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TACTICAL INFLUENCES ON THE DESIGN AND PERFORMANCE OF FIRST LINE FIGHTERS.

Vital decisions will soon have to be made by the air staffs of the world on the basic battleworthiness of the light weight fighter. An attempt is here made to state the tactical implications of this kind of military aircraft.

A FALORDE.

The maxim says that fighting power is the product of quantity and quality. The appearance of the light weight fighter as represented by the Folland Midge and the Folland Gnat has made it imperative that a fresh assessment of the ways and means of air defence be made. It is the intention here to deal with the tactics of this kind of machine; but it is necessary to postulate certain matters which have to do with production and maintenance. There must be, in short, an agreement on the quantity side before useful discussion can take place on the quality side. For any useful tactical discussion the relative numbers engaged must be stated. Consequently the first step will be to refer to the quantities of light weight fighters which might be available. Afterwards their quality will be discussed in relation to that of other aircraft.

Claims have been made by Mr. W. E.W. Petter and the Folland company concerning the economy in man-hours and in money of the Gnat type of fighter when compared with the heavier, more complicated conventional fighter. It has been argued that, for the same number of man-hours five Gnats could be produced for one conventional fighter, and that for the same monetary expenditure three could be produced. It has also become clear during the early period of development flying with the Midge that a higher utilisation may be expected from the light weight fighter than from the conventional machine. The Midge is so much simpler that it must require fewer man-hours for servicing. It is so small that it can be carried on a lorry and easily shipped or air-borne so that it gains in strategic mobility. Logistically it also gains for there are fewer pieces of accessories and equipment to be held in store and moved from base to base. On the other hand the light weight fighter runs level with the conventional fighter in the provision of pilots. Each type of machine (as now under consideration) has one man in it, the pilot.

Quantitatively we have, therefore, a few facts upon which a reasonable assessment may be made of the possibilities. The reduction in the man-hours of production is especially important where the industrial areas of the producing country are liable to be close to the battle area. In factories sited far from the main battle areas it is easier to maintain a high rate of production of more complicated machines. The nearer the factories are to the battle area, the more important it becomes that the work of production should be simple and should demand the fewest man-hours to the unit made. It may be said, therefore, that the figure of five Gnats to one conventional fighter may be accepted. It might be open to criticism as a straight production comparison, but when the circumstances of war are taken into account it appears to be a fair estimate.

Five Gnats would be available where one conventional fighter could be made available by the same labour force. And they could each - apart from battle damage - be maintained at a higher utilisation rate.

But there would then remain the problem of pilot training. This would tend to place a different emphasis on the relationship. It may be true and probably would be true that it would be easier to train a pilot to handle a Gnat well than to train him to handle a conventional, complicated fighter well. The point is made clearly enough on the airlines where the most skilled pilot is expected to take at least six weeks in order to convert to another type of modern airliner. The more complicated the aircraft, the longer the pilot training period.

Even this, however, would not adjust the balance in the favour of the Gnat. The supply of men with the necessary aptitude to make fighter pilots is limited. Instructors are hard to find. The country entrusting its main daylight defences to light weight interceptors would need to make remarkable exertions if it were to be able to throw into the field five trained fighter pilots for one on the other side. An adjustment must therefore be made in the five-to-one ratio to account for this problem before the further tactical implications are examined.

Pilot training can be done at any aerodromes and the schools are not tied, as are industrial plants, to fixed sites. Although, therefore, the country producing complicated conventional fighters is particularly vulnerable if its industrial areas are near the main battlefields, the vulnerability does not stretch to pilot training. That can be done almost equally well by a country near the battlefields as by one far distant from them.

Let us therefore summarise these considerations bearing upon the quantitative aspect of the two types of fighter. In the first place the five-to-one ratio may be accepted as a production, maintenance and utilisation figure borne out by basic reasoning and by such experience as has been acquired with conventional fighters and with the Midge. It might be that, if no other considerations except man-hours of production and maintenance and the situation of the industrial areas were considered, the ratio would be more nearly six or seven to one. There would, in the view of the present author, be no possibility whatever for factories sited close to the main battle zones, which we may expect would be in the European theatre, being able to turn out conventional, complicated and heavy fighters at high rates to the man-hour. Production would fall the more rapidly as the aircraft was more complicated. For production under the stress of bombardment and the threat of invasion by airborne and other forces, the object to be produced must be held as simple as design ingenuity can make it.

On the American continent it might be possible to turn out in quantity and at a reasonable rate to the man-hour, machines as complicated as are some of the latest conventional all-weather fighters. But there would be no such possibility for any of the European North Atlantic Treaty countries. They must choose simplicity in their fighters or risk having no fighters at all soon after the start of any major war.

Simplicity's strongest suit is this: that it enables production to continue under heavy stress. It is a point not hitherto given sufficient attention when the rival claims of the conventional machines and the lightweight machine are being considered.

But we still have the pilot training problem. If there were two countries of equal size, could they turn out adequately trained pilots in a ratio of five to one - even granting that the five would not require such lengthy or elaborate training as the one?

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It is probably fair to say that there would be little possibility of achieving this ratio. When an attempt is made to hit upon a practical and probable figure it is found that there are no statistics to go upon. In man-hours of production reference may be made to many works which throw light on the possibilities; but in the training of fighter pilots there are no such works. An estimate must be made and it is admitted that it is no better than a guess. It is a guess influenced by the fact that it is easier to train pilots for light weight fighters (a point amply made by the Boscombe Down pilots who have flown the Midge) and that battle stress affects training programmes less than production programmes. It might, it is true, be possible by great efforts to turn out four Gnat pilots to one conventional fighter pilot. That figure would meet the kind of differential established by the main airline companies in the training of their captains for the large, longe range airliners with their great weights and great complications and for the training of captains for the smaller, feeder line machines. But even four to one might be held to be too great a difference by those who are opposed to the light weight fighter so that the more modest figure of three to one will be taken in the tactical discussions which follow.

The two hypothetical countries which are at war with one another and which enjoy exactly the same powers of production and have the same numbers of people available for training as pilots would therefore go into action with three light weight fighters to one conventional fighter. That is the quantity side of the matter. But we recall the maxim at the beginning that fighting power is the product of quantity and quality. So we now turn to the quality of the light weight fighter.

Once again it is necessary to go back to basic requirements. If the assumption be made that the aircraft type that is to be considered is the interceptor fighter, then we may assume that it will often operate in daylight and at heights where clouds are infrequent. It will be engaged mainly upon 'open air' duties. It should be mentioned in passing, however, that the Gnat carries radar. There are at least two radar equipments suitable for fitting in this machine and they conform to the lightness and simplicity requirements. So that the conventional fighter is not given any advantage in the possession of a scanning system not fitted to the light weight machine. Both types carry radar. But we are here assuming that the interceptor of the conventional pattern is a single-seater. We are not therefore setting the Gnat against an all-weather fighter with a crew of two such as the Gloster Javelin.

But is should be observed in parenthesis that in the United States there is at present a tendency to dispense with the second crew member even in those aircraft designed specifically for all-weather operation. Nevertheless the practice in machines like the Javelin and the de Havilland 110 may be taken as normal at the present time. They are two-seat fighters of a specialised kind and are not appropriate for comparative purposes with the Gnat. Our comparison will be single-seater versus single-seater. One other point must be made. The 'conventional' fighter is hypothetical. It is not yet possible to make an actual comparison because it is not known at the time of writing whether or when the Gnat will go into production; nor is it possible to assess how much more quickly it would go through its development work than any particular conventional fighter. The English Electric P1, for instance, has had a start on the Midge. It was flying first. But it may be that its development period will be somewhat more extended because of its greater complexity. That would be a reasonable assumption and would have nothing to do with the intrinsic merits of Midge or of P1.

It now becomes necessary to make a taking off point for the discussion of quality. There must be a central point to which all the argument must tend. Fire power is that point. Thus the starting point is an armament group that is sufficiently powerful to destroy any other flying machine without requiring perfect accuracy in the aim and delivery of the shells.

If perfect aim and delivery were to be accepted, it might be said that an ordinary machine gun could bring down any known aeroplane. That might well be true; but the changes of succes with a single ordinary machine gun would be negligible. Nor can any group of machine guns, whether of the 0·6 size or any other, be held to be adequate. An explosive shell is an essential in the armament of a modern fighter. But again a 20 mm explosive shell would require an accuracy of aim and of delivery which would place the kill at too large a change. The 30 mm shell is needed and there is much to commend the Gnat's armament of two 30 mm Aden cannon as being the minimum effective armament for an interceptor fighter. With two 30 mm cannon any aeroplane will be brought down if it is directly hit in any part. The element of chance is almost eliminated. With reasonable aim and reasonable accuracy in delivery, any other aeroplane, whether fighter, , bomber or anything else, will be destroyed.

The starting point for further consideration of the Gnat, then, is a pair of 30 mm cannon and one pilot. Those are the primary essentials. From them the other matter and material must be added while a continuous watch is kept that there is not a milligram of weight more than is essential for the task in hand.

From the point of departure, the minimum armament, we may move to the next features. Mr. Petter/expressed himself clearly on some of these matters. For instance he has said that there must be no compromise on aircraft performance and no compromise on pilot services. Thus the Gnat must be able to perform at least as well as any contemporary conventional fighter. It must be as fast and it must be able to climb as rapidly and to have as good a ceiling.

But it here becomes noticeable that in an overall estimate, the Gnat might be superior to the conventional fighter. It is admitted that it will be difficult to give a Gnat as high a top speed in straight and level flight as may be achieved by conventional machines. But the Gnat will certainly be superior in powers of manoeuvre and it will probably be superior in rate of climb. With the Bristol Orpheus engine in fully developed form, possibly with some kind of simplified re-heat, and with thin wings and powered ailerons the Gnat should be capable of a speed greater than Mach 1·25 straight and level. Some conventional fighters which may be contemporary with the Gnat at production time may be capable of higher speeds straight and level; but the difference will not be great and there is the difference in development time which has already been mentioned and which may easily reverse the situation and cause production Gnats to be available with a higher top speed than conventional aircraft also at the same production stage.

It may be asked how it has been possible to obtain as high a performance with the much smaller machine and the much lower thrust. The answer, however, would take us outside the scope of this article. It has to do with the scrupulous care exercised by Mr. Petter and his design staff and by the component and accessory makers who co-operated in excising every unnecessary piece of material in the aircraft.

No compromise on performance is matched by no compromise on pilot services. The pilot's cockpit is pressurised and air-conditioned and there is a light weight ejector seat. Instruments have been reduced in number where it is felt that it is possible to do so without affecting the essential information provided to the Pilot.

/has already

We may, therefore, summarise the situation before we turn to the tactical processes themselves:

	Speed	Climb	Manoeuvre
Gnat	-	0	+
Conventional Fighter	+	0	-

We have seen that in quantity the Gnat must be superior. It is easier to turn out from the factories and there is less likelihood of production being seriously interrupted by enemy action. In quality the Gnat shows an advantage in some respects - especially in manoeuvre - over the conventional machine and a disadvantage in absolute all-out level speed. Its climbing powers should, theoretically, be somewhat superior to those of a comparable conventional fighter, but on this it is probably fair to assume equality.

Fighter versus fighter.

In battle, therefore, the expectation will be for light weight fighters to outnumber conventional fighters by at least three to one. Let it be assumed for purposes of argument that both types have the same armament and let it be supposed that each aircraft can deliver 1000 rounds in unit time. We then apply F.W. Lanchester's law for unmasked fighting vehicles in order to determine the relative fire power.

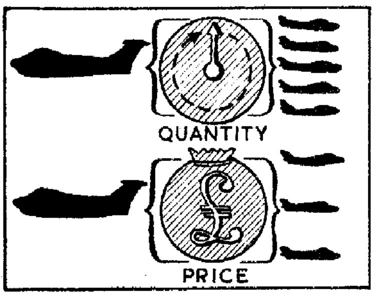
Lanchester enunciated his law, sometimes called the N squared law, in 1914, in a paper that was re-published in 'Engineering". It is a law that has been applied by noted commanders through the years, including Nelson, but before Lanchester's time it had never been simply stated or recognised in true terms. Lanchester's law states that when unmasked fighting vehicles meet in combat the fire power superiority goes to the numerically superior side as the square of the number. The elucidation of this law is easily achieved by imagining four fighting vehicles meeting one fighting vehicle, all having exactly the same armament. As they are unmasked, fire can be exchanged at the full rates attainable. Let it be supposed that each vehicle can deliver 1000 rounds in unit time. Then the four will put into the one 4 x 1000 rounds or 4000 rounds while the one will put into each one of the four 1000 rounds divided by 4. The single vehicle is hit by 4000 rounds while each one of the group of four vehicles is hit by 250 rounds, a ratio of 16 to one, or, expressed in the form taken by the law, $4^2 : 1$.

If two unmasked vehicles are ranged against one, then the relative superiority is not in fact as two to one but as four to one. On the basis of Lanchester's law the importance of quantity appears in a new light. But we have seen that the Gnat may carry only two 30 mm guns whereas the conventional fighter may be expected - if we look forward to the sort of period when both might become available to air forces - to carry four 30 mm guns. The fire power of the Gnat is, therefore, half the fire power of the hypothetical conventional fighter which we are considering.

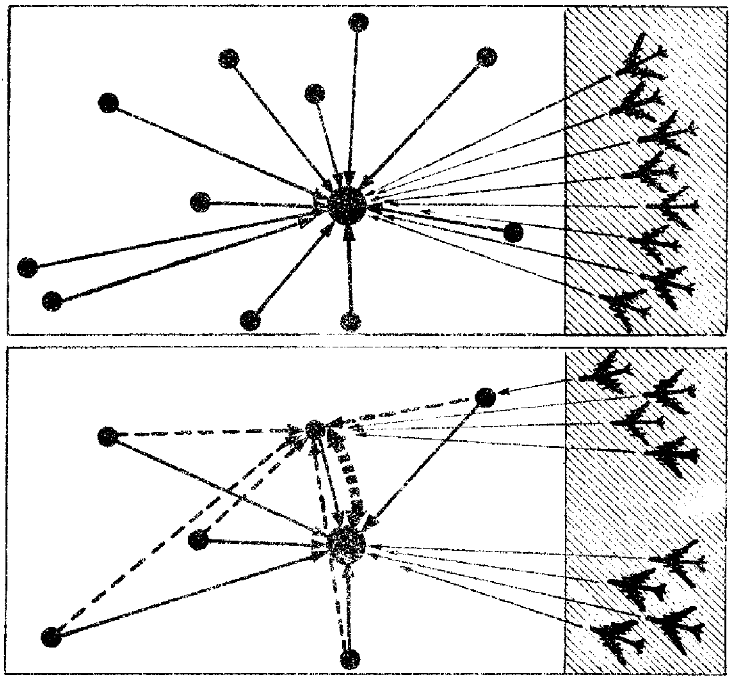
But it follows that if the production ratio is only as two to one, two Gnats for one conventional fighter - the fire power favouring the Gnat is still as two to one even when its lighter armament is set off against the numerical superiority. We have decided that it would be fair to assume that the Gnat's numerical superiority would be as three to one. On the average there would be three Gnats to one conventional fighter in the field. With equal armament the Gnat's fire power superiority would then be as nine to one (see the diagram) but with half the armament the Gnat's superiority would still be as four-and-a-half to one.

Lanchester's law, as has been stated, has been applied by great commanders through the centuries.

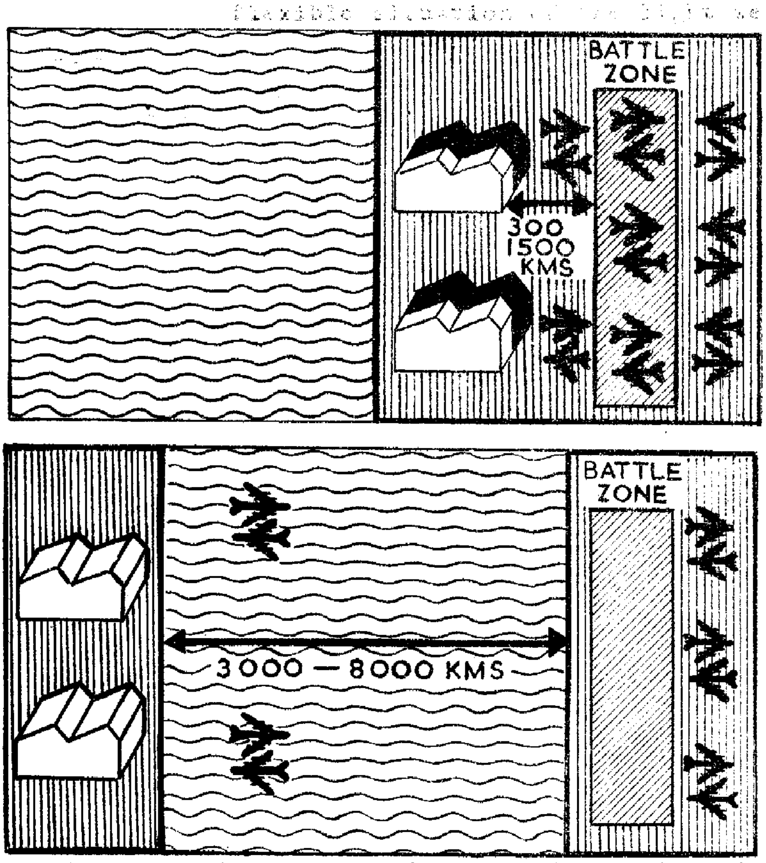
TACTICAL INFLUENCES ON THE DESIGN AND PERFORMANCE OF... FIRST LINE FIGHTERS.



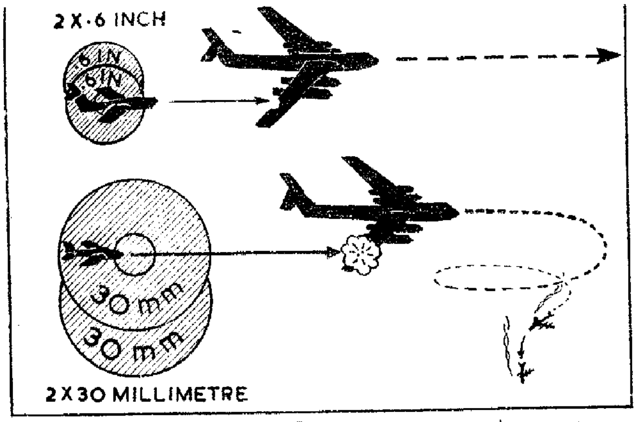
The maker's estimates of the relative cost in man-hours and in money of the light weight, first line fighter and the conventional [illegible].



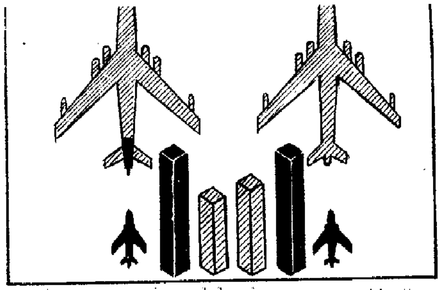
Complexity, and its own cost in time, the rather [illegible] of the [illegible] fighter (top) with its many different parts and central [illegible] point, contrasts unfavourably with the more flexible situation of the light weight fighter.



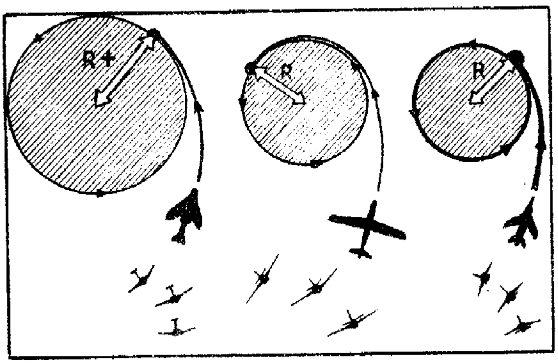
Proximity to the main battle areas diminishes the power of the productive resources [illegible] heavy, complicated [illegible] industrial plants have to [illegible] ted, the light weight, [illegible]



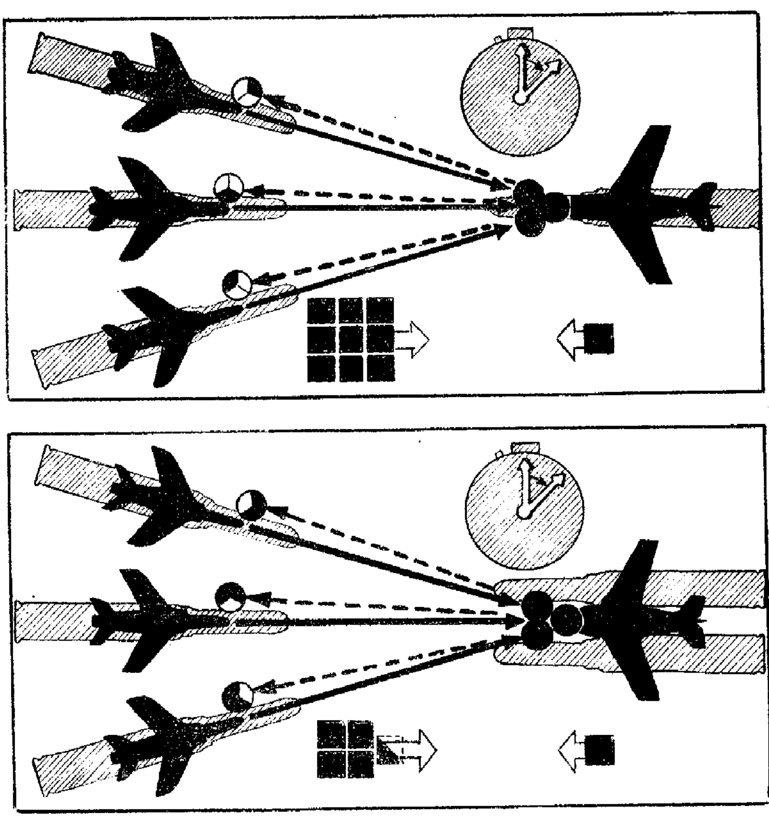
Minimum armament. There is a point at which multiplied armament becomes redundant. At the present time and for a number of years to come it appears that the armament [illegible] of two 30 millimetre cannon is lethal to any known aircraft, assuming reasonable [illegible] for accuracy in aiming [illegible] of delivery.



Radar controlled rear guns are being fitted to some American bombers. But when defensive armament goes in, performance goes out. The bomber with defensive armament must inevitably be of lower performance than the one without it. Consequently the performance differential is more in favour of the fighter. The fighter then has a larger choice of approach. He can make flank attacks or attacks from above or below with greater certainty.



The shape of a turn. Tactically the manner in which a turn is initiated is almost as important as the radius of the turn. The aircraft with the lower lateral inertia and with the more rigid structure will be able to initiate a turn more rapidly than the larger, heavier, more complex conventional machine.



Lanchester's law. These two pictures illustrate diagrammatically the N squared law, originally enunciated by F W Lanchester, and applying to unmasked fighting vehicles in combat. It states that where the numerical advantage is as two to one, the fire power advantage given equal weapons is as four to one, similarly when the numerical advantage is as three to one the fire power advantage is as nine to one. If the light weight fighter has but half the static fire power of the conventional machine its superiority in production, maintenance and servicing give it a fire power advantage (see lower picture) of at least four and [illegible] to one.

It was applied by the fighting pilots of the First World War and the Second World War. In commanding a formation the leader will seek to engage in such a position that there is a local numerical superiority. He will be particularly anxious to do this if the overall superiority in numbers lies with his adversaries. Lanchester's law is a more precise statement of the adage 'divide and conquer' and it becomes of paramount importance when considering the advisability of introducing the Gnat or any other light weight fighter into general air force service.

Nor is it true to say, as some suppose, that because the guns of a fighter are fixed to fire forward in the line of flight, therefore it is impossible to concentrate the fire of two or more machines. There are numerous tactical procedures which make this practicable. But in order to assemble two or more aircraft upon one aircraft there must be comparable performance and especially there must be a superiority in turning performance and general powers of manoeuvre.

It is trange to think that two major wars and the lesser Korean operations have all, without exception, emphasised the importance in combat of the powers of manoeuvre, yet that so little attention is paid to them by the air staffs of the different countries. Powers of manoeuvre gave the Spitfire its superiority over the Messerschmitt 109 and the exact difference in such things as turning performance were measured in flight by the Royal Aircraft Establishment and formed the subject of a technical report. The Spitfire could turn on a smaller radius at the same speed and was able as a consequence to acquire the initiative whenever it met Messerschmitts in prolonged combat.

Although this fact was established during the war and after the Spitfire had proved its worth it was not - like the eight-gun arrangement - the consequence of remarkable prevision on the part of those staff officers responsible for specifications. On the contrary there was a lamentable absence of any sign that those officers understood the value to the fighting pilot of good powers of manoeuvre. It is the fact that there is still no sign of this recognition. It is an astonishing thing that the combat reports of hosts of experienced fighting pilots should emphasise the value to them of powers of manoeuvre yet the staff officers who compile specifications do not seek to emphasise these powers in new aircraft. On the contrary they permit weights to rise almost without check and size to increase.

The larger, heavier aircraft has a higher lateral inertia and is not only incapable of making turns on so small a radius as the smaller machine, but it also takes longer to initiate a turn. The point has been demonstrated a million times yet it is neglected by official specification. The greater powers of manoeuvre of the Gnat when compared with those of a conventional fighter are among its greatest fighting assets.

The Gnat, with a small span and with a stiff structure, is able to achieve a rate in roll much higher than that attainable by any heavy conventional fighter. It can initiate its turns more swiftly, and it can switch from one direction of turn to another more swiftly. The shape of a turn is indicated in the diagram. There are, in effect, two stages; first, the initiation of the turn, which is mainly a matter of rate of roll. With equal design merit it is inevitable that the smaller aircraft should be quicker on the turn.

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It must be able to outmanoeuvre the contemporary conventional fighter provided only that there is no marked inferiority in top speed or rate of climb. It has been made plain that there should be no such inferiority.

There is one other point about small size. It seems a trival point to those who have never engaged in combat in the air; but it is, in fact, sometimes a determining factor. It was the practice of skilled pilots in the wars of 1914-18 and of 1939-1945 to utilise the fact that the larger the aircraft, the sooner it can be seen. It was proved possible to effect a surprise attack not only upon one large aircraft, but equally upon a formation of large aircraft by employing this fact. Let it be put thus: if two aircraft are flying towards one another and if their crews are equally vigilant and the possessors of equally good eyesight, the crew of the smaller aircraft will se the other first. It is an obvious point, but one that has been completely neglected in weighing the qualities of the small and the large fighter.

It is the fact that much of the watch would be kept in any future war by radar; but Squadron Leader Neville Duke reminded his hearers at a meeting in the United States not long ago that the final stages of combat are still likely to be fought by direct visual reference; not only by eyesight used for the reading of instruments but by eyesight used to engage and to do battle with the adversary. While direct visual reference is employed in aerial combat, the smaller aircraft will have some advantage over the larger one simply and solely by virtue of its smallness.

Fighter versus bomber.

So far the main argument has been strung along the lines of the fighter versus fighter type of combat for the reason that this is the simplest to deal with theoretically. It must also be remembered that it may be the critical type of combat. For the training of aerial ascendancy in any theatre the preliminary stages may well be a struggle between the fighters. While an effective and powerful defensive force of fighters remains in being, there is little chance of an offensive bomber force obtaining a complete and decisive result. There must be some preliminary attempt to damp down defensive fighter activity if not to shut it down completely. Therefore the fighter versus fighter combat is one which must always be studied first because it is often the basis of the rest of the aerial struggle.

When it comes to the second stage there is the fighter versus bomber combat to consider. This is tactically often similar to the fighter versus other types of machine, such as long range reconnaissance aircraft and naval aircraft. The central facts are that the fighter has a large superiority in performance and in powers of manoeuvre. It can, therefore, catch the bomber and when it has caught it it can select the mode of approach. The fighter, with an adequate margin of speed and climb, can elect whether to make a flank attack or an attack from the rear or from above or below.

In reply the bomber can be armed. There is a good deal of argument about whether the arming of a bomber improves its chances of reaching the target or not. The experience of major wars is that the bomber needs armament. In theory of the unarmed bomber, although persuasively argued on many occasions, has never yet proved to be satisfactory in practice. More than that it has been found in practice that where two technically and productively equal countries are opposed to one another, it is impracticable to make bombing attacks in the daylight without fighter escort. The bomber therefore brings us back to the struggle for fighter superiority already mentioned.

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If there is no fighter superiority, the sending out of a bombing force without fighter escort will lead to crippling losses, and will not be accompanied by satisfactory bombing results.

It may be argued that this would not apply if atomic bombs were in use. It might then be true that it would be worth accepting an enormously high bomber loss rate - it might be 50 per cent - simply because if a few bombers reached their target the destruction they could do would be sufficient to warrant the doctrine that the bomber force was expendable in the largest sense, and that it should be allowed to dwindle to nothing in the first few days of the war.

With that view it is difficult to argue because it is made on assumptions that have never been tested. But on the basis of what has been experienced it may be said that the bomber may always get through, but that it will get through only in small numbers, partly damaged and therefore operationally inefficient unless there is absolute fighter superiority in the area or unless the bombers have a fighter escort.

The superiority of the interceptor over the bomber does not, therefore, need lengthy exposition, for it will generally be accepted. But there have been introduced in some American bombers automatic radar controlled guns. These might offer some protection against attack by fighter but it must be remembered at the same time that they reduce the performance of the bomber and make the performance difference between bomber and fighter all the greater.

The consequence of this is that the fighter will be able an even more absolute choice in the mounting of his attacks. He will be able to choose his moment, and his manner of approach. He will be able to study to avoid the radar armament and it is unlikely that any bomber will present no arcs in which fire cannot be brought to bear. So the advantages of radar guns in bombers must be set against the basic and inevitable fact that the more armament and radar equipment that is packed into the bomber, the lower will be its bomb load or else its performance or both.

In the fighter versus bomber combat the light weight machine enjoys all the advantages of the larger interceptor, and many that the larger machine does not share. It is true that the Secretary of the United States Navy has recently said that the Russians have bombers which are capable of supersonic speed. If this is so then Britain has no interceptor fighters, nor will she have any, capable of dealing with them for several years. But the supposition is made throughout this article that there is no such marked difference between the merits of Russian and of Allied engineering and design genius. Neither Britain nor America nor any of the NATO countries has a bomber capable of supersonic speed. If such a bomber were to appear it is almost certain that it would appear after the fighter capable of supersonic speed. We expect that kind of fighter soon. The bomber will follow. But at any given instant in time the air forces of the world are likely always to have fighters of superior performance to their bombers.

It will be seen that however the situation is regarded the light weight fighter shows well. It can compete with other fighters and it can compete with bombers, always with a chance of success at least as great as that of the conventional heavy weight, complicated fighter. The theoretical case is complete and it is fully supported by experience in major wars.

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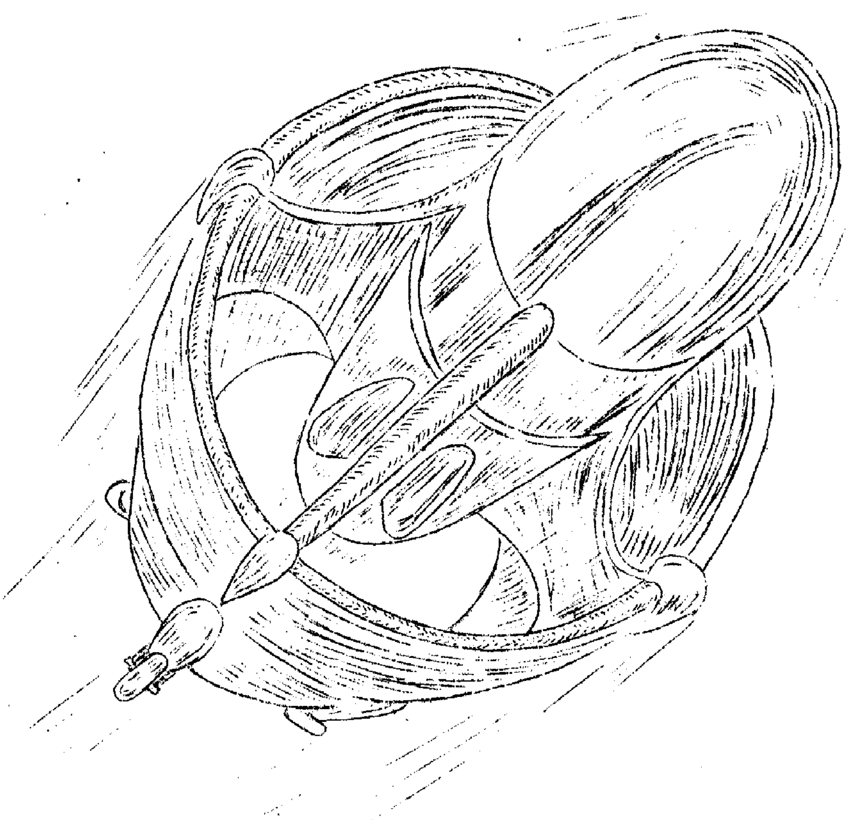
DE COLEOPTER

HET VLIEGTUIG VAN MORGEN.

Ir. von Zborowski ontwierp een revolutionair toestel.

Er is moed voor nodig, om na de stortvloed van bizarre berichten over vliegende schotels, vliegende sigaren en vliegende kachelpijpen en vooral na de banvloek van de Utrechtse Sterrenwacht, nog over "vliegende servetringen" te komen spreken. Maar toch zullen wij trachten die moed op te brengen. Want de "vliegende servetring" is geen product van de verbeelding, ze is even werkelijk als het befaamde "vliegende ledikant" van Farnborough. De "vliegende servetring" - een naam die we aan het apparaat gegeven zagen - heet eigenlijk niet zo. Ze draagt een wel wat voornamer doopnaam. Die naam is "Coleopter". Het is de wetenschappelijke naam van een groep insecten, n.l. de hardvleugeligen, de kevers. Evenwel is deze "coleopter", waar wij het hier over willen hebben, in het geheel geen kever, geen insect, maar een uiterst merkwaardig vliegtuig, dat al direct gedoodverfd is geworden als het "vliegtuig van morgen".



Een vliegende schotel? Neen, een coleopter, het vliegtuig van de toekomst.

en, naar het zich laat aanzien, niet zonder reden. Want het is een uitvinding, welke waarlijk verrassende perspectieven biedt en een revolutionnair karakter draagt. En dat wil wel iets zeggen, want het aantal revoluties is in de vijftigjarige ontwikkelingsgeschiedenis van het vliegtuig niet zo heel erg groot geweest.

SAMENWERKING

De Coleopter is typisch een vliegtuig van de moderne tijd. Alleen reeds daarom al, omdat het een product is van Frans-Duitse samenwerking. Een succesvolle samenwerking zelfs. Dat "succesvol" betekent echter niet, dat de coleopter al gevlogen heeft. Tenminste, dat is niet waarschijnlijk. Wat er van verteld is wekt de indruk, dat men nog niet verder is dan de fase van proefnemingen in windtunnels ter confrontering van de theorie met de feiten. Het "succesvol" slaat op deze proeven.

De ontwerper van de Coleopter, Ingenieur Helmut von Zborowski, heeft over het sensationele vliegtuig op 15 October j.l. mededelingen gedaan ter gelegenheid van de te Duisburg gehouden derde jaarvergadering van de Duitse "Wissenschaftlichen Gesellschaft für Luftfahrt", en het is niet ondenkbaar dat deze bijeenkomst eerlang een plaatsje zal krijgen in de annalen van de luchtvaartgeschiedenis als een van haar historische momenten. De Coleopter is een van het huidige afwijkend, volkomen nieuw vliegtuigtype. Von Zborowski heeft er samen met prof. dr. Heinrich Hertel, dr. Wilhelm Siebold en anderen, jarenlang in zijn Bureau Technique te Boussy bij Parijs aan gewerkt.

Het heeft al heel weinig overeenkomst met het gewone vliegtuig. Het bestaat uit een sigaarvormig lichaam, omgeven door een ring- of buisvormige vleugel. Het lijkt dus op een soort vliegende kachelpijp. De afmetingen zijn betrekkelijk klein, de doorsnee is zowat 4½ meter, de lengte 5 tot 8 meter. De Coleopter staat vóór de start loodrecht op de grond en stijgt ook loodrecht op. In twee minuten kan het een hoogte van 15 kilometer bereiken. Na de opstijging legt het zich in een grote boog horizontaal en kan op deze wijze snelheden bereiken, die ver boven de geluidssnelheid liggen.

VERTICAL TAKE OFF

De Coleopter behoort dus tot de klasse van de loodrecht opstijgende en landende vliegtuigen, of, zoals de Engelsen ze noemen, de "V.T.O.-vliegtuigen", de toestellen van de "vertical take off". De betekenis van de "vertical take off" is, zoals wij al eerder hier ter plaatse uiteen hebben gezet, gelegen in het feit, dat de, in het bijzonder bij een hoge belasting, lange en ruimte vorderende dure startbaan voor het vliegtuig vermeden wordt.
De verticale start staat al sinds de oorlog in de belangstelling. De raketten van het type V. 2 startten verticaal. Ook de verschillende helicoptertypen, en de speciale typen van raketvliegtuigen, door de Duitsers tegen het einde van de oorlog ontworpen, als de zg. "Natter" van Bachem. De verticale start is ook gegeven aan de Amerikaanse prototypen Lockheed XFV-1 en Convair XFY-1 en aan het Engelse "vliegende ledikant". De helicopters kunnen ook weer verticaal landen en hebben dus maar een landingsterrein van beperkte omvang nodig. De raketten en raketvliegtuigen zijn daartoe niet in staat. De helicopters worden in hun ontwikkeling en hun toepassingsmogelijkheden echter belemmerd door de slechts geringe snelheden, welke zij in hun horizontale vlucht kunnen maken en welke hen verhinderen te concurreren met de gewone vliegtuigen.

Pogingen om dit te verbeteren zijn evenwel tot nogtoe niet geslaagd.

De verticale start en het zich via een grote boog op de horizontale vlucht instellen van de Coleopter vertoont overeenkomst met de opstijgcurve van de raket. Maar er is een wezenlijk verschil. De raket vliegt, na het ombuigen, als een steen door haar eigen vaart voort. De Coleopter evenwel wordt in horizontale stand, precies zoals ieder ander vliegtuig, gedragen door zijn ringvleugel, de "buis". Hij combineert dus de mogelijkheden van raket en vliegtuig beide. En hij combineert daarbij nog een aantal hoogst begerenswaardige eigenschappen: een extreem laag constructiegewicht, een eenvoudige bouw, zeer hoge vliegsnelheden, ongelofelijk hoge stijgsnelheden.

SUCCESVOLLE TOEPASSING

Het toestel bestaat dus uit een ringvleugel van een vorm, gelijk aan die van het omwentelingslichaam, dat ontstaat, als men een vleugelprofiel om de rotatieas van het toestel laat wentelen. Ze is zowat even lang als wijd. Uit deze ring, deze buis, welke dus het dragend gedeelte is, steekt de ongeveer sigaar- of stroomlijnvormige vliegtuigromp naar buiten, precies in de as van de ring aangebracht. Deze romp bevat de cabine en de aandrijvende apparatuur. Daarvoor komen in aanmerking straalaandrijving, straal-turbines en propellerturbines.

Von Aborowski is er in geslaagd de ringvleugel, die naar de klassieke aero-dynamische opvattingen voor een typisch slechte vleugel doorgaat een succesvolle toepassing te geven. De coleopter toont zich voor alle toepassingsmogelijkheden bruikbaar. Hij kan de taak van de helicopter vervullen, maar ook die van een straaljager. Hij kan als postvliegtuig gebruikt worden, als lange-afstand-projectiel, maar ook als passagiersvliegtuig. Von Zborowski heeft in zijn ontwerpen al deze mogelijkheden onder ogen gezien.

Het Coleopter-postvliegtuig is de verwezenlijking van een oude droom. Al vóór de laatste wereldoorlog heeft men hier in Europa proeven genomen met het transporteren van post door middel van raketten. Het Coleopter-postvliegtuig is gedacht als een onbemand vliegtuig, voortgedreven door een straalturbine. Het weegt slechts 700 kg. en bereikt op een hoogte van 11 km. een reissnelheid van 800 km per uur. Wanneer het een nuttige last van 700 kg aan boord heeft - en dus zijn eigen gewicht aan post vervoert - kan het een afstand afleggen van 500 km. De totale lengte is 5,5 meter, de doorsnede van de ringvleugel is 2 meter. Deze getallen zijn uitermate verrassend. De transportkosten kunnen met die van de normale luchtpost een waarlijk dodelijke concurrentie aangaan.

Het Coleopter-passagiersvliegtuig zal zes tot twaalf personen kunnen vervoeren. Von Zborowski heeft het in zijn ontwerp een propellerturbine van Armstrong-Siddeley toegedacht. Het heeft uiteraard grotere afmetingen dan het postvliegtuig, hoewel die afmetingen toch altijd nog verrassend gering zijn. De ringvleugel bedraagt 4,6 meter, doorsnede van de lengte ongeveer 8 meter. De machine weegt 2400 kg en bereikt een topsnelheid van 700 km per uur. De afstand welke afgelegd kan worden is 3000 km. Het feit, dat het toestel niet aan min of meer afgelegen vliegvelden gebonden is, maar in het centrum van de steden kan opstijgen en landen, geeft het een grote voorsprong op gewone vliegtuigen.

Von Zborowski heeft zelfs een sportvliegtuig ontworpen, met het gewicht van een auto, een toestelletje van 900 kg startgewicht, dat drie à vier zitplaatsen heeft. Het kan een snelheid maken van 400 km per uur en zonder tussenlanding een afstand van 1000 km afleggen.

MILITAIR

Tot zover de civiele sector. Maar er valt over de ontwikkeling van een nieuw vliegtuigtype wel nauwelijks te spreken zonder de militaire sector er bij te betrekken. De ervaring van twee wereldoorlogen heeft geleerd, dat het voornamelijk de militaire interessen zijn, die een grote stoot geven aan de ontwikkeling van nieuwe vliegtuigtypen. Dit vindt hierin zijn oorzaak dat voor zulk een ontwikkeling niet onbelangrijke financiële middelen nodig zijn. En voor militaire doeleinden komen die nu eenmaal vrij gemakkelijk op tafel.

Von Zborowski heeft daarmee terdege rekening gehouden en ook militaire ontwerpen overgelegd.

Een gevechtstoestel, uitgerust met een Atar 101 straalturbine van de SNECMA, die een snelheid van 1450 kilometer per uur kan bereiken. Het verbazingwekkende is niet zozeer daarin gelegen, als wel in het feit, dat het toestel slechts 1800 kg weegt. Een moderne jager weegt ongeveer het vijfvoudige. Een ander type - een opvangjager - bereikt in twee minuten een hoogte van 15 km en maakt een snelheid van 2100 km per uur.

Tenslotte heeft Von Zborowski zijn Coleopter ook als lange-afstand-projectiel ontworpen. Met gegevens daarover was hij evenwel niet erg gul. Toch heeft hij meegedeeld, dat het projectiel 70 pCt van zijn startgewicht aan springstoffen mee kan nemen. Wat dit betekent, illustreert het feit, dat de V-2 slechts 5,6 pCt van zijn gewicht aan springstoffen kon meenemen.

Al deze gegevens tonen wel aan, dat het gewettigd is de Coleopter, voor zover reeds verwezenlijkt, een revolutionnaire vinding op luchtvaartgebied te noemen.

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U.S.NEWS & WORLD REPORT 26 November 1954.

A KEY BASE GROWS SHAKY

Iceland's Reds Dig In to Push Americans Out

Trouble is building up for the big U.S. military base in Iceland. It is no longer considered secure.

This key outpost guards the bomber routes and submarine lanes. It's a northern anchor for U.S. Atlantic defenses.

But American forces actually have a precarious foothold on the remote island. This on-the-ground report shows why.

REYKJAVIK

Russia and the Communists are establishing a powerful and dangerous beachhead here in this remote island nation where the United States is building one of the free world's most vital strategic bases.

An on-the-spot investigation shows that the American position in Iceland - never really solid - is becoming more and more shaky as a result of Communist inroads among the people.

Communists and another openly anti-American party polled more than 22 per cent of the vote in the last election. Reds control 9 of the 52 seats in Iceland's Parliament. They have heavily infiltrated Government offices, and key unions are in their grip.

Soviet prestige is growing here. Russia has become this country's main trading partner, and the Soviet peace offensive is spurring hostility to the 5000 American troops and builders stationed in Iceland.

As a result, Americans are not ruling out the possibility that the U.S., in the not-too-distant future, will be asked formally to withdraw its military forces from this island.

A glance on the map shows why this situation is beginning to worry American planners.

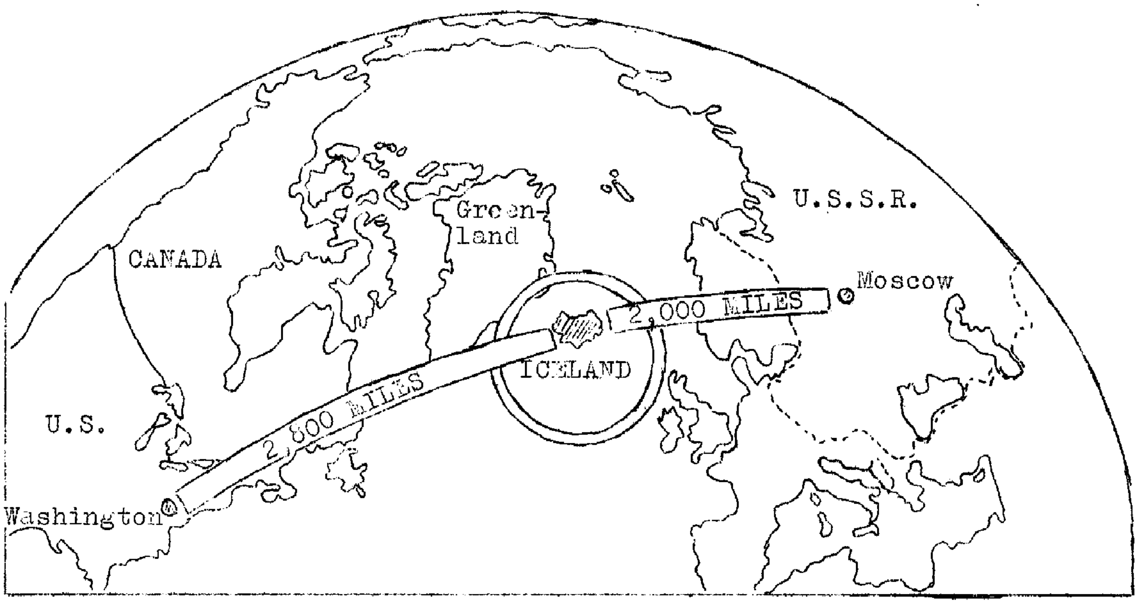
The huge air base which the U.S. is building at Keflavik, 35 miles from the capital, Reykjavik, provides the first line of defense against transpolar aerial attack on the United States. from key Soviet bases.

Keflavik lies within a few minutes' flying time of the shortest route between the Soviet Union and the East Coast of the United States. Iceland is the eastern anchor of the radar and interceptor screen protecting the transpolar approaches of the U.S. It also would give American bombers, in case of war, an operational base of fueling stop only 2000 miles from Moscow.

Without access to an air base in Iceland, it would be impossible for the U.S. in wartime to ferry short-range jet aircraft to Europe. Security of North Atlantic sea routes depends to a large degree on patrol planes from Iceland to track down and destroy enemy submarines over a wide area.

AS A SOVIET BASE. Iceland, in Russian hands, would constitute a frightening threat to the United States in a future war.

U.S. SECURITY - AT STAKE IN ICELAND



THE AMERICAN BASE AT KEFLAVIK

Protects East Coast of U.S. against Russian bombers

Can support long-range aerial attack on Russia

Enables U.S. to ferry short-range jets to Europe

Guards Atlantic shipping against submarines

It would put Soviet bombers within 2800 miles of Washington, D.C., and the Great Lakes industrial region. It would give Russian submarines a base within very short striking distance of convoy routes.

Russian seizure of this island is by no means a purely theoretical forecast if the Communists succeed in their campaign to force U.S. troops to leave.

Iceland has no defense force whatever of its own. Even its tiny police force is virtually unarmed. Communists here are strong, while,the population is indifferent toward Red conspiratorial activity. That is why a Communist take-over, dismissed by Icelanders as a practical impossibility, is considered by outsiders to be anything but impossible.

A Russian grab in the first days of a war is another possibility. Military experts say that, if Americans pulled out, Soviet fishing boats operating normally in Icelandic waters could land enough men in a surprise attack to occupy the island.

Communists, at present, are mobilizing support among Icelanders for a demand that the Government oust American military forces, repudiate the 1951 Iceland-U.S. defense agreement, and cancel Iceland's participation in the North Atlantic Treaty Organization. They are making considerable headway.

One secret of Communist strength here is the fact that Icelanders, with few exceptions, reject the idea that Communism is a conspiracy seeking to overthrow the democratic system.

Rather, Communism is accepted as a legitimate political movement to be treated as other political parties are. Iceland's Communists are pictured as idealistic and loyal citizens seeking to improve working conditions, protect Iceland's culture and defend its independence.

Idea of Communist loyalty to Moscow is played down. Even Prime Minister Olafur Thor says: "The Communist leaders are loyal to Moscow, but not the rank and file."

To be a Communist in this country certainly is not considered a desgrace. In all walks of life, almost every family includes a couple of Communists. One important Government official, who belongs to the Conservative Party, has three brothers of whom one is a Communist- "and he's the richest of us all," says the official laughingly.

WHAT HELPS THE REDS. Almost universal resentment toward the stationing of foreign troops in Iceland also helps the Communist campaign to undermine the U.S. position here.

Icelanders, numbering in total fewer than 160.000, regard the presence of any foreign troops as a menace to their sovereignty, language and culture.

This feeling goes back to World War II, when tens of thousands of British and American troops descended on the island to keep it out of German hands. The impact of this experience on the economy and social life of Icelanders was staggering- and they haven't forgotten about it yet.

Older people fear that the 5000 Americans now stationed here will corrupt the country, especially its youth. They insist on virtually segregating American troops. Few U.S. soldiers come into Reykjavik, but feeling persist that Americanization is to be feared. For instance, complaints are being made that radio broadcasts from the U.S. air base are infecting Icelandic youth with jazz and American slang.

Complaints are also heard that theAmericans are disrupting the economy. Nearly 2.500 Icelanders are employed at the base. Trawler fishermen find it hard to hire labor, and wages have been driven up.

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Much is said about this, but little about the general prosperity that Americans have brought to Iceland.

Communists are quick to magnify and exploit every incident. A minor incident involving a G.I. and an Icelandic girl was quickly blown up into a national scandal-and soon picked up by the non-Communist public. Communists, too, inspired the story now making the rounds that a small, domed structure, erected at the air base for electronic equipment, is really intended for storage of atom bombs. A big hangar at Keflavik is called "hell hangar" since the Communist press reported that hydrogen bombs are to be stored there.

American contractors and some U.S. military officials are having trouble in their labor relations, too. The Cabinet minister who negotiated the U.S.-Iceland defense agreement accuses Americans of resorting to "high-handed" practices. Americans, he said, repeatedly refuse to conform to standard labor practices here and balk at settling valid wage claims.

U.S. representatives say that much of the trouble arises from labor policies dictated by the Icelandic Government itself. But the continuing friction on labor policy gives the Communists more grist for their propaganda mill.

WAR SCARE: GONE. The Russian "peace" offensive gives Communists another boost in their campaign to get U.S. forces out of the country. Among Icelanders there is a growing feeling that American troops no longer are needed for this country's security. In fact, the continued presence of Americans here is considered provocative to Russia. The war scare, which caused Iceland to sign its defense agreement with the U.S., is a thing of the past.

A "Committee of Forty", including prominent persons of every political shading, has been organized - with the help of Communists behind the scenes - to circulate a petition demanding the immediate withdrawal of American troops from Iceland.

Even conservative officials in the Government are wavering on this issue. One Cabinet Minister, commenting on Iceland's defense agreement with the U.S., said: "We must re-examine this question in the light of the changing world situation on a year-to-year basis".

In contrast with the decline of American popularity, Russian prestige grows steadily. Russians are credited with easing international tension/ Russia is taking nearly all of Iceland's fish, the island's main export, and supplies all of its gasoline.

Russians are strengthening this foothold with a propaganda offensive. An Iceland-Soviet Friendship Society is flourishing. It is headed by Iceland's most famous author, Halldor Laxness, who isn't a Communist himself but is strongly anti-American. The society recently sponsored an "introduction month" to acquaint Icelanders with Soviet culture. A parade of prominent Soviet artists and intellectuals toured the sparsely populated island.

In the Government, Communists have managed to infiltrate most ministries, and to honeycomb several of them. The educational system and radio broadcasting organization are considered Communist strongholds -- but no one questions the right of Communists to hold the most sensitive positions.

NEW PARTY'S ONE AIM. In last year's general election, the Communist Party -- which runs under the deceptive name of Amalgamated People's Party--Socialist Party - got 16.5 per cent of the total vote, a slight drop from the preceding election. But the anti-American vote registered an increase, with 6 per cent of the popular vote going to the new National Defense Party which has as its sole policy the withdrawal of American troops from Iceland.

Two other political parties, one of which is represented in the Icelandic Cabinet, are badly split on the American-base issue.

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Altogether, the voting strength of anti-American groups is estimated as high as 40 per cent of the electorate. The Prime Minister Himself admits that "more and more politicians are moving steadily closer to the Communist position because they're afraid of losing votes".

Communists are counting on their strength in organized labor to hasten the trend. They dominate the major unions, including the dock workers'. So far they are excluded from leading posts in the Icelandic Labor Federation. Now non-Communist Labor leaders are beginning to split up, and there is a chance that the Communists may be able to work their way into control of the federation too.

If that happens, Communists are certain to do their utmost to disrupt work on the Keflavik base by precipitating labor disputes.

Thus the Communists, with the trend of opinion here running against the U.S., have a ready-made situation that they are exploiting with great success. Loss of Iceland to the Communists would put a big hole in the security of the U.S. against air attack. It would expose Atlantic shipping to submarine warfare and deprive American bombers of a striking base for attack on Russia.

One of the best-informed foreign observers here was asked whether he foresaw the Communists' getting a majority to support their drive for withdrawal of American troops.

"Not this year", he replied. "Maybe not next year. But in time it's far from impossible".

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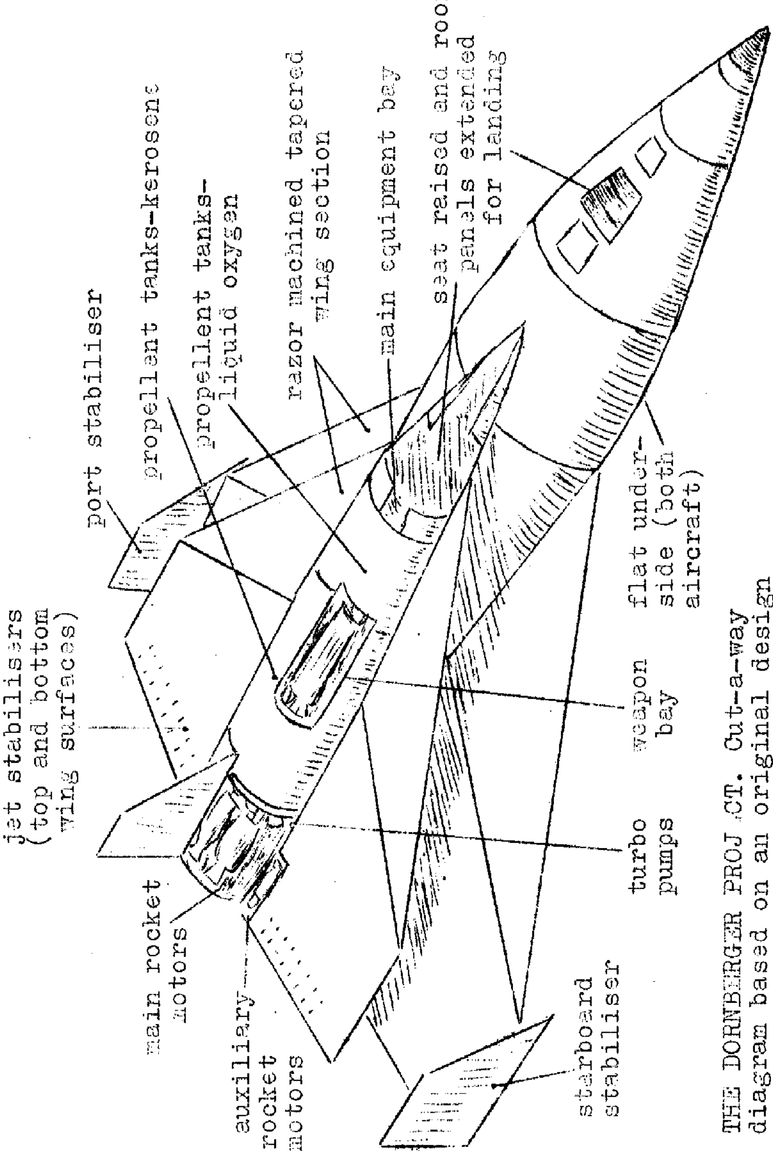
ROYAL AIR FORCE FLYING REVIEW December, 1954.

THE DORNBERGER PROJECT

The scene is a remote rocket test centre somewhere in the United States. From the top of the blockhouse, nerve-centre of launching operations, a red smoke signal gives warning of an impending firing. The "count-down" has already begun; soon the sky will receive a new challenger, faster than anything that has gone before - steel, titanium, and man!

Extending across the desert base in a straight line as far as the eye can see, a railed track is set in a low concrete embankment; but this is no ordinary track and no ordinary vehicle will move along it. Where the track begins, about half-a-mile from the block-house, rests a strange machine having the appearance of a futuristic bi-plane with sharply-swept delta wings. In fact, two aircraft are mounted one above the other - but so efficiently are they blended that they can operate together as one supersonic aircraft. This unique combination is itself mounted on a giant streamlined launching sled whose slipper-feet grip the rails of the track; the sled, neatly faired in behind the aircraft extends twice its length and eight large rocket nozzles emerge from the rear.

In the block-house, tension nears its climax . . 3-2-1-"FIRE"! The powerful motors of the sled burst into life, sending forth a blast of flame that will raise a dust storm across the desert wastes. THIS is the Dornberger Project!



THE DORNBERGER PROJECT. Cut-a-way diagram based on an original design study by Dr. Walter Dornberger and Krafft Ehricke (Preliminary Design Department of the Bell Aircraft Corporation)

A BELL AIRCRAFT DESIGN STUDY

The designers of this remarkable composite aircraft are none other than Ex-Major General Walter Dornberger, chief of Germany's war-time rocket research station at Peenemüde, and his colleague, Krafft Ehricke. Both these men ar now members of the Preliminary Design Department of the Bell Aircraft Corporation, which is reported to be engaged on a detailed investigation of their proposals under a Government contract.

Although the overall conception of the Dornberger Project is original, the designers have clearly been influenced by three earlier projects.

First, there are the successful experiments which Bell themselves are making with rocket powered aircraft. Already, the Bell X-1a has achieved a speed of 1,635 m.p.h. in a test run at 70,000 ft. (Mach 2.5). Flights have also been made as high as 90,000 ft.; with more than 9/10ths of the atmosphere beneath the aircraft, this has brought man to the threshold of space itself.

This performance was made possible by launching the X-1a in flight from a parent aircraft (a B-29 "Super Fortress") which enables the rocket plane to operate with full propellent tanks from an altitude of 35,000 ft.

Not only has this proved a valuable research technique, enabling the test machine to climb to great heights and make supersonic-speed runs where the air is thin and offers less resistance, but it has led to the development of a special type of air-launched guided-missile. This is the Bell B-63 "Rascal"; carried partially within the bomb-bay of long range bombers, it can be released from a height of 40,000 ft when the launching aircraft is 100 miles from its objective. The bomber no longer makes a run over the target but turns away immediately its weapon has been released.

The second great influence was undoubtedly Sänger's "antipodal bomber" project, a German design study (backed up by a considerable amount of preliminary experiment between 1936 and 1942) for a 100-ton rocket powered bomber to reach a maximum speed, at high altitude, of 13,000 m.p.h. and travel 14,000 miles.

The two outstanding features of similarity here are: (a) the use of a long horizontal track for launching the aircraft at supersonic speed, and (b) the fuselage shape, flat on the underside to improve the aircraft's lift characteristics at high speeds, with a low-mounted wing (of triangular wedge section), the underside of which merges with a flat fuselage. Whereas Dornberger specifies a delta layout, Sänger's aircraft had a conventional wing and tailplane arrangement.

The third factor was the famous A-9/A-10 project with which Dornberger himself had been intimately connected at Peenemünde in 1942. The idea was to take the basic V-2 rocket, re-design it structurally and at the same time provide it with highly-swept, dart-like wings and a more powerful rocket motor. This improved V-2 was then to be mounted on top of a 70-ton rocket booster.

After taking off vertically, driven by the motor of the booster, the two rockets would reach a height of 80,000 ft. and a speed of 2,600 m.p.h., the vertical ascent path meanwhile being changed to an angle of 45 degrees to ensure maximum range. At this point the booster's propellent would have been exhausted, when the motor of the winged rocket would fire causing separation from the booster, the latter being recovered by drogue parachutes. The smaller rocket, continuing the climb, was expected to reach a maximum velocity of over 6,000 m.p.h. However, instead of plunging back to the ground on a ballistic trajectory (like the V-2), the dive would be terminated by means of automatic controls at a height of about 28 miles, whereupon the rocket making use of its wings, would extend its range in a protracted supersonic glide. A <u>pilot version</u> was also considered.

<u>STEP CONSTRUCTION</u>

The technique of launching one rocket from another in flight is known as the "step principle". Several rocket steps, or boosters, can be employed which drop off as soon as their propellent is exhausted and impart their impulse to the steps ahead. In this way, no dead-weight in the form of tanks, motors and rocket structure, is carried a moment longer than necessary - and, in consequence, much greater speeds (and ranges) can be achieved by the <u>final</u> step than could ever be obtained by a single rocket of the same overall weight.

The step principle is employed to good effect in the <u>Dornberger Project</u>. The first booster stage, being a launching sled, does not leave the ground and can be refuelled and used again repeatedly.

Moreover, in raising the speed at take-off to more than 1,000 m.p.h. (the minimum speed at which the aircraft could fly at maximum load), it conserves the machine's entire propellent up to this point. The most outstanding feature, however, is that both the second (booster) step and the third step are designed as fully controllable supersonic aircraft, the final vehicle being mounted pick-a-back fashion in the region of the booster's centre of gravity. Both machines embody the flat underfuselage favoured by Sänger, fitting snugly together with the maximum possible aerodynamic efficiency. A rail in the top of the parent aircraft enables the smaller machine to ride forward and separate cleanly

PILOT-MONITORED CONTROL

Although the flight plan would be largely ground controlled both aircraft are intended to be piloted - one man occupying each machine. Propulsion is obtained by rocket motors employing liquid oxygen and kerosene, with small auxiliary rockets for "cruise" conditions preparatory to landing. In each machine, the pilot's cabin is placed conventionally in the nose with essential equipment, radio, navigational aids, etc., occupying a position aft of the cabin. Behind these are the propellent tanks and in the extreme tail the pumps and rocket motors. A bomb-bay, housing a 2,500 lb. nuclear weapon, is situated between the propellent tanks of the smaller aircraft.

Many features of the Dornberger Project are, of course, secret. However, in conjunction with details of the earlier Sänger "antipodal bomber", it is possible to give a fairly accurate description of the machine's intended operation.

The estimated launching weight of the two aircraft is nearly 100 tons. The rocket powered take-off sled would probably operate at a thrust of about 600 tons, taking approximately 12 seconds to accelerate the aircraft to supersonic speed (approximately Mach 1.5), and consuming 40 tons of propellent in the process. When this velocity was reached, the composite aircraft would disengage automatically and the launching sled, now considerably lightened by the consumption of propellent, would be quickly brought to rest on the track. In this connection, it is of interest to note that an experimental rail-sled used in the USA for testing braking parachutes and other high-speed equipment, has already attained a speed of 1,500 m.p.h. along a 10,000 ft. track. The sled is brought to a safe stop by lowering a scoop into a water trough laid between the rails.

Meanwhile, having left the launcher, the aircraft would already be climbing under the impulse of its own rocket motors, ultimately to assume an ascent path of 30 degrees which will take it to an altitude of 15 miled (and a velocity of 3,500 m.p.h.). Then, with only reserve propellent remaining in the tanks of the parent aircraft for the return to base, the smaller machine would separate - going on to reach its maximum velocity at a height of 30 miles. Being then in highly tenuous atmosphere, it would follow a ballistic trajectory, the peak of which would be more than 100 miles above the earth. However, upon returning to the atmosphere, the flight path would be flattened out and the machine, now lightly loaded, would act as a hypersonic glider. Calculation shows that at the beginning of the glide, the aircraft would be moving at no less than 10,000 m.p.h., and with this large amount of kinetic energy to dissipate, it could travel between 5,000 and 10,000 miles.

The flight path would be so arranged that the machine passes over the target at high speed, releasing its weapon on the way, reaching a friendly air-base in a more or less straight line. It is possible that automatic star-tracking navigation would be employed.

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With empty tanks, it is claimed that the parent "booster" aircraft and the final stage bomber could make conventional landings at speeds of less than 200 m.p.h.

PROBLEM OF SKIN FRICTION

One of the most formidable problems posed by the development of aircraft of this type is the considerable air temperature rise that will occur due to the ram effect. At a Mach number of 2.0, an ambient temperature of -67 degrees (equivalent to an altitude of 70,000 ft.) will heat to approximately 320 degrees F. At Mach 2.5, the temperature will be about 486 degrees F. - and at Mach 10.0 it would theoretically reach several thousand degrees F.!

In view of this, conventional aircraft materials, such as duraluminium, are giving way to metals which retain their strength characteristics at higher temperatures. Bell's latest supersonic aircraft, the X-2, intended for research at speeds of between Mach 2.0 and 3.0, has stainless steel wing and tail surfaces and a nickel-alloy fuselage.

The fact that the nose of the aircraft and the leading edge of the wings receive the most heat means that there is a tendency for materials in these regions to stretch. There is also the problem of thermal stresses arising between the hot outer skin and the cooler inner structure. Needless to say, the nose compartment would be refrigerated to cool the cockpit.

In the case of the Dornberger Project, aerodynamic heating would be most critical when the upper component reentered the atmosphere at the beginning of the hypersonic glide. To meet this problem, Sänger proposed that his "antipodal bomber" should have a strongly radiating skin to obtain, as far as possible, equilibrium between heat intake and radiation; he also advocated a control technique whereby the machine would literally "bounce on the atmosphere", describing a wave-shaped trajectory such as a flat stone follows if made to skip over the smooth surface of a pond. In making these successive "hops into space", only at the low points would the aircraft encounter maximum heating effects; moreover, its range would be extended because less drag was incurred.

Whether or not this flight technique has been adopted in the Dornberger scheme is not known, nor has the method of control been revealed. Obviously aerodynamic control surfaces would be useless at the great heights this aircraft would travel. They would have to be replaced by a system of jet-control, exhaust orifices in the trailing edges of the wings - for example - taking the place of ailerons and elevators. These would be fed from a steam generator similar to the type employed to drive the turbo-pumps of the rocket motors.

In view of the radical nature of the project, it would be necessary to carry out an extensive programme of prior research. One of the objects of this programme might be to obtain data on aerodynamic heating by the use of winged research models, fired to high altitude from conventional type step rockets. Larger research aircraft would follow, gradually probing to greater speeds and heights, the technique proposed by Dornberger and Ehricke suggesting an ideal method of air-launching at supersonic speed. In these preliminary experiments, the upper component would probably be pilotless and entirely ground controlled.

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VALUABLE RESEARCH VEHICLE

Apart from the obvious advantages of the Dornberger aircraft as a bomber, it would also lead to important advances in space research - the earth satellite vehicle being an obvious example. To establish a vehicle in free orbit 500 miles from the earth requires a final velocity of more than 18,000 m.p.h., which also represented the energy that must be absorbed, largely by means of aerodynamic braking, to permit a safe return through the atmosphere. Thus, the Dornberger Project may not only represent a powerful military weapon but a valuable research vehicle leading the way to the space-station and interplanetary flight. Time will tell.

Note: None of the information contained in the above article should be read as being of official Air Ministry origin.

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FLYING January 1955.

RED STARS IN THE BLUE.

From the welter of information and mis-information on Russian aircraft production, a definite picture of Red airpower emerges.

"SOVIETS DEVELOP ROCKET INTERCEPTOR" . . . "RUSSIA HAS A HELL BOMB CARRIER" . . . "RED VTO FIGHTER" . . . "TRANSCONTINENTAL GUIDED MISSILE" . . . These are headlines.

To get a picture of what Russia really has would take the combined knowlegde of the CIA, the British MI. 5 and the Deuxieme Bureau, plus somebody smart enough to thresh the unavoidable chaff out of the official files. Unless we can see them in numbers and flying, we can never be sure what the Soviet Air Force creations are, but we can sift through the wealth of reports and rumors and at least get a fair idea of what the Red jet wash smells like.

The Korean campaign exploded the popular belief that the Soviets are a bunch of peasants aloft. The snappy MIG 15 proved that Russian planes are not to be sneezed at. Disregarding the Red sonic contrails, some swivel chair theorists tried to discount the MIG by arguing that the design had been stolen from Kurt Tank, the German plane wizard. The German-brain-Russian-brawn yarn runs like this - the Russians kidnapped top German scientists and engineers who have been developing unfinished German projects. As soon as those German planes are built, the progress in Russia will come to an abrupt halt.

Others pointed to the Tu-4, the Russian carbon copy of our B-29, and said: "Look, the new Russian bomber - the Boeingski Superfortski".

Sure, they copied the B-29; exploited German engineers for all they were worth; copied the British jet engine and stole the American A-bomb. Does it matter how the bandit got the gun that's nudging your ribs?

Besides, upon closer scrutiny, we realize that (a) the Russian copied only the weapons which would suit their own production methods, and (b) they adapted western designs to their needs and even improved some features.

That's what happened with the MIG 15. Suppose they stole the original Kurt Tank design and powered it with the British "Nene". They had a fighter that equalled everything but our best. Later they came out with the MIG 15-B - the all-weather version, and still another modification for high altitude fighting, popularly known as MIG 17.

This latest MIG looks like a bigger brother of the original MIG 15. The fuselage is longer - it extends flush with the trailing edge of the rudder. The angle of wing sweep is increased and so is the wing chord. Larger wing root fillets have been added and the air intake was copied from the Sabre. The increased wing area takes care of the extra weight of the afterburner, which means a lot more power. The increased sweep will let it hit a higher Mach number to make it a tough customer.

Judging by the looks of things, the Soviet Air Force is sold on the basic MIG configuration. Poland, Roumania and Czechoslovakia manufacture the standard combat version (without afterburner) and the two-place trainer U-MIG 15 in quantity. There have been reports of MIG's equipped with rocket auxiliary power for quick, target area interception and with wing fuel tanks for long range escort. Two MIG's have been seen slung under the wings of the Tu-4, and one was reported in a wheel-less version shot into the air from a catapult tilted up at 45 degrees.

Apart from working on new slants for the old MIG, Russian research and development centers are going through the usual routine of expensive trial and error. Several queer ducks have been hatched, some of them flown, and all of them confusing the amateur spies. However, from the confusion of prototypes emerged a beauty, the true successor of the battle-weary MIG 15.

The new addition to the Red stable of fighters was announced in the west by several conflicting reports and rumors. However, they all agreed that the Red Wonder was a target-area rocket interceptor. Tagged by the Pentagon as Type 11, the new interceptor is reported to be Yakovlev's effort - the Yak 21.

The Yak 21 is intended to make any Soviet target really hard to get. Light, fast and manœuverable, the new Yak has enough firepower to blast an A-bomber with one burst. The little plane bears the stamp of simplicity which all Yakovlev designs display. Col. Pokryshkin, one of the top Soviet aces says: " ... we have many excellent fighter planes, but a Yak is sure to be a pilot's plane".

Yakovlev has a faculty for understanding what the pilot really wants. "Speed, rate of climb, acceleration, ceiling, range, firepower?" they query. "All right, you can have all those, provided you sacrifice your personal comfort." Soviet designers maintain that a little discomfort in the cockpit keeps the pilot sharp. Lavochkin, one of Russia's top fighter-plane designers said, "A little cold will keep my eagles mad".

Following this design philosophy, the Yak 21 has an austerity cockpit. By way of compensation for lack of automatic air conditioning, automatic pilot, dual systems, etc., the pilot has an excellent field of vision, few controls to worry about and few warning lights and gadgets to distract him in combat His plane gets him through Mach 1 with little trouble. The stubby, thin wings give him a high rate of roll and the low power loading literally rockets the little plane in a vertical climb.

Powered by the HWK 11/211 rocket motor of 3,800 kg thrust (8,560 lbs.), the Yak 21 can reach 60,000 feet in 2.5 minutes. This rate of climb does not sound so fantastic if we remember that the German rocket fighter, the Me 163 b-1 climbed at better than 15,000 feet per minute. That was 11 years ago when the Me163 was powered only by a 3,000 lb. thrust engine. The new Yak's engine can be switched off at altitude and the interceptor can glide to look around while he conserves fuel.

The engine can be restarted easily and set either at full thrust or by using the cruising nozzle - at 3,500 lbs.

Designed for ease of production, Yak 21 is touted as the "people's" plane. The wings are thin, straight and stubby, of a rectangular plan form. The tubular fuselage with the cockpit enclosure faired in, has few compound curves. The only complicated thing about the plane is the landing gear that retracts into the fuselage; the rest is so simple that the planes could probalby be built in a kolkhoz barn. Already reported in squadron service around the major Soviet cities, the Yak 21 is a formidable defender with its two 30 mm cannons and radar gun sight. Its role- to form the backbone of the high altitude defense of Soviet industry.

Withtheir home bases presumably protected, the Russian is concentrating on long range bomber development. His progress within the last seven years must be faced, since from the Tu-4 he has jumped long steps in the heavy bomber race. His latest entry is the TsAGI Typ 428-a four-jet long range bomber. Dubbed the "Soviet Comet", the heavy bomber looks much like the ill-fated British jetliner. The four oversize engines with afterburners are buried in the wing roots and are reported to deliver 14,300 lbs. static thrust apiece. This extraordinary power accounts for the fact that the four engine Typ 428 possibly competes with the eight-jet B-52.

Four different reports on this new Russian bomber have been examined by the writer. All four agree more or less on all Typ 428 data with the exception of dimensions. One of our sources, possibly the one that supplied the Pentagon, gives the span as 165 feet and the length as 150 feet. The report does not specify the gross weight, but on the basis of size, the weight can be computed as about 250,000 lbs.

However, three other sources approximate span at 120 feet, length 110 feet. Basing computation on these smaller dimensions, we arrive at 180,000 lb. gross weight, which is more reasonable, if we are to believe the 650 mph speed claim for the bomber.

TsAGI Typ 428 or, as the Pentagon calls it -Type 37, is credited with a range of 3,000 miles without refueling. Of course, it can be refueled. In-air refueling has been practiced in Russia for some time and the ADD -the Soviet counterpact of our SAC- has a sizeable fleet of Tu-4 tankers located at arctic bases.

With ample fuel to reach American targets, drop the atom bomb and return to Siberia, Type 37 is the first real threat to our cities from the air. True, Russia has had a fleet of fast, twin-jet Type 39's of the B-47 class, but their bomb load is rather small and they could not carry the H-bomb which the bigger Type 37 can do with ease.

The appearances of Type 37 over Moscow means that Russian planners have entered their last stage of preparedness. Looking back on the end of World War II and the subsequent evolution of Red air power, we find confirmation of reports about the Kremlin's master plan. Their first step was mass production of a jet interceptor which would be advanced enough to allow time for development of a medium jet bomber. The MIG 15, produced in large numbers, provided adequate home defense while the Type 39 medium bomber was being groomed.

This was the second step -organization of a striking force medium jet bomber that could neutralize allied advanced bases, thus preventing retaliatory action. Poised to strike from some 200 arctic bases, the medium bomber units are still being equipped while the third and last stage has begun.

With our atom-air bases neutralized, the four-jet bomber task forces figure to delivdr the "H" cargo to our cities.

Judging by past experience, the giant Red bomber seen over Moscow is probably the only prototype now flying.

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This gives us time, but not too much. According to my best reports, Type 37 has been scheduled for delivery to combat units by December, 1955. Using a large percentage of slave labor and treating their "free" labor only a bit better, the Russian aircraft industry can change production schedules with complete disregard for employees. Entire plants are shut without notice when production changes take place, and thousands of workers are laid off will y-nilly, transferred, or re-employed. This way, there is no cumbersome staggering of models to keep up the labor force. The decks are cleared quickly and production of a new plane can be inaugurated easily.

Just as any new model, Type 37 will give Russian engineers plenty of problems and headaches, unless of course, the whole thing is a gigantic bluff. According to persistent reports from various points along the Siberian coast, the Russians have made heady progress in long range guided missile development. Several Russian observers and at least two neutral sources suggest that Type 37 will never see mass production; that a piloted transcontinental rocket will be used as the A-bomb carrier. In the light of what we know about German rocket development toward the close of the last war, it is quite possible that the Russians have continued some unfinished German projects, such as the little publicized project A9/10.

A9/10 was a two-stage rocket. The second step, A/9, was a craft the size of the old V2. It was equipped with thin wings and a cramped cockpit for one man. The A/9 part was mounted atop the A10 which was a 68-ton rocket booster. The booster was to lift the A9 to an altitude of 15 miles, where the booster fuel would be exhausted. The empty booster shell would then parachute down while the A9 with its 1,000 lb. warhead would speed on its way, using its own rocket motor.

Given a starting speed of 2,500 mph, the A9 would reach a speed of 6,000 mph above the atmosphere. Its fuel exhausted the rocked would return to the atmosphere where it would use its wings to stretch the glide. The pilot would aim the rocket at a large target -say, a city and set an automatic pilot device to finish the flight after he jettisoned himself and parachuted to safety.

Do the Russians have the A9/10?

We know they got most of the German rocket data, equipment and scientists on the post-war give-away program. In 1951 there came an unconfirmed report from Finland that a special Red submarine task force was dispatched "in cooperation with rocket missiles in the North Atlantic". On September 29th, 1954, Radio Moscow announced a Gold Medal award to several scientists who have distinguished themselves in rocket development. Speculating further, we might consider the repeated press reports of sightings of strange subs off our Atlantic coast. Maybe the Reds are just snooping, but maybe that Finnish report was right -maybe there are piloted rocket missiles and Red subs are there to pick up parachuting pilots.

While speculating, let's go a step further -into the domain of rumor and the Soviet Air Force that "ain't". In Europe, the writer has come in contact with several "information" salesmen. All that's needed to attract them are American clothes and an interest in aviation. They corner you and display their wares. The most famous parcel of hot air ever peddled was the Russian VTO fighter CZ2 bis.

The writer has seen the photographs of an authentic looking "three-view" taken on microfilm. Also photographed was the "secret data" and "description" of the VTO machine.

"The plans have been smuggled out of Red Poland", the peddler told me- "the latest design of the famous Professor Czerwinski." That "Professor" deal sounded suspicious. A quick check with Polish Air Force veterans in London disclosed that there never was a "famous Professor Czerwinski" who designed super rockets. The deal was a phony. And the pay-off came when the writer met a German commercial artist who had set himself up in business "designing" various "Soviet aircraft".

Under pressure, the man admitted "creating" the VTO rocket interceptor. He also confessed authorship of other "secret" pictures and documents. Among them was the famous picture of the MIG 19. Working with a couple of aviation veterans, the artist painted a picture of a weird looking imitation of one of the German designs that never flew. The picture was photographed and the photo sold to an American news service as the real McCoy. From the same source came "authentic" photos of a heavy penetration fighter, a ground attack ship, and several other works of art. Fortunately, that's all they were.

Russian engineers are good. Considering the state of Red aviation industry at the end of the last war, the progress they have made is staggering. Even without "phantom" models, the Red Air Force is a very <u>real</u> power, and a threat to the free world.

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U.S.NEWS & WORLD REPORT. December '54.

ATOMIC ARMY FOR EUROPE.

New Plans Built Around Nuclear Weapons.

A big change is coming up in Europe's defense - one that means atomic battlefields if Russian armies attack.

Idea of Allied military chiefs: Scrap conventional defense plans, stake everything on A-weapons.

They say it's the only way to repel Soviet attack. It's also a fateful commitment for the U.S. and its allied.

PARIS.

Ministers from the 14 countries of the North Atlantic Treaty Organization, now meeting here, are facing their most momentous decision since the birth of that Western alliance.

That decision is whether or not to approve an unanimous, 32-page proposal from their military chiefs to base all of Europe's defense plans on the battlefield use of nuclear weapons. The new plans would require the Allies, in a few years, to meet a Russian attack with atomic arms - or not at all.

As matters now stand, U.S. units would carry the big load of nuclear power, with some help from Britain. There are no definite plans for training the forces of other NATO countries to handle atomic weapons alongside American and British forces.

Objections to the military chiefs' proposal already have been raised by Belgium and Denmark. The idea is political dynamite everywhere in Europe, including Britain. But governments of the U.S., Britain and France have decided to press their allies to accept the new atomic-warfare plan.

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Big changes. This plan calls for drastic overhaul of NATO's military forces, strategy, tactics and facilities to meet the requirements of atomic warfare.

Nuclear arms would be built up into the dominant weapon of the Allies' tactical arsenal. Conventional forces would be dispersed and re-equipped to absorb Soviet atomic blows and exploit American nuclear strokes on the battlefield.

The plan calls for the new weapons to be introduced gradually. Initial reorganization of NATO forces would take three years. Sometime between 1957 and 1960. Allied armies and air forces would reach the "point of no return". Then, they could no longer fight an effective conventional war.

Civil control, still. The proposed switch-over does not actually delegate to military commanders the authority to use nuclear weapons automatically on the outbreak of war. In the NATO countries, including the U.S., political authorities must retain ultimate control over nuclear missiles.

But if the cabinet ministers this week approve the new plans, they will -in effect- be making their decision in advance. Allied political leaders no longer could decide not to use nuclear weapons once they became Western Europe's only real defense.

The proposed nuclear strategy results from more than a year of studies by the headquarters of Gen. Alfred M. Gruenther, Supreme Allied Commander, and by subordinate commands.

More than 300 pages of conclusions and recommendations were submitted last July to NATO's "standing group" in Washington -the U.S., British and French chiefs of staff.

That group approved the plans and drafted a 32-page summary. At a special meeting in Washington on November 22, NATO's military committee -composed of chiefs of staff of all 14 Allies- endorsed the plans and forwarded them to the North Atlantic Council of Ministers, now meeting here.

Tested by paper "war". These studies were made on the basis of nine paper "battles" that were "fought" along the 4,000-mile "front" from Norway's North Cape to Turkey's Mount Ararat.

Purpose of the exercise was to discover what would happen if war broke out in Europe in the spring of 1957. Planners assumed that by then the Russians would outnumber the Allies' conventional forces by more than 2 to 1 -but that NATO would be substantially superior to Russia in nuclear weapons and menas of delivery.

The "battles" showed that, if neither side used nuclear arms, the Allied countries would be overrun by the Russians. But they also showed that NATO forces could win if both sides used nuclear weapons.

The West may have to maintain some conventional forces for future "brush fire", or local, wars. But costs would be prohibitive if an attempt were made to maintain conventional capacities alongside growing nuclear power.

As nuclear weapons are added to the NATO arsenal, military chiefs propose to discard many heavy weapons and vehicles now in use. The huge logistical "tail" of World War II armies would be a perfect atomic target -so ground forces and their supply trains would be stripped down to bare essentials. That would alter substantially arms-production, manpower and training programs.

The ministers meeting here may approve the new plans, avoid a decision, or decide against the new strategy. But they are on public notice from General Gruenther and from NATO's ground forces' commander, Field Marshal Viscount Montgomery, that Allied military leaders already are putting their new strategy into operation.

Unless the North Atlantic Council flatly prohibits it -and U.S., British and French determination to prepare their own forces for nuclear combat makes this highly improbable- nuclear weapons are likely to be confirmed in the next few days as NATO's central weapon against Russia in any future European war.

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AVIATION WEEK. January 3, 1955.

RED AIRPOWER THREATENS OFFSHORE ISLANDS.

Most of Chiang holdings could fall to invaders.

Lack of planes precludes mainland invasion plans.

By Dan Kurzman.

Taipei - Air inferiority of Nationalist China not only renders most of the offshore islands vulnerable to Communist invasion but also precludes the possibility of an attack on the mainland by Chiang Kai-shek's forces.

While the Nationalists maintain they could establish a beachhead on the mainland and hold it with little difficulty, fighter cover would be essential and the numerical superiority of the Red air force would have to be neutralized.

However, of greatest concern right now is the threat to Nationalist-held islands. An invading army of 40,000 to 50,000 men could take almost any of the offshore islands, including the 30 relatively larg ones, if the Nationalists had to fight alone.

And, indeed, if there is disagreement within the Nationalist high command on military policy, all agree that Chiang's troops without American air aid, could not hold out on the main islands if the Reds attacked in force.

U.S. Aid - The Tachens are particularly vulnerable. A steady buildup of Red air strength along the Chekiang coast opposite them, in addition to artillery bombardments from nearby Communist-held islands, eventually will enable the enemy to isolate this area.

Members of the high command here suggest that planes of the U.S. 7th Fleet-with up to four carriers at a time in the region, each capable of carrying about 80 aircraft-might be used to join Nationalist planes on patrols.

Actually, American planes do patrol occasionally within 12 miles of the mainland and Red-held islands, risking encounters with Communist aircraft. They cover a much wider segment of coastline than 7th Fleet destroyers and operate much closer to Red air and naval bases in the Shanghai region.

"Too Few to Risk" - "The Communists are not too anxious to control the land," a high command officer says. "What they want is to bag a large number of troops. We have too few to afford the risk. We should conserve all our military strength for the one allout invasion of the mainland. We must think in military rather than political terms, or we might lose everything."

So completely does the Red air force dominate the air that a large percentage of Nationalist planes are chased back to Formosa long before reaching their offshore island destination. To avoid radar detection, Formosan planes must fly at very low altitude as long as possible.

The Communists have so many more planes than the Nationalists that they do not have to worry about altitude. Their MiGs fly high, their Tu-2s fly at medium altitude and their prop-driven planes at low altitudes.

Nationalist aircraft are sent on about 150 missions a week, exceeding Communist activity, but most are simply for patrol purposes.

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Only occasionally - and almost always at night -- do these planes sneak through the Communist air defense curtain on bombing missions.

Cross Fire - Usually, the main target of the Formosan-based aircraft are the Red-held islands north of the Tachens. Planes based on Big Quemoy, which has an excellent airfield, generally gun for Red artillery positions on neighboring Amoy to the West.

Heavy firing from Communist-held Amoy, combined with that from Wei-Tou to the East and Lienho to the north, can all but blanket Big and Little Quemoy, the southernmost islands.

Nationalist air attacks are made on Red bases on the mainland but they have been the least effective of all because of their hit-and-run nature.

Six to One - About six Nationalist planes have been shot down since the island war started in earnest last September. Three F-47s are believed to have been felled by anti-aircraft fire over Quemoy and three MiG fighters in the Tachens area.

Approximately 10 aircraft, mostly F-47s and P4Ys have suffered damage. Altogether, more than 10 crew members have been killed.

The Reds have lost only one plane -a MiG shot down by an F-47 north of the Tachens. One other MiG is reported to have been damaged.

Outmoded Network - The Tachen Defense Command, which includes scores of tiny islands in addition to the Tachens proper, could probably use more anti-aircraft guns and modern radar equipment. This is particularly true of the Yushans, only 60 miles southeast of the Red naval base at Tinghai on Chushan Island.

The Nationalists' radar network still is made up largely of outmoded World War II Japanese sets. The U.S. has promised to send about six modern sets, but only a few parts have arrived so far.

The proposed network would give Formosa about 20 minutes warning of an enemy air attack.

Invasion Planning - Should the Nationalists attempt an invasion of the mainland, large numbers of bombers -particularly heavy bombers- would play a minor role, military experts here say. The Formosans would avoid strategic bombing for fear of turning the people, on whom they would have to depend for support against them.

Although Chiang's forces would need American naval and air aid, they maintain they would not want U.S. troops. For this, they say, would give the Reds the chance to sell the idea to the Chinese people that China was being invaded by American armies.

The Nationalists argue that their relatively small forces would be sufficient to hold a beachhead for three or four months-long enough, they figure, for a large-scale defection of Red troops. They also say the Communists would be unable to concentrate more than 800,000 to 1 million of their 3 million troops in any one area because of the long coastline they must defend.

Long, Slow Buildup - Although the Nationalist air force is not prepared now the attack the Communist mainland, it has come a long way since May 1951, when the United States started to supply Formosa with military aid under the supervision of the Military Assistance Advisory Group (MAAG).

At that time, Chiang Kai-shek's airforce consisted of only about 160 combat planes. It had no jet fighters and few piston powered fighters or patrol and reconnaissance aircraft.

MAAG, whose 840 American officers and men are under the command of Gen. William C. Chase, former commander of the First Cavalry Division that was the first to enter Tokyo during the war, has done an excellent job assisting and advising the National Chinese military leaders and seeing to it that material received from the U.S. is used wisely.

2,000 Combat Pilots - One of MAAG's most important functions has been to train pilots to fly the modern jet aircraft Formosa is getting. A large percentage of Nationalist China's estimated 2,000 combat pilots, who average from 80 to 100 patrol or combat missions each, have been trained under this program.

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