BUILDING INSTRUCTIONS

HIGH POWER ROCKET KIT

Excel

Fisher series kit

Kit Specifications:

Designed for TRA and NAR Level One and Level Two certifications, the Excel stands ready to do the job. Designed for an easy build, stable flights and eye-catching looks. This kit also comes with nice upgrades like motor retention hardware, rail buttons, nylon recovery harness and a rip-stop nylon parachute. It also features our unique, super strong fin section components and detailed instructions

Features a kit industry first...Modular fin can construction!

DIAMETER: 4.0”
LENGTH: 51”
MOTOR MOUNT: 38 or 54mm
REC. MOTORS: 38mm: H242T I161W I211W I300T I195J
I284W I435T J350W J570
*54mm: J180T J275W J460T J415W K550W

(*) Indicates that this model can fly on 54mm motors if nose weight is added for stability, or if using our dual deployment kit which adds needed length for stability. In addition, for flights that may achieve mach speeds, it is highly recommended to reinforce the fins with fiberglass or carbon fiber to minimize fin flutter.

Kit includes cut and sanded 1/4” aircraft quality plywood fins, high strength airframe tube, centering rings, aft thrust ring. high quality hardware package, motor tube, plastic nose cone, computer designed and cut vinyl decals to finish as shown. Includes motor retention!

NOTICE TO BUYER...This model rocket kit is not a toy! It is not recommended for children under age 18, unless used under adult supervision. If not assembled and used properly, it could cause property damage, personal injury, or death. By purchasing this kit, the buyer agrees that neither Binder Design nor the designer of this kit will be responsible for damage occurring through the use of the product and shall be held harmless in any such claims. If the buyer is not prepared to accept full responsibility for the use of this product, buyer should return unopened kit in original condition to place of purchase. Always follow NAR or TRA Safety Codes when using any model rocket products, and use common sense. This model may require FAA waiver for flight. Consult your local rocket club for more information or contact the NAR or TRA.

BINDER DESIGN
www.binderdesign.com

PARTS LIST

1 - 4" Plastic Nose Cone
1 - 4" X 34" Airframe Tube
1 - 38mm or 54mm X 8” Motor Tube

3 - 1/4" Plywood Fins
2 - 4” X 38mm or 54mm Centering Ring
1 - 4” X 38mm or 54mm Aft Thrust Plate
1 - Set Rail Buttons

1 - 18’ Recovery Harness
1 - Eye Bolt/Washer/Assembly

1 - Excel Instruction Manual
1 - Excel Decal Package
1 - Fin Alignment Guide (last page)

ITEMS NEEDED TO COMPLETE THIS KIT...

Hobby knife, sharp blades
Sandpaper (150, 220, & 400 grit)
Ballpoint pen and straightedge
15 and 30 minute epoxy
Epoxy mixing sticks and cups
Rubbing alcohol
High quality spray paint (Rustoleium white and orange used on prototype model)
30” octagon parachute or larger required for flight (sold separately)

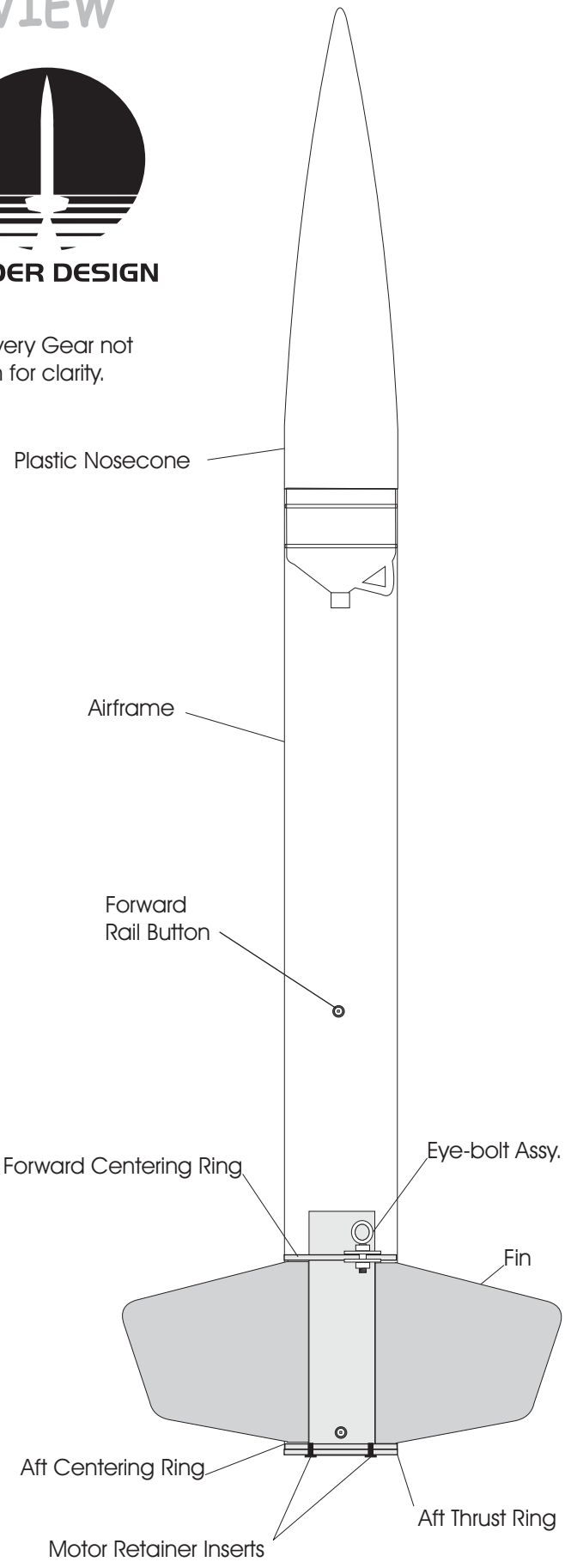
OPTIONAL ITEMS FOR THIS KIT...

Milled Fiber
Autobody Spot Putty (small tube)
Binder Design Dual Deploy Upgrade with Recovery Gear
Electronics for drogue to main deployment.

CUT-AWAY VIEW

BINDER DESIGN

Recovery Gear not shown for clarity.



THANK YOU for purchasing a Binder Design Kit! If at any time you are in doubt during building, please stop and call Binder Design between 9 a.m. And 6 p.m. at the number on the front of these instructions The cost of the phone call could save you the cost of the kit in helping you avoid a major mistake.

Nothing beats experience! That's why we recommend that you seek the assistance of an experienced high power rocket modeler before flying your model for the first time. High power rockets are capable of very high altitudes at near mach speeds and are considered differently by the FAA than smaller rockets you may have flown in the past. Flight of this model may require an FAA waiver.

Designed for the advanced modeler or sport flyer in high power rocketry, the Excel makes a great launch vehicle for Tripoli or NAR certification level one or level two flights. It is also easily set up for altimeter dual deployment with our optional altimeter bay. Includes premium hardware package that includes a Binder Design EZ Motor Retainer and Delrin rail buttons.

We recommend using only heavy duty launch equipment for launching your rockets. Most rocket clubs provide heavy duty launch equipment for larger models. Use a rail launcher that is at least five feet or longer and only launch this model vertically. Know and follow all NAR and Tripoli safety codes in operation of this rocket.

Make sure that you read and throughly understand all instructions before starting assembly! It doesn't take long to build a Binder Design kit, so take your time and enjoy yourself. We've included some helpful hints that will make all of your future building projects easier, stronger and better looking.

Again, Thank you for choosing
A Binder Design Kit!

NOTES: _____

REMEMBER! Build Light! Every ounce you save building this rocket kit will add up to increased performance. When using epoxy, use enough to secure the joint - don't build up too much. Excess epoxy only adds weight, not strength. Because high power rockets are exposed to high levels of stress and extreme temperatures, you will want to use plenty of epoxy around the fin attachment areas and motor tube assembly. We recommend the use of milled fiber added to all epoxy fillets as well as the use of 30 minute epoxy if you plan on flying this model on the higher thrust motors. Contact Binder Design for the purchase of milled fiber.

Getting Started

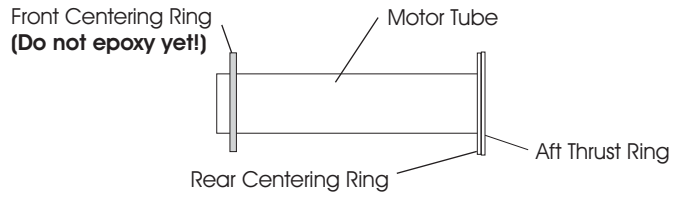
☐ **STEP 1:** Remove all parts from the packaging and inspect them. Familiarize yourself with each part and, if necessary, mark each part so that you can identify it later. **Make sure that you check all packing material for small parts!** If any parts are missing contact us by phone or e-mail and we'll be glad to get you replacements.

Building the Motor Mount Assembly

☐ **STEP 2:** Begin by building the Motor Mount Assembly. Locate the Motor Tube, Centering Rings, and Thrust Ring.

☐ **STEP 3:** Bonding the Aft Thrust Ring. It is the largest of the three rings. Apply epoxy to the motor tube just above one end. Slide the Aft Thrust Ring onto the Motor Tube until it is even with the end of the tube, rotating it to ensure that the epoxy is distributed evenly.
To ensure that the ring sets up square, stand the motor tube with ring on it on a flat surface until the epoxy is cured.

(Fig. 1) **CUT AWAY VIEW OF MOTOR MOUNT ASSEMBLY**

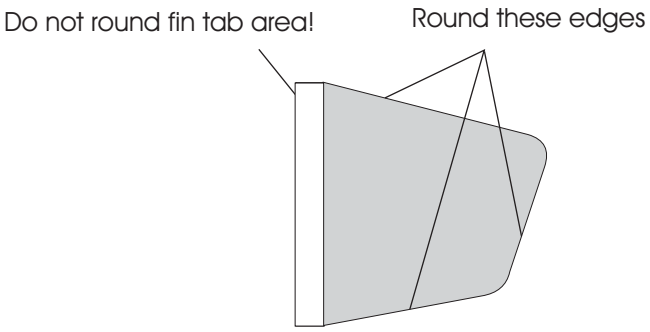


☐ **STEP 4:** After the epoxy on the thrust ring sets up, apply epoxy on the side of the ring that will mate with the rear centering ring, and also on the motor tube just above the thrust ring. Then, slide the rear centering ring down the motor tube until it fits tight against the aft thrust ring. Make sure to clean off any epoxy that squeezes out from between the rings, otherwise it will interfere with the fit later on. Don't epoxy the front centering ring on just yet, we will do this in a later step. While this cures, we'll move on to Fin Beveling.

Beveling Fins

☐ **STEP 5**: Locate the three fins in preparation for beveling. Since this is a sport model, we recommend only rounding the edges of the fins rather than trying to airfoil them. This is easily done with 100 grit sandpaper and a palm sander, but excellent results can be had by hand sanding and patience. Do not bevel the root edge!

(Fig. 2)



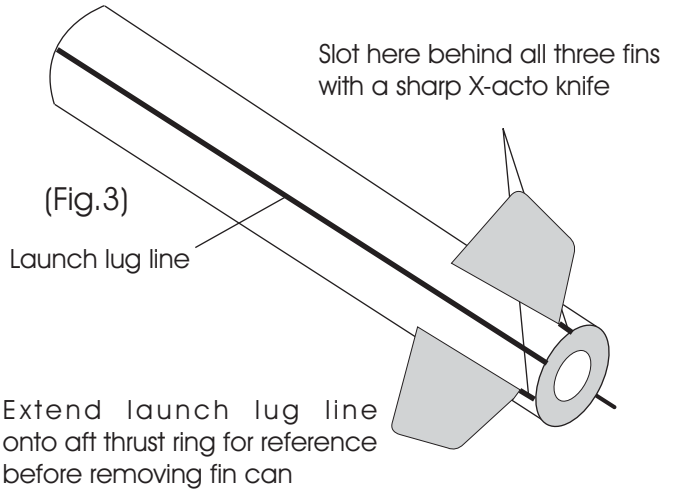
Building the "Fin Can" Assy.

☐ **STEP 6**: After the aft rings are completely cured and the fins have been beveled ,it is time to build the Fin Can Assy. Slide the front centering ring onto the motor tube approx 1/4". Do not epoxy it yet! Now slide the motor tube assembly into the end of the airframe with the slots pre-cut for the fins. Make sure that the front centering ring is forward of the slots when fully inserted. Do not epoxy anything in place yet!

☐ **STEP 7:** Attaching the fins. Apply a thin layer of 15 minute epoxy to the root edge of the first fin and insert it into the slot until it contacts the motor tube. Be sure not to get epoxy on the slots or anywhere else on the airframe tube! The importance of this cannot be over stressed because the fin can will be slid out of the airframe tube in a later step. Just use enough epoxy on the fin root to tack the fin in place. Once the fin is in place, use the Fin Alignment Guide supplied and visually sight down the tube and guide to make sure it is straight. When you are happy with the alignment, set it aside, fin pointing up, until the epoxy cures.

Repeat this procedure for the remaining two fins. Remember to use the Alignment Guide to get them on straight.

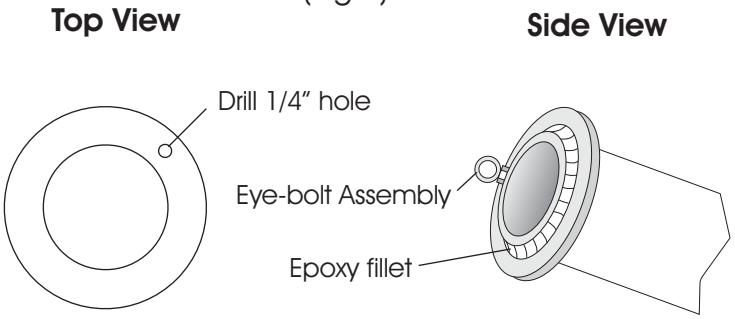
☐ **STEP 8:** Removing the fin can assembly. After the epoxy that is holding the fins on has fully cured, locate your x-acto knife and prepare to cut the airframe tabs that are behind the lower fin tabs as shown in the fig. 3 illustration below.



After the slots have been extended to the end of the airframe tube, and the tabs removed, it is time to slide the fin can out. Before this is done though, use a pen or pencil to extend the launch lug line down onto the aft thrust ring. This will give you a reference point for reassembly to ensure that the fin can is always installed in the correct position. Grasp the tailcone in one hand and the airframe in the other and pull the fin section out. If it does not come easily, you may have been sloppy with the epoxy and gotten a bit in the fin slots. Double check this and cut it loose with a x-acto knife if need be.

☐ **STEP 9:** Attaching the eye-bolt assembly. After the fin can is removed from the airframe tube, carefully remove the upper centering ring that has not been epoxied in place yet. Drill a 1/4" hole in the ring and attach the eye-bolt hardware as shown in the illustrations. Be sure to put some epoxy on the threads to ensure that it won't come loose in the future.

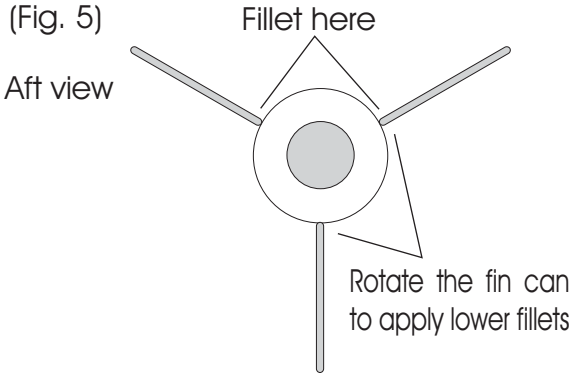
(Fig.4)



☐ **STEP 10:** Attaching the front centering ring. Spread a ring of epoxy on the motor tube just above where the fins end. Also, spread some epoxy on the upper root edges of all three fins. Then, slide the upper centering ring down in a twisting motion until it stops against the top root edges of the fins. Be sure to center the eye-bolt assembly between two fins. Stand the assembly upright and fillet the top of the ring where it meets the motor tube as shown in Fig. 4..

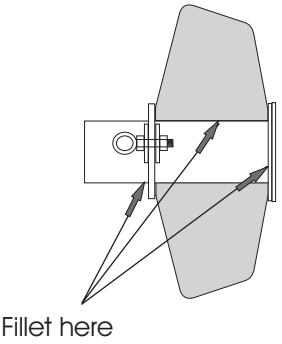
☐ **STEP 11:** Filleting the fin can assembly. Note that until now, the fins are only tacked on to the motor tube, so care must be taken in handling the assembly. This next step will add the strength to the part. Support the fin can assembly on its side with one fin pointing toward the floor and the other two fins pointing up at equal angles as shown in fig. 5. Fig. 6 shows where to apply fillets.

(Fig. 5)



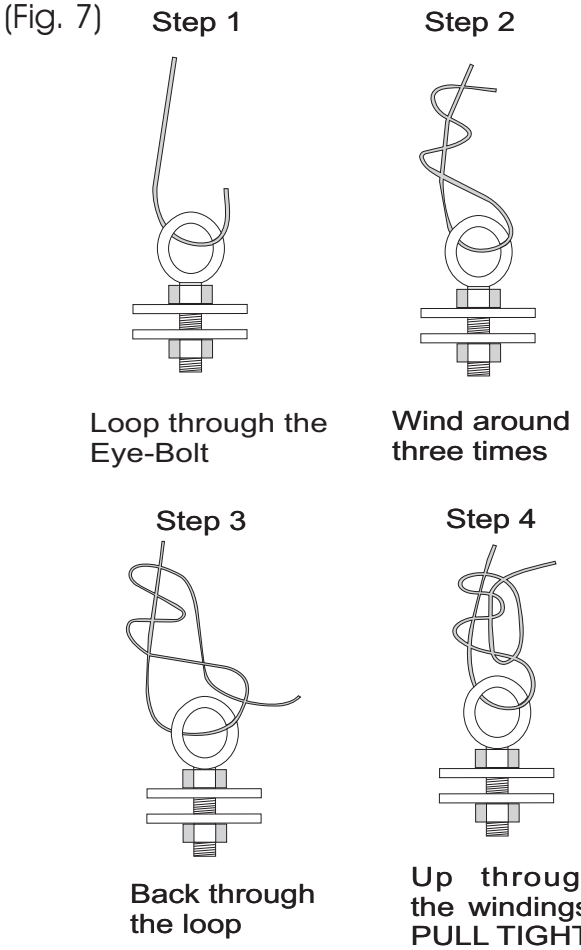
Mix up some 30 minute epoxy with some milled fiber added to it. Fillet the edge of each fin where it meets the motor tube as well as the centering rings. Do the inside edge of two fins at a time, smoothing the joint with a gloved finger. Wait for the epoxy to cure before rotating the fin can to the next set. Be sure to use nitrile or latex gloves when handling epoxy!

(Fig. 6)



☐ **STEP 12:** Attaching the recovery harness. This next step must be done now while it is easy to reach. If you forget, you may be dismayed to find that your arm is either too big or too short to reach down inside the airframe tube to attach it later!

(Fig. 7)



Attach the recovery harness to the Eye-Bolt as shown in Fig. 7. This shows the proper way to tie an attachment point and in many cases, a good knot is stronger than sewn harnesses. When you are satisfied with the knot, soak it in epoxy to set it in place permanently.

☐ **STEP 13:** Attaching the fin can to the airframe. After all internal fillets are cured, test the fit of the fin can inside of the airframe. Be sure to use the reference mark that you made earlier for proper alignment. Slide it down inside the airframe and make sure that it seats all of the way. When you are happy with the fit, slide it back out and mix some more 30 minute epoxy.

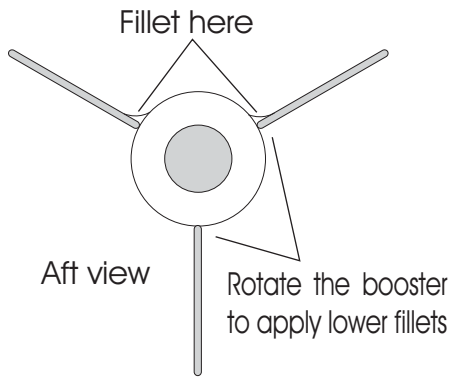
Using a wooden dowel or stick, spread a ring of epoxy on the inside of the airframe tube where the forward centering ring will contact. This will be just forward of the fin slots. Slide the fin can section in, but only about halfway.

Next, apply some epoxy just inside the airframe where the rear centering ring and aft thrust ring will seat. Insert the fin can the rest of the way until it seats firmly. For best results, tie the rear of the airframe firmly with some twine, or use rubber bands or a small bungee cord to hold the airframe tight against the rear centering ring. Then, set the finished booster section upright to cure. This will allow gravity to fillet the centering rings to the airframe tube.

Applying External Fin Fillets

☐ **STEP 14:** Mix some 30 minute epoxy with milled fiber added for strength. Referring to fig. 8, apply external fin fillets, smoothing with a gloved fingertip. This is similar to the internal filleting done on the fin can, except for these fillets will be exposed, so take your time for them to look right. Be sure to fill in the small holes left behind each fin from the slotting. Try not to be sloppy, or you will have lots of sanding to do later. If you get epoxy where it doesn't belong, clean it up before it hardens with isopropyl alcohol. Be sure that one set of fillets is fully cured before rotating the rocket for the next set, otherwise they will sag.

(Fig. 8)



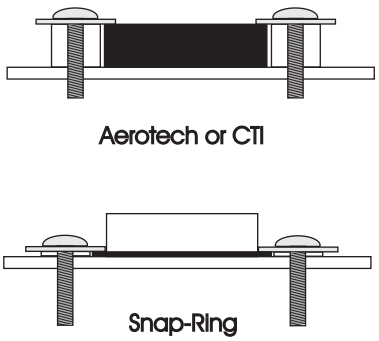
Attaching the rail buttons

☐ **STEP 15:** We prefer to attach the rail buttons before painting since we prefer to bond the base of the button directly to the airframe to give additional support. Make a mark on the launch lug line ½" from the aft end of the tube and another 16" from the aft end of the tube. This is where you will drill holes for the rail button screws. Now follow the mounting instructions that came sub-packed with your rail buttons.

Attaching the EZ Motor Retainer

☐ **STEP 16:** Locate the **EZ Motor Retainer** hardware that came sub-packed with your kit. Follow the instructions carefully, the placement of the inserts is critical for it to work properly on all types of motor hardware as seen in fig.9. After it is installed, don't forget to occasionally lubricate the screw threads in order to keep the corrrosive exhaust products from messing up the threads.

(Fig. 9)



Preparing the Fins for Paint

☐ **STEP 17:** Sealing the fins. Use a good quality sanding sealer on all of the finished fins. Brush on two coats and sand with fine sandpaper (220 grit) after each coat dries.

Finishing

FOREWORD: These next steps will just cover the basics of rocket finishing, but depending on your experience and skills you may wish to take it further by using automotive finishes, even wet sanding and polishing…that's up to you!

☐ **STEP 18:** If you have small holes above the fins from the fins slots, you may fill them with autobody spot putty, available from your local automotive parts store. Sand the epoxy fillets lightly with 220 grit sandpaper so that the paint will adhere easier. It is not necessary to sand the airframe tubing as it is coated with glassine which accepts paint without sanding. Be sure to sand the nose cone because paint adheres poorly to it if left smooth.

☐ **STEP 19:** Wipe down the entire model with a tack cloth and put a light first coat of primer. Let flash dry and apply a second heavier coat. Repeat if needed. Allow primer to dry overnight. Using 220 grit sandpaper, lightly sand the entire rocket. Wipe down with a tack cloth. Now you are ready for the color coats. Be sure to choose a compatible paint for your primer. We suggest sticking with one manufacturer, as different brands of paints are not always compatible with each other. Start with a light coat and let flash dry. Follow up with a second, heavier coat. Let that flash dry for 15 minutes, then apply the third coat heavy enough to "wet out" fully to avoid dull spots. When it is done, don't even think about handling it for at least 24 hours!

NOTES:

Applying Vinyl Graphics

☐ **STEP 20:** Your rocket kit comes with computer cut vinyl graphics. They are supplied in one sheet. Carefully cut around all of the fin decals to separate them from the sheet. Just cut between the decals and don't get too close to the vinyl. They are simple to apply. Decide where the graphics will be located, take measurements if necessary. Refer to the front cover if you are unsure of their placement.

Carefully peel the application tape (the semi-transparent part) away from the backing. **THE VINYL LETTERS WILL COME UP WITH THE APPLICATION TAPE - THIS IS GOOD!**

This also exposes the adhesive on the vinyl, so don't remove the application tape until you are ready to apply the lettering directly to the airframe! Take your time, once you've applied the decals to a surface, they are stuck! Make sure that you line everything up before letting the decal to touch the rocket! The main trick to avoiding bubbles or wrinkles is to allow the center of the decal to touch first and then smoothing it carefully towards the edges. If you take your time, you will be pleased with the results. If you have problems, you can order more decals from Binder Design.

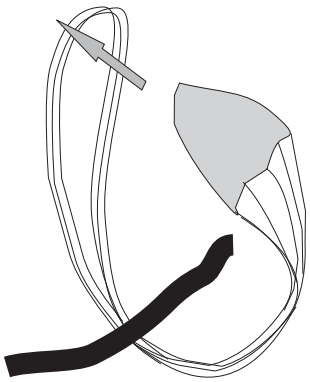
Recovery Attachment

FOREWORD: One of the most important parts of your project is the proper set up of recovery gear. These next few steps will cover the proper rigging of the supplied recovery devices. It may help to look at figs. 11, 12, and 13 (exploded views) on the next pages.

☐ **STEP 21:** Tie the loose end of the recovery harness to the nosecone in the same method that you used to attach it to the eye-bolt inside the rocket. If needed refer to fig. 7 again.

☐ **STEP 22:** See Fig. 11 for this next step. Locate the parachute. Suspend it evenly by the lines. Bundle the lines together in a loop. Slide this loop under the harness about two feet down from the nosecone. Then, pull the parachute through the loop. Pull tight. If you have done it correctly, your parachute will be securely attached to the harness. Your recovery harness is now done.

(Fig. 11)



Gather shroud lines under recovery harness. Carefully loop all lines and pull canopy through. Pull tight!

☐ **STEP 23:** Now for an important test. Lay the parts out on the floor and make sure that when the recovery harness is fully extended, that the parachute is pulled completely free of the payload tube. If it does not, move the parachute further up on the harness until it does. Failure to do this step can result in the parachute not being pulled from the tube at ejection causing severe damage to your rocket!

☐

STEP 24: To pack the parachute, lay it out flat folded in half. Fold it in half again. Starting from the top, loosely roll the parachute up toward the shroud lines around the rolled parachute. MAKE SURE SHROUD LINES ARE NOT ALLOWED TO TANGLE AROUND THE PARACHUTE OR EACH OTHER! Loosely pack the recovery harness into the recovery section and place the packed parachute on top of them. Insert the booster section into the recovery section.

NOTES:

Preparing for Flight

After you get to the flying field, you will need to re-check the packing of the recovery gear and add wadding or flame resistant chute protector(s). These are not supplied. Contact Binder Design for "Heat Pack" brand wadding. Be generous with your wadding and pack your recovery gear carefully to prevent scorching of your premium parachutes. NOTHING BEATS EXPERIENCE! If this is the first time you have prepped a high power rocket, consult someone in your local club to assist you.

Your rocket should now be ready to fly. Your first few flights should be reserved for testing the construction of your model. Remember this important advice.....GET THE HELP OF AN EXPERIENCED HIGH POWER MODELER!! There are many little tricks that you will learn about high power rockets that can only be gained by watching those who have experienced this great sport. You've made a significant investment in your model and will most likely spend a good amount of cash for your motors. Naturally, you'd like everything to go perfectly, or at least have your investment returned to you unharmed. Contact a local club and attend a launch for your model's first flights.

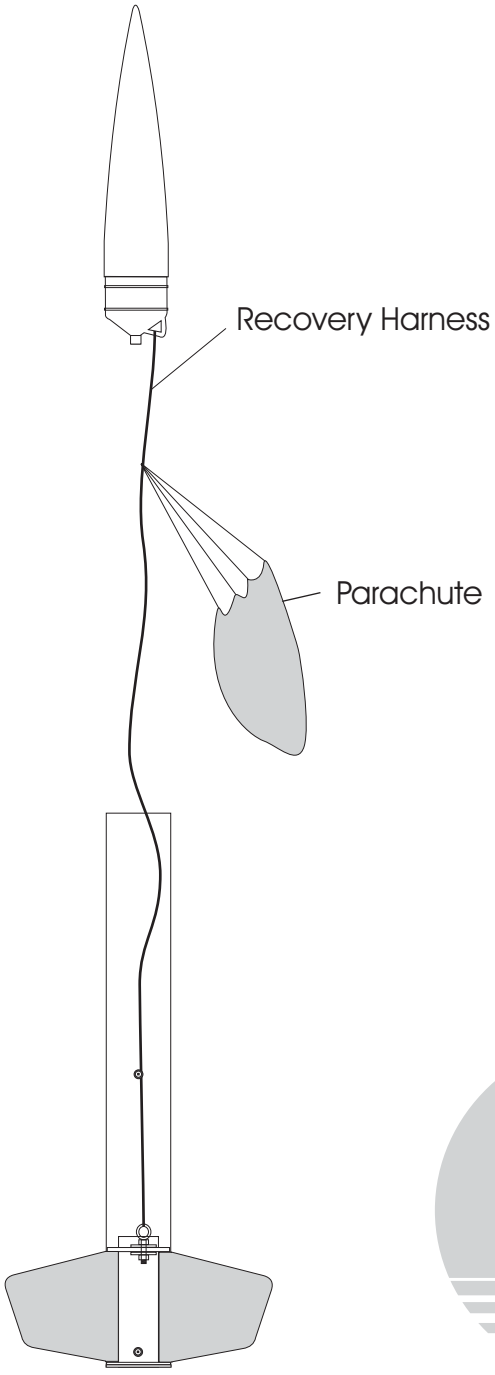
We recommend a high thrust H motor or a mid thrust I motor for your first flight. If this rocket comes with a 54mm motor tube, you will need to adapt down to 38mm with an adapter if you plan on flying the smaller diameter motors. You can use a kraft paper or phenolic adapter, or the SLIMLINE adapter. Contact Binder Design for purchase of the adapter.

After your motor is built and installed, check the packing of the recovery gear and the fit of the nosecone or couplers. You should have a snug fit of the parts, but not so tight that it cannot be separated by the ejection charge. Do not install the igniter until your rocket is on the launch pad!

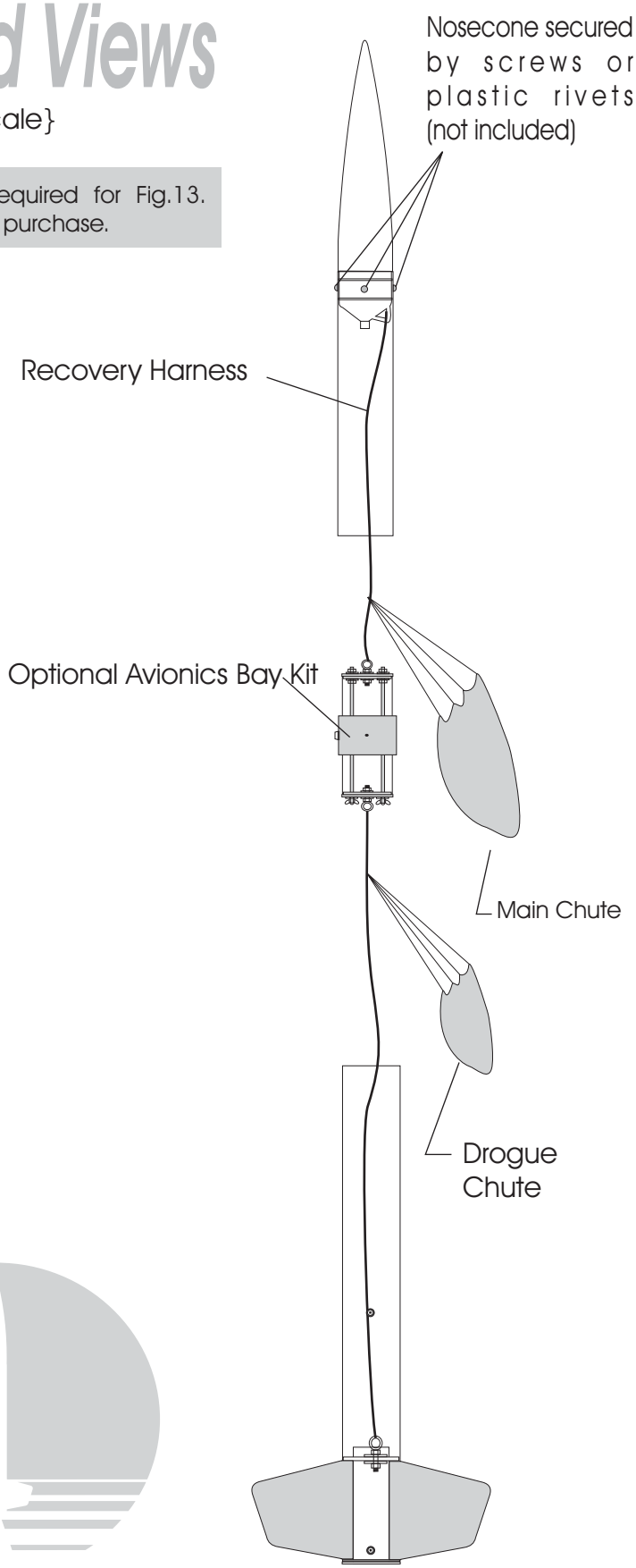
Exploded Views

{Not to Scale}

Dual Deployment Kit required for Fig.13. Contact Binder Design to purchase.



(Fig. 12) STOCK CONFIGURATION

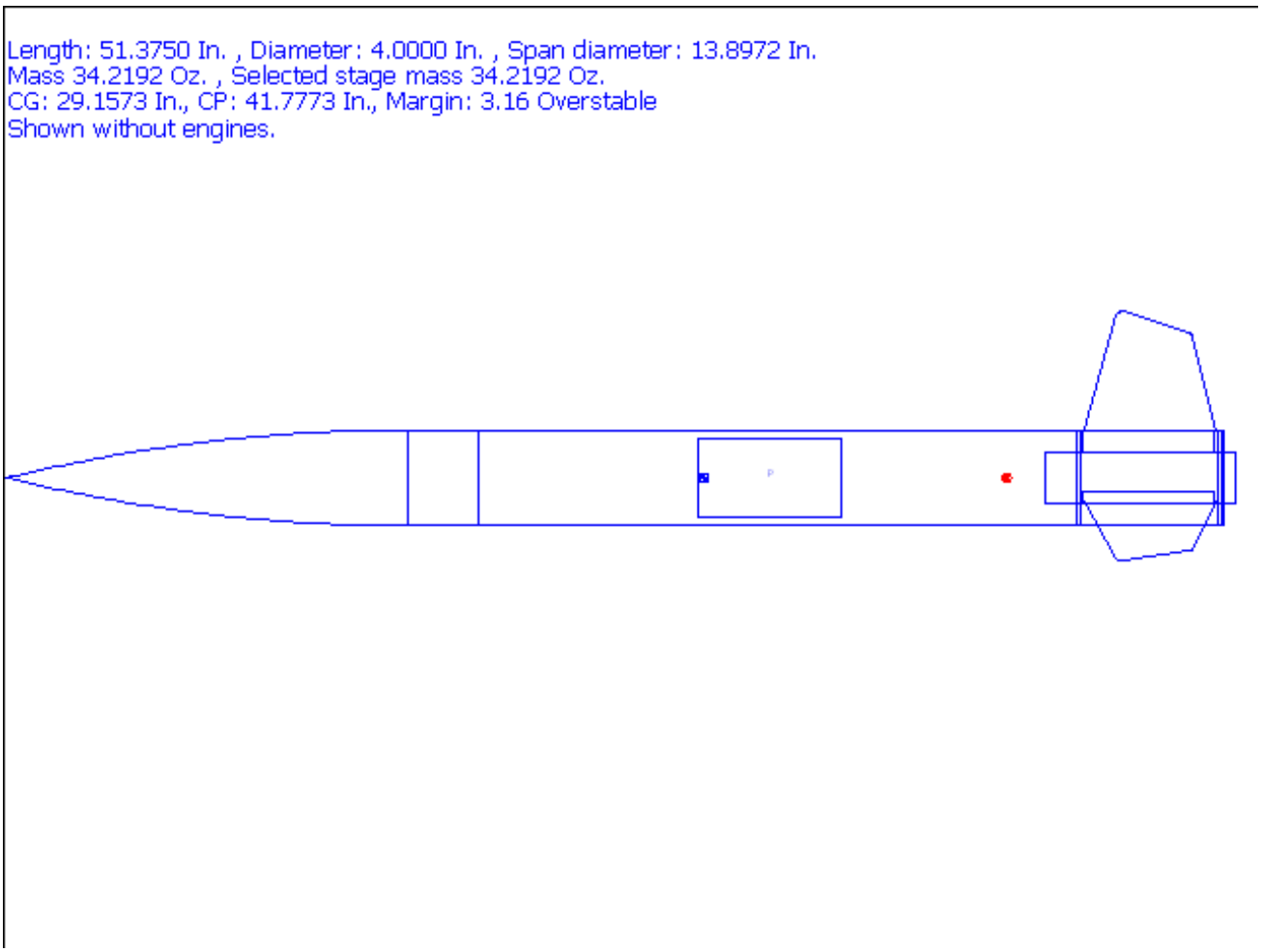


(Fig. 13) ADVANCED CONFIGURATION

BINDER DESIGN

Rocksim CP Data

Used by permission of APOGEE COMPONENTS



At Binder Design, we use Rocksim software to help design our models. This ensures a stable model, and gives performance data on the most popular motors. You can download the demo version of the program at http://apogeerockets.com or purchase the newest full version. Above is a screen capture of the stability data for the Excel. Note the location of the center of pressure or CP. It shows that the CP is 41.77" from nose tip. The center of gravity or CG is also shown. Keep in mind that the shown CG above is with no motor loaded.

Make a mark or use the CP decal provided at 41.77" from the nose tip. For ease of marking, you can round that to 41.75" That is your model's CP.

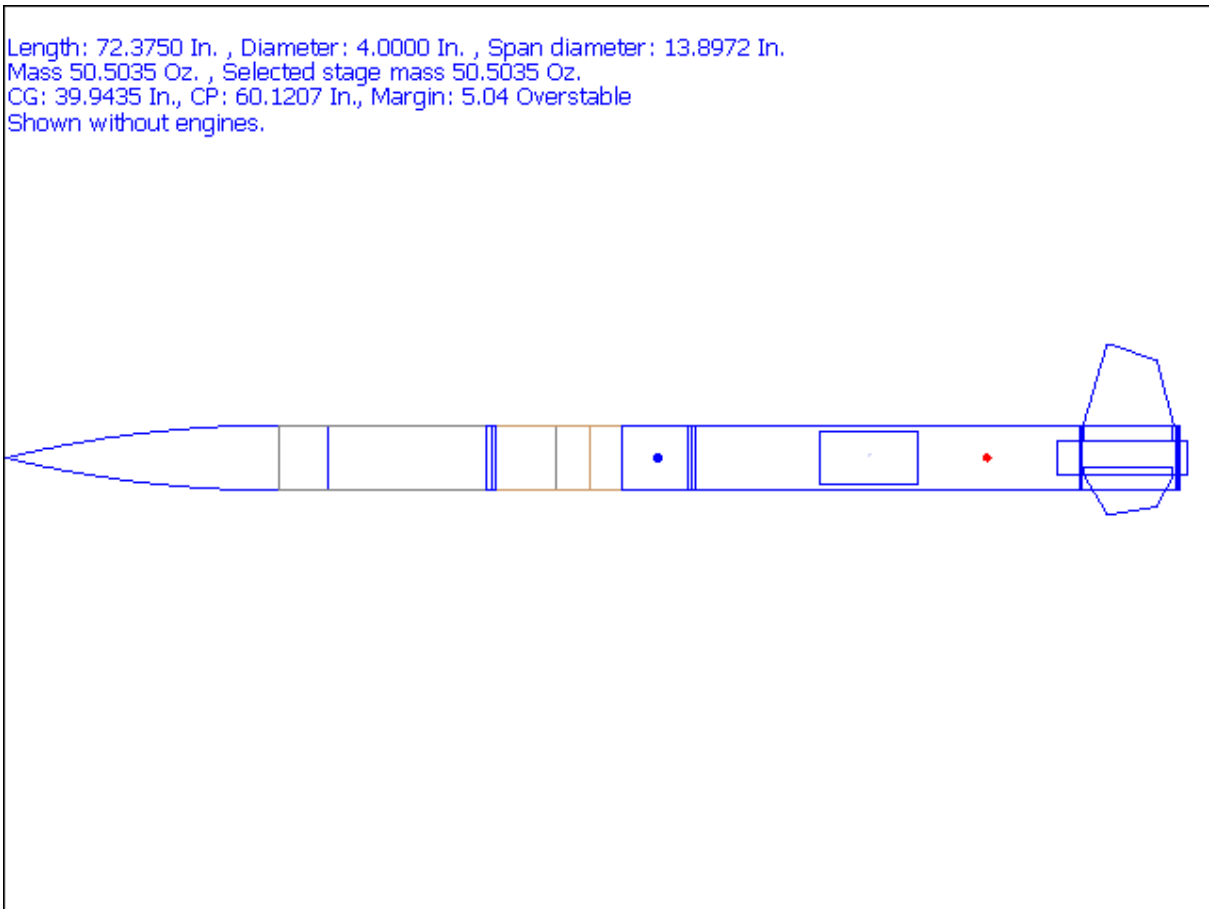
Before flight, you will need to balance the fully loaded rocket to determine the CG. The CG should always be at least one body diameter IN FRONT of the CP. In this case it is 4". The general rule for safety margin is 1 ½ calibers ahead of the CP. In this case that would mean that you want the CG to be at least 6" in front of the CP to ensure a stable flight. If it is not, you will need to add nose weight, or use a smaller, lighter motor.

A note on wadding. If you are using one of our baffle systems and motor ejection only, you don't need wadding. If you are using our Avionics Bay with electronic deployment, you will need to use wadding or chute protectors to keep your recovery gear from being scorched by hot ejection charge gasses. Biodegradable flame retardant wadding is available from Binder Design.

ENJOY!

Rocksim CP Data

Used by permission of APOGEE COMPONENTS



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Make a mark or use the CP decal provided at 60.12" from the nose tip. That is your model's CP.

Before flight, you will need to balance the fully loaded rocket to determine the CG. The CG should always be at least one body diameter IN FRONT of the CP. In this case it is 4". The general rule for safety margin is 1 ½ calibers ahead of the CP. In this case that would mean that you want the CG to be at least 6" in front of the CP to ensure a stable flight. If it is not, you will need to add nose weight, or use a smaller, lighter motor.

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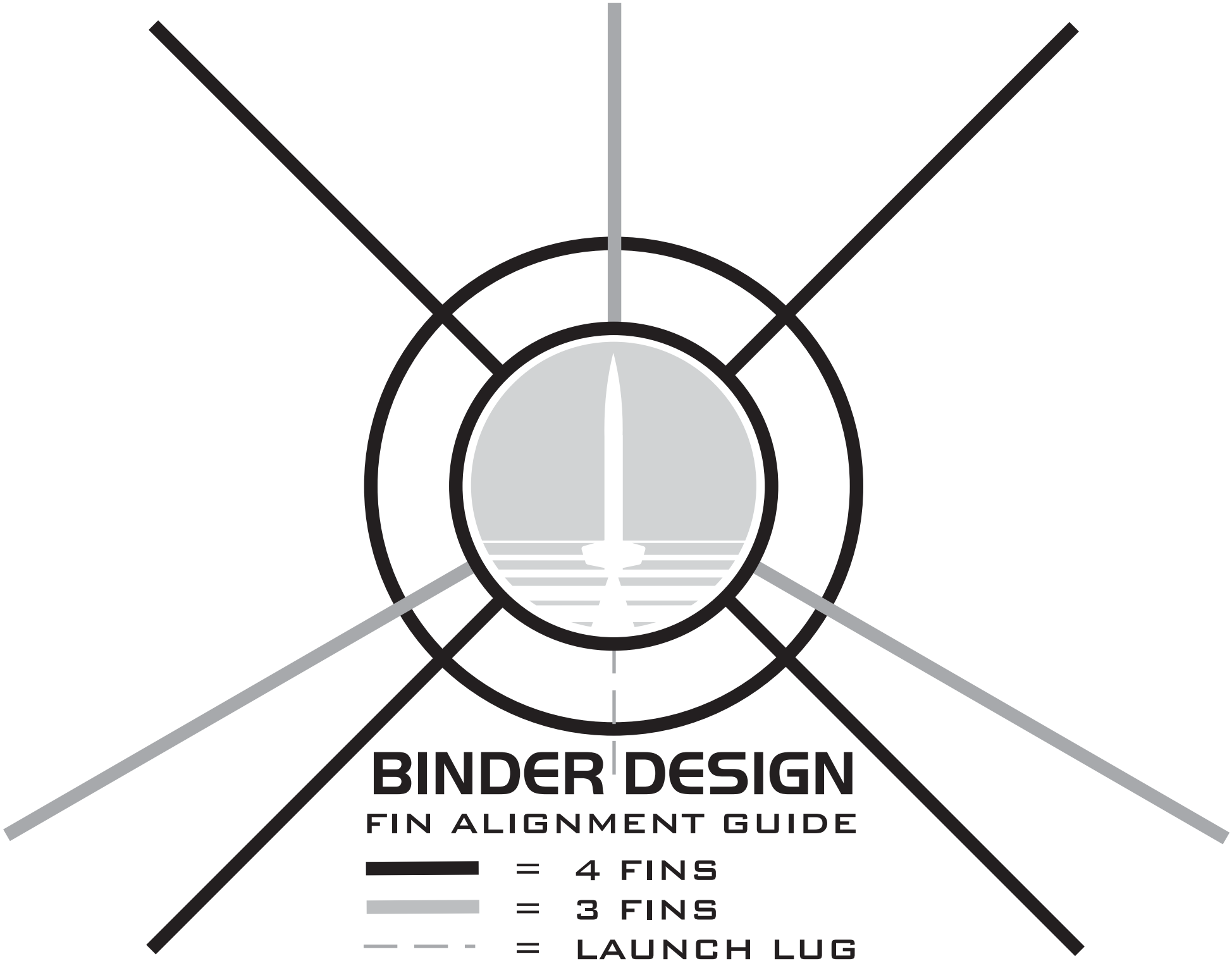
BINDER DESIGN
FIN ALIGNMENT GUIDE
= 4 FINS
= 3 FINS
= LAUNCH LUG