



Skill Level 2

CHEROKEE - 

*Derived from the Estes Cherokee-D
By C. P. McGraw*

Revision Date: Dec 8, 2005

Length	30.90"
Diameter	1.320"
Fin Span	6.235"
Weight	6.5 oz

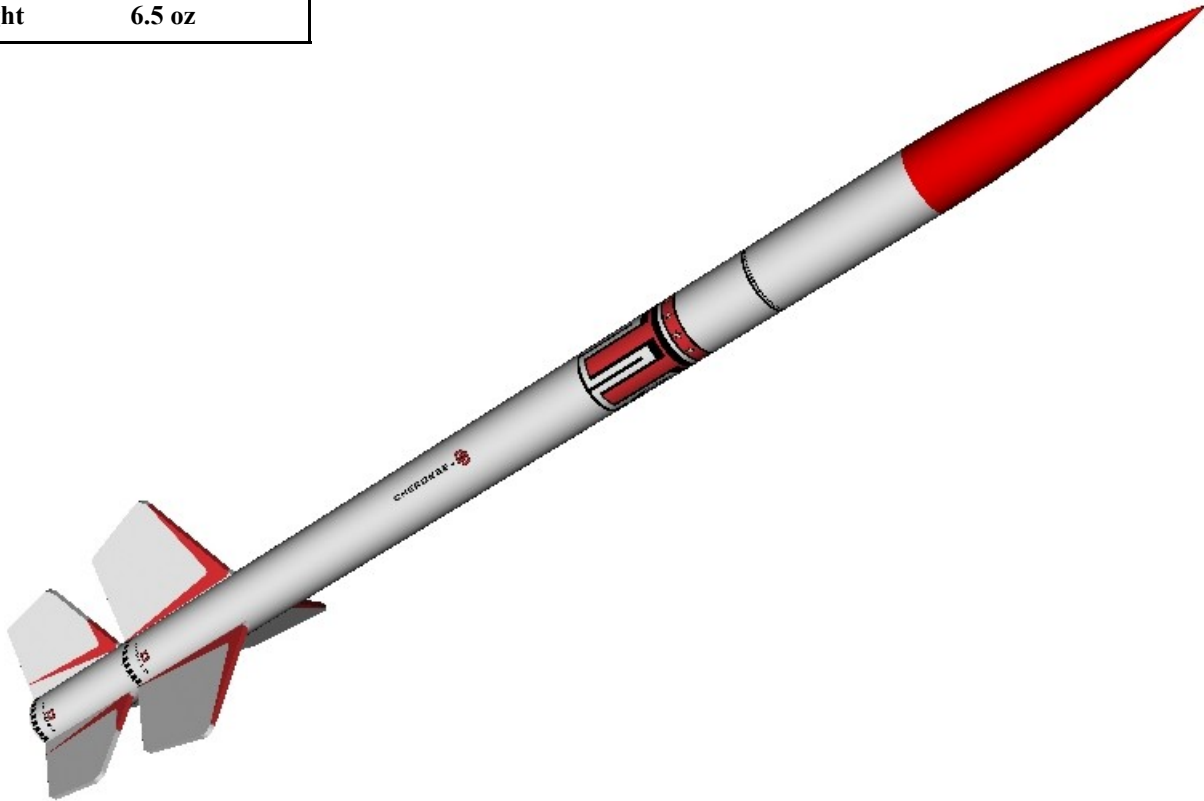


Image created with RockSim v8

Main Parts List

Nose Cone.....	PNC-55AC	Engine Hooks.....	(2) EH-275
Payload Body Tube.....	4" BT-55	Fin Stock.....	1/8" x 3" Balsa Sheet
Sustainer Body Tube.....	18" BT-55	Launch Lug.....	LL-18-225
Booster Body Tube.....	3 1/2" BT-55	Parachute.....	(2) CPK-12
Bulkhead.....	BMS NB-55-2	Shock Chord.....	SC-24
Stage Coupler.....	JT-55C	Shock Chord Mount.....	SCK-24
Booster Motor Tube.....	BT-50J	Screw Eye.....	Medium
Sustainer Motor Tube.....	BT-50S	Snap Links.....	(3) #12
Centering Rings.....	(4) CR-5055	Decal Sheet.....	Excelsior Rocketry CDD
Thrust Blocks.....	(2) CR-2050	Cardstock.....	1 sheet

Important Notes

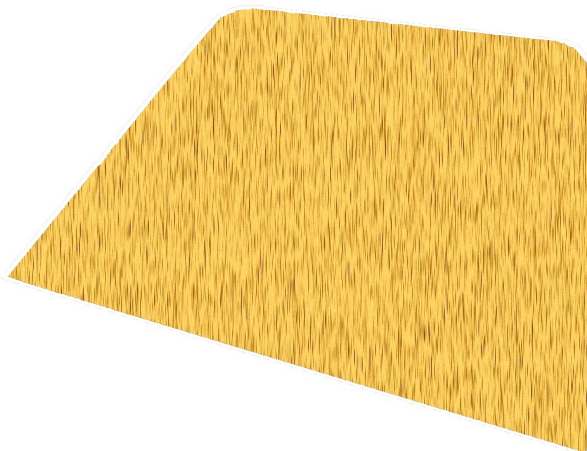
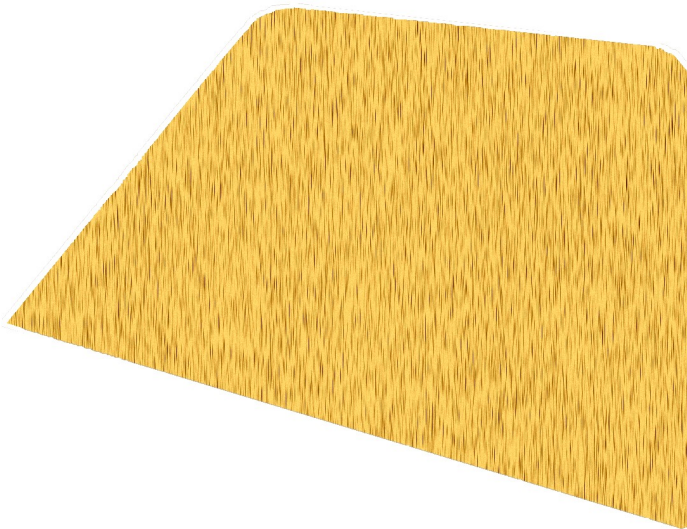
An excellent starting point for building the **Cherokee Double-D** is the Estes **CC Express** kit, #1302. With the parts in this package, you only need to obtain the following items:

Payload Body Tube.....4" BT-55
Bulkhead..... BMS NB-55-2
Stage Coupler.....JT-55C
Engine Hooks.....(2) EH-275
Fin Stock.....1/8" x 3" Balsa Sheet
Parachute.....(2) CPK-12
(or one additional Estes 12" parachute)

Shock Chord.....SC-24
Shock Chord Mount.....SCK-24
Screw Eye.....Medium
Snap Links.....(3) #12
Decal Sheet.....Excelsior Rocketry CDD
Cardstock.....1 sheet

Arrangements have been made with *Excelsior Rocketry* to print a special decal sheet for the **Cherokee Double-D**. This sheet is complete with all of the decals for the booster, payload body, and sustainer body. The main body wrap matches the #1200-series version of the original Estes decal. No reproducible decal patterns will be provided in this plan, as we are encouraging builders to purchase this professionally-made set.

Full-Size Fin Patterns



Print the patterns at left onto cardstock to create the templates for marking the balsa for the main and booster fins. Unlike traditional designs, the larger fins mount on the sustainer body, and the smaller fins mount to the booster body.

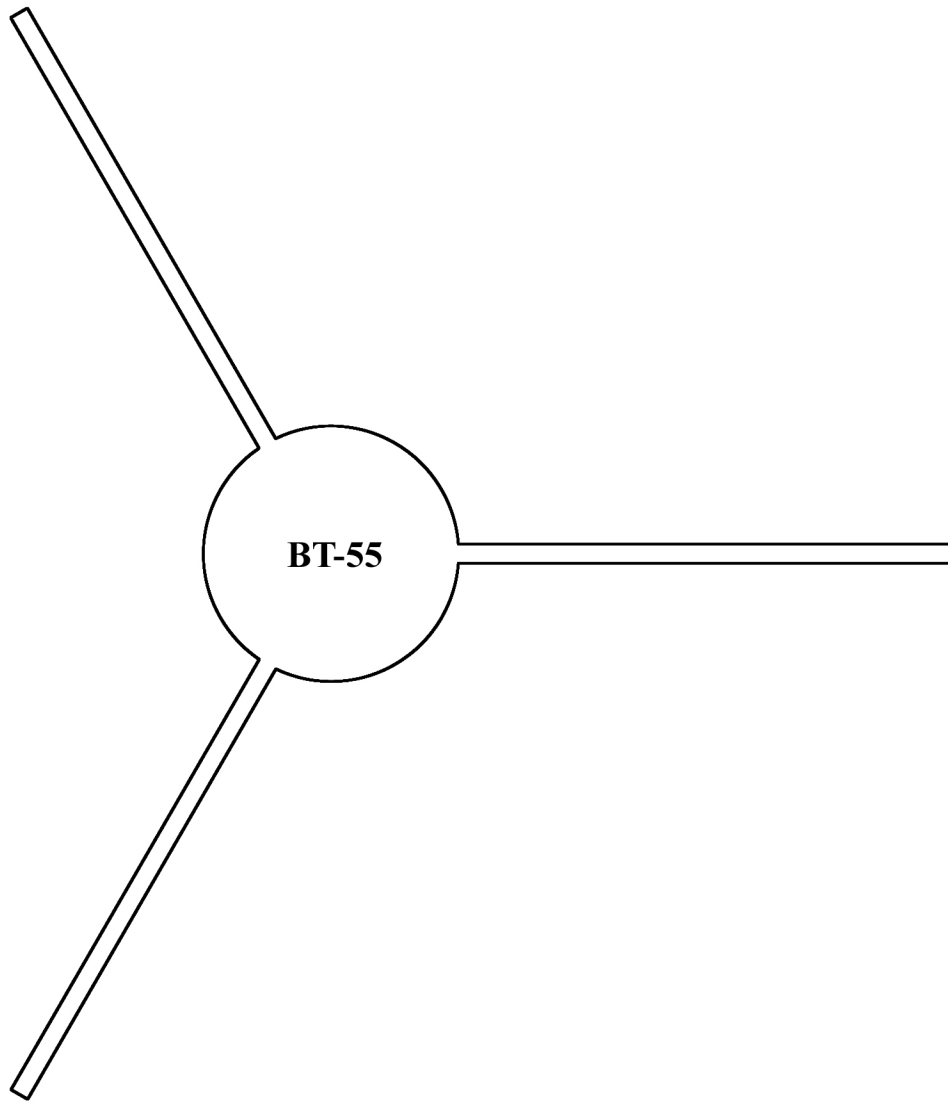
Additional Items Required

#1 Knife Handle with #11 blade(s)
Sprayable Primer
Sprayable Paint
Sprayable Decal Fixative*
Sprayable Solvent-Based- and Water-Based-
Clear Gloss Acrylics**
Tack Rag
Yellow, Brown, or White Carpenter's Glue
Soft-Bristle Artist's Brush(es)
220-grit, 400-grit, and 600-grit Sanding Sheets
Sanding Twigs
Pencil

* *Excelsior Rocketry recommends MicroScale Liquid Decal Film as the ONLY fixative for their very thin decals. Follow the directions that come with the decal sheet carefully. Excelsior indicates the MicroScale Decal Film can be thinned with windshield washer fluid for airbrushing onto the decals.*

** *Excelsior Rocketry indicates they have tried acrylic sprays from several manufacturers for gloss coating, all with disastrous results. They recommend only FUTURE FLOOR FINISH as the final overcoat(s) for their decals. Other products may be used for glossing the model before applying the decals, however. BARCLONE recommends Krylon's Clear Gloss Acrylic (slow-cure formula, not the 15-minute version) as your gloss underlayer, as this is a solvent-based acrylic and will not react with water as you apply the decals. Allow any solvent-based acrylic to fully cure before applying the decals, to reduce the chances for damaging them.*

Fin Alignment Guide



Main Assembly Sequence

- **Step 1** Print the fin patterns onto cardstock and cut them free with a knife, or scissors. Transfer the outline of the patterns onto 1/8" x 3" balsa sheet stock, following the direction of the grain as indicated. Draw three of each fin. Cut these out and set aside for a later step.

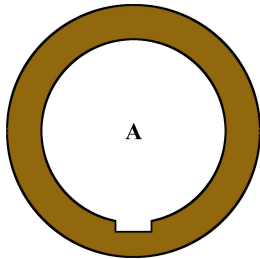


Figure 1

- **Step 2** Modify **three** of the four CR-5055 centering rings as shown in Fig. 1. Use a 1/8" wide sanding twig for best results.

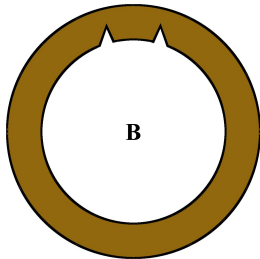


Figure 2

- **Step 3** Modify the one remaining CR-5055 ring as shown in Fig. 2 with a pair of "V" notches.
- **Step 4** Cut slots in both of the motor tubes 2.50" from one end, wide enough for the tip of a motor hook to slip through. Mark **both** tubes 1.0" and 1.75" from this same end. Mark the **short** motor tube 2.25" from this end. Mark the **long** motor tube 0.25" from the **opposite** end.
- **Step 5** Cut two strips of paper 0.5" wide and 3.5" long.
- **Step 6** Figure 3 shows the general final configuration for both mounts. The actual

appearance will be slightly different for each of the two mounts.

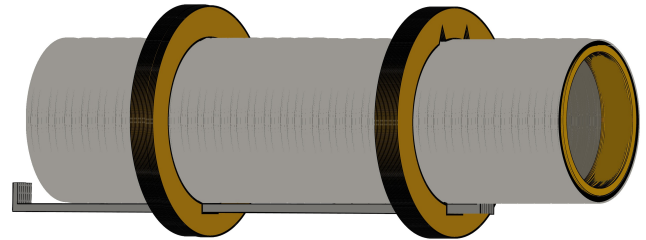


Figure 3

- **Step 7** Insert the tip of one of the engine hooks into the slot of the **short** motor tube, then slide one of the three flat-notched rings down from the top of the tube over the hook, until it touches the mark at 1" from the bottom. The flat notch should be aligned directly over the engine hook. Repeat this step for the **long** motor tube.
- **Step 8** Apply a thin, evenly-spread layer of glue to one side of a paper strip from Step 5. Wrap this strip around the **short** motor tube, between the mark at 1.75" and the top of the hook, such that the overlap of the strip occurs over the hook (double layer over the hook). Press this strip firmly against the tube to work out any wrinkles or trapped air. Use your fingernail to burnish the strip into the crease at the edges of the hook. Allow this to dry about 15 minutes. Repeat this step for the **long** motor tube.
- **Step 9** Slide the third flat-slotted ring down from the top of the **short** motor tube until it touches the paper strip, with the flat notch over the hook.
- **Step 10** Slide the ring with the two "V" notches down from the top of the **long** motor tube until it touches the mark 0.25" down from the edge.
- **Step 11** Apply a bead of glue around the inner diameters of all four CR-5055 rings where they contact the motor tubes, on both sides of the rings. **Do not** allow glue to block the two "V" notches on the long motor mount upper ring. These notches

must remain open for a later step. Set these aside to dry about 15 minutes.

- **Step 12** Apply a bead of glue inside the top end of the **short** motor tube, then slide one of the CR-2050 thrust blocks down through the glue until it touches the top of the engine hook. Use an empty 24mm motor casing as a push tool. Do not stop during this step before the ring has touched the tip of the hook, otherwise the glue might “freeze” the ring at the wrong location.
- **Step 13** Similar to Step 12, apply a bead of glue down inside the **long** motor tube, about 1” from the top edge, and push the second CR-2050 ring down into the tube until it touches the tip of the hook. Set both motor mount assemblies aside for about 15 minutes to dry.

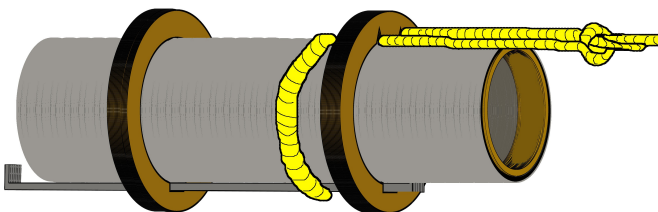


Figure 4

- **Step 14** Tie a knot about 5” from one end of the Kevlar thread. Push the **short** end of the thread through one of the “V” notches on the **long** motor mount, as shown in Fig. 4, wrap the thread around the motor tube, and push the thread back through the second “V” notch. Tie the **short** end of the thread around the **long** end with a slip knot, then pull the two knots together. Pull the excess thread through the ring, pushing the thread firmly against the back edge of the forward ring. Even out the two “legs” of the thread forward of the ring. Apply a layer of glue to the knots, and to the thread behind the ring to firmly secure it in place. Set this aside to dry.

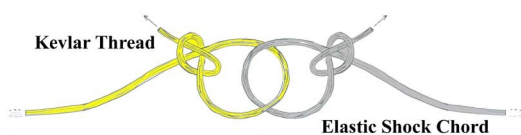


Figure 5

- **Step 15** As shown in Fig. 5, tie a slip knot at the opposite end of the Kevlar thread, about 0.25” from the end. Leave the loop open slightly. Tie a slip knot in the elastic shock chord **through** the Kevlar loop. Pull these two knots tightly together and secure them with some thinned glue. Allow to dry. Attach one of the three snap links to the long end of the elastic shock chord.

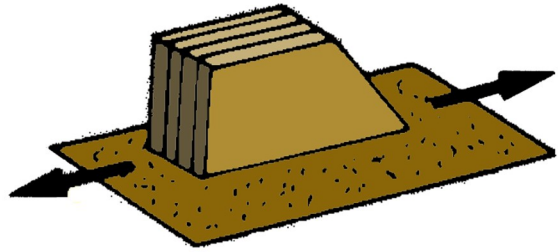


Figure 6

- **Step 16** Stack the three sustainer fins side by side and clamp them firmly together. Sand the root edge square, as shown in Fig. 5, making sure the fins are held at 90 degrees to the sanding surface. Do not release the fins at this time. Repeat this sequence for the booster fins.
- **Step 17** Apply a layer of thinned glue to the root edges of the stacked fins and allow to dry. Keep the fin sets clamped together at this time.
- **Step 18** Carefully sand the entire length of the three body tubes with 220-grit paper until the “shine” from the surface has been removed. Do not sand more than the outer glassine layer.
- **Step 19** Sand the nose cone at this time, removing any “flash” from the parting line and from the shoulder area. Fill any mold flaws with a plastic-compatible solvent-based spot putty. Do not use too much at one time, or the solvent will soften the plastic and ruin it.
- **Step 20** Using a pencil, mark the booster body tube and the sustainer body tube for three fins, 120 degrees apart. Mark the

sustainer for the launch lugs halfway between two of the fin lines. Extend the booster lines for the entire length of the tube. Using the edge trim around a door, as shown in Fig. 6, or a length of 1/2" brass angle stock, extend the sustainer fin lines upward from the bottom edge of the tube 4". Extend the launch lug line the full length of the tube.

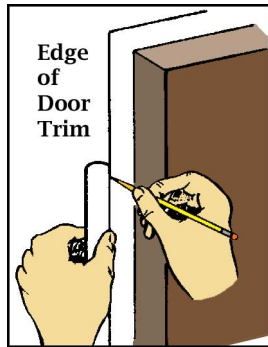


Figure 7

- **Step 21** Using the booster fin template as a length guide, measure up from the bottom edge of the booster body tube the length of the booster fin root edge, and mark each of the three fin alignment lines at these locations. Apply a thinned layer of glue to the lines from these marks back to the edge of the tube. Allow the glue to dry.
- **Step 22** Using the sustainer fin template in the same way, mark the sustainer body tube fin lines and apply thinned glue to these. Set aside to dry.
- **Step 23** Apply thinned glue for a length of 1.125" from the bottom edge of the sustainer tube along the launch lug line. Do the same at the top edge of the sustainer tube. Allow to dry.
- **Step 24** Separate the fins using a sharp knife to slice through the glue holding them together. Do not remove the glue from the root edge. Sand the surfaces of all six fins with 220-grit paper to remove the fuzziness from the grain. Do not gouge the balsa with the paper. Round over all of the outer edges of each fin except the root edge.
- **Step 25** Print the fin alignment guide

onto cardstock, and remove the area within the outline. Trim off the corners at the base of each fin opening. Do not cut the fin openings too wide. Use a sharp knife with a steel ruler as a cutting guide.

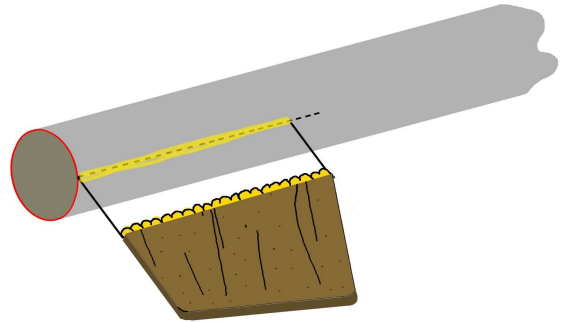


Figure 8

- **Step 26** As shown in Fig. 8, apply glue to the root edge of a booster fin, and bring it into contact with the booster body, directly on top of the glue you applied in Step 21. Remove the fin briefly, then re-apply the fin into the glue left behind by the fin. The fin should be directly on top of the line, with the trailing edge of the fin even with the rear edge of the body tube. Hold the fin in general alignment with your fingers for about 10 seconds, until the glue grabs and holds the fin by itself. Use a moist soft-bristle hobby brush to remove the excess glue that squeezes out, and to form the initial fillet. Carefully slide the fin alignment guide down from the top of the tube, over the fin. Make gentle adjustments to the angle of the fin to get it through the slot. Let the glue dry about 20 minutes before removing the guide. Repeat this step for each of the remaining booster fins. Attach the sustainer fins to the sustainer body tube using the same sequence for each fin.
- **Step 27** Cut the launch lug into two equal-length pieces. Attach one launch lug half to the bottom end of the sustainer body tube, on the lug alignment line, touching the edge of the tube. Attach the other half to the top of the sustainer tube, on the lug

alignment line, touching the top edge. Set the sustainer aside and allow at least fifteen to dry before handling again.

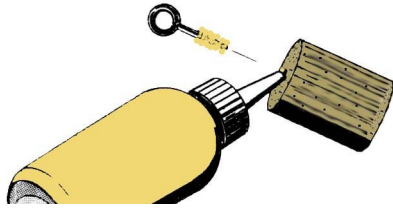
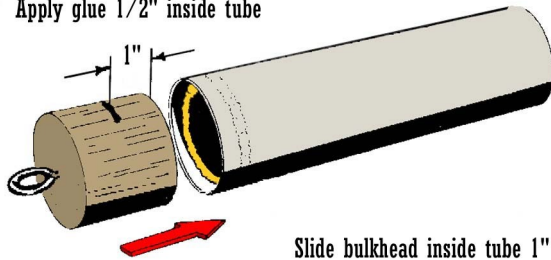


Figure 9

- Step 28** Use the threads of the screw eye to cut a hole in the base of the bulkhead. As shown in Fig. 9, reverse the screw eye out of the hole, then coat the threads with glue. Force glue into the hole, then reinsert the screw eye. Do not wipe away the excess glue. Allow the bulkhead to dry in a base-up attitude until the glue dries.

Apply glue 1/2" inside tube



Slide bulkhead inside tube 1"

Figure 10

- Step 29** The BMS bulkhead is 2" long. Don't cut this length. Mark the bulkhead at the halfway point. As shown in Fig. 10, apply a bead of glue completely around the inside edge one end of the 4" payload tube, about 1/2" wide. Using constant pressure, slide the bulkhead as shown into the tube for a distance of 1". Do not stop during this process as the glue may "freeze" the bulkhead in the wrong location. Allow this to dry completely.
- Step 30** We recommend the use of Elmer's Fill-n-Finish to fill the grain of the balsa fins in preparation for priming and sanding. This compound should be thinned with water and brushed vigorously into the wood. Allow at least one full day for this compound to dry before sanding. Reapply as needed to fill all visible surface voids.

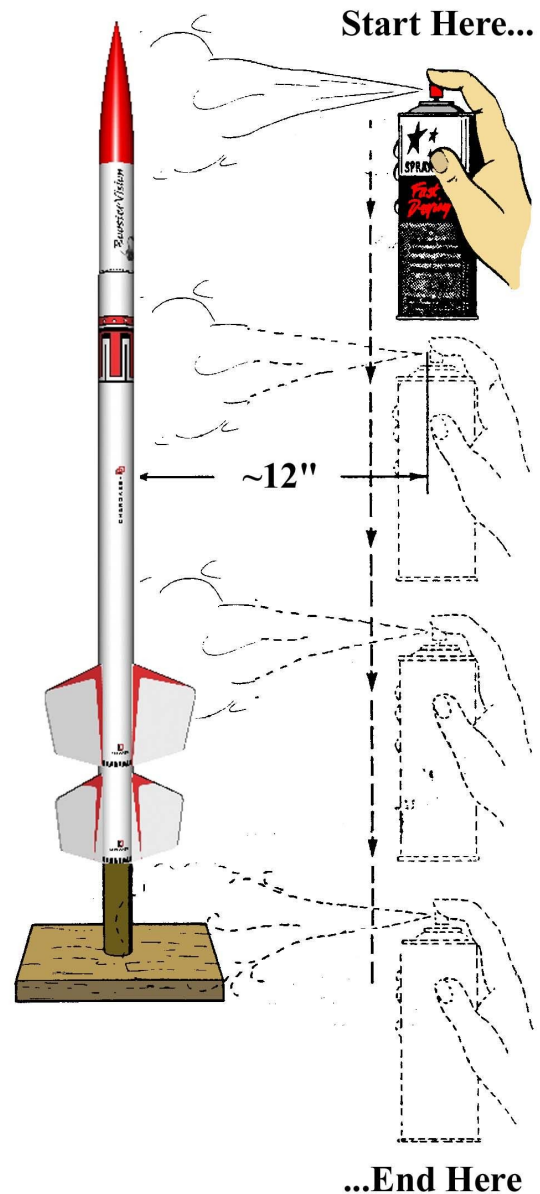


Figure 11

- Step 31** Tack rag the model after sanding the filler, then spray the entire model with your choice of primer. As shown in the illustration of Fig. 11, spray the model using a top-down method to avoid paint runs. We have found Rust-O-Leum Clean Bare Metal Primer in white to be an excellent product, and Krylon's H2O Prime Coat as a good second choice. Spray at least two coats before sanding, allowing at least a full day between coats to dry. Sand and re-prime as needed to fill any remaining surface imperfections. After the final spray of primer, give the model at least two full days to eliminate any remaining solvents before

applying either a white paint, or a gloss coat.

- **Step 32** Use a scrap piece of BT-55 tubing as a holder when priming and painting the nose cone. This color should be a bright red, matching the original Cherokee-D color.
- **Step 33** We recommend spraying a clear coat over the entire model before applying the decals, and after applying the decals. Excelsior Rocketry indicates they have found many of the regular spray acrylics, such as those from Krylon and Valspar, to be destructive to their thin-film decals. Their recommendation for a clear coat is Future floor finish. Follow the instruction sheet provided by Excelsior carefully to achieve the best results.
- **Step 34** If you are using the pre-assembled Estes parachute(s) from the CC Express kit, proceed to Step 34B. Otherwise, assemble the SEMROC parachutes as shown in their instruction sheet, but attach the lines to the plastic sheet with a through-the-hole arrangement for added strength. See Fig. 12. Use the tape disks to reinforce the attachment point, but punch a tiny hole through the disk and tie the ends of the thread through this hole.

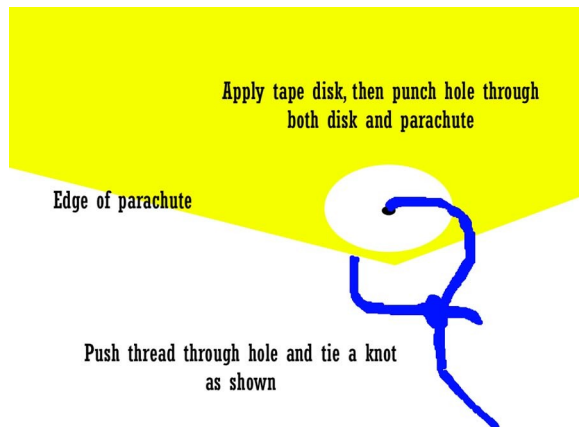


Figure 12

- **Step 34B** Attach one snap link to the shroud lines of each of the parachutes.

- **Step 35** Attach the snap link of the two parachutes to the screw eye of the payload module just before flight. Do not store parachutes inside a model rocket when not flying. Fold both parachutes using the illustrations in Fig. 13 as a guide.

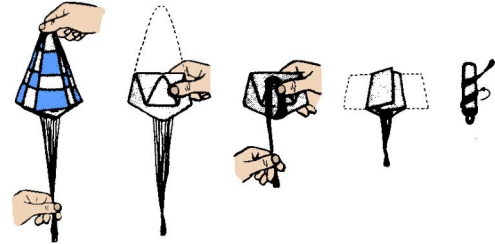


Figure 13

- **Step 36** Attach the snap link of the shock chord to the screw eye of the payload module. As shown in Fig. 14, insert your choice of 5 or 6 flame-resistant wadding sheets, or about 2" of flame-resistant shredded cellulose insulation into the top of the sustainer body tube. Do not pack this material tightly, but tamp down slightly with a dowel. The purpose is only to create a gas seal between the parachutes and the deployment charge on the top of the motor. Next, insert the shock chord on top of the wadding material. Finally, insert the parachutes far enough to clear the shoulder of the payload module.

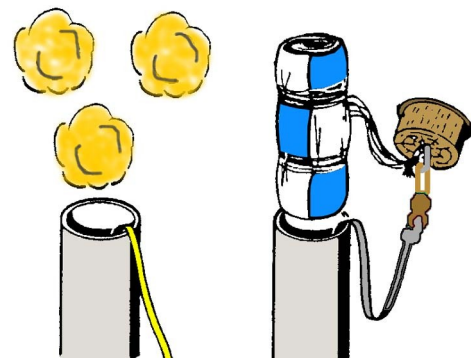


Figure 14

- **Step 37** Insert the payload bay into the top of the sustainer body tube, then insert the nose cone into the top of the payload module.
- **Step 38** For your first flights with this model, we recommend a low-power

combination of 18mm motors using adapters to fit into the 24mm motor tubes. Get familiar with the flight profile before attempting a full-power launch. Keep in mind the altitude that this model can reach.

***Recommended Motor Combinations
(No payload mass in module)***

B6-0/B6-4 --- 570'
C6-0/B6-6 --- 870'
C11-0/C11-7 --- 1160'
D12-0/C6-7 --- 1700'
D12-0/D12-7 --- 2000'

**Developed for BARCLONE Rocketry
by C. P. McGraw**

**Original Cherokee-D design by Estes
Industries.**

**Cherokee Double-D modifications
copyright © 2005 by C. P. McGraw**

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Model Rocket Safety Code

Materials: I will use only lightweight, non-metal parts for the nose cone, body, and fins of my rockets.

Motors: I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.

Ignition System: I will launch my rockets with an electrical launch system and electrical motor ignitors. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.

Misfires: If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock, or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

Launch Safety: I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with "D" motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them to a safe distance.

Launcher: I will launch my rockets from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or I will cap the end of the rod when it is not in use.

Size: My model rocket will not weigh more than 1,500 grams (53 oz) at liftoff, and will not contain more than 125 grams (4.4 oz) of propellant or 320 N-sec (71.9 lb-sec) of total impulse. If my model weighs more than one pound (453 grams) at liftoff, or has more than four ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration (FAA) regulations before flying.

Flight Safety: I will not launch my rockets at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload into my rockets.

Launch Site: I will launch my rockets outdoors, in an open area at least as large as shown below, and in safe weather conditions with winds speeds no greater than 20 MPH. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

LAUNCH SITE DIMENSIONS

Total Impulse (nSec)	Motor Size	Minimum Field Size
<i>0.00 – 1.25</i>	<i>1/4A – 1/2A</i>	<i>50'</i>
<i>1.26 – 2.50</i>	<i>A</i>	<i>100'</i>
<i>2.51 – 5.00</i>	<i>B</i>	<i>200'</i>
<i>5.01 – 10.00</i>	<i>C</i>	<i>400'</i>
<i>10.01 – 20.00</i>	<i>D</i>	<i>500'</i>
<i>20.01 – 160.00</i>	<i>E, F, G</i>	<i>1000'</i>
<i>160.01 – 320.00</i>	<i>2G</i>	<i>1500'</i>

Recovery System: I will use a recovery system, such as a streamer or parachute, in my rockets so that they return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rockets.

Recovery Safety: I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

Model Rocket Safety Code
developed by the
National Association of Rocketry
Revised Code November, 2004