

1971 Mid-Engined Firebird 400



By Don Keefe
Photos by Pete Lyons

Editor's Note: You may notice that the photos in this article are not up to our normal quality standards. The reason for this is that the negatives for the original construction photos that were shot by Pete Lyons in 1971 were lost and only a scan of the original contact sheet remains. We obtained the scan of the contact sheet and were able to extract these images. We thank you for your understanding and hope you enjoy this fascinating article. We also thank Paul Lamar, Pete Lyons and Herb Adams with their help with the preparation of this article.

Though General Motors was embroiled in a difficult period of transition in the years leading up to the 1973 Arab Oil Embargo and beyond, there was still a spirit of innovation and a desire to improve their product line in dramatic fashion. Insurance rates for musclecars were rising, new emis-

Paul Lamar's Unique Approach

sion and safety laws were taking hold and the old formulas for success were not going to last much longer. New ways to inject some excitement in the product line were being explored.

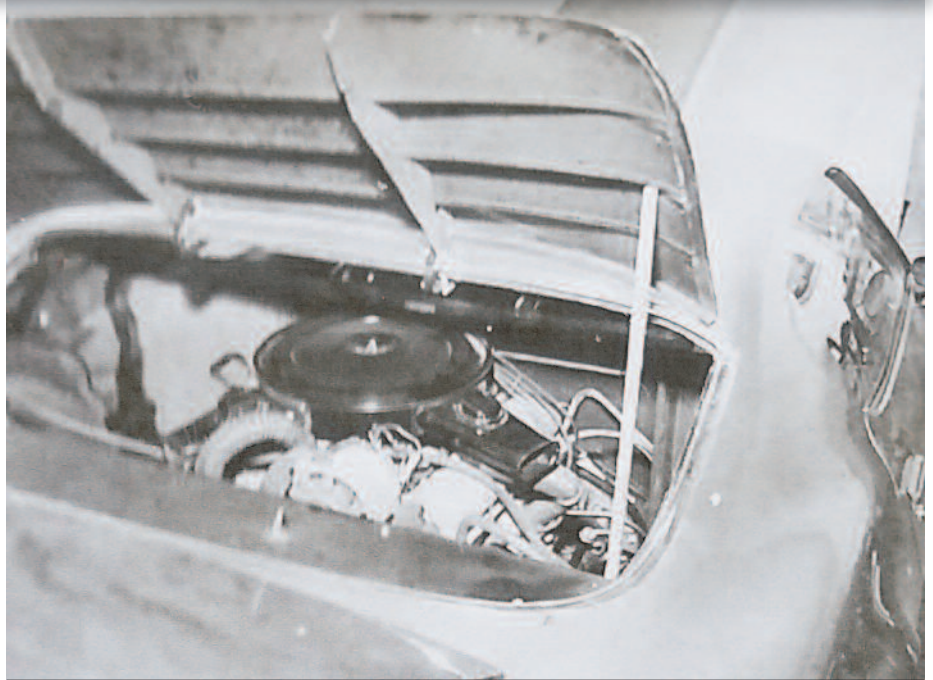
One of these projects was the development of an economical mid-engined drivetrain solution that could be installed in existing platforms.

"It was actually a pretty exciting time at Pontiac," said Herb Adams in a recent phone interview. "Our Chief Engineer, Steve Malone was very interested in improving the vehicles we were developing."

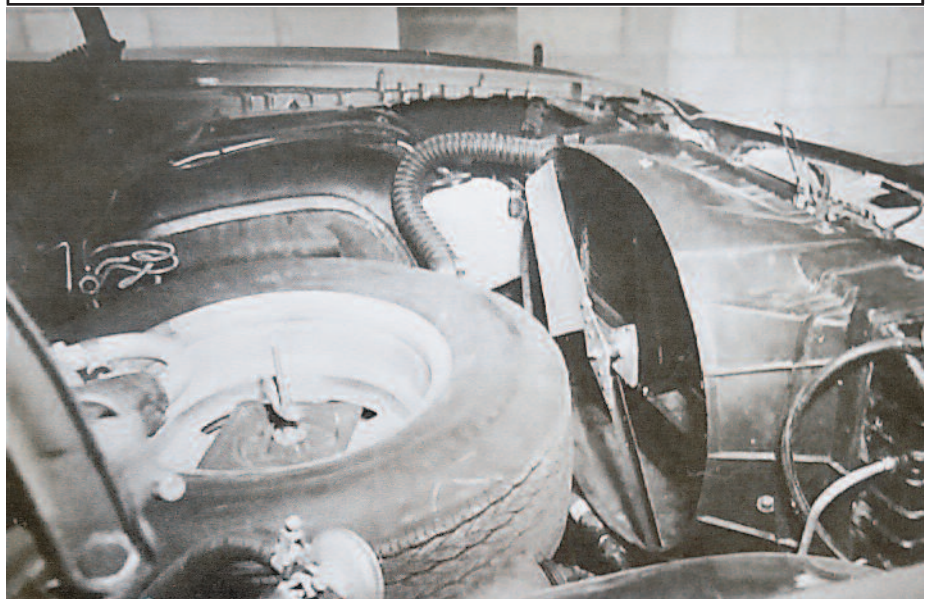
As head of Pontiac Special Projects, Adams was able to assign development programs to outside sources and after some conversations with his friend Paul Lamar, head of Lamar Engineering in California, they decided to tackle the project.

Lamar is a graduate of George Washington University and was previously employed by Chaparral, where he developed the first aerodynamic wing ever used on a racecar and later, worked with Adams on the development of the aero package used on the 1970 1/2 Trans Am. Adams had met him during the time that Lamar was working with Jerry Titus and the two became friends.

At some point, the conversation



Above: The Firebird's original 400 four-barrel was turned around 180 degrees, bolted to an Oldsmobile Toronado TH-425 transmission and mounted where the rear seat used to be. The rear window was removed and louvered metal hatch was fabricated to allow for engine access.



Engine compartment featured a thermostatically-controlled Lucas electric fan and aluminum coolant tubes that ran from the engine through the transmission tunnel to the radiator. The full-size spare tire found a new home where the engine once sat.



The engine encroached heavily into the Firebird's interior, restricting legroom to a certain extent. Thin-shell fiberglass seats were used to maximize the room that was left and the wheelbase was also extended one inch to help in that area.

of mid-engine layouts came up and Lamar said that they should build a mid-engined Firebird- and Adams agreed.

For the project, Lamar was given a 1971 Firebird. It was a base model car with a 400 four-barrel and automatic- nothing particularly unusual, the kind of vehicle one would find

in a Pontiac motorpool at the time.

Once delivered to Lamar, the process began. The original engine, transmission, driveshaft, rearend and rear leaf springs were removed and set aside. The seats and most of the interior were also removed and a section of the floorpan between the rear frame rails was re-



Interestingly, the location of the engine allowed for the stock trunk and fuel tank to be retained. A louvered hatch replaced the rear window. Note the Frankland differential located just inside of the right rear leaf spring. The location of the transaxle necessitated an offset differential location.

moved from the rear seat area to just ahead of the tail panel.

A new T-shaped rear subframe was constructed to accommodate the revised powertrain setup. The 400 Pontiac V-8 was bolted to an Olds Toronado Turbo 425 automatic and was mounted to the subframe using stock engine mounts. The mating of the engine and transmission required the starter to be relocated to the right side of the engine and the oil pan to be modified to clear.

The positioning of the engine was very unconventional, with the front of the engine facing rearward in the car. Rather than use the Oldsmobile differential, the power was transferred to a Frankland sprint car rearend by way of a constant velocity (CV) joint. A new bearing housing and cover was fabricated at the end of the transmission to accept the CV joint, one of the few pieces other than the subframe that had to be fabricated.

The differential housing used a 3.36:1 ring and pinion and a Weismann limited-slip differential system. The subframe could easily be removed from under the car by the removal of just three bolts and unhooking the CV driveshaft.

With the transmission offset to the passenger side of the car, the differential had to be located directly behind it, necessitating a very short passenger side axle and a very long one on the driver side. The rearend was mounted on a set of stiffer five-leaf springs that replaced the factory-issue four-leaf units and the rearend was fitted with production rear drum brakes.

The rear axle was located one inch behind the stock location, moving the powetrain back and providing a bit more legroom.

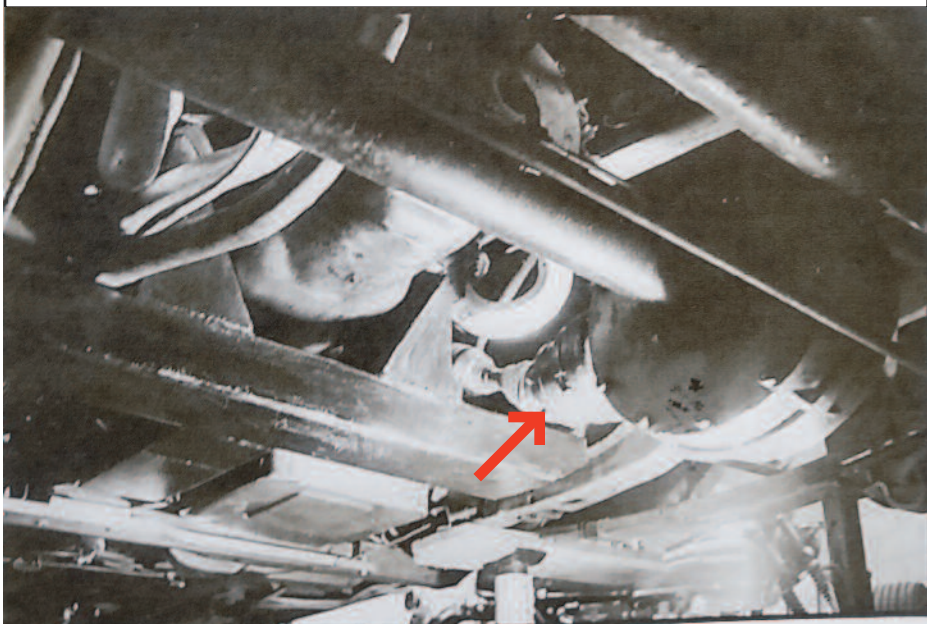
The specialized nature of the application necessitated the used of a rearend like the Frankland, which was available with a wide variety of axle lengths and other options, which allowed it to be custom-tailored to Lamar's specifications using off-the-shelf Frankland parts. Had a production version of this car been developed, there is little doubt that a GM 10-bolt rearend would have been developed with the axle dimensions needed for the installation. The rearend was fitted with production-style drum brakes and the stock proporting valve was removed in order to put more braking power to the rear binders, to compensate for the significantly altered front-to-rear weight distribution, which was now 42/58, with a test weight of 3,880 pounds.

Cooling the aft-mounted 400 required some modifications. Lengths of aluminum tubing ran inside the driveshaft hump to provide coolant to the stock-located radiator and overflow tank. A thermostatically-controlled Lucas electric fan replaced the engine-mounted unit and the area where the engine originally was installed was repurposed to store the spare tire.

An interesting sidenote of the installation was that the Firebird's stock trunk was retained and the fuel tank was re-installed in it stock location. The engine's location in the Firebird's back seat area made for a fairly cramped interior, however. A pair of thin-shell fiberglass



Though fairly blurry, this construction shot nonetheless shows the location and orientation of the 400 Pontiac and the Olds Toronado TH-425 transmission. With the stock Toronado differential removed, what was left was a transmission that simply routed the power 180 degrees. The transmission tailshaft still turned in the correct direction for proper forward motion with a conventional rearend, which was used in this instance.



The Frankland rear axle featured a very long driver side axle and a very short passenger side unit. The driveshaft (arrow) was a rubber-booted constant velocity joint that took power from the end of the Toronado transmission and transferred it to the Frankland rear axle. A production version, had it been released, would likely have used a special GM 10-bolt rearend with an offset differential and unequal-length axles.

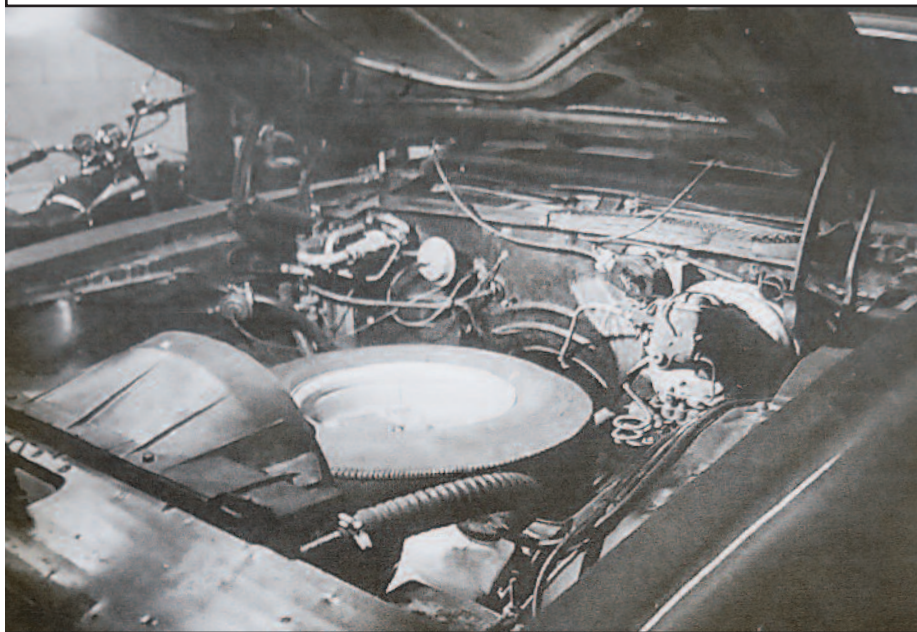
racing seats replaced the stock high-back buckets and were used to make the most of the space

available.

Directly behind them was a bulkhead made out of .040-inch steel,



The mid-engined Firebird displayed some initial cooling issues and some significant understeer in its original as-tested condition. Plans were made to add heavier Trans Am swaybars and do some follow-up evaluations. Aside from these minor new-build shortcomings, the project was deemed a success. The project was supposed to conclude with a crash test and postmortem to determine if there were any safety advantages to having the engine behind the passengers. Adams doesn't believe that the crash test ever took place, though he doesn't know whatever happened to the one-off Firebird.



Seen from another angle, we can see that the engine compartment looks quite a bit different than a factory-issue 400-powered Firebird. Aside from the engine's obvious absence, we can see that much of the other componentry remains in its factory locations, including the radiator, master cylinder and air conditioning accumulator and evaporator. Even though the spare tire took up the lion's share of the engine compartment, there was still room for additional luggage, etc.

covering a 1.5-inch steel tubing framework. The bulkhead was insulated to repel engine compartment heat and carpeted. A flat laminated automotive glass panel above the bulkhead provided rearward vision.

The question looms: why go to all of the trouble of mounting the engine backwards and simply using the Pontiac engine with the full Toronado transaxle with differential and face the engine in the normal position? Engine swappers have been using the Toronado/Edorado transaxle for years, hooking it up to a variety of different engines and placing it in kit cars, trucks and even Fieros. It would seem like a no-brainer to simply install the engine on a custom subframe and fabricate an independent suspension using the

Olds front suspension pieces. After all, if backyard hot rodders have been doing it ever since the front-drive Olds and Cadillac started hitting the junkyards.

The reason is that the project objectives were to keep the car as stock as possible, including the rear suspension and as much of the stock stock unibody as possible. Pontiac was interested in as close to an A-B evaluation of the engine placement as they could and this setup as designed did achieve those objectives. Retaining a beam axle with leaf springs, a very similar transmission in terms of gearing, operation and weight and the same 400 4-barrel, a very relevant evaluation could be achieved.

The results were remarkable in their unremarkability. The mid-engined Firebird didn't offer a significant difference in overall driveability or personality. In fact, when John Lamm tested the car for a February, 1972 *Motor Trend* article, he found that while driving it at night, he had to remember whether he was driving it or the companion Trans Am that they were loaned.

Some initial teething problems were discovered soon after its completion. The engine overheated, though that was corrected with a larger coolant recovery tank. Also, the steering was slow compared to the Trans Am and the car tended to understeer, a combination of the relocated engine and base suspension settings. Though there were plans to update those fairly minor shortcomings, it is unclear whether they were actually performed.

So whatever happened to the



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mid-engined Firebird? We don't know for sure. It is highly unlikely that it survived, as the original plan was to build the car, evaluate its performance and then conduct a safety-related postmortem on it after a crash test. Essentially, they wanted to see if the relocating of the engine behind the passengers offered any performance advantages in normal operation or safety advantages in the event of a crash. Herb Adams doesn't believe that the tests were ever conducted, as the interest in mid-engined F-bod-

ies quickly evaporated.

It is likely that the advantages of a mid-engined Firebird could have been more effectively capitalized in a competition setting, where a mid-engine layout could help cornering and the traction- a benefit to both drag and road racers. In the end however, the advantages were small enough that they weren't seen as a necessity in a street performance application. It's a testament both to Lamar's engineering expertise and the inherently solid design of the Gen 2 F-body platform.

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