



Blue Sky Aircraft *Predator 142*

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A predator is a creature who's résumé reads: "Trained and equipped to prey upon less formidable beasts." A predator of the air brings to mind a swooping peregrine or perhaps a rapacious pterosaur. The new

glider from Blue Sky Aircraft — aptly named the Predator — brings to mind all these images.

The Predator is the latest glider on the market. It is the next step up from the UP TRX. Showing its heritage, the Predator

shares a lot of characteristics with the TRX, but there are plentiful differences as well. In fact, many innovations on the Predator are unique to hang gliding and may point the way to new design tactics.

I was fortunate enough to get a Predator

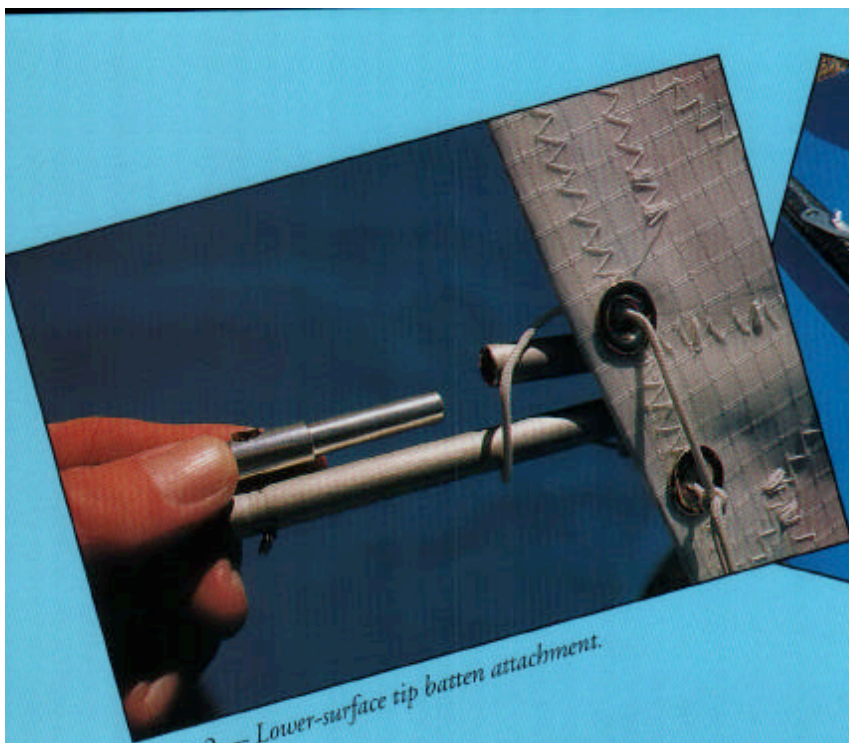


Photo 2 — Lower-surface tip batten attachment.

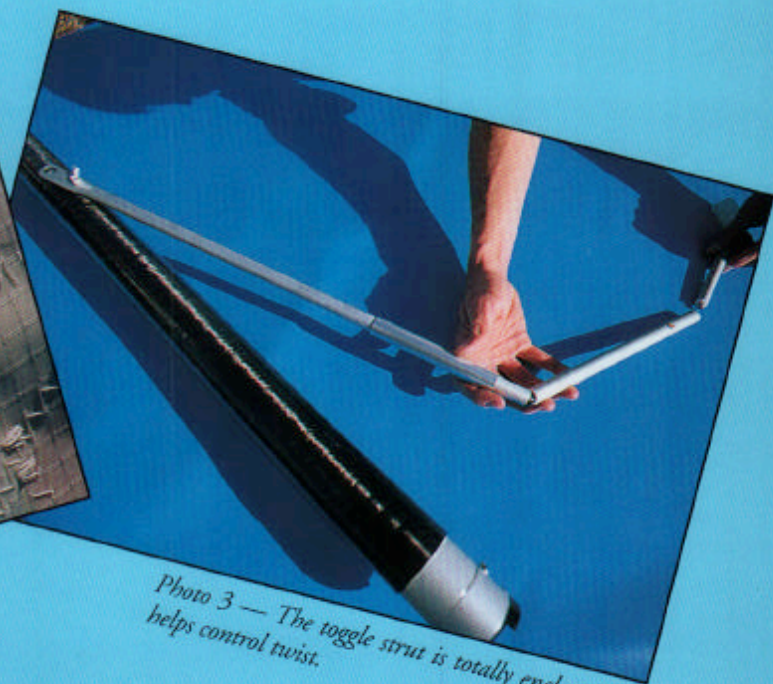


Photo 3 — The toggle strut is totally enclosed and helps control twist.

from the second brood Blue Sky produced. I have been seizing every reasonable opportunity to fly it in the late-autumn Pennsylvania skies. Finally, a tremendous burden of snow has blocked most of our sites, so it's time to collect our impressions and pass along what we have learned about this audacious avian. When all is said and done, I am sure you will learn, as I have, not to mock a killing bird.

THE LINEAGE

We begin with a little background since both the glider and company appear to be new. But appearances are deceptive. Blue Sky, the core, has been around as long as any manufacturer, for Dick Cheney, the principle, has been making sails for the likes of Manta Wing and others since the mid-1970's. Later, Dick ran UP during the heyday of the TRX. Finally, with a little reorganization, he created Blue Sky to produce the Predator.

Another integral part of the company is John Heiney, a pilot long known for his flying excellence. Together, Dick and John developed the Predator with several goals in mind:

- 1) They wanted to update and upgrade the TRX.
- 2) They wanted to maintain the same graphite airframe.

- 3) They wanted to challenge the competition in performance.
- 4) They wanted to introduce some interesting innovations into hang gliding design.

Our review will illuminate how they achieved their goals.

In the course of discussing the Predator with pilots I have heard a few question the viability of this upstart company. Besides the fact that it is, in fact, not an upstart, it should also be known that for almost two decades Dick's sail loft has produced sails for ultralight companies and continues to do so. This means that Blue Sky is a much bigger operation than it appears at a glance, and their future should remain cloudless.

THE PREDATOR HATCHES

Perhaps you can picture in your mind an angry little chick chipping away with its egg tooth until it bursts from its shell, unfurls its wings in a stance of defiance and focuses its adamant eyes to find something to devour. But our Predator was not quite so precocious, for it springs from a very mild-mannered parent — the TRX. One of the main concepts of the Predator design is the use of the TRX airframe. For those few pilots who have been stationed on the moon for the past several years, we should point out that almost the entire TRX airframe is

made from carbon graphite. This makes the TRX the lightest glider in its class with corresponding easy handling.

Graphite airframes make a lot of sense since we are foot-launching aficionados. Despite some early skepticism, graphite has proven its viability as hang glider airframe material, and I for one hope to see more. I think I'll get my wish, as I hear that other companies are adopting the technology. Blue Sky is definitely in the catbird seat on this issue since they have several years experience in the field.

Not only does the Predator use the TRX airframe technology, but it uses the TRX *airframe*. That's one of the successes of the Predator design project. A current TRX owner can simply purchase a new sail and some hardware fittings and connect their TRX to a Predator. This conversion will not be cheap, since sails are labor intensive, but it will certainly beat buying an all-new glider. The idea is that the airframe will outlast several sails.

We wish to make it clear that the Predator *is not* a TRX. It has expanded the TRX performance envelope and there are handling differences. The Predator shares the airframe and planform with its progenitor and you can tell it comes from the same family, but it does not feel entirely the same as we shall see.

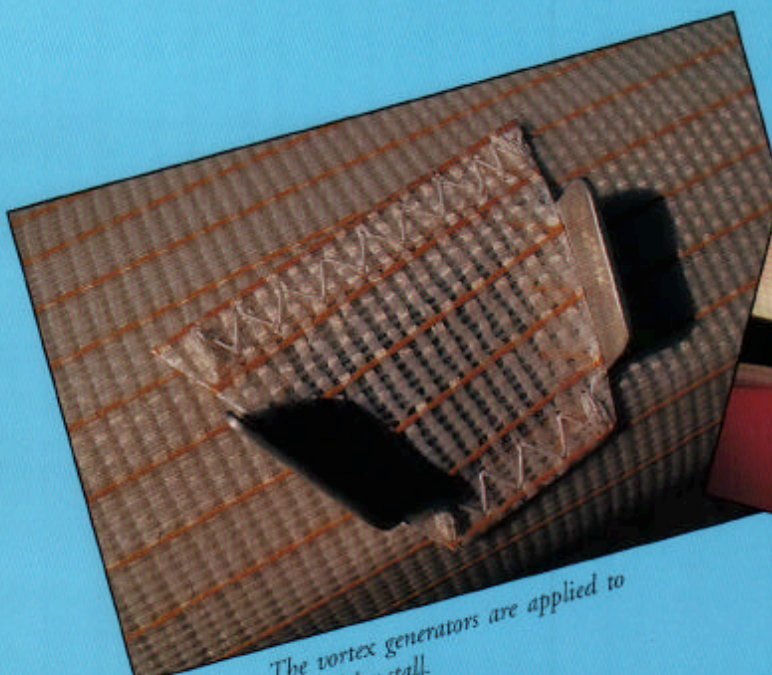


Photo 4 — The vortex generators are applied to the leading edge to delay stall.

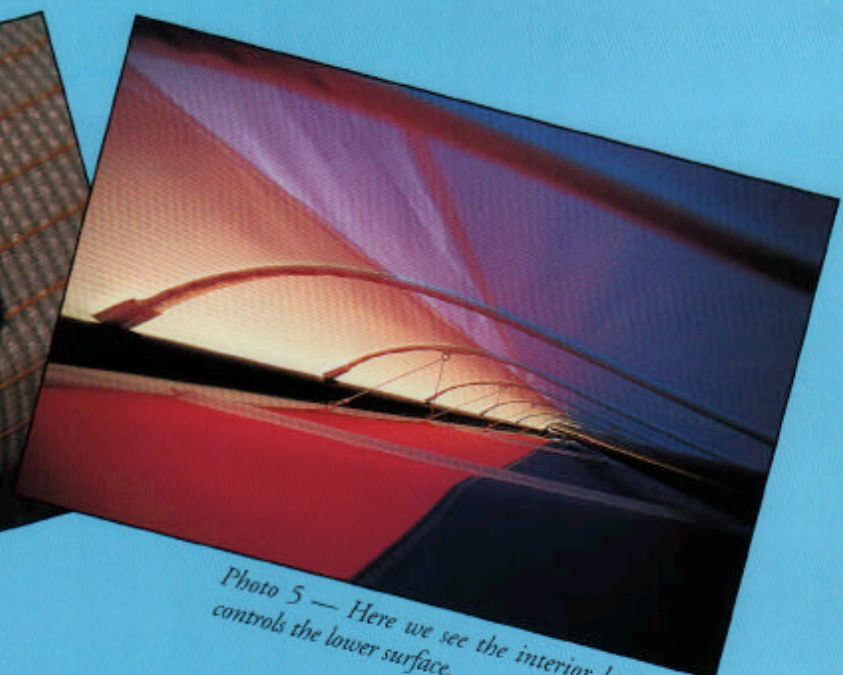


Photo 5 — Here we see the interior lacing that controls the lower surface.

PREDATOR INNOVATIONS

Perhaps the best way to introduce you to the Predator is to enumerate its novel features. A whole lot of thought went into the Predator's tip area, so let's begin there.

Curved Lower Tip Battens

If you happen to look at your outside tip in a turn, or either tip in a dive, you may be able to tell that they are not doing much except going along for the ride. In fact, their angle of attack will often be close to zero and they are contributing only drag — no lift — to your performance package. This state of affairs is due to wing twist or washout which is necessary for pitch stability. We have to live with it, but we don't have to let it bring us down.

Designers have approached this problem with various solutions, such as applying 100% double surface at the tips (Prodesign series and Solar Wings design) or using internal webbing to define a low drag, low angle-of-attack airfoil (RamAir and Laminar). The Predator incorporates the 100% double surface trick (see Photo 1) and adds a new twist to the washout problem: two cambered (curved) undersurface battens at the tip help make this area lower drag by creating a semi-symmetrical airfoil. The lower-surface battens are each coupled with an upper batten to produce this effect. In flight you can observe that the Predator's tip

area undersurface is stable and shrugs off debilitating parasitic drag. The lower tip battens are easy to insert and are held in with plugs on the upper battens (Photo 2).

Toggle Struts and Tip Plug

The next noteworthy Predator change is the toggle strut. This strut takes the place of a tip batten and comes off the *top* of the leading edge rather than the bottom as the tip batten did on the TRX. To install this strut you plug its tip in, then lever it straight and slide down a sleeve to hold it in place (Photo 3).

Because of the toggle lever action and because the strut is located on top of the leading edge, it effectively helps reduce twist. As mentioned, twist is necessary for stability, but too much hurts performance by reducing lift produced by the outboard area of the wing. The Predator appears to have the least amount of twist of any glider I have viewed (more on this below). The toggle tip can be adjusted in length simply by turning a screw in or out.

While we are regarding the tip area we must make note of the new tip fairings. Gone are the huge, clear "aquarium" tips of the TRX. The Predator tips are still made of the same tough PETG plastic, but they are much smaller, lighter and infinitely easier to put in. I suppose you could still use them for aquariums, but only for guppies, not koi carp.

The other tip feature is a new skid that has no seams in the wear areas. The broad tips of this design warrant such a protector, and the Predator's skid is an important improvement over the TRX's which was a part of the fairing.

Vortex Generators

Alright, now we'll look at the feature you've all been waiting for: the vortex generators. Many pilots have expressed wonder at these snazzy little doodads. Are they for real? Do they work? Are they the technology of the future? The short answers are: yes, yes and I think so. The complete answer demands that we understand some principles of how the air massages our wings.

As air flows over the top of a wing it is slowed near the wing surface due to friction (viscous drag for you tech types). As the flow progresses toward the rear of the wing, the slowed surface layer gets thicker. The higher the angle of attack, the more pronounced this process. In fact, at some high angle of attack the air near the surface *reverses* its flow direction, the overall flow detaches from the wing and a stall occurs. We all know the consequences of a stall, and they range from bad (we are limited in how slow we can circle in a thermal) to worse (we lose control in a spin or dive).

The role of vortex generators is to help delay the onset of stall by "energizing" the sluggish layer next to the wing surface. They

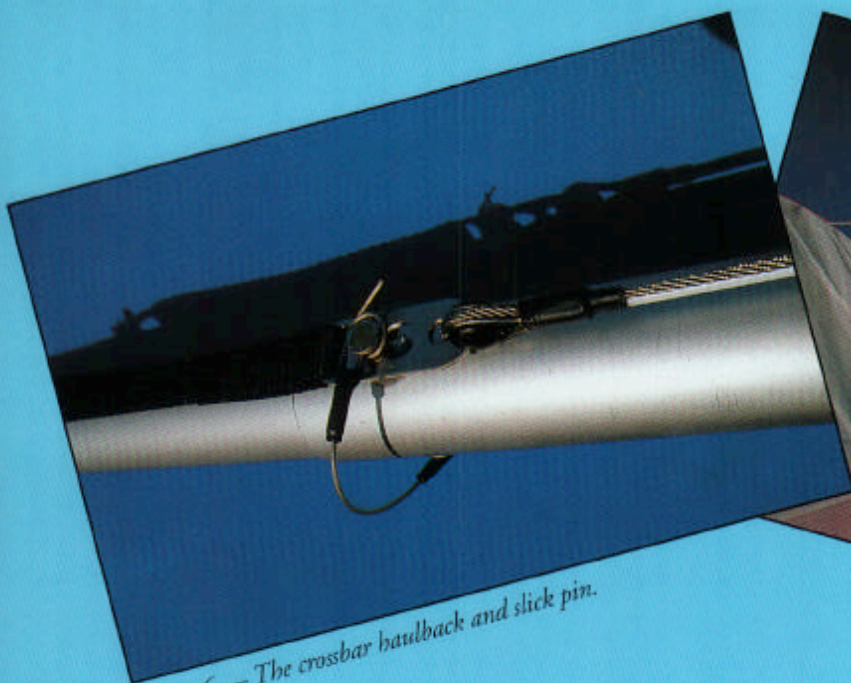


Photo 6 — The crossbar haulback and slick pin.



Photo 7 — Here the kingpost is being pulled up by the front cable.

do this by creating mini-swirls — turbulence or vortices if you will. These vortices mix the faster-flowing air further away from the wing with the slower surface flow and thus help prevent the reverse flow that initiates a stall. Of course, vortex generators cannot delay a stall forever, but they do allow the area of the wing they influence to go to a higher angle of attack than normal before onset of a stall.

Vortex generators are not a new idea in aviation; they are used on plenty of high-wing-loading airplanes. But they are more or less new to hang gliding. (Other, less effective generators have been tried, and the “trip strips” at the leading edge of faired downtubes work on the same principle.) The Predator vortex generators come in threes. One is placed about 2-1/2 feet from the tip and the next two continue inboard about a foot apart. They are made from a piece of folded aluminum that creates two angled tabs about 1/2 inch high (Photo 4). They are held on with a sewn sleeve and can only be removed if the leading edge is removed.

The vortex generators should *not* be removed, for they serve a very definite purpose. Due to the reduced washout of the

Predator, the wing will spin readily without the vortex generators. This means the inside wing in a turn is stalling extensively. With the generators applied, you *cannot* spin the glider in loose VG setting (I tried). So the generators do work on the Predator and they allow it to get away with lower twist, which has its own rewards as we discuss below.

Will we see some form of generators on other designs? I believe so, for right now every hang glider wing could benefit from a delayed stall on the inside wing in a turn. Such a delay would allow the glider to slow more in a thermal and thus get a better climb rate.

The Predator vortex generators are located on the leading edge, partially to prevent wear during storage. I don't think wear will be a problem as long as gliders aren't stacked, and Blue Sky intends to have a pad in the cover bag to specifically address this question.

Lower Surface Control

The next most interesting Predator innovation is the interior lower-surface control system. This system consists of a series of laced lines that pull up the lip of the lower surface Mylar when the VG is tightened (see Photo 5). The purpose of this system is to diminish drag by better fairing in the leading edge in the tighter VG settings. There also may be some effective reduction of the airfoil thickness since the lines are routed from the airfoil high point to the rear of the leading edge. (Note: The German Thalhoffer glider has a similar system intended to camber up the lower surface for better performance at lower speeds).

These lines work automatically since they are connected from side to side. When the nose angle widens as the VG is pulled, the lines become tighter and perform their job. You can watch them work inside the sail while a



Photo 8 — The Predator fittings are clean, simple, functional and strong.

friend pulls the VG rope. There is little concern about wear on the lines since they experience light tension, and even if they break, both sides will equalize.

Setup/Breakdown

We include setup and breakdown of the Predator in this "innovations" section because the system is completely different from the TRX, and the kingpost system is unique in the industry. Setup of the Predator begins nicely with a pip pin in the control bar corner (a bolt is optional, as is a folding basetube). Then the process is standard: turn the glider upright, spread the wings, stuff battens. Once the battens are in you pull the haulback at the keel to pop open the wings, then fit the keyhole tang over a stud and insert an ingenious little AN safety pin (Photo 6). This pin has a straight leg with a loop, so all you have to do is push it in and it snaps securely over the stud. To remove it you simply lift the loop leg and it slides out easily. I'd like to meet the clever AN elf who designed this elegant device.

I do know who designed the clever kingpost — John Heiney. The Predator's kingpost erects automatically when you pull on the haulback, for the nose cable routes through a pulley and back to the haulback (Photo 7). There is no need to hook up reflex bridles on the Predator since they remain on the kingpost.

The only other setup item we must note is the safety cable inside the sail that must be placed on a stud and secured with another of those slick AN pins. The procedure is simple because the Predator's lower surface has three well-designed zippers that allow you easy access to all the inside plumbing.

Other Predator Features

To help distinguish the Predator from the TRX and other gliders, we'll provide a list of the more notable features. The VG system includes a looser and effectively tighter setting than available on the TRX. This aids both handling (loose) and high-speed performance (tight). The VG rope itself has a full pull of 42 inches and is easy to haul since all pulleys are blessed with ball bearings. The jam cleat itself is the stainless steel sailboat type that should never wear out.

An item I really like is the neoprene bootie that covers the kingpost hole as well as the hang straps for an airtight fit. I used to hand-make these for my gliders, and now someone has finally provided them for the public.

In the same sense, I really like the hang strap system inherited from the TRX. This system consists of webbing and a spreader bar from the kingpost, then another loop over the spreader bar. Such a setup allows a very easy hang height change. The Predator comes stock with the official 1.2-meter (47.2-inch) distance between hang and basetube. (Although we have been promoting this standard for several years some harness manufacturers are still not up to speed.)

All the fittings on the Predator are CNC machined 6061-T6 aluminum (Photo 8). They are completely different from those on the TRX. They should prove to be a bit more rugged and are certainly easy to access when changing cables, downtubes, etc. The glider I had was equipped with aluminum downtubes and kingpost, but graphite in these three tubes reduces the glider's weight by almost three pounds.

Also available as an option is a towing ring (for truck towing) that fits over the keel at the nose. This is the only such system on a production glider. Along with this system you get an extra zipper slider so the lower-surface zipper will open from the nose as well as the rear. One thing I like about the Predator is its easy CG adjustment which consists of a series of holes in the keel. You simply move a bolt forward and back for a total 2-1/2 inches of adjustment.

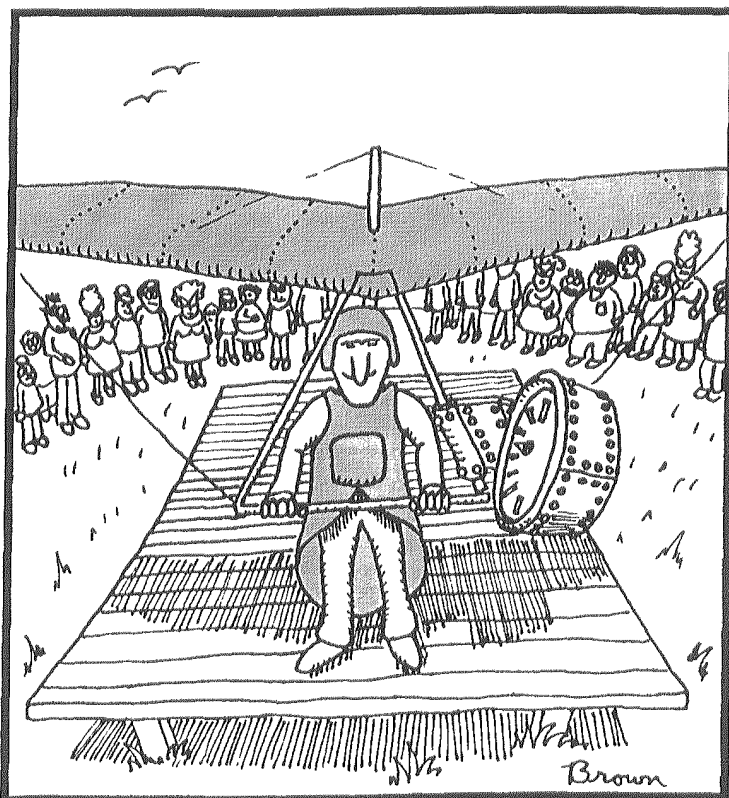
PREDATOR PERFORMANCE

When a new glider comes out the first thing everyone wants to know, naturally enough, is how it performs. I will do my best to inform you, but please note: Because of weather factors and time constraints, I could only get five flights and 6-1/2 hours on the glider. I never did get a chance to compare it with my known measuring sticks in meaty thermals. Also, with my winter weight and clothing my wing loading was 1.8 lbs./sq. ft. on the 142 Predator, whereas normally I fly at around 1.67 lbs./sq. ft.

Handling The Predator

Anyone coming from a TRX to a Predator will feel right at home with the turn technique. The Predator handles more easily than the TRX and coordinates the same (I had two flights on a TRX just before the Predator arrived). In looser VG settings the handling is quite pleasant, and these gliders respond to the "punch turn" trick better than any I know. To perform this trick, any time a wing gets sticky or doesn't respond immediately to roll input, you apply a quick pitch out and back on the bar and you have an instant turn. Some pilots use this technique with every turn (be warned that it does not work with all glider designs).

For those not familiar with TRX handling, let us point out that the glider has a wide span and a stiff airframe, so the glider readily notices a waft of errant air under one wing, but the light airframe and flexible sail allow you to maintain an even keel as easily as with other gliders in its performance class. Because the Predator has its tips held down more firmly, I feel it does not off-load a wayward gust quite like the TRX, but it still responds so quickly that handling the glider in turbulence is no problem. A TRX pilot should feel right at home turning the Predator. A pilot new to the general



Trent was proud of his large vario.

design should be comfortable in short order.

The pitch trim on the Predator is a departure from most other gliders. Usually, when you pull the VG on tight, the trim slows a bit because of the weight of the crossbars moving rearward (even though some wing twist is removed). With the Predator, however, pulling on the VG speeds the trim up noticeably, which is what we would expect if the outboard area is truly flying better. With full VG the bar wants to settle near your upper chest, and bar pressures at higher speeds get very light. As a result, you have to push out to fly at minimum sink, but can perform furious dives with little tiring bar pressure. Even though the bar force is very light in the full VG mode, it will still return to trim if you let go of it.

Takeoff and Landing

The Predator launched very easily, even with my 1.8 wing loading and clumsy boots in snow. The glider is fairly light (67 lbs., which is up from the TRX due to the aluminum downtubes and kingpost as well as the additional features) and perfectly balanced. Since the VG loosens more than that of the TRX, the side cables are slacker on takeoff, although a small amount of VG pull is reasonable in non-turbulent launches. I

self-launched the Predator in variable conditions a couple of times and had no problems.

Landing is straightforward (figuratively) even if you aren't going straight forward (literally). I found this out when I tried a slight turn in ground effect to check its response. I didn't have the wings exactly level, yet the glider was forgiving enough that there were no repercussions (figuratively or literally). The glider settled gently and that settled that.

You will find that the Predator lands easily with a broad flare window. I did find it to have a strong pitch trim with the VG off which was noticeable the first time I stood up for landing (I had to pull in to keep my speed up). But this was no problem once I was prepared. The factory suggests landing with some VG on in smooth conditions, but I did not find this necessary and only tried it once.

Sink Rate

As near as I can determine, the sink rate of the Predator is at least as good as the competition with a similar wing loading. In tests in Salt Lake City it has been reported to me by a third party (not affiliated with Blue Sky) that the Predator readily tops the stack in the evening boatoffs.

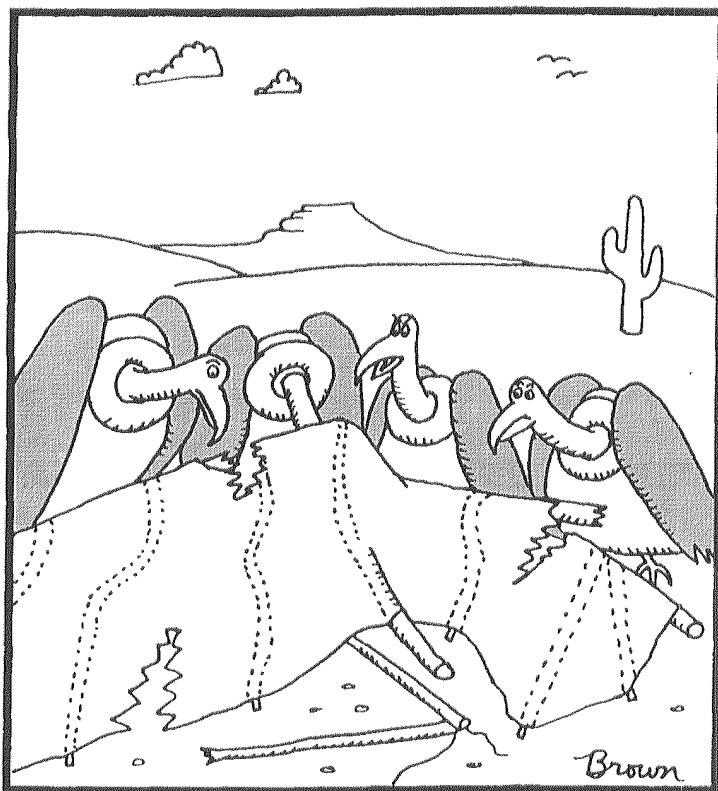
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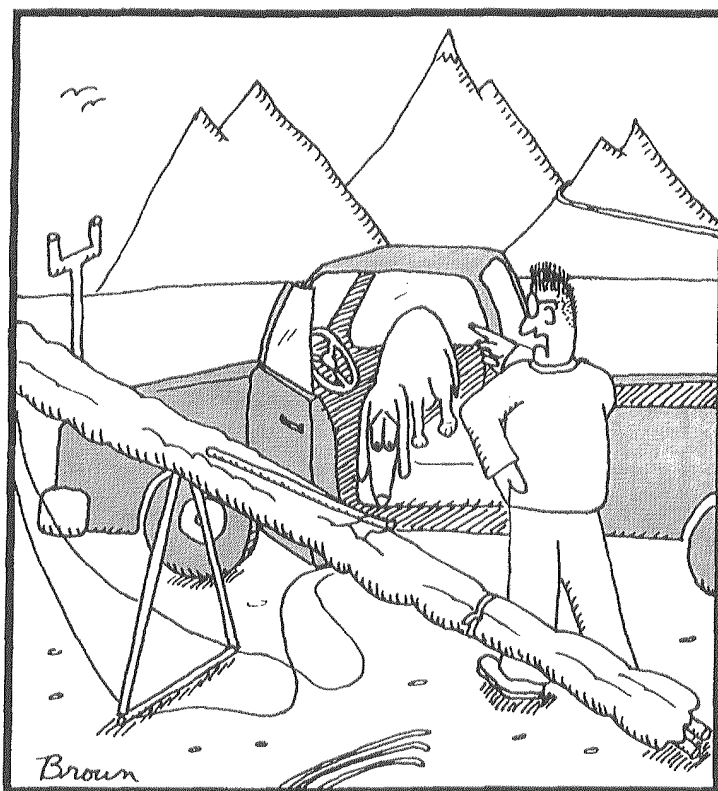
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"Damn! Another pod! Am I getting lazy or do you guys miss cocoons too?"



"You forgot the coverbag again?! BAD DOG! BAD DOG!"

As mentioned earlier, I did not get a chance to truly compare the broad range of its thermaling capabilities. I did work light thermals with my wife Claire a couple of times and found her 1.5 lbs./sq. ft. wing loading and expert skills hard to beat, but, naturally, a person my size would be flying the larger model (see below) in most cases. My conclusion is that the Predator will climb at least as well as the TRX, and that is well indeed, as Tony Barton, Dave Sharp and Butch Peachy proved when they were team pilots.

Speed and Glide

Testing the maximum L/D of a glider is extremely difficult short of performing multiple flights in dead calm air from a relatively low hill or off tow. I didn't have the opportunity to perform such a test, but with its reduced washout I expect the Predator will outglide most gliders.

Something I did test was the Predator's glide at speed. I did this by doing runs at various speeds while flying next to other cooperating pilots. I found I could noticeably walk away from the others. My wing loading notwithstanding, I now believe the Predator is the fastest thing in the sky. I have flown all the fast gliders except the four kingpostless gliders in Europe. The Predator outstrips anything I have flown, and I doubt a glider without a kingpost will be showing its tail feathers to the Predator.

I attribute this top speed performance to the Predator's stiff leading edge (at high speeds a more flexible tube bows back and

"You'll find the folks at Blue Sky have spared no effort to make the Predator as sleek and neat as possible."

bags out the sail), washout control, interior lower surface control and smooth lower surface at the tips. High aspect ratio gliders aren't known for their top end, but the Predator has managed to beat the odds with a few aces up its sleeve.

On one flight the wind picked up to over 20 mph. I found I could easily stay above all the other gliders. After I landed I found out why. At times, they had to fly with their control bars almost at their waists, while I was barely pulled in. With a Predator will you be caught short in a penetration struggle? Highly unlikely. Will you be late to a thermal gaggle? Quite doubtful. Will you be at the tail end of a dive to goal? Probably never.

FINAL DETAILS

The Predator 142 is in production, and by the time you read this will be certified. A larger size — somewhere between 155 and 160 square feet — is being developed as you sleep and should be ready soon. This larger size should have all the fine characteristics of

the 142 and be very easy to fly, if we can use the TRX 160 for comparison.

As with all gliders we urge you to try the Predator before you buy it, if at all possible. The factory can tell you where the nearest demo is available. While you're admiring this new bird, take time to notice the fine workmanship and attention to detail. You'll find the folks at Blue Sky have spared no effort to make the Predator as sleek and neat as possible. Now go set the sky ablaze with a flight, and be sure to keep an eye out for your natural prey: other gliders.

For more information, contact:

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PREDATOR 142 SPECIFICATIONS

Area	142 sq. ft.
Span	34 ft.
Aspect ratio	8/1
Airframe	Carbon fiber
No. of battens per side	16 total (10 upper, 6 lower)
Glider weight	67 lbs. 64 lbs. (carbon uprights and kingpost)
Pilot weight	140 to 220 lbs.
Pilot skill	Advanced
Price	\$4,900



Thermals - Not elusive anymore -

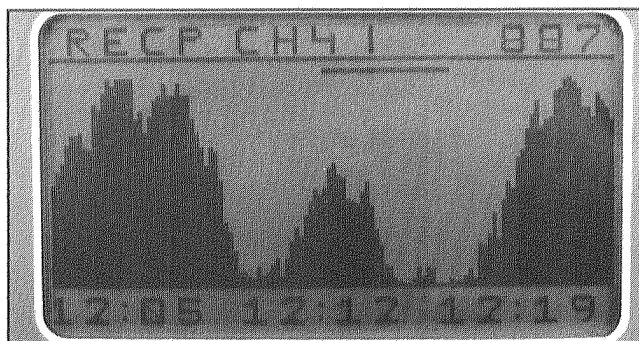


Photo above shows LCD screen displaying three thermals in good thermal conditions. Thermal in centre of display at 12:12 local time could not develop fully because of cloud shadow over the area (indicated by horizontal line). Current thermal activity level (1-10) is shown at right hand side of screen. The three digits in top right corner indicate last three update values announced by THERMAL VOX eight...eight...seven. If you have internet access an information page is located at <http://www.interworld.com.au/~rbwa/>

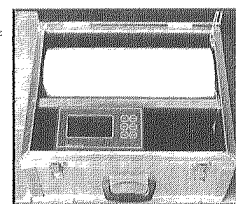
The Thermal Profiler is available from Fastwind PTY/LTD W.AUSTRALIA

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Thermal Profiler

- * Displays thermal activity on LCD screen (updated every 10 sec)
- * THERMAL VOX - automatically announces last 30 sec of thermal activity. Connects to Mic input of any two-way radio.
- * Yes - you can time your take-off exactly to launch directly into thermals.
- * Printer output - lets you print out the days "thermal signature". Clearly shows when thermals start in the morning and develop during the day. Important for cross-country flights to maximize air time and distance.



Supplied in sturdy aluminium instrument case for travel and storage.