A PROGRESS REPORT: The Turbine

George J. Huebner, Jr. . . . the turbine man

Research aims at solutions of car emission problems

America's most heralded automobile of the early Sixties was a car without a name, an unknown market and an unpredictable price tag. But it had a power plant that conceivably could have challenged the 65-year reign of the internal combustion piston engine. It was called, simply, the Chrysler Corporation Turbine Car.

There never has been an automobile introduction quite like that of the Chrysler Corporation Turbine Car. Fifty were produced, a large number for an experimental passenger vehicle. All were two-door hardtops and all sported a bronze finish. The Chrysler-designed bodies were handmade in Italy and shipped to Detroit for final assembly.

Two of the 50 went to New York City in May, 1963, for a national press unveiling. The following October a nationwide test program, covering 48 states and Washington, D.C., began with turbine cars assigned to housewives, schoolteachers, students, and salesmen.

When the mammoth trial run ended on January 28, 1966, the turbines had been driven by 203 people who logged more than a million miles. The very first turbine tester was Richard Vlaha, a Chicago systems engineer who hasn't changed his address or the size of his family (three children) since. But he has been promoted three times and is now a senior marketing manager for IBM.

Vlaha's wife asked the big question: "What's happened to the turbine?"

A logical question, particularly at a time when the public almost every day reads something about reciprocating piston engines, the new Wankel, steam engines for cars, electric cars, and even an auspicious sounding contraption called a stratified - charge engine. An appropriate question, too, in a decade when headlines warn about a fuels crisis, the possibility of eliminating the automobile from inner cities to reduce pollution problems, and tight government regulation of automobile requirements.

There's little doubt that automobile power plants are undergoing basic changes.

So, what about the turbine?

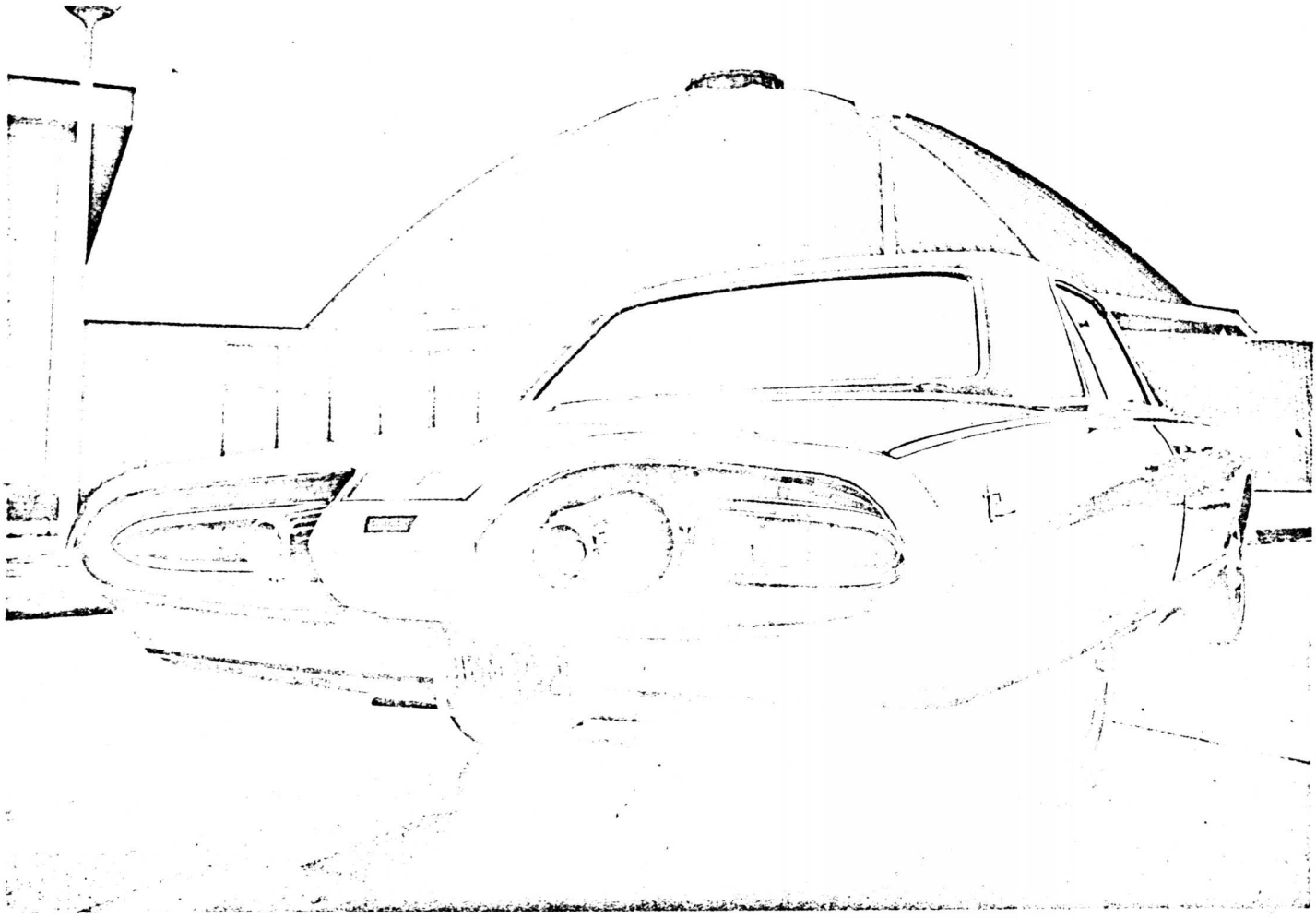
The man who probably knows more about automotive turbines than anyone in the world is George J. Huebner Jr., research director for Chrysler Corporation and a turbine buff since he began tinkering with its development in 1939.

"Those test cars were powered by the fourth generation engine," says Huebner. "Before the driving program ended, a fifth engine had been developed and we had started work on the sixth design to be used for research purposes only."

It was about that time that ecology, a word then relatively unfamiliar to the public, began to rival the Vietnam War for page one attention. California, particularly, took legislative steps to clean up its atmosphere.

"It quickly became apparent that we were up against a situation that would require everything we could throw at it," Huebner continued. "That was the problem of oxides of nitrogen (NOx), a major component of Los Angeles smog. It was a case of all hands to the pump to check NOx emis-

America's first turbine-powered passenger car marks its tenth birthday. This hardtop is one of the last nine of the original 50 cars tested by 203 drivers over a million miles of streets and highways.



sions on the conventional piston engine. Experts in this area were hard to come by and our most able engineers were in the turbine project. They moved over and explored catalysts and exhaust manifold reactor systems to reduce chemical emissions on our internal combustion engines. Meanwhile, turbine work stopped except for some experiments with its combustion and metallurgy."

So, Mrs. Vlaha, that's what happened to the turbine car.

Now, the veteran turbine team is completing its piston engine work for 1975 models. It soon will hand over 1976 catalyst systems to the engineering product people for continued development.

Many of these key turbine engineers are back on the turbine program. Huebner says activity is at its highest level in more than six years. Some important factors could make the program more important today than ever before.

Meeting emission standards of the Federal Clean Air Act for 1975 and 1976 may be too great a burden for any piston engine. The turbine shows promise of doing it without expensive afterburners or catalysts that some experts believe will raise the price of automobiles with a conventional power plant as much as $500.

"That much of a dollar load may be in excess of what a lot of people might be able to handle," Huebner says. "And we may not even be able to meet the strict atmospheric requirements with the piston engine for very long."

Warnings that the nation faces a severe energy crisis point up another favorable factor in the turbine's future. It does not have the fuel appetite of the piston engine, can run on unleaded gasoline, kerosene or diesel fuel. Because it does not require an octane-tailored petroleum, the oil industry would be able to produce more gallons of usable fuel from a barrel of crude oil. Currently, the latest turbine engine about matches the piston engine in fuel economy. But it has the potential to do much better. That would be another plus in the battle to conserve energy.

The Environmental Protection Agency (EPA) has a stake in the turbine. Chrysler Corporation recently was awarded a $6.4 million EPA contract. With the sixth generation power

1976 Federal Standard—unattainable

plant as a base, Chrysler is evaluating its own work as well as progress made by other researchers in combustion controls and manufacturing techniques.

"The contract is tremendously valuable because it means that all this information will be made public," Huebner declares. "It is bound to advance the state of the turbine all over the world. I have no qualms about releasing our own data because you either stay ahead in this ball game on your own efforts – or you don't belong in it."

Huebner, who started turbine work at Chrysler before World War II, enthusiastically lauds its merits. It weighs about 200 pounds less than an average piston engine and has 80 percent fewer rotating parts. Virtually a sealed engine, the turbine requires no timing, no tuneups, no oil change—and only a single spark plug to ignite it.

As to durability, it's no contest. Some turbine engines in the research lab have run the equivalent of 175,000 piston engine road miles without a repair.

A driver of the sixth generation turbine probably will find it nearly vibration free. The latest version reflects what Chrysler learned from drivers who tested that 50-car fleet back in the Sixties. It has better fuel economy at low speed, and shows improved pickup from a standing stop. It sounds like the whoosh of a vacuum cleaner, much quieter than the jet whine of the bronze car of 10 years ago. At that time about 15 percent of the drivers complained of too much whine, 50 percent asked for more, and the rest were noncommittal.

The turbine principle of power goes far back in time. A windmill is a turbine – driven by the wind and turning a grinding mill attached to it. The Chrysler engine creates its own wind by drawing air through a compressor and heating it into a hot, rushing gas. The gas is directed toward the turbine wheels which transmit power to the vehicle and its accessories.

Huebner believes the turbine has the potential to become the dominant automotive power source 20 years from now. But a pair of substantial barriers blocks its path.

One is NOx emissions. Turbines handle carbon monoxide and hydrocarbons –the other two main automotive pollutants – without any trouble. Huebner reports: "The turbine today meets Federal requirements on NOx for 1975 but the 1976 standard of .40 grams per mile is virtually unattainable. Piston engine or turbine hopefully can meet or even beat the three-gram rule for 1975."

Typically, the research director thinks Washington is asking for too much. "California people are pretty knowledgeable on this and they are seeking 1.5 gpm by 1976. If we have to live with Federal goals we may never see a turbine or any other kind of an engine."

The second obstacle to mass turbine production is the conversion of plants and training of personnel now assembling piston engines. "The only similarity between the two power plants might be the screws that hold pieces together," Huebner says. "Since a wide range of turbines would be needed to power a variety of car sizes, the cost of conversion on an industry basis would run into billions. Even if we got a real breakthrough on NOx, it would be at least another five years before the turbine could be produced in any volume—and that kind of a timetable would be strictly a crash program."

The turbine would not be the first alternate power plant to be built and sold for American cars. Already powering a couple of foreign makes, the Wankel rotary engine is expected to appear in 30,000 General Motors cars in 1974. The engine naturally has generated a lot of enthusiasm at GM and at American Motors, which has obtained a license to produce them. But the Wankel has received a lukewarm reception by Ford Motor Company and a cool response from Chrysler.

"The Wankel is just another internal combustion engine and really isn't the answer," Huebner asserts. "It's dirty and it's a fuel hog. It does perform smoothly and has the appeal of novelty. An army of people with money are eager for something different, perhaps the Wankel. Most of them compare economy with the luxury car in their garage. Wait until they discover a neighbor is getting 25 percent better gas mileage on a comparably sized piston engine car."

Huebner thinks we may see a limited number of electrics as delivery vehicles in central city areas. "They simply don't have enough range and speed with available batteries for safe expressway driving and need about an eight-hour charge nightly." Chrysler has engineered and built an electric car which has been given to the University of Michigan.

"Awfully complicated and awfully expensive" is how Huebner describes the steam engine. But he reveals that the corporation has a subcontract from Steam Engine Systems Inc. of Watertown, Massachusetts, and will build one within 18 months.

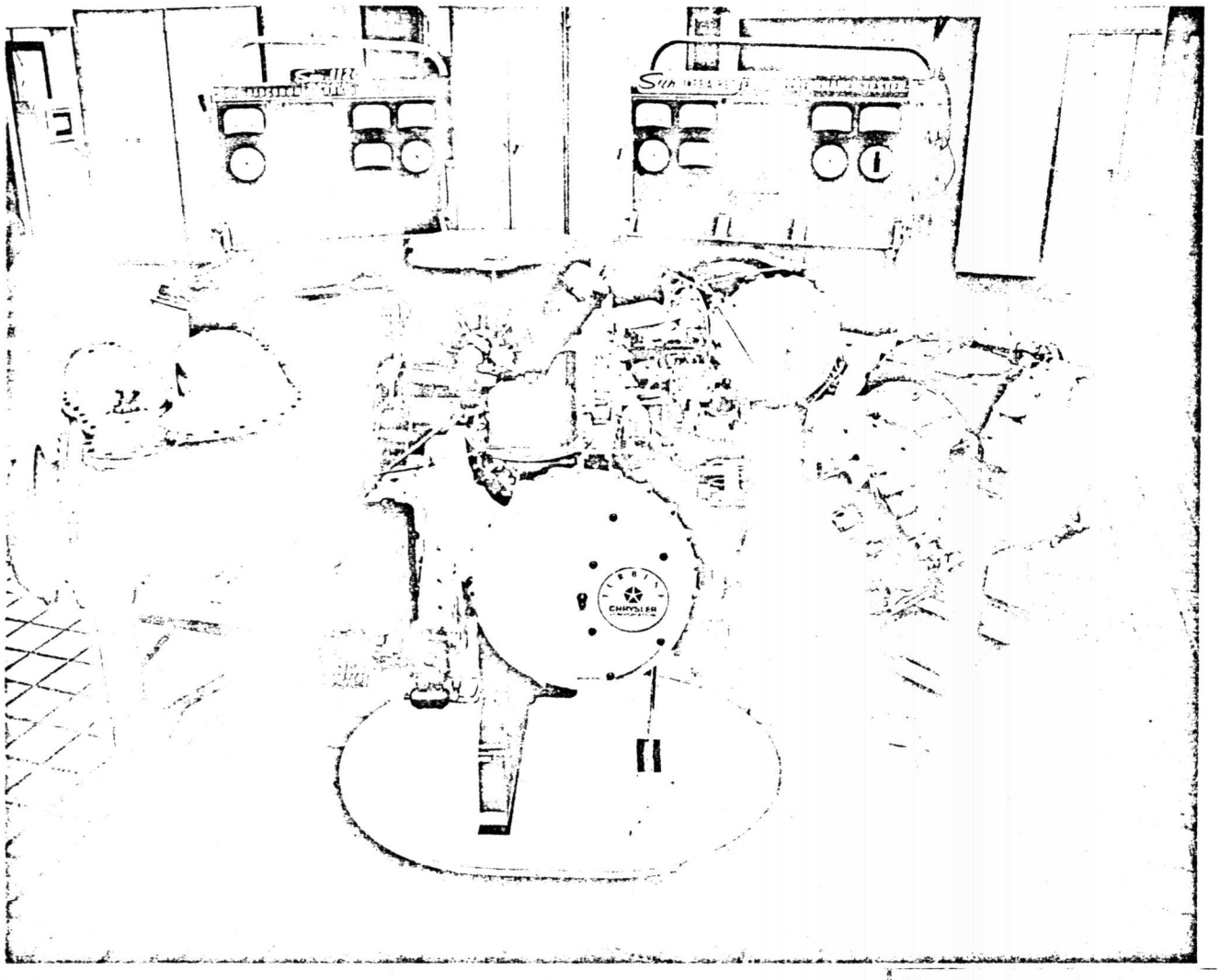
The stratified-charge engine earns a "not bad" rating from Huebner. It is a piston plant that burns its fuel with excess air, thus lowering the formation of emissions right in the combustion chamber as does the turbine. The problems: weight, cost, frequent maintenance.

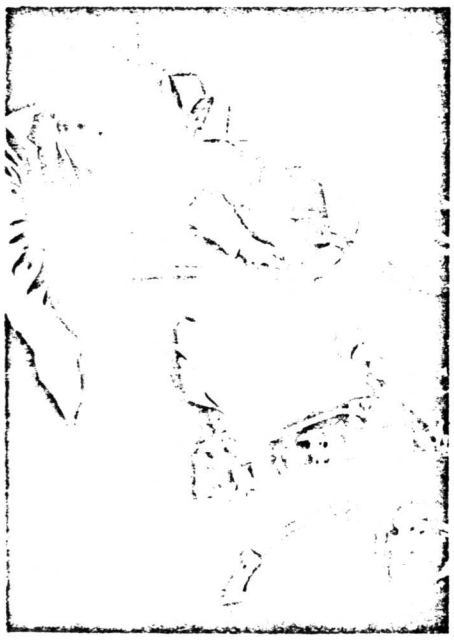
His observations on alternate automotive power sources leave no doubt that George Huebner believes the turbine is the way to go. He cites the experiences of those test drivers who never had to change oil and noted no increase in emissions as the engines piled up mileage. "They learned that the air filter had to be shaken out only once every 28,000 miles and that the compressor had to be cleaned occasionally. That's simple. Idle the turbine, throw a couple of ounces of cleaner into the compressor intake and that does it."

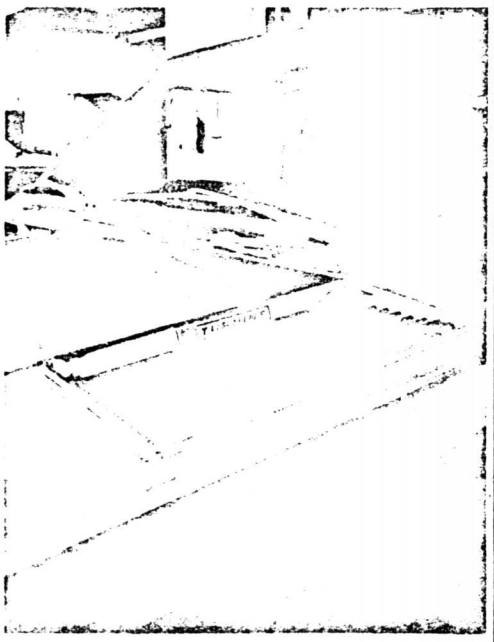
Of that 50-car fleet, all but nine have been torn down. Six are in museums and three are in corporation hands. Although Huebner is not a stylist, he thinks the '63 design is basically good today. "I'd get rid of that big tube running down the center of the passenger compartment and I think we could do away with that gullwing rear-end design. Of course, we would have to make four-door as well as two-door cars."

If NOx and the problems of mass production are solved, can we expect a turbine on the market by the end of the Seventies? Huebner replies: "Who knows? If we get it, it will be a seventh generation engine."

Any further questions, Mrs. Vlaha? □







Six generations of turbine engines. Clockwise (to the left of the blue-white newest engine), the first version in 1954 generated 100 horsepower. Output doubled in the second plant in 1959. No. 3, in 1962, cut acceleration time from idle to full speed by 1.5 seconds, a 50 percent reduction. The fourth, a 130-hp. engine, power source of the 50-car test fleet in 1963, was a fresh design—more compact, quieter and lighter. The fifth, 1965, delivered better fuel economy. The sixth, 1966, was quieter, updated to handle air conditioning. Left: Howard Collister, a turbine technician for 19 years, checks air intake pressure on the sixth generation turbine. And the hood of the same car with special air intake louvers.