JACQUES SAOUTCHIK

MAÎTRE CARROSSIER

APPENDIX 1

COACHBUILDING: THE RESTORATION OF SUZY PRIM'S DELAHAYE 135M SAOUTCHIK CABRIOLET, CHASSIS 800858

ESSAY BY DAVID COOPER

French Coachbuilding

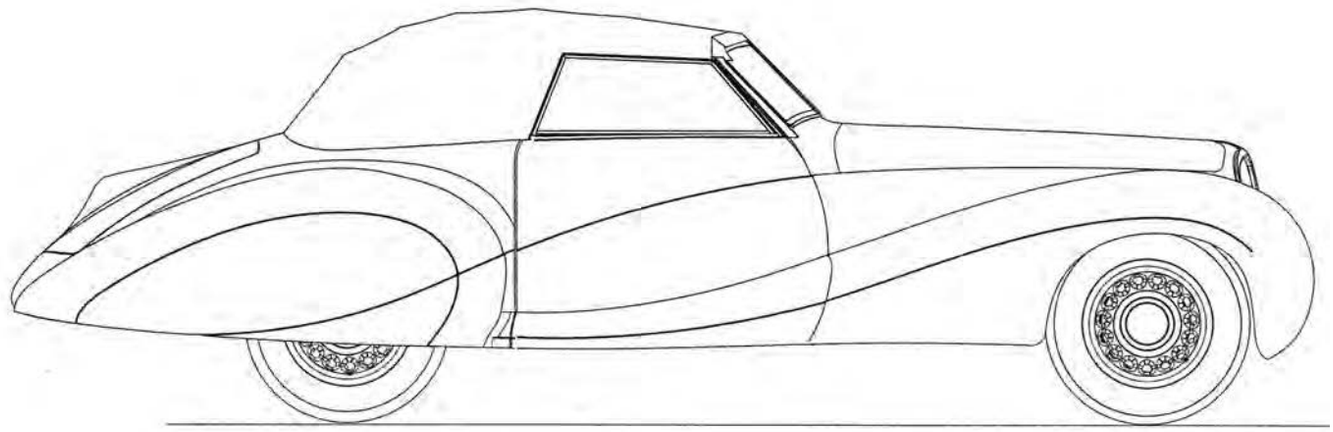
From the beginning of the 20th century and until the 1940s, the manufacturers of the finest automobiles made only the chassis and powertrain. Everything visible, the custom-designed handbuilt body and interior, was the art of the coachbuilder. As the finest couturier adorned and presented a beautiful woman, the coachbuilder expressed the style, elegance and beauty of the car. Commissioned by a discerning group of wealthy clients, these coachbuilt cars satisfied their demand for luxurious, private high-speed travel.

For reasons of style and efficiency, streamlining gained particular importance in France in the years before World War II, and French coachbuilders developed unique new techniques to manufacture limited production custom bodies with complex curves and shapes. The key term is limited production, because the techniques developed by Saoutchik, Letourneur et Marchand, Figoni, Pourtout and other French coachbuilders were not applicable or cost-effective when producing larger numbers of one design.

It is curious that there are almost no photos showing the inside of the coachbuilder's *atelier*. It is as if coachbuilders wanted to keep their techniques and methods secret, but often wood and sheet metal artisans would move from one company to another. So within the community, the differences between the coachbuilders were known, and more importantly, the similarities.

Design

Coachbuilders typically prepared sketches and color renderings of the body design for client approval. Large drawings of the side and top view of the body were then prepared, from which *maquettes*, full-size body forms, could be constructed. Many coachbuilders made *maquettes* using wire construction. These wire forms could be made quickly and gave both the designer and the sheet metal craftsman a good sense of the designer's vision, allowing them to study the shape in three dimensions and correct design flaws. Surviving photographs show that Saoutchik used full-scale wood bucks of the body shape to fit the sheet metal panels. These *maquettes* were used for test



Line drawing by Cooper Technica, Inc. of 800858 in the style of Saoutchik. This drawing was based on a laser scan and reflects accurate proportions and dimensions of the car. *(David Cooper)*

fitting the shape of the panels and not for forming or hammering. Forming bucks, often made of hardwood, allowed the sheet metal to be shaped and hammered directly on or over the buck. However, a lot of sculpting time was required to construct forming bucks and changes were difficult.

There are a number of hard points that defined all coachbuilt car designs: the location and design of the chassis, wheelbase and track, springs, engine and drivetrain, radiator and grille and bulkhead. In the streamlined era, manufacturers sought to lower the chassis and other mechanical parts through reducing ground clearance and moving the axles above the springs, so that the body could consequently be lowered. The art of the coachbuilder consisted of taking the fixed hard points and designing a graceful and unique body.

There are three separate areas of the coachbuilt body which had to be formed:

- The cabin, which has an internal wood structure. On streamlined cars the trunk was integrated into the cabin area;
- The engine cover panels, supported by the radiator on the leading edge and the firewall or front lip of the cabin on the trailing edge;
- The fenders and running boards, which are typically supported by steel brackets mounted to the chassis rails.

With streamlined bodies of the 1930s and 1940s, these shapes are more complex and often interplay with one another, challenging the designers and artisans of the coachbuilder.

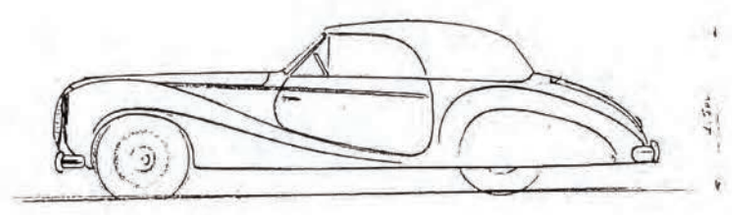
Wood Skeleton

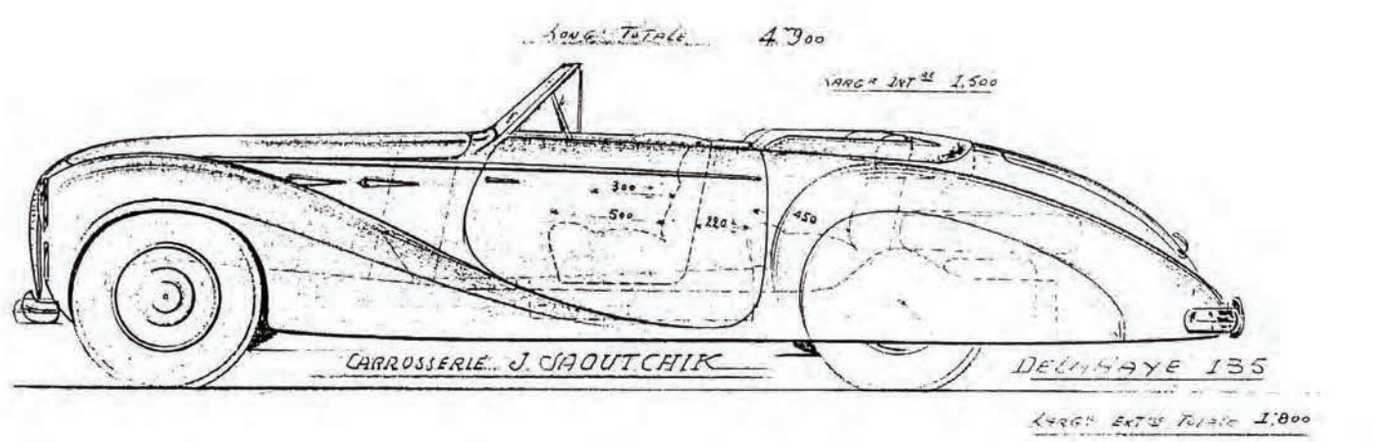
Whereas 19th century automobiles often had wooden bodies, the internal body structure in coachbuilt cars beginning with the 20th century and until the 1940s was a handbuilt wood skeleton. This skeleton, wrapped with sheet metal and invisible in the finished car, allowed complicated body shapes and designs to be built quickly and economically. Designed and constructed first, the wood structure works integrally with the outer sheet metal body shape.

Understanding the physics of the wood skeleton is essential. It functions as a unit, absorbing, transferring and dispersing vibrations, movement and energy in an organized way. The wood skeleton withstands the extreme forces of wind, temperature, moisture and flexing upon the body at speed and over irregular surfaces. The idea of the body as a rigid structure, called a uni-body, was a later, mostly postwar development as there was a need to mass produce vehicles with less expense and handwork. As early as 1922 the Lancia Lambda was built using a uni-body construction. The uni-body approach, however, drastically limited the coachbuilder's design choices, as the structural body panels could not be changed. In a coachbuilt, car the chassis was the structure, the body was non-supporting and its only function was to keep passengers isolated from the weather, while transporting them at high speed in luxurious comfort.

The only way to restore a coachbuilt car body properly is to carefully disassemble it, in order to restore it in the same sequence in which it was first built. That means stripping the paint from the original sheet metal, carefully removing the sheet metal and thoroughly examining the wood body structure, as the fabrication of the wood structure precedes the forming of the sheet metal body panels.

The technique of forming wood has not changed much since carriage days. Ash is typically chosen for a number of reasons – it has the best strength to weight ratio and it has important qualities for the coachbuilder. It is hard, supple, water resistant, insect resistant and does not break along grain lines. Maple, which might be considered an alternative, is both hard and fine-grained, but is not water resistant. Oak has the problem of cracking along the long grain lines when





Client sketch by Saoutchik for a Delahaye 135. Details are shown in the larger drawing while the top in raised position is shown in the smaller drawing. *(David Cooper)*

Saoutchik's workers test fitting the outer front fender panel on the wood *maquette*. The cowl and front valence panels are in place and being prepared for welding. *(France Magazine, Peter Larsen)*

Saoutchik used wood body *maquettes* to fit the sheet metal panels. Here a worker is checking the dimensions. *(France Magazine, Peter Larsen)*

subjected to stress. The ash chosen for car bodies must be dried so it will not warp and distort after assembly. Kiln drying and air drying over time are common. The ash is usually aged for a number of years to make sure it is dry and stable.

In the immediate postwar period in France, coachbuilders like Saoutchik were struggling to obtain materials. Much of the supplies of aged ash wood was used or destroyed during the War, so green ash was used. This ash is not as stable or impervious to insects or movement as ash that has been aged (air dried) for years. The wood structures of the cars of this era have not weathered as well as the prewar cars. Of course, if the original is in good condition or if it can be salvaged, it should be restored and reused. Often this is not practical, however, as wood, glue and varnish all age, becoming brittle. After studying the wood skeleton carefully on the 1948 Delahaye 135M chassis 800858, there was no hesitation with regards to replacing the cracked, rotted or insect-attacked wood parts.

Several prominent restorers work diligently to save some of the original wood structure by sawing off rotted portions, joining new wood to the sawed off joint with glue or metal splices, and then impregnating the finished part with resin to forestall further deterioration of the original wood portion. This approach is inherently contradictory. While the goal of saving the original whenever possible is admirable, a new wood part built from one portion old and one portion new, spliced and resin-impregnated is in no way the same as the original part. Furthermore, the integrity of the vehicle and the function of the wood skeleton are compromised. A part treated with resin becomes rigid and can no longer flex or absorb motion. It is no longer "wood". From a structural point of view, it is therefore a better solution to make a replacement part using the same material as the original, with the same dimensions and the same construction techniques.

There are essentially three ways to create the individual wood parts that make up the body structure: cut them out from larger items; laminate them and then cut them out to shape; and steam-form them or bend them to shape. Door posts, which bear the weight of the door via the hinges, are often made from one large block of wood. When complex curved parts are needed, the laminating method, the steam forming method or a combination of the two will be stronger as it does not cut across the grain – this is particularly appropriate for parts like curved fender supports, etc. The individual wood parts are joined using a variety of methods: slots or dove-tails, glue and screws. Moisture causes the glues of the era to deteriorate over time.

The cabinetry of the wood skeletons differs from coachbuilder to coachbuilder. Letourneur et Marchand, for example, were renowned for the intricacy of their skeleton design and the quality of their joinery. Gangloff's wood skeletons were surprisingly crude under the beautiful sheet metal. At first glance, Saoutchik's skeletons may appear workmanlike, but they were designed to support the multiple overlaying elongated curves of his body shapes. Each of the individual

Detail of the damage sustained by the original wood in 800858. The wood supporting the trunk has cracked and rotted. This wood cannot be repaired safely or effectively by splicing and impregnating the wood with resin. *(David Cooper)*

Working on the shape of the door on the wood skeleton. *(David Cooper)*

Saoutchik's complete wood skeleton for 800858 as restored by Cooper Technica, Inc. On display at Epoqu'Auto Exhibition in Lyon, France. *(David Cooper)*

French Crown Forming machine, also known as the Three-Olive machine. This particular machine, now restored and in use at Cooper Technica's workshop, was originally owned by Henri Chapron. The machine weighs approx. 3,175 kg and is 3.2 m long. *(David Cooper)*

Two operators are necessary to form parts on the Three-Olive machine. The machine can be powered in either direction, but does not feed the part. One metal shaper locates and feeds the part in the right portion of the roller to achieve the desired arc. The other man pulls the part through the machine, twisting it to the side if a compound curve is desired. *(David Cooper)*

Detail of the part being shaped by the center roller set of the Three-Olive machine. *(David Cooper)*

wood members are quite complex. Restoring the wood skeleton of a Saoutchik body is unusually challenging because there are no straight lines to the skeleton that can be drawn from the chassis, like there are with other coachbuilders.

Rear Fenders

The very long rear fenders on the postwar designs were attached to the wood skeleton on the side of the cabin that was formed of several plies of wood parts steambent to the same sweeping curve. Some coachbuilders might have used plywood for this part or found a way to mount the fenders to a shorter wood structure, easier to craft.

Doors

Saoutchik always paid particular attention to ingress and egress. It was said that he wanted a woman wearing a pencil skirt to be able to enter the car gracefully. In the case of chassis 800858, that meant large, heavy doors that incorporated the sills into the door for ease of entry. Because the sweeping fender line extends into the door and makes the lower portion of the door quite thick, potentially causing clearance issues, the rear door hinges had to be thought through carefully. The horizontally curved wood members that supported the dual curves of the door sheet metal panel were incorporated into the wood structure of the door. The rear door-jamb support was the heaviest wood part on the car, formed of one large piece of ash.

Sheet Metal Body Panels

The coachbuilder's art is to produce a complex curved sheet metal body fitted snuggly over the wood skeleton. The larger the panels that can be formed, the less welding and joining will be needed, thus enabling faster production. This approach relied on highly skilled sheet metal craftsmen. To fabricate dramatically curved sheet metal panels quickly, all of the major French coachbuilders used a Crown Forming machine, also known as a Three-Olive machine. This machine differs from an English wheel, one of the main tools of an English coachbuilder. While the English wheel is manual, the Three -Olive machine is powered. There is an upper convex roller and a lower concave roller. Sheet metal panels are fed through the rollers by two operators, one feeding and one receiving the panel. These machines are designed to work with steel or aluminum and adjust to accommodate a wide variety of thicknesses. There were as many as six choices of roller sets to produce a wide vocabulary of curves, though most coachbuilders used the three most common sizes.

The first step is to produce large curved panels that match the wire *maquette*. The metal shaper cuts out a blank panel in the shape he wishes to form. He then determines the dominant curve in the panel, and that curve is the one he then forms using the Three -Olive machine. The art of this machine is choosing the right portion of the roller with which to achieve the desired arc. The metal shaper feeds the panel into the machine and pushes the panel to get it started. The man receiving the panel then reaches in and pulls the panel through the machine. The Three-Olive machine does not feed the

part through. Instead, the powered roller functions as a continuous wide hammer form that rolls or presses the part into the curved shape desired while it is being manually pulled through the machine.

The man receiving the panel can pull it out straight from the Three -Olive machine, or off to the side if both a curve and twist are desired. The panel is then test-fitted on the *maquette*. If it needs more or less curve, or if it needs a different twist, the panel can be fed through the Three-Olive machine repeatedly until the shape is correct. This is important because this method does not work-harden the part as an English wheel does.

Once the dominant curve has been formed, the metal shaper must shrink or expand the other adjoining curves. Often a machine like an Eckold Reciprocating machine with shrinking dies is used. This machine has two shrinking or expanding dies at the top and bottom and the part is fed through the machine until the desired effect is achieved. After these secondary curves have been formed, the panel can be fed through the Three-Olive machine again for planishing, a process of finishing and smoothing the sheet metal surface through gentle hammering.

An Eckold Reciprocating machine with shrinking dies removes the stretch from the formed part. Often this is used after the dominant curve has been formed on the Three-Olive machine. *(David Cooper)*

Planishing finishes and smoothes the surface of the sheet metal panel. *(David Cooper)*

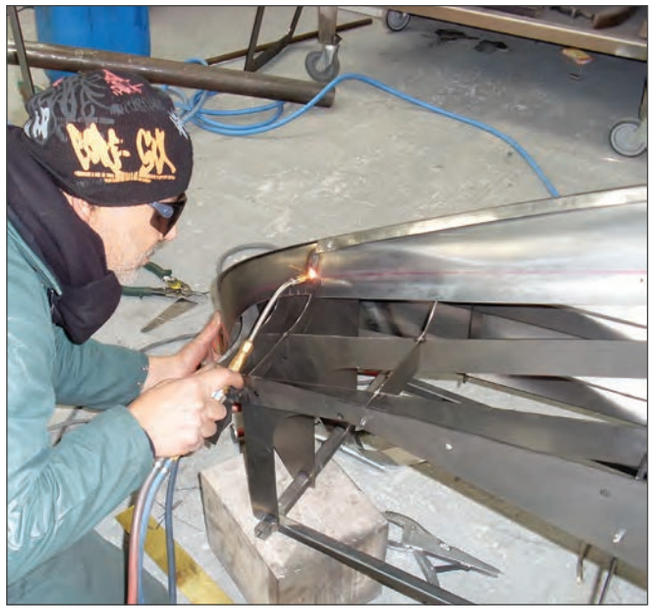
French metal shapers also used power hammers for forming gently curved parts such as roof panels, and a machine like a Pullmax for forming louvers, darts or tucks in a panel for extra shrinking effects. The Pullmax machine is a long-throat shearing and forming machine with a powered reciprocating upper mechanism that works against a fixed lower support. The upper and lower mechanisms can be fitted with custom dies to form, nibble, punch, shear or press shapes in sheet metal. An operator moves the work through the machine to control the process and achieve the desired effect.

Saoutchik's metal shapers incorporated all of these techniques, but pushed the shaping to the limits of the equipment. Saoutchik liked

Planishing used to seat the inner structural brace against the sheet metal skin on the inside of the rear wheel skirt. *(David Cooper)*

A power hammer is used to form gentle curves in sheet metal parts. *(David Cooper)*

Forming darts on a Pullmax for shrinking the sheet metal along an edge, without affecting the dominant curve on the sheet metal panel. Pullmax tools are made by the metal shaper for the effects he desires. *(David Cooper)*



Butt-welding two panels together on a fender by hand using a gas or oxygen-acetylene torch and minimal heat. *(David Cooper)*

A hydraulic brake is used to bend sheet metal or form it along straight lines. Custom tools are made by the metal shaper for different effects. Coachbuilders formed hood hinges on brakes with special tools. *(David Cooper)*

his bodies to incorporate many subtle curves, meeting in complex transitions. This meant that some of the panels were made of smaller parts requiring extra torch welding. This is apparent in the shape of 800858. In the rear fenders, for example, the top curve of the fender changes shape subtly as the design moves towards the rear and a triangular panel is fitted between the fender-top crease and the trunk panel to fabricate these curves. Letourneur et Marchand and Pourtout, by contrast, tended to design larger curved panels with fewer modulations.

Once the individual smaller pieces of the panels had been shaped and fitted to the body *maquettes*, the sheet metal shapers would weld these panels together. Typically the panels would be butt-welded by hand using gas or oxygen-acetylene welding. The swarf left over from the saw cut on the panel edge functioned as welding rod. First the panels were tacked together and fit was again tested. Then the panels were carefully and patiently joined along the seam, slowly using the minimum flame to keep the heat down. When finished, discolor from the heat from the weld will be consistent, and only extends 10 - 12 mm both ways from the weld seam. The gas welding method Saoutchik and other coachbuilders used, while slower and requiring more skill, left the part more malleable and limited the heat distortions. After welding, the part was refitted to the *maquette* and distortions introduced by welding in the now larger panel had to be removed.

Modern TIG welding requires separate rod, produces more heat and hardens the panels along the welded seams. This makes it more challenging to reshape and complete the panels after welding. For his postwar cars, Saoutchik had obtained a spot welder and used it generously and often. This tool was used to attach supports and mounting brackets to the sheet metal panels. The body was mounted to the chassis using forged steel body brackets. To keep the body rigid, even with large door openings, Saoutchik used extra body brackets to unite the front and rear sections of the body. Hardware was chosen carefully or fabricated to complement the design.

Butt-welding two panels together on a fender by hand using a gas or oxygen-acetylene torch. Note the narrow band of coloration change showing the limited heat used in this type of welding. *(David Cooper)*

Saoutchik used forged steel body braces to mount the wood skeleton to the chassis. On 800858 he used extra forged steel bracing because he designed large door openings for ease of ingress and egress. *(David Cooper)*

Saoutchik Delahaye 135M chassis 800858 at the *Concours d'Élégance* in the Bois de Boulogne June 17, 1948. The car was painted deep blue. *(David Cooper)*

Saoutchik's Coachbuilding

After the War, Saoutchik became known for his flamboyant and extravagant creations, which were characterized by elaborate bright work, trim and exquisite interiors. Beginning in 1947, this design language reached its culmination on styles such as Talbot-Lago T26 Grand Sport chassis 110110, Delahaye 175 chassis 815023 and the Cadillac convertibles which are discussed at length in this volume from the point of view of design. These bodies were created in 1948 and 1949, and designs from 1950 and onwards were somewhat less embellished. Delahaye 135M chassis 800858, which was eventually acquired by actress Suzy Prim, belongs to the very curvaceous period shortly after the War, where one single curved shape was not allowed to dominate the design.

Chassis 800858 was a non-disappearing top *cabriolet*, finished in 1948. It shares the complex side treatment first seen on the Talbot-Lago T26 Record shown on the Saoutchik stand at the Paris Salon in October 1947, although the amount and use of chromed scallops is more restrained. The top is a three-position folding top, which allows a middle, or *Milord* position with only the rear seats covered.

Saoutchik repainted Delahaye 135M 800858 black for the *Concours d'Élégance* in Enghien in late June, 1948 and claimed it was a different car than the one shown in Paris. Comedian Yves Vincent is driving and Suzy Prim is in the back seat. *(David Cooper)*

The rear-hinged suicide doors incorporate the sweeping fender line and doorsill and open all the way to the chassis frame rail for ease of entry. The rear fender is fully skirted and partially covered with a large triangular and chromed trim panel or scallop, unlike the later scimitar-shaped scallops which followed the curvature of the leading edge of the fender.

The side view illustrates how Pierre and Jacques Saoutchik created two strong curves in playful opposition that define the shape of the car. It is the space between the curves that interested them, a tension like the relationship between two masses in a stark modern painting of the same era. On 800858, a third curve echoes the lower one, namely a crease line along the fender sweep. The scallop does not simply follow the line of the lower curve, but instead creates its own contrasting shape. The top line of the hood and door is almost ignored, seemingly unimportant compared to the other tensions. Then, to complete the composition, Saoutchik let the fender pull away slightly from the cabin leaving a concavity, which creates yet another curve which has a voice in the conversation.

Another view of Saoutchik Delahaye 135M 800858 at the *Concours d'Élégance* in Enghien, June 1948. Pierre Saoutchik is in the back seat. *(David Cooper)*

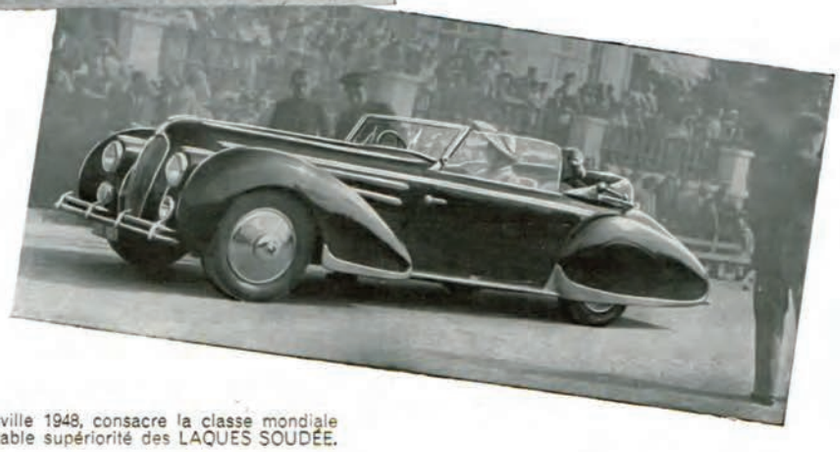
Side view of the Saoutchik Delahaye 135M 800858. Pierre Saoutchik is in the back seat, left. June 1948. *(David Cooper)*

CONCOURS D'ÉLÉGANCE AUTOMOBILE DE DEAUVILLE 1948

Le Grand Prix Toutes Catégories a été attribué à une Rolls-Royce carrossée par SAOUTCHIK — LAQUES SOUDÉE — présentée par son propriétaire, Sir John Gaul et par Mme Pierre Saoutchik habillée par Callixte et coiffée par Marie-Christine.

Le Grand Prix d'Honneur a été attribué à une Delahaye carrossée par SAOUTCHIK — LAQUES SOUDÉE — présentée par Mme Marc Soudée habillée par Worth.

Le premier Grand Prix d'Honneur a été attribué à une Delahaye carrossée par FRANAY — LAQUES SOUDÉE — présentée par Mlle Yvette Bidermann habillée par Raphaël.



Le Grand Prix d'Excellence a été attribué à une Delahaye carrossée par FIGONI-FALASCHI — LAQUES SOUDÉE — présentée par Mme Michau habillée par Jacques Fath.

Le Concours d'Élégance Automobile de Deauville 1948, consacre la classe mondiale des Maîtres Carrossiers Français et l'incontestable supériorité des LAQUES SOUDÉE.

Ad from a French magazine showing award winning cars at the *Concours d'Élégance de Deauville* in 1948. Chassis 800858 won the *Grand Prix d'Honneur* at the *concours*. *(David Cooper)*

The doors open with a small push-button release mounted on the cowl, and the required side marker light on the panel just behind the door was selected to be elegant and minimal. A thin chrome strip which began at the leading edge of the hood was used to accent the shape. This strip proceeds down the side of the car parallel to the upper curve, then sweeps down across the rear fender parallel to the triangular chromed scallop, but continues past it to terminate gracefully along the lower edge of the rear fender skirt at the rear edge of the tire. The interior was finished in parchment calfskin with dark red piping. Interior wood, which was positioned around the windshield and on the door tops, was finished in mahogany to complement the dark red accents.

Provenance and History of Chassis 800858

In 1948, it was still difficult for coachbuilders to obtain chassis from the manufacturers. To keep the workshop busy, Saoutchik built three cars on spec, intending to sell them during the summer season of 1948. Two bodies were prepared to fit a Talbot-Lago T26 Record chassis and a third was constructed for a Delahaye 175 chassis. However, Talbot was having problems making deliveries and Saoutchik only received one of the two chassis he had ordered. As a substitute, Saoutchik obtained a Delahaye 135M chassis and adapted the main body to fit the shorter wheelbase of the Delahaye (295 cm instead of 312 cm), modified the bulkhead to the steeper Delahaye angle and adapted the length of the doors and rear fenders to fit the different dimensions. This gave Saoutchik an opportunity to perfect his design, refining and improving the body shape for the 135M chassis. The narrower width of the Delahaye chassis gives the car graceful prewar proportions.

Chassis 800858 was completed in time for it to debut at the *Concours d'Élégance de l'Auto* held in the Bois de Boulogne on June 17, 1948. Saoutchik wanted to show the Delahaye at the *Concours d'Élégance* at Enghien the following week, along with the T26 Record and the Delahaye 175. It is not known why, but in order to claim that he was showing a different Delahaye 135M at Enghien, Saoutchik quickly repainted the body from blue to black and used a different license plate at each concours. Not only did he get away with this deception, it has also confused future Delahaye historians. To verify the story, large patches of the surface paint on the car were carefully hand-stripped layer by layer to reveal these two original color layers. The black paint is a thin layer painted right over the blue without primer, and beneath the blue are the original primers and surfacers applied on the bare metal.

Later in 1948 the Delahaye, still black, was shown at the *Concours d'Élégance Automobile de Deauville* and won *Le Grand Prix d'Honneur.* Suzy Prim, a well-known French film actress and B-movie femme fatale, was photographed riding in the back seat of the Delahaye at the *Concours d'Élégance* in Enghien in June 1948. She purchased the car in the early autumn just after the concours in Deauville. Suzy Prim starred in many films in the 1930s and 1940s, including Jean

Suzy Prim was a well-known French film actress and B-movie femme fatale. She purchased 800858 in the early autumn of 1948, just after the *concours* in Deauville. *(Peter Larsen)*

Renoir's 1936 film, *Les Bas-Fronds* (The Lower Depths), Mayerling (1935) and many *film noir* including, *Les Pirates du Rail* (1938), The Benefactor (1942), The London Man (1943), Majestic Hotel Cellars (1945) and The Sinners (1949).

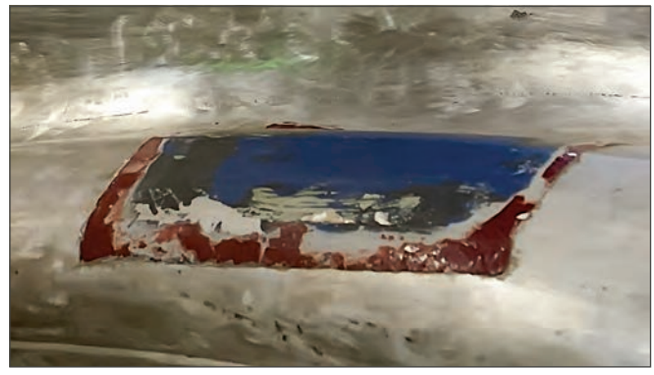
Six years later, in mid-1954, Prim traded the car to a Paris garage. After Prim, there were seven owners. The second owner repainted the car in a two-tone color scheme in the mid-1950s. Subsequent owners repainted the car but retained the two-tone look. Fortunately, the car was never stripped to bare metal when repainted, so the original paint layers were preserved. In 2007, 800858 was purchased by David Cooper in view of restoring the car. The car was complete, and restoration is being done to the highest standards. Because so much of the original documentation exists, as well as original sheet metal, chassis, engine, upholstery and other parts, it can be ensured that the restoration work will be authentic to the original.

Restoration of the Saoutchik Body

Aside from determining the original exterior color, the biggest issue in the restoration of 800858 was restoring the wood skeleton of the body. Since the wood skeleton had been constructed before the sheet metal was fitted, thereby allowing the sheet metal to conform to the wood shape, it was necessary exercise great caution. In restoration, the demand is to preserve the original sheet metal and repair or replace some of the wood, which makes it mandatory to reconstruct the wood to the exact same dimensions as the original. This was almost impossible until the advent of laser scanning and digital imaging technologies. With 800858, the entire car was laser scanned before disassembly. The scan constitutes a three-dimensional digital record of the car's shape and all of its dimensions.

The scanned data is then transferred to a digital CAD program. The digital images can be examined and compared with factory drawings and original photographs of the car taken when the car was new. The digital images can be distorted to match the photographic distortions caused by the lens focal length. In this way, the digital images can be compared precisely with original images of the car. The CAD program allows the operator to place a light source on the digital rendering just as the sun is placed on the original photograph. When the digital image is correct, the reflections of sunlight on the digital image are the same as in the original photograph.

On 800848, the original sheet metal was in excellent condition. These original sheet metal panels were all carefully cut and peeled from the wood skeleton. Examination of the wood skeleton revealed that it was in very poor and compromised condition. In some areas the skeleton had suffered water damage and cracked, in others insects had attacked the wood. The right rear corner had been damaged in an accident and never properly repaired. Cracks had spread into the trunk area. Consequently, it was not possible to save the original wood skeleton. Reluctantly, the decision was made to fabricate a new wood skeleton using the same type of aged ash wood and joinery that Saoutchik used originally. A technique was developed which allowed fitting all of the original and preserved sheet metal panels to the refabricated wood skeleton.



Detail of the original paint layer on 800858 with black paint showing around the edges. The black color, painted by Saoutchik one week after the car was first shown at the *concours*, was applied directly on the blue without primer or resurfacing between the layers. This confirmed the story that the car was quickly repainted for the *Concours d'Élégance* at Enghien. *(David Cooper)*

Eleven layers of paint from the body shell of 800858 were chemically hand stripped layer by layer to reveal the original sheet metal. In one area the original dark blue color paint color was left for reference. *(David Cooper)*

After the paint was stripped from the body, the original sheet metal was coated with a zinc chromate primer to protect the original steel from rusting. The sheet metal of the body was carefully removed after laser scanning and preserved for re-installation after the wood skeleton was repaired. *(David Cooper)*

Rear body panels, fenders, trunk and valence of 800858 after removal. These original panels were in excellent condition. They were preserved and reinstalled. *(David Cooper)*

Once the sheet metal was removed, the wood skeleton was laser scanned. Like the exterior scan, this provided a complete three-dimensional digital record of the wood as it fit the original sheet metal. With this information, it was possible to construct a dimensional drawing of the wood, and then separate patterns for the individual wood members of the skeleton. In addition, this dimensional information was used to design and fabricate *maquettes* for the exterior and interior of the wood skeleton. When refabricating the wood skeleton, these *maquettes* are essential in order to be able to hold onto the original dimensions. Tolerances are less than 2mm. Laser scanning also makes it feasible to verify that the restored wood skeleton has the exact dimensions of the original.

In addition, it was evident from the scans that the front wheel on the right side was out of alignment, and the spindle was slightly bent. A Talbot-Lago T26 Record chassis was also scanned so that the two could be compared and an understanding reached of all the small changes that Saoutchik had made to adapt the body from the Talbot to the Delahaye. This marriage of the latest state-of-the art technology and the techniques and materials of the 1930s and 1940s makes a level of authenticity and accuracy in a restoration possible which has eluded past restorers.

Once the wood was completed, the original sheet metal panels were reinstalled. The rear section of the body behind the door posts was addressed first. On this section, there were several areas of rust or damage that needed repair, but most of the original panels could be reinstalled without change. Some of the sheet metal panels had to be cut and rewelded to give the metal shaper access to the top and bottom of the original panel for precise fitting to the wood. The wheel skirts were badly damaged from accidents and dents over the years. They had been repaired multiple times and much of the original sheet metal had been lost. Both skirts were refabricated exactly as they had been made by Saoutchik with the same interior bracing and hardware. The panel at the front of the rear fender was

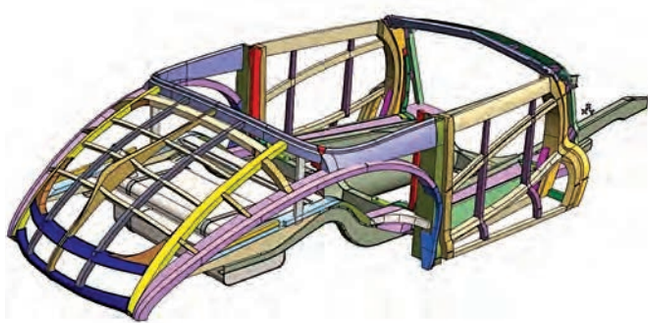
Side view of the original sheet metal panels of Delahaye 135M 800858 after removal from the body. These panels were in excellent condition and over 85% could be preserved and reinstalled. *(David Cooper)*

badly dented. The rear valence lower edge was rusty and corroded. These panels needed to be replaced. About 85% of the original rear body sheet metal was preserved.

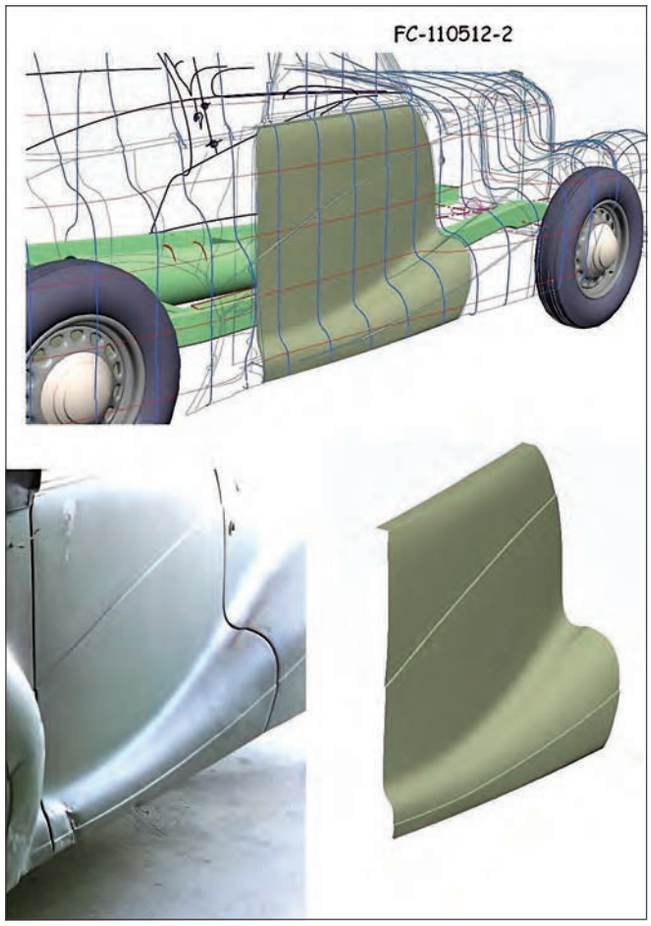
To demonstrate how unusual it is to be able to preserve the original sheet metal panels over a new wood structure, the rear section of the Delahaye 800858 was displayed at the Lyon Epoqu'Auto Exhibition in November 2013. The body was mounted on a special fixture and the sheet metal panels left unpainted, so people could view the car. Officers of the Delahaye Club were astounded at the quality of the work that had been done and impressed to see the preservation of the original body sheet metal.

Once the body sheet metal was removed from 800858, the original wood skeleton was exposed for inspection and repair. It had deteriorated badly. *(David Cooper)*

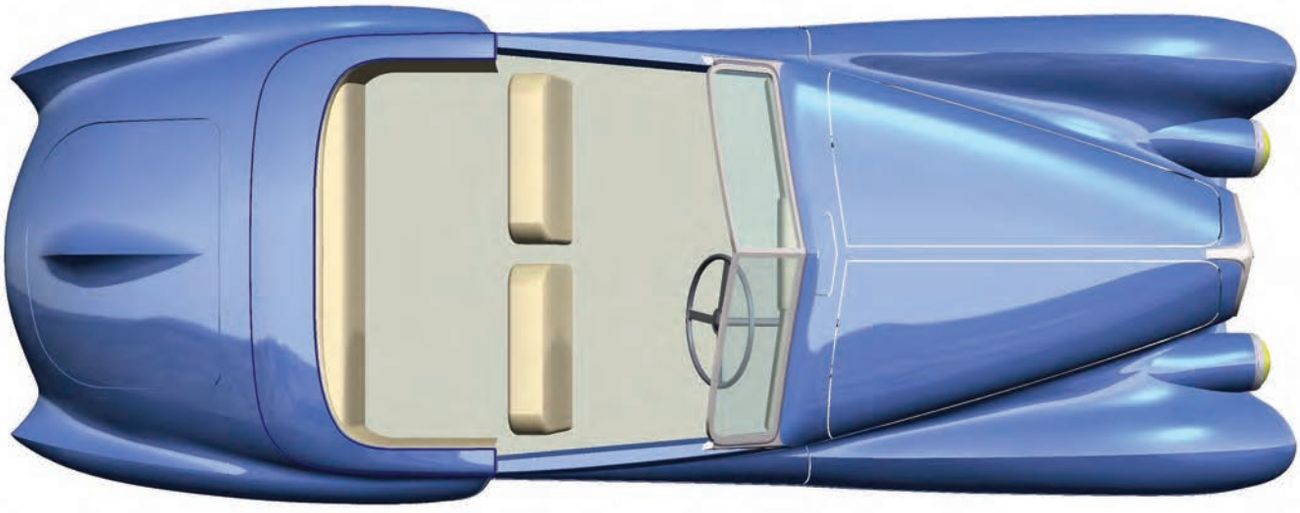
Detail of the trunk area of 800858. Note the damage to the wood below the trunk cover. *(David Cooper)*



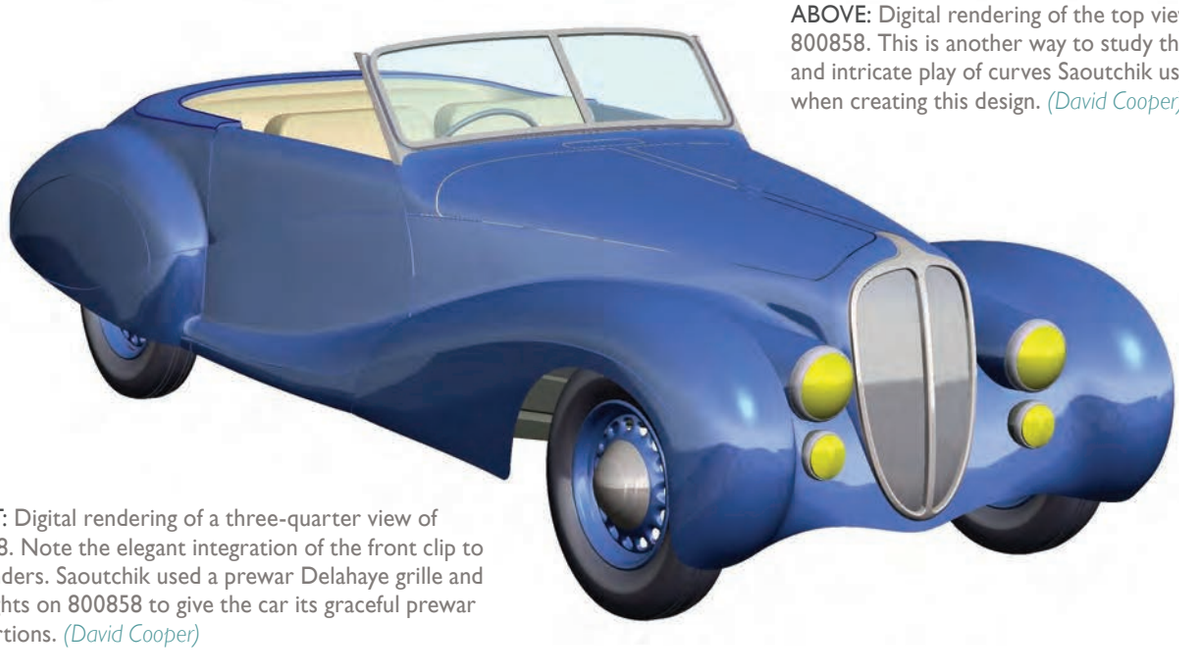
Digital rendering of the wood skeleton for 800858 based on the laser scan of the original wood. This rendering was the first step in creating patterns of each individual wood component so that the wood skeleton could be restored properly. *(David Cooper)*



Detail of the digital rendering of the right door of 800858. The original door is shown in the lower left for comparison with the rendering. The rendering forms the basis for fabricating new body *maquettes* for the sheet metal panels. This allows the original sheet metal door panel to be restored exactly to its correct dimensions. It eliminates distortions introduced in previous repairs. *(David Cooper)*

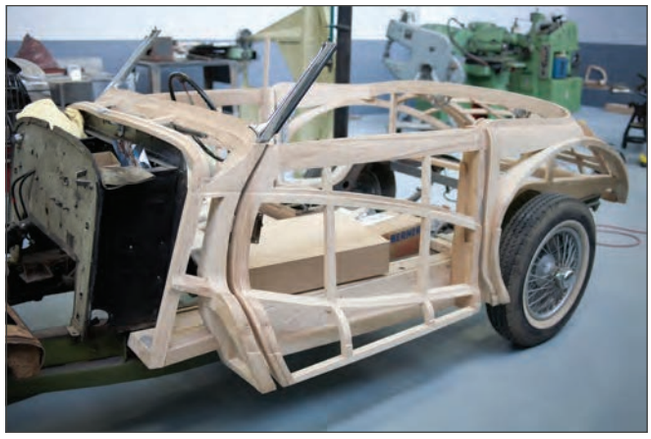


ABOVE: Digital rendering of the top view of 800858. This is another way to study the subtle and intricate play of curves Saoutchik used when creating this design. *(David Cooper)*



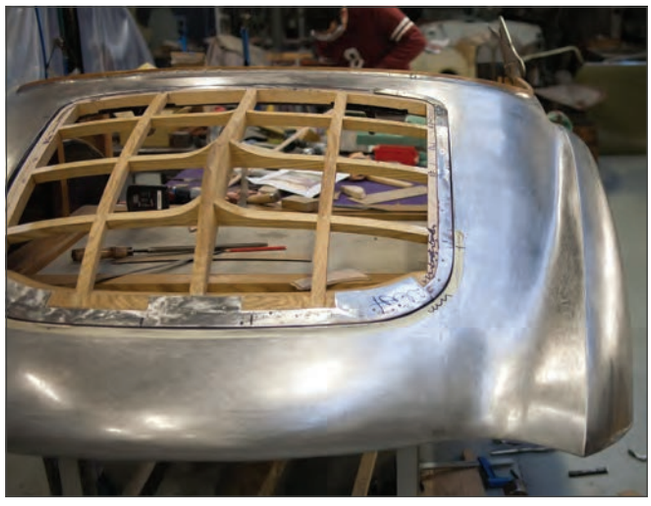
RIGHT: Digital rendering of a three-quarter view of 800858. Note the elegant integration of the front clip to the fenders. Saoutchik used a prewar Delahaye grille and headlights on 800858 to give the car its graceful prewar proportions. *(David Cooper)*

Laser scan of the original wood skeleton of 800858. This scan provided an accurate three-dimensional portrait of the wood skeleton and was used to design patterns for restoring the wood skeleton. *(David Cooper)*



The wood skeleton of 800858 restored exactly as original based on the patterns made from the laser scanned original wood skeleton. The new wood has the same structural integrity as the original. The precision and accuracy of this technique allows the original sheet metal to be preserved and installed on the new wood. *(David Cooper)*

Detail of the rear fender of 800858 showing Saoutchik's original butt-welds on the fender panel. Saving the evidence of Saoutchik's original construction was the purpose of chemically hand-stripping the paint from the sheet metal. The multiple complex curves created by Saoutchik for this design required small sheet metal parts to be formed and welded to make up the fender shape. *(David Cooper)*



The original rear sheet metal reinstalled on the body of 800858. Over 85% of the original sheet metal could be preserved and reinstalled using this technique. *(David Cooper)*

Installing the rear body sheet metal of 800858 around the wood skeleton at the door panel. The sheet metal is wrapped around a steel edge screwed to the wood door jamb support. *(David Cooper)*

Hammering sheet metal panel body nails into the wood on the rear valence of 800858. *(David Cooper)*

Fitting the restored rear wheel skirt to the rear fender of 800858. *(David Cooper)*

Finished installation of original rear sheet metal on chassis 800858. Shown unpainted at Epoqu'Auto Exhibition in Lyon, France, November 2013. *(David Cooper)*

Rear body of 800858 shown at Epoqu'Auto Exhibition, Lyon, France, November 2013. The original sheet metal was preserved and reinstalled on the restored wood skeleton. *(David Cooper)*

Rear body of 800858. Note the sweep of the curve across the rear wheel skirt. Saoutchik accented this curve by swaging the body panel below the curve. He then installed a chrome panel over this embossed section, not shown here. *(David Cooper)*

Interior

Traditionally, seats and seatbacks were formed by constructing a wood base, which was often framed with steel. A spring unit was fabricated to fit the seats and the backs. The spring units were fitted and then covered with horsehair to isolate the springs from the seat. Then the assembly was covered and shaped with cotton batting. Finally, the entire assembly was covered with a linen fabric, which enveloped the cotton and allowed the entire seat unit to slip against the leather or fabric cover and breathe. The process of tanning as well as the choice of types of leather has evolved considerably over the years.

All of the original leather seats and interior panels for 800858 remain, although the original leather has dried and cracked over the years. During one of the past restorations, the leather was painted to change the color and "refresh" the look. Saoutchik used calfskin leather with a cellulosic vegetable surface dye. The carpet was wool, also colored with vegetable dyes. Knowing this, it was possible to order leather and carpet made to the same specifications and colors. Saoutchik wrote the body number on all the interior components, including the inside of the seat bases. It was also possible to preserve these components.

The original interior mahogany trim wood components at the door tops and around the windshield were in good condition and will be revarnished and reinstalled. Special hardware chosen or fabricated by Saoutchik will be restored and rechromed.

Exterior

Paint composition and application techniques constitute another area which has changed over the years. Before the mid-1950s, cars were painted with lacquer. After that time enamels became more widely used. The disparity is comparable to the difference between tea and coffee. Tea is a suspension where tea molecules float in the water, so one looks through the water when perceiving the color.

Coffee is a solution where the coffee molecules join with the water molecules. This means the color is on the surface and the material is opaque. Modern cars are all painted with versions of enamel, typically a water-based catalyzed urethane enamel. To get depth to the color, clear coats are added so that one must look through the clear coat to see the opaque color layer. With lacquer it is not necessary to apply a clear coat to get depth. Lacquer is much harder, which means it reflects the light like glass, but is also prone to chips. It can be repaired easily. While many people believe that lacquer is no longer available this is not the case. The main reason lacquer is not used today is that it takes a good deal more time and effort to apply. Lacquer is painted in very thin layers, allowed to air dry for at least a day or two, and then wet sanded to prepare for another layer. Rolls-Royce used nineteen paint layers to create their finishes. Modern urethane enamel paint can be applied in two layers in one application, as the catalyst causes the paint to dry chemically and quickly.

Lacquer has also gone through technical changes over the years. Before World War II, on most cars the body surfaces were painted with nitrocellulose lacquer. In France, this was manufactured by several firms, notably Radiose and Nitrolac, where Saoutchik cooperated for many years with the latter. Nitrocellulose was an improvement over earlier natural lacquers, which came from tree sap. In the postwar period, acrylic was substituted for nitrocellulose. The acrylic suspension material lasted far longer and was more resistant to ultra-violet deterioration. A finished lacquer painted panel looks the same regardless of which suspension medium was used. In restoring 800858, hand-rubbed acrylic lacquer will be used. The chassis and suspension components were typically painted with a stove-enamel. Stove enamel was hard and durable but not beautiful enough for exposed decorative surfaces.

Completion

The Saoutchik Delahaye 135M 800858 is scheduled to be completed in spring 2015 in time for its debut at the Pebble Beach Concours d'Elegance in August.