Adventures in Airflow

By Don Butler

Part I

In response to the world's fuel situation, auto manufacturers are applying a variety of technical skills and mechanical devices designed to improve fuel economy. One logical element of the fuel economy campaign is the application of aerodynamic design principles in the shaping of vehicles, since a form having less air resistance requires less power and fuel to achieve and maintain motion than a form of equal mass and weight but with less aerodynamic efficiency.

But fuel economy was not the reason for early experiments in reducing the air resistance of automobiles. Higher speed was the primary objective. Racing was very popular during the first 20 years of the auto industry, enabling auto makers to gain publicity for their products. A stock racing chassis usually had only a cowl and two seats, but some were fitted with lightweight bodies. The absence of stock bodies and fenders reduced weight and increased speed, due in no small part to something else of which the makers had very little knowledge — reduced "wind battle."

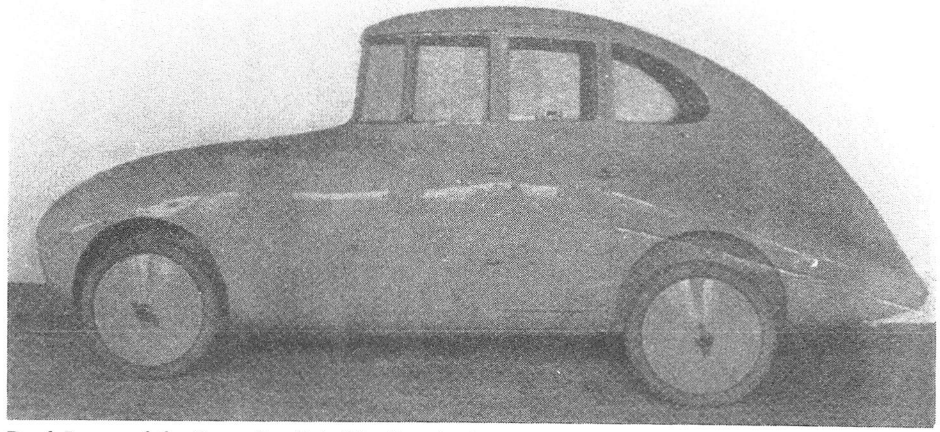
Now and then, individuals who were aware of the possible speed advantages rigged cars with bodies or appendages they hoped would split the air smoothly. Slanted, rounded and tapered extensions were applied in front of the radiator. Tail-end extensions of cone, wedge and odd shapes were tried. Body sides were smoothed, and some enclosed the driver and mechanic with a cab to eliminate wind disturbance in that area. Actually, the earliest experiments were not so much for racing as for record-breaking speed runs.

These attempts at what was known as "streamlining" were crude, but they functioned well enough to encourage further thought and trials. Until 1911, most builders of such cars seemed to regard the whale-like shape of dirigible balloons as a proven shape for land speed vehicles. They augmented it with their own ideas, and it covered only the central longitudinal string of elements — wheels were left completely exposed. While in no sense resembling a dirigible, passenger cars began to receive the first touches of a years-long smoothing treatment in 1911. Nearly all were open cars and they were often said to be of "torpedo" type or design, a term for implying sleekness similar to the weapon which was "streamlined" for rapid transit under water. Cars of "torpedo" design had already been built in Europe, however.

Europe was also where the first car intended to smooth the air flow was built. The locale was in Belgium and the year was 1899. Racing driver Camille Jenatzy was bent on setting a new speed record in a car with his favorite kind of power — electric. The car had to be of special form, so a bullet-shaped body was created and mounted on a chassis which, unfortunately, stood high. Regardless, the car accomplished his goal with the help of a tailwind. It swept the flying kilometer at a mean speed of 65.8 mph.

Four years after Jenatzy's electric dash, a man in the U.S. trotted out his own electric creation with which he hoped to smash the world land speed record. Walter Baker knew much about building electrics for normal use, and he put everything he knew into this speed car. Aware of the slowing effects of air resistance, he gave it a whale-shaped body with an enclosed cockpit and kept the profile low. He built what remains credited as the first streamlined U.S. car. It was ill-fated, however. During the record attempt, a tire blew out and the car was demolished.

A different concept of low-resistance design was applied to a Stanley steam-powered speed car that broke five world speed records at Ormond Beach, Fla., in 1906. The flat body sides converged to the vehicle center at each end and this was topped by a tapering crowned form. The car was also very low, which kept frontal air-impact surfaces to a minimum, and in this respect borrowed a principle from Baker. The steamer flashed across the flying mile in 28.2 seconds, which figured out to a mean speed of 127.66 mph and entitled Stanley to advertise "The Fastest Car in the World."



Paul Jaray of the Zeppelin dirigible firm in Germany applied scientific aerodynamics to auto design and patented the idea. This little experimental was based on a Loreley chassis in 1922. It had full-length "pontoon" sides that U.S. production cars would not have until 1946.

Relieving wind resistance was proving advantageous for high-speed specials, and its application to a family-type car would certainly be tried. A French coachbuilding firm did it in 1910 for reasons of uniqueness, advanced thought and publicity rather than aero-efficiency. It had a practical aspect, however, since it was a sedan — a pioneering type, since open cars were the only "factory" offerings on the market. This was set on a standard Gregoire chassis with a conventional radiator, hood, fenders, lamps, etc., which related to the unusual body shape only in a transportation sense.

In 1913, the "teardrop" concept of automotive design was adopted by an engineer named Marco Ricotti. He designed a pointed-tail body with sedan-like inner capacity and with the sides and roof beginning at the extreme front end of the chassis, thereby engulfing the engine. The driver's seat and controls remained unmoved on the standard Alfa chassis, which must have given him a feeling similar to sitting in a tunnel and looking toward the end. The shell had front glass and side panes extending a short distance toward the driver, porthole side windows, and did not enclose the chassis frame and wheels.

Ricotti had the body built by the Italian coachbuilder, Castagna. The car, with a 50-hp touring car chassis, attained a top speed of 87 mph. This was much faster than the standard Alfa touring of this size, which could hit only about 55 mph. The elementary aerodynamics were apparently responsible.

The remaining teen years brought no significant examples of effective automotive streamlining, but a few half-hearted attempts were built. World War I and the first use of airplanes in military service ushered in the beginning of the study of aerodynamics as a science.

Not long after the war, Edmund Rumpler began work on a rear-engined car that combined other unusual characteristics. He was a German airplane manufacturer, so one would expect his car to be definitely aeronautical in concept. Apparently, he also was fond of boat shapes, as the car's main form and cabin were much like a boat. Projecting from the sides were thin horizontal "mini-wings" arranged in a staggered manner, intended to deflect dirt and spray from the fully exposed wheels. The cabin's seating plan was similar to that of a sedan. It seems that Rumpler's streamlining ideas were complex, for the car was more freakish than less air resistant. When shown in 1921, it stirred public curiosity.

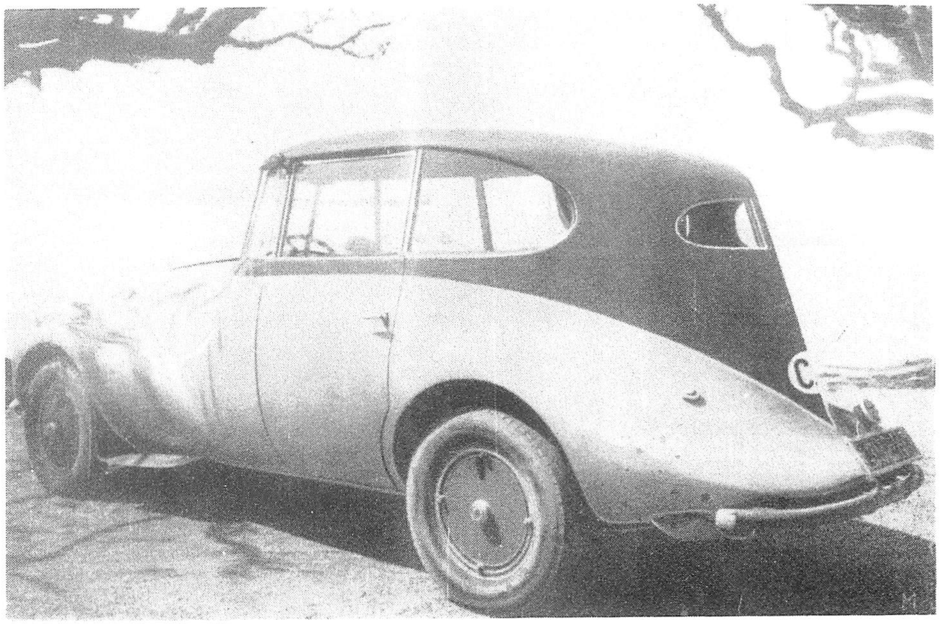
By this time, another fellow was well into the development of automotive form according to the best aerodynamic principles, some of which he probably formulated and proved. Dedicated and thorough, he was truly a scientist in the field and was the first to apply scientific intellect toward minimizing the air resistance of motor cars. Paul Jaray, a Hungarian by birth, had been employed as an engineer at the Zeppelin Airship Works in Germany since 1914. When the war ended in 1918, peace terms shackled the German aircraft industry and Count von Zeppelin set up a department for new projects. Jaray took charge of it as chief engineer.

One of the projects focused on the development of better aerodynamic forms for dirigible hulls. In this work, Jaray first became intensely involved in the study of air effects on objects in motion. Another project was the development of bodies for automobiles. Jaray was jubilant. This was a new field for him. In his view, however, development should embrace the entire car rather than the body alone. Von Zeppelin apparently accepted this point of view, for in 1921 the finished vehicle concept was presented to the firm's general management for consideration.

The shape was radical but simple, and clean of line, surface and contours. Dr. Jaray immediately took steps to protect his design by applying for a German patent in September of 1921. This established the design formula that would prevail in a second German application in January 1922, and an application received by the U.S. Patent Office seven months later.

The first car built in the Jaray form was based on a Loreley chassis in 1922. Loreley cars were products of the Rudolf Ley factory in Germany, whose specialty was small two and four-cylinder cars. Jaray had utilized a wind tunnel for testing airflow behavior and was the first to use this technique on scale-model cars. This was not the first wind tunnel, however, as the device had been known for perhaps 50 years.

Sidney, Ohio



Jaray developed this design on a 1928 Chrysler 72 chassis. It was built in Europe without the involvement of Chrysler Corp. It featured fender-like body forms at the front, headlamps integrated in Pierce-Arrow fashion and a roof that ended in a "V" shape.

In 1923, Jaray set up his own business in Zurich, Switzerland, continuing to experiment with car design. In this work, he stuck doggedly to his original convictions. The basic principles were rigidly adhered to, but he added refinements and altered details. This flexibility was possible because of the all-encompassing nature of the claims spelled out in the patent requests. Regardless, additional applications were filed in later years to cover these changes that further developed the original ideas.

The U.S. patent was granted in June 1927. Drawings showed two enclosed-type cars, a two-door and a four-door, the former being a smaller vehicle than the latter. Of course, they were similar in basic shape. In profile, the main mass had a rounded front from which the upper line arched back and down to join the bottom line at the rear end. The cab superstructure, also as seen in profile, had a slightly slanted windshield and the roofline curved down in the manner of a fastback to meet the tail-end point of the main mass.

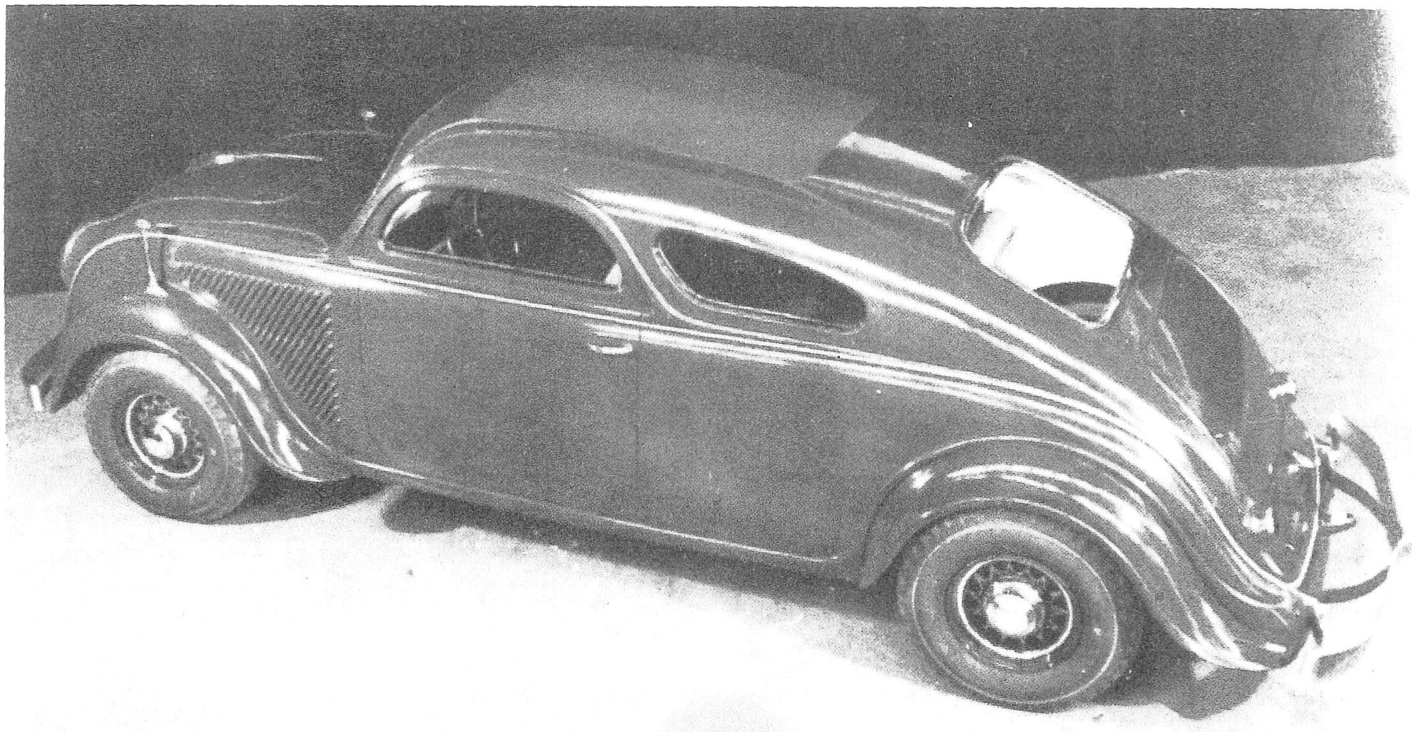
As viewed from above, the front end was rounded for the four-door car and squarish for the two-door, the rear end (at the tail-end "point" in profile view) was straight-across for both cars, and the cab of both was of so-called "teardrop" outline. A cross-section of the four-door car showed the shape of the main mass as one-half of a circle, the halving line representing the car's enclosing underpan. The cab cross-section of both cars showed the windows and sides to be slanted in a "tumblehome" manner.

The four-door car's wheels were enclosed, while those of the other car could be fully seen. The two-door car also had fairly flat sides. Jaray stated that in practice his form of design guided air flow around it in a low-resistance manner and passed the air currents off at the rear in a way that kept road dust low. Indeed, the patent covered the entire automotive form. Eventually, this coverage was expanded to include buses, trucks and rail cars.

A Chrysler chassis was chosen by Jaray to become an experimental car, but Chrysler Corp. was not involved in this project. The chassis was a 1928 six-cylinder series 72 which had a wheelbase of 118.75 inches. This was a good base for tailoring the Jaray formula to a medium-size car. The chassis emerged from the construction shop as a sedan of interesting form. Instead of "pontoon" sides that typified the patent designs, this one featured front fender forms that were integrated with the body rather than applied to it. The roof was not swept down in fastback fashion, being fairly high at the rear where the cab sides met at the center as a "V."

To determine or prove its advantages, the car was road-tested in comparison with a stock Chrysler 72 model. With three passengers each, the Jaray job (Car A) weighed 4,240 pounds against 3,900 for the stock job (Car B), and both were powered by stock engines. In the acceleration test, conducted in high gear from 18 to 56 mph, Car A did it in about 22 seconds and Car B took about 27 seconds. Coasting on the level was another means of testing aerodynamics. For this, the cars were accelerated to 56 mph and allowed to coast to a stop. Car A's coasting distance bettered Car B's by up to 35 percent.

Fuel consumption was checked at an average 32 mph speed on a measured 34.2-mile stretch of road. Car A used 1.72 gallons while Car B gulped 2.77 gallons. Allowing for weight differences, etc., Car A used 40 percent less fuel. The fuel savings was estimated, as in reality, more than 45 percent by accounting for the fact that Car A required much less horsepower for the fuel-test run.



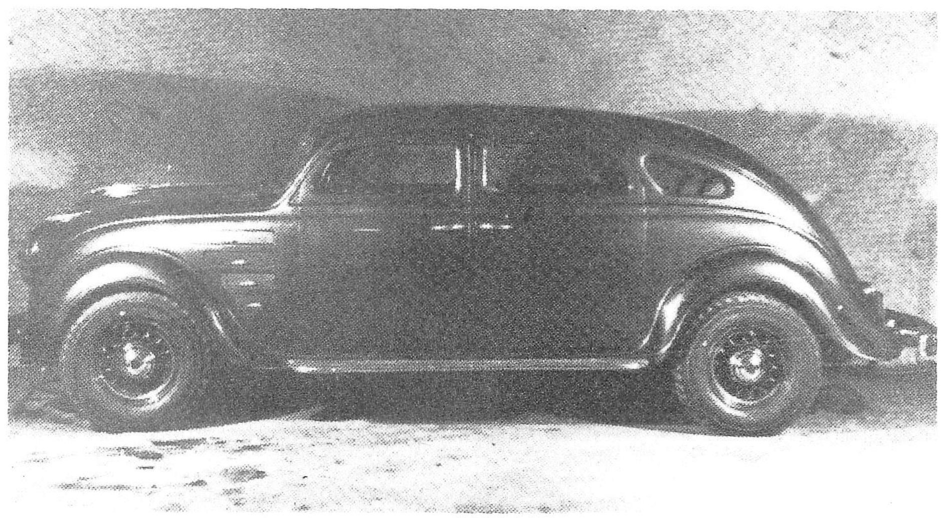
A full-size wooden mockup of one of the Airflow trial designs for Chrysler models. The sleek two-door proposal was photographed late in 1932.

Airflow

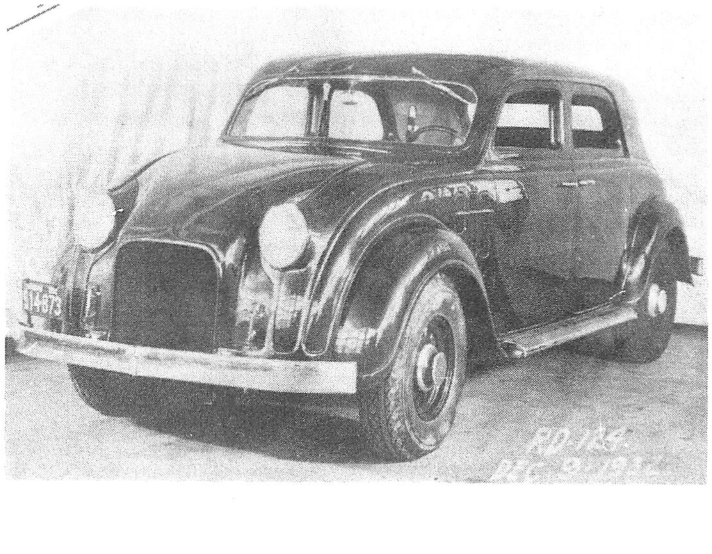
Publicity about "streamlined" cars occasionally appeared in trade journals as Jaray-influenced and less professional efforts showed up in a few racing and passenger car specials. Interest was growing, though slowly, and the progressive new Chrysler Corp. already had an aero-study project underway. It was begun in 1927 by Carl Breer, of Chrysler's famed trio of executive engineers, Zeder, Skelton and Breer. The first requirement, a small wind tunnel, was designed according to the advice of aviation pioneer Orville Wright, who had been quite familiar with one in Dayton, Ohio for 25 years.

Breer began the wind tunnel tests with basic shapes fashioned from wood blocks. Next came small-scale model cars of various experimental shapes, plus a conventional sedan. In testing the latter, it was turned tail-to-the-wind and surprisingly found to have less air resistance than when facing the wind. The impact of this discovery fractured many corporate doubts of the advantages of aerodynamics, and research then concentrated on finding an acceptable form. It must be feasible for manufacturing methods and costs as well as servicing and repair at dealerships and elsewhere. Not only were these requirements resolved, but new concepts of vehicle structure, passenger space and riding comfort were incorporated.

The products of Chrysler's program were introduced to motordom as "Airflow" cars. They were Airflow Chryslers and Airflow DeSotos. Their debut in Janu-



This experimental Airflow Chrysler was one of the road-test cars in 1932-33. The form was fairly close to the production version, but fender skirts would be added, a spare wheel hung on the rear and details changed.



Rides in the "Trifon Special" road-test car in 1932 convinced Walter P. Chrysler that the advanced design must be put on the market. This DeSoto "trial runner" differed considerably from the eventual production car.

ary of 1934 was the culmination of more than six years of research, development, road testing and final planning for production.

During this period, public awareness of automotive aerodynamics had risen sharply. Aero-sleek monsters set world land speed records, made newspaper headlines and flashed across theater screens in newsreel movies. Somewhat more practical from the motorist's point of view was the Burney Streamline car that appeared in prototype form in 1928. The brainchild of airship designer Sir Dennistoun Burney, a few were produced for sale in England before the design was acquired in 1933 by Crossley, another English firm.

William B. Stout, the famous U.S. designer of airplanes, radical automobiles, railcars, etc., built his first "Scarab" rear-engined car in 1932. Briggs, the body-making firm in Detroit, built a full-size mockup of a proposed rear-engined aerodynamic car in 1933. This was displayed by Ford at the Century of Progress in Chicago. It was developed by John Tjaarda, a designer/stylist who had designed cars that were mysteriously called "Sterkenburg" during the few years just previous to going to Briggs in 1932. Tjaarda's Briggs car evolved into the 1936 Lincoln-Zephyr.

Pierce-Arrow created much interest with the aerodynamic "Silver Arrow" in 1933 and built a small number of them to sell. Also in 1933 came the Dymaxion with a shape most similar to a fat cigar. This Dymaxion was the first of three that had a rear engine, three wheels, and were products of Buckminster Fuller, an inventor in the U.S.

The amount of publicity about streamlining was increasing. Until the latter months of 1933, none of the publicity related to Chrysler, however, as the corporation had tried to keep the Airflow programs as secretive as possible. Chrysler had its own publicity plan, however, that would build up public interest in a manner that Chrysler felt best. Strangely, it would carry no positive word that the company was about to place streamlined cars on the market.

The first publicity punch was a stunt to dramatize the fact learned by Carl Breer in his early wind-tunnel experiments — that conventional cars were less wind-resistant when moving backwards. Noted racing driver Harry Hartz drove a 1933 DeSoto sedan backwards at road speeds from Michigan to New York City. Reportedly, he did this on his own because of personal interest in streamlining experiments, and he wanted to talk with Prof. Klemin of the Guggenheim School of Aeronautics at New York University. Demonstration rides for press reporters and movie newsreel companies got the desired publicity. The car's conversion to backward driving was done by a firm in New York, working in conjunction with Chrysler. Identification marks were removed from the car to make it anonymous, when in fact the stunt was the Chrysler-DeSoto promotion of the coming Airflow cars.

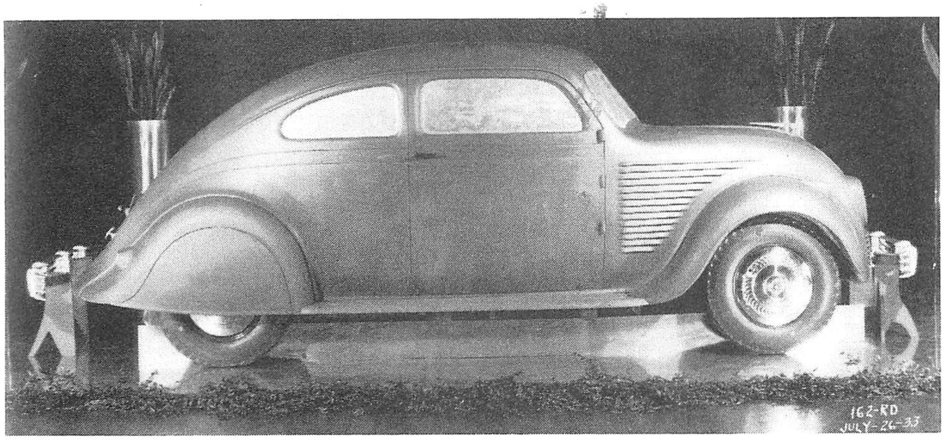
While the "anonymous" backward car was arousing curiosity and making news in New York, a press release from the DeSoto factory in Detroit quoted president Byron Foy. He made no reference to the stunt trip, nor to DeSoto's plan to introduce streamlined cars. He said "The work already done in streamlining airplanes and railroad trains is setting the stage for the introduction of truly streamlined motorcars," and predicted that they would be "entirely different from any cars on the roads of America today." He added that the aeronautical engineer and designer, Major Alexander de Seversky, had joined DeSoto as a consulting engineer.

It was logical for DeSoto to take the leading Airflow publicity steps, for the Airflow development programs had been credited to the DeSoto division of Chrysler Corp. since their beginning. At first, only DeSoto cars were to be of the new design. The decision to apply it to the Chrysler car lines was not made until exploratory problems were settled.

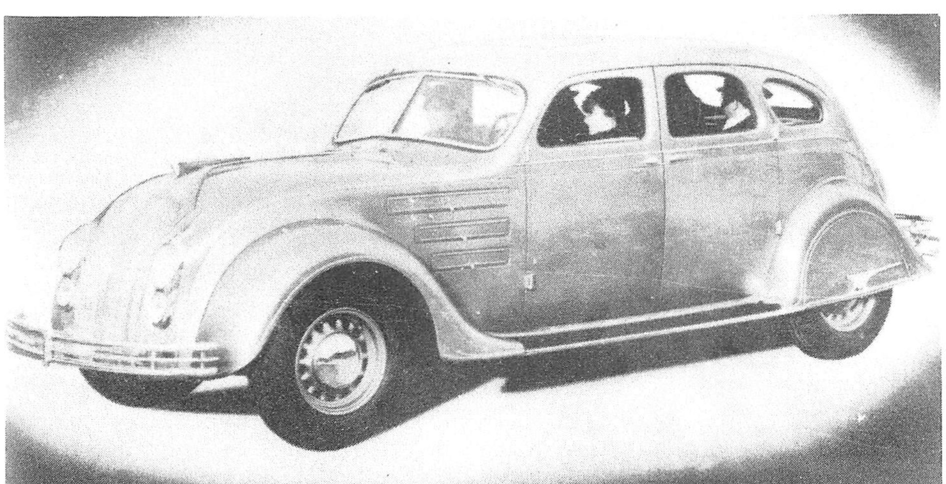
DeSoto production operations were in the Chrysler car plant. The staggering cost of rearranging and tooling for the new production methods required by these radical cars would have prohibited the setting up of two factories. The Chrysler plant had ample capacity to handle the anticipated production volume. Using another division's facilities was not new to the DeSoto Motor Corp., which had not had a home of its own since its inception in 1928.

The first production Airflows came out of the factory about Feb. 1, 1934. The DeSoto assembly rate increased satisfactorily, but Chrysler assembly was slow until March. General sales manager Joseph W. Frazer, who eventually teamed up with Henry Kaiser, explained the production lag to Chrysler dealers across the country. He said that road tests of the Airflow Eight (Model CU) had shown that brake drums and the clutch disc should be larger. Also, the automatic clutch, standard equipment on the Airflow Chryslers then in production (the Eight CU and Imperial CV), was too soft-acting for the powerful engines, causing poor acceleration and irritating drivers when they were left behind at the "go" light. The brakes and clutch disc were being changed, he said, and the automatic clutch was dropped from the standard list and made optional with the provision that buyers would be warned of its disadvantage.

The late start-up and slow initial production pace caused disappointment at dealerships. Some dealers in outlying territories hadn't even had an Airflow to dis-



Airflow development was nearly finished when this full-scale clay model was photographed in 1933. The two-door design was for a 106-inch wheelbase DeSoto, as Chrysler had a token interest in small cars.



Shown in production form is the sedan of the 1934 Airflow Chrysler Eight, Model CU.

Airflow

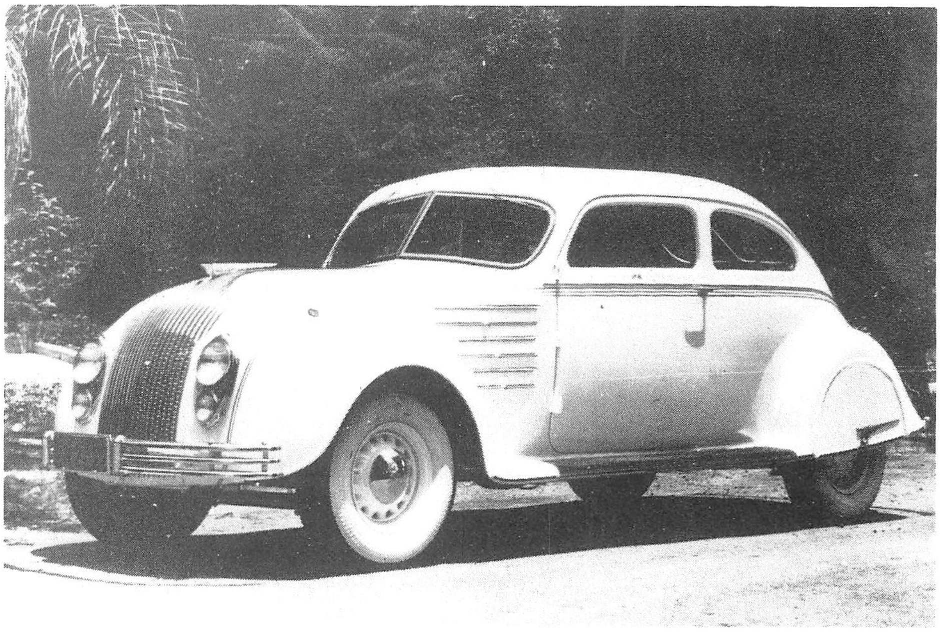
play or demonstrate. Dealers in metropolitan areas needed cars to deliver, many waiting buyers were impatient and some had canceled their orders.

The January show cars were pre-production jobs with a few very minor deviations from what was to be production, but the viewing public was not aware of this. Chryslers and DeSotos were known as stylish and well-engineered cars and people were eager to see what the newspapers and radio had very recently told them were streamlined cars for "a new era of transportation." They studied the new shape and approved the girder-trussed frame's safety factor and the new riding comfort claimed for the more forward location of the seats.

They had expected advanced engineering ideas and streamlined styling. Generally, they liked the Airflows — except for the rounded front with no projecting features for relief. As a result, the hood looked too short to a public accustomed to a long straight hood. In fact, the cars were too advanced for their time. Years-ahead progress was represented in this one sudden jump. Chrysler Corp. was confident that the decision to move in this manner and at this time was correct, but not without risk. Some public hesitation was expected at the start, but acceptance would grow as people got used to the design and realized its advantages. Unfortunately, there was no sure way of proving this judgment right or wrong without placing the cars on the market.

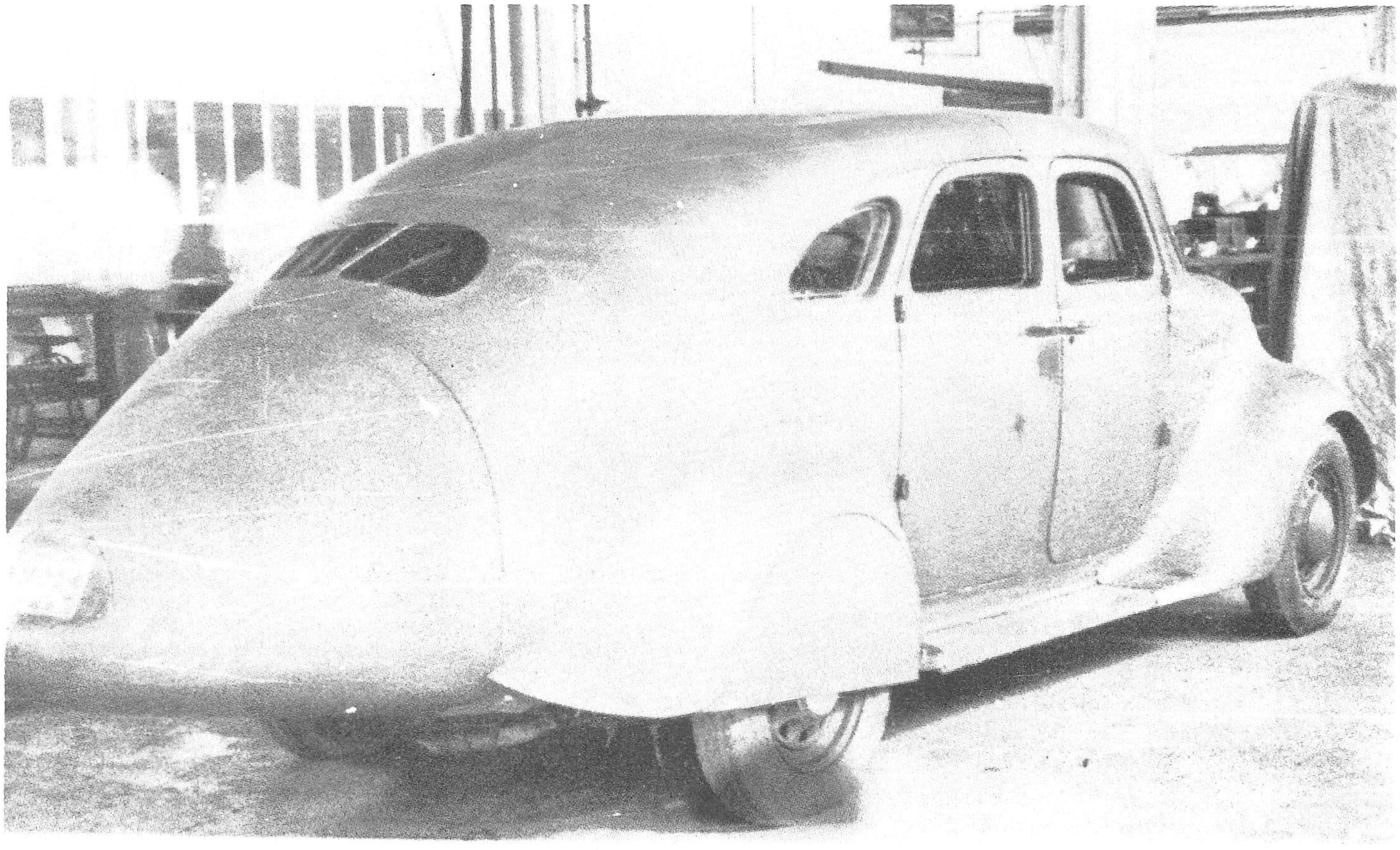
As the national populace became more aware of the Airflows, reactions were as mixed as those generated at the auto shows. Sales improved with the coming of warm weather and the availability of cars, but there was no buying surge.

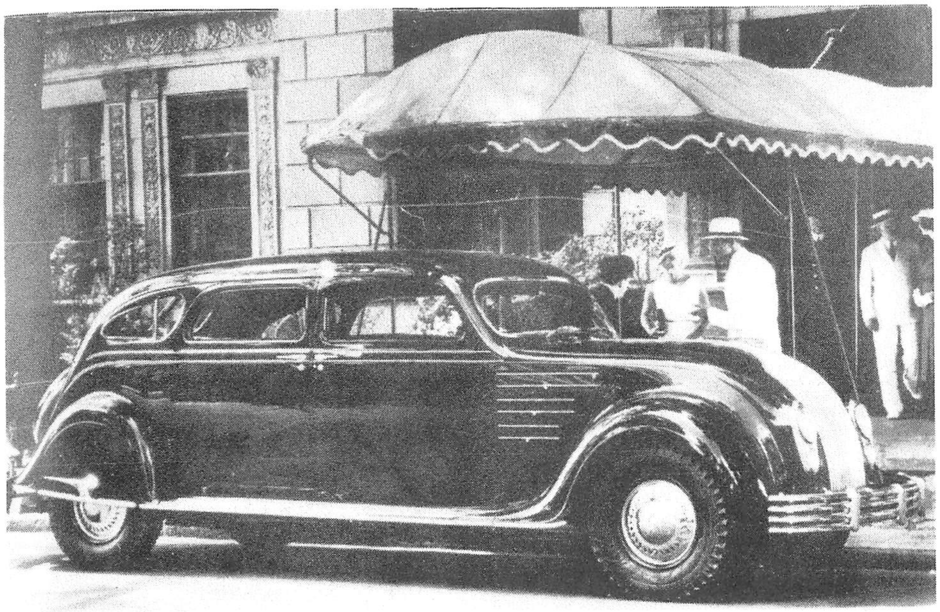
Airflow body types were as varied as the girder-truss frame and unit construction concept permitted, which prohibited convertibles, roadsters and phaetons. The latter two were no longer saleable in the U.S., anyway. Coupe design was not of the traditional short-cab/low-deck configura-



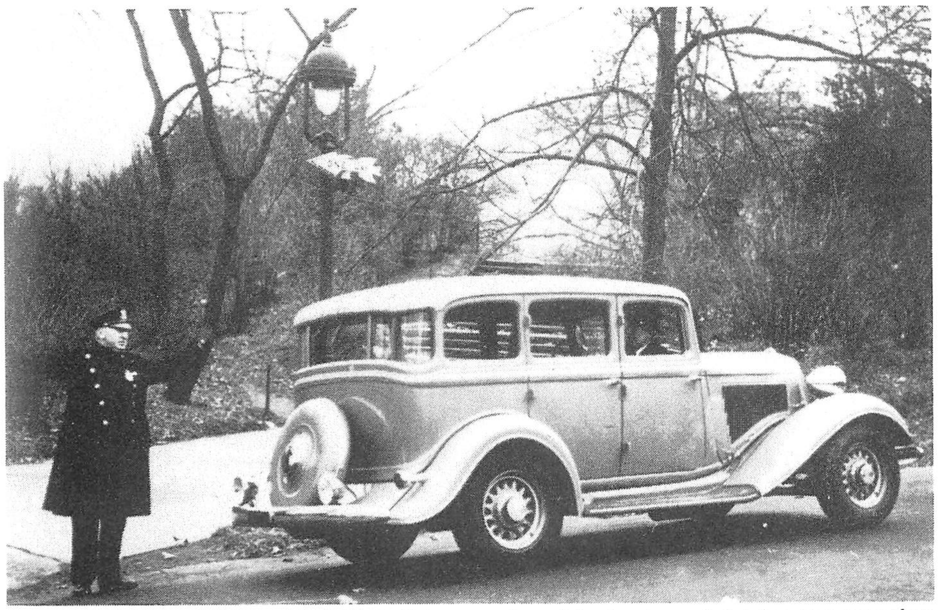
The 1934 Airflow Chrysler Imperial Coupe is shown in production form. This particular example of the Model CV sported Vogue whitewall tires, beltline striping and a door insignia of crossed flags, obviously for a special purpose or owner.

Chrysler's wind-resistance studies continued long after the Airflow cars entered production. This was a stock 1934 DeSoto with superficial forms applied to everything but the doors. It even had an underbelly sheath.

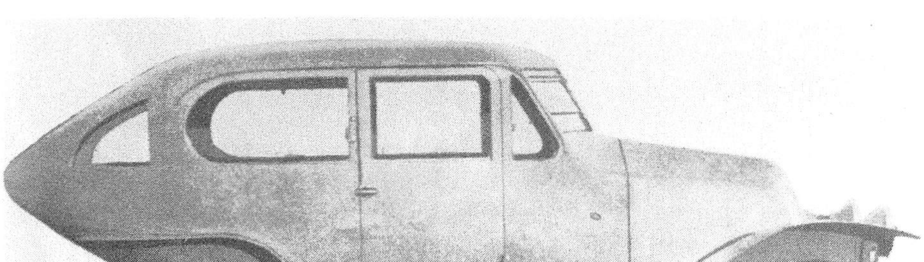




Largest of the 1934 Airflow Chrysler family was the Custom Imperial of 146.5-inch wheelbase. This series was identified as the Model CW.



For pre-Airflow publicity, this 1933 DeSoto was rigged for backward driving to prove that conventional cars had less wind resistance in the wrong way. The car was driven to New York City where it was stopped by a baffled policeman who thought it was going the wrong way on a one-way street.



Nothing is known about this special-bodied 1917 Franklin or its designer, W.H. Emond. The photograph is from the collection of William L. Bailey.

tion, but was a tapering fastback with the spare wheel inside. Other models exposed the spare wheel on the rear.

Airflow Chryslers for the 1934 U.S. market were offered in four sizes, all with straight-eight L-head engines. The smallest, lowest-priced and therefore most popular line was known as the Eight, code-designated Model CU. Horsepower was 122 and the wheelbase was 122$\frac{13}{16}$ inches. This line offered the Coupe; the Brougham (two-door sedan); the Sedan (a four-door "six-window" car); and the Town Sedan (a four-door car with "blind" rear quarters). All were six-passenger cars except the Coupe, which could seat only five. At introduction, all Eights were factory-priced at $1,245, but this was increased $100 later on. Shipping weights ranged from 3,806 to 3,856 pounds. Total CU production was 8,389 cars.

Next in size was the Imperial, Model CV, with 130 hp and 128 inches of wheelbase. This series was comprised of the Coupe, Sedan and Town Sedan, all initially factory-listed at $1,495 and given a later boost of $130. Weights ranged from 3,929 to 3,974 pounds. The factory turned out 2,277 units. This series and the CU Eight were the first to be placed in production.

Assembly of the 130-hp Custom Imperial models of 137.5-inch wheelbase began in June. This series, known as Model CX, was not mentioned in company advertising during the earlier months. Available were the Sedan and Town Sedan for six passengers and the Sedan Limousine and Town Sedan Limousine for eight passengers. The first two models delivered at the factory for $2,245 and the latter two for $2,345. They weighed 4,154 to 4,304 pounds. Only 106 CX models were produced.

Also placed in production in July was the queen of the Airflows, the huge Custom Imperial of 150 hp and 146$\frac{1}{2}$-inch wheelbase. Coded Model CW, its list of body types read like that of the Model CX. The shipping weight range was 5,780 to about 5,900 pounds. Records show that 42 left the factory. Sedans were priced at $5,000 and Limousines at $5,145.

DeSoto presented a single series, the Model SE. The six-cylinder L-head engine developed 100 hp and the wheelbase was 115.5 inches. The body type list was identical to the Chrysler CU, and DeSoto gave all of them a $995 factory price. A shipping weight range of 3,323 to 3,378 pounds was reported for the series. The production total was 13,940 cars.

Production of 1934 Airflows amounted to 24,754, substantially less than the 1933 output of 37,114 DeSotos and eight-cylinder Chryslers, Imperials and Custom Imperials. This loss was in sharp contrast to the auto industry's 41 percent increase in passenger car output and the comforting gain earned by Chrysler Corp. due to the conventional Dodge, Plymouth and Chrysler Six lines.

Next Month
Airflow proves a winner
in everything but sales