Radio Controlled

# Soaring Digest

September 2011 Vol. 28, No. 9

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**Front cover:** Brendon Beardsely, Junior F3J World Champion, holds up F3J Towman Dave Kalamen's NAN Models Experience Pro V-tail. The Experience Pro is available through Soaring USA <http://www.soaringusa.com>. Photo taken at 60 Acres South, Redmond Washington, by Will Beebe. Will's photo essay of the evening can be found starting on page 4 of this issue.
Nikon D700, ISO 100, 1/2000 sec., f4.5, 70mm



**Back cover:** Piloted by José Carrion, a seven meter span home made Nimbus 4 does a fly-by at La Muela, near Madrid, Spain. Photo by Pierre Rondel
Canon EOS 10D, ISO 400, 1/1000 sec., f11, 50mm

# R/C Soaring Digest

## September 2011

Volume 28 Numbers 9

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# In the Air

Art and science, a personal experience, two building projects, and a tool for improvement are in this issue. In addition, several new contributors are welcomed to the pages of *RCSD*.

This issue starts out with a photo essay by Will Beebe <http://www.wi11.me>. Will spent an evening at the Seattle Area Soaring Society flying field at 60 Acres South in Redmond Washington, photographed the flying activity there, and shot some fantastic images.

George R. Vale produced some fascinating results concerning a number of slope soaring airfoils utilizing XFLR5. We've included all of the generated polars along with the Excel spreadsheet that outlines the results.

On the way to LSF5 you must complete an eight hour slope flight. Ryan Woebkenberg tells readers about his experiences on the slope fulfilling this task.

David Jensen and Trevor Ignatosky write about two entirely different construction projects. David relates his building of a small sloper for intense winds, while Trevor talks about a club build which culminated with a contest.

Curtis Suter tops off this issue with links to audio files suitable for ALES tasks, thermal duration tasks and landing practice.

Enjoy!

Time to build another sailplane!

# An Early Evening at 60 Acres

A photo essay by Will Beebe, WillBeebe@gmail.com


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# THE ULTIMATE HIGH WIND SLOPER

David Jensen, david.jensen@comcast.net

*Although technically not a true lead sled, the Higgens California Sloper, above, is a great compact high wind sloper with a 48"wing span. This one has an AUW of 56 oz. and can carry 22 oz. of lead. She runs out of elevator when fully stuffed and at speed. The wing loading is from 24 to 30 oz/ft$^2$.*

Unfortunately there are a very few R/C pilots that will ever experience the energy that comes from a Lead Sled.

What is a Lead Sled you ask?

These are slope gliders designed to fly fast - very fast - in very high wind conditions. They typically have wing spans under 65 inches and that helps with launching.

The shorter wing span makes handling and throwing these ships into a turbulent rushing 50+ mph head wind much easier — anything larger makes it very difficult to hold, control and launch.

The only other requirement is the ability to hold lots of lead in the belly.

The PNF factor and wing loading makes building and flying these one of a kind slope ships the ultimate in high wind flying. The energy potential of lead when raised to great heights is phenomenal and the speeds these sleds can achieve are truly impressive to say the least. So what are the key ingredients to the Lead Sled flight performance?

Lead and wind. Lots of lead and lots of wind.

These sleds start with a wing loading of at least 25 oz/ft$^2$ un-ballasted, and can go as high as 40 or more oz/ft$^2$ when the belly is stuffed full of lead. With only 400 sq in± of wing surface area this is truly very heavy territory. When you compare this to most slopers that have wing loadings of 10 to 18 oz/ft$^2$, you see where the term “Lead Sled” comes from. You don’t even think about hucking one of these off the slope until the wind speed is 40 mph or better.

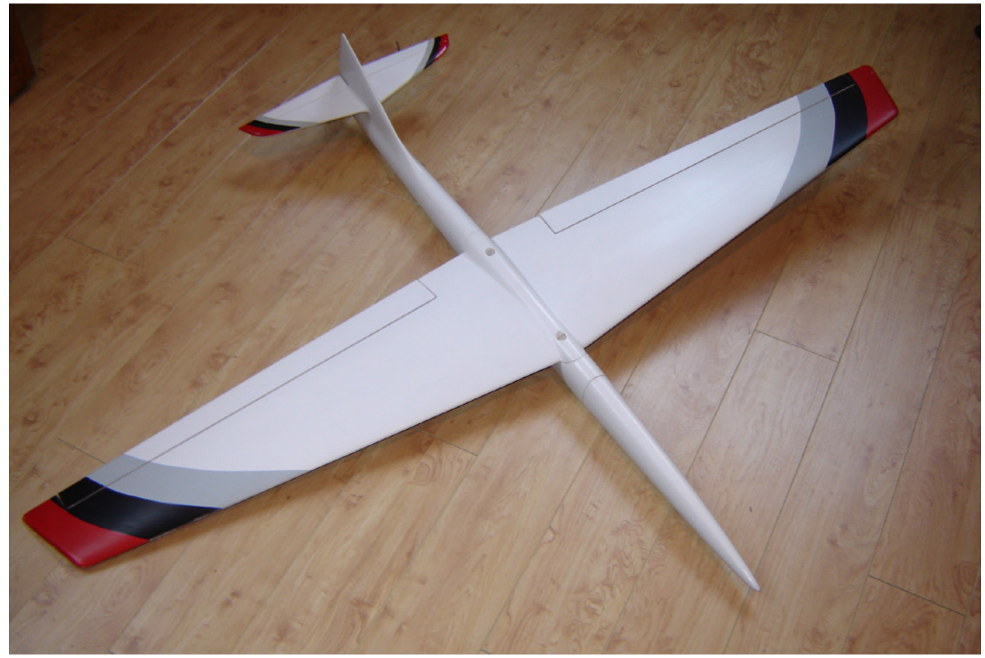
Lead Sleds require a slope that will allow them to reach their potential. This means the slope needs big lift and a very large flying area as the sled will cover a lot of ground while traveling nearly 100 mph (146 feet/second).

Add to this the need for a fairly large (semi-soft) landing area that supports 50+ mph winds without rotors or other nastiness and the slope requirements for successfully flying and landing a Lead Sled in 50+ mph winds is limited to just a few world class slopes.

Fortunate for us we experienced one of these 50 mph days at Eagle Butte in Washington State in early spring this year. We got the chance to fly a Higgens R1 Rodent fully ballasted with 28 oz. of lead in its skinny belly for a total weight of nearly 90 oz. and a wing loading of just over 35 oz/ft$^2$. We never thought we would fly this ship at that weight and anyone who ever picked up this ship at 90 oz. just could not believe it could ever fly. We flew it earlier in the day half ballasted at 75 oz. and it was great, but now it was time to commit to do it with all the lead.

Launching a 90 ounce ultra compact mass of PNF takes a good strong arm. The nose is a real asset as it counter balances the airframe. You have to throw it hard and down the hill to get it up to speed and flying.

*Todd shows off his R1 Rodent.*



*The R1 Rodent is the epitome of PNF. This 'ship also suffers from some elevator envy when fully ballasted due to the small elevators and short coupled design.*

The results were unbelievable. Speed runs of over 100 mph and the 750 foot up lines on half pipes were a site to see. We were able to pull huge loops into the wind with a radius of about 250 feet that took almost 15 seconds to complete.

There is nothing quite like managing this amount of free energy. Of course there is always the flip side of the coin and that comes when it's time to land the sled. With wing loadings above 35 the air speed needed to stay flying is a major deterrent to the landing process

The ailerons acting as spoilers help some but at this wing loading there is little you can do but attempt a controlled nose high impact in the general vicinity of the landing area.

Eagle Butte has a rounded top and the wind moves through the landing area largely undisturbed with few rotors so it makes for the perfect landing field for Lead Sleds. Landing the R1 on this occasion was fairly easy, but it almost overran the landing area with its momentum.

Most sleds are built brutally strong and can take many hard landings, but generally the more lead stuffed into the sled the harder the landing is going to be. It's just simple physics.

Flying in winds above 45 mph creates its own set of challenges. Not only are you concentrating on the flying but you are being pushed and buffeted with enough wind force to keep your body moving all the time. Goggles for eye protection are a must and you can forget about wearing a hat with any kind of brim on the front.

*An R3 Rodent I built in 2007.*

*The Rudy has PNF written all over it.*

You cannot just stand there and fly, you have to lean forward into the wind and you're constantly adjusting your footing to compensate for the buffeting. Add to all this the wind noise and now no one can hear anyone else, so warning anyone of a problem is useless.

With each 5 mph increase in wind speed the forces on your body seem to double. Try doing this with winds at 60+ mph when the temperature is only 42 degrees (wind chill makes is closer to -42 degrees) and you can see it takes a truly dedicated slope pilot to cope with the punishment Mother Nature can dish out. I lasted about 10 minutes in this environment wearing my full ski gear when I had to land and get back into the car and warm up. TOO MUCH FUN!

Ah, but Mother Nature also provides for the dedicated Lead Sled slope pilot with winds strong enough to lift lead high into the sky. If you like speed, well then these ships deliver everything Mother Nature can energize them with.

The higher the altitude the more stored energy, and after flying the R1 we still have not found the speed limit with the Rodents. They do not turn hard due to their short coupled design and small elevators and usually don't have rudders, so other than loops and rolls they are not very aerobatic, but they are not designed for that.

They will educate the pilot about speed, energy and momentum and the pilot must quickly learn how to deal with this much mass packed into a rocket ship and hopefully it won't be a crash course.

The pilot also needs to be thinking well ahead and plan on where he's going because the ship is going to be there very soon and if he doesn't have a plan for the next turn, which can take quite a

*The R3 Kit as it comes out of the box.*

*Three Higgens fuselages: the F-20, R1 and CA Sloper.*

while), can get you into trouble quickly. Don't ask me how I know.

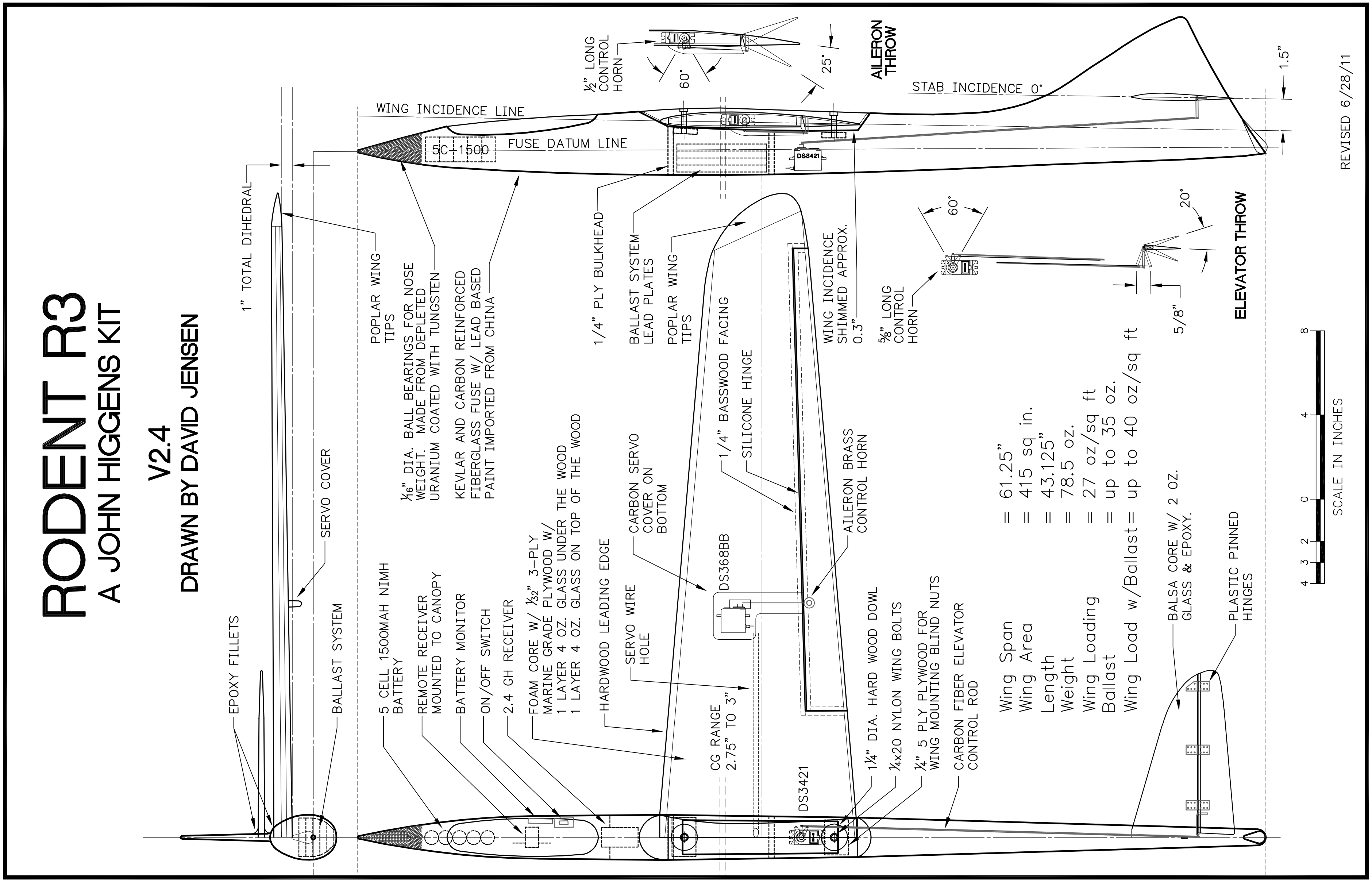
They also will test the pilot's ability to visibly see the ship after screaming across the ridge of the slope at very high speeds and pulling up into a vertical line and having to wait a full eight seconds for the sled to slow down and become a tiny speck in the sky as it makes the wingover turn at the top.

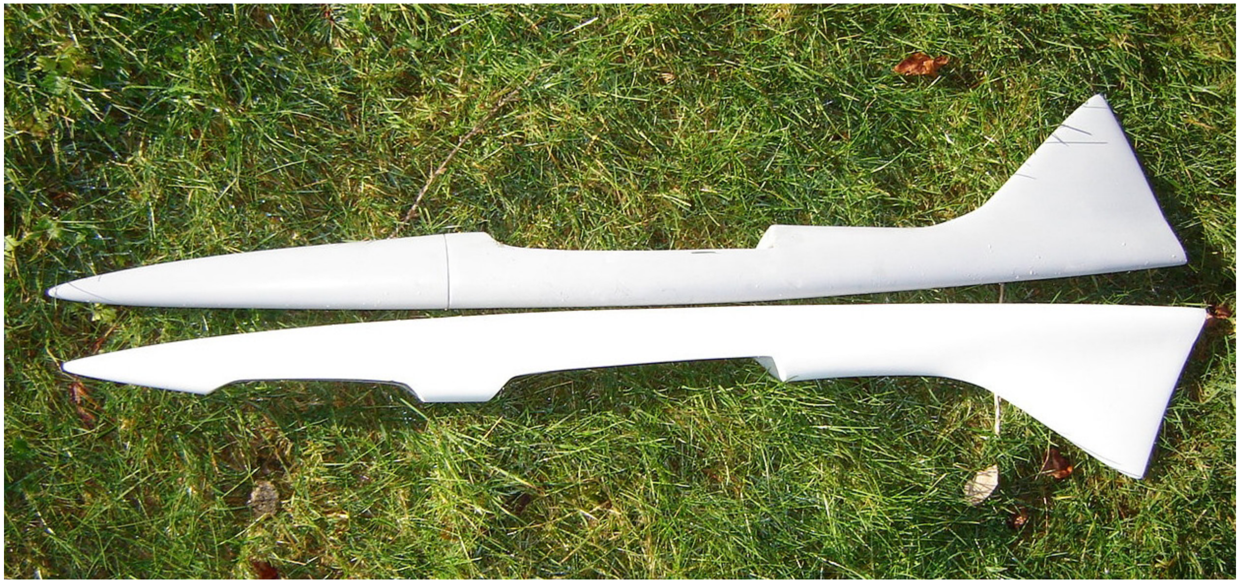
Think about this... The sled is traveling better than 100 mph coming out of a dive when you pump up into a vertical line and after four seconds going straight up, it's gone over 500' up and is still traveling well over 50 mph. Very few other slopers will do this. Tossing a fully ballasted SRTL or Opus into a raging 50+ mph wind requires a sturdy wallet.

After building three other lead sleds and realizing their flight potential, I wanted to build the ultimate speed racer for those special days on the slope that happens only once or twice each year.

The starting point was a John Higgens R3 Rodent kit. This will be an abbreviated build log as it would be impossible to list every detail of the build, but I will show the highlights and I must apologize for the poor picture quality. Some of the pictures are from the first R3 I built in 2007 but the techniques and results are the same.

Higgens kits are the original Lead Sleds and they are responsible for creating the PNF lifestyle. I started with making an accurate drawing of fuselage and wings using AutoCAD so I could design how I wanted the sled to look when completed. In my quest for speed I added modified wing tips that were inspired by the Opus and I'm confident that they will increase the speed of this sled considerably. At least they look cool.


RODENT R3
A JOHN HIGGENS KIT
V2.4
DRAWN BY DAVID JENSEN
1" TOTAL DIHEDRAL
SERVO COVER
EPOXY FILLETS
BALLAST SYSTEM
POPLAR WING TIPS
1/16" DIA. BALL BEARINGS FOR NOSE WEIGHT. MADE FROM DEPLETED URANIUM COATED WITH TUNGSTEN
KEVLAR AND CARBON REINFORCED FIBERGLASS FUSE W/ LEAD BASED PAINT IMPORTED FROM CHINA
5 CELL 1500MAH NIMH BATTERY
REMOTE RECEIVER MOUNTED TO CANOPY
BATTERY MONITOR
ON/OFF SWITCH
2.4 GH RECEIVER
FOAM CORE W/ 1/32" 3-PLY MARINE GRADE PLYWOOD W/ 1 LAYER 4 OZ. GLASS UNDER THE WOOD 1 LAYER 4 OZ. GLASS ON TOP OF THE WOOD
HARDWOOD LEADING EDGE
SERVO WIRE HOLE
CARBON SERVO COVER ON BOTTOM
CG RANGE 2.75" TO 3"
WING INCIDENCE LINE
FUSE DATUM LINE
5C-1500
1/4" PLY BULKHEAD
BALLAST SYSTEM LEAD PLATES
POPLAR WING TIPS
1/4" BASSWOOD FACING
SILICONE HINGE
DS368BB
AILERON BRASS CONTROL HORN
DS3421
1¼" DIA. HARD WOOD DOWL
¼x20 NYLON WING BOLTS
¼" 5 PLY PLYWOOD FOR WING MOUNTING BLIND NUTS
CARBON FIBER ELEVATOR CONTROL ROD
WING INCIDENCE SHIMMED APPROX. 0.3"
½" LONG CONTROL HORN
60°
25°
AILERON THROW
STAB INCIDENCE 0°
1.5"
REVISED 6/28/11
⅝" LONG CONTROL HORN
60°
20°
5/8"
ELEVATOR THROW
Wing Span = 61.25"
Wing Area = 415 sq in.
Length = 43.125"
Weight = 78.5 oz.
Wing Loading = 27 oz/sq ft
Ballast = up to 35 oz.
Wing Load w/Ballast = up to 40 oz/sq ft
BALSA CORE W/ 2 OZ. GLASS & EPOXY.
PLASTIC PINNED HINGES
4 3 2 0 4 8
SCALE IN INCHES



*The R1 (top) and R3 fuses side by side. Not much difference.*

*Here is the big difference, R3 (top).*

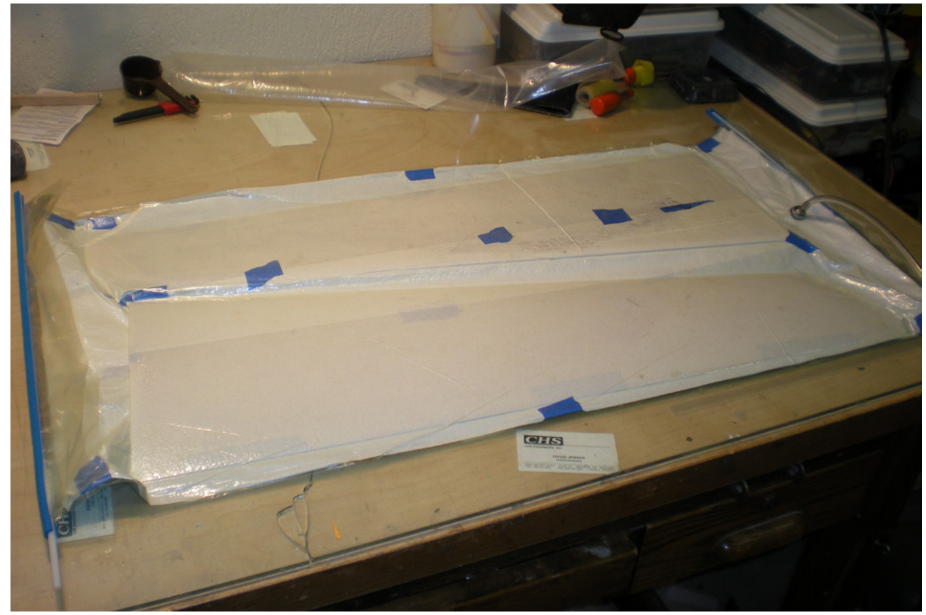
I also redesigned the shape of the stabilizer to more closely match the wing shape and enlarged the stab and elevators by nearly 20% each to compensate for the lack of elevator suffered by the previous Rodents.

The ailerons were tapered and reduced in overall size, as all three previous Higgens kits had way more aileron than needed. The R3 fuselage is much fatter than the earlier R1 and R2 Rodent variants and has a 60" wing (3" longer) that I extended to 61.25" with the wing tips. The R1 and R2 with their ultra thin fuses have limited space for lead.

The R3 fuselage on the other hand can handle lots-o-lead and I chose to make mine from 1/16" thick lead sheet. I folded it over and pounded it into a rectangular bar shape that fits into a cavity under the wing on the CG. I painted the bars with spray paint to make them less toxic. I made one 20 oz. bar, one 10 oz. bar and one 5 oz. bar. I can fit up to 35 oz. into the belly of the beast taking its total AUW to 113.5 oz. (7+ lbs). I could add another 4 to 5 oz. easily but there is no reason to go overboard quite yet.

This is one of the greatest aspects about building a Lead Sled. Weight is not an issue! You never have to worry about using light materials or trying to shed a gram here or there.

*The wings in the shucks being pressed and curing.*


*The top layer of glass being vacuum bagged.*

I know many builders who take great care to limit the amount of glues they use and select the lightest materials to lighten the load. With this type of build you actively add epoxy and lead to where ever you can. Most R3s could easily be built with an AUW in the low 60 oz. range but they will never fly well until they get over (way over) 80 oz. and into a minimum 40 mph wind, so it's pointless to build light. How often have you heard that in this hobby/sport?

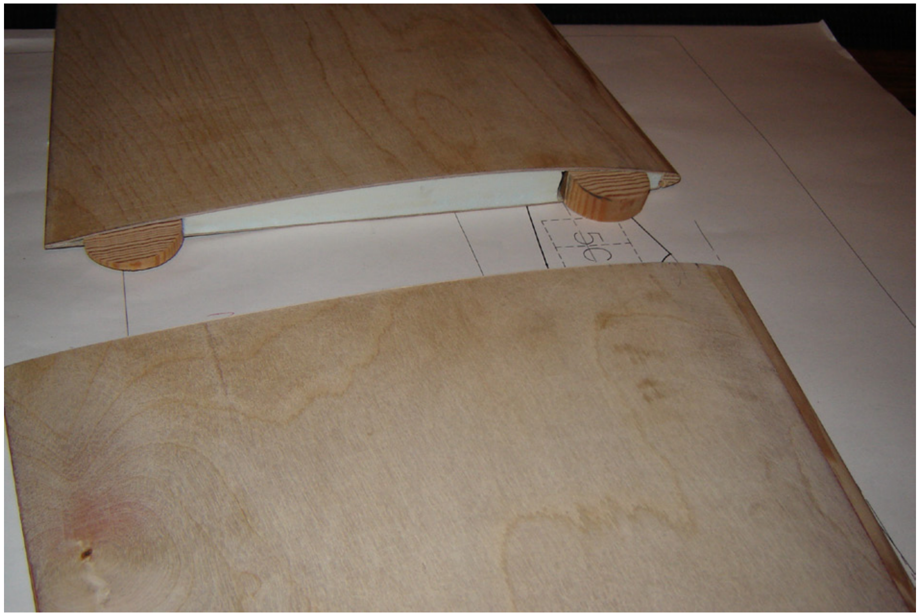
The wing construction is blue foam core and uses 1/64" 3-ply marine grade plywood with a layer of 4 oz. S Glass under the wood and another on top of the wood. I pressed the wood and under layer of glass in the shucks with weight using West System epoxy. The layer of glass on top of the wood was vacuum bagged after sanding the wood surfaces with a 24" sanding bar to make them near perfect. Bagging the wing with painted mylars is not worth the effort due to the wing fairing that is added after the wing is mounted.

I used poplar wood for the wing tips and a hard wood half dowel for the leading edge.

The hard wood (Oak) strips that come with the kit are too narrow and I wanted to extend the leading edge 1/16"+/- to make it sharper and increase the speed potential. Yes, I know it also increases the stall point, but we have the need for speed here.

I glued in 1¼" hard wood dowels that were beveled to match the wing thickness at the root of the wing that become the hard points for the wing bolts.

Next is cutting out the ailerons and facing both the aileron and the wing with bass wood. The wing skins were difficult



Above: *Hardwood dowels for hard points for wing bolts.*

*Right: The servos installed and the ailerons cut out.*

to cut and I had to use a cut off wheel on my rotary tool and still had a difficult time.

Next is joining the wing halves and glassing the center section and I added 1" of dihedral to the wing. I cut out the servo holes to the exact size of the servos and I potted the JR 368BB servos so that they lay flush with the bottom wing skin.

All I need now is to tack the servo to the skin with goop and it is held firmly in place and can be removed easily.

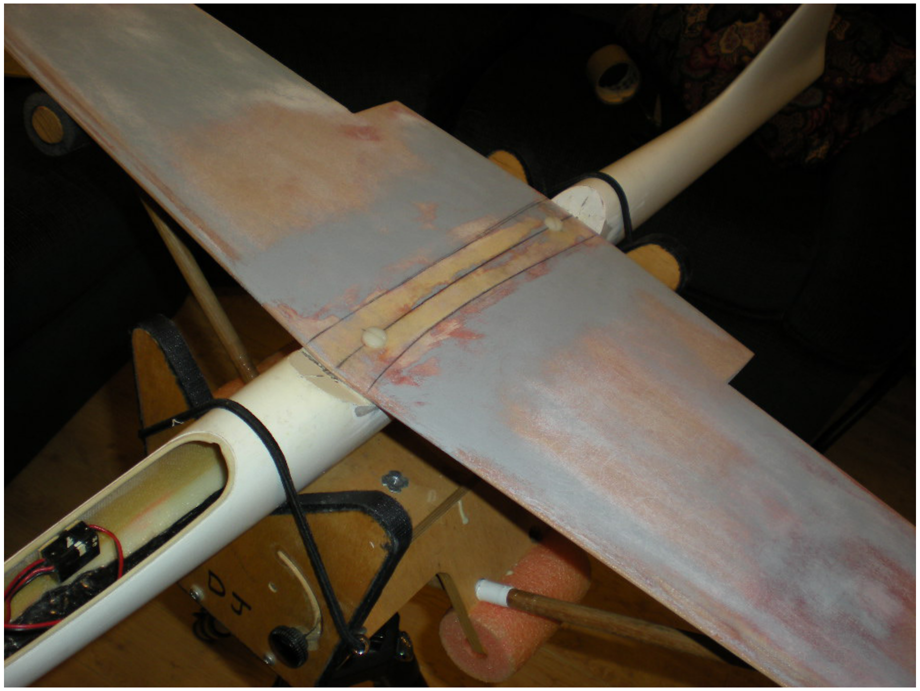
I used silicone hinges for the ailerons. They take some experience to get right but they work well and so far they have not failed on me. This type of hinge is very good for high speed applications and is less prone to flutter.

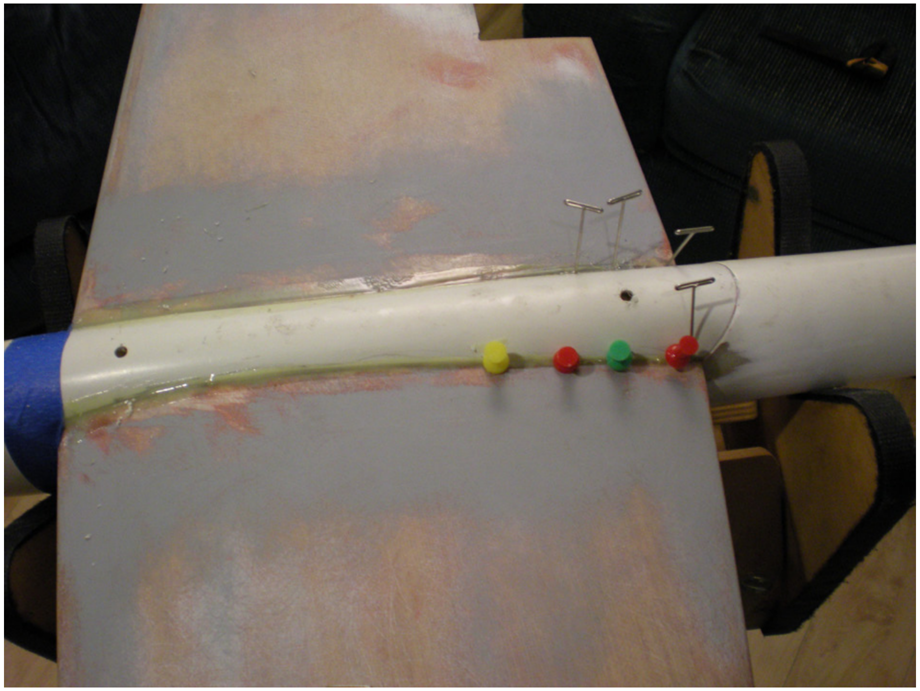
*Opposite page:*

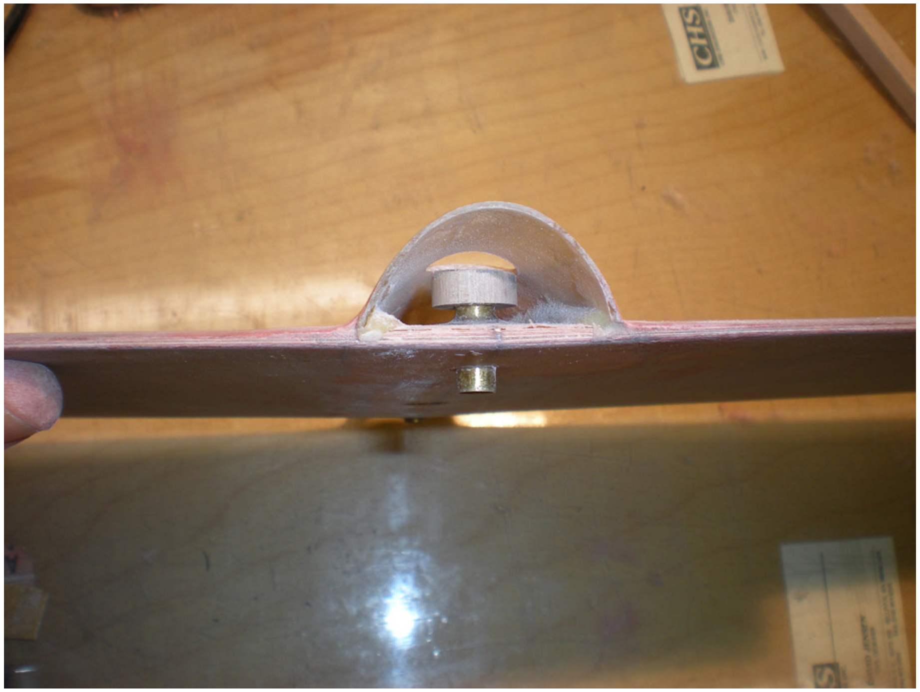
*Upper left: The wing bolted down for the first time and measuring for position.*

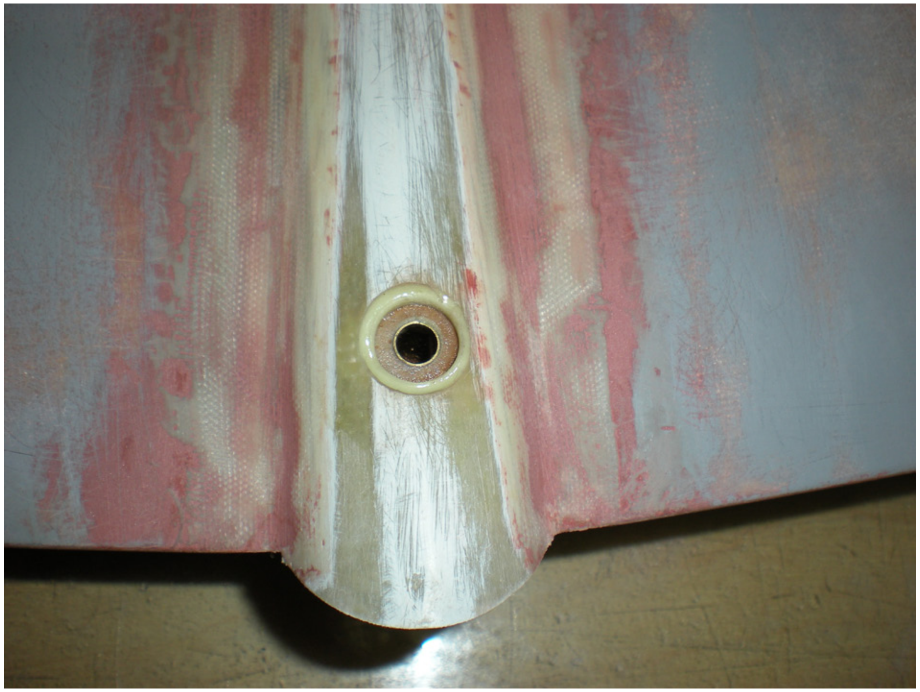
*Upper right: Tacking the wing faring into place.*

*Lower left and right: Here is the brass tube and wood donut for the wing bolts before and after filling the area with epoxy. I managed to stuff about 3.5 oz. of lead shot into these two cavities.*









*These photos show the new epoxy added to the fuselage to make a seat for the canopy.*

Mounting the wing takes time and good measuring tools to make sure the wing is 90 degrees to the fuselage and 90 degrees to the vertical fin.

For this design I modified the wing seat to adjust the fuselage angle relative to the wing. My measurements showed the fuselage would fly with a noticeable nose down attitude so I raised the back of the wing seat to compensate for this.

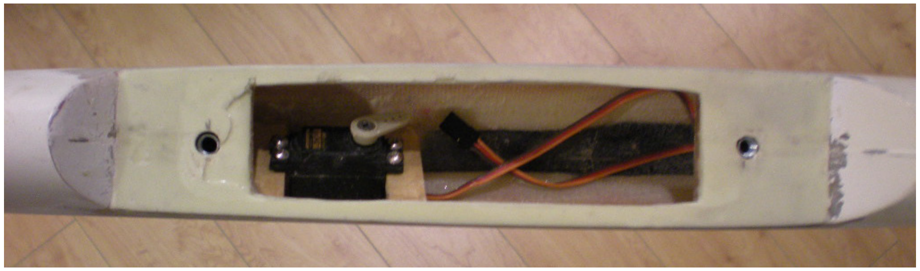
Drilling the holes through the wing hard points and into the plywood plates for the mounting bolts is stressful as you only get one chance to line it up and do it right. After installing the blind nuts I glued in the brass tubes that are the sleeves for the 1/4x20 nylon wing hold down bolts.

These tubes give me the wiggle room needed to get the bolts aligned perfectly with the wing and blind nuts mounted into the ¼" plywood plates in the fuse. I added a wood donut to the top of the brass tubes and filled the area under it with epoxy and this gives the nylon wing bolt something to sit on without pressing entirely on the brass tube.

The fit of the canopy and wing cowl needed a lot of work to make perfect.

The canopy did not have any kind of seat so I had to make one. I have developed a technique using 15 minute epoxy that makes this possible.

I use really thin clear plastic tape and mix the epoxy with milled glass fibers and micro balloons to get a thick mixture I call splooge. I place the thin tape on the canopy to keep the glue from sticking to it and I apply the splooge to the seat area after it starts to gel in the mixing pot, about five minutes, and gets into a paste form. It still sticks well at this point and after a few more minutes of spreading the mix I squish the canopy

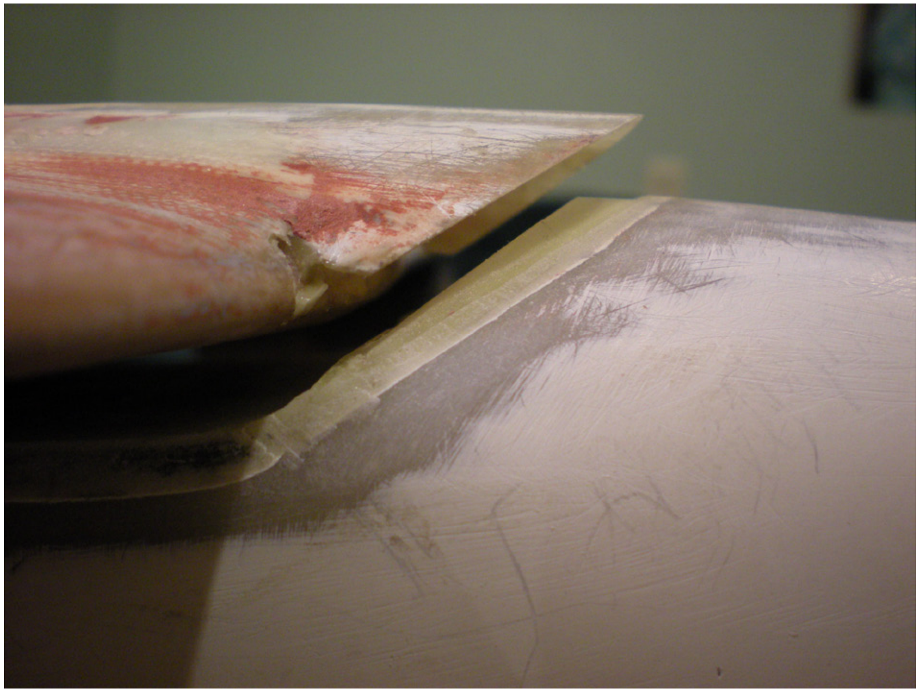


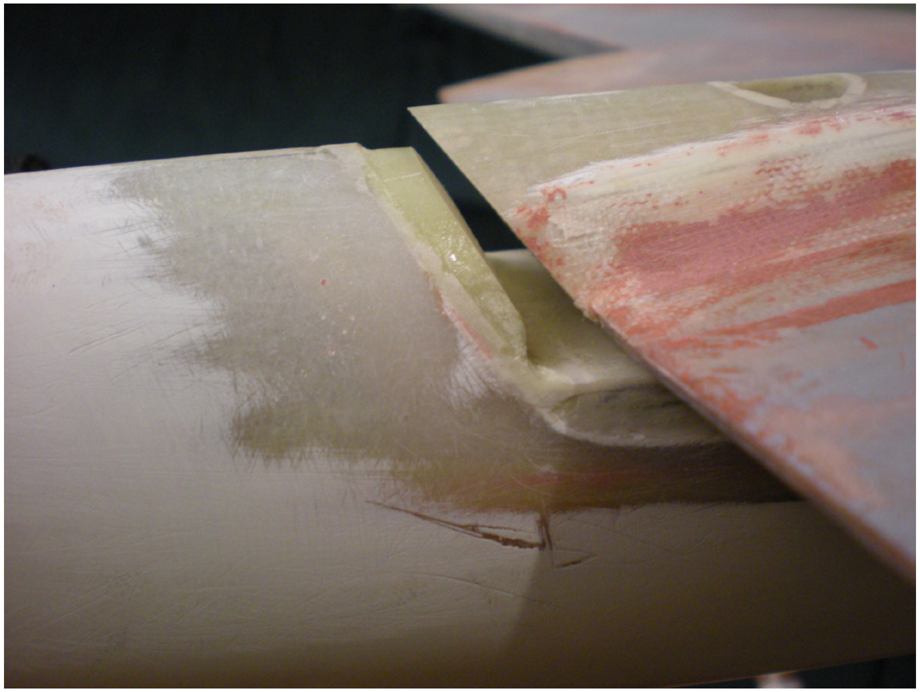
*Left: The wing seat filled in and shaped with the wing.*

*Above: The wing bolt blind nuts installed and the elevator servo.*

*Lower left: The front wing tab keys into the fuselage.*

*Lower right: The rear wing tab key.*





*Here is the stabilizer with the 2 oz. glass securing it in place.*

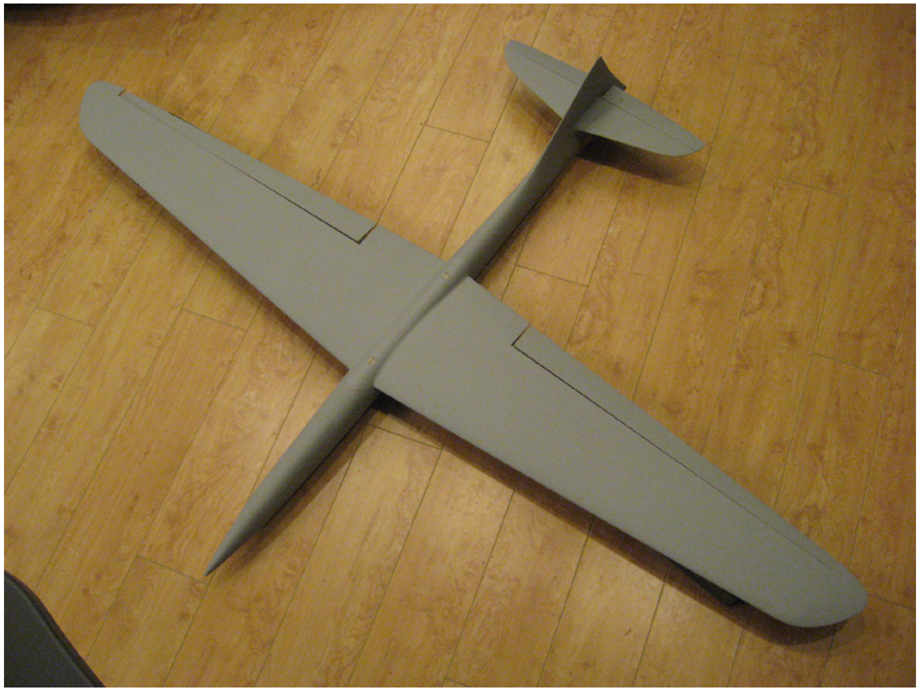
*Here the epoxy fillet is sanded to rough shape.*

down into place and wait for 15 minutes or so for the glue to solidify and then pop the canopy back off. The splooge is still pliable and moldable with your fingers and you can cut off the excess glue and then reseat the canopy and let the epoxy fully cure. It takes a few passes and a lot of sanding to complete the process but it works great.

I used this method for the wing seat as well. After getting the wing bolts in place I taped a layer of thin plastic tape on the wing so the epoxy will not stick to the wing and applied splooge to the wing seat area and mounted the wing and squeezed it down to the location I wanted and measured again and again and again. The excess splooge is cut off after the 15 to 20 minutes it takes to congeal. Now, with the brass tubes secured in the wing and the wing seat complete, the wing "clicks" into its position making it very easy to install the wing bolts.

The front and back of the wing saddle were also built up so the wing fairing front and back tabs interlock with the fuse. This helps hold the wing laterally in place and adds to the wing structure as it attaches to the fuse. This makes for a very strong attachment and will allow for some more of those controlled impacts.

Mounting the stabilizer also takes time and needs to be measured many times to insure it's done right. I set the stab at 0 degrees incidence to the wing. After tacking the stab in place I added some 2 oz. glass strips and lots of epoxy to secure it in place. I used epoxy mixed with micro balloons, about 40% by volume, to make the fillets and this easily sands into the shape I wanted.



*Can you see the seams for the access hatch or between the wing and the fuselage?*

*The silicone hinges are not installed yet.*

The elevators are hinged with plastic pinned hinges. I used a slightly oversized carbon rod for elevator control as it is unsupported from the servo to the bell crank.

Now we have an airframe and the painting process can start. Here is where I really abbreviate the build log. Sanding, filling, sanding, priming, sanding, priming, sanding, filling, sanding and priming and sanding once again to get a nice smooth pinhole free surface. Add another shot of primer and we have a newborn furless grey rat.

Designing a color scheme for this sled was made easy with AutoCAD. My take on this R3 is it's not really an airplane or a glider. It's a guided missile with wings and as such it has an access hatch, not a canopy, so there is no need to paint the hatch a different color.

The CA Sloper fuselage has some pleasing lines and even the R1 Rodent has pleasing lines, although they are rather pointed lines. The R3 fuselage does not have any pleasing lines and the fuselage shape is just a missile tube with a rodent tail. But this is what it takes to hold serious amounts of lead so I'll just have to live with it.

All the paint is rattle can enamel and I have a couple of shots of clear on top.

*Did I mention it is red?*


*Your typical blue striping on the bottom of the wing.*

The wing seat and the access hatch both got paint on the seating area and it lifted both of them by the thickness of the two coats of paint. It's not really visible but you can feel it when you rub your fingers over the seams.

So here is the final product - fresh vermin - ready to fly.

Unfortunately, the slope season is over here in the Pacific Northwest and I'll have to wait until this fall to get the right conditions to get her on the wing.

I'll report back after its maiden flight.

*Now for those of you that are wondering, what the heck is this PNF?*

*Like I said, it's a life style.*

*Really, I have the sweat shirt.*

POINTY NOSE FETISH

PNF

*Another sortie at Eagle Butte*

# MY LSF 8 HOUR SLOPE FLIGHT

Ryan Woebkenberg, rdwoebke@hotmail.com

*Ryan and his Paragon. Photo by David Woebkenberg*

My favorite part of the LSF program is that every participant has both a shared experience and a unique experience. Every Level 4 has flown a 2K goal and return cross country flight. But each L4's 2K was a unique experience.

I had a unique experience Sunday April 10, 2011 when I flew my Paragon for eight hours from the slope in Frankfort, Kentucky.

Really this story started in 2003 when I built my Paragon. The kit was a gift a few years earlier, back when I was flying almost exclusively hand launch at the time. It sat in a closet for several years. I'll always regret not building it sooner because it was a kind of revolution point for me in my RC soaring.

Flying it I won my first club contest, had my first one hour plus flight (for L4), flew my first cross country flights, and flew it to 2nd place in Nostalgia at the 2003 Nats, my first Nats trophy. That familiarity/experience was the genesis for why I chose to fly the Paragon for my 8 hour attempt. It wasn't necessarily the best at cutting through big winds, but I know it extremely well.

For some months I knew I wanted to do my eight hour slope flight as my first LSF5 task. Many pilots dread the idea of the eight hour slope flight but I have always looked forward to it.

I'm lucky in that there are three slopes that have produced eight hour LSF tasks within about a four hour drive of my home, but I also realized that Frankfort would be the ideal location for me due to it being the closest of the three suitable slopes and I knew I would have the excellent support of the LASS club in particular Gordy Stahl and Ed Wilson.

Preparation is half the work for the eight hour slope flight. The details of the power supply for the plane and transmitter are important. There are a number of solutions to this problem that work well. I chose to go with four alkaline C cells for the airborne power supply. I ended up using my trusty old 72MHz Multiplex Cockpit for the radio. I haven't yet re-programmed the Paragon with a newer radio and chose to use the old familiar setup for this task. I wired up alkaline AA cells into a transmitter pack that fit nicely within the Cockpit case. In my Cockpit the AA alkalines were good for at least 12 hours. Always a source of advice, Gordy had good info on how to securely and safely solder up the dry cells.

Next step of preparation is finding the proper day. I hadn't flown at the Frankfort slope prior to my right hour attempt so I relied upon the experts of the hill like Gordy and Tony Utley to guide me in the best wind direction and weather pattern.

Once I knew the optimal direction I used my favorite wind forecast tool <http://www.usairnet.com/cgi-bin/launch/code.cgi> to watch for a suitable day. I also kept in frequent contact with the LASS club to ensure I would have witnesses available. Finding a good site and having witnesses is critical.

Starting Wednesday April 6 I could tell the upcoming weekend was a possibility. I kept dialog open with the LASS club and had originally considered Saturday, but by Friday night it looked like the winds would not be strong enough. As it turns out that was right, the winds were light all day and not from a good direction. Frankfort slope likes southwest winds.

Sunday was looking favorable, although maybe on the high end of the wind speed the Paragon could handle.

Saturday I communicated with the LASS club that I would make the attempt the next day. That afternoon I soldered up my transmitter and receiver packs, did some flat land flights on the Paragon to make sure all was still in working order, and checked the plane over to make sure it would be ready for the next day.

My dad was onboard to travel along as a helper and he did a great job of packing drinks, snacks, chairs, and sunscreen for the day. I probably wouldn't have survived the experience as well as I did without his help.

Sunday at 5:30 CST was a Mass offered for my grandmother who passed away about a year earlier. Dad and I met at my place, went to the service, and then started off for Frankfort. I was so excited about the flight that I only slept about two hours the night before. I'm glad we went to the service; there were times during the day I definitely felt like I might have had a little help from above. My first flight over 20 minutes was from the farm my grandmother had lived on for over 70 years.

We arrived at the Frankfort slope about 8:15 CST to sunny skies but little wind. I had expected that from the forecast, but hoped it would be at least a five or so steady wind.

I put the Paragon together, calmed my nerves, applied sun block, and just to be safe performed a range test. Ed Wilson and Lee Atchison arrived at a little before 9 CST. Ed is a well-known Level 5 and Lee like me is a L4. Ed suggested the winds were starting to become favorable and urged me to get flying.

At a little after 9 CST I gave the Paragon a good firm throw and I was flying. Lift initially was pretty weak. I tip-toed up and down the hill at first. The wind was weak but mostly from the right direction. The hill is home to many hawks and the hawks helped me find the best spots for flying. Gordy arrived about 9:20 CST.

After that first hour the wind began to pick up. There was no problem now finding lift. The lift was everywhere. Now the problem was staying out in front of the hill. The Paragon isn't exactly known for its ability to penetrate winds.

By 10:30 the winds were strong and gusty. Above 20 mph for sure at times. It was all I could do to keep the Paragon from being blown back over the lip and into sudden doom.

I worked the Paragon all day long. It was constant work.

I had to keep trying to keep the nose down and out in front of the hill. Luckily every hour I got a break.

It was Ed that first noticed this. I anticipated that thermals would come through and stop the hill from working. That's a well-known long duration slope flying phenomenon. The hawks were a good warning of the upcoming thermals. When the thermals would come through I would be able to climb really high and sort of rest for 5-10 minutes. That was my work break. But I didn't dare take the plane far back behind the hill because it never would have made it home.

*Gordy Stahl, Ryan's father David (front), Dave Smith from the BSS (Lexington) club, and Ryan flying. Ed Wilson photo*

At least once I came dangerously close to landing in the trees and just barely cleared the slope face when I became a bit complacent and rode the lift only a few hundred feet behind the slope lift, even though I was at 800 feet half a minute before. Experiencing, learning to predict, and working the massive thermal cycles was the main flying lesson I took from the experience. Unexpectedly, the eight hour slope task has made me a better prepared thermal pilot.

Even though I was hard at work for eight hours the experience was very enjoyable. Any time you can fly the Paragon is a good time.

I spent most of the day lounging in a camping chair with a bottle of water and the Cockpit resting on my lap.

I had a great support system.

My dad kept me hydrated. Beef jerky is probably the ideal food for the eight hour. It is not overly messy, you can kind of bite chunks off it, it has plenty of protein and replenishes the salt you are sweating out. I made sure to drink at least half a bottle of water every hour.

I also tried to apply sunscreen every other hour.

Gordy and Ed kept my spirits up, kept me concentrated, and kept the conversation going.

Lee and others kept things from getting too boring by doing some DS circuits and ripping up the air.

Having the other planes in the air was beneficial. If I was struggling to work the lift I could use those planes to help evaluate if it was me losing concentration or the air.

If I got in trouble Ed would say a word and suddenly two or three planes would stop their DSing or aerobatics and be on the prowl to help me re-acquire the lift band. Some folks say that other planes flying while doing a long duration flight is a dangerous nuisance and it might add some degree of risk of midair, but I think that is a small concern compared to the benefit of having planes to gather information from.

A few unexpected things happened during the flight. One was that sweat and sunscreen on the forehead is not a good combo. The sunscreen sweating into my eyes made them burn badly. At least three times I had my dad get me a tissue to try to wipe my eyes to stop the burning. Luckily that seemed to happen when the plane was high.

*David Woebkenberg watches son Ryan during a relatively calm period. Photo by Ed Wilson*

After flying for half a day my thumb actually started to become sore from the spikey transmitter stick. The Cockpit has bigger spikes than most transmitters.

But the most unusual thing was about midway through the flight I reverted to flying mode 1. I started out flying mode 1 when I started self-teaching myself to fly in 1994. Even though I haven't flown that mode for over a decade I found myself flying the RE Paragon with both hands. I'm not sure if it was more comfortable to fly that way or what, but I found myself using the center slider that I have mixed to the elevator for "speed and float" as the elevator stick and the right stick as just the rudder. So that was a kind of weird classical conditioning experience.

The Paragon was a real trooper for this flight, but there were lots of times I didn't think it was going to hold up. I flew with extreme speed to try to keep away from the lip of the slope. Sometimes there would be turbulence and I would be flying fast and the wing looked like a wet noodle. It would kind of flap and flutter. It made some scary noises. But in the end it held together and that's all that matters. I have flown it several times since so I don't think I did any real structural damage to it. It sure looked scary at least a dozen times though.

The wind was very strong, really too strong for the Paragon. I would be flying it as fast as possible near what appeared to be VNE and it would be just crawling to try to make ground coverage and get into the better lift band and away from the hill.

I didn't start to feel nervous until near the end.

As the flight time went from four hours to five to six I started to get a bit nervous. Honestly, I'd gladly do an eight hour flight every weekend, it was that fun, but getting a full day away from family duties, with the witnesses isn't something that happens very often for me.

During this time Ed and Gordy probably sensed I was getting nervous and probably remembered feeling that themselves. They kept me focused.

Other friends showed up as well. AJ and Dave from Lexington. My rocket flying friend Patrick. And two guys from Wisconsin on their way south for a vacation brought out some slope toys.

All of them wished me encouragement and helped keep my spirits high. Once the final hour came the wind started to die down a little, which made flying a bit easier. But still gusts would come through and the wings would look like they were going to turn into confetti. And I would get scary low and close to the slope.

One hour became 30 minutes, and then 15, and then five, and then finally the final minute arrived.

About that time I realized I had never actually made a landing at the Brookville slope. I asked Ed to give me advice on how to land.

He suggested I fly perpendicular to the slope, and then turn in at a certain point to avoid the rotor, and carry enough of the energy through to end up near the lip of the slope.

I tried this several times but my early problem was I wasn't going deep enough and I ended up doing a kind of DS circuit.

Once again the Paragon made some scary noises as it gained energy from the speed getting back into the lift band. Finally I flew deep enough and kind of pushed through the rotor and flopped it down on the ground.

Official flight time was eight hours and six minutes. A lot of whooping and hollering commenced. Some photos were snapped, Ed and Lee signed my blue form, and my dad and I were back on the road for the journey home, relieved and content that the eight hour slope task had been successful.

I hope this recount of my experience has been useful. I encourage anyone with questions about the right hour task to post to a LSF flight performance tasks thread on rcgroups <http://www.rcgroups.com/forums/showthread.php?t=832596> and to give the program a try.

*Photo by David Woebkenberg*

# Selecting a Profile for General-purpose Slope Soaring Models Using XFLR5

© George R. Vale, ergav@waitrose.com

## Introduction

I fly what can politely be called sport aerobatics on a rather moderate slope. For my gliders therefore I need good aerobatic capability and maximum soaring potential. A decent roll rate seems to call for an aspect ratio no more than about 8, which is quite a restriction on soaring ability. Apart from general drag reduction, the main remaining way to improve performance is by careful choice of aerofoil section.

Experience suggests that the foil should have a camber in the range 2 to 2½%. Thickness should not be too low, at least at the root, because of the high G forces involved.

The combination of good aerobatic and soaring performance calls for low drag at a wide range of lift coefficients. In the full-size world this would be achieved by using a very thick laminar-flow section; however model gliders fly at lowish Reynolds Numbers, where sections need to be on the thin side for good performance.

All these conflicting conditions make the choice of section critical. There are foils which excel at one specific lift coefficient, and some such as Eppler's which are good at two, and less good at other values. However when flying near the ground, turbulence is such that a model is tossed around, experiencing lift coefficients from zero to stall. So in my view a broad spectrum of performance from CLmax<D> to CL<D> = 0 needs to be considered, plus some attention to drag at negative G for aerobatic capability.

## Procedure

I assessed 32 foils using XFLR5's default conditions except that I set NCrit. at 7, corresponding to somewhat turbulent air. The foils assessed were mainly in the range 10 to 12% thickness, and 2 to 2.5% camber. For each foil I noted CD<D> at CL<D> of -0.3, 0 and +0.4, and L/Dmax<D> and CLmax<D>, corresponding respectively to inverted, diving for speed, cruising, soaring, and stall. I recorded this information for each foil at Reynolds Numbers 1, 2 and $3\times10^{5}$<D>.

For the overall assessment I used only the figures at the nearest appropriate Reynolds No., i.e. inverted and diving at $3\times10^{5}$<D>, cruise at $2\times10^{5}$<D>, stall and L/Dmax<D> at $1\times10^{5}$<D>.

From these I produced an 'Overall Drag Figure' (ODF), being the weighted sum of the CD<D> (or CLmax<D>) at each point.

For CD<D> at maximum L/D I simply used the inverse of L/Dmax<D>, since CL<D> at this point is usually in the order of 1.**

The weighting procedure had two stages. Firstly, results for each point were normalised to an equal variance. This had the effect of making drag variations at each CL<D> point equally important.

Secondly, I assigned each point a weighting factor according to my assessment of its importance in flight. These were:
At CL<D> = -.3, weighting factor 0.2
At CL<D> = 0.0, " 0.4
At CL<D> = +0.4 " 1.0
L/Dmax<D>, " 0.8
CLmax<D>, " -0.3 (Note ***)

For convenience I multiplied all CD<D>s by 100 before analysis.

I also checked a selection of seven foils at NCrit. = 4, corresponding to very turbulent air near the ground and/or poor surface smoothness. These results were not included in the main analysis above.

## Profiles Compared

1. Published Foils:

HQ2512; same + turbulator*; HQ2511; same + turbulator*; NACA 2.5/410, 1.5/412, 2.25/412, 2.5/412, 3.5/412; Eppler 374 and 207; S8055; MH120; LDS-2; DF101; DF102; RG-8.

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**It is unwise to choose a fixed value of CL<D> for comparison in this region, since many foils show a sharp rise of drag beyond L/Dmax, which could give rise to an anomalously poor rating in some cases. [Fig.1.]

The same argument could be made about the CL<D> = -0.3 point. However this point was chosen as being one where most of the foils were still performing adequately. It received a low weighting, so I considered the refinement unnecessary.

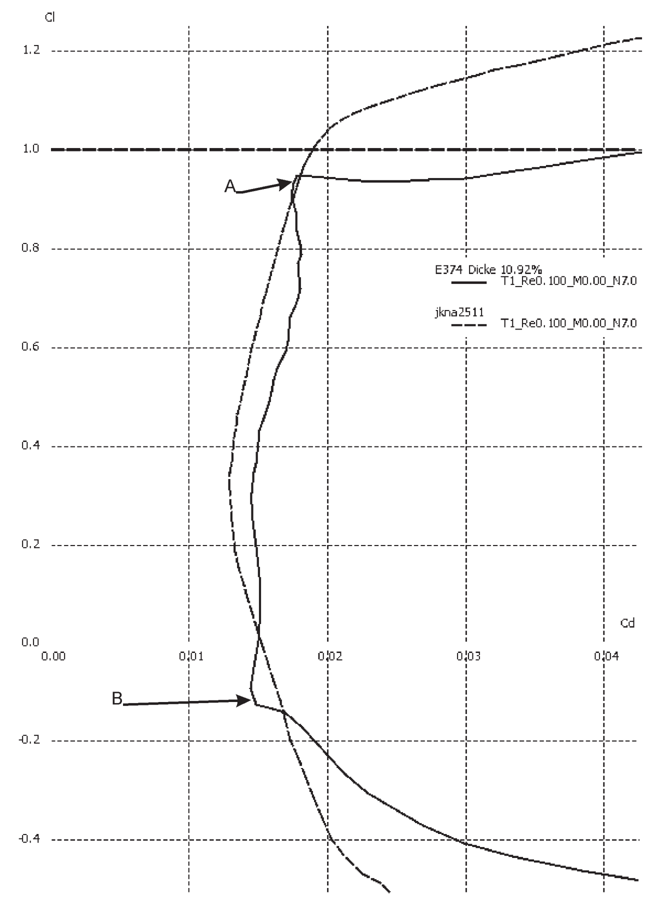



*Figure 1. Using an arbitrary value of CL at low-speed end, e.g. 1.0 (heavy line), would have given an unrealistically poor rating to some foils, as with E374 in this instance. Accordingly I used 1/L/Dmax for all foils, as measure of high-CL drag. For both foils shown, L/Dmax would be near point A. Note how E374 has higher drag everywhere except at two small peaks, A and B.*

2. Author-generated Foils:

'jouk12p22', Joukowsky 12% thick, 2.25% camber;

Above + turbulator*;

'jk2510x', Joukowsky 10% thick, 2.5% camber, scaled from above in XFLR5;

'jou22510, jou2510, jou27510', Joukowsky thickness form bent on NACA 0400 camber line, 10% thick and scaled to 2.25, 2.5, 2.75% camber respectively;

'jkna1222 and jkna1225x', as above but with 12% thickness and 2.25, 2.5% camber respectively;

'jkna2511', as above but 11% thickness and 2.5% camber;

'cl12257a', 12% thick with 2.25 camber at 25.5, 39.2% chord respectively;

'lam12p22x', quasi-laminar-style foil 12% thick with 2.34% camber.

P4891225, essentially RAF30 profile bent on NACA 0400 camber line, scaled to 12% thick, 2.5% camber;

'p150515bx', as above but rearward maximum camber, scaled to 12% thickness and 2.5% camber in XFLR5;

As above + turbulator*.

jb401225, 12% thick Joukowsky thickness form bent on single-parabola camber form (2½%) , max. at 40.2%.

***Some might disagree with this weighting method. For comparison I also recorded a crude ODF, being the sum of all the drag figures minus (CLmax<D> - 1). Correlation with the weighted ODF was +0.75. Worst foil was still MH120; the best foil slipped to 3d. place, by a small margin. I conclude that minor changes to the weighting method would not greatly affect the results.

[Ordinates for the author's foils are linked in *Available on-line*.]

## Results

At NCrit. = 7 Drag Factors (ODFs) were remarkably similar for all foils. The worst was MH120 at 5.5409, which was only 21% higher than the best, jou27510 with 4.5713.

The main surprise was that the modern published foils did not show up well. Only three, RG-8, DF101, and HQ2511 with turbulator were better than average. NACA2.25/412, 2.5/412, 3.5/412 and 2.5410 were also amongst the better foils.

ODFs showed little variation with camber, but tended to increase with thickness. This was statistically significant but, as hinted in the introduction, suggests that although thinner foils may have a small aerodynamic advantage, this would probably not justify the increased difficulty in construction and the resulting weight increase. To investigate further, I checked jou2510 thinned down to 8 and 6%, which gave ODFs of 4.5041 and 4.6959 respectively. Plotted with the other results, this suggested that the aerodynamic optimum might be just over 8% for this series. [Fig.2]

At NCrit. = 4 there were no dramatic changes compared with NCrit. = 7. Foils with small nose radii showed fractionally lower ODFs, more rounded ones increased a little. The correlation coefficient between the results at 7 and 4 was +0.9, i.e. good agreement.

## Proof of the Pudding?

I had for some time been quite contentedly flying a slope soarer with a laminar-flow type section of 15% thickness [RJ46x at root]. Based on some earlier work I built a new wing for it, with 'jouk12p22' section at the root, and 'jkna2511' at the tip. The ODF for the old wing would be around 6.23, the new about

*For 'turbulator' results I set XFLR5 to a forced upper surface transition at 70% chord.

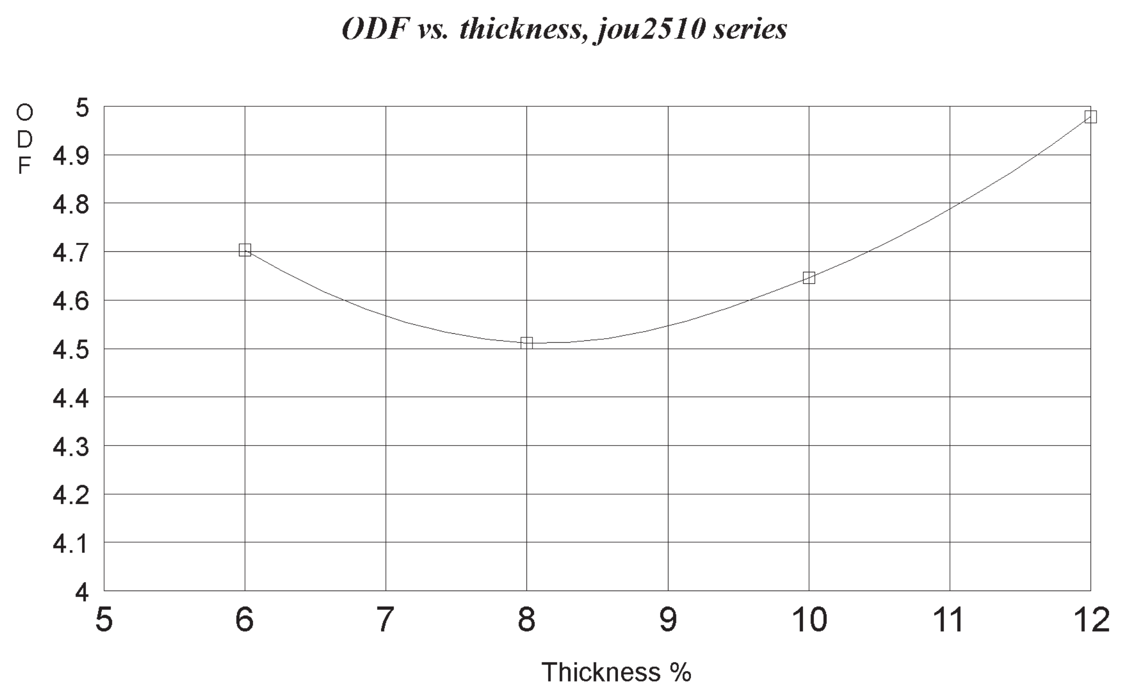



*Figure 2. Shows the optimum thickness for jou2510 series was just over 8%.*

4.93. Despite this difference of 21%, the performance of the two wings are not as different as hoped, though the new wing feels distinctly livelier.

## Conclusion

If XFLR5 is to be believed, the computer-age foils which I assessed here appear to have nothing to offer where broad-spectrum performance is required.

The Joukowski-based and NACA foils, from the pre-computer age, showed up remarkably well.

It appears that, so long as a sensible thickness and camber are chosen, it matters little what foil is chosen.

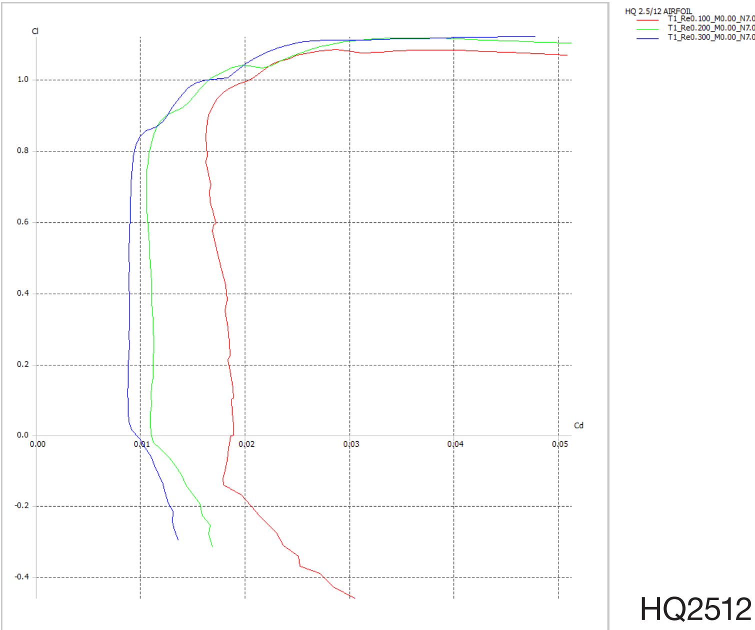
Needless to say, I do not expect this conclusion to be popular with professional aerodynamicists!

## Available on-line

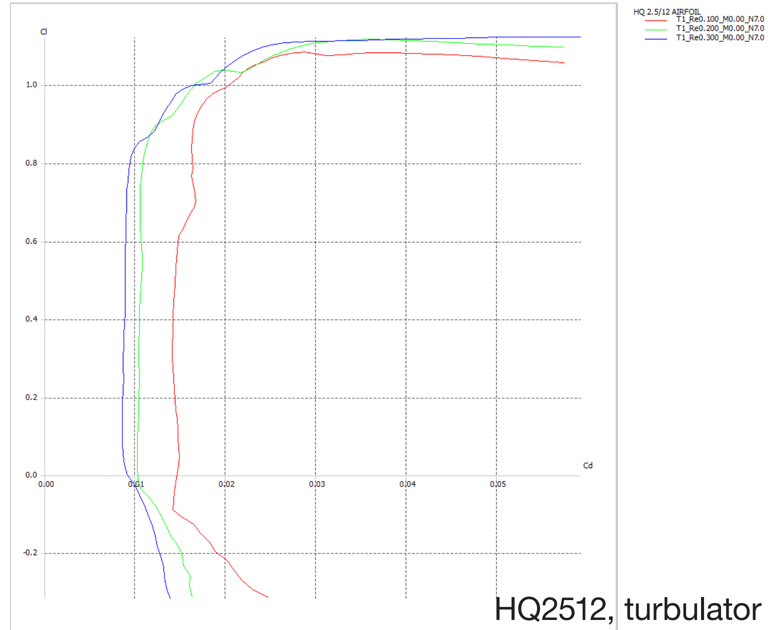
Ordinates for author's airfoils <http://www.rcsoaringdigest.com/Airfoils/Vale_Slope_Sections_201109/Slope_afls.zip>

XFLR Graphs as .wpa files <http://www.rcsoaringdigest.com/Airfoils/Vale_Slope_Sections_201109/Xslpwpas.zip>

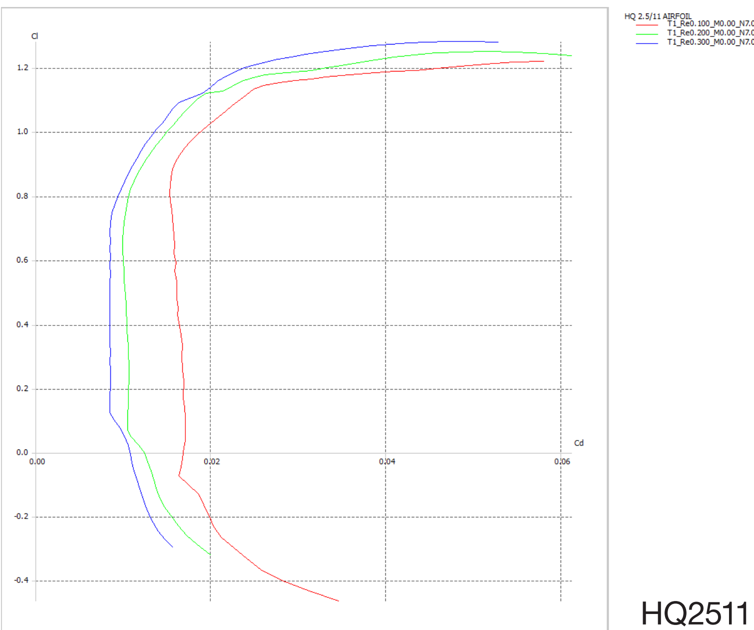
Results Excel spreadsheet <http://www.rcsoaringdigest.com/Airfoils/Vale_Slope_Sections_201109/XFLSLOP3.XLS>



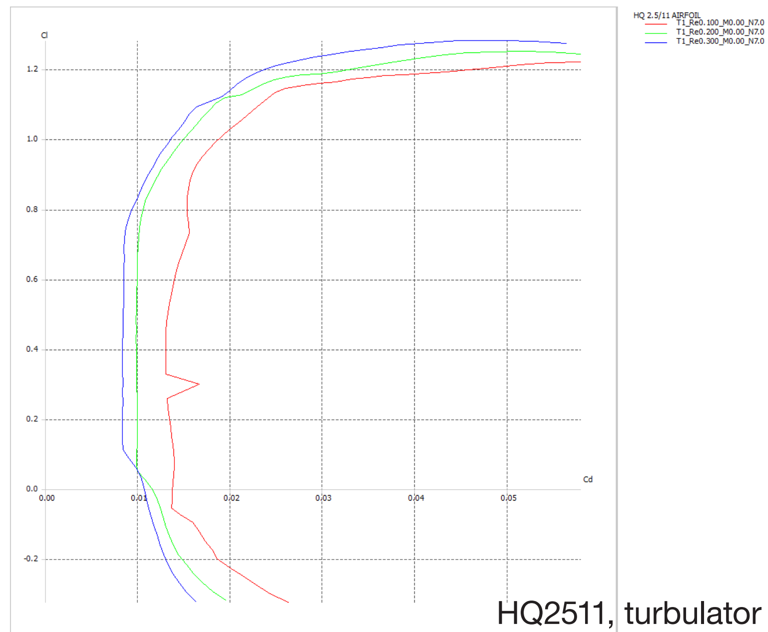

HQ2512



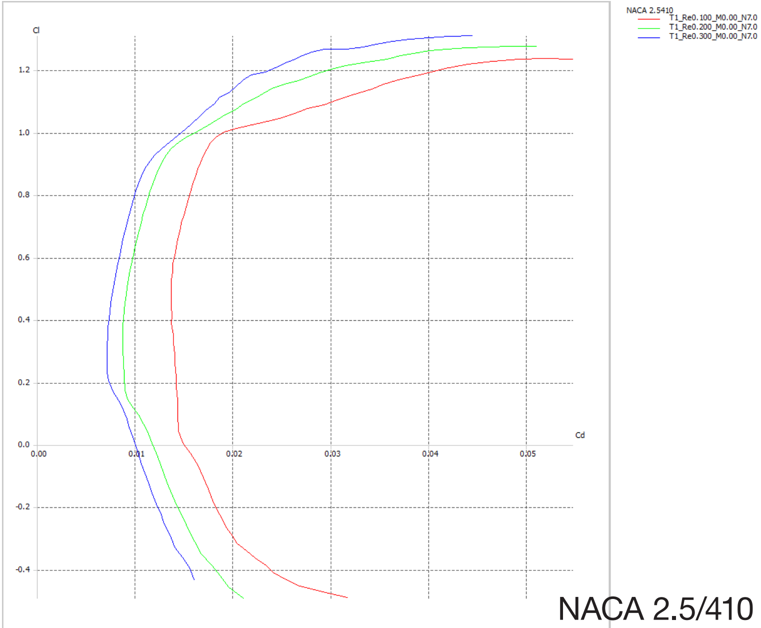

HQ2512, turbulator



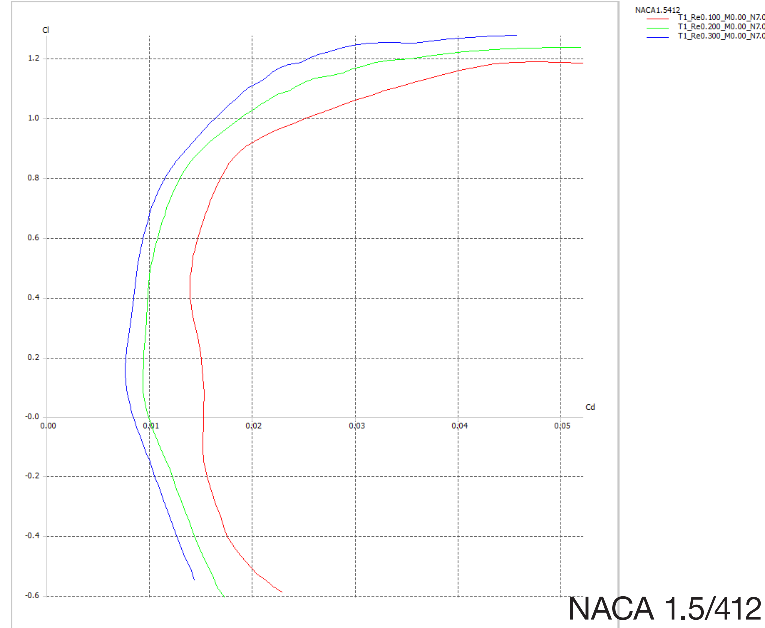

HQ2511



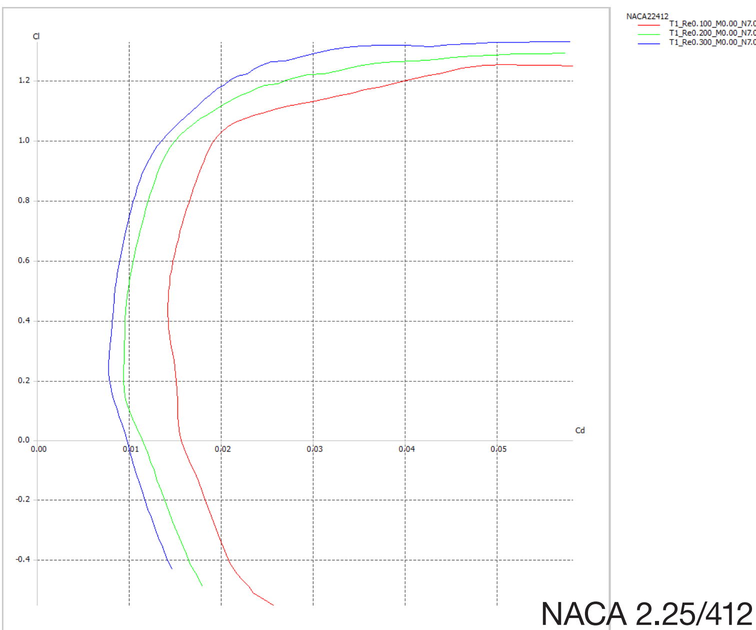

HQ2511, turbulator



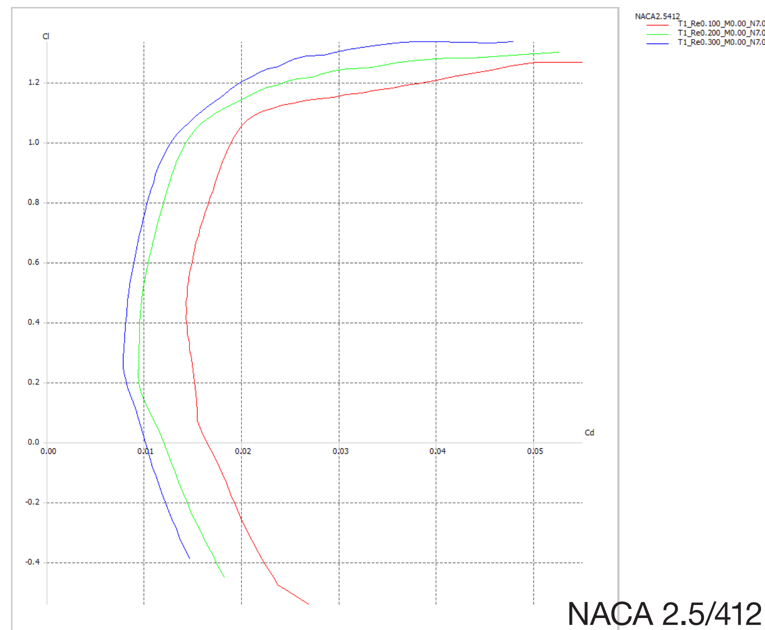

NACA 2.5/410



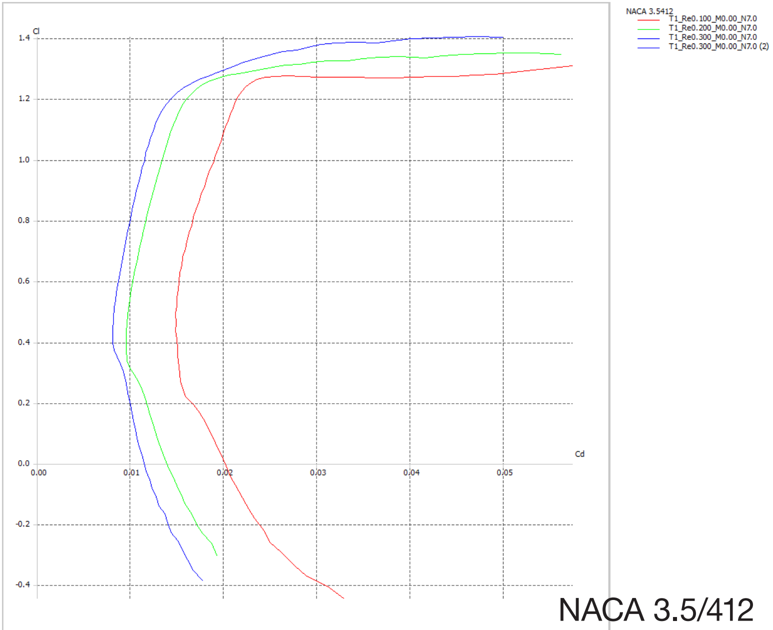

NACA 1.5/412



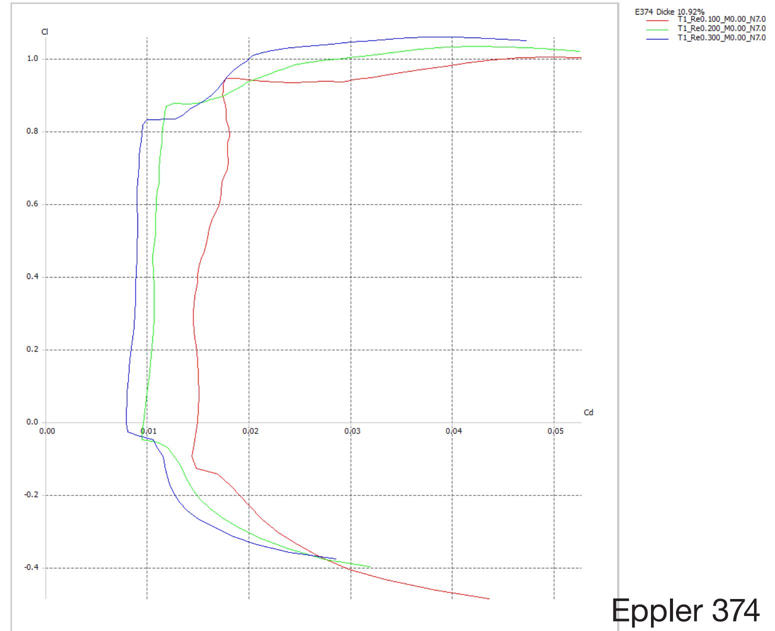

NACA 2.25/412



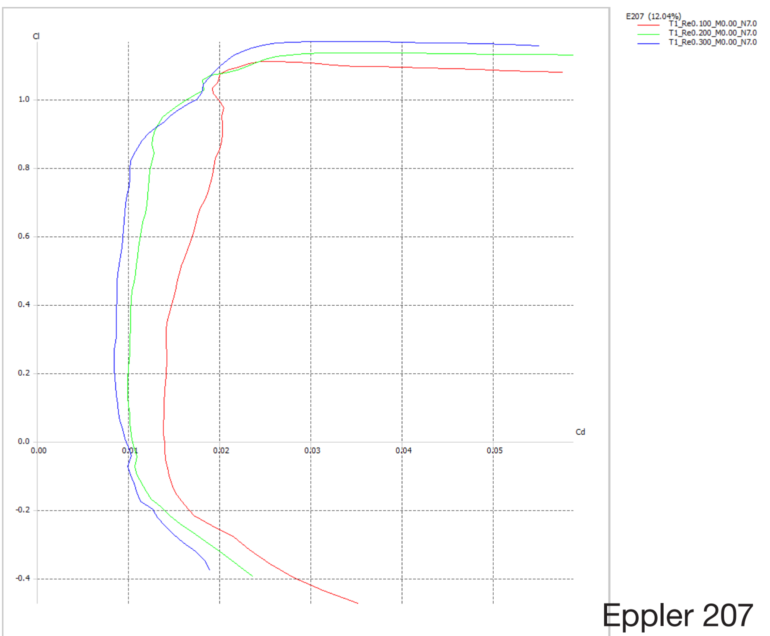

NACA 2.5/412



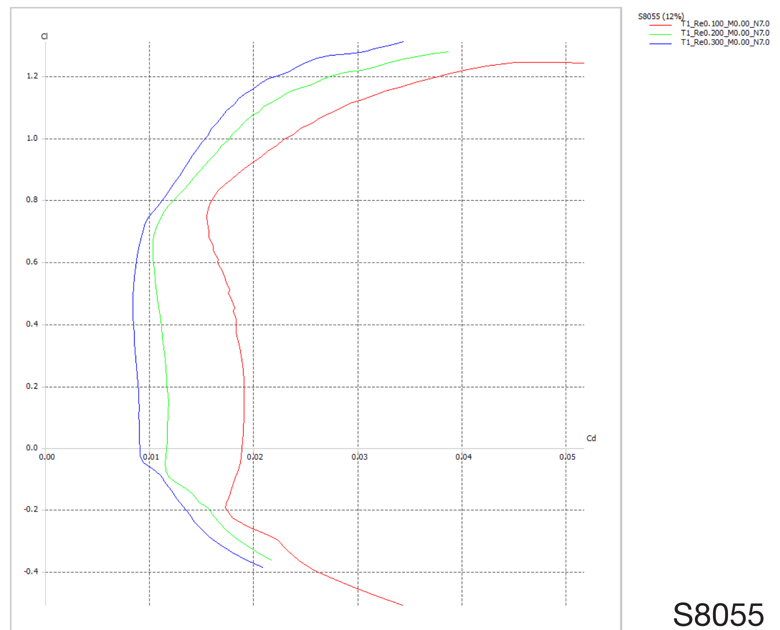

NACA 3.5/412



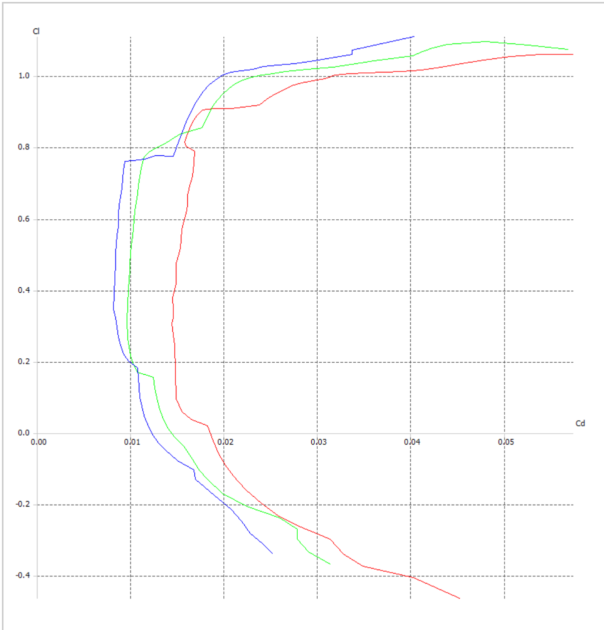

Eppler 374



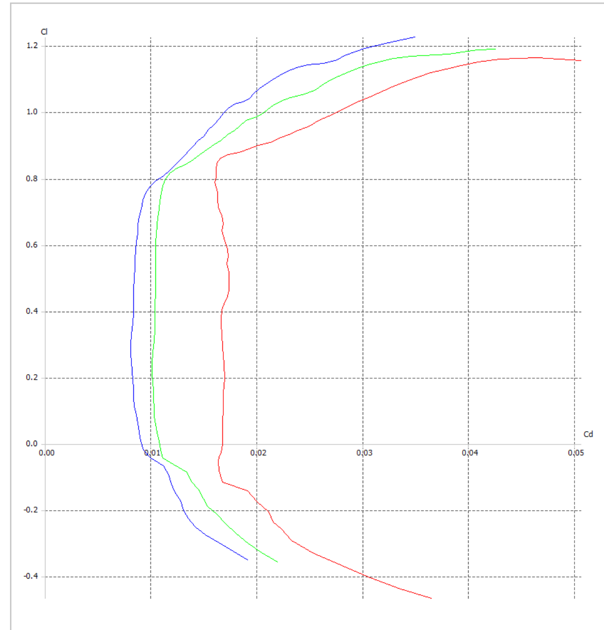

Eppler 207



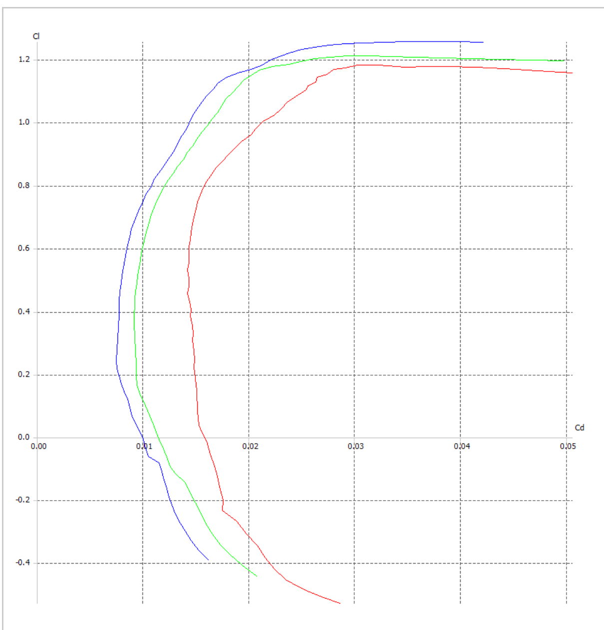

S8055



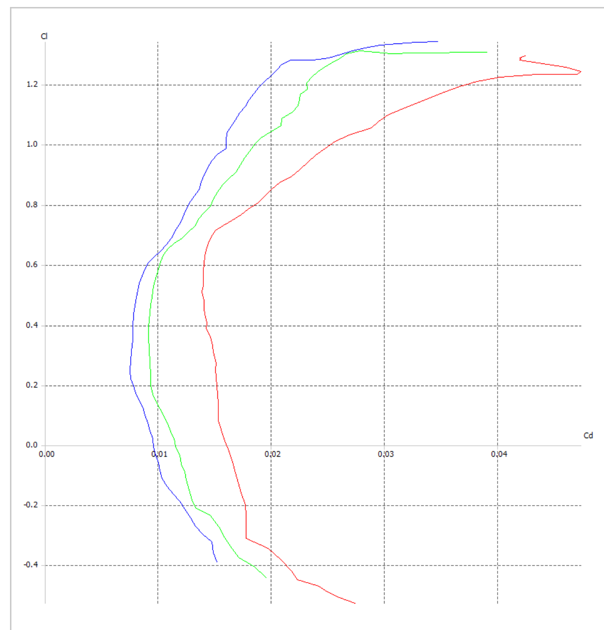

MH120




LDS-2




DF101

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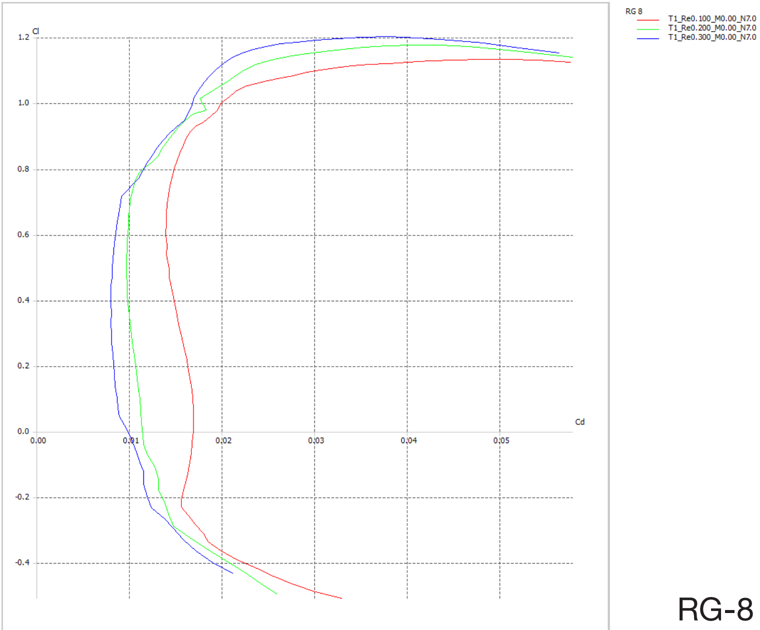
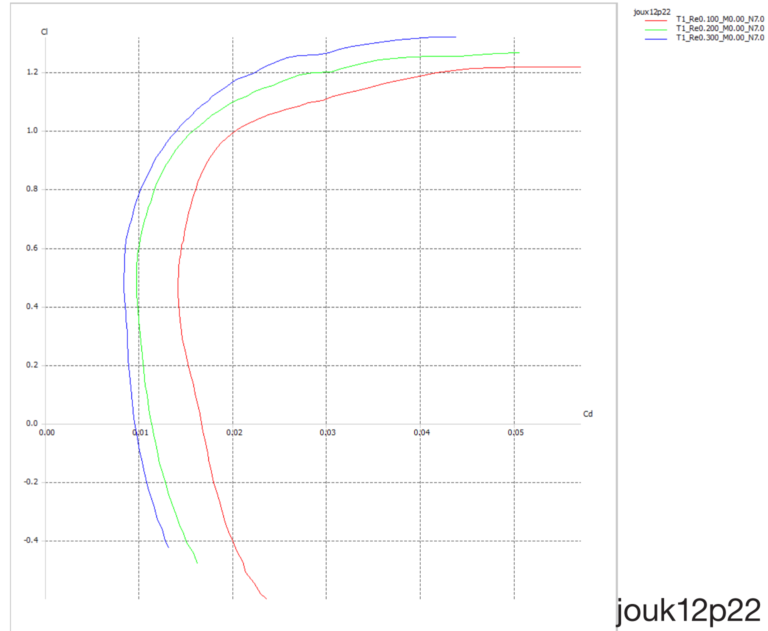
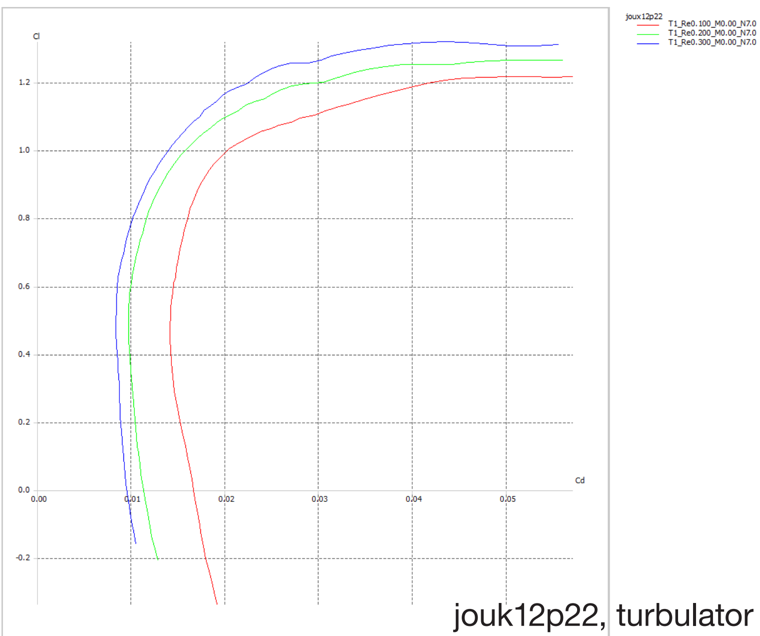


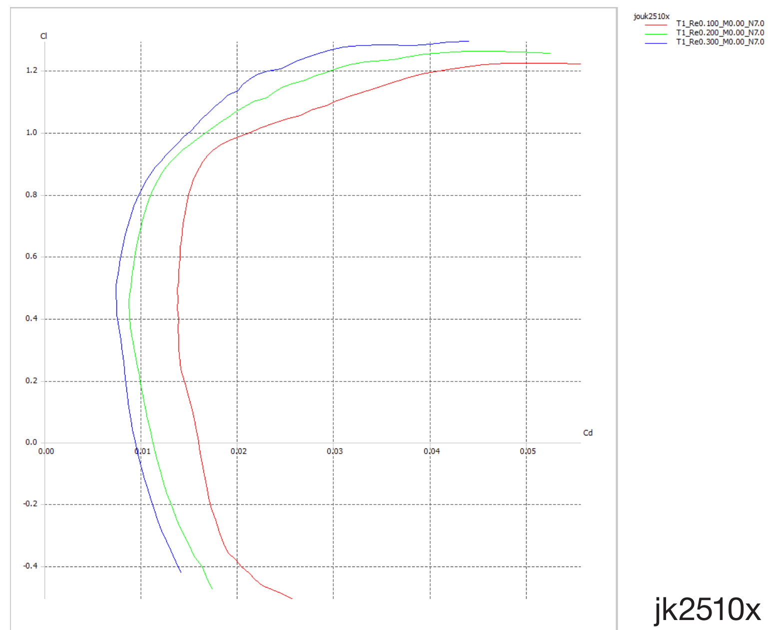

RG-8




jouk12p22




jouk12p22, turbulator

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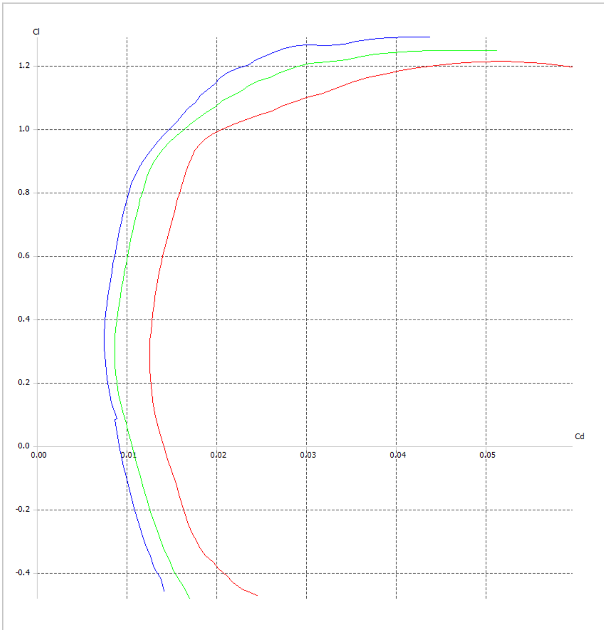
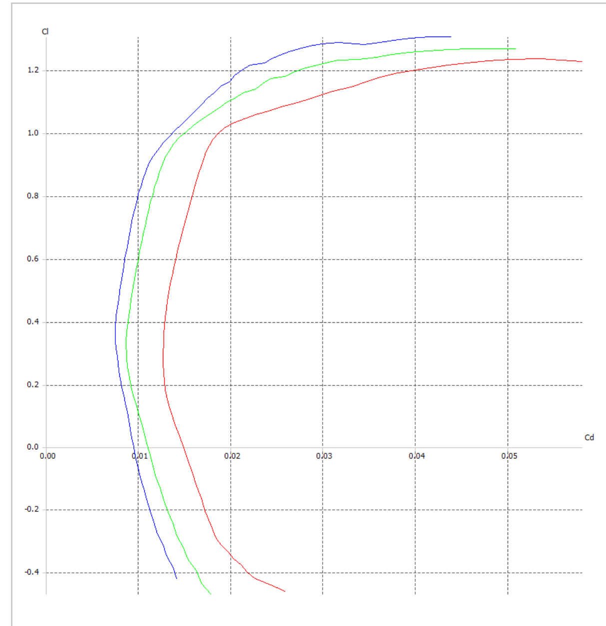
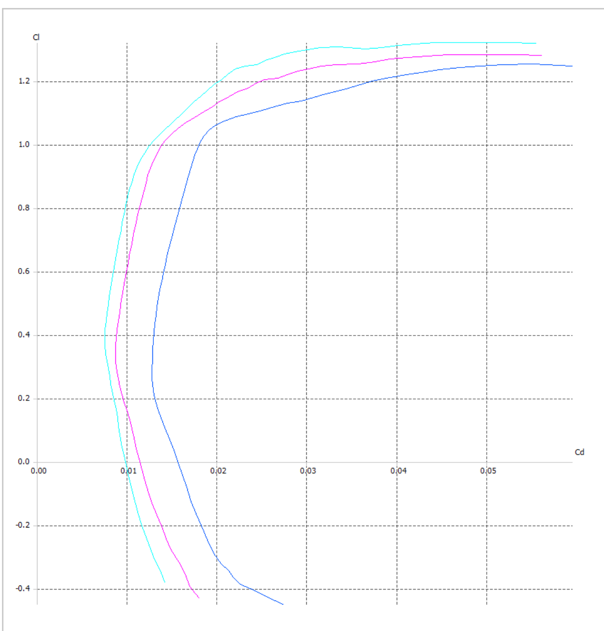


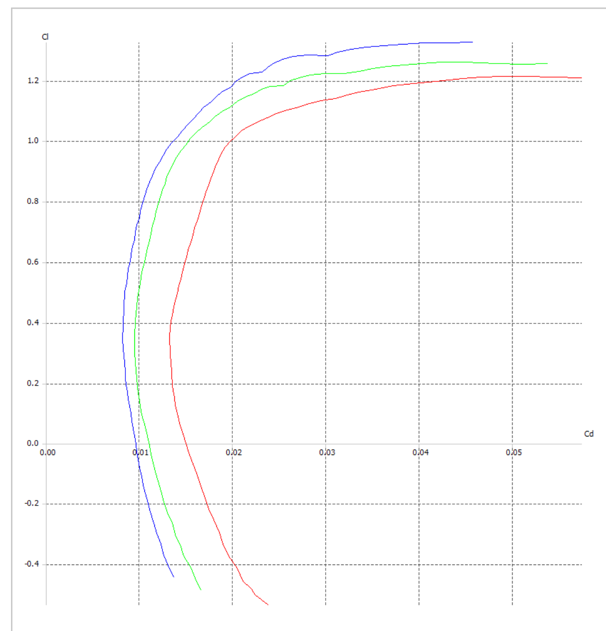

jou22510



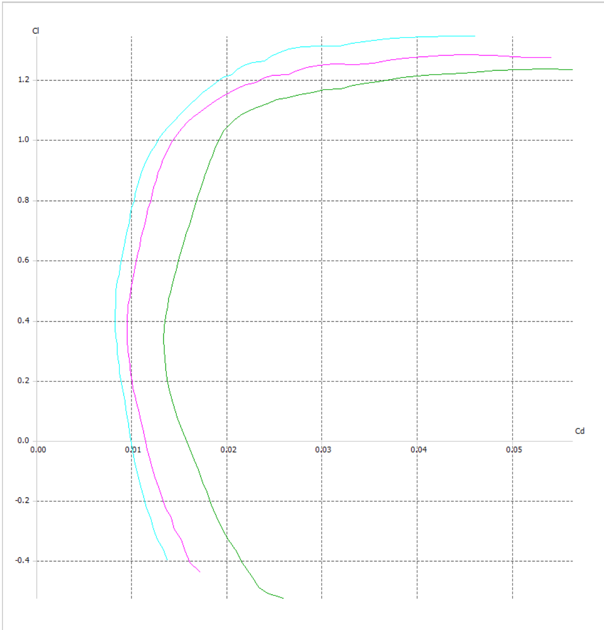

jou2510



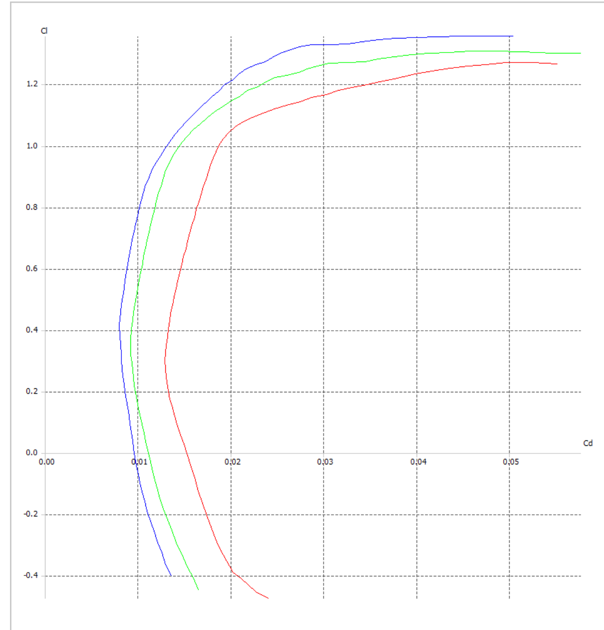

jou27510



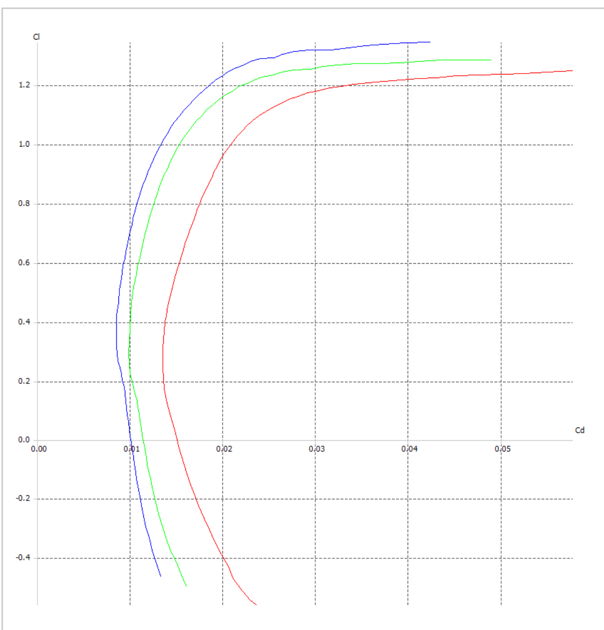

jkna1222



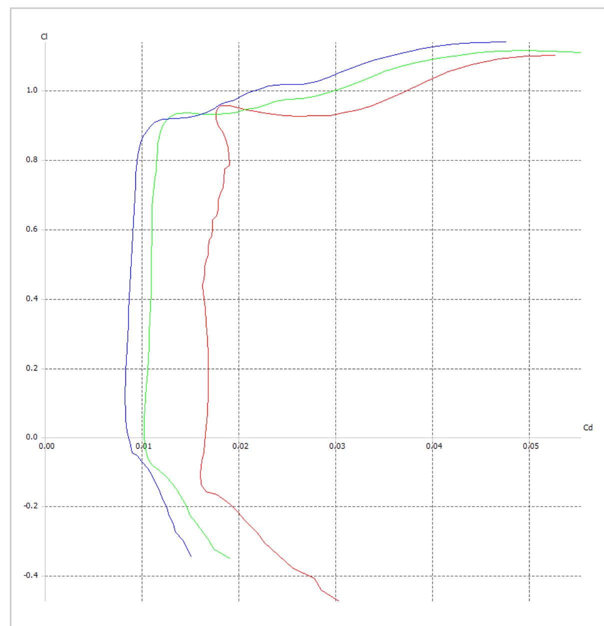

jkna1225x



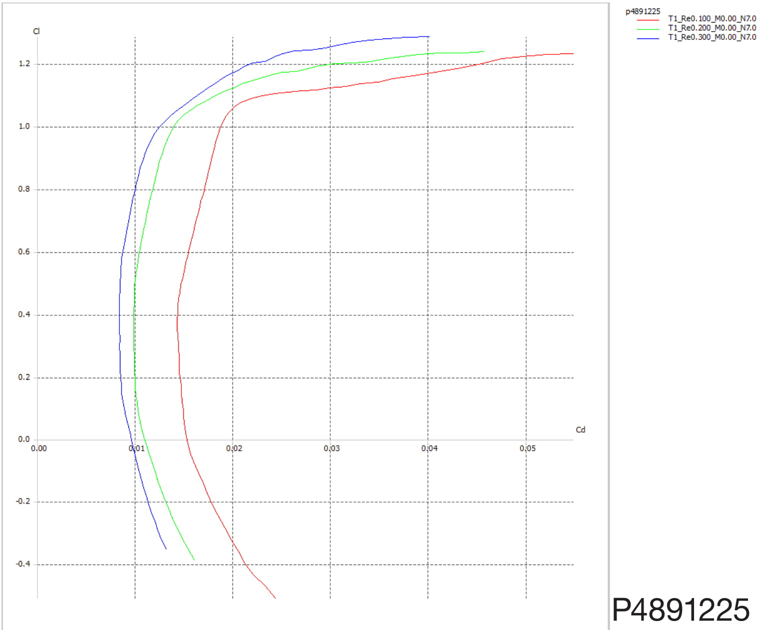

jkna2511



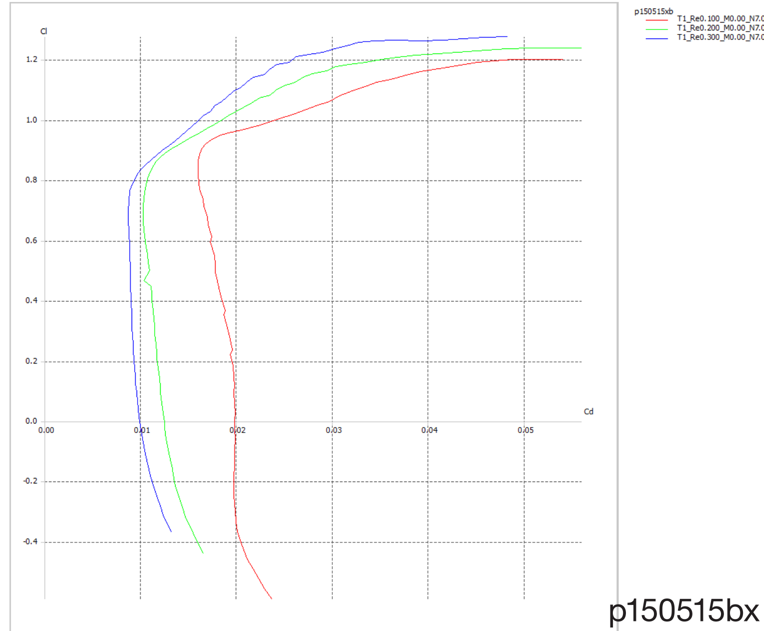

cl12257a’



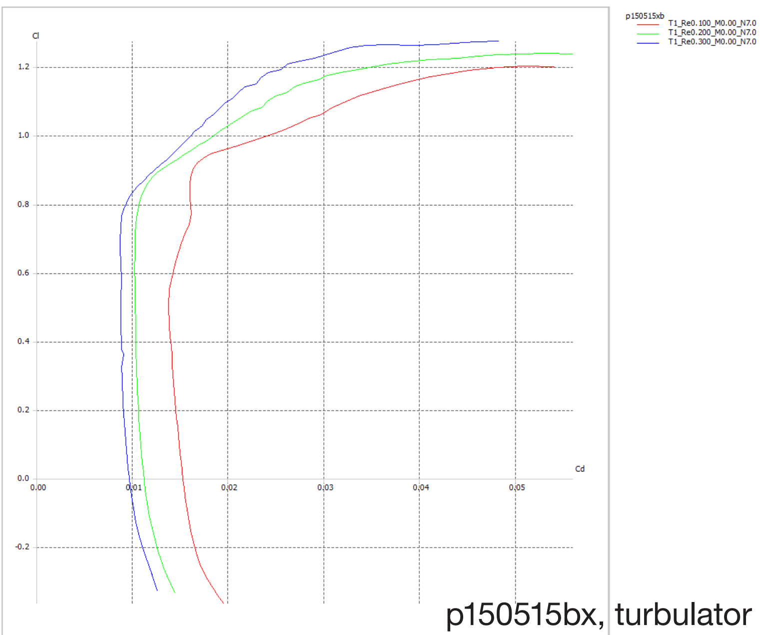

lam12p22x



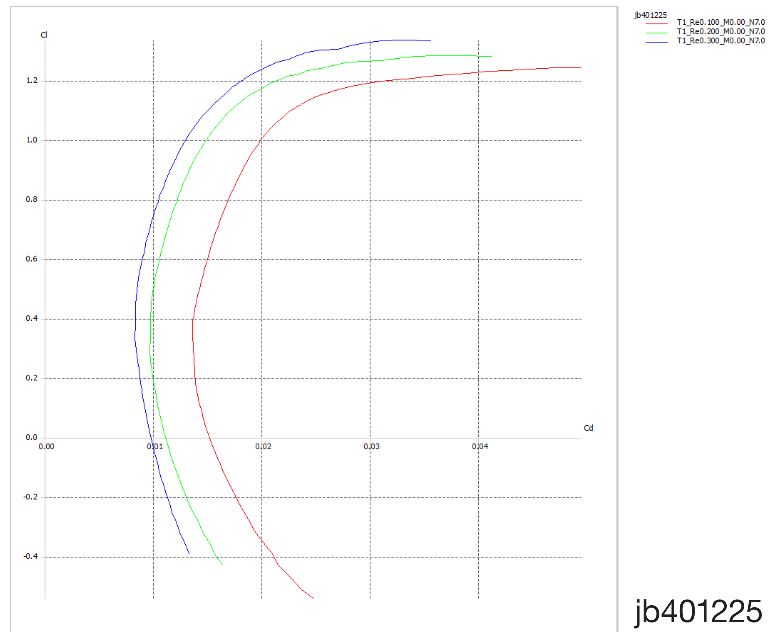

P4891225



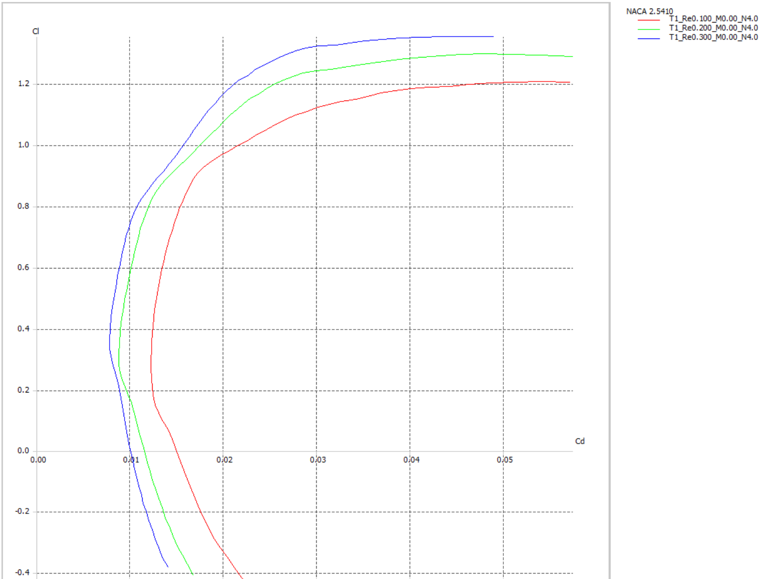

p150515bx



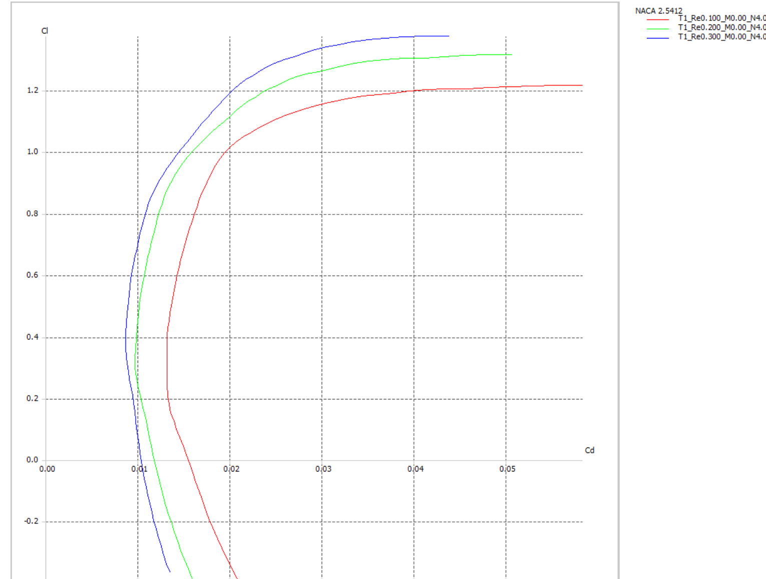

p150515bx, turbulator



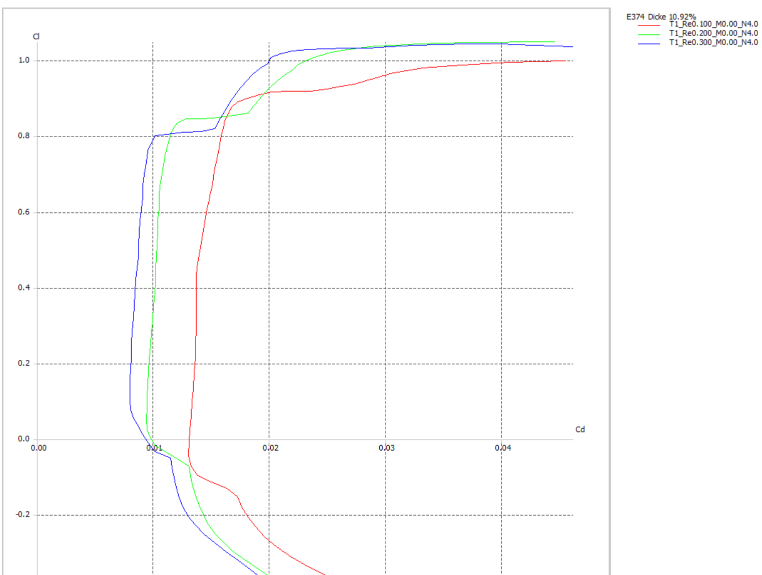

jb401225



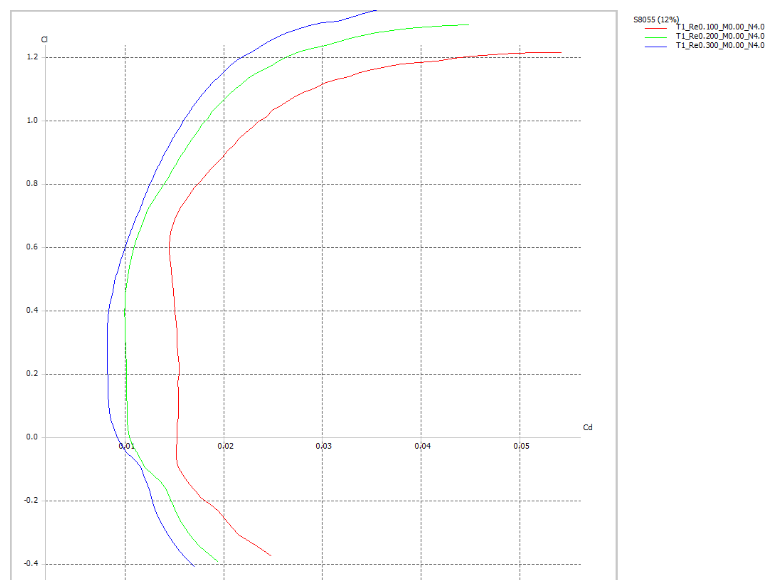

NACA 2.5/410, NCrit. = 4




NACA 2.5/412, NCrit. = 4

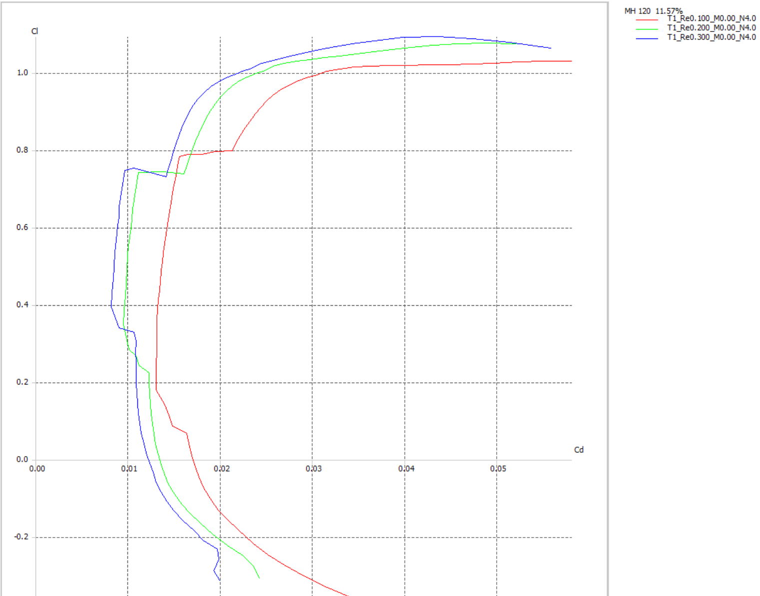



Eppler 374, NCrit. = 4

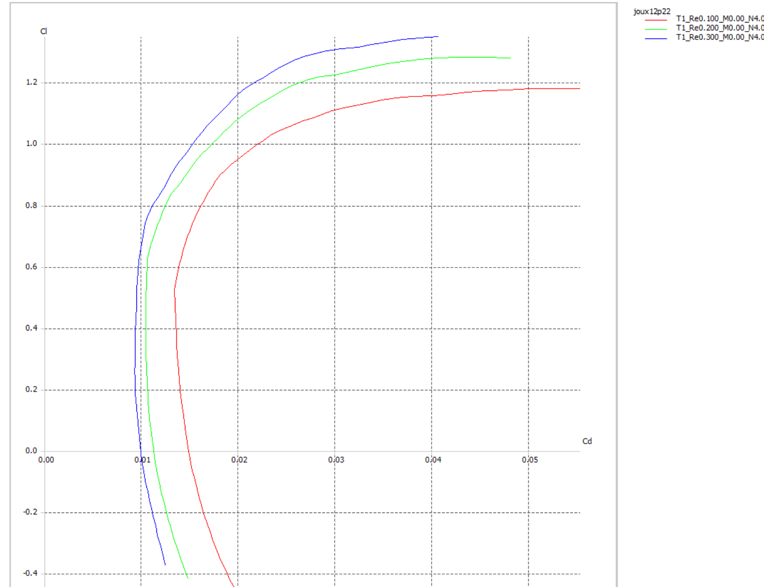



S8055 , NCrit. = 4

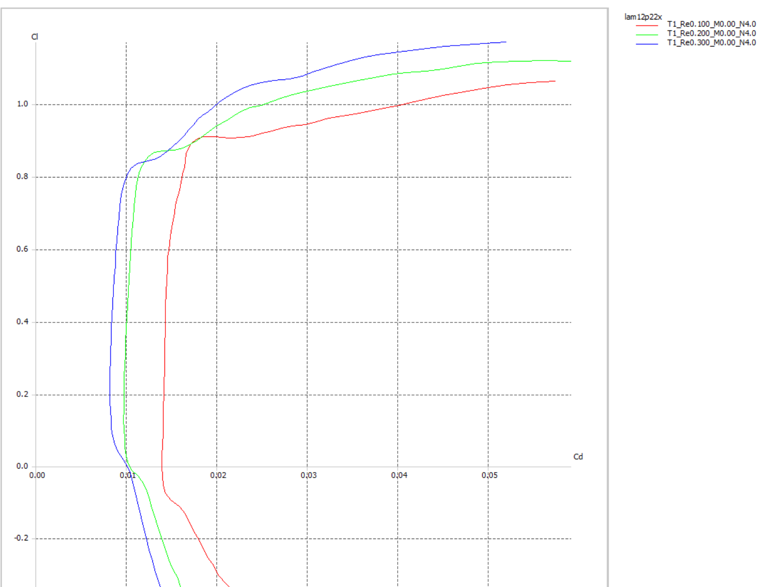
*The author's model with its new wing, 66" span. The plug-in extension wing tips which are seen in the photo below are for use in weak lift.*




MH120, NCrit. = 4




jouk12p22, NCrit. = 4




lam12p22, NCrit. = 4

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Slope afls FM (ODF) 5.2011 | | | | | | | | | | | | | |
| 2 | Afl | CD0@300 | CD0.4@200 | 100D/Lmax@1 | CLmax@100 | CD-.3@300 | FM simple | FM std | Thickness% | camber % | | | | |
| 3 | HQ2512 | 0.95 | 1.1 | 1.835 | 1.08 | 1.37 | 5.175 | 5.353376148 | 11.96 | 2.5 | | | | |
| 4 | HQ2512/turb | 0.92 | 1.05 | 1.828 | 1.08 | 1.37 | 5.088 | 5.190981335 | 11.96 | 2.5 | | | | |
| 5 | HQ2511 | 1.08 | 1.05 | 1.767 | 1.22 | 1.58 | 5.257 | 5.108775478 | 11 | 2.5 | Below average | | | |
| 6 | HQ2511/turb | 1.075 | 0.99 | 1.764 | 1.22 | 1.55 | 5.159 | 4.944354053 | 11 | 2.5 | | | | |
| 7 | jouk12p22 | 0.96 | 0.99 | 1.932 | 1.22 | 1.17 | 4.832 | 5.046532206 | 11.99 | 2.36 | lowest | | | |
| 8 | jouk12p22turb | 0.97 | 0.98 | 1.934 | 1.22 | 1.23 | 4.894 | 5.04139246 | 11.99 | 2.36 | | | | |
| 9 | jkna1222 | 0.965 | 0.966 | 1.953 | 1.214 | 1.18 | 4.85 | 5.030194921 | 11.6 | 2.25 | highest | | | |
| 10 | jkna1225x | 0.99 | 0.96 | 1.916 | 1.23 | 1.24 | 4.876 | 4.971036221 | 11.59 | 2.55 | | | | |
| 11 | jkna2511 | 0.962 | 0.9265 | 1.876 | 1.27 | 1.222 | 4.7165 | 4.754740681 | 11 | 2.5 | | | | |
| 12 | naca2.5412 | 1.01 | 0.95 | 1.89 | 1.27 | 1.34 | 4.92 | 4.893008179 | 11.99 | 2.5 | | | | |
| 13 | CL122257A | 1 | 1 | 2.092 | 1.25 | 1.18 | 5.022 | 5.316163828 | 11.93 | 2.24 | | | | |
| 14 | p150515bx | 0.99 | 1.12 | 1.815 | 1.2 | 1.23 | 4.955 | 5.253802344 | 11.99 | 2.51 | | | | |
| 15 | p0150515bx/tu | 0.96 | 1.03 | 1.818 | 1.2 | 1.22 | 4.828 | 5.004234312 | 11.99 | 2.51 | | | | |
| 16 | NACA2.25412 | 0.975 | 0.957 | 1.929 | 1.292 | 1.251 | 4.82 | 4.902579134 | 12 | 2.25 | | | | |
| 17 | NACA1.5412 | 0.838 | 0.983 | 2.096 | 1.189 | 1.16 | 4.888 | 5.20607341 | 11.99 | 2.5 | | | | |
| 18 | NACA3.5412 | 1.156 | 0.96 | 1.789 | 1.276 | 1.58 | 5.209 | 4.917501485 | 11.99 | 3.5 | | | | |
| 19 | Eppler 374 | 0.792 | 1.06 | 1.88 | 0.945 | 1.74 | 5.527 | 5.388742901 | 10.91 | 2.25 | | | | |
| 20 | p4891225 | 0.964 | 0.986 | 1.869 | 1.225 | 1.25 | 4.844 | 4.95020537 | 12 | 2.5 | | | | |
| 21 | jou27510 | 0.975 | 0.889 | 1.799 | 1.265 | 1.3 | 4.698 | 4.571303956 | 10.08 | 2.75 | | | | |
| 22 | jou22510 | 0.914 | 0.883 | 1.89 | 1.214 | 1.2 | 4.673 | 4.684618701 | 10.07 | 2.25 | | | | |
| 23 | jou2510 | 0.95 | 0.886 | 1.845 | 1.236 | 1.25 | 4.695 | 4.637336629 | 10.07 | 2.5 | | | | |
| 24 | NACA2.5410 | 1 | 0.881 | 1.835 | 1.236 | 1.37 | 4.85 | 4.669362995 | 10 | 2.5 | | | | |
| 25 | lam12p22x | 0.862 | 1.09 | 1.883 | 1.1 | 1.43 | 5.165 | 5.311688863 | 11.99 | 2.34 | | | | |
| 26 | S8055 | 0.908 | 1.11 | 1.995 | 1.245 | 1.625 | 5.393 | 5.436659071 | 12 | 2.05 | | | | |
| 27 | MH120 | 1.225 | 0.974 | 1.905 | 1.06 | 2.37 | 6.414 | 5.540871113 | 11.57 | 2.6 | | | | |
| 28 | LDS-2 | 0.91 | 1.038 | 1.923 | 1.164 | 1.65 | 5.357 | 5.241795539 | 11.97 | 2.16 | | | | |
| 29 | DF101 | 1 | 0.919 | 1.974 | 1.181 | 1.405 | 5.117 | 5.042147192 | 11 | 2.31 | | | | |
| 30 | DF102 | 0.959 | 0.917 | 2.119 | 1.233 | 1.407 | 5.169 | 5.163762835 | 11 | 2.31 | | | | |
| 31 | RG-8 | 0.983 | 0.983 | 1.812 | 1.134 | 1.495 | 5.139 | 5.009000226 | 10.8 | 2.22 | | | | |
| 32 | Eppler207 | 0.98 | 1.029 | 1.866 | 1.11 | 1.64 | 5.405 | 5.251611174 | 12.02 | 2.5 | | | | |
| 33 | jk2510x | 0.947 | 0.882 | 1.815 | 1.225 | 1.235 | 4.654 | 4.589419223 | 10 | 2.58 | | | | |
| 34 | jb401225 | 0.979 | 0.975 | 1.992 | 1.245 | 1.229 | 4.93 | 5.096228017 | 12 | 2.5 | | | | |
| 35 | | | | | | | | | | | | | | |
| 36 | Afl | CD0@300 | CD0.4@200 | 100D/Lmax@1 | CLmax@100 | CD-.3@300 | FM simple | FM std | Thickness% | camber % | | | | |
| 37 | | | | | | | | | | | | | | |
| 38 | At NCr=4: | | | | | | | At NCr=4: | Cf. at NCr=7: | Correl. NCr.=4:7 | | | | |
| 39 | E374/Ncr4 | 0.938 | 1.017 | 1.919 | 1.044 | 1.65 | 5.48 | 5.340852406 | 5.388742901 | 0.897612685 | | | | |

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | MH120/Ncr4 | 1.224 | 0.965 | 1.99 | 1.027 | 1.965 | 6.117 | 5.62554242 | 5.540871113 | | | |
| 41 | NACA 2.5412 | 1.04 | 0.982 | 1.9305 | 1.213 | 1.275 | 5.0145 | 5.115231485 | 4.893008179 | | | |
| 42 | Jouk12p22 | 0.993 | 1.047 | 2.012 | 1.181 | 1.19 | 5.061 | 5.386124445 | 5.046532206 | | | |
| 43 | lam12p22x | 1.023 | 1 | 1.923 | 1.064 | 1.334 | 5.216 | 5.309634697 | 5.311688863 | | | |
| 44 | naca2.5410 | 1.01 | 0.896 | 1.897 | 1.207 | 1.287 | 4.883 | 4.830302744 | 4.669362995 | | | |
| 45 | S8055 | 0.922 | 0.99 | 2.155 | 1.212 | 1.42 | 5.275 | 5.396077604 | 5.436659071 | | | |
| 46 | | | | | | | | | | | | |
| 47 | Extras (at NCr.=7): | | | | | | | | | | | |
| 48 | jou2508 | 0.933 | 0.82 | 1.803 | 1.149 | 1.35 | 4.757 | 4.504113094 | 8 | 2.5 | | |
| 49 | jou2506x | 0.916 | 0.769 | 1.821 | 1.008 | 2.41 | 5.908 | 4.695948433 | 6 | 2.5 | | |
| 50 | RJ46x* | 0.953 | 1.255 | 2.07 | 0.955 | 1.367 | 5.69 | 6.242096182 | 14.86 | 1.97 | *Root foil of laminar-flow style | |
| 51 | NACA651412 | 1.171 | 1.195 | 2.004 | 1.024 | 2.02 | 6.366 | 6.192714649 | 11.98 | 2.21 | wing mentioned in text. | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | SD | 0.081022044 | 0.068707492 | 0.09155846 | 0.076112071 | 0.244675639 | 0.341572584 | 0.25341851 | | | | |
| 55 | | | | | | | | | | | | |
| 56 | mean | 0.97340625 | 0.984828125 | 1.894875 | 1.19528125 | 1.38965625 | 5.047484375 | 5.047484375 | | | | |
| 57 | | | | | | | | | | | | |
| 58 | Multiply factor | 0.339203946 | 1 | 0.600337684 | 0.443107839 | 0.056162103 | | | | | | |
| 59 | | | | | | | | | | | | |
| 60 | resultant mean | 0.330183241 | 0.984828125 | 1.137564869 | 0.529638492 | 0.078046018 | 2.000983761 | | | | | |
| 61 | | | | | | | | | | | | |
| 62 | Net multip fact | 0.855642435 | 2.522501418 | 1.51435266 | 1.117740153 | 0.141668985 | | | | | | |
| 63 | | | | | | | | | | | | |
| 64 | Afl | CD0@300 | CD0.4@200 | 100D/Lmax@1 | CLmax@100 | CD-.3@300 | FM simple | FM std | Thickness% | camber % | | |

# A "One Design" Build and Contest

Trevor Ignatosky, trevor2@optonline.net

Our club, the Long Island Silent Flyers (LISF) has just completed a One Design Build and Contest. During the build, the project gained momentum and members from our club, then spilled over into another club and even to independent builders in and out of the country. What made this build and contest attractive was that we allowed, even encouraged, divergent builds of the model design while also making the build and the contest rules such that no one had an unfair advantage. This article is a chronicle of our passage from initial discussions, through the build and then into the contest. It is written for those who would like to organize a One Design Build and/or Contest.

Either a One Design Build or a One Design Contest can be fun by itself, but put them together and they can keep your club members engaged throughout the building and flying seasons. If you would like your club to have a One Design Build and you live in the northern hemisphere, now's the time to bring the subject up and discuss it amongst your club members; before the building season begins.

Getting started with our build, there were some discussions, some decisions, more discussions, more decisions and then, finally, throughput. In went balsa, glue, covering, electronics, more time than anyone planned on and out came sailplanes, bleary eyed builders, camaraderie and good times. Seems like a good tradeoff; just make sure your builders go have a lie down before they start flying.

You and your club members have to establish and then maintain throughput long enough for the builds to be successfully completed. A One Design Build kind of sustains itself once it gets going: builders motivate one and other by

*Opposite page: A One Design Bird of Time with a four piece wing, spoilers and carbon capped spars takes a gentle ride up the winch. Photo by Sandie*

showing their progress at club meetings and on a build thread. I found a build thread to be an excellent motivator and the pivot point of our build. It provides a place where builders can help each other in a timely fashion and also to show what they've done and how they did it. And it's a lifeline to the build for those of us that get snowed in.

At the end of the build you'll have sailplanes and builders that should be interested in having a One Design Contest. They almost have to be interested. Somehow the thought, my build is better than your build and I'm going to prove it to you, seems to be a natural bi-product of folks building like models. You should definitely plan on a contest to channel all those good-natured competitive spirits into the open air before they set fire to something.

The Bird of Time (BOT) is the model we settled on for the One Design Build. We started discussions in November 2010 and had our One Design Contest July 2011. During those nine months, the BOT has been the topic of many discussions both on and off line; numerous show and tells featuring pieces of BOTs undergoing construction; has been regularly sighted flying around our field and has even been entered in our club's Unlimited and RES contests. It finished dead last in the Unlimited and fifth out of nine in the RES Contest. In defense of everyone else, the RES contest was held on a very windy day. In both contests it was being launched off the winch. This shows that the BOT, built with slightly stronger wings, can be a good entry level model for those looking to get a feel of what a thermal duration contest is like or for those who want to get their feet wet and be somewhat competitive in a RES contest without spending much; relatively speaking. The kit is $70 and the ARF is $150 US.

## Team Build Versus Group Build

We had two clubs building Bird Of Time sailplanes in the BOT One Design Build: Long Island Silent Flyers (LISF) and the Meroke Radio Control Club. The clubs are from opposite ends of the RC universe. LISF is a sailplane club and Meroke is a power club. LISF allows no gas engines at its field and Meroke allows no gliders at theirs. The clubs employed dissimilar building styles, too. LISF did a group build: each person worked on building their own BOT. Meroke did a team build: each person was part of a team that was building a single BOT.

The differences in the two builds also carried forward into the contest. Meroke had a couple of pilots flying a single plane. LISF had one pilot per plane. LISF had many planes in the contest. Meroke had only one plane. But the Meroke's had an advantage. If anything untoward happened to their plane, they had a pit crew made up of the original builders on hand. That stood them well when they had a broken wingtip. They

*Battle surgery. The Merokes had their own surgical team right on the field. Photo by Rudi Oudshoorn*

were able to strip it, fix it and recover it, and keep on flying. Sadly, not all LISF sailplanes made it through to the end of the contest.

## Choosing a sailplane

I originally pitched building the Genie Easy LT/S (about $200 US, with balsa sheeted foam cores) to the LISF club members for a One Design Build. The Genie is a full house sailplane that could be built up without resorting to exotic construction techniques. It seemed reasonable to me. The club had built a half dozen Bubble Dancers as a group project a couple of years ago and had good success with it. Some Bubble Dancers from the build are still flying in the club today. The beauty of the Bubble Dancer build is that it got more club members involved in club contests in the Eastern Soaring League (ESL) and not only in our club's contests; a significant change.

Looking at the faces of some members during the club meeting when I proposed using the Genie for a One Design build and then listening to their questions and arguments against it, I could see it was one idea that wasn't just shot down in flames, but was chopped up and buried in the smokey hole along with any hopes of reviving it. Thinking about it later on, I realized that they weren't against the idea of a One Design Build, just against the uncertainties of building a strong wing. The big question was, would we be able to guarantee building strong, light, competitive wings given the level of expertise available at the time? The simple answer was no.

In retrospect, I can see there was also a divide between the pilots. On one hand there were pilots that already had high

*The One Design Contest winner Pete Nicholson's nostalgic looking Bird Of Time with Polyspan wing covering. There's more going on under the wing covering. Photo by Vinny La Scalza* performance three meter TD and RES sailplanes: mostly store bought, but with an occasional homemade Bubble Dancer in the mix. On the other hand there were pilots flying lower performance two and three meter sailplanes, like the Spirit Elite, Gentle Lady, and Radian. The Genie didn't appeal to either group. The owners of high performance sailplanes didn't need to spend time and money to duplicate the performance of models they already had and the owners of lower performance sailplanes didn't want to gamble time and money on completing a model that they may not even like flying.

I started over again, looking for sailplane kits that were inexpensive, not too complicated to build and would be good for sport and okay for entry level contest flying. I looked at the Gambler, Olly II, the Marauder, Chrysalis, Scepter 100 RES, whatever members threw out for consideration and the Bird Of Time. I settled on the Bird Of Time (BOT), by Dynaflite. Why? Dynaflite offers the model as a AFR and as a kit. In addition, they offer replacement parts for the ARF versions. As our club president Ed Anderson said, "It should not become a hangar queen." This is a sailplane that can be easily repaired if it's a kit build or replacement parts can be purchased for it, if it's an ARF version. That's enough pluses for building the BOT as a One Design Build and then organizing a One Design Contest around it.

The BOT has been around since the 1970's and is well known, having been built by many folks over the decades. Some of our club members even had a kit or a finished BOT around the house: a wing here, a fuselage there and the tail feathers somewhere else. I hoped to see those BOTs come out of the woodwork and join the project.

When I pitched a BOT build to the members I was gratified that there were some positive responses. A few guys even said they'd join the build before the meeting ended. I think the timing, right at the beginning of building season, made it easy to say yes and there was the prospect of months in which to order kits, peruse the instruction manual and relax with some hot chocolate to ward off the cold before anyone would be making serious and potentially embarrassing inquiries about build progress.

## Build and Contest Rules

The tricky part of all this was to make the contest fair yet allow builders as much leeway as possible to satisfy their creative urges, helping to keep them engaged in the build. We created a simple set of rules for the build and contest, mostly for the build, to ensure this.

Rules of the build if you want to fly it in the One Design contest:

- OK for plans, kit or ARF build
- OK for 108" nostalgia version or 118" version
- OK for carbon on the wood spar (remains woody legal)
- OK for larger wing rod
- OK to add spoilers, but they must be disabled for the OD contest
- OK to reshape and fiberglass the kit fuselage and finish it as you please
- OK for one, two, three or four piece wing
- OK to use either screws or rubber bands to hold down the wings
- OK to choose your own electronics and layout
- Decorate as you like
- No skegs will be allowed in the contest (you won't need one)
- Other modifications: With the new launch approach, more leeway will be given to modifications as they will not make a major difference when launching. The basic guideline is to make internal improvements (lighter, stronger, easier to transport) and not external enhancements to the wing or tail group (bigger wing, different shape wing, different airfoil). The CD has the last word on whether a model modification may be entered in the one Design Contest. If your modification falls outside of these rules it would be a good idea to ask first.

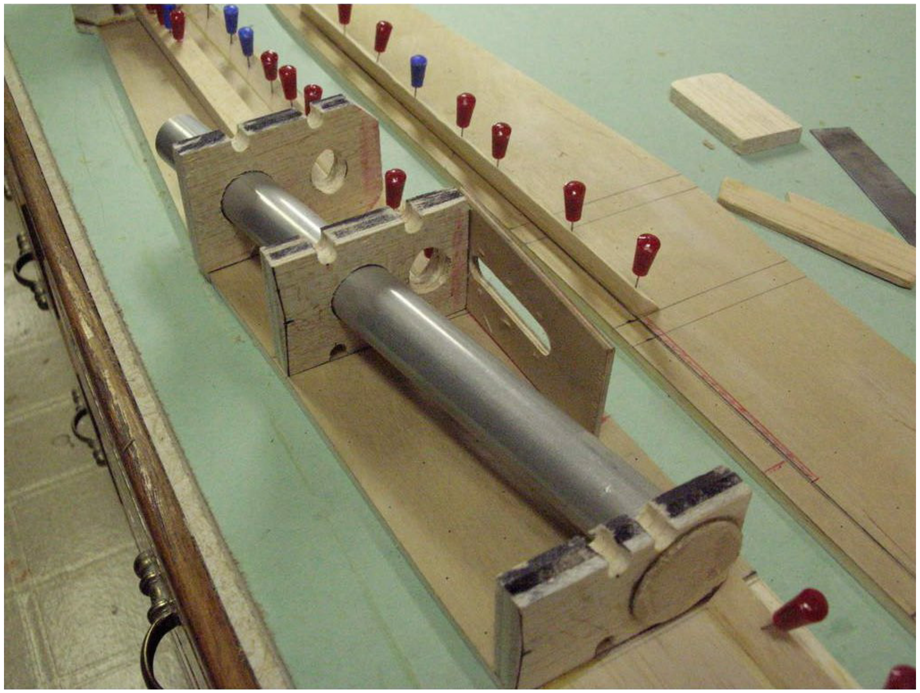
Initially the rules, as shown above, were meant to work with only flying off a Hi-start. That was so BOTs with stronger, carbon capped wings, would not have an advantage flying off the winch versus BOTs that were built to plan: without the carbon capping. Just before the contest the Merokes tried flying off the winch; just for fun. They instantly fell in love with it. As you can probably forecast, the contest was changed to allow pilots a choice between the Hi-start and the winch. By that time all the BOTs had been launched off the winch at least once, so everyone had the ability to use the winch as an option. We made the best of the situation by setting the Hi-start and the winch up to launch to about the same height.

## Building

Getting some club involvement with a BOT build was incentive enough for me to start a BOT Build thread on RCGroups. I thought of it as an icebreaker: show some progress and get more folks involved. I used my own build in the thread, intending to show and solve problems I encountered before anyone else got to them in their own builds. I ended up being just good enough to chug along making steady progress and staying ahead of the rest of the club builders, but not doing anything novel. I was blown away, a few times, when builders showed up on the thread and added commentary and pictures of their BOT builds. They did the truly novel builds, showed new techniques and gave

*Frank Strommer throws and pedals the Meroke BOT for its first flight off the winch. This is where it all went mushroom shaped.*

*Who knew the Meroke guys would embrace the winch so quickly. Photo by Rudi Oudshoorn*



*Upper left: Wayne Smith's BOT build adds a ballast tube and longer nose to his BOT. (His build starts on page 17 of the build thread in RCGroups)*

*Upper right: Pete Nicholson begins construction of a BOT wing using carbon capped spars. (His build starts on page 20 of the build thread in RCGroups)*

*Left: John Cole's BOT build is a must read. It's a wedge shaped fuselage with spoilers and has too many innovations to go into here, but you can see a couple in this picture. (His build starts on page 32 of the build thread in RCGroups.*


*Howard Applegate, a top notch LISF builder, built this Bird of Time keeping to the plans, but replacing the kit wood with better wood in places. Photo by Rudi Oudshoorn*

the thread the spice it needed to keep folks coming back. By the way, if you plan on using a thread to get your own club members involved, use lots of pictures. When I had less pictures in a post, I had less response and less build input from others. Interesting.

I learned a lot about building techniques that I've heard about, but never tried. Just following a builder's thoughts as they are building or even planning on building can be a great learning experience. It was a way of not having to think of everything all on my own. Did I just describe the builders as teachers? Well, they were.

At some point, after the thread got going, the builders started asking less questions and began reporting more progress building their BOTs. Progress in each person's build varied wildly. One person might be spending a lot of time planning just how to build the wings really strong for launching off the winch. Another was very concerned about and hence was replacing some wood in the kit. One was learning to build with CA and balsa for the first time. Another was building a new, lighter, nostalgic wing. Not everyone finished in time for the One Design Contest. To those of you that weren't ready for the One Design Contest, just keep plugging away. There will be more contests.

## Meroke BOT Maiden

Since there were a lot of folks involved in Meroke's team build and we (LISF) hosted and helped them to maiden their BOT at our field, we got a well photographed event: each club had a photographer there.

Meroke built their BOT as a team build. Their seven person team was divided up so one guy worked on the fuselage, another on the tail feathers and the remainder on the wing. The day they came to the field to maiden their BOT is when it all came together for the first time. That presented a bit of an extra challenge: they had to scrounge around their toolboxes to find enough weight to balance the plane. Since we didn't have much, if any, lead, some of their balance weight was tool shaped and taped to the top of the nose for the first day's flights. As Nelson, from Meroke, explained to me later, "Power planes don't need a lot of weight in the nose. They

*Day 1: A good landing. It didn't get planted in a tall tree or the ground and it missed the poison ivy. Photo by Dennis Osik*

*Day 2: Nelson takes the Meroke BOT up for the first time. Photo by Dennis Osik*

already have an engine there, so their builders are accustomed to only adding a couple of ounces to balance the plane."

We flew in on-and-off rain over two days. The morning of the first day was spent mostly waiting for the mowers to finish. Afterward we did a lot of test throws trying to figure out what went wrong on the first Hi-start launch, causing Meroke's BOT to end up in a small tree. It had launched well, though not very high, and after leveling off did a one eighty; right towards the trees. Naturally, as soon as it made it to the tree line, it spiraled down. We were lucky. It missed the tall trees and all the damage it sustained was that one leading edge got a small dent. Eventually, after many hand throws and some head scratching, we found it had a bad servo. The servo was replaced overnight and some smaller dimensioned weights used inside the nose for that streamlined look.

The second day was much better. We flew my BOT just to regain some confidence after the previous day's crash and then Meroke's. Meroke's BOT flew very well right from the start. The Meroke guys got some test throws and a couple of flights out of it before the rain picked up and we called it a day; a very happy day for all.

Nelson Ramos did the honor of flying the Meroke BOT. He had a big smile at the end. Nelson is a guy with a basement workshop full of large power planes,

*Nelson completes his first real flight of the Meroke BOT. Rain? What rain? Photo by Dennis Osik*

but he said he experienced some heart thumping excitement flying the BOT. He was launching and flying higher than he normally would, gliding over trees on his approach and with a non-power sailplane and he only had one chance to make it back for a landing. He did very well.

## The One Design Contest

The BOT One Design Contest, held this July 24th, had weak thermals and a strong turnout. Both the Meroke and LISF clubs were well represented in pilots and supporters. Total BOTs: seven. Total pilots: eight. Total spectators: lots.

Winds were very low, which was good for this contest. Pilots new to sailplanes and pilots flying recently completed BOTs with very low airtime had, in theory at least, easier and less eventful trips up the Hi-start and winch.

Each pilot was free to fly off the winch or the Hi-start. The winch launched noticeably higher than the Hi-start, even though we tried to make them act the same by lengthening the line on the Hi-start and tapping up the winch very gently. Interestingly, most pilots chose the Hi-start over the winch. The Hi-start could have done better, if only we had a descent headwind. Still, it was no slouch and we were getting reasonably high competitive launches off it. Pete Nicholson, who had the longest flight of the day, had it off the Hi-start, when the winch was having problems. We used a Hosemonster three meter Hi-start, with one hundred feet of rubber and only 400 feet of line: the maximum that would fit on our field without having to launch out of a tree, given the direction of what wind there was. The winch had 550 feet of line.

## Where Does It all End Up?

A One Design Build can create changes in a club, but does the club really want those changes? A tougher question is, is what a club wants what's really good for the club? That's a question to file away and pull out when you're kicking back after a day's flying and in a philosophical mood. To see what direction your club may go and the fallout of traveling in that direction, ask yourself some questions ahead of time, then ask the folks who will be affected by the change. Is the group building a different type of model than everyone else is flying? Imagine adding a bunch of unlimited ships to a club that is primarily DLG. Will the build lead to more of one contest type than another? Contests have a way of taking over a field and not everyone will want a One Design Contest. Will the build change the balance of the club? Will people leave because they don't want to share their field with a different type of plane or the folks flying it? Think of foamies suddenly showing up and flying on the same field that has traditionally been the domain of unlimited ships.

Change: we can observe it, ignore it, flow with it, direct it or fight it. Those club members not involved our One Design Build could pretty much ignore it. Those that were involved flowed with it, though each took a slightly different course. Once started, it needed very little direction and no one fought it... um, that is not after we agreed on a model to build and the rules. I'd like to think we were making only positive changes by having the One Design Contest. Some of the contestants may never have been more involved in contests than to fly on the field at the same time as a contest; if they were allowed to fly during the contest at all. So our One Design Contest was a good change for our club; wasn't it? Members became engaged more and flew more. If you believe this, just be prepared; not everyone will see it the same.

In a club's One Design Build you'll find a harmony of opinions and actions. They are like votes saying, we members want this and we want this enough to invest our time and money and to build it with our own hands. The build could be a passing interest that fades away to be replaced by next season's build or it could continue to grow and develop. In either case, while the building is going on, the builders are growing themselves, their club and their hobby.

## Reference

The One Design Build Thread: <http://www.rcgroups.com/forums/showthread.php?t=1331363>


*One Design contestants and their Birds of Time. Photo by Rudi Oudshoorn*

# ALES Timing Practice Audio Files

By Curtis Suter, suterc@msn.com

There are many times when I'm flying my gliders with no one else at the field and would like to fly a timed task. Without some kind of goal to achieve I find that I fly aimlessly around the sky and landing only in the general area. It's great fun but at the end of the day it lacks satisfaction. I could have learned more about myself, my glider and the weather if I were flying a timed task as I have a goal to achieve.

So I searched for an automated timer that would count down a timed task without the use of a human being. I purchased a "Talking Timer" which was fine but it didn't have the countdown format that I prefer. Then I saw some .mp3 audio player timing files on RCGroups. They sounded great and were very well done but they also didn't count down in the format that I prefer.

So I made some of my own using free text-to-speech and sound editing software. I thought I'd share them with the worldwide modeling community.

I've provided four files for practice of Altitude Limited Electric Soaring (ALES) soaring tasks. Actually they can be used for any precision thermal duration task flying. There are one, three, five and ten minute task files. The files are in .mp3 format and should work on any portable music player.

The countdown timing format is a five second countdown prior to start, a 30 second statement after the task starts which is to help the pilot identify motor shutdown when using an altitude limiting device such as the CAM from <http://www.Soaringcircuits.com>. A reminder every minute till the last two minutes, every 15 seconds under two minutes, every 5 seconds under one minute, and lastly every second the last 20 seconds of the task.

The sexy lady's name is Microsoft Anna.

If you wish to make your own audio files you can do so with free sound editing software. Dave Register has written a nice tutorial on how to do so and shared this on RCGroups. Thanks Dave! <http://www.rcgroups.com/forums/showthread.php?t=887035#post10060103>

The audio timing files are brought to you FREE courtesy of <http://www.TailwindGliders.com> and can be downloaded on the "Articles/Files" page of the website.

I wish you the best of luck with your flights and landing practice.

<u>Links</u>:

Audacity Sound Editor:
<http://audacity.sourceforge.net/>

Here are some other audio timing files that may be of interest:

Dave Register's files can be downloaded at RC Builder:
<http://www.rcbuilder.com/download/DLG-Timing.zip>

and more from Dave here:
<http://myweb.cableone.net/regdave/DLG_Time.htm>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