

FOUR-WHEEL-DRIVE Z-CARS

Ferguson Conversions on Police Ford Zephyrs

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THE first of the batch of 25 four-wheel-drive Ford Zephyrs ordered jointly by the Metropolitan Police and Mintech is now complete and undergoing test. Based on the conversion carried out on a Ford Mustang earlier this year, the modifications to the 3-litre police Zephyr are extremely neat, using some of the same parts designed for the Mustang. We were told that the design of these conversions is now so definitive that individual cars of the same configuration as the Zephyr, that is with a vee engine and Borg-Warner Type 35 transmission, can now be undertaken on a commercial basis once Ferguson Research commitments to the police and Mintech have been met.

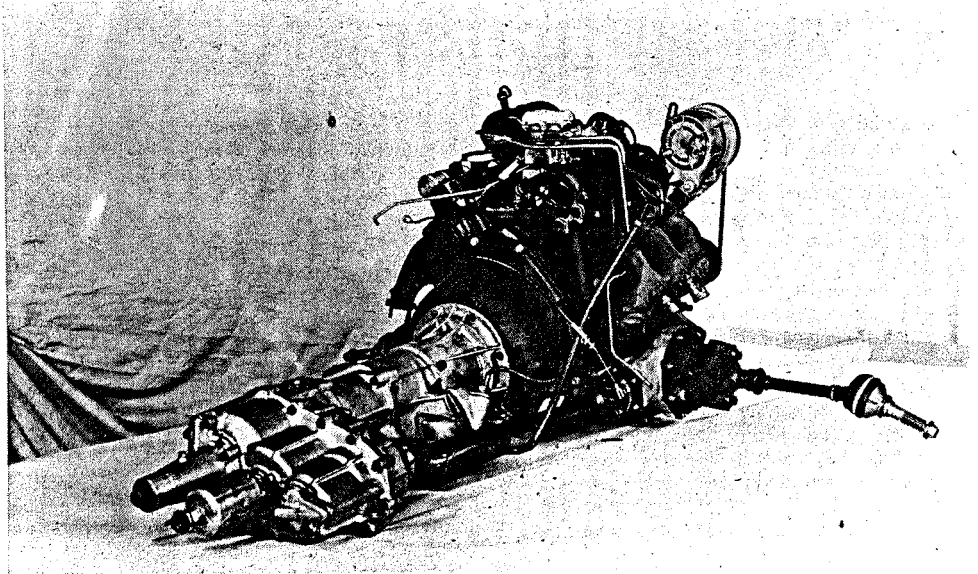
As a measure of cost, the price would not be more than £1,000 per vehicle if a batch of a dozen identical vehicles were converted. It is interesting to hear that costing exercises have been done on representative quantities up to 5,000 cars per year. In these numbers the extra cost to the customer would be about £400.

The most fundamental change to the standard Zephyr has been to convert the front suspension from the MacPherson strut type of the standard Zephyr to an unequal-length wishbone layout in order to allow the front drive shafts to pass through to the front hubs. This has entailed designing new front wheel carriers with live hubs, and modifying Mustang top wishbones to fit them and the revised suspension geometry. The MacPherson bottom "wishbone" formed by the front sway bar and transverse link is retained. Springing is by means of coil springs co-axial with Armstrong dampers, mounted above the top wishbones and butting into a special sheet metal housing welded to the inner faces of the front wing valances. It has also been necessary to fabricate a new front cross member, passing below the engine, to clear the front differential and to carry the inner pivots of the Mustang wishbones.

The decision to concentrate conversion round the Borg-Warner Type 35 transmission was helped by the police preference for automatic gear boxes on the score that they reduce driver fatigue and eliminate the cost of replacing clutches. Ferguson Research welcome the idea because, on private orders, there would be less tendency for customers to specify out-of-the-ordinary axle ratios. The transfer box casing is a mirror image of that of the Mustang conversion—the drive passes along the right hand side of the engine instead of on the left to clear the steering id'ar, with detail changes to match it to the Typ. 35 casing. Internally it has the

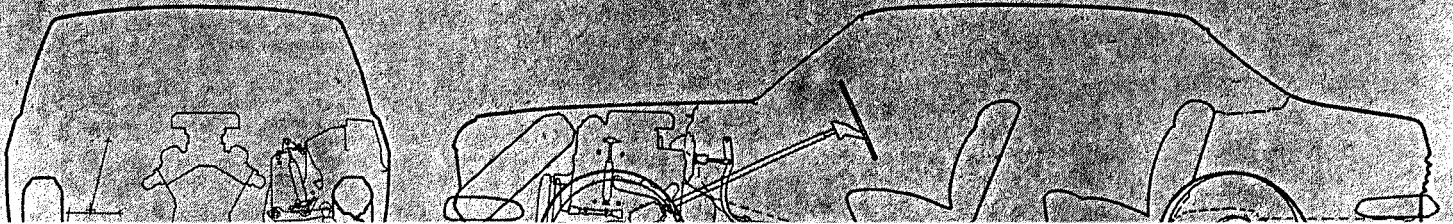
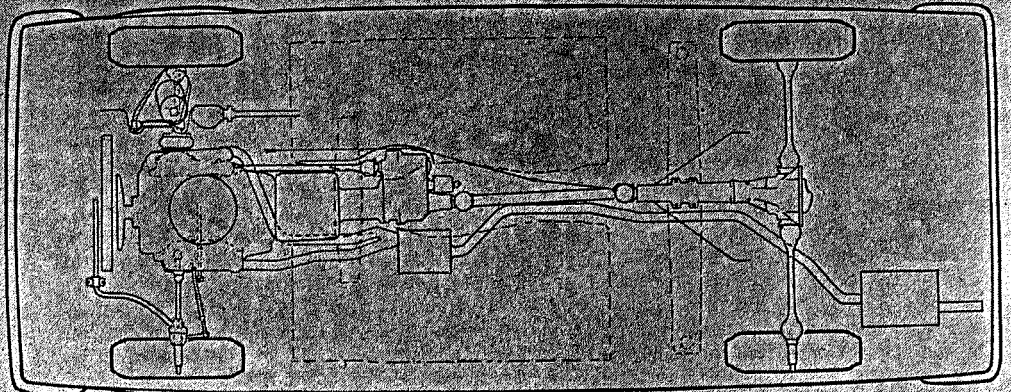
same Morse Hi-Vo chain drive stepping the drive sideways to the Ferguson self-locking fore-and-aft differential. This is geared to the Dunlop Maxaret unit which is mounted externally on the back face of the transfer casing. A new, cast aluminium sump incorporating the front drive casing replaces the original Ford sheet metal unit and it has been necessary to raise the engine approximately one inch and set it sideways to the left about two inches to get the ideal drive run. There is adequate clearance under the bonnet for this modification and there is no external visible evidence of it. Individual lubricants are used in the engine and front

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Complete engine and front transmission package. Gearbox is the Borg-Warner type 35 and the front differential is housed in a new aluminium sump casting

Layout of the Ferguson components in the Zephyr body



FERGUSON 4 WHEEL DRIVE

transmission, an internal partition being provided to separate them.

The front differential is of a perfectly straight-forward spiral bevel type, the only innovation in the front drive, for Ferguson, being to use Rotaflex "doughnut" rubber couplings at the inner ends of the drive shafts in place of the Lobro plunging Rzeppa type joints used on the Mustang. These were slightly susceptible to torque locking, incidentally a problem which has caused a deal of trouble on Lotus formula one cars this season. Outer joints are the Hardy Spicer Rzeppa type used on the BMC 1800 series.

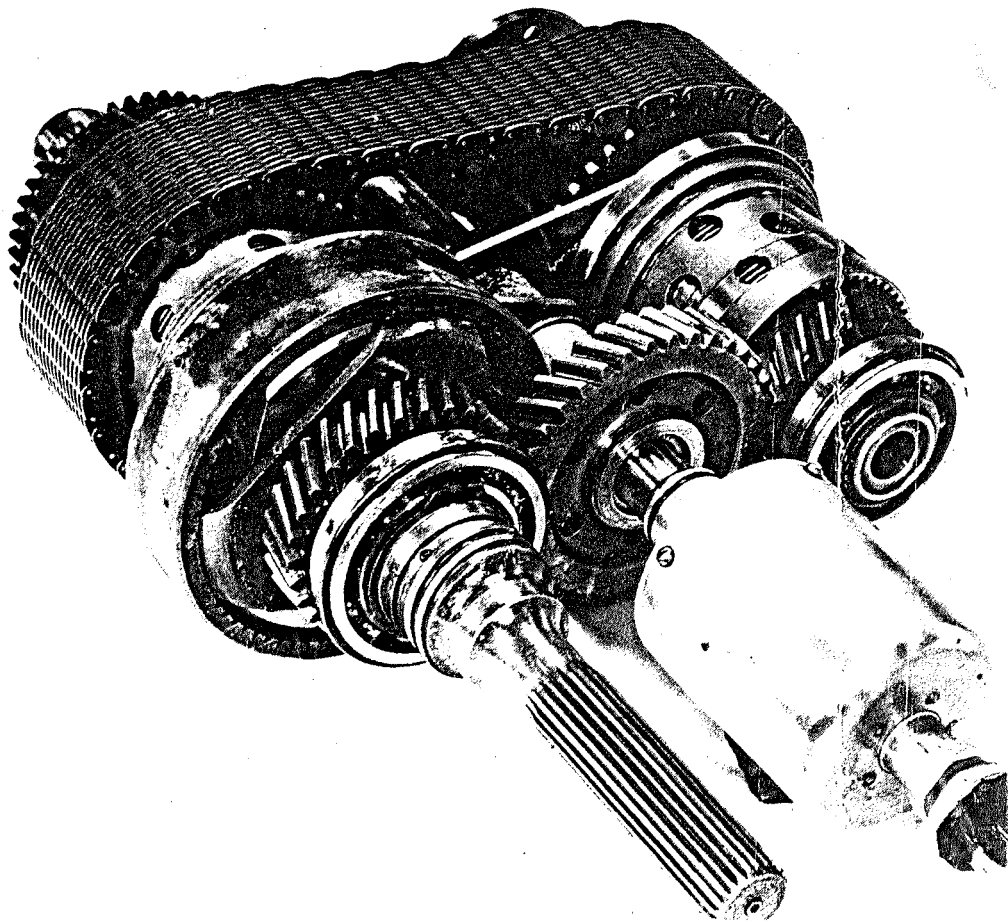
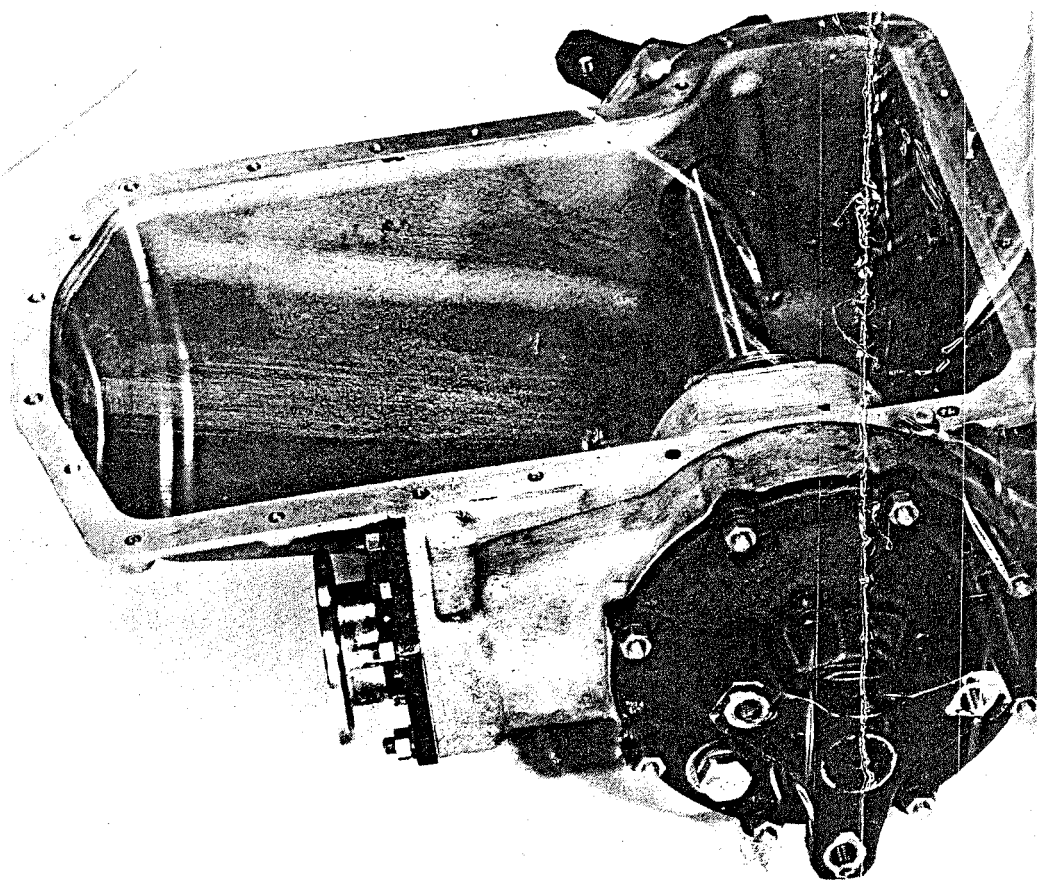
Except for a shortened rear propeller shaft the rest of the car, which is to police specification, is unchanged, and on the road will be impossible to discern from a normal Zephyr until it has to get away or stop on slippery surfaces.

Taking into account the additional mechanism involved, the weight penalty is commendably low. The transfer box and Ferguson differential add 73 lb in the middle of the car while the front-drive unit and cast sump together add a further 54 lb at the front. The small diameter, solid, front drive-shaft weighs 12 lb while the drive out to the front wheels including the hubs and joints adds 26 lb. Including 4 lb weight of transmission oil, the total extra transmission weight is 171 lb. The direct-acting Girling brake booster, Maxaret unit and solenoid vacuum bleed valve add another 25 lb.

With so much extra weight at the front of the car it would seem logical to move the spare wheel and battery into the boot and this could presumably be done on any privately commissioned conversions.

As more and more all-wheel-drive Ferguson cars get into circulation, the more desirable the system is seen to be from a safety standpoint in a wide variety of quite usual conditions—the roads are not always dry or non-greasy-wet in temperate England. The cost is undoubtedly high for the small quantities produced at the moment and in larger quantities it is still expensive. But the motor industry pundits, who have always poo-pooed the idea on the score of cost, could very well be proved wrong when the very real advantages of the system become widely appreciated.

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A new aluminium sump replaced the sheet metal Ford one, with a separate compartment for the differential oil

Drive for the front wheels is through a Morse Hi-Vo chain and the "can" on the back of the idler shaft is the Dunlop Maxaret anti-lock sensing unit