

# FLIGHT

and  
AIRCRAFT ENGINEER

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**Shades of Dumbo**

**I**T so happened that the maiden flight of our new and very impressive Naval fighter, the Supermarine N.113 (pictures on page 129) occurred simultaneously with fresh disclosures concerning its American counterpart, the Chance Vought Crusader (page 134). Being specifically designed for the defence of naval and merchant fleets of the free world, and amazingly divergent in technical emphasis, the two fighters are ripe for comment, as were the shore-based P.1 and F-104 in a former issue.

It will be seen immediately that whereas the N.113 is the end product of a planned development process, the Crusader is a wholly new—indeed novel—design, wherein the most startling innovation is a variable-incidence wing (and, in respect of a supersonic fighter, innovation it most assuredly is). The supposed object of this radical high-lift device is the reduction of take-off and landing runs, and its employment on the Crusader is the more remarkable in that Supermarine, having themselves amassed more experience of the v.i. wing than any other company, have seen fit to forsake that expedient in favour of flap blowing, or “supercirculation,” as they term the process.

Thus we have a piquant situation wherein America's new supersonic fighter bears a stronger resemblance to the Supermarine Type 322 “Dumbo” piston-engined torpedo/bomber designed in the late 1930s than to the jet-propelled N.113 interceptor of 1956.

There is contrariety, too, in the matter of powerplants, the N.113 having twin laterally disposed, unboosted Rolls-Royce Avons and the Crusader a single Pratt and Whitney J57 with afterburner. The seafaring pilot will immediately warm to the Supermarine formula on the grounds of security; but in a technical sense the absence of reheat on the N.113 may imply rejection of the modern tenet that this form of power boost is a “must,” at least for the final phases of an interception. The lack may, of course, be only temporary.

It seems appropriate to consider these violent disparities in technical approach (especially the lengthy evolutionary background of the N.113) relative to a remark made last year by a famous British designer to Mr. F. O. Detweiler, president of Chance Vought. It was to the effect that in the aircraft business the chances of failure are far greater than the chances of success—this being interpreted by Mr. Detweiler as a “kindly exaggeration”.

The British designer was—need it be added?—Mr. George Edwards, managing director of Vickers-Armstrongs (Aircraft), Ltd., and responsible as such for the overall technical direction of the Supermarine design office.

**Anglo-American Airliner**

**F**ROM sharp divergences between American and British practice we can now turn to applaud the realization, in the Napier Eland Airliner, of an Anglo-American alliance from which can stem little but mutual profit and goodwill. For an outlay which might be estimated at something like a million pounds D. Napier and Son, Ltd., have procured a Convair airframe, have tailored an Eland turboprop installation at an attractive kit-conversion cost, and are now able to contemplate a programme of demonstration to Convair operators and potential Eland users. Their ultimate reward could be conversion-kit orders from many of the present 35 operators of Convair 240s and 340s (and eventually of 440s also) and purchases of Elands for conventional airliners of more than one type, for short take-off machines and even helicopters. Already the Eland is acclaimed as one of the finest pieces of aero-engineering to be turned out from a British factory in post-war years, and it would be sad indeed if those responsible were not now enabled, by their merchant-venturer enterprise, to secure a due return for their technical skill and commercial courage.

# FROM ALL QUARTERS

## New Export Record

THE total figures for British aviation exports during 1955, recently made available, show that the record figure of £66,189,978 was reached, an increase of £10,080,104 over the previous year's figure and £48,439 more than the record total of 1953.

The December figure, at £6,281,456, was £1,526,686 more than for December 1954. It is a good augury for 1956, observes the S.B.A.C., that the monthly average for the last six months of 1955 was almost £800,000 more than during the first six months of the year.

## Transport Command Britannias

IT is officially announced by Bristol Aircraft, Ltd., that a contract for six Britannia military transport aircraft, to be operated by R.A.F. Transport Command, has been placed by the Ministry of Supply. The decision to order these machines was first notified by the Ministry on November 11th last year, and they are to be delivered during 1958. They are additional to three others of the same type previously ordered by the Government for troop operations.

The Transport Command Britannias, to be designated Britannia 253, are to be built at the Belfast works of Short Brothers and Harland, Ltd., where a second Britannia line has been established. Mean cruising speed will be over 400 m.p.h. Performance and carrying capacity are, in fact, of such an order that each machine could transfer over a hundred troops from Britain to Singapore in less than 24 hr.

## American Jets for Canada

IN a statement last month to the Royal Commission on Canada's Economic Prospects, Mr. G. R. McGregor, president of T.C.A., disclosed that the airline proposes to buy four jet transports from the United States, representing a total investment of \$35m (12.5).

The amount mentioned suggests that, despite reports that T.C.A. favour the Boeing 707, the airline may intend to buy the more expensive Douglas DC-8. T.C.A. are believed to be considering the use of Rolls-Royce Conway by-pass turbojets in preference to the P. and W. J75.

The announcement of the pending purchase was made following the submission of an estimate that T.C.A.'s gross transportation revenues, assuming no change in the airline's monopoly position, would reach \$110m (£32m) in 1960 and \$250m (£90m) by 1980. Mr. McGregor said he did not think a competitor for T.C.A. would be practical for another 30 years and then only after ten years' notice, to permit T.C.A. to modify their equipment orders. He doubted whether atomic-powered aircraft would be in service within the next 15 years. Advocates of atomic-powered aircraft, he said, "may have overlooked the possible effect of their complete destruction, on the ground or in the air. The consequent release of radioactivity would not differ substantially from that which would follow the detonation of a small atomic bomb and would probably make the surrounding area untenable for years."

## Common Problems

ADDRESSING members of the French Chamber of Commerce in Great Britain at a luncheon in London on January 25th, the Minister of Supply, Mr. Maudling, said that when it came to the production of an established type of aircraft the record of the British aircraft industry was "commendable," and the flow of established types to the R.A.F. was well maintained. The most difficult period was that of development. Mr. Maudling went on:—

"The American aircraft industry is by far the largest in the free world. The British industry is its most serious competitor and you, in turn, are our most serious competitors in Europe. But our two European industries have resources at their disposal very much less than have the Americans. Whether you look at the test facilities available—wind

## "FLIGHT"

Owing to the dispute in the Printing Trade this issue has had to be reduced in size and copies may be late in reaching readers. To all who are inconvenienced in any way we offer our sincere regrets in circumstances beyond our control.



**ROYAL ROUTE:** The Queen and the Duke of Edinburgh left London Airport last Friday by B.O.A.C. Argonaut for their three-week tour of Nigeria, where they are using the Queen's Flight Vikings and Heron. Members of the Royal Household are flying in a Bristol Type 170 of West African Airways Corporation, who have presented to the Queen this leather-bound volume of maps showing the routes due to be flown by the royal aircraft in the course of the tour.

tunnels and so forth—or the number of trained engineers, or to the size of military and civil orders that can be placed, the American competitive advantage is great indeed. I am not for one moment saying that this advantage cannot be overcome. What I am saying is that we ignore it at our peril. What we must do, and what I think you in France have been doing with great success, is to concentrate the more limited resources at our disposal over a relatively narrow front. . . .

"I have often seen suggestions that there are too many individual firms in the British industry. There may be something in this. Further concentration of firms might well be an advantage, though I think it would be a bold man who claimed to be able to decide for himself the right number of firms or to declare that Government assistance or contracts should be given only to a small and select band. The real truth is, of course, that the danger is not at the present moment too many firms, but too many projects. . . . I think your experience in France is particularly interesting in this connection. You have produced some excellent light military aircraft because you have concentrated on these types."

"In fact, the development time of military aircraft differs very little between the United States and the United Kingdom. Experience seems to show that for heavy bombers, in particular, the American development period is just as long as our own. But they, and we, both realize that in the face of what the Russians appear to be doing in military aviation, we must strive to do even better. . . ."

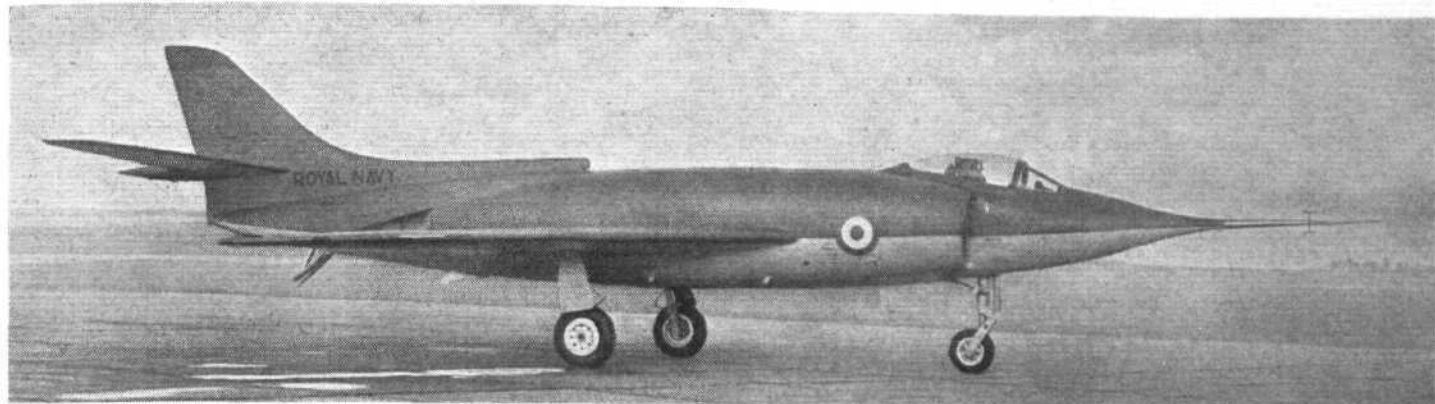
## Canberra Navigators' Ejection

TO improve the emergency escape facilities of the English Electric Canberra B.2, a frangible Fibreglass hatch to replace the metal unit now fitted over the navigator's compartment has been designed by the Martin-Baker Aircraft Co., Ltd. At the same time the company has developed from the existing Canberra seats a new fully-automatic ejection seat fitted with a duplex drogue, an 83ft/sec telescopic ejection-gun, arm-rests, and a secondary firing handle on the front of the seat pan. Thus equipped, the navigator should be able to fire himself through the frangible hatch and descend safely from almost any altitude. Canberras at present have the Mk 1 non-automatic seat, and parachutes carry barometric rip-cord release devices.

It has been found by experience that, without the explosive hood-jettisoning gear linked to the seat-ejection mechanism, it is preferable to eject through a canopy rather than to jettison it first. The crew member is thus protected from air blast while he is reaching for the firing handle, and a number of pre-ejection actions, with their associated delays, are eliminated. When g forces are operating on the aircraft, as may well be the case in an emergency, any pre-ejection action may become excessively difficult and precious time be lost. It is not, in any case, necessary for a good ejection that the canopy should come away cleanly.

Following a series of successful test ejections, on static rigs and in the air, a demonstration in the presence of Service representatives was given at Chalgrove airfield on January 19th. A "standard dummy man," using the fully-automatic seat described above, was ejected through the new frangible hatch from a Service Canberra flying at about 300 kt at 400ft. The aircraft was piloted by Capt. J. E. D. Scott, the company's chief test pilot. The test is stated to have been successful in showing the practicability of ejection through the new Fibreglass navigator's hatch, and also in demonstrating the advantages of the procedure. Both the Fibreglass hatch and the new ejection seat have been designed to be easily and economically fitted as a retrospective modification.





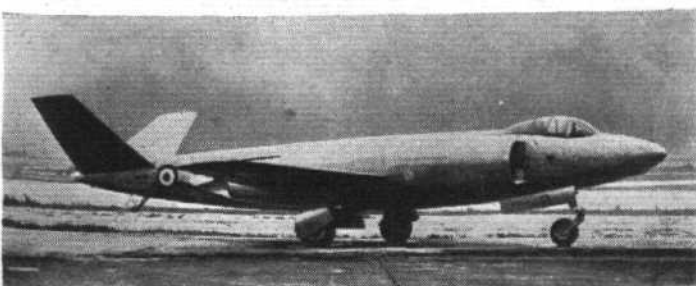
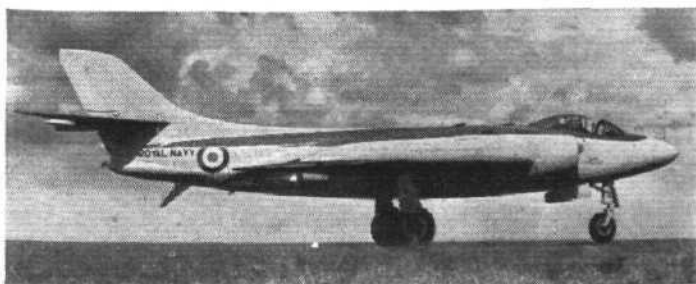
## Supermarine's New Fighter—the Naval N.113

THE officially approved photographs above are the first to be released of the Supermarine N.113, a new deck-landing single-seat fighter/bomber, now in production as a replacement for the Hawker Sea Hawk. The genesis of the type is traced by comparative pictures at the foot of the page, the two upper views showing the N.113's immediate predecessor, the Type 525, and the lower ones the straight-wing Type 508/529. It will be seen that compared with the Type 525 the N.113 has a lengthened, pointed nose; and it would appear that the intakes are of increased area, suggesting higher thrust from the flank-mounted Rolls-Royce Avons. There is no evidence of afterburning. A maker's statement remarks that the new machine has the saw-tooth leading edge (first introduced in this country on the Swift) and an all-moving tail. Eventually the new fighter will benefit from "super-circula-

tion," a system whereby air ducted from the Avon compressors is blown over the upper surfaces of the flaps to increase the lift by local acceleration of the airflow. Armament is likely to be a combination of 30 mm Aden guns and guided missiles, and it has been officially disclosed that an atomic bomb is a possible load. Note how a single intake is located at the commencement of the prominent "spine" and how the numerous small dorsal intakes which marred the lines of the 525 have been suppressed.

The N.113 made its first flight, of 15 min duration, on January 20th at the Aeroplane and Armament Experimental Establishment, Boscombe Down. Lt-Cdr. M. J. Lithgow, newly appointed deputy chief test pilot of Vickers-Armstrongs (Aircraft), Ltd., was at the controls.

Editorial comment on the N.113 appears on page 127.





Powered by Armstrong Siddeley Cheetahs, four C.A.S.A. 201 Alcotans, the first of 112 machines for the air force, come off the production line at C.A.S.A.'s factory near Madrid. The company is responsible for three transport aircraft as well as the Heinkel 111 bomber, the Dornier 25 liaison aircraft and Bücker Jungmann trainers.

## MADE IN SPAIN

### *Design and Production in the Peninsula*

By C. M. LAMBERT

**D**URING a visit to Spain last month I was granted extensive facilities by the Spanish Air Ministry to visit the country's aircraft factories. In fact, the review which follows could not have been prepared without the wholehearted co-operation of the Ministry, of the government agencies supervising production and of the directors of the firms themselves. And this was not all; I was invited to make a full conducted tour of I.N.T.A., the national aeronautical institute, which is an organization combining the functions of our own Farnborough and Boscombe Down.

Little comprehensive information about Spanish aircraft design and construction seems to reach other countries, partly because the industry is, for many good reasons, established on a very much more limited scale than those of more extensively industrial countries, such as the U.S.A. and Great Britain, and partly because production is not aimed to any great extent at export sales to other countries. This latter condition is in many ways regrettable, for some of the aircraft now being developed appear to be well worth exporting.

The industry as a whole suffers under several severe handicaps, the most important of which are the lack of a really comprehensive accessory industry, the absence of home-produced engines of high power, and the difficulty of producing the most complicated components with the materials and equipment available. Aircraft construction (though by no means based on outmoded principles) is therefore generally simple; and new aircraft have not until recently been designed round very high-powered engines. Spain has found it difficult for one reason and another to import materials and equipment from abroad; but components of all kinds, and particularly engines, are now reaching the factories in larger numbers.

Most severely affected has been the production of the aircraft built under German licence in Spain since World War 2. The Heinkel 111 bomber and the Messerschmitt 109 were put into fairly large-scale production in Spain and were to have been powered respectively by the Junkers Jumo 211 and the Hispano 12-Z-17. The Jumos were, however, made in France during the occupation and those that were delivered (some 200) are now very old and not always reliable. The Hispano 12-Z-17 was made in Spain, but production has since stopped. Numbers of Heinkel 111s and some Me109s have therefore been awaiting new powerplants for some considerable time, but this has now been remedied by the purchase from Britain of a large number of Rolls-Royce Merlins. One version of the Merlin is being installed in the Me109, for which it is admirably suited, and another in the Heinkel. It is not claimed for either of these types that they are any longer front-line fighting aircraft, especially since T-33s for conversion training and F-86Fs for squadrons are now being delivered to the Spanish Air Force from America.

The important factor about these German aircraft is that they have given the factories a knowledge of the construction of modern

and fairly complex aircraft which makes them capable of undertaking any similar work that may now come to hand. This holds good particularly for the factories of C.A.S.A. (the main constructor of large aircraft), which are well laid out and well equipped, and for Hispano, who are even now beginning to take on jet-aircraft construction.

The engine difficulty is by no means general, however, since E.N.M.A.S.A.—the national aircraft engine company at Barcelona—now has in production a range of lower-powered engines which has given (and is still giving) excellent service in several types. They range from the 150 h.p. Tigre to the 750 h.p. Beta. The national company is at present developing the new Sirio medium-powered radial engine and the first test runs of a medium-thrust turbojet have been made at I.N.T.A.

The problem of airscrews has been overcome by E.N.H.A.S.A.—the national airscrew company in Madrid—by the production under licence of some de Havilland types, and the English company has in fact designed a small metal, four-blade, constant-speed airscrew specially for the Sirio engine. This power unit is at present being bench- and air-tested at I.N.T.A. and in the central nacelle of one of the C.A.S.A.-built Ju52s.

There are a number of subsidiaries of foreign component companies—such as Spanish Pirelli, Marconi, Bressel and Standard—which provide the industry with tyres, radio, instruments, electrical equipment and radiators; but practically everything else—including in some cases rivets and other small parts—are made by the constructors themselves. Among these components are undercarriages, hydraulics, brakes and other specialized items, so the design staffs consequently have to shoulder a load which should not normally be theirs. In its turn this must discourage designers from trying too quickly to incorporate in their projects such complex equipment as advanced radio or radar, pressurization and air-conditioning and gyro gun-sights, which would in Britain or America receive the attention of companies that have long specialized only in such equipment.

The following account of the various companies' activities attempts to make no comparison between individual concerns, but gives a picture of present activity and of new aircraft now being developed. A number of foreign designers have been able to take advantage of the industry's capacity to produce new aircraft such as the Hispano trainers, the A.I.S.A.-Dewoitine AVD 12, C.A.S.A.'s Dornier 25 and the Cantinieu helicopters of the Aerotécnica company. These merit particular attention because they show what the industry can accomplish in small aircraft. An excellent purely Spanish light aircraft is the A.I.S.A. I-11B, now in production, and C.A.S.A. is now developing the C.A.S.A. 207 Azor twin-Hercules transport.

**Hispano Aviación, S.A.** Traditionally the Hispano company has built single-engined aircraft of the fighter and advanced-trainer type. By virtue of this, and because of a long-standing



connection with Messerschmitt, it is quite natural that they should have produced the first Spanish jet-propelled aircraft, the HA.200-R1. The main factory is in the Calle San Jacinto, Seville, and there are flight-testing facilities at the city's main civil airport, San Pablo.

Production is at present centred mainly on the Messerschmitt Me109, the G variant of which is still being turned out. Originally the Germans provided 25 Me109Gs; construction then began, using the Hispano 12-Z-17 engine of 1,300 h.p. Three-blade, metal, constant-speed de Havilland airscrews, made under licence by the Spanish national aircraft propeller company, are now standard.

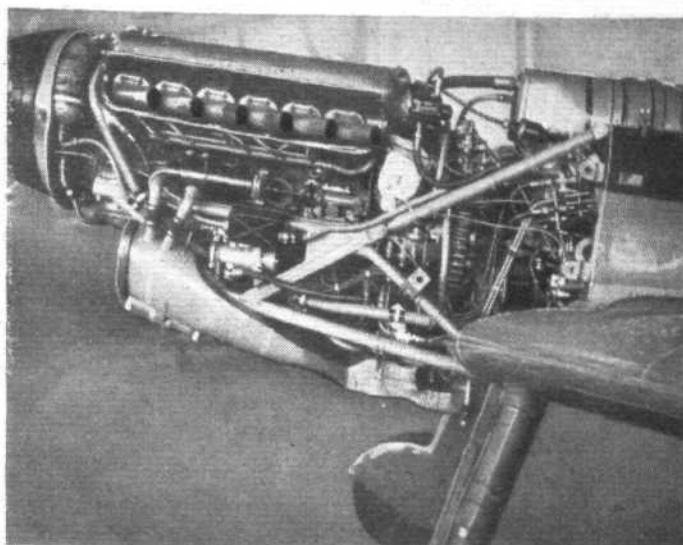
Several versions have appeared. The first licence-built machine with the Hispano engine was designated HA.1109-K1L. It corresponded in most respects to its German forerunner, but examples which still exist appear to have no armament. A few years ago the Spanish government ordered two prototypes of a tandem two-seater trainer, the HA.1110, which varied only in cockpit layout from the standard fighter. These two prototypes are still at San Pablo, and no production order has been placed. The Hispano 12-Z-17 engine went out of production some time ago and the version designated HA.1109-M1L was produced, powered by a Rolls-Royce Merlin 500-45 engine of 1,400 h.p. with a Rotol four-blade airscrew. An armed version of the K1L is now coming off the production lines with eight rocket rails and two Hispano 20 mm cannons, while similarly equipped M1Ls will soon take its place.

The sight of numbers of Me109s in the Seville factory, all painted dull grey and looking distinctly aggressive, gave me a shock; comparatively few Englishmen can have seen such a sight before. Because the details of the aircraft must even now be fairly unfamiliar, it is worth while noting some of them here. The empty and all-up-weights are respectively 5,390 lb and 6,300 lb and the maximum speed at 12,200ft is 414 m.p.h. Range at cruising speed is 405 miles and the maximum rate of climb at 9,100ft is 2,196ft/min. Service ceiling is 33,500ft and touch-down speed 112 m.p.h. The aircraft carries 88 gal of fuel in a boot-shaped tank fitting behind and underneath the pilot's seat. Span, length and height are respectively 32ft 7in, 29ft 7in and 8ft 6in.

The Merlin of the latest version is arranged in a powerplant almost identical with that of the Spitfire to which it was originally fitted and it is notable that no difficulty at all was experienced in mounting it in the Me109. The under-wing radiators, the engine bearers and the other fixed items were all completely suited to it and the company said that they had remarkably little trouble with the conversion. It is well known that Messerschmitt designed the fin and rudder of the Me109 as an aerofoil section in order to counteract torque by "sideways lift." The Merlin rotates in the opposite direction to the Hispano; but, since speed is no longer important in the aircraft, no alteration has been made to the vertical tail surfaces and the changed torque is counteracted simply by maintaining the rudder some degrees to the right in flight. The first two 1109 M1L prototypes had an extended tailwheel leg to reduce the tail-down attitude on the ground, but this expedient is to be eliminated in production. After showing me the aircraft, the technical director, Don Ricardo Monet y Antón, hastened to add that it was not considered as a front-line fighting aircraft by the Spanish Air Force, but rather as an operational trainer.

In the prototype field, Hispano is very active with a design-team broadly directed by Willi Messerschmitt. The first completely post-war aircraft, the tandem two-seat HA.100, with tri-

*The Hispano HA.1112-K1L carries four small rocket rails and a Hispano 20 mm cannon on each wing. The engine in this case is the Hispano 12-Z-17 of 1,300 h.p.*



"Flight" photograph

*The engine bearers, radiators and other fixed items of the HA.1109, the Spanish Me109, were found to require very little alteration before the Rolls-Royce Merlin 500-45, shown here, could be fitted.*

cycle undercarriage and a radial engine of some 750 h.p., was in fact designed under his direction. The HA.200-R1 Saeta jet trainer is a direct development of this machine though considerable modification was, of course, required. Four prototypes of the HA.100 were ordered. Two of them, with the sub-designation E1, are powered by the Spanish Elizalde B.4 Beta of 750 h.p. with de Havilland two-blade, constant-speed airscrew; and two, sub-designated F1, have the Wright Cyclone 800 h.p. engine with an Aeroproducts two-blade, steel, constant-speed airscrew. Two of the prototypes are now complete, the first flight having been made by Maj. R. Lorenzo Bellido in December 1954; the other two are under construction.

Production jigs for the HA.100 are now almost complete and the type has been ordered for service with the Spanish Air Force. It is all-metal, flush riveted and has a two-piece sliding canopy. The tailplane is variable in incidence and the flaps are slotted and extended rearwards, Fowler-fashion. Fittings under the wings will accommodate bomb pylons or rocket rails and a three-leaf airbrake is extended under the fuselage, at the wing trailing-edge, by a single hydraulic ram. A plain reflector gun-sight is provided for the front pilot. The tricycle undercarriage retracts hydraulically inwards and rearwards and is completely covered by fairing plates.

Main data on the HA.100 are: span, length and height respectively 34ft 1in, 26ft 1in and 10ft 8in, with a wing area of 187 sq ft. Wing- and power-loadings are 29.21 lb/sq ft and 8.11 lb/h.p. Empty and all-up weights are 3,858 lb and 6,010 lb. Fuel capacity is 158.5 U.S. gal, giving a range of action at cruising speed of 821 miles. Maximum and cruising speeds at 9,514ft are 292 m.p.h. and 269 m.p.h. and service ceiling 33,630ft. Minimum speed is 63.4 m.p.h. and initial rate of climb 2,130ft/min. The landing distance over a 50ft obstacle without wind is 1,783ft. The makers' name for the aircraft is Triana.

I spoke about the HA.200-R1 with Major Fernando de Juan Valiente, the company's chief test pilot, who has so far done all the 15 hours' flying in the new aircraft. I might have been able to fly in it myself had it not been undergoing a routine engine change and inspection. The second prototype was nearing completion in the factory. Major de Juan was enthusiastic about the aircraft's handling qualities. It was, he said, light and responsive, with a completely viceless and straightforward stall. Raising the speed by easy stages he had so far reached 460 m.p.h. without trouble. He had made the first flight on August 16th last year. In his flights so far, without trying to establish rigid performance figures, he had found a stalling speed, clean, of 87 m.p.h. and, with flaps and undercarriage down, 76 m.p.h. He normally approached over the hedge at 100 m.p.h. and the take-off run was between 1,143ft and 1,206ft. The design maximum Mach number is about 0.8.

Apart from a slight modification to the wing-root attachments and the alteration of the wheel wells to accommodate a slightly shortened main undercarriage, the wings of the HA.200 are externally identical with those of the HA.100. The tail also is common to the two types. From the rear of the canopy forwards, however, the HA.200 is completely new. The canopy has been redesigned to take the stresses of pressurization and access is therefore via two hinged panels.

The two Turboméca Marboré IIs are mounted side by side low down in the nose and breathe through a common oval intake.

## MADE IN SPAIN . . .

The tailpipes are led past the wing root to exhaust just aft of the trailing edge, low down. The engines are, in fact, mounted on a stressed-skin structure which forms the outer surface of the under-fuselage and which can be completely detached from the aircraft at a point where the fire-wall of the HA.100's piston engine would have been placed. Fuel to a total of 261 gal is carried in two fuselage tanks, two wing tanks and two permanently attached tip tanks. From the last-named, fuel can be jettisoned in an emergency. Wheel-brakes are hydraulically operated by toe pedals; the nosewheel is not steerable.

The cabin of the first prototype is not at present pressurized, and a section is undergoing tank tests. I sat in the cockpit and found it most comfortable. The instrumentation is, of course, largely concerned with early flight tests and includes g-meter, Machmeter and an American A.S.I. on which a red-and-white-striped needle shows maximum permissible indicated air speed at any given height. Wide, sloping consoles run down each side of the cockpit and on these are disposed electrical switches to the right and engine and flight controls to the left. The variable-incidence tailplane is operated by a handwheel and the throttles are paired like those of a Meteor for easy single-handed operation. The windscreen is low, but Major de Juan reported that visibility was ample over the nose.

The Saeta has all the appearance of being an excellent basic trainer and, if it goes into production, would provide the Spanish Air Force with a jet trainer cheaper and simpler than those they would otherwise have to obtain abroad. The fuselage is wide enough to accommodate two people side by side and developments can be foreseen either in the shape of a side-by-side trainer or a four-seat fast liaison aircraft. For all these rôles the Saeta appears to be excellently suited.

Having long been concerned directly or indirectly with aircraft engines and armament, and having a fighter tradition, the Hispano company can be expected to be engaged on a fighter project, and a wind-tunnel model of a design which may by now have been superseded by something yet more advanced was seen in the aerodynamic test department of the Spanish national aeronautical technical institute. This showed a needle-nosed delta-winged single-seat fighter with a tailplane set close behind and below the main wing. The single turbojet had wing-root intakes and a tailpipe immediately below a sharply swept fin and rudder, the base of which sported a small bullet fairing. A knife-edged windscreen suggested radar armament-aiming, but this hypothesis was not at first sight substantiated by the proportions of the pointed nose. There were conventional ailerons and plain flaps and it can be presumed that the whole design was something in the nature of a lightweight fighter.

**A.I.S.A. (Aeronautica Industrial, S.A.).** This company is mainly concerned with the construction of the lighter aircraft and has its factory at Carabanchel Alto airfield, 12 km south of Madrid, and its main offices at Alcalá 10, Madrid. I was shown over the works by Don Juan Pombo, the factory director. In the past the company has produced a series of basic trainers and touring aircraft, some of them designed by Huarte Mendicoa of C.A.S.A. Two prototypes of the IP-Z—a military towed-gliding

trainer with two seats in tandem, a very sleek low wing and a retractable tricycle undercarriage—were designed by Emil Dewoitine and built to meet a Spanish Air Force requirement for training military glider pilots. The two prototypes are still at the factory, where also is lodged Prince Cantacuzene's highly aerobatic Bücker Jungmeister which is powered by an American war-surplus Lycoming 275 h.p. engine.

Production is at present concentrated on the Chipmunk-like I-115 powered by an E.N.M.A.S.A. Tigre GIVB engine of 150 h.p. with an E.N.H.A.S.A. P.8 two-blade fixed-pitch airscrew. The prototype first flew on July 16th, 1952, and tooling for production began in May 1954. Since then a batch of 150 has been delivered to the Spanish Air Force and a further batch of 150 is under way.

The I-115 is of wood except for such minor items as canopy frames and wing-tip fairings. The fixed undercarriage is designed and made by the company. The complete wing is built as one unit and offered up to the fuselage on the production line. Being a military trainer, the I-115 carries a full blind-flying panel and Iberavia ITR-6 radio and intercom. The transparent plastic for the canopies of this and other aircraft is made by a subsidiary company of A.I.S.A. in the north of Spain and moulded in the factory itself.

Maximum all-up-weight is 2,180 lb with a limitation of 1,870 lb for aerobatics. Maximum wing-loading is 14.4 lb/sq ft and power loading 14.5 lb/h.p. The span is 31ft 5in, maximum speed 143 m.p.h., touch down speed with flaps 51 m.p.h., sea-level rate of climb 740 ft/min and service ceiling 14,050ft. Endurance at 70 per cent power is 3.5 hr. The company is considering the possibility of installing a 190 h.p. Lycoming engine.

An A.I.S.A. aircraft with a very fine reputation is the little side-by-side two-seat club aircraft called the I-11 Peque. The first prototype appeared with a tricycle undercarriage, but since private owners preferred the more traditional layout, only the I-11B with a tailwheel has gone into production. This is well under way and many have been built. The 70 aircraft of the first series have only basic flying instruments, while the second batch of 110 have a full blind-flying panel. The I-11, following A.I.S.A. tradition, is of wooden construction (a type of pine found near Segovia is used) with plywood covering, and the single-piece wing is bolted into a slot in the under-fuselage. The undercarriage, again designed and made by the company, is fixed. The standard powerplant is a Continental C-90 of 90 h.p. with a two-blade wooden airscrew, although an American metal variable-pitch unit is offered as an optional extra. With two pilots limited aerobatics are permitted, but with one alone the I-11B is fully aerobatic. Everyone who has flown it speaks well of it.

Maximum all-up-weight of the I-11B is 1,420 lb with a limit of 1,185 lb for full aerobatics. Maximum wing loading is 9.9 lb/sq ft and power loading 15.9 lb/h.p. The span is 30ft 8in, maximum speed 74 m.p.h., landing speed 49 m.p.h., sea-level rate of climb 690 ft/min and service ceiling 14,900ft. The company is also considering fitting a more powerful engine in the I-11B; this would be a Lycoming of 105 h.p.

A.I.S.A. is now turning over to all-metal construction and one venture in this line is the building of the second prototype of the Aerotecnia AC-12 helicopter, the transmission and lifting

Four of Hispano's recent aircraft: top left, the HA.1110-K1L two-seat trainer modified from a fighter; top right, the Merlin-engined HA.1109-M1L fighter trainer, now in production; lower left, the Wright Cyclone-powered HA.100-F1 advanced trainer, production of which will soon begin; and the first prototype of the HA.200-R1 jet trainer with two Turboméca Marbore IIs, which has now flown some 15 hours.







The current A.I.S.A. designs are seen top left and right: the I-115 trainer, in full production for the Spanish Air Force, and the I-118 club aircraft, powered by a Continental 90 h.p. engine, also in production. The lower views show the A.I.S.A.-Dewoitine liaison machine with combined flap and aileron surfaces lowered and with the two starboard cabin doors opened to give unrestricted access to the whole cabin.

systems of which are made by the national airscrew company in Madrid. The principal all-metal venture, is however, the AVD-12 liaison aircraft which, with C.A.S.A.'s Dornier 25, was designed in response to a government specification issued in 1953. The first prototype was powered by a Tigre GIVB and is now at I.N.T.A.; and the second prototype, with a Continental 220 h.p. engine, is nearing completion at Carabanchel Alto. This aircraft was designed by Emil Dewoitine, who has worked in Spain intermittently for many years. His was one of the original group of companies from which the present French S.N.C.A.S.E. was formed, and it was M. Dewoitine who designed the Pulqui I jet aircraft in the Argentine during one of his absences from Spain.

The AVD-12 uses Dewoitine's patent single-spar principle of construction for which is claimed a combination of lightness and strength. In fact, for a weight of 209 lb the fuselage took a load of 17,600 lb during static tests. For one test all the lead available in the factory (some 2,200 lb) was used, and still it did not fail. The company considered that leading-edge slots in the wing should, if possible, be avoided by reason of the limited use which was made of them in operations, and because of complication and expense. They therefore had recourse to double trailing-edge surfaces in the form of full-span slotted ailerons in eight sections and with a total arc of movement of 40 deg, mounted on a full-span slotted flap which could itself be lowered to 40 deg. They thus achieved the effect of a double-slotted drooping surface providing both hypersustentation and lateral control.

Bending of the cantilever wing was allowed for by making flexible the joints between the four sections of flap and aileron in each semi-span. This also eliminates increases in control-

hinge friction as the wing bends under load. Operation of both surfaces is through rods and a hydraulic connection causes the tailplane incidence to change as the flaps are lowered.

There are doors on both sides of the cabin and the starboard rear door carries with it the main side-pillar, so that the complete side of the cabin is uncovered for the loading of stretchers. Since the wing is cantilever there are no struts in the way.

The undercarriage consists of two rigid legs pivoted at their roots inside the fuselage and sprung by two compression oleos mounted transversely under the cabin floor. This saves weight and complication and keeps the oleos clear of dirt. The engine exhaust pipe terminates in a fishtail set in a narrow passage at the end of the cowling so that the exhaust gases entrain air over the cylinders to give better cooling during slow flight and ground-running in hot weather.

The AVD-12 has a span of 36ft 6in and a wing area of 193.7 sq ft for a maximum permissible weight of 2,225 lb. The normal wing-loading is 12.2 lb/sq ft. The Tigre-engined version has an empty weight of 1,428 lb and a series of all-up weights from 1,868 lb upwards, according to its use variously for forward-area liaison, air-evacuation, photography or normal liaison. Maximum speed is 140 m.p.h., cruising speed at 62 per cent power 113 m.p.h., minimum speed with flaps 40 m.p.h., service ceiling 16,400 ft and range 468 miles. The performance of the Continental-powered version can be expected to show a considerable improvement. The prototype with the Tigre engine made its first flight on August 18th with A.I.S.A. test pilot Javier Guibert at the controls.

(To be continued)

## AIR RACE WINNERS HONOURED

AT a Royal Aero Club house dinner on January 24th in honour of the 1955 winners of the British Air Racing Championship and the King's Cup Air Race, Nat Somers and Peter Clifford respectively, it was disclosed that over £1,500 had been raised towards the prize-money for the 1956 air racing season. Col. R. L. Preston, secretary-general of the club, said that the Good-year and General Electric companies and the Kemsley Flying Trust had made substantial donations towards this total; he hoped other organizations would follow their example and enable the prize-money to be increased significantly this year.

After reviewing last season's air racing, Col. Preston referred to this year's meetings, to be held at Yeaton on May 21st and at Baginton on July 21st. A replica of the British Air Racing Trophy was presented to Nat Somers by Mr. S. Kenneth Davies, chairman of the club, who also congratulated Peter Clifford on his King's Cup achievement.

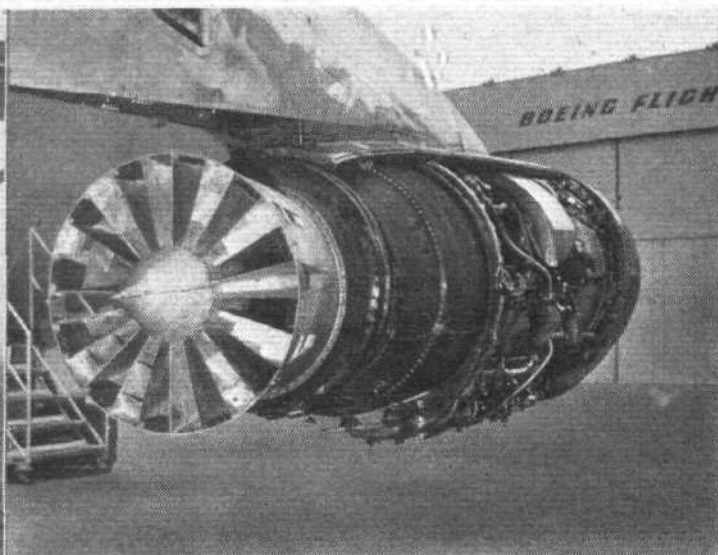
Somers (left) and Clifford at the Royal Aero Club dinner.





"Flight" photograph

**GOOD OPENING FOR FARMER'S BOY:** Revised arrangement of the rear door on the Edgar Percival P.9 agricultural aircraft (see below).



**NOISE-REDUCING NOZZLE** fitted to the starboard inner J57 turbojet of the prototype Boeing 707 and tried in static and fast-taxying trials.

## HERE AND THERE

### The 1,000 m.p.h. Voodoo

IT is unofficially reported in Washington that a McDonnell F-101A twin-jet long-range fighter/bomber has flown at over 1,050 m.p.h. on half a dozen occasions and at over 1,100 m.p.h. at least once.

### An I.A.S. Honour

MR. PETER MASEFIELD, managing director of Bristol Aircraft, Ltd., has been elected an honorary Fellow of the Institute of the Aeronautical Sciences.

### P.9 Progress

DURING January, a complete range of flight trials at full normal-category load was completed on the prototype Edgar Percival P.9 based at Stapleford Tawney. Over 20 flights, amounting to some seven hours, had been logged by Friday of last week. For reasons of simplicity, the clamshell rear doors have been joined together and hinged on the starboard side only, as illustrated above. On production machines, it is stated, the one-piece structure will also give a saving in weight.

### More Matadors

THE U.S.A.F. has placed additional orders for a substantial quantity of Martin TM-61 Matador tactical guided missiles. New manufacturing techniques, it is claimed, have resulted in the Matador having the lowest cost in dollars per airframe-lb of any

airframe now in production for the U.S.A.F. The powerplant is an Allison J33-A-37, which gives a speed of over 650 m.p.h. (the final dive on to the target is at supersonic speed) and an operating height of over 35,000ft.

### Fang Prang

THE most original tell-me-another story we have heard for some time comes from Tower, Minnesota, U.S.A. A few days ago, it is reported, Jack Burgess and Richard Lilya were flying in the area when they spotted a pack of wolves on frozen Putnam Lake. They went down to have a closer look, and were skimming the ice when a wolf took exception to the intrusion and attacked the aircraft, hitting one of its skis. The subsequent crash resulted in complete demolition of the aircraft (type unrecorded), although both occupants were uninjured.

### Super Sabres for Europe

THE United States Air Force announces the assignment to Europe and North Africa of North American F-100 Super Sabre fighter/bombers. The first arrivals will go to the 45th Fighter Bomber Squadron at Sidi Slimane, in French Morocco. This unit was chosen as a training squadron because of the excellent North African weather. Most deliveries will be made to Europe from Warner Robbins Air Materiel Base, in Georgia, via Labrador and Iceland.

### Instruments on Show

NEXT Thursday, February 9th, the Scientific Instrument Manufacturers' Association opens its permanent exhibition at 20 Queen Anne Street, London, W.1.

### Gas-turbine Specialist Honoured

THE 1955 James Clayton Prize of the Institution of Mechanical Engineers has been awarded to Dr. E. A. Watson, O.B.E., for "his outstanding contributions in the last 15 years to the progress of the aircraft gas turbine, particularly in the fields of combustion and fuel control"; these latter formed the subjects of his James Clayton lecture last December. Dr. Watson is a director of Joseph Lucas Ltd.

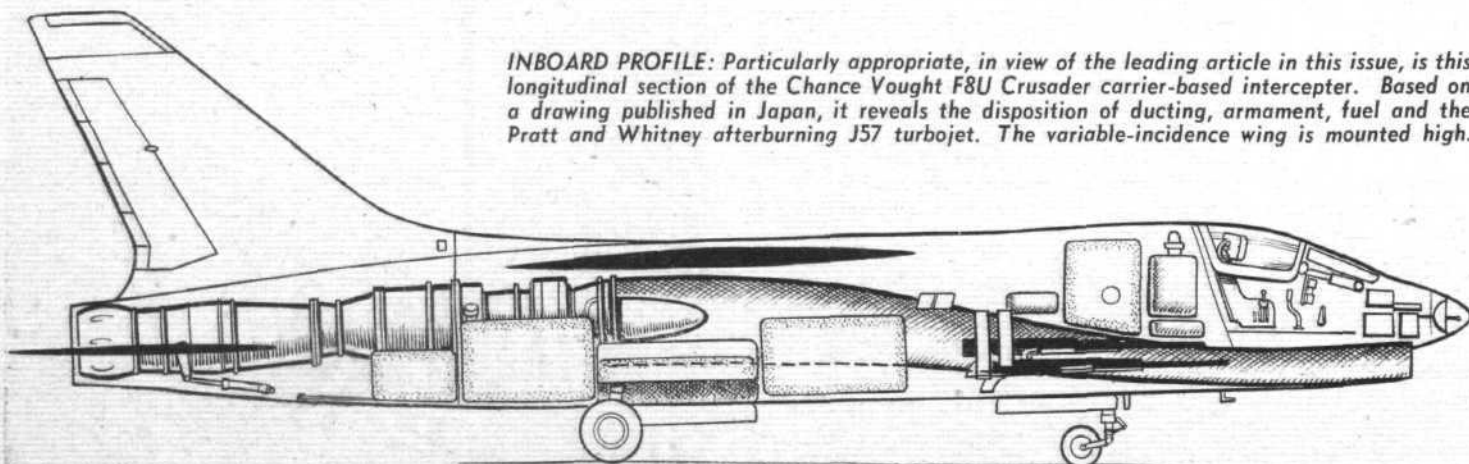
### V.T.O. in France

OFFICIALS of the S.N.E.C.M.A. organization told reporters recently that a military V.T.O. aircraft using the company's system could be ready by 1960, and that the first passengers to take off vertically in a jet airliner might do so in a civil version by 1965.

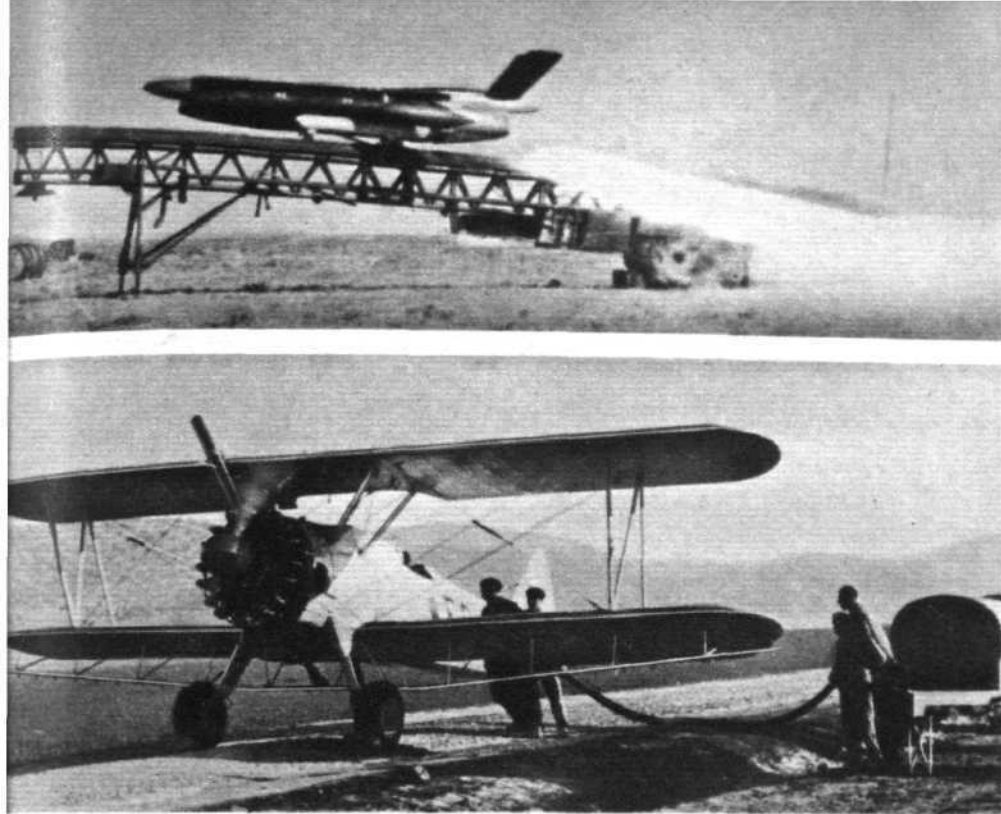
### For Sopwith Old-timers

THE Sopwith Apprentices Association, formed in 1916, is to hold its first annual reunion dinner at London Airport on February 8th. Sopwith apprentices, 1912-18, are asked to communicate with the original hon. secretary, V. W. Derrington, 159-161 London Road, Kingston-on-Thames (Kingston 5621).

**INBOARD PROFILE:** Particularly appropriate, in view of the leading article in this issue, is this longitudinal section of the Chance Vought F8U Crusader carrier-based interceptor. Based on a drawing published in Japan, it reveals the disposition of ducting, armament, fuel and the Pratt and Whitney afterburning J57 turbojet. The variable-incidence wing is mounted high.







The target aircraft seen at the moment of launching is the S.N.C.A.N. CT-20; its speed at the end of the ramp is 380 m.p.h. and acceleration is 10g. A height of 33,000ft is reached in 5 min and endurance at that level is 45 min at 560 m.p.h. The elderly biplane is a Stearman (Boeing) PT-13, converted in Spain by A.I.S.A. for crop-spraying and powered with a Wasp Junior engine. What appears to be a smoke stack is, in fact, the exhaust pipe, so arranged to avoid interference with the spray.

### France

**Canberra with Turboméca Gabizo.** The S.N.C.A.N. technical department has lately installed a Turboméca Gabizo turbojet of approximately 2,400 lb static thrust under the fuselage of an English Electric Canberra belonging to the official flight test centre.

**Marcel Dassault M.D.550.** This light-weight delta-wing interceptor, having completed preliminary official trials, is now back at the Dassault plant, where it is being fitted with its rocket engine in addition to the two Viper turbojets. With the complete powerplant Mach 1.7 will be possible.

## AIRCRAFT INTELLIGENCE

### Canada

**CF-100 Mk 5.** This designation is now officially confirmed as relating to a new version with a longer wing-span. Despite this increase considerable saving in weight has been achieved and an improved high-altitude performance results. The first Mk 5 is now being flight-tested.

### U.S.A.

**Douglas AD-7 Skyraider.** According to a Douglas announcement, a new contract for a developed version of the carrier-borne Skyraider extends for at least another year "the longest continuous deliveries of any combat airplane now in production." Designated AD-7, the new model will be delivered in quantity as from next August and will be the 50th version of the AD series since the prototype first took the air, in March 1945. About 3,000 Skyraiders have been built since that time. Among basic differences, compared with the AD-6, are an improved Wright R-3350-26WB engine and strengthened wings "to prolong service life under higher tactical loads."

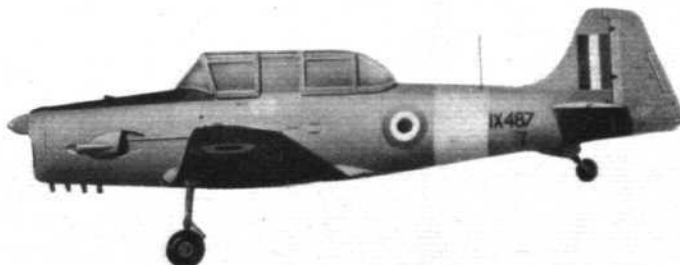
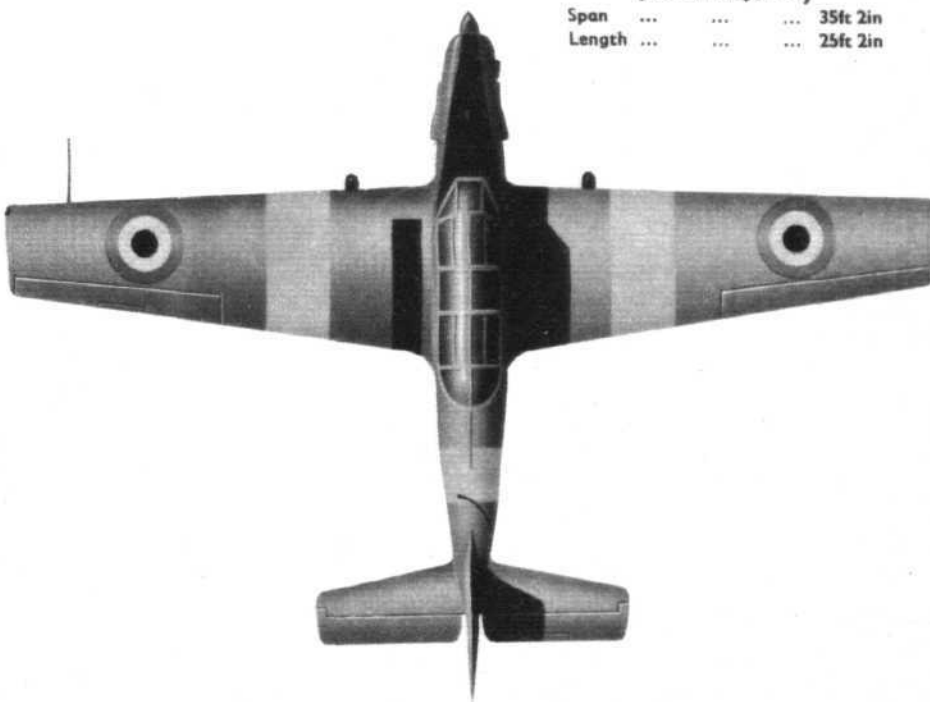
**Boeing B-47 Stratojet.** All the requirements of Strategic Air Command having now been satisfied, surplus bombers of this type are being diverted to Tactical Air Command. They will be equipped with the "buddy" system for the air-refuelling of fighters and tactical bombers.

**Learstar Executive Transport.** Orders for five Learstar executive transport aircraft, totalling \$1,900,000 (about £680,000) and including two for European concerns, have been placed within the past two months. Mr. J. Nelson Kelly, manager of the aircraft engineering division of Lear, Inc., has stated: "Adding these orders to nearly \$4m already shipped has confirmed our company judgment that a very large market exists for this type of airplane. Consequently projected production through 1956 is being substantially increased. We started last year to test a market which seemed neglected and found that a high-speed, long-range transport certificated in the airline category exactly fits the requirement of most corporate business. We are prepared now to make demonstrations continuously, with a backlog of many dozens of interested prospects."



**HINDUSTAN HT-2**  
(Cirrus Major III)

Span ...	...	35ft 2in
Length ...	...	25ft 2in





Prominently placarding its new powerplant, and finished with cheat-line of traditional Napier green, the new airliner is seen almost ready to begin flight trials. It is, incidentally, the first Convaire to have a U.K. registration.

## NAPIER ELAND AIRLINER

*A British Turboprop Transformation of the Convaire 340*

**T**HE first practical realization of a much discussed business partnership—American airframe and British turbines—is now nearing the flight stage at Napier's development establishment at Luton Airport. The aircraft is a production Convaire 340 which Napier have bought as a private venture, and engineered to take Eland turboprops in place of the existing 2,400 h.p. Pratt and Whitney R-2800 CB16 piston engines.

There are about 200 Convaire 340s in service with 21 airlines all over the world, not counting a large number of the military version, and the order-book for its successor, the new 440 Metropolitan (accounting for 81 aircraft to date), continues steadily to grow. Generally agreed to be the most attractive medium-hauler ever made, until the Viscount dominated its market, the Convaire 340 has, with its 240 predecessor, carried a major share of the world's regional traffic; and it will continue to do so for several years ahead.

Turboprop power, it need hardly be said, transforms the 340 into an aircraft of even greater appeal. A number of Convairs have been so converted, including the experimental Allison T38-powered Turboliner of 1952 and, more recently, two YC-131Cs—whose Allison T56s, since June 1954, have amassed some 3,000 engine flying hours in operations with M.A.T.S. (paid for by the U.S. Government). So far, however, there have been no commercial orders for this version.

Encouraged by the progress of the Eland (now with some 3½ years of development behind it, including considerable air experience in a Varsity and an Ambassador) Napier foresaw brisk business awaiting a good turboprop that could be retrospectively fitted to suitably modified Convairs—and perhaps even offered in production aircraft. In November 1954 the company took delivery of a brand-new 340 and set about engineering it to take Elands. Previous experience with the Varsity and Ambassador was invaluable, but there was an important difference in the approach to the Convaire: the conversion had to be made with the least possible interference to existing structure, control runs, accessories and instruments, in order to keep the cost attractive to

operators. Furthermore, U.S. and British civil airworthiness design requirements had to be met in every respect.

The first questions that a Convaire owner inevitably asks are: What performance advantage shall I gain, what is involved in the conversion, and how much will it cost? A glance at the accompanying graph will reveal the potential superiority of the Eland Convaire over the existing aircraft in payload-range performance and in speed. It shows that the Eland airliner can haul a capacity payload of 12,880 lb over stage-lengths of up to 1,000 statute miles, compared with 300 for the standard aircraft. This is cruising at 15,000ft—a height which favours the piston engine. After 1,000 miles, the Eland Convaire's range falls off steeply and 1,100 miles is about the longest stage over which a practical payload can be carried, compared with 1,500 miles and more for the standard aircraft. Ultimate stage-length is, however, of less interest than ranges well below 1,000 miles, in which Convairs do most of their work.

In terms of block speed, as might be expected, the Eland Convaire shows marked gains: the comparative block-to-block speed bands between 200-mile and 1,000-mile stages are 230 m.p.h. to 290 m.p.h. and (assuming 1,100 h.p. cruising power for the standard aircraft) 200 m.p.h. to 250 m.p.h. Typical comparative cruising speeds are 320 m.p.h. for the Eland and 280 m.p.h. for the standard aircraft.

A study of payload-range performance in relation to take-off performance for the two versions, and with temperature and altitude taken into account, yields an interesting comparison. Under prevailing United States Civil Air Regulations, framed for piston-engined aircraft, no "temperature accountability" is re-

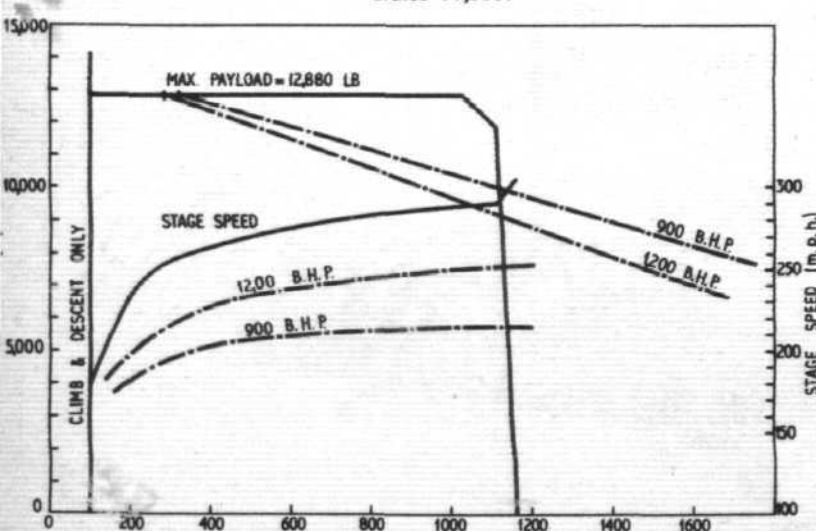
PERFORMANCE COMPARISON:  
Eland Convaire 340 and the standard Convaire 340

	Convaire 340 with Eland NE16s of 3,500 s.h.p. each	Convaire 340 with P. & W. CB16s of 2,400 h.p. each
<b>SEA-LEVEL AIRPORT:—</b>		
Max take-off weight	53,200 lb	47,000 lb
Limiting case	49,860 lb Structure Engine-out take-off climb	47,000 lb Structure Structure
CAR take-off field length	4,405ft 4,600ft	4,655ft 5,055ft
Max payload stage length	1,330 st miles 722 st miles	290 st miles 280 st miles
Appropriate mean cruise T.A.S.	318 m.p.h. 289 m.p.h.	275 m.p.h. 272 m.p.h.
<b>3,000ft AIRPORT:—</b>		
Max take-off weight	53,200 lb	46,230 lb
Limiting case	47,000 lb Structure Engine-out take-off climb	46,230 lb Engine-out take-off climb Engine-out take-off climb
CAR take-off field length	5,090ft 5,140ft	5,180ft 5,580ft
Max payload stage length	1,330 st miles 252 st miles	200* st miles 200* st miles
Appropriate mean cruise T.A.S.	318 m.p.h. 293 m.p.h.	275 m.p.h. 272 m.p.h.

This table compares performance of the Eland Convaire 340 with the standard aircraft in I.S.A. conditions and (in italics) in I.S.A. + 23 deg C (C.A.A. "hot day") conditions. Assumptions are: Reserve fuel for 150 mile diversion; fuel for one hour's stand-off; representative time and fuel airport allowances; climb, cruise and descent in I.S.A. + 15 deg C for take-off in I.S.A. + 23 deg C.

Note: normal take-off flap is assumed. Max. payload is 12,880 lb.  
\*with 12,500 lb payload.

A comparison of payload-range performance and speed between the standard piston engined Convaire (broken line) and the Eland airliner. Assumptions are: I.S.A. conditions, cruise at 15,000ft in still air, fuel for ¾ hr holding at 5,000ft, 250-mile diversion (3,000 lb reserve for stages greater than 250 miles). Eland r.p.m.: climb 12,000, cruise 11,500.





## NAPIER ELAND AIRLINER . . .

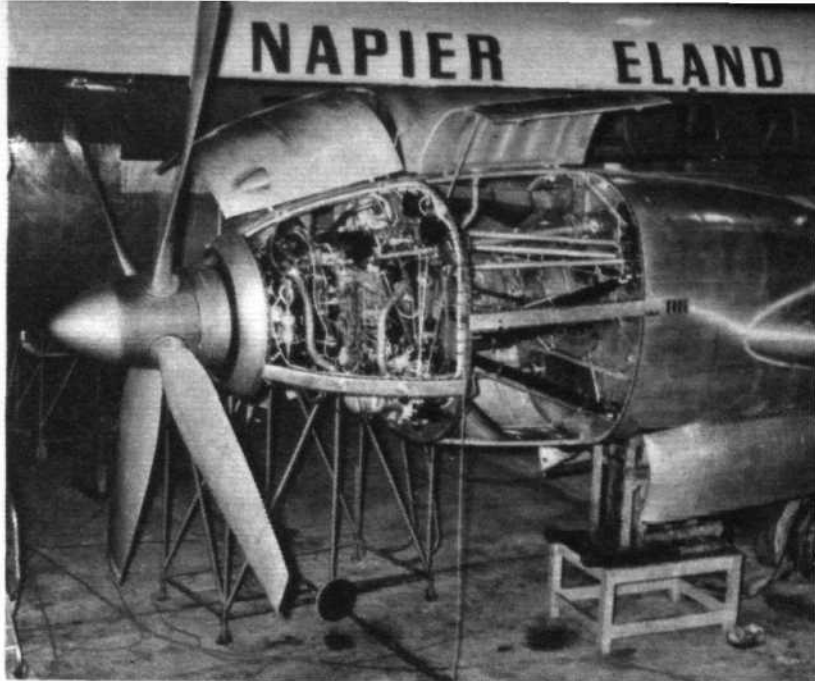
quired for engine-out take-off and climb. The tabulated figures (previous page) provide for 100 per cent accountability for the Eland Convair. As may be seen, the maximum permissible take-off weight is limited either by engine-out take-off and climb requirements or by the Convair's limiting structure weight.

The conversion has taken the Napier team a little over 12 months to complete. Work is already in hand in the engineering of kit conversion packs, and it is estimated that the routine job of conversion will occupy little more than a few weeks. The aim has been to keep structural and equipment alterations to a minimum. With the exception of small alterations to the instrument panel (existing piston-engine dials have simply been replaced by appropriate turbine-engine indicators), to the control pedestal and to the electrical system, there are no changes except within the nacelle, and to the ice-protection plates in line with the airscrews on the fuselage side (moved forward slightly, and repositioned to allow for right-hand rotation).

While it was tempting to go for a pencil-slim nacelle—a glance at the uncowed installation reveals the scope for this—it was soon evident that the extensive structural alterations involved would not have been justified. The cost to operators would have been increased considerably for an advantage in cruising speed of three to four miles per hour, and a slight improvement in C.L. It is interesting to examine the changes that have in fact been made.

The present "prototype" conversion is powered by two 3,000 h.p. Eland NEL.1s; there will be no difference in the installation of the NEL.6 of 3,500 h.p. Here it is interesting to observe that, without changes to the Convair's tail surfaces, 3,250 h.p. is about the maximum power that can be put through each airscrew; for this reason the NEL.6 will be torque-restricted to this figure for take-off. Thus the engine will have a reserve of power for hot-day operation. The engine thrust-line differs by a mere 1.25in to compensate for changed vibration characteristics; and Napier, while prudently awaiting flight trials "to see what the man says," do not anticipate any adverse changes in stability and control.

The familiar twin exhausts on the top of the Convair's nacelle have been replaced by the Eland's jet-pipe. The main nacelle firewall has been renewed in stainless steel, and a new vee-frame tubular mounting picks up on it at four points, attaching to the engine at three. Local strengthening of nacelle longerons was necessary, and most of the top of the nacelle has been re-skinned to fair-in the jet-pipe. In order to keep longeron bending loads to a minimum the centre distances of the firewall attachment bolts have been increased slightly. There are no alterations to the undercarriage bay. A second steel firewall separates the compressor and turbine zones; it is not attached to the engine, which may be removed without its displacement. Engines are fully interchangeable. The engine cowling is of the "bonnet" type and the panels are double-skinned, stainless steel inside (in accordance with CAA requirements) and light alloy outside. Flush N.A.C.A.-



Generous accessibility of the Convair's new Eland installation is apparent in this view. A weight of 1,000 lb per power plant has been saved. The airscrew is a D.H. turbine unit designed for the Eland.

type intakes provide adequate ventilation, oil and accessory cooling. The cowling panels yield an accessibility which, as may be seen from the photographs, is probably unsurpassed by any other aircraft powerplant.

The jet-pipe incorporates a muff for hot-air supply to the air-frame de-icing system, incidentally at a flow 25 per cent higher than in the standard aircraft. The pipe is supported at two points, the forward adjacent to the front spar, giving both axial and transverse freedom of movement, and the rear support giving axial freedom only for expansion purposes. Adequate ventilation ensures that temperature limits are not exceeded.

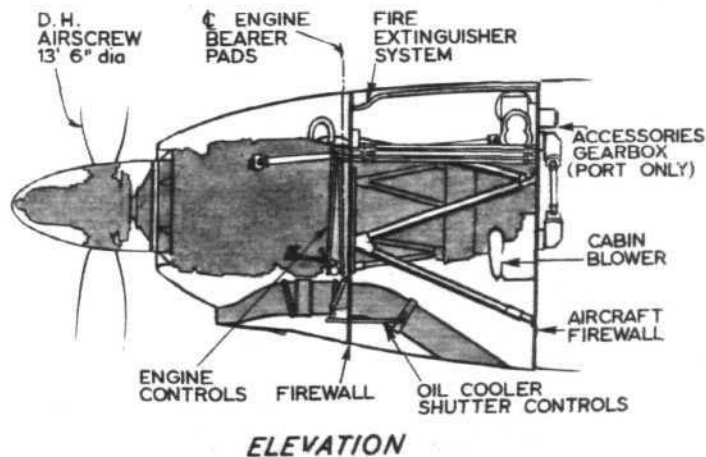
No changes have been made to the undercarriage installation, although an additional mechanical door-latch may be necessary for the higher airspeeds. The original accessories have been retained, with the exception of a new (Rotax) 40 kVA. alternator for airscrew and spinner de-icing, and a single drive shaft transmits power to an enclosed accessory gear box on the firewall. On the starboard nacelle a further shaft drives the AirResearch cabin blower which, because of the Eland's higher r.p.m. range, has been adjusted for single-speed operation only.

The oil system is contained in the compressor zone, and it is worthy of note that in comparison with the existing system some 350 lb weight has been saved. Engine controls are unaltered from the cockpit to the firewall; movement thereafter is transmitted by torque tubes, push-pull rods and bell cranks. The existing Convair fuel tanks are satisfactory for kerosine or wide-cut fuel and no changes are necessary to the system except for the calibration of the "gallons gone" flow meters. Additional fire-extinguisher bottles have been provided and a "Firewire" detection and spraying system installed. The existing 28-volt D.C. electrical system has been retained, and lightweight lead-acid batteries in a new 120-volt starting circuit provide sufficient power for eight consecutive engine starts.

The airscrews are of de Havilland design and have been specially tailored to match the Eland installation. They are 13ft 6in Hydromatic units with high-activity (121) Dural blades; control features include full reversing (or discing as required), feathering, hydraulic pitch-locking, and auto pitch-coarsening.

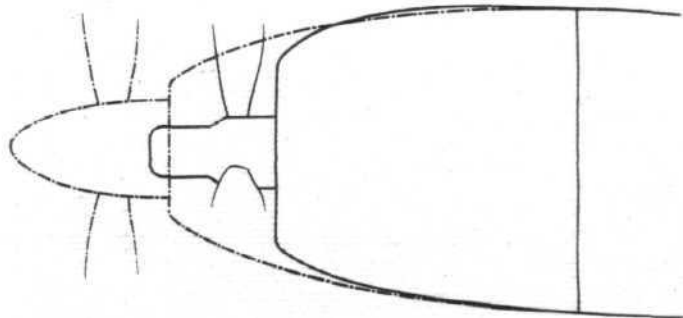
The cost to Convair operators of an Eland conversion is not yet available for publication. The price will obviously depend upon the number of aircraft involved. Probably, however, it will be rather less than the figure of £125,000 quoted by American sources for the Allison T56 Convair conversion. Operating costs for the Eland aircraft are not yet available, but they are certain to be an improvement on those for the existing aircraft, which may be reckoned to produce some £300,000 to £400,000 profit in a typical year's operation. The customer is thus offered an airliner with a new lease of life at a cost which may be written-down in a relatively short period.

By the time these words appear the Napier Eland Airliner will probably have made its maiden flight. Napier's first objective will be the gaining of a special-category Certificate of Airworthiness so that the aircraft will be qualified for overseas demonstrations, and the company's flight-test team will then carry out European demonstrations and route-proving trials, probably in co-operation with Continental operators. In this way a large number of engine flying hours will be amassed to qualify for a normal category C. of A. for freighting purposes. There will follow a programme of demonstrations in the United States. In the meantime, production of the NEL.6 engine goes ahead in the company's factory at Acton.



ELEVATION

The general arrangement of the new installation is apparent in the above view. The diagram below shows the comparative proportions of the existing Pratt and Whitney plant (unbroken line).

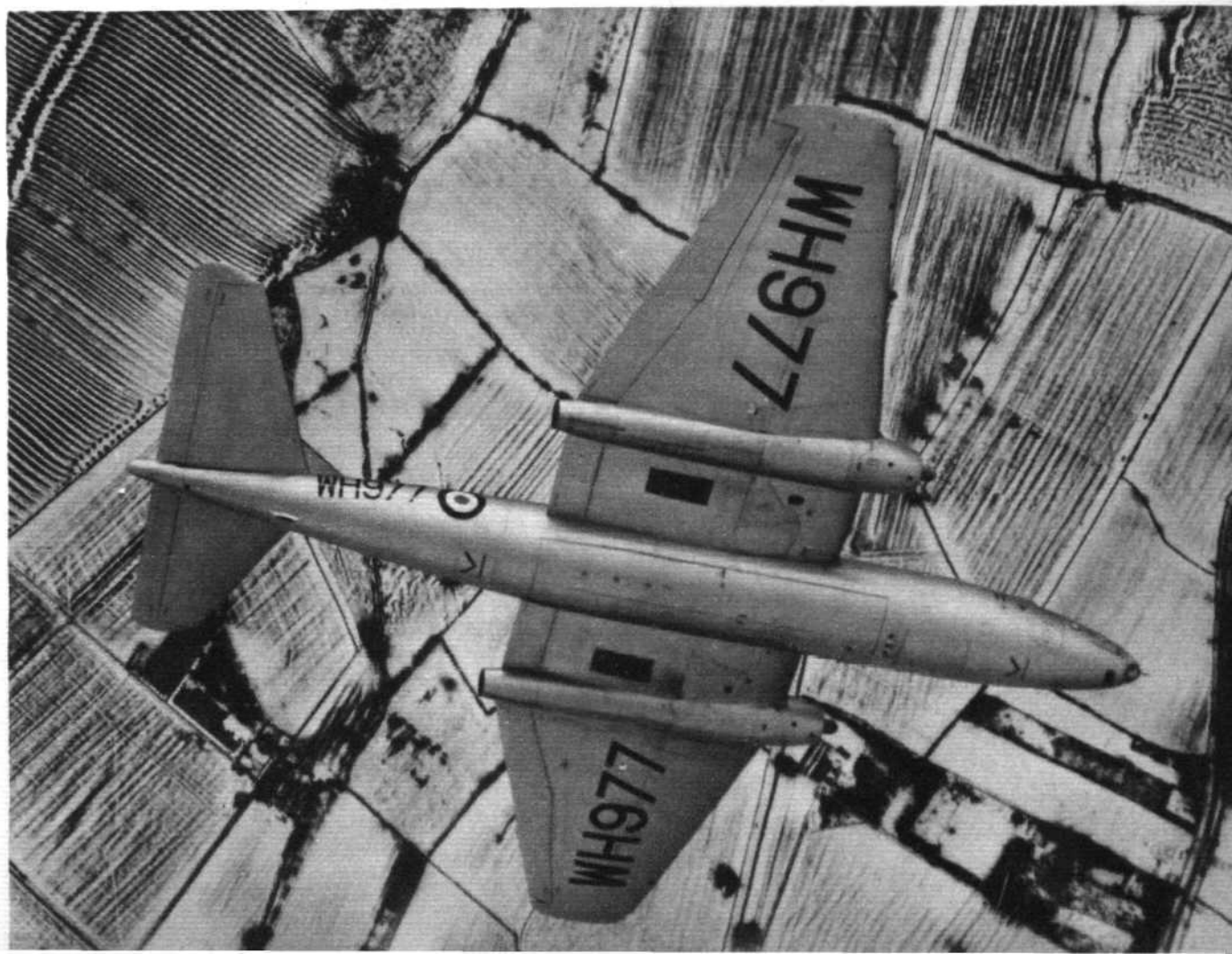




## TO SALUTE THE QUEEN

SIX English Electric Canberra B.6 light bombers (two Rolls-Royce Avon) of No. 9 Squadron, R.A.F. Bomber Command, left Binbrook on January 24th for "Operation African Tour," during the course of which they are performing ceremonial fly-pasts before Her Majesty the Queen and the Duke of Edinburgh at Lagos, Kaduna, Enugu and Ibadan. Piloting one of the Canberras is the force commander, A. V-M. J. R. Whitley, A.O.C. No. 1 Group, who is seen in the centre picture opposite, together with personnel of the tour: (From left to right, front row) F/O. D. B. Hopkins (navigator), F/L. D. F. B. Hall (pilot), S/L. L. G. Bastard (C.O. of No. 9 Squadron), A. V-M. Whitley, F/L. P. Thomas (pilot), F/L. D. E. Kinsey (navigator), and F/O. D. G. Dickie (nav.); (back row) F/O. C. P. Pratt (pilot), F/O. F. F. Ridpath (nav.), F/O. D. C. Brown (nav.), F/O. R. E. Spencer (nav.), F/O. S. G. Corps (pilot), F/O. G. J. Rondel (pilot), and F/O. G. Hart (nav.). On this page S/L. Bastard is seen taking his Canberra B.6 past the vertical before rolling off the top of a loop. The latter manoeuvre is simulated at lower right, over snow-patterned Lincolnshire countryside. At the top of the opposite page is a neat echelon of five Canberras flown by S/L. Bastard, F/L. Thomas, F/O. Pratt, F/L. Hall and F/O. Corps. Ground crews and spares are being carried in Handley Page Hastings transport aircraft of No. 24 (Commonwealth) Squadron, Transport Command.





# SWEDISH LANCE

*The Saab A32 Lansen  
is Now in Service*

*The photograph on the right shows the fifth production Lansen about to leave the works at Linköping. Below are production wings and fuselages. The overall efficiency of Saab's airframe production is outstanding, being equal to that of the best American plants.*

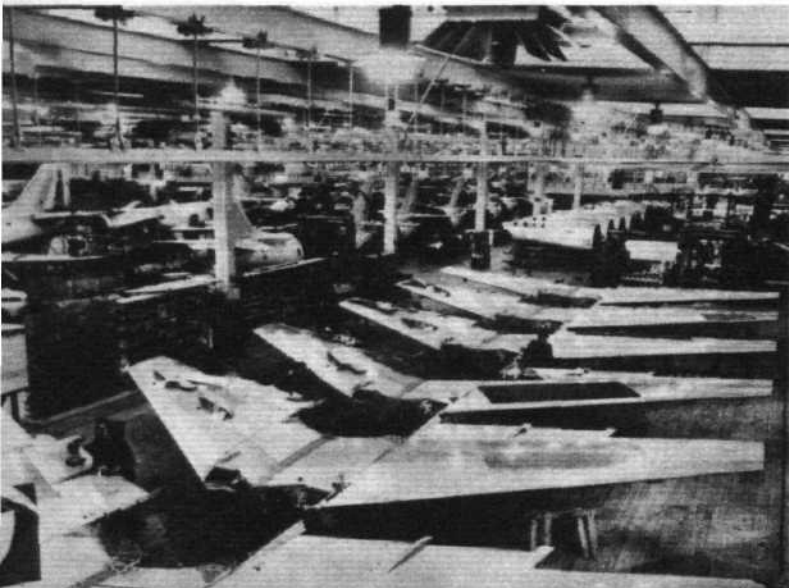


**S**INCE the end of world war 2 (in which they were one of the few nations not to participate) Sweden has established herself in an almost unique position. A small and—by comparison with the U.S.A. or Britain—industrially poor nation, she has known exactly what military aircraft she wanted and has then proceeded to design and develop machines which are at least the equal of any of their contemporaries. We believe it is a truly remarkable fact that Sweden has been able, through her own exertions, to keep her air force fully up-to-date with quantity deliveries of advanced types of aircraft at the correct time.

Further information is now available upon the latest type to enter service with the Royal Swedish Air Force, the Saab A32 Lansen. This aircraft was designed during 1951-52 and the proto-

type first flew in November of the latter year. It is a two-seat all-weather multi-purpose machine powered by an afterburning Rolls-Royce Avon turbojet. Both from the aerodynamic and structural viewpoints the airframe is of an ambitious nature, and yet is proving an eminently suitable structure for mass production.

Of conventional general layout, the Lansen can carry an exceptionally heavy load of all kinds of warlike stores, including those of a size corresponding to tactical atomic weapons. The fixed armament consists of four 20 mm cannon. Other interesting design features include the Saab-designed ejection seats for pilot and navigator; the thermal de-icing system for the wings, tail and air intakes; an autopilot (which can no doubt be tied in with the electronic fire-control system); Fowler-type flaps to confer good





## SWEDISH LANCE . . .

short-field performance; the Saab-designed cold-air unit and cabin-conditioning system; provision for a large external fuel tank under the belly; and the possibility of rapid conversion to dual controls for pilot familiarization. Early production Lansens are powered by the Svenska Flygmotor RM5, which is the Rolls-Royce Avon of the RA.7R-type licence-built in Sweden. Area-ruling of the Lansen fuselage has facilitated the installation of an exceptionally large and useful type of afterburner which probably increases the sea-level emergency power to nearly 10,000 lb. It is also known that very much later and more powerful types of Avon are scheduled for installation in future Lansens as well as in the forthcoming J35 supersonic interceptor.

Four prototypes were built (one was lost) and Mach 1 was exceeded for the first time on October 25th, 1953. Since then supersonic speed has been surpassed "hundreds of times" by Saab pilots, frequently with external stores in place. Lansens have also been put through "Sweden's Boscombe" at Malmslätt. During 1953 a large production order was placed and Saab

invested very heavily in new production tooling, plant facilities and other equipment. Of more than two million engineering man-hours expended on the Lansen (more than twice the work needed to develop the J29 fighter), over half were spent on tooling. Some 1,500,000 working man-hours were needed to manufacture the tools, which include some 23,000 detail tools, 365 jigs and about 2,000 detail-assembly fixtures. Saab have also calculated that each Lansen absorbs approximately 325,000 rivets, 25,000 screws and bolts, 21,300ft of electric cables, 21,250 sq ft of sheet metal and 5,165ft of metal sections.

Quantity deliveries are now being made. The first unit to be fully equipped is the Blekinge (F17) wing at Kallinge in southern Sweden, where the Lansen is replacing Saab 18Bs. A recent Swedish budget proposal suggests a 25 per cent increase in R.S.A.F. attack strength, and a repeat order for Lansens is therefore in prospect.

**Saab A32 Lansen** (Rolls-Royce/Svenska Flygmotor Avon RM5): Span, 42ft 8in; length, 48ft; height, 15ft 6in; weight empty, about 15,500 lb; normal gross weight, about 22,000 lb; maximum speed, 700 m.p.h.; landing speed, 125 m.p.h.; service ceiling, about 50,000ft.

# MISS KENYA'S STORY

## Flying in a 30-year-old D.H.51

By JO WOODWARD

**T**O fly in an aircraft which is the only one of its type still in operation 30 years after its first test flight is a notable experience, and I count myself lucky to have had the privilege. The aircraft in question is a de Havilland 51—appropriately named *Miss Kenya*, having been the first aeroplane imported into that colony.

The first four entries in *Miss Kenya's* log-book are signed by Captain (now Sir) Geoffrey de Havilland, who test-flew her in September 1925. Bought by Mr. J. E. Carberry, she was shipped out to Kenya in 1926. From Mombasa she went by train to the Thika railhead, where she was off-loaded on to a wagon, drawn by 18 oxen and driven by Mr. Carberry's Afrikaner friend, Piet Smith, up to Nyeri. There arose the problem of getting the aeroplane off the wagon. No cranes were available, so a long, sloping hole was dug, the wagon hauled into it, and *Miss Kenya* off-loaded at ground level. She was assembled by a British sergeant mechanic, and Mr. Carberry flew her for the first time on April 4th, 1926.

In June 28 the aircraft was purchased by Messrs. Campbell Black, G. Skinner and A. Hughes, of Nakuru, Tom Campbell Black using her as a "refresher" in order to obtain his civilian licence, a document which was only then becoming necessary. September 10th, 1928, was the great day when, for the first time in the history of aviation in East Africa, an aeroplane was registered in Kenya, the D.H.51 being allotted the nationality and registration markings of G-KAA. Shortly afterwards, the initial registration letters VP were allocated to the Colonies, and she became VP-KAA on January 3rd, 1929.

*Miss Kenya* now followed a somewhat chequered career, passing through several hands. In September 1933 she was registered in the name of D. A. G. Onslow, of Kisumu. During the war she acquired R.A.F. markings, but never flew on duty; and finally she was pranged at Kisumu and left derelict. Mr. G. F. Baudet, a ground engineer who had been a pilot in France in the early days of flying, took her over in June 1946, registered her in his name, carried out repairs and flew her locally. In May 1951 he offered her as a museum piece to the Royal Air Force at Eastleigh. The offer was accepted; but, flying her into Eastleigh, Mr. Baudet made a heavy landing. A battered *Miss Kenya* was relegated to a corner of the R.A.F. hangar, and remembered only on party nights, when it was felt that she would be cheered up by having her petrol tank filled with beer.

It was in 1954, when it looked as if *Miss Kenya* would never fly again, that Mr. J. A. Johnstone of the A.R.B. and Mr. J. S. le Poer Trench of Noon and Pearce Air Charters asked the R.A.F. if the old aeroplane could be handed over to them with a view to making her airworthy. The Service agreed with alacrity, and VP-KAA was registered in the name of J. S. le Poer Trench.

There began the job of getting her back into the air. She was in a bad way (*inter alia*, the beer had to be drained from her tanks) but Johnstone and Trench were supported in their venture by the generous assistance of various commercial firms and individuals. Interest in the veteran was aroused in aviation circles in Nairobi, and material assistance received from—in particular—the Palmer Tyre Co., de Havillands, Shell of East Africa, East African Airways, Airwork, Noon and Pearce Air Charters, and many individuals too numerous to mention.

A few weeks ago, Jack Trench was kind enough to take me for a

**A FORTNIGHT** ago we published in the Correspondence columns a letter from a reader concerning a D.H.51, "*Miss Kenya*," which is still flying in East Africa. This rare vintage aircraft took part in the Kenya Air Show on January 7th; a photograph appeared in our report of that event, in last week's issue; and it is now possible to publish this more detailed history of a unique aircraft. The D.H.51 was designed as an economical private or commercial two/three-seater; though not so small as the Moth, it was in some degree its progenitor. Only three D.H.51s, we believe, were built.

short trip in this historic aircraft. Although of a generation now almost extinct, *Miss Kenya* stood on the tarmac of Nairobi West airport impeccably groomed, the evening sun glinting on the silver fabric of her wings. Her Airdisco-Renault vee-eight engine was the one originally installed in 1925; her cockpit was simplicity itself, containing only six instruments—rev counter, oil pressure gauge, altimeter, compass, lateral level indicator and airspeed indicator.

I stepped into the front cockpit, Jack Trench piloting from the rear. The prop was swung by Mr. D. Stewart of the A.R.B. and we taxied out past a surprised Asian who had just landed a Cessna. On the ground the vibration seemed to me considerable, for I was unaccustomed to flying in biplanes with flying and landing wires shuddering between the wings. From the airfield, which stands at an altitude of 5,500ft, we were airborne in little more than 100 yards. Once in the air vibration ceased, *Miss Kenya* climbed steadily to 2,000ft above Nairobi West, and settled down at an airspeed of 65 m.p.h. From this height we were able to see the snow-capped summit of Mount Kenya, a hundred miles away to our right, a violent tropical thunderstorm coming up from the

**A close-up of the D.H.51.** Standing by the cockpit is Mr. Douglas Stewart, A.R.B. representative in Nairobi, and at the tail is Mr. J. S. le Poer Trench.





"Miss Kenya" lined up alongside a Dove operated by Williamson Diamonds, Ltd.

## MISS KENYA'S STORY . . .

direction of Kilimanjaro, and the black crests of the Ngong Hills ahead; below we could just distinguish zebra, wildebeest and buck in the game park adjoining the airfield.

One of the most noticeable things flying in this aircraft is the lack of noise and vibration—Jack Trench considers that when the engine is throttled back to 1,600 crankshaft r.p.m. it offers the nearest thing to gliding ever experienced in a powered aircraft. A rate of climb of 500 ft/min can be reached at this altitude, and controllability is exceptionally good at all speeds from 40 m.p.h. to approximately 120 m.p.h. (the maximum so far obtained), and there appears to be no falling-off of performance up to 9,000ft: *Miss Kenya's* ultimate ceiling, in fact, is still to be guessed at. She can attain an airspeed of a little over 80 m.p.h. at a reduced throttle setting giving 1,800 r.p.m. on the crankshaft and 900 r.p.m. on the four-bladed wooden airscrew, for a fuel consumption of 7 gal/hr. Jack Trench is thinking of setting up a second-hand

oil sales department, as the level seems to increase at the end of each flight! Though still fully aerobatic, *Miss Kenya* has, in deference to her age, been subjected only to the milder forms of aerial manoeuvre, such as steep turns, stalls, stall turns and side-slips.

The evening was cool, and I placed my hands along the sides of the D.H.51's cockpit in the warm air flowing back from the engine. Back over the airfield she was put into a tight turn and pivoted round on a wing-tip with no sign of strain, and seemingly in a space no wider than her own diameter. Then she was headed towards the runway and, with her low stalling speed and the drag on her tailskid, ran for only 80 yards on the *murram* surface. So ended one of my most enjoyable flights.

Two weeks later Jack Trench and Douglas Stewart flew her up to Kitale, two hundred miles from Nairobi, for the Kenya Air Show. Here the "Grand Old Lady of Kenya" put up a splendid display, proudly taking her place with the more streamlined products of de Havillands—Doves, Chipmunks and Venoms.

## TEXT-BOOK DITCHING

A NIGHT ditching in the Atlantic with two of four engines inoperative, a 42 kt cross-wind and a 12-15ft swell . . . this was the situation faced by eight men aboard an American Military Air Transport Service C-54. Thanks to teamwork and skilful piloting, every man escaped with barely a ducking. First related in "The MATS Flyer," the story has now been re-distributed by the Flight Safety Foundation. Though the action took place a year ago, we make no apology for reprinting the account in its entirety, both as a dramatic story in its own right and as an object-lesson in coolness in an emergency.

"GOD bless you," was the last message received from the Coast Guard cutter. Eight lives rode with the MATS C-54 transport preparing to crash land into the stormy Atlantic on 26 January 1955. Capt. Paul S. Evans shifted his vision from the searchlights and flares flickering in the pitch black night outside. Glancing at the 80 m.p.h. air-speed, he pulled off the power. "Help me kick it out!" he yelled to copilot Lt. Jack W. Suggs.

In the second or two that remained before hitting the 15-foot waves, the C-54 had to be straightened out from the terrific crab caused by 42 knots of direct cross wind.

When MATS 45569 had started from Lajes carrying cargo and one passenger to Bermuda it had looked like any other routine flight.

At 1604 local time they were over a Coast Guard cutter, radio-coded "ECHO" and about 10 minutes behind schedule. Capt. Edward T. Cobb, the navigator, noticed that the winds were from 260 degrees at 42 knots, a little stronger than the forecast.

Twenty minutes later Lieutenant Bowen, the passenger, walked from the crew compartment to the cabin. He glanced out at the left wing as he passed. Then he looked hard. It was still daylight, and he could see a heavy flow of vapour appearing to come from under the flap behind the No. 2 engine. He called A/1c Braun, the flight attendant, who checked and immediately went forward and told the aircraft commander, Captain Evans. T/Sgt. Brooks, engineer, came back and looked.

"Fuel leak and coming pretty heavy," he told Captain Evans. Copilot Suggs came up and took over while Captain Evans looked for himself. With Sergeant Brooks he checked the fuel gauges. No. 2 was lower than any of the others.

"O. K., left cross feed—No. 2 main boost on."

A good plan, but No. 2 main tank gauge went down faster than gas could be pumped into No. 1. Only 40 gallons were saved—360 were lost. Now with No. 1 and No. 2 engines both running off No. 1 main tank (and No. 2 main tank completely empty and cut off) the pilot and engineer checked again. It was still there. Same vapour trail. Same spot. With reluctance the aircrew feathered No. 2 engine. It would be touch and go to make Bermuda with these winds.

Another check revealed the fuel leak had stopped. The navigator passed his position and flight data to Airman Hodge, the radio operator. Pilot Evans dropped 10 degrees of flaps and slowed up to 140 m.p.h. in order to jettison cargo. Airman Hodge

### *The Story of a Remarkable Escape from the Atlantic*

Capt. Paul S. Evans, who, in command of the C-54, made the ditching.



began transmitting. His message started off, "Emergency . . ."

Aircraft commander Evans, with five of the men, went to the cabin, and with the crew ladder prized open the forward cargo door enough to jettison the cargo. In 15 minutes, they had kicked out a ton and a half of cargo, mail and personal effects.

All this time, Captain Cobb and Lieutenant Suggs were up front checking fuel versus headwinds. The loss of No. 2 had cut the indicated airspeed down to about 150 m.p.h. At 1650L (local), 46 minutes past ECHO, flight attendant Braun glanced out at the right wing and saw it—a heavy oil flow coming over the flap behind No. 3 engine. He started forward. At the same time, engineer Brooks checked his instruments and saw No. 3 oil pressure drop to 40 pounds. No. 3 oil quantity showed 15 gallons.

Brooks checked the wing and immediately started transferring from the 40 gallons in the auxiliary oil tank. Even with continuous transferring, the oil quantity gauge never came above 6 gallons; oil pressure never above 40 pounds. In 15 minutes, there was no more reserve oil. Captain Evans watched closely. When the No. 3 manifold pressure started falling and the tachometer started fluctuating, he feathered No. 3 engine.

As they began descending to maintain airspeed, the navigator hollered, "Couldn't make it to Bermuda anyway with this air-speed and our present winds. We don't have a chance. Sorry, Skipper, that's the best I can do for you."

The ailing C-54 began a 180 degree turn back to ECHO, an estimated one hour and twenty minutes away. Hodge got ECHO again and advised them of their intention to rendezvous and ditch. It was getting dark now, and they were descending in the soup. The vacuum instruments were getting sloppy, so No. 2 was allowed to windmill for vacuum pressure. Lieutenant Suggs transmitted DF tones on 121.5 MCs for the rescue aircraft. At a thousand feet above the ocean they were 100 feet under the overcast and visual again.

With No. 2 engine windmilling, No. 3 feathered, No. 1 and 4 cowl flaps wide open, 40 to 45 inches of manifold pressure and 2,550 r.p.m., the pilot could only get 115 m.p.h. No. 1 and 4



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*Herald*

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H A N D L E Y P A G E

RADLETT

LONDON

READING

# do you measure up to supersonics?

Vital data on supersonic flight is recorded by this manometer. Its columns of mercury measure the air pressures at different points over the surface of a wing that is being tested in the supersonic wind tunnel at Bristol.

Draughtsmen and technicians are urgently needed to join new design and project teams now being formed in London and Bristol. Please apply to the Chief Personnel Officer, Bristol Aeroplane Company Limited, Filton House, Bristol.

## BRISTOL



# TEXT-BOOK DITCHING . . .

cylinder head temperatures were 220 degrees. When an attempt was made to increase the airspeed by feathering No. 2 propeller, the vacuum instruments became sloppy.

Outside, there was no visual reference. The overcast hid all stars above and with no lights on the ocean below, there was nothing but solid blackness ahead. Just ball, mag compass and airspeed, for attitude indicators weren't enough, so again No. 2 was windmilled to provide vacuum pressure for the gyro flight instruments.

On ETA 1830L they passed over ECHO. No need to check any longer. They could never make it to Lajes. Evans recalled the only other time he had come down on water had been to land an L-20 floatplane in Greenland—in daylight.

Aboard ECHO, the U.S. Coast Guard cutter *Coos Bay* all hands were now in action. Almost one hour earlier the boys watching the evening movie heard the speaker blare out, "NOW HEAR THIS—NOW HEAR THIS—MATS 45569 DITCHING—ALL HANDS TO DITCH AND RESCUE STATIONS."

Commander Vaughn ordered all engines ahead full for ditch and rescue operations. At 1817L the Combat Information Centre on ECHO had 45569 in radar contact. The C-54 requested a ditching heading and ECHO recommended 130 degrees; gave the winds as 230 degrees at 42 knots with waves 12 to 15 feet high, swells from 220 degrees. They recommended ditching parallel to the swell. MATS 45569 "Rogerred."

Minutes later at 1837L the *Coos Bay* commenced laying a 4,000 yard sea lane. They used 20 depth charge markers. It took them only eight minutes to lay those floating flare pots. The Coast Guard cutter then moved into position 1,200 yards upwind and to the right of the sea lane. They waited.

Back in the C-54 cabin everything was set—life rafts, Gibson Girl, Mae Wests—all checked. Jenkins and Braun stowed the Gibson Girl and life raft by the rear door. Then, Lieutenant Bowen helped them take a crew bunk mattress and place it against the forward cabin bulkhead. They strung a tiedown strap through the rings in the floor for a hand hold. They then waited.

As the transport completed a dry run over the sea lane, Captain Cobb secured his navigator's stool and removed the astrodome. He grabbed all of his navigational gear and ditching equipment and went back to the cabin. Captain Evans gave the word and Cobb and Braun jettisoned the four emergency exits. The cargo door hit the left horizontal stabilizer with a terrific jolt. Up front the pilots felt the blow. They were tense, wondering just what would happen next. A big jolt, nothing more.

Brooks had left his seat on downwind. He stowed the crew compartment raft on the front of the lower crew bunk. He checked himself and everyone else for ditching gear and climbed in the lower crew bunk behind the raft.

The gutted transport now turned onto the base leg. Hodge stood up front and held the mike to Captain Evan's lips. The pilot didn't have enough hands for everything; both he and the copilot were flying the big plane now.

MATS 45569 then turned onto the last final approach it would ever make. ECHO radar asked, "Have you power for emergency pull up?" Captain Evans answered, "No." Instructions commenced for a PPI final.

At 1900L ECHO advised, "Six and a half miles out on final. You need not acknowledge any more messages." Hodge now started to secure for ditching. When he finished, he walked back to the cabin and joined the others.

Captain Evans brought the transport down slowly, a hundred

feet per minute, crabbing hard to the right. He dropped 10 degrees of flaps and waited, then 10 more and waited. Two hundred feet off the water he dropped 10 more and slowed to 90 m.p.h.

Twenty feet off the water he dropped his last 10 degrees of flaps and slowed up to 80 m.p.h. ECHO was firing mortar flares for illumination at this time. Landing lights were left off.

The last words from ECHO were "God bless you."

At exactly 1905L both pilots kicked hard left rudder. Power came off and they were down. They didn't hit, they skidded. No first impact and then a second more severe impact, just a very rapid, smooth deceleration. The touchdown was so gentle—despite the water hitting the tail—that Captain Evans was able to hold the control column with one hand.

Outside, waves were running 12 to 15 feet; wind was about 42 knots. The aircraft had weathervaned as soon as it stopped. It was now "bucking" like a mad Brahma bull. In the cabin, the lights were still on. Braun and Cobb threw the raft out of the main cargo door. They all held it in close while Lieutenant Bowen climbed aboard. Jenkins managed to climb in. Between them, they got one more man aboard each time the raft moved in. As soon as all five of them were on the raft they pushed away from the airplane.

Up front, Captain Evans and Lieutenant Suggs had shielded their faces with their arms as soon as they had touched water. They really didn't need to for there was no jolt, no real impact. Try as they might, they couldn't get the six-man raft through the astrodome. So, up they went out onto the slippery back of their agitated monster. Flat on their stomachs, they were barely able to hold on.

The *Coos Bay* moved in at flank speed as 24-inch searchlights played on the scene. The horizontal stabilizer of the aircraft was rising and falling about 10 feet with each swell. The flyers in the raft had drifted back almost under the tail. Each time the tail came down they managed to push away. They finally were clear of the tail, but couldn't return to the aircraft for the other three men. Hodge advised ECHO with the emergency VHF radio that all of them were out—five in the raft and three on the top of the airplane.

At 1910L Lieutenant Ray Baetsen of the *Coos Bay* had the motor surfboat fighting through the snarling seas toward the downed airmen. The boat couldn't get in close enough, so the Coast Guard lieutenant had Captain Evans, Lieutenant Suggs and Sergeant Brooks slide back between the vertical stabilizer and wing and jump off into the water. The three were only in the water (67 degree F.) for two minutes. One by one the crew of the surfboat lifted them aboard. Lieutenant Baetsen then wheeled around and moved in on the raft. A line was secured, and one by one five more men were dragged aboard. Fourteen minutes from time of ditching all eight men had been hauled into the surfboat.

Lieutenant Baetsen skilfully fought his way back to the *Coos Bay*. Finally, the hookup was accomplished. At 1942L all were aboard the *Coos Bay*.

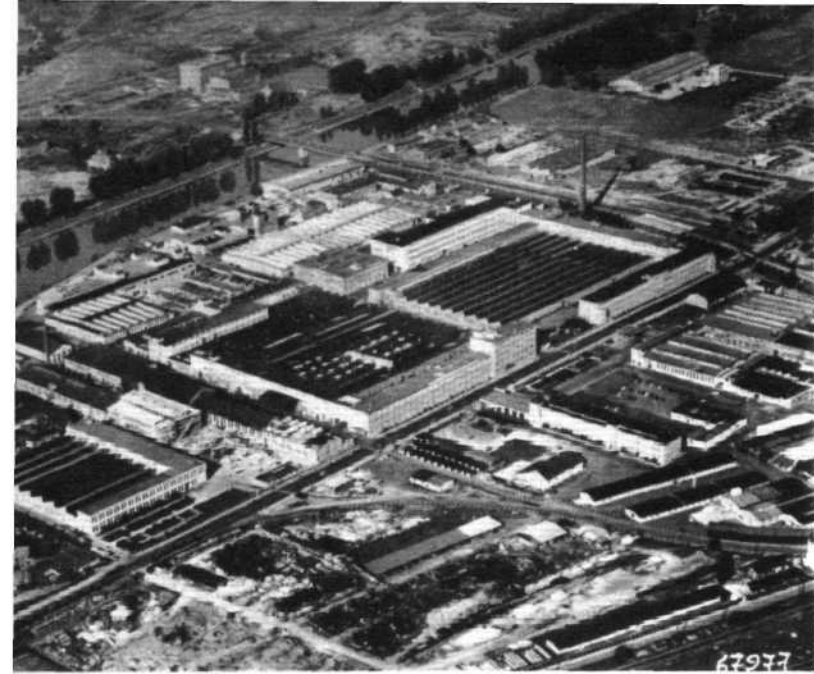
MATS 45569 was last seen still floating 40 minutes after it hit water. Captain Evans noted only slight damage as he exited. In fact, a bent prop on No. 2 engine and the loss of its rear cowling was all the damage he remembered.

The aircrew was safe and deeply grateful to Commander W. S. Vaughn, Lieutenant J. G. Baetsen, Lieutenant J. G. Kearney, and the officers and men of ECHO. . . Through fine piloting, and with the munificent support of the U.S. Coast Guard, MATS had kept eight lives from the fury of the unforgiving sea.

## FORTHCOMING EVENTS

- Feb. 7. Institute of Transport: Informal Luncheon.
- Feb. 8. Air-Britain: "The Conquest of Space in the Light of New Developments," by P. Moore.
- Feb. 9. R.Ae.S.: Section Lecture: "Propellers for Military and Civil Aircraft," by L. G. Fairhurst, M.I.Mech.E., F.R.Ae.S.
- Feb. 10. Helicopter Association: "Engineering Aspects of Helicopter Bus Operations in City Centres." Three papers introduced by J. S. Shapiro, Dip.Eng., A.F.R.Ae.S. (at 5.30 p.m.).
- Feb. 11. British Interplanetary Society: Birmingham Branch: "Aerodynamic Considerations of an Orbital Rocket," by W. F. Hilton, Ph.D.
- Feb. 14. R.Ae.S.: Graduates and Students Section: "Flight-Testing of High-Speed Aircraft," by T. H. Kerr.
- Feb. 16. R.Ae.S.: Main Lecture at Yeovil: The First Henson and Stringfellow Memorial Lecture, by Dr. A. M. Ballantyne, T.D., B.Sc., A.F.I.A.S., Hon. F.C.A.I., A.F.R.Ae.S., and Capt. J. L. Pritchard, C.B.E., Hon. F.I.Ae.S., Hon. F.R.Ae.S., M.R.I.
- Feb. 17. Air Transport Auxiliary Association: Annual Dinner, Eccleston Hotel.
- Feb. 17. Association of British Aero Clubs and Centres: Annual Dinner.
- Feb. 21. R.Ae.S.: Section Lecture: "Design of Low Landing Speed Aircraft," by R. C. McIntyre, A.F.R.Ae.S.

- Feb. 23. Aerodrome Owners Association: Annual General Meeting, and Annual Dinner.
- Feb. 24. Lancashire Aero Club: Annual Supper Dance.
- Feb. 28. R.Ae.S.: Section Lecture: "Use of Elementary Plasticity in Design," by A. J. Barrett, B.Sc.(Eng.), M.S. in A.E., M.I.A.S., A.F.R.Ae.S.
- March 1. R.Ae.S.: Section Lecture: "Powerplants for Supersonic Flight," by Dr. E. S. Moulton, B.Sc., M.I.Mech.E., F.R.Ae.S.
- R.Ae.S. Branch Fixtures (to February 24th):—
  - Feb. 6. Derby, "Propeller Turbine Engines for Naval Aircraft," by W. H. Lindsey; Halton, "Developments of Ramjets," by S/L. R. C. Rogers.
  - Feb. 7. Boscombe Down, "The Future of Air Power," by Air Marshal Sir Robert Saundby.
  - Feb. 8. Manchester, "The Artificial Stabilization of Modern Aircraft," by Dr. K. H. Doetsch.
  - Feb. 10. Brough, Annual Dinner Dance.
  - Feb. 13. Halton, Film: *Henlow*, A.G.M.
  - Feb. 14. Bristol, "Aerial Photography," by Charles E. Brown.
  - Feb. 15. Coventry, Lecture by E. P. Hawthorn; Reading and District, Lecture and Film Show on Guided Weapons by S/L. R. E. W. Harland.
  - Feb. 16. Isle of Wight, "Operation of Turbo-Propeller Aircraft," by P. G. Masefield; Yeovil, Main Lecture (see above).
  - Feb. 21. Belfast, "The New London Airport," by R. F. Bulstrode.
  - Feb. 22. Weybridge, "Training and Research in the Field of Aircraft Production," by Prof. J. V. Connolly.
  - Feb. 23. Cheltenham, "The Investigation of Flutter by Flight Tests," by H. G. Peacock.
  - Feb. 24. Leicester, Lecture.



The rebuilt Daimler Benz works at Stuttgart; the smaller picture shows the central area in its bombed condition.

# GERMANY'S AVIATION INDUSTRY

## A Personal Report—Part II

By FRANK ZIEGLER

**A**LTHOUGH Professor Seewald, chief of the research institute at Aachen, is working on the design of a ramjet, it is unlikely that any important aero engines, either foreign or home-grown, will be made in Germany unless and until it is planned to build more aircraft in that country than is at present the case. All the aircraft types now on the programme, including the Do27, will be powered, at least at the outset, by foreign engines. As for jets, only about 400 licence-built Fouga Magister trainers will probably be ordered from German sources, and this is hardly enough to interest any German firm in the licensed production of their Turboméca engines.

More interest is shown in the engines of the Luftwaffe's future fighters, expected—at least until recently—to include Hawker Hunters. It is thought that a contract for the maintenance and repair of such engines would, through the process of manufacturing more and more parts, eventually lead to the licensed production of complete engines.

With the former Junkers plants removed from the map, the firms that come chiefly in question are Daimler-Benz, Heinkel and the Bayrische Motorenwerke (B.M.W.), all of whom have an imposing record—stretching right back to Zeppelin days in the case of Daimler-Benz. D.B.601 engines were also made in Kessel, at the Henschel aero engine works—which, after being requisitioned

by the Americans until two or three years ago, are now making air-cooled Boxer-diesel engines and machines for the chemical industry. As for Heinkel and B.M.W., at the war's end both had in the pre-production stage turbojets which were then the most advanced of their kind. The French Atar engine is in fact a direct development by Dr. Oestrich, now technical director of S.N.E.C.M.A., with French nationality, of the B.M.W. 018.

But although Heinkel's headquarters are now at the very works he acquired during the war for gas turbine development, and the rebuilt Daimler-Benz plant at Stuttgart occupies a vast area with immense resources (including a neighbouring wind-tunnel used in the development of the latest Mercedes racing cars), any re-starting plans in the aero engine field seem to be locked in the heads of Professor Heinkel and Dr. Nallinger, neither of whom did I succeed in interviewing. I was told at the factory that the excellent machine tools (many of them fully automatic) at present used in the manufacture of engines for road vehicles, could be applied to the manufacture of piston engines, but not easily to gas turbines.

The firm that at present seems best placed to cover the greatly reduced engine requirements of the future German air force with minimum outlay is B.M.W., whose B.M.W. 003 was fitted in the closing stages of the war to the two- and four-engined Arado Ar234 reconnaissance bomber and the He162 Volksjäger.

This firm is particularly fortunate in that its Munich-Allach works—the only one of five former aero-engine production centres now situated in Western Germany—somehow escaped serious bombing. From 1945 till 1955 it was in fact kept in running order as an ordnance depot of the U.S. Army for the overhaul of tank and lorry engines, with the aid of some 7,000 B.M.W. employees. This forced B.M.W., in the interests of their car and motor cycle production, to rebuild and completely re-equip its other Munich works at Milbertshofen—which, as the former aero engine development centre, was 60 per cent destroyed and completely stripped by 14 nations.

Of the two former companies, respectively responsible under a joint board of directors for road vehicles and aero engines, the latter has since the war been a mere holding company. In December 1954, however, the nucleus of a new company, at present called a "study group," was revived under the leadership of Helmuth Sachse, technical director of the old company and previously head of the aero engine section of the former German air ministry.

Director Sachse told me that the Allach works has a total area of three million square feet, undamaged water and electrical installations, and an underground capacity for 227,000 gallons of fuel storage, with appropriate pumping equipment. Some 2,000 B.M.W. 801 double-row radial engines were produced there monthly during the war. Though a part was recently sold to

Herr Helmuth Sachse of B.M.W. and (right) Prof. Dr. Nallinger, technical director of Daimler Benz.





## GERMANY'S AVIATION INDUSTRY . . .

the M.A.N. machine company, there remain a workshop ground area, excluding galleries, of 439,000 sq ft, 600-700 machine tools of universal application, and no fewer than 56 engine test-beds—enough basic equipment to satisfy the entire gas-turbine needs of the new Luftwaffe for the foreseeable future. An additional advantage is that in Berlin-Spandau B.M.W. owns a subsidiary company which manufactures machine tools for the parent company (or companies) as well as the general market.

Of 2,500 specialist engineers formerly engaged in the development and production of B.M.W. piston, turbine and rocket engines, many have since the war been working in other countries, and some are likely to remain there. Many others, however, have returned, and these include all those who till a year ago worked under Russian contract. Herr Sachse has therefore considerable talent to draw on, and of his former top engine experts he has so far re-recruited 20. B.M.W. (and Germany) may well be ultimately grateful, first to the Americans for keeping the Allach works going, and secondly to the Russians and French for keeping German specialists abreast of modern developments.

The interest of the present "study group" is purely in gas turbines for locomotives, road vehicles and ships as well as for aeroplanes. Herr Sachse claims that by 1960 the physical and personnel resources of the revived company could develop the prototype of an aircraft gas turbine of their own design which would rival the creations of Britain and America. Unless, however, it were greatly superior to these it would never, of course, be ordered by NATO, which by that time will be reluctant to add to already standardized types. In other words, there would be no market. On the other hand, the repair and maintenance of gas turbines could start almost at once, and the licensed production of complete engines in a little over two years.

As to finance, Herr Sachse said that the recent statement in a British newspaper to the effect that for aero engine production Daimler-Benz had the capital but not the facilities and B.M.W. the facilities but not the capital, was a typical misunderstanding. As such engines will only be produced under contract to the German Ministry of Defence, there is no open competitive market, as with cars, and bank credits will be State-sponsored. B.M.W., says Sachse, are in a position to produce aero engines most economically because no initial financial outlay is needed for new workshops—a position said to be unique in the West German aviation industry.

**Finance and Politics.**—For the German aviation industry as a whole, finance is at present the main impediment. One problem is its still unresolved debts dating from the last war. While the Federal Government simply cancelled the RM.8000 million-odd owed by the Nazi state to the industry for war-time deliveries, the bank credits issued to finance this production are still standing, and amount to about RM.500 million. Though this represents only DM.50 million (about £4½m) in present currency, the share of the pure aviation firms is much too heavy for them to repay in their present condition, and the position is further complicated by the fact that other firms like Daimler-Benz and B.M.W., with flourishing incomes from other sources, have already repaid theirs. So far as I am aware, this problem has not yet been seriously tackled.

The other problem, of course, is the investment needed for rebuilding and re-tooling. Though much of this is expected ultimately to come from non-governmental sources, some initial help from the state is necessary. Here the aviation industry suffers from the lateness of its revival, at a time when other industries, having consumed most of the available capital, are already paying their way.

In fact the demands of the industry's Association are not excessive. No "lost subsidies" are asked for: only a state "guarantee," an interest rate more favourable than the present 7½ per cent usual on German loans, and a scheme of tax relief such as that already granted to the shipping industry with startling results.

Despite the relative modesty of these claims, and of the aviation programme, Dr. Rothe complained recently that the problem was passed from one ministry to the other, and that no one could be found to take the responsibility for a decision. Whereas a cabinet minister, Herr Strauss, has been appointed to look after nuclear development in Germany, and funds for this work have been allocated, the aviation industry—equally important, according to its spokesman, for the technical development of industry as a whole—seems to have escaped all mention in the last federal budget. Herr Blank's reported statement that the reconstruction of the whole aviation industry would be paid for out of the ordinary budget funds of his own Defence Ministry seems hardly convincing. Anyway, until the government makes up its mind, and the contracts already signed with foreign companies have been made effective by orders from the Defence Ministry, the starting date (expected when the programme was drawn up to be mid-November last) becomes ever further postponed.

It may be that the Federal Government is not yet convinced



An architect's model of the B.M.W. factory at Munich-Allach.

that an aviation industry is necessary. German production costs generally are not so low as is commonly supposed (in some cases they are higher than in Britain); and, despite the sacrifice of foreign exchange involved it might be cheaper, even in the long run, to buy aircraft from abroad. There is also the abiding hope that America may supply them as presents in the interests of European defence. In this connection it is not known (by me, at any rate) under what terms the Luftwaffe is shortly getting certain American fighters, nor how these affect the Hawker Hunters that for at least a year have been billed as part of the "off-shore" programme for Germany. What is known is the activity of the American Advisory Group in Coblenz in pressing American products.

Another factor is Dr. Adenauer's policy of close political co-operation with France. I have been told that while in France last June he accepted (to the disgust of his "air ministry") at least 50 Morane Alcione three-seater trainers. These may already have been delivered. On December 30th *Flight* published a note on French proposals for a close Continental association of European producers, which, so it was feared, would result in the German aviation industry being dominated and virtually deprived of orders. These proposals were discussed not long ago at Brussels, apparently with no opposition from the representative of the German Foreign Office, who did not even inform the German aviation industry about them.

Germany, unlike Britain and America, is already a member of the Association Internationale des Constructeurs de Matériel Aéronautique (A.I.C.M.A.), and it is feared that the proposed new association would still further restrict Germany's freedom to deal with Britain. Absence of such dealings is very much regretted by the German aviation industry. One spokesman told me he suspected that the Hunter would be replaced by the French Mystère; another that the Luftwaffe would prefer the Percival Jet Provost to the Fouga Magister as a jet trainer. He also quoted the Luftwaffe's chief planner, Col. Panitzki, as having said he would like 500 Folland Gnats for local defence. The spokesman added that he was more likely to get a French or Italian equivalent.

Whether from doubts of Germany's political stability or of her industrial or economic capability, or from fears of trade union trouble at home, the British aviation industry seems to have done little to farm out work under contract, or even to sell its products. I was told that the price quoted for an Auster was DM.40,000 (about £3,400), whereas an aircraft of similar specification could be produced in Germany for DM.15,000 (£1,280).

The British attitude may help delay the resurrection of the German aviation industry, but will hardly prevent it. Its momentum, chiefly psychological though it may be at the moment, is probably now too great. More planning is going on than appears on the surface; the machine-tool, light-metal and electrical industries are in good order; research institutes, particularly at Stuttgart and Aachen (the latter again sponsored by State Secretary Brandt, a former radar expert who wants to keep German aviation under democratic control) have been founded or revived; and German scientists and engineers who have been helping other countries' aviation industries since the war, are now anxious to help their own.

It is my own view that, failing support from its own government or the West, the German aviation industry may look east. Already at least one right-wing political party has championed trade in this direction, and already one of two German experts of world fame, at present employed behind the Iron Curtain, have visited West German firms with a view to co-operation.

# CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

## The Edgar Percival P.9

IN response to the numerous personal letters I have received, as well as those appearing in *Flight* of January 20th, praising my enterprise in producing my most recent design, the P.9, I am prompted to express my thanks. This whole undertaking required considerable research on my part and much travelling to ensure I was made aware of the exact requirements. It has also meant a large cash outlay—about £60,000, all of which I have provided personally, to back my judgment as to what was required and to produce a design best suited to meet the requirements.

The fact that all D.O. work was carried out and the aircraft built and flown in eighteen months is due in no small measure to the ability, enthusiasm and loyalty of the D.O. team (which by any standards would be considered numerically minute) and of the works team who so ably built the aircraft.

Although so recently announced, the P.9 has already created wide interest in overseas markets, indicating a new export business so essential for this country.

It is most encouraging to me to know I have the support and good wishes of so many. If we have built an aircraft that will measurably help in producing more food in a better manner, as well as providing a versatile transport vehicle for the "out-back," we shall find considerable reward in that thought alone.

London, W.1.

EDGAR PERCIVAL.

[The Percival P.9 (270 h.p. Lycoming) is a multi-purpose agricultural aircraft. A detailed description appeared in *Flight* of December 30th last.—Ed.]

## Flight Decks and Crew Complement

YOUR brief article and photographs under the heading "Flight Decks 1936-1956" (*Flight*, January 20th) does indeed show up the fact of the vastly increased complexity of the modern airliner compared with its counterpart of twenty years ago. Add to this the equally vast increase in the amount of air traffic today, with the attendant congestion, airways routings and the inherently increased necessity to keep a constant look-out, and it follows that the work-load on the pilots has gone up in proportion. Yet—incredible as it may seem—the operators are doing their utmost to reduce the crew complement on the flight deck, thereby still further increasing the strain on the pilots and so reducing the margin of safety.

Modern methods have considerably simplified navigation and the advent of long-range R/T. will soon render the specialist W/T. operator unnecessary. This, however, is surely no excuse for pushing the navigation and/or the in-flight communications onto the two pilots—who in many cases are already carrying out the duties of the flight engineer in addition to their own.

"Safety First—and Always" must be the motto of the Merchant Air Service, and a reduction in the flight-deck crew under present day conditions just is not compatible with this motto.

London, W.1.

SENIOR CAPTAIN.

## Australia's Historic Aircraft

I AM sure you will agree that half-truths can be far more misleading than entirely incorrect statements. In *Flight* of December 30th you refer, in commenting upon the death of Sir Keith Smith, to a report from Australia saying that he died an embittered man because his Vickers Vimy had been removed from the National Museum in Canberra.

I doubt very much whether Keith Smith did die embittered for this reason. However, if he did, he had either forgotten or ignored what he was told when the Vimy was first placed in the museum in which it was located in Canberra.

In the first place, Australia has no "national museum," either in Canberra or elsewhere, each State having its own state museum (Hinkler's Avian is hanging from the ceiling in the Brisbane Museum). The museum in which the Smith Vickers Vimy was temporarily placed was the National War Museum (I emphasize the word "war"). The Vickers Vimy used by the Smiths had, at one time, been used in the war—it was a war disposals job—but its fame was not earned in war, but in peace. Similarly, MacIntosh and Parer's Sopwith (?) was also in the National War Museum, temporarily, its antecedents and fame being on the same level as the Vimy.

When these were placed in the museum many years ago, the Smiths, MacIntosh and Parer were told by Dr. C. N. Bean (chairman of the Australian War Memorial Trust) that the aircraft did not come within the description of war exhibits, but would be

kept in the museum for the time being subject to subsequent removal. These terms were apparently acceptable at the time. Subsequently Kingsford Smith's tri-motor Fokker *Southern Cross* was given to the Government, but has never been removed from its hangar at Mascot Airport.

Room in the aeroplane hall at the National War Museum is at a premium as, in fact, is room in the whole War Museum, and the Trustees recently decided to remove some First World War relics to make room for a selection from the Second World War and Korea. Real war relics have had to go into store, and quite naturally the Vimy and the Sopwith have been removed—incidentally, to make room for Lancaster "G for George" with 59 missions and two world cruises to its record.

The report is still haywire in the reference to the Vimy lying in pieces in an R.A.A.F. hangar. This hangar, at the R.A.A.F. Fairbairn Station at Canberra Airport, is the official National War Memorial Annex, and has been opened specifically to guard and preserve the thousand-and-one valuable, but bulky, war relics which, because of building limitations, cannot yet be housed in their permanent home.

Sentimentalists need have no worries about the care these relics will receive. Dr. Bean is still chairman of the Trust, leading Naval, Army and Air Force officers are trustees, whilst the Director of the Australian National War Memorial (of which the museum is an integral part) is Major J. J. McGrath, M.C.—a man with a very real realization of his responsibilities.

If, on final assessment, the Vickers Vimy is regarded as a fitting war museum exhibit, it will go back on show, unimpaired. If not, it will be carefully looked after until the Commonwealth Government decides as to where it shall be housed—as will the other "Smithy's" *Southern Cross*.

With its tradition in the making, Australia will not be careless of its relics.

Sutton Coldfield, Warwickshire.

H. N. WALKER.

## Confusing Terminology

I AGREE with Mr. Geoffrey Dorman in what he says in *Flight* of January 6th under the heading "When is a Jet not a Jet?" The same kind of confusion occurs in the term "atom bomber." Sometimes it means a bomber built to carry atomic bombs; at others it stands for a nuclear-powered bomber. Such things are misleading and it would be worthwhile for people who use these terms to arrive at a decision.

Boskoop, Holland.

HUGO HOOFTMAN.

## A Squadron Motto Translated

WITH reference to your article on page 676 of *Flight* for October 28th, 1955, describing No. 100 Squadron, I am afraid your Malay translator had neither version correct. The four words of the squadron motto form a special type of Malay sentence called a "pantun," the approximate English word for which is "proverb." In these "pantuns" the verb has a special passive force. Additionally, the word *jangan* in the middle position is not a "command" but an "exhortation."

The meaning of the phrase "*Sarang tebuhan jangan dijolak*" is as follows: *Sarang*, the nest; *tebuhan*, of the hornets; *jangan*, don't let anyone; *dijolak*, literally "poke with a stick."

In English phraseology this pantun could be rendered: "Don't let anyone attack the hornet's nest."

Singapore, Malaya.

F. J. H. ADCOCK, P/O.

## The First Air V.C.

WITH reference to the brief history of No. 201 Squadron published in *Flight* of December 30th: Among the squadron records handed over to Guernsey via a London flying-boat on May 26th, 1939, the most interesting was a battle report by Sub-Lt. Warneford, describing the shooting-down of a Zeppelin on June 7th, 1915, and a telegram from H.M. King George V, dated June 8th, 1915, awarding him the Victoria Cross. Was this the first air V.C.?

Little Marlow, Bucks.

C. H. CAHILL

(Commanding 201 Sqn., 1939-1940).

[The first was 2nd-Lt. W. B. Rhodes-Moorhouse, of No. 2 Sqn., R.F.C., who made a low-altitude bombing attack on a heavy concentration of enemy troops at Courtrai in the second battle of Ypres. Mortally wounded by rifle fire, he flew his B.E. over 30 miles of enemy territory and then on to Air H.Q. in order to make his report. This was on April 26th, 1915, and the award was gazetted on May 22nd, 1915.—Ed.]



# THE INDUSTRY

## Mr. H. T. Sayer Retires

THE retirement is announced of Mr. H. T. Sayer, engineer-in-charge of the Croydon establishment of Marconi's aeronautical division.

Mr. Sayer has completed over 40 years' service with the company, 32 years of which have been spent more or less continuously with the aeronautical division, mainly at Croydon. He will long be remembered as chief instructor at the company's radio school at Croydon, where he was known as "The Colonel." Mr. Sayer first came into air radio during the First World War, when he served with the R.N.A.S. and the R.A.F. He went to Croydon Airport during the 1920s, and eventually became engineer-in-charge of the Marconi aircraft radio servicing organization there. During the Second World War he renewed his association with the Royal Navy, this time as an instructor at the Admiralty Signals Establishment. On the reconstitution of Marconi's Croydon establishment, he again became engineer-in-charge. He will be succeeded by Mr. W. L. Munday.

## Heating a Helicopter Hangar

THE helicopter hangar on the deck of the *Oluf Sven*—the vessel being used for Hunting Aerosurvey's expedition to Graham Land—is heated by a Hursel 1½kW flame-proof oil-filled radiator. The hangar is a fabric structure, and a flame-proof source of heating is essential by reason of the presence of aircraft fuel. An additional feature of the Hursel radiator—the makers of which are Hursel, Ltd., 229 Regent Street, London, W.1—is that it is inherently frost-proof, so that there is no danger of its freezing when not in use.

## Lightweight-hose Fittings

FOLLOWING the introduction last year of their lightweight flexible hose, for the conveyance of oils, chemicals and other fluids, the Compoflex Co., Ltd., of 25 Grosvenor Gardens, London, S.W.1, have now introduced a range of aluminium-alloy couplings which are stated to be less than one-third the weight of comparable brass fittings.

During initial tests it was established that the particular alloy used for the couplings was comparable in strength with brass. There remained, however, the problem of obtaining a thread which would be able to stand up to rough usage, and which, if employed in conjunction with a fixed coupling of brass, would not cause bi-metallic action. The problem was solved with the co-operation of the Cross Manufacturing Co. (1938), Ltd., of Bath, Somerset. In the case of an outer coupling, the thread is of enlarged dimensions and a high-tensile steel wire helical spring—diamond-shaped in cross-section—is threaded in. The spring itself thus forms a standard-sized thread, and as it is of steel the risk of bi-metallic action is greatly reduced.



Cdr. P. W. Kent, R.N., chairman and managing director of George Kent, Ltd., presents the Sir Walter Kent Prize to apprentice J. C. Keeling at the firm's 34th annual prize-giving. Other principal prize-winners were: H. R. Ledger, Commander Kent Challenge Cup; E. L. Amiss, R. W. Bedford Challenge Cup; and W. Carrington, Grout Prize.



Appointed to the Board of Armstrong Siddeley Motors are Mr. R. J. Ashley (left), who joined the company in 1953 as general manager of their car and diesel engine division, and Mr. J. E. Attwood, who is also a director of Armstrong Siddeley (Brockworth), Ltd. Before joining A.S. Mr. Ashley was managing director of Skyways, Ltd., and Mr. Attwood was general manager of the Bristol engine division.

## British Tubing for America

IT happened recently that an American firm concerned with rocket-motor research and development could not obtain a type of flexible piping suitable for a particularly stringent requirement. As the project in hand was one of great urgency, the assistance of British industry was sought, and a well-known firm of thermo-plastics designers and manufacturers, Creators, Ltd., of Woking, Surrey, were able to produce the material required in a matter of hours and ship it by air to the States.

The requirement was for an extremely flexible type of piping which would be resistant to most types of corrosive acids and which could be twisted and bent without reducing the internal bore. Creators, Ltd., manufacture a special type of p.v.c.-covered steel-spring tubing; so, after an exchange of priority cables, quantities of ¾-in-bore Armourvin, as the tubing is called, were on their way to the United States.

## IN BRIEF

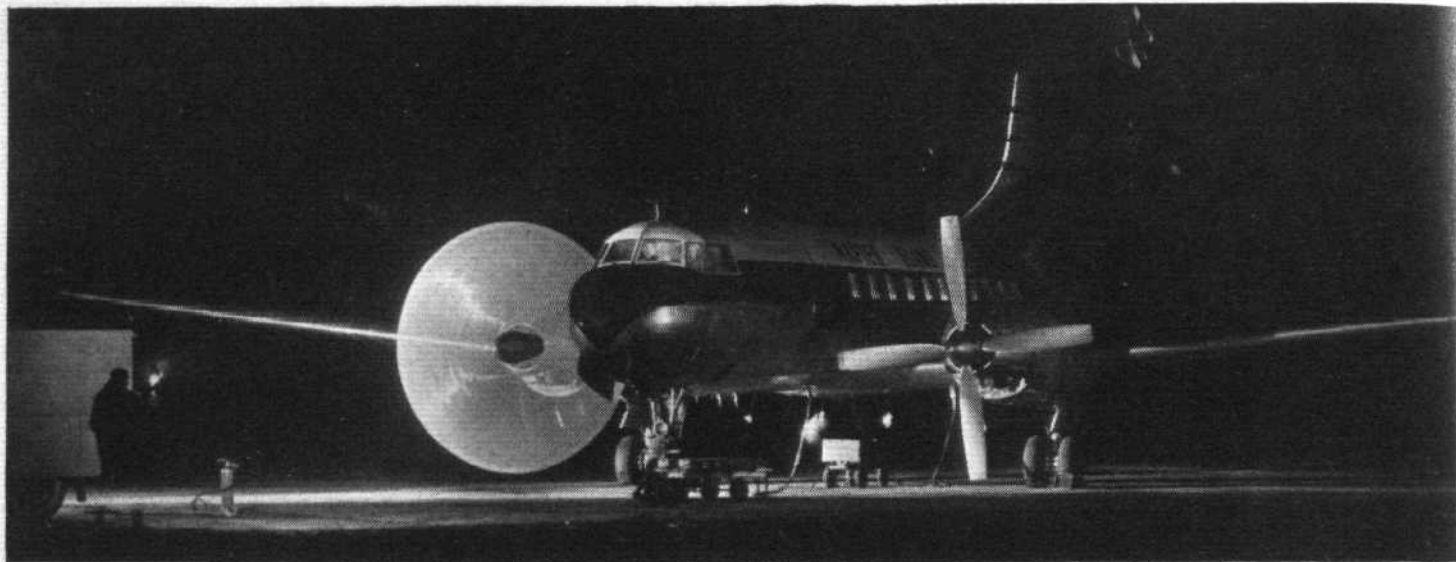
Blackburn and General Aircraft, Ltd., have produced a brochure telling, in numerous impressive pictures, the story of the Fahud airlift last November, in which a Blackburn Universal moved 129 long tons of oil well equipment in nine flights over a 365-mile route in south-east Arabia.

Avica Equipment, Ltd., Mark Road, Hemel Hempstead, Herts, have published an illustrated brochure giving technical data on their Mk 1 series of high-pressure swivel pipe-couplings (described in *Flight* of June 17th, 1955). The publication is chiefly intended to help designers and engineers contemplating the use of this type of coupling, with rigid piping systems, in place of conventional flexible piping.

Maj. J. Vivian Holman, A.F.R.Ae.S., M.I.Ae.S., F.Inst.D., has recently been appointed aeronautical consultant to the General Fire Appliance Co., Ltd., of New Addington, Surrey. Since he served in the R.F.C. and R.A.F. during World War I, and again in the R.A.F. from 1922-27, Maj. Holman has held executive posts in a number of prominent firms in the industry, and at various periods he had experience as a flying instructor and as a test pilot.

A new range of mobile air compressors working on the Hydrovane principle has been introduced by the Hymatic Engineering Co., Ltd., Redditch, Worcs, to replace their existing range of reciprocating-type sets. Providing displacements of up to 40 cu ft/min at working pressures up to 100 lb/sq in, the new models are powered by four-stroke petrol engines or electric motors. The only moving parts of the Hydrovane compressor are a slotted rotor with sliding vanes running in an oil bath; wear is therefore negligible and the air is delivered smoothly.

J. A. Prestwich Industries, Ltd., announce that Mr. W. R. Bishop has joined their Board. Since 1953 he has been sales manager to J.A.P., following three years as group sales manager of Sheepbridge Engineering, Ltd. During that period (1950-1953) the Sheepbridge Group expanded to embrace 14 companies dealing with light and heavy engineering. Mr. Bishop's post-war career includes the appointments of sales manager to Wellworthy Piston Rings, Ltd., and a similar executive rank with J. Stone and Co. (Charlton) Ltd.



Spotlight on the Eland: the starboard D.H. airscrew makes a bright disc in the night as pre-flight work proceeds on Napier's Convair 340 demonstrator. To be known as the Napier Eland Airliner, the aircraft is discussed on pages 136-7.

## CIVIL AVIATION

### ANOTHER SILVER CITY FERRY

**S**EVEN-YEAR approval of their application to run a ferry service between Southampton and Guernsey is announced by Silver City Airways. Daily services between Eastleigh (Southampton) and La Villaize Airports will begin on February 27th. Bristol 170s will cover the 120-mile route in 50 min.

"The main object of the ferry," Silver City state, "is to deliver perishable food, cars and manufactured goods to the island of Guernsey and to airlift cut flowers and market-garden produce back to the mainland . . . The services can also carry tourists' vehicles and up to six passengers a day. An application for an easing of the passenger restriction is under consideration by the Ministry of Transport and Civil Aviation."

### FRIENDSHIP ORDERS REPORTED

**A** CORRESPONDENT in the Hague reports that the Netherlands Government will order a Fokker Friendship as a personal transport for Queen Juliana and Prince Bernhard. It will replace the Royal Family's DC-3, which is frequently piloted by the Prince himself.

According to the same source, the first six Friendships from the Fairchild production line may be bought by West Coast Airlines of Seattle. The president of the airline, which operates a fleet of 14 DC-3s, visited Amsterdam recently to fly the prototype Friendship. A report from New York last week said that Mackey Airlines of Florida had ordered two Friendships with an option on a further two. September 1957 has been quoted as the first delivery date for Fairchild-built Friendships.

(Right) Carrying H.M. the Queen and the Duke of Edinburgh, the B.O.A.C. Argonaut "Atalanta" left London Airport for Lagos last Friday. Pictured here are the crews who will operate the two stages of the Royal flight, with their commanders—Capt. Parker and Ballantine (right)—at the foot of the steps.

(Below) The seventh of the fleet of eight D.H. Herons now delivered to West African Airways Corporation. Vikings and a Heron of the Queen's Flight are providing Royal transport during the Nigerian tour, but W.A.A.C. are responsible for ground handling, and the Corporation's chief pilot, Capt. Greenacre, has been appointed advisory commander to the Queen's Flight.



### BRITANNIAS BY NUMBERS

**C**HANGES in Britannia designations are announced by the Bristol Aeroplane Co. As previously reported, the new series-numbers 310 and 250 respectively have been allocated to the aircraft previously designated 300 L.R. and 250 L.R., though the designations Britannia 100 and 300 are retained.

In addition, "variant numbers" have been given to aircraft ordered for particular operators, as follows:—

Britannia Series	Operator	Variant No.
100	B.O.A.C.	102
310	B.O.A.C.	312
310	EI Al	313
310	C.P.A.L.	314
250	M.o.S. (Transport Cmd.)	253
250	M.o.S. (trooping)	252

### CORPORATION NOMENCLATURE

**I**T is learned that, as in the case of the Comet 1s, B.O.A.C. have decided not to name individual aircraft of the Britannia fleet. Though no definite decision has yet been reached on the DC-7Cs, it is likely that they too will not carry a name, but the fleet will be known as the Seven Seas fleet. In contrast, B.E.A. have already decided in broad principle the names of their future aircraft. The additional Viscounts that they have on order will remain in the "Discovery"-class, the 802s being named after explorers and the 806s after discoverers, such as Sir Alexander Fleming, Guglielmo Marconi, etc. (these names have not necessarily been chosen, but are quoted as examples). The Vanguards will carry the names of ships of the Royal Navy of Nelson's time.





CIVIL  
AVIATION . . .

Indicative of the tempo of current Viscount production is this view of No. 2 line in the Vickers-Armstrongs factory at Hurn. The line is headed by the first of three Viscounts for L.A.V., followed by aircraft for Misrair, T.C.A. and C.A.A. No. 1 line is entirely occupied with production for Capital Airlines, who have ordered 60. Nine of Capital's Viscounts have been delivered to date.



## THREE MEN IN A BRITANNIA

A MINIMUM crew of three (two pilots and an engineer) is required by the A.R.B. for operation of the Bristol Britannia 100 flight deck—not two, as stated in a caption on page 75 of *Flight* for January 20th. The reference to two-crew operation originally appeared in the manufacturers' brochures and advertisements, which have now been amended accordingly.

## EUROPEAN AIRLINES' SUMMER PLANS

THE European airlines' "summer"—the period in which peak frequencies are effective—will begin this year on April 22nd and end on October 6th. This was decided in Paris recently at

the annual summer-timetables meeting of I.A.T.A. airlines.

During the summer season I.A.T.A. members operating European routes will offer 20 per cent more seats than in 1955, when the corresponding increase over 1954 capacity was 14 per cent. Cities newly added to the European network this year will include Ankara, Bergen, Bardufoss, Ostend and Venice.

On February 1st, a new cargo tariff came into effect on European routes. Actual charges are unchanged, but the system of commodity rates has been simplified to facilitate air-freight selling and to bring European tariffs into line with those recently adopted for the North Atlantic route. The number of commodity descriptions has been reduced from 374 to 176 and the number of rates from 3,014 to 1,840.

## BREVITIES

A KARACHI report suggests that Pakistan Airlines may be among future purchasers of Viscounts. The airline's management has concluded its studies on the question of replacing Conquairs and DC-3s, and a decision from the board is expected within the next few weeks.

Approach-radar equipment at eight major United States airports is being modified to give a better picture of aircraft during rain and snow storms. The modification involves the introduction of omni-directional, or "circular", polarization instead of the conventional vertical and horizontal polarization.

There are approximately 99,000 registered civil aircraft in the United States, according to the Aircraft Owners and Pilots Association. The current British civil register lists 1,774 aircraft, of which 1,264 have certificates of airworthiness.

Despite a 3 per cent drop in aircraft movements, the Paris airports of Orly and Le Bourget handled 10 per cent more passengers last year than in 1954. Combined 1955 traffic results for the two airports were 84,000 movements, 1,925,000 passengers, 30,740 tons of freight and 9,120 tons of mail. Orly had the larger share of Paris air traffic, including 58 per cent of movements and 72 per cent of passengers.

The seventh Viscount for T.A.A., VH-TVG, began its delivery flight to Melbourne on January 23rd. Flown by a T.A.A. ferry crew under the command of Capt. R. N. Hirst, the Viscount carried 12 ground engineers recruited in Britain for the airline's overhaul base at Essendon. Latest reports from Australia, incidentally, indicate that the passenger load factor on T.A.A.'s Viscounts is being maintained—more than a year after their introduction to regular service—at the unprecedented figure of 86.4 per cent.

The frequency of the Canadian Pacific Airlines trans-polar service will be increased from weekly to twice weekly on April 1st. Westbound flights will now terminate at Auckland and Sydney alternately instead of serving both cities. The new schedules provide for departures from Amsterdam on Monday and Saturday. The Monday service reaches Auckland the following Friday, turning round on the same day to reach Amsterdam on the Monday. The Saturday flight from Amsterdam arrives at Sydney on the Wednesday and begins its return journey on the same day, reaching Amsterdam by Saturday. Some 60 per cent of westbound passenger traffic, incidentally, is reported to originate in the U.K.

Rear Admiral Louis de Florez, U.S.N.R., has been appointed president of the Flight Safety Foundation in succession to Admiral John Towers, who died last April. Admiral Florez learnt to fly in 1912 and served with the U.S. Navy in both world wars.

It is reported from Johannesburg that South African Airways plan to introduce their three new DC-7Bs due for delivery shortly on April 1st. From that date, it is expected, the airline's four Constellations will probably be transferred to inland routes.

Bristow Helicopters, Ltd., have been named as the company interested in the operation of a helicopter service between Hull and Grimsby. The company is reported to have approached large firms in the area with a view to the formation of a helicopter charter syndicate whose members would undertake to buy a given number of flying hours per annum.

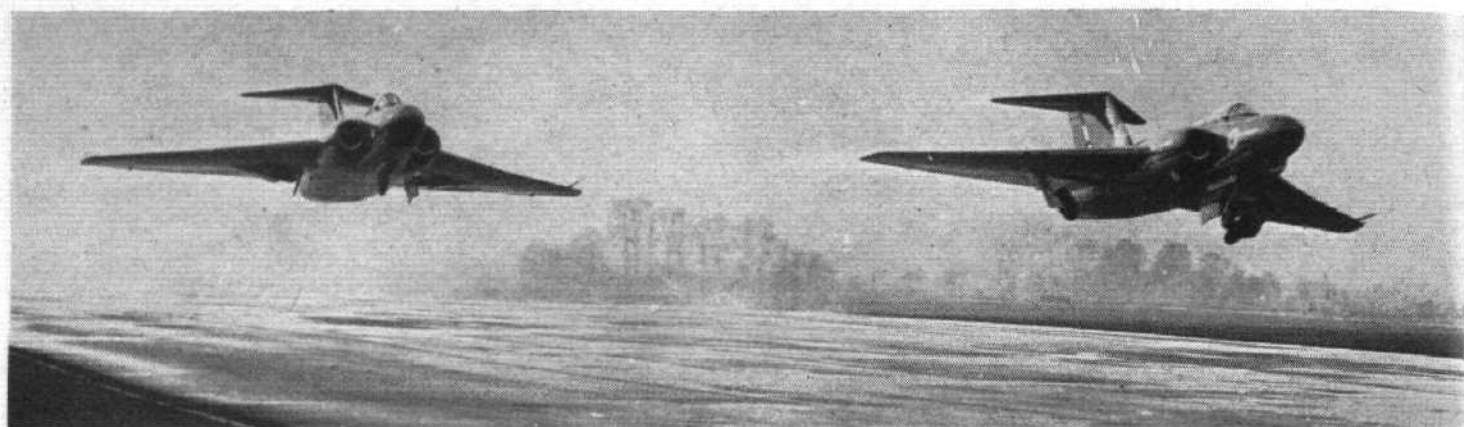
America is to finance and staff a comprehensive survey of the Philippines' transport needs—land, sea and air. The survey, costing £53,000, will be performed by a seven-man team from the Stanford Research Institute of California.

The C.A.B. has approved B.O.A.C.'s application to operate services between Detroit and San Francisco and London via New York and between New York and Nassau. Both applications now await final presidential approval.

Moscow radio reported last week that Aeroflot plan to introduce large jet transports in 1960. According to the January issue of *Interavia*, Lt. Gen. Zakharov, deputy director general of the Soviet airline, has claimed that two jet types would be introduced in 1956—a 70-ton, twin-engined 50-seater, and a 100-ton, four-jet airliner carrying 70 passengers.

Recent improvements to Schiphol, Amsterdam, bring the airport into the I.C.A.O. A.1 category. They include a 2,460ft extension to runway 19/01, increasing its total length to 8,340ft. This runway has also been provided with precision approach radar, instrument landing system and cross-bar approach lighting.

Mr. V. Christensen, U.K. general manager of S.A.S., has been re-elected chairman of the Foreign Airlines Association of Great Britain, which is representative of 29 major airlines and will be celebrating its tenth anniversary this year. Also re-elected were Mr. W. Whelan (Aer Lingus) as Hon. Secretary and Mr. W. E. Lachs (El Al) as Hon. Treasurer.



The first two Gloster Javelins to be delivered to the R.A.F. leaving their makers' airfield at Moreton Valence last week for a Service station. They were flown by S/L. P. Scott and F/L. P. W. R. Varley, two of the Service pilots seconded to Glosters for development flying.

## SERVICE AVIATION

*Royal Air Force and Fleet Air Arm News*

### Taking Over

ON Monday of last week 32 R.A.F. Sabres flew past over the combined headquarters at München-Gladbach to greet Air Marshal the Earl of Bandon as he made his first official entry into the headquarters building as commander of 2nd A.T.A.F. In his new post he succeeds Air Marshal Sir Harry Broadhurst.

On the same day Air Marshal G. E. Nicholletts arrived in Malta to take over from Air Marshal Sir Brian Reynolds the post of Deputy C-in-C. (Air) to the C-in-C. Allied Forces Mediterranean, Admiral Sir Guy Grantham.

### C.A.S.'s Record Flight

FLYING his own Canberra recently, Air Chief Marshal Sir Dermot Boyle, the new Chief of the Air Staff, set up a record time of 3 hr 40 min for the flight from Hong Kong to Kuala Lumpur, Malaya. Sir Dermot Boyle, who piloted a Canberra across the South Atlantic in 1952, is the first pilot to fly a twin-jet aircraft over this far-eastern route. He was making a familiarization tour of R.A.F. bases in the Far East.

### Naval Guided Weapons

LAST Friday the Guided Weapons Group was opened at H.M.S. *Excellent*, the Navy's gunnery school at Whale Island, Portsmouth. The Group, which has the use of an office, lecture rooms and a cinema, has been formed in advance of the introduction of guided weapons into service in order to teach officers and men the operating techniques and technical capabilities of the new weapons.

### West Raynham's Loss

IT is with regret that we record the death, in a flying accident on January 15th, of W/C. R. B. Cole, D.F.C. and Bar, A.F.C. and Bar, and S/L. P. Needham, A.F.C. The following are extracts from a tribute to W/C. Cole by a brother officer:—

"The son of an Indian Army officer, Bruce Cole possessed the qualities of greatness. Courage and integrity were his, together with a burning sense of purpose.

"A young man in the early days of the last war, he fought with distinction in the desert campaign. . . . the fire and enthusiasm which inspired him in those early days never left him. Intolerant of inefficiency, he had a great gift of imparting knowledge. . . . he was held in the

highest regard and affection by seniors and juniors alike both in his own Service and in the United States Air Force, with whom he had recently served with unqualified success in an exchange posting. Since the war his leanings had been towards development and evaluation of flying, and by constant study and diligence he acquired a very wide experience . . . knowledge of the many problems surrounding the design, building and operation of high speed aircraft.

"A brilliant pilot with an analytical mind, he had the rare ability of not only being able to assess the measure of an aircraft as a fighting weapon by flying it, but also of being able to pass on to the scientist in his own language a scientific interpretation of the practical requirements. . . ."

S/L. Needham joined the R.A.F. in 1941 at the age of 17 and served with No. 256 Sqn. and in the Middle East. He was posted to West Raynham in 1954 as Squadron Leader Night Tactics. He was recognized as a brilliant pilot and an expert in his particular field. He leaves a wife and two children.

### Cyprus Air Base

WORK is continuing apace on the new R.A.F. base at Akrotiri, which is being built on a square, flat headland of rock jutting out from the southern extremity of the island of Cyprus. The married quarters, in the form of prefabricated bungalows laid out as a model village, are now complete; amenities to be constructed later include churches, cinemas, shops and sports fields. The main runway will be 3,000 yd long.

Cyprus is the only air staging-point between Malta and Singapore and Malta and Aden which is completely under British control. El Adem in Libya, Mafraq and Amman in Jordan, Habbaniya and Shaibah in Iraq and Abu Sueir in the Suez Canal Zone are occupied only under treaty arrangements.

### Australian Re-equipment

THIS year fighter squadrons of the R.A.A.F. will be re-equipped with Avon-Sabres. First to receive them will be No. 3 Sqn. of No. 78 Fighter Wing based at Williamstown, N.S.W.

The new aircraft will call for a variety of new equipment, including two Avon-Sabre flight simulators made by Redifon, Ltd., in England. The first of these will reach Williamstown during the next few months.

Another item of equipment is the new

radar control and reporting unit, the first of which has been completed near Sydney at a cost of about £A1m.

The R.A.A.F. is also receiving nine Canberra T.4 trainers, two of which have been bought directly from English Electric in England. They are to be based at Amberley, near Brisbane, with No. 82 Bomber Wing. Ferry crews to fly them to Australia have been provided by No. 6 Bomber Sqn. The remaining seven Canberra trainers will be produced in Australia as part of the total of 48 Canberras ordered from the Government Aircraft Factory at Fisherman's Bend, near Melbourne.

### Long-term Partnership

AT a recent ceremony at Weybridge Mr. G. R. Edwards, managing director of Vickers-Armstrongs (Aircraft) Ltd., presented to S/L. J. C. Ward, commander of No. 70 Sqn., a model of a Valetta to commemorate the fact that for 30 of the past 36 years the squadron has been equipped with Vickers aircraft. Between 1920 and 1945 No. 70 Sqn. had Vimys, Vernons, Victorias, Valentias and Wellingtons, and since 1950 it has had Valettas. In the interval between 1945 and 1950 it was equipped with Liberators, Lancasters and Dakotas.

### No. 219 Sqn. History

INFORMATION is being sought by F/L. P. Gilliatt, R.A.F. Driffild, Yorks, about the early years of No. 219 Squadron's existence from its formation in August 1918 until February 7th, 1920, when it was disbanded. F/L. Gilliatt is compiling a history of the squadron.

### R.A.A.F. Appointments

THE new S.A.S.O. at the H.Q. of the R.A.A.F.'s Home Command at Penrith, N.S.W., is to be A. Cdre. G. C. Hartnell, whose promotion to his present rank was recorded in *Flight* on January 20th. His place in the important post of Director of Air Staff Plans and Policy will be taken by G/C. W. N. Gibson. G/C. C. W. Pearce is to become Director of Training and will be succeeded as S.A.S.O. Training Command, Melbourne, by G/C. C. F. Read.

The three first-named officers were all with No. 10 Flying Boat Sqn. in Britain at the outbreak of World War 2, and G/C. Read commanded No. 77 Fighter Wing from 1944 to 1945.