play your ace

Formulae for winning form on AC's Bristol-powered race winner.

by Dennis May

► With AC's delectable Ace Bristol, like most dual purpose sports cars, there are other ways of giving lap times a shave or improving average speed potential on the highway besides manuring the herbs under the hood. This hometruth, aired briefly in *SCI's* December 1958 issue, struck us afresh during a recent flirtation with an Ace that has probably contested more races and won more bawbees than any other AC extant.

VPL442, the car in question, is the property of Ken Rudd, managing director of K. N. Rudd (Engineers) Ltd., of Worthing, Sussex, England, who is known anyway by name to Ace fanciers all over the world. It could be that if Rudd hadn't wooed Charles Hurlock of AC and T. V. G. Selby of Bristol into a triangular lunch date back in 1954 the Ace Bristol would never have been born. On a different plane (more of this in its proper place) it was Rudd who once involuntarily demonstrated that the eupeptic Bristol engine will survive competition rigors with a mixture of oil and beer in the sump.

If you don't have a Ferrari income, any sports car you're likely to own will offer great scope for experimentation and workbench surgery; the point is, though, that some are worth it and some aren't. The Ace Bristol, with its rigid tubular chassis, well engineered independent suspension all around, and a hemispherical headed engine that is seemingly impervious to the march of the decades, is worth it.

Let's start with roadability, handling, control finesse, furniture arrangements for optimum driver convenience. The Ace, of course, is a handmade car, and one-at-a-time construction has advantages and disadvantages. Among the latter are occasional deviations from dimensional exactitude. Rear wheel camber is a case in point. On paper, the wheels have 2 deg. of negative camber with the car unladen; in practice, this angle can vary slightly, not only as between one car and another but between two wheels on the same car. An Ace with this form of built-in limp will naturally lack precise uniformity of cornering characteristics, thisaway compared with thataway. The cure is to have an exactly symmetrical replacement main leaf made up, also a new helper leaf.

The pure drift, as is well known, doesn't come naturally to the Ace but its predilection for staying on invisible rails is surmountable. To make it more driftworthy you need a whiff of oversteer, and the way to get it is to decrease negative camber of the back wheels by fitting a longer spring. Whether it's worth it or not is much a matter of individual taste. Adapted for drifting, the Ace probably won't be any faster through corners but it will feel and look faster. When Stirling Moss tried a normally rigged Ace at Goodwood circuit he was two seconds per lap slower than Rudd's best times, simply because he was instinctively trying, unsuccessfully, to tweak 'er into drifts.

For reasons that aren't too obvious, incidentally, the AC's characteristic unsliding progress pays a better dividend under night racing conditions than by day, as Rudd discovered en route to winning the three-hour sports car event at Snetterton, Norfolk, in 1957; after dark, with his Ace traveling the way it was pointed on turns, his headlamps lit up the outfield markers with perfect clarity, whereas rivals on live-

axle cars found their candlepower beamed at a virtually useless angle, obliquely towards the infield.

Pertinent to everything foregoing, and a good deal of what's to follow, is the fact that Rudd uses Michelin X tires exclusively (they are standard AC issue, of course); many of the words we're taking out of his mouth would be inapplicable to Aces shod otherwise. His considered advice, unless you are more interested in looking and feeling fast than in going fast, is to stay on X's, which are the proper complement to the phenomenal sidebite that the Ditton firm builds into its products. The pressures he recommends as a starting point for experiment — and naturally subject to considerable variations to suit different courses and degrees of surface humidity, if any — are 28 psi front and 30 rear. This assumes the car has disc brakes in front and drums at the back, a factor that affects unsprung weight (discs are heavier than drums). With drums all around, the front tires need about 2 psi less.

It's worth checking wheels for circularity. Ovality in excess of about 1/8 inch warrants a rebuild of the wheel.

As issued, the Ace's weight is distributed in the proportions of roughly 49% on the front wheels, 51% rear. For hill-climbs, if and when such modifications are permitted, Ken lightens the back end by running with a 4 gallon fuel tank, located directly over the axle. Apart from its effect on the balance of the car — you might or might not consider it beneficial — it eliminates fuel surge, which can cause momentary weakening of the mixture and consequent valve burning. A light and/or resited tank is obviously a factor with a bearing on wheel camber. Sharply negative cambered wheels are liable to hit the inside of the arches on full bump, a matter that can be rectified by switching to 15-inch wheels. But this in turn, of course, where conditions call for a drop in ratio. lowers the effective gearing, and will perhaps be a convenient way of doing so

As far as the Ace can be said to possess a vice, it takes the form of a sort of rhythmic side-chop or lurch under certain cornering conditions. This quirk, which isn't as dangerous as it possibly feels to an unaccustomed driver, can be banished by the longer back spring recipe for a modicum of oversteer. Then, with the chop eliminated, you can, if you're a really dedicated empiricst, try playing around with *front* spring spans; for some tastes, a fractionally overlength front spring is a good thing to have. Keep an eye on your spring anchorage nuts too, front and back both; if they work loose even slightly, as they may, most of your chassis tuning program will be nullified.

If and when an X-shod Ace breaks away at the back end, don't resort to panic corrections, advises Rudd; the tail won't flail as far or as fast as you think, and an overdose of compensatory lock is apt to aggravate rather than rectify a situation that is just getting interesting.

As replacements for the regular fixed-rate shocks, AC sell Armstrong sets with external adjusters. These Rudd classifies as a luxury rather than a necessity, but certainly they provide a convenient and inexpensive way of ringing changes on suspension characteristics.

The attachment of the steering box to the chassis could use some extra rigidity, distortion of the mounting bracket being appreciable when X tires are fitted. To kill the lost motion you can interpose a straight tubular strut, with suitably trapped and formed ends, between the box and the bridge carrying the front suspension system. I believe a stiffener of this type is available from AC, but it's the sort of simple item that anyone could have fabricated locally.

With front disc brakes and drums aft, grabbing of the rear pair is a fault the Ace is occasionally heir to. It occurs because the drum brakes do very little work under low pedal pressures, and they still don't do much at beefier pressures because of high back-to-front weight transference; consequently, high spots will survive on the rear linings for mileages up to maybe 10,000. These must be eradicated by lapping. Make sure, too, that the disc brakes have no shake on the front hubs.

Imposing proportions of the Ace's handbrake lever flatter its performance, due to the fact it's mounted on the bulkhead straddling the body behind the cockpit. You can't expect mere sheet metal to resist such leverage and it doesn't, not totally anyway. The resulting lost motion doesn't matter in racing or street work, of course, but for rally tests and suchlike it's worthwhile rigging a new mounting to put the brunt on the chassis itself rather than a body component.

Every last control on VPL442 has been reworked one way or another, even including the steering wheel. In spite of having a telescopically adjusted steering column, the Ace wheel's range of movement is such that in the faraway position it denies a long-armed driver some reach he could comfortably use. Rudd accordingly lopped an inch off the top of the post . . . then found himself short on knuckle clearance relative to the edge of the cockpit. To beat *that* one he junked the standard wheel and fitted a smaller one; the increase in effective steering ratio didn't do any harm. This post-shortening mod, incidentally, involves the sacrifice of the column's adjustability.

I don't know whether Aces are still being issued with the steering wheel fitted so the spokes obscure the speedometer and tacho dials, but many of the cars in circulation have this peculiarity. The cure is obvious anyway — take the thing off and put it back properly.

All three pedals on the Ace have a superfluously long range of movement, and they don't line up ideally for heel-and-toeing the brake and throttle. On VPL442 and its predecessors *chez* Rudd, Ken shortened the accelerator travel by repositioning the pivots on the carb actuating levers, then reduced pedal throw by adding a stop; this brought the movement down from around 9-inches to between 4 and 5. Similar stops were rigged for the brake and clutch pedals, arranged so all three pads finished up in the same plane. The large overall travel of the clutch pedal was totally unnecessary because only the initial half-inch (approximately) of movement does any actual trade.

Apropos Borg and Beckware, Rudd is not an exponent of a racing clutch on Aces, except perhaps for very exceptional conditions of use. It was only recently he first installed a racing clutch on VPL442, and he considers its drawbacks outweigh its advantages. If this is so in his case, with 148 bhp to transmit, there aren't likely to be many Ace operators who'll stand to benefit from the bonus spring strength. The AC driveline is a fairly unyielding piece of mechanism (and none the worse for that, either), and virtually devoid of wind-up; so the sole outlet for inertia in violent takeoffs is through wheelspin, which in delicate operations like hillclimb standing starts is an obvious embarassment if it's excessive. Going from third to top gear at maximum revs with the throttle wide open, using the standard clutch, Rudd says he gets a momentary whiff of incendiary smell but nothing worse. If the clutch has a bad time under this punishment, it anyway recovers fast.

To conclude the catalog of amendments and addenda in the controls department, VPL442 features some extra degrees of crick in the shift stick, to bring the knob back where it'll be conveniently reachable with the seat shunted well to the rear; and a block of wood to serve as a footrest, just above the dipper switch, which the driver's foot is otherwise apt to crowd.

Standard location for the clutch and brake fluid reservoirs is just back of the rear exhaust downpipe, where local heat is intense and by no means beneficial to these important liquids. Rudd therefore resites the canisters on the firewall, somewhere around the centerline of the car. Mainly for use in rally tests, he has fitted his Ace with a hand throttle control; this is attached to one of the dash support tubes, just above the transmisison hump, and takes the form of an English type motorcycle ignition control, connecting with the carbs through a cased cable.

Additions to the dash constellation on VPL442 include a switch for the electric pump that supplements the original fuel feed system, and another switch in the dynamo field circuit. With the latter at "off" the Bristol is relieved of a generating chore that eats up 2 bhp at full power. The Ace's staple means of raising gas from the tank to the triple Solexes is a mechanical pump, feeding fuel into one end of a gallery pipe flanking the carbs; the supplementary electric pump draws fuel from the side of the tank remote from the mechanical supply, and delivers it to the opposite end of the gallery. This duplication of pumps (now, incidentally, an optional AC extra), eliminates the momentary starvation of one Solex, or maybe two, that can occur under certain conditions.

In general, the Ace doesn't suffer from excess weight, but there are at least a couple of places where the poundage can be pared, assuming this doesn't contravene regulations you'll be racing under. Rudd replaces the standard battery with a lightweight job, and usefully bants his radiator and its appurtenances. The regular rad is bigger than its duties warrant, both in surface area and thickness. His firm made one up that is superficially re-

duced and also shallower in section, enabling the mounting brackets to be lightened as well. Overall saving is of the 30% order.

And talking of cooling, he dispenses with a fan altogether in competition, without incurring any overheating penalty. Located as it is, almost laughably remote from the radiator, the fan is suspectedly ineffective above about 20 mph anyway, while it absorbs around 2 bhp at maximum power.

Unless AC have had a change of heart in very recent times, Aces are still being issued with their header tank filler caps drilled to defeat the system's intended 4 psi of pressurisation. You can put those 4 psi to a good use in long races, so the thing to do is throw the perforated cap away and drop in at your local BMC dealer for a Morris replacement. It's exactly the same, only it doesn't have the unwanted hole.

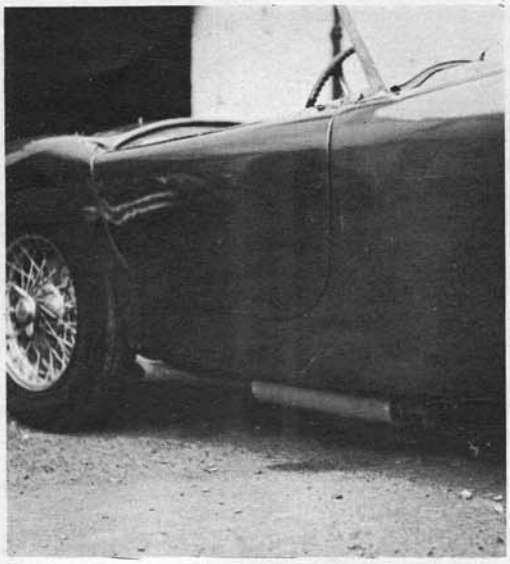
The radiator cowl that AC currently include among their optional extras for competition was originally a Rudd invention. He developed it in pre-Bristol days, found it was worth 4 mph in conjunction with AC's immemorial single-ohc engine. It gives the Ace Bristol more than that.

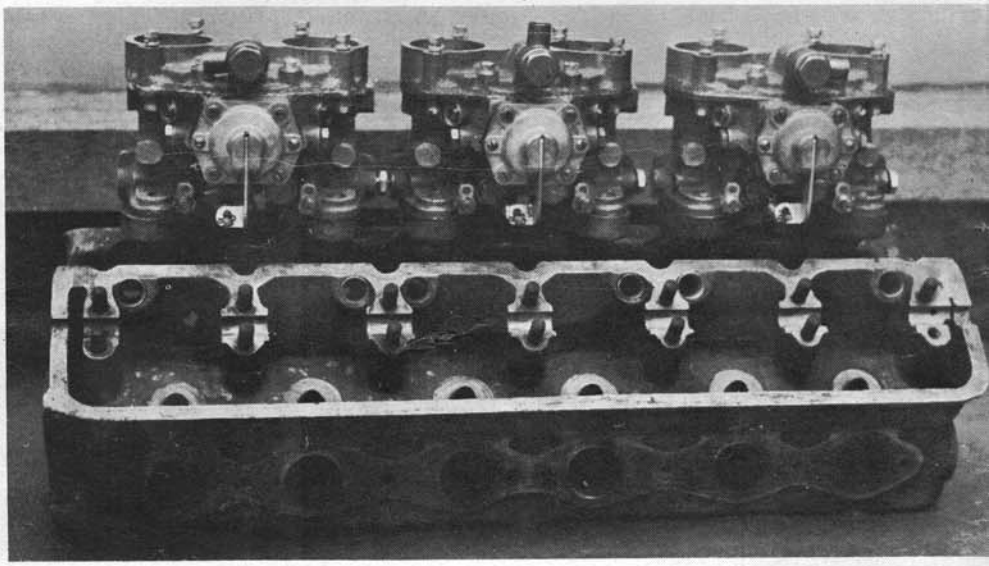
Undershielding an Ace to cut drag is a three-stage operation. Very good results are gotten without going any further than stage one, which consists of cowling in the bottom of the car from the underside of the air intake mouth to the front cross member. The next stage shuts in the nether area from this cross member to the front of the sump. Finally, if you take your racing really seriously, you can add a last sheet of alloy to enclose the space from the back of the engine (leaving the underbelly of the engine itself exposed) to the fuel tank.

With either one of these stages of shielding, an oil cooler is indispensible; even without any of them, nobody in his sense races a Bristol, or indeed operates it anywhere in its more advanced states of tune, without this somewhat expensive item of equipment.

Rudd naturally had an oil cooler on his Ace when taking part in the British ranking event for the European rally championship last year. At an advanced stage of the rally, when he was on the point of retiring for the purely personal reason that he'd contracted pneumonia, he and his co-driver noticed their oil pressure was dickering between 2 and 5 psi. Investigation revealed that the sump was not merely full but overflowing with a light, frothy and altogether evil looking swill. It was calcuable that over 100 miles of rigorous motoring had elapsed since any hypothetical saboteur could have had privy access to the car. Later, when Ken was rid of his pneumonia, he had the stuff analysed. It consisted primarily of motor oil and beer, plus the Bardahl lacing his engines always get. It isn't every engine, even with the aid of Bardahl and an oil cooler, that will keep right on functioning with a high percentage of Whitbread's pale ale in the pan.

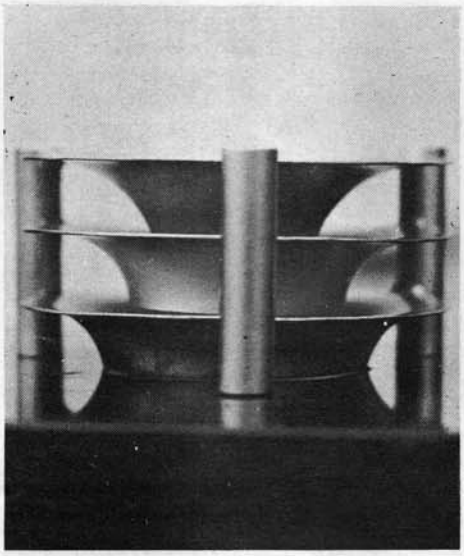
If you're thinking of sculpting a scoop in an Ace Bristol's hood to get cold air to the carbs, think twice. Experiments in

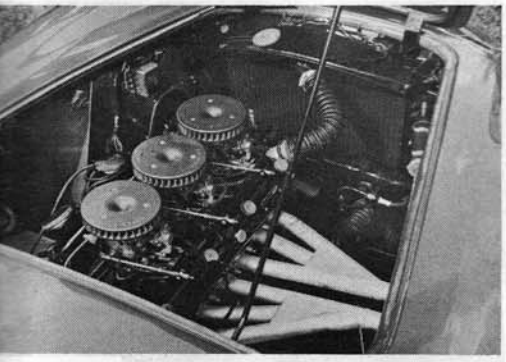




Experimental six-port Bristol head (above) developed by Ken Rudd. New top hamper accommodates three triple choke Solex carburetors. It has not been completely de-bugged, and at present cost prevents production.

Vocal Le Mans exhaust system (far left) as fitted to Rudd's Ace Bristol has outlet ahead of the back wheel. Gear shift lever (left) is bent to bring it closer to wheel rim when in third gear. Rudd-type carb air straighteners (below) add about 4 bhp at top end.





Aces with Bristol (above) power have been fairly successful in US racing. With super tuning, ala Rudd's VPL442, they become even more of a threat.

Englishman Ken Rudd (left), whose Ace has very seldom been trumped, swigs victory drink at end of Snetterton 3-hour race.

this vein were tried on the 1957 Le Mans car, but rather puzzingly led to the conclusion that the thing preferred warm air. During Goodwood tests, those responsible for the car's development alternately blanked and unblanked the forward facing scoop without telling the test drivers what they'd done; repeatedly, lap times were faster with the scoop shuttered off. Admittedly, however, the two new type ACs that ran at Le Mans last year featured scoops in their hood tops, and presumably these were open.

Talking of Le Mans reminds us, with a certain irrelevancy to our main theme, of the piquant circumstances in which the Bolton/Stoop AC raced into eighth place overall in last year's prix of endurance — a story hitherto untold. Somewhere around the seventh hour the on-duty driver pitted and reported the car felt sort of flaccid, almost as though it was being held together by its shock absorbers. The pit manager lifted up the stern lid, peeked within, winced, slammed it down again and whispered hurried confidences to the driver. The shocks were indeed holding the chassis together, with a slight assist from the tail-lamp wires. The frame had broken in three places.

Given leave to proceed — for awhile anyway — as long as he drove with extreme sloth and caution, Bolton complied by lapping at 85 and keeping right on doing so. To agonised pit men signifying take it easy, he responded with ribaldly defiant gestures. The fractures, incidentally, had carried away the pipelines to the back brakes, but with twin master cylinders in the system this bereavement could be borne. The AC's race average was 89.5 mph.

Sequel to the adventure came the day after the race, five miles out from Le Mans en route for England and home. While pootling gently along at sightseeing speed, the AC just collapsed, subsiding onto its belly in the road. Later again, in the TT, it was to break its frame for the second time, a fact that the retinue had the presence of mind to obscure by disconnecting a water hose at the pit and giving it out their retirement was due to overheating trouble. (If you own an Ace, or are thinking of owning one, don't take these revelations too much to heart. The Le Mans ACs had space frames of a new design, altogether unlike the regular Ace).

This isn't the place, even if we had the space, for an exhaustive treatise on wringing more power from Bristol engines as supplied for the Ace; but an item or two of Ruddlore can perhaps be crammed into the few column inches we haven't used up yet.

Assuming you're starting out with a 100DI engine and wish to hoist the compression ratio from the standard 8/1 rating to 10/1, there are at least two ways of doing it. One is to fit 9½/1 pistons and machine 30 thousandths off the head. Alternatively, and this has certain advantages apart from the cost factor, you can retain the 8½ pistons and machine off 90 thousandths

VPL442's engine develops 147 bhp; or, more realistically, it develops something different almost every time it goes on the brake: at sea level and on its best behaviour it turns 147 horsepower, and in proper shape it never drops below 140. But you won't get performance of this order merely by raising the compression to 10/1 and putting everything together nicely. The Rudd engine, for instance, departs considerably from stock in the carburetion department. The triple Solexes are fitted with air straighteners, have their chokes bored from 28 to 30 mm. (bringing them down to wafer thickness, incidentally), and use 145 main jets in combination with 210 air compensating jets. In Solex experiments the amateur is best advised to play around with air compensating jets rather than mains, the former being much easier to change.

Air straighteners, which Rudd's company is exclusively authorised to make and market, working from Bristol drawings, are worth about 4 bhp at the top end and absolutely nothing low down. The current type has three elements. The earlier model with only two elements is approximately half as effective. If you're thinking of counterfeiting a set of homebrew air straighteners, by the way, get every dimension right to a hair's thickness; they're highly critical dimensionally, and if they aren't spot-on correct you are better off without them. These straighteners, with the vital elements encased in a standard top and bottom member from an ordinary air cleaner, are deceptively simple looking devices. Being taller than the old two-ring pattern, the three-ring model is a tight fit under an Ace's hood. Under-hood clearance varies slightly from car to car, and those with lesser clearance need a bulge built in to accommodate a set of late type straighteners.

In streamlining Solex butterflies you can aim at a lot or just a little. The basic step, of course, is to fine down the two semicircular lands of the flaps themselves, relieving these areas on opposite faces to maintain a proper air seal. Then you can go to work on the protruding heads and tails of the screws fixing the flap to the pivot; with the screw ends cut back flush with the surrounding metal and the heads carefully flared, you should be able to count on 4 bonus bhp.

Next, the butterfly lands can be built up with solder to merge them into the pivot strips. And finally, if you're prepared to risk having a butterfly cast its moorings on full power, you can dispense with the pivot strip on the side remote from the screw heads, shortening the screws appropriately and securing them by punching.

Turning to the engine itself, all inlet tracts should be smoothed and matched to their carb stubs in the usual way; but it's important to realise the section surrounding the tracts isn't meaty enough to allow actual reshaping or enlargement. Carbs are not interchangeable and should always be mated with their original cylinders after disassembly.

On putting an engine up when the head has been off, make frequent valve clearance checks. Clearances may need resetting three or four times before the engine really settles down. And relap the head to the block every time the head is lifted.

The Le Mans type exhaust system is a

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must for those in search of utmost output, specially in combination with air straighteners and 140 to 145 main jets. This noisy plumbing uses downpipes and dual tailpipes if 1¾ and 2 inches outside diameter respectively, and has a side outlet ahead of the rear wheel.

Bristol engines are sensitive to interrelative pushrod weights and valve spring strengths. Rudd, exploiting an AC dealer's prerogative, and being conveniently based within fifty miles of the factory, makes up exactly matched sets of springs and rods from batches of five or six dozen.

The ignition distributors fitted to Aces and Acecas sometimes develop play on the rotor arm bearings after quite a small mileage, allowing the cams to float at high revs, with resulting alteration in the sparking gap. If the distributor shows any sign of movement on the central boss, replace it or have it reconditioned. In Rudd's case, and presumably others, Lucas have in the past supplied a superior quality substitute distributor that eliminates this fault. As an alernative, Delco Remy make an excellent instrument with dual contact breakers, which is provedly capable of standing long periods of hard work.

Bristol engines are of course broken in before you get to buy them, although it is Rudd's personal experience that they are in their prime after about 15 hours' running, or say 3000 miles. With this operational time or distance under their rockerboxes, typical ones (9/1 compression version) have shown 128 bhp on the Rudd dynamometer; this is 3 bhp up on the makers' claim. The weekend before I toothcombed — and briefly drove — VPL442, the car had done its first competition of the '59 season, a hillclimb, calling for screaming bursts of revs in the gears; and immediately before *that*, after a mileage of 68,000, it had had a complete engine overhaul entailing the renewal of pistons, main and bigend bearings, etcetera. This gives a telling indication of the Bristol's voracious appetite for hard work immediately following a rebuild, and its invulnerability to savage usage during this ordinarily critical period.

Among other interesting abracadabra we stumbled on in a quiet corner of the Rudd premises was a mouth-watering ensemble comprising a Bristol cylinder head fitted with three dual-choke Solexes. Bristol themselves, you may remember, used a topgallant of this type when they raced at Le Mans and elsewhere a few years back, although the example unearthed at Worthing was a Rudd production. The crux of the deal is the battery of specially cast adaptors nestling between the carbs and the ports. These, cast in light alloy, were produced to Ken's own moulds, and they probably differ in detail from those made at Bristol for the company's own edification and fun. Rudd's firm had done some tentative development on the six-throat setup, arriving at two main conclusions:— 1) It would likely raise maximum output to 160 bhp or thereabouts; 2) It would be strictly for millionaires at the sort of price they'd have to charge. — *D M*