When you squint hard, they do look something like Mazda RX-7s. The glass hatchback certainly looks about right, the roofline and rear pillar are box stock and the slope of the hood seems at least familiar. But beyond those surface similarities, there isn't much to remind you of the basic street car. This strikes us as truth in packaging, because under its topskin an International Motor Sports Association (IMSA) RX-7 racer bears about as much resemblance to stock as an F-16 does to a hang glider.

This is, of course, a fact of life that goes well beyond IMSA to all forms of "stock car" racing—road, oval, superspeedway or quarter-mile. The cars are stock in the sense that the preparer begins with a stock unit. From there, he tests the limits of the modifications rules laid down by this or that sanctioning body, be it IMSA, NASCAR, SCCA or what have you. In this sense, the car builder has to have a wide streak of lawyer in him somewhere, as well as a strongly legalistic sense of semantics. For the builder so inclined, the rules and regs become a blueprint for success; all he needs is the cunning and technical savvy to exploit them. This is the key to the Unfair Advantage, as Mark Donohue called it. Besides money, it's the cutting edge that separates the winning teams from the also-rans. Understand, we're not talking about cheating here. It's more a matter of illuminating the gray areas of the rule book.

In support of this basic theory of racing success, we present the Kent Racing Mazda RX-7s. They're the current leaders in the IMSA GTU (GT Under 2.5 liters displacement) championship. And there's little prospect of anything getting between them and a second straight title for Mazda.

The Kent R_X for Racing

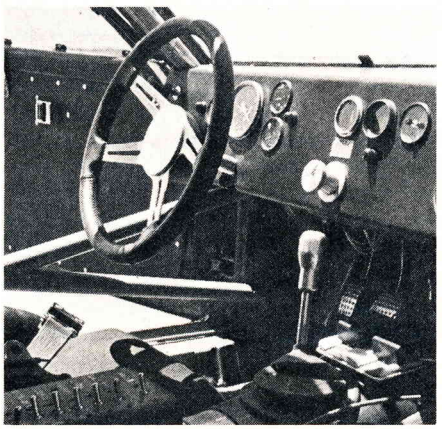
On track with America's hottest RX-7s

by Tony Swan and Ron Grable

PHOTOGRAPHY BY BILL JENNARO

Mazda came onto the GTU scene in a big way in 1979, finishing 1-2 in its class (and 5-6 overall) in the 24 Hours of Daytona. To understate things a little, this achievement startled the GTU establishment (read Datsun). There were complaints that Mazda's unfair advantage was *too* unfair. As the RX-7s rolled formidably into the 1979 sprint races, IMSA chief John Bishop responded to the complaints with his standard remedy for competitive disparities: changing the power-to-weight ratio of the offending vehicle. The Mazdas were ballasted with as much as 300 pounds, and even though the weight handicap was relaxed somewhat in the late-season races, it was enough to help Don Devendorf defend the title for Datsun.

Last year, with Racing Beat enjoying the principal Mazda factory backing, the RX-7s showed up at Daytona sporting fuel injection. Although this refinement didn't produce much in the way of additional peak horsepower, it did fatten up the rest of the powerband quite nicely. And even though IMSA did a bit more weight juggling during the course of the season, the RX-7s were unbeatable. Racing Beat drivers Walt Bohren (who's been in Mazdas of one sort or another since 1975) and Jeff Kline finished 1-2 in the drivers' standings. The factory had its first championship.



Instrumentation is simple by passenger car standards, including only tach, oil temp, coolant temp and oil pressure gauges in primary cluster.

Dave Kent, the disheveled genius of GTU. When it comes to determining the true operational limits of a set of racing regs, Kent says, "I just keep putting stuff on until they tell me to stop. It's just a matter of finding what we can live with."

This year Dave Kent has the factory IMSA deal, Racing Beat having moved on to other endeavors. Even though IMSA has

The trick and the quick — a driver's impression

(Ron Grable is no stranger to racing fans who followed the old Continental and Formula 5000 series in the late Sixties and early Seventies. Besides being a top contender there, he's also driven IMSA, USAC and NASCAR events, and numbers an SCCA national championship among his many accomplishments. Still active in club racing, Ron is a graduate mechanical engineer with considerable experience in race car chassis design.—John Dianna)

These Dave Kent race cars are beautiful. They are menacing, sleek, sensual—almost overwhelming in their intensity. And I can't wait to drive them. Damn, where's my helmet.

Okay. Slide inside over this maze of roll cage tubing and slip down into the seat. Buckle up the four-point harness. Organize about a million switches and light it up. No mistaking the sound of ignition in an RX-7 racer. There's nothing else on earth that sounds like a racing rotary, which is why the Mazdas are always pitted by themselves.

Right, here we go. Out onto the Willow Springs sun-baked asphalt and into the first turn, running about half-speed until everything comes up to operating temperature. The hood slopes sharply down toward the track, which makes forward visibility great. I find I need very precise, small motions with the steering wheel: the fat racing tires immediately move the car in the direction it's pointed.

It's not long before I can feel the shift lever getting hot through my glove, and the heat of the engine begins to roll into the cockpit. The brakes and tires have also come up to readiness; It's time to find out what these IMSA RX-7s are all about.

My right foot eases toward the firewall, and everything else in the world fades away. It's just me and the car and the track, the engine pushing me back in the seat as it reaches for peak revs, the braking forces throwing me against the straps of the harness, my head bent over one shoulder, then the other by the lateral cornering loads. My helmet seems to weigh about 50 pounds. Smells of hot fiberglass, hot oil, hot exhaust system, hot brake pads, hot rubber scrubbing off the tires. And penetrating everything—my helmet, my earplugs, my concentration—is the shriek of that engine. I know that days from now I'll still be able to hear it and feel it.

I wish it could go on forever.

The white car is driven in combat by Lee Mueller, the red one by Walt Bohren, and, aside from color, the two cars look almost identical. The differences lie underneath, partly the result of individual driver preferences, partly from ongoing experimentation by Dave Kent.

The most significant of these differences is in the rear, where the axle-locating linkage has been considerably altered on Bohren's car to achieve a lowered roll center. Lowering the roll center has two basic effects. It increases weight transfer (due to body roll) to the outside wheels and, at the same time, decreases weight transfer (due to roll center height) to the outside wheels. Since these are obviously counteracting, the degree of absolute change can only be determined by prolonged instrumented testing. In my all-too-short time in the cars I was unable to relate the differences in their cornering characteristics specifically to the roll center height differential, although I'm sure their regular drivers can.

The other basic chassis difference between the two cars is in stiffness. Mueller's car is stiffer in roll and in bump, owing to heavier anti-roll bars and higher spring rates.

There is, however, one other significant difference between the two cars, and this is in the area of aerodynamics. The Bohren car, which is Kent's rolling testbed for innovations, makes use of air flowing under the car to generate downforce. To accomplish this, an inverted wing section has been located just behind the front air dam. Air flows over the inverted wing, creating a partial vacuum in the manner of an aircraft wing, and is then exhausted out through the engine compartment.

To balance the front downforce, Kent has harnessed the natural partial vacuum created behind the car by its passage through the air. This has been accomplished by smoothing the underside of the car, using end fences to retard turbulence as much as possible and to extend the low pressure area as far forward as possible. Does it work? Only one way to tell.

We started with the more conventionally equipped Mueller car first. Kent's only restriction was an 8,500-rpm rev limit. This is a very neutral car. It goes where it's pointed and always seems to be just a little ahead of me. I find it very

On-track shot shows visual differences between race-prepped RX-7s and box stocker. Racers' engine air enters through square opening, radiator air through narrower horizontal slot. Round holes pipe air directly onto front brake rotors.

deprived Mazda of the fuel injection advantage, Kent and his cohorts have come up with enough innovations to totally dominate the GTU category. With 11 of 16 races run, the Kent cars have scored six 1sts, five 2nds, and three 3rds. Veteran Lee Mueller, who drives the No. 92 car, leads the drivers' standings with four victories, one of which he shared with teammate Bohren. Bohren has two wins of his own and stands 2nd, while Mazda has the manufacturers' title all but locked up.

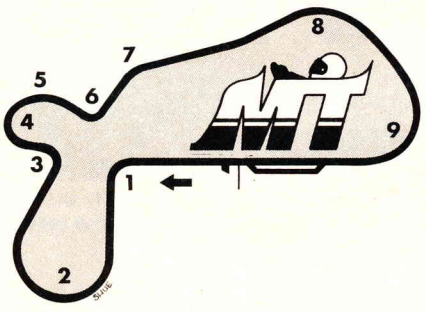
The key to Mazda's impressive success is the rotary engine—for its volumetric efficiency (lots of horsepower from not very

confidence-inspiring—just the car to give you a quick tour of the Willow Springs 2.5-mile layout.

We pass start-finish in 4th gear and change down to 3rd for Turn 1, a 90-degree left-hander, giving it full power across the apex with a little twitch as the banking rolls away at the exit. Then it's up to 4th again and down a gentle hill to Turn 2. I like to enter this turn, a long, constant-radius uphill righthander, with a little left foot braking, using the car's nice initial understeer to scrub off some speed. Then I feed in throttle until the car is neutral and properly positioned on the track, using more throttle to maintain speed against tire scrub and ultimately to get a higher rear slip angle for a power slide exit.

Now things start getting busy. For Turn 3, a left-hander that goes sharply uphill, we're very late on the brakes, changing down to 3rd as the front suspension compresses into the uphill banking, following up with full power to establish the uphill slide to Turn 4. We snap the car to the right for 4, then pick up speed quickly through 5, heading downhill toward 6, a 90-degree lefthander with a ravine yawning on the outside. Feather the throttle to get the right attitude, then back into full throttle, and into Turn 7.

The section of track between the entry to 5 and the exit from 7 is a very complex, demanding piece of road, involving a fast right, off throttle, sharp braking, and then a sharp left, catching the slide with right lock steering. Then it's back on the throttle and up towards the blind over-the-hill Turn 7, committing the car before the apex is visible. There's a wonderful moment of drama before you know whether you've done 7 right or not, followed by an adrenalin-pumping little twitch as the car crests the hill. Then it's 4th gear again, and a 140-mph rush down the quarter-mile back straight and into Turns 8 and 9, two righthand sweepers hooked together by an almost-straight chunk. I'm flat on the throttle around 8 until it straightens up, then I use a bit of left foot braking, change down to 3rd, use full throttle across the deceptively late Turn 9 apex and, with about one and a half minutes gone, we're ready to repeat the whole process.

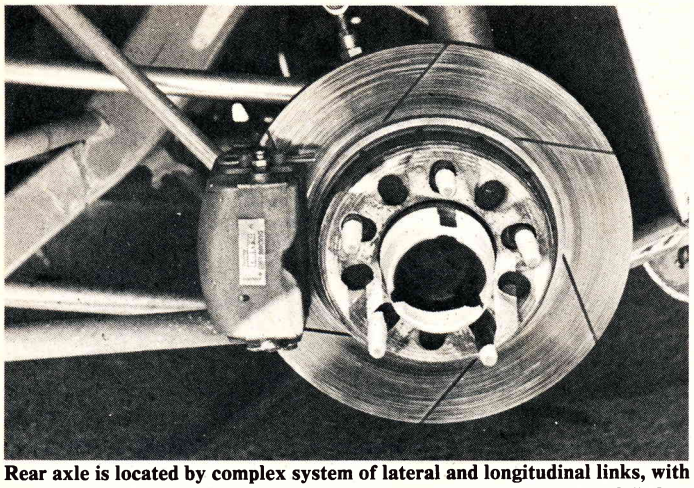


The 5-7 combination, which entails a change from negative camber to positive camber, tells us most of what we want to know. Basically, this is really a dialed-in racer, probably one of the best production race cars I've ever driven. So if this conventional car is this good, Bohren's car, with the trick rear suspension and the aerodynamic innovations, ought to be faster yet, right?

Maybe for Walt. But not for me. In the first turn it was immediately apparent that this was a much different car. It required constant steering inputs to maintain a line through this turn and in the other faster corners (2, 8 and 9), and would oscillate about its vertical axis every time a steering correction was fed into the chassis. In Turn 9, I wasn't able to extract full throttle, while the Mueller car could be driven right to the braking point flat-out in 4th. My initial reaction was that the car had bump steer, a term used to describe a change in toe-in (or toe-out) as a wheel moves through its up and down travel.

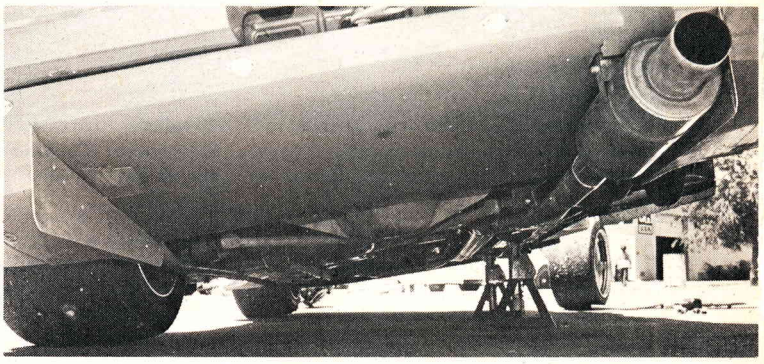
However, after conferring with Kent and his crew, it was determined that the front wing was exerting sufficient downforce to compress the front suspension right down to its stops. This accounted for the instability, since it created front roll stiffness that was virtually infinite, like a giant go-kart. So off came the wing, and out I went again. It was just like a new race car, without the twitchiness and with a lot more predictability. The car was a little softer than Mueller's, and not as much to my liking, but it obviously suits Bohren; He's given an excellent account of himself in it this season.

The point is that Kent's aerodynamic experiments obviously work; downforce has been generated in more than ample quantities. Now the goal is to incorporate the innovations into the cars in a manner that doesn't upset the chassis dynamics, enabling the drivers to balance the cars to their individual styles. Although it is my personal feeling that this goal may still be a little ways off, it's hard to argue with Kent's record as an IMSA innovator, or with Bohren's record on the track. I think the best answer may be another test drive . . . as soon as possible. *—Ron Grable*

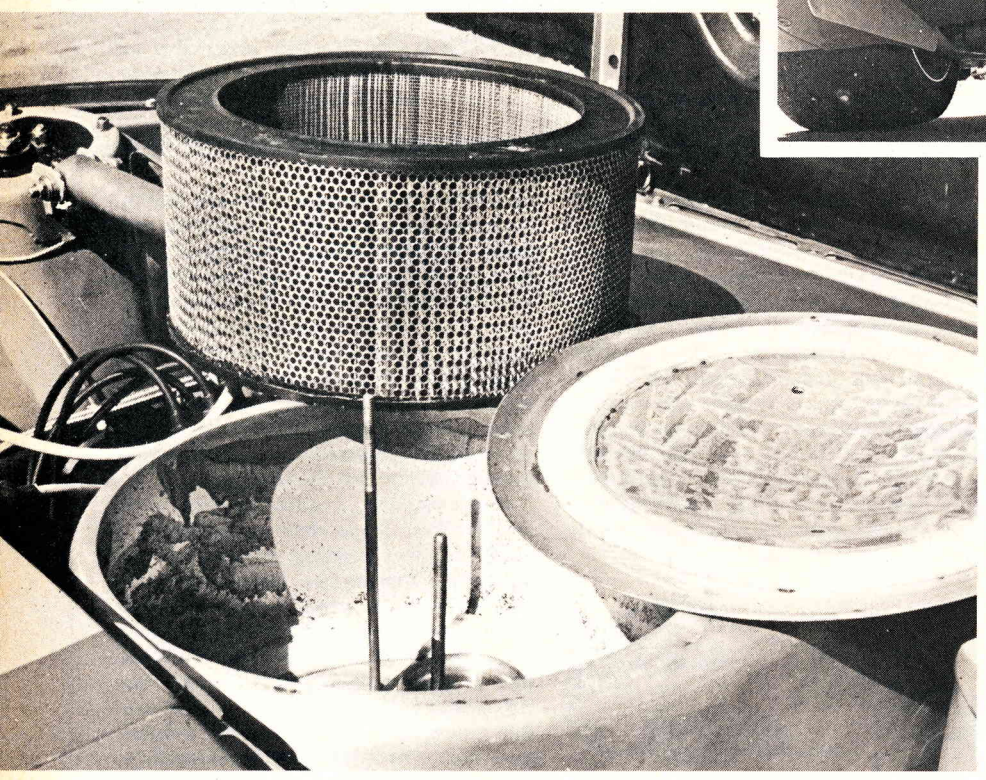


Rear axle is located by complex system of lateral and longitudinal links, with struts modified for height adjustability. Frame arch has been modified to allow increased suspension travel. Sway bar is adjustable.

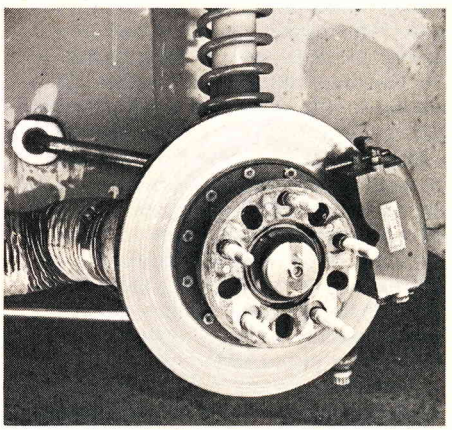
With front air dam removed, front wing of Walt Bohren car is visible. Airflow over wing creates front downforce, increasing steering effort by as much as 50%, according to Kent. Kent balances front downforce by increasing rear spoiler height. Mueller prefers a more conventional setup, with very neutral handling.



Rear of Bohren's car is set up to smooth airflow as it exits under car, with longitudinal fences to augment channeling. Muffler, an IMSA-required installation this season, doesn't do much for airflow but brings Mazdas' ear-splitting war whoop down just below the threshold of pain.



Since microscopically pure air is vital to rotary engine health, Kent came up with this fix to ensure clean air ingestion: a tightly covered airbox and wall-to-wall fiber air filter. Round aluminum cover seals airtight. The bolts at right control camber adjustment.



Front suspension is reasonably straightforward, employing Mazda Cosmo struts with threaded shock bodies for height adjustments. Brakes are Lockheed, cooled by air ducted through front air dam. Rollbar is adjustable.

much displacement) and for its compact design. Kent has been successful at exploiting both of these qualities. Although he's had to make his cars go without fuel injection this year, he's altered the shape of the stock porting from a D-shape to one that's square, for more duration. This seems to have restored engine performance to 1980 levels, which is to say, somewhere between 280 and 300 horsepower.

Although the rotary's achievements in its first three seasons of GTU don't reflect much in the way of teething problems, Kent and others involved with RX-7 racers soon learned that the engine had virtually no tolerance for dirt. Daytona, with its abrasive mixture of sand, salt and crushed seashell, taught this lesson very quickly. The tiniest speck of grit in the combustion chamber can cause scoring in the walls, whereupon compression quickly goes away, along with horsepower. As the accompanying photos indicate, Kent has come up with a way of keeping the air microscopically clean, and dirt ingestion has ceased to be a problem. When something is amiss, diagnosis is a snap; a simple compression check tells you everything you need to know.

Since the rotary is essentially a 2-stroke, Kent and other RX racers use 2-stroke oil in the racing gasoline at a ratio of 100:1. A corollary problem with these engines is that gasoline manages to sneak past the seals and will dilute the engine oil over the course of a long race. As a result, Kent developed a quick-dump oil system, making it possible to perform an entire oil change in about 2 minutes. The oil system is dry sump.

With dirt eliminated from the engine's diet, and factory-developed carbon apex seals keeping compression where it should be, the rotaries have long since become solidly reliable. Kent has cured ignition problems with a Mitsubishi solid-state unit, so about the only shortcoming now is the mainshaft plain bearings, which limit reliable rpm to under 10,000. However, some SCCA RX-7 racers are said to be using as much as 1,500 more than that, and Kent is working on a needle-bearing replacement for the plain bearings. But as the series standings indicate, the need for this refine-

ment is something less than urgent.

Because of its size, the rotary engine doesn't take up much space in the engine bay, thus lending itself to relocation. Kent seized on this advantage quite promptly, moving the engine back 6 inches, right to the firewall (another stock item that survives), and down 2 inches for 50/50 weight distribution and a lower center of gravity. Kent's fix has since become pretty much standard practice among the RX-7 racers.

There isn't much of the original RX-7 discernible under the car. About the only stock piece up front is the lower control arm, which has been modified to employ a Porsche ball joint. The struts are from a Mazda Cosmo, and the brakes are stop-you-right-now 4-piston Lockheed racing units. The rear suspension is an intriguing collection of linkages that totally replaces the factory-supplied elements. While the rear axle location is standard, Kent, like most other Mazda racers, has given up on the stock differentials, substituting competition internals for better reliability. Nevertheless, this continues to be a weak point in the cars.

Like a few others, Kent has gone to carbon fiber driveshafts for his cars. Although they're not cheap, they seem to be tougher than steel, and much lighter.

There are elements of the factory body pan and chassis in use on the racer, but it takes a keen eye to pick them out. Besides modifying to achieve better roll stiffness, Kent and company had to make room for the fat (11-inch front, 12-inch rear) 3-piece alloy Hayashi wheels and racing tires. The external body modifications, designed to accommodate the tires, as well as for aerodynamic considerations, are glass. Kent is quick to point out that credit for the cars' innovative design features belongs to Trevor Harris of Frissbee Can-Am car fame, and Lotus veteran Martin Wade.

Although the two Kent cars appear to be similar at first glance, they are set up quite differently. The white car, which is driven by Mueller and dates back to 1979, is the more conventional of the two and is set up to be very neutral in all handling areas. Walt Bohren's car, on the other hand, has a number of new Kent tricks going for it, including a modified ground-effects system that works. These are detailed in the accompanying driving impresssion.

Whether Kent will have an opportunity to further develop the ground-effects machine for the 1982 campaign remains to be seen. As we go to press, Mazda is evaluating its GTU racing program and may decide to put the weight of the factory effort elsewhere in IMSA. GTO (GT over 2.5 liters) is a possibility, although Mazda doesn't make a rotary engine big enough to deliver the kind of power needed for this class. A more intriguing possibility is a Mazda foray into the wild world of GTP, where a twin-rotary may sally forth to do battle with the Lolas, Mustangs, March-BMWs and Porsche 935s.

But whatever the tactical decision, we look forward to seeing Kent somewhere near the center of the action. MT

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