



Air Currents



The Official Newsletter of Diablo Valley Radio Controllers

Werner Hoch's plane, DVRC 2017 Open House





President's Corner

Welcome to the first edition of our club newsletter in several years, with Ray Simon as your Newsletter editor. Please give him all the support you can so that he can develop newsletters that are full of photos, articles, reviews and other interesting information. Please send your subject material to Ray as they occur and he will compile them into our periodical. You can reach Ray at his email address, ray.c.simon@gmail.com.



The DVRC elections for 2021 were held in November at the DVRC Pits with the result that the Officer positions were uncontested, with all officers staying on for another term through 2021. There were also two open director positions, one being the completion of a 4-year term, now taken (unopposed) by Gordon LaPorte, and the other, relinquished by Daniel Heering's resignation, which has been taken over by Bill Selling.

I would like to take this opportunity to thank our current Officers and Directors for all their hard work in 2020 and for their continued resolve for 2021.

On another subject, as you know, safety should always be on our minds as we setup and fly our aircraft.

It is an exciting and anxious time whenever we ready a new plane for its maiden flight. It is always a good idea to have one of more seasoned club veterans review your new aircraft for points of weakness, general airframe structural rigidity, warps in wing surfaces, and correct center of gravity.



Many aircraft today are of the foamy PNP (Plug-N-Play) type where you just add your receiver and battery. Much of the aeromodelling work has been done at the factory, even including full installation of servos. Never be complacent that the factory has done a quality job of servo installation, including pushrods placement, and proper connection to the control surface horns. Always check the throws of each control surface against the recommendations for low- and high-rate conditions. Also don't be afraid of giving the control surfaces a good tug to check that the hinges have been installed properly.

Something that I find fairly common with pilots of new PNP aircraft is that many do not calibrate the ESC with the receiver before they fly. The purpose of this is to sync the full throttle transmitter travel to the full RPM of the electric motor. You may get lucky and have no problems, or you could find you only have a very narrow band of throttle control, i.e. the motor may not start-up until your throttle stick is at 25% or more.



The calibration process is simple to perform, just follow the instructions within the ESC manual; it takes only a few minutes to complete.

The gas and nitro burning community are not exempt from problematic issues either. I believe the most common source of problems stem from high vibration, which is generated by every internal combustion engine. All machine screws must be Loctited when fastened. I've personally witnessed engine mounting fasteners magically unscrewing themselves during a test run of an engine. If that occurs in the air, the consequences can be dire. The solution is to check everything and then check everything again after the maiden flight.

Enough of my rantings, I hope you all had a wonderful Holiday season despite our stay-at-home orders and Covid-19 woes. However, I am optimistic about these new vaccines to combat Covid and hope they bring an end to this pandemic soon.

Something to think about:

When you consider the correct amount of power for a new aircraft, "If a little is great, and a lot is better, then way too much is just about right".

Happy Flying,
Nigel Watson, President, DVRRC

Upcoming Events

DAY	DATE	TIME	EVENT
Saturday	2/6/2021	9:00am	Work Party (first Sat of each month)
Saturday	3/6/2021	9:00am	Work Party (first Sat of each month)

Notes From The Membership Coordinator

We had 14 new members join DVRRC in 2020, which was amazing, considering COVID- 19 and our restriction for new pilots. We ended the year with a roster total of 97 members: however, so far we have only had 69 members renew their membership for 2020. We hope that more members will rejoin. I would also encourage all of members with GREEN badges to set a goal of getting a yellow badge in 2021.

Gene Aughtry, DVRRC Membership Chairman

Our next issue will include contribution from our newly elected Membership Coordinator, Gordon LaPorte. We certainly appreciate Gene's commitment to serving this position!



Notes From The Safety Officer

Happy New Year Everyone:

Last year was a good year from a safety perspective. We got through the year without any reportable accidents or injuries at our flying site. Let's continue to practice safety in the enjoyment of our hobby.

I have noticed a few things that need to be mentioned as a reminder to ensure safe operation of our aircraft. Never install the battery in an electric powered aircraft on the setup tables, use the startup tables when installing the batteries. Taxiing in the pit area is not allowed. When operating a gas-powered aircraft AMA requires that a fire extinguisher be readily available.

The ability to perform a high-speed pass east of the fence, e.g. (down the runway) has been approved by the DVRC Board of Directors. There can only be one other pilot flying when performing a high-speed fly-by down the runway. The pilot must declare his intention to perform the high-speed fly-by, e. g. "fly-by from the left", and the other pilot must acknowledge, e. g. "fly-by left ok" before the fly-by can be performed. It is important that this procedure be followed to prevent startling/distracting the other pilot.

Remember to practice social distancing and face covering when within six feet of another individual. Stay safe and I hope to see at the field.

Ron Penn, DVRC Safety Officer

Member Contributed Content

Many thanks to our great leadership team and committed volunteers who keep our location safe and in excellent working order with new signage, clean pits, and a runway that is smooth, weed-free, and wide enough that most of us can land on it.





Internal Resistance of Lipo Batteries

by Nigel Watson

When I was introduced to electric aircraft systems some years ago, I realized how much I didn't know about the motors, ESCs, and LiPo batteries.

I jumped in with two feet and purchased all three components that would get me in the air. The size of the motors and the ESCs were typically recommended by the kit manufacturer. That left me to decide which battery would do the job.

Without any real depth of knowledge, I opted for value and purchased some Zippy Compact 4S, 3700mAh 25C batteries and was able to hook them to the motor and ESC to get my plane in the air. However, I noticed that my batteries began to progressively change and puff as if they were pressurized from within. The batteries still continued to function, yet this puffing continued.

I then purchased a Computer Battery Analyzer (CBA) from West Mountain Radio and started to monitor the batteries' capacity. During periodic testing, I noticed that the amp hour capacity of all the batteries tested, progressively diminished. The batteries also exhibited different levels of puffing.



Chart 1. CBA test - Amp hour decay under constant current (5.9A load).

This chart shows the reduction in Amp hour capacity from original (purple line) down to 34% of original capacity (green line) after 20 to 30 charges (7 months).



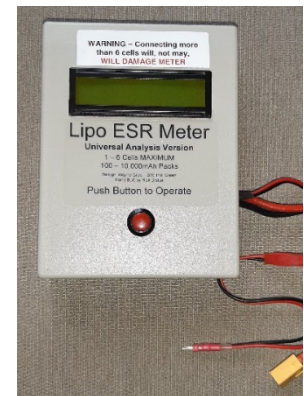
I damaged a lot of batteries in my early experiences of LiPo batteries. They progressively puffed and appeared to have much reduced capacity compared to original. I then had to discard/recycle them. For any new aircraft, I usually ground test the electric system to determine the max amps, watts, and propeller RPM to assess how it will perform in the air. I didn't know I was abusing the batteries; I thought I was well within the amp usage recommendations of the batteries.

I asked fellow members for suggestions about which battery manufacturer they thought was good value and so I purchased several Admiral 4S, 4000 mAh, 40C batteries. Unfortunately, those batteries also started to puff within a few months of use.

Understanding how many amps/watts I was drawing at full throttle, I calculated the minimum "C" rating of a battery that would provide the amps/watts for full throttle flight.

To calculate the maximum current output of a battery, you multiply the C rating by the capacity of the battery. So a 4 Ah battery with a 40C rating could theoretically deliver 160 amps to my ESC without damage to the battery. The current draw at full throttle was 57 amps, so I thought I was OK. I didn't understand why my batteries were losing capacity, and why were my batteries still puffing? There must be something else I was missing in the characterization of my LiPos.

The more I read, the more it seemed that the internal resistance (I.R.) of the batteries had something to do with the puffing of my batteries. I then purchased a LiPo ESR Meter which was recommended by one of my model magazines to assess battery internal resistance. ESR stands for "Effective Series Resistance" It is conceptually a more accurate term than "Internal Resistance" as it includes the resistance of connectors and leads as well as the Internal Resistance of the cells in "Pack" measurements.



Further reading revealed that the ESR of any LiPo is dependent on temperature; the lower the temperature, the higher the ESR.

I bought several more batteries and set out to investigate the effect of temperature on the ESR (I.R.) of individual cells within the batteries. I thought it would also be interesting to test any correlation between the extent of battery puffing and its internal resistance at 70F. Before taking and resistance measurements, the batteries must attain a uniform temperature, which can take 1 to 2 hours.

The tests were conducted on Admiral 4S, 4000 mAh, 40C batteries, which exhibited various levels of puffing, from my inventory of batteries. I measured the amount of puffing using a dial caliper across the thickness of the battery and subjectively converted the readings to a puffing range from 0 to 10, zero being no puffing and 10 being fully puffed (almost circular cross section).

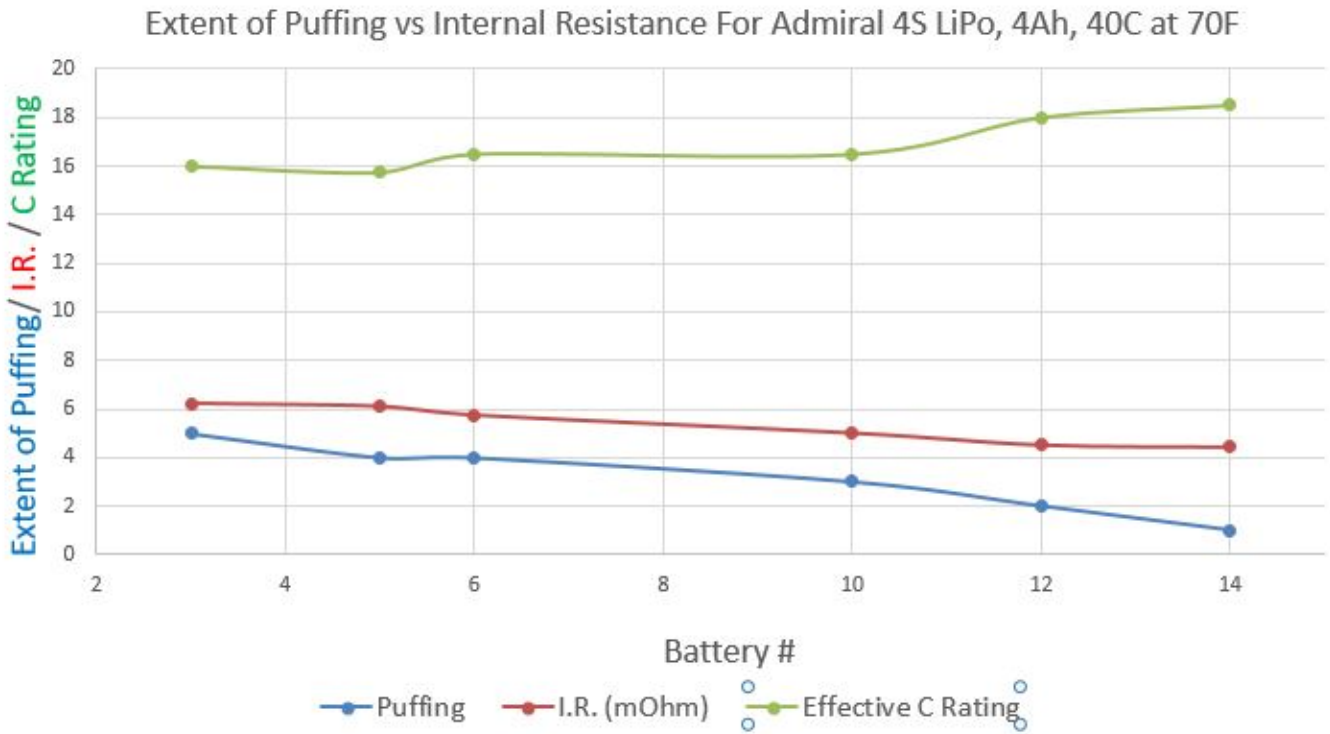


Chart 2. The I.R. (mOhm) and C rating of several puffed Admiral Batteries

Essentially, Chart 2 shows that for each battery pack from #2 to #14 on the X axis, the puffing factor increased with increasing internal resistance of the batteries.

During testing, the ESR meter also provides a calculation of the effective C rating of the battery. Interestingly, the C rating was significantly lower than the manufacturers' C rating marked on the battery.

The chart also shows that at 70F, the manufacturer's 40C rating was way overstated, with the effective ESR for the least puffed battery (#14) being 18C, less than 50% of specification. I decided to continue my investigation by testing the Admiral batteries against another type of similar capacity battery, the Nano Tech 4S LiPos, 3.85Ah, 65C-130.

The batteries were tested at several different temperatures from 38F to 95F to evaluate their ESR (I.R.) at those temperatures, being careful to let the batteries reach uniform temperature before testing.

The results are shown below:



Max Safe Amp Output of 2 Types of LiPo Batteries At Different Temperatures

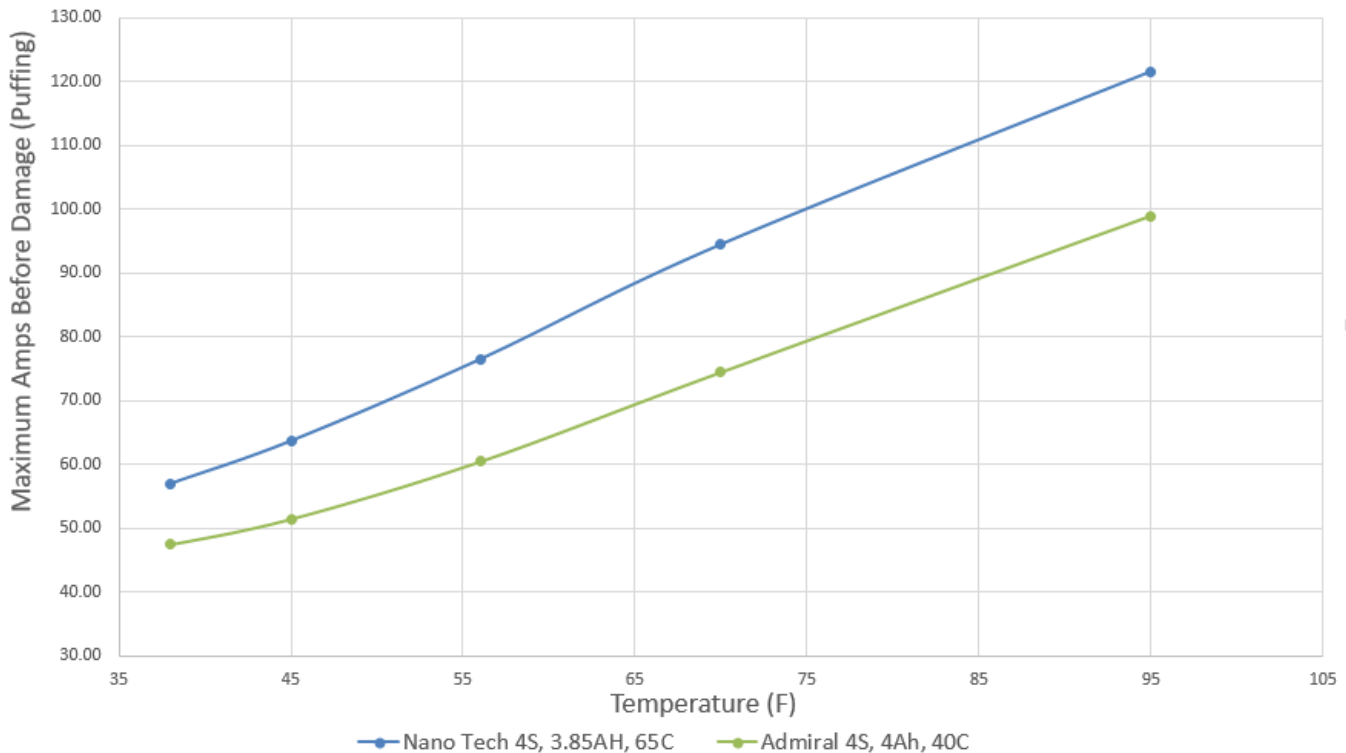


Chart 3. Comparison of 2 types of LiPo batteries.

The projected maximum amps of the Nano Techs batteries was considerably better than the Admiral battery. At 45F the Nano Tech promised to deliver over 64 amps of power and be safe from damage (puffing). In contrast, the Admiral battery could only deliver 52 amps of power at the same temperature. This result could be quite a problem when flying your aircraft in winter, where temperatures easily reach down to the low 40Fs.

Now this isn't rocket science, higher C rated batteries deliver more amps and that's why they cost more. However, I hadn't realized until after my testing that if you fly in cold temperatures and use a low C battery (25C), then its actual C rating is more likely to be <10C. Considering the case of my original airplane (drawing 57amps at full throttle) and my Zippy Compact 4S, 3700mAh, 25C batteries, at 45F, any current draw beyond 37 amps would damage my battery permanently, as observed.

Discussion and Conclusions

LiPo batteries degrade over time/usage and especially, when they are subjected to more current draw than is safe for them. When that happens, the LiPos tend to puff, signifying internal damage. This damage is also associated with a progressive loss of battery capacity, as shown in the Chart 1. Manufacturer's specifications are routinely way overstated, which means that if you purchase a battery to deliver a required amount of amps at full throttle, you may be disappointed to find your batteries start to puff and degrade before their time.



The test LiPos were chosen from my inventory of batteries and had dissimilar C ratings. Chart 3 shows that the graph lines are parallel because both battery type are of LiPo chemistry, but they are separated by their C rating.

Essentially, you need to be aware that low temperatures may affect the performance of your aircraft. Therefore, you should buy the highest C rating batteries you can afford. Treated properly, they should last you for years. In fact, I did this investigation a couple of years ago when I purchased 8 Nano Tech batteries to power my aircraft. I have been operating these batteries for nearly 2 years with 30+ flights on each and all of them are showing no evidence of puffing. I also check the batteries periodically by use of my CBA, and they all still exceed 90% of their original capacity.

It seems reasonable that aiming at a max continuous current should ensure that your LiPos have a good lifespan. However, in actual flying, LiPos will be subjected to surges when full throttle is applied quickly and these surges last for about 10 seconds and amount to about 40% greater than the safe continuous current. This represents doubling the heat dissipated within the pack for the duration of the surge. Therefore, you should consider buying batteries that have a capability of the handling such power surges.

Readings of Real "C" values from an ESR meter may well disappoint, but this is because battery C values have been so wildly exaggerated by so many suppliers that the C rating is merely a relative indicator of C, rather than a specification.

The alternative to buying more expensive batteries is to keep lower C rated batteries warm in winter, until you put them in your plane to fly with them.

One final note, there are conflicting recommendations from LiPo experts that, to maintain the long life of your batteries, keep them at a storage level when not in use. Some experts believe that you shouldn't keep your batteries in a fully charged state beyond a week. Others believe that it is ok to leave them fully charged for up to 6 weeks. So who do you believe?

Over the last year, I have returned my batteries back to storage level after each flying session. I'm sure this has helped the longevity of my Nano Tech batteries, including perhaps, the absence of puffing.

Most LiPo chargers have a storage setting in their charge/discharge menu, but discharge time to storage level can be a long process. If your charger is like mine, it claims to discharge at a rate of 1 amp, but in reality, it discharges at a much lesser rate (0.2 amps). That means if you have a fully charged 4 amp hour battery, and want to reduce it to storage level, it could take as much as 10 hours to get down to storage level.

A device that I purchased over the last year is a Maylibet Smart Discharger, which balance discharges LiPo batteries up to 6S, discharges them at a rate of up to 8 amps, and automatically switches itself off when finished. Worth every penny.



Mounting a Cowl

by Grant Angove

Wanting to be very cautious about mounting the cowl to my new Tower Hobbies Sbach, I used tape instead of paper to make the "fingers" that the instructions suggested for determining accurate mounting drill hole locations in the new pristine painted fiberglass cowl. Though the instructions in the manual are adequate, the use of just tape rather than paper and tape worked very well as documented with the following photos.

The instruction manual suggested cutting four inch fingers with a mounting screw hole at the end of each, suggesting holes should be punched into the fingers using a sharpened 3/32" brass tube. Instructions went on to suggest to tape each finger end with punched hole over the two mounting holes on each side of the fuselage. The other end of the finger would be taped towards the tail in a horizontal manner with the idea that the cowl could be kept in place with tape (or possibly using another person as an assistant) and new fingers would be laid over the ones taped in place to provide an accurate means to determine where to drill the mounting holes in the cowl.

I typically work alone and thought the fingers could easily be made using some painters tape I had on hand. I layered the tape accurately over each other, four lengths each on a gridded cutting board. I cut through the layered tape using a sharp exacta knife and punched a 3/32" hole at the end of the two stacks (one per fuselage side) of four evenly cut tape finger guides. I added some grid lines to each piece of tape as they were pulled from the stacks for additional reference while placing them on each other on the fuselage. I was careful to align the cowl up with the spinner back plate and tape it in with the proper 3/32" clearance alignment before adding the layered tape over the sides of the cowl to determine proper drilling hole locations.

Once the tape was put in place it provided a means of easily removing the cowl by lifting the fuselage tape end up while holding the correct drill hole spots as well as paint finish protection around the drill area. The mounting screw holes were drilled in the cowl using a wood paint stick held inside the cowl as support for preventing a tear or breakout chip in the fiberglass.

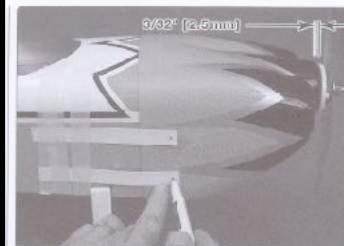
See pictures on the following pages describing the process.

Mount the Cowl (Steps 1-5)

Use painters tape rather than “paper or cardstock” to make the 4 inch fingers used as the cowl drill hole location guides. Using a gridded cutting mat... stack four pieces of tape on top of each other and cut the ends off squarely to make the 4 inch fingers. As illustrated in the photo an exacto knife and ruler were used to neatly cut through the stacked ends cutting the fingers precisely the same 4 inch length. I duplicated the process making another cut stack of fingers for finding the drill hole locations on the other side of the cowl.

Use a sharpened 3/32 inch brass tube to punch a hole through one end of both of the two stacks. The hole end of the tape will be placed over the screw mount. Marking the tape with grid lines with an ink pen as shown for additional reference is probably not necessary and so is optional. Pull the layered tape off one piece at a time and apply them over the cowl's mounting screw holes as shown.

The “finger” method for finding drill hole locations works well and is sure to be easier to use applying the painters tape technique!



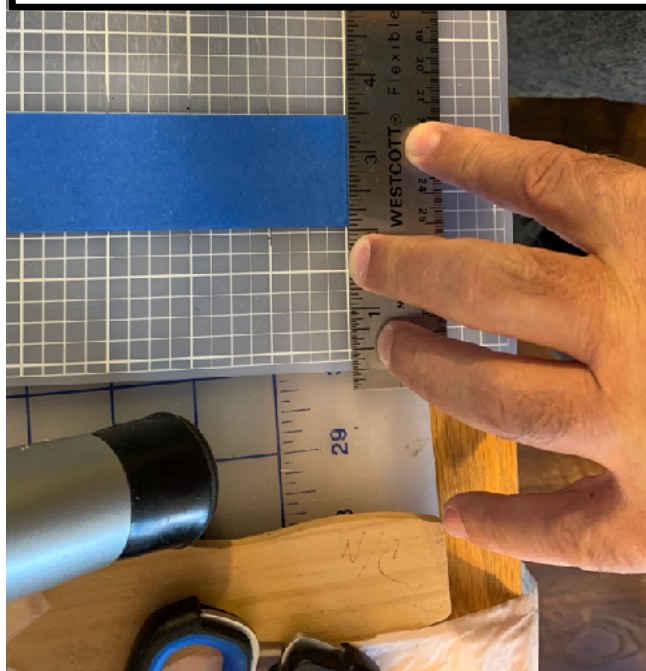
3. Install the cowl, the spinner back plate, propeller and prop nut to the motor. Position the cowl so it accurately aligns with the spinner back plate with the desired spinner gap (approximately 3/32" [2.5mm]). If necessary, use tape or an assistant to hold the cowl in alignment while marking the holes in the fingers onto the cowl. (Once aligned the cowl on our model stayed in place on its own.)



4. Remove the prop, spinner and cowl. Support the inside of the cowl with a piece of wood while drilling 1/16" [1.6mm] pilot holes through the cowl at the marks you made.



5. Enlarge the pilot holes with a 1/8" [3.2mm] drill. Then test-mount the cowl with the spinner and prop using M3 x 10 Phillips screws and lock washers and flat washers. The 1/8" holes in the cowl should be just large enough to fit the screws so if the cowl requires slight adjusting to perfectly align with



Mount the Cowl

1. Cut four approximately 4" [100mm] long "fingers" from paper or thin cardstock. Use a 3/32" [2.4mm] brass tube sharpened on the end or a hobbyknife to cut a small hole in the end of each finger.

2. Align the hole in each finger with the hole in each tab for the cowl mounting screws and securely tape the fingers to the fuselage.

Punch a hole in each stack of fingers using a 3/32" sharpened brass tube

Apply the 1st layer of tape aligning the punched holes

Position the cowl in place using additional tape to hold position

Apply the 2nd layer of tape over 1st for accurate new drill hole locations repeat same tape application steps to other side for drill hole locations



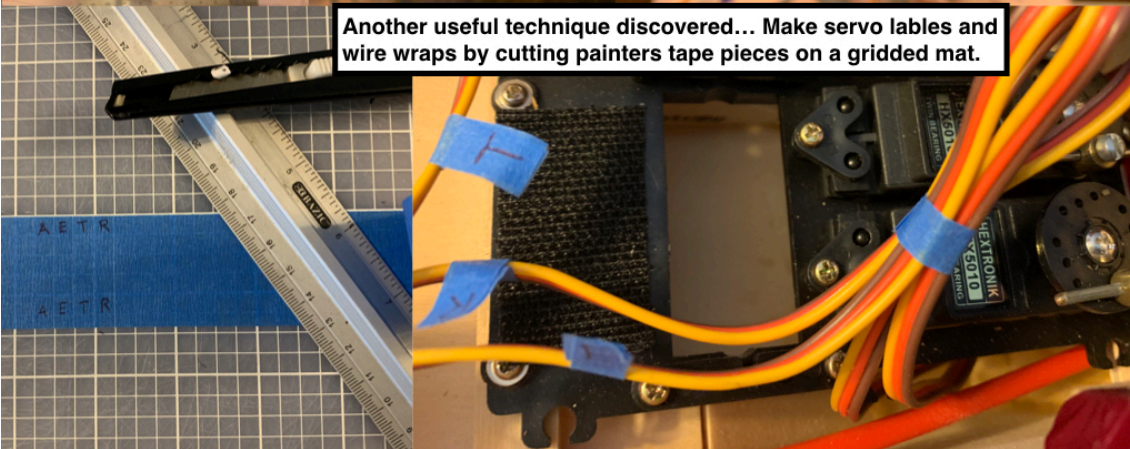
Remove cowl to drill holes leaving tape in place on it.

Drill initial hole using small bit first. A piece of wood (paint stir stick) was held inside the cowl for support to prevent paint and fiberglass breakout damage.

For the purpose of display only, it is not necessary to install screws with tape still left in place.



Success... the cowl fits well and looks good from all angles!



Another useful technique discovered... Make servo labels and wire wraps by cutting painters tape pieces on a gridded mat.

**"Annie" = AN-2 PROJECT**

by Gordon LaPorte

This is my AN-2, Antonov-2 or Annie for short. I acquired this plane via Craigslist. Great price but it was in several pieces; prop, motor, 4 wing sections, a few servos and the fuselage. Not to mention about a pound of dust and mold spots! But the plane appeared to have good "bones" so I bought it.

This was an ARF kit from Maxford USA, Santa Fe Springs, California. They are still in business. It is a balsa plywood model and is covered as a kit.

The Annushka as it is nicknamed, is a single engine bi-plane designed for passengers or freight and agricultural duty. The plane was designed in 1946, and as a STOL aircraft found its way into servicing Siberia as well as Alaska so it was well suited for short and unimproved air fields. There were approximately 18,000 built and there remains several hundred still flying.

The model has a 62" wingspan at 1/11 scale. It weighs a ton! Really closer to 11 pounds.

After downloading the manual from Maxford's web site, work started with an initial cleaning, and more in depth review of the pieces and parts. Motor and ESC has been increased in capability, there were 2 dead servos that I replaced and a cracked cowl. Maxford still has spares for this plane. The hardest part was figuring out the mounting scheme for the 4 wing pieces; two for the top wing and 2 for the lower wing as well as the support structure, wire cables on the wings and the flap and aileron connections.

Just a few more items to repair and adjust...then the hardest part will be to gain the courage to bring the plane to the field to fly. Maybe I will have to knock on my neighbor's door, Mel Nash, and ask him for an airplane inspection for the first flight!





Ryan ST Plans Build

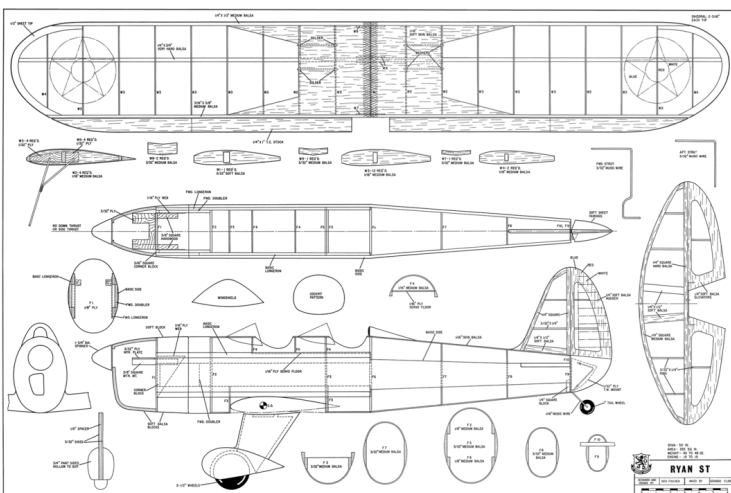
by Ray Simon

Since I was a kid I've built airplane kits that were die-cut, laser cut, or foam board. I've never built from scratch or from plans, which sounded like a great new challenge.

I discovered the website outerzone.co.uk. It has many plans of free flight, control line, and RC planes. A semi-scale Ryan ST from the March 1969 issue of RCModeler magazine caught my eye. It will have 50 inch wingspan and requires minimum 4 channel for rudder, elevator, aileron, and throttle. I printed out full-size plans at Kinkos and started cutting.

Here you can see the plans on the left and a recent pic of the progress on the right.

I've posted a build log at the DVRC Forum on RCGroups, which you can read about in the "New and News" section of this newsletter on the next page.





New and News

Did you know that our chapter has its very own dedicated forum on RC Groups? You get there by going to this web address: <https://www.rcgroups.com/place/1953-diablo-valley-radio-controllers-pittsburg-ca>

Here's a pic of our club's page!

The screenshot shows a web browser window displaying the RC Groups page for the Diablo Valley Radio Controllers. The page title is "Diablo Valley Radio Controllers (Pittsburg, California, United States)". The location is "Pittsburg, California, United States" with a "Place ID: 1953" and a "Report this Place" link. The description states: "The Diablo Valley Radio Controllers have a 500' X 40' paved runway with 125' X 12' shade structure w/work tables, Helicopter Pad, great hills for slope soaring (you can drive to the top), a 1700 sq. ft. clubhouse on a bluff overlooking the flying area, and onsite bathroom facilities on 238 acres in Pittsburg Ca. Take Hwy4 to Bailey Rd. South, Left on Leland Rd. Right on John Henry Johnson Parkway, right into driveway at end." Below the description are buttons for "New Thread" and "New Event". The forum section is titled "Threads in Forum : Places [Mark This Forum Read]" and has a table with columns for "Category", "Thread / Thread Starter", "Rating", "Replies / Views", and "Last Post".

Category	Thread / Thread Starter	Rating	Replies / Views	Last Post
Build Log	Ryan ST Build Log by Ray Simon RC Simon, Yesterday		Replies: 6 Views: 43	RC Simon Yesterday 05:33 PM

This is a great online site that our members can keep up with each other's projects, share ideas, tips, or just let everyone know what's keeping you busy in the RC hobby lately. Even if you can't make it to the field very often, you can still check in to see what your fellow members are up to.

As mentioned above, I've created a "build log" for the Ryan ST which has lots of pictures of the build process. Since this is my first project building from plans (no kit) it would be great to hear some words of wisdom from our membership as the build progresses.

If you have a project you'd like to share, go ahead and start a new thread. I'm sure the rest of the membership will appreciate it. The more pictures you include, the better!

Happy Flying!



DVRC Contacts

President: Nigel Watson; (925) 229-2336; Resolves questions on bylaws, policy, etc. Contact the president to get items put on meeting agenda.

Vice President: Steve Anderson; (925) 672-7352; If President is not available, same as above. Solicits items for and plans meeting program.

Secretary: Doug Schramm; (650) 222-8060; AMA dealings, keeps DVRC forms, records, correspondence. Takes minutes at board meetings and monthly membership meetings.

Treasurer: Mel Nash; (925) 597-8142; Collects dues, special assessments, other revenues. Pays expenses. Keeps financial records.

Board Members: All Officers listed above plus: Bill Selling, Gene Aughtry, Werner Hoch, Gordon Laporte, Marshall St. John

Membership Coordinator: Gordon LaPorte; (925) 997-0709; Maintains membership Manual. Sends out new member packages when requested and processes new members.

Field Manager: Open Position: (925) 788-5898

Safety Officer: Ron Penn; (925) 383-3232

Newsletter Editor: Ray Simon: (925) 310-3041; Publishes newsletters, solicits articles and other material.

Raffle: Allen Fleurey (925) 291-6459; Manages raffle program, selects prizes, etc.

Contact DVRC - PO Box 9411, Pittsburg, CA, 94565