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C-4 YOURSELF

Inside The World's Lightest Three-Speed

By Dave Wallace

Thanks to the recent race-track success of a small Rancho Cordova, California-based company called ATO Racing Transmissions, Ford's little C-4 is getting a second look on both the street and strip. All-out drag racing models—complete with internal transmission brakes—shifted a couple of small-block Super Stockers to major NHRA upsets at Sears Point and Sacramento last season. Now, a similar ATO Pro Street version is making its way into five-liter Mustangs and full-sized pickups. Even some skeptical owners of big-block FoMoCo products are reconsidering the compact C-4.

Once upon a time, the always-tempting weight and size of the C-4 was overshadowed by its fragile reputation. In particular, Ford owners with modified powerplants and/or heavy vehicles were wary of this little transmission's voracious appetite for clutches, bands, servo gaskets, thrust washers and sealing rings. Even after beefier C-4s became available from the aftermarket, Ford bracket racers remained discouraged by the absence of any reliable C-4 transmission brake—a significant disadvantage against the GM competition's "braked" Powerglides and delay boxes.

ATO founder, Jim Galatioto, has been working on C-4 durability since the mid-1970s. It was a long-term development

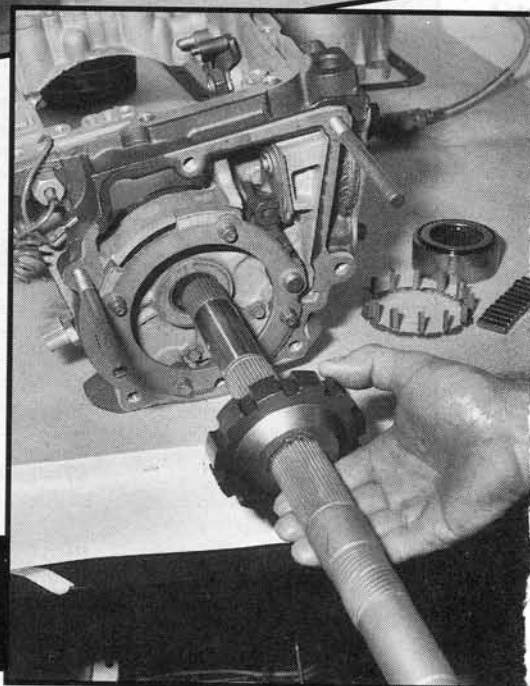
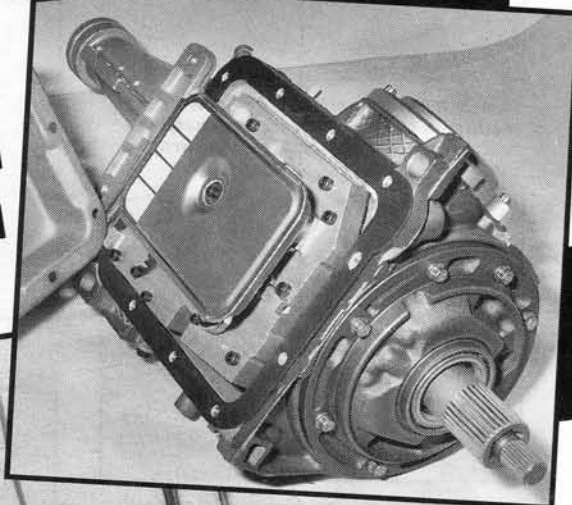
ATO owner Jim Galatioto begins the C-4 assembly process by installing his company's billet-aluminum second-gear servo.

program for off-road racing trucks that initially inspired him to experiment with various types of Teflon sealing rings, rollerized bearings, reinforced bands and billet-aluminum servo housings. At the same time, Jim was building lightened C-4 transmissions and torque converters for his drag racing customers, along with

Output shaft and parking gear are stock Ford parts. Visible on the table are the roller bearings and race of ATO's exclusive low-gear sprag.

Photos by author

The ATO High-Energy Servo assembly acts like a reinforcing girdle, preventing the gasket from blowing out. Two O-rings in the front of the cover increase the sealing power.

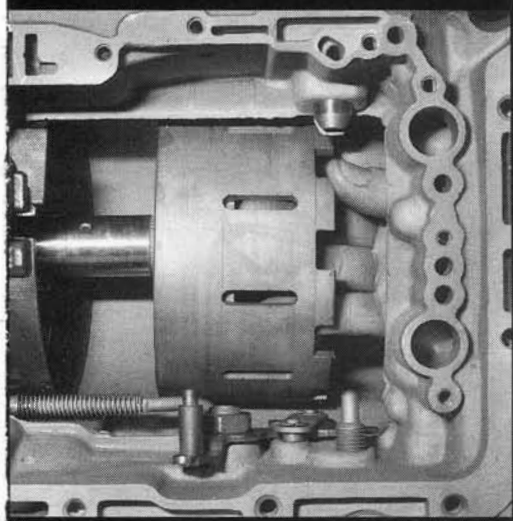


hard-hitting manual valve bodies. These diverse motorsports experiences ultimately resulted in the bulletproof, 81-pound racing gearbox pictured here.

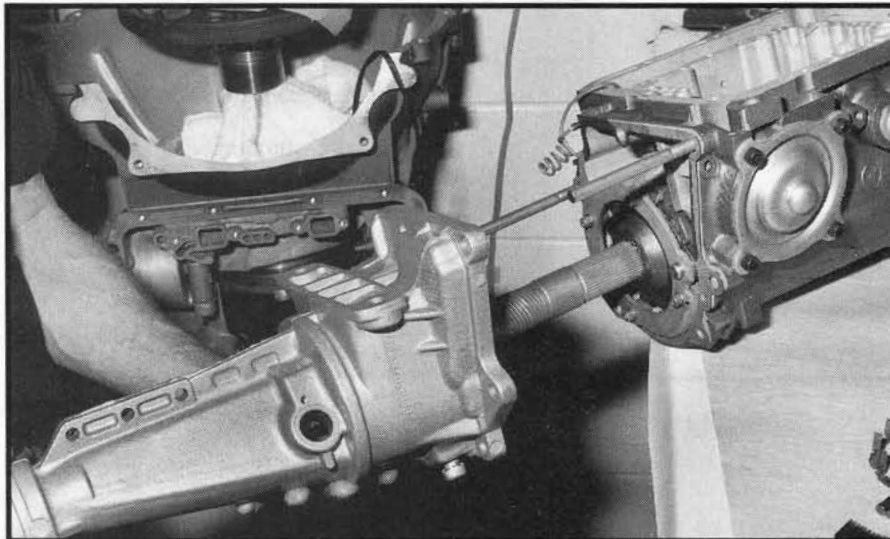
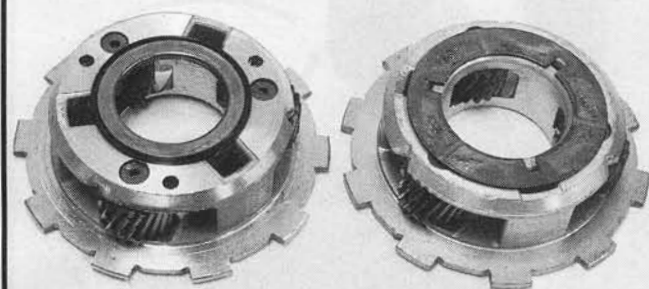
"That's 60 pounds less than a typical C-6," reminds Galatioto, "and most of that weight is in larger components that are rotating. Heavier components take more horsepower, because you've got to get that inertia moving. And the more fly-wheel weight you have, the longer it takes for the engine to respond and launch the vehicle. That's the beauty of the C-4: for the person who needs three speeds, here's a three-speed that's smaller and lighter, and requires less horsepower."

At present, Galatioto is content to lighten the reciprocating mass of its competition transmissions by carving large chunks of steel from stock Ford drive shells and clutch drums. (Eventually, ATO plans to reproduce these components in lightweight billet aluminum.) Machining the drums also speeds the outward flow of transmission fluid, reducing friction on the clutches inside.

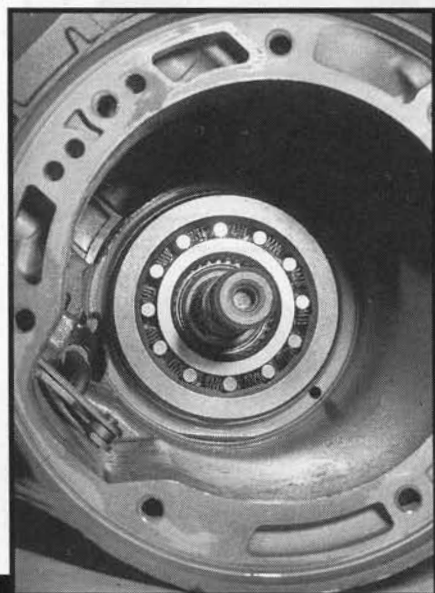
Reverse drum doubles as part of the holding power for ATO's trans brake. Lightening slots appear in racing units only.



ATO rear planetary (left) is fitted with low-drag roller bearings top and bottom, instead of the metal washers used by Ford (right).



Manual-valve-body applications permit removal of Ford's large governor housing. ATO leaves just enough surface to hold the parking pawl ring and arm in place. Extension housing is stock.



ATO's unique low-gear sprag has a roller thrust bearing machined into its race, replacing the factory's thrust washer.

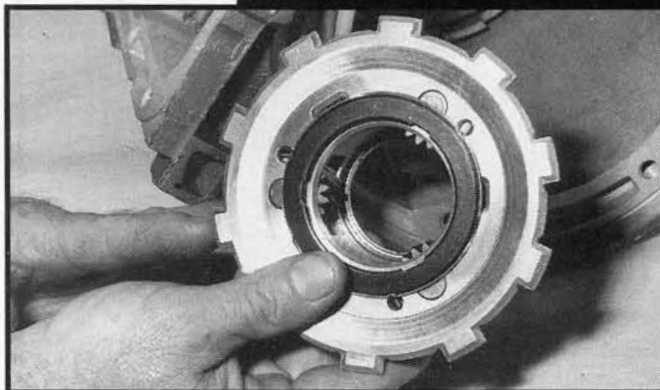
"A stock, fully enclosed drum is especially tough on the high-gear clutches," Jim explains. "Until the transmission shifts into high, these clutches are constantly spinning against steel plates. As the oil impacts itself into the stock drum for lubrication, it forces the plates to wear against the steel for extended periods of time, creating unnecessary friction."

Opening up the drum gets the fluid in and out quickly. You get as good or better lubrication, without the extra friction and wear."

Indeed, ensuring long life for any high-performance C-4 requires the reduction of excess heat and friction throughout its mechanical and hydraulic systems. A traditional weak spot is the back of the pump. In all ATO Pro Street and racing transmissions, the four cast-iron rings that seal the stator to the drum are replaced with .060-inch Teflon seals. Installed correctly, these hand-shaped seals will never wear out, according to Galatioto, thus eliminating pressure leaks and the resultant clutch failures that inevitably occur after the stock iron rings start wearing into their metal ring lands.

Factory thrust washers are another source of unnecessary friction and drag. Moreover, because there's no wear surface for these bronze-coated washers, they scuff and shed metal into the transmission fluid. Unless the fluid is changed religiously, the contaminated oil ultimately

With the ring gear installed (background), the rear planetary drops into position.

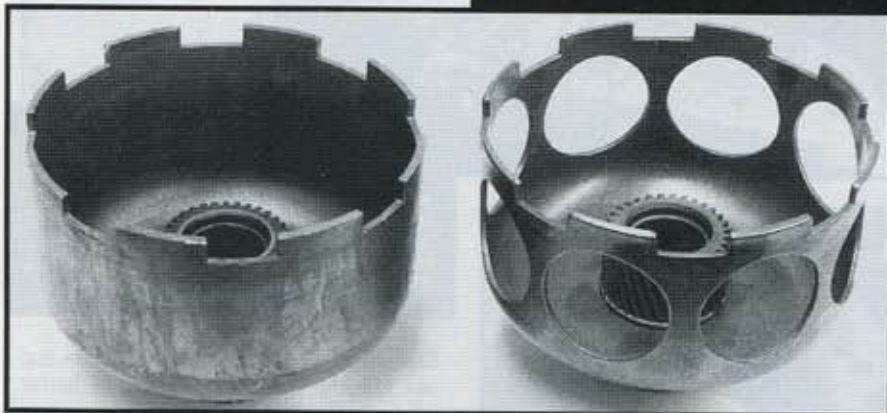


C-4

causes the valve body to malfunction. By substituting low-drag roller bearings for every thrust washer, ATO simultaneously prevents fluid contamination and frees up horsepower.

These substitutions demand delicate machining of various stock parts to create the registers that hold the needle bearings. Complicating matters is the

A stock drive shell (left) is extensively milled to reduce rotating weight in ATO competition transmissions.



Side-by-side comparison with factory parts (right) reveals two ATO Teflon rings in the front planetary, plus roller bearings in the ring gear. ATO also polishes the ring gear to provide the smoothest possible wear surface for the Teflon rings. Preparation is identical for all street and racing transmissions.

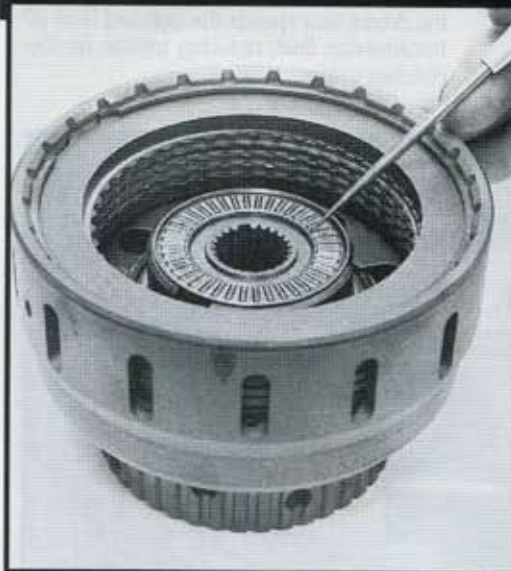


Planetary journal is machined to accept the .060-inch Teflon rings that replace a stock brass bushing. Teflon reduces friction and eliminates the particles resulting from metal-to-metal wear.

increased thickness of the new bearings, typically about .140-inch, compared to .062-inch for a standard thrust washer. Thus, ATO's registers must accommodate the bearing thickness plus the clearances necessary to retain original deck height of .062-inch. Complete roller bearings are standard ATO equipment in Pro Street and competition assemblies alike. A needle-bearing planetary kit is also available separately for about \$250.

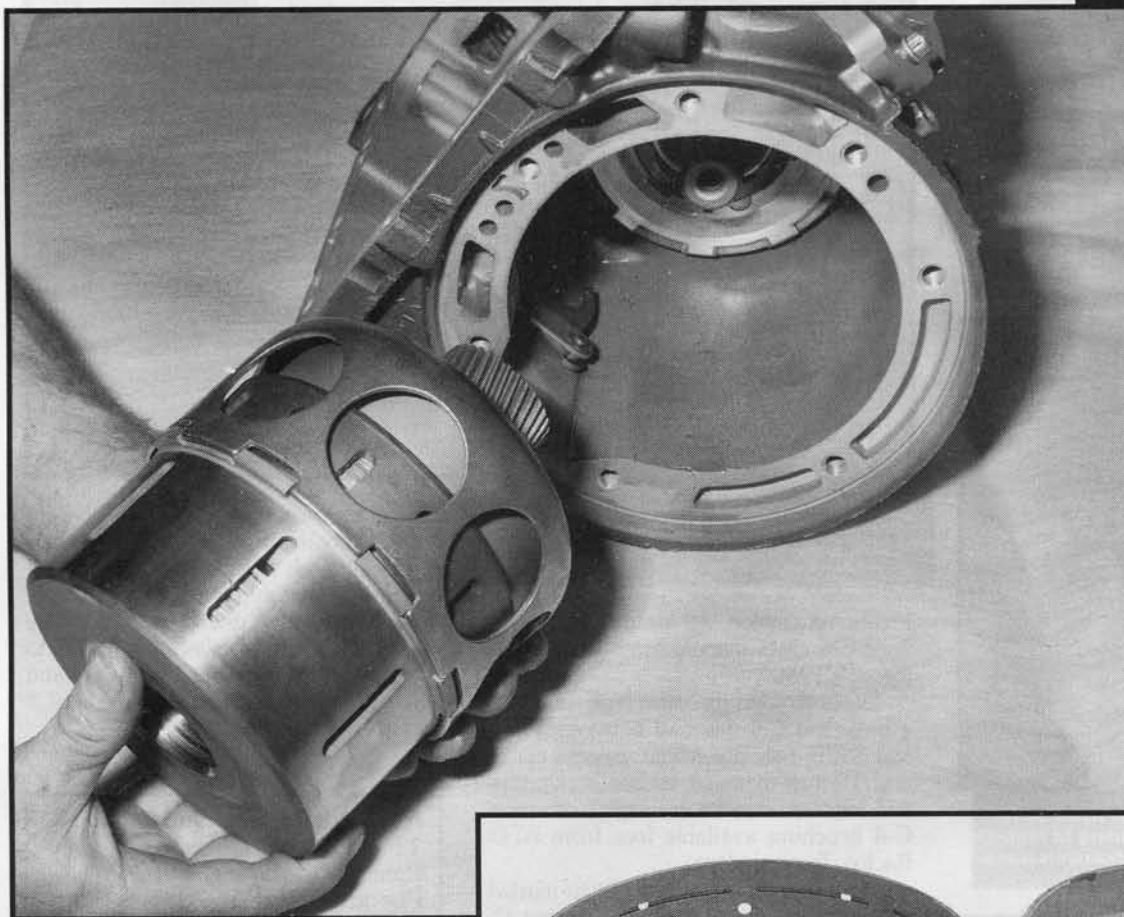
What really sets this company apart from other C-4 shops is ATO's line of performance valve bodies; in particular, the billet-aluminum model that controls a unique ATO transmission brake. Like other popular three-speed brakes, this

Roller thrust bearing is pressed into the forward clutch drum, replacing stock thrust washer. Machined slots appear in competition units only.



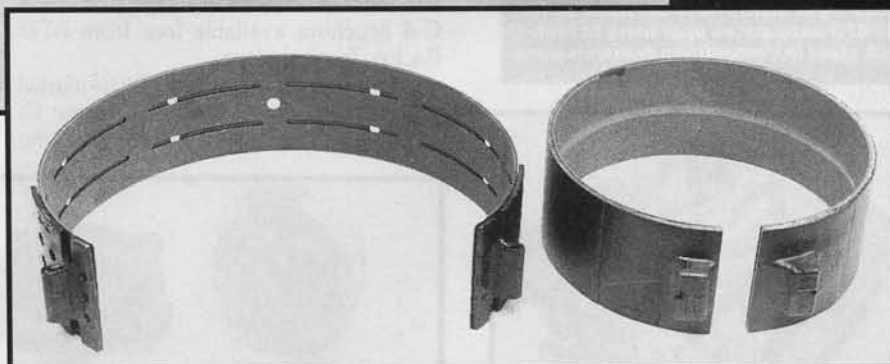
ATO's high-gear package includes piston, piston retainer, snap ring and Raybestos clutches. In drag racing transmissions, the drum is machined (as shown) to reduce weight and quickly disperse oil after the band is lubricated.



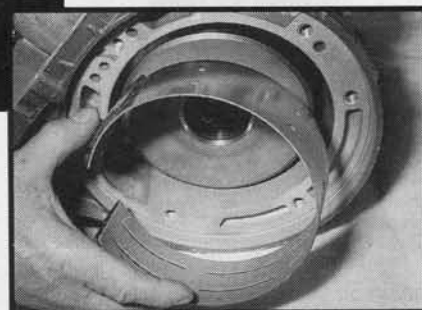


The direct clutch drum, forward clutch drum, drive shell and front planetary are installed as an assembly. The cumulative weight savings of machined ATO components is evident in this photo.

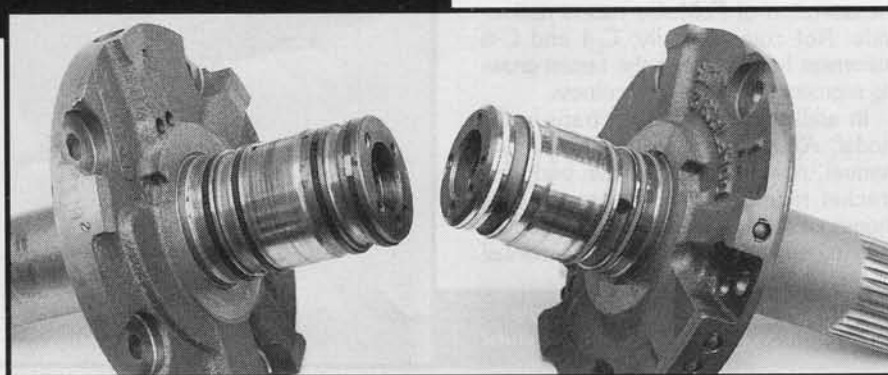
Trans-brake applications get a flexible second-gear band (left) that's been TIG-welded and relined for optimum strength. Other ATO transmissions retain Ford's solid-steel band (right).



Switching from a solid band to this reinforced flex band added 500-plus rpm to the holding power of ATO's trans brake.



The Teflon rings in ATO's modified stator (right) provide a tighter seal under pressure than Ford's metal sealing rings (left), and will last virtually forever. On the opposite side of the stator, the factory's drainback check valve is removed, ensuring continuous flow from the torque converter to the cooler.



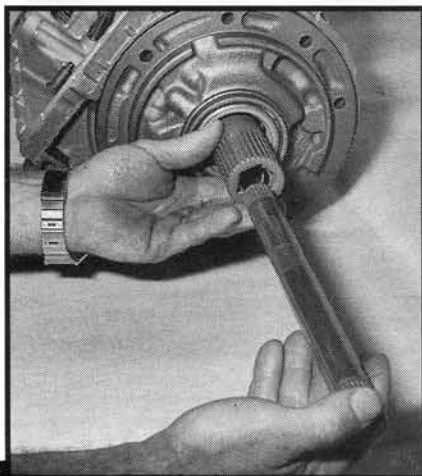
one locks up the transmission by preventing the output shaft from turning in low gear. To suddenly launch the car at 5000-plus rpm, the driver simply releases a button that's wired to a submersible solenoid inside the valve body.

Most other brake manufacturers rework a stock control body to apply, then suddenly release, the high-gear clutch and reverse band at the same time. But ATO's milled-aluminum valve body engages reverse and second, instead of high. Designer Galatioto cites a quicker release time for second gear, along with reduced clutch and band wear. Veteran Ford racers John, Ben and Ken Hultsman confirm the inventor's claims, and then some.

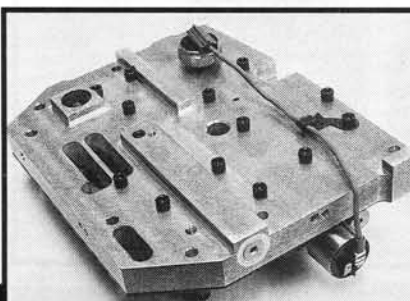
The Hultsmans told *Fabulous Mustangs* that they received their ATO valve body last June, just in time for NHRA's Winston Drag Racing Series meet at Sacramento (California) Raceway. There was no opportunity to test the unit beforehand. In his first experience with any type of trans brake, John's GT/MA '85 Mustang recorded its best-ever reaction time (a perfect .500), 60-foot time (1.52), elapsed time (11.35), and mph (116.56). Better yet, he won Super Stock Eliminator.

The following month at Sears Point Raceway, brother Ken's ATO-equipped '64 Comet Super Stocker repeated at NHRA's California Nationals. It was the Hultsman family's first national-event vic-

C-4



Stock input shafts have survived so far, but ATO anticipates upgrading to high-tech steel in competition transmissions.

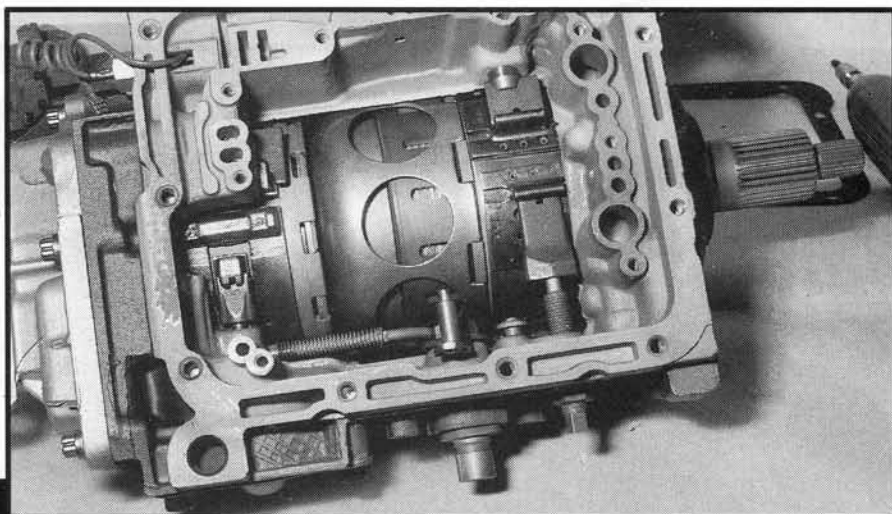


The brains of the transmission is this billet-aluminum control body. Pressure switch (rear) permits trans brake to apply in low gear only, eliminating any chance of accidentally locking up the rear wheels at speed. Special submersible solenoid (front) is electrically activated, but mechanically operated.

tory in 30 years of drag racing. It was also the big breakthrough that brought ATO to the attention of FoMoCo racers nationwide. Not coincidentally, C-4 and C-6 customers have become the fastest-growing segment of Galatioto's business.

In addition to the \$495 trans-brake model, ATO offers a conventional full-manual, reverse-pattern valve body for bracket racers. Street customers can choose either a vacuum-assisted, automatic valve body or a hard-hitting, full-manual

Complete and ready to install, ATO's competition C-4 weighs just 81 pounds!



Bottom view of the entire rotating assembly, ready for installation of the valve body.

Pro Street version. All are designed to fit Ford C-4 cases manufactured from 1965 through 1980.

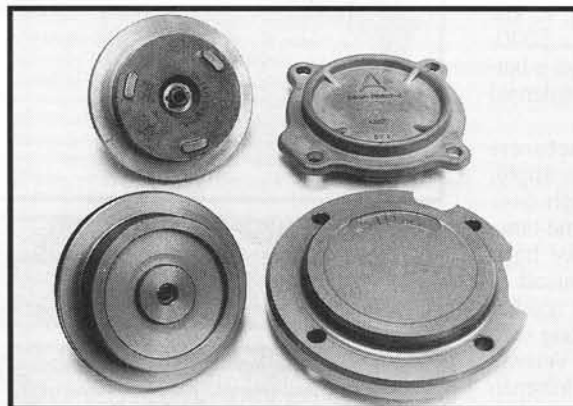
Depending on the valve body selected, a brakeless C-4 will cost between \$700 and \$935, fully assembled. Special eight- and 10-inch-diameter torque converters and other accessories are explained in the C-4 brochure available free from ATO Racing Transmissions.

Now that ATO has brought to market a competition three-speed that's some 15 pounds lighter than a Powerglide, the

company's owner has set a new goal for himself: breaking the 70-pound barrier! Jim Galatioto is already working on billet-aluminum prototypes of a front drum, rear drum, reverse drum and pump body that could collectively slash another 10 to 12 pounds of rotating weight. If and when he succeeds, you'll read about it first in *Fabulous Mustangs*. **FM**

ATO Racing Transmissions

11336 Sunco Dr., Suite C
Rancho Cordova, CA 95742
Phone (916) 631-9008
Fax (916) 631-9073



ATO's trans-brake valve body is designed to accept the filter and deep steel pan of a late-model C-5 transmission.

