

THE DEPERDUSSIN RACER

BY
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Although technically classified, like the Bleriot XI, the Hanriot Monoplane, and the Curtiss Model D, as a “pioneer aircraft,” the Deperdussin Racer, in physical appearance alone, indicates that it does not belong to this category. Its completely covered, streamlined, bracing wire-devoid fuselage; single, razor-sharp wings; tiny tail surfaces, drag-reducing spinner; faired landing gear; and modern control wheel all reflect advanced technology and speed, placing the type in a “transition” category of its own, between the original, pioneer and later, World War I designations.

It owes its origin to Armand Deperdussin, who was neither an airplane inventor nor a pilot. Beginning his career as a cabaret singer in Belgium, he pursued several professions, none of which were remotely related to aeronautics, including luring customers into motion picture theaters operated by the Lumiere Brothers as a barker and selling fabric at wholesale prices to French department stores. In the fall of 1909, he agreed to supply the Bon Marche store of Paris with a Christmas display featuring an aircraft, but, despite his own interest in the budding science, he knew nothing of aerodynamics or design himself, thus forced to approach the Societe de Construction d'Appareils Aeriens to fill his needs.

Instrumental to this display, and Deperdussin's future, had been 32-year-old Louis Bechereau, graduate of the Ecole des Arts et Metiers d'Angers and chief engineer there. His reputation had reached “brilliance” stature.

Attracted by its canard aircraft, Deperdussin himself acquired the Societe de Construction d'Appareil Aeriens, located in Bethany, near Rheims, France, in 1910, and renamed it the “Societe de Production des Appareils Deperdussin,” or “SPAD.”

The intended static display, appearing at the end of the previous year, resembled an Antoinette monoplane with a tailskid.

The flying version, based upon it and retaining the overall Antoinette configuration, particularly in the tailplane, was completed in 1910 and offered in several versions, which varied both by powerplant and number of seats.

The Deperdussin A, for example, had been powered by a three-cylinder Anzani, a 50-hp Clerget, and a 50-hp Gnome engine.

Featuring a long, slender, 24-foot, 11.5-inch spruce and ash frame and a 28-foot, 10.5-inch wingspan covered with oiled cotton, the Deperdussin B, the first version to receive significant attention, succeeded the initial variant in 1911. Powered by a 50-hp, seven-cylinder Gnome engine and weighing 551 pounds, it sported hinged elevator and rudder surfaces, the latter serving as the deflecting surface for vertical control and attached to the remainder of the fixed, stabilizing fin. Cables, actuating the aircraft's wing-warping mechanism, were routed down to a T-shaped lever, itself mounted on the rear cross member of the chassis, and then passed over pulleys on skids before branching out into two wire pairs which connected with an equal number of points on the wing's spars. Pilot control was achieved by means of a pinned crosspiece-mounted wheel, its direction of turn differentially deflecting each wing spar—that is, while one was pushed down, the

other was pulled up, changing their angles-of-incidence and inducing a bank away from the increased one.

Resting on two wheels and a tailskid on the ground, the monoplane attained a maximum, 56-mph speed in the air.

The type notched up several records. Of the seven aircraft entered in the June, 1911, Circuit of Europe race, for instance, the one flown by Rene Vidart won third place, while the type demonstrated considerable performance capability in the Concours Militaire, held later in the year, between October and November, in Rheims. Indeed, two Deperdussin Monoplanes, along with a Nieuport, had been the only designs capable of meeting the French military's requirements.

The Deperdussin C, following in 1912, had been powered by a 100 hp Gnome engine and accommodated two persons, and the type, noted for its carrying capacity and speed with large payloads, held all of the world's records for up to five seats and distances of up to 30 miles until the end of 1911. The aircraft enjoyed widespread use in both France and England.

Separated by only two years, the Deperdussin Racer, which was alternatively known as the "Deperdussin Monocoque," appeared as if it should have been separated by two decades from its Monoplane predecessor.

As demonstrated by early, fixed-wing aeronautics, aircraft frames required three basic components:

1. The frame or fuselage, considered the common attachment point of its flight surfaces.
2. Supporting methods, such as trusses, cross beams, and bracing wires.
3. A covering or surface, then usually of fabric.

Although wood had traditionally been employed to build up airframe structures, it had, particularly by turn-of-the-century methods, been difficult to mold or bend in order to form a single unit integrally incorporating even two of these parameters until Eugene Ruchonnet, a Swiss pilot and engineer, who had previously worked at the Antoinette factory with Rene Hanriot, sublimated his boat construction experience into aeronautical design, covering a basic frame with mahogany and producing a light, but strong, minimal-drag fuselage concept which could carry high stress loads.

Louis Bechereau, the Deperdussin Racer's designer, further developed this concept, forming two halves of a fuselage by diagonally overlaying three thin strips of steamed, glued tulipwood, which was ordinarily used in cabinet building, in three cross-crossed layers, permitting them to dry before removing them from the reusable mold and assembling their two halves. The result, designated "monocoque"--from the Greek "mono," or "single," and the French "coque," or "shell,"--resulted in a radical departure from the wooden, trussed fuselages of aircraft such as the Bleriot XI, providing a circular, although decreasing-diameter, cross-section which tapered as it progressed from the nose to the tail, but which carried its own loads, integrally incorporating the three components of frame, support, and covering. Streamlined, strong, and aerodynamic, it obviated the need for external struts or bracing wires and became the standard of aeronautical design up to the present day.

The Deperdussin Racer, with a 20-foot, 1/8th-inch overall length, introduced this advanced construction technology, which represented a "step-change" in aeronautical design.

Equally deviating from the majority of both pioneer and World War I aircraft, it sported single, or mono, high-mounted, razor-sharp wings, which incorporated inverse taper on their inboard trailing edges, spanning 21 feet, 9 ¾ inches and covering 104 square feet of area.

Like its Deperdussin Monoplane predecessor, it featured both hinged elevators and rudders affixed to seemingly tiny, horizontal and vertical stabilizers, covered in proofed linen. The aircraft had a seven-foot, 6.5-inch overall height.

Powered by several successively higher-horsepower Gnome engines, the Deperdussin Racer employed rotary technology.

Engines, evolving from the steam to the internal combustion types, developed progressively more horsepower per pound of engine weight, and the latter, appearing at the dawn of heavier-than-air flight, can be subdivided into reciprocating and rotary categories. Designed by Laurent Seguin and his half-brother, Louis, (whose great-grandfather, Marc, had coincidentally been the nephew of the Montgolfier Brothers who themselves had made the world's first successful balloon flight in France in 1783) it had its origins in 1907 when they explored a new, light-weight configuration, designated the "Gnome," which evolved from the previous year's 34-hp static unit.

Built of solid, drop-forged blocks of steel, the powerplant featured a 13.5-pound crankshaft reduced from its original, 100-pound mass of raw material, and extremely thin piston walls.

Contrasted with the reciprocating engine, whose pistons turned the crankshaft on which the propeller itself was mounted, the rotary type featured a fixed crankshaft about which the cylinder block rotated. Nevertheless, it employed the standard, four-stroke, Otto cycle, although its valves were located in the pistons, and each cylinder, as with both types, experienced a different phase during this cycle.

During the intake stroke, for example, a vacuum formed in the cylinder, forcing the intake valve to open in order to draw the fuel-air mixture in from the crankcase, while it was compressed during the compression stroke, at the end of which its spark plugs fired, slightly before the top dead center position was reached. During the power stroke, the exhaust valves opened before the bottom dead center position, and this was followed by the exhaust stroke.

Featuring symmetrically mounted cylinders round a drum-shaped crankcase, the Gnome rotary engine revolved with optimum balance. The cylinders themselves were designed with head-located inlet and exhaust valves operated by rocker arms, fuel drawn in and burnt gasses expelled by means of centrifugal force, which itself was neutralized by counter-weighted valves. Fuel, entering at one end of this crankshaft, ultimately flowed into the carburetor attached to the other. Blipping the engine during descent cleared the cylinders of any accumulated raw fuel and oil.

A virtual design solution to the often-contradictory balance of power, weight, and reliability, the rotary engine offered several advantages.

1. Because its large, rotating block of cylinders effectively served as a flywheel and there were no engine mounting point-related reciprocating parts, it delivered power very smoothly.
2. The shorter crankcase and crankshaft reduced structure weight.
3. Because the entire block rotated, obviating the need for radiators, water pumps, fans, and cooling liquids, it featured its own integral, airflow cooling method, further reducing structure weight compared to that of water-cooled powerplants.

The rotary engine equally offered three disadvantages.

1. Since it had to be run at full throttle throughout all of its flight phases, it consumed a large amount of fuel.
2. The rotating block, of considerable mass, created a formidable gyroscopic effect, which augmented immediate, rapid right banks, but resisted those to the left. These were slow and sluggish.
3. Because centrifugal force expelled castor oil after a single flow through the engine, as contrasted with the recirculating method employed by the reciprocating type, the aircraft's range was, to a degree, limited by its oil capacity.

The 50 hp, seven-cylinder Gnome rotary engine, competing with the Antoinette and first appearing at the 1908 Paris Salon, featured a 172-pound structure weight, a 110-mm bore, a 120-mm stroke, and turned at 1,100 revolutions-per-minute.

A later version, offering improved maintenance access and turning at 1,300 revolutions-per-minute, generated 70 hp and followed in 1911, burning almost 90 pounds per hour of fuel as opposed to the 50-hp's 44.1, and it had a .5-to-1 gallon oil-to-fuel consumption ratio.

The first practical rotary available to aircraft builders, the Gnome, produced in copious quantities totaling 3,638 units between 1908 and 1913, achieved almost all of the world's speed, altitude, and endurance records for the airframes they powered, such as London-Manchester, Paris-London, trans-Alps, round the Statue of Liberty, and the Circuit de l'Est, becoming the dominant powerplant during the dawn of World War I. Credited with the first significant increase in performance, the rotary engine, like the monocoque fuselage, constituted a step-change in technology.

Powered by a 160-hp, 14-cylinder, two-row Gnome rotary, the Deperdussin Racer, driving a mahogany propeller and fronted by a large, but aerodynamic, drag-reducing spinner which appeared to be the forward, integral portion of the fuselage, achieved maximum, 127-mph airspeeds and feisty maneuverability. It was often dubbed "the flying engine."

The 992-pound aircraft was ground-supported by a twin-wheel undercarriage with a central skid.

The Racer, like its Monoplane predecessor, retained the latter's standard cockpit control wheel, whose left or right turn activated the wing-warping mechanism to control its lateral axis, wires stretching from its forward and aft spars routed to two, upper-frame, triangular-shaped king posts above and the lower landing gear assembly below. Pulling or pushing it deflected the elevators for pitch, or longitudinal, axis control, while a foot-operated rudder bar provided yaw control. A wheel rim-located blip switch interrupted engine power to induce descents.

Demonstrating and validating its superior performance characteristics, it notched up an impressive array of accomplishments.

On September 9, 1912, for instance—a swelteringly hot day—Jules Vedrines flew his Deperdussin Racer in a continuous circuit at low altitude during the fourth Gordon Bennett Race, winning the prize for the fastest aircraft, clocked at 105.5 mph, while Marcel Prevost, circling at 20 to 30 feet above the ground in his own aircraft of the same type that afternoon, placed a close second. They were the first to exceed the 100-mph mark. All the other entrants, with the exception

of an engine-overheating Hanriot, had withdrawn from the competition the previous evening. The Hanriot itself only completed half the course.

On April 10 of the following year, a pontoon-equipped Deperdussin, again flown by Prevost, won the Schneider trophy at Monaco, the only time in the two-decade history, from 1912 to 1931, of the event that the French had succeeded in doing so.

During the fifth Gordon Bennett Race, held at Bethany Aerodrome, near Rheims, on September 29, 1913, four aircraft had competed, inclusive of two Gnome-powered Deperdussin Racers, one powered by a Le Rhone engine, and an Alfred Ponnier-designed monoplane, itself a development of the Hanriot Racer. Following Henri Crombez's 10:00 a.m. circuit, Prevost took off in his Gnome-powered, clipped-wing Deperdussin at 11:15 a.m., completing his second, third, fourth, and fifth laps in two minutes, 50 seconds each and covering the 20, ten-kilometer lap course in 59 minutes, 45 ³/₅ seconds at an average 204 kph, the first to ever do so in under an hour, and achieved an absolute world speed record of 126.67 mph.

The following month, on October 27, a Deperdussin flown by Eugene Gilbert won the Henry Deutsch de la Meurthe air race round Paris.

The Deperdussin Racer became the fastest, most maneuverable, pre-World War I design.

The Old Rhinebeck Aerodrome example, the result of a 1974 trip to Paris during which Cole Palen and his wife, Rita, studied, measured, sketched, and photographed the aircraft on static display in the Musee de l'Air et de l'Espace, was built in his Florida home during that winter, at which time Cole completed two monocoque fuselage frames before destroying the mold he had created prior to them.

A later restoration, undertaken by Brad Adams, Ryan Cassens, Bob Mackenzie, John Nenadic, Paul Savastano, and Nick Ulfik, between 2000 and 2001, was prompted by engine cowl cracks, flat tires, rusty cable rails, peeling spinner and fuel tank paint, and the absence of its 160-hp Gnome powerplant.

After transfer from the hill-located Pioneer Building to the Fokker hangar on the field, the aircraft was fitted with a static engine assembled from spare parts and three wooden valves coated with epoxy glass resin and painted, while its other deficiencies were equally addressed.

In restored guise, it first appeared in the Westchester County Civic Center during the Westchester Radio Aero Modelers Show in February of 2001.

Because of the Deperdussin Racer's high speeds and minimal surface areas, Cole had decided to limit it to ground taxiing on the grass field which would have failed to offer sufficient length for safe, public-proximity operation, and today, it is often displayed in the courtyard immediately beyond the covered bridge entrance to the aerodrome, a sleek, aerodynamic, high-performance monoplane radically differing from its other pioneer counterparts embodying advanced, step-change technology. It proudly showcases those features which comprise it.