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A Reprint from *The Aviation Consumer*

Testing the Famous Flight Bonus Mod

Are the extravagent claims bonafide? A before-and-after comparison of Horton Stol-Craft's speed and STOL mods for the Cessna 182 suggests they really are.

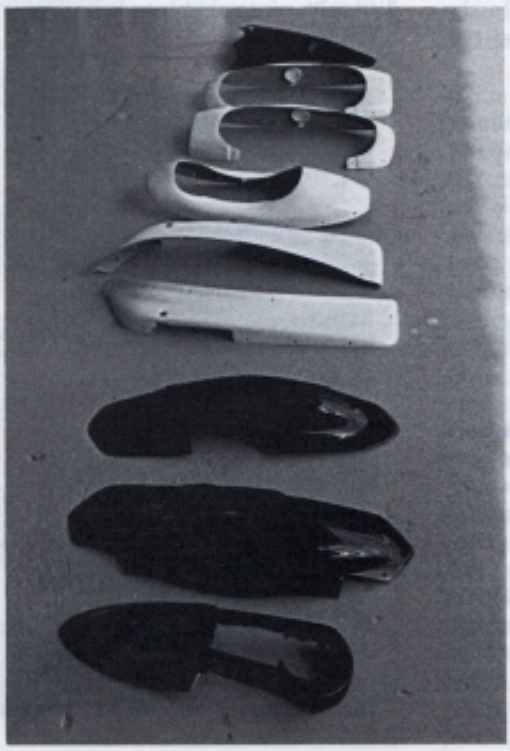
Some months ago, we published a roundup of modifications available for the Cessna 182 Skylane. Among them were the Horton mods to help the Skylane speed up—and slow down. Some readers challenged the Seibel/Horton speed-up claims, so we decided to check them out.

Horton's speed mods are evolutions of the widely heralded kits first developed by Charlie Siebel. Siebel had found and eliminated critical drag-producing areas on the Skylane, and he eventually proved his point by racing a speed-kit modified fixed-gear Skylane against a retractable model. (He boasted that the fixed-gear version actually won.) Several subscribers were skeptical that the Horton speed mods could deliver what they promised. As one reader put it, "Are we to believe that these mods are so efficient that not only is the drag reduced to zero, but even less than zero, thus causing the gear to actually 'suck' the plane through the air?"

Take heart, dear readers. We have flown the Horton speed mods and can say most assuredly that they do add quite a bit of speed to a fixed-gear Skylane. At the other end of the spectrum, the Horton STOL mods made the Skylane we flew almost unstallable.

The Alaska Connection

The test project came about when one of our subscribers, Dr. Roger Fellows of Fairbanks, Alaska, contacted us. He had read our earlier articles about the Horton mods, and his interest was piqued. So he responded to our printed call for an aircraft to test before and after the mod work was performed. He decided to take his 1968 Skylane down to Horton's home base of Wellington, Kans. to have the mods done there.



Landing gear fairing components, ready for assembly, show meticulous attention to detail and finish.

He felt that the Horton folks could do a much better job than his local shop.

He delivered his airplane to Horton in early May. We were there and test flew the Skylane in its stock form. We found nothing remarkable or out of the ordinary about the airplane. Handling was straightforward Cessna, and performance was within book limits for the stock airplane.

Baseline Speed Runs

In order to establish a baseline for the performance of the stock Skylane, we conducted a series of speed runs. We defined a course off the Wichita VOR, using the 190-degree radial. At 9,000 feet, he ran the Skylane wide open over four-mile segments in both directions along the radial. This would tend to cancel out the effects of winds on the groundspeed readings from the DME. Also, to ensure consistency, we kept the runs to within 15 miles of the VOR. We called for firewalling to prevent engine instrument errors from reducing the accuracy of our power setting.

With an outside air temperature of 9 degrees Centigrade and an altimeter setting of 30.07", we were flying at a density altitude of about 9,990 feet and a pressure altitude of 8,860. With the throttle, prop and mixture controls firewalled, we were showing indicated airspeeds of 136 mph (118 knots) and average groundspeeds of 132.5 knots. The indicated airspeed translated into a true airspeed of 157.5 mph (137 knots).

At Horton

After the Skylane had been dropped off at Horton's Wellington, Kans. facility, company President John Diebold showed us around the shop. We found Horton's facilities impressive, to say the least.

One interesting aspect of the Horton operation is the fact that very few parts come

Since lower approach speeds felt more comfortable in the modified Skylane, the new owner found he had to adjust for a tendency to steepen the approach.

from outside vendors. Most of what ends up bolted on an airframe is made right there at Horton's facility. Indeed, excluding bolts and fastening hardware, the only parts that are not made right there are the nosegear scissors assemblies. These cast-aluminum assemblies are supplied by an outside vendor, but they arrive at Horton as unfinished castings.

Arriving as they do in such a raw form, Horton is able to closely inspect them for any casting defects or potential problems. Even minor problems merit rejection, thus avoiding problems down the road. Horton then drills and finishes the castings, grinding off metal and adding bushings, and so forth, to achieve the final scissor assembly.

For STOL kits, Horton even rolls its own leading edges. The company buys stock aircraft aluminum, cuts it to size and then carefully rolls the new leading edge to shape. Using profile templates, the leading edge is checked for conformity, alignment and accuracy along its length.

New Pants

When the company first began offering the Siebel speed kits, they attempted to use the customer's original wheel pants, simply adding the needed fairings. This could have represented a major cost savings for both Horton and the customer. However, after finding that most customers' wheel pants were in need of repair (due to cracking), the company decided to simply make their own pants.

This has offered several advantages. First, Horton could be assured of the quality of the parts it put on the customer's plane. Second, it ensured a much better and more consistent fit between fairings and pants. Lastly, it allowed the establishment of what might be called pre-installation installations.

Due to the vagaries of fiberglass manufacturing, it's not uncommon for parts to come out of a mold with some variations. Often these are so minor they're unnoticeable. Sometimes, though, a wheel pant may come out bowed or with a poor parting half. In such a case, it may be difficult or impossible to install, or it may not mate evenly with its other half, causing installation aggravation for the customer, as well as headaches for Horton.

Before (top) and after views of the wheel pant moldings. Goodbye at-a-glance brake inspection.

To prevent this, Horton takes each finished wheel part, whether nosegear or main, and "installs" it on static jigs. This effectively simulates the entire installation out in the field, and if there's anything even the slightest bit wrong with any part, it's immediately apparent. This kind of quality control has resulted in happy mechanics and customers, and paid dividends in improved sales, reduced aircraft downtime and lowered handling costs at both ends.

Odds and Ends

While the wheel fairings play a large part in the drag-reduction program for the Skylane, Horton has a few other tricks up its sleeve. Among these are fairings fashioned for other parts of the airplane. For example, the factory-stock fairings at boths ends of the wing struts are replaced with low-profile designs. These also reduce vortex formation at the junctures (which in itself cuts drag measurably). In addition, they also fit much better than the Cessna fairings, leaving fewer and smaller gaps.

The landing gear struts also get new coverings and fairings. Again, they reduce vortex formation and provide a lower drag profile. A significant part of the new gear fairings is the scaled-down step. Cessna's step is big enough to accommodate feet the size of Bozo the Clown. Horton replaces this platform with a smaller, more streamlined step that we found to be quite adequate for getting in and out. (In fact, we've found the conventional step to be a real pain in the shins when trying to move around the aircraft or do any interior work from the outside.) Again, this smaller step cuts drag with its smaller profile and by cutting vortex formation. The nosegear receives perhaps the most noticeable changes. In addition to a new wheel pant, the

Since a great deal of drag can be produced by the extended nosewheel after liftoff, a specially designed Horton scissor limits strut extension. Photos show the strut compressed, left, extended, top left. The other photo shows how small fairings are attached even to the cylindrical strut to cut drag.

nosegear also gets Horton's new nosegear scissor. The scissor limits the nosegear strut extension, thus holding the nosegear up in the low-energy airflow behind the prop. On many tricycle-gear aircraft, the nosegear oleo can usually be seen at full extension when the aircraft is off the ground. No matter how streamlined the nosewheel pant may be, once it's outside the arc of the prop, it's producing prodigious amounts of drag. The Horton scissor not only prevents such extension, it also provides a degree of streamlining for the oleo itself.

Horton also attacks the drag produced by the engine/cowl combination. Some new baffling is installed, and a new floating gasket is used around the exhaust pipe outlet. This improves airflow through the cowling, cutting cooling drag somewhat.

Another nose-drag reducer is a piece of Astroturf (believe it or not) fitted between the prop spinner backplate and the cowling. Glued (securely) to the cowling, the Astroturf allows the prop to spin unimpeded, but provides a measure of gap sealing between the spinner backplate and the cowl.

The Finished Job

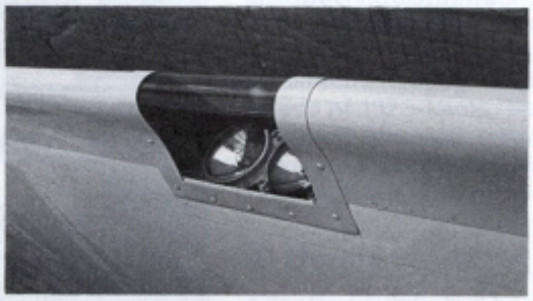
Three weeks after Fellows dropped off his airplane, it was ready to go. Despite various complications (including Alvin Janzen, Horton's lead mechanic and a company principal suffering a detached retina), the Skylane was ready on time.

We examined the aircraft closely before test flying it. Fit and finish of all components ranged from good to superlative. All the new fairings except one fit perfectly. The lone dissenter was a lower wheel pant fairing on the left main gear with a 1/4- to 1/3-inch gap at its lower forward lip. This was a minor point, in our opinion.

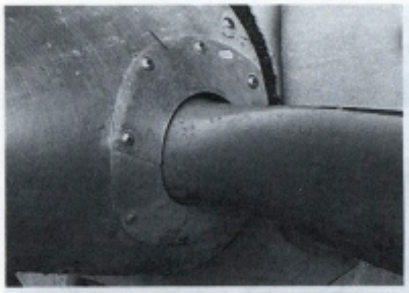
The new wheel pants had been primed, painted and trimmed out by Horton. They were an excellent match for the Cessna factory pants, but the paint job was just a little better on the Horton pants. The color match with the fuselage trim scheme was dead on.

The wing strut fairings were true to form, sealing perfectly all the way around at both ends of the struts. The same held for the landing gear fairings (except for the previously mentioned left main gear fairing). The new landing gear strut covers fit beautifully, and the new reduced-size step looked as though it should have been there all along.

Fellows had decided to go with both the speed mods and the STOL kit after meeting with Diebold and the rest of the Horton crew three weeks prior, so we also got to check out the STOL installation. Here, too, the quality of the components and the care of the installation was evident. The new leading edge, complete with new landing light lens and small fences, mated perfectly to the wing. Horton grinds the edges of the leading edge before installation to provide a bevel. This makes for smoother airflow at the surface, as well as an aesthetically pleasing installation.



A new drooped leading edge cuff is part of the STOL mod, and it requires a new landing light lens. Close-up shows the old leading edge behind the lens "window."



Special cuffs seal the gaps around the spinner's prop opening. The hairy matrix at the spinner/ cowling juncture is not a giant bird nest, but an Astroturf liner.

The stall fences Horton installed on the outer portions of the upper wings showed excellent conformity with the airfoil. Again, installation appeared flawless.

On the whole, despite the number of modifications to the aircraft, the overall workmanship and attention to detail were outstanding. Indeed, the results coming out of Horton were clean and shiny, with no dings, chips or smudges on the finish of either the parts or the airframe.

The Bill

The price for all this work was not cheap, but on the other hand it was not exorbitant. Fellows' total bill came to $8,958.91. This was for both modification kits and some other work.

This other work included a new flap motor, since the original flap motor was slowing down. (It turns out that there's no way to test or troubleshoot the flap motor. It either drives the flaps down in 10 seconds at 100 mph indicated, or it doesn't. This one wouldn't, so it had to be replaced.)

Fellows also had the engine baffling replaced, since the old baffling was getting kind of ratty and worn out. (The mods include one new piece of baffling.)

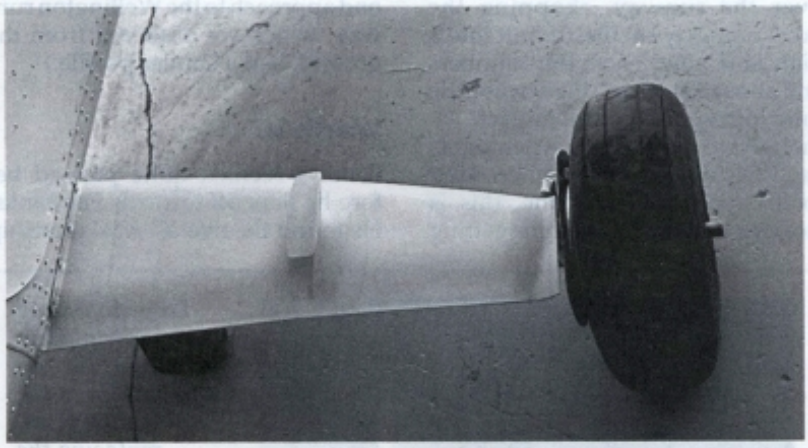
Flight Test

Of course, only flight testing would show whether Fellows got his money's worth and whether the mods actually work as advertised. We took the Skylane out for a two-hour flight and put it through its paces.

The speed runs showed a definite increase in speed. At 7,500 feet, with a density altitude of 8,922 feet (OAT 14 degrees Centigrade), we firewalled the engine. The indicated airspeed climbed to 152 mph (132 knots). This translated into a true airspeed of 173.5 mph (151 knots)—a 16 mph increase (14 knots) over performance before the mods were installed. Average groundspeeds were 139.25 knots.

The real surprise came when we tried to stall the aircraft. Despite our best efforts, the most we could get was a steady prestall buffet with power on and flaps up. In any other configuration, the aircraft would slow down until the stall horn came on and then just mush along at a high angle of attack.

For example, with power off and the flaps up, the aircraft slowed to 52 mph indicated with an 800 fpm sink rate and the control yoke at the aft stop. It was very stable in this configuration, with no buffeting and no rolling or wallowing tendency. Aileron response was very good, and even aggravated inputs could do no more than raise the sink rate. With full power and flaps up, full-aft stick produced the stall horn and mild buffeting, but no real stall break. Again, aileron response remained good.



Scaled-down new step on the gear leg (top) cuts drag, but actually serves the human foot quite adequately. Gear legs themselves receive new lower-drag fairings. Lower photo shows the original gear leg and its larger step.

In all other respects, handling qualities remained unchanged. Phugoid damping extended a cycle and a half more, though most pilots would never notice this unless they were looking for it. Roll divergence showed no change, nor did rudder responsiveness. As mentioned, aileron response and roll control authority were extended well down to the lower speed ranges.

Landing proved to be a new adventure. There was a stiff 20-30 knot wind at Wellington, which resulted in a serious undershoot. However, thanks to the STOL mod, flying the aircraft to the runway proved easy, with never any question about controllability close to the ground.

On the other hand, once we were over the runway, chopping the power quickly set the aircraft into a high sink rate. Over the numbers and about 20 feet agl, there was little time to respond before impact. Although we never like it when pilots say, "Oh, it's fine once you get used to it" about any airplane, this is clearly a trait that takes some getting used to. The steeper approaches at slightly lower airspeeds that the STOL kit makes possible call for proper planning well away from the airport. (We noted that Fellows' second approach to the Wellington runway, which we observed from the ground, had a similar profile.)

Alaska bound, Dr. Roger Fellows with the finished product: faster, yet slower.

Worth It?

Fellows seemed quite pleased before he flew off towards Fairbanks. He found the overall workmanship excellent, and the mods certainly delivered what they promised.

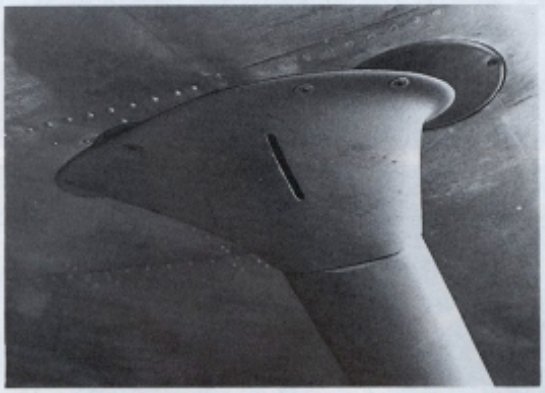
In the quest for speed, it's an open debate whether going the slick-up kit route is better than simply buying a faster airplane. However, for those who like what they've already got, but wish it would go a little faster, the Siebel speed kits may be just the ticket.

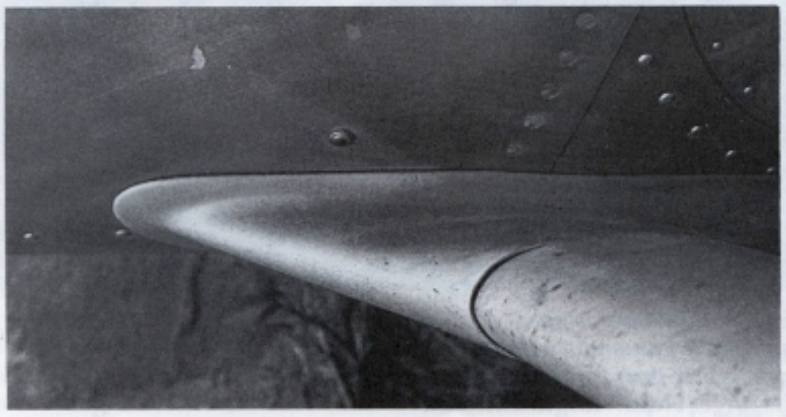
As far as STOL conversions go, the Horton kit certainly delivers. The improved controllability at low speeds make these mods quite worthwhile.

While either kit can be installed by almost any mechanic, having Horton do the job has definite advantages. For one thing, since they've done so many of these, they can generally do the work faster than field installers. For another, the quality of their workmanship is outstanding. Last, having encountered almost every installation problem that can come along, they can deal with it right then and there, where a mechanic in the field may require several phone calls to get things ironed out.

In our opinion, the Horton mods certainly live up to their claims. For owners of many Cessna models from 150s to 337s, the Horton mods are well worth looking into when the need is both to speed up, and slow down.

John Likakis





Large low-drag fairings are fastened at the top and bottom of the wing strut, replacing the original high-drag Cessna ones.