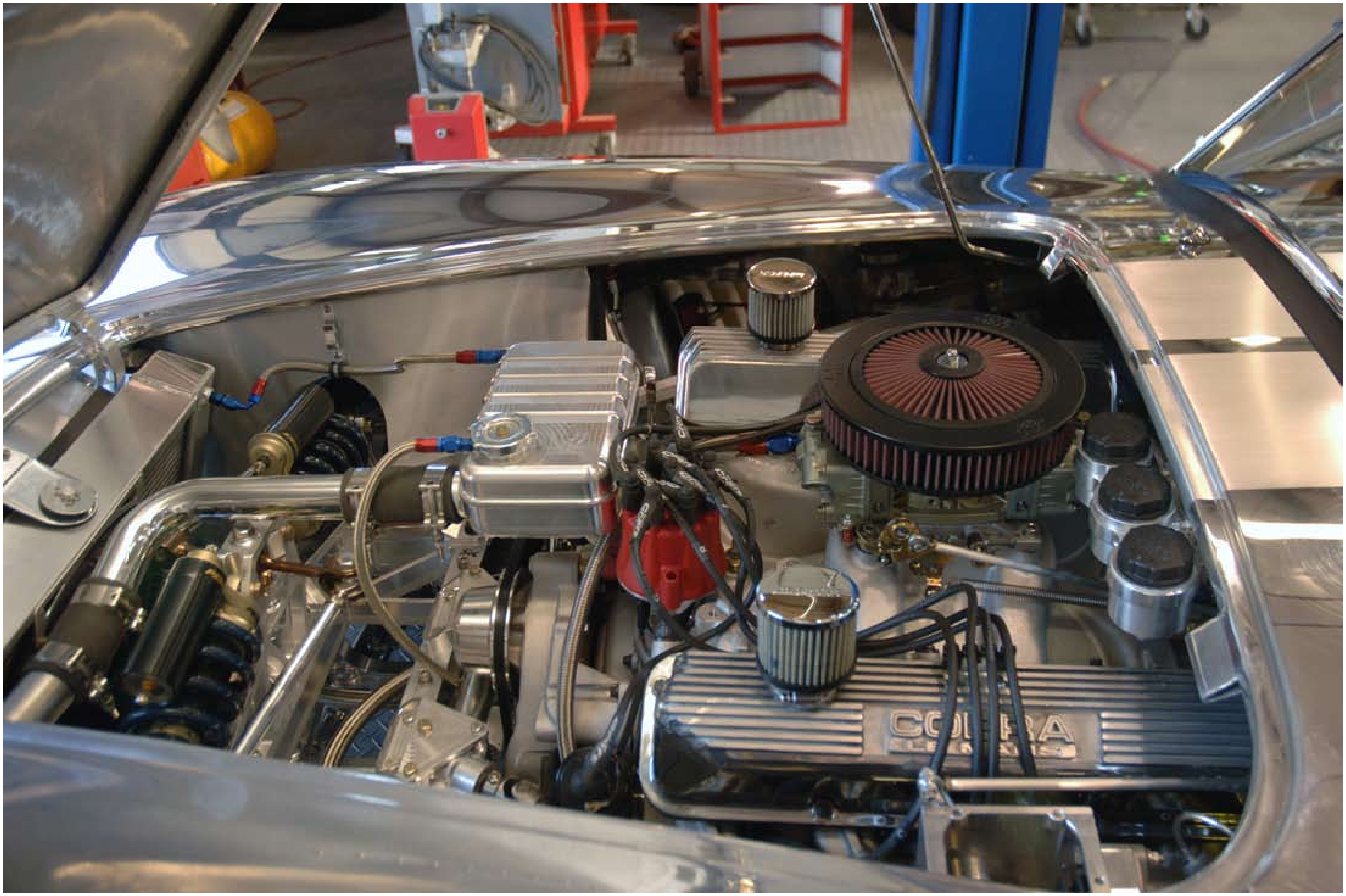
ENGINE AND TRANSMISSION

Yield to temptation. It may not pass your way again.

Robert Heinlein

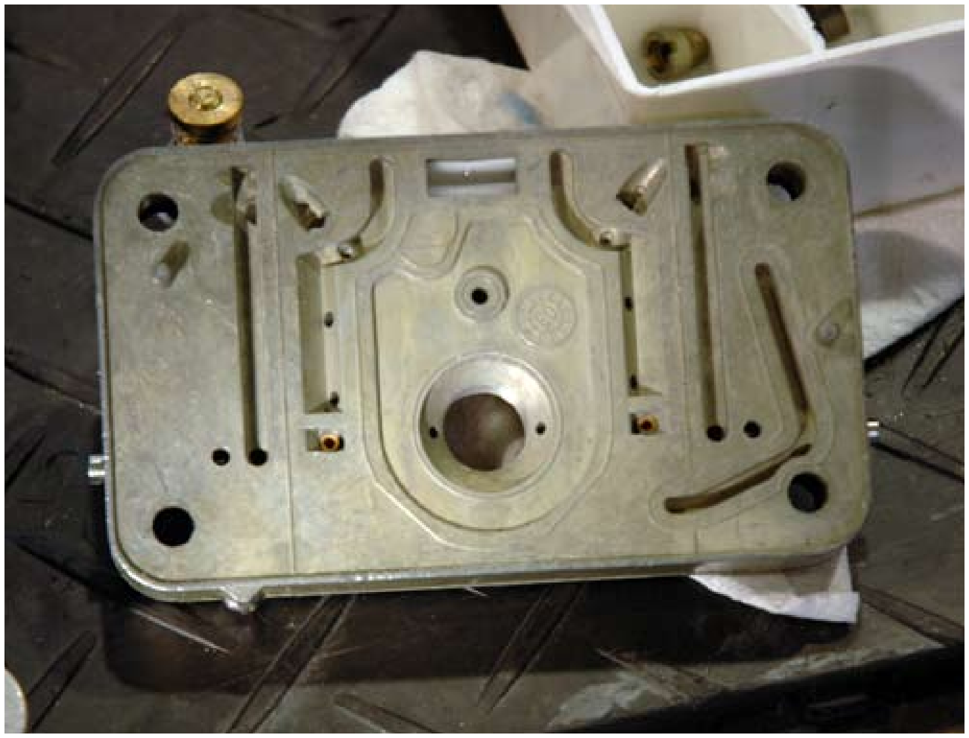


The heart of this billet Chariot of Fire is an asphalt-eating aluminum FE 427. The engine has 4340 H-beam connecting rods and a 4.25 inch stroke x 4.25 inch bore for a total of 482 cubic inches. The aluminum block was made by Shelby. The aluminum heads are made by Edelbrock. Keith Craft built the engine and did his magic 5 axis porting on the heads for incredible flow. We specified a hydraulic roller cam in the engine to minimize maintenance. The engine dyno'd at 643.5 horsepower at 6300 rpms. Torque is 600 foot pounds at 3000 rpms. This gives Larry's car a power-to-weight ratio greater than a Bugatti Veyron.

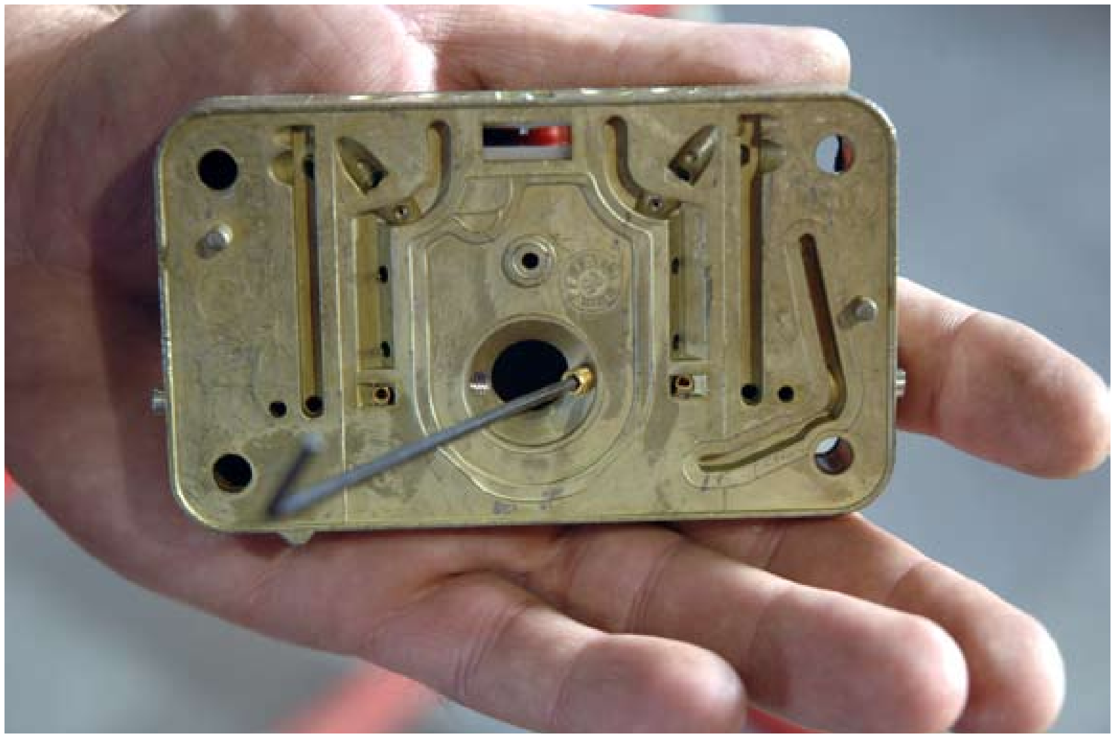
Milling off the factory air horn for greater air flow.

There were many modifications we did to the carburetor to make the car more streetable. We started with a standard 830 Holley double pumper carburetor. We use the 830 because it has large annular boosters that can react faster to the slight throttle differences encountered in street driving. By drilling and tapping the bleeds in the metering plates, we can precisely control the fuel-to-air ratio between idle, transient response, and full throttle.

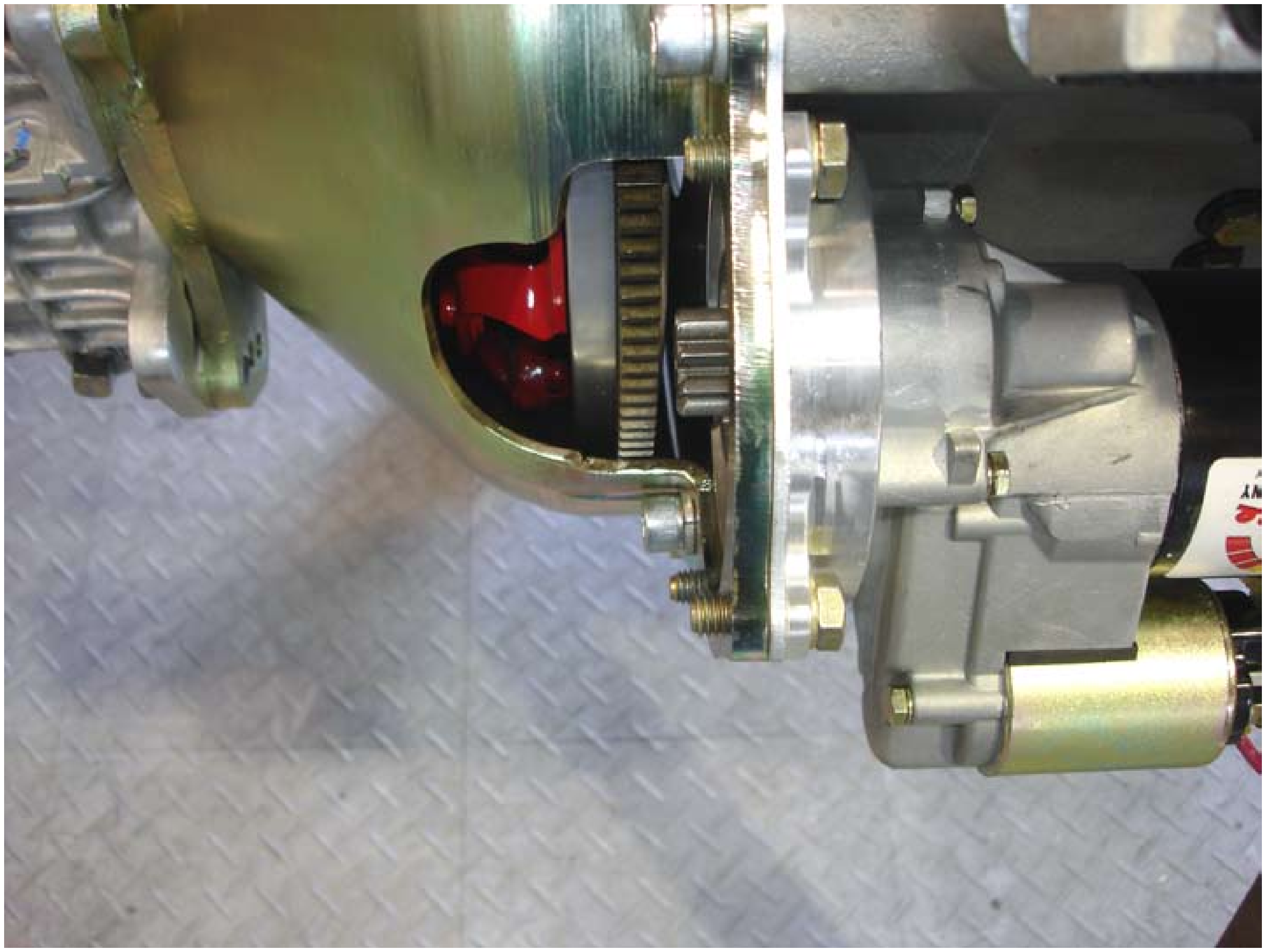
The factory fuel bleeds are too rich for the motor.



By drilling a very small hole in a set screw and tapping fuel bleeds, we control fuel flow precisely.



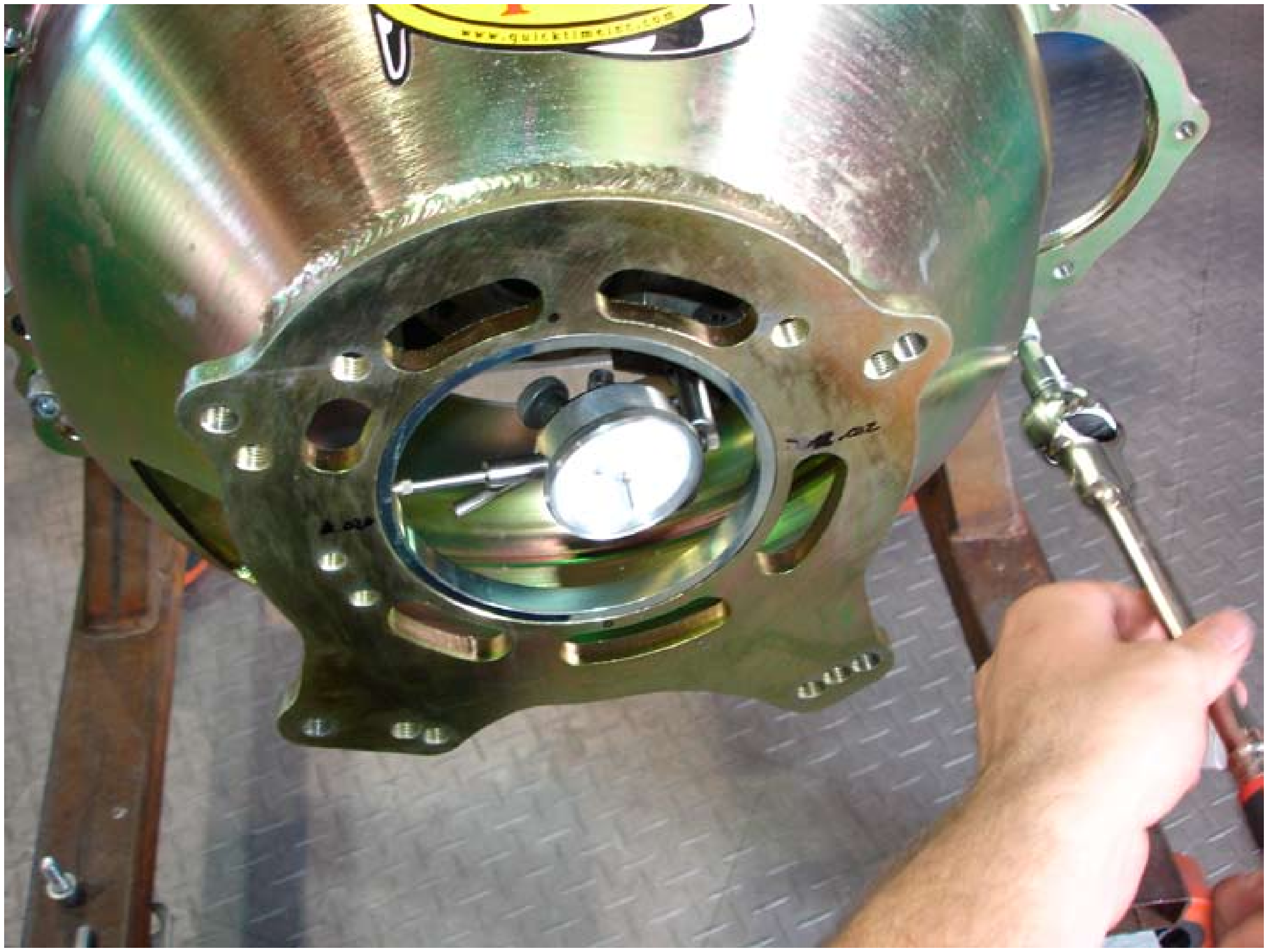
The engine prior to installation It is always easiest to set up everything on the engine while it is out of the car. The alternator, however, is in the way.



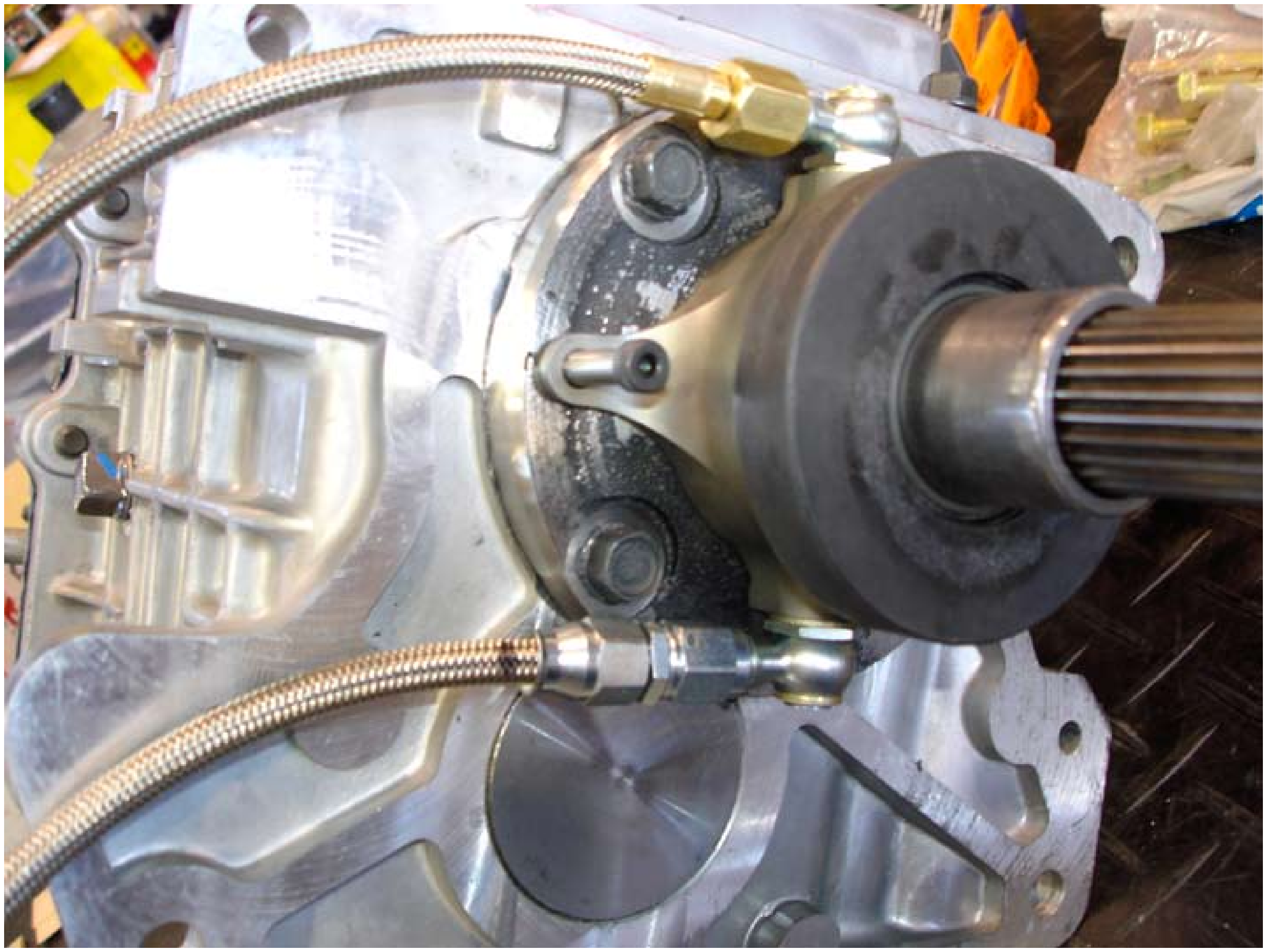
One thing almost everyone forgets is to measure is the distance between the flywheel teeth and the bendix gear on the starter. If the starter is too far away, it will not completely engage, and it will chew the teeth off of the ring gear. If it is too close, it will not release.

With this setup, fuel flows past the carburetor and into a bypassing fuel regulator. If the fuel pressure is too high for the carburetor, the regulator sends the extra fuel back to the tank. A bypassing fuel regulator is the best way to keep the carburetor's fuel cool, as fuel is always circulating. If the fuel sits too long in the fuel line the engine heats it up causing vapor lock. The fuel pressure reading is also taken after the carburetor for a correct reading.

We made a special radiator expansion tank with the outlet facing forward so the radiator tube would clear the shock.

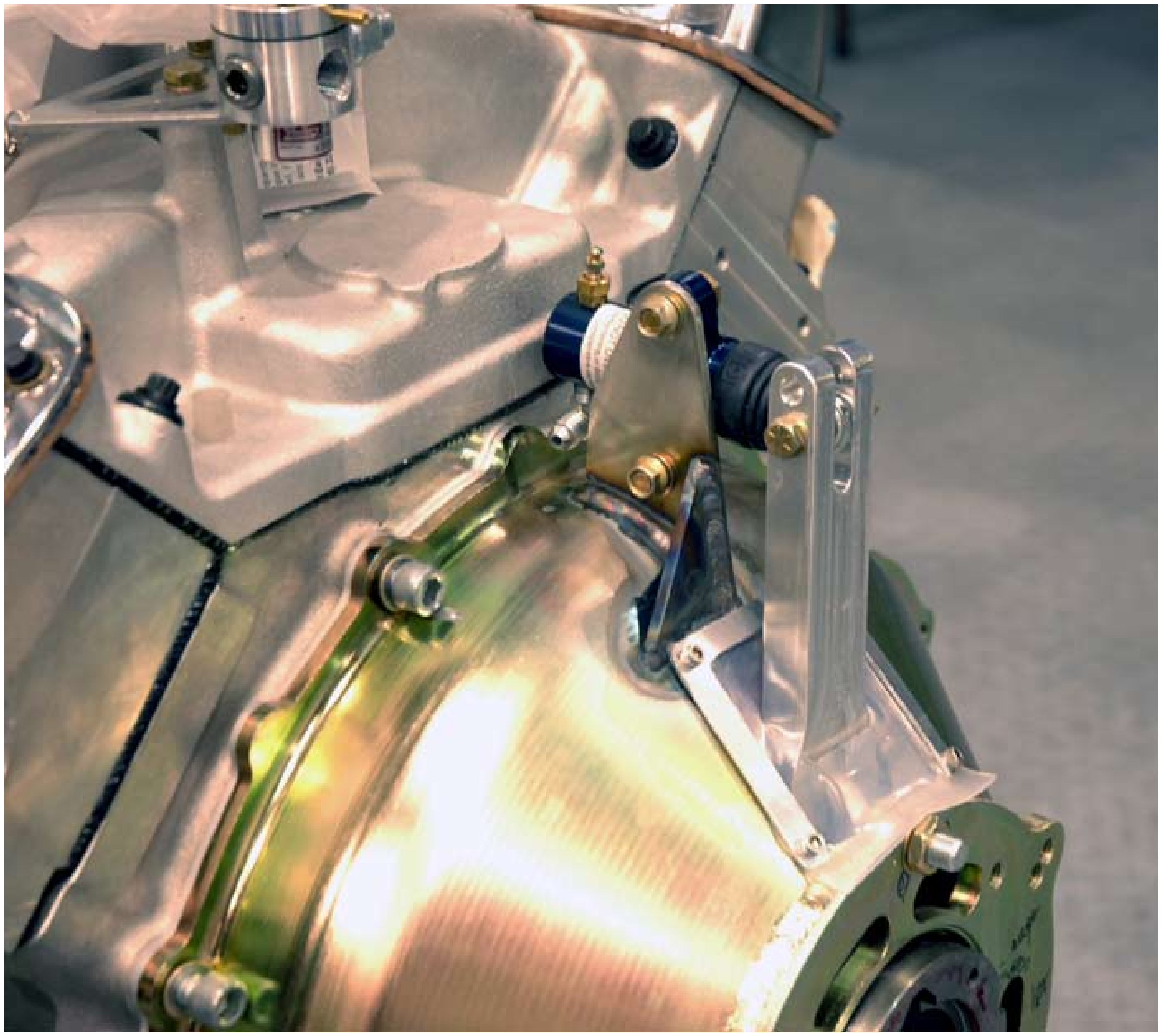


The bell housing must be aligned within 0.012 inches of runout. If the transmission is not in line with the crank shaft, there will be a bind on the input shaft causing the transmission to shift poorly.

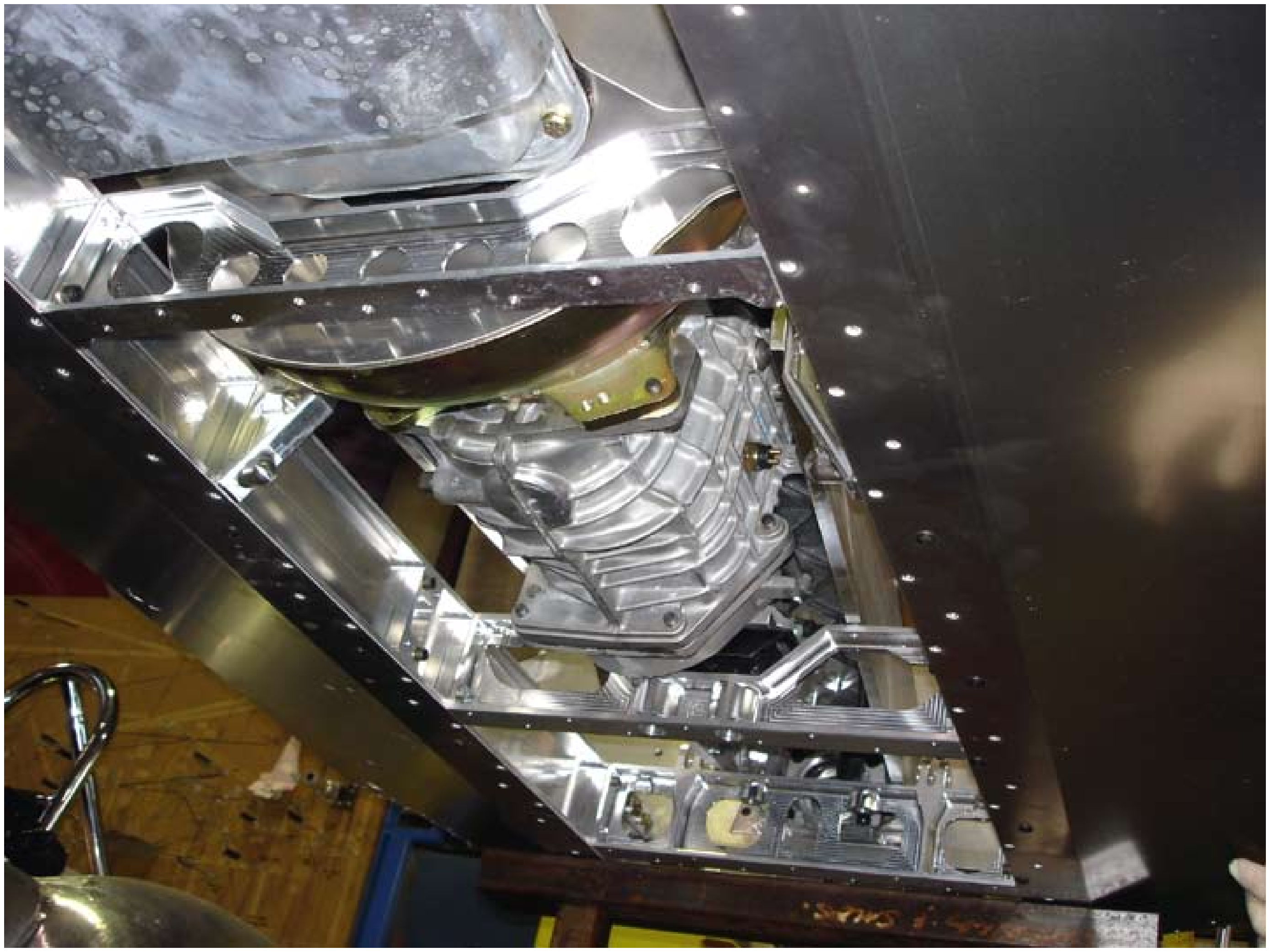


Because there was simply no room for our normal throw-out bearing assembly, we opted to go with a Tilton unit like that used on all modern race cars. Once the motor was installed, however, the clutch pedal felt like a bear trap—it had to go. The prototype car still has this throw-out bearing setup.

I could not stand the high pressure of the throw-out bearing so we had to find another answer. As there was no room in the standard location for the throw-out bearing arm, we moved it to the top of the bell housing. Here I am welding a special bracket we cut out on the water jet onto the bell housing to hold the slave cylinder.

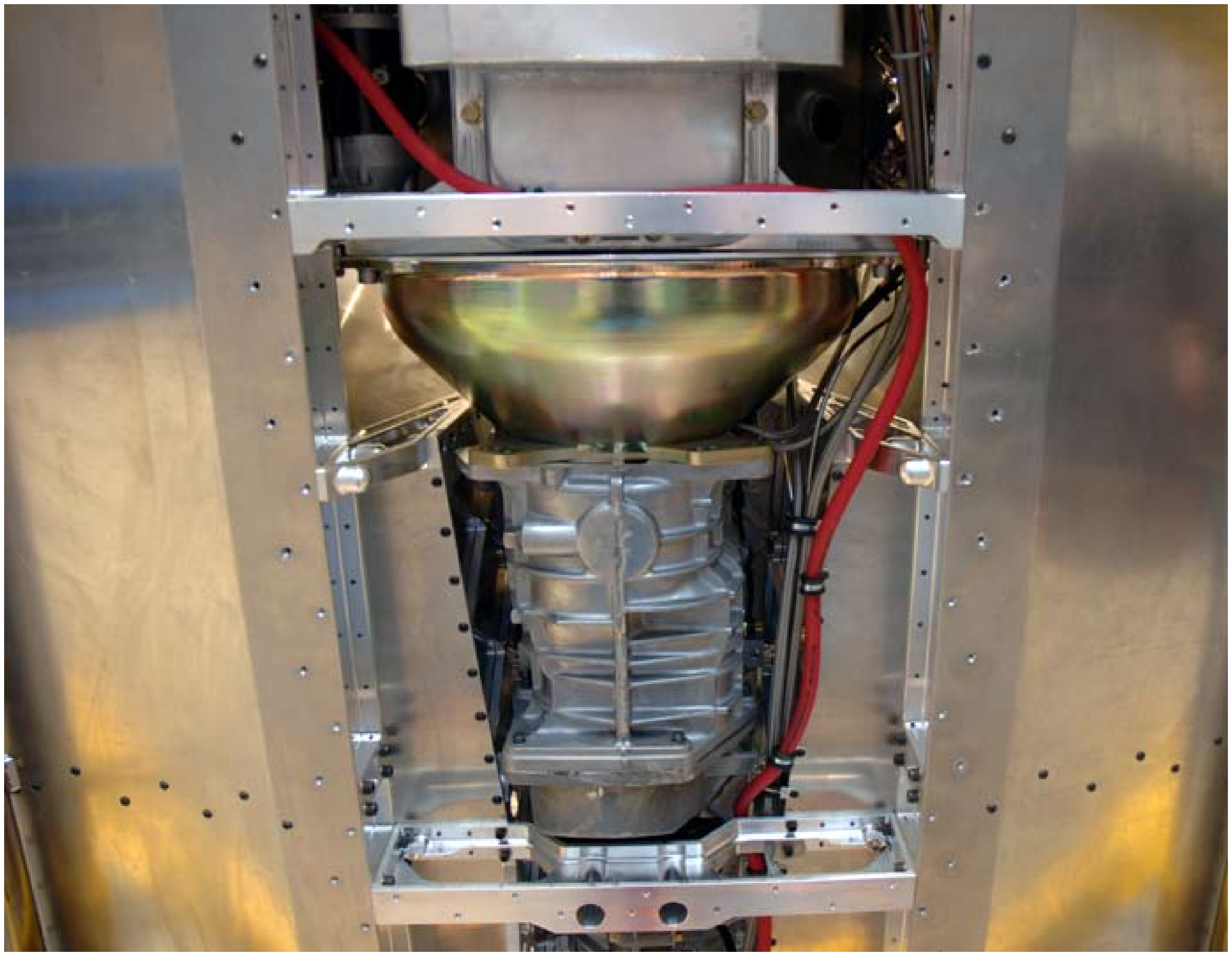


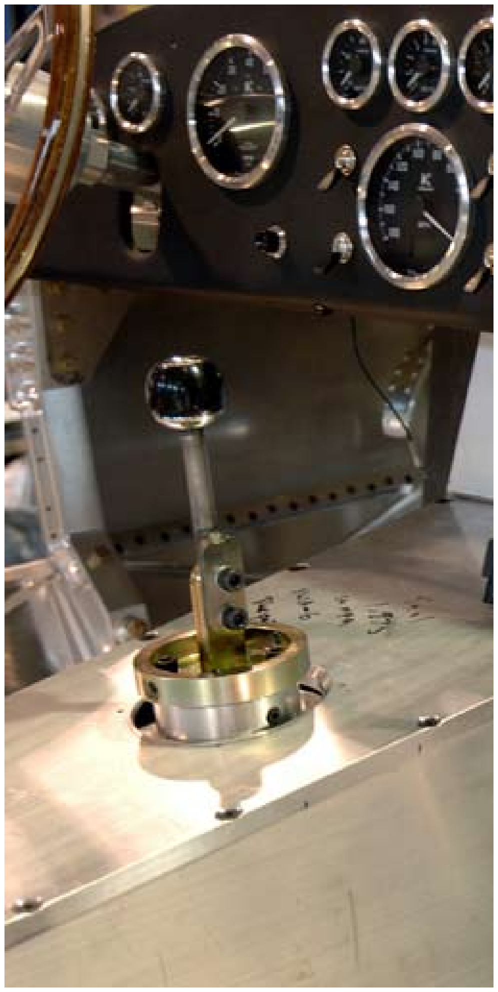
The slave cylinder pushes on the clutch arm with a rod end. The billet clutch arm also pivots on a rod end. This makes for a very smooth clutch action. There are two holes on the clutch arm—the upper hole is for an easier, but longer, clutch action. The lower hole releases the clutch faster—albeit at a higher clutch force.



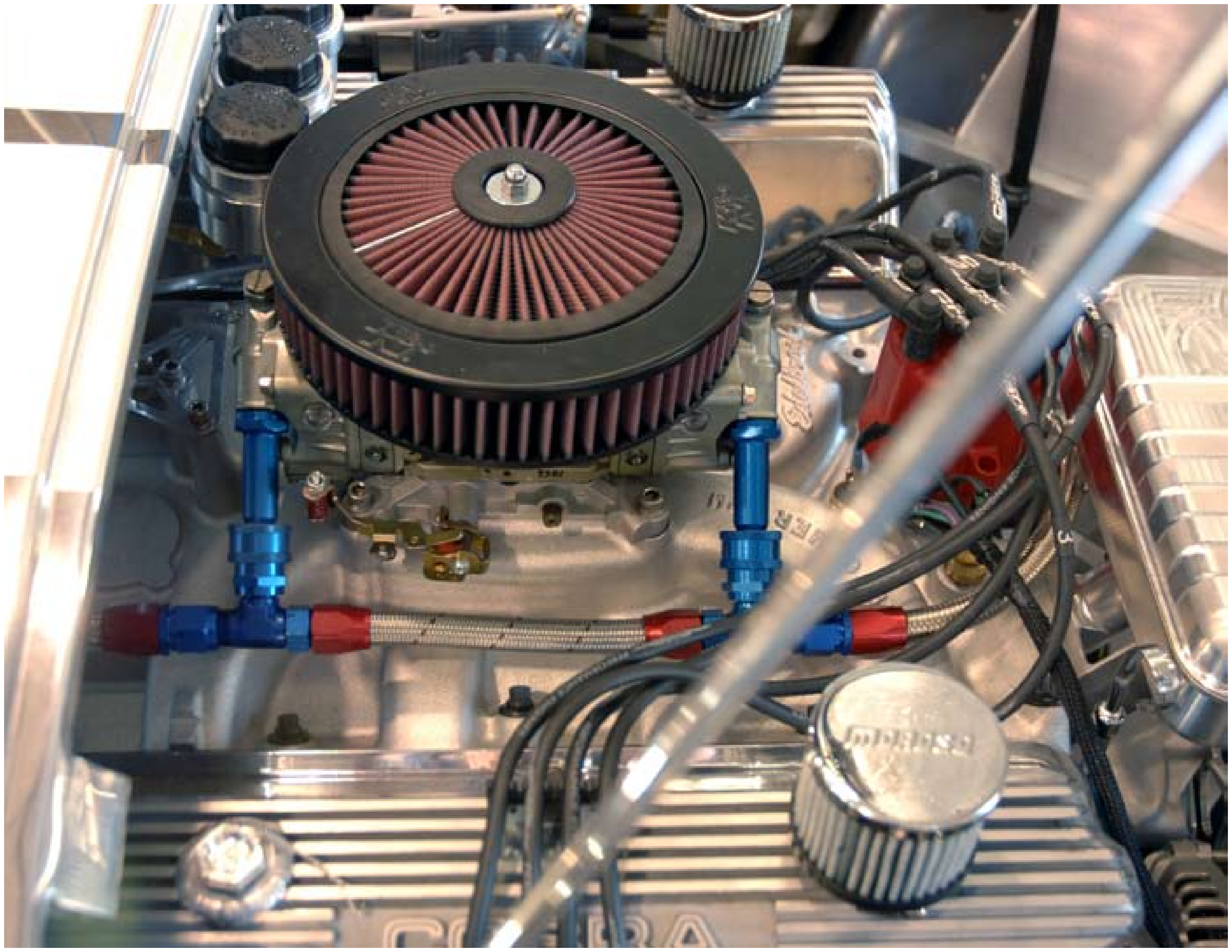
Prototype: We used the construction of an airplane as inspiration for the design of the chassis. The main frame rails form the longerons and the belly pan are a stressed skin. By moving the stress to the outer skins, we were able to make the chassis very stiff.

There was very little room to make everything fit. The battery cables are 1 gauge fine-stranded welding cable to carry the current all the way to the engine—even if things warm up under spirited driving.

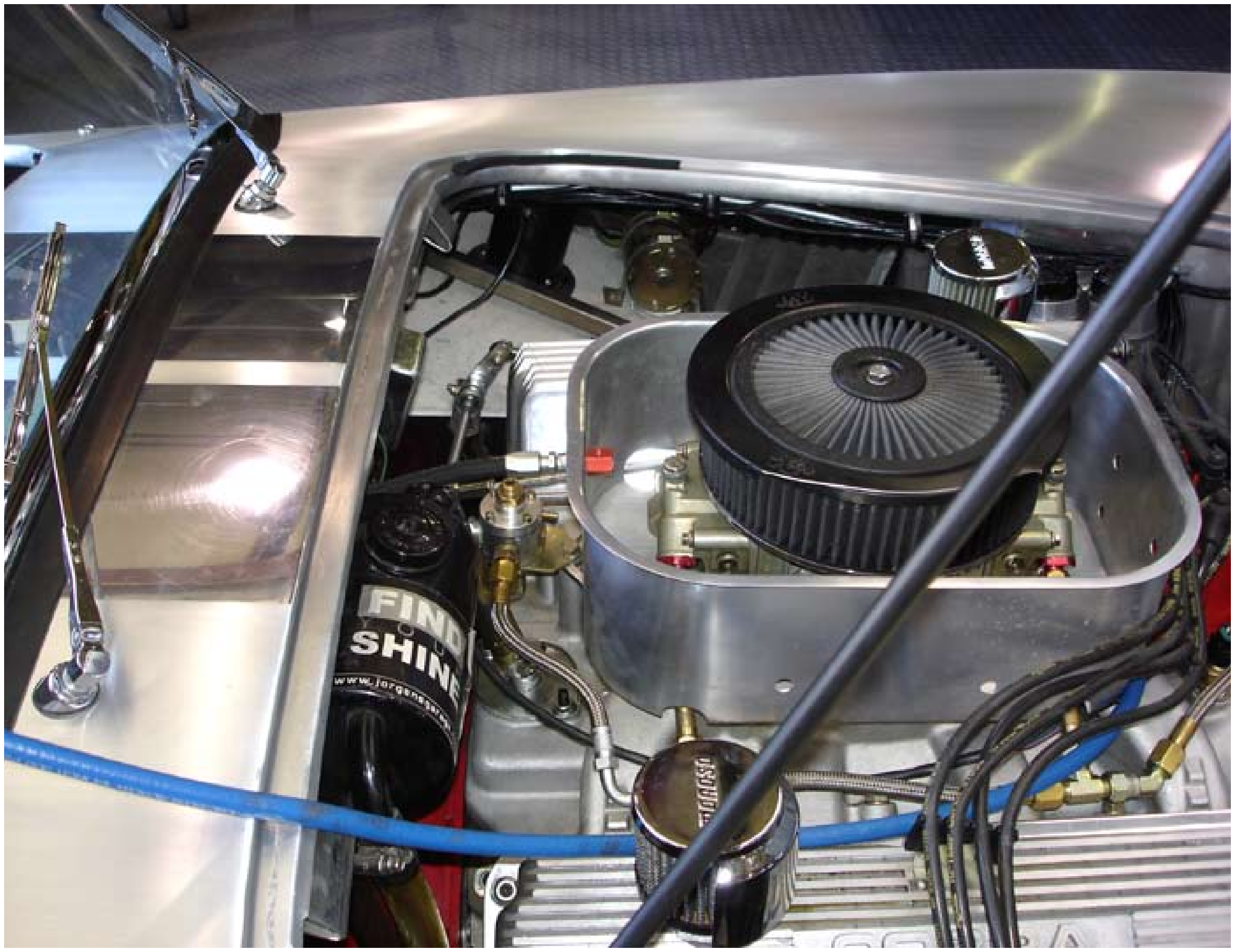




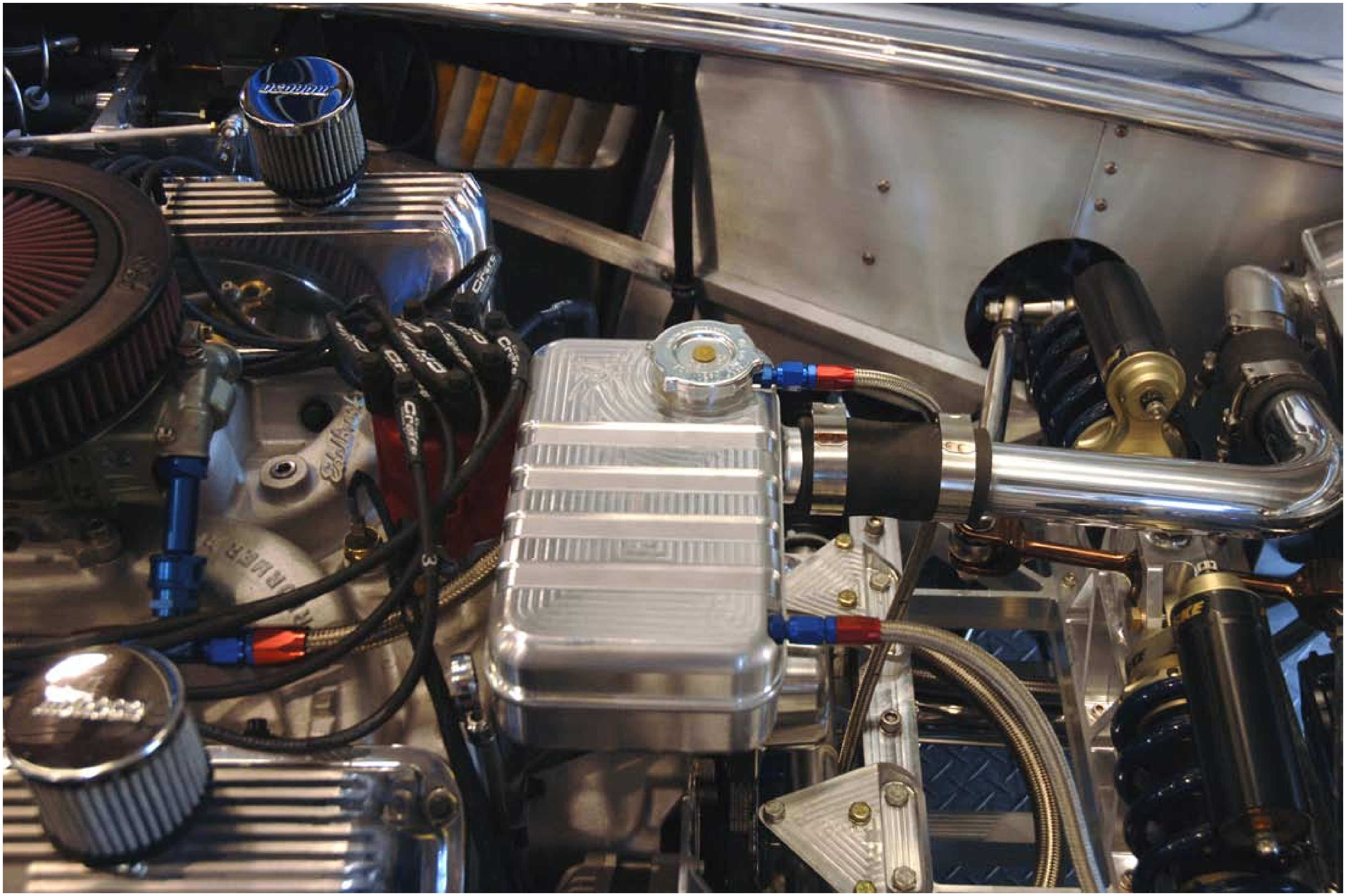
Far left: When the motor was installed, we noticed the shifter mechanism was quite bulky and would have looked ugly in the car. So we removed the shifter box and machined our own (left) that was much smaller. Below, the new shifter box is installed.



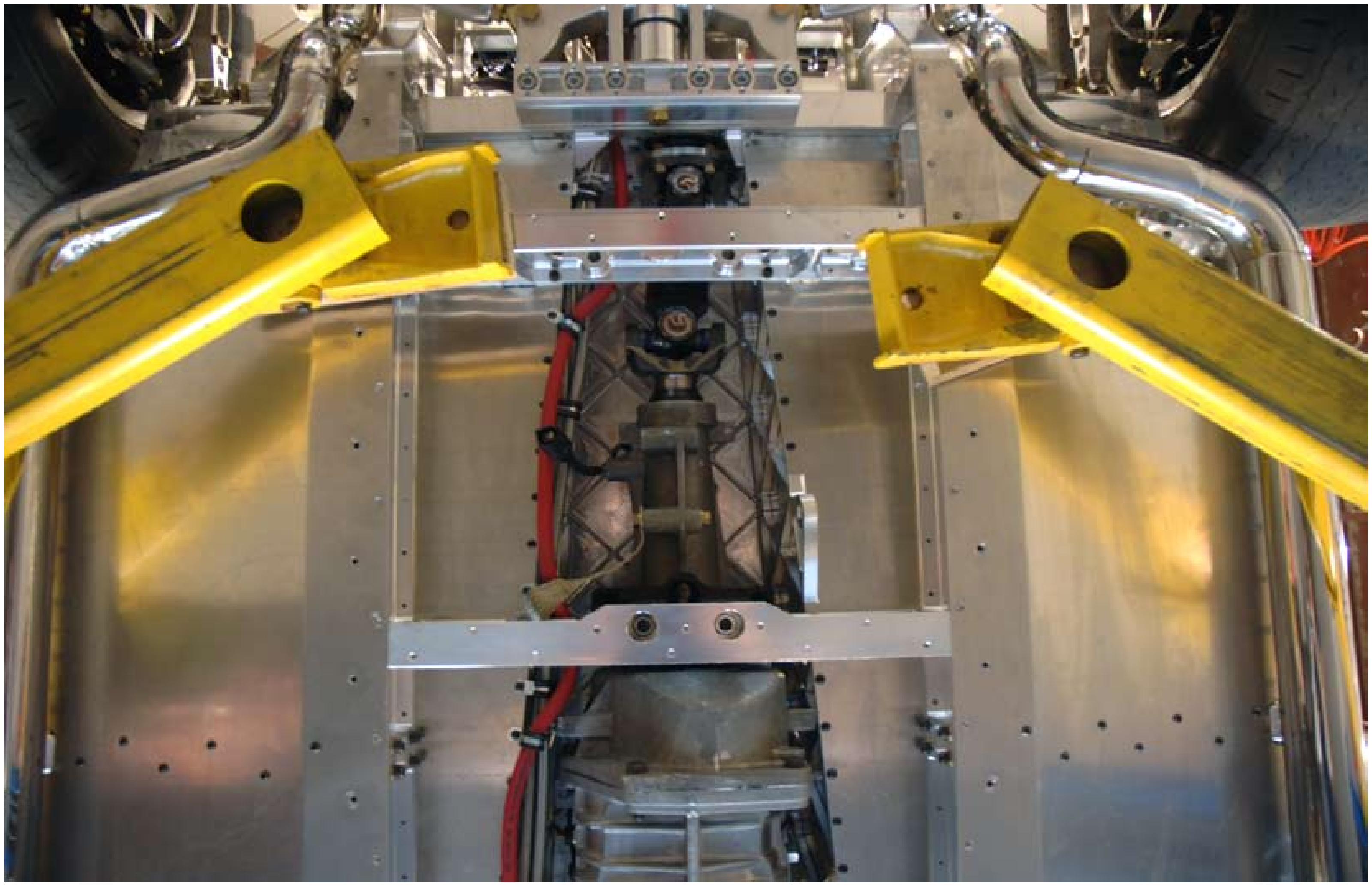
Here is the final engine placement in Larry's car as it was delivered to him. Notice the distance from the back of the air cleaner to the edge of the hood jam is only about 2 inches.



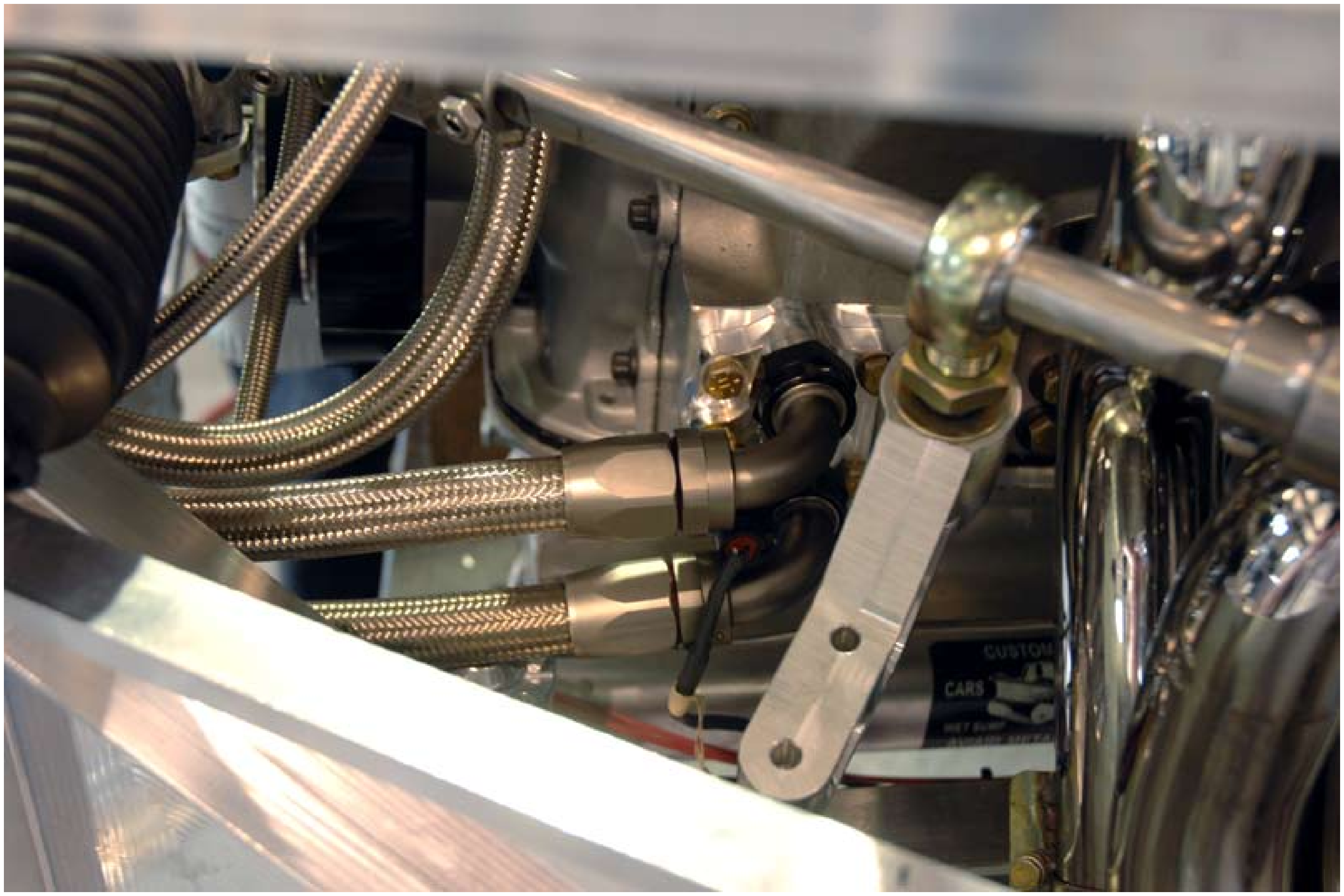
This is a picture of one of our standard cars with the engine installed. Compare with the billet car photo (above). We moved the engine back 6 inches for enhanced weight distribution.



The outlet for the radiator tank had to face forward so the coolant could pass between the shocks. In this picture, you can also see the car sitting on the ground at ride height because the angle between the sway bar and the sway bar links is 90 degrees. The sway bar is "softest" when it is positioned at 90 degrees.

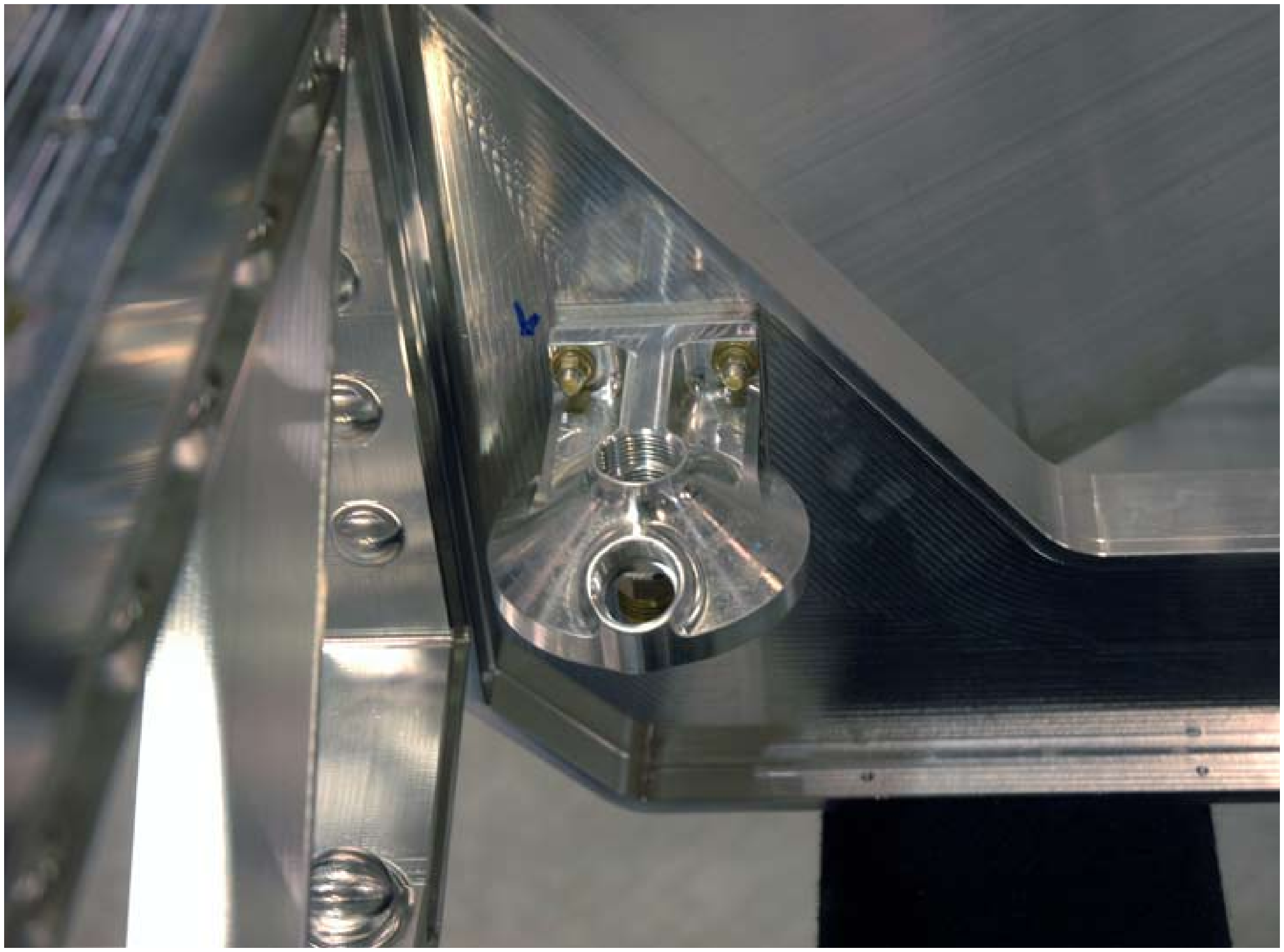


The tunnel is being trial fit for final assembly.



The oil cooler lines have special "double swivel" fittings on the ends. The hose is free to swivel on the fitting, and the fitting is free to swivel on the motor. Many failures occur because the hose is rigidly mounted and it fatigues and cracks from the engine vibrations.

Here you can see a specially threaded fitting we machined and welded in where the original valve cover breather used to be. Notice the safety wire to prevent the plug from vibrating out. We discovered we had to move the breather to the front of the valve cover when Desire Wilson, a retired F1 pilot, took the prototype car out for some hot laps. We watched her lap faster and faster as she gained confidence with the chassis. When she finally returned to the pits, she had filled the passenger footbox up with engine oil. Because of the extreme cornering and acceleration G-forces the car was capable of, oil was trapped in the back of the valve cover and ran out past the breather. At least Desire was smiling.



We mounted the oil filter lower in the chassis to make changing the oil easier—and cleaner. This is a picture of the oil filter bracket. These fittings are also of the double-swivel type.

The oil cooler also has double-swivel fittings. These special fittings eliminated an extra adapter on the end of each fitting—another potential source for leaks. On this car, we continued the brushed stripes right onto the oil cooler shrouding.