Radio Controlled Soaring Digest

February 2007 Vol. 24, No. 2

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Front cover: The cockpit area of a 1:3 scale Breguet Br–903 "Choucas," built by Arnold Hofmann of Freiburg Germany, and now owned by Rick Briggs of Southern California. Rick provides more information on this model starting on page 23 of this issue. Photo by Doug Hackett. FujiFilm FinePix 3800, ISO 100, 1/420 sec, f8.2.

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Back cover: The gorgeous Acacia 2 of Greg Dakin. Greg achieved the fastest time of 39.96 secs and was runner up at the sixth event of the 2006 BMFA F3F League, the UK national league for F3F models. Greg's performance in 2006 saw a renewed interest in this pretty yet very strong F3F ship. Photo by Michael Shellim. Pentax *ist DS, ISO 200, 1/1500 sec, f5.6, 103mm

R/C Soaring Digest

Managing Editors, Publishers — B² Kuhlman

Contributors — Chris Adams, Gerry Carter, & John Skinner
Chris Boultinghouse
Dave Copple
Jay Decker
Dave Garwood
Russ Light
Dave Locke
Tom Nagel
Mark Nankivil
Dave Shaw
Jerry Slates

Photographers — Dave Garwood
Dave Beardsley
Gregory Luck
Mark Nankivil
Michael Shellim

Contact — rcsdigest@themacisp.net
Web: http://www.rcsoaringdigest.com
Yahoo! group: RCSoaringDigest
AIM screen name: RCSDigest
Microsoft Messenger: rcsdigest

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R/C Soaring Digest (*RCSD*) is a reader-written monthly publication for the R/C sailplane enthusiast and has been published since January 1984. It is dedicated to sharing technical and educational information. All material contributed must be exclusive and original and not infringe upon the copyrights of others. It is the policy of *RCSD* to provide accurate information. Please let us know of any error that significantly affects the meaning of a story. Because we encourage new ideas, the content of each article is the opinion of the author and may not necessarily reflect those of *RCSD*. We encourage anyone who wishes to obtain additional information to contact the author.

In the Air

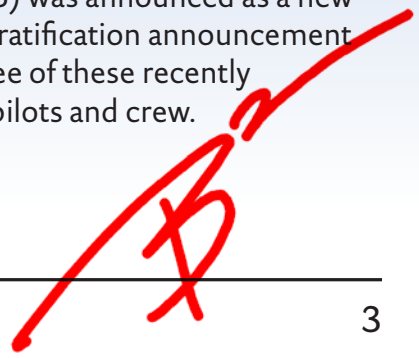
We mentioned availablity of the small Submissions.pdf at the end of our editorial last month. Since then, we've received articles and photos from several readers, one new to *RCSD*. Given that this is the first contribution any of these readers have made to *any* publication, the response is especially gratifying Thanks, guys!

We have some exciting articles and stunning photos planned for future issues of *RCSD*, but there's always room for more. If you are considering contributing to *RCSD*, but have been held back for some reason, we encourage you to send in what you have. We and other RCSD contributors are standing by to assist you in getting your article ready for publication.

Our windstorms, snow and rain have been making national news. We have, however, been able to do some backyard flying a few times with our Alula2. It's now on its second gear set in its second elevator servo, but still going strong. What a great little glider!

This last month has been an active one for FAI, the worlwide aviation governing body, and records for model aircraft. We've listed all of the most recent records in this issue on page 7. Interestingly, one record (No. 14045) was announced as a new claim just the day before the record ratification announcement was published (see page 51). All three of these recently ratified records now belong to U.S. pilots and crew.

Time to build another sailplane!



Soldering for R/C Sailplanes

An outline of tools, materials, and techniques

Russ Light, Seattle Area Soaring Society

This article is based on a two-part PowerPoint® presentation given by Russ to the Seattle Area Soaring Society, November 2006 and January 2007.

• TOOLS

Soldering irons and tips, solder, soldering flux, holding vise, wire stripper/diagonal wire cutter, surface preparation tools, heat gun, heat shrink tubing, volt-ohm meter

• MATERIALS

Solder, flux, cleaning iron tips, desoldering

• TECHNIQUES

Basic soldering, wire splicing, wiring harnesses, DB-9 connector, Deans Ultra connector, control linkages

SOLDERING IRONS, ETC.

Pencil type (AC and battery powered, 20 to 30 watts) and gun type (75 or more watts). Gas type not recommended.

PENCIL TYPE IRONS
American Beauty Little Dandy Model 3108, 20-30 Watts, $60.
Applications - electronics, small gauge wiring, connectors

SOLDERING GUN
Weller 7200, 75 Watts, $33
Applications - control linkages and heavy gauge wiring

SOLDERING STATIONS
Weller WESD51PU power unit with PES51 soldering pencil, H50 stand, ETA tip and sponge, 350°F to 850°F, 50 Watts, approximately $150
Applications - electronics, small gauge wiring, connectors

The Weller soldering station.

PORTABLE SOLDERING IRONS
Battery powered soldering irons are not a substitute for a good AC powered iron.

SOLDER

Tin-lead (60/40) with rosin flux core or acid flux core. The rosin flux type has been the standard for electronics until the recent move to leadless solders.

A typical tin-lead (60/40) solder with rosin flux in the core. Available in one pound rolls.

Silver solder gives a stronger joint with a higher melting temperature.

Lead-free solder is becoming increasingly available. The two main alloys are variants of tin-copper and tin-silver-copper. These alloys have higher melting temperatures and wet metal surfaces more slowly,. The joints also look different in that the surfaces are not as reflective as tin-lead joints. The flux chemistries that worked well with a leaded process are not the best fit for lead-free soldering. Always use lead-free compatible fluxes when working with lead-free solder.

Wonder Solder is a rosin flux solder which comes in 0.031" and 0.050" diameters. One pound spool of 0.050" is $39.00, 10 feet is $4.00; one pound spool of 0.031" is $44.00, 10 feet is $2.00.

Cardas Solder Quad Eutectic Roll Solder is an ultra pure, tin/lead/silver/copper, 0.032" solder, with an activated rosin core or organic water base flux. Available in 1 lb. or 100 gr. rolls.

SURFACE PREPARATION

Purpose: Remove oxide layer on metals to be soldered. This increases the ability of wetting (alloying) the solder to the metal.

Abrasion with a diamond file

Cleaning (degreasing) with isopropyl alcohol or acetone

SOLDERING FLUX

Purpose: The flux produces an acid upon heating. Different fluxes produce different levels/types of acid and at different temperatures. The acid is designed to remove oxides from the metal surfaces to be soldered.

Rosin type is made from pine sap and produces mild organic acid (abietic acid)

"Acid" type (paste flux) is the stronger class of flux; often a form of hydrochloric acid. (The paste form has zinc chloride.) This is good for making difficult oxides dissolve so difficult metals like stainless steel can be solder-wetted. This type of flux should be cleaned away from parts after use with baking soda, isopropyl alcohol and a small amount of dish soap.

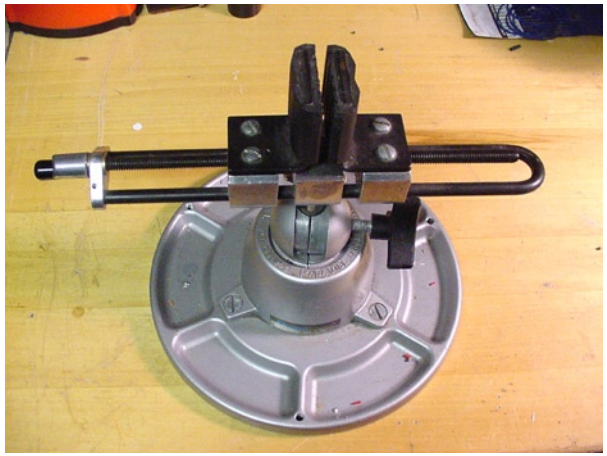
DESOLDERING

This process can be accomplished using either desoldering wicks or a vacuum bulb.

HOLDING VISE (THE THIRD HAND)

Desoldering wick

Purpose: Some kind of "third hand" is essential for soldering. Most bad solder joints are due to not holding the parts still during the cooling process. A good holding vise for electronics work is the Panavise Model 350, about $60. I have found it to be the most versatile for soldering and many other modeling activities.



Panavise Model 350

Typical wire stripper

Typical wire cutter

WIRE STRIPPER

A good quality wire stripper is essential. Buy one that has specific wire gauges, not variable gauges.

Be sure its designed for stranded wires, not solid wire.

You're looking for a 16-26 stranded wire stripper like the Newark InOne No.: 58F587, Ideal Part No.: 45 45-121, about $15.

Always test the wire being used to determine the best hole. Wire insulation depth can vary so AWG rating can sometimes be misleading.

Keep wire and tool at 90 degrees.

Do not use a stripped wire if the wire strands are cut into and fall off. Servo wire is very small gauge (standard is AWG 26) and you need all the strands.

WIRE CUTTER

The wire cutter should be able to cut flush against circuit boards, etc. Try the Newark InOne Part No.: 50F172, Xcelite/Cooper Tools No.: 170M, about $7.

HEAT GUN

A Monokote heat gun works fine for heatshrink tubing. Its disadvantage is that the air is highly distributed as compared to a commercial heat gun designed specifically for heat shrink applications. Use the focus attachment and set the gun for heat temperature by closing the rear vents. Protect airplane parts from excessive heat by using aluminum foil or sheeting to divert hot air.

I do not recommend using the soldering iron or recommend open flame for heat shrink. The heat is not applied evenly and the temperature is too high.

VOLT-OHM METER

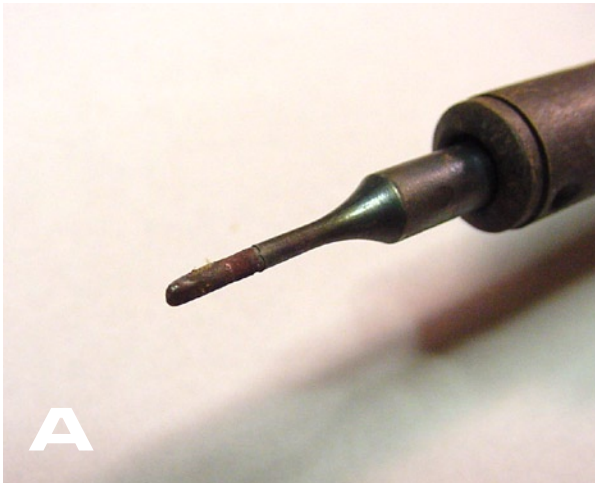
A volt-ohm meter is very useful for checking continuity of wiring harnesses, voltage of battery packs, current consumption, etc. Cost anywhere from around $20 to $100.

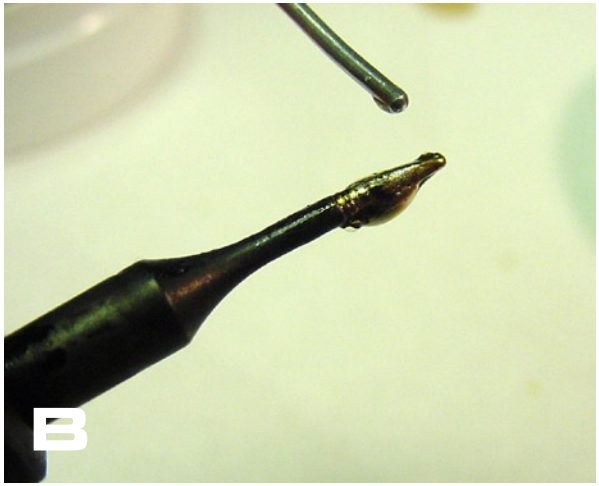
SOLDERING DO'S

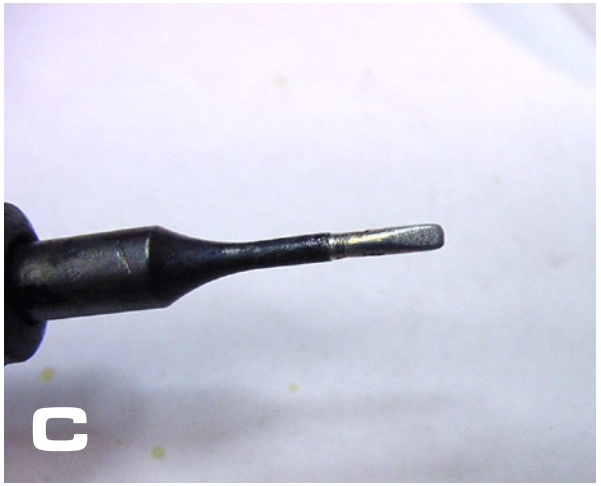
– Do tin all wires
– Do ensure materials can be held in place during soldering and cooling
– Do clean tip for each solder joint
– Do tin soldering iron tip before each joint
– Do heat materials then apply solder
– Do make sure the finished joint is smooth and shiny
– Do allow joint to cool naturally
– Do use rosin core solder

SOLDERING DON'TS

– Don't use acid flux for wire or connectors
– Don't use wrong wattage iron or tip
– Don't apply too much heat, get in and out
– Don't forget to put heatshrink onto wire before soldering
– Don't leave sharp or jagged tailings, retouch with iron
– Don't blow on joint to cool it
– Don't jiggle during cooling
– Don't be lazy and not redo a connection that you know is marginal







A dirty tip (A) can be easily cleaned. Heat iron and apply flux paste, clean. Then "tin"with rosin solder (B). (C) Clean tip between application.

SOLDERING IRON MAINTENANCE

Use 400 grit sandpaper or ScotchBrite to clean badly oxidized tips

Heat iron and apply flux paste, clean. Repeatedly "tin" with rosin solder, and clean tip between application.

TINNING

Always tin a wire before soldering.

Strip the wire to the proper length, hold wire in a vise. Clean soldering iron tip and tin.

Timing is everything. Touch the iron tip to the exposed wire and quickly feed a small amount of solder into the tip while running the tip over the length of exposed wire.

The stranded wire should quickly receives the solder, completely covering the exposed wire so it is smooth and continuous.

A small bead will often form at the end of the wire. This bead should be removed. Trim with sharp diagonal cutters.

WIRING HARNESSES

WIRE

STRANDED VS. SOLID

Never use solid wire for any aircraft application, it is too prone to breakage after bending. The more strands the better for a given wire gauge.

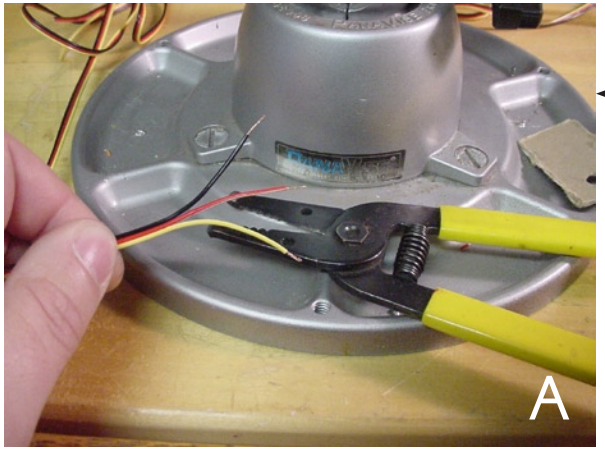
WIRE GAUGE

– Micro servo wire – 32 Awg
– Standard servo wire – 26 Awg
– Heavy duty servo wire – 22 Awg

INSULATION

– PVC VS Teflon PVC tends to shrink back under higher heat. Teflon will not do this.

Small and large soldering iron tips. Both of these examples have chisel-shaped ends.



TECHNIQUES FOR WIRE SPLICING

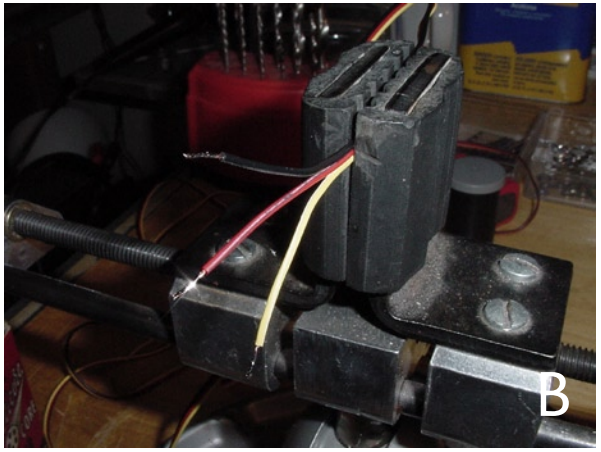
(A) Strip and twist wire ends

(B) Tin wire ends and trim tips

(C) Don't forget the heatshrink!

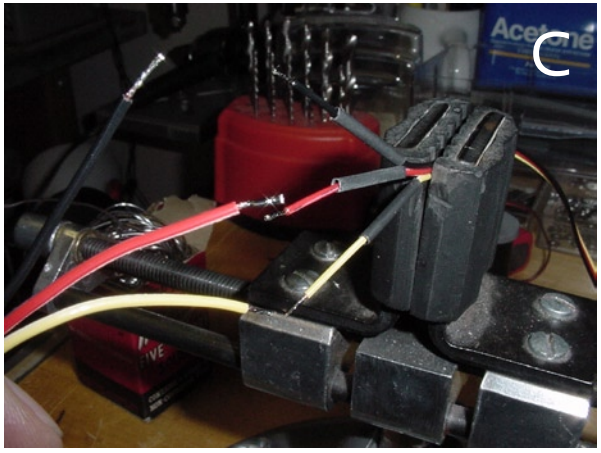
(D) Side-by-side soldering technique

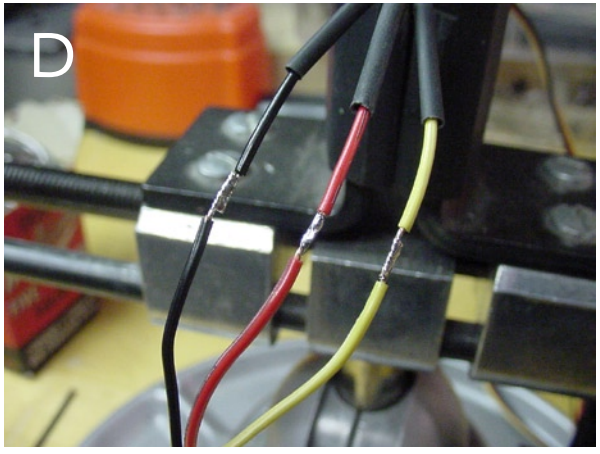
(E) Ready for shrinking

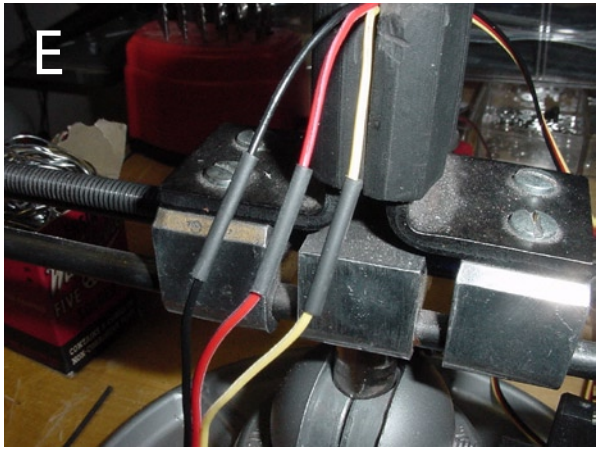


HOW TO MAKE TWISTED CABLES

- Separate the three wires in standard servo wire by cutting between insulation with cutters and pulling apart slowly
- secure wires in a vise
- secure other end in cordless drill
- lightly pull tight and run drill at slow speed
- add a small piece of heatshrink every six inches to hold the twists in place







CONNECTORS

These include the sub-miniature DB-9/15, Micro D, Multiplex– 6 Pin, Molex KK Series 0.156" Type, and the Dean Ultra Connector

DB-9

The DB-9 is the most popular connector.
- Use a very small soldering iron tip, about 1/16" = 0.063"
- Tin servo wire
- Cut tinned wires to a length that fits just to the bottom of the DB connector solder cup plus a fraction
- Slip heat shrink over each tinned wire about 0.5" long, slip back as far from tinned end as possible to avoid shrinking during soldering
- Mount DB connector in vise with cups pointed to the ceiling
- Heat and fill each solder cup with solder, be sure to get good flow and fill the cup to just below the surface
- Start on one end of connector and alternate between the two contact rows, for thee right-handed, start on left side
- Clean solder iron tip, tin with a small amount of solder then while holding the tinned wire in one hand heat the solder in the cup to receive the wire. When the solder flows in the cup insert the tinned wire and hold until cool
- After installation of all wires slip heat shrink down over each connection. Heat shrink is critical since even with this procedure some of the wire insulation will no doubt have melted back exposing bare lead which can be a source of a short.

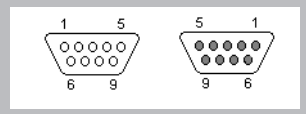
Some notes on using the DB-9 connector in sailplanes:

In electronics, the DB connector will have a strain relief backshell to prevent wire breakage. In sailplanes this is not possible. After testing all electrical connections of the connector use some epoxy and thickener on the back of the connector for a strain relief. Be sure to use the thickener so that the epoxy does not run out to the sides - the opening for the DB connector is very tight.

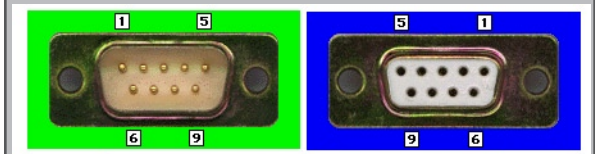
For the DB-9 connector you have 12 servo wires and only nine contacts. Standard convention is to use the female connector for the side of the circuit delivering power. Use the female connector for the fuselage and the male for the wing.

This lack of a contact for each servo wire makes the DB-9 not the ideal connector for a full house wing but is very prevalent in sailplane models and easily acquired.

I like to assign contacts 1,2,6,7 to one side of the wing, and 4,5,8,9 to the other (contact 3 is unused). Never try and install two wires into a single DB solder cup. Instead, solder a single wire to the cup about 1" long then solder the two power or ground leads to this wire and cover with heat shrink.



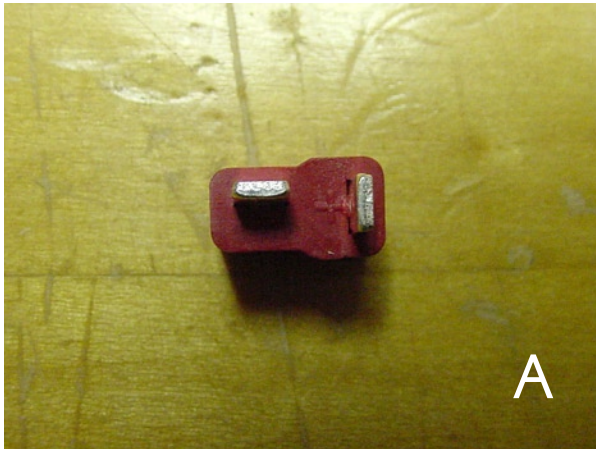
DB-9 pin layout



Micro D connector

One possible DB-9 pin arrangement:

CONTACT	SIGNAL
1	Left wing power
6	Left wing ground
2	Left wing flap
7	Left wing aileron
5	Right wing power
9	Right wing ground
4	Right wing flap
8	Right wing aileron
3	Unused



DEAN ULTRA CONNECTOR

(A) Apply wires on this side of blade

(B) Pre-tin Contacts

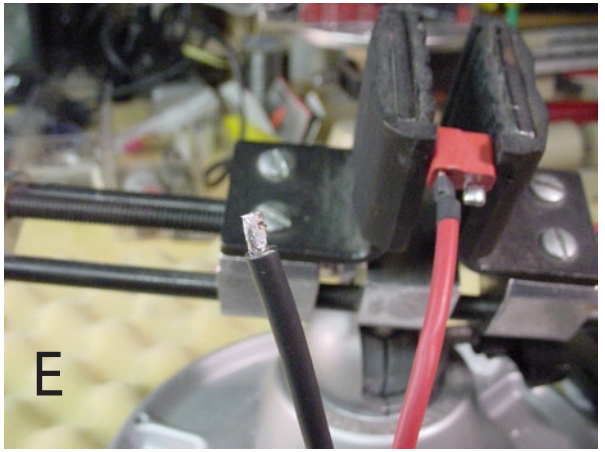
(C) Strip wires, apply required heat shrink, and add heatshrink to end of one wire to avoid shorting

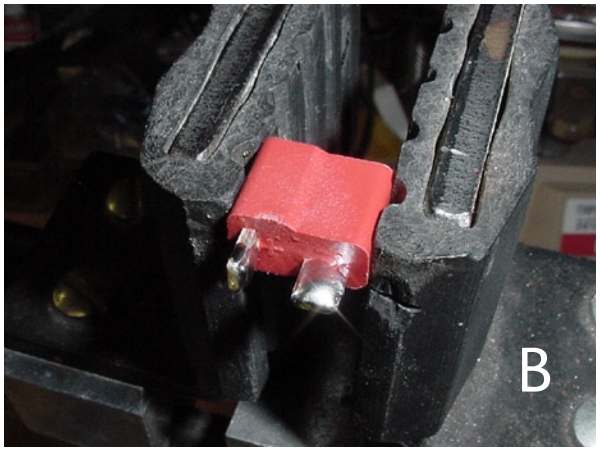
(D) Pre-tin wire

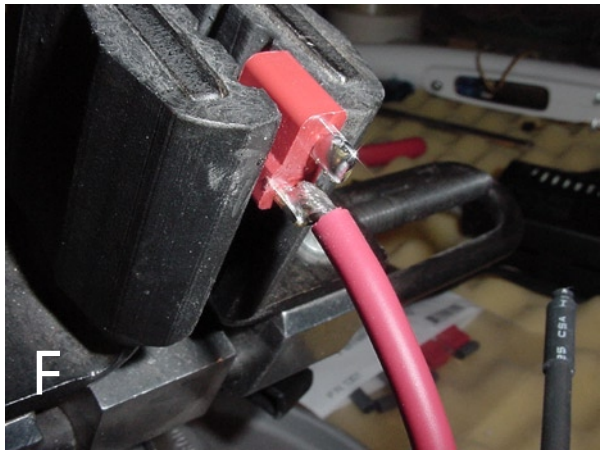
(E) Flatten pre-tinned wire to get better contact with connector blade

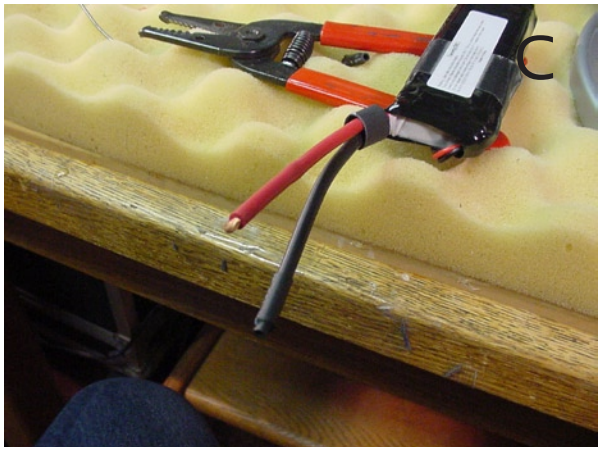
(F) Solder one wire

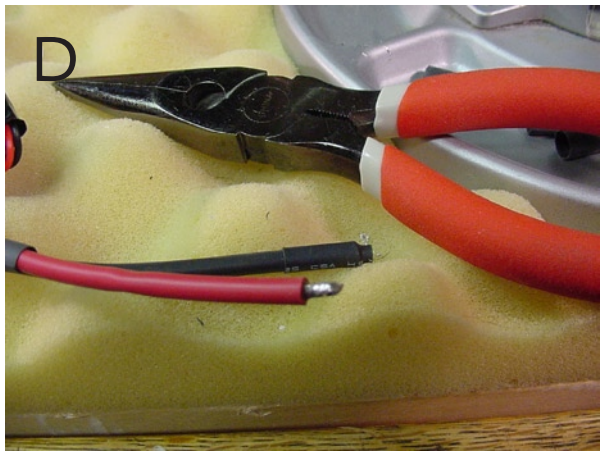
(G) Apply heatshrink and repeat with second wire

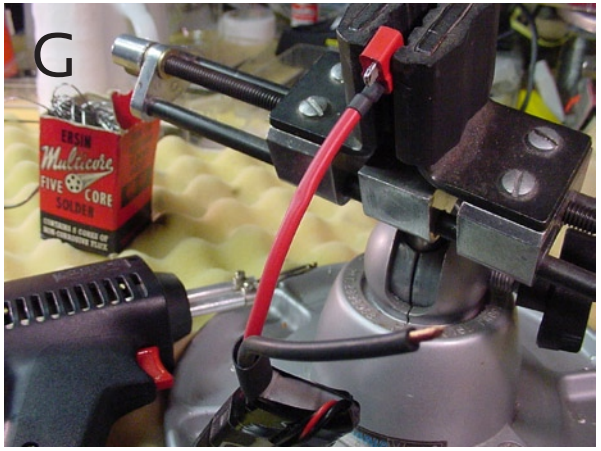


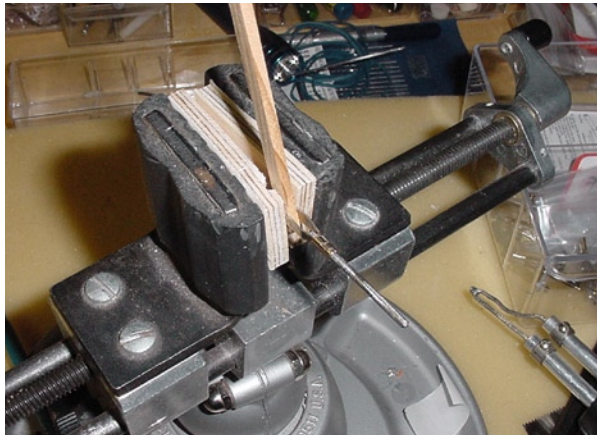


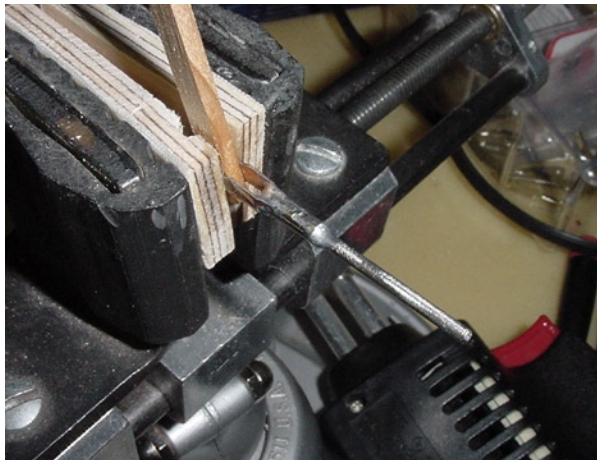


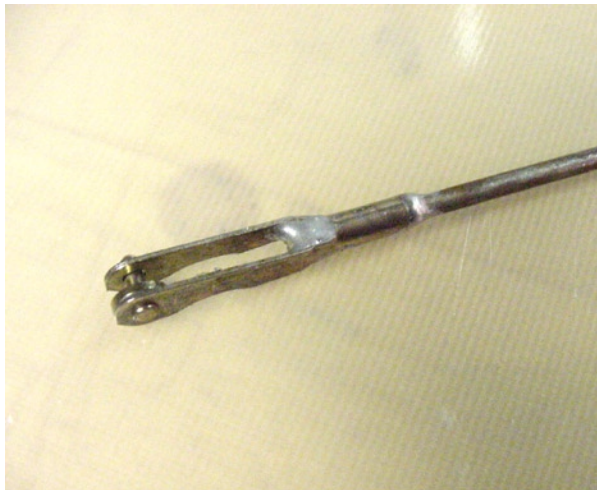












CONTROL LINKAGES

The soldered control linkage is one of the most strongest, most slop-free and reliable linkages possible. On the internet there is much debate on the soldered linkage versus the carbon rod/glued linkage. Investigate and make up your own mind on the subject. Personally, I prefer the soldered linkage, but I am comfortable with the soldering process.

What is Music Wire? Music wire is a high grade, uniform steel wire originally intended for strings in musical instruments. It is currently used in the manufacture of spiral springs and mandrels. AISI 1085 spring wire has excellent fatigue properties and will endure high stress.

Solder linkage consists of using a metal clevis and music wire. Preparation, acid flux, and a higher wattage iron are the keys to success.

Work in a well ventilated area preferably with a small fan running to get a modest amount of air flowing past the work area but not so much as to be cooling the area where the soldering will occur. Fumes from soldering are not healthy especially with the use of acid fluxes.

Use 2-56 threaded Sullivan clevises. These are always stocked locally instead of the solder version.

Drill out the threads with a 5/64" drill.

Buy 0.077" music wire (at least that is what my caliper says, actual value may be +/- a few 0.001), 2-56 threaded rod is 0.080"

This diameter music wire will just fit into the clevis with quite a bit of friction. This allows for holding the rod precisely when you are doing soldering or just doing trial fits.

Setup all the linkages using 2-56 threaded rod. Measure distance between clevises with calipers and cut 0.077" wire to the appropriate length. Measure and the cut music wire so that about 0.1"-0.2" extends beyond inside of the clevis.

Use a diamond file and rough the end of the music wire over the area that will receive the solder.

Rough the inside of the clevis with a small round file.

Degrease the wire and clevis using solvent (e.g. isopropyl alcohol or acetone).

Apply acid flux to the music wire and clevis.

Hold the clevis in a vise, but use some small pieces of wood between the vise jaws and clevis. This helps to prevent the vise from acting like a large heat sink.

Insert the music wire into the clevis to the proper distance.

Use a 75 watt or greater soldering iron. Heat the iron to maximum temperature. Starting at the front of clevis apply the tip of the iron to the joint of the wire and clevis and hold. Heat both parts for about 30-45 seconds until the acid flux melts.

Feed solder into the iron tip and clevis. If you got the parts hot enough the solder will flow around the area smoothly. If the solder only partially melts or too quickly cools then you probably need a hotter iron.

Repeat the step above at the base of the wire and clevis. Do this immediately after the above step as the parts will be already heated and should require only a small amount of heating before applying the solder.

Allow the soldered parts to cool completely then inspect to be sure you got good soldering flow around the clevis in both areas. Rub the area with some baking soda to neutralize the acid flux and rinse in water.

After soldering one side, push on the other clevis to the exact distance.

Be sure to check that the clevises open to the correct side for the particular installation. Set against a flat surface to align the clevises.

Solder the second clevis to the music wire.

FINAL THOUGHTS

Buy the best tools you can afford, it really makes the difference.

Take your time, soldering is just like any other activity in modeling.

Practice first on a spare wire, connector, or linkage.

If your joint is not shiny and smooth, do it again.

FAI has ratified the following Class F (Model Aircraft) records :

Claim number : 13908
Sub-class F5 Open (Aeroplane, Electric motor S (rechargeable
F5: Radio Controlled Flight Category
Type of record : N°174: Distance to goal and return
Course/location : Wakita, OK (USA)
Performance : 144.42 km
Pilot : Thomas HAYS (USA), Crew : Dan BIERLY (USA)
Date 02.06.2006
Previous record : 142.8 km (27.05.2006 - Raymond J.V. COOPER, Australia)

Claim number : 14000
Sub-class F5 Open (Aeroplane, Electric motor S (rechargeable
F5: Radio Controlled Flight Category
Type of record : N°171: Duration
Course/location : Stillwater, OK (USA)
Performance : 12h 21min 40sec
Pilot : Thomas HAYS (USA), Crew : Dan BIERLY (USA)
Date 24.06.2006
Previous record : 10h 38mn 30s (21.06.1998 - Emil HILBER, Switzerland)

Claim number : 14045
Sub-class F5 Open (Aeroplane, Electric motor COMB (all sources of
F5: Radio Controlled Flight Category
Type of record : N°195: Distance to goal and return
Course/location : Stephenson County, IL (USA) - Winnebago County, IL
Performance : 67.32 km
Pilot : David FRATELLO (USA), Crew : FRATELLO Armond
Date 16.08.2006
Previous record : 80.43 km (24.09.2006 - Jüri LAIDNA,(Estonia)

60th

Model Aeroplane Association of Australia

Nationals

Theo Arvanitakis gives Jim Houdalakis one of his trademark *uber* launches, Dave Pratley looks on in awe.

Steve Keep campaigned the Dave Hobby Pike Superior to good effect.

Graham Norman campaigned a Mibo Modeli Shadow to great effect; both pilot and glider coped well with the conditions. The Mibo Modeli Vision is one to watch.

The 60th MAAA (Model Aeroplane Association of Australia) Nationals were held December 28th 2006 through January 4th 2007. Albury-Wodonga hosted the Australian Nationals over the course of a week. All aspects of aeromodelling were addressed, but for the glider pilots HLG, F3J and F3B reports follow. Thanks to Gerry Carter (CD) and John Skinner for the reporting. — Chris Adams

F3J Thermal (with winch launch)

This event was run over two long days with 13 rounds flown in all. Run to the FAI F3J rules, this event was tougher in a number of ways to the usual Australian Open Thermal Rules. In particular, under the FAI F3J rules, there is no such thing as a "perfect" score. The task is to achieve the longest flight possible within a 10 minute window. Flight time is measured from the time the model leaves the launch line to the time the model touches the ground. There is also a precision landing bonus. The model must touch the ground before the 10 minute window expires.

The flight line was arranged with teams 15 metres apart so that all pilots could launch at exactly the start of the working time. It was quite a sight to see up to five high

John Skinner looking well pleased. His F3B speed run stopped the clock at 14.11 secs. His weapon of choice; Caracho 3000.

Brad Wilman launches for Marcus Stent. The glider is in development and is the brainchild of Bruce Nye, Marcus & Stephen Boag.

performance gliders, all with wing spans of over 3 metres, launching simultaneously.

When all pilots achieved their flight times, the landings were also all happening at the same time. Thermal conditions over the two days varied widely with some heats won with times that were much less than the theoretical 10 minutes maximum. This made the whole event very challenging in terms of testing the pilots thermalling skills.

The outstanding pilot was Carl Strautins who seemed to have no trouble finding thermals and whose landings were deadly in both timing and accuracy. At times there was massive lift, and at other times massive sink.

Competitors were very appreciative of the effort put in by the VMAA, the TCMAC, and the facilities and catering provided for the pilots.

Throughout the competition the pilots also became quite familiar with the property owner Andy and his wife and family, and they showed a great deal of interest in our activities. Andy is a bit of a character, a lovely man and was good fun to have around.

The final result for F3J:

1st Carl Strautins - Icon (Maple Leaf Design <http://www.mapleleafdesign.com/icon.html>)

2nd Max Kroger - Pike Superior (Samba Model <http://www.f3j.com/superior.htm>)

3rd Daniel Haskell - Espada RXL (Jaro Muller <http://www.jaro-muller.com/espada_rl.html>)

John Skinner unleashing Mike Taylor's Caracho 3000.

F3B Glider Multi-Task

This event was run at the same field as the F3J Thermal over the following two days and six rounds were flown.

The three tasks are;

Task A (Thermal) 10 minute flight and precision landing in 12 minutes working time.

Task B (Distance) The most times up and down a 150 metre course in four minutes wins. The four minutes is within a seven minute working time.

Task C (Speed) The quickest time for four laps up and down a 150 metre course wins. The working time is four minutes.

We were fortunate and extremely grateful for the help of a group of Air Cadets who volunteered their time to help with the running of the distance task. This task requires a person at each end of the course for each pilot so that, if three pilots are flying, you need six helpers.

Radical F3B Brad Launch

Without this help there is no way that the event could have gone to six rounds. They did a great job. We were also fortunate to have two pilots (who weren't able to continue to fly) to man the pylons for the speed rounds. This enabled this part of the competition to run much more quickly than would otherwise have been the case.

Conditions were similar to those for F3J except that the wind direction for launch was at best 90 degrees to the direction of launch and more often than not, even more than this. However all pilots handled the situation well by steering their gliders around to the side (and beyond) so that the release of the glider from the line was into wind.

Plane? Check. Chair? Check. Eski? Check. Sombrero? Check. All the essentials for tackling the event. Mike Taylor prostrate.

Highlights of the competition were a number of scores for the distance task of 30 laps (of 150 metres) achieved by Steve Keep and Max Kroger. That's 4.5Km in 4 minutes with a lot of turns as well.

Speed demons stepped up next, and John Skinner peeled off a seemingly-innocuous run that yielded 14.11 seconds! That's an average of 153 Km/Hr assuming that the bare minimum of 600 metres was flown. This is perhaps the fastest competition speed flight ever achieved by any pilot in Australia.

Once again everybody was very appreciative of the effort put in by the VMAA, the TCMAC, and the facilities provided for the pilots and the property owner Andy continued to be very interested in our activities.

In the end, consistently high performance over all tasks wins F3B events and on this occasion those honours went to following;

The final result for F3B:

1st Steve Keep (Caracho 3000 <http://english.vektormodelltechnik.de/f3b,3.html>)

2nd John Skinner (Caracho 3000

<http://english.vektormodelltechnik.de/f3b,3.html>)

3rd Gerry Carter (Estrella

<http://www.aerodesign.de/modelle/F3B/estrella.htm>)

The Shadow of Graham Norman, Steve Keep launching.

HLG (Hand Launched Glider)

The entries for this event were very low, but the standard of flying was very high, particularly in the case of the winner.

Marcus Stent dominated the event with his thoroughly researched and practised discus launch technique and his flying skills.

Unfortunately one pilot was taken out of the event by a willi willi (small localized whirlwind) that picked up the model from the ground and broke it. Another was taken out when Marcus launched it using his advanced technique and folded the wing;

Marcus' launching technique is approaching martial arts status.

Three rounds were flown with the winner being Marcus and second was Theo Arvanitakis.

Competitors for F3J at the Australian NATS in Albury, NSW.

Competitors for F3B. All look surprisingly well after a rigorous four days in 37°C/98.6°F heat.

Summary

Overall the MAAA NATS glider events were a terrific challenge for competitors. It proved once again that Australia is a great breeding-ground for producing world-class pilots.

< http://www.lsfaustralia.org.au >

Have Sailplane - Will Travel

The Easy Rider

Tom Nagel, tomnagel@iwaynet.net

I have been writing periodic "Have Sailplane - Will Travel" columns for a number of years now. One of the key points is that when I write about my own travels, I am not writing about trips I take to go soaring. I write about trips that I go on with my family or for business, and then manage to squeeze a sailplane into the luggage and sneak off to go flying for a few minutes.

In order to get away with this, the sailplane has to be of modest size, and stowable, and durable enough to survive handling in the back of the family van. Most of the time that means I take a slope wing with me, early on a Zagi LE, and more recently a Boomerang. On one trip I took Rick Powers' all EPP U-2 spy plane, which packed well, but needed more wind and more space than I could always find.

I think I may have a new traveling companion, the 70" Multiplex Easy Rider. Actually, the box said "Multiplex Easy Glider," but that was so close to Easy Rider

that I downloaded some Captain America and Peter Fonda decals off the internet in order to have custom decorations.

The all Elapor Easy Rider comes in two versions: pure sailplane, and electric. I went for the electric version, which for $89 includes the airframe, pre-installed control surfaces, a bag of mechanical doodads, a speed 400 motor and a folding prop. The electric version with a 1200 MAH lipo weighs 30 ounces ready to fly. The kit builds fast and easy. The fuselage and wings only have about 8 foam parts.

Just follow the directions, which in the English version at least are clear and accurate. It feels strange to build a foamy using thick cyanoacrylate glue and spray-on accelerator, but it works just fine. The kit even includes a DVD demonstrating the construction and assembly.

A comment on construction: The wimpy little plastic canopy hold-down latches are altogether too easy to break. Tape messes up the paint job on the canopy so I am using some small niobium magnets from Radio Shack to hold down the back end of the canopy.

The kit parts come wrapped in a large sheet of bubble wrap which you can tape the into a nice wing bag for the two wing halves, and you can carry the completed model in the box the kit came in. The fuse won't go back in completely because of the tail surfaces, but you can nestle the fuse on top of the wings when traveling. The original box is sturdy and can hold the wings, fuse, batteries, charger, wing rod, transmitter and odds and ends. You also need to keep a little wire hook in the box to help you thread the aileron leads through the fuse.

In addition to the Peter Fonda decals and canopy hold-downs, I made one other mod to Easy Rider. Following a tip from the internet, I bought a three foot section of round 5/16th steel rod at Lowe's for a few bucks. It slides perfectly inside the carbon fiber wing rod, right at the CG, and adds about 12.5 oz of ballast for sloping. Fit a small piece of wood dowel at each end of the carbon fiber wing rod to make up the 1 meter length. The steel rod and the larger 2200 milliamp lipo bring the total weight up to 45 ounces. The plane still flies well even 50 % heavier than stock. (If you are a 200 pound guy, imagine how well you would get around at 300 pounds.) The extra weight helps

with penetration and speed on the slope. Easy Rider can handle 15 mph winds un-ballasted, but is faster and smoother with the ballast rod on board

I use the spoileron set up suggested in the instructions, and find that it helps with landings both on the slope and on the flat field.

Easy Rider is not a high performance electric; its launches are sedate, and its roll response a little slow. The under-cambered wing section saps the top end speed. But in my opinion, you do not want to haul expensive high performance equipment along on vacation.

Easy Rider is an easily available, decent performing, inexpensive sailplane that you can slope, thermal or power fly, and it fits mostly back inside its original box, making it easy to haul along on travels. Also it looks like a real sailplane, so you can impress the girls on the beach. (Don't let my wife see this part, OK?)

1/3 scale

Bregyet Br-906 "Choucas"

Owned by Rick Briggs, Long Beach California

The model was built by Arnold Hofmann from Freiburg Germany. Its 1:3 scale, and the span is 6.3 meter.

The fuselage is all built up, the wings and V-tail are foam and Obeche with glass lay-up. Its weighs aproximately 28 pounds, which is very light for the size.

Arnold is a great model builder, I also have a 40% Condor IV of his. You might have seen it, it's yellow.

Arnold built the Choucas from photos, as no three-views were available. He also built the single seat Brequt 805 Fauvette in the same scale and color, and I have photos of it as well.

Arnold is well known for his model building. I first saw the Choucas model at the 2000 Elmira aerotow when Frank Oeste from Germany owned it. I found out he wanted to sell it, so I contacted him and the rest you know.

It's very stable in flight, and one of my favorites. With the red and white it's easy to see at high altitudes. I use a Tommy vario on board.

The events I go to are mostly the Visalia Spring and Fall; I've been to the JR Event three times. Peter Goldsmith and Horizon put on a super event. I also fly with the Southern California gang on different weekends. There are about 10 of us.

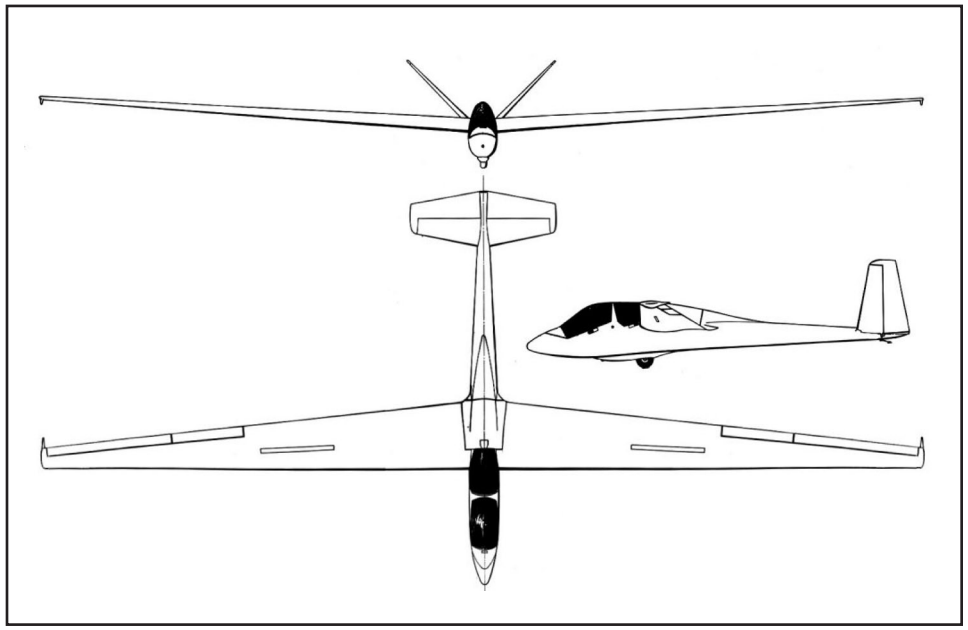
-- Rick Briggs

http://www.soaringissa.org/

Rick's Choucas on tow at the 2004 JR Aerotow. Photo by Mark Nankivil


D-9193
F-CCGP
F-CCGP


CHOUCAS




D-11-167
F-CCGP

Photos by Mark Nankivil

Dave Shaw's Astro Jeff

Say, are you tired of spending $1200 on a full house mega-ship only to be beat by someone else flying the $1300 Quasi Moto 14 channel twin computer-controlled ship? Longing for the good ol' days when flying was both fun and relaxing? Is that's what is troubling you Bunkie?

Well lift your head up high and gaze at a beautiful soaring machine from the 70's.

The Astro Jeff was designed by Jerry Mrlik for his son to fly in the 1973 SOAR Nats. Young Jeff, only 12 at the time, smoked the 132 other fliers with a soaring queen that is both graceful and fun to fly. It even makes me look good.

So let's fire up the way-back machine, Mr. Peabody, and take a trip to the seventies — the happy days of good old soaring where it took a real pilot to make his ten minute flight using several thermals and not a zoom launch. No hard feelings composite guys, but here we go.

The Astro Jeff is available through Skybench Aerotech <www.skybench .com>, along with many other NOS legal planes, as well as all woodcrafter legal birds.

Ray Hayes, who is no stranger to soaring, has taken the time to bring back nostalgia and some beautiful kits back to the market.

Having flown with Ray at my local club here in Michigan, I learned more about soaring and how to have fun flying in a contest.

But I should tell you a little more history of this ship. I started flying about 1972 with a CraftAir Drifter. I started off with a plane that weighed 1½ pounds, and by the time I learned how to solo it weighed over five pounds.

Then I spotted an article in the old American Aircraft Modeler (old AMA magazine) about the Jeff. I knew I was not good enough to scratch build one, but I got to see Jeff fly it at the '74 Snow Fly. WOW, what a sight. This bird covered more air than any other plane out there. And I vowed to one day have one, having flown with some great pilots, like the late John Hoover and the great Gene Pastori of the "Davison Hilltoppers." All the other pilots flew power, but both John and Gene never let me give up my dream of soaring.

Jump forward to 2004. I sent my order in to Ray at Skybench. Within a week the biggest box I have ever seen was sitting on my front porch. Like a kid at Christmas, I ripped it open and found beautifully laser-cut ribs, enough lumber to build a house, and a flawless fiberglass fuse.

I cleared the workbench, grabbed some glue, dumped it out, shook it a few times, then covered it. Not really, but the plane goes together extremely fast. All the laser-cut ribs fall right into place, and even the tail feathers are all laser-cut. Ray bags all the parts and labels them (he does this on all his kits), so there is no guesswork as to what goes where.

I won't go into a detailed build, as Ray has that on his website. But a few changes that I have made are as follows.

- For the rudder post attached to the fuselage, I used 3/8 balsa block and used Dubro hinges with a removable wire to ease transporting of the ship.
- I put the spoiler servos, with cable extensions, in the wings.
- I 'glassed the poly break and the root area with two layers of 4oz. cloth. Having snapped a few wings in the past, I felt it was a good idea to reinforce these sections. As a builder, you don't have to follow the 'glass part, as it does add a few extra minutes to the work.

All told, it took me about ten hours of building before it was ready to sand and cover.

The plane that is pictured is my number two ship. The one on the Skybench Aerotech

website was my first one, but I made a big boo-boo. I was hooked up to a hi-start that would launch a golf cart several hundred feet into the sky. Flying Man-on-Man, when I let go I hit the down stick with my neck strap. Ten pounds of 'glass and wood took off nose down into the turf. It held there for a brief second, then "Splorch!" (Yes, "Splorch!"), at 100 mph it bounced across the turf, shedding parts for 300 hundred feet. What a mess! "Hello, Ray! Send me a New 'Jeff."

I still ended up placing quite well, despite my boo-boo.

Now for the real meat and potatoes.

The very first flight of my 'Jeff was a typical spring day here in Michigan. Winds North 10 to 20, with temps in the 60's. Not your best soaring day. So I stretched out my heavy duty hi-start and put together three birds. My old Drifter (found on E-Bay), my SailAire (aka Pig Drifter), and my Astro Jeff. Being it was the first and trim flight, I had to get the nerve up to fly it. So up went the Drifter, to land after three minutes. Same with the Pig Drifter. I finally got up the nerve to try the 'Jeff. Having set the incidence at ½ degree positive on the elevator, I hooked it up and paced back about 100 paces.

Now we have all read where some author has taken out a new bird and on the first flight caught the mother of all thermals and landed at his feet just as the batteries went dead. But when we try, we're lucky to get three minutes and a short hike to where it landed. So I was skeptical as to how it would fly.

After a brief and silent prayer, I lifted up the nose, pointed it into the wind, made sure left was left, up and crash (down) was correct, and let her go.

It towed straight up with out even a click of trim. Towards the top I fed in a little up to stretch out the line, and off she went.

An easy left and right turn to see how it responded, and then crank it over for a thermal turn. What's this? It's going up! Wow, this plane looks great.

Soon a park employee stopped by and I gave her the sticks. She never flew before and she did great.

Well that first flight lasted over 18 minutes. How I wish all my flights were that good. "Great Gliding Hoss Flies, Fly Man, the thing flies!"

Now for landing. This is a big plane with a wing loading of about 8.4 oz/ft^2, so take your time setting up your approach. At 30 seconds out, I try to be about 100 feet off the ground and right off my shoulder, 20 seconds turn on final with half spoilers, 10 seconds line up and full spoilers and grease it in.

One of the unusual things that I found with my Astro Jeff is that by cracking the spoilers, and they are not that big, it penetrates as if it has two pounds of lead.

I hope you enjoy building and flying an Astro Jeff half as much as I do. If you are looking for a nice relaxing sailplane for contest or just Sunday flying, get your order in soon.

As for me I am ordering a fourth one. The third Astro Jeff I ordered went to my best friend — a very special young man to whom I was a Big Brother in the 70's and early 80's. So if you happen to run across two guys with planes big enough to threaten the planet with their shadows (151" wingspan, 1370 square inches wing area), then that would be team "Fly Long... Fly High," Steve and myself.

The Astro Jeff is available through <http://www.skybench.com>

The current price is $295.00 plus $19.00 shipping for the full kit, $165.00 plus $8.95 shipping for the semi-kit.

A little more about myself. I've been flying since the 70's and work in radio as a part-time host on Sundays at a country music station. I'm owner/operator of my own truck, leased to an expediting company, and have several NOS and scale 'ships.

— Dave Shaw

One Tangent ASH-26 chases another along the hillside near Cuesta Ridge in San Luis Obispo, a site about 10 minutes from Hwy 101 at the top of the Cuesta Grade. Photo by Dave Copple. FugiFilm FinePix S5000, 1/1000 sec, f8, ISO 200.

Yeti

a 34 inch CNC sloper

An update by Dave Locke, Sydney, Australia

I completed the Yeti and she's flown successfully! The HS-55's were ditched for JR 371's. A few ounces of lead were needed in the nose, as expected. The CG is set about 150mm from the pointy end.

The maiden flight occured after some cajoling by the local riffraff. After a few nervous trimming throws, it got up in a moderate breeze and flew quite well. However, I'm now totally unsure where the CG should be!

Straight line speed was great, turning too sharply was nerve racking, as I found out on the first landing approach when too much elevator was put in. She spun around almost in her own length. Photographer Klaus likened it to a gumleaf blowing in the wind.

Otherwise, fast flat turns with enough speed (which was no problem!) was like it was on rails.

The amount of reflex in the elevons was about 5mm (or ~3/16"). It's a PW51 airfoil, which has reflex already built in, so this is surprising.

It's really stable in straight line with this amount of reflex, with no hyperstalling or other bad habits. A small amount of lead was added for the second flight, which I thought made it better (probably just made it faster), but on landing it tip stalled again on too much elevator. Total elevator travel was about 3mm up and down.

In a dive it was almost hands off. I did probably push in a little down elevator. I didn't manage to get it inverted as I couldn't get it high enough in case a recovery was required.

Overall it was a nerve racking few flights, mainly because the slope is really rocky in some parts, and one mistake would've meant instant "Yeti spaghetti."

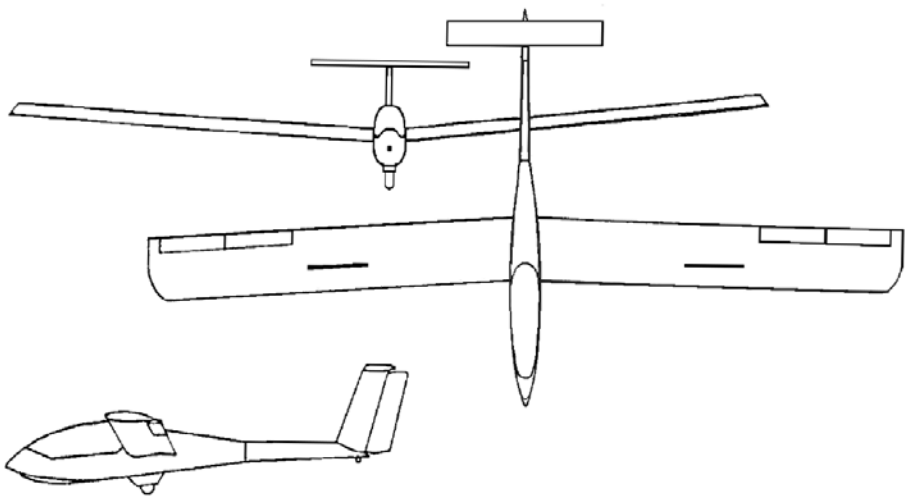
Feedback seems to be the CG should be moved back slightly and elevator throws cut back, so more flight testing is in the future.

PZL Krosno KR-03A "Puchatek"

N289S, sn 03-24

Walk-around by Mark Nankivil, nankivil@covad.net

The KR-03A "Puchatek," also known as the "Krosno," is a tandem two-place metal framed sailplane designed as a basic training glider. It first flew in 1985. It is suitable for both winch launch and aerotow, and can be used for basic aerobatics training, thermal and wave flying, hill soaring, and passenger flights. The instrument panel is located forward of the front seat only, but it is possible to install an additional instrument panel in the rear cockpit. After minor modifications it can be used for blind flying training or bungee-launching. It has a metal monocoque structure. The one-piece canopy is starboard hinged. The cantilever wings are rhomboid in planform with three degrees of forward sweep. The rear of the wing is fabric covered. The glider has a T-tail with fabric covered control surfaces. The main wheel is on a hydraulic shock absorber and has disc brakes. The glider has both front and rear skids, although some are equipped with a front tire instead of the front skid and/or a small rear tire in place of the under-tail skid. The KR-03A has both front and CG tow hooks. Approach control is by top and bottom surface Schempp-Hirth type airbrakes.



N289S, sn 03-24 is currently owned by
Illini Glider Club, P.O. Box 143, Monticello IL 61856

Manufacturer: PZL Krosno, Poland

Designer: Jerzy Krawczyk and Eugeniusz Pelczar

Span	16.4m, 53.8 ft	Wing chord	1.2m /3.9 ft	Wing area	19.44m^2, 209.25 ft^2
Aspect ratio	13.9	Sweep angle	3° forward	Dihedral	4 degrees
Incidence	5.0 degrees	Wing airfoil	FX S02/1-158	Water ballast	None
Length	8.63m, 28.3 ft	Height	1.65m, 5.4 ft	Tailplane span	3.5m, 11.5 ft
Maneuvering	+5.3 g, -2.65 g			Tailplane airfoil	FX 71-L-150/30
Empty weight	350kg, 771 lbs	Payload	190kg, 419 lbs	Gross weight	540kg, 1190 lbs
Max. wing loading	27.8kg/m^2, 5.7lbs/ft^2	L/Dmax	27 @ 87 km/h, 54 mph, 47 kts	Min. sink	0.78 m/s, 2.38 fps, 1.41 kt @ 81.4 km/h, 50.6 mph, 44 kts
VNE	200km/h, 124 mph	Stall speed	57 km/h, 35.4 mph, 30.8 kts @ minimum gross weight 72 km/h, 44.7 mph, 38.9 kts @ maximum gross weight		
Dive brake speed	200 km/h, 124 mph				


N289S


N289S


TEXAS

Dale King in the front seat


KR-03A
G56EU


N289S
KR-03A
MADE IN POLAND


DO NOT LIFT


N289S
KR-03A
MADE IN POLAND


N289S


WSK
Krosno
KR-03A
MADE IN POLAND

Sled Driver Chronicles

Jay Decker, sleddriver@monkeytumble.com

How Did You Get So Much Stuff? Vacuum Bagging Part 1


Kelly Johnson

Note: This series of articles uses the work "suck" gratuitously. If you are offended, get over it. It is just part of the vernacular of the vacuum bagging community.

Your spouse, significant other, roommate, or mother ever walk into your model area, just look around, and make some exclamation about how much model airplane stuff you have? This is in addition to the exclamations you receive when you ask or beg to buy more model airplane stuff when you haven't used all the model airplane stuff you have already. I recently received that exclamation from a fellow modeler when he saw all the composite materials, vacuum bagging supplies, and other building stuff I had. I was incensed! How could a modeler question having all this valuable and useful stuff? Actually, he just wanted to know how or why I had come to have hundreds of pounds of laminate, miles of bagging tube and Mylar, dozens of vacuum bag clips, etc., etc. So I told him the truth, which is that I had bought out a few guys who had thought that they wanted to get into vacuum bagging and molding, but ended up not sticking with it for whatever reason.

Even though it is more likely that you have insomnia and think reading this article is the cure, I'm going to assume that you are at least interested in pursuing the composite construction path outlined last month or are already somewhere on the path. And, even though my spouse calls this path the "Highway to Hell," it really is a fun journey. So, let's start with what you really need to vacuum bag wings, which might be less and less expensive than you might think.

You do not need a bunch of expensive equipment and supplies to start vacuum bagging skins on to foam cores. In fact, you might have everything you really need around your shop and the garage, except a vacuum pump system. I'm going to share my thoughts regarding vacuum pump systems, and next month we'll talk about vacuum bags and start you sucking down vacuum bags for practice.

Basically you have three options for a vacuum pump system: 1) you can borrow one, which is what I would suggest that you do initially, 2) you can buy one, or 3) you can build one. If you can, I would suggest that you borrow a vacuum system to experiment with vacuum bagging, and eventually buy or build a system if you want to continue on the composite construction path. If you are able to borrow a vacuum system, you

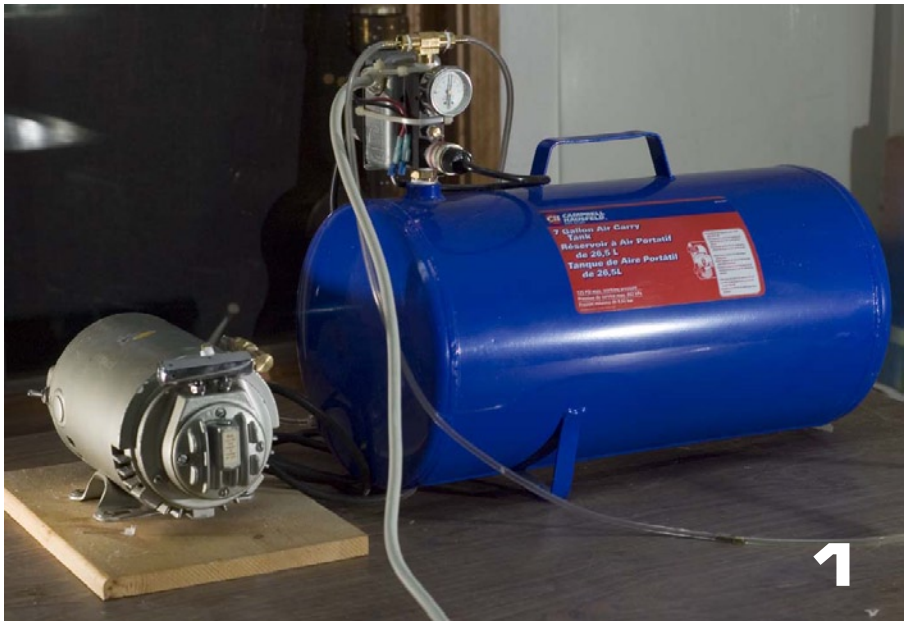


Photo 1: This is my current vacuum system. The vacuum reservoir is a $17 air tank from the automotive department at Wally World (Wal-Mart). The nice thing about this tank is that it has a 1/4-inch NPT fitting to connect everything, and it is a pretty shade of blue.

Photo 2: The vacuum pump is a rotary vane pump that was salvaged from a hospital. This pump pulls about 21-inches of vacuum and is an oiled pump, i.e., I have to put oil in it to keep it lubricated. Paid $40 for it and it works great.

Photo 3: The aquarium check valve in the line between the pump and vacuum reservoir. Purchased from a pet store, it's cheap, and keeps air from leaking through the vacuum pump into the reservoir.

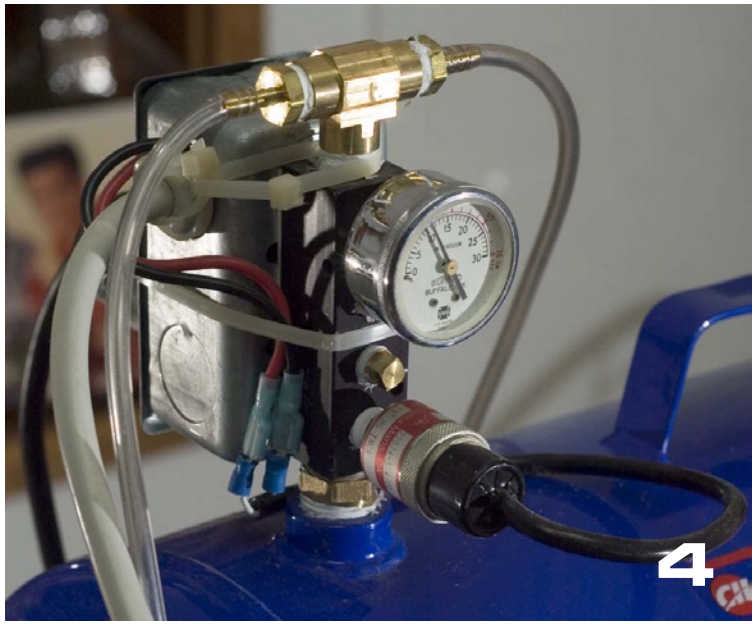
will likely be able to borrow vacuum bag materials also, which I would also encourage you to do.

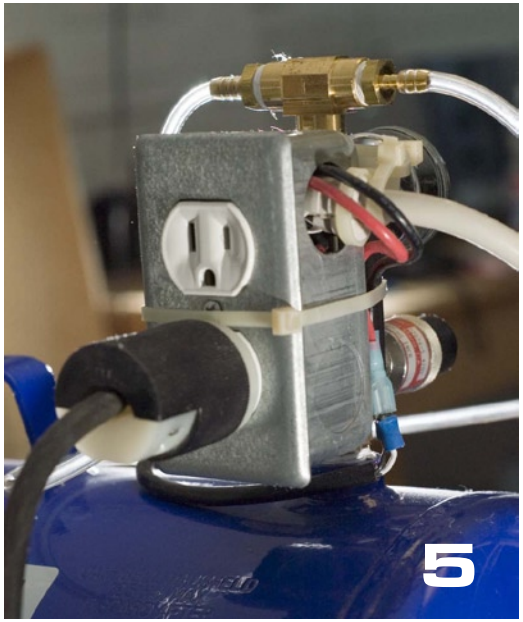
If you can't or don't want to borrow or build a vacuum system, you can buy commercially available units. I'm sure that there are a multitude of systems available between the usual suspects, like ACP and CST, woodworking veneer bagging suppliers, and homebuilt aircraft suppliers. Here are my suggested recommendations for a small home wing bagging vacuum system:

Vacuum Switch Control – A vacuum switch controls the amount of vacuum by turning the vacuum pump on and off to control the amount vacuum. I prefer this type of control over the type where the pump runs continuously and a bleed valve is adjusted to leak air into the system to control the amount of vacuum.

Vacuum Reservoir – A system that has a tank which "holds some vacuum" to minimize vacuum pump motor cycling, which can be very helpful when you are trying to find leaks in the system and the noise of the vacuum pump motor drowns out the telltale hissing sound of a leak.

"Oil-less" Diaphragm Vacuum Pump – Vacuum pumps are electromechanical devices that came out of the "military-





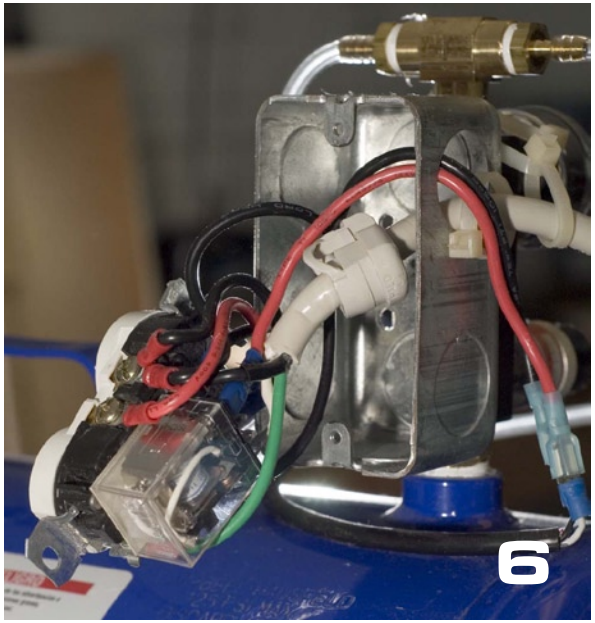


Photo 4: From top to bottom, the barbed tubing connections, vacuum gauge, vacuum switch, and vacuum reservoir.

Photo 5: Vacuum pump plugged into an electrical outlet, and outlet is wired to a relay and the vacuum switch.

Photo 6: Electrical relay wired to the vacuum switch and the electrical outlet the vacuum pump plugs into.

industrial complex." There are actually many types and varieties, including some that require maintaining an oil level for lubrication. Fortunately, the little Gast and Thompson diaphragm vacuum pumps have become fairly ubiquitous and are relatively idiot proof.

Five to 15-inches of Vacuum (minimum range) – In this country, vacuum is measured in units of inches of mercury. In communist units, I mean metric units, vacuum is measured in torr, which is millimeters of mercury. An inch of vacuum inside the vacuum bag results in about a half pound of force per square inch of surface area on anything within the vacuum bag. Foam is relatively weak, so you only need a limited amount of vacuum before the foam begins to crush. Five-inches of vacuum is good for white bead foams, nine-inches is good for the softer grey, pink, and blue extruded foams, and up to 15-inches of vacuum is good for the high compressive strength extruded foams.

If you don't have a friend available to loan you a vacuum system to try out, and you'd rather build a vacuum system than purchase one, this section is for you. You basically need around half a dozen major components, most of which you can salvage and buy locally or off the internet. Here's a list of the major components you need for a good system:

Vacuum Pump – If you can find one or it fits your budget, get one of those little oil-less diaphragm vacuum pumps. You need one

Photo 7: Vacuum manifold with toggle actuated valves that turn the vacuum on and off to the plastic hoses coiled on a hook in the right of photo.

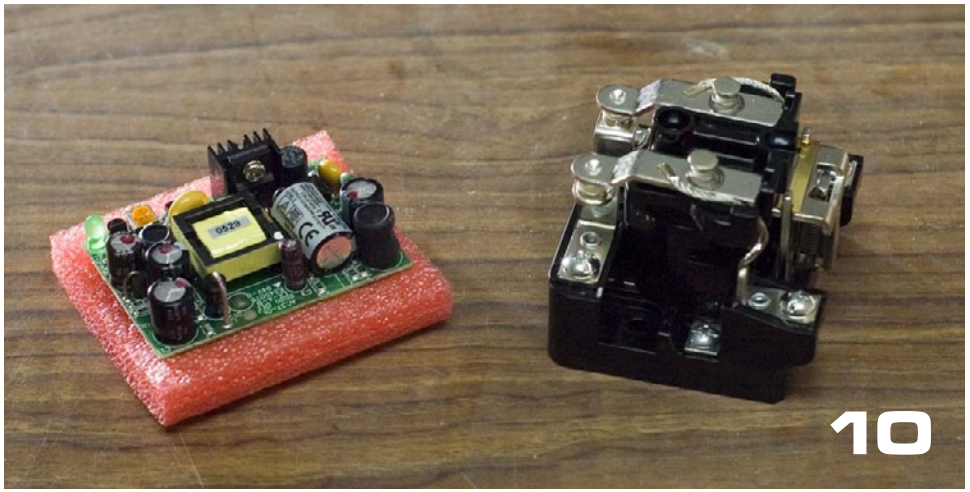
Photo 8: Gast diagraph vacuum pumps, a single stage pump on the right and a two stage pump on the left. The single stage pump pulls around 18-inches of vacuum and the two stage pumps around 28-inches.

with a 1/6 to 1/4 hp motor and one or two stages that can produce 15 to 29-inches of vacuum. Gast and Thompson seem to be the dominant manufactures of these pumps in this country.

Other pumps will work just fine, including the Freon pump in that old fridge in your front yard. But, you are going to need a little more apparatus to return oil to the enclosure and make connections.

One more suggestion, if you think you are going to want to really get into composite construction, get a pump capable of pulling at least 25-inches. Being able to pull near full vacuum is useful for bagging into molds, vacuum degassing, and other things you might want to advance to.

Vacuum Switch – The vacuum switch senses when the vacuum decreases and turns the vacuum pump on, and it senses when the vacuum has increased and turns the vacuum pump off. The difference in vacuum between when the pump is turned on and off is called the "dead band." Personally, I like the vacuum switch dead band to be 1-inch or less. The vacuum switch used to be the toughest part to find, but I found a bunch of high quality vacuum switches on eBay for less than $5 a pop. However, the good ones typically have light duty switch contacts that can not handle the current of your vacuum pump motor. So, you might need a relay circuit, which is an electrical switch that is controlled by the vacuum switch. Might sound a little complicated



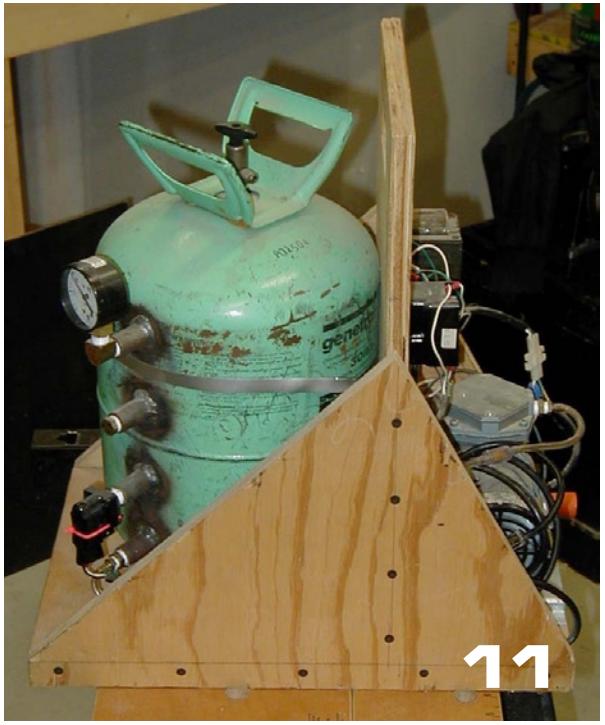
and scary if you are not electronically inclined, but it isn't that hard – a friend who knows a little about electronics or any 12 year-old can help you.

Relay Circuit – A relay is an electrical switch that opens and closes under control of another electrical circuit. In the case of your vacuum system, the "another electrical circuit" is you vacuum switch. I would recommend that you use a relay that has a 12 volt direct current coil for electrical safety sake. However, that will mean that you need a 12 volt DC power supply to run though your vacuum switch and the coil side of your relay. A wall wart type 9.6 volt NiCad battery charger, which produces about 12 volts to charge a 9.6 volt battery pack, will work just fine for a power supply. Again, it might sound complicated, but your local electronics geek or your 12 year-old should be able to help you right out.

Vacuum Check Valve – Virtually all vacuum pumps leak air back into the system when the pump is not running. So you install something called a check valve to stop this leakage between the vacuum pump and the reservoir. Go to PetSmart or another aquarium supply shop and buy a couple aquarium check valves. Install these valves in your vacuum system in the correct orientation and you are good. These valves do wear out, but they are pretty cheap, so it good to have another available as a replacement.

Photo 9: The black vacuum switch on the left does not work well below 15-inches of vacuum and has a dead band of 2 to 3-inches of vacuum. The cylindrical vacuum switches in the photo are very accurate industrial vacuum switches with a 1/4-inch of dead band that work great and were purchased on eBay about $5, but require the use of a relay circuit.

Photo 10: High current load industrial relay on the right and a 12 Volt power supply on the left that will be used to energize the relay coil. These components will be used with two stage pump and vacuum switches shown above to build a new super-duper vacuum system with multiple set points.



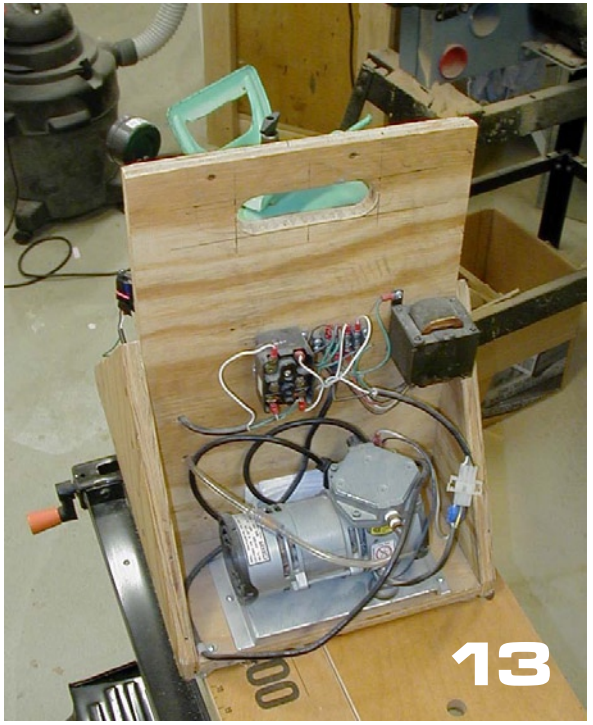


Photo 11: My first vacuum system, which was built around for about $30. The carrier was cut from a plywood shipping crate.

Photo 12: The vacuum reservoir was a Freon tank liberated from an automotive AC shop dumpster.

Photo 13: The vacuum pump was liberated from a piece of industrial equipment for the right price, but the pump had a 220 Volt motor that required the use of voltage step-up transformer and a relay, which were inexpensively purchase from an electronics surplus supplier.

Photo 14: Industrial vacuum system can be purchase as complete units, like this one that was retrofitted with a better vacuum switch and relay circuit. These units can be affordably purchased from surplus suppliers.

Vacuum Reservoir – There are a multitude of things you can use for a vacuum reservoir. I use a steel air tank that has a 1/4-inch pipe thread fitting to hook up to. I bought it in the automotive section at Wal-Mart for $17.

Vacuum Gauge – Get one and plumb it into you system so that you know how much you suck, I mean, how much vacuum your system is pulling. Granger has vacuum gages, I've seen them at auto stores and some hardware stores, and like everything else, they exist on the internet.

Miscellaneous wiring, piping, and tubing components – You will need wire, an on/off switch if you want one, tubing, and pipe fittings to connect your components. You should be able to get this stuff from hardware stores. I've found that DIY stores, like Home Depot, don't always have the tubing and barbed hose fittings that other hardware stores like True Value Hardware and some other stores have, so you might have to make a few stops to get what you want. Also, you need tubing that will not collapse under vacuum, so you need to get some tubing with a wall thickness greater than what PetSmart sells for aquariums.

The cost of all this stuff just depends on the availability of surplus industrial parts in your local area and how much effort you put into scrounging parts and cobbling things together yourself. If you get first class major components on eBay and buy the other components new, it will probably set you back a $150 to $200. If you scrounge hard and put it some sweat equity, I've put together a vacuum system for less than $30.

While a vacuum system might sound like a bunch of stuff, after it is all assembled it will be smaller than your beer chest, which should be below the threshold where your spouse, significant other, roommate, or mother will be able to sense as a discernible increase in your modeling stuff. See, it isn't that hard to get on the composite construction path.

So, come on in, the water is fine.

FAI has received the following Class F (Model Aircraft) record claim :

Claim number : 14045
Sub-class F5 Open (Aeroplane, Electric motor COMB (all sources of current))
F5: Radio Controlled Flight Category
Type of record : N°195: Distance to goal and return
Course/location : Stephenson County IL - Winnebago County IL
Performance : 67.14 km
Pilot : David Fratello (USA)
Helper : Fratello Armond
Date: 16.08.2006
Current record : 41.14 km (04.09.2004 - Jüri LAIDNA, Estonia)

The details shown above are provisional. When all the evidence required has been received and checked, the exact figures will be established and the record ratified (if appropriate).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