

TESTING

□ NEXT WEEK we carry our road test procedure and presentation a stage further, the most significant development being that henceforth they will occupy six instead of five pages. It is only two years since we increased from four to five; in pre-war days the space allocated was a mere 1½ or 2 pages, the first three-pagers arriving in 1951 and the next addition seven years later.

Two main reasons underly this gradual evolution. First, the vehicles have become more and more complex in design, and their abilities in terms of performance and road behaviour greatly extended; at the same time much new equipment has been added (heating and ventilation, screenwashing, signalling devices and so on), so there is more to write about.

Second, the motoring public generally is now much more interested in the subject. With this wider understanding and appreciation of the technicalities it has grown far more critical and selective.

By increasing our wing-spread, so to speak, we can find room for more information, and are taking advantage of this to extend our test procedure on braking. Next week's six-page test (of the Jaguar S-type) will include our first measurements on brake fade, with a diagram to illustrate brake behaviour during 10 successive stops from 70 m.p.h. More details about this anon. We hope that our revised layout of the tests as a whole will make their content easier to absorb as well as more attractive to look at.

YOU may wonder how and why we decide to change our Road Test procedure and presentation. The answer is quite simple—that though the findings of occasional reader opinion polls, a constant interchange of letters with readers, and our personal discussions with “off-duty” friends, we know that these tests are the most important single feature of our journal. This knowledge keeps us on our toes, trying to maintain the standard and improve it when we can.

Inevitably our tests have their critics for a variety of reasons, not all really valid when you come to think of them; for instance—why do we borrow test cars from the manufacturers? Would it not be more representative to buy them unheralded from showrooms and test them over a longer period? Answer—not practical, if we are to continue publishing a full test every week. Buying 52 cars a year from, say, Minis to Maseratis would cost a lot of money, take up a lot of administration time—and involve perhaps 150,000 miles of running-in alone!

Agreed: then wouldn't it be better to borrow them from distributors rather than manufacturers? Answer—but distributors, as “interested parties” are just as deeply involved as the manufacturers, and what is to stop *them* from giving the cars “special attention”? Besides, whereas we know certain manufacturers used to “fix” test cars, and very occasionally have reason to suspect this still, those guilty in the past have usually suffered in the long run from dissatisfied customers complaining bitterly because their cars would not go so well as ours did, and repeatedly taking them back for adjustment. Our long experience gives us a good idea what a car should do, even a new type. Also, we often have a new model for test before any have gone out to distributors.

Do we not “miss out” through not running each car 10,000 miles like *Which?*, for instance? Answer—inevitably, in certain respects; but our job is to report on the performance, handling and equipment as soon as the new car becomes available. In fact, we buy a selection of cars for our

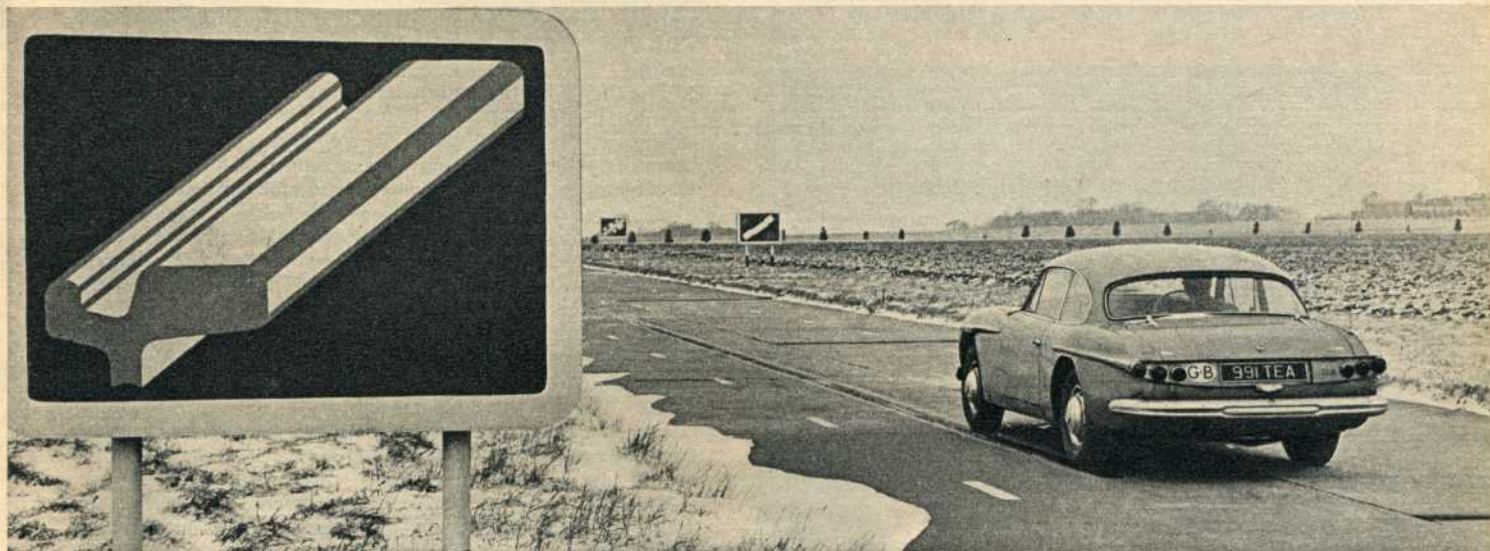
fleet and keep careful record for a year or two as well. Moreover, whereas new cars sometimes suffer a lot of troubles in their first 5,000-10,000 miles, most settle down after that and do much better for the next 20,000 or so.

Our chief aims in these weekly tests are, first, to establish the car's abilities in terms of measured performance (speed, acceleration, braking, fuel consumption) using the best equipment we can find for this purpose; and second, to discover how the car behaves on the road, and to deal with this aspect subjectively in such a manner that a prospective buyer should have something more than plain facts and figures to guide him. We also include a comprehensive data table as a reference for amateur and professional engineers, and so that the technical features, equipment and dimensions of each car can be compared.

miserable job, despite having the use of a big lock-up garage with strip-lighting.

Every evening someone takes the car for a drive, the tester responsible for it naturally having priority; and when anyone has a journey to do, he may use the test car if it is convenient.

The day before the car's performance figures are to be taken (weather permitting) the company garage installs one of our electric Petrometers for measuring fuel consumption. This instrument comprises a metering head which is piped into the fuel delivery line between pump and carburettor and connected to the car's electrical supply; it is also wired up to a small counting-head carried in the car, which registers every two-thousandth part of a gallon passing through to the carburettor. This can count up to one million, or 500 gallons, so in addition to using it for measur-



Ride and handling: tyre and suspension characteristics are investigated on the M.I.R.A. circuit of bumps, cambers and even tramlines (as displayed by the sign on the left)

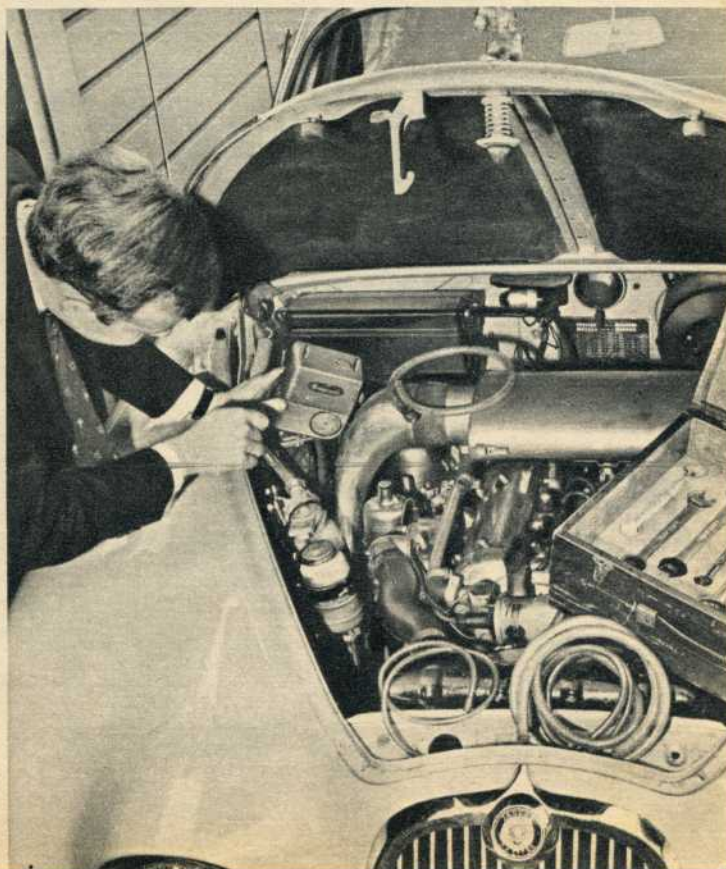
Is one man responsible for each test, or are they collective efforts?—Answer: Yes in both cases, with this reservation: that, while an individual is responsible for putting together and writing each test, the opinions expressed are collective, since as many of the staff as possible try out each car and pass on their reactions and opinions in writing.

Would we admit to having ever misjudged a car? Answer—of course! In our view it doesn't happen often, but we are human and fallible like people in any profession. Occasionally we have been a bit "carried away" by an enterprising design, only to discover a few months later that in regular service it isn't really all that good. Conversely, we may have underestimated one or two cars which have not shown their true worth during our fortnight's tenancy. Although we usually keep test cars for only 15 days one or more of our drivers is likely to have had other opportunities to drive similar cars.

How we go Testing

Let's assume that all the preliminaries of telephone calls, letters, postponements and so on are over, and the test car has been delivered to Dorset House. First job is to start a log card for it, entering a few special details such as recommended tyre pressures (which we do not always stick to), type of fuel and oil to be used and so on. Then one of us takes it to the local filling-station to brim the fuel tank and check the oil level. Probably the photographers have been alerted already, since it's best to take the formal pictures before a car gets dirty. The artists, too, are told when the car will be available to measure the main dimensions, draw the general arrangement diagrams, and, of course, those splendid little annotated sketches showing the control layout. In the winter theirs can be a rather cold and

Fuel consumption: an electric Petrometer is fitted between the fuel pump and carburettors with a counter head inside the car



COME TESTING . . .



Acceleration: at the start of the quarter-mile on the M.I.R.A. No. 2 straight, the Jensen takes off trailing the electric fifth wheel for speed measurements. Several runs are made each way



Acceleration: an observer notes times from the recording stopwatch after a run. Between his legs is the head of the electric speedometer

ing the rate of fuel consumption at constant speeds between 30 and 100 m.p.h., we also employ it for ordinary road journeys. In this way we can determine the car's rates of consumption in varied conditions of traffic and topography, when being driven hard, normally or perhaps very gently.

The garage also clamps a towing eye on to the rear bumper. This is for our fifth wheel speedometer, which consists of a heavy duty cycle wheel carried in forks which pivot on a one-way hydraulic damper, designed to keep the wheel in contact with the road as much as possible. A flexible cable drive, driving a worm gear incorporated in the hub, turns a small generator, with long leads connecting it to a speedometer head carried in the car. Messrs. Boone and Porter of Hammersmith manufacture these fifth wheel speedometers, and the generator and instruments are supplied by Smiths. The accuracy of this apparatus is usually with about 0.5 per cent at 140 m.p.h., which is the highest reading.

The fifth wheel speedometer, using a small-section bicycle tyre pumped to fairly high pressure, has no problem with differential tyre expansion in relation to speed, and is therefore potentially much more accurate than any device run off one of the car's wheels. By attaching a gear-driven distance recorder to a fifth wheel and taking several readings over the same measured stretch of several miles, at widely varying speeds, we have satisfied ourselves that it remains extraordinarily accurate at any speed. Even when it is being bounced somewhat, the wheel's inertia keeps it going.

Our main testing area is the Motor Industry Research Association establishment near Nuneaton, where there is a 2.8-mile banked circuit, an inner road circuit for testing brakes and roadholding, as well as a special "handling" circuit full of everyday hazards such as corners with reverse camber, tramlines, and washboard. Here is also a test hill with a 1-in-3 slope at one side, 1-in-4 on the other—as well as steering pad, water splash, dust tunnel and so on. We avoid the dust tunnel; that's for the manufacturers to play with.

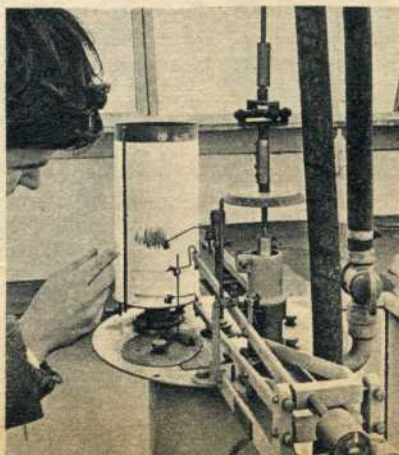
Having booked in at the watchtower, we begin by checking weather conditions—temperature, barometer pressure and wind speed. Next we attach our fifth wheel, check the car's tyre pressures, oil and fuel levels, and probably start work taking acceleration figures on one of two strips laid out for this purpose.

This has measured quarter-miles with marker posts for each direction, and is long enough to allow a powerful car to reach 100 m.p.h. or more. Our figures are hand-timed, usually on a Swiss Heuer recording stop-watch. This has an annular ink reservoir at the tip of the needle, and a spring nib which deposits a spot of this on the clock face each time a small button is pressed. With it one can record any number of elapsed times on a single run up to 60sec. Three runs in both directions are usually the minimum for each set of figures from a standing start; but often one needs several dummy runs to determine the best way of leaving the mark, and the most advantageous points at which to change gear. This is particularly important for sports cars, of course, where fractions of seconds saved in performance testing are all-important. The "same-gear" figures (in 20 m.p.h. increments) are quite straightforward and require no skill.

Next we take to the outer circuit. This is semi-triangular in shape, with three banked curves, and can be lapped comfortably up to 110 m.p.h. In fact, the lap record stands at over 150 m.p.h. (Jaguar tester Norman Dewis in a D-type sports racer). Here we first check the readings of the car's speedometer with those shown by the fifth wheel instrument, and then set about gathering the constant speed fuel consumption figures. While the driver holds the car at steady speeds his assistant starts the fuel meter ticking at a mile post, switches it off two miles later; and repeats the procedure from 30 m.p.h. up to the car's practical cruising limit, although never above 110 m.p.h.

If the car has a maximum not higher than 110 m.p.h. we time it over several flat-out laps around this high-speed

Weather conditions: readings of wind velocity are taken from the anemograph on the roof of the M.I.R.A. control tower, together with barometric pressure and temperature



circuit. The figure is usually practically identical to the mean top speed achieved on a straight and level road.

For brake testing we attach a pressometer to the brake pedal and fix a Mintex U-tube accelerometer to the screen with rubber suckers. This is set to zero with the car on level ground, and shows a plus or minus reading on a vertical scale like that of a thermometer, depending on whether one is accelerating or braking. It reads as a percentage of *g*. The sequence of operations is as follows: First the car is accelerated to just over 30 m.p.h., then the driver puts the car lever in neutral and presses the brake pedal to give a steady reading of 25lb on his pressure gauge, while his observer watches the Mintex reading as the fluid level drops. This operation is repeated at increasing pedal loads until no greater retardation can be shown by the U-tube. A few cars can manage 1.0*g*, and a handful even better. Handbrake retardation is also noted, but not the pull needed on the lever.

Beginning next week we are to include a brake fade test. This has long been in our minds and we hope the scheme evolved will be fair to all types of car, bearing in mind that the greatest enemy of a brake system is the car's accelerative power. In other words, a vehicle that can accelerate quickly to a high speed after being braked hard gives the discs or drums and their friction pads or linings little time to cool off between applications. So we are basing our successive applications of the brake pedal on a distance rather than a time factor. The car will be driven to 70 m.p.h. and braked to a standstill at a constant 0.5*g* retardation 10 times, with approximately $\frac{1}{4}$ -mile between each stop. Cars that cannot accelerate quickly will automatically give their brakes a longer recovery period. Brake friction materials vary in their behaviour, hard ones (used in fast cars) often becoming more efficient as they warm up; then the pedal load to reach 0.5*g* is reduced. Brake fade will be indicated if the pedal load required to sustain 0.5*g* increases to any marked extent, and this we shall portray on a graph.

Measuring Turning Circles

Years ago we used to quote the manufacturers' figures for turning circles, but have since found the official figures often quite inaccurate. Our method is to place the car with both its rear hubs over a straight line, and with the front wheels at full lock in either direction. Then a plumb-line is lowered from the outer front corner (usually the bumper end), and its point of contact with terra firma marked with, say, a coin. Another marker is placed against the front tyre that side. Then the car is driven slowly round through 180 deg, until its back wheels are over the same line but with the car pointing in the opposite direction. Front tyre and bumper positions are again pin-pointed, and the distance between the pairs of tyre and bumper markers are measured. The operation is then repeated in the opposite direction.

Test cars are always taken over M.I.R.A.'s special surface of high-frequency corrugated concrete, simulating the wash-board-surfaced dirt roads found in certain overseas territories, and the stone-set *pavé* for which Belgium used to be renowned. Although U.K. owners who stick to the better roads when travelling on the Continent need not be too concerned about our remarks, a car's behaviour on these horrors will show up inadequate spring damping, and any structural shortcomings leading to creaks and rattles or suchlike. Plunging repeatedly through a long concrete water trough here may upset braking efficiency or stability, show the need for some baffle to stop water short-circuiting the ignition system, or betray weather sealing faults round the bulkhead, door frames or pedals.

Although our subjective analysis of a car's roadholding characteristics is based mostly on its behaviour over public roads, at the M.I.R.A. Proving Grounds we can really let our hair down, hustling it round the unbanked inner circuit and special handling courses in the certainty that nothing will be coming the other way, and test its reactions to the very limit.

To establish the maximum speed we run the car in both directions over the same stretch of motorway, where possible in new sections which do not yet lead to anywhere important, and therefore are fairly free of traffic. Very fast cars mean a crack-of-dawn start, and occasionally we make an expedition to a continental motorway. **R. B. and G. P. H.**



Handling: on the inner road circuit at M.I.R.A. fast cornering reveals each car's characteristics at the limit of adhesion



Braking: to measure the ultimate retardation it is usually best to hold the wheels just on the point of locking, although on some cars the weight transference forward causes the back to lock-up early



Braking: from 30 m.p.h. in neutral the car is braked at constant pedal pressure and the retardation read off the Mintex manometer. When this picture was taken 50lb produced 0.34*g*

Weight: each car is weighed at the L.C.C. office. The car straddles two weighbridges to give the front and rear axle loadings separately to calculate the fore and aft distribution

