ENGINEERING

Jet Engine in Your Car?

The gas turbine engine, the powerful "pinwheel jet" that packs more horsepower per pound, is now being tested in cars by the major automobile manufacturers.

By EDWARD HOUSMAN

➤ THE JET AGE is coming for the motorist. His dream car of the future very likely may have a new type of motor with no pistons to give trouble, no cylinder valves to jam and no water system to overheat.

The revolutionary engine, a gas turbine, is simple and rugged compared to today's piston engines. And it is not as fussy about its fuel diet. A gas turbine will burn almost any liquid fuel, including kerosene and cheap diesel oil.

The inherent simplicity of the new motor, which operates on the pinwheel principle, reaches down to the transmission. There will be none of the clutch and shift jerks felt by riders even in cars with modern automatic transmissions, but a smooth, continuous acceleration with a fan-to-fan linkage that should be trouble free.

Gas turbine engines already have an impressive record as an aircraft power plant. In their turboprop form, gas turbines power the Vickers' Viscount, a four-engine passenger liner just put into service in the United States. The engine shows its muscles in the Navy's "Pogo Stick" fighter that generates enough propeller power to take off vertically from a nose-upward position.

The gas turbine packs more power per pound of engine than the piston motor—three times as much in General Motors' experimental sports-race car, the Firebird.

Exhaust-less Jet

Though it has no fiery exhaust tail, the gas turbine is a real jet engine. Hot gases generated in the combustion chamber are harnessed by a turbine instead of being shot out the rear as in turbojet planes.

The major automobile manufacturers have test models on the road today, but there are problems in designing a satisfactory version of the engine for mass produced cars, trucks and buses. Once on the production line, however, these motors should cut the purchase cost and operating expense of a car. The engines have far fewer parts than today's motors, and only one of the parts requires workmanship to close tolerances. That is also the only real moving part, the turbine, an efficient fan that converts the jet blasts to turning motion, much like a pinwheel in the breeze.

The motor is easy to take apart and put together. It takes about day for the job, a near impossibility with the complicated auto engines of today. And it is rugged.

An experimental Navy gas turbine engine, about the size of an auto motor, but one-third less in weight, was run continuously for more than 1.300 hours before its first failure. This is equivalent to 52,000 miles of trouble-free service at 40 miles-per-hour on a car.

The failure was a minor one. One of the turbine blades broke. The engine could be quickly repaired and, probably, run for another 1,300 hours before another failure. The engine went through a tough test schedule, too, being speeded up, slowed down, stopped and started on a regular schedule to simulate actual use.

Gas turbine engines also have no electrical system to mention. One spark plug is used, but only to start the engine. Once the fire is ignited in the combustion chamber, burning continues spontaneously during operation. This would reduce bothersome repairs and adjustments of distributors, batteries, generator and voltage regulators necessary in today's cars.

Another major repair item on today's auto is the transmission.

The purpose of the transmission is to connect and disconnect the wheels and the spinning shaft of the motor. This makes starting, stopping and changing gears possible. In the Navy's gas turbine, two fans, or rotors, stand face to face but are not mechanically connected. When the fan connected to the engine spins, the flow of hot gases from it makes the second fan turn.

Steps in Power Conversion

Here are the fundamental steps by which the gas turbine converts fuel and air to power:

1. Air, taken in from the grillwork at the front of the car, is compressed.
2. This high-pressure air rushes into the engine's single combustion chamber where it mixes with fuel and burns with a very hot flame. This expands the volume of the gas.
3. The hot, compressed air from the combustion chamber then rushes through the blades of a turbine, which like the windmill or the water wheel changes the flowing motion to spin.

Today's cars get their power from a much more complicated and critically machined motor that works by harnessing individual

"JET" CAR—A Chrysler Corporation engineer checks under the hood of the firm's experimental "Turbine Special," a 1955 chassis powered by a gas turbine engine. The car is undergoing tests as are gas turbine models designed by other auto manufacturers.

explosions in its six or eight cylinders. The heat caused by these cylinder explosions is removed by circulating water.

Parts of the gas turbine engine, get red hot, but water cooling is not necessary. The hot parts will be designed to withstand the heat with ordinary air cooling. An aluminum shield over the hottest parts of the engine is enough to prevent the heat from damaging the car body.

Auto manufacturers, after tests of the gas turbine on vehicles, say that it is not necessarily the engine of the future despite its performance record. There are still bugs that have to be ironed out. General Motors is running two vehicles, a bus and a race car with experimental engines. Chrysler Corporation has a conventional-looking experimental gas turbine model on the road, the "Turbine Special." Ford Motor Company is testing and improving the new motor part by part.

One disadvantage of the gas turbine is that there is no braking force from the engine when the driver takes his foot off the accelerator.

At high speeds, especially, the motor's role in breaking is important, even more important than the brakes themselves. Brakes alone could not stop the car in time in many cases.

Engineers believe the braking problem will be solved. It may, however, entail a large bill for maintaining a more powerful and complicated braking system than we find in today's cars. The GM Firebird gains extra braking force with adjustable fins on the body, and exterior wheel brakes. The GM Bus, the Turbocruiser, gets extra retarding force on steep downgrades by reversing its engine.

Another difficulty with the engines is that the auto industry is not tooled to produce them. The initial expense, some say, would be prohibitive. New materials, such as the high temperature steels for the combustion chambers and the turbine blades would have to be stockpiled at great expense.

There may also be objections from the oil industry, which has huge investments in production of high octane gasoline, too rich a diet for the new engines.

Cars Still in Future

These factors indicate that although successful experimental engines are now available, it may be five or ten years before gas turbine cars will be coming off the production line.

General Motors insists its Firebird is only experimental and that there are no plans to put it into production.

The Navy, on the other hand, is quite optimistic about gas turbines for certain applications.

A. C. Skortz, head of the gas turbine branch of the U. S. Naval Engineering Experiment Station, Annapolis, Md., who has been testing the Navy's small gas turbines, pointed out that these small turbines are vibration free.

The noise generated by the gas turbine is a high pitched whine, but it is a high-frequency noise and is fairly easy to muffle.

Gas turbines have come a long way in the Navy in the past 11 years, back to the time when about the only operating one was the Experimental Allis-Chalmers engine that filled a huge warehouse-type building at the experiment station.

Tiny Gas Turbines

That engine is now being taken apart and scrapped and, in a corner of the same building, the new tiny gas turbines are being tested and improved. These latter were designed and built by Boeing Aircraft Company for the Navy.

Gas turbine engines at their present stage of development drink fuel faster than piston engines, but it is cheap diesel fuel. Potentially, the gas turbine could use even cheaper fuel and the efficiency per mile per gallon could be stepped up.

Mr. Skortz sid he is now trying to run the motors on a very cheap. low grade, black, sticky oil called "Bunker C." The motors have run on it, but there are big problems involved in long term operation with such crude fuel. The experiment shows how variable the gas turbine's diet can be. Diesel oil seems to be the standard fuel.

Gas turbines are used by the Navy for auxiliary power aboard large ships.

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PSYCHOLOGY

Women Can Equal Men in Learning Gun Assembly

➤ WOMEN may not know as much about mechanics as men but, in the Navy, female recruits could learn as well as men how to assemble the breech block of a 40mm anti-aircraft gun.

Tests showing this were reported by Roger B. Allison Jr. of the Educational Testing Service, Princeton, N. J., at the American Psychological Association meeting in San Francisco. The tests were made under the sponsorship of the Office of Naval Research.

Four groups of naval recruits, men and women, were shown a motion picture on assembling a 40mm antiaircraft gun breech block. The recruits were then tested on what they knew about it and on putting one together.

In the knowledge test, females did as well as males, and they were only slightly behind males in the actual assembly test.

The conclusion was that "under controlled learning conditions female recruits were able to learn a mechanical-motor skill despite obvious background differences."

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