GERMAN SECRET WEAPONS

The story that lay behind the secret weapons that Germany was developing during the war is still shrouded in mystery. By any standards the expertise and technological skill involved was considerable: 'flying saucers', cannons that fired invisible 'shells', gigantic guns of many kinds—some of them firing finned, rocket-like projectiles, beams of sound that could kill a man at 50 yards . . . the range of secret developments that was under way as the war drew to its close is still, even now, very impressive.

The background to this great upsurge of development lay in the activities of a special weapons-assessment group—the *Wa Prüf*—as part of the army weapons office, *Heeres Waffenamt*. Its activities were largely the result of the enthusiasm of Carl Cranz, who was the research institute leader from 1912 until the earlier part of the Hitler régime. He was succeeded by Professor Schumann, who in turn took the Institute—one of the most successful branches of the *Wa Prüf* by now—through to the end of the Second World War. However the Institute (known as *Waffen Forschungs*, or *Wa F* for short) never developed to its fullest potential, as it had done under Cranz's leadership; it employed less than 100 scientists throughout most of its wartime activity and was never instrumental in leading policies and decisions that affected new weapons. Moreover, it was the earliest of the German research establishments connected with wartime developments, and certainly anticipated much that was to follow.

It was in the 1930s that the ability to respect intellectual ability for its own sake and enthusiasm for study and academic research came to their height in Germany. Then, as the Hitler régime began to assert itself, this natural tendency to respect things academic was diverted into more rewarding channels where tangible technological progress could be achieved—the professor, the academic, were decried to an unprecedented extent: from then on it was to be the technologist, the engineer, and the practical man who reaped the benefits of respect by people and government.

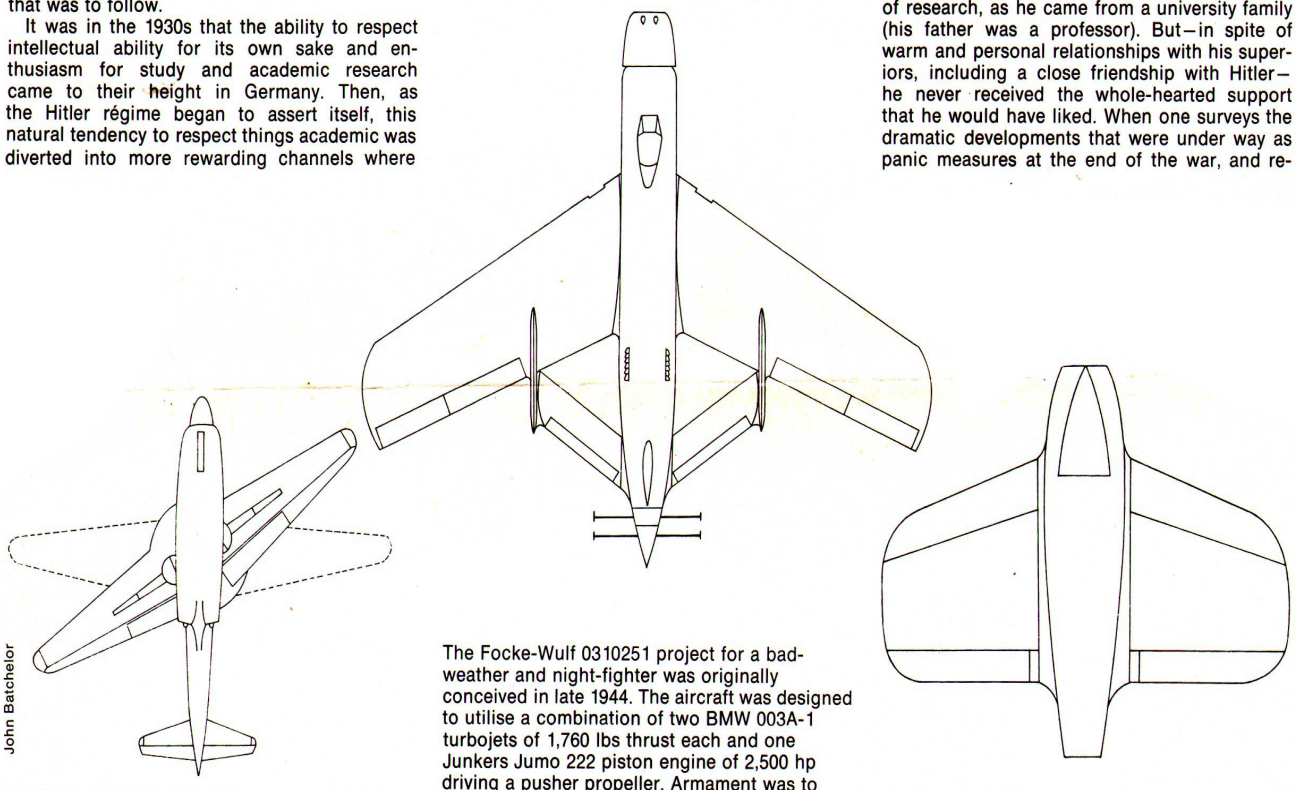
It was during this time that many German scientists, frustrated by this swing away from a respect for academic research, left Germany to work elsewhere. It was only when the war began to turn against Germany that Hitler felt he had been mistaken—and he encouraged pure research to provide a new generation of secret miracle-weapons which could at the last minute turn the tide in his favour. By then, of course, it was too late.

Much of Germany's technological skill was diverted to the important work that enabled her to overcome many of the restrictions imposed by the Treaty of Versailles. The limitations that the Treaty placed upon size of weapons—the calibre of artillery, for example—led the Germans to develop armaments that either gave the greatest possible performance from limited dimensions, or were rapidly convertible into heavier-calibre equipment. It was this treaty which was basically responsible for the effort which went into the development of the pocket-battleship, a vessel small enough to come within the provisions of the agreement, yet with the 11-inch armament of a capital ship. The Germans, with their heritage—almost a tradition—of mechanical excellence, were well fitted to develop the manpower necessary for the production of new, compact weapons. Big business was involved and soon gave rise to independent research institutes devoted to weapons development—even (in cases like the Krupp empire) to vast testing grounds. With government backing the industry of weapon-development assumed a rapidly growing importance, and with Göring at the head of the Luftwaffe a further important step took place.

This step was a tacit rebellion against Hitler's dislike of the academician. Göring realised, wisely, that it was brain-power that would make the Luftwaffe into the high-efficiency arm he required, and even to the extent of keeping men of Jewish stock in senior positions, he maintained an intelligent core of research workers devoted to the discovery of new principles.

Göring was associated with a host of important developments in wartime German research from the great Research Council to a whole range of individual Research Institutes. But behind his name lay the efforts of another man; awarded a doctorate shortly before the end of the war, he was a prime mover for most of the Luftwaffe research that gave rise to so many German secret weapons. His name was Bäumker.

He had served as an officer in the German air force during the First World War, and—though not a scientist—he understood the importance of research, as he came from a university family (his father was a professor). But—in spite of warm and personal relationships with his superiors, including a close friendship with Hitler—he never received the whole-hearted support that he would have liked. When one surveys the dramatic developments that were under way as panic measures at the end of the war, and re-



John Batchelor

The Blohm und Voss P. 202 was a project for a single-seat fighter, in which the most unusual feature was the arrangement for swinging the wings. Instead of variable sweep wings, this aircraft's wings swivelled on the centre line of the fuselage, giving an angle of sweep of 35°, with the left wing leading in the configuration for high speed flight. Power was to be provided by two Junkers Jumo 004 turbojet engines providing 1,960 lbs thrust each

The Focke-Wulf 0310251 project for a bad-weather and night-fighter was originally conceived in late 1944. The aircraft was designed to utilise a combination of two BMW 003A-1 turbojets of 1,760 lbs thrust each and one Junkers Jumo 222 piston engine of 2,500 hp driving a pusher propeller. Armament was to comprise four 30-mm cannon mounted in the nose. Span was 68 ft 6 ins and the length 54 ft

The Lippisch P. 01.116 was first conceived in April 1939 as a rocket driven interceptor fighter for the Luftwaffe, a rôle that was eventually to be filled by the Messerschmitt 163 Komet. The basic idea behind the design, that of a small tailless aircraft, was common to both, but whereas the Messerschmitt featured swept wings, the Lippisch used stubby wings of large chord. Later Lippisch designs, however, were nearer to those of Messerschmitt

The range and variety of the secret weapons developed and investigated by the Germans during the war astonished the Allies when they learned of them. Many of these were purely exploratory and came to nothing, but some German discoveries were well in advance of their time, and with adequate backing could have made an enormous difference to the Axis war effort. The backing, however, was not forthcoming. *Brian J. Ford*

flects how Nazi policies had hindered their earlier development, then one can see how different the course of the war would have been if greater support for Bäumker had been forthcoming earlier.

However, as far as it went, support for the scientists engaged in wartime research was very well done: housing was congenial and generally in areas populated by men with similar interests; laboratories were well furnished, leisure-time areas carefully geared to the psychological needs of these top-secret specialists; no civilised comfort was spared. Yearbooks *(Jahrbücher)* were published to emphasise disciplinary achievements, honours systems for leading scientists were active and fairly operated, and the *Zentralstelle für wissenschaftliche Bericherstattung,* or ZWB—the central clearing office for reports—provided an active system of intercourse in the form of circulars and reports. And, of course, the salaries paid to research scientists engaged on such secret developments were very good—certainly in excess of £1,500 a year, which, in Germany at that time, was affluence indeed.

It was the Luftwaffe which encompassed the greatest amount of original research and development in the production of secret weapons, as we have seen; the army—in spite of its longer tradition in this respect—was probably the least active of all the services, and the navy relied on a great deal of independent research carried out by industrial firms for their new torpedoes, mines, and submarines.

An adverse factor

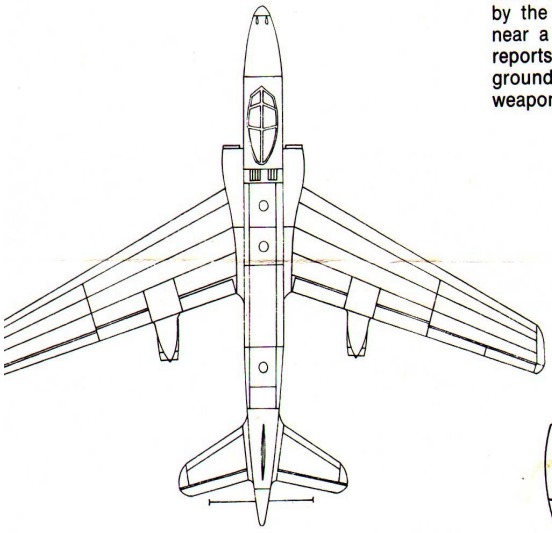
It is interesting to reflect how the activities of the independent companies were an adverse factor in some of the later research developments. The presence of such lavish centres of research naturally discouraged the government from setting up large establishments of their own (as it would be costly indeed to tempt scientists away from their industrial posts) with consequent risks of duplication.

The businessmen, on the other hand, were naturally more keen to sell their products and to make a profit than to produce better weapons out of pure, disinterested altruism. Often they did not entirely understand the problems of war in practice. There was, as a result, undeniably a certain loss of impetus in this vital sector of the war effort.

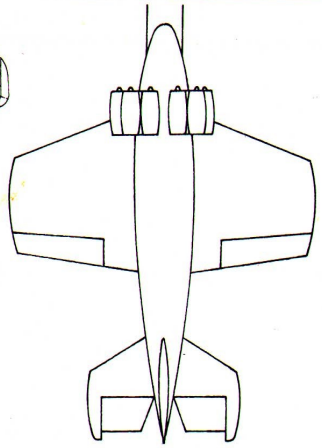
But in spite of governmental hesitancy and commercial self-centredness, many unusual and revolutionary developments took place. A so-called 'wind cannon' developed in Stuttgart was intended to fire a 'plug' of air at aircraft and so shoot them down without shells. The device took the form of a large angled cannon which burned a critical mixture of hydrogen and oxygen —although coloured gases were used initially to observe the path taken by them after firing— and produced a violent projected explosion. Proving-ground tests (stated to have been at either Hillersleben or Hillersheim) were followed by the installation of a prototype wind-cannon near a bridge over the Elbe, but, according to reports, this proved unsuccessful. The proving-ground tests, on the other hand, showed that the weapon (standing 30 feet high, with a sloping barrel totalling some 50 feet in length) was capable of breaking a 25-mm board at a distance of 200 yards, so great was the pressure set up by the air projectile.

Another example of the use of air pressure was the 'sound cannon', which was developed by the research establishment set up at Lofer, Austria by the Speer Ministry and under the control of Dr Richard Wallauscheck. This device projected a beam of sound energy at about 1,000 cycles-per-second (a high-pitched whine) with a great destructive potential. The device took the form of two large parabolic reflectors of different sizes (the larger being 10 feet across), built onto the front of a combustion tube fed with an oxy-methane mixture. This, by burning in sharp pulses, produced the high-energy sound wave which even at great distances caused dizziness and disorientation. It was predicted that it would produce death within a minute at distances of 50-60 yards and that even at 300 yards a man could be incapacitated for some time. Tests on the machine were carried out, though it was never used operationally.

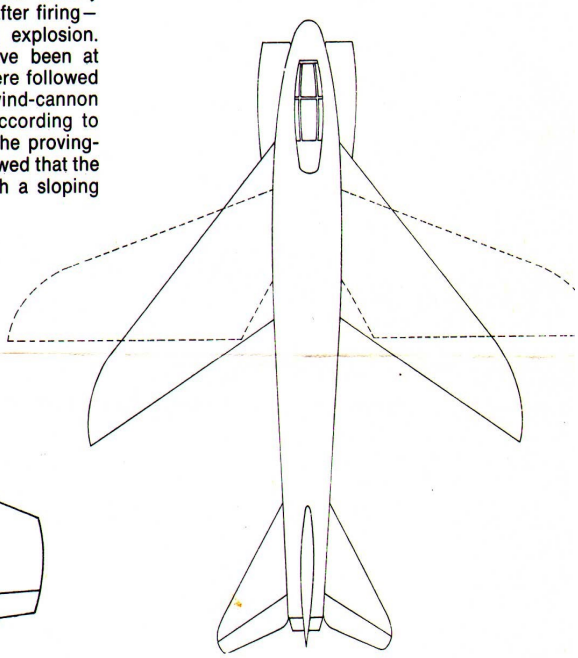
A third use of the power of air in movement was realised through the development of the 'hurricane cannon' at Lofer. It was an attempt to produce artificial vortices in the atmosphere which would throw an aircraft out of co-ordination and bring it down. Initially attempts were



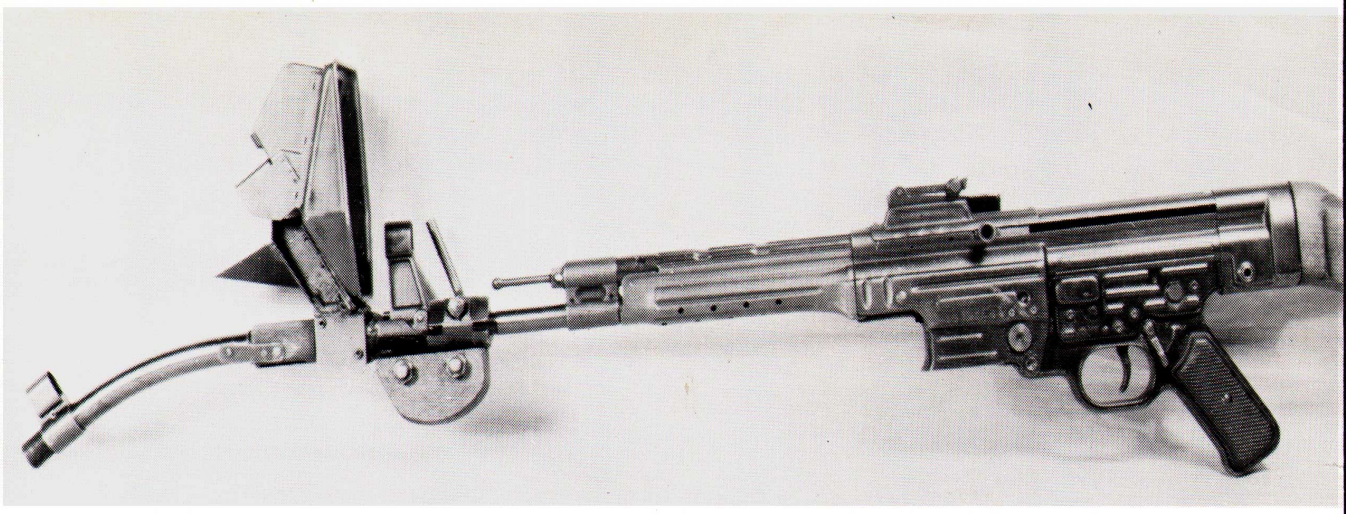
The Focke-Wulf 0310.025 project was conceived in 1944 in answer to a request for a high altitude fighter. Armament was to have comprised two 30-mm cannon and two MG 213 cannon of 20-mm calibre. The powerplant was to have been one Argus 413 of 4,000 hp driving contra-rotating propellers. Weight was to be 21,600 lbs loaded for normal flight. Span was 53 ft 9 ins and length 46 ft 6 ins

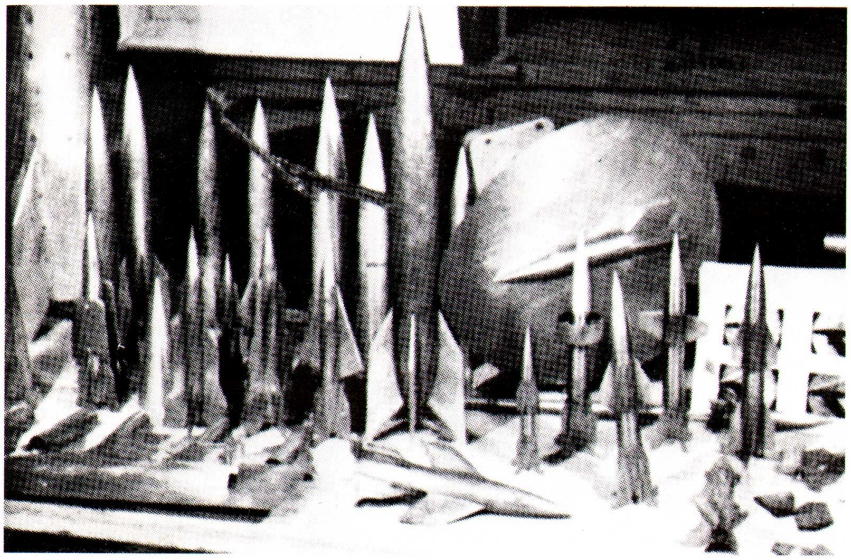


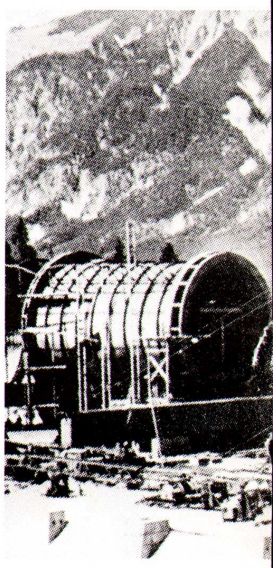
The Junkers EF 09 project was for a vertical takeoff fighter designed to take off under the power of ten small jets mounted on the nose. After climbing vertically, it turned to the normal attitude and flew like an ordinary fighter. The landing was made on skids. Top speed was estimated to be about 600 mph, the span 13 ft, and the length 16 ft 6 ins. The pilot adopted a prone position to alleviate the acceleration forces at take-off



The Messerschmitt P. 1102 project of 1944 for an unarmed bomber featured variable sweep wings (sweep was 20° for take off and landing, 50° for high speed flight). Power was provided by three BMW 003 turbojets of 1,760 lbs thrust each, two being mounted under the nose and one in the tail. The aircraft was carried on a tandem bicycle type undercarriage under the fuselage, balanced by outrigger wheels beneath the wings







Above: German MP 44 machine carbine with its periscope sighting system fitted with a device to enable it to fire round corners. *Left:* Scale models of V-2 and *Wasserfall* ready for wind tunnel testing at Kochel. *Right:* The wind tunnel at Otztal in southern Germany under construction. When completed, it would have been able to accommodate spans of 26 ft and speeds of Mach 1. *Far right:* The *Hochdruckpumpe* sectional gun. Extra firing chambers along the barrel gave the shell extra muzzle velocity and range

confined to the firing of pulses of compressed air, but these were a failure. Subsequently the experimenter, a Dr Zippermeyer, decided to fire powdered coal in a projectile containing a central explosive charge. A 'noodle powder' explosive (less sudden in its combustion than a 'brisand' explosive) was incorporated into the shells to impart the correct lateral velocity of the coal-dust. In essence the coal-dust/air mixture acted as an explosive itself and experiments showed that, provided the shell was fired with sufficient forward velocity, an appreciable vortex could be produced. However this 'miniature tornado' was not used in warfare.

The sun was also at one stage chosen as a source of energy to aid the war effort, and a German inventor produced a sizeable concave mirror which was intended for use against aircraft: it would 'burn them out of the sky'. There are no records of the device being put to the test.

The rays of the spectrum which are invisible, however, did produce a new line of research which resulted in the production of an infra-red device enabling the user to see in the dark. The principle of converting wavelengths in this way is not new; ultraviolet light shining onto a fluorescent material will be absorbed and re-emitted as visible light. The result is that invisible rays may easily be rendered visible for the unaided eye, but (as one always finds in these cases) energy is lost in the process, and visible light is less 'energetic' than the ultraviolet that produced it. This is the basic concept of the physical sciences. Infra-red, however, is *less* energetic than visible light—so that conversion into light rays can only be brought about by the rays gaining in energy, rather than losing it. This contravened an essential, fundamental law of science.

This was the problem that the German scientists tackled, and, as it happened, tackled with success. Obviously in principle the device must put in some extra energy, as it were, thus enabling the infra-red radiation to be raised to the limits of visible light rays. This device—an infra-red image converter, as it became known—acted by focusing infra-red rays from an invisible source at night onto a kind of phosphor, which in turn produced radiation focussed by means of a high-voltage device onto a fluorescent screen; the high-voltage electrical charges employed supplied the extra energy and in this way a secondary image was produced on the viewing screen.

Before the war years, when there were many agreements between Nazi and Russian scientists in the research field (most of these agreements were secret, in view of the restrictions of the Treaty of Versailles), Soviet experts had been keen to find the secret of the German infra-red image converter, but without success. The German high command was determined to keep the device cloaked in security—it was regarded as one of the most important of all the secret devices in the German armoury.

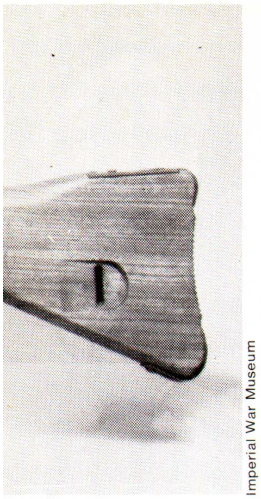
Eventually it became a standard fitting to tanks and was often used with machine-guns; the range—initially 500 yards—was increased to over 3,000 by the end of the war. By then it was, without question, an important adjunct to the war effort.

A perfect secret set-up

Many of Germany's most important secret weapons, however, were aircraft or rockets, and heavy guns. Vast aerodynamic research lay behind these new developments, much of it being carried on in top-secret research establishments such as Braunschweig. This was a perfect secret set-up; the buildings were nearly all in wooded land and were built well below tree-top level so that the camouflage was totally convincing—none of the Allies had the slightest suspicion of the existence of this vast complex until the war ended. Where buildings (such as a main air-tunnel facility) were exposed, they were constructed as farm buildings. In this instance the main equipment of the tunnel was buried underground, and one of the out-houses' roofs slid back to reveal the air-intake when the tunnel was in use—it turned out to be an inventive and thoroughly undetectable ruse.

Other wind-tunnels were planned, such as a Mach 10 experimental tunnel at Kochel—it was designed to operate as a test rig at air-speeds of ten times the velocity of sound. At Otztal a gigantic tunnel with a testing chamber over 25 feet across was designed for sonic velocities. Neither project was realised, although the Otztal tunnel was half built at the end of the war; but they were both indicative of the all-out attack on high-speed flight that the Germans were determined to make.

The routine Kochel wind-tunnel, when the very first tests were begun, produced results which were obscured by large numbers of small shock-waves throughout the field of view. They were probably caused by particles being eroded from the throat of the chamber by the high-velocity air currents—but there were no high-powered turbines driving the air as there are in conventional post-war tunnels. This wind-tunnel operated by the evacuation to virtually a total vacuum of an 800 cubic-yard capacity reservoir. When the tunnel inlet valve was opened, air—under atmospheric pressure—rushed in at high speed, and until the air-tank was nearly refilled with air it was possible to take pictures showing the shock waves surrounding the models of the projectiles themselves. Fine tubes were led through the arm that supported the model to various regions of its surface, thereby enabling pressures to be



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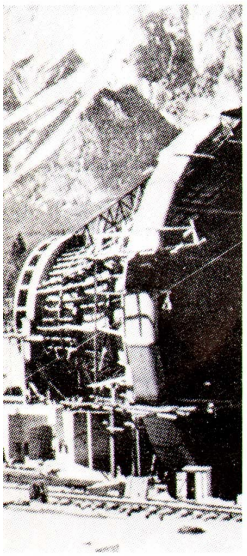
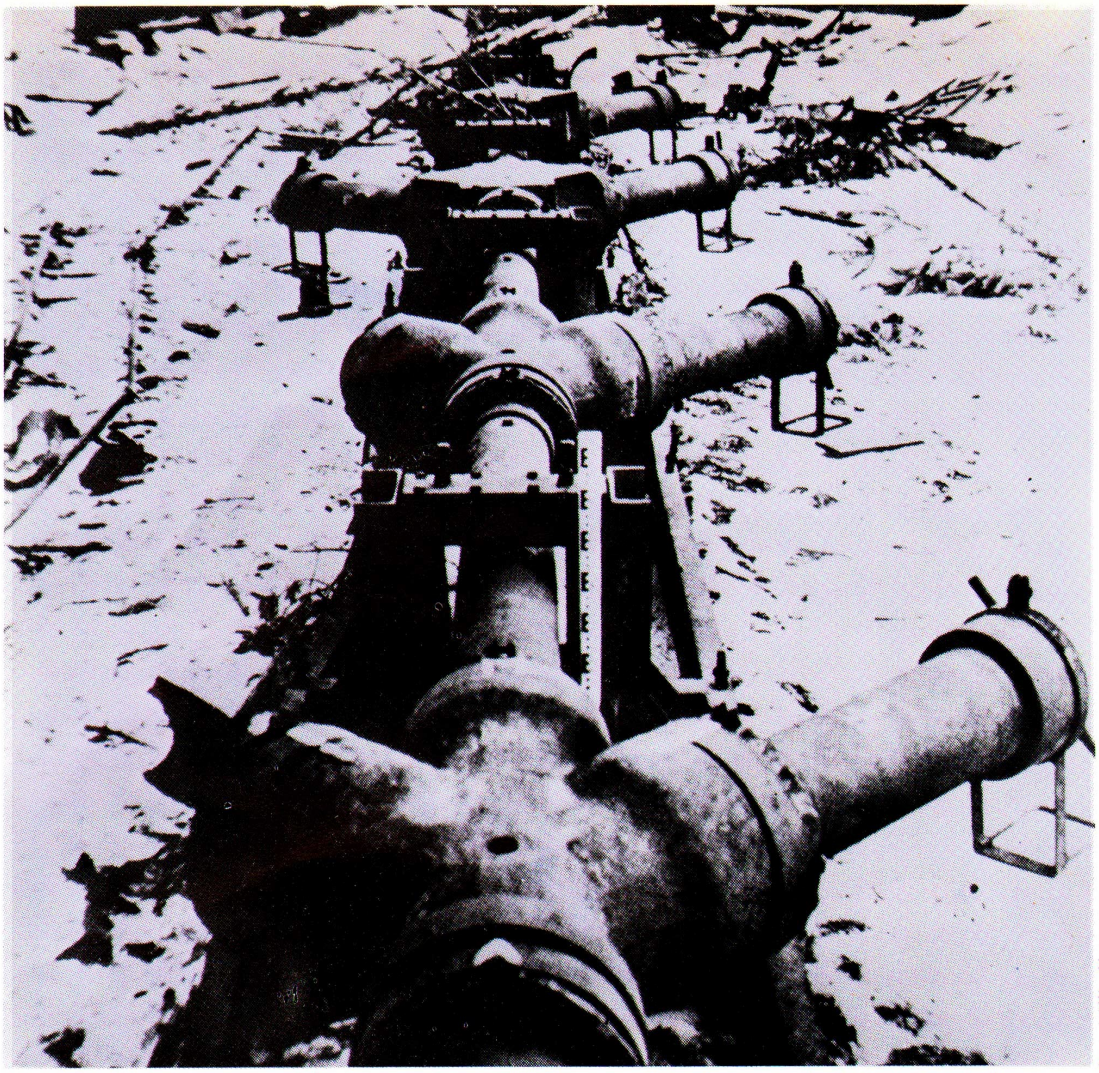




Imperial War Museum

read in a series of manometer tubes.

It is interesting to note that the readings were carried out by groups of trained observers, rather than by any sophisticated instruments—or even by the taking of photographs at the time for later analysis. However, the Germans were particularly poor in the field of instrumentation, for a variety of reasons—a deficiency found in many other fields of research.

Many of Germany's most successful rockets and aircraft were developed with the aid of model trials at this establishment; the V-2 itself owed much of its eventual exterior design to the research carried out on scaled-down models studied in detail at Kochel.

The V-2 was known to the Allies, and was not truly a secret weapon. The German use of finned projectiles led to a different approach to the bombardment of London, in the form of a monster gun—the *Hochdruckpumpe* or HPD, (also known variously as *Fleissiges Lieschen* or *Tausendfüssler*): a 'high-pressure pump' gun.

This 'super-gun' was the invention of the manager of the Saar Röchling establishment and it took the form of a long sectional tube, with paired lateral projections at intervals. In these charges were fired successively, as the 8-foot projectile travelled along the barrel, thus building up a formidable gas pressure which ejected the missile at a speed of 4,500 feet-per-second. Two pioneer 'super-guns' were constructed to bombard Antwerp and Luxembourg respectively. The barrels were roughly 150 feet long—but there was a severe drawback to their use, since one of the component sections would explode violently every few times the gun was fired, and had to be replaced. The sectional construction aided this procedure.

The greatest of all these guns, however, was constructed (partly buried deep in the ground) near Calais as the first of a battery of the weapons. But Intelligence heard of the planned site and British bombers damaged the super-gun beyond repair shortly before the first shot was due to be fired. The installation of five of the guns, each with a range of some 85 miles, would have been a psychological blow to the Londoners, although (even in the estimation of those men who designed and built the weapons) they were too unreliable to become a useful threat as there was too much to go wrong, especially with the synchronisation of the explosive charges. However, the 150-yard barrel of the first of the Calais super-guns remained as a surprising relic for the Allied forces after the invasion—it was history's largest and longest-range weapon of its sort.

The arrow projectile—a long shell stabilised by lateral fins rather than by spin—was another important secret weapon that the Germans developed. The greatest length a shell can have for spin-stabilisation to work is eight times its diameter and longer shells with lateral fins proved to be a considerable advance in technique. However, their very secrecy prevented them from being used against British and American forces—the Germans were fearful that the Allies would copy the design and use it against the Axis forces, and so the finned projectile was used only against the Russians. Thus it too remained a secret until after the war.

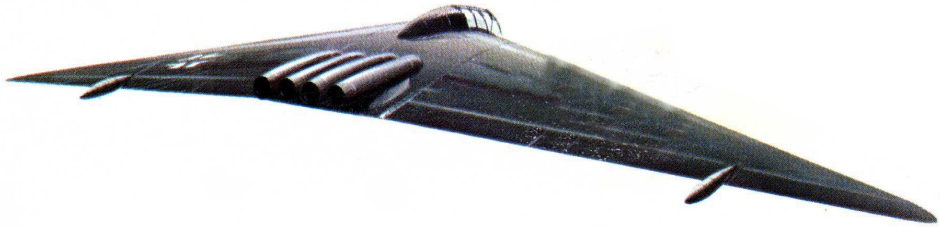
At the other end of the scale, so to speak, was the German curved-barrel rifle—the *Eckgewehr*. The barrel of the gun had a 32° curve in it to enable it to fire around corners, and the sights were in the form of a prismatic lens system which gave a considerable degree of accuracy. The principle of a curved-barrel gun of this sort seems to be bizarre: but it worked surprisingly well in practice—albeit not as well as some of the enthusiastic German armoury experts advertised to the troops. One of the most successful uses of the gun was in tank defence, where the weapons could be used to pick off Allied soldiers who were making 'cocktail' attacks on the tanks. Tactics decreed that a tank is best attacked by the individual soldier at close quarters, out of sight of the crew within, so that he is in 'dead ground' to the guns inside the tank. The curved barrel, however, overcame this limitation and cost many lives until the secret eventually came out.

Much original work was carried out in the ballistics field generally. Detailed analyses of temperature, pressure, velocity, and the like, within a gun barrel, even such often-neglected parameters as friction, shock-wave, flight characteristics, and fragmentation, were examined to the last detail. The use of hollow explosive charges, following selective laboratory tests, greatly improved the use of smaller amounts of explosive in causing the maximum amount of damage. The subsequent shortage of steel in the German economy led to yet another secret development—the use of concrete as a shell housing. Its shrapnel properties were said to be good.

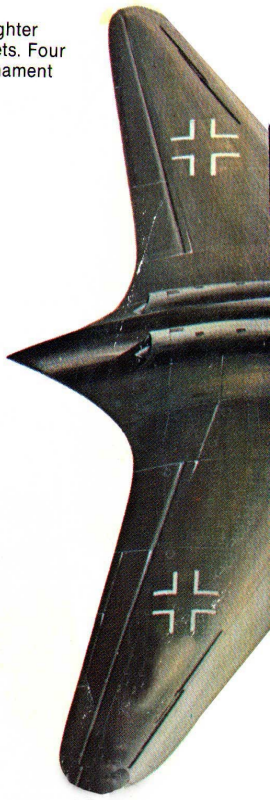
There were even reports that the Germans had built 'flying saucers', though these were certainly exaggerated reports and little concrete evidence has ever been found of a progressive research investigation into them. However, it is clear that in many aerodynamic fields, as in the broader field of technology in its widest sense, the German war effort threw up many startling discoveries. Their 'secret weapons' were certainly more impressive and potentially far-reaching than those which the Allies were left to contend with.

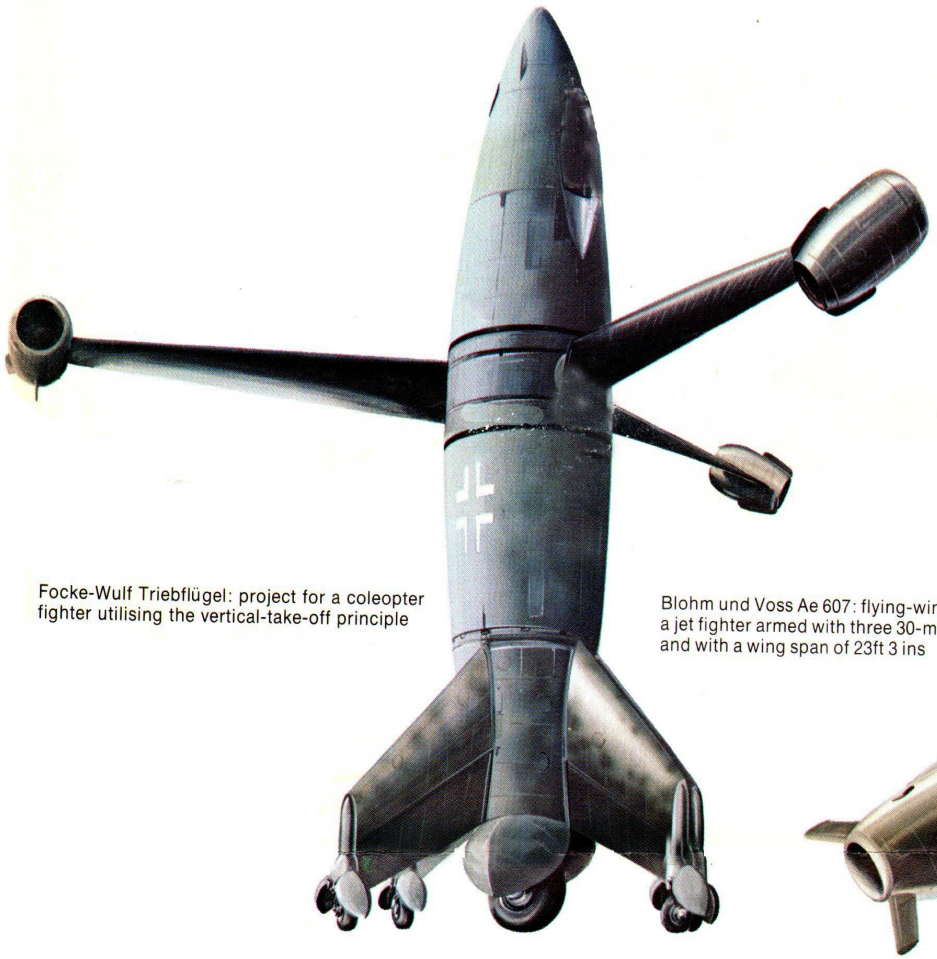
[*For Brian Ford's biography, see Vol 3, p. 1117.*]

Junkers EF 130: project for a four-engined flying wing jet bomber. Speed: 625 mph. Range: 3,700 miles. Metal centre section, wooden wings



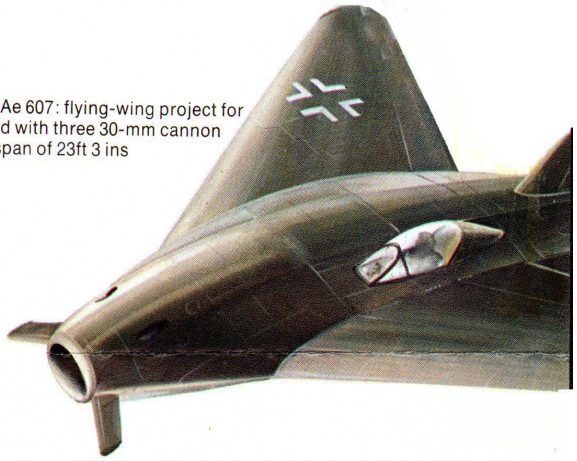
Horten Ho IX A-Series: project for a fighter using two 1,960 lbs thrust Jumo 004 jets. Four 30-mm cannon were envisaged as armament

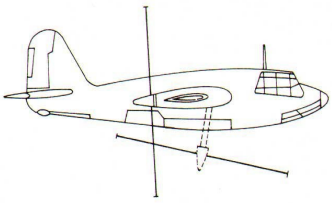


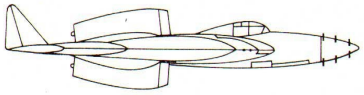


Focke-Wulf Triebflügel: project for a coleopter fighter utilising the vertical-take-off principle

Blohm und Voss Ae 607: flying-wing project for a jet fighter armed with three 30-mm cannon and with a wing span of 23ft 3 ins



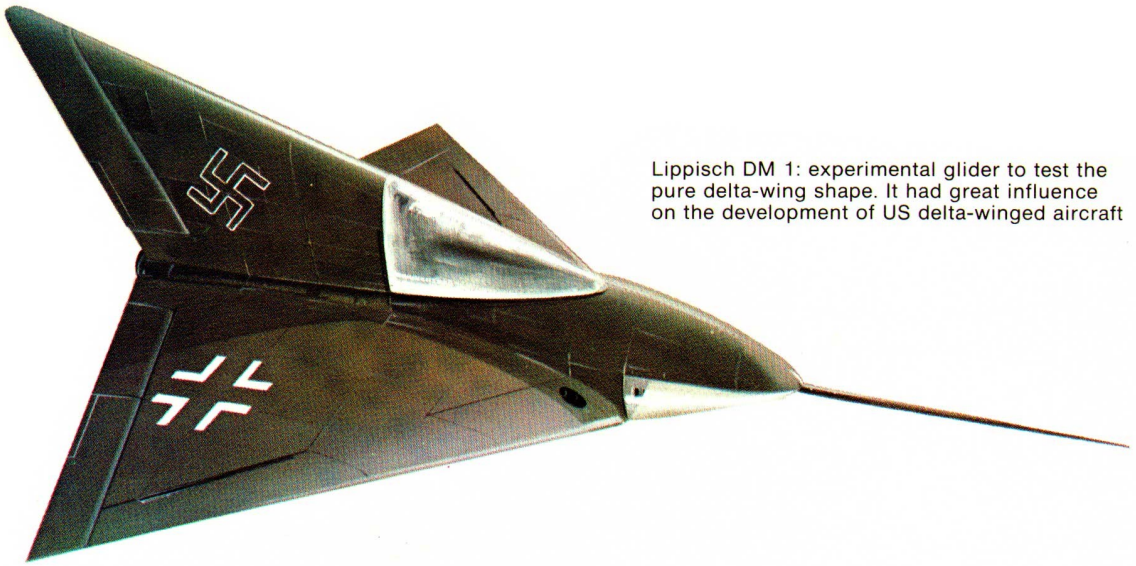




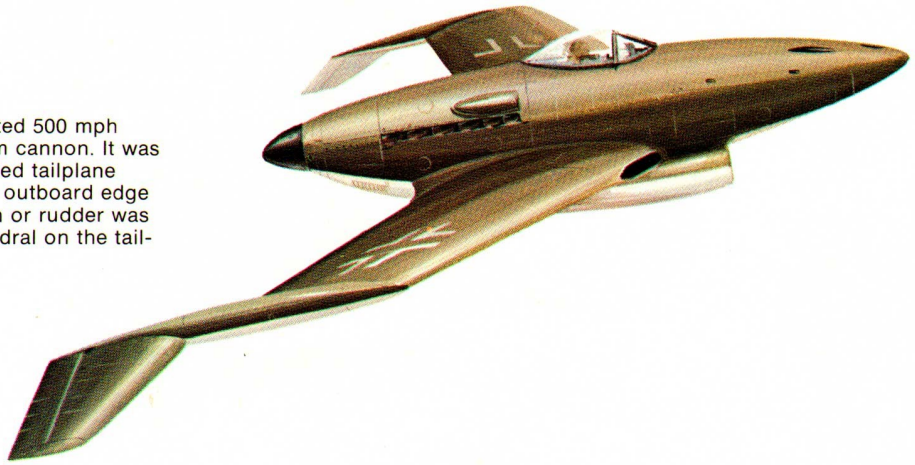
The Focke-Wulf 1000 X 1000 X 1000 B project was for a bomber capable of carrying a 1,000 kilogram bombload (2,200 lbs) at 1,000 kilometres per hour (625 mph) for 1,000 kilometres (625 miles). Span was to be 41 ft 6 ins and length 47 ft 3 ins. There were three designs to the same specification, two being conventional in layout. This version, of near-delta layout, appeared to possess better flying characteristics; but would have been hard to maintain

The Focke Achgelis Fa 269 was a project originated in 1941 for an aircraft able to take off and land vertically by means of swivelling propellers mounted in each wing. These would swivel to a vertical position to lift the aircraft off the ground, then turn to the rear to drive the aircraft along at an estimated 375 mph in level flight. Long undercarriage legs were provided to give ground clearance to the propellers when the aircraft was on the ground

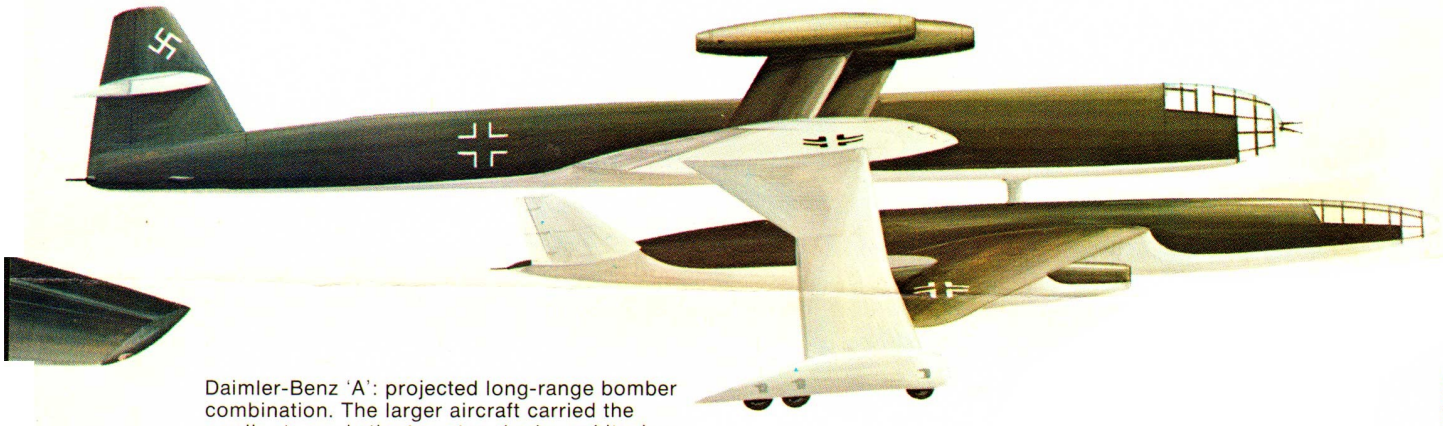
The Gotha P.60C was a project for a large fighter equipped with Morgenstern radar in the nose for night fighting. The most unusual feature of this aircraft was the arrangement of the powerplants, two BMW 003 turbojets giving 1,760 lbs of thrust each, in a tandem mounting above and below the rear fuselage. This aircraft was another German attempt to produce a tailless, swept-wing design, a field in which Germany led the world



Lippisch DM 1: experimental glider to test the pure delta-wing shape. It had great influence on the development of US delta-winged aircraft

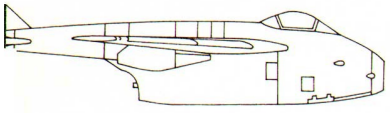


Blohm und Voss P.208: projected 500 mph fighter armed with three 30-mm cannon. It was to use swept wings and a divided tailplane carried on short booms on the outboard edge of the main wing panels. No fin or rudder was necessary because of the anhedral on the tail-plane

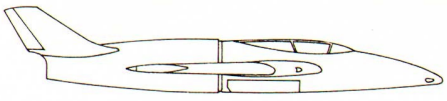


Daimler-Benz 'A': projected long-range bomber combination. The larger aircraft carried the smaller towards the target and released it when this was relatively close, this giving the combination great range as the bomber aircraft did not waste fuel on take-off and cruise

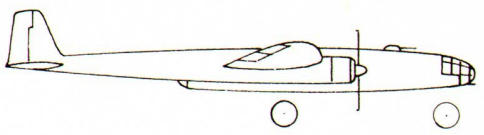
John Batchelor



serschmitt P.1101 was designed as a jet
1 1944, but the structure proved to
ieavy as a result of the complicated
ttachment, so the aircraft was dropped
ter though Messerschmitt intended to
rototype as a research aircraft. It
/ever, destroyed by bombing just before
mpleted. Estimates of its performance
1 speed 608 mph; ceiling 46,000 ft;
ft 0¾ ins; and climb rate 4,380 ft/min



The Messerschmitt P.1110/II fighter project of 1944 featured two unusual ideas. The more obvious of these was the V-shaped tailplane, but no less interesting was the other oddity, the air intake for the Heinkel HeS 011 turbojet. This intake was arranged the whole way round the fuselage toward the rear of the sharply-swept wings. Armament was to be three 30-mm cannon; speed 630 mph; span 21 ft 6 ins; length 31 ft; and range 940 miles



The Focke-Wulf 0310225 was a project for a long-range bomber carrying 6,600 lbs of bombs for 5,625 miles. The aircraft had a large central fuselage with the divided tailplane carried on booms attached to the wings so that the rear gunner had a good field of fire. The speed estimate was 360 mph at 28,400 ft with four BMW 801D engines giving 1,600 hp each. Armament was to be four 30-mm, one 20-mm and four 15-mm cannon, and four 13.1-mm machine guns