

## ENGINE COMPARISON

Specifications	Baseline Engine (6th Generation)	Upgraded Engine (7th Generation)
Power	150 hp (112 kW)	104 hp (78 kW) Base 123 hp (92 kW) Augmented
Engine Weight	650 lb (295 kg)	500 lb (227 kg)
Vehicle Test Weight	4300 lb (1950 kg) (1973 Intermediate)	3500 lb (1588 kg) (1976 Compact)
0-60 mph Time	12 seconds	13 1/2 seconds
Turbine Inlet Temp.	1850° F (1010° C)	1925° F (1052° C)
Idle Fuel Flow	10 lb/h	(2.0 kg/h)

### Configuration

Housing	3-piece	1-piece
Regenerator	2 Metal	1 Ceramic
Accessory Drive Engine (Regen., O/P) Vehicle (P/S, A/C, Alt.)	Gas Generator Power Turbine	Power Turbine (Free Rotor)
Control	Hydromechanical	Electronic
Transmission	3-speed Automatic	3-speed Automatic
Torque Converter	11 3/4 in. (298 mm) diameter	10 3/4 in. (273 mm) diameter - Lock-Up at 2-3 shift

## CHRYSLER/DOE TURBINE CAR SPECIFICATIONS (7th Generation)

	Turbine Concept Car	1976 Dodge Aspen
Body Type	Restyled 1977 LeBaron 2-door	4-door Sedan
Wheelbase	112.7 in. (2863 mm)	112.5 in. (2858 mm)
Track	60.0 in. (1524 mm) front 58.5 in. (1486 mm) rear	
Overall Length	204.1 in. (5184 mm)	201.5 in. (5118 mm)
Overall Width	73.5 in. (1867 mm)	72.8 in. (1849 mm)
Overall Height	53.3 in. (1354 mm)	54.8 in. (1392 mm)
Engine	Upgraded Gas Turbine (7th Generation)	
Transmission	3-Speed Automatic	
Rear Axle Ratio	3.21	
Suspension	Transverse Torsion Bars	
Steering Type	Power	
Brakes	Hydraulic Power Assist	
Diameter		
Front	10.82 in. (275 mm) disc	
Rear	10 x 2.40 in. drum (254 x 61 mm)	
Tires, Radial	GR70 x 15 Glass Belt	FR78 x 14 Steel Belt
Weight	3884 lb (1762 kg)	3685 lb (1672 kg)

## **EMISSIONS AS A CRITICAL DESIGN PARAMETER**

During the early development of the turbine, research scientists in California had related the smog in the air of certain U.S. cities to a complex photochemical reaction involving oxides of nitrogen (NO<sub>x</sub>) and hydrocarbons (HC). Both of these compounds are found in automotive exhaust. This led to enactment of stringent legislation which affected the exhaust, crankcase, and fuel systems of the automobile. This legislation created a situation in the automobile industry which required an all-out effort to solve.

These strict vehicle emissions standards actually enable the gas turbine to compete more favorably with the conventional piston engine. The only Federal Emission Standard that the Chrysler Corporation upgraded gas turbine does not fully meet is the oxides of nitrogen (NO<sub>x</sub>) limit; however, there are promising modifications which may reduce NO<sub>x</sub> emissions to the compliance level.



**1976 — COMPACT SIZE — DODGE ASPEN**



**SMALLER—UPGRADED TURBINE ENGINE**



**DRAMATIC — AERODYNAMIC — TURBINE CONCEPT CAR**



**UPGRADED TURBINE ENGINE  
BUILT FOR THE U.S. DEPARTMENT OF ENERGY**

## THE FUTURE

There are many economic, technological, and government regulatory factors which influence the turbine car's future. In the research laboratories, the turbine engine has met the original 1975 Federal exhaust emission standards and shows potential for meeting those of 1979 and beyond; but, in view of fuel economy regulations and a potential energy shortage, the turbine must demonstrate better fuel economy and driveability than a piston engine while meeting these standards. Other items to be resolved are the turbine engine's dependence on high cost nickel alloys and the economics of tooling a new engine plant and the training of personnel prior to production of a turbine engine. These must be weighed against the conventional engine's increasing need for unleaded fuel and its reliance on imported rare materials for the necessary catalysts.

A promising future design concept is to use ceramics in place of nickel alloys in the hot sections, and to replace the typical turbine of two shafts, two sets of variable blading and a three-speed transmission with a single-shaft turbine with a single compressor impeller and single radial turbine coupled to a continuously-variable transmission. The use of ceramics would allow up to 2500° F (1400° C) operating temperatures where a 20 percent fuel economy improvement potential could be realized. This increase in temperature permitted by the use of ceramics would contribute to a decrease in engine size and weight. Both silicon carbide and silicon nitride ceramic materials have shown promising developments recently for such turbine engine applications.

Another key component under development for the upgraded engine is an integrated electronic system which controls engine operation by controlling the fuel system, the power turbine nozzle vane position, the position of the compressor inlet guide vanes, the water injection system, and the engine starting sequence. The control system will also include a diagnostic feature for ease of maintenance and evaluation.

As automobiles become increasingly more expensive to buy and maintain, car buyers will expect them to last longer with less maintenance. The turbine, with fewer parts, requires no routine maintenance other than cleaning the air filter occasionally and replacing the single spark plug about every 25,000 miles (40 000 km). It has been run in tests equivalent of 175,000 miles (280 000 km) without a major repair. Perhaps, after further development, this operating economy could help overcome the inherent material cost disadvantage of the gas turbine engine and enable it to compete for certain vehicle applications on a functional and economic basis.