

David Phipps looks into the outcome of the Cardinal project

## INNOVATION or EVOLUTION

A Ford Cortina won the East African Safari Rally, where toughness is more important than speed. Last year the Cortina won a number of sedan races, including the 12-hour event at Marlboro, proving both speed and durability. Its rival, German Ford's Taunus 12-M has an insignificant competition record, and its only high-speed durability demonstration to date has been an observed 222,000-mile run at Miramas in Southern France at an average speed of 65.71 mph. The car went off the track after 56,867 laps when the driver fell asleep, and while it was being repaired, a Cortina set a new 100,000-mile record at 72.10 mph.

From a point of view of design, the German car represents innovation while the British one stands for evolution. Which is best, and for what type of driving? We have now got some experience of all models within each range and have pleasure in presenting our findings.

Both cars sprang from the parent organization's desire to oppose Volkswagen in the U.S. market with

an American-built small car, and the radical suggestion which later became the Taunus 12-M nearly reached the production stage at River Rouge before both projects were handed over to Ford's European factories.

Five years after Ford's Cardinal project was instituted, the English and German Ford companies in the fall of 1962 announced new five-seater sedans of very similar outward appearance and highly contrasting technical specifications. The British Consul Cortina (which sprang from the Archbishop prototype, built up mainly of existing components in production at the Dagenham works) was entirely conventional, while the German Taunus 12-M featured a V-4 engine driving the front wheels, as on the Cardinal prototype (C/D October, 1962).

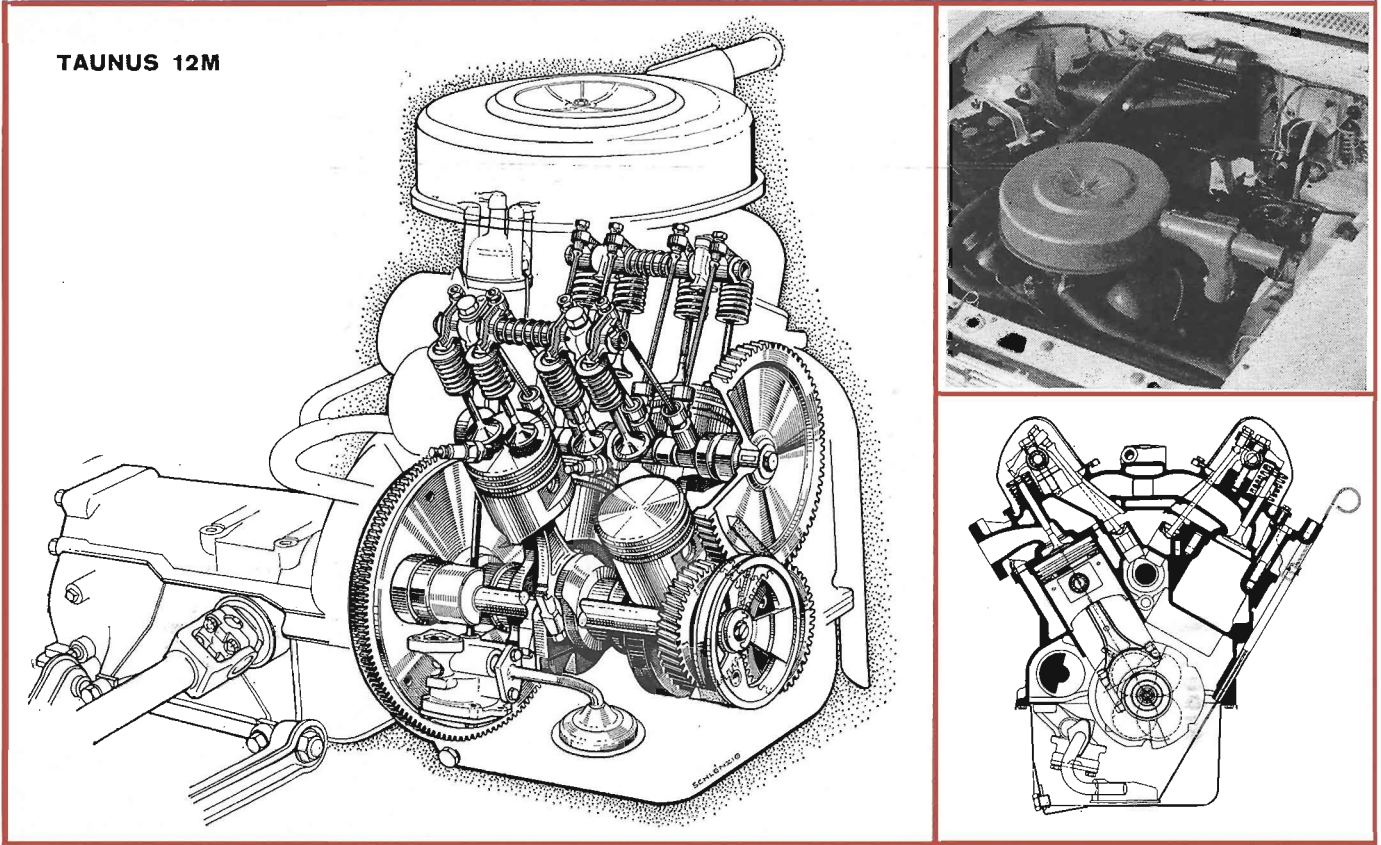
The Cardinal project originated in Cologne but the intention was to produce it in Dearborn. All the engineering on the Cardinal was carried out in Dearborn, since the Cologne engineering staff had their

hands full putting the finishing touches on the conventional 17-M model range. Then, as the market for compact cars became less attractive to Ford's market researchers, the Cardinal was seen as more of a threat to the Falcon than to the Volkswagen. The project was returned to Cologne for further development in the hands of Jules Gutzeit, chief engineer; Hans Kling, chief development engineer and brother of Daimler-Benz's competition manager Karl Kling; and August Momberger, a front-wheel-drive expert with years of experience from the Goliath branch of Borgward.

The Taunus 12-M began its production life as an addition to the existing model range at Cologne and was aimed directly at the Volkswagen market. By contrast, the Consul Cortina was a replacement for the Consul Classic, Dagenham's Edsel, which was run-down before its introduction and looked terribly dated.

Both the Taunus 12-M and the

## TAUNUS 12M



Cortina began their careers with 1.2-liter engines, and both have later been given more powerful 1.5-liter versions of the basic power plants. Initially they both came only as two-door sedans, but the 12-M range has been extended by a coupe and a station wagon while the Cortina range now includes a four-door sedan and a station wagon.

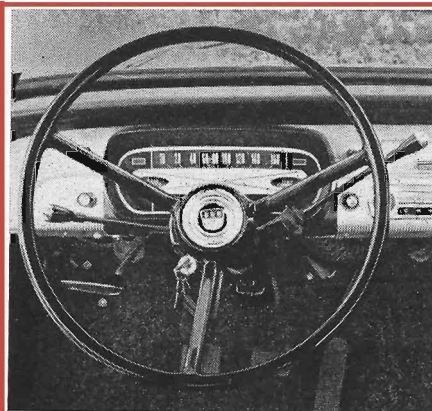
The standard 12-M is a thoroughly practical but not particularly exciting means of transport. However, its price has been kept within reach of the potential VW customer despite the very comprehensive equipment of the Taunus. Its engine is rather lumpy at idling speeds and sounds very busy at high rpm, but it will cruise all day at 75 mph and will cover long distances without unduly

tiring either driver or passenger, chiefly thanks to the soft springing and the spacious if not especially comfortable seats. Acceleration is leisurely in the gears and almost non-existent in top, but the car nevertheless gets along quite well by virtue of its predictable handling (firm understeer) and high directional stability. It also feels remarkably robust on poorly surfaced secondary roads.

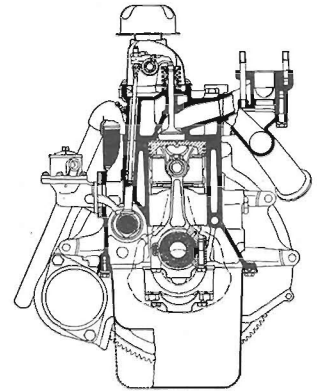
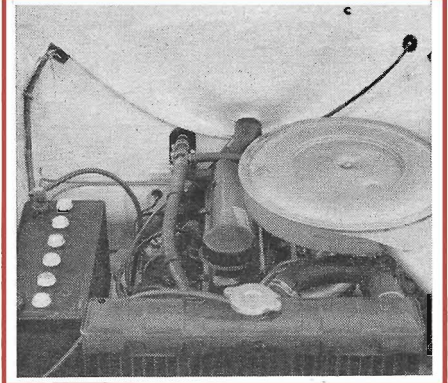
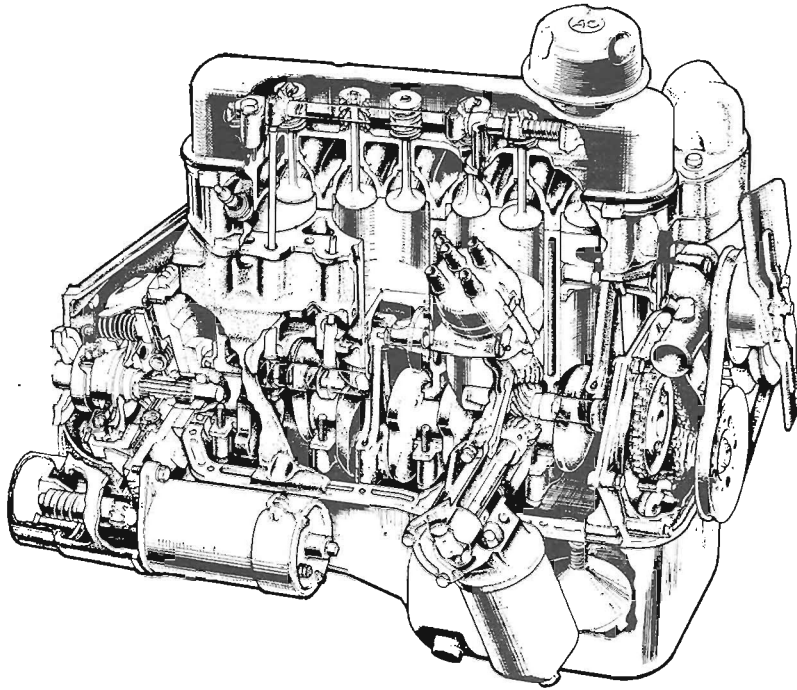
The 1.5-liter version of the 12-M combines these characteristics with a little more urge, which is most noticeable in the form of mid-range torque, and the TS goes a step further, becoming fully competitive in European-style motoring, and is capable of passing slow-moving traffic in reasonable safety. Like all

Taunus models, the TS retains a column gearshift, but it's an extremely good version and has unbeatable synchromesh on all four forward speeds.

Ford's front drive layout combines an inner Hooke joint with an outer Rzeppa joint, the latter having a maximum operating angle of 42°. The inner joint operates through much smaller angles and it was thought unnecessary to go to the expense of a constant-velocity design at the inner ends of the drive-shafts. On extreme jounce or rebound, there will be velocity pulsations in the shafts, however, and the Rzeppa joint faithfully transmits them to the wheel hub instead of canceling them out as another Hooke joint would have done. But the sys-



**CORTINA GT**



tem works very well in practice, on the Taunus 12-M as on all the front-drive models from the British Motor Corporation and Lancia.

With the increased power of the 1.5-liter 12-M, the basic understeer becomes more pronounced, and on the Nürburgring—especially the little-used South Circuit—it assumes such proportions as to suggest a reappearance of the monsters which are reputed to have pushed the big pre-war racing cars into the undergrowth. However, few people are going to drive the Taunus in this manner on the road (we hope), and anyone planning to use it in competition would presumably blow up the front tires and fit a stiffer rear anti-roll bar.

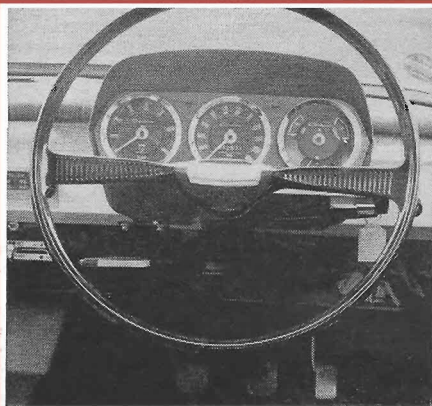
All Taunus interiors are well fin-

ished, with equipment ranging from a bench-type front seat (with divided backrest) and rubber mats on the basic car to separate seats and a pile carpet on the TS. A heater-cum-defroster unit is standard on all models, as it is in fact a vital part of the engine cooling system, which means that warm air is available very soon after a cold start. The heater core acts as a radiator until the water temperature reaches 178° F, after which the conventional radiator (which has no fan) comes into play, while the heater fan will be switched on automatically should the water temperature exceed 204° F. With the heater control in the "Off" position, all the warm air is directed away beneath the car.

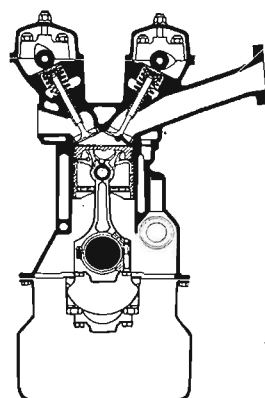
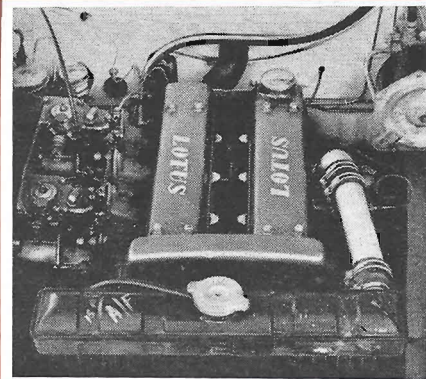
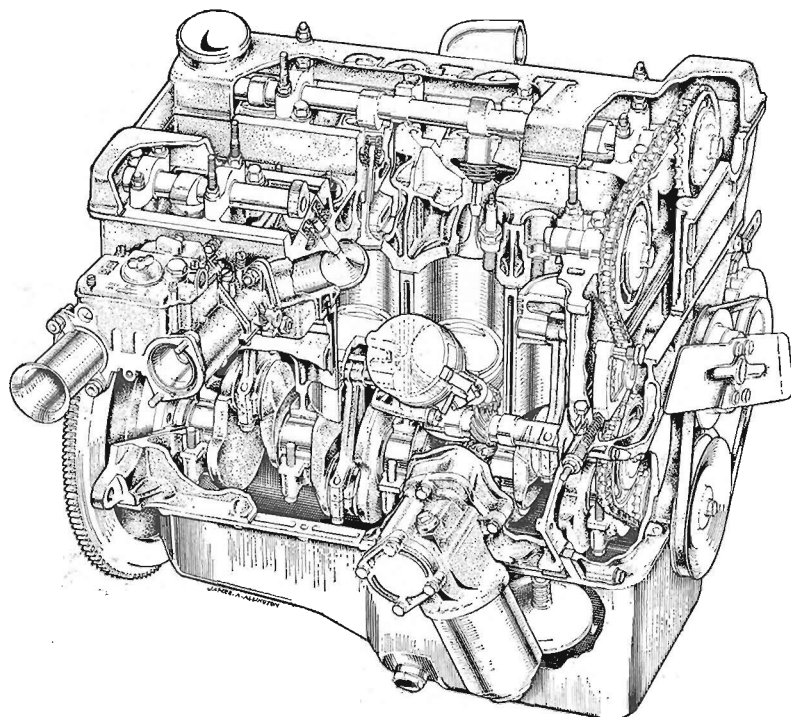
A useful optional extra on the

Taunus is a sunroof, operated by winding a handle, which is completely weatherproof when closed. The reversing light is a standard fitting.

The general architecture of the Taunus 12-M has not resulted in any spectacular gains in interior space, as might have been expected, although nobody will dispute the pleasure of having a completely flat floor. Front seat width in the Taunus is 116 in. against two seats of 53 in. each in the Cortina, and seat-to-ceiling distance is 86 in. against the Cortina's 83. But in the rear, the Cortina has a one-inch wider seat and only one inch less headroom. Rear seat to footwell distance is 50 in. on both cars, and front seat to pedals is adjustable between 38 and



## LOTUS CORTINA



48 in. on the Taunus and 36 and 46 in. on the Cortina. And the trunk of the German car is only moderately larger: depth 88 in. vs 104, height 41 in. vs 47, and width 136 in. vs 125, mainly because it uses a rigid "dead" rear axle which needs space to move around in.

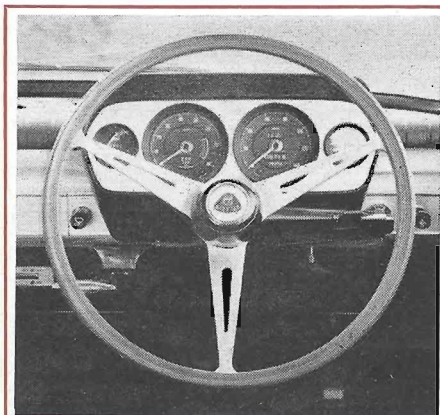
When the Cortina first appeared it was dismissed by sections of the motoring press as dull and uninteresting, yet it has become the fastest-selling car ever made in Britain, and one of the most successful competition sedans. Most of the sporting successes have been recorded with the GT version, but even with the 1.2-liter engine the Cortina is surprisingly lively and considerably more flexible than the 12-M. It also handles far better than it is entitled

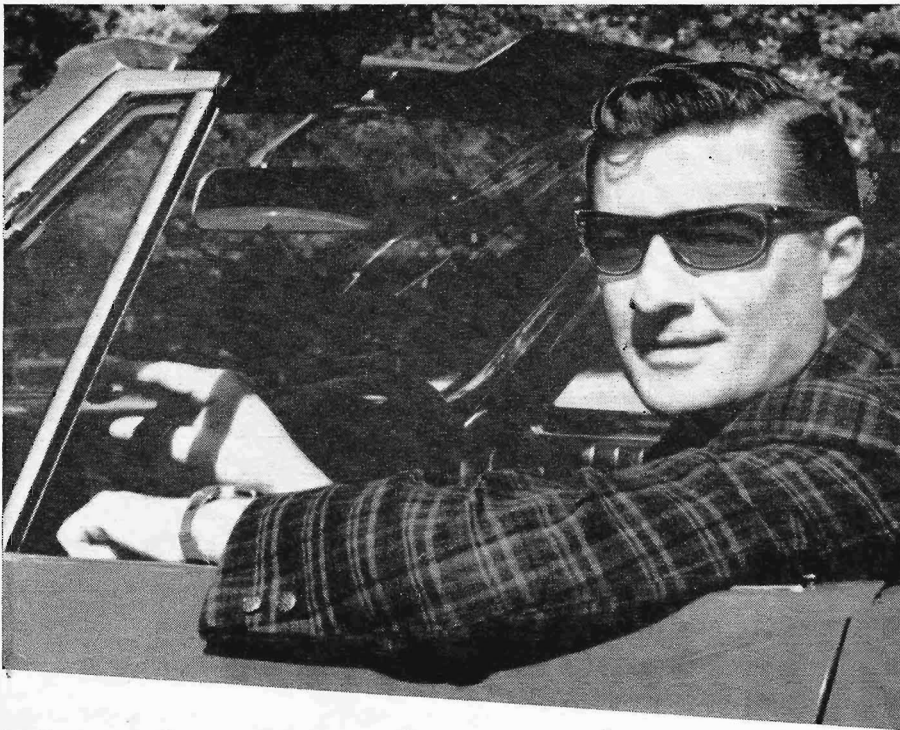
to and feels well balanced in all conditions, although the standard Firestone tires provide very little grip in the wet and make wheelspin in both first and second gears a common occurrence. A contributory factor is its 55/45 weight distribution, and the use of a live rear axle is another, especially in view of the car's lightness (curb weight 1720 lbs). By comparison, the Taunus has a curb weight of 1960 lbs and a weight distribution of 60.5/39.5—with the majority in this case on the driving wheels.

Although it has only a three-bearing crankshaft, the engine of the 1.2-liter Cortina is remarkably smooth—even to the extent that the five-bearing 1498cc unit offers no noticeable improvement in this

sphere. However, the design change to a five-bearing crank was made because experience with the 1340cc engine of the Classic indicated that an enlargement to 1.5 liters would make the engine harsh and noisy when installed in a car, although the bearing area appeared adequate for the expected power. Naturally, the 1498 cc unit has considerably higher low-speed torque, which enables the driver to make right-angle turns and traffic circles in third gear rather than second, and it provides significantly improved performance both through the gears and in top.

Stepping from a Super-Cortina into a GT, most people would be amazed at the performance improvement obtained by changing the  
*(Continued on page 76)*





carburetor from Solex to Weber, installing a four-branch exhaust manifold, and replacing the stock camshaft with a Cosworth cam. In dynamometer terms the increment is only 18.5 bhp, but on the road the 0-60 time comes down from 19.6 seconds to an even 12, and maximum speed is raised by 10 mph, all without any loss of flexibility. Disc front brakes provide commensurate stopping power, and stiffer springs and a stronger front anti-roll bar makes a noticeable difference in the handling.

As a result, the five-seater Cortina GT will out-drag the two-seater, 300 cc larger MGB up to about 65 mph, and will not by any means be outclassed on twisty roads. On smooth surfaces, in fact, its cornering power is remarkable, and it will hold its line in a positive manner not usually associated with sedans. Bumps in the middle of a turn naturally tend to upset the rigid rear axle, but doesn't do it quite as badly as might be expected, and the steering is quick enough to catch and hold an incipient slide as soon as it starts. It also remains pleasantly light, despite the stiffer anti-roll bar, and the extra power more than offsets any tendency toward increased understeer.

Another remarkable feature of the GT is that its fuel consumption is not significantly higher than that of the Super-Cortina or a hard-driven standard Cortina, while at steady speed above 60 mph it actually gets better mileage. This is a tribute to the efficiency of the Weber carburetor and a reminder of the advantages of "long" gearing.

Early Cortina GTs had a most unfortunate instrument layout, with the tachometer stuck on the steering column, and oil pressure gauge and ammeter located down by the driver's ankles, but current cars have a very neat panel of matching circular dials ahead of the driver. Standard Cortinas now have a similar layout, less tachometer. Other GT features include a remote-control gearshift instead of the cranked lever or column shift of the basic model. However, the GT has the same transmission with widely spaced ratios and an almost unacceptable "hole" between second and third, while the Lotus-Cortina has a very pleasant close-ratio gearbox. On all of them, the linkages are very good, but English Ford's synchromesh is not faultless. One GT modification we do not care for is the armrest/cubby-hole that displaces the handbrake to a very non-GT

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position under the dash. Still, it's not surprising that over 25% of Cortina 1.5-liter buyers are now opting for the GT version. If it only had a good independent rear end (BMW-type semi-trailing arms or Chapman struts, both of which have been used on experimental Cortinas) it would probably be The Best Buy among European sedans. Even as it is, at \$2225 (suggested retail price) as against \$1809 for the basic Cortina, it comes pretty high on the list.

The Lotus-Cortina looks very much like the standard car, but it's a vastly different proposition on the road. It goes like a rocket, handles like a Lotus, and sounds like a racing car, with thrashing timing chains, whining gears, thumping suspension and a clonking differential, not to mention exhaust resonance in the roof. It could almost be sold as the Lotus Super Seven Sedan. The engine doesn't really pull smoothly below 2000 rpm, which means that in traffic it spends much of its life in first and second. Still, this is no great disadvantage, as the clutch is relatively light (but fierce), the gearbox is, on the whole, pleasant, and using the gears means that instant performance is on tap.

The chief distinguishing feature of the Lotus-Cortina is a green flash on either flank and across the rear panel (like Ford's black Model T, you can have the Lotus-Cortina in any color you want so long as it is ermine white with a green flash). Enthusiasts will also notice the wide-rim wheels with Dunlop 6.00 x 13 tires, plus the small Lotus badges on the grille and both rear quarters. Alongside a standard Cortina the Lotus model is visibly lower, but all fundamental body components are unaltered. But for the use of stiffer springs and a heavier anti-roll bar, so is the front suspension. At the rear and under the hood modifications are more extensive; they involve replacing the standard semi-elliptic leaf springs with coil springs, locating the axle by means of an A-bracket and radius arms, and reducing unsprung weight by the use of a light alloy differential nose-piece. The engine has a twin-cam cylinder head (as described in our Road Research Report on the Lotus Elan, C/D, February, 1964) and an increased bore. A special competition version of this car is now available too, but the Lotus versions come only with right-hand drive, as the Burman steering gear seems to be incompatible with the massive four-branch exhaust system.

(Continued on page 78)



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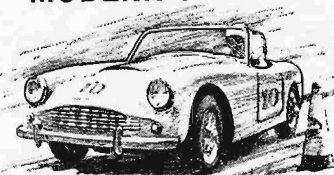
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## INNOVATION (cont. from Pg. 77)

The outstanding feature of the Lotus-Cortina is its handling, aided by steering which is considerably quicker than standard. Cornering power is way above that of a normal Cortina—probably more because of the wide rims and Dunlop tires than the suspension modifications, although the latter clearly play their part in reducing roll, axle tramp and wheelspin. But to get the best out of it, the car needs to be handled delicately—like a thoroughbred horse—and this also applies in the stopping department. Although the power-assisted brakes (9.5-in. discs front, 9-in. drums rear) work extremely well in response to relatively light pedal pressure, they need to be treated with caution in the wet as the rear wheels tend to lock first. The Cortina body is relatively free of wind noise at lower speeds, but the engine begins to sound busy at anything over 5500 rpm. A governor on the distributor prevents the red-line of 6500 rpm from being exceeded.

Because of its mixed parentage, the Lotus-Cortina is inevitably a compromise, but it's a lot of motorcar for \$4300 (F.O.B. England). It's not a car for pottering about town, nor is it suitable for attracting glam-

orous young ladies (it looks too much like a Cortina and makes too much noise) but for the real enthusiast it could be the answer to years of prayer.

Ford of Cologne has not seen fit to provide any alternative to the standard column-shift four-speed transmission, while Dagenham not only offers an optional close-ratio box for the Lotus versions but also makes the Cortina available with the Borg-Warner 35 as a factory-installed option or with the Hobbs Mecha-Matic as a dealer-installed option. The three-speed Borg-Warner unit is well tried and gives very smooth shifts, but it has a major disadvantage in that bottom gear can't be engaged above five mph, which sometimes makes it impossible to pass slow-moving traffic on uphill stretches. The Hobbs gearbox can be used automatically or manually, and has been shown to have an advantage over conventional manual transmissions on racing circuits, but for some reason (and we suspect political rather than technical) Ford—and other manufacturers—fight shy of it. This is a pity, as it seems to offer the best of both worlds and could well be the transmission of the future. Ironically, it

	TAUNUS 12-M	TAUNUS 12-M	TAUNUS 12-M TS	MUSTANG I	CORTINA	SUPER CORTINA	CORTINA GT	LOTUS CORTINA	LOTUS CORTINA
Engine type	V-4	V-4	V-4	V-4	4-L	4-L	4-L	4-L	Competitor 4-L
Displacement	1183	1498	1498	1498	1198	1498	1498	1558	1594
Compression	7.8:1	8.0:1	8.5:1	11.0:1	8.7:1	8.3:1	9.0:1	9.5:1	10.5:1
BHP @ 5000	50	57	62	109	53	64	83.5	105	140
Torque @ 5000	5000	5000	5000	6500	4800	4600	5200	5500	6500
Torque @ 2700	61.5	79.7	55	99	66.5	85.5	97	108	125
Carburetor	1 Solex	1 Solex	1 Solex	2 Weber	1 Solex	1 Zenith	1 Weber	2 Weber	2 Weber
Type	28 PDSI	28 PDSI	32 PDSI	D20A3	B-30	33 VN	DCD/1	40 DCOE/2	40 DCOE/2
Gear ratios									
Rev	3.96	3.96	3.96	3.96	3.96	3.96	3.96	2.81	2.81
1st	4.03	4.03	4.03	4.03	3.54	3.54	3.54	2.50	2.50
2nd	2.33	2.33	2.33	2.33	2.39	2.39	2.39	1.64	1.64
3rd	1.48	1.48	1.48	1.48	1.41	1.41	1.41	1.23	1.23
4th	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final drive	3.78	3.56	3.56	3.30	4.125	3.90	3.90	3.90	3.90
optional	4.125	4.125	4.125	3.56	—	—	—	3.77; 4.125;	4.125; 4.43
								4.43	
Tires									
mph/1000 rpm	5.60x13	5.60x13	5.60x13	5.30x13	5.20x13	5.60x13	5.60x13	6.00x13	5.50x13
Steering gear	17.8	18.9	18.9	21.7	15.7	17.3	17.3	17.9	18.3
0-60 mph (sec)	22.1	22.1	22.1	15.1	16.5:1	16.5:1	16.5:1	13.4:1	11.8:1
Standing 1/4-mile	24.4	19.6	17.2	8.0	22.4	19.6	12.0	11.0	8.2
Top speed (mph)	36.0	30.0	27.2	15.0	23.0	20.9	18.4	17.0	15.4
	77	85	84	125	79	83	93	107	128

**"So they will last 100,000 miles..."**

could well be adopted for the 12-M, as Hobbs is now developing a trans-axle version, as well as a high-torque model for more powerful cars.

Comparing the merits of the Cortina and the Taunus results in a very close finish. As for the engine, the Cortina scores on performance and flexibility while the Taunus offers better gas economy. In the transmission department, the Taunus wins out despite the Cortina options because of its better synchromesh action and superior power-to-ground transmission. The Cortina's brakes are more powerful and seem superior in terms of response, fade-resistance and pedal pressure. The Taunus is inherently more directionally stable, but the steering of the Cortina offers better response, accuracy and feedback. The Cortina must be acknowledged as the better-handling car. In addition, its suspension is superior in terms of roll stiffness, while the 12-M offers better ride comfort and harshness control. The controls, their location and relationship must also be adjudged to the Cortina, mainly because of the availability of floorshifts and the convenient handbrake (except on the GT). In interior space utilization, the Taunus has a clear advantage, but the Cortina has a more versatile heating and ventilation system, which will supply large amounts of either hot or cold fresh air, and can be set to provide warm air for the feet and cool air for breathing at the same time. On service accessibility, the score again goes to the Cortina. But in quality control, the general finish of its hardware and interior trim, the Taunus is superior. We also know that the Cortina is tough, but on overall robustness, we must give a point to the 12-M. The duel ends with eight points to seven in Dagenham's favor. How incongruous that Victor Raviolo, who is now Technical Director at Dagenham but was connected with the Cardinal project some years ago and favored the front-drive V-4 over the conventional Archbishop, is responsible for turning the latter into a car that is at least equivalent to the 12-M in its general characteristics and has the additional advantage of a great list of options. Colin Chapman's interest in the car must not be underestimated, but the GT was created without any help from Lotus, and that's the everyday car that comes out on top in this particular survey of the two automobiles in question.

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**WHEEL HOP** Car "skitters" around corners, or during acceleration and braking. You feel like you're about to lose it. **Cause:** Shocks not effective for small, high frequency wheel movements. No lag in Koni operation. Because of highly machined parts and patient Dutch assembly and testing, they will damp every bit of movement.

**FRONT END WALLOW** A "mushy" feeling encountered on entering a high speed corner or on wavy surfaces. **Cause:** Sometimes too-soft tires, but more often inadequate or worn-out shocks are responsible. Koni Shocks are built to last, won't let you down. They can be fully adjusted to take up wear, often go 100,000 miles without replacement.

**ROCKING HORSE RIDE** On all but the finest roads, you feel like you're in a rodeo. **Cause:** Unbalanced shock absorbers, resulting from overloading of front (or rear) suspension in the original design. Koni Shocks are built, adjusted and balanced to each make and model of car, and since there is no compromise in design, Konis have the full capacity to handle the loads at any speed.

**HIGH SPEED FLOAT** At speeds over 50 mph the car feels like it has lost touch with the road. Very unsafe. **Cause:** Shock absorber fade. Most shocks are limited in their capacity to handle high loads. Fluids bypass seals. Air become entrapped. Impossible on a Koni. Triple safe seals grow with use, can't admit air. Unique valve design stays on the job under all loads... without flinching.

**SEA SICK SYNDROME** Most often encountered by rear seat passengers. Occurs in some of the newest domestic products. **Cause:** Manufacturer's demand for a "soft" ride without providing an adequate shock absorber to control the large wheel movement at all speeds. Koni Shocks are designed and tuned to give positive, progressive control of the largest movements over the widest range of speeds. We make no apology to cost cutting departments.

**THEY BOLT ON TO THE ORIGINAL MOUNTS so any dealer can install Koni shocks** or you can do it. Each Koni comes complete with instructions. No modifications to your car. Done in less than an hour.

**\$19.50 A SHOCK FOR VWs, \$25 FOR CADILLACS** You can't get better handling, and you'll never buy another shock absorber for the life of your car. Supplied through your dealer, anywhere in the U.S. For further data, prices, dealer name, write the factory representative: Kensington Products Corporation, 240 West 60th Street, New York City 23. (In Canada: Eurocan Motor Products, Ltd., 9010 Park Avenue, Montreal 11.)

**KONI SHOCK ABSORBERS**

Send Data on Koni Shock Absorbers for

Year \_\_\_\_\_ Make \_\_\_\_\_ Model \_\_\_\_\_

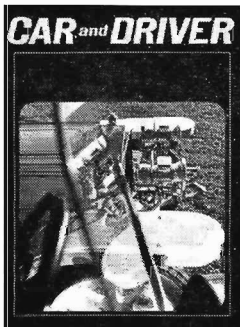
Your Name \_\_\_\_\_

Address \_\_\_\_\_

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