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POPULAR MECHANICS MAGAZINE

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SECRETS *of* SUPER-Speed!

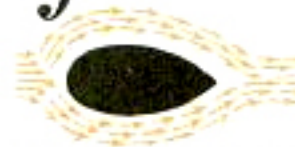
Top, Looking through Blades of Wind-Tunnel Fan at Model of Streamlined Auto; Left, Experimenting with Shapes of Various Kinds for a Streamlined Street Car

FIFTY miles to the gallon, smoother, faster riding and, consequently, more comfort at less cost—these are the ultimate aims of hard-headed engineers in turning to "teardrop" automobiles.

These streamlined cars are not just freaks, or somebody's effort to be different. They simply can't be laughed off because they mean that the automobile is emerging from the horse-and-buggy stage into its own field of fast transportation.

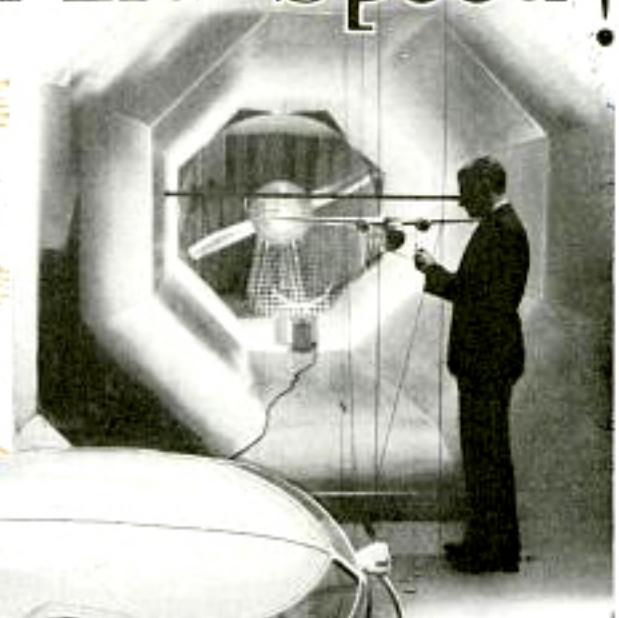
W. E. Lay, professor of mechanical engineering at the University of Michigan, where air resistance and related problems have been studied at length, concludes that "streamlined cars provided with variable-gear transmissions may be built to travel three times as far on a gallon as the conventional sedan can at normal touring speeds."

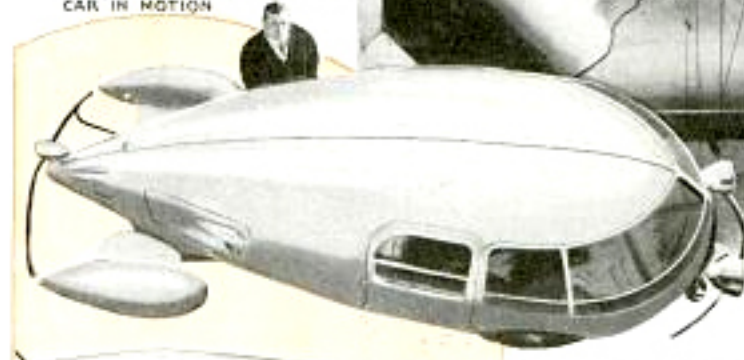
This statement was made after models of automobiles, trains, street cars and airplanes had been subjected to wind-tunnel tests, the results being checked later with the performance of real vehicles built from these models. Tests have also been



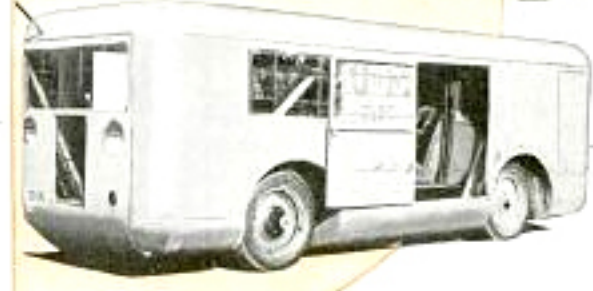
ILLUSTRATES THE EFFECT OF STREAMLINING IN REDUCING WIND RESISTANCE

DEPICTS RETARDING FORCE SET UP BY NON-STREAMLINED CAR IN MOTION





Above, Lockheed Model in Wind Tunnel; Left, Teardrop Car with Rear-Engine Designed by Lyman Voisel



Floating Body on Axis for Wind-Resistance Test; Yawmeter in Front Measures Force of Side Winds

made at the university with full-size cars fitted with boxlike bodies set on ball bearings which allowed the body to move back as the wind exerted its force, the resistance being recorded on indicators, and other experiments have been made with the yawmeter which enables the engineer to study the effect of side winds on a moving vehicle. From such experiments, Professor Lay offered several suggestions to manufacturers who want to build a car in which the power is used to propel the vehicle instead of to fight the wind. Here are some of his ideas:

Remove the wind-claws from the body or build the body out to inclose them; replace sharp edges and corners with rounded surfaces; build the front of the car to bore a hole through the air with the least possible disturbance of the surrounding air, and the rear to lay the air back in place without eddies or turbulence. He points out that the shape of the ideal streamline form naturally provides space for housing the engine at the rear

Above, Streamlined Model of Lockheed Plane Suspended in Wind Tunnel; Right, Moderately Streamlined Street Car and Locomotive; Below, Streamlined Racing Car

and that full advantage cannot be taken of correct streamlining without improving the transmission so the engine will operate at the most efficient speed for all car speeds. This suggests a gearshift with more than three forward speeds, but Professor Lay believes the solution is in the variable-speed automatic or partly automatic transmission.

For several years normal driving speeds and maximum car speeds have been increasing. This increase has been accomplished mainly by using larger engines, but engineers have realized that this policy, if continued, will lead to ridiculous power plants. In casting about for ways to provide more speed without building bigger engines eating more fuel and adding more weight, they learned that air resistance absorbs much engine power above thirty miles per hour.

By reducing air resistance, these experimenters found they could kill several birds with one stone. Streamlining, they discovered, cut down the power requirements to propel a vehicle. The power thus saved could be used to develop more speed with no increase in power plant. They also found that the pure streamline form offers vast possibilities in the saving of weight, and this in turn saves power and adds still more speed.

The conventional boxlike sedan body, it was found, has about half as much air resistance as a flat plate of the same size. Merely rounding the corners of a sharp-

Above, Looking through Window of Wind Tunnel at Car Model under Test; Left, Streamlined Tank Truck with Rear Engine; Below, Air Flow as It Passes over Streamlined Car

edged body, may reduce its air resistance to nearly one-half, but by streamlining front and rear this resistance may be reduced to one-tenth the original value. Tests have shown that one form of streamlined cars offers air resistance of six pounds per square foot at 100 miles per hour, compared with fifteen pounds for the boxlike body.

At thirty-five or forty miles an hour about one-half the engine power is used to overcome air resistance with the conventional car. Eliminating fifty or sixty per cent of this resistance, therefore, adds twenty-five or thirty per cent to the engine power available. But it is also contended that correct streamlining would lend itself to cutting over-all weight from twenty-five to forty per cent, so the engine in the car of pure streamline would also have less weight to propel.

Some of these things have been known for a long time, but the public has very definite ideas of how an automobile, a train or an airplane ought to look, and the makers have been afraid to change the appearance. Gradually, however, corners have been rounded, some of the protuberances have been removed from bodies, windshields have been slanted, radiators rounded, fenders skirted and an attempt has been made to mold the rear into some-

thing less like a rectangle. How far has streamlining progressed toward its ultimate goal? Not very far, say engineers. But the public is at last becoming streamline-conscious, and will become more so when it is generally known that it means more than a startling body style. One critic has declared that a pure streamlined car could be made so beautiful as to make present models look like "a very intermediate streamline form hiding a mechanical buggy with one foot in yesterday's buggy graveyard."

Pure streamlining—a bulletlike nose, smooth flowing line and a long tapering rear section—naturally lends itself to a commodious passenger compartment so placed as to assure a maximum of comfort. It also gives the body builder a chance to create stamped designs of pressed metal and the car builder an opportunity to discard some of the iron which he has used heretofore to support the weight.

Europe has carried streamlining to the underside of its cars and now offers models with the bottom of the chassis entirely inclosed. Hal Holton, sales engineer of the New Era Motors corporation, advises automobile manufacturers to allow machine tool makers and pressed steel men to try their hands at making a simply designed structure fully streamlined.

"If they ever do," he remarks, "they would have a car that could be sold at a reasonable profit per pound; one that the poor white-collar man could afford to operate and one that the so-called common people could use in place of street cars; a vehicle that could be sold throughout the world."

Above, Balances from Which Readings Are Taken in Wind-Tunnel Tests of Models; Center, Diagram Showing Arrangement for Testing Models in Wind Tunnel at University of Michigan; Below, Applying Plastic to Give Streamlined Model the Shape of Old Square-Cornered Car