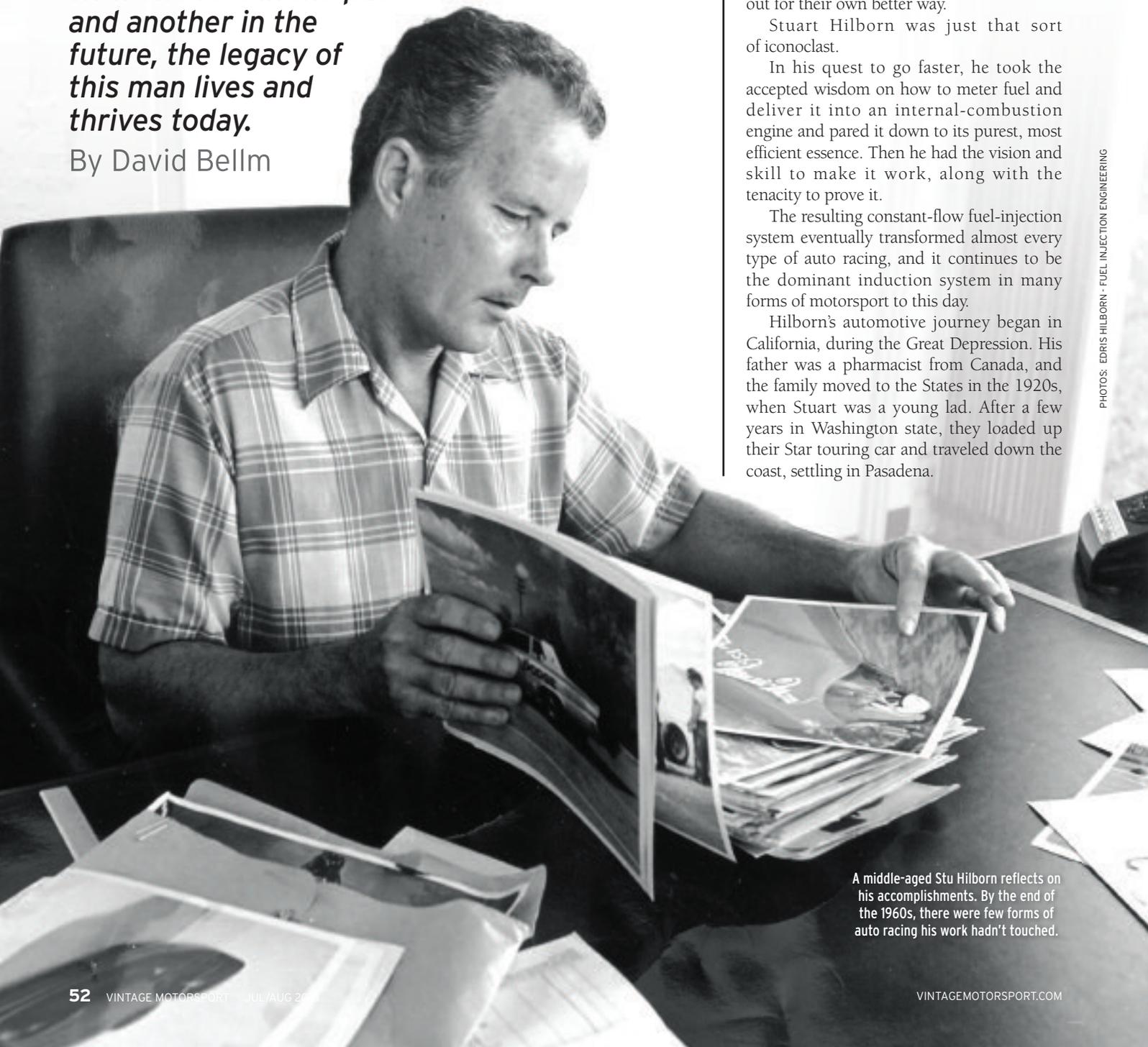


STUART HILBORN

FUEL INJECTION PIONEER

With one foot in the past and another in the future, the legacy of this man lives and thrives today.

By David Bellm



Classic beginning: Stu's '29 Ford lakes roadster.

Auto racing has always been a sport of rebels. The ideas that have transformed it have often been the creation of people who dared to see things differently—pioneers who took the existing norm and flipped it, stripped it, or just plain threw it out for their own better way.

Stuart Hilborn was just that sort of iconoclast.

In his quest to go faster, he took the accepted wisdom on how to meter fuel and deliver it into an internal-combustion engine and pared it down to its purest, most efficient essence. Then he had the vision and skill to make it work, along with the tenacity to prove it.

The resulting constant-flow fuel-injection system eventually transformed almost every type of auto racing, and it continues to be the dominant induction system in many forms of motorsport to this day.

Hilborn's automotive journey began in California, during the Great Depression. His father was a pharmacist from Canada, and the family moved to the States in the 1920s, when Stuart was a young lad. After a few years in Washington state, they loaded up their Star touring car and traveled down the coast, settling in Pasadena.

A middle-aged Stu Hilborn reflects on his accomplishments. By the end of the 1960s, there were few forms of auto racing his work hadn't touched.

PHOTOS: EDRIS HILBORN - FUEL INJECTION ENGINEERING

Stuart graduated high school in 1935 and enrolled in Los Angeles City College, majoring in chemistry. Money was tight, so he was relegated to public transportation while in school. But after graduating, he got a job as a chemist with the General Paint Company, which gave him enough money to buy an unreliable '32 Auburn.

Around this time, in 1939, a friend invited him to watch the speed trials at Muroc Dry Lake. The experience transformed Hilborn. Like so many other motorsport pioneers of his era, the throngs of home-crafted machines hurtling across the stark desert proved irresistible to him. Best of all, it was tantalizingly accessible.

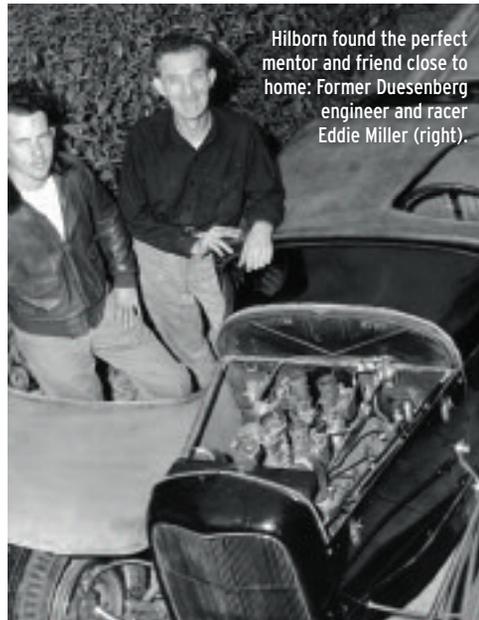
Hilborn was hooked. And it would soon launch him toward what would ultimately be his life's work.

The Legend Down the Street

To get in on the action at the dry lakes, Hilborn first needed a suitable car—the old Auburn certainly wasn't up to the task. And then there was that little detail of knowing how to work on cars. Hilborn had only recently gotten his first car. He wasn't exactly an expert mechanic.

But, as luck would have it, down the street from the Hilborn home lived one of the best allies one could possibly hope for—an accomplished race car driver and automotive engineer.

That great neighbor was Eddie Miller. This early pioneer had first begun his career with the Duesenberg factory in 1915. He quickly moved up in the company to mechanic, then engineer, and finally driver, which culminated in a 4th-place finish in the 1921 Indy 500. The following year, Miller left Duesenberg, moved to California,



Hilborn found the perfect mentor and friend close to home: Former Duesenberg engineer and racer Eddie Miller (right).



Stu (second from left) with the Low Flyers club, which was filled with future legends



and opened one of the first speed shops. There, he ground cams, modified heads and sold parts that hop-up enthusiasts craved.

Hilborn knew Miller's son, Eddie Jr., and after a quick introduction, Stuart and Miller Sr. became good friends. The veteran racer took Hilborn under his wing and helped him find his first car to build for the lakes, an engineless '29 Ford roadster they found at a used car lot. Together they located a '34 Ford V8, and treated it to an aftermarket two-carb intake manifold and a cam that was custom ground by Miller.

Soon after getting the car running, Hilborn got his first taste of induction system design. The duo had become dissatisfied with the performance of the two-carb manifold they'd started with, so they decided to build their own four-carb setup. Initially they wanted to use big two-throat

carbs, such as the Stromberg EE, which was found on Duesenbergs and V12 Cadillacs. But at that point, EEs and similar units were simply too expensive. So the pair improvised by using three single-throat Strombergs that they already had, and then they mounted one two-throat EE over the cylinders that needed the most fuel because of their firing order.

It was unorthodox, but it worked. And it gave Hilborn his first taste of induction system design, as well as a lesson in the out-of-the-box thinking that would later serve him well.

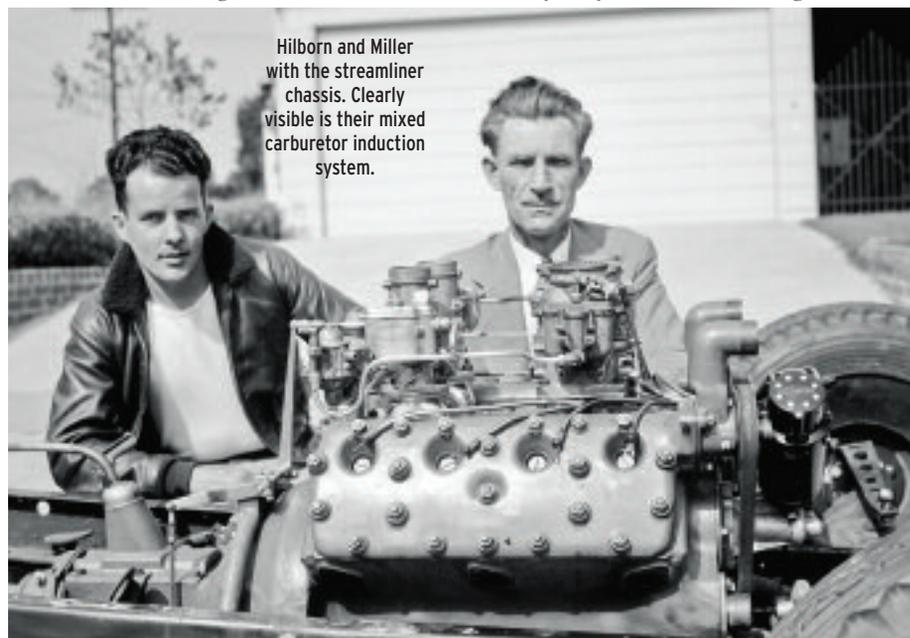
Hilborn began racing the roadster at lakes meets regularly, and in 1941 he entered the record book, running 124mph. But, like all racers, he craved more speed. So he was keenly interested when he heard that fellow lakes racer Bill Worth's streamliner was up for sale. It had typically run around 130mph with a potent 4-cylinder. Hilborn figured it would be a substantial jump in speed if he could shoehorn the V8 from his roadster into the narrow chassis. At \$75, the price was right, and Hilborn had his next race car.

Stu and Eddie worked on the streamliner over the winter, getting it ready to race for the 1942 season. With some modifications to the chassis and body, the roadster's V8 squeezed in fine, and they topped the revamped machine off with a rich, shiny black paint job.

The streamliner ran as well as it looked. In June, 1942 it ran 137.73mph to set a new B/Streamliner class record. But by this time World War II was in full swing.

Vision of Speed

Hilborn joined the Army in March, 1943, and was assigned to the Air Corps as a



Hilborn and Miller with the streamliner chassis. Clearly visible is their mixed carburetor induction system.

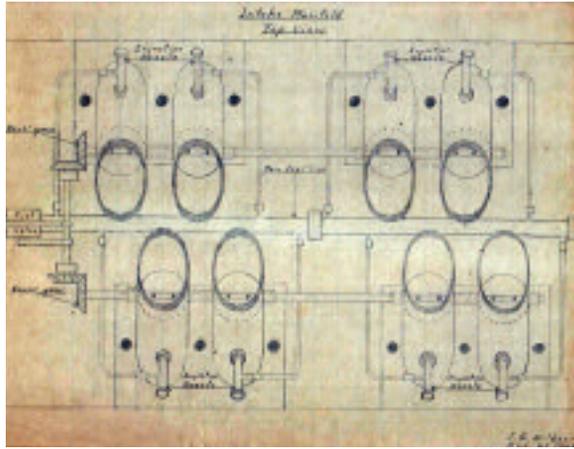
gunnery instructor. Stationed in nearby Nevada, he taught air crewman how to use the 50-caliber machine guns that bristled from B-17 and B-29 bombers. Amid the backdrop of the desert and far removed from the rigors of combat, Hilborn's thoughts naturally shifted to automotive engines and racing.

In particular, he ruminated on how the production gasoline carburetors he'd been using weren't really up to the task of feeding a methanol-hungry race engine—the jets weren't big enough for adequate flow and the pot metal would decay when exposed to methanol.

In his spare time, he drew up plans for a revolutionary new fuel-injection system. When he was discharged from the Army, in 1946, he returned to his job at the paint company and started building a working prototype of the system in his evenings and weekends.

As his injection system took shape, he continued to race at the lakes successfully, until August, 1947, when one of the spoked wheels on his streamliner collapsed during a high-speed run at El Mirage. The car went into a slide, then flipped a number of times. With no rollbar, Hilborn suffered several crushed vertebrae, putting him in the hospital for weeks.

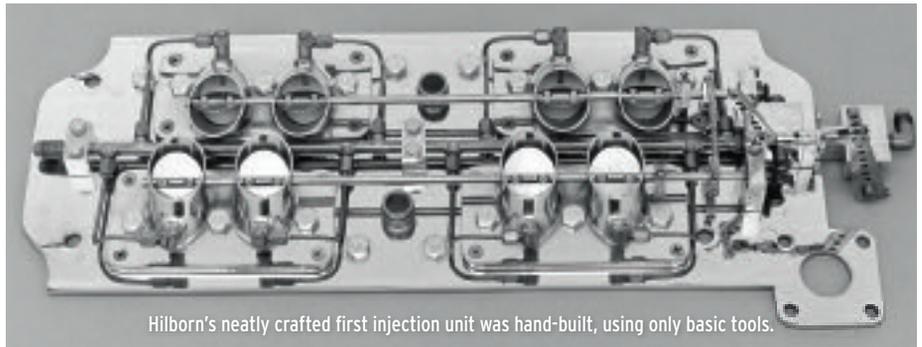
Fortunately, his friend Eddie Miller completely rebuilt the streamliner while Stu recovered, and Hilborn eventually was well enough to continue chipping away at his injection system. Aside from these challenges, building it went relatively



Simplicity personified: Plans for Hilborn's first injection system.



Stu's unusual idea made headlines.



Hilborn's neatly crafted first injection unit was hand-built, using only basic tools.

smoothly for the most part. The simplicity of the design belied how unusual it really was.

Although fuel injection was relatively new to the hot-rodding world, the basic concept was more than a half-century old by this point, with Rudolph Diesel filing a patent for such a system in 1892. More recently, German Messerschmitt fighter

planes had utilized sophisticated fuel-injection systems for their V12 engines during the war.

In essence, Hilborn's system was similar to these predecessors. But his design differed in one crucial way. Up to this point, fuel-injection systems had been timed—when the intake valve was closed,

Into the big leagues: Bill Vukovich won the Indy 500 in 1953 with help from Hilborn (fourth from left).



the fuel flow to that cylinder would be shut off. It was commonly held wisdom that this was the only way fuel injection could work; most people reasoned that the fuel would have no place to go if the system sprayed continuously into the engine, without interruption.

But this was the masterstroke of Hilborn's vision. He had the audacity to strip this aspect out of the system altogether, simplifying it to a nozzle that continuously sprayed fuel at the intake port.

And in this one bold move, he had distilled induction system design to its most fundamental essence.

Naysayers and skeptics, some of whom were experienced engineers, were quick to tell Hilborn the folly of his design. But such criticism didn't deter him. He was always confident it would work. And anyway, he wasn't out to convince anyone else. He was just trying to make his own car faster.

Finally, in 1948, Hilborn bolted his injection system onto the tried-and-true

Flathead in his streamliner. The engine fired up right away, and he could immediately feel how much stronger it ran. Stu put his foot into it and easily blasted to about 120mph, then backed off.

The Burden of Proof

Hilborn showed his fuel-injection system alongside his streamliner at a hot rod show that year, and it grabbed as much attention as the car. Then another breakthrough got people really talking. With Howard Wilson at the wheel and fuel injection underhood, Hilborn's streamliner became the first to exceed 150mph on the lakes, setting a new record.

By then, some of Hilborn's friends had gotten jobs working for midget-team owner John Balch, and Stu would sometimes help out in the pits. Balch suggested that Hilborn build a fuel-injection unit for the small Offenhauser 4-cylinder that powered his cars. Soon, Offy purveyors Meyer-Drake asked if they could test Hilborn's system out on their new dynamometer.

Up to this point, the most they'd ever been able to coax out of the 100cid Offy was 99 horsepower. So everyone, including Hilborn, was surprised when the engine immediately made 10 percent more power on the dyno than it ever had before, topping out around 110hp.

As racers began seeing fuel injection's potential, Hilborn quit his job and went into business for himself. It was a daunting move, but the leap wasn't entirely solo. Partnering with Hilborn was Jim Travers (VM 2004/4), one of his dry-lakes buddies. And Hilborn also had an important ally at Meyer-Drake. During the dyno test, the company's legendary engineer Leo Goossen had looked Hilborn's design over, recommended some relatively minor changes, and said the company would be very interested in it. The result was the first production Hilborn fuel-injection unit, a system for the 105cid Offy, which powered the fastest midget racers of the time.

Orders for the new system began coming in, and the company was slowly gaining ground. But it was still tough going. Although the business could perhaps earn a living for one person, it wasn't enough to support two partners. Travers left Hilborn and teamed up with a different dry-lakes pal to go racing again.

Earlier, Travers had been part of John Balch's team, and when the midget magnate sold his entire operation to wealthy oilman Howard Keck, Travers got an unexpected opportunity—a shot at fielding a car in the Indy 500. Once again, Hilborn got called for pit duty.

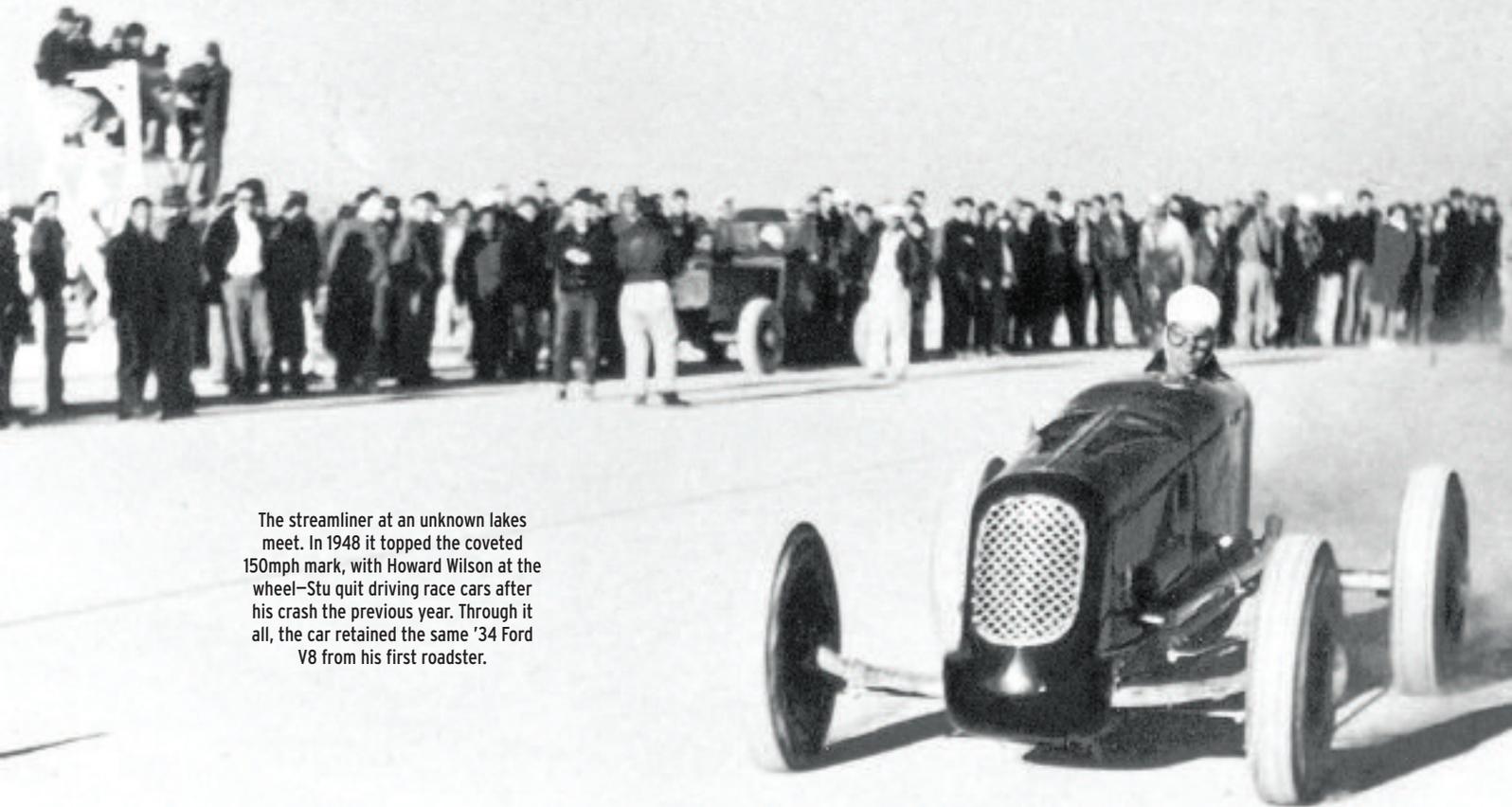


In 1947 a collapsed wheel at speed nearly killed Stu and wiped out his streamliner. But both survived, and the car would go on to set more records.



Vuky and the Keck team after grabbing the pole at Indy for '53. The next year the entire field used the handiwork of Hilborn (front, second from right).

PHIL REILLY COLLECTION



The streamliner at an unknown lakes meet. In 1948 it topped the coveted 150mph mark, with Howard Wilson at the wheel—Stu quit driving race cars after his crash the previous year. Through it all, the car retained the same '34 Ford V8 from his first roadster.

Stu's first appearance at Indy was in 1948, with Travers and company shepherding Keck's Deidt-built front-drive car, driven by Jimmy Jackson. Although Hilborn was strictly a crew member this first time out, the following year he brought along a fuel-injection unit he had developed for the 270cid Offy.

Unfortunately, Hilborn wouldn't get much of a chance to prove his system's merits at the Brickyard yet. Despite having a friend and former business partner in charge, the team didn't want to risk trying the system in the actual race. Travers and the others weren't convinced it would be reliable enough to go 500 miles at speed.

But Keck's team was at least willing to try fuel injection for qualifying. With the system's help, Keck's team started the '49 Indy 500 solidly, in 7th place. The strong qualifying performance was noticed by other teams, especially those who were struggling to make the field. The first was Bayliss Levrett. In desperation, he asked Hilborn if he could borrow his fuel-injection unit.

With Hilborn's system, Levrett's car gained five mph, getting him into the show. Word quickly spread, and team after team borrowed Hilborn's fuel-injection unit. It ended up qualifying six cars that year.

And yet none of the teams

wanted to risk trying it in the race.

For 1950, Stu was again invited to help the Keck team at Indy, now with three-time Indy winner Mauri Rose driving. After qualifying 3rd using fuel injection, the team planned to once again revert back to carburetors for the race. But Rose refused to switch. He was adamant that the fuel-injected engine ran better than any he'd ever driven. So the team left the unit on. Rose led 15 laps of the race, eventually finishing an impressive 3rd place.

Although the rain-shortened event that year was only 345 miles long, it was enough to finally convince most of the skeptics that Hilborn's system was robust enough to go the distance. From there, the trend toward fuel injection continued—1951 would be

the last time a car would ever win the Indy 500 with carburetors.

In 1952, Hilborn proved what he had known all along: His fuel-injection system could win at Indy. Troy Ruttman took the checkered flag, with the 2nd- and 3rd-place finishers that year also running Hilborn injection.

Around this time, Stu changed his company name from its original "Hilborn-Travers," to "Fuel Injection Engineering."

Then, in 1953, the Keck team finally made it to the Indy 500 winner's circle. With hard-charging Bill Vukovich behind the wheel of the Fuel Injection Special, they eclipsed everyone on the track, starting from the pole and leading all but five laps to take the win.

Then, proving it wasn't a fluke, they won again in '54.

The Universal Induction System

Besides getting another win at Indy, 1954 was significant for Hilborn in another important way: For the first time, every car that started the Indy 500 that year was running Hilborn injection. In roughly six years, his system had gone from being an oddball experiment to being the standard induction system for one of the most demanding events in motorsports.

And it wasn't just at the Brickyard that Hilborn's system was gaining almost unanimous acceptance. By the



Hilborn injection was everywhere...even a Buick-powered Kurtis SX (left).



Stu's original streamliner vanished in the early 1950s. But in 2004, Jim Lattin partnered with Hilborn and others to build an exact replica. Here, Stu is at the wheel of it, amid a crowd of family and fans.

mid-1950s, legions of drag racers were discovering the vast potential of constant-flow fuel injection. The short, full-throttle nature of the drags proved to be an ideal application for Hilborn's setup, and its participants seem to have resisted fuel injection far less than the Indy crowd had.

Hilborn readily served drag racers, offering his iconic eight-stack injection design for a wide array of engines, including Chrysler Hemi, nailhead Buick, small-block Chevy, and even Y-block Ford. Then, when superchargers began to take over drag racing's top ranks, Hilborn was ready again. He designed injection systems to sit atop GMC blowers, and the setup ruled the strip as drag racing sped into the wild 1960s.

With so much of the motorsport world thus conquered, one might think Hilborn was left without any more big challenges. But Indy would soon beckon again—this time to resurrect an old friend. By 1964, there were signs that the venerable Offy was losing its nearly three-decade-long hold on Indy. What surely seemed to be the final blow came in 1965, when Jimmy Clark drove his Ford 4-cam V8 to a five-minute lead over the nearest Offy in the Indy 500.

But then a surprising turn of events opened the door for the Offy's return. Rules changes took away most of the Ford V8's fuel-economy advantages. This, coupled with USAC's relatively generous 170cid displacement limit for forced-induction engines raised hopes that the Offy might have a chance again—if turbochargers or superchargers could be made to work on it.

Turbocharging quickly emerged as the most effective forced-induction configuration for the Offy, but there was one nagging problem with it—turbo lag. It continued to cast a dark cloud over the classic engine's rebirth until Hilborn developed a unique dual-stage injection system for it, which used smaller jets for lower rpms, then brought in a set of larger ones as boost increased.

With the lag problem cured, by the early 1970s the Offy had returned to its place as the top engine at Indy. The turbocharged Offy would remain a force at the Brickyard until the end of the 1970s, when rule changes finally pushed the grand old powerplant off the podium for good.

Built for the Ages

In the decades that followed, Stu continued to develop fuel-injection systems for a wide array of motorsports. In the 21st century, new



Hilborn in his element, working well into his 90's.

electronic fuel-injection (EFI) technologies brought the classic look and performance of Hilborn injection to a new market—street-driven engines, which now comprise roughly half of the company's business.

And Stu was always right there in the thick of it. Even in his early 90s, he still came into work every day, just as he had done for more than half a century. He continued to do so until the very last couple years of his life.

Stuart Hilborn died in 2013, at the age of 96. But the company he created lives on. And it's still very much a family affair. His daughter Edris manages much of the day-to-day business, her twin brother Duane is the company's head machinist, and his wife Carol handles customer service and invoicing.

Along with the whole new following EFI has opened up for them, a big part of Fuel Injection Engineering's business today is still in motorsports, especially drag racing, sprint cars, micro/mini sprints, and hillclimb. At the same time, the company gladly offers support for vintage race enthusiasts using older equipment.

With one foot in the past and another in the future, the legacy of Stuart Hilborn lives and thrives today. Of course, the healthy company he founded is evidence of that. But for real proof, you just have to look on any race track—almost all forms of auto racing have felt the impact of Stuart Hilborn in some way or another.

Pretty impressive for a guy who originally just wanted to make his own car go faster. 🏁

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