

FLIGHT REVIEW



# KITFOX



# S7 STI



**A wonderful development.**

BY PAUL DYE

**Every good airplane designer** needs a development airplane—something to use to try out new ideas and experiment with upgrades and the evolution of the design. Ideally, that test plane shouldn't be the company owner's personal airplane because they generally want to fly that—a lot! Building a dedicated airframe to try out different design innovations costs a little, but a company that dedicates the funds to do so can make a lot of interesting discoveries and observations.

Kitfox has just such an airplane, and you have probably seen it around. Painted silver with bold green stripes, N81KA is, basically, a straight Super Sport at heart. But it has been modified in a number of ways with various wing and engine configurations to see just what can be done with that basic design. We recently got a chance to fly the airplane in its current configuration. Sporting a high-lift STOL wing and a Titan X340 carbureted engine putting out 180 hp, it was a fun airplane to steer around the sky—and to dabble with on the ground.

Before we go any further, let's emphasize this again: This is a developmental test bed, but it is also a product that you can find for sale as the S7 STi. John McBean, president of Kitfox, first told us about the new wing a year or so ago, and it



Factory pilot, mountain flying instructor, and transition trainer Paul Leadabrand enjoys flying the STi around the country for airshows and demonstrations.

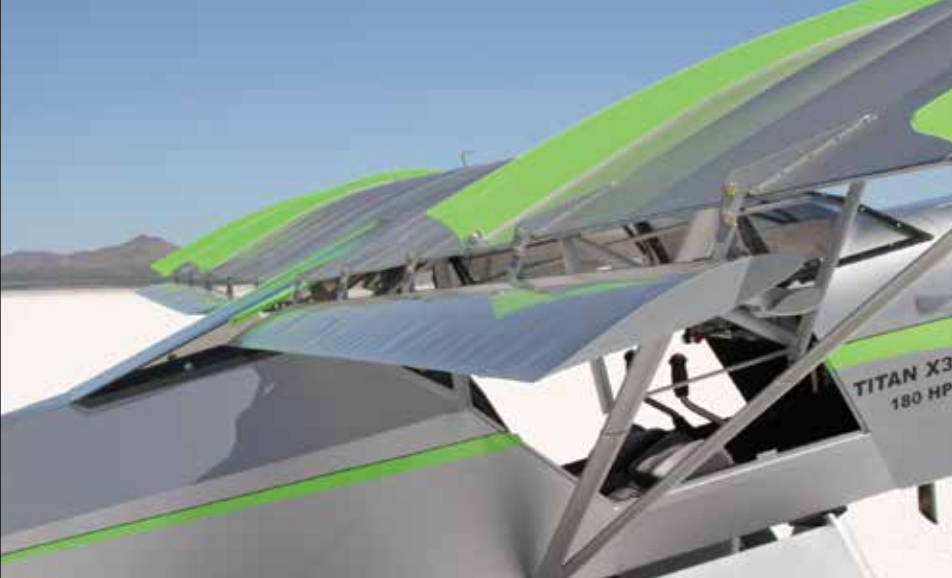
has been flying with the Titan engine for about six months. Before that, the same airframe had a standard wing and a Rotax engine—and the next time we see it, there might be further modifications. It is an airframe where McBean and his associates can tune the basic design for various edges of the envelope, learning and having fun along the way. And, of course, they saw no reason why customers shouldn't join in the fun, even if they might make further changes in the future.

As you look at the pictures of the cockpit, you'll see a panel that might not be as pleasing as what you'd expect.

There is a reason for this: As a test bed aircraft, the panel has been put together with minimal systems and only those instruments necessary to accomplish the testing and flying required. It is not optimized the way a builder/pilot might like, so don't think negative thoughts about the airplane because of what they have mounted. An engine monitor, radio, basic GPS, and transponder account for all of the panel's electrical stuff—and the pilot really doesn't need much more than airspeed and altimeter to supplement the Alpha Systems AoA that is located front and center in the panel.







The flaperons are carefully designed airfoils that serve as both high-lift devices and roll-control surfaces. The flap deflection is limited to allow downward movement of the “ailerons” without stalling the surface.

### The STi Option

Despite what I’ve said about this being a development test bed, you *can* buy the options required to build one. The new wing has been offered by Kitfox as the S7 STi since last year. You can most likely also convince the company to provide you with the Titan engine option, although they are still working on optimizing cooling and prop pitch. With Kitfox, it’s easy to talk with John McBean to work up a package that meets your requirements from the many things the company has created. That’s another good reason for having a flying test bed—developing options for builders who want to buy a specific configuration à la carte.

### The Wing

The basic Kitfox wing is efficient and yields a good cruise speed of close to 120 mph. I have shoehorned those airplanes into marvelously short strips after winding down Idaho mountain canyons and landed with room to spare. But McBean was convinced that, with a different airfoil, they could do better. So he designed a new set of wings with greater span, greater chord, and a customized, under-cambered airfoil. The flaperons remained the same, and instead of leading edge slats, the wing features vortex generators on its upper leading edge.

One of the design goals for the new wing was that it had to be entirely backwards compatible with previous Kitfox



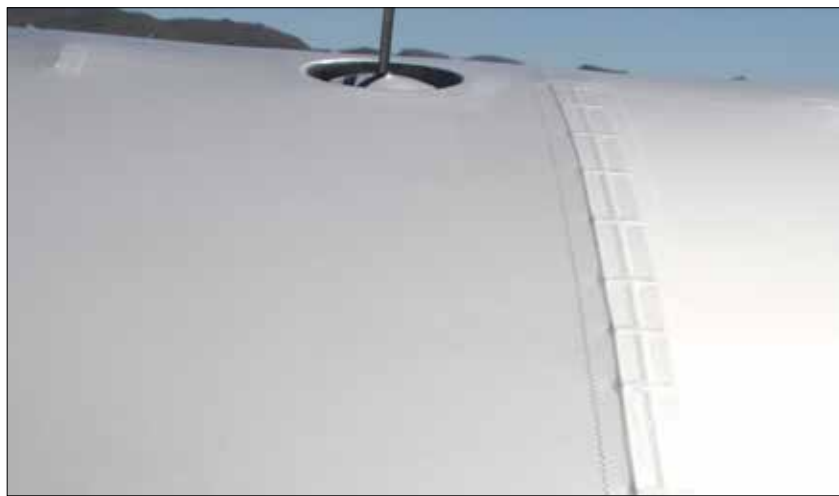
The stabilizer trim is typical of rag-wing airplanes from Cubs to modern times. The current development aircraft is a little nose-heavy, and the factory is working on adjustments to alleviate that tendency.

fuselages, and McBean is happy that they were successful. The result is that the new wing can be installed on already built aircraft—and the folding capability is still there, for those sharing hangars or keeping their planes in tight quarters. Just like all previous models, removing a couple of screws, driving out some pins, and removing the rear window (it’s designed to do that easily!) allows the wings to pivot around the rear attach point and nest alongside the tail. Your airplane is now easily transportable!

Originally longer than it is now, the wing was shortened by one rib bay after they determined that the bending moments out near the tips were deforming the flaperons a little bit. The current wing has a span of 31 feet, and we found the stall and low-speed flight characteristics to be predictable and smooth. The stall break, flaps up or flaps down, power on or power off, was mild, yet positive—it didn’t just mush along like many high-lift airfoils, but the break was gentle, telegraphing to the pilot that it was time to lower the nose.

The flaperons are limited to 20 degrees down to leave some room for aileron deflection before the airfoil stalls. A good look at the end of the flaperons shows the classic airfoil design; this is a nice lifting surface designed for efficient lift and control.

Takeoffs with the new wing were short, even without wind. With full



Subtle evidence of the deeper airfoil shape can be seen in the recessed fuel caps. The tanks are the same as in other models, so they end up sitting below the tops of the wing surface. The scuppers drain out the bottom of the wing.

## KITFOX S7 STI WITH TITAN X340

Kit Price .....	\$31,445
Estimated completed price .....	\$80,000
Estimated build time .....	1000 hours
Number flying (at press time) .....	3
Powerplant .....	Continental "Titan" X340,
.....	180 hp @ 2700 rpm
Propeller .....	WhirlWind, 2-blade, ground-adjustable
Powerplant options .....	Rotax 912 ULS, Titan X340

### AIRFRAME

Wingspan .....	31 ft 0 in
Wing loading .....	10.7 lb/sq ft @ 1550 lbs;
.....	9.12 lb/sq ft @ 1320 lbs
Fuel capacity .....	27.0 gal
Maximum gross weight .....	1550 lb (1320 lbs LSA)
Typical empty weight .....	900 lb (800 with 912)
Typical useful load .....	650 lb (750 with 912)
Full-fuel payload .....	490 lb (590 with 912)
Seating capacity .....	2
Cabin width .....	43.0 in
Baggage capacity .....	150 lb

### PERFORMANCE

Cruise speed .....	110 kt (Depending on prop pitch)
Maximum rate of climb .....	2000 fpm
Stall speed (landing configuration) .....	31 kt
Stall speed (clean) .....	34 kt
Takeoff distance (to 50 ft agl) .....	350 ft
Landing distance (from 50 ft agl) .....	550 ft

*Specifications and pricing provided by the manufacturer.*



The Kitfox STi sports a larger cowl to house the Titan X340 engine and features the larger wing for STOL performance. The massive 29-inch Alaskan Bushwheels complete the STOL package, allowing this plane to go where many other machines fear to tread.

flaps, the tail came off the ground in a couple of plane lengths. Then, if you didn't push the nose too low, the airplane quickly lifted off and you were flying. With a 10-knot wind down the runway, you can probably get off within the length of a set of average runway numbers. Landings can be equally short of course—just fly slowly, more slowly than many are used to, and parachute in with a touch of power.

### The Motor

As with many STOL airplanes designed to LSA standards a few years ago, the big question has always been, can I take

off the Rotax and put on a Lycoming or Continental? What will it do with more power? Just about every company has taken a look at this question and is now providing an option—or at least a test bed—that answers that question. In the case of the Kitfox, a design that started out with a 64-hp two-stroke, the answer about what it can do with 180 hp is, a whole lot! Factory pilot Paul Leadabrand reports that he has seen 2000-fpm climbs at sea level, and as was mentioned above, the short-field takeoffs are immediate and exciting. It's hard to beat raw power when it comes to getting an airplane off the ground and on its way uphill.

## Under the Hood

You know it's not your everyday Kitfox when you pull the cowling and find a four-cylinder Titan X340 hiding there. Ordinarily, the Kitfox Super Sport would be displaying a Rotax and its associated fuel, oil, and cooling systems when the lid comes off. It's almost refreshing for an inveterate homebuilder to open things up and find the familiar lines and wires of a Lycoming clone in all its glory and simplicity.

The Titan X340 is, of course, a stroked 320, carbureted and provided with an airbox and oil cooler. Putting out 180 hp and pulling the airplane with a fixed-pitch WhirlWind prop, it's a familiar package. The installation is simplicity itself, especially since Kitfox has fit this one with a plenum to keep from having to mess with upper baffles and seals. The cowling comes off easily, with a few quarter-turn fasteners and one duct to remove from the NACA inlet, which provides forced air to the oil cooler. The exhaust is straightforward, and most of the wires are for the four-cylinder EGT and CHT probes.

Because this is a test bed, no cabin heater is installed, but there is a carb heat muff and duct going to the all-metal airbox. The air filter is a straightforward Brackett, easily obtained just about anywhere

airplane parts are sold. The rest of the powerplant systems are simple as well. The two wing tanks are plumbed together and feed a small header tank under the passenger seat. An electric boost pump is used to supplement gravity pressure for takeoff and landing because of the possibility of steep climb angles temporarily unporting the fuel supply. (We experienced no burps at all during any of our operations).

The X340 is fired by dual electronic ignitions from Light Speed Engineering; the brain boxes are mounted behind the firewall, which makes for a very clean installation on the engine itself. The oil cooler is mounted to a firewall bracket, and air is forced through via the aforementioned NACA duct and a 3-inch SCAT tube.

The prop currently installed is fairly flat in pitch, and it is easy to over-speed the engine in a dive, but this is just one facet of the development nature of the aircraft. Props can be easily changed and re-pitched to whatever specs are needed for current testing. Overall, the X340 package is clean and uncluttered—perfect for a bush airplane—for whatever isn't there can't fail on you at some remote airstrip in the mountains.

—P.D.





The full carbon plenum on the top of the Titan X340 makes for a clean installation. Ignore the masking tape—it's just part of the development nature of the aircraft.



The NACA scoop on the side of the cowling feeds air to the horizontally-mounted oil cooler via a SCAT tube and duct.

Even with the standard engine for the Super Sport being the Rotax 912, McBean and company have been dabbling with more horsepower for a number of years. We flew the Rotax 914 turbocharged engine with a constant-speed prop in the Idaho mountains a couple of years ago, and the extra horsepower made for a very capable airplane. The much larger Titan adds another notch in the horsepower wars, taking the airplane into the realm of the Super Cub and its clones—but with side-by-side seating and plenty of baggage room. It will probably lift just about anything you can fit through the doors, although

we always recommend checking (and observing) the design gross weight for any airplane. Adding horsepower directly affects how much an airplane can lift and how fast it will climb—and they have certainly achieved a lot of both with this version of the Kitfox.

Regular Kitfox pilots will notice one thing as soon as they climb in: The view of the nose is considerably different than in a Rotax-equipped bird. The larger Titan engine requires a bigger cowling that is both higher and longer, so the view over the nose in a three-point attitude is not what you'd call spectacular—unless you're Paul Leadabrand, factory transition pilot,

mountain flying instructor, and a tall man who can see over just about anything! With the 29-inch Alaskan Bushwheels, that view is even more restricted on the ground. But once you're in flight, the horizon is clearly visible, so it's not really a problem. The view out the sides when taxiing is more than adequate to get you to the runway and back, and the low takeoff and landing speeds mean that you really aren't rolling blind on the ground for very long.

### Other Neat Bits

The current version of the airplane features a few other accoutrements that



The simple exhaust system provides carb heat, but does not yet feature a cabin heat muff. It undoubtedly will in customer aircraft.



A simple airbox and filter make for a nice clean engine installation.

enhance performance. One of these is the T3 tailwheel suspension. With an articulated spring/damper system that prevents harsh movement like you'd get with a leaf spring (without damping), the T3 is a unit we have flown on our own bush plane and like a lot. It interfaces with the fuselage and the standard Scott tailwheel yoke, and it allows firm touchdowns on the tailwheel, without the rebound of a stiff spring that can launch you into a gallop down the runway.

As is obvious from the photos, the airplane is also equipped with 29-inch Alaskan Bushwheel tires—the better to land on rough, unimproved surfaces. The first time I flew with large balloon tires, I was worried about a poor touchdown launching me back into the air with a vengeance. But the truth is, with the low pressures in the tires, they absorb such a touchdown and cushion the landing, rarely bouncing, and making the pilot look good (no matter if they are any good or not). The airplane can be built with numerous tire options, of course—from differentiated Tundra tires to standard 8.50s, probably better suited (and longer lasting) on paved runways. For those based on pavement who want to go into the bush, you'll give up tire life on the pavement for the off-field capability—just a choice that has to be made.

With gap seals and vortex generators on the upper surface of the wing (as well



The fully articulated shock-absorbing T3 tailwheel suspension adds significantly to the nice feel when landing the STi. It absorbs the shock of a firm tailwheel touchdown without launching you back into the air.

as the lower surface of the horizontal stab), an approach speed of 45 mph is very reasonable—and for those not used to working that slow, a little hard to attain. Suffice to say, however, it is really a matter of perception, not of skill, and working down to that number will pay off in short-field performance and the ability to drop into places you never thought possible.

One more obvious detail is the Shock Monster landing gear—dual shock units on each side that absorb the landing and also keep from relaunching you and your airplane back into the air when touching down on a rough field.

## Current Performance

The current configuration of the Kitfox we tested is optimized for short field operations and impressive climb. The thick wing is certainly draggier than what you'll find on the standard airplane, limiting the cruise speed in favor of slower operations. At 7000 feet on a standard day, we saw about 97 mph indicated in cruise (which was about 107 mph true), burning roughly 8 gph. For an airplane that can be dropped into short fields in the mountains, this wasn't bad—but you certainly need to plan long trips to take a bit more time than with the other models. You never gain in one area without giving up something in another, and that's part of having a developmental test bed. Kitfox quotes a decrease in top speed of about 20 mph with the new airfoil, climb prop, and 29-inch Alaskan Bushwheels. If you're exploring the local area, and that area includes rough fields and mountains, it is probably a worthwhile trade.

Kitfox is quoting 110 knots TAS with the right prop, and therein lies an important point. The airplane as we tested it was propped for climb; in level flight, you had to pull power back considerably to avoid over-revving the engine by a couple of hundred rpm. Adding pitch will certainly add speed—but that will decrease climb performance. A constant-speed prop would give you

## Evolution

This is not your father's Kitfox! When the line began with the original 1984 Model 1, it sported a 64-hp Rotax 532 as the standard engine. The airplane was light and tiny—the selling points being that it was simple and affordable, just what you see people having fun with in Paradise City at Sun 'n Fun.

The inevitable quest of all aviators (more, faster, higher, farther) quickly drove model development; however, one can be forgiven if they can't keep all of the various models straight. Suffice to say, there have been *many* aircraft kits sold, built, and flown that carry the Kitfox name, all sharing a look and a common heritage, but generally growing in size until this day.

The Super Sport is today's basic airframe and is sold as an SLSA, as well as in kit form. It can sport a wide variety of engines, from the 100-hp Rotax 912, up to the 180-hp Titan X340. Other engines that have been used include the Lycoming IO-233 and O-235, the Continental O-200 and IO-240, and the Jabiru 3300. There's also a radial engine that fits under the round bump cowl—the seven-cylinder, 110-hp Rotec R2800.

—P.D.





The large swing-up doors can be opened in flight, but the convex Plexiglas gives such a good view that you may not have to—the view is equally good with them closed or open.

the best of both worlds, of course, and for someone who wants both excellent climb and the ability to go somewhere more quickly, that should be a strong consideration. The STi was designed to be a full STOL airplane, without a lot of extra aerodynamic devices added on, and it was a conscious design decision to sacrifice top-end speed to accomplish those goals.

It's actually hard to talk about just how slow the airplane will fly. Airspeed indicators are notoriously hard to read, and not necessarily accurate, at the speeds we see in the current crop of STOL airplanes—the Kitfox included. Suffice to say that if it's short, you can slow things down to where you can just plop the airplane wherever you want it. You can also probably get into places you can't get out of, however, so think about that in advance. Stall speed is quoted at 31 mph, and although we were unable to read the airspeed accurately when the wing paid off, we believe that number.

Because the engine installation is developmental, we were warned that cooling might be a bit of an issue. In fact, we did see some temperatures we had to manage, but it was nothing we don't deal with regularly when flying slowly in airplanes with high-performance engines. There simply isn't enough cooling air at slow speeds to keep the engine as happy as we would like. The answer is to lean

aggressively beyond peak to rapidly drop CHTs or to lower the nose and pick up some speed (and therefore airflow) for a while. We were actually mildly surprised that the cooling was as manageable as it was in this configuration. It never stopped us from doing what we wanted, and we did a number of slow-flying exercises on a warming spring day in the deserts of Nevada, never feeling like we had to stop and allow things to cool down or reevaluate our operations.

Handling qualities of the airplane were sprightly for a STOL plane with

a relatively large wing. We were pleased with the roll rates, and equally pleased with the visibility out the top greenhouse into the turns. Pitch and roll are reasonably harmonious, and the rudder is quite powerful: A steep slip to landing was controllable and breathtaking—and the recovery to straight flight completely normal. The current configuration, with the Titan X340, is a little nose-heavy, and even with full up trim, we needed to hold back pressure to get really short landings. The AoA indicator is great in this condition, as it gives you instant feedback on how much additional back pressure is needed. The trim situation is just one of the little things Kitfox is working on with the development aircraft.

### Going Kitfoxing!

As we've said earlier, the short field capability of the STi is quite good, and you should be able to put this airplane just about any place you might want to go. Just be careful not to get into someplace you can't get out of. Faced with a beautiful spring day in Nevada, a full tank of gas, and light winds, we figured we should try it out.

In the past, we've taken Kitfoxes into steep, wooded, and short mountain strips. For our test flight in the STi, we decided to try out a different kind



The Kitfox seating is very comfortable, with laid-back positioning that is comfortable for a long time. The baggage area behind the seats is larger than it looks and holds up to 150 pounds.



of off-field experience—landing on a large dry lakebed whose surface had recently become usable after a record winter rain and snowfall. With part of the lake still fairly wet looking and nearby lakebeds sporting actual lakes, we approached the dry white surface carefully at first, descending slowly into a very low pass. From a few feet up, we could see the distinct cracking of the lakebed surface that showed it to be rapidly drying in the sun, so we let the altitude decay a little more and rolled slightly to touch one wheel as we rolled along. We were rewarded with a nice cloud of dust and little sign of a wheel track, so we lifted off and came around one more time for a landing.

It's tempting in situations like this to simply chop power and touch down straight ahead—but just because one portion of a lakebed is dry and hard doesn't mean that the rest of it is as well. Better to go back around and touch down where you have tested, lest you find yourself in the unpleasant situation of trying to unstuck a stuck airplane out in the middle of nowhere. Landing in this case was a non-event; all we had to do was avoid a couple of rocks and embedded old tires that somehow found their way into this otherwise pristine Nevada desert.

Rolling out on the lakebed, we killed the engine and enjoyed the utter silence



The panel is designed to provide just what is needed in this development aircraft/test bed, and is not representative of what builder/owners might actually install. Still, it is fun to fly a nice simple airplane that has only what you need.

of a no-wind day with no one in the vicinity. It's a neat experience to be so far from the madding crowd—as soon as you push thoughts of the engine not starting again out of your mind. The west is dotted with many dry lakes like this one, and most are under the control of the Federal government, so it is legal to land on them. It's always worth checking, of course; no need to find yourself surrounded by law enforcement (official, or otherwise) when all you are trying to do is enjoy a little peace and quiet.

Leaving the lakebed behind, we climbed into the Pine Nut Mountains, looking for wild horses. There are several beautiful valleys set between the desert floor and the 9000-foot summit of the range where the horses like to spend their time. This year's late spring has slowed their migration from the lower elevations back up to their summer homes, and we saw none, but the promise is there for later on. There was still a little snow on this late April day, hiding on the north-facing slopes and in the trees, a promise of more water for



the coming season and another warning to check those lakebeds before landing!

### Building the Kitfox STi/180

Like all of the aircraft in the Kitfox lineup, the kit you choose to build is easily customizable with a long list of options that can change the airplane considerably. The STi is put together by buying a regular S7 fuselage kit and then adding the STi wing as an option. Kitfox supports a number of different engines, and the Titan is undergoing final tweaking, so we expect that by the time you read this, they will be amenable to providing the required installation bits and pieces—but they hadn't reached the point of having pricing available, as we were flying the test bed.

### Having a Good Time

As in all things in Experimental aviation, we are faced with choices. The Kitfox can be built many different ways, with lots of different options. Going fast, going slow, landing short, taking long trips—you just need to know what you want to do with the airplane, then talk it over with the folks at the factory. Their options list can almost certainly serve your desires (as long as you're not looking for a fast-glass cruiser), and the kits will be there to serve your needs.

Having flown the Super Sport with the Rotax 912, the turbocharged Rotax 914, and the Titan X340, it is hard to pick a favorite. They all have their pluses and minuses. The Titan is a solid engine with lots of horsepower, but the 914 with a constant-speed prop was quite the delight. The new wing on the STi would be high on my list if my purpose was backcountry flying, and the nice thing is that with all these options, you get the same cockpit and baggage area, which is roomy and comfortable. The bubble side windows/doors really add to the spaciousness, and make for a great place to watch the world go by.

If low and slow, short and sporty is your desire, these machines are worth having a look. Just be warned—spending a day flying in the backcountry is addictive, so make sure you've got some money in your checking account for a deposit before you go. ✈

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