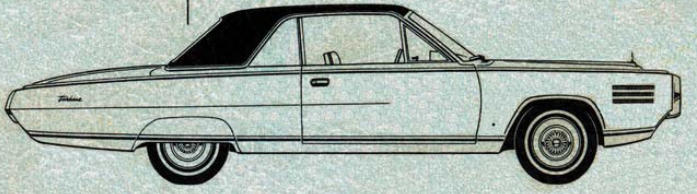
The Chrysler Corporation *Turbine* Car



CHRYSLER CORPORATION

ENGINEERING STAFF—TECHNICAL INFORMATION SECTION

THE
CHRYSLER CORPORATION
TURBINE CAR

CHRYSLER CORPORATION
ENGINEERING STAFF
Technical Information Section

April 5, 1963

PREFACE

Vibrationless power from a lightweight, simple, compact engine has long been the dream of automobile designers. That's why they look to the gas turbine engine. A gas turbine is a simple engine. Its basic element is a turbine wheel, which has a ring of blades around the outside of a hub. When a mixture of air and combustion gases flows through the ring of blades, it causes the wheel to rotate (like a windmill) and this is how power is produced in a gas turbine.

The gas turbine engine is light and compact and has only a fraction of the number of parts of a piston engine. It runs smoothly, without vibration, and can use any of a wide variety of fuels. Since it operates with excess air, the fuel is burned completely and practically no noxious fumes, such as carbon monoxide, are produced.

The piston engine, by its nature, cannot match the vibrationless operation that is characteristic of the gas turbine. Moreover, the piston engine has been brought to its present high degree of efficiency and dependability by intensive development over many years. It is, so to speak, nearing its peak, while the gas turbine engine is in its infancy in the automotive industry and its potential for improvement is vast.

The gas turbine engine thus is highly desirable as a power plant for passenger cars, trucks and other vehicles. It has already demonstrated its efficiency and reliability as an aircraft power plant. However, it has not been practical merely to adapt an aircraft-type gas turbine engine for use in an automobile. Operating conditions are different, and so are the economic requirements.

Most of the time an aircraft gas turbine runs at constant speed, while an automobile engine operates at widely varying speeds and must have quick response to meet variable power demands. It also must provide "engine braking" to aid in slowing the car. An aircraft gas turbine engine spends most of its operating time at high speed and high altitude where it is superior to the piston engine. The automobile gas turbine, on the other hand, competes where the piston engine is king and must offer comparable fuel mileage over a wide operating range.

An automobile gas turbine must be quieter and have a lower exhaust temperature than an aircraft gas turbine. The automobile engine must be compact so it can fit in the

engine compartment, and its manufacturing cost must be low so it is within the reach of the average automobile buyer. Thus it cannot use the high-temperature alloys, made of scarce and costly elements, that are used in aircraft.

This is a big order, but Chrysler Corporation engineers have overcome these problems and have developed a practical automotive gas turbine. By developing a "regenerator"--a rotating heat exchanger--that recovers much of the heat from the exhaust gases, they have made it possible for the turbine engine to achieve good fuel mileage and low exhaust temperature, much cooler than a piston engine, in fact. To provide efficiency, flexibility and optimum performance over the full speed range, they have perfected a variable nozzle system for directing gas flow to the power turbine.

Chrysler research scientists formulated new high-temperature alloys which use materials that are available in quantity and at reasonable cost. They also utilized production methods (casting turbine wheels in one piece, for example) which avoid some of the complex and costly operations used in manufacturing aircraft gas turbines.

In these ways, Chrysler engineers have solved the special problems of an automotive gas turbine and developed a practical engine. Now, before it can be produced in volume, this engine must prove itself in the hands of the average motorist.

Since Chrysler Corporation looks forward to a day when the gas turbine will be an accepted power plant for family cars, the current limited-production engine is being offered in a practical highway car, not an "idea" car nor an experimental car that has little usefulness beyond that of a demonstrator. It is a personal car--a four-passenger hardtop coupe that would suit the desires of thousands of ordinary motorists. At the same time, in keeping with its role of a limited-production car introducing a revolutionary vibrationless engine, it is an especially luxurious car with its own individual styling, leather upholstery, power accessories, and a unique control console.

A limited number of these turbine-powered vehicles will be made available during 1963-64 to selected users in all sections of the country. The experience of these drivers with turbine-engined cars under a wide variety of driving conditions is expected to furnish indications of public reaction to the benefits of turbine-powered passenger cars and thus to be a guide to the next phase of the Corporation's turbine program.

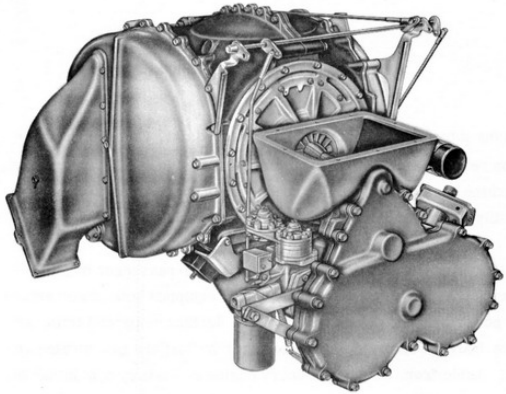
CONTENTS

INTRODUCTION

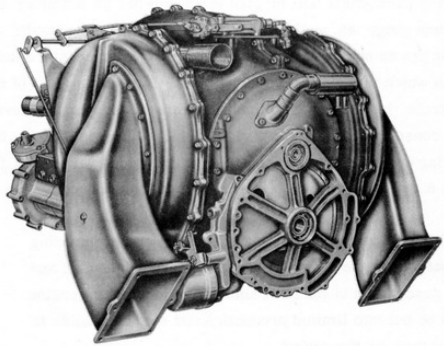
With the introduction of its turbine-powered car, Chrysler Corporation reaches a milestone in automobile design. The appearance of turbine cars on the public roads signifies an important point--possibly a turning point--in automobile evolution.

The Chrysler Corporation Turbine Car is a 4-passenger hardtop--a luxury car in every sense of the word, equipped with power steering, power brakes, power window lifts, leather seats and trim, and with a body structure designed to accommodate the gas turbine engine. Aside from its revolutionary engine and luxury appointments, the car has the normal configuration of an American automobile. The engine is in the front of the car and supplies power to the rear wheels. The car has the normal instruments found in a passenger car (driving enthusiasts will be glad to know it has an ammeter and oil pressure gauge as well as an oil pressure warning light). In addition it has an engine speed indicator and a temperature indicator with which the driver should become familiar. Most of the hand controls, including the automatic transmission control lever, are in a console at the driver's right hand. Otherwise, it has the foot braking and acceleration controls with which everyone is familiar. A major difference is there--but under the hood.

> This publication presents the styling and engineering features of the Chrysler Corporation Turbine Car and a description of the first automotive gas turbine engine to be put into limited production and made available to the man-on-the-street.



Front View



Rear View

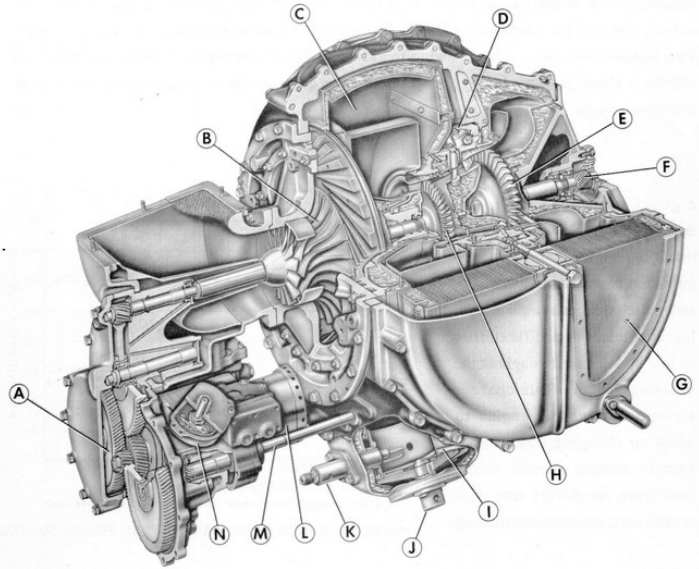
CHRYSLER CORPORATION TWIN-REGENERATOR
GAS TURBINE ENGINE

POWER PLANT

The power plant of the Turbine Car comprises a new gas turbine engine coupled to a modified TorqueFlite 3-speed automatic transmission.

ENGINE

The Chrysler regenerative gas turbine engine has two independent turbine wheels, one driving the compressor and accessories and one driving the car. It is a "regenerative"



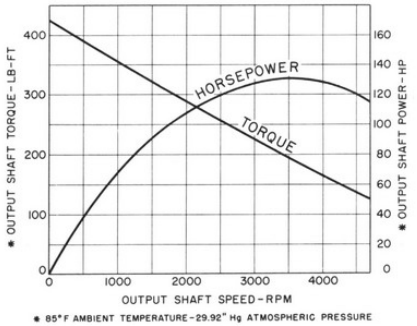
MAIN COMPONENTS OF THE TWIN-REGENERATOR GAS TURBINE:
(A) accessory drive; (B) compressor; (C) right regenerator rotor; (D) variable nozzle unit; (E) power turbine; (F) reduction gear; (G) left regenerator rotor; (H) gas generator turbine; (I) burner; (J) fuel nozzle; (K) igniter; (L) starter-generator; (M) regenerator drive shaft; (N) ignition unit.

turbine because it utilizes two rotating heat exchangers--called regenerators--to recover heat from the exhaust gases, thus boosting fuel economy and reducing exhaust temperature. The two regenerators rotate in vertical planes, one on each side of the engine.

Performance Rating

The gas turbine engine is rated at 130 horsepower at 3600 rpm output shaft speed and 425 lb-ft torque at zero output shaft speed under ambient temperature and atmospheric pressure conditions of 85°F and 29.92" Hg, respectively. However, unlike a piston engine, which is tested and rated as an individual unit without transmission or accessories, the gas turbine power plant is rated as a complete package including transmission and accessories. Thus, owing to rating methods and torque characteristics, the 130-hp turbine power plant gives performance comparable to a piston engine rated at 200-hp or more.

A glance at the torque curve of the turbine engine indicates that this engine has its maximum torque available at breakaway and thus provides excellent acceleration and flexibility at low speed and throughout the cruising range. This characteristic enables the engine to adapt to changing conditions rapidly without special attention from the driver and with minimum transmission shifting.



CHRYSLER CORPORATION GAS TURBINE POWER CURVES

For example, when the car begins to climb a grade, the engine will assume the increased load with only slight reduction in vehicle speed. And it is virtually impossible to stall the engine under any load condition since an increase in torque requirement merely causes the power turbine to slow down without affecting the gas generator.

ADVANTAGES of the GAS TURBINE ENGINE

Simplicity	Number of parts reduced 80%
Vibrationless	Rotary motion instead of reciprocating
Exhaust gases cool, clean nontoxic	Excess air flows through engine, fuel completely burned, practically no carbon monoxide
Overload won't "kill" the engine	Compressor and first-stage turbine rotate independently of power turbine--keep on idling even if sudden overload stops power turbine
Light, compact	Few parts
Dependable low-temperature starting	Low friction--fuel injected directly into combustion chamber--igniter fires repeatedly--timing not important--vaporization not critical
No warm-up period needed	Can operate under full power if desired as soon as fuel is burning steadily
Instant heat available in winter	Hot gases immediately available as soon as engine is operating under own power--no cylinder block and coolant to heat up first
Negligible oil consumption	No pistons or cylinder walls to lubricate
Antifreeze not required	Temperature controlled by air flowing through engine--therefore no water, no antifreeze
Operates on wide variety of fuels	Less limited by vaporization or detonation characteristics of fuel
Less maintenance	No tune-ups required--less friction and wear--fewer parts--no valves, camshaft, distributor, etc.

How the Gas Turbine Operates

When the turbine engine is operating, the first-stage turbine rotates the centrifugal compressor impeller to draw in air and compress it. The compressed air is heated as it passes through the high-pressure side of the regenerators, and then it enters a combustion chamber (burner) into which fuel is injected and ignited. The burning fuel raises the temperature of the gases (a mixture of combustion products and air) and increases their energy level. These hot gases pass through the first-stage turbine driving the compressor and then through the second-stage turbine (power turbine) which drives the car. The gases leaving the power turbine pass through the low-pressure side of the regenerators, giving up heat to the regenerator honeycomb, and flow out the exhaust ducts.

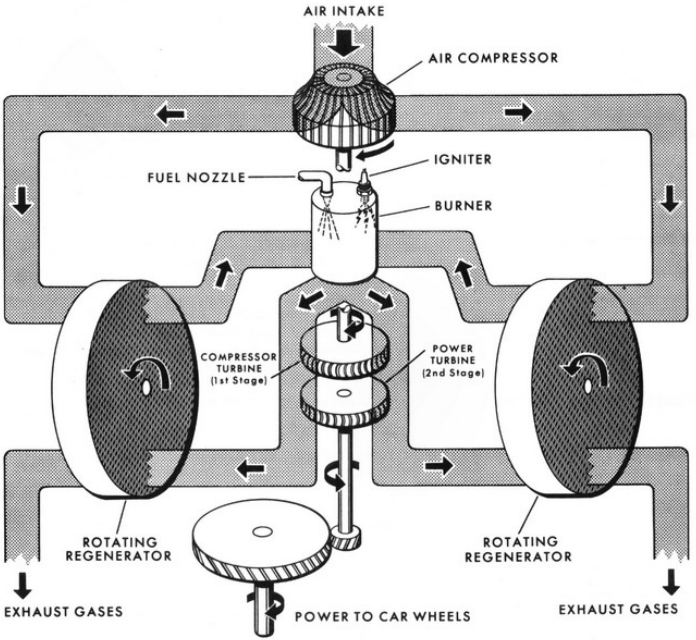


DIAGRAM OF GAS TURBINE OPERATION

With two small regenerators, the engine is compact and has balanced temperature gradients on both sides. Intake air from the compressor is split into two paths, which pass through the regenerators and come together again at the burner. The hot gases from the burner, after going through the two turbine stages, also are split into two paths to flow through the two regenerators and then out through the exhaust ducts.

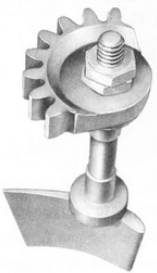
The compressor and first-stage turbine, along with the burner and regenerator, are called the "gas generator" section of the engine since these components produce the hot gases that power the engine.

The two turbine wheels are not interconnected mechanically, and thus one may rotate while the other is stationary. The first-stage turbine always rotates while the engine is operating, its speed varying from 18-22,000 rpm at idle up to about 44,600 rpm at rated power. The second-stage turbine, being connected directly to the car's drive train, rotates only while the car is in motion. Its speed ranges from zero at standstill to a maximum of about 45,700 rpm.

Since the power turbine is rotated by hot gases and is not mechanically connected to the gas generator rotor, the power turbine stops whenever the car stops, and the gas generator continues idling. Thus the engine will not stall under overload.

Nozzles

Both turbine wheels are axial-flow type (like windmills) and the hot gases are directed into each turbine wheel blade row at an angle by nozzles. A nozzle assembly made of a ring of fixed airfoil-shaped vanes directs gas flow to the first-stage turbine blades, and a ring of variable vanes directs gas flow to the second-stage turbine.

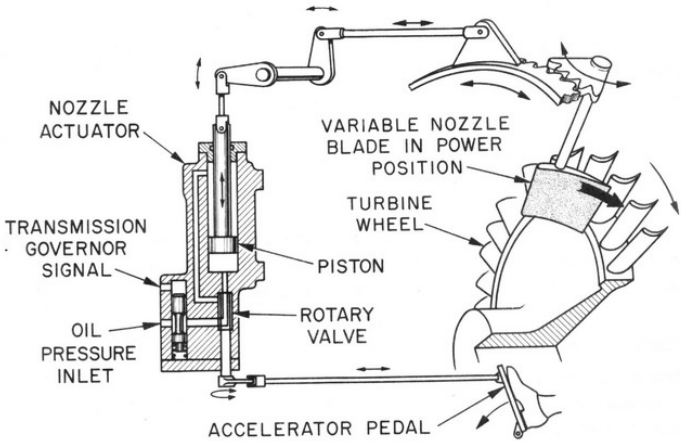


VARIABLE NOZZLE VANE

The variable nozzle system for the power turbine is one of the outstanding features of the Chrysler engine, permitting it to deliver high performance over the full speed range without

BRAKING POSITION

ECONOMY POSITION



VARIABLE NOZZLE SYSTEM

exceeding safe temperature limits. At starting or idle, the nozzles are open, with the vanes directing gas flow in an essentially axial direction; as the accelerator pedal is depressed, the vanes turn to direct the gases in the same direction as the rotation of the power turbine. The nozzle angle varies with pedal position to provide optimum cycle conditions. In this manner, the direction of gas flow is always at an optimum angle for maximum performance and efficiency without reducing engine life.

The vanes of the variable nozzle assembly are located on radial shafts that engage a ring gear, and the angle of the nozzle vanes is varied by rotating the ring gear through a small arc. The ring gear is operated by the accelerator pedal through a cam-controlled hydraulic servo actuator, which receives hydraulic power from a central hydraulic system.

VARIABLE NOZZLE AND RING GEAR ASSEMBLY

To provide engine braking, the hydraulic actuator receives a pressure signal from the transmission governor, which affects the angle of the nozzle vanes when the accelerator pedal is released. With the vehicle moving faster than 15 mph, releasing the pedal turns the nozzle vanes to a reverse angle, directing gas flow against the rotation of the power turbine wheel to slow up the car. If the vehicle is standing still or moving at less than 15 mph when the accelerator pedal is released, the actuator merely turns the vanes to their wide-open idling position.

Fuel Control

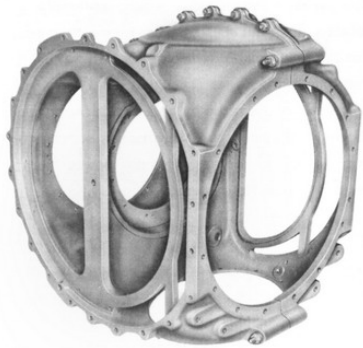
Engine power is varied by controlling rate of fuel flow to the burner. The fuel control contains a fuel pump, governor, pressure regulator and metering orifice. During constant-speed operation, the governor regulates fuel flow to the burner spray nozzle in response to accelerator pedal position. During gas generator acceleration, fuel flow is controlled by the pressure regulator and metering orifice.

When the pedal is released, the control shuts off fuel until the gas generator rotor slows to idling speed; then the control permits fuel to flow at the idling rate. Fuel flow is automatically controlled during engine starting and is unaffected by accelerator pedal position until the engine reaches idling speed.

The compressor idles at 18,000 rpm when the transmission control is in "Idle" or "Park." In Drive, Low, or Reverse, a solenoid-operated fast-idle stop maintains the idle speed at 22,000 rpm to afford quick response in normal driving or maneuvering.

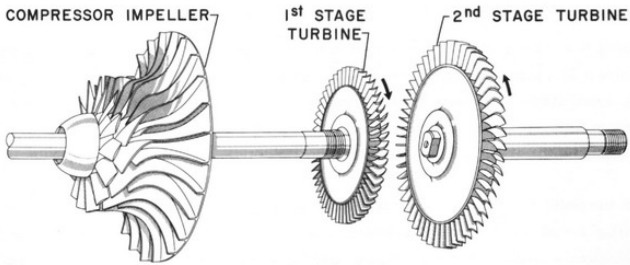
Construction

The engine housing is cast iron, made in two pieces which are bolted together. The housing is lined with insulating material held in place by a high-temperature low-alloy sheet liner which directs gas flow with a minimum of turbulence.



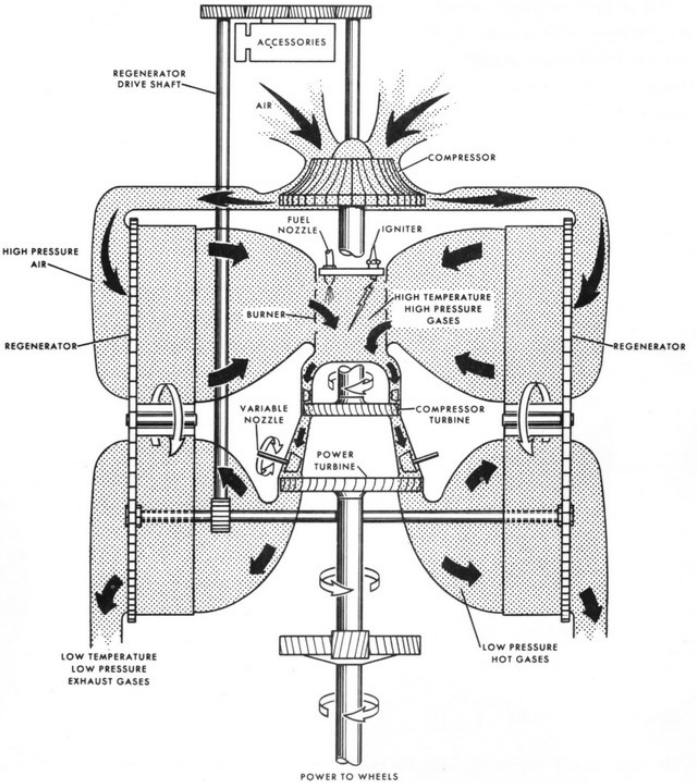
GAS TURBINE ENGINE HOUSING

The two turbine wheels are similar in construction, each being cast of high-temperature alloy with a ring of over 50 airfoil-shaped blades surrounding the hub. The gas generator rotor assembly, installed in the front of the engine housing, includes the first-stage turbine wheel on the rear of a steel shaft, and a cast aluminum compressor impeller and cast steel compressor inducer on the front of the shaft.



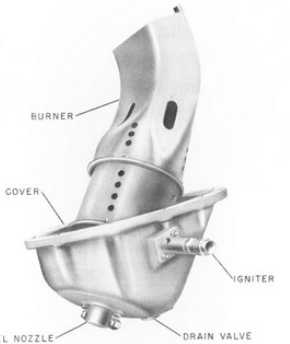
GAS GENERATOR ROTOR AND POWER TURBINE

The accessory drive, geared to the compressor shaft, is located in an accessory case at the front of the engine. Located aft of the first-stage turbine, the power turbine wheel is mounted on a steel rotor shaft which turns the pinion of a 9.76:1 helical reduction gear. An exhaust diffuser of high-temperature alloy is at the rear of the power turbine wheel.

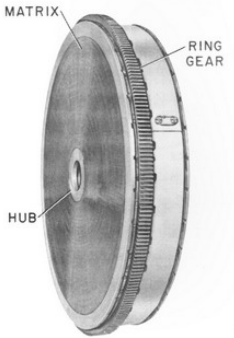


REGENERATOR AND ACCESSORY DRIVE SYSTEM

The burner is at the bottom of the engine. Fuel is sprayed into the burner through a nozzle extending through the burner cover, and air supplied by a cam-driven air pump is used to atomize the fuel. An igniter also extends through the burner cover, and a swirl plate imparts a swirling motion to the fuel-air mixture and to the burning gases.



BURNER AND COVER ASSEMBLY



REGENERATOR ROTOR

The two regenerator rotors, each 15 inches in diameter, rotate about a horizontal axis. Ring gears on the outside of the rotors are driven from a cross-shaft geared to the accessory drive, so that the regenerators rotate at a speed proportional to the compressor speed. Rotational speed of the regenerators thus varies from about 9 rpm at idle to 22 rpm maximum. The regenerator rotors are constructed of brazed stainless steel honeycomb, and face-type seals separate the high pressure and low pressure sides of each regenerator.

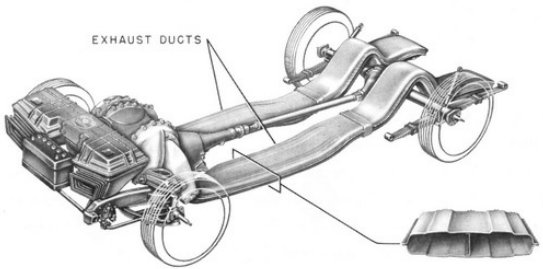
MULTIFUEL CAPABILITY

The gas turbine engine can operate in all kinds of climates and geographic locations, and it can run on almost any liquid that flows through a pipe and burns with air. However, for optimum service, specific fuels recommended for the Chrysler engine include only diesel fuels, unleaded gasolines, kerosene, and JP4 aircraft turbine engine fuel. Leaded gasolines should not be used, except as an extreme emergency measure.

EXHAUST SYSTEM

Engine exhaust gases, after leaving the regenerators, pass out to the rear of the car through two rectangular aluminum exhaust ducts, emerging at a temperature of about 500°F at full power (depending on outside air temperature) and only about 190°F when the engine is idling. (By comparison, the temperature of exhaust gases emerging from the tail pipe of a piston engine is several hundred degrees higher under most conditions.)

Two cast-aluminum convergers, bolted to the regenerator covers, collect the exhaust gases from the regenerators and direct them into the ducts. The two exhaust systems are separate, one exhausting gas from the left regenerator, while the other carries exhaust gas from the right regenerator.



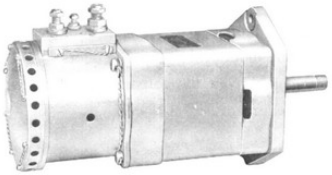
TURBINE CAR EXHAUST SYSTEM

The exhaust ducts extend to the rear, curve over the axle, and end just ahead of the rear end of the car. Each is supported by three flexible hangers. At the outlet end, the cross-section enlarges to slow up flow, and the upper surface of each duct curves to deflect the exhaust gas downward. Aluminum channels, bolted to the underbody parallel to the ducts, serve as skid strips to protect the underside of the ducts when the car passes over rough ground.

ENGINE ELECTRICAL COMPONENTS

A starter-generator, mounted on the rear of the accessory case at the front of the engine, is coupled directly to an accessory drive shaft. When the engine is being

started, the starter-generator, operating as a motor, rotates the gas generator and accessories until the engine fires and the first-stage turbine begins to accelerate under its own power. When the gas generator rotor reaches self-sustaining speed, the starter circuitry disengages and field current is introduced to the generator, which then provides d.c. power for the car's electrical equipment.



STARTER - GENERATOR

An ignition unit mounted on the front of the engine is driven from the low-speed accessory shaft. It has an ignition interrupter which fires the shielded igniter 80 to 200 times per second when the compressor is rotating. Although the igniter does not have to keep firing to maintain combustion, each time the accelerator pedal is released to let the car coast, fuel is shut off and must be reignited, and this is achieved simply by operating the ignition system continuously.

CENTRAL HYDRAULIC SYSTEM

Hydraulic pressure for power steering, for transmission clutch and band actuation, and for the engine variable-nozzle actuator is provided by one pump in a single hydraulic system. Oil from this system (Type A Suffix A transmission oil) also is used for lubrication of engine, accessory drive, reduction gear, and transmission. The system contains an oil-to-air cooler, and the transmission oil pan is the sump for the system.

The central hydraulic pump, adapted from a 0.96 cu in. displacement power steering pump, is mounted on the lower left rear face of the engine and is driven off the rear of the regenerator drive gear box. This single pump replaces four pumps normally used in a car with comparable power assists--namely engine oil pump, steering pump, and two transmission pumps.

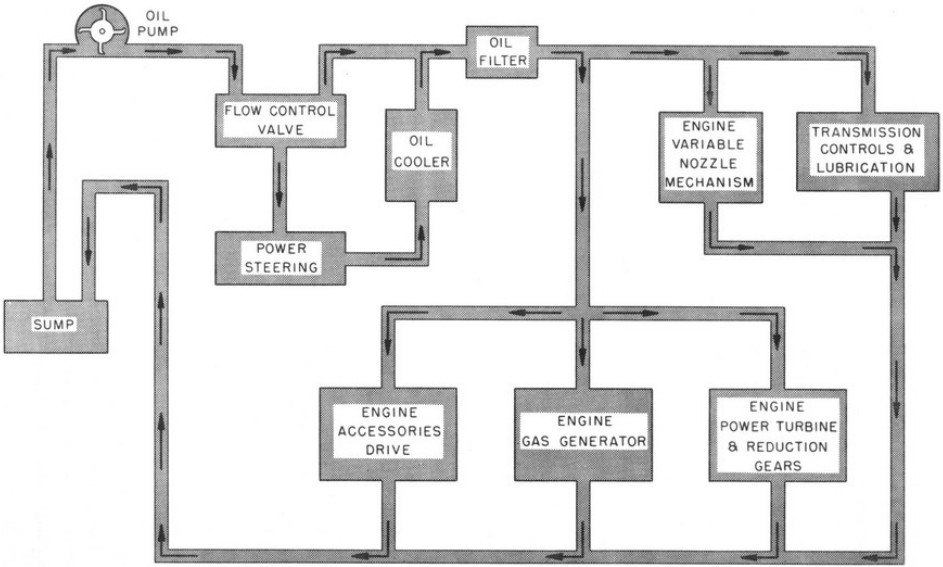
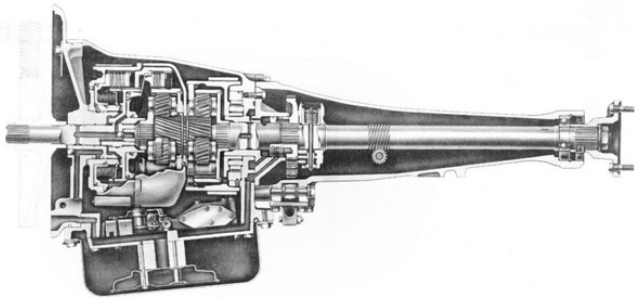


DIAGRAM OF CENTRAL HYDRAULIC SYSTEM

TRANSMISSION

In Chrysler's Turbine Car the excellent flexibility or elasticity of the engine is augmented by a 3-speed automatic transmission. This modified TorqueFlite transmission requires no slip device, such as a hydraulic torque converter, since the power turbine of the engine is independent of the gas generator. Thus the power turbine is connected through its reduction gear directly to the input shaft of the transmission, and a cast-iron adapter plate is used to mount the transmission to the engine.



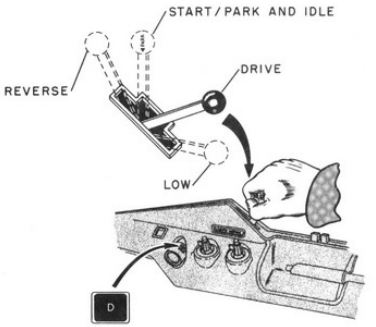
TURBINE CAR 3-SPEED AUTOMATIC TRANSMISSION

Since the engine cannot be started by pushing the car, there is no rear pump on the transmission, and there is no front pump since pressure for actuating clutches and bands is furnished by the central hydraulic system. To maintain smooth shifting, the hydraulic circuitry of the transmission is modified to adapt the transmission to the output characteristics of the gas turbine engine.

Control Lever Positions

The driver controls automatic transmission settings by a lever mechanism with "Reverse," "Idle," "Drive," and "Low" positions. Position is indicated by a separate cable-driven, barrel-type indicator with "R," "Idle," "D," and "L" call-outs. For convenience and safety, the control lever mechanism is gated, making it necessary to move the control handle sideways before it can be shifted into Reverse or Low. The driver thus can change control lever position merely by "feel" without looking at the indicator.

"Start/Park" position is engaged by pushing downward on the lever when in "Idle" position. With the lever pushed down, a sprag mechanically locks the transmission, and a light on the console indicates that the position is engaged. This "push-in" engagement of "Start/Park" position affords an added safeguard against accidental release, since it takes a positive upward pull to release the lever.



TRANSMISSION CONTROLS

Turbine Overspeed Control

Two features are incorporated in the transmission to avoid overspeeding of the power turbine. One is automatic upshifting when the control is in "Low." The other is the substitution of a lock-up "Idle" control-lever position in place of neutral. When the control handle is in "Idle" position and the engine is running, the direct clutch, forward clutch and reverse band are engaged, locking up the transmission. A blocker mechanism prevents engagement of the "Idle" position above about 15 mph.

With the control lever in "Low" position, the transmission, reacting solely to the speed of the car without regard to accelerator pedal position, will upshift to 2nd and 3rd at normal wide-open-throttle upshift speed. It will downshift at wide-open-throttle kickdown limits to give maximum braking. In "Drive" position, the transmission has normal shifting and kickdown behavior, reacting to a combination of both vehicle speed and accelerator position.

The transmission effectively prevents overspeed of the power turbine under normal driving conditions. However, with the transmission control in D, L, or R the turbine wheel could overspeed if the engine were operated with one of the car's rear wheels free to spin--as on ice or on a hoist. Thus the engine should never be operated with the car on a hoist or a rear wheel jacked off the ground, and if the car is operated on ice or in other slippery conditions that permit a rear wheel to spin, the accelerator pedal should only be depressed intermittently to avoid sustained acceleration of the engine.

OPERATING INFORMATION

The driver of a Turbine Car will encounter new sensations, notably acceleration smoothness and the absence of engine vibration that he has become used to with piston engines. Otherwise, normal driving with the Turbine Car is the same as with any piston-engined car with automatic transmission. The driver has an accelerator pedal and a brake pedal. He pushes the accelerator pedal to go, releases it to reduce speed, presses the brake pedal to slow abruptly or to stop--just as in a conventional car with automatic transmission. However, because of the turbine engine and the modified automatic transmission, there are certain differences in care and handling of the turbine vehicle in special situations.

Starting

The turbine engine will start easily under conditions that would thwart a piston engine (such as extreme cold). Its starting procedure actually is simpler than for a piston engine since the driver merely turns the key and releases it, and then all functions are carried out automatically. To assure easy starting, the driver should keep his foot off the accelerator pedal until the engine is running under its own power.

Once started, the gas cycle reaches full-operating temperature almost instantly so that the engine can be driven immediately at high power if desired, without a warm-up period.

Pushing and Towing

The turbine car cannot be started by pushing. As a general rule, it should not be pushed under any conditions.

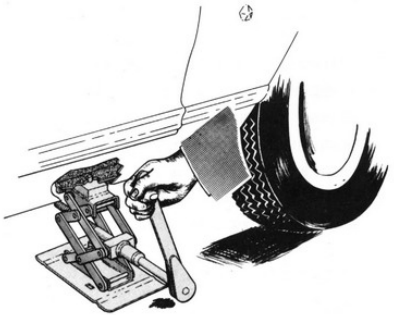
It may be towed for short distances (through a car wash, for instance) with the engine shut off and the transmission control lever in any position except Start/Park.

Jacking

Convenient jacking is a special feature of the Turbine Car. The car is raised for wheel or tire changing by placing a jack under a side sill at either front or rear, and raising one corner of the car. Jacking surfaces for this purpose are formed in the underside of each side sill near the wheel openings. Each of these surfaces has a hole that engages a vertical pin in the jack pad to prevent slipping. No jacking should be attempted at any

point other than one of the four side jacking points. This type of jacking is possible because of the unitized body construction with strong, rigid side sills.

A scissor-type jack furnished with the car has a ratchet handle and is designed to reduce jacking effort. Since the jack has a pin to prevent slipping, it is recommended that no other jack be used with the exception of those found in service garages.



FRONT JACKING POSITION

If a rear tire is to be changed, the fender skirt must be removed before the wheel can be removed.

Caution: The engine must never be operated with a rear wheel off the ground.

Engine Coolant Not Required

The turbine engine does not require water or antifreeze since it is "self-cooled" by air surrounding it in the engine compartment and by compressor air flowing through it.

Lubrication Recommendation

Chassis and body mechanisms should be lubricated according to the recommended schedules, which are similar to those for other Chrysler Corporation cars.

Oil level should be checked at intervals and oil added if necessary.

Precautions Against Overspeeding Power Turbine

- Do not operate engine with car on hoist.
- Do not operate engine with rear wheel jacked off ground.
- Avoid sustained engine acceleration with wheel spinning on ice, snow, or mud.

STYLING FEATURES

A luxurious personal car, the Chrysler Corporation Turbine Car is styled with an elegance that sets it apart from regular production cars. It will be offered in one body style only--a four-passenger, two-door hardtop, and in one exterior color treatment--metallic copper "Fire Frost" with a black top. The interior, too, is available in only one trim combination, with copper the dominant color.

EXTERIOR STYLING

The Turbine Car is styled as a car of today, rather than a futuristic or "dream" car. Yet its styling is distinctive, different from all other Chrysler Corporation cars, and appropriate to its role as a vehicle for the turbine engine.

Front

The functional elements at the front are integrated into the basic form of the car. The dominant elements are the rings outlining the headlights, and the grille area is restrained to accentuate these outboard circular forms.

Thin, horizontal aluminum bars are framed within a broad rectangular grille opening, outlined in bright stainless steel. A chrome-plated bezel encircles each of the two 7-inch head lamps and simulates a bladed wheel. The bezel itself is recessed within a

heavy gauge steel ring which is part of the front bumper and serves as a visual extension of the front fenders. A 5/8-inch deflection gap concealed by a color-keyed vinyl extrusion separates the bumper ring from the front-end sheet metal.

Added impact protection is afforded below the center of the grille opening by a heavy-gauge license plate housing. Parking/turn signal lamps, located directly beneath the headlights, are keystone-shaped and each is recessed within a broad chrome-plated collar.

The brow of the hood dips below the front fender crown line, affording the driver an excellent view of the front fender projections. This helps him judge front-end clearance under traffic and parking conditions. The hood is decorated in the front center by a thin, pylon-shaped ornament and, in the front left corner, by a "Chrysler Corporation" plaque plus the word "Turbine" in bright-metal script.

Engine Compartment

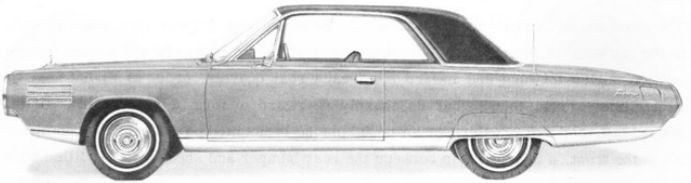
Contrasting bright-metal finish and paint colors in the engine compartment make the engine stand out against the sheet metal. The engine housing is black, while the air intake is painted body color. The front diffuser, end covers and exhaust collectors are polished aluminum, and accessory covers are both black and bright metal. A circular plaque containing a Pentastar and the words "Turbine" and "Chrysler Corporation" is mounted on the inlet duct.

Side

The Turbine Car displays a low, thin-roof silhouette supported by a narrow front pillar and wide rear pillar. A bright molding outlines the side glass opening and follows the belt line across the base of the rear pillar and around the rear. Both roof and rear pillar are covered in a durable black vinyl. A subtle horizontal crease line along the middle of the body side puts the lower body in slight shadow and emphasizes the low appearance of the car.

The word "Turbine" in bright-metal script appears on both rear quarters, and a gold Pentastar is carried on the right front fender behind the wheel opening.

A flat chromed molding, with a raised black paint-filled double rail in its center, seats over the character line on the fender crown and extends to the end of the rear quarter



panel. In both the front and rear quarter areas, the molding is split along its middle and mounted over the hood and deck openings so that it effectively conceals them. A remote-control outside rearview mirror is seated in the molding on the left door, and a manual radio antenna is located within the molding, on the left side, ahead of the rear deck opening. On the front fender, three narrow rectangular louvres, simulating air intake vents, are inserted flush with the sheet metal, one above the other.

In the sill area, the body side rolls outward to indicate a character line extending along its entire length. The line is emphasized by a wide paint-filled molding, with all sheet metal below the molding painted silver. Removable skirts cover the rear wheel openings.

Each wheel cover is highlighted by a ridged outer rim surrounding a center hub styled with radial ribs.

Rear

The most distinctive exterior appearance is the rear, which gives immediate identity to the car with its "swept back" aerodynamic styling. A large chrome-plated bumper section angles forward and inward from each rear quarter corner to a point near the center line. From there it curves sharply rearward to form a squared-off, airfoil-shaped tail, and a "Chrysler Corporation" plaque is mounted on this central prominence. As in the front, a 5/8-inch gap between the rear bumper and sheet metal is filled with a color-keyed vinyl extrusion. The deck is flat and wide, broken only by a thin wind-split in its center, and the back window, enclosed by a plain, level molding, provides a smooth, uninterrupted surface flowing downward from roof line to deck.

Rear lamp areas are shaped in the form of horizontal tear drops, framed by the bumper. A concave recess within each opening is painted copper color. Within the recess, the inner end of a blade-shaped tail lamp lens butts into the base of a long, fluted, chrome-plated backup light body.

The rear license plate frame of bright metal is suspended below the rear bumper projection.

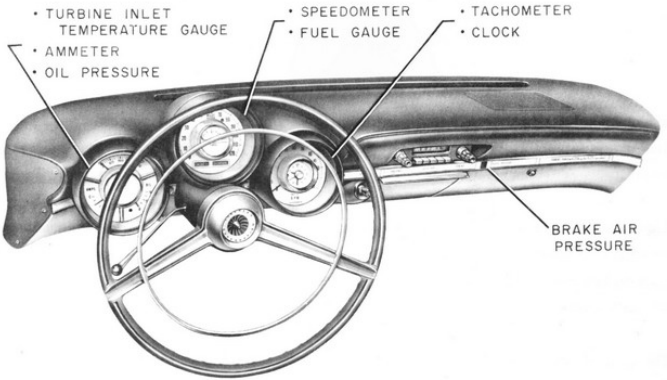
INTERIOR STYLING

Luxurious and lasting beauty is displayed throughout the Turbine Car interior by full leather trim accented by bright and brushed-finish metal. Seats, doors, trim panels

and instrument panel are covered in soft, rich copper-colored leather. A unique and striking feature of the interior is a bright anodized aluminum console tube extending from front to rear between the seats.

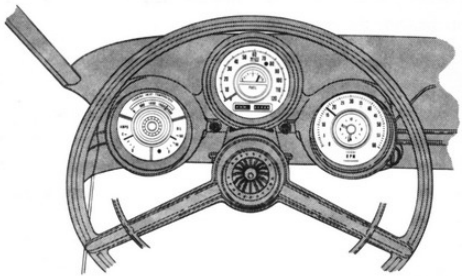
Instrument Panel

The instrument panel is airfoil in shape and enclosed in leather to a point midway down the lower panel. Below the leather is a horizontal electroluminescent band, with the remainder of the lower panel covered in a satin-finish stainless steel. The non-reflective reddish leather covering the top of the panel is safety-cushion padded from the instrument cluster to the right end of the panel.



TURBINE CAR INSTRUMENT PANEL AND STEERING WHEEL

The instrument cluster comprises three circular pods mounted over the steering column. The center pod, covered in the same material as the panel, contains the speedometer, odometer, trip odometer, high-beam warning light, and fuel gauge. Both left and right hand pods intersect the lower panel and are painted to match the nonreflective color of the leather covering the top of the panel. The left pod houses a turbine inlet temperature gauge, ammeter, oil pressure gauge and oil pressure warning light. The right



INSTRUMENT CLUSTERS

pod contains a clock set in the center of a tachometer, which indicates speed of the first-stage turbine. Each pod has electroluminescent lighting for glare-free nighttime visibility.

Right and left turn signal indicator lights are located at each side of the steering column, with the trip odometer and clock reset knobs positioned directly below each light. The ignition key slot, cigar lighter and a flush-set ash receiver are in the lower portion of the instrument panel between the instrument cluster and glove box.

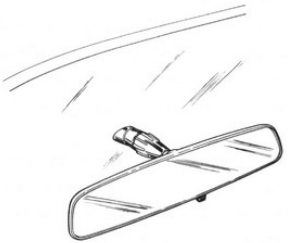
The electroluminescent title strip, extending across the length of the lower panel from the instrument cluster, contains call-outs for Ignition, Lighter, Volume, Selectors, and Tuning; a red warning light and call-out for Brake Pressure; and the words, "Turbine Power by Chrysler Corporation."

A deluxe, push-button radio is recessed deeply within the leather-covered section of the lower panel directly over the ash receiver, and a color-keyed, perforated metal speaker grille is mounted within the top of the panel, to the right of the radio.

The circular steering wheel, constructed of copper-toned plastic, has a full metal horn ring with the words "Chrysler Corporation" around the perimeter of the hub.

Inside Rearview Mirror

The inside rearview mirror is cemented to the windshield glass. A double-ball pivot mounting provides an added safety feature by permitting the mirror to move easily upon contact.

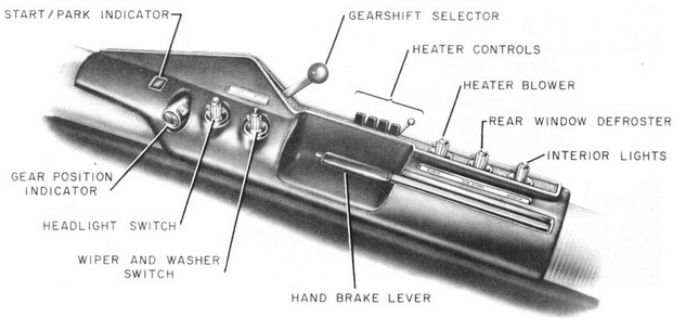


WINDSHIELD-MOUNT INSIDE REARVIEW MIRROR

Console

The console controls are within easy reach of the driver's right hand. The console tube projects rearward from a bright-chrome simulated bladed wheel at the front and extends to a similar large, simulated bladed wheel at the rear. Side pads, covered in copper-tone leather, cradle the console tube. Adjacent to the driver, copper-colored leather covers the console tube in the control-station area that includes controls and indicators for the automatic transmission, parking brake, heater/blower, lights and wipers. The black-knobbed transmission control lever extends from a raised section along the top of the console tube.

In the rear seat area, a small sliding panel in the top of the console tube draws back to reveal a built-in ash tray, cigar lighter and cigarette pack holder.



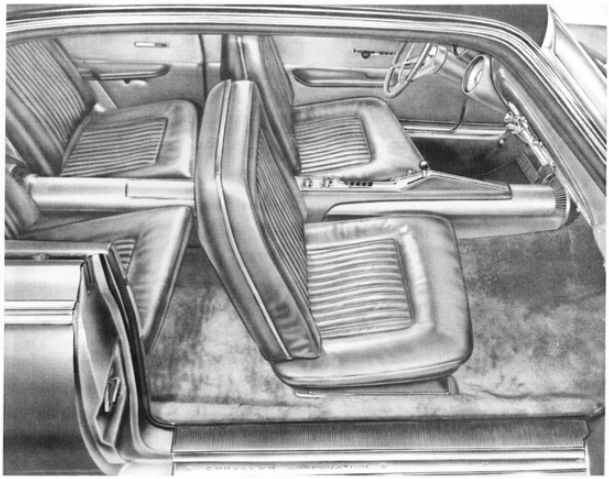
CONSOLE CONTROL STATION

Seat Appearance

The bucket-shaped front and rear seats are of a unique design featuring a "swept back" seat cushion in which the leading edge angles rearward from inboard to outboard. All seats are covered in soft, copper-tone leather, with pleated center inserts. Bright chrome moldings surround the seat back perimeters.

The front seats are equipped with copper-colored safety belts with concealed floor attachments. A decorative feature on the rear of each front seat back is a large square, satin-chrome finish pan, with a bright molding surrounding the pan and a black rubber kick pad.

Seat tracks and support brackets are covered in a copper-toned leather which blends in with thick all-nylon, tufted carpeting of the same hue. Similar colored leather is used in the rear seat shroud which extends down between the bucket seats.



TURBINE CAR PASSENGER COMPARTMENT

REAR SEATS

REAR ASH RECEIVER AND LIGHTER

Trim Panels

The doors and rear quarter panels are trimmed in copper-colored leathers and a broad, horizontal brushed-stainless steel band which continues off the lower portion of the instrument panel. A rectangular plate inserted into the band on each door contains a window-lift button plus a door release lever. A similar plate in each rear quarter trim panel is fitted with a window-lift button and courtesy light. Leather armrests, the same color as the trim panels, are mounted just below the decorative stainless steel band.

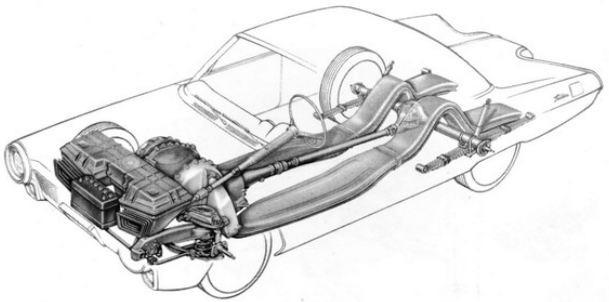
Headlining is off-white perforated vinyl, and leather-covered padded sun visors are the same color.

Moldings

A wide, two-tone satin-finish and bright chromed molding frames the interior side glass and windshield and the front pillar. The perimeter of the rear window is outlined by a two-tone molding in bright metal and paint matching headlining color.

CHASSIS

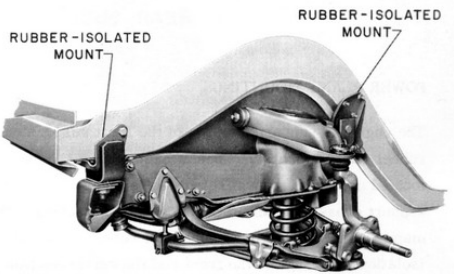
Among interesting chassis features included in the Chrysler Corporation Turbine Car is a unit front suspension that enables engine, transmission, and suspension to be removed as a unit for easy servicing. A low "sports car" steering column angle is made possible by a relay-link steering system. To accommodate the turbine engine exhaust ducts, the mounting angle of the rear shock absorbers is different from that of regular production cars.



TURBINE CAR CHASSIS COMPONENTS

SUSPENSION

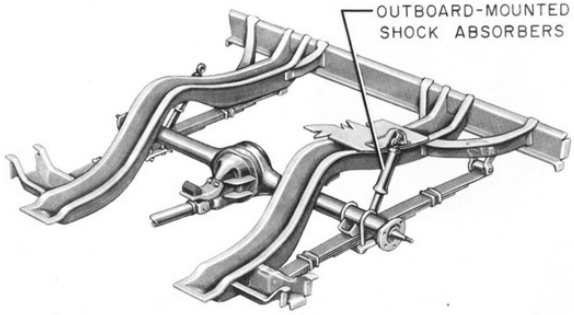
The front suspension of the Turbine Car has upper and lower control arms with ball joints, coil springs and a sway bar. Shock absorbers are located within the coil springs. Control arm pivots are designed to provide both antidive characteristics and low caster change.



FRONT SUSPENSION

The suspension elements are attached to a large cross member connected to the body forward longitudinal structural members by four rubber-insolation mountings which cushion the body from shock, noise and harshness.

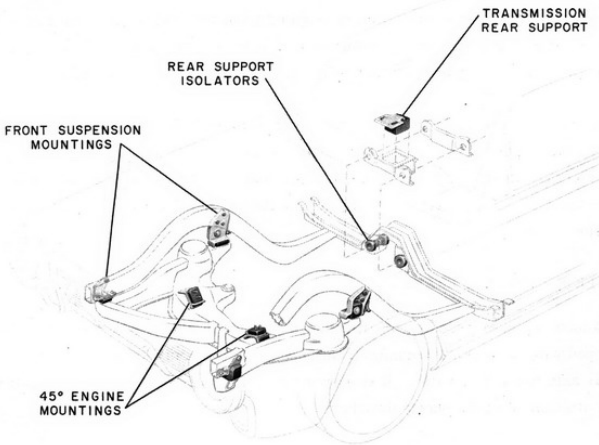
The rear suspension has two fore-and-aft six-leaf springs and Oriflow shock absorbers. These are "fore-and-aft" shock absorbers which extend rearward and upward from the axle to the body and do not lean inward as on regular production cars. Each shock absorber, at its lower, forward end, is connected to a bracket on the axle spring seat and, at its upper, rearward end, is anchored in a bracket in the underbody.



REAR SUSPENSION

POWER PLANT MOUNTINGS

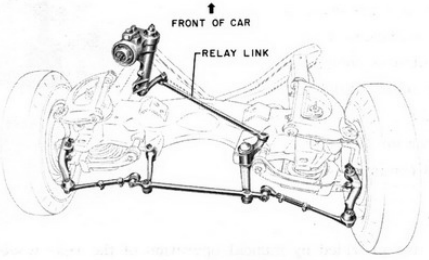
The engine is supported on top of the front suspension cross member by two 45-degree rubber shear mountings, one at each side of the engine. The third engine mounting is located under the transmission extension at the rear and is supported on the transmission-support cross member in the underbody structure. The removable portion of this cross member also is isolated by means of rubber bushings. By disconnecting the four rubber-isolation mountings at the front and the center section of the transmission-support cross member at the rear, the front suspension and power plant can be removed as a unit.



RUBBER-ISOLATED POWER PLANT AND SUSPENSION MOUNTINGS

STEERING

The Turbine Car is equipped with power steering and a newly designed idler-arm linkage. The power gear chuck is mounted on the front suspension cross member, and



TURBINE CAR STEERING LINKAGE

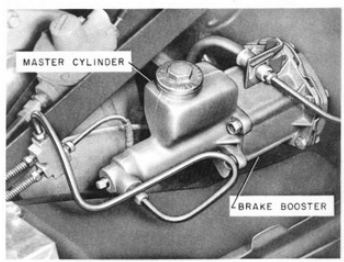
hydraulic pressure for gear operation is supplied from the car's central hydraulic system. A relay link extends from the pitman arm of the power gear diagonally rearward through openings in the cross member to the right actuator-arm of the linkage.

The steering column angle, approximately 14 degrees from horizontal, gives the driver a comfortable "sports car" feel. The column has two universal joints. One is a fabric joint that blocks the steering column noise path, and the other is a ball-and-trunnion joint that permits linear movement to accommodate motion of the rubber-cushioned front suspension.

DRIVE LINE, WHEELS, BRAKES

A 2-3/4 inch diameter propeller shaft connects the transmission with the rear axle. It is equipped with a ball-and-trunnion front universal joint and a cross-type rear joint. The rear axle has a 3.23 ratio. It is a standard 8-3/4 inch axle with spring seats modified for attachment of the shock absorbers.

The Turbine Car has power brakes, with a self-adjusting servo-type brake assembly, 10-inch diameter x 2.5 inches wide, at each wheel. The hydraulic master cylinder is operated by an air booster instead of being vacuum-suspended, since no vacuum is available from the turbine engine. Air pressure is provided by a continuous-duty, electric-motor-driven compressor and a reservoir tank. Pedal travel is only 2.83 inches, which is about 2 inches less than for 1963 power brakes, without compromising brake "feel."



POWER BRAKE

Parking brakes are provided by manual operation of the rear wheel service brakes through a cable remote control. They are applied by upward movement of a lever mounted on the console and are released by a push button on the lever. An equalizer

assembly is located immediately behind the brake lever mechanism inside the console tube and above the propeller shaft. The cable adjustment nut is accessible through the rear console ash receiver opening. Cables are routed rearward through the console and then to the rear wheels. This direct routing improves efficiency and makes it easier to apply the parking brakes.

The car has 14-inch wheels. The tires, specially engineered for the Turbine Car, are 7.50 x 14, 4-ply rayon-cord with a decorative "turbine wheel" design on white sidewalls.

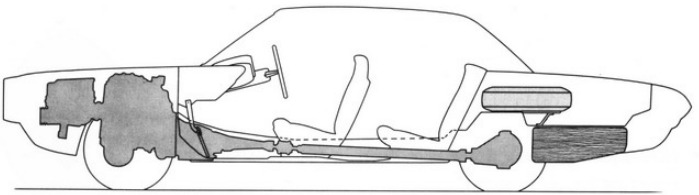
FUEL SYSTEM

A 5/16-inch diameter fuel line extends to the engine fuel pump from a 21-gallon fuel tank specially designed to fit the configuration of the Turbine Car. The fuel tank, supported by two fore-and-aft straps, has a 1-3/4 inch diameter filler pipe with a 3/4-inch external vent line and a vented cap. The internal end of the vent line is located near the top of the tank and designed with a small vent hole so that normal filling of the tank will stop when the fuel reaches the end of the vent tube, thus allowing room for thermal expansion of the fuel.

BODY

In length and width, the Chrysler Corporation Turbine Car is roughly midway between the 1963 Dart and Plymouth. Its wheelbase is one inch less than that of the Dart, and its height is about the same as the Valiant. This length and wheelbase afford easy maneuvering and parking.

The interior is tailored to accommodate four passengers comfortably, with individual bucket seats of a unique design.



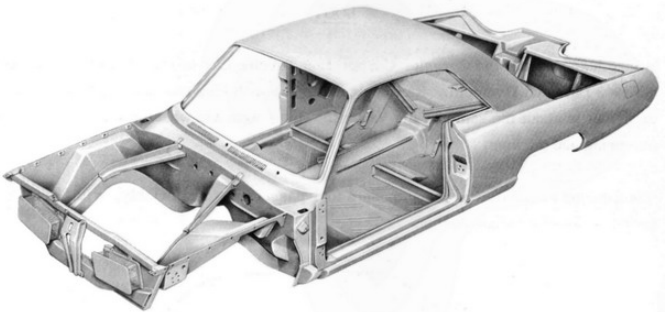
SPACE LAYOUT OF TURBINE CAR

STRUCTURE

The Turbine Car body is entirely new. Designed specially for this car, it is a fully unitized structure similar to those used in regular Chrysler Corporation production cars. Differences in some structural members are necessary to accommodate the turbine engine.

The underbody includes the following special features: bolted-in fore-and-aft aluminum "skid strips" to protect the exhaust ducts; rear seat risers on which the rear bucket seat cushions are mounted; and "shock towers" (for the upper attachment of the rear shock absorbers) welded and bolted to the wheelhouse inner panel and to the underbody.

The rigid, box section front longitudinal rails have a "kick up" similar to that usually seen at the rear. Bumper supports extend from the longitudinals to the head lamp impact rings and from the front cross member to both the head lamp rings and the front



TURBINE CAR BODY STRUCTURE

license plate housing. At the rear, bumper supports extend from the rear cross member to the bumper framing the tail lamps.

The upper structure includes sturdy box-section front and rear pillars, with box-section roof side rails and windshield header and a channel section rear window header. Further roof support is achieved with a channel roof bow. A bolt-in aluminum cowl upper panel extends across the base of the front pillars, and conceals the lower portion of the windshield weatherstripping. The rear pillars are spanned by the structural shelf panel and braces.

Hood and deck inner and outer panels are constructed of aluminum, bonded by an adhesive. Front fenders are of the bolt-on type with welded-in side shields.

Corrosion protection is provided within the front fenders by using full fender splash shields which prevent the accumulation of corrosive elements in pocket areas and fender corners. The body sills are galvanized.

Thick felt and fiber glass padding are used in the dash, cowl, and roof areas to block out external noises. The floor pan is muffled with jute and mastic silencer pads and heavy floor covering. Fluid deadener materials are used in doors and wheelhouses, and the body is undercoated.

SAFETY AND CONVENIENCE FEATURES

Among features that add to the convenience of the Turbine Car are swept-back seats and such luxury items as automatic interior lights and power window lifts.

Seats

The new "swept back" seats offer more than a unique design. The sweepback makes it easy to enter or leave the car, and seating comfort is assured by the use of deep, foam-covered spring construction. Both cushions and back are contoured to contain the passenger in a manner that affords not only comfort, but also a sense of security, especially during turns. The seat back is taller, and the upper part breaks forward slightly to give added shoulder support, affording noticeably superior comfort, particularly for the driver.

FRONT SEAT

The front bucket seats are rigidly supported by straight-section tracks bolted directly to the floor. Seat-adjuster handles are located in a convenient position at the lower front of the seat cushions.

Lighting

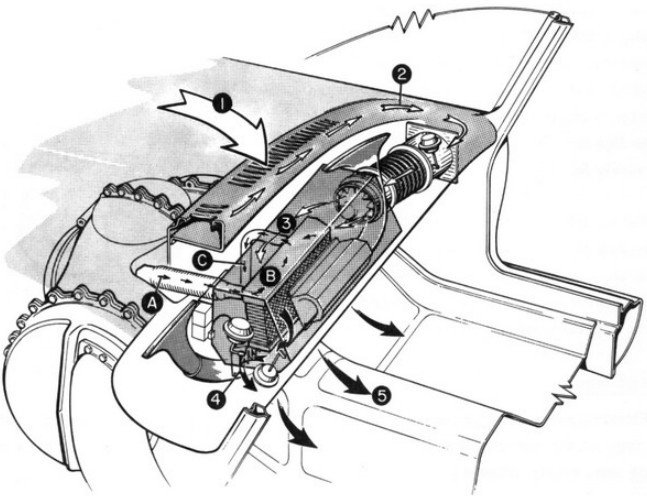
Electroluminescent lighting, featured within the instrument cluster pods and in title strips on the instrument panel and console, reduces any tendency to eye fatigue through its soft, evenly diffused glow that eliminates glare.

Interior compartment lighting consists of two courtesy lamps beneath the instrument panel (one on each side), a map light with switch mounted over the radio, one light in each door lower trim panel, and one light in each rear quarter panel trim integrated in a plate with the power window lift switch. When either door is opened, all lamps light up automatically, including a red warning flasher light in the armrest of the door that is open.

FRONT DOOR ARMREST WARNING LIGHT

Heating and Ventilating System

The heater assembly, although similar in design to that introduced on 1962 Plymouth and Dodge cars, features an "instant heat" gas-to-air heat exchanger in which the fresh air is heated by hot gases from the turbine engine instead of by hot water. Turbine gases are tapped from the turbine engine housing before they enter the regenerator, and are passed into the heater core, which then transfers its heat to fresh air that is distributed through the passenger compartment in the conventional manner. Because



1. OUTSIDE AIR ENTERING AIR COWL
2. AIR PASSING THROUGH PLENUM CHAMBER
3. BLOWER FORCING AIR THROUGH HEATER CORE
4. HEATED AIR FORCED THROUGH DEFLECTOR
5. HEATED AIR CIRCULATING IN PASSENGER COMPARTMENT

A. HOT GASES FROM TURBINE
B. HOT GASES FLOWING THROUGH HEATER CORE
C. GASES EXHAUSTED TO OUTSIDE OF CAR

HEATER AND VENTILATION SYSTEM

of the absence of normal engine vacuum, the heater flow-control actuators are designed for pressure instead of vacuum actuation. Air pressure for this function is tapped off of the compressor diffuser of the turbine engine.

Push-button Radio

A highly reliable, 5-1/2 watt, fully transistorized radio with an electroluminescent dial face has the interesting feature of "quick-playing" as soon as it is turned on.

Windshield Wipers and Washer

The windshield wipers have a parallel-wipe pattern and are actuated by a variable-speed electric motor. Maximum wiping area is achieved through the use of 18-inch airfoil blades.

The windshield washer is electrically operated. The reservoir bag and pump are located in the engine compartment, and the washer is operated by a push-button in the center of the wiper control button on the console.

BODY HARDWARE

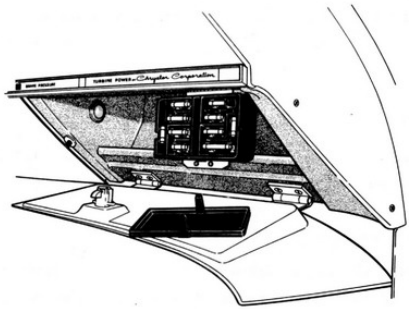
Single pivot, rear hinges are used on the hood, which is counterbalanced by a chrome-plated push rod linked to a coil spring within the cowl. This device presents a clean appearance since only the push rod is visible. Double locking protection is provided by a positive-closure type latch, which is connected by cable to a release lever mounted below the left side of the instrument panel.

A positive-closure type latch also is used for the deck lid, with a cable-actuated remote-control release operated from a lever on the left side in the rear passenger compartment. The deck lid is hinged at the front and balanced by torsion bars.

Door hinges have torsion bar-loaded cam and roller checks, which hold the door open in either of two positions. Exterior door handles are the pull-up type.

ELECTRICAL EQUIPMENT

All electrical fuses are grouped in a fuse block located inside the glove compartment. The block is shielded by a removable cover and is hinged to swing downward, affording



FUSE BOX IN GLOVE COMPARTMENT
(Fuse box shown in lowered position)

easy access to the fuses. The circuit, current rating, and type of fuse are marked on the fuse block to minimize any error in changing the fuses.

The car has a standard-production turn signal switch, heavy-duty mechanical stop-lamp switch, 70 amp-hr battery, and dual horns.

GENERAL FEATURES

and

STANDARD EQUIPMENT

The Turbine Car generally has the advanced design and engineering features associated with Chrysler Corporation automobiles. It is a luxury car with leather upholstery and bucket seats of an unusual design, and has several chassis, body and interior features not found on any other Chrysler Corporation automobile. These include a central hydraulic system, pressure-boosted power brakes, hot gas-to-air heater, rubber-mounted unit front suspension, aluminum hood and deck lid.

All features and equipment are standard. There is one body color and one interior trim combination. No options are available.

Standard Equipment

Automatic Transmission
Power Steering
Power Brakes
Power Windows
Heater-Defroster
Rear Window Defogger
Variable-Speed Windshield Wipers
Windshield Washers
Self-adjusting Brakes
Back-up Lights
Front and Rear License Plate Frames
Outside Remote Rearview Mirror
Rear Wheel Skirts
Wheel Covers
White Sidewall Tires
Undercoating
Padded Instrument Panel
Padded Sun Visors
Prismatic Inside Rearview Mirror
Genuine Leather Seats and Interior Trim
Front Seat Safety Belts
Map Light
Clock
Transistorized Push-button Radio
Rear Seat Speaker
Door-mounted Flashing Warning Lights
Courtesy Lights in Door and Quarter Trim Panels and Below Instrument Panel
Glove Box, Ash Tray, Trunk and Underhood Lights

SPECIFICATIONS

Model	2-door, 4-passenger hardtop
Dimensions	
Wheelbase	110.0 in.
Tread - Front	59.0 in.
- Rear	56.7 in.
Over-all Length	201.6 in.
Overhang - Front	36.2 in.
- Rear	55.4 in.
Over-all Width	72.9 in.
Over-all Height (with 4-passenger load)	53.5 in.
Turning Radius - Curb to Curb	38.8 ft
- Wall to Wall	42 ft
Weight (estimated)	3900 lbs
Engine	
Type	Regenerative gas turbine, A-831
Location	Front
Rated B.H.P.	130 @ 3600 rpm output shaft
Torque	425 lb-ft @ zero output shaft speed
Maximum Speeds	
Compressor Turbine	44,600 rpm
Power Turbine	45,700 rpm
Reduction Gear Output Shaft	4,680 rpm
Transmission	
Type	Modified TorqueFlite 3-speed automatic (without torque converter)
Control	Console-mounted gated lever
Parking Lock	Push-down sprag

Rear Axle	
Type	8-3/4 in. dia., 2-pinion
Ratio	3.23
Brakes	
Power	Master cylinder air-boosted
Type	Four-wheel hydraulic servo-type, single anchor self-energizing, self-adjusting
Size	10 x 2.5 front and rear
Parking Brake	
Type	Cable application of rear service brakes
Control	Hand lever
Tires and Wheels	
Tires	7.50 x 14, Tubeless, 4-ply rayon, white sidewalls, special design
Wheels	14 x 5K, 0.9 inch dish
Steering	
Type	Constant-Control hydraulic power gear
Gear Ratio	15.7
Over-all Ratio	18.8
Suspension	
Front	Long-and-short control arm type, coil springs--attached to cross member which is supported on rubber isolation mountings.
Rear	Hotchkiss-type, asymmetrically mounted fore-and-aft leaf springs.
Capacities	
Fuel tank	21 gallons