HIGH-STYLE sedan is to appear on the road in limited numbers this fall. Tom made test

ENGINE is up front—and that is the one conventional thing to be reported about it.

REAR END makes it look like what it is—that is, like nothing on the highway today.

drive on Chrysler's high-speed track.

INTERIOR of the turbine car is lush in a Buck Rogerish sort of way, says Uncle Tom.

McCAHILL TESTS...

Chrysler's GAS TURBINE CAR

Tom found this experimental cyclone in a tin can to be silent, vibrationless, an adequate performer . . . and, just maybe, the car of tomorrow.

By Tom McCahill

AS THIS issue goes to press almost everyone has had something to say about Chrysler's new gas turbine. Chet Huntley did a show on NBC television about the car and how it ran, and nearly every newspaper in the world has run articles of one type or another about turbines present and future. If Chrysler did nothing else and decided to scrap its turbine tomorrow morning, they'd have gained millions of dollars worth of publicity. I have met people who bought Chrysler stock as a result of these reports.

Turbine-driven vehicles are nothing new. They've been around in one form or another for many years. Eighteen years ago I worked on an MI article with Captain Eddie Rickenbacker in which he predicted that nearly all cars soon would be powered by gas turbines. The good

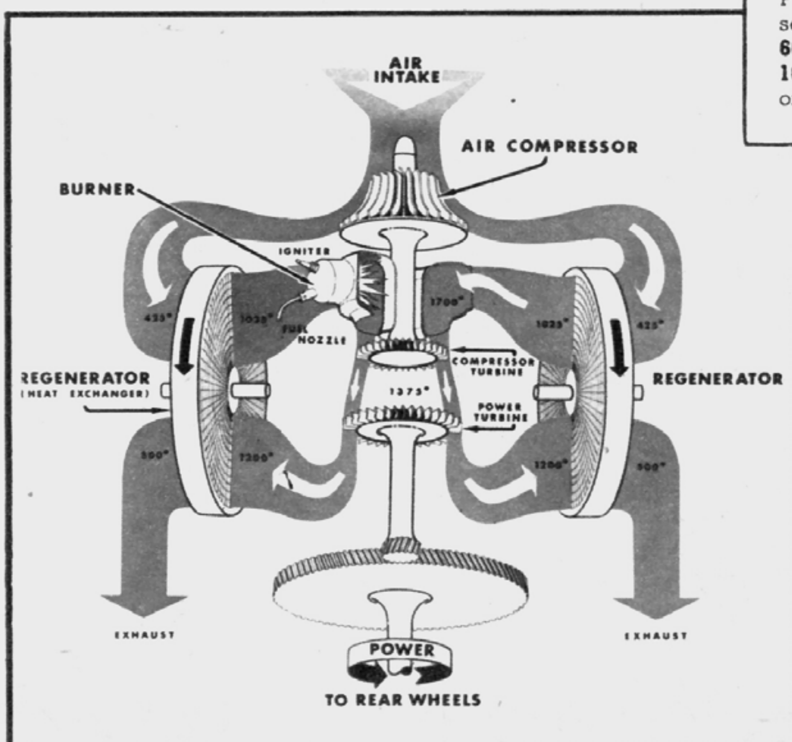
captain was ahead of his time but he possibly could be right ten years from now. I merely cite this to show that this turbine-powered guff has been going on for a long time. Rover of England has been working with turbines over ten years and a Rover/BRM completed the Le Mans race last June, the first turbine-powered car to accomplish this feat.

The big question is whether the turbine can replace the piston engine. To approach this problem another way, if some fuzzy cat had invented the turbine engine before [*Continued on page* 118]

CORNERING NICELY is a Chrysler habit, has little to do with a turbine mill; transmission used here is an adapted Torqueflite.

TEST CAR SPECS

MODEL TESTED: **Chrysler Gas Turbine**
ENGINE: **Regenerative gas turbine; 130** brake hp at **3600** rpm output shaft speed; Torque: **425** ft-lbs@ zero output shaft speed; Fuel required: **Kerosene, etc.** Standard axle ratio: **3.23.** Wheelbase **110** ins; length **201.6** ins; height **53.5** ins; width **72.9** ins; front tread **59** ins; rear tread **56.7** ins. Weight **3,900** lbs. Fuel tank capacity **21** gals. Turning circle diameter **38.8** ft. Tire size **7.50x14.**
PERFORMANCE: **0-30** mph, **4.4** secs; **0-60** mph, **12.1** secs; **40-60** mph, **6.1** secs. Top speed **108** mph. All times recorded on corrected speedometer.



AIR going through turbine engine is sucked in by compressor, heated to high temperature by regenerator, mixed with fuel and ignited. Expanding gases rotate the first-stage turbine, which powers compressor, and a second-stage one which powers car. Regenerators heat incoming air, lower exhaust heat.

Tom Tests Gas Turbine

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the piston engine and if all our cars today were turbine-driven, what would the inventer of the piston engine do? In my opinion, he would cry his eyes out while slowly starving to death.

There are some major problems that must be solved before serious thought is given to a complete turbine takeover, but perhaps we'd better explain first how the turbine and piston engine differ. Without going into how a piston engine works, as 99 per cent of our readers know, here's where the gas turbine makes it's strong bid: it uses only 20 per cent of the parts found in a typical piston engine. It doesn't need a cooling system since it is air-cooled, and if it runs as it should it requires only minimum maintenance. Carbon monoxide gas is practically nonexistent, as the fuel is burned completely. It will operate on just about any fuel that will burn, from Napoleon brandy to peanut oil. Our test car used diesel fuel. It would have run equally well on kerosene or even good unleaded gasoline.

Here's how it works. According to the Chrysler experts, when the turbine engine is running the first-stage turbine rotates the centrifugal compressor impeller to draw in air and compress it (which causes a certain amount of heating in itself). This compressed air is heated more as it passes through the high-pressure side of the regenerators, and then it enters the combustion chamber. Here it is sprayed with fuel and ignited by a single spark plug. These fully heated gases pass through the first-stage turbine driving the compressor and then through the second-stage turbine (power turbine) which drives the car.

Unlike piston engines that pump a lot of waste energy out the exhaust pipe, these gases, after spinning the turbine, go through the low-pressure side of the regenerators—they are actually heat exchangers—which take out most of the remaining heat before the waste is exhausted. The regenerators use the heat taken from the exhaust to heat the next load of incoming air. This does two things. It ups the fuel economy and cuts the final exhaust heat so a cat sleeping under the car wouldn't be burned to a crisp. Some gas turbines, such as those used in the aircraft industry, run without regenerators, or heat exchangers, and the exhaust from them is hot enough to fry a bull moose at 20 paces.

If this all sounds confusing, here's a simpler explanation of how a turbine works without all the goodies Chrysler had to add to make it a practical engine. Picture a metal box, sealed except for a set of blades like an electric fan or a windmill at one end. Heated air is forced into this box from the outside under pressure. Fuel is sprayed into this hot air and a spark plug ignites the load. It won't take the brightest kid in a physics class to realize that this hot air, already under pressure, mixed with burning fuel, builds up tremendous pressure.

The metal box would explode if it wasn't for the little turbine wheel that's bleeding off this pressure as it spins at a terrific rate, allowing the expanded gases to get out of the box. In other words, you create a cyclone in a tin can and, in escaping, the cyclone turns a turbine wheel.

In practice, as Chrysler does it, many refinements have been added to control this cyclone. The hot gases, for instance, are directed through nozzles at the turbine wheel blade. The nozzle assembly, made of a ring of fixed airfoil-shaped vanes, directs the flow of escaping gases at an angle where it will do the most good. These nozzles also will reverse for braking power when the gas pedal is released at high speeds.

Another article could be written on the variable nozzles and still another could be done on the regenerators. The whole power plant could perhaps be described as complicated simplicity.

As this is supposedly a test piece and an evaluation of the gas turbine, let's consider some other factors. The fact that this engine has been produced and that now we're about to have some Chrysler turbine cars on the road is due as much to the metallurgists as it is to the design engineers. Much higher temperatures are experienced with turbines than with piston engines. Rare and extremely expensive metals once were

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required to cope with the heat. But Chrysler now says it has developed some substitute metals that are less expensive, though they're still as rare as cold beer in England. If the entire automobile industry wanted to switch next week to gas-turbine power plants, they'd stopped dead for lack of these materials, which just can't be picked up by the ton at any corner store.

Let's take this bucket of steam on a test run. The first thing you notice is a brand-new sound. Those of us accustomed to the muffled explosions of old Nellie will have to get used to that jet-like swish of the turbine. If there were a lot of them on the road it would be more like spending an afternoon at the airport than on a turnpike. When I drove one of the early Chrysler turbines a year and a half ago it was a pretty noisy bucket and all conversation had to cease if you were within 50 yards of one that was running. Today the sound is muffled and, while it is unlike the sounds you hear at Sebring, it's not in the least unpleasant or too loud.

The car itself is a beautiful high-styled sedan with appointments that are strictly lush in a Buck Rogerish sort of a way. The car handles and corners nicely but then this is a chassis problem which Chrysler has solved well for years. The transmission is an adaptation of Chrysler's Torqueflite and rumors already are in the mill that a newer transmission is being worked out for future Chrysler turbines.

You start the car with the conventional key and it is so silent and vibration-free that you don't feel it running at all. In fact, no car ever made before ran at any speed with as little vibration as this one. For the record, zero to 30 mph averaged 4.4 seconds and 0 to 60 came out 12.1. You may remember that I reported briefly last year that 0 to 60 mph was 10 seconds with the old car with a top speed of 110 mph. The sound-deadening may have taken some punch away but 12.1 seconds for 0 to 60 mph is still quite impressive, especially when you consider that this new turbine is rated at only 130 hp.

Forty to 60 mph averaged out at 6.1 seconds and I would say that the low spot on the turbine's performance, while not bad, is when you want to increase speed in the 50 to 80 mph and 40 to 70 mph range. This car doesn't have the moxy of an engine of 300 hp or more. But it has as much belt as typical 130-hp engines used to have and a lot more top speed. Incidentally, the standing quarter mile averaged 19.4 seconds. I drove this car about 40 miles flat-out on Chrysler's high-speed track. Top speed was 108 to 108.5 and at (hold your hat) 44,000 rpm. As I recall, I did 110 mph at 46,000 rpm with the old model. This is a good-performing automobile, though not record-breaking, but certainly passable and similar to the current standard V8 Chevy Impala.

At this writing there doesn't appear to be any advantages over the piston engine from a consumer's standpoint. Fuel consumption was hard to nail down. At normal turnpike speeds of around 65 to 70, I'm told it will give between 16 and 17 miles to a gallon. I didn't have the test car long enough to check this out. In city traffic, my Chinese grapevine informs me, the gas consumption is not up to the typical piston engine. In fact, it's pretty low, but I couldn't check this out or get any confirmation on it either. Of course, diesel fuel and kerosene still sell for a lot less than high-test gasoline.

What do I think of this turbine rig? I like it. It's quite possible that the gas-turbine-powered car may have the entire market in ten years or less. The piston engine could well be on its way out. Not as things are today, of course. There are many problems to be solved before the gas turbine can be a serious threat to the piston engine. Metallurgy, as we've already stated, appears to be the major problem. Due to a turbine's design, it has to be a precision machine in which no sloppy tolerances can be tolerated, as they are in some of our current Detroit iron.

The turbine blades that must operate at extreme temperatures are highly susceptible to dust and the blades are receptive to corrosion. This calls for superior air filtering, which will be solved, but there are still a lot of ifs. Ten years ago, if any-

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one told you a guy named Cooper would orbit the world more than 20 times, you'd have screamed for the men with the white coats and butterfly nets. Ten years from now the problems the turbine has today may be solved. However, that fuel consumption at low speeds just could be the toughest problem of all.

If the turbine has any advantages to offer over our better piston cars today I wasn't able to find them, aside from lack of vibration. If two, three or four years from now the turbine shows up with some definite improvements, watch out. As I said early in this piece, if the gas-turbine engine had been built first, how would you go about selling a piston engine? After all, the piston mill is a pretty awkward thing, and it never was as easy to take care of as a horse. •