AERONAUTICS

Jet-Propelled Planes

Several possible propulsion methods applicable to aircraft. Announcement of new fighters recalls previous experimentation in several countries.

➤ FIGHTER AIRPLANES employing jet-propulsion engines soon will be in production, having passed experimental tests successfully, the War Department announced Jan. 6. Originally of British design, work on the engines was begun in Great Britain in 1933 by Group Captain Frank Whittle. The first successful flight was in May, 1941. Through cooperation of the British R.A.F., the Ministry of Aircraft Production and the United States Army Air Forces, the first-flight engine was sent to the General Electric Company in September, 1941, and the first American-built engine was ready for test in less than six months. Bell Aircraft Company built an aircraft powered by two of these engines. The first jet-propulsion combat plane flight was on October 1, 1942. Several hundred successful flights have been made since in this country and abroad, many of them at high altitudes and extreme speed. (*See SNL,* Oct. 24, 1942)

The War Department's announcement arouses speculation as to the mechanisms that can be used in such aircraft.

There are four kinds of jet or rocket propulsion that have been experimented upon in the past. One of these contains an engine and compressor that took oxygen-containing air and compressed it to be mixed with fuel to produce a propelling jet. Another uses liquid oxygen in a similar arrangement. Propulsion by explosives is another method, similar to the rockets used in warfare, such as the famous bazooka. Another possibility is the gas turbine combined with an air compressor in one assembly.

Italian experiments of several years ago used the engine-compressor unit feeding air to a fuel jet. German reports published in translation by the National Advisory Committee for Aeronautics in 1942 used the liquid oxygen method.

Explosives may be useful in take-off propulsion devices but do not seem to be adapted to continuous propulsion.

The gas turbine, combined with an air compressor in one assembly, would be an ideal combination. What has held it up so far has been the inefficiency of the compressor and lack of a practical gas turbine. Perhaps these two obstacles have been overcome. Some Russian experimenting has been reported. Some patents have been issued in this country on such a combination, some of them to German inventors.

The new jet-propulsion engine is reported in press accounts to be more efficient than the old. That may be with no regard to the power developed and applied to the air jet, but the air jet itself is very inefficent as a means of propulsion, especially at low speeds. But there may be a saving of gasoline in that high octane gasoline is not required. In fact, depending on the kind of engine, it may be possible to use low grade fuel like that used by the Diesel engine.

The propulsion is reported in one account to be by means of short, sharp explosions; another said it was by means of a steady jet. If the engine-compressor combination is used, it is more likely the latter. But it may be either. Even a turbine may be run by a series of explosions instead of a steady stream.

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AERONAUTICS

Fundamentals of Rockets

➤ INVENTORS have dreamed of rocket ships flying about in space beyond the atmosphere, the rocket being the only sort of propulsion possible under the circumstances. The rocket ship, shooting out burning gases or other material at terrific speed, becomes a gun which is propelled by its own kick. But the high-speeding bullet of any gun takes by far the greater portion of the energy developed by the explosion, more than 400 times as much as the gun kick in the case of the Springfield Army rifle. This makes the rocket the world's most wasteful motor.

Nevertheless it has its uses as a temporary boost on occasion and has been so used in this war. There is no other means by which such a tremendous burst of power can be obtained with so little weight of machinery. Two rockets under the wings of an airplane will for a few minutes develop as much power as two extra engines, and help to get a heavily laden bomber off the ground.

A curious thing about rocket propulsion is that it really produces no new motion at all. The momentum of the two masses flying apart being equal, the center of gravity of two masses remains unmoved, or if it was moving in the first place, its motion is unaltered by the explosion that thrusts the masses apart.

Momentum is often called the quantity of motion, so that when two objects are thrust apart by a force between them (or pulled together by an attraction) there is just as much motion in the one direction as there is in the opposite direction, or no net motion of the system at all.

The new jet-propulsion plane has a reported speed of 500 to 600 miles per hour or more, which approaches the speed of sound.

When a plane approaches the velocity of sound in air, which is about 750 miles per hour, the propellers begin to lose their grip on the air, and the plane itself encounters more resistance. The air instead of sliding smoothly over the wings and along the fuselage, becomes turbulent, breaks up into eddies, whirlpools and irregular motions.

With jet propulsion there is no such loss of power as the speed of sound is approached. On the contrary, the higher the speed the more efficient is this mode of propulsion. And the plane can be especially streamlined for speeds higher than sound. At lower speeds it would encounter more resistance than the ordinary plane, but these speeds could be passed through so rapidly that this would not matter.

The velocity of sound is not much affected by the thinness of the air at high altitudes. It, however, is affected by the temperature and is faster at the low temperatures there prevailing.

A drop in temperature of 100 degrees Fahrenheit would increase the speed of sound by about 75 miles per hour.

Thin air also does not have the disadvantage for jet propulsion that it has for the propeller, for the jet is actually more efficient in the thin air high up than in the dense air at sea level.

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