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2008 Miniplane Top 80 Weight
Shift (WS)

Flown 05/27/2008, Reviewed 05/31/2008, Photos by Jeff Goin, Tim
Kaiser |

original article on :

<http://www.footflyer.com/Equipment/Paramotors/miniplane-ws/index.htm>

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2008 June 4 Added new harness diagram and flight verbiage after more testing.

Miniplane has been building PPG engines for a long time, since maybe 1996. They make both the Top 80 engine and the Miniplane paramotor that, not surprisingly, only comes with that engine. Owner Diego Cecchetto has made his niche in the lightweight arena. The motor is used on a number of other frames and is popular in other countries outside the U.S, especially for competition pilots where thriftiness is well rewarded. There have been numerous improvements to tweak both thrust and weight since it was last used extensively on the Sky Cruiser from 2000 to 2003.

The motor is good but that's not what intrigued me, it's the harness and frame—the implementation of a hard point low hook-in harness with weight shift that that I really like. Miniplane calls it their ABM system.

It's more of a mid-point hook-in, really, but has the good weight shift of the low hook-in models.

During Britton Shaw's "Endless Foot Drag" in May, 2008 I got a chance to fly Miniplane's new creation. There was one at the April 2007 convention but, for whatever reason, I didn't have time to fly it. I'll admit to thinking the weight shift would be no different than others and that it was probably just an afterthought—a bow to European preferences. I didn't even realize it was a low hook-in, hard point attachment; rather I thought it was just like the weight shift on my Sky Cruisers and Blackhawk. How wrong I was.

I've flown nearly every hard-point low-attachment machine out there and have always objected to the fore/aft movement endemic of the species, especially with thrust changes. Full power tilts you forward, powering off lets you tilt back. I did an experiment with one such machine and, by bringing my feet up, I would angle way back. And that was with the attachment as far aft as it allowed (setting for the lightest weight pilot). The Miniplane had none of that behavior.

As an aside, while testing a machine whose owner called it unflyable, I

came up with a cure for most of the objectionable behavior and enjoyed flying it afterwards. Hopefully I'll get an article on that up in

Educational, Chapter 12. It was during the Arizona Flying Circus where I was given a low-attachment machine to use with the admonition "If you can make it flyable, it's yours for the weekend." My solution, a four inch rope worked splendidly..

The Miniplane WS manages to almost completely eliminate fore/aft tilting, even during power changes from idle to full. It maintains the best benefits of low hook-in including lower hand position and weight shift. That is, to me, huge and when combined with other desirable traits, led me to purchase the machine for my own use.

Weight A well-balanced 46 pounds. You can stand around with this thing on your back for a long, long time. Leaning over slightly removes it's pull back.

On June 1, 2008 I ran the motor out of gas, made sure there was nothing in the pouches and weighed it on my postal shipping scale. For verification I weight it on a Mustad digital scale and it came out 45.6 pounds. This is the Empty Weight since there may be the minutest amount of fuel in the bottom of the tank although I can't see any (a credit to the pickup system and skinny tank bottom). Even so it wouldn't be more than a couple ounces.

Harness & Suspension (-): Very comfortable on the ground and in flight. This is where the machine shines. Hand position is low like on most low attachments brands but not quite as low. In fact, it's perfect!

A few vestigial parts attest to it's straight-arm origins. The frame-mounted distance bar tubes are still there. Of course they add necessary strength but a simple support would shave a few ounces. Also, the over-shoulder harness straps are flight worthy as if they'd be handling flight loads. But on this arrangement they're just ground handling straps and could be scaled down to reflect that use, saving maybe a half-pound. Plus they're more difficult to adjust than the original ground handling straps.

The original Miniplane harness is probably the most copied style in all of paramotoring, at least in the U.S.—kind of like PAP seems to be in Europe. Hopefully the lessons of this new method of low-attachment will be incorporated and improved on by others,

especially since Miniplane can't make enough frames to go around.

The harness achieves its nicely balanced higher carabiner pivot mostly via the special S-shaped bar. But another subtle help is how the carabiners attach to the bar (2nd harness picture above). That triangular loop of strap becomes rigid in flight. I watched it. So the carabiner actually pivots an inch above the arm, further raising the pivot point without needing to raise the S-arms. This might not have been intentional, but it sure does work.

The pivot point is very near or just above the thrust line. You can move the carabiner attachment fore/aft by loosening a rubber-lined collar on the swing arm then moving the collar fore/aft and retightening the bolt. I plan on trying it in more aft position.

Starting (-): Top 80 easy. I've now started it on my back several times. Reach back and pull upwards. High compression makes the pull force high and there's no flywheel effect but it's still only an 80 cc motor. There is also a handle with what appears to be a heat shield although the standard model doesn't have it so I don't really know what it is.

Ground Handling & Kiting (-): Easy. Feels like other low attachment systems but with only the weight of a Top 80, so it's quite manageable.

Launch (-): Reverses are a dream. Being light weight makes it easy to whip around for an almost no-wind reverse inflation.

Forwards launches are more difficult for two reasons. 1) you can't use power to help inflate. Using partial power (25% or so) from the start of a launch improves success, but doing so might flex netting into the prop. Having said that, I tested a partial power technique and it worked fine but the manufacturer recommends against it.

Secondly, and this one is easily curable, the fabric netting sleeve tends to slow down or snag the lines. See the picture above. Fortunately there is a simple cure. Slide about \$2 worth of slippery tubing (shown above) over the hoop's bottom half. Now lines should slide up easily. I'll do another test and try to get pictures.

Getting in can be done without sitting on the ground. I find it easier to stand up first then buckle the harness but that increases the chance for forgetting something. Otherwise I do like the series shows pictured just above.

Climbout (-): Comfortable without any fore/aft wobbling around. It was easy to get into the seat although I had to let go of one brake and push down on the seat back. Having tighter leg loops may have negated the need for that.

There is left/right movement in the weight shift arms but even that is muted because the frame and seat doesn't move as much as on many other low hook-in models. I don't mind the left/right movement anyway, it conveys wing motion that you translate into a feel for the air and handling. Of course even high hook-in machines with weight shift do this to varying extent.

Flight (-): A dream. Low hand positions and easy weight shift. This is the first low-attachment machine I've been able to really like and I like it a lot.

The motor has been easy to restart for the three times I've tried it. It takes a good overhead tug with both hands. The rope bottoms out so it's good to think of using a short, quick burst.

Throttle response is immediate and smooth. A popular myth is that clutch units take a long time to spin up. That's simply not true once the clutch is engaged. Even from idle the clutch engages darned fast. I've had no problem doing high precision maneuvering and foot drags. That's not just the Top 80, either. I've flown lots of clutched brands and the majority of them spin up fast provided they're tuned and running correctly. I fly a belted black devil machine about half the time so I'm not biased either way, just pointing out observations.

A minor complaint is that the risers are more in the way for taking pictures. On high hang point machines it's easier to position the

camera. I've noticed this on all low attachment machines and it's certainly easy enough to work around.

June 4, 2008

More testing and this time with a pilot who has never flown low hook-in systems although he has well over 100 flights on other systems. We both flew it, taking a bunch of pictures to better understand the harness. This time it was bumpy, probably a solid 3 on the bump scale with occasionally more—enough that Tim landed because of turbulence. There is a fair amount of left/right wobbliness which is part and parcel of any good weight shift system, but nothing fore/aft.

On

landing the system does leave you hanging back like most low attachment machines so you're more likely to fall back in a high wind landing if not prepared. Of course even high hook-in systems can have this behavior if set up to hang back. We didn't notice it "scooping" you up on launch, though, and in fact you have to push down on the back of the seatboard to fully get into the seat. Tim never got fully back in the seat but didn't report it to be uncomfortable.

As the picture just above left shows, he struggled a bit with the leaned back touchdown attitude. The landing was soft but brake position and angle was different. It's certainly something to get used to but, since you're moving forward on touchdown, is not a problem.

Weight Shift (-) Weight shift is awesome. It may not be quite as loose (free) as the Paps or pulley systems but its darned close. I'd call it at least 95% as effective. It was plenty for me. I love the pulley system on my Blackhawk but it adds a dash of complexity and weight.

Torque (-):

I was unable to detect any torque turn at all, even under full power on the Spice.

On a later flight, under a Swing Mistral, it did cause a slow left turn as you would expect. On my first flight (Spice), I did several cycles from idle to full power and got no detectable turn. Go figure. So obviously torque is well controlled.

Thrust (-): It's no slouch. Miniplane has eked out more oomph without over tasking the guts. Primarily this was done through a more efficient prop and a less draggy reduction drive. The 49 1/4 inch carbon fiber prop probably adds 2 - 5% over previous machines and the oil-filled reduction drive probably adds another 2 - 5%. That's a lot.

Consequently, this Top 80 is probably getting 5 to 8% more thrust than my older ones. I'd estimate the thrust at about 105 pounds.

My climb rate was over 300 feet per minute.

Endurance (-):

Forever. They put a large tank that I suspect would easily provide 3 hours of flying. I'd estimate the fuel burn at 0.7 gallons per hour for a 145 pound pilot (me) and a moderately efficient wing at 23 mph.

Vibration (-):

Minimal. Nothing out of the ordinary and maybe less than average. Padding was enough to keep vibration at bay.

Sound (-): Very quiet. Essentially as quiet as the Fresh Breeze putting out the same thrust. Most of the noise is from the Prop.

Safety (-):

Some sacrifice is made here owing to the desire for being low drag and light weight. The frame is minimalistic. It will still provide some protection in a vertical crash but less than most.

The netting will clearly not stop an open human hand from hitting the prop at full rated thrust. And the prop extends behind the cage hoop so it may be possible to get a hand around far enough to be whacked. I suspect you'd have to be really flailing for that to happen.

A positive design element is how the gas tank is curved near the bottom. That makes it unlikely to be struck by the prop in even a bad crash.

Like most harness systems that attach on a hard point there are is a carabiner back up strap. Same here. It appears that a broken S-arm would merely drop you into a weight shift turn of a few inches—completely manageable.

Construction (-):

Welds are sound and finish is good. A radial rods was loose and popped off during one of many test forward inflations while simulating a gust. The others are just the opposite and won't come off easily, even when I want to pull them off. I'm still working on that. Netting, motor, exhaust and everything else seems very well constructed.

The motor uses parts from an Italian Scooter

but is heavily modified and tweaked both for power and longevity. The reduction drive looks extremely well made. Being oil filled, it has lower drag. And that aluminum muffler reduces weight where it's needed most—aft. It will be interesting to see how it holds up. It appears well made. In fact, I took a magnet to the machine to ferret out anything ferrous and came up nearly empty. The frame, swing arms, radial arms and even the fan cage is aluminum. Someone over there is Mr. TIG.

Reparability (-): If anything breaks you'll need a welder or Italian parts. The radial arms going out to the hoop are proprietary, although fiberglass tape, aircraft safety wire and aluminum tube from the hardware store can work in a pinch. Don't ask me how I know that.

The netting uses a particularly fine material so as to reduce friction and decrease the flat area presented to the wind. Lots of thick netting provides good hand protection at an expense in drag. This minimizes drag. You can buy the netting also from other sources such as Marc Damon and possibly Paratoys.

Transport (-):
At first I was disappointed about this until I started to really look at it. First, the arms don't just slide out like the Sky Cruiser or Fly Products. You must remove a bolt. However, if you unscrew the swing-arm D retainer, which is done by hand, the arms fold all the way up.

Also, and this sealed my fate for purchase, the motor comes off with 4 bolts and a wire tie. That's it. You unbolt, take off the air box (loosen its screw on the carb) and you're ready to ship it. The throttle is attached only to the motor. Now the lightweight frame can be placed in a box with your wind and shipped as checked luggage. The carbon fiber puzzle prop fits in there, too.

This machine was bought to replace my traveling Snap 100 so being able to ship it around was important. The frame requires probably a 36" box to be sufficiently padded but the wing can be used for that, too.

Cost: As European imports goes, it's about average at just under \$5300. The Euro exchange rate hurts. Parts are relatively cheap and seem well stocked by Brad Weiss of Top80USA2.

Miniplane advertises the WS as their ABM model. It's not being marketed much but then the machine isn't marketed heavily anywhere, it seems. There are two importers,

Francesco DeSantis and Scott Johnson, but units will likely have to be custom ordered as they are not always carried in stock.

Overall: Obviously I'm thrilled with the Miniplane WS, given that I've purchased one. The Top 80 engine seems to have been improved and the harness is a pure joy to fly. I haven't been this excited by a paramotor design in some time. Don't get me wrong, I love my existing machines and there is a lot of good gear out there but this ability to have low hang points without the fore/aft wobble is good. Time will tell and, no doubt, I'll update this as I gain experience and knowledge.

Other comments on the machine from

First Backyard Flight.

This is the geometry between the frame and swing arm. The current design works quite well and is very light. My proposed arm is in light gray.

The reason for this style is to accommodate bigger motors. Pilot size doesn't matter near as much as motor size on this setup. A bigger motor would require the hang point be moved back at least an inch. If you reduce the arm's curve, that would be possible without reducing the room for your arm.

Of course any changes can have un-intended consequences. Lord knows we've seen that before. So they must be tested, tested and tested some more.

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Remember, If there's air there, it should be flown in!

