 Fellowship, though as yet it does not seem to have loomed as a serious competitor.

The US local-service airlines are likely to be the most interesting ones to watch. Although they are not yet off subsidy, and may not be for some time, they are sharing in the general boom now being enjoyed by the US domestic airline industry as a whole. Now that the bigger jets have settled down and traffic growth is heavy, the trunks and the regionals are making money. Even Eastern, thanks to its new management and "operation bootstrap," is quickly coming out of the red in which it has languished for the past six years. While BAC would naturally be delighted to get an order for perhaps 40 One-Elevens from this airline and from United, they are nevertheless just as determined to win orders from locals, of which there are a dozen all sure to re-equip with jets eventually. Such orders would come in smaller numbers, if not exactly penny numbers, but BAC recognize that in the long run the healthiest order books are made up of a large number of operators, from whom repeat orders come over the years. The big "plum" customers, who order in batches of 30 or 40, perhaps make life easier for the manufacturer, but BAC are in fact going very hard after the smaller airlines too, and not only in the USA.

G-ASJI, which was allocated to the 200hr route-proving part of the certification programme, called at Rome Fiumicino





By the spring of 1966 One-Elevens in service with more than half-a-dozen operators will have flown 100,000hr

ONE-ELEVEN RELIABILITY

BAC's experience of more than 400 Viscounts means that "design for maintenance" is more than the usual manufacturer's claim. The One-Eleven has a maintenance programme drawn up by a joint committee consisting of representatives of the customer airlines and BAC, and approved by the FAA Maintenance Review Board. A high proportion of systems components (over 70 per cent) have no fixed time between overhaul (TBO) and are retained "on condition." This has been achieved by the use of proven components in duplicated systems. This, combined with the flexible structural inspection programme, minimizes the operator's maintenance work and increases the flexibility of the maintenance programme. Any maintenance job should be capable of being completed in an eight-hour period; the longest single job is changing a tailplane and this takes 6 hours and 45 minutes including the time to function-test the replacement.

The structural inspection part of the maintenance programme is claimed to involve the least amount of work of any jet airliner built. Such is the confidence which BAC and the airworthiness authorities have in the structural design. This has been brought about by structural features such as the three shear webs in the primary wing structure, the use of fatigue resistant copper-bearing aluminium

alloys in both the top and bottom wing skins, and the extensive static and fatigue structural tests.

Using the approved maintenance programme it is calculated that the One-Eleven will require 6.0 man-hours per flying hour for maintenance and overhaul of aircraft, engines, and all equipment. This figure also covers supervisory labour and a considerable allowance for unscheduled removal. This is a great improvement over current types. On a comparable basis the Viscount requires between 9 and 12 man-hours per flying hour and the Boeing 707 25 to 30.

BAC's reliability studies show that by the time the One-Eleven is established in routine service the technical delay rate will be not more than 1.0 per 100 departures. The returns for Viscounts from many operators show delay rates between 1.0 and 2.0.

BAC and the equipment suppliers offer warranties covering materials, workmanship and design. Major suppliers also offer parts cost guarantees and cost-sharing proposals. These warranties and guarantees are the best obtainable from any manufacturer and are a financial demonstration of the confidence which British Aircraft Corporation, Rolls-Royce and the suppliers have in the reliability of their products.





ONE-ELEVEN



ENTERS SERVICE

COME AND STALL IT YOURSELF

A Note on the One-Eleven's Low-speed Handling

ONE of the questions about which both BAC and Douglas are asked by airlines concerns the super-stalling characteristics of T-tail aircraft. On this subject BAC speak as the authority.

As a result of their findings BAC made data on super stalls available to all other major aircraft manufacturers, including Boeing and Douglas.

The primary cure employed for the One-Eleven were aerodynamic modifications to the wing and provision of a fully powered elevator system and a stick-pusher.

The ARB, having recognized the seriousness of control problems in jet transport aircraft in adverse conditions (there have been a number of unexplained crashes from high altitudes of large jet aircraft in recent years), have revised their requirements. The new requirements call for demonstrations of stalls with far more vigorous handling than has ever been required by any regulating authority. It is to meet requirements of stall recovery in these conditions that a stick-pusher system has been developed to give added safety to the aircraft in extreme manoeuvres. Extensive research work using completely representative full simulation has demonstrated that the stick-pusher has no adverse effect whatsoever on aircraft control characteristics in turbulence.

The stick-pusher system is comparable to yaw damper systems (giving artificial limitation in yaw) and Mach trim systems (giving

artificial limitation of minimum wing incidence). The stick-pusher system gives artificial limitation of maximum wing incidence.

The stick-pusher concept is becoming an accepted airline safety aid. The Trident and the VC10 have stick-pusher systems; both are certificated by the ARB and both are in regular airline service. The latest American T-tail civil jet to be certificated, the Learjet, has this safety aid installed. Furthermore, the FAA is shortly to issue preliminary regulations for stick-pusher systems. It is known that there is a strong body of opinion within the FAA who believe that the stick-pusher is a valuable safety aid for all T-tail aircraft.

The stalling programme which followed the deep-stall tragedy in October 1963, including certification of the new powered elevator and stick-pusher, has undoubtedly been one of the most intense—fierce would be an appropriate word—in civil flight-testing history. Some of the dynamic stalls which have been carried out in the last few months would probably have done for most if not all conventionally tailed transport aircraft that have been in service for years. Perfection of the stick-pusher and its integrity is in fact the main reason why completion of the test programme has been delayed, and this has been fully accepted by BAC's customers.

The answer to those in doubt is always "come and stall it yourself." This in fact is what all the senior pilots of One-Eleven customer airlines—and others—have now done.



G-ASJC (above) was the aircraft mainly responsible for a stalling programme of unprecedented severity and thoroughness. The new powered elevators were fitted first to G-ASJD (left)

BUA

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D The Dunlop contribution to the world's first short-haul jet airliner is considerable. The One-Eleven lands on Dunlop tyres and wheels. It is brought safely to rest by Dunlop brakes and axle-mounted Maxaret anti-skid units. In bad weather, flight-deck visibility is improved by hydraulically operated wind-screen wipers. Control valves for these, the brakes and other systems are also of Dunlop manufacture. The pressurization system incorporates a completely new type of flexible air ducting, constructed of terylene webbing and silicone rubbers, and fitted with swaged light alloy couplings. In the air and on the ground, the One-Eleven will be backed by the world-wide service that has made Dunlop a famous name in aviation.

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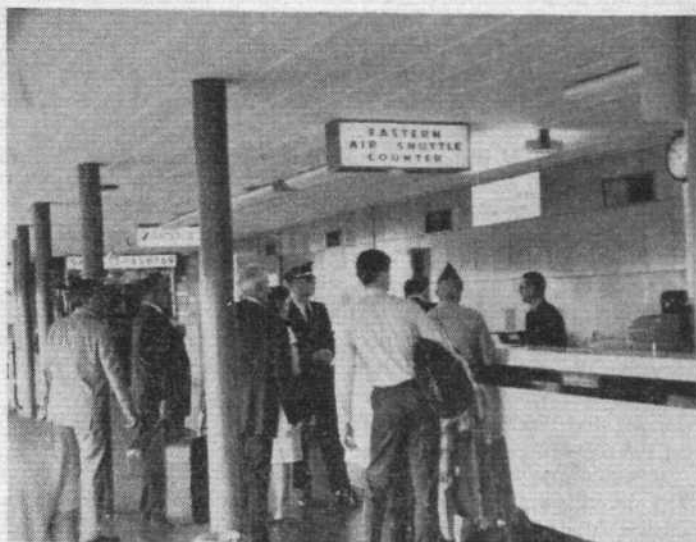
AIR TRANSPORT (continued from page 283)

Why Shuttle Services Must Come

THIRTEEN thousand feet below us the snow-covered farmlands of New Jersey passed rapidly by. When the stewardess approached I was engrossed in watching the bright blue exhausts of the Wright Turbo Compounds following a curved path along the Super Constellation's engine nacelles. Unconsciously I withdrew \$16 from my billfold—this being the usual fare for Eastern Air Lines' shuttle flight between New York's LaGuardia Field and National Airport at Washington. The stewardess apologetically reminded me that the fare had, several days earlier, been raised to \$18. I paid the extra few dollars uncomplainingly—and so did the other 95 passengers in the totally filled aircraft. The fact that no one seemed to be irritated by the fare increase reminded me of an axiom of mine: "Why is it that airlines, like the proverbial husband, are always the last to find out?"

The newspaper releases which accompanied the latest fare increase traced the history of the shuttle operation, noting that the Washington - New York one-way fare had initially been set at \$14. Soon thereafter the \$16 rate was adopted. Passengers flocked to the service, which offered them a no-reservation, no-frill flight. One simply came to the airport at one's own convenience. Flights departed hourly on the hour in each direction. Sufficient aircraft were available so that when one aircraft was completely filled another rolled up in its place, and so on. Every passenger was guaranteed a seat and on several occasions flights were dispatched with no more than one or two people on board. This I can personally vouch for, since I was once one of but two passengers for whom a back-up Connie was flown between the two cities. Contrast this with pre-shuttle operations when it was customary for another carrier on the New York - Washington route to develop, strangely and consistently, mechanical troubles on its aircraft during pre-warm-up check-out when there were fewer than six people on board.

The economics of the shuttle operation were always subject to much speculation—the common belief being that Eastern was



"Flight" photographs

losing mightily despite the popularity of the flights. The airline held to its low fares for as long as possible in the belief that it was the low fares and nothing else which induced people to use the service. Reluctantly, in the face of rising costs and, particularly, in the light of unexpectedly high maintenance costs associated with

operations, Mr Stevens says: "We want to put on a service that the public wants, not something that has a gimmick value. The American shuttle services are operated with fairly old, depreciated equipment. We do not believe that the public wants to fly in older type equipment and we are trying to adjust our equipment situation to give them the aircraft and services they want. I think we can do a great deal next year to solve that problem." Next year BKS...

Mr C. J. Stevens, managing director of BKS Air Transport (quoted in "Flight," September 3, 1964)

these older aircraft, the fares again had to be raised. The current rates are now in excess of the tourist fare charged by other carriers on the same route—which means that one can fly between the two cities on much more modern aircraft (Electras) which are faster (55min versus 69min) and which offer some frills (snacks as opposed to nothing). So Eastern faced this latest fare rise with some trepidation. But still people flock to the shuttle. And if I am any kind of judge—and I believe that I am qualified to be one, since I have

was right with his generalization: "Take a look at your hostility to radical experimentation; and above all, take a ride on the Eastern Air Shuttle between Washington and New York."

Mr Hans Heymann, US air transport economist (quoted in "Flight," October 1, 1964)

used the Eastern shuttle on approximately 50 occasions—they will continue to do so.

How it is that the airlines should be so late in appreciating why shuttle-type services are extraordinarily popular is incomprehensible to me. Businessmen comprise the greatest single travelling bloc in the USA; and I am one of this breed, having made close to 500 commercial flights for business purposes in the past 15 years. I have had many, many conversations with fellow passengers about airline travel and if there is a common gripe for all of us it is that the reservation and check-in procedures of the airlines are for the convenience of the airline, not for the convenience of the traveller. The shuttle service is the single exception to this rule.

For the regular services you check in about 40min before



AIR TRANSPORT...

departure time (lest they cancel your reservation), wait on a long line to buy a ticket, wait again a few minutes while previously made reservations are confirmed, and then wait some more while a clerk fills out a large ticket in longhand, duly noting not only the passenger's name, but city of origin and destination, fare, Federal tax, flight number, departure time, and so on. The clerk then tears apart the neatly printed ticket, staples it together again in a different manner, inserts it in an envelope folder and hands it to you. At the boarding gate the ticket is torn apart again. The shuttle, in contrast, allows a passenger to walk into the terminal 5min before boarding and *guarantees* that he or she will anonymously (or almost so) be given a seat on an aircraft. No consultation of schedules is required—simply show up at the airport and within an hour at the most you can be winging your way to your destination.

It should therefore come as no surprise to Eastern that we are willing to pay a premium above other fares for a shuttle-type service. We always would have and we always will. Paying a premium for a convenience to oneself is an accepted part of today's society, and the more airlines that appreciate this point the better off the travelling public will be.

It may sound all very well to say that the fare increase by Eastern will not effect its traffic—but what comments or advice do we offer for the future so that the airlines will not again be "the last to find out." My comment is simply that there are countless people who would be willing to pay a fare *in excess of first-class fares* for shuttle-type services using truly modern aircraft on *any or all* routes. It is inevitable that shuttle-type services will become the rule rather than the exception on nearly all major routes. So let us get on with the business as soon as possible.

DON ADAMS

SUPERSONIC MAN

"IT'S just that where you've GOT to go, you've got to GO. All it takes is a belief in the value of better transportation . . . and the full application of a sound technology." Thus Boeing sums up the case for the SST in an amusing little booklet entitled "A Short History of Man on the Move . . . into the age of supersonic travel."

Had such a booklet been produced by BAC, it would almost certainly have been pounced on by the critics as yet another example of the commercial immaturity of the British aircraft industry, of its inability to grow up, of its status as an overgrown child playing with

frivolous toys rather than as an industry with great export potential. For this Boeing booklet does not set out a deeply serious and carefully-argued case for the SST's commercial viability or economics; for much of its length it is frankly flippant—the happy product of a self-confident industry.

It traces man's progress during the centuries through various forms of short-haul and long-haul transport. "For instance, when the first would-be equestrian leaped aboard the family meat supply, the problems of control and stability were immediately apparent. And one could hardly blame intelligent observers for pointing out that this system was *radical, dangerous, an unknown quantity, impractical, expensive (all that good horseflesh!) and disturbing to the peace of the community*. Or for saying: **IT WON'T WORK**. But *someone* had some answers. Like a bridle. And some carrots. And a stick."

In similar vein, progress is traced through the log dug-out to the clipper ship, the early steamboats and steam trains, the horseless carriage and the flying machine. And it is interesting to recall that one of the early arguments against the big jets was that "too many lives would be risked in such a big airplane"; this point is now being used to demonstrate the basic unsuitability of a 700-passenger airliner. The booklet concludes by a summing-up of the main arguments in favour of an American SST among which is: "A major airplane export program will improve our balance of payments and the flow of gold." Is there a clue to timing in this sentence? "Now we have at least eight years in which to *perfect* a product that will go to market in time to compete successfully in world markets."

M. J. H.

Sperry Autopilot for Skyvan An initial order for the SPL.45(D) Sperry autopilot has been placed by Shorts for the Turbo-Skyvan.

Mr Adli Dajani has been appointed commercial manager of Kuwait Airways. He succeeds Mr Wafic Ajouz.

Mr Roger E. Chase has been appointed director, agency sales, for Trans World Airlines.

Dart-Convaire Tests The first flight test of the prototype Convaire 240D with Rolls-Royce Dart engines is scheduled, says *Aviation Daily*, for June 1. The first three engines have been delivered to GD/Convaire at San Diego.

Swissair will use Balair's F-27 for night-tourist services between Basle and London in addition to those between Basle, Geneva, Berne and Zurich (see *Flight*, February 11, page 202) and between Basle and Frankfurt.

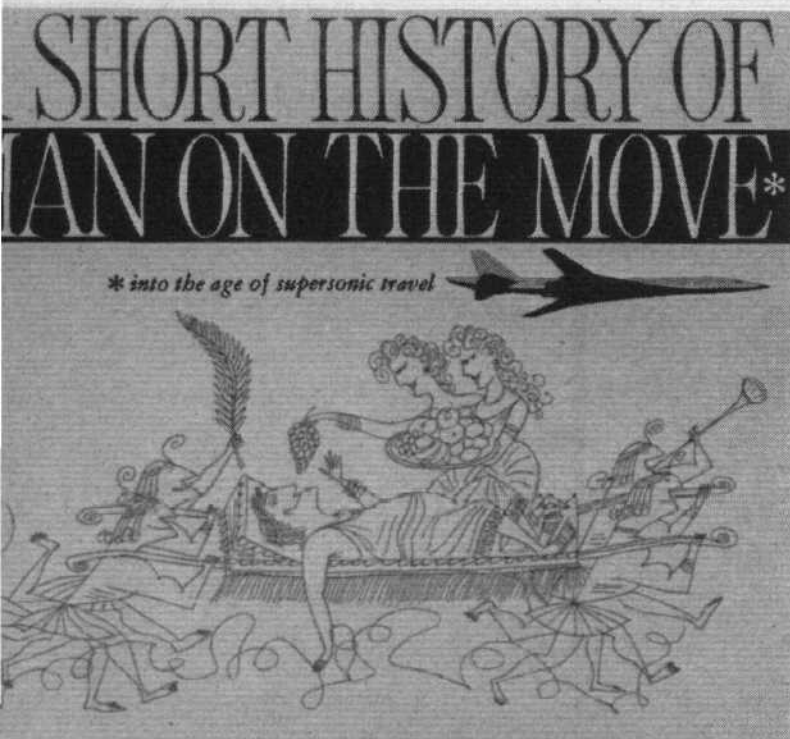
A Cargo Unit at Liverpool has been opened by British Eagle. The airline plans to start all-cargo services between London and Liverpool on April 1, with frequencies building up to 14 flights every weekday.

Redifon Flight Simulator for the Boeing 727 has been ordered by Trans-Australia Airlines, and will be in operation at Essendon Airport, Melbourne, early next year. It will be available for use by Ansett-ANA and the Department of Civil Aviation.

Mr Gerrard Payne has been appointed BEA's station manager at London Heathrow after 14 years at Manchester Airport, Ringway. Mr Payne joined BEA at Northolt on its first day of operation in 1946, and was the corporation's first representative at Heathrow in 1947.

Mr Reginald J. Fenner, an assistant chief technical officer of the Air Registration Board, is now resident in Washington, DC, USA, as the board's representative. Mr Fenner will be primarily concerned with the One-Elevens soon to be delivered to Braniff, Mohawk and American.

East Midlands - Paris Service The ATLB has approved a service by Skyways Coach Air between the new East Midlands Airport, Castle Donington, and Paris via Beauvais. Subject to French Government approval the service, with HS.748s, will start at the end of April. The licence is valid until March 1977.





benefited from the economics and élan of this type of aircraft. First of all came medium-range versions of the early types, further improved after re-engining with turbofans; then, within the past year, there followed the 100-seat-plus tri-jet short-haulers. Not only have smoothness and comfort taken the fear out of flying for many people, but with experience airlines are finding out how to operate jets economically, and fares are coming down. This summer passengers on low-cost inclusive tours will travel in BUA's One-Elevens.

In view of the pride and prejudice which somehow still permeate even the most rational design teams it is perhaps remarkable that same-generation airliners invariably look alike. With power, payload and airfield performance more or less fixed the only major variable left to chief-designer discretion is engine location. Once this is decided there remains very little scope for the individual touch to show itself in the overall shape.

The chief recognition point which distinguishes the One-Eleven from the DC-9 is the latter's slightly more swept wing (24° versus 20° at quarter chord) of higher aspect ratio and with straight leading and trailing edges. The Douglas aircraft is also some 10ft longer (the fuselage is parallel

TWO OF A KIND

The BAC One-Eleven and Douglas DC-9: Thoughts on Visual Comparisons

TEN years ago two practically identical types of long-haul jet airliner were the centre of intense airline interest. They were the Boeing 707 and the Douglas DC-8. In October 1955 Pan American's historic order for both projects triggered-off an almost instantaneous world-wide buying spree. This was three years after the de Havilland Comet had paved the way by proving to the airline industry the jet's magnetic effect on traffic.

A similar though probably less dramatic revolution is about to begin on the world's short-haul routes. Douglas is again contending, but this time in the wake of British Aircraft Corporation. Within the next few days the Douglas DC-9 will make its first flight, and very soon the BAC One-Eleven will enter commercial service in Europe and America.

Since the first applications of jet-propelled transports to long-haul routes in 1959 an ever-growing number of services has







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TWO OF A KIND . . .

over the whole cabin length) and has its bigger-diameter engines carried further outboard. The DC-9's tailplane—recently increased in span and area—is also noticeably different in its proportions from that of the One-Eleven.

At the moment the One-Eleven and the DC-9—and soon, no doubt, the similar but smaller Fokker Fellowship—are the aircraft being bought by the airlines operating short-haul routes of relatively thin traffic density. These new jets are designed to replace Viscounts, Convair 340/440s, DC-6s and so forth. Can they be improved upon

in the immediate future? Boeing is very active with its 90-seat 737, which daily grows bigger than the established rivals; a decision to build cannot be long delayed. Boeing's answer is a fatter, six-abreast fuselage, and putting the engines back under the wings in order to save, it is claimed, 1,500lb of weight.



Lords Look at the Industry

IN the House of Lords on Wednesday, February 17, the EARL OF GOSFORD, introducing a discussion on the aircraft industry, said that the products of the industry were particularly suitable as exports, since they involved relatively little imported raw material, but a high proportion of skill. The ratio of cost per pound of the finished aircraft to the main raw materials was about 130 : 1, compared with a ratio of between 20 : 1 and 4 : 1 for the motor industry and the ship-building industry.

The aerospace industry was a "frontiers of knowledge" industry, pioneering not only for itself but also for other important associated industries such as electronics and metals. We must not reduce it to a sub-contracting industry, "building only third-rate, humdrum aircraft." This was merely a suspended sentence of death, and the industry would lose its impetus, its ability and its key men. The cancellations recently announced by the Government must gravely impair Britain's ability to remain at the forefront of progress and to develop new machines, in an industry where to lag behind was to die. It was true that the industry had been suffering from malaise: "It is based on a small home market, works too much in a strait-jacket and is plagued by stop-go policies both in civil as well as in military projects."

World Markets

The industry should be allowed to design and build for world markets. It was criminal for the Government to have damaged Hawker Siddeley by cancelling the HS.681 and P.1154 for the sake of one-fifth of the subsidy given annually to British Railways. This was a blow from which Hawker Siddeley might never recover.

If we were to avoid US technological domination, we should collaborate with Europe, and with France in particular, and with the Commonwealth—Australia and India both needed an aircraft like the P.45. Such collaboration was the only rational pattern: it reduced individual costs, it increased the initial markets and yet, if there were a crisis, it would not take away our ability to supply our own weapons from our own production lines.

"If we delay we shall find the USA has got there first, via Germany, and then indeed the cause will be lost and the grave part-dug. Technical and industrial co-operation with the USA is strictly a one-way valve. Co-operation with Europe is not. Europe really needs our skills and facilities, and we need hers."

LORD BYERS said that much of our present trouble seemed to have stemmed from two causes: the delay in the availability of new types of aircraft, and the mounting costs of the different projects. The industry appeared at present to be extremely unbalanced, perhaps because it had become dependent on far too limited a market.

With the western alliance we seemed to be heading for a somewhat one-sided deal with the United States, one which must

inevitably harm the British aircraft industry. The TSR.2 appeared to have a higher operational value than anything we could get at the moment from the USA. To overcome the delay in delivery of the British machine, could we not hire or borrow American replacements for a short period to bridge the gap on the basis of lend-lease? Was there not a requirement not only for Britain but for other countries in the western alliance? Why was Britain always to have the small production run? There ought to be far more give and take on these matters within the alliance.



The Earl of Gosford

To command a much larger market, collaboration with France was an obvious first step towards a long-term co-operative European project. A European agency should be set up, in which would be associated not only the aircraft industries of Europe but also, in producing specifications for civil aircraft at an early stage, some of the major airline operators. In the short term the Government should strive for a better deal with the Americans than appeared to be scheduled at the moment; in the long term the Government should accept that collaboration with Europe might be the answer.

EARL JELICOE said that, having pressed hard for the purchase of Phantoms for the Royal Navy, he could not argue the case against purchases abroad. But it was one thing to buy a limited number of aircraft off the foreign peg, but quite another to switch the main weight of our procurement across the Atlantic. The Government's decisions appeared to reflect a complete reversal of policy. The "whole strategic scenario" had suddenly changed. The changes involved in cancelling the P.1154 and HS.681 were catastrophic for the industry and called for much fuller explanation by the Government.

Would the Government not consider developing the P.1154 as a research project? It was lamentable that we should decide to opt out of this sphere at the moment when trials of the French Mirage IIIV were being reported. The Government should weigh very carefully their ultimate decision on the TSR.2. Having dealt a body blow to one of our great airframe groups, they must think very hard indeed before dealing out the same medicine to the other group. Much more information about the factors involved was needed. How could the Government say that the annual saving would be £30m if the number of American aircraft to be ordered was not known?

To judge the Government's decision, full facts were needed on timescale, performance, costs and other items. Would the Government publish these facts in a separate White Paper, or embody them in the Defence White Paper? For the long term we needed to maintain a healthy and efficient British aerospace industry: could the Government say what criteria should be used in judging the efficiency of the industry? What sort of industry had they in mind?

On the matter of interdependence in aircraft research, development and production, we should be wise to choose our partners very carefully. If we needed to buy aircraft off the peg it might be sensible on occasions to shop in the USA. But if we proposed to carry through a joint project from the start, the Government would be wiser to choose partnership with our neighbours in Western Europe.

LORD SHACKLETON, Minister of Defence for the RAF, gave an outline of Government thinking on military aviation in general and current projects in particular, emphasizing a number of the points made by Mr Jenkins and Mr Healey in the Commons the previous week (*Flight*, pages 241-4, February 18). The decision to cancel the P.1154 and HS.681 were not simply related to the acute present economic situation, he said. Because of delays by the previous Government in ordering aircraft, and slippage in their development, we should have been confronted in the early 1970s with an extremely unbalanced situation and an enormous concentration of expenditure.

Defence Review

The Government found on taking office that the P.1154 could not have been in squadron service before 1970-71, and that some front-line squadrons would still be equipped with Hunters in 1973-75. "We also discovered that there was no prospect of the HS.681 being in full service before 1971 or 1972. Even then it would have started its life without the highly desirable short-take-off characteristics."

The estimated saving was calculated on "the number of aircraft we should have ordered at home, together with the number to match that total that we should need to order from the United States . . . there is a major defence review pending and it would be foolish if we were to settle the number at this stage."

"The problems we have tackled are only the immediate ones," Lord Shackleton said. "It is the development of collaborative projects that are important. I should like to make it clear that it is no part of Her Majesty's Government's policy to abandon the market to the United States or to any other country, and this is a definite assurance. Our objective is to help the industry to go forward on a realistic basis."

"This means that there must be more realism in the projects themselves. In the second place, we shall have to make greater efforts to reach agreement with our allies, particularly in the United States and in Europe, to co-operate in an increased

LORDS LOOK AT THE INDUSTRY...

number of research and development projects and, indeed, new production of aircraft..."

THE LORD BISHOP OF COVENTRY said that 5,000 men and women worked at the Hawker Siddeley factory at Coventry; the probable redundancy there was nearly four times the total of all vacant jobs available at present in the city. The men and women concerned were the casualties of a national policy adopted by the Government for the nation's total good—they were not simply the victims of a private enterprise that had miscarried.

This sort of situation was likely to arise in various branches of technology and industry, such was the pace of change. We must be ready to respond to new needs—but in terms of social responsibility as well as technology. Facilities for retraining were inadequate.

LORD WYNNE-JONES, in his maiden speech, mentioned that he had been in charge of the chemistry division at the Royal Aircraft Establishment for two years. He questioned the alleged value of fall-out or spin-off from the aircraft industry. "One cannot justify spending the vast sums of money that we spend on aeronautical research and development merely by producing a slightly better refrigerator or a somewhat more comfortable pair of shoes. It can only be justified by producing the aircraft which are wanted, at the time at which they are wanted and in the quantities which are wanted."



Earl Jellicoe

VISCOUNT WATKINSON, a previous Conservative Minister of Defence, emphasized the serious effect of the recent cancellations of military aircraft on the ability of the country to export civil aircraft. Interdependence, he said, had been tried many times: "In logic, it is right; in practice, it is depressingly barren of real results." There were basic objections to mating the British aircraft industry with those of the USA or of France.

The Government should think again. If they wanted to cut costs, they could have a "de-sophisticated" version of the TSR.2. The cost of the original specification was high. "If we want a simpler aircraft, perhaps for a simpler type of operation, I do not see that this is a very difficult thing at all. It will still, I think, be tragic if we do not order a reasonable number of the fully automated version." Lord Watkinson suggested also that the Government should say that the Navy and the RAF "have got

to live with the 1154 and not have the Phantom at all."

THE LORD BISHOP OF SOUTHWARK suggested that a far-sighted review of possibilities and requirements should be carried out in the context of the Commonwealth and of the underdeveloped countries. The production of British aircraft to help world development would make a major contribution to world peace-making as well as safeguarding and developing both the skills and quality of the industry. It could make entirely new calls on the inventive capacity of our designers. The industry was entitled to ask for a planned transition to the really constructive use of its energies and skill.

LORD MORRIS OF KENWOOD spoke as probably "the only person in the Chamber today who has flown the Hawker Hunter operationally." He reviewed the history of procurement of RAF aircraft in detail, and concluded: "As one who flew and appreciated British aircraft and was very proud of them—and while I regret as much as anyone that for practical purposes it is obviously necessary for the Government to pursue the present policy of buying some aircraft from abroad, at any rate for the time being—it seems to me that this is the only method of ensuring that for the next few years our Air Force is equipped to a standard not only that is expected of it but which it has a right to expect. Coupled with this there must be, of course, long-term planning to ensure that the British aircraft industry is maintained as a leading force, but within the scope of our economic possibilities."

"It must be recognized that the days when Britain could 'go it alone' are over. By co-operating with our European friends on such projects as the Concorde, the aerobus and the light strike/trainer aircraft, I feel sure that the technicians and the research and other skilled craftsmen will find ample scope for their unbounded talents within the industry."

LORD AMPHILL suggested that the RAF and the airlines should have the same relationship to the aircraft industry as the Royal Navy and Merchant Navy had to the shipbuilding industry. "In such a relationship I do not think there is any place for the Ministry of Aviation. The last Administration very nearly pushed the Ministry of Aviation under the carpet at the time they were reforming the Ministry of Defence and, to be perfectly frank, I thought at the time it was a great pity they had not pushed it out of sight. I really do feel that the Ministry of Aviation in its present form is a fifth wheel in the coach, and is really a hindrance to the rapid development and procurement of aircraft, whether they be for military or for civil purposes..."

"The Royal Air Force have a very good operational requirements division of the Air Staff, and I am told that it is staffed by highly qualified officers with plenty of experience. Nevertheless... I think the Royal Air Force should seriously and very carefully consider having for themselves a Royal Corps of Aircraft Constructors on the same lines as the Royal Navy has the Royal Corps of Naval Constructors. There are only 200 men, I think, or 220 men, in the RCNC, so there is not a large number of



Lord Shackleton

men involved in it; but if the Royal Air Force had an RCAC (as I shall call it for brevity) I think it might help them in the way that, down the years, the RCNC has proved its value time and time again to the Royal Navy."

VISCOUNT BRIDGEMAN stressed the need for "a set-up in Whitehall which will ensure that decisions are as easy to take as possible." The pressure on Ministers was great; there was the defence aspect; the immense amount of money involved; and the need to distinguish between differing technical advice and to steer a way between the various kinds of "hard-selling and hard-line stories."

The dual responsibility of the Ministry of Defence and the Ministry of Aviation had probably contributed to what had appeared to be indecision and vacillation. This was inevitable if the Minister had to listen to advice from two sets of experts, "each backed by subordinate experts and people who want to sell things." If those responsible had only one source of advice, many of the things complained of would not have happened.

VISCOUNT DILHORNE said that the Government's explanations were lacking in clarity and extremely unconvincing. The defence of British interests must not depend on the provision of foreign aircraft. Had an arrangement to buy American aircraft been made by the Prime Minister while in Washington?

THE EARL OF LONGFORD intervened to say that the Cabinet had been free to discuss the question of aircraft procurement on its merits. There had been no prior commitment by the Prime Minister.

LORD SHEPHERD, replying for the Government, said that the Government did not believe that cancellation of the P.1154 and HS.681 would in any way affect export orders, although they might have an effect on some of Hawker Siddeley's civil production. He concluded:—

"There are a number of prospects... of further collaboration in what I should have thought were exciting aircraft. It may well be that we may not have to use the same number of design teams because we shall be dividing the effort with our Continental friends. But there is still a future. I would not accept that men who are at the moment aircraft design teams have not a contribution to make in other types of advanced industry. In fact, as I said earlier, we would welcome some transfers."

"The noble Viscount, Lord Watkinson, spoke about American competition. Of course the American companies are very big and powerful... Her Majesty's Government will do all they possibly can to aid and support our aircraft industry in selling their aircraft overseas."

Letters

Letters for these columns are welcomed, though "Flight International" does not necessarily endorse the views expressed. Name and address should be given, not necessarily for publication in full. Brief letters will have a better chance of early publication.

Belfast versus C-130E

SIR,—As military adviser to Short Brothers & Harland Ltd, I am writing to express appreciation of the article "Defence Decisions," in your issue of February 11. I found it a very informative review of this controversial subject.

My particular interest, of course, centred on the references to the Belfast aircraft in connection with the decision to buy the Lockheed C-130E instead of the displaced Hawker Siddeley 681. I would like to make three comments.

First, concerning the practicability of taking 150 troops into a 2,000ft forward strip. This proposal was put forward to meet a particular RAF STOL requirement only. Using a "military" landing technique acceptable for tactical missions and without braking parachute, the Belfast SC5/15B has a field performance comparable with that of the C-130E.

Secondly, the argument that sheer size was against the Belfast in terms of load handling, ground manoeuvre and contact pressure on poor surfaces does not bear close analysis. The Belfast has a more capacious cargo hold designed specifically for ease of loading and securing wheeled or tracked vehicles, and for rapid conversion to other roles such as troop carrying. In brief: being larger, it simply carries more than the C-130.

Ground manoeuvrability was well demonstrated at the last Farnborough Show, including the ability to reverse easily, and for bad-surface operation a new undercarriage with larger size tyres has been planned.

Thirdly, cost and time-scale. It has been said that the cost of the C-130E to Britain would be something under £800,000 (in dollars) and it is agreed that the Belfast would be roughly twice this sum (in £ sterling). It is also known that the price of the C-130E to the Australian Government was to be £A1.3m, and the discrepancy is yet another indication of the value placed by the Americans on any contribution towards undermining the British aircraft industry.

As regards time-scale, there is probably little in it. The "stratcal" version Belfast could be developed by 1967 and C-130E will surely take as long as that if the proposal to fit Tyne engines is adopted.

London W1

G. L. FITZGERALD, Brigadier

A Protest to Mr Wilson

The following is a copy of a letter sent to the Prime Minister on February 10 and signed by 23 members of the Pre-production Department of the Kingston-upon-Thames, Surrey, factory of Hawker Siddeley Aviation Ltd, Hawker Blackburn Division.

DEAR SIR,—In continuation of the action so far taken by members of this department in demonstrations and lobbying, etc, we would try to impress upon your attention the implications of your attitude towards British-designed aircraft and the consequences of your wholly negative approach to the industry.

- (1) The abrupt cancellation of orders immediately deprives highly skilled design teams of work, and within weeks stops all work in the actual factories.
- (2) The complete lack of any orders to replace those cancelled means redundancy in both offices and factories, simply because the firms cannot be expected to hold employees with no work available or in prospect.
- (3) Mr Brown disagrees with the 14,000 redundancy figure quoted by Hawker Siddeley as a direct result of your cancellations, and says more work is on its way, so that actual redundancies will not approach this figure.

Where is this new work? Redundancies have already commenced and only the Americans are getting orders!

- (4) Your consultant adviser (Mr Richard Worcester) would appear, from his television and press statements, to be inexplicably biased towards American aircraft, and to be also unaware of the skills inherent in the British aircraft industry.

He even went so far as to state publicly that the V/STOL Kestrel was "too early in its field." We ask you, is this not plain stupidity? With such an attitude we would not invent anything!

- (5) Do you realize that the quantity of Phantom aircraft you propose to order for the Navy is sufficient for five aircraft carriers, yet only one is capable of taking this aircraft?

Have these costs of modifying carriers been taken into account?

- (6) The Phantoms require considerable modification to operate from our carriers. This will inevitably take a long time; yet, whilst the Government keeps stating with apparent glee that British industry cannot produce aircraft in time, no time limit is placed upon the delivery of American aircraft. Why is this?

- (7) The Navy requires new aircraft by 1970. The P.1154 would have been ready by then; yet you cancel it, even though jigs are completed!

- (8) In conclusion, your negative policy in the face of all your self-imposed difficulties—such as the way you walked out of the recent debate on the aircraft industry, and the way you cancel things so easily but cannot contrive to do anything constructive—will inevitably deprive Great Britain of the technologists, designers, scientists, etc, who before the Election you stated were essential. In short, our country will lose the word "Great" and simply be known as "Britain," a fifth-rate country consisting of people incapable of thinking ahead!

Yours faithfully, on behalf of
Pre-production Department,

B. N. SWAN, P. LANCASTER, J. S. WILKINS, R. N. LEWIS, H. A. LOCKE, R. I. CARTER, J. H. DUNCAN, M. HAYWARD, D. PARKER, H. E. BEDFORD, G. W. GREEN, B. C. TAYLOR, A. ALLEN, M. ALLEN, R. UNDERHAY, G. D. GREGORY, J. M. STUART, E. EARTHROWL, J. E. HODGSON, F. GUNSTON, L. A. L. STRIPP, H. STREET, D. RODGER.

Kingston-upon-Thames

Too Kind to the Government?

SIR,—Since last October, when *Flight* expressed its welcome and good wishes to Mr Roy Jenkins, you have shown every courtesy to him and his Ministry. I feel that you have been leaning over backwards to be polite to the people whose decisions are now destroying the aircraft industry.

Without being less than scrupulously fair in covering the political aspect of aviation I feel that you could give more of a push in the right direction. *Flight* not only reports the flying world; it has considerable influence on it. One good shove in a few months' time and this Government of half-baked history dons will be back in their mining villages, Balliols and remote islands. The fate of the late Foreign Secretary will be common to all. Please don't leave it to your resident comedian to make suitable comments on such items as Brother George Brown's TV remarks on the aviation industry (Straight and Level, February 11).

The people now at the top of the Labour Party are the very antithesis of the flying men who edit *Flight*, and your customary good-humoured consideration is quite wasted on them. Let's have a bit more attack.

Penarth, Glam

E. H. MORONEY

Saving British Light Aviation

SIR,—At a time when members of both the aircraft industry and the light aircraft clan are feeling rather frustrated, I can only echo the clamour for something new in the light aircraft scene from British manufacturers.

I am sure that many of the skilled design staff bred in a very cost-conscious industry, and now facing redundancy, could come to grips with a tough design objective on the following lines:—

continued overleaf

LETTERS . . .

All-metal (with perhaps limited use of glass-fibre) two-seater monoplane; fully aerobatic, and capable of operation from grass strips; easily stretchable to a four-seater. Price: two-seater £2,000, and £4/hr operating cost over 400hr/year; four-seater, £2,500 and £5/hr over 400hr/year; both aircraft designed around Rolls-Royce Continental 100 and 145 h.p. engines respectively.

The initial costs should be based on a first production run of 250-300 aircraft. This sounds a lot; but, after all, there are that number of Auster types, all approaching old age, whose hourly costs are already around £4 10s per hour.

Carshalton, Surrey ROBERT J. BURGESS
[We have reason to believe that Beagle have advanced far with a project which would more than meet Mr Burgess's specifications.—Ed]

SIR,—Light aviation, and all sorts of aviation, are unlikely to be saved until the descendants of the Civil Servants whom Nevil Shute described so well in *Slide-rule* (when they tried to build an airship) are eliminated. Without them there would be no dearth of light types nor, probably, heavy ones as well.

However, this Utopian state is unlikely to develop in the foreseeable future, and something must be presented to the Government that is simple and practical if a plan for saving light aviation is even to be read, let alone considered.

Doug Bianchi informs us that the Linnet prototype cost less than £3,000. Could we not, then, start by asking the Government to buy for, say, £6,000 each prototype side-by-side two-seater built in this country in the next two years? Then they could hold a competition to decide which one to encourage.

As a specification baseline one could take the Chipmunk, and require that aeroplanes qualifying for purchase must exceed its performance in all essential respects.

Southampton

V. H. BELLAMY

Recording Already, Teaching Now

SIR,—Space does not permit me to write the commentary that I would wish on your article "Record Now, Learn Later" (February 18). Having been recording for many years, using the only methods so far developed in the world which are appropriate to the subject-matter of your article, we have learned a great deal already. Unfortunately the commentary would be nearly as long as the article, which we regard as a "curate's egg." I therefore give this précis of the more outstanding points:—

Wire as a recording medium is inferior to tape, and its weaknesses dictate digital recording. As all other companies in the UK propose wire they have no alternative but to choose digital. The requirements of efficiency, and economic and high-speed processing, should dictate the optimum recording format and not the untrammelled availability of recorder transports.

A 200hr wire record takes 20hr to re-wind and 30hr to replay. The comparable figures for tape are 1min and 15min. The "quick look" playback on the ramp has already been done. This is extremely easy with an analogue system and impossible with a digital one. Digital processing must be done by stages with extremely expensive equipment, which produces the case for teleprinter links and centralized processing. This is why, having solved the engineering problems involved, we recommend analogue systems—but can, of course, supply digital. The RAF have a high-speed playback and processing system allowing decisions as to what spares to order in the same half-hour—not next week. Air Canada is now using 56 channels out of 270 and not 20 out of 50 as stated, and will expand to full capacity by stages.

Our tape system has passed the full crash-proving tests laid down by the latest FAA proposals, which are of unprecedented severity. At the low speeds involved in this problem,

solid-state switches are on every count very much inferior to well designed mechanical switches. Sub-multiplexing has been in use in Royston systems for two years. The MATS C-133 trial has been completed successfully, resulting in a US contract having been signed for equipping the entire fleet.

Byfleet, Surrey

K. G. DOBSON,
Managing Director, Royston Instruments Ltd

At Upavon 50 Years Ago

From A Cdre Sir Vernon Brown

SIR,—I was very interested in the photograph of the Experimental Flight at Upavon shown in your issue of January 28, because I joined that Flight not long after it was taken. Ian Henderson was the son of General Sir David Henderson, who was then in the War Office and the equivalent, I suppose, of the CAS of later days. Ian and I served together in France in 19 Sqn during the Somme operation in the summer and autumn of 1916.

Will R. Rose was particularly fond of flying in a Vickers Fighter (the Gunbus) because of his splendid position for oblique photography. Griffiths, a theoretical physicist of Merton College Oxford, was one day given by Henry Tizard the problem of checking his calculations on the path of a falling bomb before having the CFS Mk II bomb-sight made up in the workshops (then commanded by the Master of Sempill). After about a week the following exchange took place at our Monday morning staff meeting:—

H.T.: "What about that bomb-sight calculation, Griff? There is a war on, you know."

I.O.G. (producing three pages of neatly written mathematical calculations on which was the same answer, but to two more decimal places): "Here it is."

H.T. (looking at it and going very red in the face): "But Griff, I did this on the back of an envelope."

I.O.G.: "Yes, yes, but mine is much the prettier method."

I took Bannatyne's (not Bannatyne) place on his posting to France, where he was killed shortly afterwards. Nobby Clark was also killed soon after he left the CFS and for a time I commanded the Flight—I think until I went to France in the spring of 1916 with 70 Sqn.

I remember the surprise which was expressed by the CO (Col "Pregnant Percy" Burke) when he saw me get out of an aeroplane one day with a writing pad strapped on my leg and a pencil hanging round my neck. But then, bless him, he always wore his spurs when he flew!

Staines, Middx

VERNON BROWN

Sperry's Record

SIR,—With reference to Roger Bacon's remarks about Sperry's GW Group (Straight and Level, February 11), Sperry is not a British company, but only run for British workpeople by first-class British management. During the last war the Sperry record was first-class, and continues. If Mr Wilson wants some know-how—and he does—he could well take over Sperry. He would have better results than he now gets from the Hungarians!

Pulborough, Sussex

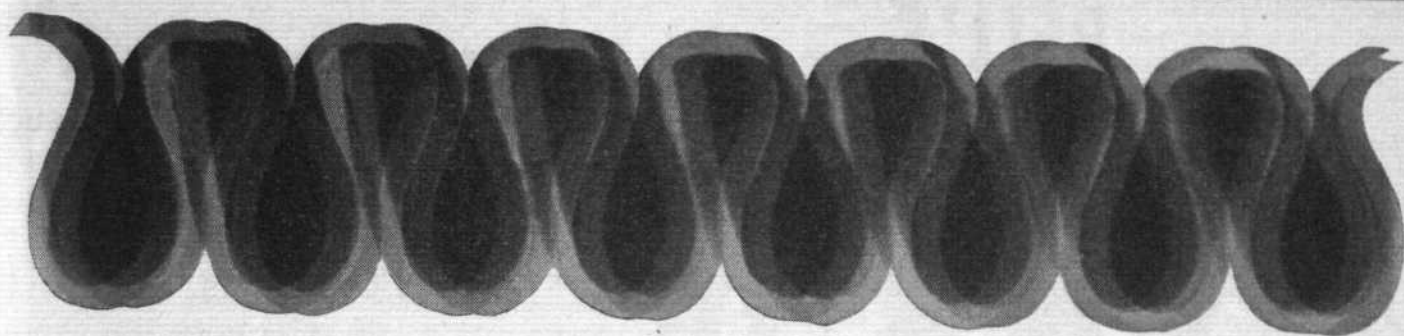
J. VIVIAN HOLMAN,
(ex-manager, Sperry Aeronautical Division)

Knock for Knock

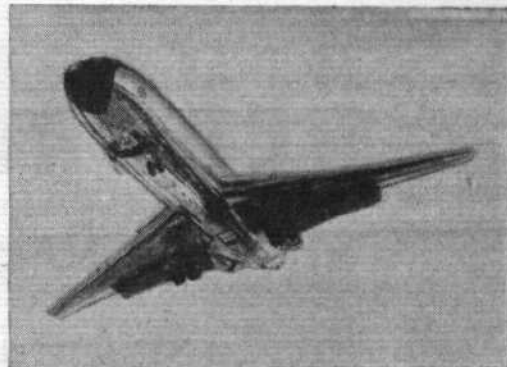
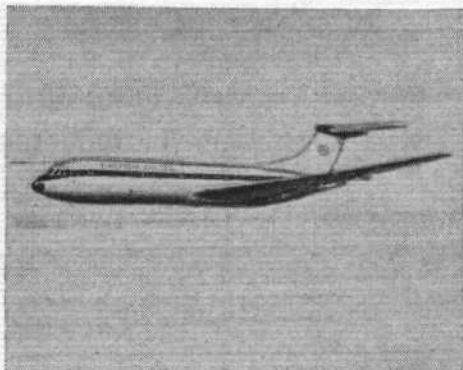
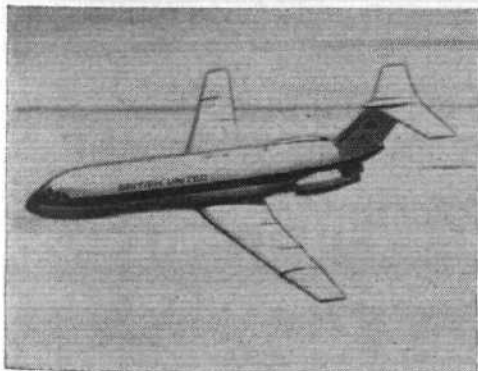
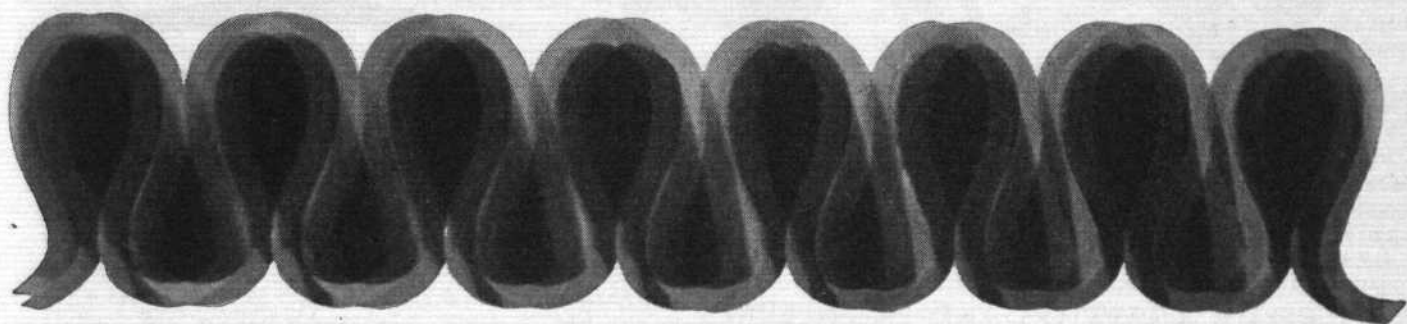
SIR,—We note with interest Roger Bacon's reference (Straight and Level, January 28) to our recent advertisement in *The Director*, and feel inclined to comment on his speculation regarding a possible British Rail counter-attack.

In point of fact, it is not our policy to "knock" other forms of transportation through the medium of our publicity material or other promotional activities. Nevertheless, if our attempts to provide a satisfactory service are bearing fruit, this is surely fair game.

It is perhaps appropriate that one should examine the other side of the coin. There have been numerous recent instances when our attention has been directed to promotion activities which suggest that the policies of other transport



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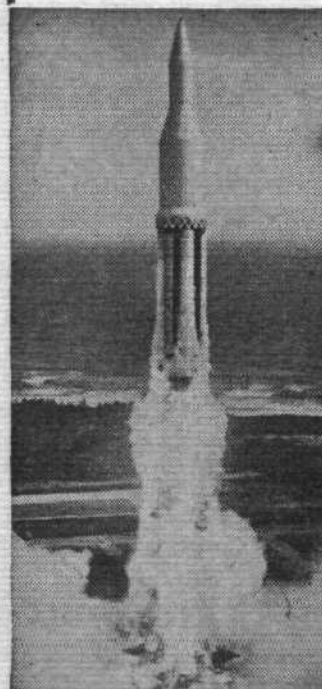
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LETTERS . . .

undertakings do not necessarily accord with our own. We have purposely refrained from comment on such occasions, for the reasons mentioned.

In short, we feel there is nothing to be gained by allowing gyros to topple over this one!

London W1

J. W. E. NEWBY,
Public Relations Department,
BKS Air Transport Ltd

[Roger Bacon's comment was about a BKS advertisement which knocked British Rail. Mr Newby encloses a British Rail publicity folder which adversely compares airline and road travel from Bradford to London with the journey by rail.—Ed]

Atlantic Prestige and Profit

SIR,—Although I do not wish to hog too much of your space I would welcome the opportunity of defending my previous letter (December 10).

The form of my letter obviously cut correspondent R. C. Browne to the quick to bring about such a caustic and emotional outburst as that contained in his letter published on February 11. I was not qualified, nor did I desire, to go into details on the VC10/B.707 affair, my letter being merely a gesture aimed at restoring to some extent the balance of equilibrium at a time when everyone seemed to be jumping on to the anti-VC10 bandwagon. As this apparently does not satisfy Mr Browne I will attempt to re-assert the sympathies I expressed before, without resorting to "flag waving." As I depend on the British aircraft industry for my bread and butter my argument may suffer from a little bias.

My main argument with "Puzzled" is that he goes to great lengths to point out the demerits of the VC10 whilst mentioning few, if any, of the merits. The resultant impression is one of the VC10 being inferior in most respects to the 707. I submit that this is not true. In a comparison of this sort one must take into account all the parameters and not just select those which support the argument. Performance-wise, "Puzzled's" calculations appear to prove that the 707 wins hands down, but this does not automatically indicate that the 707 is the better aircraft. It should be remembered that the 707 has been under development since 1954; could its economics in 1957 compare with those of the VC10 today?

As far as noise is concerned, no one can argue that the VC10 is not the quieter, whilst on average the pitch of rivets on the 707 is approximately twice that of the VC10. Furthermore, the sight of a bepodded and highly stressed wing flexing under flight loads may not worry unduly the intrepid gliding man, but it could well leave an unfortunate impression on a nervous "first timer." If all these factors, and others too numerous to mention here, are analysed objectively, as advocated by Mr Browne, then there can be no doubt that the VC10 will come out on top every time.

If Mr Browne should think that this letter is also "stupid" I would say this: the British aircraft industry is at present going through one of the most critical periods in its history and it should be realized that apart from the competition

it has a built-in handicap known as Her Majesty's Government. If it is to come out of this period alive it will require all the support and encouragement it can obtain, not only at executive level, but also of the plain and simple "flag-waving" variety.

Hucknall, Notts

R. B. GRIFFIN

SIR,—Having had the good fortune to fly in the Standard VC10, one wonders if your now famous correspondent "Puzzled" has ever had the pleasure of flying in this magnificent airliner.

For week after week we read of "Puzzled" facts and figures, but never of passenger appeal. I am sure the ordinary passenger is not worried in the least by figures, and all airliners overrule many facts.

RAF Gaydon, Warwicks

D. J. DAVIES

Standard VC10 Deliveries

SIR,—It is not my wish to turn even a small part of the correspondence columns of *Flight* into a representation of an aircraft spotters' gazette; however, may I briefly take up Mr H. E. Biraben's letter in your February 11 issue on the subject of Standard VC10 deliveries to BOAC?

Mr Biraben is suffering from a slight case of mistaken identity when he asserts so positively that he flew in VC10 registered G-ARVC (Victor Charlie) on November 16. A phone call to BOAC's meticulously efficient Revenue Statistics Department confirmed, almost within seconds, that the VC10 in question was G-ARVG (Victor George). Mr Biraben can draw comfort that he is certainly not the first to make this sort of mistake with registration lettering written small.

Again, for the record, G-ARVC (Victor Charlie) was delivered to BOAC on December 1. The corporation's fleet of 12 Standard VC10s became complete on February 6 with the delivery of . . . On second thoughts I will not give the registration, for obvious reasons. Assiduous folk can buy a back copy of *Flight* for December 24 last, where the answer appears in a letter on page 1092.

Weybridge, Surrey

J. H. MOTUM,

Sales Publicity Manager (Civil Aircraft),
British Aircraft Corporation (Operating) Ltd

Design Factors Ventilated

SIR,—I was interested to see, in the article on diversification ("Survival of an Industry") in your February 11 issue, the mention of Saab's car body being designed in a wind tunnel.

It brings to mind what was, to the best of my belief, the only British venture in this field, which took place some years ago. The aim of the project was to overcome the enervation brought on by conventional drawing office air-conditioning, and a simple open-circuit tunnel was employed. This proved unsuccessful, for two major reasons. First, the drawings tended to be blown off the boards; secondly, there was a high rate of absenteeism because of bronchial complaints.

It seems that no further work has been done in this country, but perhaps we could learn something from the Swedes.

London SE1

SYDNEY JOHNSON

DIARY

- Feb 25** Aerodrome Owners' Association: a.g.m. (3.15 p.m.) and annual dinner (7.30 p.m.). Hyde Park Hotel, London W1.
- Feb 25** RAeS Southampton Branch: Chartered Engineers' Lecture, "The Process of Technological Innovation," by Sir John Cockcroft. Guildhall, 8 p.m.
- Feb 25** RAeS Yeovil Branch: Tenth Henson and Stringfellow Memorial Lecture, Park School Hall, 7.30 p.m.
- Feb 25-26** Institution of Mechanical Engineers: Symposium, "Gyros"; 1 Birdcage Walk, London SW1.
- Feb 26** RAeS Rotorcraft Section: Half-day symposium, "Rotors for High-performance VTOL Aircraft," by R. L. Lichten; and "Structures and Mechanisms in Bird Flight," by R. H. J. Brown; 2.15 p.m.
- Feb 26** RAeS Gloucester and Cheltenham Branch: "Management in the USSR," by I. Rostov. Gloucester Technical College, 7.30 p.m.
- Mar 1** RAeS Derby Branch: "Satellite Communications (including Telstar)," by F. J. D. Taylor. Rolls-Royce Welfare Hall, 6.15 p.m.

- Mar 2** RAeS: "Automatic Throttle Control for Deck-recovery of Carrier-based Aeroplanes," by Prof E. J. Andrews; 6 p.m.
- Mar 3** Kronfeld Club: "Man-powered Flight," by B. S. Shenstone; 74 Eccleston Square, London SW1, 8 p.m.
- Mar 3** RAeS Reading Branch: Main lecture, "Development and Manufacture of Light Aircraft," by G. H. Miles. Ship Hotel, 6.30 p.m.
- Mar 3** RAeS Swindon Branch: "Conception and Development of the Concorde," by E. N. Brailsford. Technical College, 7.30 p.m.
- Mar 3** RAeS Weybridge Branch: "Flight Development of the VC10," by E. B. Trubshaw. BAC Apprentice School, 5.45 p.m.
- Mar 4** RAeS: Eighteenth Louis Blériot Lecture, "Modern Solutions to Coupling and Transmission Problems in Aircraft Engines," by Marcel Bruyère, 6 p.m.
- Mar 4** RAeS Belfast Branch: Film night. Queen's University, 7 p.m.
- Mar 5** Air Transport Auxiliary Association: Annual dinner. Eccleston Hotel, Victoria, London SW1.

Note: RAeS lectures other than those given at branches take place in the Society's lecture theatre at 4 Hamilton Place, London W1.



Most recent figures on the Turbo Commander are: price \$299,950 (about £107,000) ex-works; climb to 16,500ft in 10 min, cruise at 285 m.p.h. TAS, with 7,900ft cabin altitude, for 1,100 miles with 45min reserve. A batch of 56 is planned with first delivery in June and seven per month in December

SPORT AND BUSINESS

Shropshire Aero Club, almost exactly ten years after its formation, has won the Lennox-Boyd Trophy of the Association of British Aero Clubs for making the most praiseworthy contribution to club flying during 1964. Presentation of the trophy was by Viscount Bledisloe, a vice-president of the Association, at the annual ABAC dinner in London on February 12.

The whole future of the flying clubs was in jeopardy, Viscount Bledisloe stated at the dinner, because of the removal of the fuel-tax rebate. Another ABAC vice-president, Sir Lionel Heald, MP, claimed that the matter of the rebate had not yet been properly considered. The Association was at a moment of crisis in its history, he added.

Deputising for his Ministerial colleagues from the Ministry of Aviation, Mr Bruce Millan, MP, Under-Secretary of State for Defence for the RAF, justified the withdrawal of the tax concession by comparing the situation in 1950 with that of 1965. Then, the clubs needed assistance; now, "you are a vigorous and healthy movement." The Government's action in removing the rebate had not been taken lightly, but only after serious consideration, and the Government hoped that the light-aircraft movement would thrive and expand. As if to give practical expression to this hope, Mr Millan announced the Government's decision (reported last week) to make £600,000 available to Beagle Aircraft.

More Mystère 20s Ordered The production rate of the Dassault Mystère 20 executive jet—marketed in North America by PAA's Business Jets Division as the Fan Jet Falcon—is to be increased from four to seven a month. This was decided when Mr Juan Trippe, president and general manager, and PAA executives, visited the Dassault and Sud-Aviation factories, and flew in the first production aircraft. The second production Mystère 20 is due to fly early next month, flight testing is going ahead intensively, and the eleventh fuselage is now on the assembly line at St Nazaire.

Following Mr Trippe's visit, PAA was reported to have taken up its option on another 14 Mystère 20s, of its total option of 120.

Aircraft Exports by Aero Commander, Beech, Cessna and Piper during 1964 amounted to 1,775 aircraft valued at \$44,118,286, compared with 1,577 aircraft worth \$35,060,600 in 1963. For 1965 the Aerospace Industries Association estimates a probable total of 2,000 with a market value of over \$50m.

World Gliding Championships at South Cerney next May will be preceded on the eve of the contest by a barbecue in Cirencester Park for competitors and helpers, by courtesy of the Earl of Bathurst. A flying display, but no contest flying, is scheduled for the day of the opening ceremony, Saturday, May 29. On the day of the closing ceremony (Sunday, June 13) there will be another flying display and an official luncheon. Entries received for the championships comprise:

ARGENTINA One open, one standard.
AUSTRALIA J. Blackwell, Std Austria, and D. Reid, Skylark 4 (open); M. Jinks, Schneider ES60, and R. Rowe, ES60 (standard).
AUSTRIA F. Ulbing, Mg23 (open); H. Wödl (standard); plus one.
BELGIUM H. Stouffs, Ka-6CR (open); M. Cartigny, Foka, and M. Baeke, Ka-6CR (standard).
BRITAIN J. S. Williamson, Olympia 419, and H. C. N. Goodhart, Dart 17 (open); G. E. Burton, Dart 15, and A. J. Deane-Drummond, Olympia 465 (standard).
CANADA W. J. Mix, Skylark 4, and D. Webb, Dart 17 (open); C. M. Yeates, Olympia 460, plus one, Olympia 460 (standard).
CZECHOSLOVAKIA Three entries.
DENMARK H. W. Jensen and E. E. Nielsen (open); N. S. Sejstrup and I. Braes, Ka-6CR (standard).
FINLAND S. Hämäläinen, Skylark 4 (open); J. Horma, Havukka, and P. M. Wiitanen, PIK-16C Vasama (standard).
FRANCE Two open, two standard.
EAST GERMANY M. Blauert, Foka, and B. Nolte, Foka (standard).
WEST GERMANY R. Spänig, D-36, and R. Kuntz, HKS-3 (open); Heinz Huth, Ka-6, and R. Lindner, Phoebus (standard).
HUNGARY K. Thuri, G. Petröczy and F. Csepány (two open, one standard).
ICELAND L. Magnusson, Ka-6CR, and T. Filippusson, PIK-16C Vasama (standard).
INDIA V. B. Gupta (standard).
IRELAND N. W. Kearon, Olympia 419, and M. Slazenger, Olympia 419 (open); T. W. Evans, Ka-6CR (standard).
ISRAEL M. Bar, Skylark 3f, and D. Arber, Skylark 4 (open).
ITALY W. Vergani, Skylark 4, and F. Lamera, M-100S (open); A. Pronzati, M-100S, and L. Briigliadori, Uribel C (standard).
NETHERLANDS E. van Bree, Ka-6, and E. Reparón, Ka-6 (standard); G. J. Ordelman, Sagitta (open).
NEW ZEALAND S. Georgeson, Skylark 3, and Westenra, Skylark 4 (open); Cooper, Olympia 460, and Cameron, Ka-6 (standard).
NORWAY T. Johannessen, PIK-16C Vasama, and H. Høimyr, Ka-6CR (standard).
POLAND E. Makula, Zefir 3, and J. Wroblewski, Zefir 3 (open); J. Popiel, Foka 4, and F. Kepka Jr, Foka 4 (standard).
RHODESIA R. R. Smith, Skylark 4, and O. J. L. Arnett, Skylark 3f (open).
SOUTH AFRICA E. Dommissie, Olympia 419 or BJ2 (open); M. Jackson (standard).
SWEDEN S. Rodling, PIK-16C Vasama (open); P.-A. Persson, PIK-16C Vasama, and I. Silesmo, Ka-6CR (standard).
SWITZERLAND H. Nietlisbach, Skylark 4 (open); M. L. Ritzi, Standard Elfe, and U. Bloch, Standard Elfe or K-10 (standard).
UNITED STATES R. H. Johnson, Skylark 4, and A. J. Smith, Ka-6 (open); R. E. Schreder, HP-12, and W. A. Scott, Ka-6CR (standard).
USSR M. M. Veretennikov, A-15, and V. I. Chuvikov, KAI-19 (open); I. V. I. Jarushevichus, KAI-14, and O. N. Suslov, KAI-14 (standard).
YUGOSLAVIA K. Korpar, Delfin, and V. Stepanovic, Libis-18 (standard); plus one open.

The Helio H.500 Twin six-seater is now being put into production

STOL Specialists Supreme

IN almost every case where actual vertical take-off or landing and near-vertical climb or approach are unnecessary there is at least 300yd of open space from which a true STOL aircraft can operate. Such an aircraft then offers very considerable advantages in cost, simplicity, speed, and economy over the helicopter, and it is this special area in which Helio Aircraft Corp have long specialized with their Courier. Their British distributors, McAlpine Aviation Division at Luton Airport, have themselves made extensive use of just these features with several Couriers.

Now, Helio offer the Courier 2—at one time called the Caballero—with better power and speed and a genuine six-seat capacity. It is probably the only aircraft currently available to offer such large capacity and exceptional field performance combined with a usefully high cruising speed. Price, delivered in UK, but without the current import surcharge, is £15,369. Performance is listed in the table below.

To provide twin-engined safety with the same seating, Helio are now putting into production the Helio H.500 Twin, powered by two of the Courier 2's engines—250 h.p. Lycoming O-540 burning 80/87 Oct fuel—with Courier features such as steel-tube cabin section, highly stressed seating and high-lift devices, but adding an unusual high-visibility nose and a fixed aerodynamic slat between the engine nacelles. Expected ex-works price is reported to be \$110,000 (about £39,200).

Most exciting of all is the projected ten-seat turboprop Stallion which, while improving on the outstanding low-speed and field performance of the Courier, has a cruising speed of over 200 m.p.h. With the further developed engine, the cruising speed reaches 224 m.p.h. and take-off to 50ft is a mere 200yd. Either Garrett AiResearch or United Aircraft of Canada engines are offered. Tip-tanks are optional and ultimate ferry range is 2,615 miles. Hard points are already incorporated for 2,400lb of external stores or weapons for COIN-type applications.

Military designations of the Courier and Twin are respectively U-10A and B and U-5. The USAF has bought Couriers and Twins. The US Army has evaluated the Stallion in competition with other types, such as the Turbo-porter, with prospects of considerable purchases.



Above, the new Courier 2 has improved payload and performance. Below, the turboprop-engined Stallion has even better field performance, but seats ten and can cruise at over 200 m.p.h.



	Helio Twin Model H.500	Helio II Model H.250A	Helio Stallion		
			Max CAR 3 load (Gross 5,100lb)	Full STOL (Gross 4,750lb)	Ultimate 800 h.p. STOL at 5,100lb
Number of seats	6	6	10	10	10
Engine	Two Lycoming 250 h.p. O-540-A2B (two)	Lycoming 250 h.p. O-540-A2B	550 h.p. U.A.C. PT6A-6 or Garrett 600 h.p. TPE 331-2-1	550 h.p. U.A.C. PT6A-6 or Garrett 600 h.p. TPE 331-2-1	Garrett 800 h.p.
Fuel	120 US gal (80/87 Oct)	60 US gal (80/87 Oct)	120/224 US gal (JP.4)†	120/224 US gal (JP.4)†	120/224 US gal (JP.4)†
Wing span	41ft	39ft	41ft 7in	41ft 7in	41ft 7in
Length	31ft 10½in	30ft 8in	39ft 5in	39ft 5in	39ft 5in
Wing area	241 sq ft	231 sq ft	241 sq ft	241 sq ft	241 sq ft
Weight empty	3,065lb	1,910lb	2,777lb	2,777lb	2,792lb
Weight loaded	4,500lb	3,400lb	5,100lb	4,750lb	5,100lb
Maximum range at 10,000ft	850 mi	700 mi at 143 m.p.h.	1,200 mi at 160 m.p.h.* (ferry range 2,615 mi)	1,200 mi at 160 m.p.h.* (ferry range 2,615 mi)	1,200 mi at 160 m.p.h.* (ferry range 2,615 mi)
Minimum manoeuvre speed	40 m.p.h.	33 m.p.h.	38 m.p.h.	38 m.p.h.	38 m.p.h.
Best cruising speed	170 m.p.h.	150 m.p.h.	204 m.p.h.	204 m.p.h.	224 m.p.h.
Payload	1,435lb	1,290lb	2,323lb	1,973lb	2,308lb
Take-off to 50ft	662ft	960ft	790ft	660ft	600ft
Take-off run	305ft	460ft	415ft	340ft	322ft
Landing run	370ft	192ft	250ft	232ft	213ft

* With tip tanks: 555 miles without tip tanks

† Without and with tip tanks respectively



First small turbine-powered helicopter to be launched in the civil market, the Hiller FH-1100 is almost identical with the company's OH-5A submission in the US Army LOH competition

HILLER'S FH-1100 VERSION OF THE LOH

FAIRCHILD HILLER have decided to put their OH-5A Light Observation Helicopter into commercial production as the FH-1100 before the US Army announces its final choice of LOH helicopter. Hiller OH-5A and Hughes OH-6A are in the final stages of the Army competition and Hiller feel themselves in a very strong position. They were first to deliver the initial test OH-5A in December 1963. It was the only design to complete 1,000hr without change of any major dynamic or airframe component and now has more than 1,200hr of flight time. It had the lowest parts consumption, in terms of both units and cost, and showed the best serviceability and lowest maintenance time per flight hour, scheduled and unscheduled. A condition of the LOH programme was that FAA civil certification should be achieved before Army evaluation.

Nevertheless, Hiller's decision to start commercial production was influenced also by the slowing down of Army replacement orders for the piston-engined H-23 because of the LOH prospects, by a dip in civil orders and by the need to keep design and engineering staff together through a current valley in design workload. By launching civil production Hiller can also offer the Army a more attractive price and production situation. The stakes are high, because the Army will require up to 4,000 LOHs during coming years and a civil market for a further 4,000 is foreseen. The first civil FH-1100 is to be completed in December.

The Hiller OH-5A was described in detail in *Flight* for May 7 last year. It represents, as does the OH-6A, a concerted attempt to incorporate every possible "state of the art" improvement in a light utility helicopter, but while Hughes stressed light weight, small overall size and speed, Hiller stressed manoeuvrability and simplicity. Hiller also incorporated a version of the Hamilton Standard simplified two-axis stabilization system now offered in the L models, plus a simplified version of that machine's rotor head and fully powered controls with a 900lb/sq in hydraulic system.

An important development since the LOH evaluation is the first growth stage of the Allison T63 turboshaft. The civil engine for the FH-1100 is the 250-C10B with a normal rated power of 270 h.p., a take-off rating of 317 h.p. and a ram power of 335 h.p. The 250-C14 with 350 h.p. is currently under development and can be expected to power both civil and later LOH helicopters. The basic OH-5A was designed to accommodate a 500lb overload, represent-

HILLER FH-1100

(One Allison 250-C10B: normal 270 h.p., take-off 317 h.p., ram 335 h.p.)

Gross weight	2,000lb	2,530lb*	3,000lb†
Empty weight, lb ...	1,370	1,370	1,370
Useful load, lb ...	630	1,160	1,630
Max permissible speed (S.L. to 5,000ft), m.p.h. ...	128	128	115
Max rate of climb (take-off power), ft/min ...	2,570	1,850	1,350
Vert rate of climb (take-off power), ft/min ...	2,220	1,200	420
Max rate of climb (normal power), ft/min ...	2,430	1,710	1,250
Vert rate of climb (normal power), ft/min ...	2,060	1,040	240
Normal range at S.L. (70 US gal fuel), st ml ...	373	362	343
Ferry range at S.L. (135 US gal fuel), st ml ...	730	730	—
Normal endurance (70 US gal fuel), hr ...	4.4	4.2	3.9
Max endurance (135 US gal fuel), hr ...	8.4	8.1	—
Hover ceiling o.g.e. (take-off power), ft ...	19,400	12,000	5,900
Hover ceiling i.g.e. (take-off power), ft ...	23,200	16,900	11,500
Service ceiling, ft ...	23,200	17,200	12,700

* Present normal gross weight.

† Overload gross weight.

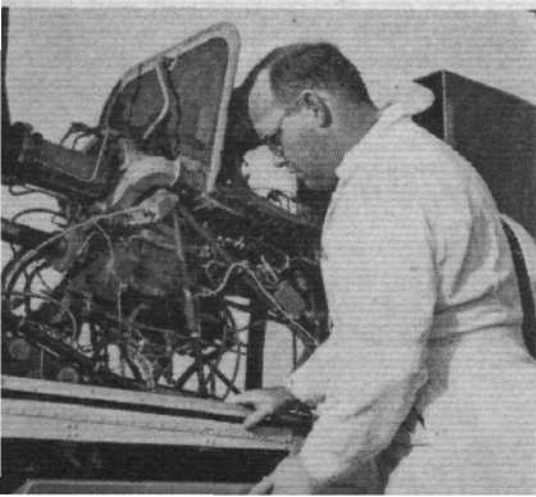
ing a 15 per cent increase in gross weight. The accompanying performance figures include such an extension.

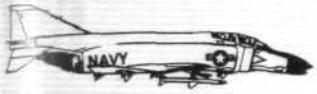
In addition to maintenance and loading features demanded by the Army specification, the FH-1100 offers better cruising speed, a fuel consumption at cruise power only a few gal/hr greater (and with cheaper JP-4 fuel) than equivalent piston-engined machines, and therefore much improved operating economy. The stabilization system has 10 per cent authority in the pitch axis and 15 per cent in roll, giving harmless runaway characteristics but allowing hands-off flight even in the hover. A very low disc loading of 2.5lb/sq ft produces an autorotational sink rate of only 1,400ft/min. If power is lost a few feet above ground at the 120 m.p.h. cruising speed, the FH-1100 can zoom to 350ft, make a 360° turn, glide for half a mile and make a zero-speed landing, all without power. Present "red-line" speed is 128 m.p.h., but the OH-5A has been flown at more than 160 m.p.h.

The FH-1100 will set out with 5,400hr blade life and 1,200hr transmission life without intermediate inspections. Altogether, it represents a 500 per cent increase in cost effectiveness over previous helicopters of the same capacity.

Hiller will now have a complete range of light helicopters, including the 12E series (of which a new batch is being laid down), the L series, with new rotor head and stabilization, and the turbine-powered 1100. The last-named is to sell for approximately \$85,000 (about £30,250), while the SL4 costs \$69,960 (about £24,800).

The diminutive Allison 250-C10B turboshaft (left below) weighs only 134lb but delivers 317 h.p. for take-off. At right, a mechanic makes use of the built-in maintenance platforms





PHANTOM II: *The Complete Air Force*



For the first time, nations with limited national resources can free themselves from the restrictions of a single mission air force. With the Phantom II, they can have air power for defense, air power for attack. Its all-weather capability gives teeth to deterrence 24 hours a day, good weather or bad. The Phantom II can perform air superiority, air defense, interdiction, long range attack, close support or even a mixture of missions. The Phantom carries self-protective armament to fight its way in and fight its way home on attack sorties. It even doubles as its own trainer. It doesn't have to be modified; just arm it for whatever mission is to be performed.

It's a record breaker. And it's all one airplane. The Phantom II.

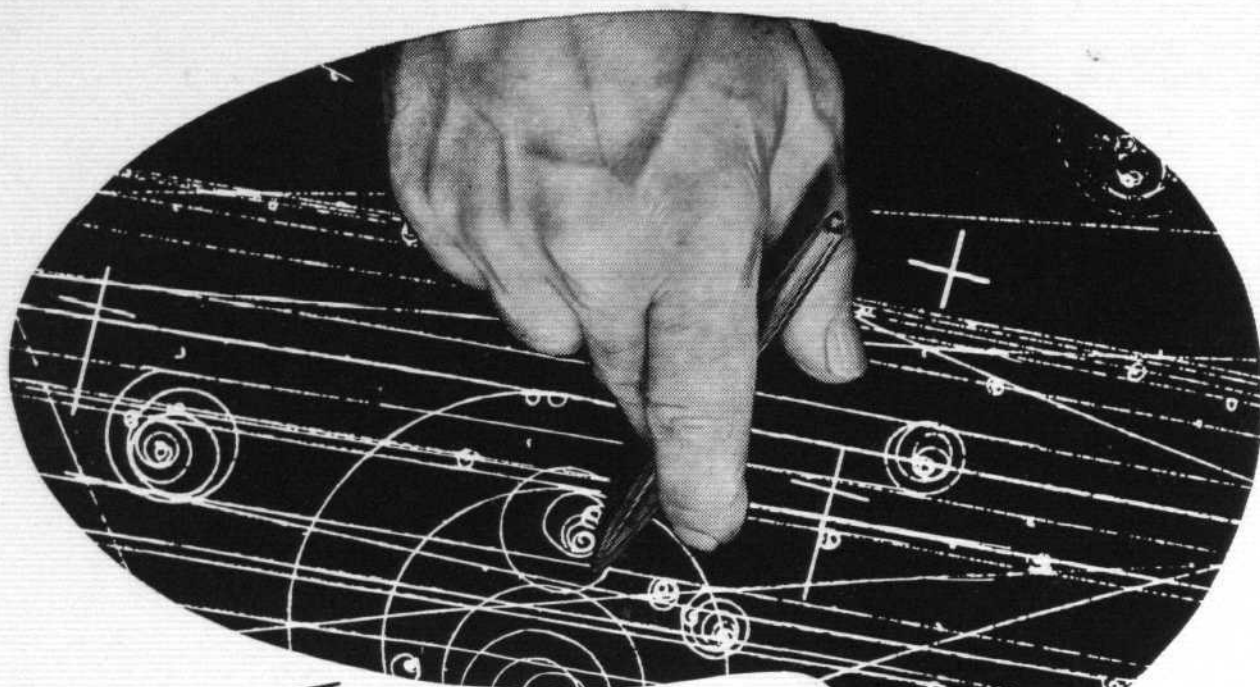
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Particle tracks in hydrogen bubble chamber;
European Organisation for Nuclear Research, Cern

1964—the début of a new particle?
Will it bring new order after a decade of
proliferating fundamental particles?
Whatever the outcome,
1965 brings order out of the
information flood which faces
scientists and technologists

A new information concept for scientists and technologists

As the implications of a new particle transcend the realms of physics, so developments in any branch of science and technology have profound effects on others. Scientists and technologists must be aware of advances across the whole spectrum of progress.

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SCIENCE JOURNAL is born of years of deep research among an exact cross-section of scientists and technologists. Interpretative news reports of the month's developments are combined with full length features by the world's leading scientists and technologists.

Thus it provides the broad-based account of international progress which scientists and technologists so urgently need.

Contributors to the first issue: Lord Rothschild, F.R.S. (Fuel Cells); Professor J. D. Bernal (Science of Science); Dr. Alex Comfort (Causes of Ageing); Dr. A. H. Meleka (Electron Beam Technology); Sir Graham Sutton, F.R.S. (Energy in the Atmosphere); Professor H. J. Eysenck (Scientific Treatment of Criminals); Martin Biddle (Winchester: The Archaeology of a City); Dr. C. W. Kilmister (Relativity since Einstein).

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Great Britain

Ultrasonic Thickness Gauge Portable ultrasonic gauging equipment has been developed by Dawe Instruments Ltd, of Western Avenue, Acton, London W3. Weighing 16lb, it is powered by its own rechargeable battery, but can also be operated from mains.

Suitable for both flaw- and thickness-gauging, it is fitted with a $2\frac{1}{2}$ in \times $2\frac{1}{2}$ in c.r.t. screen, the scale of which can be expanded to represent $\frac{1}{16}$ in thickness of steel. Gauging accuracy is stated to be ± 0.005 in for materials in the thickness range 0.1in to 6.0in. For flaw detection, where accuracy is generally less critical, the range extends up to 100in.

Pre-impregnated Plastics by 3M The Minnesota Mining and Manufacturing Co Ltd, of 3M House, 103 Wigmore Street, London W1, is now marketing in Britain Scotchply reinforced plastic. This is a glass filament, pre-impregnated, epoxy-resin-reinforced material, with rigid control maintained on the type and size of filaments. Combined with strict control of the highly-developed epoxies, it is claimed, this ensures high strength and stiffness.

Scotchply is widely used in the USA, in the aircraft and other industries where extremely high tensile strength combined with the ability to withstand extreme flexing fatigue are required. In this country Rolls-Royce make extensive use of one of the Scotchply formulations in their RB.162 lift engines.

To Head Research Dr James Kendall, formerly managing director of Edwards High Vacuum Ltd and an authority on semiconductors, has joined Ross-Hatay International Ltd, consultants, as joint head of their Electronics Research Division. Dr Kendall is a graduate of both London and Cambridge Universities and was for 12 years head of the Physical Chemistry Laboratory of Metropolitan-Vickers.

He has also held senior positions with Plessey, Texas Instruments, Microwave Associates and SGS-Fairchild.

Aircraft Servicing Equipment worth £10,500 and manufactured by Auto Diesels has been ordered by the People's Republic of China. Commenting on the order, Mr A. J. W. Green, chairman of Auto Diesels, said: "Although this is not a large order it is an encouraging one and underlines the company's policy of exploring all possible export markets."

Comprehensive Catalogue A model publication of its kind, both in presentation and in the amount of technical information it

provides, is the new catalogue of aviation products of Bells Asbestos & Engineering Ltd, Bestobell Works, Slough, Bucks. It contains over 100 data sheets covering hoses, end-fittings, connectors, seals, sealing rings and gaskets, insulation, Janitrol couplings, clamps and clips and general information.

Canada

Canadair's New Chief Mr Frederick R. Kearns, executive vice-president of Canadair Ltd, has been elected president and chief executive officer; he succeeds Mr J. Geoffrey Notman, who becomes chairman of the board. The changes have been made to accelerate Canadair's efforts to broaden and diversify its operations.

Mr Notman will devote his time to long-range planning and development. President and general manager since 1952, he is also a vice-president of General Dynamics, Canadair's parent company.

USA

New Glass Fibre in Space Research A new glass and a new glass-finish which, it is claimed, together produce glass fibres 40 per cent stronger than any previously available, and resistant to temperatures 200°F (110°C) higher, were recently developed by the Owens-Corning Fiberglas

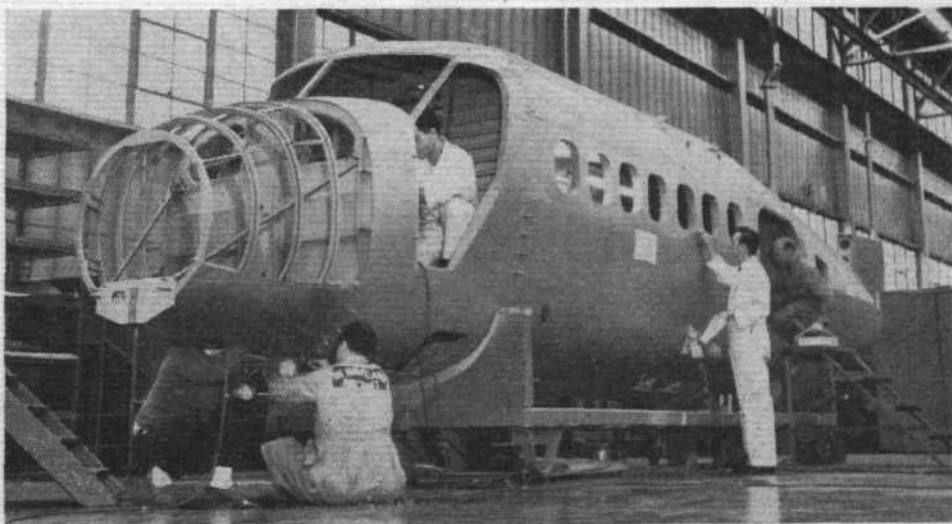
Mr Nagahide Mori, prominent in furthering Japanese exports, has been appointed president of the Nihon Aeroplane Manufacturing Co, builders of the YS-11 short-haul turboprop airliner



Corp, of New York. They resulted from a research programme sponsored by the US Government to find lightweight materials for use in aerospace research. Already the new glass-fibre, mixed with epoxy resin in the proportion 4 : 1, has replaced steel alloy in the rocket casings of the Polaris missile, increasing the missile's range from 1,000 to 2,500 miles. It has also been used in the Saturn S-IV rocket and in the Mercury space capsule in applications where structurally rigid components must also provide thermal insulation.

The new glass itself, known as Fiberglas S(994), has a composition of 65 per cent silica, 25 per cent alumina and 10 per cent magnesia, unlike traditional "F" or electrical-grade Fiberglas which contains sodium and potassium oxides. Filament diameter of both is 0.00038in. The tensile strength of Fiberglas S(994) when treated with the new "HTS" finish is 700,000lb/sq in at 75°F (24°C) compared with a maximum of 500,000lb/sq in for the best previous glass fibres. And since the density of an 80/20 glass/epoxy composite is only 0.074lb/sq in the strength/weight ratio is higher than that of any known metal.

Progress is swift in the construction of the development batch of five Twin Otter light twin-turboprop transports at de Havilland Canada's Downsview factory. This photograph of the first fuselage was taken on February 12; three days later the wings were added. Roll-out is planned for late spring and the first flight for the early summer





Kestrel Order Placed

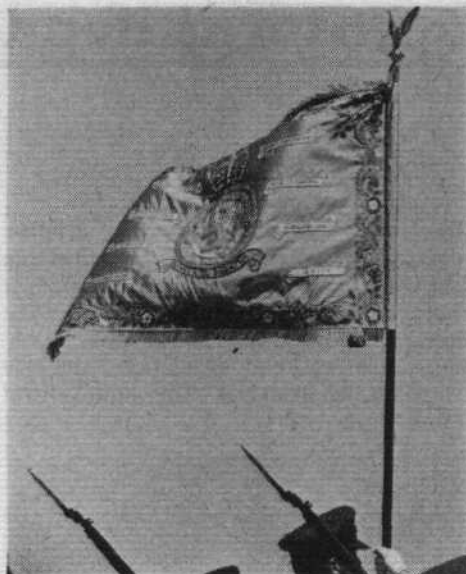
THE WORLD'S FIRST production contract for jet-lift VTOL fighters has finally been placed—in only 17 days, after years of delay. This quick decision was to avoid redundancies at Hawker Siddeley. Though reported ultimately to cover 100 Kestrels worth £65m, the contract is not initially for this number. Nor is there any decision yet on the engine—long-life 15,200lb thrust Pegasus, or shorter-life 18,000lb Pegasus allowing VTOL instead of STOL with the required payload. First RAF squadron deliveries are intended in 1968.

Further Defence Decisions

WRITTEN AND ORAL ANSWERS on defence matters in the House of Commons last week by Mr Denis Healey, Secretary of State for Defence, referred to a number of plans.

The fifth British Polaris submarine is not to be built. The resultant saving is £45m, less cancellation charges yet to be determined. The four remaining Polaris submarines, all ordered during 1963, will be capable of being modified to carry the Polaris B3, now called Poseidon. The programme for construction of further SSK nuclear hunter/killer submarines can now be resumed following its interruption by the Polaris submarine programme.

The base for Polaris submarines on the Gareloch is being built and will be ready in



A Standard was presented to 78 Sqn at RAF Khormaksar on February 11 by Lt Gen Sir Charles Harington, C-in-C Middle East Command, to mark the squadron's 25 years' service. Commanded by Sqn Ldr B. M. Burley, 78 Sqn flies Twin Pioneers on tactical support missions all over the South Arabia Federation

time for the first submarine in July 1968. It will cost £45m.

The new aircraft carrier CVA-01, first announced in the 1964 Defence White Paper, will be of about 58,000 tons, will cost about £60m and should be in service in 1973. It is being designed now and construction will be put out to tender next year. Any decision on CVA-02 awaits the outcome of the current defence review.

There are no plans at present for equipping RN ships with surface-to-surface missiles, because the carrier-borne aircraft is still felt to be the best weapon of this nature. The need for such missiles is nevertheless being reviewed.

While Mark 2 versions of Bloodhound, Thunderbird and Seaslug are entering service, a requirement has been formulated for an advanced low-level ground-to-air

missile, and development is in progress. Other requirements are being examined.

Modifications to the high-lift system of the Phantom, as well as fitting the more powerful Rolls-Royce Speys, will enable the aircraft to operate from British carriers without operational penalties. The RAF version may have a different nav/attack system, but will retain the carrier-landing capability, as reported in *Flight* for February 11. Deliveries to the Fleet Air Arm are to begin in 1967 and to the RAF in 1968.

Withdrawal of the Valiants from the bombing role has caused "considerable embarrassment for us with our NATO allies, and it is something we must all deplore and regret." The possibility of replacing NATO-committed Valiants with Vulcan 1s (as noted on page 302) is being urgently examined in relation to cost and other factors. Vulcans and Victors both carry fatigue meters—instruments recording successive instances of g loading of selected intensity—but none has yet shown any signs of fatigue, whereas Valiants in all their roles did show symptoms.

The P.1127 Kestrel will be developed to provide better payload and range, presumably by fitting the 18,000lb/thrust Pegasus engine already offered, but refused, for the nine tripartite machines. Discussions have been opened with the French, German and US Governments concerning a next-generation VTOL aircraft with vastly improved performance.

Rolls-Royce proposals to supply Tynes for the C-130 date back to the original Lockheed sales effort some years ago. The engine involved would be the 5,855 e.h.p. RTy.20, which would give the C-130 much better take-off performance, an increase of up to 50 m.p.h. in cruising speed and greater range, but at some penalty in time and cost of delivery.

Hawks in Israel

THE ISRAELI PREMIER, Mr Levi Eshkol, announced last week that Hawk short-range anti-aircraft missiles are being deployed in Israel and will soon be operational.



Whirlwind HAR.10s of the Khormaksar Search and Rescue Flight have recently been fitted with large sand filters over the Gnome engine intakes. The OC SAR Flt, Flt Lt "Chick" Witten-Hayden, has just completed 3,000 helicopter hours

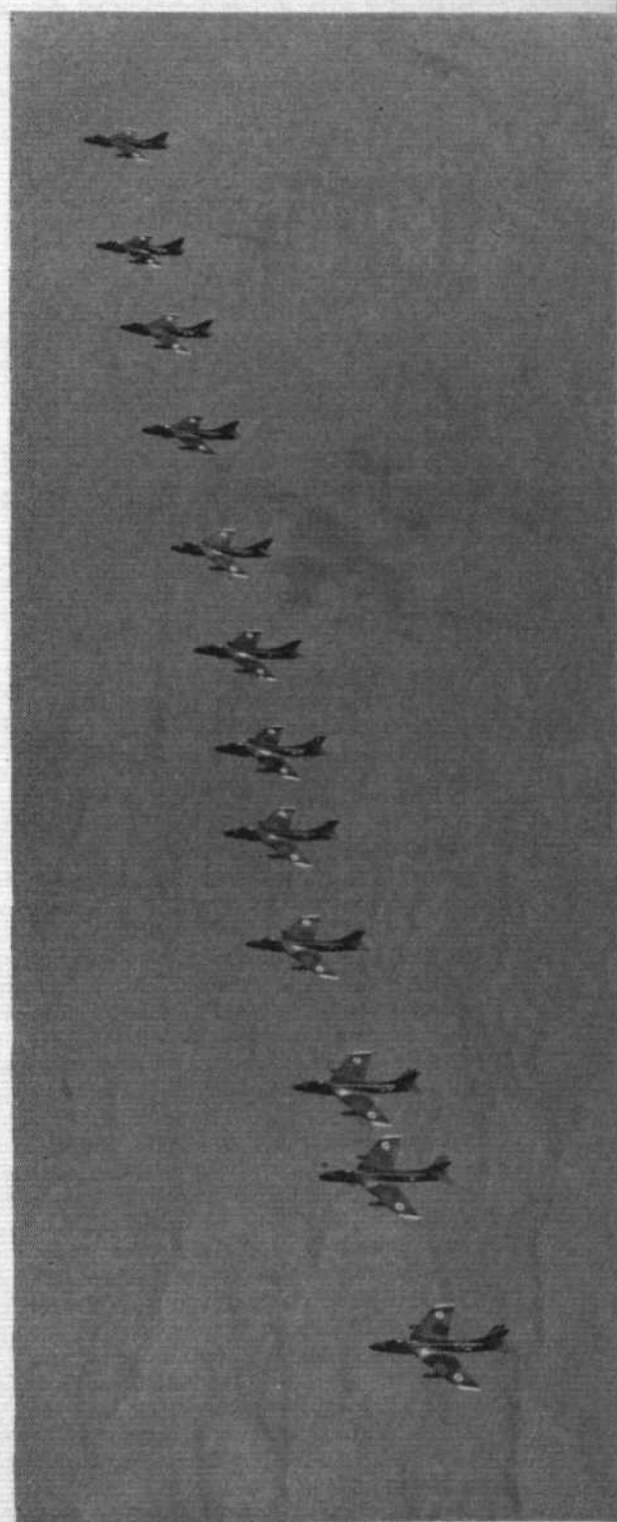




Captain's eye view from a 78 Sqn Twin Pioneer flying low in the area of Monk's Field, a forward landing strip near the Yemeni/Federation border



Above, a Twin Pioneer on the approach to Monk's Field displays its underwing weapon/supplies pylons. In last year's Radfan operations "Twin Pins" fired SS.11 air-to-ground missiles. Below, the Army is already waiting for its supplies when the aircraft lands. Right, 43 Sqn, also based at Khormaksar, strings out its Hunter FGA.9s in line abreast 10,000ft over the desert behind Aden for "Flight" staff photographer Michael Barnes, who took all the pictures on these two pages





One of seven Short Seacat missiles departs from HMAS "Yarra," the RAN's third missile frigate, to intercept a drone aircraft launched from the same ship. The firings were made off the coast of New South Wales to prove the installation



Trophy Winners

THE BOYD TROPHY, awarded annually for the finest feat in Royal Naval aviation, has been conferred on 845 Naval Air Commando Sqn for its outstanding services in Borneo during 1964. Runner up was 849A Flt, of HMS *Victorious*, which from September to November last year was based ashore in Malaysia to help counter Indonesian landings by flying radar patrols in its Gannet AEW.3s.

This is the second year running that the Boyd Trophy has gone to a helicopter squadron for operations in Malaysia—last year's winner was the since-disbanded 846 Sqn.

No Fighters for Portugal

THE CANADIAN MINISTER OF EXTERNAL AFFAIRS, Mr Paul Martin, said last week that his Government was opposed to West Germany's wish to sell 60 Luftwaffe-surplus Canadair Sabres to Portugal. Mr Martin said that the aircraft had been supplied to West Germany in good faith for NATO purposes. Bonn is reported to have made the intended sale conditional on Canadian consent.

Portugal, although a NATO country, now seems to have reached a dead end in her search for secondhand fighters to replace her now very aged F-84G Thunderjets. The USA refused to supply replacements for these MAP-provided aircraft years ago. Last summer negotiations between Portugal and Hawker Siddeley for the possible sale of refurbished Hunters were broken off on the orders of the Conservative Government, as Portugal declined to give an undertaking that the aircraft would not be used against native populations in Angola and Mozambique.

Meanwhile, Hawker Siddeley have con-

tinued supplying refurbished Hunters to the Lebanon, Kuwait and Iraq. Deliveries on the Kuwait contract are not quite completed and deliveries of secondhand machines to the Iraqi Air Force will supplement Hunters supplied new several years ago. It is understood that negotiations with other countries for further Hunter sales are in hand.

To Zambia Next Month

THE AIRCRAFT being delivered by DHC to the Zambia Air Force are four Caribous (and not six, as we previously reported) and six Beavers. The first two Caribous are due in Zambia on March 8, being ferried from Canada by four ZAF officers and six airmen at present receiving familiarization courses at Downsview. The second pair will follow shortly after, being ferried by the second

intake of ZAF personnel to pass through the DHC service school.

One of the ZAF's major requirements, as shown by the Lumpa Church uprising last year, is the ability to move at least 100 fully armed troops or riot police quickly to any part of the country. Caribous are expected to operate frequently from the "dambos"—comparatively flat open rough grass areas, which dot the country—in addition to orthodox airstrips.

Vulcan B.1s for NATO?

THE POSSIBILITY of using Vulcan B.1s, retired from the RAF strategic nuclear force, to replace the small fleet of now-grounded Valiants which were committed to NATO for long-range tactical interdiction, is being "urgently considered," said the Defence Minister, Mr Denis Healey, last week. "I cannot go further until I have studied what it would involve in financial and other consequences," he added.

There has so far been no intimation of any intended use for Vulcan B.1s, unlike the similarly retired Victor B.1s, which have been shown publicly in tanker and interdiction guises and are also to see service in the reconnaissance role. This lack of plans for further use of the early Vulcans may be due to the fact that the Vulcan B.1 component is the smallest element of the V-force and the numbers remaining in the inventory may barely constitute a viable force.

It is believed that about 25 Valiants were committed to the NATO role, including reserve aircraft.

Pakistan Air Force C-in-C

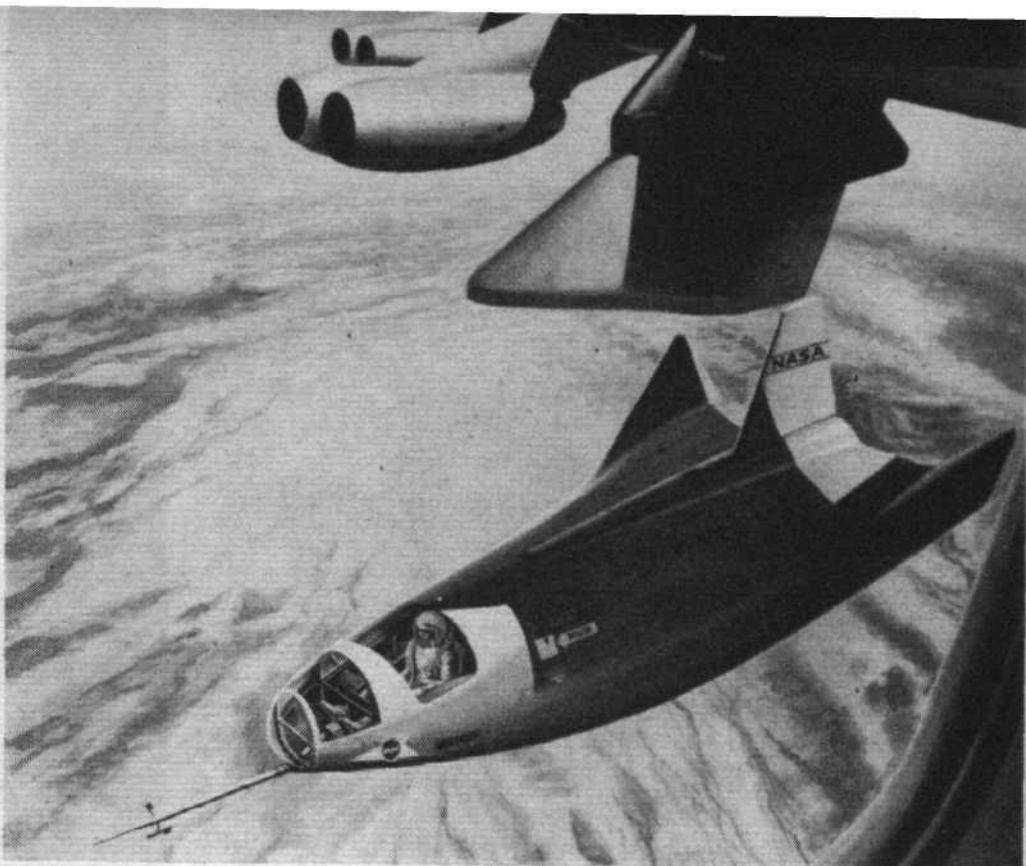
IT WAS OFFICIALLY ANNOUNCED last week that AVM Nur Khan, who is at present managing director of Pakistan International Airlines, will take up the appointment of Commander-in-Chief of the Pakistan Air Force on July 23.

Ryan's two XV-5As, below, powered by GE lift fans, have now been handed over to the US Army following completion of Phase I tests involving 100 flights totalling 42hr 15min at Edwards AFB. Complete transitions were made and the further aircraft, fully tufted, reached 450 m.p.h. Ryan have proposed a much-developed version for extended operational trials



In flight tests scheduled for later this year, NASA's HL-10 lifting-body vehicle will be air-launched from a B-52 as shown in this artist's impression. Initiated by Langley Research Center, the craft is being designed and built by Northrop. It will be tunnel-tested at Ames Research Center before moving to Edwards for flight-testing

Spaceflight



7,000 PICTURES FROM RANGER 8

A bonus of some 3,000 extra television pictures was obtained from the US spacecraft Ranger 8 by switching on its cameras ten minutes earlier than scheduled prior to its impact on the Moon at 9.57 a.m. GMT on February 20. A total of over 7,000 pictures was transmitted during the final 23min of the flight, which began with lift-off by Atlas Agena from Cape Kennedy on February 17 and ended with a crash impact on target on the Sea of Tranquility 64hr 52min later.

In general the flight followed the pattern set by Ranger 7, which was launched on July 28, 1964, and transmitted over 4,000 high-quality pictures of the lunar surface on July 31.

A midcourse correction manoeuvre was successfully executed, and the impact of Ranger 8 was only 15 miles from the scheduled target. The Sea of Tranquility is being considered as a possible landing area for Apollo astronauts; further examination of the lunar surface will be carried out using one more Ranger and subsequent Surveyor craft.

TRIPLE COSMOS LAUNCH

Three Cosmos satellites were placed in orbit by a single launch vehicle from the Soviet Union on Sunday last, February 21. This was the second triple launch, and the third multiple launch, announced by the Soviet Union. The satellites are designated Cosmos 54, 55 and 56 and are stated to be carrying scientific equipment. The three craft are reported to be moving in orbits close to each other, with a perigee of 174 miles, an apogee of 1,160 miles and an orbital period of 106.2min.

JODRELL BANK TRACKS ZOND 2

Signals from the Soviet Zond 2 spacecraft now en route to Mars have been received on a regular basis at the Nuffield Radio Astronomy Laboratories at Jodrell Bank. Using a 50ft diameter aerial, transmissions from the craft were received during January and at about 9 p.m. on February 3, 10 and 17.

The trajectory of Zond 2 was calculated from the positions of the craft announced by Tass last December. On the basis of this calculation, the spacecraft is expected to fly past Mars early in August.

During a visit by Soviet scientists to Jodrell Bank on February 17 Academician Mstislav Keldysh, President of the Soviet Academy of Sciences, was asked about future space co-operation between the station and the Soviet Union. He said he thought that co-operation

would increase and develop. Asked whether Jodrell Bank would be requested to track any Soviet space probes in the near future, Academician Keldysh replied: "We shall whenever it is necessary." He added "I cannot elaborate on this question because I am far from Moscow and all the necessary details are in Moscow."

MILITARY COMSATS DISCUSSED

The US Communications Satellite Corporation invited firms to a meeting on February 18 to discuss specifications for the design and manufacture of 24 communication satellites which could be used in a proposed satellite system for the Department of Defense. The Corporation had earlier stated that Hughes Aircraft Co could meet the specifications and requirements; last week's meeting represented an extension to enable other companies to tender for the work.

The specifications state that the satellite dispenser unit should include "the structure and mechanisms necessary to support eight satellites during the launching phase and to provide spin-up and separation after reaching the final orbit. The dispensers with satellites in place shall fit within the normal payload constraints of the standard Titan 3C shroud. The dispenser and the satellites attached to it shall be capable of withstanding all of the launch environment of the Titan 3C. The total weight of the satellites plus dispenser shall not exceed 950lb.

"The centre of gravity of the dispenser with satellites mounted in place shall be at least 72in above the interface with the Titan 3C. The dispenser mechanisms must be such that all eight satellites can be ejected within 4min after the receipt of a suitable signal from the Titan 3C Transtage.

"An alternate dispenser design must be considered for launching at least six satellites with the Atlas Agena with injection by flight-proven apogee motor into near-synchronous, equatorial orbit."

The satellite must be spin-stabilized, the specification continues, and capable of position control with an on-board propulsion system "with a capability of at least 250ft/sec." The satellite "must be capable of controlling its attitude in space to within one degree, making changes in attitude upon command from the ground. The solar power supply must be designed to work at near-synchronous altitudes and have a design life of five years considering radiation damage effects . . ."

The first ten satellites must be tested and delivered to the Titan 3C launch area by January 10, 1966. The next eight satellites must be tested and delivered to the same area by March 1, 1966 and the remaining six by May 1, 1966. In addition to the specifications for the satellites, the companies making proposals must themselves demonstrate experience in a number of aspects of the work involved.

Spaceflight

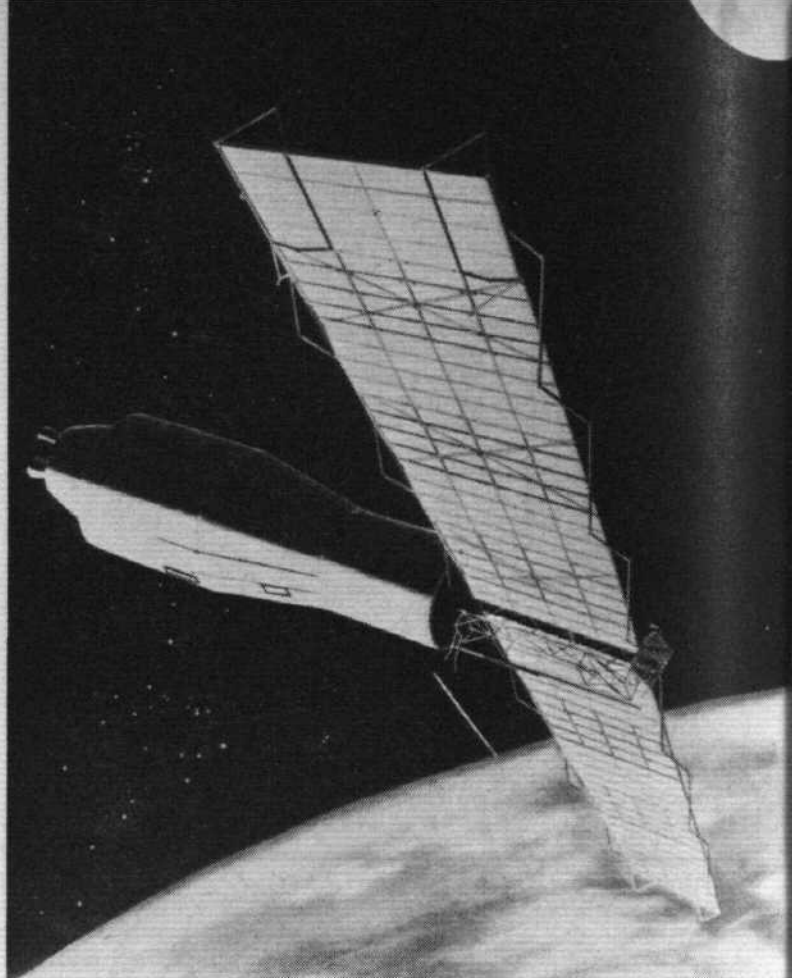
Pegasus Spreads its Wings

THE first Pegasus meteoroid-detection satellite—the largest unmanned, instrumented spacecraft yet developed by NASA—was successfully placed in orbit by a Saturn I vehicle from Cape Kennedy on February 16. Carried in a folded position within an adapted Apollo service module during launch, the spacecraft extended two multi-hinged panels to a span of 96ft while in orbit. Mission of the spacecraft is to determine the distribution, size and velocity of meteoroids. A secondary purpose of the launch was to obtain additional data for the development of the larger Saturn IB and Saturn V vehicles.

Although the vehicle was designated Saturn SA-9, the flight was the eighth flight test of the Saturn vehicle. The two remaining Saturn I vehicles, SA-8 and SA-10, are to launch further Pegasus satellites later this year. Scheduled orbit for Pegasus 1 was from 310 to 465 miles at an inclination of 31.7° , with an orbital period of 97min; the orbit achieved was reported to be close to that scheduled. It was expected that the spacecraft would have an operating life of one year.

Weighing about 3,200lb, the Pegasus craft remains attached while in orbit to the second (S-IV) stage of the Saturn. Total payload weight is about 23,000lb, including 14,500lb for the stage, 2,600lb for the instrument unit and 2,700lb for the Pegasus support structure and adapter. In addition, some 700lb of propellant remained initially in the S-VI stage, but was expected gradually to evaporate during the first few orbits. The 10,000lb Apollo command and service modules (boilerplate units) went into separate orbit.

With more emphasis being placed on larger, long-life spacecraft, designers need more information on the quantity, size and velocity of micrometeoroids. The Pegasus satellite is part of an expanding



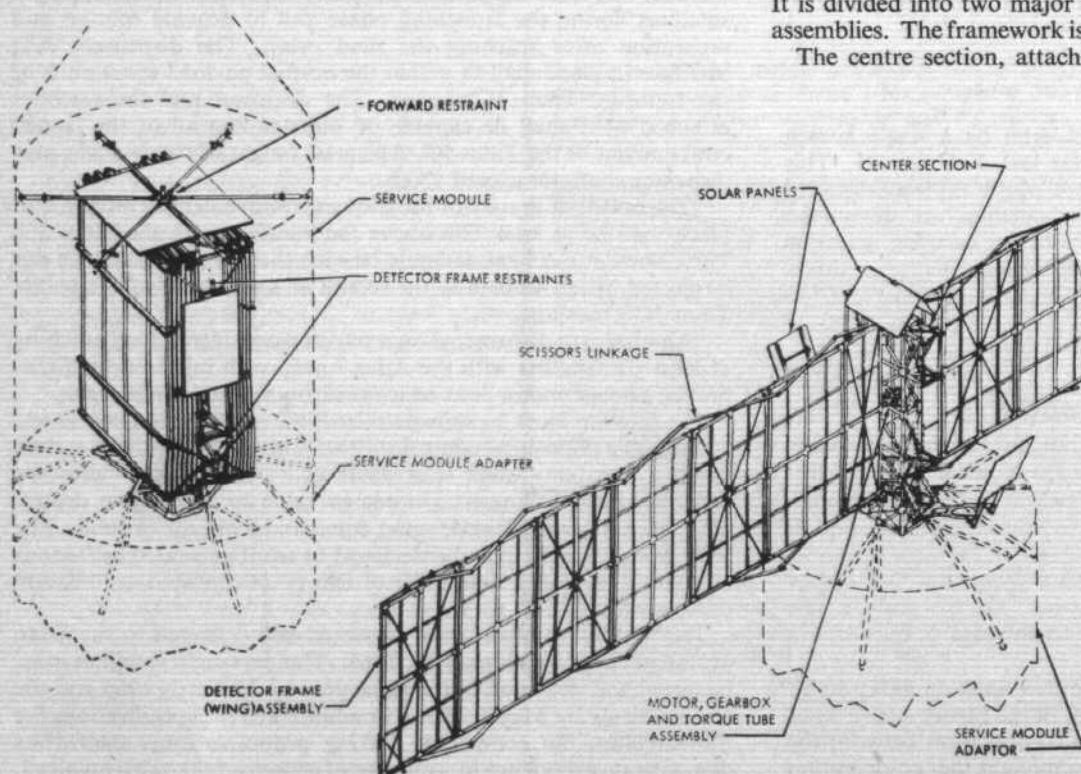
Artist's impression of the Pegasus meteoroid-detection satellite, attached to the S-IV second stage, in orbit

meteoroid-detection programme directed by NASA's Office of Advanced Research and Technology. The Marshall Space Flight Center, Huntsville, is responsible for project management both for the spacecraft and for the Saturn launch vehicle.

In February 1963 NASA began development of the Pegasus spacecraft, named after the mythical flying horse. The satellite was developed by the Fairchild Hiller Corporation. Design and electronics work was performed by the firm's space systems division at Bladensburg and Rockville, Maryland, with final assembly and checkout at the aircraft-missiles division at Hagerstown, Maryland.

In its stored position with panels folded inside the Apollo service module, Pegasus is 17ft 4in high, 7ft wide and 11in deep. It is divided into two major parts, the centre section and the wing assemblies. The framework is of riveted aluminium-alloy extrusions.

The centre section, attached to the second stage of the launch



Folded during launch, the Pegasus spacecraft extended to a span of 96ft after injection into orbit

vehicle, provides a mounting for the deployment mechanism, electronics canister, solar-power panels and sensors. Each "wing" consists of seven hinged frames. The hinges are spring-loaded so that the wings unfold accordion-fashion. The unfolding action is controlled by a scissors linkage connected to a motor and torque-tube assembly.

Arrays of panels, each panel measuring 20in by 40in, are mounted on the frames. Six frames provide mountings for 16 panels and one provides for eight panels, making a total of 208 panels on the satellite. The outer surface of the panels are thin sheets of aluminium varying up to 0.016in thick. Under the aluminium is a sheet of Mylar plastic, the rear surface of which is coated with a thin layer of copper. The sandwich of aluminium, Mylar and copper is mounted on a soft foam and, in turn, the larger sandwich is fixed to a rigid foam centre core.

A 40-volt electrical charge is placed across the surface of each side of each panel, giving the craft a total of 416 capacitor detectors. The charge is established between the outer aluminium skin and the inner copper coating. Each time a panel is penetrated by a meteoroid, the material removed by the impact is vaporized, forming a conducting gas which discharges the capacitor. The gas dissipates almost immediately and the capacitor recharges. Recharge time is 0.003sec. If seen on the screen of an oscilloscope, the blip would be a sharp saw-tooth below the horizontal line. From the shape of the blips the penetrated panels can be identified.

When a panel is penetrated, several items of related information must be recorded: a cumulative count of hits classified according to panel thickness; an indication of the panel penetrated; attitude of the satellite with respect to both the Earth and the Sun; temperature at various points on the spacecraft; the time at which each hit is recorded; and the condition of the power supply and other equipment.

Different levels of impact energy will be determined by using capacitor panels of three different thicknesses. Directional information comes from a combined solar-sensor/Earth-sensor system. An electronic system registers meteoroid penetrations of panels and stores a record of panel thickness, panel number and time of penetration. Pegasus attitude and certain temperatures are recorded on a timed schedule.

On command from the ground, all recorded information is read out of the Pegasus memory system and telemetered to the ground. A second beacon telemetry unit transmits "housekeeping" data and a total meteoroid count continuously throughout the mission. The spacecraft's two telemetry links give a total of 179 measurements.

A digital command system provides for on-off control of various system components, circuit replacement, certain in-flight tests and other control functions. Nickel-cadmium batteries, recharged by energy from the solar cells, provide power for the scheduled one-year life of the spacecraft.

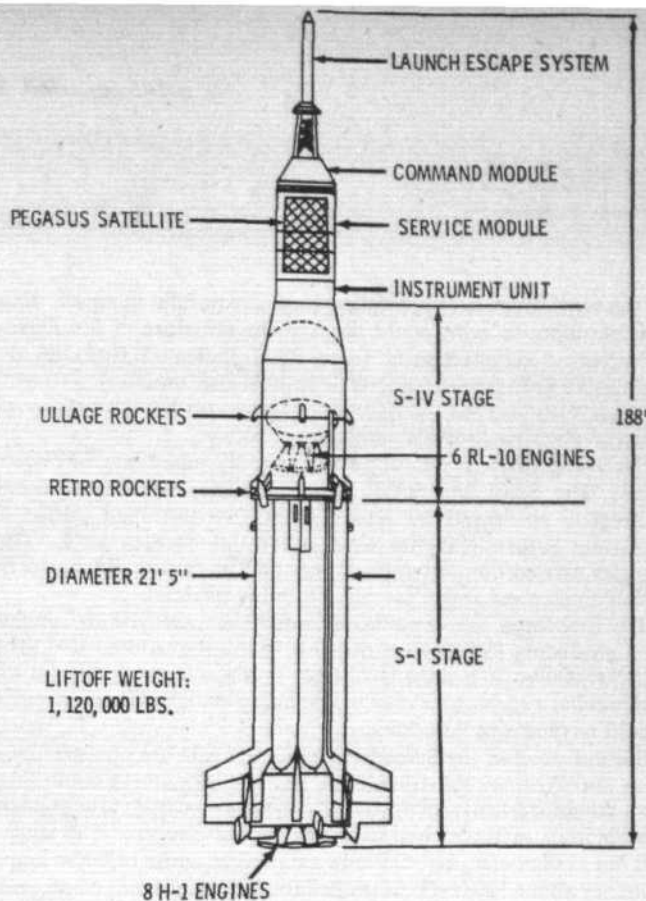
The booster stage for the SA-9 vehicle arrived by barge at Cape Kennedy on October 30, 1964, the second stage having been flown in on October 22. The Pegasus satellite arrived on December 29 and was placed inside the boilerplate Apollo in a sequence which began on January 10. The first and second stages were mated on November 19 and a series of tests on the integrated launch vehicle was begun. These included radio-frequency checks, tanking procedures and a simulated flight test.

Pegasus was subjected to systems tests for a period of several days before it was placed inside the Apollo. These included wing deployment tests of the huge structure. The Apollo boilerplate model containing the folded Pegasus was mated with the launch vehicle on January 14.

Countdown for the launch began on February 15 and covered a scheduled period of 16hr 30min. This was divided into two parts of 6hr and 10½hr respectively.

The first stage (S-I) of the SA-9 launch vehicle is the last of eight to be produced at Huntsville. The remaining two S-I stages were built by Chrysler at the Marshall Center's Michoud operations facility at New Orleans. Both have been static-tested at Marshall and are undergoing a post-firing checkout. The second (S-IV) stages of all the Saturn Is were made by Douglas at Santa Monica and static-tested at Sacramento.

The SA-9 vehicle has a redesigned instrument unit. This unit is shorter, lighter and more compact than that used on the preceding three two-stage flights. Weight was reduced by changing to an unpressurized instrument unit similar to the one to be used on the Saturn IB and Saturn V. A centre hub, designed to carry the pressurized gases, was eliminated, allowing components to be relocated



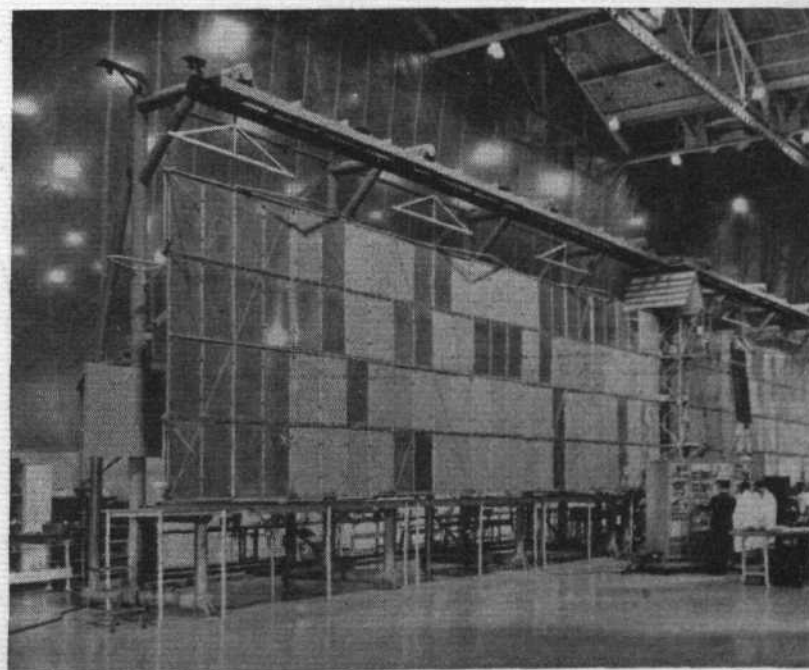
The Pegasus craft was stowed within an adapted boilerplate version of an Apollo service module on the Saturn SA-9 vehicle

for easier access. This also eliminated the need to carry pressurized purge gas on board the rocket.

The redesigned instrument unit is a 154in diameter cylinder, 34in high and weighing about 2,600lb (compared with approximately 5,400lb for that of SA-7). Components are mounted on the inside perimeter of the instrument-unit "wafer." The unit houses the main guidance and control, tracking, telemetry, measuring and electrical power and control instruments.

The SA-9 vehicle has an auxiliary non-propulsive vent system added to the hydrogen tank of the S-IV stage. Earlier S-IV stages had a residual hydrogen venting system but the small thrust created

Pre-launch testing of the extension of the Pegasus meteoroid-detection panels. The spacecraft weighs approximately 3,200lb



Spaceflight

by the venting caused the orbiting stages to tumble in space. Excessive tumbling in orbit could damage the structure of the Pegasus. Telemetered data received from SA-7 indicated that the non-propulsive vent system on that flight held the tumble rate to within acceptable limits, but the additional system on SA-9 should ensure that the Pegasus does not tumble excessively.

SA-9 was the fourth Saturn I vehicle to fly with a live S-IV second stage. The SA-6 and SA-7 flights carried instrumented Apollo boilerplate spacecraft to obtain launch environment data. The first four Saturn I flights were suborbital booster tests. These vehicles carried dummy upper stages and payloads. SA-5, the first test of the second stage, carried a dummy payload.

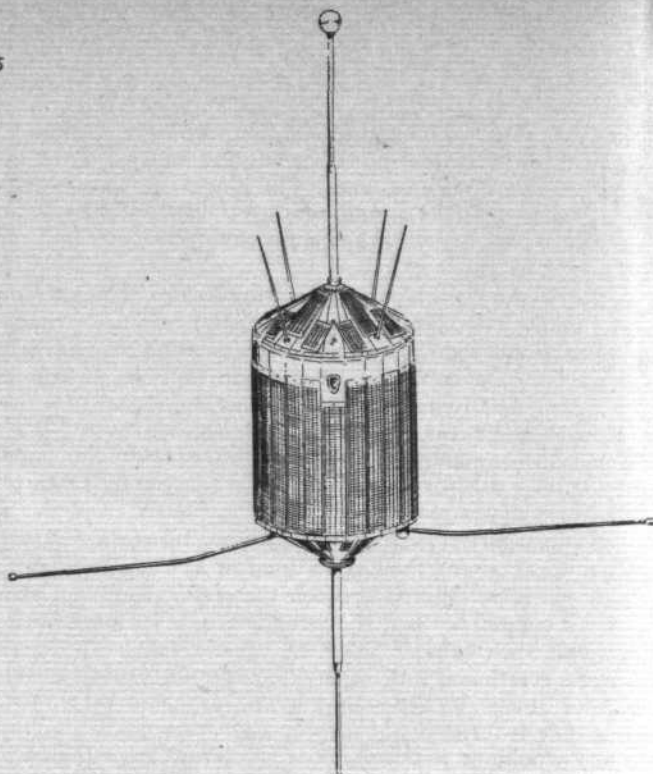
The first stage, S-I, is powered by eight Rocketdyne H-1 engines, each producing 188,000lb of thrust to give a maximum rated thrust of 1,500,000lb. The stage is 21ft 5in in diameter and 80ft 4in long and weighs nearly 1,000,000lb, including 880,000lb of propellant (liquid oxygen and kerosene).

Second stage of the Saturn I vehicle, the S-IV, is powered by six Pratt and Whitney RL-10 engines, each developing 15,000lb thrust for a combined thrust of 90,000lb. The engines burn a high-energy combination of liquid hydrogen and liquid oxygen. The stage is 18ft 6in in diameter, 41ft 6in long and weighs some 14,000lb empty. It carries about 100,000lb of propellant for about 8min of propelled flight.

A new paint was used on the S-IV stage and the instrument unit to provide thermal protection for the Pegasus payload. The paint, especially developed by Illinois Institute of Technology, Chicago, is designed to prevent the coated surfaces from absorbing heat from the Sun. Excess heat could be conducted to the Pegasus and interfere with the satellite's mission.

NASA space tracking and data acquisition network (STADAN) is scheduled to track and receive telemetry from Pegasus. The Minitrack and Smithsonian optical tracking networks will also be used. Goddard Space Flight Center has operational control of the spacecraft.

Academician M. Keldysh (left) and Sir Bernard Lovell lead a group of Soviet scientists on a visit to Manchester University's Jodrell Bank station on February 18. The 250ft diameter steerable radio telescope is in the background



Fiat and Selenia have submitted this design proposal to the European Space Research Organization for the ESRO 1 polar ionospheric satellite. Complete with Scout fourth-stage connector, the craft would weigh 191.4lb

MARINER CHECKED

An intricate series of commands were radioed 16.5m miles to NASA's Mariner 4 spacecraft on February 11 to check out spacecraft equipment that will be used if Mariner is still operating normally when it reaches Mars next July 14.

Twelve commands were sent to Mariner during an 8½hr period by engineers of the Jet Propulsion Laboratory from the Mariner spaceflight operations centre. The Goldstone station of the deep space network was used to transmit the commands. These commands dropped a lens cover off the television camera, turned on a scanning platform that carries the camera and two Mars sensors, turned on portions of the television system and checked out the capability of Mariner to perform the encounter sequence. It was not planned to take television pictures during this sequence.

Commands to turn off the encounter equipment after the check-out were timed to preset the scan platform in a position to be pointing at Mars during the fly-by, should the scan platform later fail to function, and to set the camera shutter in a desired position.

The lens cover was dropped at this time rather than at planet encounter to shake loose any possible dust particles that might interfere with the Canopus sensor, the light-sensing device that locks on the star Canopus to prevent the spacecraft from rolling.

Thor Altair, not Thor Agena, is reported to have been the launch-vehicle combination used to place USAF satellite 1965-03 into orbit from the Western Test Range, California, on the night of January 18-19. This appears to be the first reported use of such a vehicle. The second uncertain vehicle in the "January Orbits" feature of our February 11 issue was that which launched 1965-05 on January 23; this is confirmed as an Atlas Agena.

Shipborne HASPs Two HASP (high-altitude sounding projectile) meteorological rockets were successfully launched from USNS Range Tracker in the inner sea test range of the US Navy's Pacific Missile Range on January 28.

Hydra-Iris Launch A Hydra-Iris sea-launched rocket was fired from the South Atlantic, about 1,400 miles east of Montevideo, on January 26, carrying a 100lb payload to a height of 184 n.m. to measure radiation intensity within the inner Van Allen radiation belt. The rocket was developed at the Naval Missile Center at Point Mugu, California, and the payload instrumentation was provided by Lawrence Radiation Laboratory, Livermore, California, and the Navy Weapons Laboratory at Kirtland Air Force Base, New Mexico. The launch was made in an area where the inner radiation belt descends to a relatively low altitude.



Straight and Level



IN the House of Lords on February 11 Earl Ferrers asked Her Majesty's Government to state the figure for:—

(a) The average annual saving over a period of ten years resulting from the Government's decisions about the aircraft industry . . . and

(b) The estimated annual cost to the Exchequer of the abolition of the National Health Service prescription charges . . .

Lord Shepherd answered that the figures were, respectively, £30m and £25m.

I think that of all the million things that have been said about the Government's aircraft industry policies, that question and answer are the most illuminating.

● **Overheard at RAF Khormaksar:—**

Captain of USAF C-124 Globemaster, pointing to a Beverley: "Is that the largest aircraft you have in the RAF?"

RAF movements clerk: "Good heavens no, sir, you should have seen the planes which flew them in."

● **Aerospace Capability Postures Inc, ace consultancy firm headed by Heinz P. Ketchup, the world's most dreaded British aviation consultant, has been in the news again.**

Ketchup's latest report, "An Industry Gone Bad," envisions as of now, inventory-wise, an RAF equipped solely with ex-Congolese Air Force North American T-28 inventory flown by Cuban exiles, this capability posture to be attained thru end 1970.

Heinz's *a priori* assumption is that the British aerospace industry under the Wilson Administration should diversify right out of production of airplane and aero engine inventory into six inventories of new technologies: (1) jargonics; (2) acronymics; (3) capabilities; (4) pseudonics; (5) postures; (6) inventories.

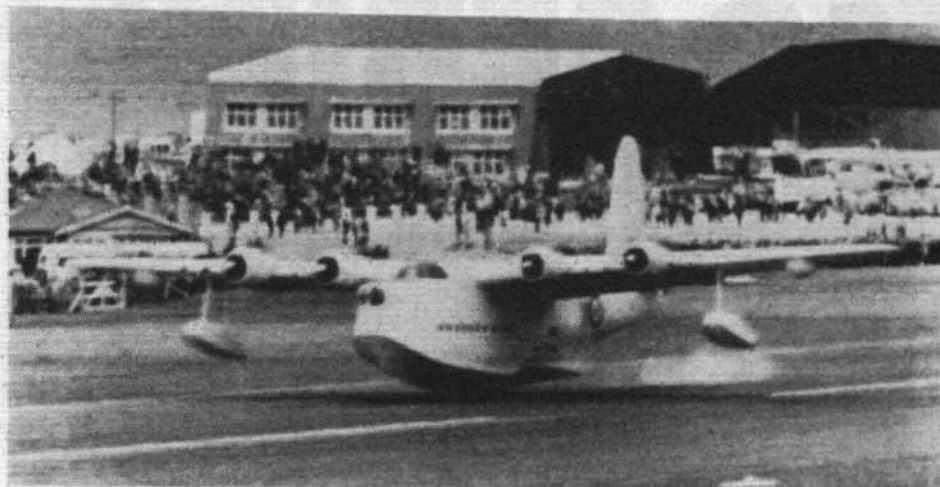
"I predict as of now," writes Heinz,

HER Majesty the Queen presented a new Dove 8 to Emperor Haile Selassie of Ethiopia, on February 5. The Ethiopian Air Force has

—From "Hawker Siddeley News," February 1965

**FEISAL GIVES
PRINCE PHILIP
A SCIMITAR**

—From the "Daily Telegraph," February 16, 1965



Just how low can you get?—No 13

RNZAF Sunderland at a flying display at Wellington Airport 1959

"complete deactivation of sophisticated aerospace technologies and *a priori* reactivation of a primarily tourist-orientated, agrarian British economy with old women in lace caps sitting outside Olde Worlde cottages at their spinning wheels to attract American tourists."

Ketchup's report has created intense excitement in the Ministry of Planes.

● In ten years each of those RAF Valiants had done only 2,500hr, almost as much as BOAC fly a VC10 in ten months. It shows the difference, doesn't it, between military and civil design requirements?

● What does an airline do when faced with such a choice of equipment? Take Alitalia, for instance. Should its Viscount replacement be the One-Eleven? or the DC-9? or the 737? Alternatively, could it replace Caravelles with Tridents? And what about air freight—what happens to Alitalia's European DC-7F network? Could it be done by Argosies?

Faced with so many urgent equipment problems, what can an airline do? Why, book more delivery positions for the American supersonic airliner, of course!

● "I shall seek an early opportunity," says the Minister of Aviation, "to appoint to BEA's board a member who will be charged with paying especial attention to the interests of the domestic passenger."

I find this intriguing. Obviously, the time is now ripe for many other such appointments in British aviation. How about appointing somebody to ensure that Rolls-Royce make decent aero engines? The Air Registration Board, too, could do with a man to check that new aircraft are airworthy. The Air Transport Licensing Board needs a member to give special attention to licensing,

and, of course, BOAC ought to have somebody to pay special attention to the corporation's western, eastern and southern routes. And so on.

Seriously, I am staggered that BEA's chairman, Mr A. H. Milward, should have publicly extended his "welcome" to this extraordinary appointment. Perhaps he was just being the courteous English gentleman that he is—like Lord Portal of BAC when he welcomed the Plowden committee, and like Sir Matthew Slattery of BOAC when he welcomed Mr Corbett's investigation.

I sometimes think there are too many stiff upper lips and kid gloves in British aviation, and that a bit of outraged speaking now and again by the professionals would not come amiss.

The one appointment that I really would welcome would be a man in the Ministry of Aviation who has even the remotest clue about what is good for British aviation.

● From *Hansard*, February 11:—

Mr Emrys Hughes: On a point of order. When the hon Member for Stratford-on-Avon (Mr Maude) was asking questions about American aviation, I distinctly heard him called a "twerp." May I ask, Mr Speaker, whether this is an offensive parliamentary expression? Should the language of the boardroom be allowed here?

Mr Speaker: In the context in which the hon Member heard it, I think that it was a sort of technical term of the aviation industry.

● Thinx Electronics Ltd announce a Ministry of Planes development contract for their new TWERP system. TWERP is a Transistorized Wet-nurse for Errant and Recalcitrant Planemakers.

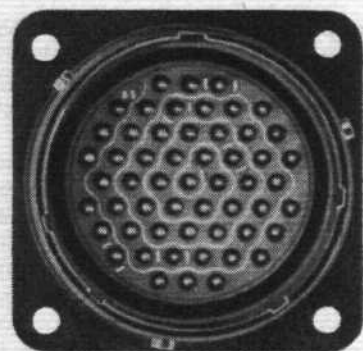
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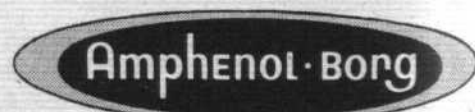
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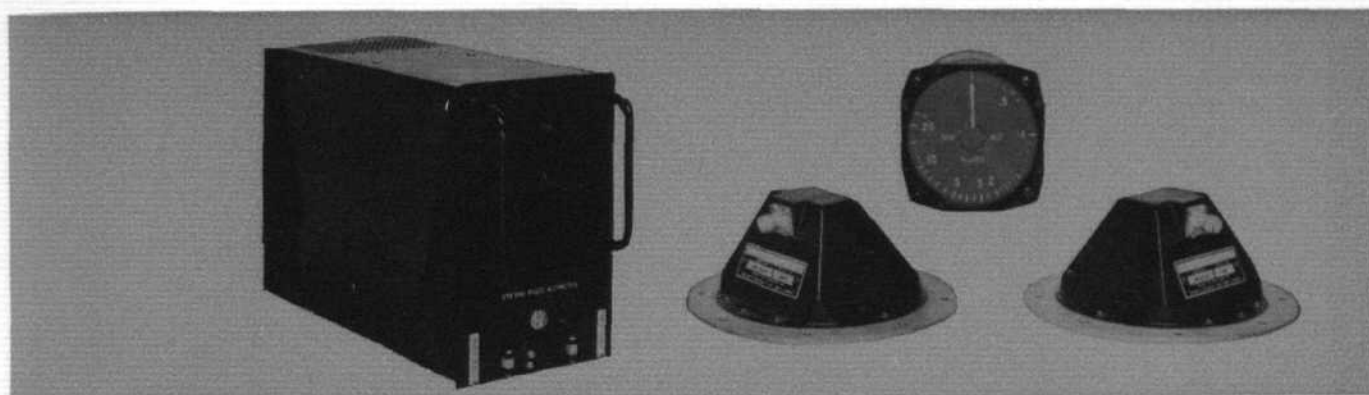
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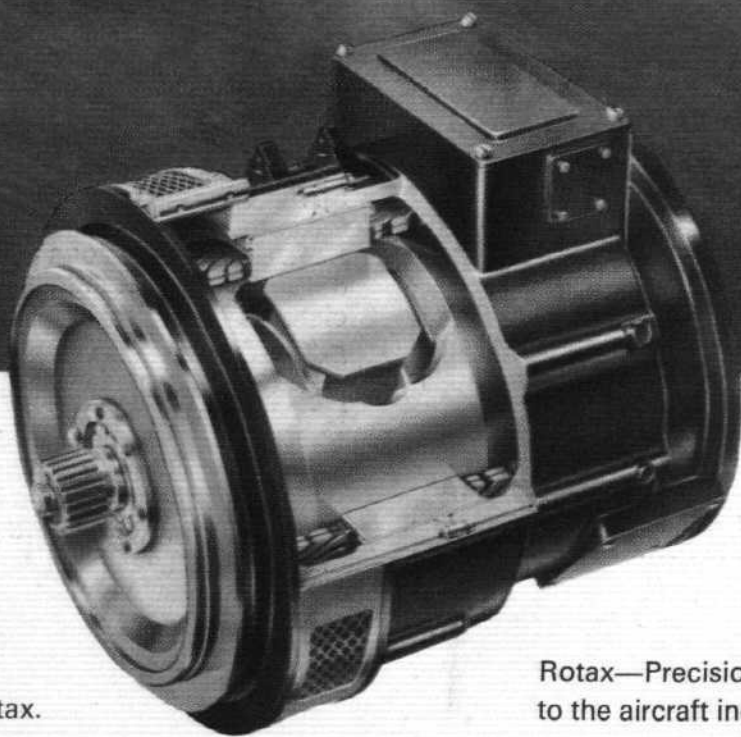
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