NIRA's Big Book -O-Tips

Compiled by Bob Wiersbe

Credits

All material in this Volume was contributed by the following people, either as direct input, as a participant of one of the model rocketry newsgroups, or taken from a past issue of The Leading Edge/Model Rocketry/American Spacemodeling/ Sport Rocketry:

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Construction

Make a copy of the plans, templates, and decals before you start building. You never know when the data will come in handy!

Save the cardboard backings from pads of paper. They are perfect thickness for fin patterns.

Ordinary brown paper bag paper works well for shock cord anchors. It becomes soft and malleable when soaked with glue, ensuring a good fit to the tube wall.

Drywall sanding mesh can be used instead of sandpaper for sanding fillercoat. The mesh does not "gum up" like sandpaper.

When a kit contains die-cut fins, trace the fins to some cardboard first. Save your fin patterns along with the kit instructions.

Use a highlighter to color wood before sanding an airfoil. The color reveals how uniformly you have sanded.

Here is a fast and easy way to divide a long piece of shroud line into 3 equal parts for assembling parachutes. It's a lot easier to do than it is to explain:

Hold one end of the line between the thumb and forefinger of your left hand. Let the line hang loose to the floor. Next hang the dangling line over the middle finger of your left hand. There should be a little "trough" of line between the forefinger and the middle finger, and the rest of the line hanging toward the floor. Stick the forefinger of your right hand (palm down) into the "trough". The remaining cord should sandwich between the middle and ring fingers of your right hand. Now press the forefinger, middle and ring fingers together to keep tension on the line, and slowly pull your hands apart. As soon a the free end reaches your right hand, stop pulling. Cut the loops and you have now divided the cord into thirds!

Here's a way to maximize the shroud line length with a minimum amount of line. It can be used with any size or shape parachute; here's how to do it with a chute using 6 lines. First cut the shroud line into 6 equal parts, then attach three of them at the corners of the chute, forming three loops. Now take the remaining three lines and attach them to the bottoms of the loops. Gather the three loose ends and attach them to the model as usual. You now have a chute with lines that are 1.5 times as long, using the same amount of line!

If you will be using a lot of Cyanoacrylate (CA) adhesive during construction, apply hand lotion to your hands first (especially the fingernails). The CA will not stick as well to your fingers.

Many kits come with spacer tubes which are used to position internal parts. These spacer tubes can be used to glue inside motor mounts immediately above the hook or thrust ring. This protects the tubes from prematurely wearing out because of repeated ejection charges.

When gluing dihedrals for small glider wings, use pennies to prop up the tips. The pennies are a uniform size which allow uniform positioning.

Avoid getting CA on rubber, it makes it brittle.

Rather than tying the shock cord to the nose using the standard overhand knot, try using four-in-hand knot (that's the same knot you use on a necktie). The loop at the top of the four-in-hand makes the nose/cord joint loose and allows the cord to project straight away from the nose.

Some brands of contact lens enzyme tablets come with plastic vials which fit into round recesses in a styrene tray. That tray works well for holding small parts (e.g., screw eyes, lugs, etc.) and the recesses hold bottles of glue or CA and preventing them from tipping over.

Whenever sanding a square edge, such as a root edge, tape the sandpaper to your counter and move the part instead.

Avoid marking tubes with ball point pen. It can leave a scribe line in the tube which will remain visible even after painting.

If construction requires a folded fiber part, such as a canopy, pre-score the fold lines from the back side of the part. That will help make the fold straight and clean.

Invest in a metallic straight edge. Use it whenever cutting balsa.

If the glossy finish gets torn off a fiber part (such as a shroud), carefully apply a smear of CA across the area, then sand with extra fine emery paper.

Use blind nuts (also called T nuts) or threaded brass inserts on the rear centering ring of HPR models. Then using clips bent from brass and socket head cap screws (preferably stainless) bolt in your reloadable motor, expendable motor, or engine mount. [The Kaplow Klip]

To keep your launch lugs straight on the body (especially if you have two or more separated by a distance), glue them in place and wait until they're half way set (i.e. still movable but not sloppy). Now take the body tube and place it on a table or other flat surface. Roll the body slowly until the launch lug(s) engage the table. Viola'! The lugs are now in line with each other and/or their centerline is parallel to the body tube's. [Note: do this _before_ you attach the fin]

The use of a small perforated disc can help prevent the tangling of parachute shroud lines. Cut a cardboard or thin plywood disc about one-half the diameter of the body tube. Drill equally spaced holes around it and thread the lines through. Running the disc up and down the lines before and after a flight will aid in keeping the lines separated. To "reef" the 'chute, position the disc in the desired place with a small piece of tape.

A common tip that is worth repeating is the use of fabric covered sewing elastic to replace the rubber shock cords found in most kits. It comes in various sizes and cross-sections and offers increased reliability and durability.

Use elastic shock cords in all your models, it lasts longer than the rubber supplied in most kits. A long cord will prevent snap back that causes dents.

Seal the ends of the body tube with thin CA and sand it smooth, this will help prevent zippering and denting.

A few things you can do to reduce the possibility of broken fins are:

1. Make sure the "leading edge" of your fin planform (shape) is parallel with the grain of your fin material if you are using balsa, basswood, or plywood.

2. Glue your fins to the body tube with Zap, Hot Stuff or whatever you are using, and then fillet each fin on both sides with a good 5 minute epoxy glue.

3. If you are using balsa fins, take a pin and punch small holes along the line where your fin will be glued on. This creates a rivet-like joint and a very strong attachment.

Finishing

Decals:

Use a soft water-soaked paint brush to move decals into position.

Decals will not adhere to flat paint. If the color is only available in a flat finish, coat with clear gloss before applying the decals, then seal with a dull clear spray (e.g., Testors Dullcote).

To dress up your sport models add detailing like that found on sounding rockets and military missiles. Hatches, antennas, bolt-heads, cable tunnels and fin support braces are just a few ideas. Study a few plans and photos of real vehicles and let your imagination run wild!

Sealing Body Tubes:

When using putty to fill tube seams, prime them first with a coat of dope. The putty will adhere better.

If you need to sand putty, especially along a fin/tube or lug/tube joint, protect the adjacent tube surface with masking tape to avoid removing the tube finish.

For sport models and scale models, I use "Hobby Poxy Stuff" to fill tube seams and any other blemishes. Make sure you lightly sand all surfaces before applying. I thin the "stuff" just a little then use a toothpick to put some in the seams. Let it set thoroughly (3-4 hrs). Cut some 1" squares of medium and fine sandpaper (240 & 400 grit for example) and go to work removing all the filler that isn't in the seams. Be careful not to take too much off the surface of the bare tube. Repeat the process if some nicks are found in the seams.

It is easier to do this filling process without the fins attached to the rocket but it might be impossible in some designs. Also, I seal the ends on the tubes (couple of inches inside) with superglue; this keeps moisture from expanding the bare paper on the ends and gives it strength for shock cord and nosecone "snap-back".

I do the body tube seams with automotive spot putty (just thick primer). Some have bad-mouthed the spot putty, but I really like it. I use a plastic squeegee to run it into the seam, so there isn't TOO much to sand off, and then I use a sanding sponge (hardware store type) to sand the tube.

The best filler stuff is Elmer's Professional Wood Grain Filler (with the orange top). It thins with water and is odorless.

Sealing Fins:

When sanding by hand, fold the sandpaper in half, the grit against your fingers will make it easier to hang onto the paper.

Avoid brushing dope (e.g., balsa fillercoat) over white glue fillets, it forms a brittle bubble which is difficult to sand away.

I use a few methods for sealing fins. I've used "sanding sealer" (dope with a filler) on balsa if weight is a concern. I've used thinned "Stuff" with good success with only one coat. On plywood fins, I use sandable primer that is compatible with the final paint.

Well, my favorite for filling balsa is two coats of Aerogloss Balsa Fillercoat sanded with 320 grit wet/dry paper, followed by 1-3 coats of Aerogloss Sanding Sealer sanded with 400 grit wet/dry paper. Ply just gets the sanding sealer, sanded with 320/

400 grit. Next comes a couple coats of Krylon white primer, followed by Krylon color coats and clear over the decals if it's looking good.

A quick and good way I eliminate sealing fins on smaller, non-professional-finish models is to use large self-adhesive label paper (4x6"sheets and/or 8x10" sheets). Sand the fin, round the leading edge, taper the trailing, brush all the sanding dust off. Then lay the fin on the adhesive side of the paper, pull the paper up and over the leading edge, then flat over the other side. Run your finger firmly over the edges, then X-acto away the excess. Seal the trailing edge with medium superglue. If you wish, you can seal the exposed edge of the fin as usual. Strengthens the fins, paints well, and takes about 3 minutes per fin! My favorite method.

Another way to achieve the same effect is to duplicate your process with silkspan or jap tissue and thinned clear dope. A couple coats of clear dope after you finish will seal it, and the results will be a lot lighter.

Fillets:

I use 5-minute epoxy (Pic from NCR). I tack the fins on with CyA and make sure the fillet area is rough sanded. I do adjacent fillets of two fins while keeping the model horizontal until the epoxy sets. There doesn't seem to be anything better than your pinky to smooth out the fillet! I mix enough to do the two fillets at a time. After the epoxy sets fully on all the fillets, I sand out any blemishes and fill pits or cracks with 'stuff'.

I add about 1/8" fillets for most models and more if it's high power. It's more important to have the fins attached through the body tube to the motor mount for HP; I've seen ply fins attached to the outside sheer right off.

Priming/Painting

A quick paint stand can be made from a disposable bottle and a spent engine. Just glue the casing to the top of the bottle and paint away. Stuff a mini engine in the casing for painting mini models.

A 1/2" dowel rod fits nicely inside a burned out A, B, or C motor, and can be used as a holder for painting rockets. These motors will fit inside a D motor for holding bigger rockets.

When spray painting, use a rubber glove on the hand holding the model. That way, you avoid the overspray on your hand.

I use "#0000" steel wool to go over the whole model before applying the primer. Make sure the steel wool is free of oils; some cheap stuff isn't very clean. After that, go over the model with a lint-free soft cloth. Sometime I use a little isopropyl alcohol, especially to remove contaminants from plastic surfaces.

I find the "Krylon" primers and paints give good results. Two coats of primer and two light coats of paint work fine for me. If you want better results, such as on a scale model, use more coats of primer and sand generously between coats. After all the finishing touches and decals I use the Krylon "clear", it protects from moisture and gives a dull- semi-gloss finish.

Something I do for putting a little lightweight color on open balsa, like gliders, is go to the fabric store and find a color of dye that I like. Mix a bit of it in some thinner and airbrush it onto the balsa. It dyes the wood and the thinner evaporates. Next to zero weight.

Spray paint works better when warm. Let your paint cans stand in warm (not hot) water for a while before you start spraying.

When applying the final color to a model, slide the nose up a bit (approx 1/8") and color a bit of the shoulder.

If your model contains translucent parts (such as styrene parts) prime the model first with a dark primer. This makes the entire model now appear opaque, ensuring the final color looks the same on all parts.

When masking off areas to apply a second color, before applying the color, spray first with clear. This seals the masking lines and prevents color from seeping under.

Launch Equipment

PVC plumbing parts, available at hardware stores, make inexpensive standoffs of your launch pad. They do not cause electrical shorts, and are surprisingly resistant to the effects of exhaust blasts.

The small spring inside a ball point pen can be used as a standoff for lightweight models. Simply bend a kink into the middle of spring and slide the whole spring over the rod. The kink creates the pressure which holds the spring in place, but the spring can still be moved up and down the rod as needed.

Clay flower pots make good HPR blast deflectors. The angled section deflects the blast away from the rocket, preventing back end burning.

Chemistry ring stand supports make good HPR rod stand-offs. [untested as yet, but I got one Labor Day Weekend from American Science...]

3"x1" dowel extension to mini-chad-pad makes an ideal platform for launching BGs and RGs from. [originally from Bunny?]

GE 9V [7.2v actually, may now be labeled with the Sanyo name] rechargeable batteries are ideal for launch systems. These have a low internal resistance; other brands will not work. One will fire solar ignitor clusters reliably. With a little work with a moto-tool, they will fit into most launch controllers designed for AA batteries. Two in series will fire
copperheads.

For relay launch systems, use s SPDT relay instead of SPST. The common pole goes to the pad. The on pole goes to the battery, and the off pole goes to the continuity buzzer. This eliminates the separate continuity check button, and lets you hear continuity as you hook up your ignitor. [another Kaplow original as used in my HPR relay launcher plan]

Use double banana plugs for ignitor leads on relay boxes. They are stackable, allowing for multiple wires connected simultaneously which is handy for clusters. They also have strain relief provisions, to prevent your connections from getting broken.

PVC tubing makes a great holder for launch rods, protecting them from moisture and keeping them from getting bent. Just cut a length slightly longer than the longest rod, glue an end cap on one end, and put a removable cap on the other. Spray the tube with WD40, and keep a piece of steel wool on top to clean the rods before using them.

Always clean your launch rod before putting it away. Wiping it down with a little WD40 helps.

On the Range

I keep a knitting needle in my range box, the pointed end is useful for tamping in igniters, the flat end works for pushing wadding into the tube.

If you intend to carry bottles of glue or CA in your range box, make sure they sand upright. Bottles stored on their side will leak sooner or later. Find some way to friction fit them to something in the bottom of your range box (e.g., an inverted spray can cap), so they cannot tip over.

Try to remove expended casings from models immediately after flight. Heat-induced seepage of tape adhesive, or subsequent swelling of casings may make the casing difficult to remove later.

Small metal boxes, such as the type Sucrets come in, are very handy for storing ignitors. (Note: Sucrets will be phasing out the box, but Altoids hardcandy come in the same kind of box).

After a launch, remember to "police" the area, pick up scraps of wadding, or whatever litter you caused. The landowner will appreciate it!

Use a wooden clothespin to clip the Solar ignitor right to the launch rod. Space it the proper distance out from the rod. Then you can just set the rocket down on the ignitor. No way this baby can fall out or misfire. [original idea - unpublished to date]

Use a hunk of body tube or a couple wraps of file card stock on the outside of the tower rails. Put a notch in the ring for each fin. This keeps egglofters and other tapered models from wobbling inside the tower and coming out crooked. [The Landis Loop]

There is an easy way to fix broken shock cords in the field. Tie the shock cord to the engine hook (or punch a hole in the fin) and then cut a slot on the top of the tube or in the nose cone where the cord enters. Besides getting in more flying you may end up with fewer broken fins this way.

Prepping

Rather than "spiking" chutes, fold them. Take time to lay the plastic smoothly and flatly into place. By doing so, you can pack the chute in a much smaller space.

Whenever you are prepping for flight, make a habit of tugging on shroud lines and shock cords to see if they are still in good shape.

When prepping a streamer for flight, fold the streamer in successive opposite directions. For example, for the first fold, fold the right half over the left half. For the second fold, fold the right half behind the left half. Keep repeating until the streamer is completely folded. The final packet is "unstable" and will spontaneously unravel with little help.

Bend loops into the ends of solar ignitors before putting the model on the pad. The loops help keep the clips from sliding off.

Models which contain pistons, like the Estes Cato, gum up with exhaust after a few flights. Sprinkle some kitchen scouring powder into the tube, work the piston back and forth a few times, and pour the now dirty powder out.

Use a plastic sandwich bag to enclose an egg before launch, just in case it doesn't

survive.

As engine hooks get older, they don't grab the end of the motor as well as they used to. A wrap of tape around the motor and the end of the hook, will help ensure the motor stays put.

To eliminate burning of parachutes, wrap them in a sheet of recovery wadding. This goes back to very early Estes motors, which included 3 cut and use streamer protectors in each motor instruction sheet. I've eliminated the cutting and just use a sheet of wadding, and cover the chute "diaper" style.

For large models, you can use a large square of crepe paper from party stores. This is flameproofed by law. For 10x10 sheets, I cut an unopened 20" package in half with my paper cutter, then remove each 10" roll and chop it down to squares. Cutting it in thirds gives sheets good for BT-60 and BT-70 sided models. [original idea - unpublished to date]

Keep a 35mm film can in your reload hardware kit. When flying smaller models, use less than the full amount of ejection charge provided. Dump the extra in the film can. They also make handy storage containers for lead shot or other small items.

Reload Tips from Aerotech

taken from a CIS posting by Gary Rosenfield

1. Always use grease sparingly. Apply a thin coat of grease to the o-rings. If grease covers the face of the delay element, ejection charge reliability will suffer. Use enough grease on the threads to allow the closures to tighten smoothly.

2. Make sure you shake the completed motor, ejection cap up, before installing in the rocket. This settles some of the ejection charge in the transfer cavity above the delay element, which helps to ignite the charge when the delay burns out.

3. Make sure the end closures are tightened completely against the case. This preloads the o-rings to prevent combustion gas leakage.

4. The delay element or delay spacer must protrude slightly (about .020"-.030") above the forward closure after being installed. When the closure is tightened, the delay or spacer compresses the delay o-rings.

5. Ensure that the motor is cleaned thoroughly after each use. Residues, especially in the forward closure delay o-ring area, can prevent proper sealing and result in the forward closure being turned into a nozzle.

6. Inspect the o-rings for nicks, cuts, thin sections or other defects. AeroTech will replace these or any other defective parts you find in your reload kits. Defective o-rings can cause hot gas leaks and motor failure. Don't use a reload kit with defective or missing parts.

7. The parts must be assembled in the correct order and location. We've seen o-rings stretched around the end closure threads, for example. Needless to say, the subsequent flight using that motor was less than perfect.

8. If you have a misfire and need to remove the aft closure and nozzle insert to install a new igniter, hold the motor nozzle up and avoid moving the liner or other internal parts. If the delay moves after the ejection charge is installed, the charge may leak under the delay o-rings and cause a forward seal failure.

9. Don't leave a motor assembled for an extended period. This can cause a compression set of the delay element. If necessary to store the motor before launch, loosen the aft closure slightly (a couple of turns) to reduce the preloading of the delay o-rings.

10. A real indication of trouble is if you have parts left over. Check your assembly again, or call AeroTech.

11. Other Notes

A hobby knife is useful for clearing out the ejection transfer port in the forward closure. The edge of a 6" steel ruler can be used to (gently) scrape any carbon build-up from the inside ends of the motor case.

The RMS casings are a *little* heavier than their single-use counterparts, but no stability problems have yet been discovered or reported. You should always check the stability of a questionable rocket/motor combination before flight.

If you rush, you can re-load in less time, but it's not recommended <g>. My estimate is 5-10 minutes under typical conditions.

Miscellaneous

Regular window cleaner works quick well to remove dirt and smudges from older models.

Invest in some clear plastic page protectors. You can store your kit instructions within a ring binder, and not have to punch holes in the instructions.

If you ever have a need to pack models for shipment or a long commute, wrap them in dry cleaner bags. The bags do not have any inks/dyes which can color the model, and the bags have a tendency to fill with air and thus cushion the model.

Some cellophane tapes have a frosted coating which makes it easy to write on. Write your name and address on such tape and apply to the shoulder of the nose cone.

Never use your teeth for any modeling activity.

You can keep unopened CA in the freezer for years.

If a fin attached by white glue (or aliphatic resin), it may sag out of position if the model lays on its side for an extended period of time. The glue joint can be warmed on a light bulb and the fin gently worked back into position.

Be good to your newsletter editor.

Empty orange juice containers make nice bins for motor storage. 8 of them fit nicely into a standard surplus ammo box.

Shotgun shell storage boxes are just the right size for 18mm motors. There are smaller rifle shell boxes that hold 13mm motors.

Expended motors can be glued to a wooden base to make dandy rocket stands.

Plastic nose cones make great payload sections!

Cut a coat hanger a few inches below the hook, and epoxy it into the nozzle of an expended motor. Now you can hang your rockets upside down in a closet or workroom.

Lava soap is great from removing epoxy or CA from your hands, the sandpaper like surface practically sucks the goop off your fingers. Roll your fingers apart if they get stuck together with CA, pulling tends to be very painful.

Not Just Single Use

by Bob Wiersbe

Don't throw away those disposable Aerotech motors! The phenolic casings are still useful, even if the motor isn't. They're strong, smooth, and have a lot of different applications. Here are just a few.

1. As a thrust ring - a single casing can be cut into many rings.
2. As a stage coupler - cut off both ends and clean it out.
3. As a payload coupler - cut off ejection charge end, and epoxy a screw eye in the nozzle.
4. As a motor tube protector - cut off both ends, clean it out, and glue ahead of the thrust ring.
5. As a paint holder - epoxy a dowel rod in nozzle or ejection charge hole.
6. As a rocket holder - epoxy motor to wooden base, or cut off ejection charge end and screw to base through nozzle.
7. As a bulkhead/coupler for staged models - cut off ejection charge end, clean it out, and feed igniter wires through the nozzle.
8. As a holder in the Estes Fin Alignment Guide - use a 24mm motor, the nozzle fits perfectly in the centering hole.
9. As a plug for clustered models - plug nozzle with epoxy, and cut 1" from nozzle end.
10. As a block for cutting tubes - insert in tube behind cut line.
11. As an ejection baffle - cut off nozzle, clean out, enlarge ejection charge hole, insert metal mesh, then glue in tube. You can also make a bunch of removable baffles this way, but you'll need to custom build the motor mount to be able to use them. For example, if you're going to be using D & E motors, glue the thrust ring far enough forward so that the baffle will fit between it and the motor.
12. As a rocket standoff - slip over launch rod.
13. As a launch rod cap - seal the ejection charge end and insert rod in the nozzle.
14. As payload ballast - seal ejection charge end, fill with sand/lead/etc, then seal the nozzle.
15. As a payload protector - cut off one end and build your payload into the casing.
16. In a piston recovery system - cut casing 1" above nozzle, epoxy leader wire through nozzle to attach shock cords to, insert nozzle end first into tube.

Ten Things I've Learned About Scale Models This Month

by Mark Bundick

1. Dividers are a really helpful tool.
2. With sufficient plastic bits and patience, you can make convincing details.
3. Use materials that don't need filler and avoid all that sanding.
4. Don't build after 10 PM; you'll just screw something up.
5. Plastic sheet doesn't like to turn into round shapes without some heat.
6. Nose cone turning requires a strong dowel.
7. Pretend the plans and drawings are a Waldo book. Look at them over and over to find new stuff you'll forget to model.
8. When you're just starting out, worry more about finishing a model and less about winning.
9. You can have fun with your scale data packet.
10. When you get stuck, get help from Bob Biedron! :-)

Saturn V Building Tips

by Peter "Buy my books" Alway

1: Some permanent spray adhesive isn't. I suggest that when applying body wraps, use a better adhesive. I used wood glue (though wood glue applied directly to paper wraps will wrinkle them-apply it to the body in a thin layer). Wrap the corrugation around dry for good alignment. lift one end and glue it. Re-adjust aliment and allow to cure with a rubber band holding alignment. then glue the rest of the wrap down.

2: Paint white paint, then black paint, and finally silver.

3: Mask with scotch Magic tape (the frosty stuff) and aluminum foil covering the vast white expanses.

4: There are white areas on the service module. refer to the launch close-up of the real thing on the box. The pattern repeats at 180 degrees.

5: Do not fly with Estes E15's with X in the date code.

6: I really love flying mine on D12-3's, but lotsa folks like to fly with bigger engines. Those may require high-power construction techniques.

7: Apply decals to glossy surfaces only.

8: If you want to be accurate for Apollo 11, omit half the ullage rockets. Keep those that are nearly in line with the fins. with care you can burnish the remaining locations on the wrap-around to match the surrounding corrugations (those places will be painted black, so flaws should be inconspicuous)

9: Leave the decal(s) off the nose cone (command module's boost protective cover).

10: Take the effort to sand and seal the fins well. They'll be painted silver, and the grain will really show.

11: Only fly your Saturn V for an appreciative audience. I believe that every model rocketry flight has a 10% chance of ending badly, and your Saturn V will be too precious to waste flying alone, or after a bunch of G and H flights that will make the Mighty Saturn V look not so mighty. After a bunch of Alphas and Berthas, you can really relish a Saturn V launch. And don't you go snapping photos. Let somebody else do that. Enjoy the flight! It's the about the coolest rocket around.

EIGHT IDEAS FOR BETTER ROCKETS

by Bruce Carey

1. Take your time! Read instructions if building a kit, or know your theory if designing and building a custom bird.

2.Use the Right materials. Match the tubes, balsa, glues and finishing materials to the needs your model demands for good performance and safe operation.

3.Understand before you start gluing. Pre-fit all parts before gluing them.

4.Sand your entire model until it's smooth. Start with #220 or #320 grit and finish with #500 or #600, using a tack rag before finishing to get all the dust off.

5.Use finishing materials (paint, etc) sparingly. Paint rockets with thin coats of paint and use flat white for a base coat. Use tissue and clear dope on gliders for lightweight strength.

6.Prepare your models for flight carefully! Don't forget recovery wadding, tracking powder (if needed), or that parachute.

7.Take pride in your building abilities and models. Models take longer to build when they are done properly, but they will last longer and be something you can be proud of.

8.Always design and launch with Safety in mind. Remember, we are all responsible for keeping our privilege to launch!