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MIXED GRILL

SEE PAGE 22

1, Lockheed P-38 Lightning; 2, Norduyn UC-64 Norseman; 3, Avro Lancastrian; 4, Consolidated Catalina (PBY-5A); 5, Hawker Typhoon 1B; 6, Douglas SBD-5 Dauntlesses; 7, Boeing B-17F Fortress; 8, Focke-Wulf Fw 190 A4; 9, de Havilland Mosquito VI; 10, Curtiss C-46 Commando; 11, Consolidated Liberator VI (B-24J); 12, Grumman Avengers (TBF-1); 13, Bell P-63 Kingcobra; 14, Curtiss SB2C-3 Helldiver; 15, Republic Thunderbolt (P-47C); 16, Vought Corsair (F4U-1D); 17, Consolidated Vultee L-1 Vigilant; 18, Martin B-26C Marauder; 19, Martin Baltimore III; 20, Boeing C-97 Stratocruiser; 21, Messerschmitt Me 262; 22, Bristol Beaufighter; 23, Messerschmitt 210; 24, Focke Wulf Fw 190; 25, Hawker Hurricane IID; 26, Douglas C-47 Dakota; 27, Messerschmitt Me 110; 28, Supermarine Spitfire Vb; 29, Caproni Ca 313; 30, Boeing B-17G Fortress.

HORS D'OEUVRES

SEE PAGE 24

1, Avro Lancaster III; 2, Focke Wulf Fw 190; 3, Vought F4U-ID Corsair; 4, Illuchin Il-2; 5, Boeing B-17F Fortress; 6, Messerschmitt Me 110; 7, Douglas A-20J Havoc; 8, Curtiss AT-9 Jeep; 9, Hawker Tempest V; 10, Lockheed P-38J Lightning; 11, de Havilland Mosquito; 12, Miles Master III; 13, Bell P-59A Airacomet; 14, Republic P-47D Thunderbolt; 15, Supermarine Spitfire XIV; 16, Petlyakov PE-2; 17, Fairey Barracuda; 18, Taylorcraft Auster IV.

Published for the Proprietors, The Air League of the British Empire, Kinnaird House, 1 Pall Mall East, London, S.W.1, by the Rolls House Publishing Co., Ltd., Rolls House, Breams Buildings, London, E.C.4, and printed by the Stanhope Press Ltd., Rochester, Kent.

AIR TRAINING CORPS GAZETTE

Vol. V No. 4 APR. 1945. 6d.

SUNDERLAND III, viewed from the front turret.

AIR Training Corps GAZETTE

PUBLISHED FOR THE AIR LEAGUE OF THE BRITISH EMPIRE, 1 PALL MALL EAST, S.W.1 (TELEPHONE ABBEY 5041)
BY THE ROLLS HOUSE PUBLISHING CO. LTD.

VOL. V NO. 4 | Edited by Leonard Taylor | APRIL 1945

Annual Training Camps Again

APRIL brings us once more to our annual training camps with our two parent Services, the R.A.F. and Fleet Air Arm, the high light and culmination of a year's hard work in class-room, workshop and in the field.

This year I hope it will be possible, now that security restrictions on so many operational airfields have been relaxed, for an even greater number of cadets to get their week at "camp." Indeed, 100 per cent attendance should be our aim, for nothing in the whole year's activities can take the place of this close and living association with the practical day-to-day work of the Royal Air Force and Royal Naval Air Stations. No cadet, or officer either, can regard himself as fully proficient without this experience.

There are two points about this year's annual training which I would like to mention. School units are helping the rest of the Corps by arranging, as far as possible, for their annual training during the Easter holidays, and I hope that any units which can take advantage of the Whitsun break will do the same, so as to leave R.A.F. stations free to take cadets who cannot get away at those times. Secondly, as far as possible I want those units which can manage to do so to fix their annual training outside of the harvest period, that is, the end of August and September. For there is going to be a call for volunteers to get in the food crops again this year.

There is just one final point. Remember that you—each cadet and each officer—are a representative of a great Corps, visiting the great fighting Services, and taken into comradeship as a fully fledged member of those Services. This is an honour not lightly bestowed. Be ever worthy of it.

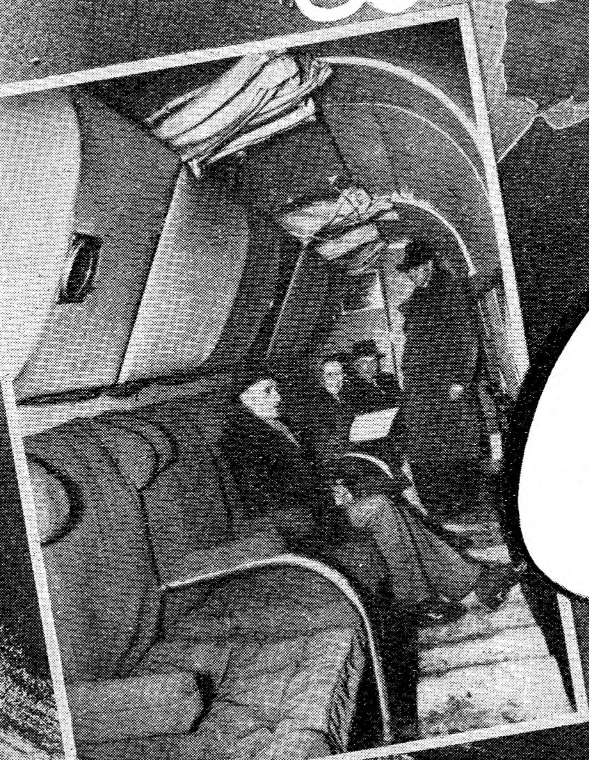
E. L. GOSSAGE, *Air Marshal,*

Chief Commandant and Director General, Air Training Corps.

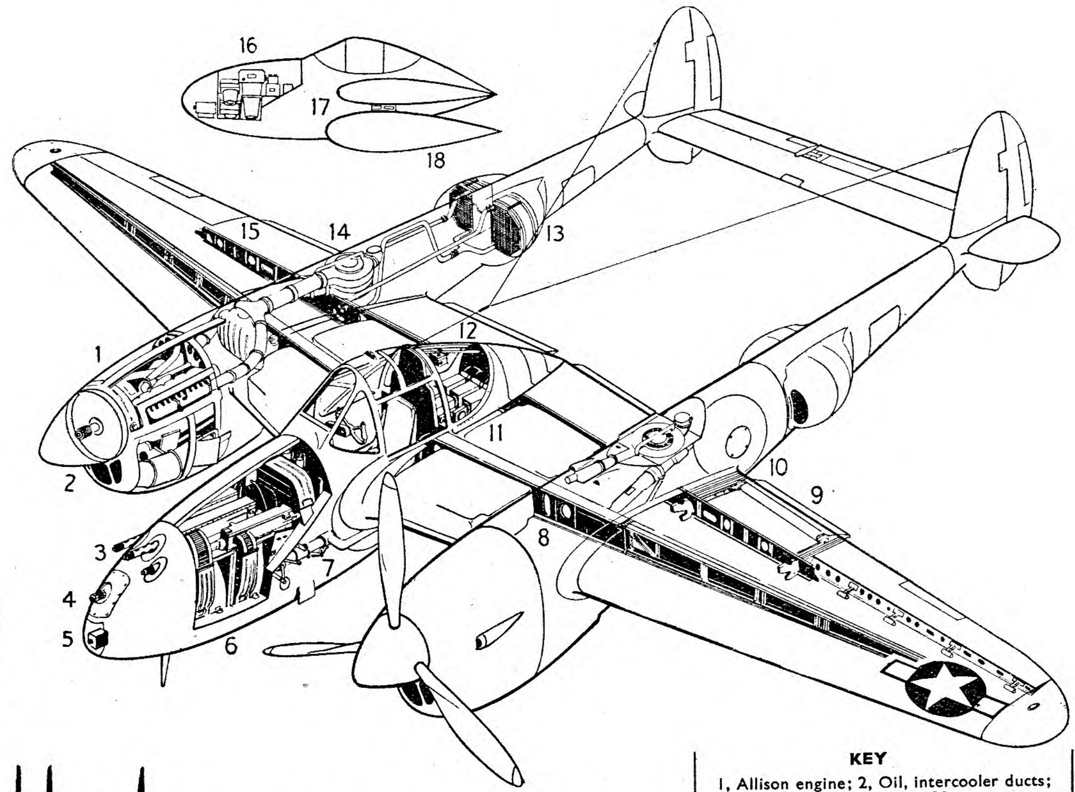
A Week-end to Remember

FOOTBALL	RALLY	BOXING
Saturday, 12th May, 3 p.m.	**Sunday, 13th May**	**Monday, 14th May, 7 p.m.**
First A.T.C. International Soccer Match to be held in England **ENGLAND v. SCOTLAND** A.T.C. A.T.C. at Tottenham Hotspurs Ground	**GREAT NATIONAL PARADE** in London preceded by Church Service. Cadets from every unit in the country will be present	**BOXING CHAMPIONSHIPS** Royal Albert Hall
Admission by turnstile only. Usual prices. No tickets.	*Further particulars will be announced later*	*Tickets, 1/6 to £1 1s., from the A.T.C. Sports Board, Air Ministry (A.C.T.2) Kingsway, London, W.C.2*

Lancastrian



The Avro Lancastrian should not be regarded as an air liner. It is merely a converted bomber, inconvenient to load, not very comfortable for the passengers, but convenient in the sense that it can get them quickly to their destinations, which is a necessity in war time. The top speed with full supercharge at 12,000 feet is 310 m.p.h., the cruising speed with full supercharge at 17,500 feet and running at maximum weak mixture is 285 m.p.h. Its total payload is 3,597 lbs., which can be increased for short ranges. The range at the most economical speed (200 m.p.h.—average fuel consumption 152 gallons per hour) is 4150 miles.



KEY

1, Allison engine; 2, Oil, intercooler ducts; 3, Four .50 cal. guns; 4, One 20 mm. cannon; 5, Gun camera; 6, Armament compartment; 7, Nose landing gear; 8, Main beam; 9, Flaps; 10, Main landing gear; 11, Fuel tanks; 12, Two-way radio; 13, Coolant radiator; 14, Supercharger system; 15, Rear shear beam; 16, Camera nose F-5 model; 17, Bomb shackle; 18, Drop tank.

Lockheed · P · 38

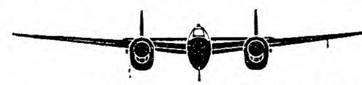
by **Maurice F. Allward**

WHEN work began on the XP-38—the 38th American Experimental Pursuit aeroplane—in 1937, it was the first military aeroplane ever attempted by the Lockheed Aircraft Corporation.

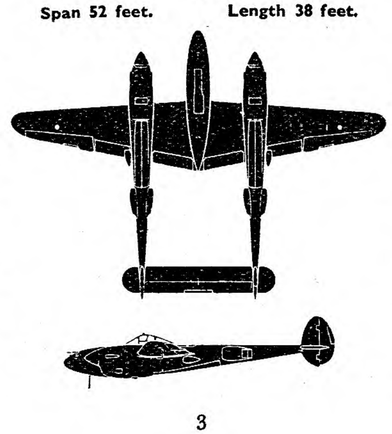
With Japan regarded as America's main potential enemy, one of the chief requirements for a fighter was that it should have a long range for operation over the vast expanses of the Pacific Ocean. Twin engines were decided upon almost from the beginning partly because there was no single engine available that was powerful enough, and partly because of the moral effect of an extra engine. That this was a most wise decision has been proved many times when Lightnings have returned to base on one engine, and has resulted in the nickname of "Round-trip Ticket," or, as the Japanese put it, "Two airplanes, one pilot," their reason being that damaging one engine is not enough, and that to shoot a Lightning down "both fuselages" must be destroyed.

Every design feature of the aeroplane, as in most successful aircraft, was originated by necessity. The distinguishing twin tail-booms, for example, were not selected because they would be different. They evolved as the logical development of engine nacelles made long to house the oil-coolers, turbo-superchargers, radiators and undercarriage. This great length made it logical to extend them into booms to carry the tail control surfaces. This unorthodox layout was a production man's headache in the early stages, and it has been said that no aeroplane ever presented a greater number of difficult engineering and manufacturing problems. These were overcome only after months of hard work, bitter disappointments and constant change to make even the smallest detail exactly right. The quality of an aircraft as a whole depends largely upon the quality of its detail design, and Lockheeds were taking no chances with the XP-38.

One serious problem was the mounting of the powerful turbo-superchargers. The great heat developed made the use of light alloy impracticable, and the use of stainless steel was dictated. This necessitated a great deal of research work on the part of the manufacturing departments concerned.



Span 52 feet. Length 38 feet.



Structural Details

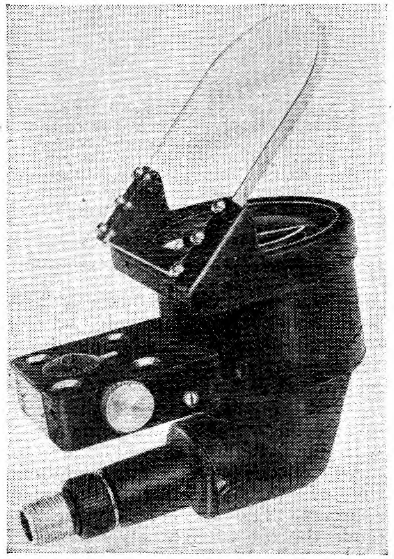
For erection purposes the airframe is constructed in four major units.

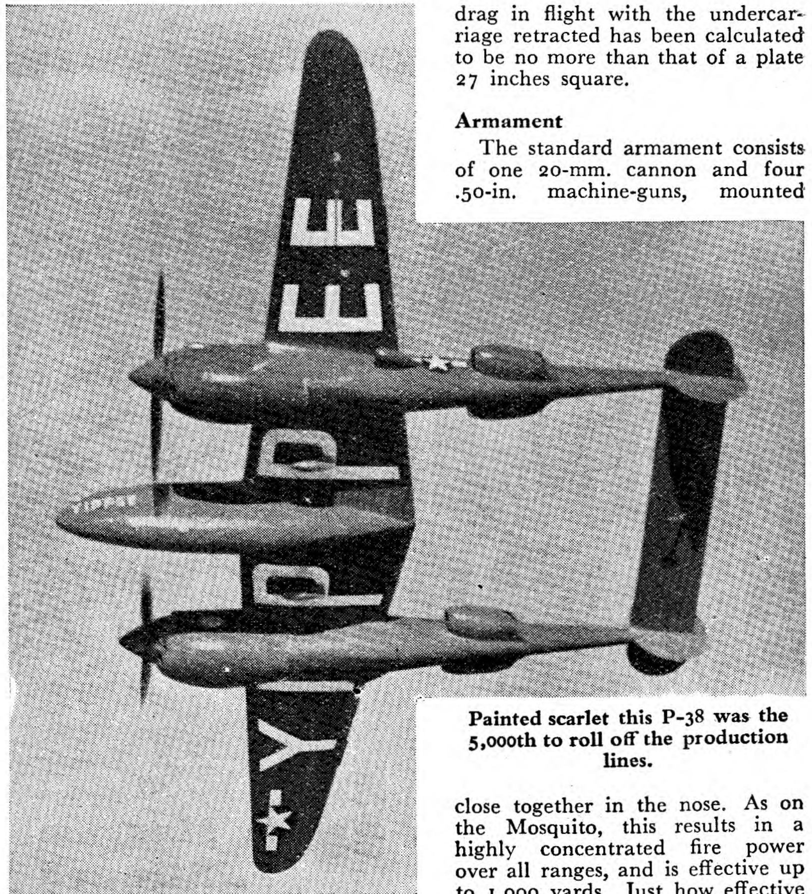
The body group: this comprises the central nacelle, the centre section of the wings and the forward portion of the booms. The whole unit is considered irreparable, and in the event of damage must be renewed completely. The central nacelle is of semi-monocoque construction, and is divided into an upper and lower compartment. The upper portion houses the armament, the pilot and the radio equipment. The lower portion contains the nose landing gear, a special compartment for spent cartridge cases and ejected links, the hydraulic plumbing, fuel cocks, valves and filters, booster pumps and so on, together with a formidable array of engine and control-surface cables.

The aft booms: these are of semi-monocoque construction, and house in their forward ends the engine coolant Prestone radiators with their air scoops attached to the outside of the booms themselves. The left boom includes a battery compartment, and balancing it in the right boom is a luggage compartment.

The remaining major units are the outer wings. Much of the credit for the robustness of the Lightning is due to these unique ribless wings, which incorporate a double-skinned stressed-skin surface. Flying loads are shared by the spars and skin, and damage to either one of them will not cause failure of the wing. Special attention has been paid to the replacement of damaged parts, and a crumpled wing may be renewed reasonably quickly.

The Lynn gunsight fitted to the P-38.

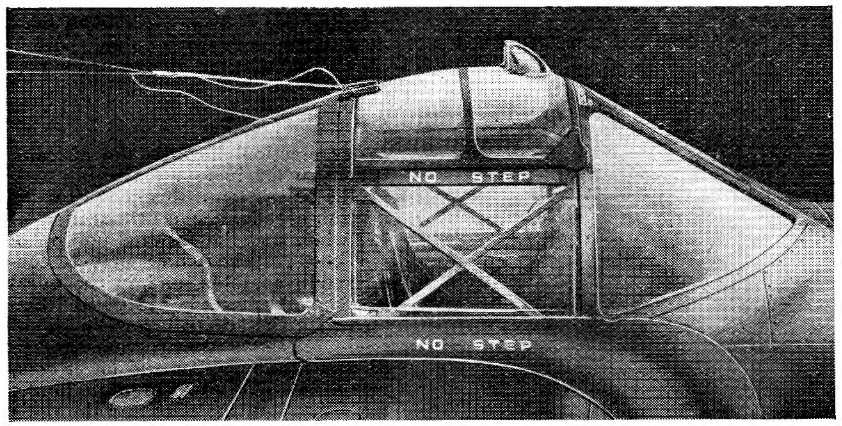




Painted scarlet this P-38 was the 5,000th to roll off the production lines.

The sturdy undercarriage has stood up well to the shocks of landing on bumpy, hastily prepared airfields. As one of the first military aeroplanes to incorporate such an undercarriage, the Lightning was severely criticised for this feature in its design stages by many aeronautical experts. A point of interest is that the drag of the complete aircraft is more than doubled when the legs are extended. The drag in flight with the undercarriage retracted has been calculated to be no more than that of a plate 27 inches square.

The pilot's cabin. Although of good streamline shape, the detail design is not as clean as that of contemporary fighters.



Armament

The standard armament consists of one 20-mm. cannon and four .50-in. machine-guns, mounted close together in the nose. As on the Mosquito, this results in a highly concentrated fire power over all ranges, and is effective up to 1,000 yards. Just how effective was demonstrated during some comparative firing trials in the United States. The Lightnings were reserved to fire last, for, while the other machines damaged the standard targets, the Lightnings blew them to bits.

In addition to the guns, a great variety of bombs may be carried under the centre portion of the wings. Two 1,000-lb. bombs are normally carried, but Lightnings are capable of carrying two 2,000-lb. bombs over short distances. It was announced a short while ago that successful tests have been carried out with a maximum bomb load of 5,200 lb. over very short distances. Recent reports have also mentioned tests with a total of 14 rocket projectiles fitted under the wing. This is nearly double the number of rockets normally carried by fighters.

Versatility

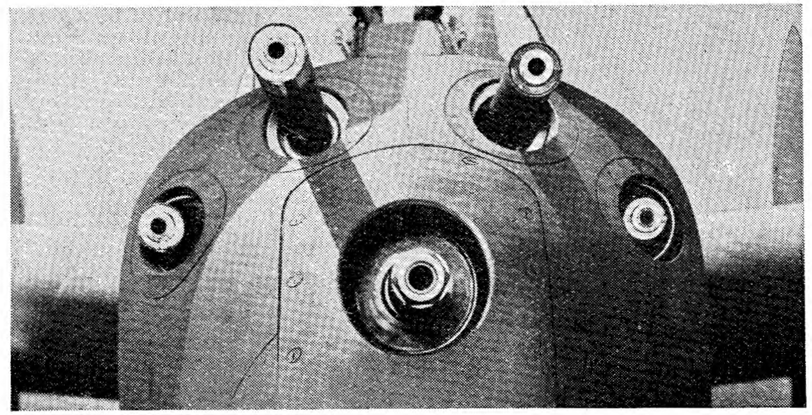
An indication that the Lightning is capable of development—one of the requirements for versatility, and thus success—is given by the fact that since the prototype of 1939 no less than 16 basic design stages have been passed through, each one of which materially improved its performance.

The prototype was fitted with two Allison C.15 engines of 1,050 h.p. each. The latest mark or model of which details are available is No. 13, and this is fitted with Allison F.M. engines, whose normal horse-power of 1,500 can be increased to 1,600 in an emergency for short periods of time. This model also has improved turbo-superchargers and an inter-cooler. These have raised the service ceiling to above 40,000 feet, and doubled the old rate of climb above 30,000 feet.

Lightnings have been used for high, medium, low, dive and skip bombing, as well as long-range escort fighters. Fitted with five cameras in the nose instead of the guns, the F-5, as this version is known, is the standard photo-reconnaissance aeroplane of the U.S.A.A.F., and is second only to the Mosquito. It was squadrons of F-5s which, from D-day minus 7 to D-day plus 14, took over 3,000,000 photographs of Northern France. On tests, Lightnings have successfully towed two fully-laden gliders simultaneously. They have also been fitted experimentally with two standard air torpedoes.

The range of the Lightning has increased in keeping with the rest of its qualities. New fuel tanks constructed as the leading edge of the wing have increased the range of the early Lightnings, which was already greater than that of most single-seater fighters.

When the request for external drop tanks was received, Lockheeds built and tested 31 different types and shapes of tanks. The final version has twice the capacity of the earlier types, yet they reduce the speed by less than four per cent. For very long-range two 150-gallon tanks are fitted, and these give a range in still air of 3,000 miles and an effective combat range of 750 miles.



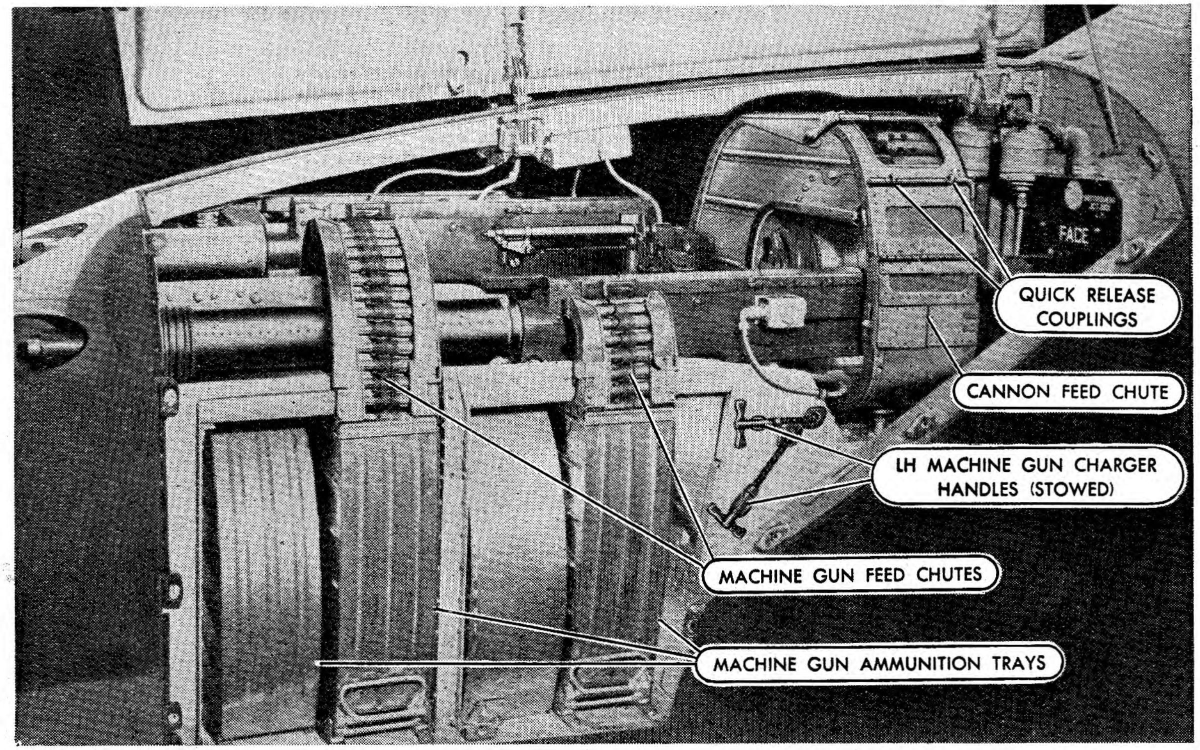
The four .50 in. guns are grouped round the cannon.

Controls

The easy and smooth operation of the control surfaces from the cockpit presented a serious problem owing to the twin-boom layout, and was solved by the very extensive use of pulleys. The cables to the ailerons run over more than 40, those to the elevator over 60, and those to the rudders and rudder-trim tabs 68. The engine controls require more than 90. That the control surfaces are easy to operate speaks well for the design of the lay-out of the cables, the fitting of the pulleys, and for the person responsible for their lubrication.

To increase the manœuvrability, the latest models are fitted with special hydraulic aileron boosters. These have an effect similar to that of the "spring-tabs" now fitted to many aircraft. The large Fowler flaps are strengthened for lowering at speed, and are used in dogfights. When fully lowered for landing, the lift of the basic aerofoil is increased by 90 per cent, and the landing speed is then only 80 m.p.h.

The compact installation of the guns is apparent from this view.



Emergency Landings

Right up to the end of his flying career every pilot always braces himself to a keener pitch of concentration when preparing to land than at any other moment in his flying life.

By Captain Norman Macmillan, M.C. A.F.C.

WHEN we are keen on flying most of us think of the going up, and less of the coming down. Yet there is only one way of going up, but there are many ways of coming down. Landing is commonly the most difficult part for pupils to learn. And of all the landings the emergency landing requires the greatest concentration.

An emergency landing does not necessarily mean a forced landing. A forced landing has to be made away from a prepared airfield under compelling conditions outside the pilot's control. An emergency landing may be made on an airfield, but it has to be made when all the conditions within the aircraft are not normal. It may be simply that one engine has packed up, so that the touchdown has to be as nearly perfect as possible, because it will be dangerous to attempt to take off and make another circuit with one engine out of action.

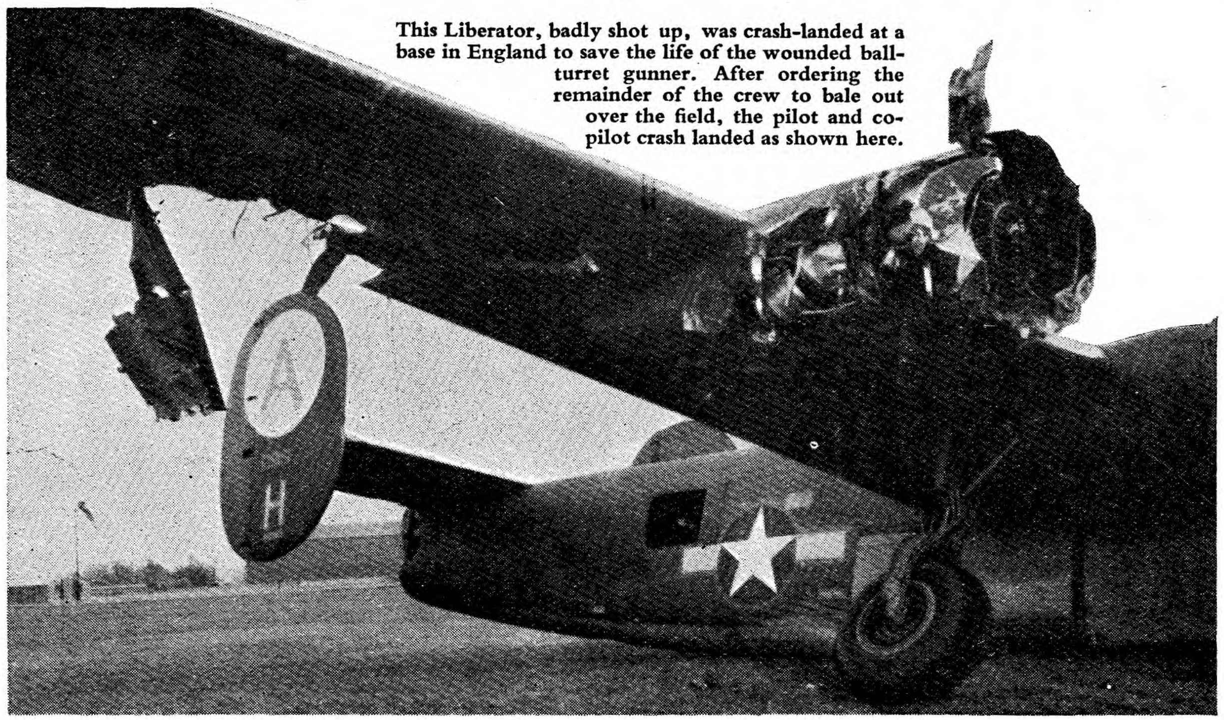
So many more conditions face the pilot of aircraft today compared with those that beset his predecessor, who had simply to get down on his undercart, preferably in one piece, when things went wrong. Now the pilot has to use more discrimination. He must first decide whether to abandon aircraft or attempt the landing. There are some cases where the choice has to be made without the possibility of assessing all the conditions. Then luck plays a part in things. There was the extraordinary case of Squadron Leader (as he then was) Jack Noakes when testing a new type of fighter.

He was gliding down to the airfield after making full-speed tests high up when he heard a sound of a crack near the tail. He looked round, but could see nothing wrong. He tried all the controls, and they all felt as though they were working normally. The aircraft still glided at the same angle. He was at 1,500 feet up, high enough to step overboard comfortably. But there seemed to be no need to do so. And he continued to glide towards the airfield.

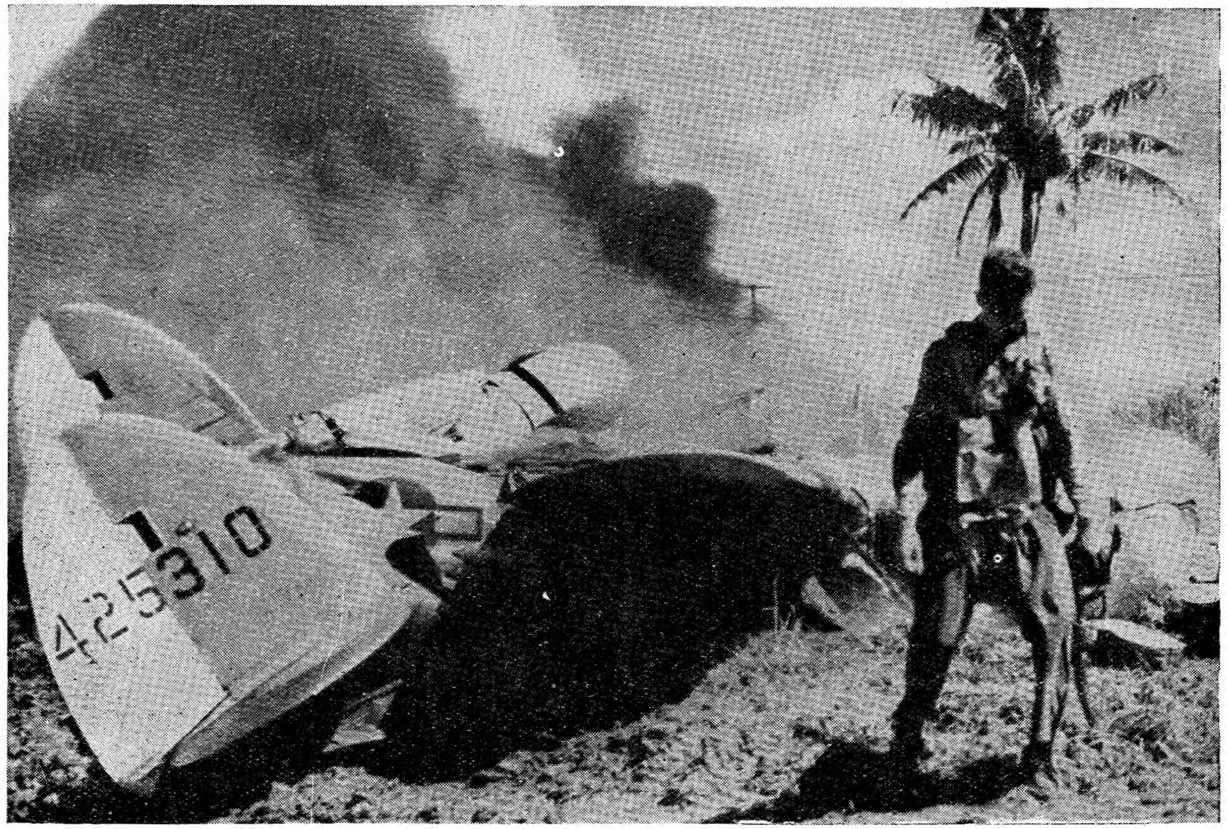
By the time he found that something really was wrong he was too low to step out. There was no response to the elevator control. The aircraft continued to glide at the same angle, and hit the ground at about 120 m.p.h., catapulting its pilot through the air as it crashed. Something at the tail really had broken in the air, and what the pilot thought was the normal weight of the elevator was the pull of the control cables in the broken parts. But such things are rare indeed in standard aircraft.

Using the Air Currents

The other day I saw a Mosquito heading inland from the sea and taking an unusual course far to the eastward of the aerodrome. Its course could not bring it to the land sooner, but rather later. Interested, I watched it make its landfall, then turn towards the airfield, and I realised that its pilot had in mind that he could make a straight run into land on the runway. But Flying Control apparently had other ideas about him, for he had to orbit the airfield. As he flew low over my head I saw the reason for his unusual approach line. His left airscrew was fully feathered. Well, he put up a good show as he orbited the field, obviously seeking the up-currents and avoiding the down-flows, and he gained height steadily as he kept going on one engine, until he was signalled down to the runway.



This Liberator, badly shot up, was crash-landed at a base in England to save the life of the wounded ball-turret gunner. After ordering the remainder of the crew to bale out over the field, the pilot and co-pilot crash landed as shown here.



This American fighter pilot was fortunate enough to walk away uninjured from the wreck of his Lightning after it had been shot down by a Jap fighter.

Undoubtedly the twin-engined fighter has a margin of safety against forced landings which—in theory at least—is greater than that of single-engined fighters. But the single-engined fighter possesses certain qualities of manœuvre and compactness that keep it in the field against all rivals, and are likely to continue so to do. By all the odds the pilot of the single-engined aircraft ought to be most prepared to have to get down in a real forced landing. The Fleet Air Arm pilot is in a class by himself. For him there is no real hope of ever making a true forced landing on the deck, and he must be prepared to take to the silk, or ditch, if he cannot make land.

No Choice

There is always the chance that circumstances may take the decision out of the hands of the captain of the aircraft, as was the case with one dramatic return to earth I witnessed. A Liberator came in low with its undercart up and pyrotechnic flares telling their tale to watching eyes. As the captain orbited the field the crash waggon and the ambulance took up station. Then down came the Lib. It was a neatly judged belly landing, but it sounded horrible, with that peculiar hollow, tearing noise that has no counterpart. The soil ploughed up as the aircraft rocked to a standstill with its trail of torn metal strewn behind it. Almost before it had stopped, the hatch opened and with astonishing speed the whole crew tumbled out and ran for safety, one of their number with crooked arms hooked in the elbows of two of his crew-mates, who pulled him backwards as fast as they could run, while his inert legs dragged on the ground.

The crew might have jumped but for this chap. But he could not have landed safely in a parachute. For him the others took their lives in their hands and, sticking together, made their belly landing. They were just well clear of the aircraft when a little red flame sprang up inside the fuselage and, curling over, grew in volume and intensity, until the wreck was burning fiercely, with its cartridges exploding and sending the bullets whizzing all around.

Think Quickly

Suppose these things happened to you. First you decide whether or not to abandon aircraft, and, if you decide to do so, you must choose (if choice is open to you) the apparently best place to make the jump. If you decide to stay aboard, you must then decide if you will try to reach an airfield, or whether you will have to force-land in the best circumstances you can find.

It does not follow that the same surface is equally good for wheel landings and belly landings, so if you have to get down before you reach an airfield do not wait until the last moment, but choose what appears to be a good place, and by judging its quality as a landing spot decide whether to put her down on her wheels or her belly.

If you have to make a belly landing do not forget that your judgment should allow for the absence of wheels. If you hold her off too high, the first bump will be a heavy one. Make your belly landing as gentle as possible, for there is no oleo, and the aircrew have to absorb the effect of the shocks on the aircraft.

It pays to get down not too far from a house or from workers in fields from which or whom you may expect aid, if aid you need. At the least you will be able through such contacts to make touch most quickly with those who are interested in your fate, and at the most they may be able to get you out if you are trapped within the aircraft.

Mechanics at work on a Halifax engine.

Technical Training Command

by Air Marshal Sir Arthur S. Barratt, K.C.B., C.M.G., M.C.

SPEED is a feature of the present age. Every day we try, either consciously or unconsciously, to do things more quickly than we did them yesterday—and often we succeed. This is a good thing in many ways, for it stimulates progress and helps people to think more quickly. But it has disadvantages, and one of the greatest is that we have less and less time in a quick-moving world to take stock of things around us. The wireless: radiolocation: the motor-car: the battleship: the tank: the heavy bomber: the jet-propelled aeroplane — all these are minor wonders in themselves, yet we accept them all almost without a second thought.

You may be wondering what this has to do with Technical Training Command in the Royal Air Force. The connection is perhaps not immediately obvious, but it is there all the same. All of you, or nearly all of you, in the Air Training Corps have an immediate ambition which you would give worlds to realise. That ambition is to fly. The sight of an air armada, with its fascinating vapour trails, heading for Germany, or the magnificent evolutions of a Mosquito in the hands of an experienced pilot, cannot fail to stimulate in our hearts a longing to "take the air" in the aeronautical sense.

The Men Behind the Scenes

But how few of us, when we see those sights, or hear our bombers roaring out over the North Sea to carry out an operational mission, think of the men on the ground without whom the Air Force would be quite unable to operate? The fitters who maintain the engines: the riggers who make sure that every control is working properly: the armourers who guarantee that the cannons, guns, bombs or rockets will respond accurately to the gunner, bomber or pilot: the electrician who makes it his first concern to ensure that every instrument in the cockpit of the modern aeroplane gives the true message it is supposed to give: the wireless mechanic who looks after all the complicated devices which the navigator and bomb-aimer use — all these are but a few of the men behind the scenes who are rarely mentioned in the papers, but whose skill is as responsible for the success of a mission as is the skill of the pilot, the navigator or the bomb-aimer.

Rapid Training

The skill of all these men and women is initially a responsibility of Technical Training Command. Perhaps one of the biggest achievements, in its way, and one which the war has prompted, is the training of technical tradesmen to a high standard of craftsmanship in a remarkably short space of time. You in the Air Training Corps have already been encouraged to use your hands as well as your heads. Most of you, for example, have been given a chance to develop any aptitude you may have for carpentry, metal-work, model-making and the like; but you will all remember how difficult the first task seemed, and how long it took to get to know how to use the tools and to feel at one with them. Yet in this war men and women who had previously no technical knowledge or experience of any kind have been made into efficient, if not expert flight mechanics, armourers, electricians wireless operators, in rather less than six months. In normal times of peace the time taken to train men to this technical standard was measured rather in years than in months.

Men of all Trades

This training has been done in what is today one of the largest technical training organisations in the country, if not in the whole world. Hundreds of thousands of airmen and airwomen who have been recruited into the Service from civil life have been converted at schools of technical training in the Command into the tradesmen and tradeswomen who keep the aircraft of Bomber, Fighter and Coastal Command serviceable, and ensure that when a squadron is required to fly against the Hun the success of the mission will not be jeopardised because the aeroplanes are not airworthy.

There is scarcely a trade which is not catered for in Technical Training Command. Cooks, batmen, radio mechanics, fitters, carpenters, fitters-armourer, clerks, are merely a representative selection of over a hundred different trades which are needed by a modern Air Force. Many of these trades have a special service application, but most of them are related to similar trades in civil life. It is the Command's job to ensure that the men and women who pass through its schools reach a standard of proficiency in their trade which will enable them to be usefully employed wherever they may be required to work.

Careful Selection

The large number of trades in the Service gives a splendid opportunity for people to be employed on work for which they are well suited, either by temperament or by skill. The selection of men and women for training in particular trades is most thoroughly and carefully made. A special board of trained men examines each recruit on entry into the Service, and gives him, or her, a preliminary test to prevent square pegs being put into round holes, or people being trained in trades for which they are not particularly suitable.

When this board has decided the trade in which a recruit is to be trained he is sent to a recruits' training centre in Technical Training Command, where he makes his first acquaintance with Service life and Service customs. He is given physical training and drill, both with arms and without, and is taught to use a rifle and automatic weapons. Every airman may, at some stage in his Service career, be called upon to fight, and the Air Force trains its tradesmen to be fighters as well as fitters. At the recruits' training centre the airman learns something of Service discipline and of the value of ready, unquestioned obedience in time of emergency.

Training Times

When the recruit, or "rookie," stage is over the airman is sent to a school of technical training to learn a Service trade, or "the gen," as it is popularly called in the R.A.F. This trade training usually takes about 20 weeks to complete, but some trade training may take much longer. A radar mechanic, for example, needs almost a year to complete his training; so also do fitters "E" (for engines) and fitters "A" (for airframes) and fitters armourer. These are, however, the exception, and most tradesmen find themselves at operational squadrons within seven months of their entry into the Service. Here they are part and parcel of a fighting Service, and the happy relationship which invariably exists between aircrew and groundcrew not only inspires the latter to give of their best, but breeds in the aircrew a confidence in the men who, though denied the adventure and thrill of operational flying, never consciously let their aircrew down by indifferent or careless work.

A Chance to Fly

But although most of the people who pass through Technical Training Command on their way to operational squadrons are needed for ground duties, an increasing number of them now get a chance to fly, many of them on operational flights. The tremendous advances made in aero-engine design since the war began had made an aircraft's cockpit a fitter's pride and a pilot's headache. The best tuning of the four engines of a modern heavy bomber; the order in which the various petrol tanks should be used; the amount of boost which should be given as the aircraft climbs to its operational height; the manipulation of the retractable undercarriage; the adjustment of flaps for take-off and landing—all throw so much more on the pilot that if he had to deal with all of them he would have little or no time to think of his piloting. So he is given a flight engineer to attend to these important matters, and thus free him for his own job of flying the aeroplane. These flight engineers are trained in Technical Training Command, and have already proved their worth many times over in bringing damaged bombers safely home by careful handling of engines and mechanical equipment.

The almost unbelievable advances that have been made in wireless and radar equipment have made a job in the air for specially trained wireless and radar personnel, who are used in long-range aircraft to help the navigator find his target and the bomb-aimer to hit it. All these tradesmen are trained in Technical Training Command before they are sent to operational squadrons to apply their trade in the air. The tendency for certain tradesmen to fly is growing, and it may not be long before the crew of every long-range aircraft will consist mainly of highly skilled technical tradesmen, who will be employed in the air to direct the pilot to his destination and to reduce the chance of a mechanical failure when the aircraft is in flight.

The first jet-propelled, jet-steered helicopter, Antoine Gazda's Helicospeeder.

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DORLAND HALL
REGENT STREET, LONDON, S.W.1

"Steady as you go." The batsman may be about to give another signal as his arms are bent.

The Art of Addling and Deck Landing

by R. G. Worcester

You may have to do as much as 150 dummy deck landings on grass before you have the run of an aircraft carrier.

THE A.D.D.L. (or Aerodrome Dummy Deck Landing) has been worked out so carefully that if a pilot can do a correct A.D.D.L. he can land on a real deck with no difficulty. Pilots usually seem to want about 100 A.D.D.L.s on easy aircraft, and perhaps 120 A.D.D.L.s on more difficult aircraft.

I do not know whether it was because I was several years older than the average young fighter pilot, or whether it was obvious from my log book that I had previously only flown aircraft (like the Oxford and others) which demand a wheel-landing and in fact the opposite of the A.D.D.L. Anyway they took one look at me and said I must do *a hundred and fifty* A.D.D.L.s. My aircraft was a Seafire, corresponding to the Spitfire Vb, which shares the distinction with the Corsair of being the hardest to A.D.D.L. because of the poor visibility. This, then, is a picture of one A.D.D.L.

The whole thing takes four minutes from opening the throttle to landing, i.e. about as long as it takes to read this article.

Not Too Fast

Take-off is normal, plus 6 boost is all that is required, tail not too high, and wheels up quickly to bring the coolant temperature down. A gentle turn should be started at once, and throttle back a bit and coarsen the pitch. At 300 feet the climb should be checked and turn completed, so that the aircraft is heading downwind and trimmed for level flight. It will be necessary to reduce the boost back to plus 2 perhaps to prevent the speed building up above 120 knots (this takes a bit of practice; I often used to glance down and see the speed soaring up around the 150 mark, which is hopeless). At no time should the speed exceed 120 knots or the height 300 feet, and never more than 1.500 yards away from the touchdown point. On the downwind leg opposite the touchdown point just before the crosswind the wheels should be lowered (coolant should be back to 85 degrees by this). Hold the chassis lever till it jumps your hand into the idle position, and at once check the wing stalks (new machines do not fit them) and green lights (the micro-switch operating the undercarriage lock nearly always gives a slight atmospheric on the R/T, which is a further check, since you know the precise moment it will lock down). The boost now should be well reduced to about minus 2, till 95 knots is registered on the crosswind, then flaps down. During the crosswind leg the speed must be further reduced to 70-75 knots, trim back and nose held high in the air by small throttle. Fine the pitch, and then about minus 4 seems to be roughly the amount of engine required. The batsman should now be visible and everything must be to his orders.

Don't Overlook the Batsman

The final turn into wind should be very gradual to keep him in view all the time. He is usually in a position near the third exhaust stub, and to see him it is essential to put one's head out in the wind, which means no more looking at the A.S.I. or other instruments. Although the aircraft is near the stall it is not too hard to keep its "feel." The stall takes the form of a sharply increased rate of sink corrected by quick throttle. A wing will not drop unless there is a downgust or it is down anyway.

The batsman will want a steady descent at some 300 ft./min. 70 knots, with the aircraft in the three-point

Seafire doing a dummy deck landing on a Naval fighter station. The batsman has just indicated "cut" by crossing the bats. Notice the nose-up 3-point position of the aircraft.

landing position, and when this is reached the stick must be held central and kept central without movement till the wheels touch, descent being regulated only by throttle (the lighter the wind the greater the float, and consequently the more care required to prevent overshooting the batsman. When drawing near the batsman it is usual to reduce throttle a little, and when he gives you the "cut" the throttle must be completely closed without stick action. To save time it is usual to let the aircraft trundle along the runway, then lift the flaps, retrim and open up to plus 4, and start the next A.D.D.L. again, and so on.

Practice Is Necessary

It is easy to describe an A.D.D.L., but some of the hardest things to get used to—that I found—were the steep turns at low altitude to get a tight circuit. The constant attention necessary to prevent the speed creeping up and the paramount difficulty of flying the aircraft near the stall without looking at the A.S.I. and obeying the batsman. The awkward, unnatural attitude of the aircraft on the approach takes a bit of getting accustomed to, as well as the strong temptation to pump-handle the stick a few feet off the ground.

The best tips are (1) to sit really high in the seat and (2) to hold everything lightly. There is no need to tense up the muscles, and the best results can be obtained by finger-tip control on the incredibly light controls of the Seafire.

The Batsman is not there to do your work for you, you are the pilot and must aim to spot-land exactly opposite him; and he will merely indicate (sometimes in no uncertain manner!) if you go wrong *what you have to do to get back to normal.* In other words, he thinks one jump ahead of you, so it is up to you to reduce the time-lag as much as possible by obeying promptly; this will help him to make his signals more emphatic and anticipatory.

After the pupil has completed the prescribed course of A.D.D.Ls the next step is to proceed direct to a carrier and carry out about half a dozen landings under proper conditions.

The method is exactly the same with a few small alterations in technique. The throttle should be opened fully and held on the brakes as far as possible if necessary before taking off, and in the overload case a flap angle can be selected by the use of wooden blocks held between the flaps. When coming in to land the main differences are to compensate for the speed of the ship by turning in a little earlier; if in a stream landing to turn some ten seconds flying time after the last man; not to forget the hook and to bear in mind that cockpit drill is much more important than when A.D.D.L.-ing—forgetting to put the airscrew in fine pitch will cause a much more ugly situation at sea.

The batsman will, of course, make the same signals, but the landing will be arrested, so aim to land opposite him in the same way and the aircraft will pick up the second wire.

WHAT THE SIGNALS MEAN

1. **"Steady as you go"**	**Arms horizontal.**
2. **"Get up—go higher"**	**Arms above the shoulder.**
3. **"Come down—come lower"**	**Arms below the shoulder.**
4. **"Come to port—you are off centre to starboard"**	**Left arm above, right arm below the shoulder.**
5. **"Come to starboard—you are off centre to port"**	**Right arm above, left arm below the shoulder.**
6. **"Raise the nose—go slower"**	**Left arm only horizontal.**
7. **"Lower the nose—go faster"**	**Arms horizontal and moved in circular movement.**
8. **"Wave off—go round again"**	**Arm waved round the head.**
9. **"Cut—chop the throttle"**	**Arms quickly crossed at waist level.**

WIND

by Stringbag

Stringbag recommends you to try to get a rough picture in your head of the relationship between wind, indicated air-speed, ground-speed and courses to steer.

THE wind gauge on the end of its pole was recording a speed of 20 m.p.h. The top of the pole was some 60 feet above the ground, but in the met. office they reckoned this as ground-level and had chalked up the information accordingly on their weather board. In actual fact the speed of the wind a foot above the runway was a mere 12 m.p.h., or a difference of eight m.p.h. from the top of the pole.

Three hundred feet higher up it had quickened further, and was blowing at a steady 25 m.p.h. At 3,000 feet its speed was 40 m.p.h., but at 30,000, where the fighter boys were doing their stuff, it was a steady 120 m.p.h. The range, therefore, from ground-level to the operational height for the fighters was 112 m.p.h. If the average light aeroplane in which most of us were trained was able to climb to such a height, it would be flying backwards at a speed of 32 m.p.h.

We Grow Used to Our Winds

These well-known characteristics of the wind appear startling when grouped together. Most of us in the course of our flying duties inhabit particular strata of the atmosphere, and grow accustomed to the wind speeds found at our own heights. Moreover, we usually fly aircraft of one type, which has one particular cruising speed, and we get to know the effect of the wind at our everyday speed so well that we know instinctively how much to allow on a compass course when on a cross-country. Thus on a Swordfish I would put on 13 degrees for a 20-knot wind on the beam, whereas a Seafire pilot would, equally instinctively, put on only about six degrees.

It is interesting to get out a course and distance calculator to see how much the wind affects the navigation of various types of aircraft. Before doing this, however, it must be pointed out that the calculator used in this way is not the final answer to good navigation. The man who is trained as an observer has his plotting board and a great many other instruments, some of them relying on wireless gear still highly secret. I am frankly approaching the subject from the pilot's point of view when he is flying alone, and when the rougher type of navigation is all that is available and is, within its limits, quite satisfactory. When I changed over from flying Swordfish to flying some of our fighters, the need for this was specially apparent. Every pilot should have at the back of his head a reasonably accurate idea of what the wind is going to do to him at various speeds.

Some Surprising Results

The tables which are printed below are the result of ten minutes' fiddling with my own C.S.C. I think that those interested in navigation will agree that they are highly pertinent. I never expected to find that the drift with a 50-m.p.h. wind on the beam would entail a correction of 37 degrees at 82 m.p.h., but only 17 degrees at 164 m.p.h., and that it would be reduced to as little as nine degrees in a fighter travelling at 300 m.p.h. Because a 50-m.p.h. wind is a common enough occurrence at 5,000 feet, the information has a practical bearing.

But something even more practical, which I had only realised at the back of my mind, is the way the wind gets hold of an aircraft at a narrow angle to its direction. To make good a track, for instance, of only 23 degrees off the same wind, a correction of 13 degrees is necessary at 82 m.p.h., 7 degrees at 164 degrees, 5 degrees at 208 m.p.h.

Another point which emerges from the tables is the difference between the correction required for a wind dead on the beam and 23 degrees off it. The suggestion is that once the wind is more or less at right angles to the course you are steering, a matter of 25 degrees either way doesn't greatly alter the required correction. Thus, with a 50-m.p.h. wind from the north, the compass course required to make good tracks of 090 and 067 reveals a drift of 37 degrees in the first cast and 33 in the second—and this at only 82 m.p.h. In an aircraft flying at twice that speed the increased drift between 067 and 090 is only one degree.

Some Points to Remember

Incidentally, if the pilot of a Tiger Moth steered 090 in the same 50-mile-an-hour wind from the north, he would make good a track of 121 for a ground speed of 98 m.p.h. This denies the supposition often made by pilots that a wind dead on the beam does not affect the ground speed. It increases it substantially. The course that the pilot would have to steer to find his ground-speed and his air-speed correspond would be 070 (making good a track of 106). On the other hand, this would only hold true for an aircraft travelling at 82 m.p.h. indicated air-speed. If the aircraft, for instance, was a Wellington travelling at 164 m.p.h.I.A.S., then for ground-speed and air-speed to correspond he would steer 080 (making good a track of 097). The same Wellington steering 090 by compass would make good 107, as compared with the Tiger Moth's 121.

One can go on indefinitely on these lines. But the points which I have already made are strong enough to suggest to all pilots the advantage of carrying a rough picture in their heads—a picture of the relationship between wind, indicated air-speed, ground-speed and courses to steer. One may not have a C.S.C. in the aircraft, the radio may be U/S and a homing unobtainable, the weather may be duff—it is just at such times that a ready-made idea of what the wind is doing to one's aircraft comes in useful.

TABLE I

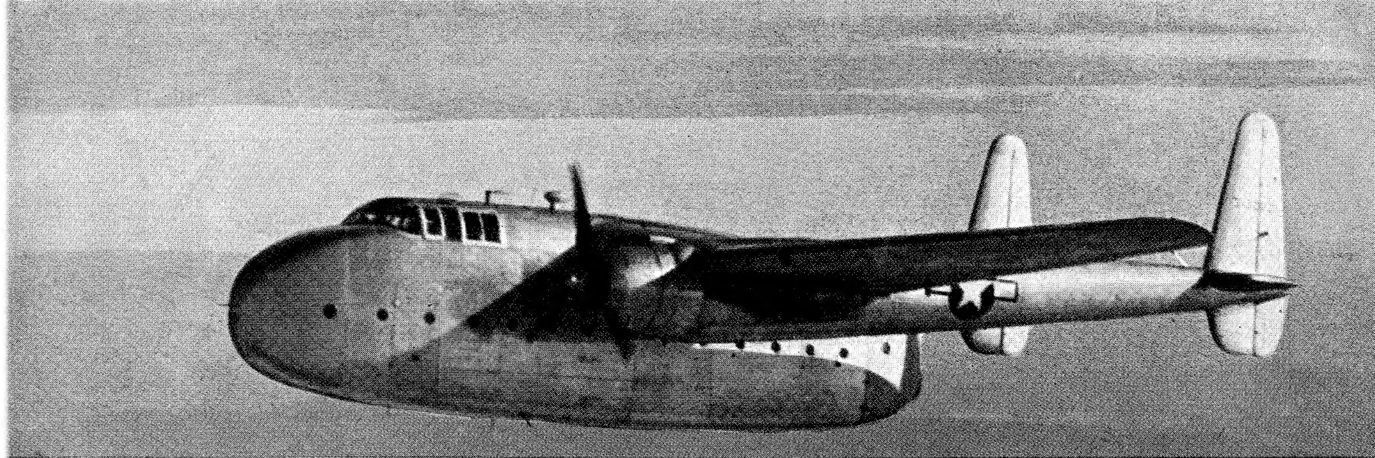
Wind 50 m.p.h. from 360

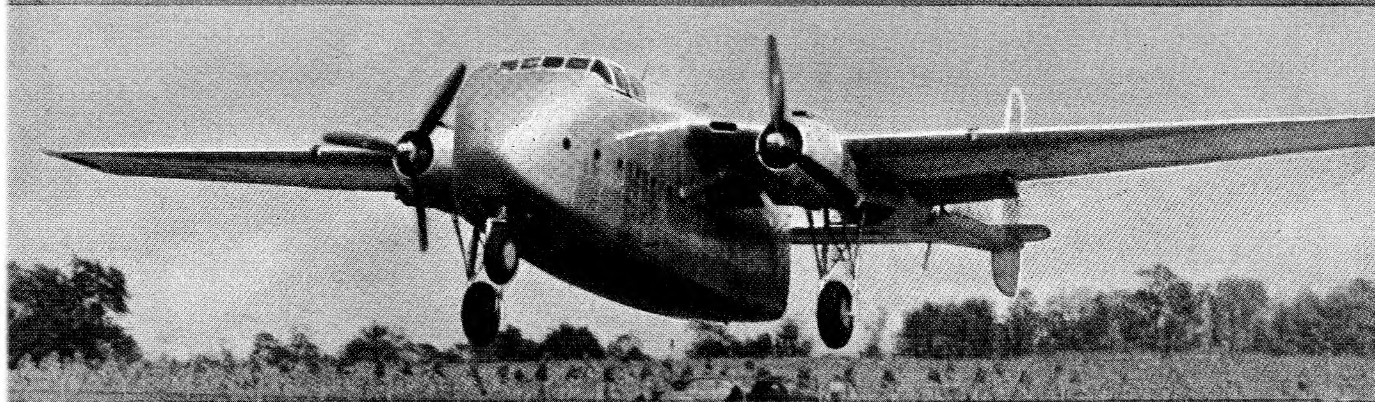
I.A.S. (m.p.h.)	*To make good*	*Steer*	*Drift*	*Ground speed*
82	023	010	13	34
	045	020	25	39
	067	034	33	50
	090	053	37	66
164	023	016	7	118
	045	033	12	127
	067	051	16	140
	090	073	17	158
208	023	018	5	162
	045	035	10	170
	067	054	13	184
	090	076	14	203
300	023	019	4	253
	045	038	7	262
	067	059	8	278
	090	081	9	298

If the wind was 20 m.p.h. instead of 50 m.p.h. the drift at each of the three airspeeds quoted above for the same tracks would naturally be much less. But it will be seen that the effect on the slower aircraft is still verv considerable.

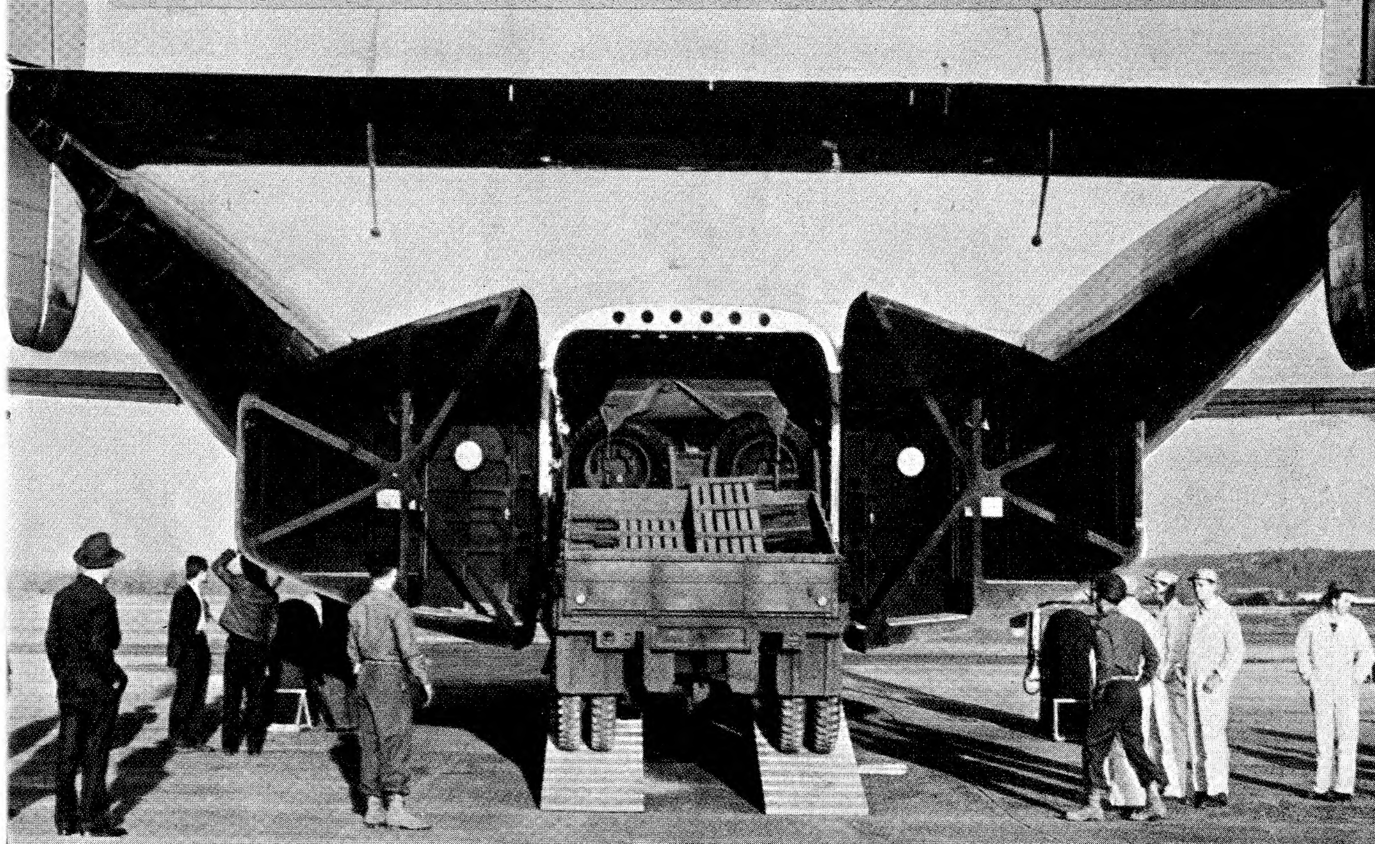
Drift at—

82 *m.p.h.*	164 *m.p.h.*	208 *m.p.h.*
5	3	2
9	5	4
12	7	5
13	7	5

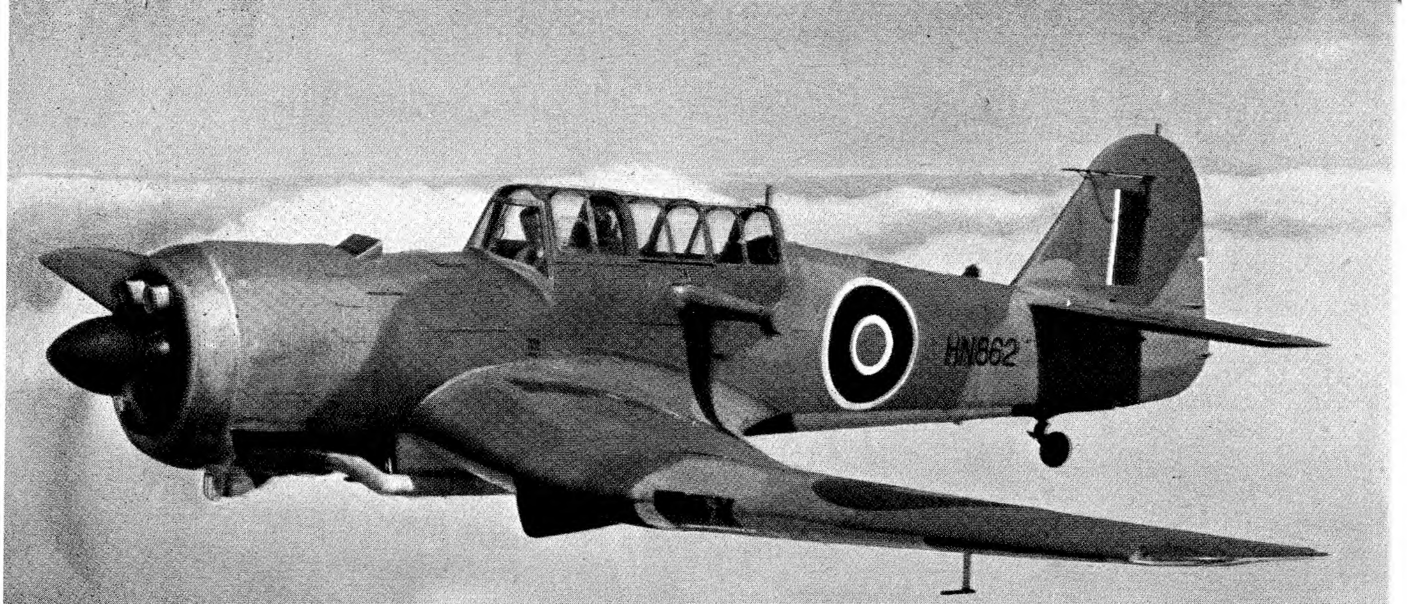




FAIRCHILD C-82 PACKET.
This cargo and troop carrier can take 10 tons of equipment or 40 fully equipped paratroopers. Double doors set between the tail booms permit easy loading and unloading. Range said to be 3,500 miles.

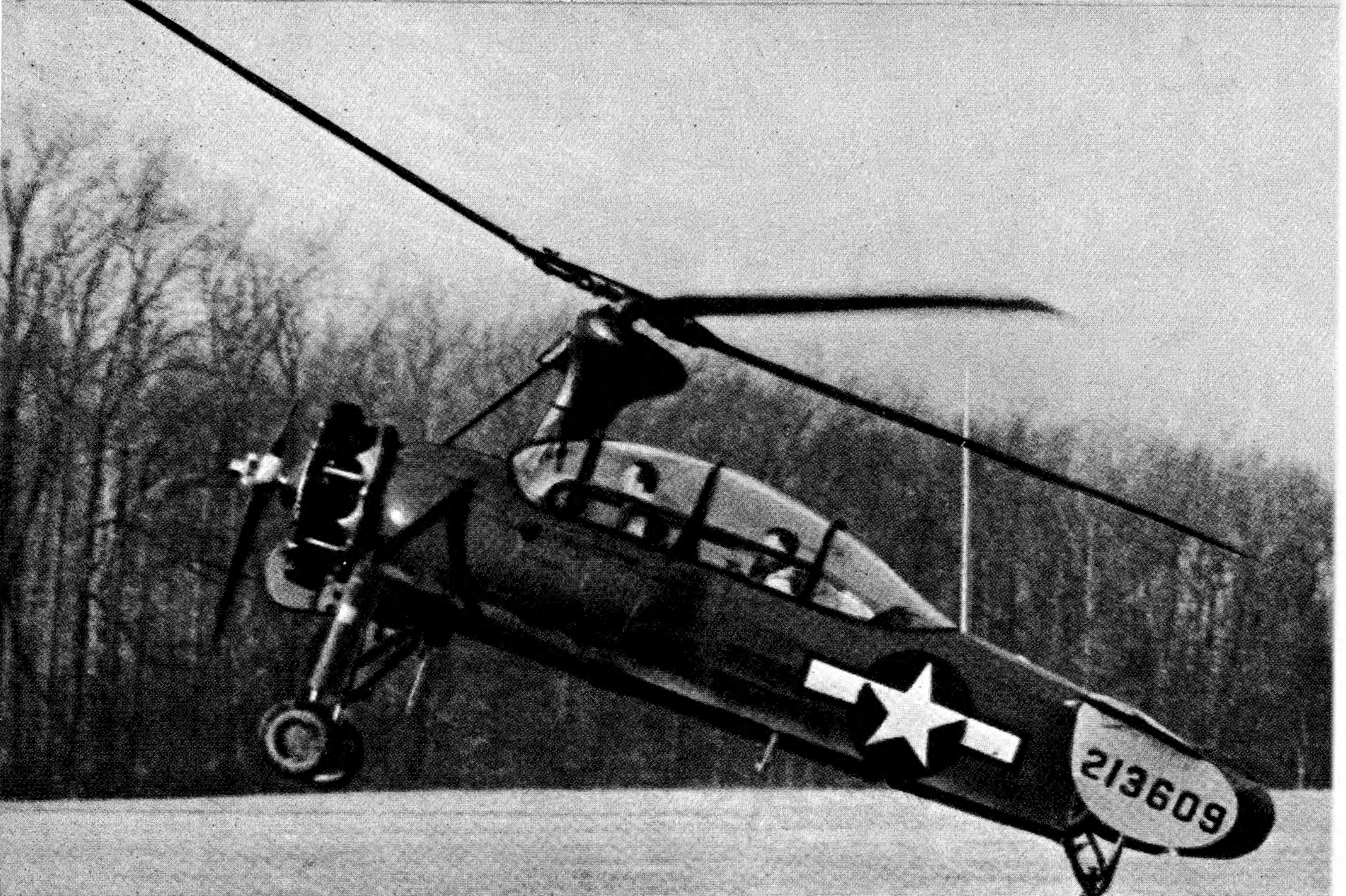


Avro Lancaster II.



MILES MARTINET.

The Miles Martinet, a development of the Master, is used as a target tower. Span 39 ft. Max. Speed 232 m.p.h. with 820 h.p. Bristol Mercury XX.



KELLETT YO-60.

Powered with a Jacobs 300 h.p. engine, the Kellett YO-60 has been produced for the U.S. Army Air Forces.

High Altitude Flying

by Squadron Leader W. R. Acott, D.F.C.

MODERN aero-engines are able to maintain their high power up to altitudes which a few years ago were thought to be impossible. Two-speed, two-stage supercharging provides the pressure in the induction system necessary to develop this power. The human body, although it is an internal combustion engine, cannot be treated in a similar way. Boosting up the pressure in the lungs would damage the delicate lung sacs. The pressure inside and outside the body must be balanced.

The body's fuel or food is broken down into sugar which is burned to form carbon-dioxide and water. Muscular energy results from the breakdown of the sugar. For this combustion to be complete, and so for the body to be fully efficient, the lungs must receive an adequate supply of oxygen. In this respect the body is behaving exactly as the engine behaves, except that in the engine the combustion is more rapid.

Oxygen Regulator

At 15,000 feet the blood is receiving only three-quarters of its oxygen requirement. It can only develop energy in proportion to the oxygen burned. A supply of oxygen is carried in the aircraft on which the pilot may draw to make up the deficiency. This is done by means of high-pressure bottles which feed oxygen to a pressure regulator. The regulator, adjusted by the pilot with a change of altitude, supplies the correct amount.

During ascent more and more oxygen is required from the bottles as the air pressure decreases, and consequently the amount of oxygen in the air. At 35,000 feet it is necessary to breathe pure oxygen to keep the blood fully saturated. This method of supplying oxygen in the right amount to the lungs, without building up local pressures which would cause damage, has enabled the body to keep pace with the aircraft in the struggle for more height.

Spurious Confidence

Failure to supply an adequate amount of oxygen to the body at altitude results in defective judgment, a spurious sense of confidence and a lack of appreciation of time; the mental processes are slowed down and simple problems become insuperable. Vision and hearing are affected. The arms and legs feel weak and the co-ordination of movement impossible. Tremors of the limbs may occur.

Danger comes from the fact that the pilot is not aware that he is suffering from lack of oxygen. His spurious feeling of confidence makes him unaware of the other symptoms. He will, finally, be unaware that he is slowly losing consciousness. If he is fortunate enough to recover at a lower altitude and regain control of the machine he will be unable to remember what has happened to him.

Bends

Another effect of flying at high altitude is decompression sickness, or "bends." When air is breathed into the lungs nitrogen passes into solution in the blood in proportion to the outside air pressure. Nitrogen is not used by the body, and so it remains in solution. As the pilot gains altitude the outside air pressure falls and the quantity of nitrogen that the blood can hold in solution is reduced. The nitrogen comes out of solution in the form of bubbles, in the same way as bubbles appear in a soda syphon when the lever is pressed.

If the ascent has been slow the nitrogen will diffuse out through the lungs. But the rate of climb of modern fighters on combat climb is far too high to allow this to happen. The nitrogen forms bubbles in the blood and moist tissues of the body which become larger as the aircraft climbs. At heights above about 35,000 feet, depending on the individual, the bubbles become large enough to tear the tissues. This tearing of the tissues causes severe pain, which will eventually force the pilot down to a lower altitude to reduce the size of the nitrogen bubbles.

Decompression sickness is first noticed by a slight itching of the skin, slight pain in the wrist, ankle or knee. The mild pains are like rheumatic pains, but they must not be ignored, for they may become rapidly worse and develop into severe cramp causing complete collapse of the pilot. A high standard of physical fitness is important. The fitter the pilot the higher he is able to fly without suffering from decompression sickness.

Tricycle Undercarriage

by A. M. Colbridge

THE tricycle undercarriage offers many advantages in landing over the conventional type. The main difference in landing procedure is that whereas a normal aeroplane is pulled up to the point of stalling on touching down, and thus has a certain fixed

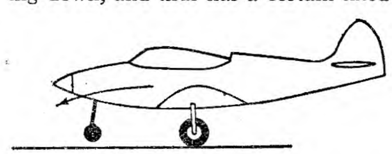


Fig. 1.

landing speed, the tricycle aeroplane is more or less flown into the ground at its gliding angle and has a *range* of landing speeds.

A normal tricycle landing is made on the main wheels with the nose-wheel just clear of the ground (see Fig. 1), which means that as soon as these touch the aeroplane is thrown forward on to the nosewheel. In this attitude the wings assume a very small, in fact nearly negative, angle of attack, so that there is no tendency to balloon-off again, however fast the landing speed (within reasonable limits of course; if the speed were too great conditions would approximate to that of the take-off, when the aeroplane would tend to rise).

Two great advantages are thus clearly apparent:

(i) No tendency to bounce or balloon-off after touching down, unless the speed is excessive and/or the aerodrome surface very bumpy.

(ii) Less accurate judgment needed in finding approach and landing speeds. The aeroplane can be landed well above stalling speed if necessary.

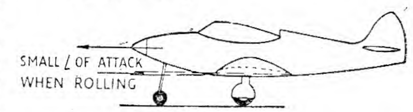


Fig. 2.

Once on the ground, brakes may be applied immediately and quite hard, for there is no fear of the aeroplane nosing over. Provided that the ground is firm, the landing run is controllable

CONTINUED ON PAGE 18

Cooling the Boost

By J. A. KYD

As we all know, the main object in the life of the aero-engine designer is to obtain the best power-to-weight ratio consistent with safety. Highly efficient aero-engines are now producing more than one brake horse-power per pound weight, which but a few years ago appeared to be an almost impossible ideal. It is, of course, not necessarily the sign of a badly designed engine if it fails to reach this high standard, for without a doubt the reliability of an engine decreases as its power/weight ratio improves. This does not mean that it is more likely to crack up in the air, but it does mean that the periods between overhauls are reduced, and when economics enter into the question the heavier engine for a given power may be the one suited for a particular job.

When the engine designer is satisfied that the design of his bearings, gear trains, etc., is as near perfect as possible, and consequently the power loss due to mechanical absorption reduced to a minimum, and yet there is still need to increase the engine power without increasing the cylinder capacity, he usually turns to the problem of increasing the compression ratio or, alternatively, of getting similar results by increasing the boost pressure.

The boost pressure, which is the pressure of the combustible mixture after it has passed through the supercharger, can be raised in several ways. The gear ratio between the supercharger impeller and the engine can be raised, thus speeding up the former; the diameter of the impeller, in the case of a centrifugal supercharger, can be increased, or another stage can be put into the supercharger system.

The first two possibilities are usually ruled out when the engine is already of very efficient design, since they create complex design problems, but the idea of putting an extra stage into the supercharger is becoming quite a common feature.

A two-stage supercharger consists of two impellers, one behind the other, mounted on and driven by a common shaft. The combustible mixture is drawn into the centre of the rear impeller and "centrifuged" outwards by the impeller blades. Instead of then going straight into the engine, the boosted mixture is drawn into the centre of the front impeller, and again "centrifuged" outwards. This second stage thus further raises the boost pressure, and the mixture enters the cylinders for combustion at as high a boost as 10-20 lb. per square inch.

The effect of raising the boost to such a high figure—before the war 5 lb. per square inch was considered a high boost—is to raise the temperature of the charge to an undesirable extent. In the first place, the high charge temperature will upset the burning characteristics in the cylinder head, thus causing detonation and loss of engine power, and, secondly, the weight of the charge for a given volume will, of course, be lowered as the temperature is raised.

At this stage, therefore, it is necessary to cool the boosted mixture to enable a greater weight of mixture to enter the combustion chamber, although the boost pressure will remain unaltered. There are two ways of doing this. The first is by means of an intercooler, which is, in principle, a filter for the mixture. The filter elements are in the form of a honeycomb, through the passages of which flow a coolant medium. The mixture in passing straight through the honeycomb has filtered from it not impurities, but its excess heat, which is transmitted to the coolant circulating through the passages in the intercooler. This system entails the fitting of a bulky intercooler, a lot of pipework and a radiator for reducing the temperature of the coolant medium after it has passed through the intercooler. An additional pump is also fitted to the engine to keep the coolant circulating.

The second system makes use of ordinary water to cool the mixture. Although only seen on American engines so far, the system is so simple that it will no doubt come into fairly general use everywhere. The idea is to inject a spray of water into the hot mixture as it passes into the manifold. This water is immediately turned into steam; in so doing it extracts the heat from the mixture, which has an immediate drop in temperature, and the desired result is obtained with very little trouble. The cooling of the mixture is necessary only when the engine is running at the top end of its boost scale and the water injection is, therefore, turned on only during the infrequent instances when full throttle or thereabout is being used.

Tricycle Undercarriage

CONTINUED FROM PAGE 17

from the moment of touching down, and even large aeroplanes can be pulled up in a surprisingly short distance. The tricycle is admirably suited to runways, although wear and tear on the tyres is considerable.

Ground control, too, is much improved, the nosewheel being made to castor. The axle trails behind the leg slightly, so that the wheel will always orient itself in the direction of the turn (Fig. 3). Hence it is possible to make steeper taxying turns at moderate speed.

Brakes and the tricycle layout go hand-in-hand. If brakes are *not* applied after landing the run is really lengthy, for the low angle of attack of the wings means that their drag is also quite low. The difference in length of landing run between an aeroplane landed tail up (tricycle) and

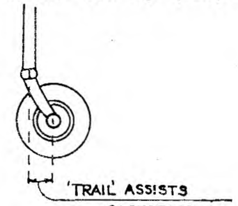
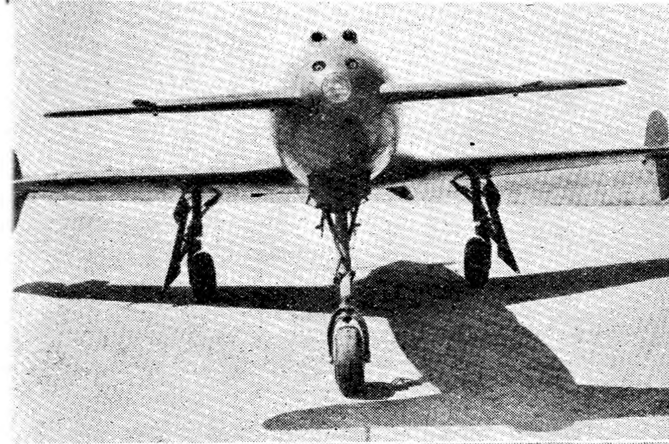


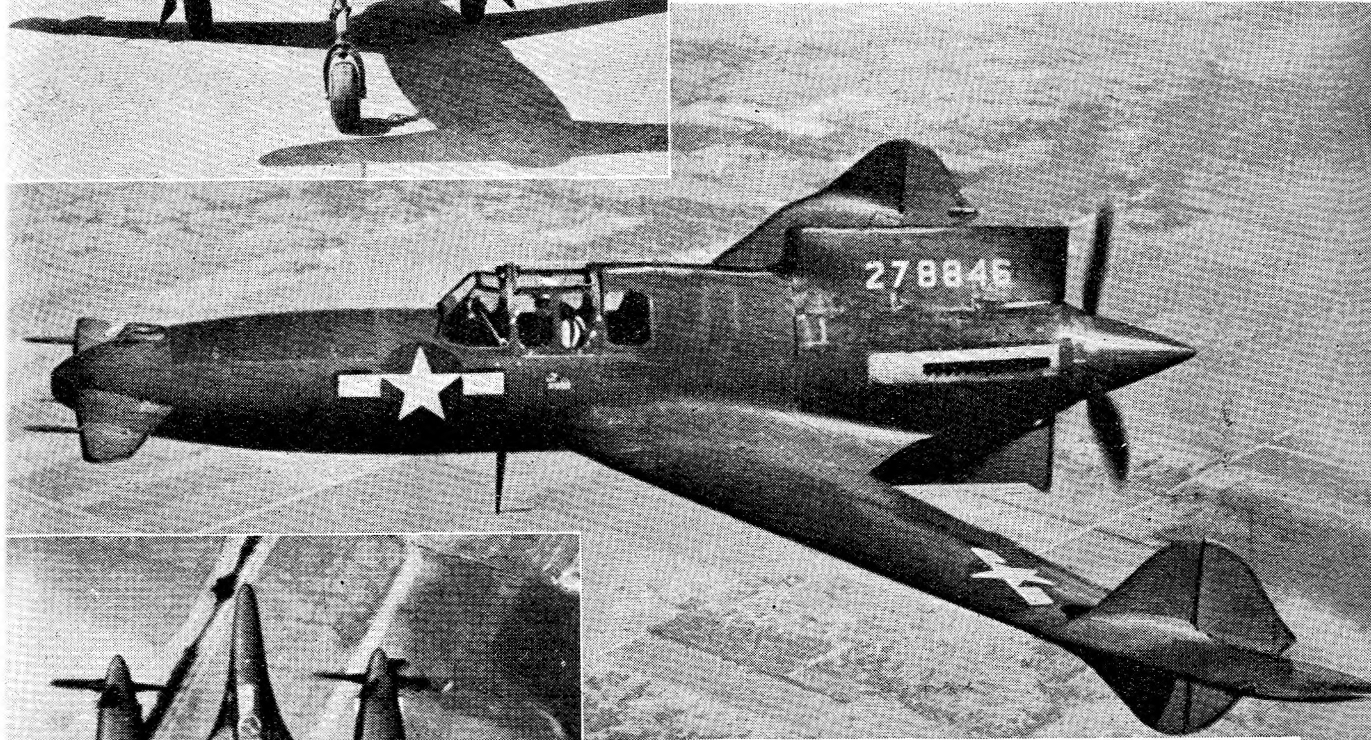
Fig. 3.

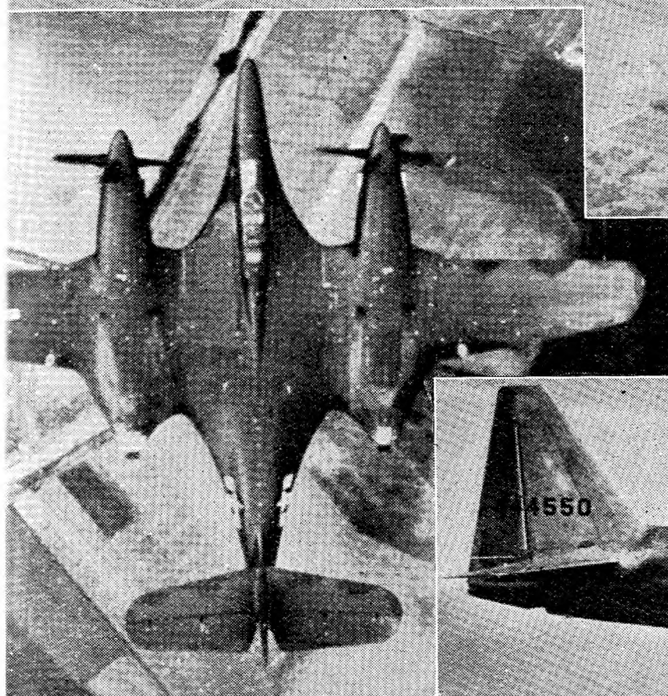
tail down (normal three-pointer) is prodigious, hence powerful brakes are a necessary complement of the tricycle layout.

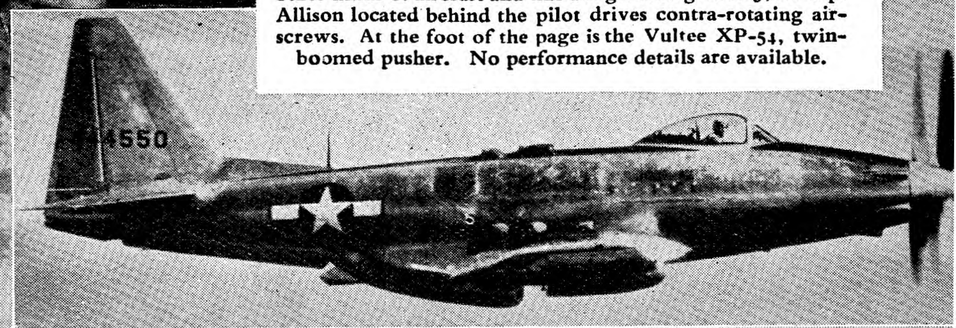
Servicing presents a greater problem, for until all aeroplanes are landed on runways or reasonably good surfaces the tricycle layout will receive the rougher treatment. And it must be reliable. A large or heavily loaded aeroplane attempting to land with the nosewheel still retracted or not locked in the "down" position is one of the greatest potential dangers imaginable to all in the near neighbourhood. Or, if the nosewheel assembly collapsed at the instant of touching down these worst fears would be realised. There is, however, at least one case on record of a pilot having made a landing under such conditions without great damage to the aircraft or to the aircrew. He was a skilled pilot and aware of the uselessness of the nosewheel but nevertheless the feat was remarkable.

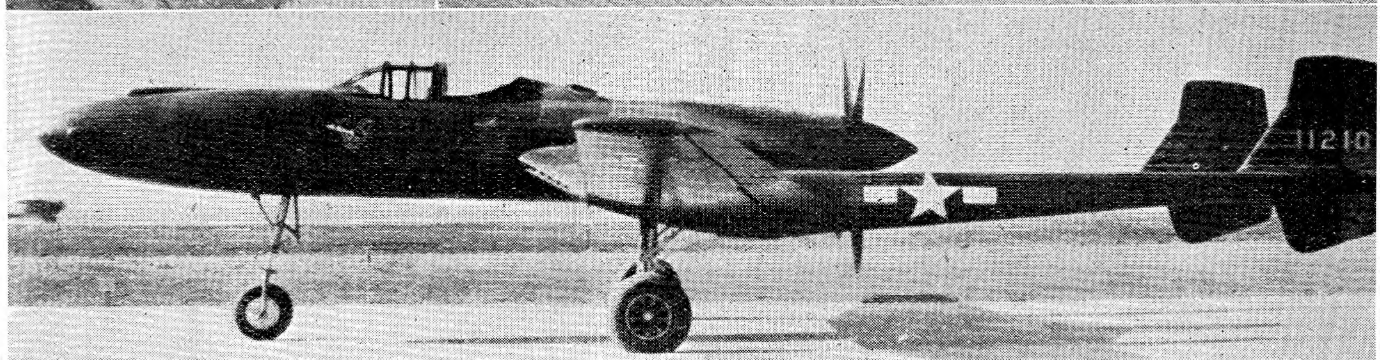
EXPERIMENTAL



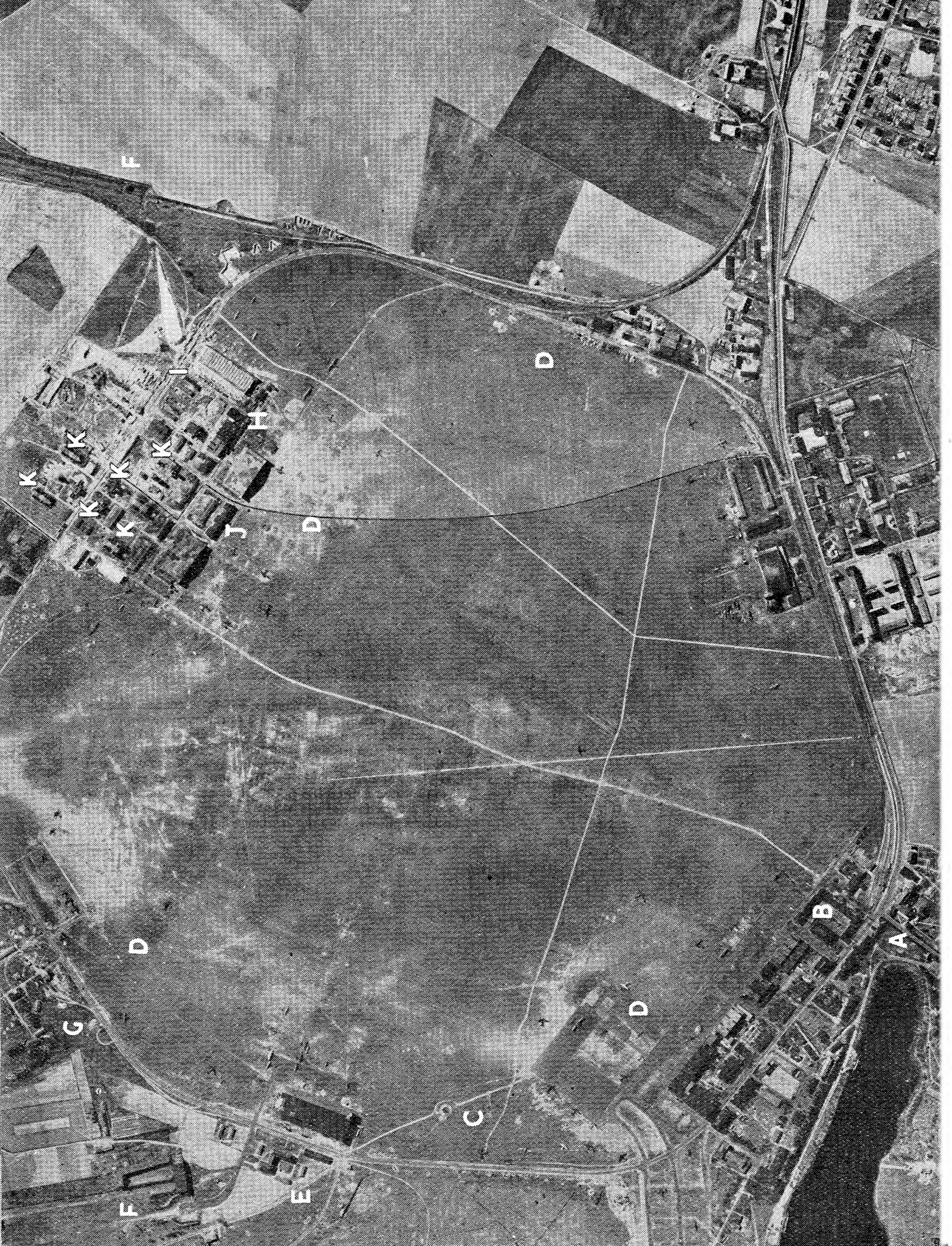








Top left and above is the Curtiss XP-55 Ascender, single-seater pusher pursuit. Elevators are in the extreme tip of the nose, and rudders near the wing tips. On the left is the twin-engined long-range interceptor, McDonnell XP-67. The Fisher XP-75 below started out as a composite of several other kinds of aircraft and this design emerged. A 3,000-h.p. Allison located behind the pilot drives contra-rotating airscrews. At the foot of the page is the Vultee XP-54, twin-boomed pusher. No performance details are available.



HOW FAR CAN YOU SEE? by GEORGE ASHLEY

EVERYONE at all interested in aircraft must at some time or other have wondered how far can be seen under conditions of clear visibility from a plane at a great altitude. This question certainly struck me forcibly a little time back as I read in a story book that certain fliers crossing the Alps at 17,000 feet were able to see almost the whole length of that chain of mountains. It seemed a surprising statement, so I began to wonder if the author were guilty of an exaggeration or not. Consultation of a reference book revealed the Alps as

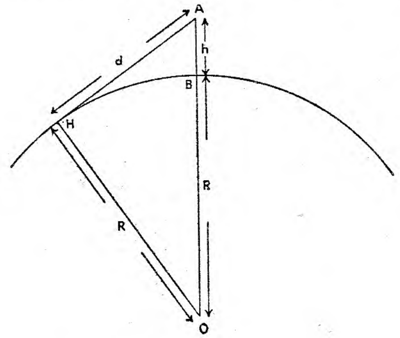


Fig. 1.

being approximately 600 miles long, therefore if our fliers were crossing somewhere in the middle the author insinuates they were able to see almost 300 miles on each side. How could I check whether that were possible?

Well, there are tables which will give the required information, but I hadn't a copy handy, and so I was obliged to calculate it for myself from the formula $D = 1.15\sqrt{h}$, where D is the distance visible (in N.M.) under perfect visibility and h is the height of the observer in feet. I happened to remember the formula, but if I had chanced to forget it I could easily have "discovered" it (or something like it) by the following little piece of mathematics.

In Fig. 1 let the curve represent part of the earth's surface, O being the centre of the earth.

Let A be the position of the aircraft at a distance h above B, the point on the earth's surface vertically beneath it.

Let H be a point on the horizon. Then AH is a tangent to the curve, and the radius OR is at right angles to it.

Let AH, the greatest distance that can be seen from A, be d, and let R be the radius of the earth (3436 N.M.).

Then by Pythagoras' Theorem

$$AH^2 + OH^2 = OA^2$$

$$\text{i.e. } AH^2 = d^2 = OA^2 - OH^2 = (R+h)^2 - R^2 = R^2 + 2Rh + h^2 - R^2 = 2Rh + h^2$$

But R is a matter of thousands of miles, while h is merely a matter of feet, i.e. h^2 is exceedingly tiny and therefore can be ignored without making any appreciable difference to the result.

This gives us $d^2 = 2Rh$

$$\text{i.e. } d = \sqrt{2Rh}$$

If we want d to be given in N.M. we must also have R and h in N.M.

$$\therefore d \text{ N.M.} = \sqrt{\frac{2 \text{x} 3436 \text{x} h}{6080}} = 1.06\sqrt{h}.$$

The "official" formula previously quoted has been obtained by applying a correction for the bending of the light rays owing to refraction in passing through the air.

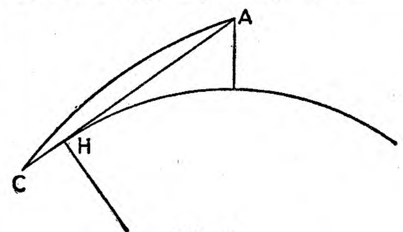


Fig. 2.

We have assumed that from our position A at height h (Fig. 2) we can see the point H by rays travelling the straight path HA. In reality we can see C by rays travelling along the curved path shown. C is obviously farther from A than is H. The extra .09 by which we multiply our $\sqrt{h}$ enables us to add on this extra distance we are able to see owing to "the bending of light".

Applying our formula to the problem of finding the distance of the visible horizon from 17,000 ft. altitude we find it to give us a result of 150 N.M. Under absolutely perfect visibility conditions it seems we could see 150 N.M. on either side of the aircraft, that is a chain of 300 N.M. length could be seen in its entirety if we were flying over the middle of it. We therefore conclude tha· our author has rather run away with himself.

But before we condemn him out and out let us think a little more about the problem. The aircraft is over a range of mountains and not over the sea. Does the height of what is being observed make any difference to the result?

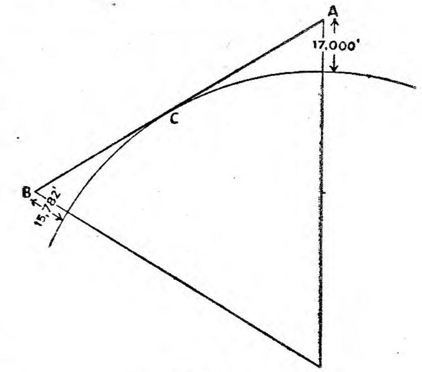


Fig. 3.

Now, what is the greatest distance at which a mountain of a certain height can be seen from an aircraft approaching at a certain altitude? For example, from how far away under perfect visibility conditions could our fliers at their 17,000 ft. altitude see Mont Blanc (15,782 ft.), the highest peak of the chain?

In Fig. 3 let A be the position of the aircraft and B the summit of Mont Blanc.

The greatest distance at which B is visible from A is when the line of sight AB just grazes the surface of the earth at C. (Actually this line of sight is curved by refraction, but the formula we are going to use makes allowance for that.)

The distance AC is the 150 N.M. already obtained by us, using the formula.

The distance BC is similarly obtained and equals $1.15\sqrt{15{,}782}$ N.M. $= 144.5$ N.M.

Therefore the peak is visible from $150 + 144.5$ N.M. $= 294.5$ N.M. $= 339$ statute miles.

It would appear then that if the Alps had a peak the height of Mont Blanc near each end of their 600 miles, these two peaks could appear near the horizon (under perfect visibility conditions) for an aircraft crossing midway between them. I therefore concluded that, making full allowance for the "almost" in the author's "almost the whole of that great chain of mountains", he is, after all, correct in his assertion (but of course only under the very, very best visibility conditions).

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KEY

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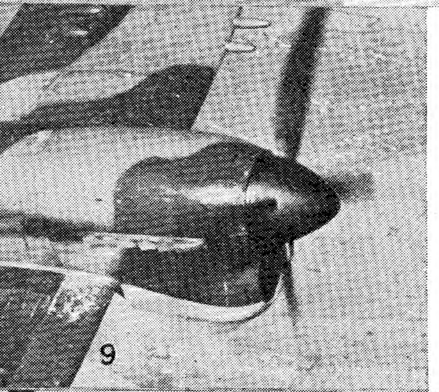

HORS D'OEUVRES

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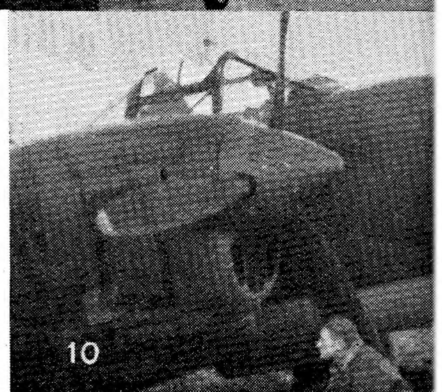

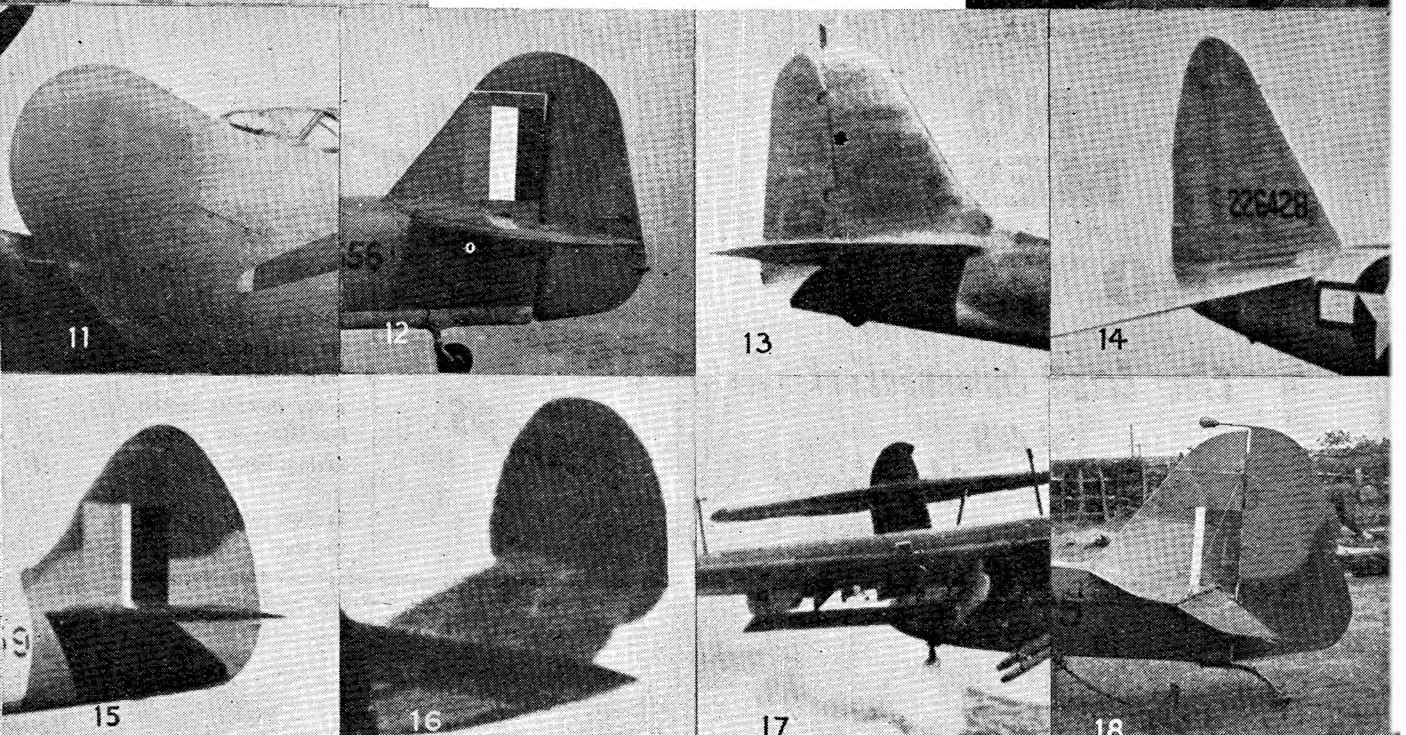

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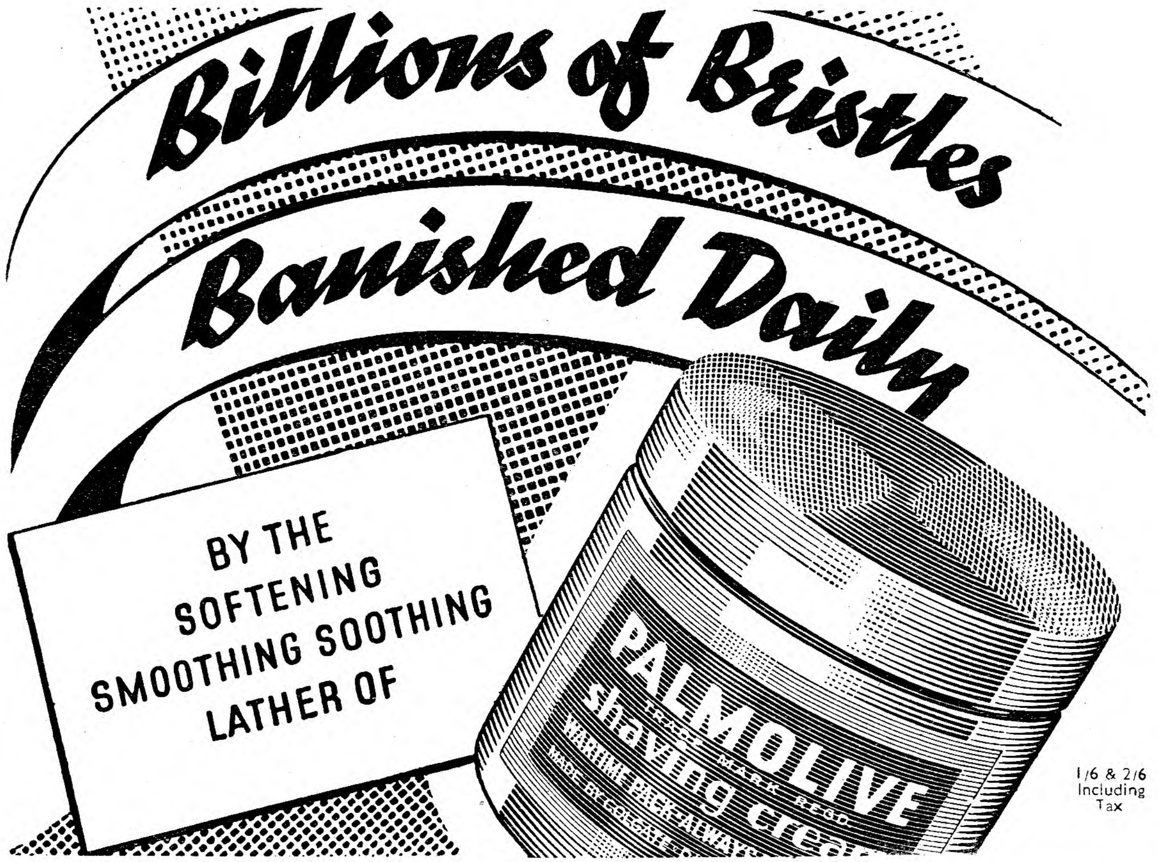
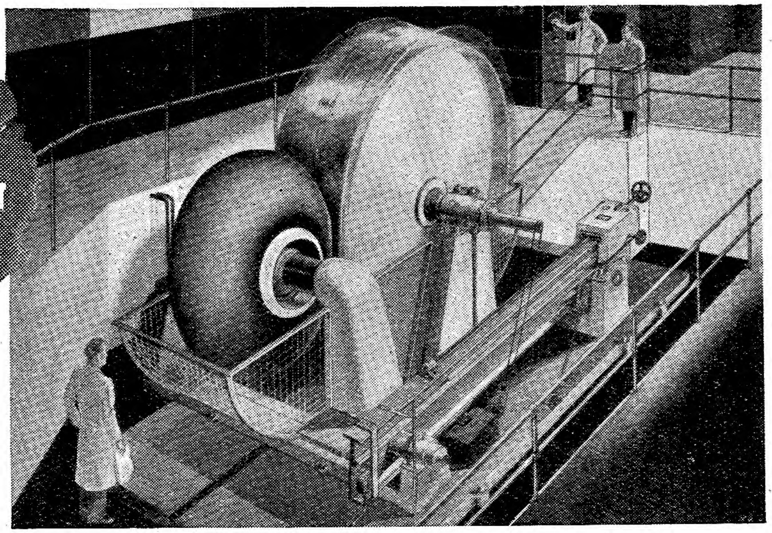


ONE TYRE SUFFERS FOR THE PERFECTION OF MANY



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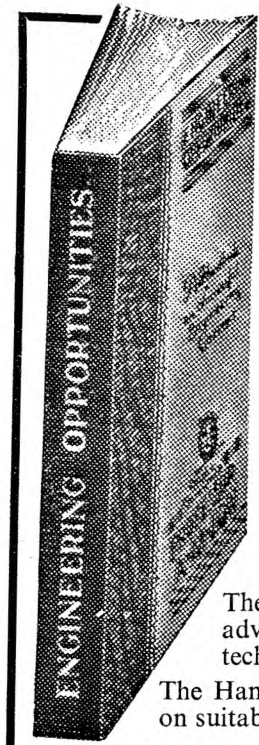

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