

## **The 1961-1963 Pontiac Tempest**

Pontiac's "Little Indian" with "Rope Shaft" Drive

by Bill McIntosh

Ever since the end of World War II, U.S. builders of automobiles had been contemplating the need for smaller and cheaper cars to fill an anticipated post-war rise in demand. Indeed, the big three -- GM, Chrysler and Ford -- had long been eyeing the onslaught of economy cars coming from Europe and contemplating what to do about it. Other U.S. makers had already entered the fray with American Motors introducing the Rambler, Willys offering the Aero, Kaiser selling its namesake the "Henry J" and Hudson bringing its Jet to the market.

In those days, Pontiac had no interest in compact cars and went on happily building large, V-8 powered automobiles. However, Pontiac dealers noticed that the Volkswagen was carving out a significant market share, and they demanded a small car offering. Pontiac succumbed by agreeing to import the Vauxhall from Germany and that, for the moment, placated dealers. Unfortunately, the Vauxhall, like so many cars from Europe, had quality control problems that resulted in a poor reputation and limited sales volume. Both corporate staff and dealers alike were happy to learn that Pontiac would build its own compact car and offer it for the 1961 model year.

With the Chevrolet Corvair already in the design phase -- targeting a 1960 launch as GM's first compact car -- corporate management dictated that Pontiac, Oldsmobile and Buick should also offer their own compact. The Tempest originated from the corporate project known as X-100 and had to share components with other GM compacts. The largest "shared" component was the Y-body which had originated with the Corvair built on a 108-inch wheelbase. All three divisions (including Pontiac) wanted a longer wheelbase -- at least four more inches (or a 122 inch wheelbase). This lead Fisher body to make a longer version of the Y-body for Pontiac, Oldsmobile and Buick. In addition, all three divisions rejected the idea of an air-cooled, rear-mounted engine that Chevrolet had designed for the Corvair. Each wanted a front-mounted, rear-drive configuration. And, while Oldsmobile and Buick opted for "going with what they knew" (conventional front mounted V-8 engine/transmission, drive shaft and standard differential) Pontiac was to go it alone with a most unconventional design.

### The Men Behind the New Pontiac Tempest

Some would argue that the team who lead the Pontiac compact car project was the most talented group of individuals in automobile history. Never before and never again would such talent be amassed in one place at the same time. The team was led by General Manager Bunkie Knudsen, the Chief Engineer was Pete Estes, and the Assistant Chief Engineer was John Delorean. By far,

the most influential person though was John DeLorean, an engineer who Knudsen had brought to Pontiac in 1956 to the post of advanced engineering. DeLorean would leave an indelible mark on Pontiac products through engineering innovations over a long period of time. DeLorean set to work on the compact car project from almost his first day on the job at Pontiac. And, as it turns out, most everything in the technical makeup of the car was a consequence of his decision to develop a car that would seat six individuals within the limited dimensions of the GM B-O-P Y-body (see below "A Most Unusual Drive Line").

### Design Objectives

The Pontiac team set out a series of ambitious objectives for the new Tempest. First, the car had to seat six adults comfortably as well as hold their luggage. Second, the car should provide the ride and handling of a full-size car in a compact package. Third, the Tempest should deliver lively performance (V-8 like) but, at the same time, outstanding fuel economy. Fourth, the compact had to provide exceptional value for its price. And fifth, it had to reflect traditionally clean Pontiac styling. These demanding specifications seemed, at times, even contradictory, but the Pontiac team forged ahead undaunted.

### A Four-Cylinder Engine?

In an attempt to meet the competing goals of fuel economy with "lively" performance, the team settled on the idea of a four-cylinder engine. Not just any four-cylinder engine but essentially one-half of the now well-proven 389 V-8. This decision has to be understood in light of the history of the four-cylinder engine within GM and the industry as a whole. GM had not manufactured a four-cylinder engine equipped car since 1928. The last high-volume American car to use a four-cylinder engine was the Ford Model A (although the engine survived for a short while in the Model B). The last American car with a four-cylinder engine was the Henry J in 1954. So, this was indeed a radical idea but one with many practical consequences.

The engine would essentially be the right bank of the 389 V-8, creating a new 194.5 cubic inch displacing engine. In addition to its proven reliability, the new four offered many cost-saving advantages. Of the 44 major components that made up the power plant, 28 came unmodified directly from the venerable 389. Only 5 were modified slightly, and only 11 components were totally new.

Pontiac would make the new four available in a number of different configurations depending on carburetion, fuel recommendation and compression ratios: a regular-fuel engine with a single-barrel carburetor and 8:6 to 1 compression ratio; two premium-fuel units with 10.25 to 1 compression ratios (one with a one-barrel carburetor and one with a four-barrel carburetor).

The engine was not without its problems in development. The chief problem was that it ran very roughly due to a multitude of unbalanced forces not seen in a V-8 engine. Any number of "fixes" were worked on by the development team, including specially designed soft rubber engine mounts, rebound stops, carefully balancing the crank shaft, and the use of a harmonic balancer and four integrally cast counterweights.

Another problem was the timing chain. Because the engine used the same fine-pitched timing chain from the V-8 engine, the torsional vibrations of the four-cylinder engine resulted in dramatic, early failure of the timing chain. As a result, they had to install a very elaborate spring-loaded automatic chain tensioner.

### A Most Unusual Drive Line

Because John DeLorean was intent on making the Tempest a six-passenger vehicle, an enormous amount of the technical and design considerations were driven by this decision. Probably the most dramatic example of that was the driveline -- something that was totally unique and only lasted three short years.

In order to provide a flat floor for both the front- and rear-center-seated passengers, the car had to have a flat or virtually flat floor board without the usual hump (transmission/drive shaft tunnel). Raising the floor was out of the question -- it would not allow acceptable seat-height and knee-angle relationships. So, clearly, the drive shaft had to be routed below the floor. In addition, the final drive (usually the differential) unit had to be separate from the axle shafts and in constant position relative to the floor pan (no movement up and down). This would necessitate an independent rear suspension (not unlike that of the Corvair). To accomplish this, two things had to be done: the transmission had to be moved from its traditional location to the rear of the vehicle (a transaxle) and the engine had to be tilted downward at the back, and, similarly, the transaxle had to be tilted downward at the front.

But what about the driveshaft? Conventional practice would have meant that the driveshaft would be a three-piece unit with three or four universal joints. This would allow the shaft to go down, under and then up to the final drive, leaving the floor pan flat or mostly flat. John DeLorean had another idea: a flexible drive shaft that would twist as it turned and needed no universal joints at all. Thus, the so-called "rope shaft" driveshaft. In actuality, it was a torsion bar that was bent along its entire length: it dropped 10-3/4 degrees or 3 inches over its 7-foot length. It was more expensive than a standard driveshaft with multiple universal joints because it had to be machined its entire length. The three-inch drop/curve of the shaft eliminated the natural tendency of a long rod to whip and create vibrations. It rode in two ball bearings at one-third and two-third positions along the shaft. It was bolted to the engine and had a splined flange at the rear. The shaft was placed in tension by arching it slightly, and, under driving conditions,

the shaft actually twisted up to 30 degrees, just like a torsion bar. Both of these engineering specifications significantly added to the damping of the four-cylinder engine's tendency to vibrate. The shaft was housed in a upside down, U-shaped channel joining the front and rear ends. The result was that the goal of a perfectly flat floor was never achieved. Nevertheless, the minimal hump in the floor (two inches at the front seat and 3-1/2 at the rear) meant that center passengers would easily straddle this small intrusion and, in effect, have both feet placed on the flat section of the floor.

As to the rest of the driveline, the new Tempest would be equipped with either a standard or automatic transmission. As mentioned previously, the final drive consisted of a transaxle using a modified Corvair unit. The automatic was a two-speed unit mounted on the transaxle and named "TempesTorque." Tempests equipped with synchromesh transmissions had the clutch mounted in the conventional position at the flywheel while the gearbox was mounted immediately ahead of the transaxle. A floor-mounted shifter was used both to simplify the mechanics of the shifter and, at the same time, to add to the sports-car-like feel the engineering team was aiming for.

### Suspension

As mentioned, to keep the rear transaxle from moving up and down, engineers specified an independent rear suspension for the new Tempest. A swing axle design (like the Corvair) resulted in stability and handling problems just like with the Chevrolet compact. Thus, after two years, universal joints were added to the wheel hubs, eliminating extreme camber changes.

Front suspension for the new Tempest came from much work done by Pontiac's advanced engineering group. Major components were stamped steel A-arms and coil springs attached to a box section cross member. Steering knuckles were held in place using ball joints, and the upper control arm pivot axis was tilted backwards to achieve an anti-dive effect on braking. Coil springs were seated against rubber shims.

### Body and Styling

Although not adopted in the United States until the introduction of the Corvair, GM had extensive experience in design and building unit-construction bodies as early as 1937 with the Opel and Vauxhall. As mentioned, the Tempest had a Y-body that was a modification of the one used on the Corvair. Rather than a conventional frame, the body shell had longitudinal hat-section reinforcements, while uniting front and rear with transverse torsional transfer members. Front wheel housings were welded to the cowl and front rails. Fenders, doors, hood, and deck lid were all bolted onto the underbody structure.

The styling was simple and designed to capture Pontiac themes from the full-sized line of cars. The new Tempest would have a split grill and side-by-side dual headlights set into either end of the grill. A simple straight bar-type bumper was used with additional air intakes in the lower front panel. Curiously, and with the exception of window frames, there was virtually no chrome on the body sides, with accent lines made entirely by body sheet metal sculpturing. The beltline extended rearward, shaping into a modest fin-like tail. Initially, two body styles were offered: a four-door sedan and a station wagon. A two-door coupe was offered later in the 1961 model year.

### Testing, Testing, Testing

Because the Tempest was so unconventional (particularly its driveline), Pontiac engineers conducted an extensive program of testing prior to going into production. Some of the testing used full-sized Pontiacs with the Tempest driveline tucked underneath. Pontiac was allegedly the biggest user of the GM Proving Grounds during this time period. By the time the Tempest was ready for market, engineers had logged over 2.6 million miles of testing. In one unusual test, a new Tempest sedan and wagon were turned over to six teenagers. They drove these vehicles around the clock for a total of 107 days from July 1 to October 15, 1960. Covering all 48 contiguous United States and seven Canadian provinces, each car required only minor services -- none related to the unusual driveline.

### Introducing the New Tempest to the Motoring Public

Pontiac's marketing department went into action well prior to the introduction of the new Tempest. In order to familiarize potential buyers and the automotive press, full information was released three weeks prior the car's debut. Attempting to sell the new car and its unique driveline on its merits, Pontiac released full information, photos, and technical drawings. Given some of the radical design and engineering aspects of the car, a multitude of articles followed in all of the major automobile magazines. The new Tempest even won *Motor Trend's* Car of the Year award.

The Pontiac Tempest was introduced on November 3, 1960. It was priced \$217 less than the Buick Special or the Olds F-85, \$193 more than the Corvair, and \$535 cheaper than a full-size Pontiac. In the spring of 1961, Pontiac made a major effort to feature the Tempest at the New York Auto Show. Its feature exhibit included a specially prepared "flip top" Tempest four-door sedan with the body tilted up and back to show off the new and unconventional driveline (see photograph). At the end of the model year, almost 101,000 Tempests had been sold -- contributing significantly to Pontiac claiming the number three sales leader behind Chevy and Ford.

## The 1962 Model Year

Because 1961 was the inaugural year for the Tempest, 1962 brought only minor refinements to Pontiac's compact offering. Tempest added a sportier Le Mans version of the two-door coupe with bucket seats and other upgrades. In addition to the sedan, wagon and coupe, Tempest introduced a two-door convertible for 1962 and was available in both the Tempest and Le Mans versions.

While the driveline for 1962 was virtually unchanged from the previous year, minor engineering changes were made. Some suspension changes were made with modified suspension bushings. Horsepower ratings rose across the board with some engines getting a new cam and lifter set while others got a newly designed intake manifold. In all there were five versions of the 4-cylinder engine with 110, 115, 120, 140 and 166 horsepower respectively. The Buick aluminum V8 offering was carried over but with increased power giving it a total of 185 hp.

Most notable styling changes included the new wider split grill with a third section of grill connecting the two, bright metal trim bolted to the fins giving them better definition, and pieces of chrome trim emphasizing the body scoop on the lower front fenders. For 1962, Pontiac sold 110,690 Tempests with the Le Mans two-door coupe outselling all other models with 39,662 delivered. It was a great sales year for Pontiac having taken 3rd overall sales leader behind Chevrolet and Ford.

## The 1963 Model Year

The 1963 model year brought the first major overhaul of the Tempest with changes in the engine line up, transmission, drive shaft, suspension and body. The engineers dropped the swing axle design and its inherent problems. Instead, double-jointed shafts and semi-trailing arms along with universal joints at the outboard end of the drive shafts were used. This made for a wonderful handling car with all the vices in handling and controllability of the swing axle gone. The Buick aluminum V8 was dropped and a new 326 cubic inch engine based on the 389 V8 was introduced and was rated at a substantial 260 horsepower. To handle the horsepower of the new V8, the driveline was modified to include a beefier drive shaft, a heavier duty differential with a larger case and cover providing additional stiffness to the rear. The new drive shaft and differential were installed on both V8 and four-cylinder cars. Two new transmissions were offered, one for the four cylinder and one for the V8 each of which had a PARK position (not on the '61 or '62 for reasons of economy) which were smoother in operation than previous units. In addition, the '63 offered a larger gas tank, new dash layout and the Delcotron generator.

From a styling perspective, the 1963 Tempest was quite different than its predecessor model. This started with a body that was 2 inches wider and 5 inches longer. The side sculpturing was

essentially done away with and the body was very much slab-sided. The roofline was more angular, wheel openings wider and tail lights were changed from the dual-stacked circular ones to rectangular ones. While the three chrome strips on the front fender remained, a new chrome strip was added to the side running from the front fender stopping just before the front door jam. This tended to "break up" the new slab-sided Tempest.

Despite all these improvements, the '63 model year was not a great sales year. Both the Plymouth Valiant and the Dodge Dart out sold the Tempest. In 1962, the Tempest lagged behind the five leading compacts including the Falcon, Chevy II, Corvair, Comet and Buick Special. For '63, this meant the Tempest was in 8th place. With the compact field becoming so crowded, Pontiac management concluded that the Tempest was not where they wanted to compete. Thus, 1963 would be the last year of the "rope shaft" Tempest and in 1964 the Tempest nameplate would be attached to a new and larger car with utterly conventional engineering.

### Acknowledgements

- *Pontiac 1946-1978 -- The Classic Post-War Years* by Norbye and Dunne
- *Automobile Quarterly*, Vol. 50, No. 4, "The 1961 to 1963 Pontiac Tempest - A Car without Counterpart" by James M. Luikens, pp. 54 -65.

### Photograph Caption Copy

1. The Unusual Tempest Driveline
2. Tempest Four-Cylinder Engine - One-half of a 389 V8
3. The 1961 Tempest Four-Door Sedan
4. The 1961 Tempest Station Wagon
5. "Pete" Estes with the First Trainload of Tempests
6. The Tempest "Flip-Top" Car (1962 Model)
7. New Tempest Being Assembled on Same Line as Full-sized Pontiacs
8. Pre-production Tempest Being Road Tested
9. Rarely Seen Tempest at 2011 Fall Meet (1962 Model)
10. GM Ad Featuring the 1961 Tempest and Full-sized Station Wagon
11. Tempest Ad Featuring the Four-cylinder Engine & Unusual Driveline
12. Pete Estes with the 8,000,000 Pontiac - a 1962 Tempest convertible
13. A sharp looking 1962 Tempest Le Mans convertible
14. A 1963 Tempest convertible
15. One of Stan Long's racing Tempests