PHYSICS

Rocket Planes Next?

Planes without propellers or engines are still only dreams for the future, but immediate and practical uses do exist for high-power rockets in war.

By DR. MORTON MOTT-SMITH

➤ AIRPLANES without engines or propellers, driven solely by rockets, may streak the skies at incredible speeds and altitudes, if investigations now in progress throughout the world realize the dreams of those who are making them.

No one knows what the exact state of this work is in the various warring countries. But whichever nation zooms into the air with a practical ship of this type will have a big advantage over the others —perhaps a decisive advantage.

When will this happen? Perhaps tomorrow, perhaps not for a long time, perhaps never—for there are still vast difficulties to overcome.

Ever since the public learned that rocket propulsion would function in a vacuum, better in fact than in air, space ships traveling from planet to planet have been envisioned as part of the future world.

But at present there is no known fuel powerful enough to lift its own weight beyond the earth's attraction, let alone carry a ship with it. The proposal has been made to build a ship in sections that would be successively dropped off. This is a possible solution, but calculations show that the weight which must be dropped off plus that which is shot out in the rocket jet would equal the weight of a small mountain.

Space Travel Awaits Atomic Power

Space travel must evidently await the advent of something approaching atomic power.

But applied to an airplane, the rocket has tremendous possibilities. Here are some of them as calculated by a German scientist about the time the Nazis came into power.

The calculations are based on measurements of thrust and velocities of jets produced by various fuels and variously shaped nozzles. The scientist is Eugen Saenger who published his findings in the German magazine *Flug,* an English translation of which has recently been issued by the National Advisory Committee for Aeronautics in Washington as Technical Memorandum No. 1012.

Herr Saenger envisions a small fighter plane, specially streamlined for speeds greater than that of sound, burning gasoline and carrying liquid oxygen to support combustion, and with very small wings in proportion to its weight. Most of the interior is occupied by fuel and oxygen tanks. The rocket motor is merely a spherical combustion chamber and a nozzle in the rear of the plane. Its size and weight are insignificant compared with other engines. Yet it develops 100,000 horsepower for a short time, giving 500 horsepower for each pound of its weight, as compared with 2,000 horsepower of our large bomber engines, giving one horsepower for each pound of weight.

Here's what this fighter plane would do.

Climbs Fast

On the approach of enemy planes it would rise from the ground at an angle of 30 to 45 degrees to a maximum height of about 12 miles. This it would attain in four minutes. The best planes of his day, Herr Saenger states, require five minutes to climb to a height of three miles, and six miles is their utmost limit.

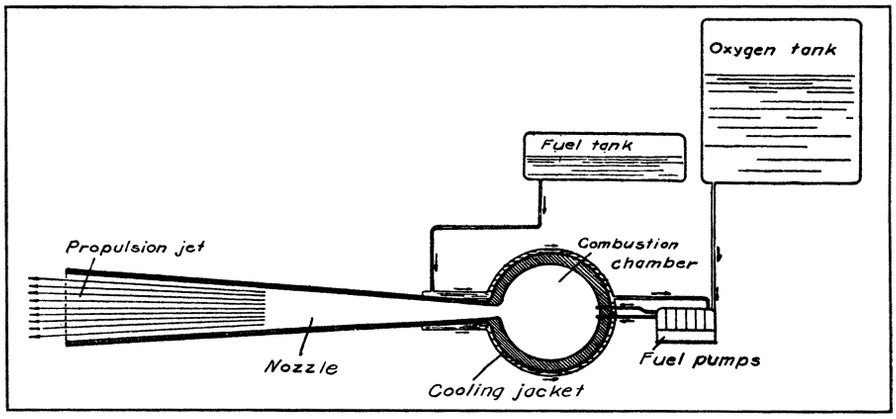
The fighter then swoops down on its victim unseen and unheard at a similarly steep angle and blasts him from the sky before the poor fellow knows what has happened. The plane cannot be seen because it is traveling at near projectile speed. It cannot be heard in advance because it is moving as fast as its noise. It might accidently be picked up at a distance of one kilometer (0.6 mile), Herr Saenger admits. But it would cover this distance in three seconds! There would be no time to train a gun on it as it approached. And it could not be hit as it receded because no projectile could overtake it.

Fuel Lasts Half Hour

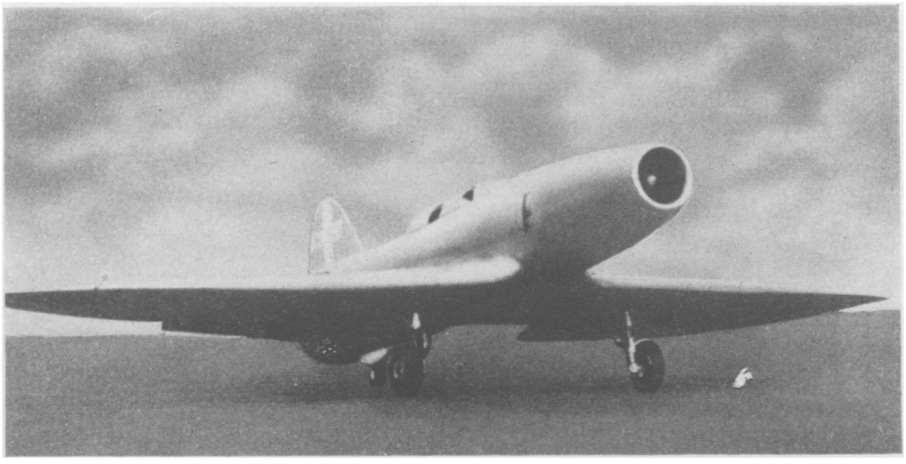
The entire fuel of this plane is consumed in one-half hour at full power. During that time, however, it can cover upwards of 500 miles, partly under power, partly gliding. It must then descend to refuel.

Despite the abbreviated wings, adapted for high speeds, there is no difficulty in landing, because the plane in its flight has thrown away 80% of its weight in burnt fuel. With empty tanks, the wing surface in proportion to weight is five times as great as at the takeoff, so the plane may land at as slow a speed as any other.

Herr Saenger envisions a bomber plane whose performance is even more remarkable. Its flight, he says, is a cross between that of a plane and a projectile. It rises from the ground under full power at an angle of 30 degrees. The ascent is continued until the fuel is exhausted.



***THE ROCKET MOTOR** diagrammed, uses fuel which has first passed through the cooling jacket surrounding the combustion chamber. Liquid oxygen, together with the fuel, is shot into the combustion chamber by fuel pumps which are the only moving parts.*



JET PROPELLED PLANE, the first to appear practical in test flights, winged the 168 miles from Milan to Rome using a combination engine and rocket as the power source.

This occurs in 15 to 20 minutes. But the bomber is then 25 or 30 miles above the earth and traveling with a speed of 5,000 miles an hour or more. With this speed, the plane is simply a super-projectile shot from that point of the sky. It continues to rise to an ultimate height of 37 miles. Then it begins slowly to descend. But being a winged projectile the glide path is 3,000 miles or more.

At the proper moment the bombs are released and the plane describing a wide arc returns to its base.

For a shorter distance the plane would ascend to a lesser height, which would be calculated in advance.

Herr Saenger points out that a flight could be made in any kind of weather, since the weather is miles below, and that no hostile agency could wreak the slightest harm on his superplanes. With weapons like these, he opined, the rest of the world would know only of "conquered peoples."

Still Theory

But Herr Saenger's dreams have not yet come true, although how far they may be on the way we have no means of knowing. The only successful flight of a true rocket plane on public record is that of Fritz von Opel in 1929, and that was of short duration only 50 feet above the ground and the plane was damaged in landing. This flight was made with rockets of the gunpowder type.

Experiments in sending aloft unmanned rockets carrying liquid oxygen have in general failed due to the high pressure developed in the oxygen tank and the difficulty of keeping the intense heat of the combustion chamber away from the intense cold of the liquid oxygen.

The great weight of the oxygen which is several times that of the fuel, is also a serious obstacle. For every pound of hydrogen in the fuel, eight pounds of oxygen must be carried, and for every pound of carbon, nearly three pounds of oxygen.

Jet Propelled

Because of these difficulties, much attention has been devoted of late to a type of jet propelled plane which takes its oxygen from the air. Such a plane cannot, of course, ascend to heights where the air is too thin to supply the required amount of oxygen, nor can it in the denser air attain the tremendous speeds possible to the ship that carries its own oxygen.

This is a hybrid type of plane, a combination of engine and rocket, although propelled entirely by the jet thrown out in the rear. Air is taken into the fuselage at the nose and accelerated toward the rear by a blower or compressor driven by an engine. Fuel is burned in the air stream, which includes the engine exhaust, just before it enters the nozzle.

While the weight of the oxygen is thus saved, that of the engine and compressor are added. In fact, except for the addition of the rocket motor in the rear, this plane differs from the ordinary one only in that the engine and propeller, instead of being on the outside of the plane and directing an air blast to the rear, are on the inside. If large enough, this apparatus alone could drive the plane, although not as efficiently as when located on the outside. The rocket motor then becomes merely an auxiliary source of power. If the compressor is small, it merely acts as a supercharger to supply the rocket motor with oxygen. Various gradations of rocket power may thus be achieved.

This plane may therefore form a stepping stone to complete rocket propulsion by allowing the experimenter to approach the latter by successive and comparatively safe steps.

Italian Success

Two successful planes of this type have been designed by Signor Campini and built by the Caproni Airplane Company of Milan, Italy. The second plane was flown last December from Rome to Milan, a distance of 168 miles, at an average speed of 130 miles per hour. This is the first time a jet propelled plane has flown any considerable distance. No attempts were made at high speeds, high altitudes or at other stunts. The performance is believed to be inferior to that of comparable planes of the usual sort. But Signor Campini has stated that he expects his type of plane to show superiority only at speeds above 400 kilometers (248 miles) per hour.

The rocket motor is in fact the world's most inefficient motor at low speeds. At take-off the efficiency may be as low as 2%. For the highest efficiency, the speed of the plane must be equal to the speed of the jet. This can occur only when there is absolutely no resistance to the motion of the plane, that is, in a perfect vacuum. Herr Saenger believes that this condition would be approached by his theoretical rocket planes at the altitudes they could reach. But practically all of the fuel they could carry would be consumed in getting there.

But despite its inefficiency at low speeds, the enormous power that a rocket can develop for a short time without any heavy engine to develop it, has immediate and important military uses.

It has long been proposed to use rockets as boosters to assist in getting a heavy bomber or transport plane off the ground, and this method is now in general use in England and in Germany. Once in the air, flight can be maintained with much less power than is required at take-off, so that with rocket assistance heavier loads can be carried.

German planes shot down during the Battle of Britain disclosed the fittings of rockets under their wings. The Heinkel 111K used two rockets said to provide 3,000 horsepower for three minutes, long enough to assist at take-off and up to 3,000 feet. The rocket tubes were then dropped off. This plane is powered with 1,300 horsepower engines, so that the rocket assistance was equivalent to more than two extra engines.

Rockets have been proposed for carrying messages to the rear, for increasing the range of anti-aircraft guns, for shooting bombs downward, and for many other purposes, so that while the rocket propelled airplane may still be a thing of the future, there are many immediate and practical uses for high-power rockets.

Science News Letter, October 24, 1942

PUBLIC HEALTH

New Health Record

U. S. Army has less venereal disease than during World War; syphilis rate is lowest in Army history. Thorough control program credited.

➤ NOT EVEN the venereal diseases, those hitherto invariable scourges of an army mobilized for war, have been able to spoil the excellent health record of our present Army.

"Venereal disease is substantially less than during the World War, with the syphilis rate now the lowest in Army history," the War Department announces in its latest statement on the health of the United States Army in training in this country.

This statement may be looked on as official announcement of a hard-won victory, another of the triumphs which the medical department of the Army has rung up as a result of efficient use of modern scientific methods for fighting disease. Here is how this medical victory was won.

When we started increasing the Army in 1940 through the Selective Service Act, we were all proud of the fact that it was the first Army in history recruited entirely from men free of any venereal disease, at least at the time of selection.

Then came a period of disillusionment. Venereal disease rates, which had been declining in the Army for many years, began to rise. Men free of syphilis or gonorrhea when examined by Selective Service boards arrived at Army induction camps with freshly acquired infection. Venereal diseases and prostitution had gotten out of control by public health and police authorities in many towns near the rapidly growing Army camps. Civilian authorities declared they could not handle the problem alone, urged the Army to invoke the May Act, passed by Congress to enable the Army to protect the men from venereal disease that might be acquired in communities near Army camps.

The Army, meanwhile, called in from civil life every specialist in venereal disease control it could get. It assigned venereal disease control officers to the headquarters of each corps area, to each major division in the field, to the air forces and to each large Army camp. These officers got full cooperation from the civilian agencies for the control of venereal disease in communities near Army camps. Under their direction, each soldier is taught how to protect himself from venereal disease and facilities for prophylaxis are provided.

The venereal disease rates as a result have shown a steady decline. The victory score board shows that in 1941 the total venereal disease rate, on a yearly basis, was 40.5 per 1,000 men. For the first six months of 1942 the rate, on a yearly basis, was 38 per 1,000, including cases arising in newly inducted soldiers where the infection actually was acquired in civil life.

"This means," states the War Department, "that about 19 new infections occurred among every 1,000 men during the first half of this year. Soldiers thus infected lose an average of 18 days or less from duty."

Most of the venereal disease rate now is due to gonorrhea which is much less serious than formerly because of the speed and effectiveness of the sulfa drug treatment for it.

So, although war or civil disturbance has always in the past brought an increase in venereal disease rates in armies, we are sending to war an Army in which the venereal diseases are taking less and less of a toll.

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INVENTION

New Polarizing Glasses Used for Different Colors

➤ POLARIZING eye glasses which will transmit or cut off light of two different colors or regulate intensity and color at will by simply rotating the lenses, are described in U. S. Patent 2,298,058 issued to Edwin H. Land of Cambridge, Mass., and assigned to the Polaroid Corporation of Dover, Del.

The new rotatable lenses are superposed on the regular polarizing glasses, much used to cut off the glare of light reflected up from horizontal surfaces. The new lenses contain two polarizing films, with their polarizing axes crossed at right angles. Each is impregnated with a dye and polarizes only a particular color, instead of all colors or white light as is the case with the regular glasses.

Suppose the two colors are yellow and blue. When turned say to the extreme left, yellow light is transmitted, to the extreme right, blue is transmitted. Midway between, the light is neutral or without color. At other positions any desired degree of coloration for either color can be obtained.

Or suppose that one film is green and the other neutral. When the neutral film is crossed with the regular glass, which is also neutral, say at the extreme left, scarcely any light at all passes. As the lens is turned, the light becomes brighter and greener until at the extreme right it is fully green.

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