

2013 PLANSBUILT AIRCRAFT BUYER'S GUIDE

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Sling USA!



***The Airplane Factory's LSA:
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All Aluminum • Quick Build***

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JANUARY 2013

Homebuilt Flying:
Why We Should Make
(and Heed) Our Own Rules





Sling Shot

A South African LSA wonder with superb handling.

BY MARC COOK

Eight years into the Light Sport Aircraft experiment, we're seeing what could be significant signs of maturity. In the beginning, many new designs arrived, jockeying for position in what was hyped as a soon-to-be-crowded market. Rushing to the front of the queue, some manufacturers cobbled together designs from European micro-lights, boosting the maximum gross weight to, or close to, the new LSA limit. Still other designs came from the other direction, downsized Experimental/Amateur-Built aircraft nipped and trimmed to get under the arbitrary 1320-pound weight limit, otherwise neutered to stay within the various top- and stall-speed limitations.

Eventually, of course, pure designs emerged, aircraft penned with the specific limitations of the LSA category in mind, crafted to take best advantage of what little real estate remained inside the LSA box. Aircraft such as the RANS S-19 and Van's RV-12 and Zenith CH 650—along with a number of aircraft sold strictly as ready-to-fly LSAs—came to exemplify the “standard” low-wing, side-by-side, bubble-canopy look of the modern LSA.

Add another to the list in the Sling 2, a design hailing from Johannesburg, South Africa. It benefits from timing: The company fully understood the LSA limitations and watched carefully as other designers struggled

with them. In turn, the Sling, built by The Airplane Factory as both a kit-built and ready-to-go SLISA, carries design precepts that help set it apart from its competition.

Speed Deed

For one thing, because the company recognizes the performance limitations of LSA, it has purposely made the cabin quite large given the overall weight and size of the airplane, and the anticipated installed power. Designer Mike Blyth understood that the performance limitations within LSA would set an upper limit for speed, and that a reasonably clean aircraft could easily increase cabin size and tail volume (and embrace other



features) while still maintaining competitive performance.

To that end, TAF claims a 75%-power cruise of 115 knots true airspeed (KTAS), comfortably under the airframe's 135 KIAS VNE. It's interesting to note that the "unrestricted," non-LSA version of the design—one that can go to 1540 pounds maximum gross weight, against the LSA limit of 1320—is slightly slower. What that says is the design is optimized for the 115 KTAS cruise speed on the normal 100-horsepower Rotax 912S. The company will also soon begin testing, and eventually will offer, the option of the turbocharged Rotax 914 (115 hp for takeoff, 100 max-continuous);

purported performance is 118 KTAS at 6000 feet, though you should expect better speeds at altitude. If the turbo Sling could maintain the same indicated airspeed at 12,000 feet as it does at 6000—again, purely hypothetical until we get a chance to actually fly one—it should run 130 KTAS. It might even do 140 KTAS while still in VFR airspace. (This is for the non-LSA version, of course, since you can't legally fly an LSA above 10,000 feet except in the vicinity of very high terrain.)

In other respects, the Sling 2's performance is in line with other LSA. Listed max climb is 900 fpm at sea level; clean stall speed is at the 45-knot limit by



Matt Liknaitzky heads up U.S. distribution of the Sling, based at the Torrance, California, airport.



Sling Shot *continued*



Comfortable chairs for pilot and passenger: The Sling 2's broad cabin will accommodate even plus-sized Americans.

Behind the passengers is an ample baggage bay. Note the finished interior pieces; no zinc chromate in view.

SLING 2

Price.....	\$26,730
Estimated completed price.....	\$55,000 - \$67,000
Estimated build time.....	700 - 900 hours
Number flying (at press time).....	2
Powerplant.....	Rotax 912S, 100 hp @ 5800 rpm
Propeller.....	Warp Drive, three-blade, ground adjustable
Powerplant options.....	none

AIRFRAME

Wingspan.....	30 ft 1 in
Wing loading.....	12.10 lb/sq. ft
Fuel capacity.....	39.6 gal
Maximum gross weight.....	1320 lb (LSA)
Typical empty weight.....	796 lb
Typical useful load.....	524 lb
Full-fuel payload.....	199 lb
Seating capacity.....	2
Cabin width.....	44 in
Baggage capacity.....	77 lb

PERFORMANCE

Cruise speed.....	129 mph (112 kt) TAS
.....	7500 feet @ 75% power, 5.0 gph
Maximum rate of climb.....	800 fpm
Stall speed (landing configuration).....	46 mph (40 kt) IAS
Stall speed (clean).....	52 mph (45 kt) IAS
Takeoff distance.....	394 ft
Landing distance.....	230 ft

Specifications are manufacturer's estimates and are based on the configuration of the demonstrator aircraft.

1 knot (reducing to 40 knots calibrated airspeed with full flaps); takeoff and landing distances are 550 and 350 feet, respectively. It's clear that there are no magic bullets for stall performance, though; the Sling 2's 127.5 square feet of wing area is almost identical to the RANS S-19's and the Van's RV-12's. Regardless of which airfoil you're using, it seems that's how much wing area you need to achieve the LSA rule's 45 KCAS clean stall speed.

Conventionally Built

Reflecting the new orthodoxy, the Sling 2 is almost completely aluminum, using traditionally formed components and blind rivets to speed assembly. Unlike the RV-12, the Sling uses match-hole tooling punched slightly under size. (The RV-12's punched holes are final size.) The procedure is to bring the components together and assemble with

Cleco temporary fasteners. Drill the holes to final size—typically 1/8 inch—for the structural-grade pull rivets. These holes have to be dressed and deburred, of course, but that's a standard process on most aluminum homebuilts. Fiberglass panels are limited to the cowlings and various fairings; again, this is a very conventional approach to light-aircraft design.

What's interesting in the Sling is the level of prefabrication. All control surfaces are basically done, with only minor work required by the builder. The integral fuel tanks are finished and proof-sealed, and any of the major structural components in the wing and fuselage that require driven rivets are completed by the factory. In essence, there are no quickbuild

In profile, the Sling appears to be just another modern LSA. That's before you sample its exceptional handling qualities.





Twin MGL Avionics EFISes bracket basic analog gauges and the radio stack. Soon, the Sling will be available with MGL's touchscreen devices and remote radios.



That's throttle on the left and brake on the right—pull aft to engage. The arrangement seems like it would be awkward, but it works fine in practice.

options because the basic airframe is already in that configuration.

Emphasis on Handling

Blyth and U.S. importer Matt Liknaitzky echo the defining terms of the airplane. “We really wanted it to be a great-handling airplane,” Liknaitzky said. “We know there’s plenty of competition, and LSA rules clump performance together, so we wanted it to be something special from the handling perspective.” Liknaitzky said that a tremendous amount of development work took place in South Africa to fine-tune the Sling’s responses; surface sizes, control gearing, ergonomics and myriad other detail tweaks helped make the Sling handle more like a larger airplane. This emphasis underpins the company’s belief that many of its customers will be coming from conventional aircraft, with more

standardized handling qualities and more heft, which tends to take the “skitter” out of light aircraft. The early accident record of LSA suggests that light controls, low wing loading and, perhaps, pilot training were all factors in the high number of takeoff and landing incidents.

With an incident-free flight on my agenda, I joined Liknaitzky at The Airplane Factory’s U.S. base in Torrance, California, for a flight in the factory Sling 2. This particular airframe used the Rotax 912S and a Warp Drive three-blade, ground-adjustable prop. As mentioned, TAF is working on a 914 installation as well as one with the new fuel-injected Rotax 912iS; the development takes place in South Africa, so there were no skunkworks to be seen.

On a typically lovely California day, Liknaitzky and I taxied out in the Sling. Preflight and startup duties are totally

routine for a Rotax-powered LSA, though he did take the time to show me the well for the ballistic full-airframe parachute—the supporting cables run under the fuselage skin beneath the sliding canopy’s rails to a well against the firewall; when the ‘chute is deployed, these cables rip through the thin aluminum skin and support the airplane from the firewall and the strengthened roll-over structure behind the pilots’ heads.

Fuel comes from two unusually large fuel tanks, carrying a total of 39.6 gallons. (The odd number comes after the conversion from liters, which is 150.) Most LSA in this category offer about half the capacity. When you fill the tanks, the 912S-powered Sling ought to fly for 7.5 hours with a full hour’s reserve! In the LSA version, you’d have to be solo or one of two very light pilots to carry that much fuel, though; TAF





A conventional slider canopy provides the expected visibility. A small sunshade provides a measure of SPF.



The Sling's "squinty eyed" cowling reflects a desire to reduce cooling drag. The radiator has its own scoop below the spinner; upper inlets feed the airbox and cylinder baffles.

lists a basic empty weight of 815 pounds. That's 505 pounds total payload, 232 pounds of which is the full lot of fuel, leaving 273 pounds for the cabin.

For our flight, we were a bit more than half full (approximately 11 gallons per side), which gives a comparable cabin load to most LSA in this class when they're full. In the Sling, you can choose to operate either tank individually or in "Both" mode, which is somewhat unusual for a low-wing design. That fuel selector takes center stage on a composite strut beneath the main instrument panel. Behind it are controls for the throttle and brakes. Manufacturers can choose from a directly steered nosewheel and a single brake, or a

free-castering nosewheel with individual brakes; TAF chose the former. It works fine, too; the gearing on the pedals results in low foot effort, but the steering is not too touchy. With just a bit of practice, you can track the taxi line without thinking much about it. Same with the hand brake, which really can't be manipulated with the throttle at or near idle. Fortunately, the Sling I flew had enough idle-speed thrust that the control could stay at idle, leaving your right hand free to work the brake lever.

Shiny Boxes

Because the U.S. arm of TAF is also an MGL Avionics distributor, it was no

surprise to see MGL boxes on the panel. Liknaitzky and I worked from the checklist stored in memory. Wrapped up with the pre-takeoff checks, I slid the Sling onto the longer of Torrance's (KTOA) two parallel runways, dropped about one-third flaps and let 'er rip. Initial acceleration is fine, probably a bit more gradual than the lighter RV-12 but on par with the RANS S-19.

Recommended rotation speed is 45 KIAS, which comes quickly enough; the Sling shows no tendency to do a dance on the gear at this speed. Moderate backpressure brings the long nose onto the horizon and the Sling steps off the runway smartly. We flew with a





Resplendent in its ubiquity, the Rotax 912S is the standard engine for the Sling. The company is looking at the turbocharged 914 and the injected 912 iS as well.



Upturned wingtips help improve efficiency.

15-knot wind running 45° off the runway heading. An airplane with good rudder/nosewheel calibration requires relatively little extra rudder once the wheel is off the ground. The Sling scored well here: As soon as the wheel was off, the nose jinked slightly left (the wind was from our left), but it was a movement easily and naturally fixed with a touch more rudder input. This ratio is

hard to peg in the design phase, but the Sling did very well.

With the prominent proboscis on the horizon, just below the field of view, the Sling, now flaps up, accelerated to 85 KIAS and maintained a healthy 700-750 fpm. Best rate of climb is 75 KIAS, so the factory's claim certainly seems in the ballpark. Temperatures and pressures looked good, with the Rotax's CHTs running

in the low 200s and oil temp at 165°. The outside air temp was 74°.

During the initial climb, the Sling's really pleasant handling qualities start to make themselves known. The ailerons are lighter than the elevator, which is lighter than the rudder effort. Making a minor change in bank angle requires little sideways pressure, but the effort/response coupling is very natural. Pitch is heavier, and I

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Landing lights, where they belong: on the wing, not below the engine.



Effectively large ailerons help give the Sling 2 superlative feel and responsiveness in roll. All axes are well balanced.

noticed it required almost no thought to peg and hold a desired airspeed. Looking at the in-cockpit video, it's clear the airplane has sufficient yaw stability. From the camera's perspective behind the pilots, it can sometimes look as though the fin is hardly working, but in the Sling, the yaw motions are mild and quite obviously damped quickly. (The pilots actually feel a bit less of this motion, sitting as they are very near the center of lift.)

Cruise Time

We leveled off at 5000 feet MSL, density altitude of 7400, and let the airplane accelerate. With 5500 rpm showing, the indicated airspeed wraps up to 106

KIAS. A two-way GPS run confirmed the resulting 118 KTAS cruise figure; the onboard fuel totalizer read just under 4 gph. Run that through your calculator to find fuel economy near 34 statute miles per gallon.

One delight of this design is the roll control in cruise. Often, finding the right balance between good forces and stability at low speed and high is difficult, with some airplanes too skittish at low speeds or with too-high forces with increased airspeed; the Sling finds the sweet spot. Moreover, it's done in a way that makes the airplane seem intuitive to fly. Specifically, the on-center response to the stick is relatively numb, so that

inadvertent movement of the stick doesn't readily displace the airplane. But as stick deflection increases, the airplane begins to respond more aggressively.

In all the maneuvers we tried, the Sling responded predictably. Stalls provide a lot of aerodynamic warning—probably not as much as the RANS S-19, which shudders like a wet dog, but more than the RV-12 and a whole lot more than many conventional homebuilts. Pitch stability is consistently positive, at both cruise and maneuvering speeds. Displace the airplane from cruise speed and release the stick: It quickly heads toward a restorative pitch attitude, bottoms out of the first correction cycle in 3-4 seconds and begins



The Sling design has ample vertical-fin area for strong yaw stability, while retaining ideal rudder forces.

What's in the Box

Most components in the Sling 2 kit are at what you'd normally call the quickbuild stage. The empennage kit includes complete horizontal and vertical stabilizers, rudder and elevators, hinges, control connectors, trim tab, composite tips. The wing kit includes all wing structures, including already assembled main spars, flaps, ailerons, hinges, bellcranks, fuel tanks, pitot mount brackets, composite wingtips. A fuselage kit contains the forward, mid and rear fuselage, including fully assembled center spar, rear spar, seats, all control mechanisms (throttle, brake, stick, rudder pedals) and the firewall; the engine mount is attached to the firewall. An "undercarriage" kit includes main and front gear, wheels, tires, tubes, axles, bearings and hydraulic brake system. The canopy kit includes, yes, the canopy, plus front windscreen, outer skins and panels, the top instrument-panel cowl and instrument-panel face, cut to suit customer requirements.

The final-assembly portion of the kit includes the engine cowlings, all composite closing fairings, pushrod assemblies, related rivets and hardware. The fuel system, electrical system, firewall-forward kit (currently supporting the Rotax 912S), upholstery and other miscellany are ordered separately. An avionics kit is available. Paint is up to the builder.

—M.C.

Sling Shot *continued*



Avex pull rivets make up all of the builder-completed structure. An OAT probe hides in the cabin-air vent.



The main gear wear 15x6.00 tires, which are only slightly smaller than a typical trainer's 6.00x6 doughnuts.

a mild overshoot. It reverts to trimmed airspeed in fewer than three cycles. The only difference at maneuvering speed is that the Sling responds slightly slower, but the indications of positive pitch stability remain.

This is not to say the Sling is stiff and overly stable. In fact, it's so pleasant to fly that you won't want to be straight and level for long. Roll rate is very good, easily on par with the flaperon-equipped RV-12, and roll responses are so natural that you seldom overshoot the desired bank angle, even when going from 45° one way to 45° the other. Through all that, the airplane is sufficiently pitch stable that the nose stays put and the VSI barely has a chance to react before the maneuver is over.

It's a bit of a cliché that pilots love airplanes that flatter their landing skills, but as every cliché is slightly based in fact, the Sling ought to find admirers. It holds the

desired 75 KIAS final approach speed well—this is higher than you'd expect, but a good starting point until you're comfortable with the airplane—and offers a magnificent view over the nose. With full flaps, it's just draggy enough that an approach begun too close to the airport and too high can be salvaged with idle throttle and a bit of a slip. (Try it with an RV-12, and you'll float down the runway, looking like a rube.) Power out nearing the threshold, the Sling settles comfortably with the nose just below the horizon. You can feel ground effect slowing the descent rate and then, right when you expect it, it dribbles down onto the runway. They'll call you Chuck Yeager.

Dollar Days

In all, the Sling 2 is a delightful flying experience. It's also priced to be competitive with its primary rivals. The Airplane Factory gives an all-up price for the

kitbuilt of \$66,685, which includes the entire kit, engine, prop, interior, electrical items *and* avionics. Van's lists the RV-12 as \$64,165. Based on our understanding of the options list for the RANS S-19, it's similarly priced. Differences in options, available avionics and other factors make it difficult to make direct apples-to-apples comparisons, but it's fair to say these three airplanes are within a vacation to Cedar Rapids in total cost.

Maturity and competition in the LSA market has been a good thing. Newer designs, those penned just for the class, have formed into a group of well-understood, fairly conventional aircraft suited to the limitations cast in stone. The Sling 2 is arguably the latest and overall best handling of that new breed.

For more information, call 310/721-9190, or visit www.airplanefactory.com. Find a direct link at www.kitplanes.com.



A Few Words from the Designer

From the time I was able to hold a pencil I have been drawing airplanes. It was my father's influence: He served in the Royal Air Force during WW-II. In 1984, after going for a short flight in a Quicksilver ultralight, I immediately realized I had found my calling. I started flying, and of course that got me sketching airplanes with renewed energy. A few years later, I made and flew my first airplane, a small two-seat ultralight. I am not sure what gets into my head, but I have made a habit of flying my prototypes over long distances after just a few hours of testing. On one occasion, I won the Microlight World Championships in a prototype trike that had just 4 hours of flight time.

The Sling is a departure from my previous ultralight and trike designs. This time the airplane is larger, faster, much more substantial and manufactured out of aluminum instead of tube and fabric.

I made a list of features I would like to see in my perfect airplane. On doing some research, I was surprised that I couldn't find a Light Sport Aircraft that had all the features in it that I considered important. It was clearly going to be a special challenge to design and make an LSA with all the features that I wanted, and particularly in South Africa, which does not have the rich aviation heritage that the United States enjoys. With the help of an aeronautical engineer, an aerodynamicist and a draftsman, the Sling started to emerge. That was in October 2005.

As time passed, the team grew and I took on a business partner, James Pitman, an experienced pilot with an adventurous spirit, who in a previous life had been a lawyer. Three years after starting the project, the development prototype flew. Over the following six months, we perfected its flying characteristics, basing the handling on mil specs. After the test flying was completed, the prototype was disassembled and a completely new production prototype was built that incorporated all of the hard-won improvements. Pitman and I, confident in our new, shiny yellow Sling, fitted long-range fuel tanks (120 gallons) in the wings, jumped into it and flew it around the world, stopping briefly at the Oshkosh AirVenture airshow. That was in 2009. Today the 80-person factory staff deliver five ready-to-fly and three kit Slings a month.



The Aircraft Factory family poses in front of their facility in South Africa.

It was a difficult road getting the Sling to be such a good all-rounder. Designs of components were made and tested and rejected and started again, building on the knowledge gained. As an example, the wings were static-loaded to destruction five times before the final design received the stamp of approval from our engineers. That is what makes the Sling what it is today. Every little part has been changed and improved and tested over and over until it was perfected for production. Apart from the handling (it really does fly like a little fighter), which Pitman and I feel is better than every other LSA we have flown, the Sling is strong. It has been thoroughly tested to 1320 pounds for the ASTM LSA standards and also to the 1540 pounds CS-VLA standard.

What was on my airplane wish list? First, make the airplane sexy. Buying an airplane for recreational use is a purchase of the heart, so I say why not make the effort to make it beautiful? Then perfect the handling so it's stable but responsive; wherever you point it, there it must go and there it must stay. It is difficult to get perfect handling in an airplane, and that is why so few have found that sweet spot. My list was long. With the Sling, there is a tick against every line.

Now it is time to start selling the Sling in North America. The Sling is ideally suited to the American market. It is made out of aluminum, it's large and comfortable, and it has efficient wings that give it excellent lift even when it's hot and high. And the kit is really good. It is easy and quick to put together, and every part is complete with all holes punched to size and deburred. Although there are a lot of LSA on the market, I know our little fighter will shine. Once you have been for a flight in a Sling, there you will always yearn to return!

—Mike Blyth ✈

