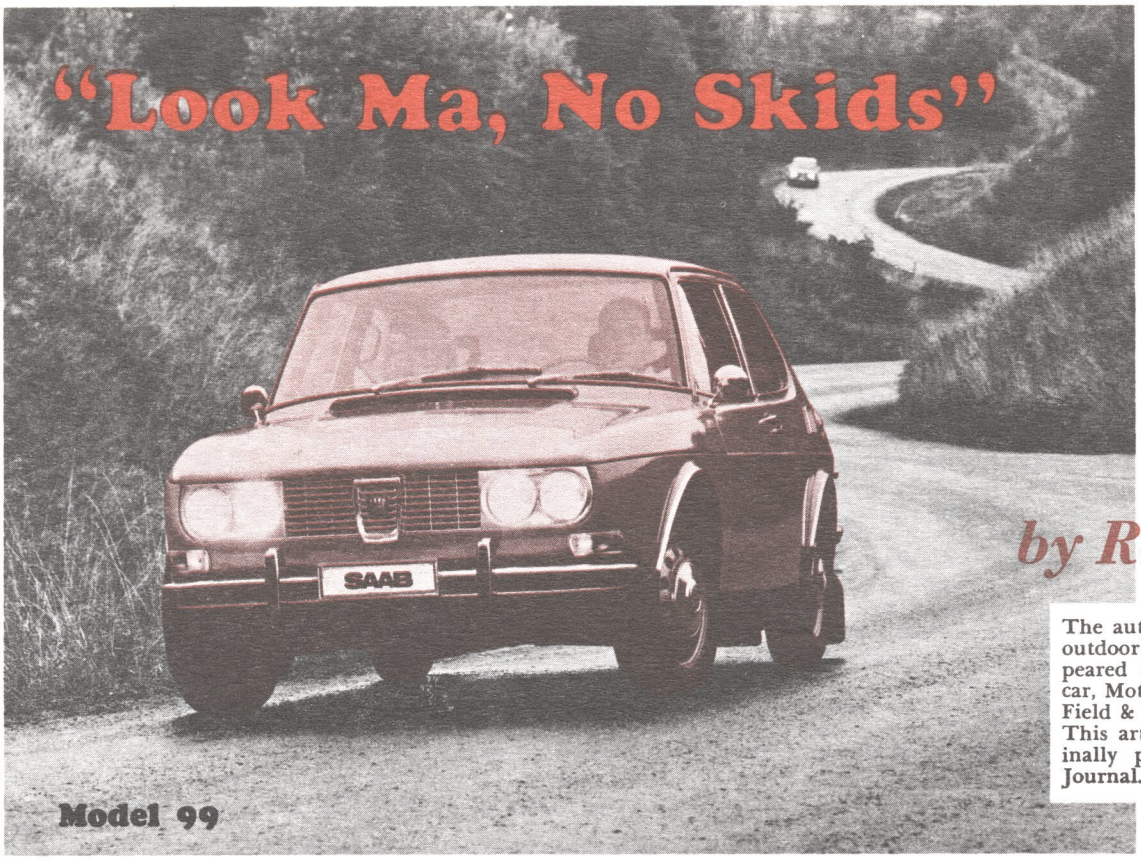
"Look Ma, No Skids"



by Roger Barlow

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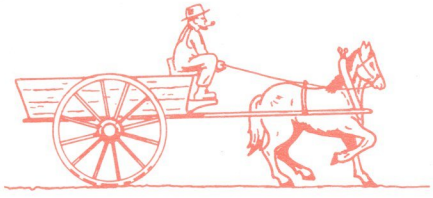
LOOK MA! NO SKIDS! No skids in the rain, no skids in the dry, no skids in the snow! No skids on gravel roads, no skids on muddy roads, not even skids on wet street car tracks!

Here I am, holding a satisfyingly fast cruising speed on a rainy day on a slick mountain road—yet in complete control of my car at all times and proceeding in perfect safety. Or belting along at high speed on a fast turnpike as steady as a train despite a vicious gusty side wind which pushes many other cars all over the road and forces them to slow. How do I do it? Am I some sort of super-skilled driver with ultra fast reactions who never makes a mistake? Not at all . . . . . I'm just fortunate enough to have selected a front wheel drive car for my travels and the way it handles under all conditions and forgives my mistakes is what makes me appear to be a better driver than I really am.

This love affair with Front Wheel Drive started with the early Cord and Ruxton cars when I was a boy and has continued for some 35 years right on through to today's great FWD cars like SAAB and Lancia.



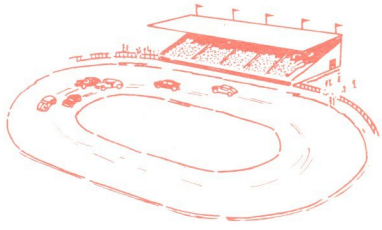
Before examining in detail some present day examples of front wheel drive cars, let us consider the history of this design. From the earliest days of the motor car the idea of front wheel drive—of *pulling* a vehicle rather than pushing it—has had great appeal. After thousands of years of using draft animals it seemed pretty evident that pulling a load was the most practical way to deal with the problem as there were mighty few examples of having the horse or ox push the load! In fact, the clearest way to indicate that something is being done the wrong way round is to say, "It's putting the cart before the horse".

This practical philosophy was quite possibly brought home to any early-day automotive engineer who got into a nasty skid on a muddy corner after applying power to the spinning rear wheels of his crude motor car; realizing ruefully that his discarded horse drawn buggy could negotiate such a slippery corner appreciably faster in complete safety. A little work that night with his drawing instruments and some common sense analysis of the forces involved undoubtedly showed this 1898 engineer the inherent drawbacks of transmitting power through the rear wheels.

He must quickly have seen that the driven rear wheels of his motor car actually *pushed* him into a skid, whereas if he could only manage to apply the power through the steerable front wheels they would *pull* him around corners—the rest of the vehicle *following* the front wheels instead of trying to continue on in a straight line.

Unfortunately for our engineering friend of the 1890s, the state of technology at that time was such that it was virtually impossible for him to construct a practical front wheel drive car. Compromise was the order of the day. To simply produce a vehicle that would move reliably under its own power was far more important than wasting time designing toward theoretical perfection or for superior road holding.

By the early 1920s, when it *was* technically possible to build a practical front drive car, automotive design was, in general, so frozen that there was little interest in any radical departure from front mounted engines driving rear wheels.



Therefore, the first practical front drive cars came not from the big prosperous manufacturers but from the specialized field of racing. The sleek and exciting looking Front Drive Miller Specials rocketed to success at Indianapolis, virtually made "front wheel drive" a household phrase and instilled in the heart of half America the burning desire to own a "Front Drive".

By 1925 the front wheel drive English Alvis was running in races and it was on the market as a sports car by 1928. In France M. Gregoire built his first front drive sports car in 1926, calling it the Tracta, and immediately won hill climbs and road races with the prototype. The Tracta was in limited production by 1927 and several hundred cars were sold during the next few years. They were regular competitors at LeMans and had remarkable success in the 1100cc class.

THE CORD CAR

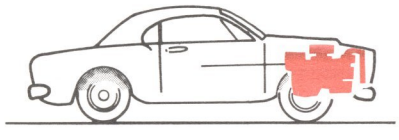
About 1929 the Auburn company in the USA built the first front drive Cord, based largely upon the Miller design. Then came the Ruxton, a better design in some ways, but destined for early failure just as the depression hit after only a few hundred cars had left the midwestern factory.

Unfortunately, all these 1925-30 designs suffered seriously from wheelspin on acceleration and on hills due to insufficient weight on the driving wheels. This was understandable for, in the Cord and some models of the Alvis, a long straight-8 engine sat a couple of feet *back* of the front axle—separated from the differential by both the clutch and the gearbox. However, even with a tendency toward easily induced wheelspin, these early front wheel drive cars had many characteristics which outweighed this defect. Road holding was generally of a very high order (for the day) and a spectacular low body line was easily achieved due to the lack of a drive shaft and a rear differential unit.

EARLY FWD CARS

By the early 1930s there was quite a notable list of front drive cars in production. In addition to those already mentioned there were DKW, Adler and Audi in Germany, the Steyr in Austria, BSA in England and a number of experimental designs in France such as the V16 Bucialli. The DKW which went into volume production in 1932 earned a couple of "firsts" in front wheel drive history. Not only was it the first FWD car to get into reasonably large scale production, it tackled the problem of wheelspin in an enterprising fashion—by designing the 2-stroke engine to sit transversely in the chassis and by combining the crankcase, gearbox and differential in one casting, a very compact unit was achieved with the center of this mass only a few *inches* behind the driving axle center—rather than 2 to 3 feet back as on all other contemporary FWD designs.

But at this same period the full resources of an even larger factory were being thrown into the development of a front wheel drive car. The Citroen which startled the automotive world in 1934-5 was more than just a front drive design. It was, like the earlier DKW, a new and completely "engineered" design. To bring the compact 4 cylinder engine as close to the front wheel center line as possible, the gearbox, instead of being mounted *between* the engine and the differential, was now mounted *forward* of the differential! In fact, the engine was now actually bolted directly to the differential case with the drive going *through* it to the gearbox and then coming *back* to the differential gears. Thus the Citroen, along with the DKW, pretty well licked the wheelspin problem and together they set a new standard of road holding by family type cars.



In 1935 the new V8 Cord, with an engine-gearbox-differential layout similar to that of Citroen, was introduced in the USA. Unfortunately the Cord was rushed into production by a firm about to fall victim to the depression years and it suffered from minor defects which could easily have been eliminated by the expenditure of just a little more time and money. However, even with its shortcomings, the Cord was a first rate road car and it was certainly far superior to anything produced then (and for many years after) by the big rich Detroit manufacturers. Anyone who ever pointed that clean, handsome, blunt hood down a road at an effortless 90-100 mph got a lesson in stability and roadholding that Buick, Chrysler, Cadillac, Lincoln, etc. could well have taken to heart. It was too bad the company failed before the Cord had a chance to prove itself and before the country recovered sufficiently from the depression to permit relatively expensive cars to be sold again in reasonable numbers.

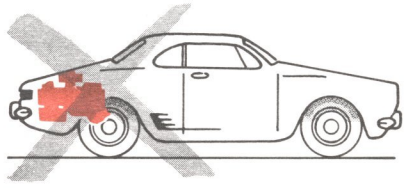
The Citroen company had also been in financial difficulties, had gone bankrupt, but had been refinanced under new management, licked the early production problems of its advanced design, and went on to become the most successful car ever to appear on the French market.

But good as the Citroen and Cord were, they were, nevertheless, only a part of the evolution of front wheel drive design. The new crop of post-war FWD cars showed very considerable improvements, particularly in the matter of even better weight distribution. Although DKW, Citroen and Cord had brought the engine well forward, it was still *behind* the front wheel centers and therefore, upon acceleration, normal weight transference still tended to reduce the all-important front axle loading. Now all the newly designed front drive cars (except for Citroen) have placed the engine *ahead* of the differential and the front wheel centers—actually increasing front axle loading upon acceleration by utilizing rather than fighting the old enemy, weight transference! The increased under-steer characteristics to be expected from so much additional weight up forward has not been evident, being largely cancelled out by the normal front drive tendency to pull itself in the direction the wheels are turned, rather than to mush on in a straight line as happens with most big engined Detroit cars entering a sharp corner.

I think it is worth mentioning that America *almost* had a new FWD car in the immediate post-war period. Henry Kaiser bought up a number of second hand Citroens for study and actually negotiated for the manufacturing rights for a Gregoire-designed FWD car developed in France in 1938-9. It is certainly to be regretted that Mr. Kaiser got cold feet at the last moment and chose instead to make just another dull copy of what everyone else was building in Detroit.

Now, for the owner, what clear advantages does front drive have over conventional layouts or over rear-engined types?

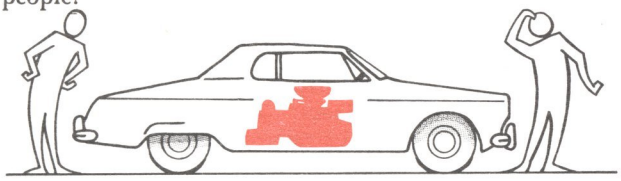
The conventional front-engine rear-drive design has had over 70 years of continuous development (hundreds of millions of dollars have been spent on its perfection) and although this type represents the major portion of world production it cer-



tainly *does not* possess superior qualities in keeping with its present volume of sales or its development costs. Rear engined cars are basically impractical except for rather small light types. The rear placement of the heavy engine mass in a long or even medium wheelbase results in a motor car that may be comfortable riding but which is positively dangerous when cornering—the momentum of the heavy engine-gearbox-differential unit tending to make the rear of the car slide in a manner difficult, and at times, impossible to control. (I have had the opportunity of driving the famous Tucker and can only say it was one of the worst handling cars ever put on the road. The experimental rear-engined Isotta-Fraschini I drove in Italy about 1948 was almost equally treacherous.)

Unfortunately many people tend to assume that the rear engined sedans on the market are quite similar to the "rear-engined" racing and sports cars which are so successful. The sedans really do have their engines in the rear, *behind* the back axle; but the sports and sports-racing cars which are referred to as "rear-engined" actually have their engines *ahead*

of the back axle in an effort to secure acceptable road holding and stability, and should therefore be called "*center*-engined" cars. However, no matter what it would be called, such a design would hardly be practical for a family sedan. With the usual rear-engined sedan there is hardly any room for luggage —with a center-engine design there would hardly be any room for people!



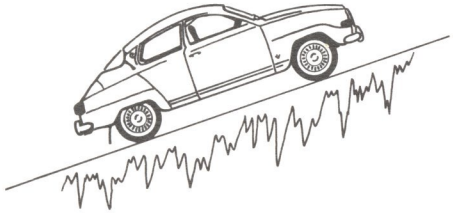
ADVANTAGES OF FRONT WHEEL DRIVE

The present examples of front wheel drive are all outstandingly safe, comfortable, practical and above all *interesting* motor cars with virtually no vices and with much, indeed, to recommend them to the average family. Let me enumerate some of the clear and evident advantages of FWD in the hands of normal motorists.

Steering:

About this part of the performance and character of a motor car it is impossible to be too critical. It is also the least satisfactory aspect of an incredible number of vehicles ranging from Detroit monsters to European midgets. I have *never* driven a front drive car which failed to go down the road as if on rails and I have rarely driven a conventional car (American of foreign) with this feeling. Most cars seem to need continuous correction. The front drive is merely pointed at the horizon and then steered only when *you* want to turn it. You don't twiddle the wheel continuously just to stay on your own side of the highway! The old pre-war Citroens and Cords gave front drive cars the reputation of being somewhat heavy steering at low speeds and when parking but the new breed of FWD cars such as SAAB, Lancia, DKW and some others are not only very light steering but actually turn sharper than many conventional cars—and without power assistance.

The type of constant velocity universal joints now found on most FWD cars not only permit these remarkably tight turning circles but have eliminated any trace of steering reaction even when full power is applied in low gear. The superb sense of control given by the steering of virtually all FWD cars must be experienced to be appreciated. On this point the FWD car cannot be excelled and is rarely equalled.

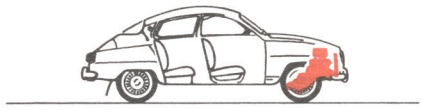


Roadholding:

In their ability to negotiate either slow or fast bends with the absolute minimum of roll, tire squeal and unwanted deviation from an established line, FWD sedans are pretty much in a class by themselves. The excess of weight in the tail of the rear-engined car results in extreme over-steer characteristics when cornering (the tendency to go backwards through the fence on the other side of the road) while the present-day conventional car with a big engine in front driving through the rear wheels suffers from under-steer when cornering hard (the tendency to go head-on through that fence on the other side of the road). All modern front drive cars I have driven seem devoid of *either* excessive over or under-steer. They simply go where pointed, and without argument! When near the limit of adhesion in a fast corner, a slight bump or spot of oil will usually send both rear engined and conventional sedans into really hard-to-control skids, but the FWD car seem virtually unaffected under such circumstances as the pull of the front wheels in the direction of the bend quickly restores directional stability even if momentarily jolted off the chosen line. On wet roads, and especially when crossing and recrossing street car tracks, the FWD sedan shows its unequalled surefootedness. One can take a modern FWD sedan, such as a SAAB, and zig-zag it across wet car tracks under full throttle in the gears, the wheels spinning wildly half the time, without the slightest inclination for it to do anything other than to go where you want it. Icy hills, where the slightest bit of rear wheelspin sends cars into the ditch, will often be climbed by a FWD car with the front wheels spinning for, even then, steerability is not lost. In terms of normal family sedans driven by ordinary drivers, there is a very considerable safety factor favoring the FWD design. It does not misbehave and frighten the driver upon entering an unexpected sharp turn at a somewhat higher rate of speed than intended. It can be taken through bends at high speeds by no more than simply *steering* it, whereas in a conventional car (and to an even greater degree in a rear-engined one) the driver negotiating the same bend at the same speed would have to be doing a job of correcting slides and using judgement and skill which the average motorist or his wife simply does not have. When roads are covered with snow or ice this goes double, and in spades!

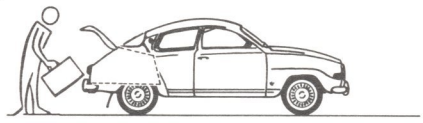
Reliability:

There seems to be a long standing belief that front wheel drive automatically entails considerably more complication than conventional or rear engined designs. Not so. The modern FWD car is unquestionably as trouble-free and long lived as any others. There is certainly no need to be concerned over the U-joints for they seem to have almost unlimited life. (One of my present FWD cars has nearly 80,000 hard miles on its speedo and yet the entire drive line seems as tight as when new). Universal joints are used, it should be remembered, on *all* cars; front wheel drives merely use an extra pair. In several hundred thousands of miles of front wheel driving with a variety of cars I have never found it necessary to carry out repairs to the front drive mechanism of any of them.



Comfort and Room:

The small FWD sedan seems to have a somewhat better ride than most conventional cars of the same size largely because of the elimination of the considerable unsprung weight of the heavy rear axle unit. Another contribution to comfort is the low build of the FWD sedan which permits softer suspension without introducing excessive roll when cornering. As the space at the rear of a motor car is more suitably shaped to accept a variety of luggage than is the space between the front wheels, the FWD sedan has a far more useful trunk than has a rear-engined car. It is usually better than that of a conventional



sedan of the same general size because the FWD car needs less space for its simple light rear axle tube or independently sprung rear wheels. And because there is no drive shaft or gearshift tunnel going back through the center of the body, the FWD sedan offers the best and most useful interior space for

the seating of passengers. An unobstructed flat floor makes it possible to enter and exit the car with greater convenience and permits a more comfortable seat height than is found in many other types.

The many practical benefits of front wheel drive design have finally become evident to numerous manufacturers in recent years.

Possibly the most surprising automotive development was the adoption of front wheel drive by Lancia. This famous old Italian firm has made a fetish of superior roadholding and steering for half a century and yet they reached the conclusion that they had made all the progress possible in this aspect of design with driven rear wheels. Having piloted their new FWD Flavia up and down a couple of Alps it is clearly evident to me that with their new approach they have not only set new standards in cornering and stability for family cars, even for Lancia, but have also secured an exceptionally comfortable and quiet ride under all conditions.

While some manufacturers have changed from conventional layouts to front wheel drive there are others, like the Swedish jet aircraft builder, who decided right from the start that the best engineering approach to making a practical, high performance, compact family sedan was to utilize front wheel drive. Thus *all* SAABs have been of this design. The combination of 2-stroke engine and front wheel drive was not only eminently suitable for the graveled roads and severe winter conditions of Sweden but quickly gained success throughout Europe and in our own New England states, where they were first introduced when SAAB decided to enter the US market with their cars.

What started out as a simple, safe, solid and practical family sedan turned out to be so solid and rugged, so safe under all road conditions, no matter how hazardous, and so thoroughly practical that sports car type drivers began to run the SAABs in many of the most difficult and demanding rallies in both Europe and America. At first these SAAB drivers were content to merely defeat cars in their own class, but success begats success and so it was inevitable that SAAB would eventually defeat all competitors, regardless of engine size; in 1962 they did this by winning outright the greatest of all rallies, the formidable Rallye De Monte Carlo. Then just to prove it was no accident, SAAB won the "Monte" outright again the following year!

Now SAABs specially equipped version of that safe and practical FWD family sedan have proudly borne the name "MONTE CARLO" and I wonder if maybe SAABs shouldn't be required to display a large sign on their shapely backside warning other drivers to, "FOLLOW AT YOUR OWN RISK . . . THIS IS A FRONT WHEEL DRIVE CAR"!

But in all seriousness, your life, and the lives of others riding with you, may some day depend *directly* upon the accuracy and responsiveness of your cars steering, upon the effectiveness of its roadholding and upon its resistance to skidding in some sudden emergency—it is in these most vital characteristics that the front wheel drive car excells. For these reasons alone it deserves our most serious and intelligent consideration when selecting a new family car.