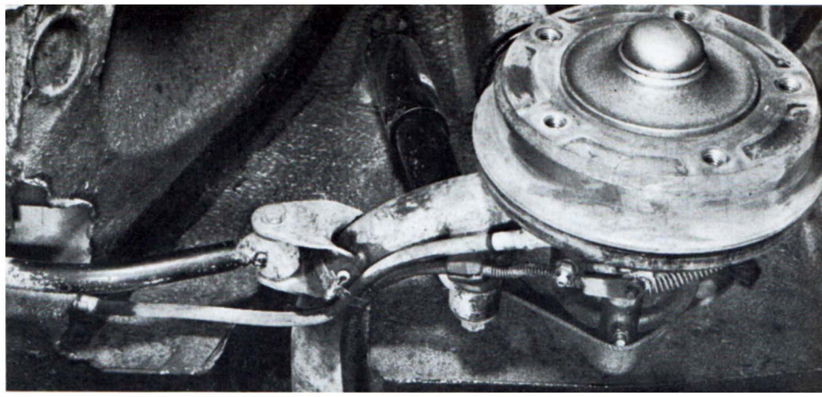
SCI
ROAD TEST: SAAB 93

Photos by Joseph E. Petrovec

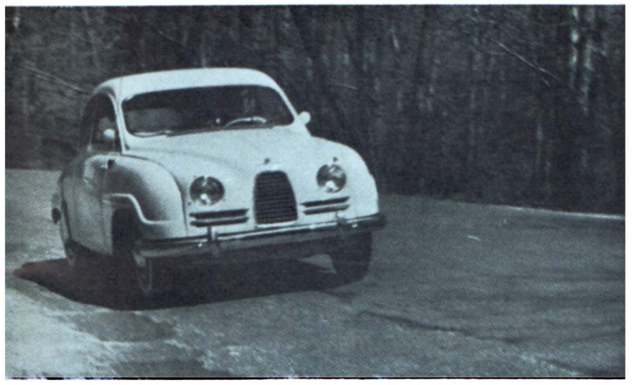
WHEN we first met the SAAB 93 at a press preview aboard ship, it looked like some weary stowaway after a long, stormy voyage. Preservatives that protected the chrome resembled a make-up hastily applied in an uninspired moment. Frankly, it looked about as stimulating as a week-old egg roll, and disappointment was whispered around more than once.

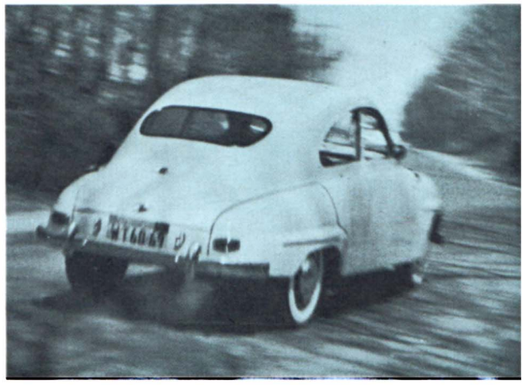
But like a good book which must be studied to be understood, the SAAB must be driven in order to realize just what lies beneath its unprepossessing exterior. So if the car appeared in an unimpressive light, it was purely a case of mistaken first impressions.

Ralph Millet, the SAAB representative, turned the car over to us in the late afternoon when the city streets were jammed with vehicles making their exodus back to the suburbs; and it gave us a fine opportunity to try its behavior in slow moving, bumper to bumper traffic. The small size of the car, together with its lively acceleration, enabled us to wheedle through the traffic like thread through cloth. The rack and pinion steering (2¼ turns lock to lock) and the positive torque, give the 93 the ability to dart in and out of the creeping cars with impunity. You have only to place the wheel in the direction desired, tromp on the pedal, and there you are. Its immediate response in heavy traffic, and its affable manners on lagging parkways make this little Swede the nonpareil among the émigrés.



Underview shows curved, rigid rear axle which is secret of SAAB's road ability. Axle is fastened to body midway between rear wheels. Longitudinal rods keep axle at right angle to fore and aft axis.





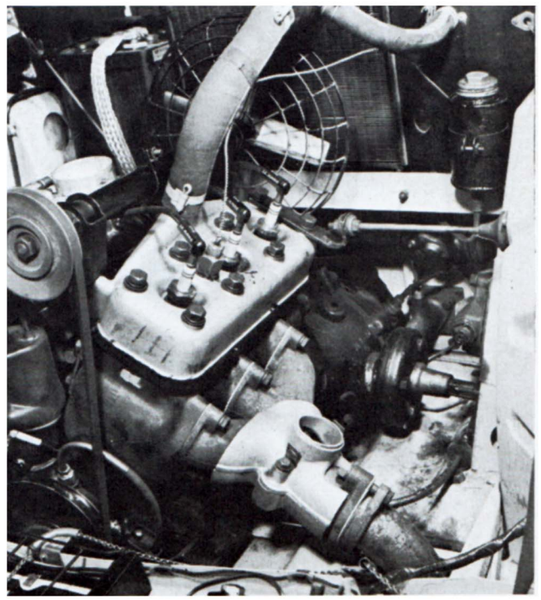
The SAAB cruises through a bend, which is slightly cambered, at 50 mph. Optics create illusion of steeply banked road. Accelerating through turns, car was absolutely unswerving, but when braking in turns, loss of control was evident.

But as maneuverable as the car is in the city, it is that much better on the open, less crowded roads. The ride is firm and quiet even on washboard surfaces, and there is a very minimum of wind noise. It conveys the feeling that each component is working as a part of the whole, functioning to serve the unit rather than itself. This is due in main to the integral construction of the body and frame, in which, like a play without a star, each player performs for the benefit of the performance rather than for himself.

Taking this front-drive car through a sharp corner or a quick S bend is a pleasant experience. Remember this is not a sports car nor does it make any pretense in that direction; but it acts and feels like one in its ability to slip around a curve without giving its occupants the notion they are about to go into a snap roll and come out of the turn sliding on their heads. Once the wheel is set in the direction of the arc and the gear lever flipped into second, the accelerator can be pancaked to the floor. The response is immediate, and the car whips around the turn with a minimum of effort and a minimum of complaint from the tires.

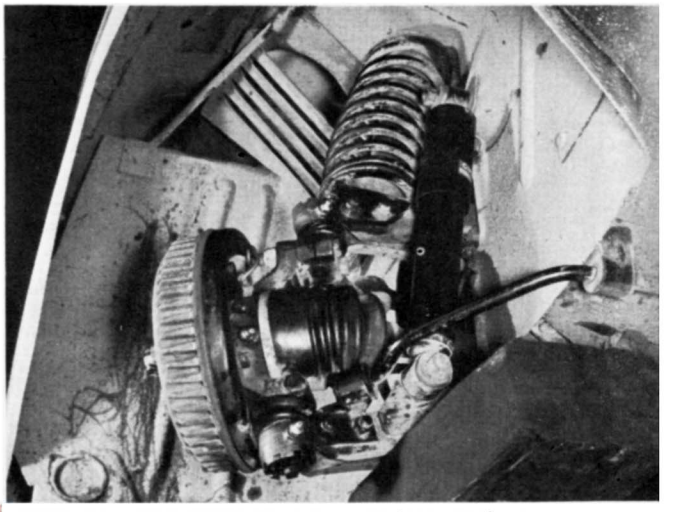
On our test circle, which has a diameter of 408 feet, the accelerator was floored with the shift in second gear. Without hesitation, the car's speedometer climbed to 55 kilometers. Translated, this would read 34 mph. The test circle is flat with no bank whatever. We went into the continuous turn placing our front wheels on the inside edge of the circle. At no time in accelerating around the loop did the rear break loose or did the car border on the rim of lighting up the tilt sign.

The effect of understeer in the SAAB was expressly de-

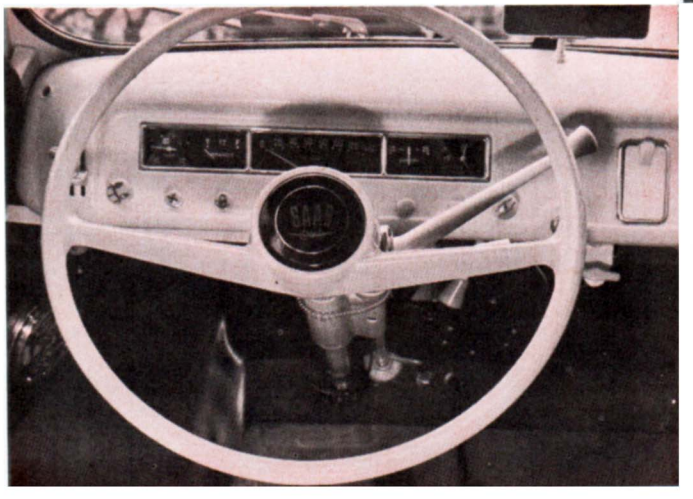


This tiny three cylinder two stroke mill is able to produce a big 38 hp and give the car moderate to good acceleration throughout all gears. Large fitting on exhaust manifold is for heater pipe which crosses to air cleaner to warm intake.

Trunk space in SAAB will amply take care of all necessary luggage needs of a medium sized family for practically any time or distance.



Front running gear detail shows spring mounted high above upper arm. Universal on front drive is protected by rubber cover. Shocks are Girling set to lower arm. Drums finned for cooling.



Dash is simple and clean. Speedometer here has metric markings, coming imports will be scaled in miles per hour. Note international symbols instead of names on knobs.

signed with that purpose in mind. It comes about by the use of a rigid rear axle, whose wheels are always at right angles to the ground, and independent front wheels whose vertical axes move essentially parallel with that of the car. Wheels that are at right angles to a surface have less of a tendency to sideslip than wheels that incline outwards in corners. And so the car tends to travel in a straight line, which must be corrected for by pulling the steering wheel further into the direction of the turn.

Yet this is not the entire cornering story of this newcomer. While its stability and conduct may be irreproachable when accelerating in sharp bends, braking in these corners suggests the use of quite another adjective. Perhaps the word playful would be most charitable.

Seats are easily removed and juggled to make a comfortable double bed. A SAAB owner can be independent of time and motels when traveling.

Minor disadvantage of two stroke engine is the necessity of mixing oil with the fuel in order to keep parts lubricated. However, excellent gas mileage compensates for added small bother.

When the foot is taken from the gas pedal, and applied to the brake, both engine and brakes, in combination, affect the forward momentum of the car. Then, since the 93 is a front wheel drive car, it is the forward wheels which retard the car's speed under engine deceleration. Also the hydraulic system has been so engineered that the front brakes have more stopping power than the rear. This adds up to one thing: the rolling weight of the car, in abrupt slow downs, is thrust upon the outside front suspension and wheel. The result is a rear end which wants to come forward and say hello to the front.

Now while the rear is undulating from left to right trying to break away from the pavement, the front is playing its own little game. The caster angle of the kingpin is set at two degrees positive; which means that when pulling, the wheels lead the weight of the car. In accelerating this is fine because the car is being towed behind the driving wheels, and there is minimal pressure upon the front suspension. In braking, however, the leading wheels are no longer pulling, but rather are being pushed from behind. This causes no end of fun, somewhat like rolling a piece of furniture on a caster wheel with the roller pointed in the direction of travel. The wheel follows an indeterminate course, wobbles through its dynamic axis and finally tries to turn itself around completely so that the car is pulling the wheel. Consequently, the car tries to pirouette on its nose and the driver must play the wheel in order to keep it on course.

However, thanks to a unique rear axle setup, this is not as bad as it sounds. The car may fight to change direction, but in so doing neither rolls nor dips. The rigid rear axle forms the shape of a very wide bottom U. It is joined to the body by a resilient bearing mounted in the car's plane of symmetry, and by two longitudinal links at the sides. The central bearing takes up the lateral forces, and the braking torque, while the side links keep the axle perpen-

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SAAB 93

TOP SPEED:

Two-way average	72 mph Actual
Fastest one-way run	74 mph Actual

ACCELERATION:

From zero to	*Seconds*
30 mph	6.65
40 mph	10.00
50 mph	16.00
60 mph	24.75
Standing ¼ mile	23.02
Speed at end of quarter	57.5 Actual mph.

SPEED RANGES IN GEARS:

I	0 mph – 26.5 mph
II	16 mph – 52 mph
III	35.7 mph – 73 mph

FUEL CONSUMPTION:

Hard driving	27.5 mph
Average driving (under 60 mph)	32-35 mph

BRAKING EFFICIENCY:

(10 successive emergency stops from 60 mph, just short of locking wheels):

	Percent
1st stop	70
2nd	65
3rd	60
4th	68
5th	63
6th	55
7th	60
8th	60
9th	40
10th	50

POWER UNIT:

Type	3 cyl.-2 stroke, water cooled
Bore & Stroke (Engl. & Met.)	2.6 in. x 2.86 in.; 66 mm/72.9 mm
Bore/Stroke Ratio	1.1
Displacement (Engl. & Met.)	45.5 cu. in.; 748 cc.
Compression ratio	7.3-1
Carburetion by	Solex Type 40 AI
Max. bhp @ rpm	37.5 @ 5000 rpm
Max. Torque @ rpm	52.1 lbs/ft @ 2000 rpm

CHASSIS:

Wheelbase	97 inches
Front Tread	48 inches
Rear Tread	48 inches
Suspension, front	Independent, coil spring
Suspension, rear	Solid axle, coil spring
Shock absorbers	Telescopic
Steering type	Rack and pinion
Steering wheel turns L to L	2¼
Turning diameter	36 feet
Brake type	Lockheed hydraulic
Brake lining area	89.95 sq. in.

GENERAL:

Length	157 ins.
Width	61½ ins.
Height	57 ins.
Weight, test car	1806
Weight distribution, F/R with driver	58 percent, 42 percent
Fuel capacity—U. S. gallons	9 gallons

provided in front of the radiator, operated from the instrument panel by means of a chain control. This arrangement lacks the automatic convenience of a thermostat, but it does permit the driver to select any operating temperature that he may choose. In an atmospheric temperature of 70 degrees F. we made a 40-mile run with the blind all the way down. This included a final burst of 90 mph for several miles. Upon stopping, you could rest your hand on the top tank of the radiator and feel no discomfort.

For rapid warmup the blind can be raised all the way, then lowered partially to maintain a reasonable operating temperature. It's all too easy, we found, to forget to lower the blind from fully-raised and then note that the needle on the water-temperature gauge has shot all the way out of sight. This happened to us on two occasions, proving what slaves we've become to automatic controls. But we lowered the blind, kept going at a moderate speed, and within a minute, the needle was back in the permissible range.

The performance factors (see tables) relating to engine efficiency are very good when judged by light car and even by production sports car standards. One of the main contributing elements to this good performance is the excellent breathing of the Volvo sports engine, achieved by means of dual side-draft carbs, over-sized valves and ports, the intake ports being polished, beefed-up valve springs, and a cam that packs a mildly warm grind. The lag you'd expect in bottom-gear getaway from rest with an engine of this size is there all right, but it's briefer than you might expect, and the pistons begin pumping very effectively at low revs. Most of the engine's components likely to require replacement in time are popular U.S., English, and German parts, widely available here. A six-volt electrical system is used.

Returning to the Volvo 444, this combination sports-family vehicle loses points on very few grounds. Its brakes appear to be its most serious mechanical shortcoming. Their lining area per ton factor is rather average and their performance is not up to the high standard set by all of the car's other mechanical elements. This definitely does not mean that the brakes are bad; in fact, they're a shade better than the Detroit average. But they do fade noticeably and during our ten-stop test registered a big decrease in efficiency, although still retaining highly effective stopping power.

The Volvo's body matches or surpasses Detroit standards of finish and solid construction; it forms a unit with the frame and is Bonderized for rust-resistance. Its paint is glass-smooth. It is one of the extremely rare bodies in the light car field that the average U.S. motorist can enter for the first time and feel quite at home in. It has all the familiar conveniences: cigarette lighter, three ash receivers, conventional (and legal) turn indicators; dome lights, seats that are well, well off the floorboards. It's a five passenger car and the seats can be folded to make a roomy bed. The rake of the front seat-backs is adjustable.

Like the early VW's, the first shipments of Volvos lacked some export refinements. Recent shipments are finished to a fine turn. Interiors, instrument calibration and labelling, and bumpers are all now competitive with Detroit. It appears obvious that Sweden is willing to do its best for the Yankee dollar.

In a nutshell, the Volvo 444 is a short wheelbase car, but is not a small car. It has the fuel economy and nimbleness of a light car, but is free of the performance limitations and claustrophobic disadvantages of many of these. It has a great deal of the zip and agility of a light production sports car, yet it's a family-sized machine. It's a skillful combination of good things from both sides of the Atlantic and as such is in a class apart.

Griff Borgeson

SAAB

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dicular to the longitudinal axis of the car. Mounted close to the wheels, at the end of the U-section, are the coil springs. Under normal driving conditions on straight paths, they compress an amount equal to that of the vertical movement of the wheels in relation to the body. The shock absorbers, however, are placed midway on the U-section. This puts them approximately halfway between the hub of the wheel and the central bearing. Again under normal driving, shock absorber action is then about half that of the wheels, and a soft pleasant ride is thereby attained. But when a rolling action occurs, then the shock absorber movement is about 80 percent of the wheel movement. This immediately sets up a high resistance to the pitching motion, and the car rides flat. Augmenting this action is the tendency of the whole axle structure to act as a torsion anti-roll bar.

The torque produced upon this U-shaped axle when braking causes it to twist downward through an arc at the central bearing. Since it is firmly attached to the body at this point, it tends to pull the rear of the car through the arc with it. As a result, there is no rear end lift when the Lockheed hydraulics take hold. The car never lurches or dips, a refinement in this small car that is markedly absent in many larger ones bearing a more fearsome price tag.

The SAAB 93 is an outgrowth of its predecessor, the SAAB 92, which was designed and used extensively as an experimental machine. A prototype machine was completed in 1946, but it wasn't until 1949 that the SAAB Aircraft Company entered the automobile market with the SAAB 92. This early model was a four seater powered by a 25 hp two-stroke engine, and employed the monobuilt body and frame. While plans for the 93 were being conceived and committed to the drawing boards, the 92 was out working up a reputation on the many and various roads of Europe. Satisfied that they had learned from the errors incorporated in the first-born, the SAAB Aircraft Company transferred notions from paper to practice with the gratifying result — the SAAB 93.

And so came to life the second Swedish automobile to hit American shores. Throughout the entire four days that we had the car, we didn't once tire of driving or riding in it. In it Parkway traffic ceased to be a hateful purgatory. We would merely spot an opening and jump into it, moving through the creeping cars to the nearest exit, pop a second shift, and hasten away from the pokey pace.

And when we say hasten, we mean just that. In the acceleration department, the SAAB is no slouch, especially through first and second gears. It is really in third gear after the 40 mph mark has been reached that the pulling power begins to taper off. A look at the graph shows an almost steady diagonal line reaching to 40 mph. At this point the shift was packed into third and from then on the line begins to flatten noticeably. From a dead start in first, the 93 jumps off the waiting line in a fit of ambition.

Considering the ridiculous power-to-weight ratio of this car, one horsepower per forty-seven pounds, the 93 doesn't do too badly at all: Praise for such phenomenal pulling power is accredited to the rather high output of the small displacement three cylinder two-stroke engine. Originally, the 92 had a two cylinder two-stroke engine whose output was considerably lower, and whose efficiency lurked somewhere in the dismal depths. The problem was to raise the power output without increasing the displacement (and therefore, European licensing costs), hence, a reduction in bore size and the addition of the third piston.

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The rugged crankshaft consists of six identical disks interconnected by main and big-end bearing pins, all case or induction hardened. The shaft is carried in four similar SKF single-row ball bearings. Tolerances on the inside and outside diameters of these bearings satisfy stringent requirements in order to keep the radial play to a minimum for quiet and smooth operation. Bearing seats are made to tolerances as close as .019 mm. The big ends of the connecting rods ride in a double row of cylindrical roller bearings which make contact with the hardened surfaces of the crank pins. To eliminate any transversal movements in the central parts of the crankshaft, as well as clatter arising from high frequency torsional vibration, a torsional vibration damper was added to the crankshaft. And it's a good thing too; for without it, the engine, in time, might very well vibrate itself into a pile of metallic dust. As it is, some slight vibration can still be felt at idle speed.

It's no more of a fuss to start this engine than it is to start any four cycle plant. The choke is pulled out, and the engine cranked. In warm or cold weather starting procedure is the same. However, a good spin of the engine is required before the cylinders begin firing. The reason for this is that compression must be built up within the crankcase before the cylinders can scavenge enough fuel-air mixture for proper firing.

Once the three barrelled mill has started, a disturbing schizoid note bursts from the exhaust. It sounds as if the cylinders are exploding at will with absolutely no regard to any firing order. But once the throttle is cracked, the tiny engine quickly settles into a soft hum. The exhaust system with its two mufflers, one mounted transversely adjacent to the engine, and the other on the right side at the rear of the car, helps keep the erratic sounds to a tolerable level.

Carburetion is by a Solex AI of the down-draught type fed by an electric fuel pump. The gas tank holds almost ten gallons to which must be added approximately 1½ quarts of oil, necessary for lubrication in any two-stroke engine.

The engine is mounted well ahead of the front drive and connects to the three speed gearbox through a dry disk clutch. Power is transmitted to the gearbox, which also sits forward of the front axle, through a free-wheel. The size of the gearbox was made shorter in the 93 by transferring power directly from the drive shaft to the pinion shaft for first and reverse. Length, then, has been kept to a minimum by transposing power to only two gears on the pinion shaft; the forward gear being used for first and third, the rear for second and reverse. Second and third both have synchronizers which can be beaten by a rapid shift. First is engaged by a dog clutch which has a large clearance, and reverse is engaged through a sliding-gear.

With the free wheel in play, it is possible to shift up through the gears without declutching, but we found the use of it ineffectual. The high rpm, two-stroke engine takes forever to wind down after the gas pedal has been released, and the free wheel doesn't ride free until the rpm's have simmered to an idle. We did find, however, that with the free wheel locked out, it was possible to shift from third to second without the usual double clutching. According to the 93's designer, Gunnar Ljungström, this was not part of the design, and if such is the case, it is purely accidental.

The gear shift lever is mounted on the steering wheel and the shift positions are the same as those on standard Detroit machinery. It seems obvious that the car was designed with an eye toward the American market. And why not? It makes an ideal second car for the average American family. It's safe, economical and versatile. Though small in size, it is roomy enough in the interior to transport four people with a modicum of comfort.

The Lockheed hydraulic brakes are more than adequate to provide a reasonable margin of safety in time of emergency. In ten successive stops there was some fade, but the finned drums dispersed the heat in a matter of minutes, and full stopping power was thus quickly restored. Although engineered so that the front brakes take the brunt of the momentum, it is the back brakes that will lock in abrupt deceleration. This is due mainly to distribution of weight: fifty-eight percent of which rests on the front wheels, and forty-two percent on the rear with the driver aboard.

Instruments can be read quickly and easily at any speed. Those who travel extensively and on occasion find themselves lacking lodging for the night can without too much difficulty rearrange the seats to make a comfortable overnight bed.

Such is the story of the SAAB 93. With its price now fixed at $1895, the car should prove to be the answer to light, fast and economical (34-38 mph) for some of America's economy-car-minded public. With its distributorship growing rapidly throughout the country, it shouldn't be long before the 93 becomes America's newest naturalized automotive citizen.

Prokop

Indy Inquest

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might've seen anything from an Offy to a flathead Mercury on the pit iron. Today it's the brave and foolish man who would try to bust the Offy-Kurtis combo with anything new. And the chances would be a thousand-to-one against him. Let's face it: For the amount of money available to build special racing cars in this country, the Offy-Kurtis combo is just about perfect. A new car like this will cost you about $30,000. How are you going to build anything different for less than ten times that much which would have even a 50-50 chance to beat it?

Undoubtedly this year's rear-drive Novi had the best chance of the last five years. They took the old supercharged winfield V-8 engine (originally designed in 1941) and put them in more or less conventional Kurtis chassis (SCI-August 1956). The Winfield engines don't weigh appreciably more than the 270 Offy, so the resulting combination theoretically gave handling and cornering comparable to the conventional cars of nearly equal weight – while still retaining the fantastic acceleration that only 600 to 650 horses in a 1900-pound car can give! It looked good on paper . . . and it went when they got it out on the track.

Russo's "Vespa" job was far and away the fastest car on the track this year. He could wind up to 185 mph in about half the length of the main straightways, then had to shut off immediately to slow down to 130 or so for the turn. (Admittedly the blower rotor has a considerable flywheel effect.) His best lap speed in practice was 146.6 mph. He could blow off the Offys on the straights as if they were anchored. When he went by O'Conner on lap 11 of the race, there was no hope of catching him on speed alone.

But then the old "problems" began to show up. The blown engine gulps down a gallon of alcohol every lap, which forced Russo to lug some 300 pounds more fuel than the others. The added weight, plus the beating the treads took when transmitting over 600 hp, was too much for the rubber. The right rear tire blew on the 22nd lap, putting Russo into the wall and out of the race. (No injury or extensive damage to the car.) What he might've done but for the blow-out . . . well, let's hope Lou Welch brings his new Novis back again next year. The weather man cheated the second job of a chance to qualify on the sec-

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