

Silver Bullet

No airplane in the world could outshine Howard Hughes' H-1 Racer—until Jim Wright built a copy of it.

Air & Space Magazine

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THE AIRPLANE HAMMERS PAST, 150 FEET OFF THE DECK, THE LONG POLISHED ALUMINUM fuselage a silver dart against the distant mountains. As it banks gracefully and climbs, it leaves in its wake the signature rasp of its Twin Wasp Junior radial and the collective awe of the spectators at the National Air Races in Reno, Nevada. "Tell you what, he's really moving," Jimmy Leeward murmurs. Leeward ought to know; he's racing his own P-51D Mustang and L-39 jet this weekend. But he sounds almost reverent when he adds, "He's doing over 300, I'd say."



On display at the Reno Air Races, the rule was "look, but don't touch." And best wear sunglasses, lest the highly polished aluminum skin sear your retinas. (Caroline Sheen)

Sixty-seven years ago to the day, on September 13, 1935, Howard Hughes set a three-kilometer speed record of 352 mph in the revolutionary one-off known as the H-1, 1B, or—his preference—simply the Racer. Five years ago, Jim Wright undertook a project of meticulous craftsmanship crossed with magnificent obsession to re-create the Racer by reverse-

engineering the original, which resides in the Smithsonian's National Air and Space Museum. Shortly before seven this morning, Wright wedged his lanky frame into the cockpit of his gleaming replica and took off in search of a world record. Not, mind you, Hughes' record. "Howard was willing to blow his engine up," Wright had explained. But because Hughes set only the unlimited record, Wright can establish a new mark in the Fédération Aéronautique Internationale's 3,858- to 6,614-pound class if he averages better than 266 mph during four consecutive runs.

The radios of the observers manning the record course crackle to life with news from the tower: "All stations copy. The Hughes Racer is northbound. Final pass." The airplane swoops down and powers past the start-finish pylon. On the edge of the ramp, three men dressed just like Wright—white button-down shirts and black pants—pound each other on the back. "We done it!" Dave Payne shouts. "We built that airplane!" His eyes follow the Racer as Wright peels off to the west. "We built that airplane," he repeats softly.

A lot of prop-heads will tell you that the Hughes Racer is the most beautiful airplane ever built. Nobly proportioned and gracefully streamlined, the H-1 presaged the engineering of the 1940s while embodying the hand-built virtues of the '30s. Wright estimates that it took 35,000 hours to create his replica, despite the liberal use of computer-aided design (CAD) and computer-numeric-control (CNC) precision machining mills. What he ended up with is the world's most elegant and most ambitious homebuilt. That's right, homebuilt. Sure, some of the work was farmed out to professional subcontractors. But the vast majority was done in Wright's hangar in Cottage Grove, Oregon, by a crew consisting of three volunteers, a paid employee, and Wright himself. "[Project manager] Ron Englund and I did all the rivets—20,000 of them," Wright recalls. "We got pretty good at it. Pretty fast too."

You'll have to forgive Wright his fanatical devotion. He came up with the idea of building the racer way back in 1978, when he read a reprint of an article, "A Movie Magnate's Racer," published in *Popular Aviation* in 1937. A machinist by trade—his company, Wright Machine Tool, builds industrial saw blade sharpeners—he developed a profound professional appreciation for the quality of the H-1's fabrication and the brilliance of its engineering. But what really sold him on the Racer were the circumstances underlying its creation.

"It was the last non-military plane to set a world speed record," Wright says. "It was also the last time an individual could design an airplane that was world-class. After this, planes of this caliber were designed by teams of hundreds or thousands of people. The Hughes Racer was a personal statement. And when you work on a machine designed by an individual, you learn a lot about that person. The Racer turned out to be a very mysterious airplane. But then, Howard was a very mysterious person."

Wright has spent so much time channeling Hughes that he refers to him by first name, as if they were old buddies. But despite the fact that both men made their fortunes from tool companies, they could hardly be more different. Wright, 53, is a hands-on, straight-up, small-town boy partial to western shirts and cowboy boots. He's soft-spoken and open with

strangers. It's hard not to be charmed by his enthusiasm for the Racer and his pleasure in others' delight in it. "Jim's fundamental energy," says Kent White, who worked on the project, "is joy."

Howard Hughes, by contrast, is remembered as America's most prominent super-rich weirdo. But in his heyday, he was an entrepreneur who achieved considerable success in aviation, most notably owning Transcontinental and Western Air and sponsoring development of the Lockheed Constellation. Still, the Racer may well be his greatest accomplishment. Designed by Dick Palmer to Hughes' general specifications and built by a small team led by Glenn Odekirk, the H-1 broke the world speed record by 38 mph in 1935. Two years later, fitted with longer wings and bigger fuel tanks, the Racer carried Hughes from Burbank, California, to New York City at an average speed of 332 mph, shattering the old transcontinental record—held, incidentally, by Hughes himself—by nearly two hours.

Hughes' creation was a melange of old and new—wooden wings, fabric-covered control surfaces and tail skid co-existing with an all-metal flush-riveted monocoque, drooping ailerons (which act as flaps at low speed), split flaps, a fire-suppression system, and hydraulically operated landing gear. Conceptually, it harkened back to the time-honored formula of shoehorning a big engine in a small airframe. But thanks to substantial wind tunnel testing and the latest in aerodynamic refinement, the 1B wasn't, like the Granville brothers' Gee Bee, a misshapen bulldog but rather a sleek greyhound whose most prominent feature was the bell-shaped cowl shrouding its twin-row, 14-cylinder R-1535 Pratt & Whitney.

"When we went into this project," Wright says, "we thought the airplane was a racer. It's not. It's a technology test bed. Howard was looking ahead further than a world record. He was building Hughes Research Number One. He was building the team that would eventually put satellites into orbit. He was building a company, not just a racer."

In the spring of 1998, Wright and his wife, Betty, decided they had the time and the resources—CNC mills among them—to build a replica. But Wright couldn't undertake the project until he secured an exceedingly rare Twin Wasp Junior. Miraculously, his first call, to California motor man Millard Marvin, hit paydirt. "We thought they were falling off trucks!" Wright jokes. "Then we spent the next three weeks calling everybody across the country [to see what was out there], and we couldn't find another one." Marvin also had an old Grumman Albatross propeller that could be reshaped to fit the Racer's specifications. Meanwhile, Marvin's engine was sent to Tulsa Aircraft Engines in Oklahoma for a rebuild.

In putting together a team to build the airplane, Wright didn't stray far from his home in Cottage Grove, a small logging town an hour south of Eugene. His old friend Mike Mann, a retired logging contractor whose father had owned and operated a small airport, came on board as a full-time volunteer. So did Dave Payne, an aircraft mechanic who used to maintain Wright's other aircraft (a Beech Bonanza, a Taylorcraft, and a Glasair III), and Al Sherman, a retired trucker with three homebuilts to his credit. To oversee the project, Wright hired Ron

Englund, who shares his placid demeanor. Although Englund was the youngster of the bunch—a mere 35 at the time—he'd already restored several antique airplanes.

Wright had a team. What he didn't have was an engineering plan. An exhaustive search turned up not a single schematic, blueprint, or wing planform. To date, in fact, he's located only a handful of photos of the Racer under construction (including just one shot of the uncovered wing), and the last remaining member of the original design team, John Newberry, died while the replica was being built. Fortunately, Hughes had donated his racer to the National Air and Space Museum, and museum officials Robert van der Linden and Bill Reese agreed to allow Wright to measure, photograph, and examine the original inch by inch.

To prepare for the pilgrimages his team would make to the Smithsonian, Wright enlarged the scale-model plans drawn by aviation historian Paul R. Matt. From there he fashioned a full-size mockup of plywood. Studying it, the team came up with hundreds of technical questions: How long was that spar? How thick was this piece of metal? How did the landing gear work? In short, how did the mockup compare with the original? ("Ninety-five percent was dead-on," Wright says, "but that five percent would have killed us.")

Wright commissioned Steve Wolf to build the wings—the long ones used to set the cross-country record, rather than the clipped set used for Hughes' speed runs. Wolf, who lives in the neighboring town of Creswell, was best known for creating the Gee Bee replica owned and flown by airshow performer Delmar Benjamin. In June 1998, Wolf and his wife Liz traveled to Washington, D.C., for a look at the Racer. Using a pair of home-made four-foot calipers, they took the necessary measurements and returned to Oregon convinced that the wings were buildable.

A few months later, Jim and Betty Wright went to Washington with Ron Englund. When they first confronted the real H-1, they were struck dumb. Not with awe but with dread. "It was heartbreaking," Englund recalls. "The plane was so nice. To come anywhere close to that standard of quality—well, we knew it was going to be very tough." Englund had planned to determine the thickness of the aluminum skins that form the surface of the fuselage by inserting a feeler gauge into the gaps where they butted up against each other. But the H-1 had been put together with such impeccable craftsmanship that there were no gaps. None. Zero. "That was the low point," Wright says. "We realized then that we were fighting a real battle, and we needed the best soldiers."

Back in Cottage Grove, Wright Tool employees Guy Ralstin and Dennis Parker generated more than 1,000 CAD drawings while Wright and his hangar crew fabricated most of the fuselage, bending the aluminum skins, riveting them in place, countersinking the rivets, then sanding and polishing the surface until it was smooth and unbroken. But the more elaborate pieces demanded special handling. The fiendishly complex curves of the engine cowl, for example, were shaped by Jim Younkin of Springdale, Arkansas, a restorer and replica builder who spent an entire year on the project. "The sheet metal cost more than a new Corvette," Wright says. (The entire airplane, he says, ran more than \$1 million.)

There's also a tail section so artfully crafted by Kent White of Nevada City, California, that it deserves its own museum exhibit. "I usually get things right the first time," says White, who cut his teeth restoring exotic cars. "If not the first time, then the second. This tail section, I threw away three pieces—three!—before I got it right."

The wings too are works of art, and ran up 3,000 hours on Wolf's clock—half as long as it took to build the entire Gee Bee replica. Hughes chose wood because it could produce a smoother surface than metal. Wolf used light-colored sitka spruce for the spars and ribs, and he covered them with dark mahogany plywood. A fiberglass fabric the thickness of a nylon stocking was stretched across the wing skin, and epoxy was squeegee'd into it. When the glue dried, it was block-sanded until, as Wolf puts it, "you could put a six-foot straight-edge across the wing and not have a piece of paper go through it." The finishing touch was 13 coats of polyurethane paint, which give the wings a dark blue liquid luster.

Although the replica is a visual twin of the original, there are differences between them. Look closely at Wright's airplane and you'll see modern wheels, tires, and brakes, for safety's sake, as well as a tail wheel instead of a tail skid to prevent gouging runways. Some pieces, like the horizontal stabilizer, are the product of informed speculation. "The only clue we had as to how it was made was the number of screws," Englund says. Wright also replaced some forgings—most prominently in the landing gear—with stronger pieces CNC'ed out of aluminum billet and sandblasted for a period look. Safety also inspired him to use rubber-bladder fuel cells instead of welded-aluminum fuel tanks, halon rather than carbon dioxide (or carbon tetrachloride, nobody's sure which) in the fire suppression system, and, to reduce the possibility of flutter, pushrods, rather than cables, to actuate the ailerons.

Just how close the re-creation came to the original became disconcertingly apparent when the Racer first flew in July. As Wright sat in the cockpit, idling on the short runway outside his hangar, he took a deep breath. Although the airplane had performed flawlessly during extensive taxi tests, Wright says "there was always the nagging fear that the reason Howard flew [the H-1] only 42 hours was because there was some serious problem, which he never would have said anything about. Was there a bear trap waiting for us?"

Wright lifted off in a level attitude at about 115 mph. The airplane exhibited benign flying qualities as it climbed. But when Wright leveled off at 5,000 feet, the propeller remained stuck in the low-pitch setting, limiting him to a paltry 120 mph at the engine's 2,625-rpm redline. As the engine temperatures rose, Wright quickly reviewed his options for an emergency landing. Fortunately, the temperatures stabilized, and he was able to set the airplane down in Corvallis, as planned.

Notwithstanding the champagne celebration that followed, it was clear that something was amiss. Wright knew from his research that the propeller had misbehaved during Hughes' first flight too. After poring over before-and-after photos of the original airplane, Wright and his team realized that Hughes had retrofitted a bigger counterweight to the propeller. Since the counterweight enables the prop to shift into high pitch, the team surmised that Hughes must

have run into the same problem that Wright did 67 years later. A larger counterweight was mounted on the replica, allowing the airplane to take full advantage of 700 horsepower.

Wright made 19 more takeoffs and landings during his flight test program. Aside from an abrupt stall characteristic and poor visibility on approach, the airplane was so stable that Wright says it could be flown with no trouble by a low-time pilot. By the time Wright made the 65-minute hop from Cottage Grove to Stead Field in Reno—cruising at 295 mph, 50 percent power, and 10,000 feet—the replica had accumulated more flight time than the Racer logged in its entire career.

The speed record attempt in Reno was just the means to an end: giving the Racer replica an appropriately grand debut. Wright shattered the old mark with an average speed of 304 mph. But back on the ground, after accepting the congratulations of his crew and hundreds of well-wishers, he quietly confides, “We’ve still got some issues to deal with.” A lingering pitch problem limited Wright to 62 percent power, and the leather seal in the prop took such a beating that grease flowed into the airstream and slathered the canopy. “Visibility was so bad I couldn’t have done one more run,” he says.

In January, the right landing gear collapsed on rollout. The damage is being repaired, and Wright hopes to replicate Hughes’ record-setting cross-country flight. He also plans to take his airplane on the airshow circuit. As it is, the Racer is the star attraction where it’s parked on the ramp in Reno. In fact, hardly anybody seems to notice the rare P-63 Kingcobra or F7F Tigercat on either side of it.

Later, after most of the spectators have left, a passerby spies the unguarded Racer. “Major wow!” he says. After a furtive look around, he ducks under the protective rope and reverently strokes the fuselage. A security guard materializes and orders him to get out of there, pronto. “Sorry,” the interloper says sheepishly. “I couldn’t resist.” The two of them stand there for a moment, gazing at the airplane. “It’s like a beautiful woman, isn’t it?” the guard says. “Yeah,” the interloper agrees. “Like a beautiful woman.”

Sidebar: California

“Would you like to see the Howard Hughes H-1 Racer?” I asked the Air Force pilot. I was sure “Joe Bill” Dryden would be interested. “Howard set a world speed record of 352 miles per hour in 1935,” I added.

It was the spring of 1975. I was a test pilot for the Hughes Aircraft Company, flying out of the company’s private airfield at Culver City, California. Dryden would evaluate our new radar by flying test missions in an F-4 Phantom. I would fly a T-33 target aircraft. We would be spending a lot of time together.

Another Hughes employee, Bruce Burk, the caretaker of all of Howard Hughes' stored aircraft, held the keys to a Quonset hut next to our flight test building. He agreed to meet us there and unlock the door. We could get a peek at the H-1 if we brought a flashlight.

The ghost-like Racer, covered by a canvas tarp, sat behind a locked chain link fence. The vertical stabilizer was exposed and the twin-blade propeller had a blanket wrapped around it. Off to the left, leaning against a wall, was the Racer's second set of wings.

Pilots always look inside the cockpit of an airplane first. We lifted the tarp and stepped under it as you would a tent. The cockpit was smaller than that of the F-4. The canopy consisted of two sections that slid down into the fuselage on each side like the windows of a car. The windscreen could be cranked forward 12 inches so that the seat could move up and forward. This allowed Hughes to see over the nose during takeoff and landing.

Attached to the side of the cockpit was a black leather tool kit containing a screwdriver, crescent wrench, pliers, and an assortment of light bulbs and screws. We didn't see a map case. "Howard didn't use maps," Burk said. "He didn't plot a course or plan his flights very well. He just took off and headed in the general direction of his destination."

The Racer had gently curving wing fillets between the wing and the fuselage to help stabilize airflow, reduce drag, and prevent potentially dangerous eddying and tail buffeting. Even under the tarp I could see that the airplane had graceful curves. On the other hand, the Phantom, with upturned wingtips and stabilizers slanted down, needed brute force to push it through the air. "The F-4 looks like someone had shut the hangar door on it," Burk said. Dryden and I would have eagerly traded our radar test flights in the Phantom to fly the Racer.

In preparation for sending the Racer to the Smithsonian's National Air and Space Museum in Washington, D.C., Howard Hughes wanted the H-1 restored to mint condition by July 1, 1976, when the museum would open. The Racer was in good shape—it had been stored in the Quonset hut, which was rarely opened, for most of its life. Burk towed the Racer across a road to the flightline. To prevent exposure to sun, wind, and rain, it was placed in a 20-foot-high, three-sided wooden enclosure.

Before the airplane could be restored, the wing and fuselage needed to be separated. Because Hughes had not planned to put the Racer into production, Burk had no drawings or schematics—only something called layout forms, which were not very detailed. "The Racer was never meant to come apart," Burk said. It would have to be cut up.

I made sure to stop and see the airplane and talk to Burk every time I went out to fly. Was he in contact with Howard Hughes? Was Hughes concerned about the Racer? Would he want to see it after it was restored?

"Hughes' physical condition is not good," Burk reported, "but I keep him aware of the Racer's status."

On a Friday afternoon in the late fall of 1975, 40 years after Hughes set the world speed record, the Racer was ready for its long trip to Washington. The fuselage and the wings were packed in large wooden boxes, which were then placed on the flatbed trailers of two trucks. It

was sad to watch the trucks depart eastbound; a chapter in the history of the Hughes Aircraft Company had come to an end.

—George J. Marrett