

# How to Create and Run a Pack 104's Space Derby

## **Preface**

The Cub Scout Space Derby is a fun event where Cub Scouts make rubber-band powered rockets from balsa wood and then race them along fishing-line type wire. The procedures for creating and running a space derby are contained in this document. The most important thing to remember is that this event, like almost all Cub Scout events, requires a great deal of advance planning. These recommendations are based on Pack 104's event held in July of 1999.

## Planning Outline

- I. At the annual pack planning meeting, set the date for the space derby. We recommend the event be held outdoors. For a high probability of good weather, the event should be held in the summer months.
- II. At the annual pack planning meeting, choose a chairman for the space derby.
- III. The chairman should choose a location for the event as soon as possible. We recommend the back parking lot at Chapel of the Cross, near the playground. Spectators can watch from shaded benches near classrooms. Currently, Ed Gonzalez is the sponsor representative who coordinates use of the church.
- IV. The chairman should make an effort to learn/observe the abilities of parents in the pack
- V. 2 months prior to the event, the committee should be chosen. There should be 4 to 5 members total. Ideally, the final committee should possess the following abilities: carpentry, modeling, prior space derby experience, ability to make flyers, organization, and leadership. The committee should meet as soon as possible.
- VI. The chairman should locate the space derby box in storage which will contain any spare parts left from this year's space derby as well as any tools specifically used for the space derby.
- VII. At the first committee meeting, a budget for the event should be drawn up. The budget should include cost of rocket kits, decorations, participation ribbons, estimated copy cost, and spare parts. Also, the exact timeline of all activities relating to the space derby should be made. A method for recruiting workers for the space derby must be decided and duties for each member of the committee need to be assigned.
- VIII. Space derby kits will be distributed at a pack meeting. Between the first committee meeting and the pack meeting a few things must be done.
- IX. Confirm date/time/location for space derby.
- X. Set date/time/location for construction day.
- XI. Set date/time/location for run-through day.
- XII. Purchase space derby kits for the active cub scouts in the pack.
- XIII. Create a flyer for the space derby event describing the location, timeline, uniform requirements, recommended extras, and construction tips. Flyers should be labeled with the name of each scout who should receive one.
- XIV. Each space derby kit contains all parts, which includes 4 rubber bands and stickers for numbering the rockets. 3 rubber bands and all number stickers should be removed from all kits. Kits should be labeled with the name of each scout who will receive them.
- XV. At the pack meeting approximately one month prior to the event, the derby kits should be distributed. All kits per den should be given to the appropriate den leader. Flyers for the event should be given out. Scouts who miss the pack meeting need to be contacted by their den leaders and given the flyer and kit as soon as possible.
- XVI. During the next two weeks, approximately, until the construction day, at least one committee member or construction day host needs to fully construct an operational space derby rocket to adequately advise cubs/parents in the proper method of construction. Also, spare parts for rockets should be purchased (propeller assembly kits, one box of spare rubber bands).
- XVII. Also, during this period, all tour permits for the various days should be filled out and submitted to the council. Separate tour permits need to be made for the construction day, run-through day, and the space derby itself.
- XVIII. During the next three weeks, approximately, until the run-through day, all positions regarding race-day activities (starter, judges, charting, etc.) need to be recruited and finalized.
- XIX. Two weeks prior to the event, a construction day, as detailed on the derby flyer, should be held for those parents/cubs who wish to work on their rockets together or need answers on construction questions. Emphasize cubs doing as much of their own work as possible. Provide tools, but minimal other supplies (sandpaper, paint, etc.).
- XX. During the next two weeks before the event, the final purchases need to be made: decorations, participation ribbons with labels, and event programs.

- XXI. In the week intervening between the construction day and the run-through day, confirmation calls need to be made to verify who will be participating in the derby. Also, the run-through needs to be scheduled by den/age level so time ranges need to be confirmed for all participating cubs.
- XXII. One week prior to the event all participating cubs and volunteers need to attend a run-through. Rockets will be inspected for compliance with rules and will be flown to verify their proper assembly. Volunteers for race-day activities should be given written procedures and do a run-through of their duties including table setup locations, track set-up, registration, rocket inspection, rocket repair, rocket winding, rocket appearance judging, and race judging. Rockets that fail to follow rules have the week up to the event to repair/create a rocket for racing.
- XXIII. During the final week, participation ribbon labels must be printed.
- XXIV. One day prior to the event, all rubber bands, except those being used to hold together the cubs' rockets, must be soaked in a soap and water (50/50) solution for 24 hours up until registration of rockets.
- XXV. One hour prior to event start-time, decorations and set-up needs to be done.
- XXVI. Registration of rockets should span 1 hour.
- XXVII. Rocket appearance judging should span 1/2 hour.
- XXVIII. Event is officially opened. Rocket racing occurs using double elimination to assess best 2 rockets per den and best overall using the best 2 per den. This spans 2 hours.
- XXIX. Ribbons handed out.
- XXX. Event officially closed.
- XXXI. Adults, siblings, and challenge races held after closing ceremony.
- XXXII. Clean up.
- XXXIII. Within two weeks after event, final space derby committee meeting held to assess success of the event, officially list results of event, assign duties of purchasing winning ribbons, write-up history and recommendations for next derby.
- XXXIV. Within one month after event, publish all documents relating to that year's derby in pack library.
- XXXV. Give winners their ribbons at next pack meeting.

## **Space Derby Date and Location**

The recommendation of the committee is that the space derby should be held in the back parking lot at our sponsor, Chapel of the Cross, next to the fence of the playground (handball court).

In 1999 our pack sponsor is Chapel of the Cross Lutheran Church located at 10000 Sepulveda Blvd. The church has one building that has two classrooms with a removable partition. Although this room is very big and probably could accommodate the space derby launch track, there are the matters of ventilation in times of hot weather, heating in times of cool weather, the great amount of existing furniture in the rooms, and the length of the derby event which makes cub scouts restless. For all of these reasons and because it was comfortable in terms of space this July, we recommend that the space derby be held outdoors. Although not specifically part of the facilities available for cub scouts, the playground equipment and large lawn beyond it are a good place for the scouts to expend some of their boundless energy when they feel bored. The church has been tolerant of our proper use of their equipment.

Because the event seems best held outdoors we recommend holding the event during the summer to minimize the chance of rain or cold weather. The drawback, of course, is the probable occurrence of very hot weather. Fortunately, there is a very big tree next to the hand-ball court which provides a great deal of shade and is large enough to accommodate a registration table, a display table, and a repair table so that the volunteers at those tables don't have to suffer in the sun. The spectators can view the race from the shade of the walkway next to the classrooms. There are built-in benches in the shade for comfort, too. As long as everyone is told to prepare for the weather, they should bring water and remain cool in the shade during the event.

Although wind can interfere with a good race, it will almost certainly affect all of the rockets equally so that no one is given an unfair advantage during any race. As long as the classrooms are reserved as an emergency back up for a location in the event of rain, weather shouldn't affect being able to hold the event.

Currently, Ed Gonzalez is our Scout Representative from Chapel of the Cross. He had no objection to our reserving the location for the space derby. Also, the two classrooms separated by a partition that border the parking lot should be reserved in case of bad weather. In a pinch, the event can be held there, but it will be a little crowded. All of this should be arranged as soon as possible after the date of the space derby is set because we share the facilities with the church staff, classes, and Troop 104.

The 1999 space derby ran from 12 noon through 4 p.m. We had 22 participating scouts. We also had some delays when winding problems were discovered. The event ran precisely according to schedule with set-up occurring from 11am through 12 noon. If the other recommendations of the committee are followed, there is no reason why this same time frame couldn't be used for the next space derby.

## **Space Derby Chair**

Speaking from experience, the chair for the space derby committee will have the most responsibility and probably end up doing the most work on the event. The person should be motivated to work on the event. Prior space derby experience is not required or even very important as long as the chair is able to get someone with experience on the committee. This event will probably consume between 30 and 40 hours of the person's time, conservatively, unless serious delegation is done. For this reason, the chair should be someone who can recruit other active people. Hopefully, these notes will remove some of the burden of discovery from the chair's shoulders and give all participants an idea of where to start when working on the space derby. The most important quality, of course, is responsibility with the ability to get everything necessary accomplished and to make painful decisions as to when to eliminate suggestions if they prove too difficult or time-consuming to implement.

Although it may seem like a committee decision, the location of the event needs to be secured as soon as possible after the chair has been chosen in order to avoid conflicts with other events. This is the duty of the chair who must scout, contact and confirm permission to use a location.

## **Committee Members**

The chair needs to observe parents in the pack in order to assess their abilities to be reliable and possessing the skills needed to make the derby happen. At some point, the committee will need to make recommendations to the parents about what types of paints are proper for use on the rockets or what sandpaper works best or some repairs may be necessary on the rocket launcher. There may even need to be some construction done if the committee decides to make something new like a tote board, for instance. Someone with strong organizational skills needs to be tapped for the committee, but this will probably be the chair. Another member with ties to many other parents in the pack needs to be added to the committee because much of what will be done will be calling parents and asking them to volunteer for race-day duties. Someone with access and experience with computers should be on the committee because of the need to create or update forms for the event. A flyer will need to be created and rosters for event results will need to be created. Someone who has worked on a derby of some sort needs to be on the committee because they will already be familiar with the entire process of planning to actually run the event. Of course, space derby experience would be ideal. Someone with experience in putting together models would be helpful because they will already have familiarity with glues and paints needed on small projects like derby construction. A relatively young member, either a Tiger or Wolf group parent, would be good because they will still be with the pack in later years when the event will likely be held again.

The most important ability is reliability. Since there will likely be few committee meetings needed to assign duties and get things working, missing even one meeting can derail the process or force other committee members to handle extra duties. These notes should provide a basic idea of all that needs to be accomplished so that it is possible to equitably divide the workload.

The committee should not be overly large. It should consist of four or five members. This makes it easier to schedule meetings without undue complications, but big enough to split the workload to manageable amounts. Also, the loss of a member during the 3 months of activity could be handled with that number.

## **First Committee Meeting**

The first committee meeting is very important because it will set the tone for the organization of the space derby. The two most important things that need to be done are making a budget and assigning duties. Since Pack 104 typically purchases all of the derby kits for the cub scouts out of the pack funds, the budget will be very big for an event. At an approximate cost of \$4.25 per kit with 30 active scouts in the pack, the kits alone will cost \$127.50. Because the rocket kits consist of small parts that are easily lost and rubber bands that typically break, extra parts will need to be purchased. One box of extra rubber bands should be adequate. The propeller assembly contains the small parts most easily lost/broken. 5 sets of propeller assemblies should be on-hand on the day of the race. Dry graphite lubricant should be universally used on all rockets and that will need to be purchased for the race as well. Participation ribbons that come 10 to a packet need to be purchased. 3-part labels will need to be purchased because they will need to be printed to note what unique category each Cub Scout has "won". Decorating costs can only be estimated because no one knows what decorating will be recommended once a person/committee is set up for that. Copies of flyers and possibly event programs will need to be made and that cost needs to be factored as well (Staples currently makes good copies for five cents each).

A large number of spare parts should not be purchased. Instead, the parents will need to be responsible for purchasing extra parts from the Scout Shop. They need to be given the information of where the scout shop is and its hours (typically on the derby flyer). Currently it is 16525 Sherman Way, Suite C-8 (That business strip center behind Denny's). The scout shop is in the back. Their telephone number is 818-781-1296 with the hours being M-F 8:30-5:30, Sat 9-4, Sun closed. There are extended hours: 3<sup>rd</sup> Wednesday of the month, open until 7pm. Call them to get pricing for budget and referral for parents.

Based on all that needs to be done, the duties for the event need to be broken up. Flyers need to be made and copied. Someone needs to make purchases. The kits need to be prepared by removing items and dividing them into groups according to dens. Many phone calls will need to be made. Someone needs to host the construction day and the run-through day. Volunteers need to be trained. Testing and experimentation with the rocket launcher needs to be done to assure that everything works.

Also, the exact dates of all public events need to be decided. When will future committee meetings be held? When will the construction day happen? What about the run-through day? Is the time range appropriate for race day given the number of scouts the pack has?

Actually, many of the items are easily discussed and decided. The meetings don't need to be very long, but they do tend to run 2 hours very easily.

These notes need to be reviewed by all members to familiarize themselves with all facets of the space derby. At the first meeting it can be discussed if all recommendations are necessary or good and make adjustments or start with a clean slate.

All existing space derby pack resources should be inspected. This may need to be the focus of another meeting or it might be considered at the first one to determine if someone needs to repair the rocket launcher or make new rubber bands hooks, etc.

### **Confirm/Set Dates/Times/Locations**

It is important to confirm the space derby location if there has been a long period since it was first set. People forget or lose things.

The construction day needs to be definitely set as far as the house/workshop and the amount of time it will take. It typically takes a couple of hours for the wood glue to dry when putting the two halves of the rocket together. Cubs who plan to attend construction day need to be reminded to come to the event with their blocks glued together and dry. Depending on the amount of carpentry experience the host has, the portion of construction day which is spent by the cubs simply sanding their rockets may vary. Each cub should have an adult in attendance because they tend to lose interest after 15 minutes or so and it can take 1 or 2 hours or more to get the sanding done adequately. However, it should be stressed that the rocket needs to be the work of the Cub Scout. Adults should be encouraged to purchase their own kits (they're little more than \$4 after all) and work on them side-by-side with their kids. Whittling, very course sandpaper, electric sanding tools and a lathe are all tools that can vary the amount of time spent at this stage. The host of the construction day should be prepared to advise the scouts on the best or fastest way to accomplish their task. The 1999 committee has no recommendation on this event other than having the cubs do their best and finding someone with prior skill in making wooden models of this size. 1999 saw everything from wall paint, to block designs with little sanding, airbrushing, several coats of lacquer, one coat of tempera paint, regular spray paint, and more. Surprisingly, little of it seemed to make any difference in the final result of rocket performance.

The run-through day is very important. It confirms participation in the event, reminding parents and cubs that the event is coming up. The rockets get tested to make sure they work properly and don't have any gross impediments like having the hanger stem extend too far into the interior of the rocket interfering with the rubber bands unraveling. It also gives the committee an opportunity to play with a large group of rockets to determine what problems might arise on race day and to counter them. The cubs should be run through in dens. There will need to be 3 prepared rubber bands per rocket and up to four rockets tested at the same time. So, a total of 12 prepared rubber bands should be ready on the day of the run-through. The cubs whose kits only contained one rubber band each will need to have these rubber bands installed in their rockets for testing and then removed after their rocket is done testing. Each rocket needs to be run at least twice and as many times as necessary to determine if there is a problem and what needs to be done to correct it. So a group of four rockets may take as much as half an hour or more to test. Therefore, all cubs should not show up at the same time. Schedule cubs by den to attend in blocks of time appropriate for the number of cubs in a den. The location of this run through needs to be determined and the length of time determined based on the number of tests being conducted.

Volunteers should be given their instructions at the run-through event. People who will be winding rockets will get an understanding of how they will do this. People in charge of installing rubber bands will become familiar with the procedure. Registration will need to be run through so that the race day goes smoothly. These volunteer activities don't need to be trained at the same time, but a reality of the testing is that rubber bands will need to be installed and rockets wound so it is recommended to have a couple of winders and/or installers in each time period.

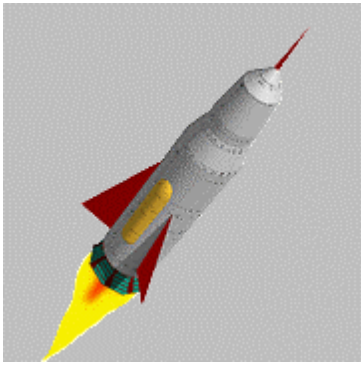
### **Purchasing Kits and Spare Parts**

The 1999 space derby was the first for our pack as far as we know. We had quite a bit of unpredictable behavior from the rockets during the race. In order to minimize the chance of additional problems being generated unnecessarily, only BSA kits and parts should be used whenever possible. The scout shop is located at 16525 Sherman Way, Suite C-8 (That business strip center behind Denny's). The scout shop is in the back. Their telephone number is 818-781-1296 with the hours being M-F 8:30-5:30, Sat 9-4, Sun closed. There are extended hours: 3<sup>rd</sup> Wednesday of the month, open until 7pm.

## **Making Derby Flyer**

The derby flyer needs to give a large amount of information. It needs to list the date/time of the event. It needs to list the race-day schedule. Proper protection from the sun should be included as well. Since this is not a getting dirty event, Class A uniforms will be worn and should be noted on the flyer. The dates and times of the construction day and run-through day should be noted. It should be noted that construction day is optional. The rules on how rockets may be made and special tips on what to do should be noted. Clip-art should be used in order to make the flyer more interesting looking. It will probably need to be a two-sided flyer due to the amount of information. The names of each scout receiving a flyer should be written on them. This makes it easier to identify who has not received one if someone is absent from the pack meeting.

A sample 2-sided derby flyer follows:



**Pack 104**  
**1999**  
**Space Derby**  
**July 31<sup>st</sup>**  
**12pm until 4pm**  
**Chapel of the Cross Parking Lot (back)**

**Rocket Check-In will be from 12-1. Races will begin at 1:30. Bring a picnic lunch and enjoy the festivities.**

**All participants will receive a ribbon the day of the event and winners will receive additional ribbons at the first pack meeting in September.**

To help get ready for the event we will have a Rocket Construction Day for those Scouts or Dens that don't wish to do it on their own.

**Rocket Construction Clinic**  
**Saturday, July 17<sup>th</sup>, 9 am**  
**McGovern Residence**  
**15944 Nordhoff**  
**893-0414**

Please give John or Lucia a call to let them know you'll be coming so they know how many people to expect. They'll even be turning on the barbecue later, so if you want to bring your turkey franks (or whatever) you can enjoy a day of fellowship with other scout families and get ready for the big day. Wear your class B or clothes you can get sawdusty in.

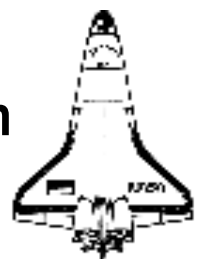
**Run Through**

How will your rocket run? To test out each rocket, we'll have a day for testing the rockets. Each rocket test should take only half an hour (and we'll be testing 4 at a time). If there is anything that needs to be changed, we'll let you know with a week to spare before race day. The dens will test at different times in the day. If you absolutely can't make it at your scheduled time, call to arrange another.

**Rocket Run Through**  
**Saturday, July 24<sup>th</sup>**  
**Godinez Residence**  
**15241 Germain St.**  
**365-5911**

Den	Scheduled Run Through
Tigers and Wolves	10am-11am
Bears	11:30am-12:30pm
Buffalo Patrol	1pm-2pm
Den 4 Webelos Scouts	2:30pm-3:30pm

**Wear Class A uniform**  
**Bring Hats, Sunglasses, Sunblock**  
**and Water to protect from Mr. Sun**



## Rocket Rules

1. The Cub Scout must do as much of the work as possible on his rocket. Parents should be present for advice and demonstration, but should leave the construction to the Cub Scout.
2. The rocket hanger may not be cut or modified.
3. No parts may be substituted. Only BSA space derby kit parts may be used on the rocket.
4. Any decals and stickers are acceptable, not limited to BSA space derby decals.
5. No lubricant of any kind may be used on rocket. This will be supplied on race day.
6. The overall length of the rocket should be the same as the length originally supplied in the kit. There will be some shortening of the rocket when sanding is done, but cutting off length from the rocket is not allowed. Likewise, gluing extra wood to the rear of the rocket to increase its length is against these rules.
7. Rubber bands will be supplied on race day. Rockets raced will not use previously installed rubber bands.
8. An appropriate rear end groove for the dowel must be made. Rockets without the groove will be altered on race day.
9. All three rocket fins must be used.

## Constructing and Operating Rockets

The official space derby kit includes all necessary materials and instructions for building. Decorate the rocket with bright colors. Apply decals furnished in the kit or others you supply yourself.

### Tips for rocket builders:

- Reduce air friction or "drag" by making all surfaces as smooth as possible. A blunt, rounded nose causes less drag than a sharp nose. A good design has all leading edges rounded and trailing edges tapered to reduce the drag.
- Rubber bands will be provided when racing. Use your rubber band to keep the dowel attached to the rocket and propeller assembly
- Use a sharp knife for cutting the grooves for the hanger fitting and fins. A dull knife will crush and splinter the balsa wood.
- When you start to carve, remember that the end with the small hole is the rocket nose.
- A potato peeler is good for carving the shape.
- To help increase the rocket's speed, reduce the wall thickness to a minimum of 1/8 inch. Do not weaken the area around the hanger (carrier) or carve away the nose button circle.
- Do not apply too much paint to the outside unless you sand between each coat.
- Make the propeller shaft as short as possible by bending it close to the prop. Cut off the excess wire with wire cutters.
- Test the rocket's balance by hanging it from a string through the hole of the hanger fitting. If the rocket is nose-heavy, carve or sand a little wood off of the end. If it's tail-heavy, remove wood from the tail area.
- Use epoxy to glue hanger to the rocket. Otherwise, your hanger may pull out.

Whereas the pinewood derby is given an advantage with more weight, the space derby is given an advantage with less. Be careful! Too little structure could cause your rocket to break!

If you also want to construct a rocket or have Scout siblings who would like to do so, please feel free to stop by the Valley Scout Shop and pick one up. This is their address and hours:

16525 Sherman Way, Suite C-8 (That business strip center behind Denny's)  
Scout Shop is in the back

818-781-1296

Hours: M-F 8:30-5:30, Sat 9-4, Sun closed

Extended Hours: 3<sup>rd</sup> Wednesday of the month, open until 7pm

## **Prepare Derby Kits**

Each derby needs to be opened and rubber bands and number stickers need to be removed. Each kit comes with four rubber bands. Since three rubber bands per rocket will be used on race day, three need to be removed. One must be left so that when the cub assembles his rocket he will have it to connect the plastic dowel in the rear of the rocket with the propeller assembly in the front. Otherwise, it falls apart and the dowel gets lost. The number stickers need to be removed to prevent their being used by the cubs on their rockets. Numbers will be assigned to each rocket on the day of the race and the stickers will be used then to mark the rockets.

Special care must be taken when removing rubber bands and stickers. The small propeller assembly parts can get lost easily. The plastic bag containing the rubber bands and propeller assembly parts needs to be cut along the top with a pair of scissors to prevent tearing. After the rubber bands have been removed, fold the opened end of the plastic bag over and staple it securely (light duty staples to prevent bag tearing). Verify that all propeller assembly parts are still in the bag.

Using labels or simply a permanent marker, each scout's name should be written on the kits. This makes it easier to identify who has not received one if the scout is not at the pack meeting where the kits are distributed.

Separate kits into den groups. The kits should be given to the den leaders to distribute as they see fit. The den may work on them together as a den activity or they may be given individually to the scouts to work on in their own time.

## **Rocket Construction Rules**

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4. Any decals and stickers are acceptable, not limited to BSA space derby decals.
5. No lubricant of any kind may be used on rocket. This will be supplied on race day.
6. The overall length of the rocket should be the same as the length originally supplied in the kit. There will be some shortening of the rocket when sanding is done, but cutting off length from the rocket is not allowed. Likewise, gluing extra wood to the rear of the rocket to increase its length is against these rules.
7. Rubber bands will be supplied on race day. No rocket may retain previously installed rubber bands.
8. An appropriate rear end groove for the dowel must be made. Rockets without the groove will be altered on race day.
9. All three rocket fins must be used.

The rules are recommendations only. Rule #2 in particular may or may not be appropriate depending on the testing of the next space derby committee. Proper spacing from the racing line down to the top of the propeller makes it necessary to ensure enough hanger length. Cutting the hanger could affect this. Also, cutting the hanger could give a weight advantage (less weight is more advantageous) over those with standard hangers.

## Rocket Launcher Preparation

The rocket launcher shouldn't ordinarily need any preparation other than an inspection to ensure that it has not been broken while stored. However, this year it was left unpainted. One duty of the next space derby committee will be to have the launcher painted/stained to protect against time drying it out and to make it look more festive.

When inspecting the launcher, the 50-lb. test fishing line used as the racetrack for the space derby will need to be installed, also, to verify that it has not suffered over time. If it breaks, the committee recommends purchasing the official space derby line from the scout shop rather than using normal fishing line.

The carrier assemblies that are threaded through the racing line need to be modified. In 1999 we used the wire adapters recommended for use when non-BSA line is being used. This was fine except that the racing line would sometimes get stuck in the strands of wire loop like dental floss stuck between a person's teeth. When you view the carrier assembly, you can see that the wire loops into which the racing line is threaded are somewhat in the shape of a cotter pin or Greek letter omega with the ends pinched closed. Energetic rockets could fly upwards and the racing line could get caught in the closed portion of the wire loop. We recommend that the next event using the assemblies put a 180-degree twist in the wire to try to avoid this tangling problem. The wire loops are shown in the carrier instructions to be placed perpendicular to the racing line, but we found that having the wire loops at a slight angle toward the rear of the rocket works better. This should avoid getting caught on any small line imperfections. If this proves ineffective to avoid the problem when testing is done (most probably on the run through day) a second recommendation is that the wire loops be completely removed. The BSA carriers should work well with the BSA racing line and may not need the use of the wire loops.

Although the recommended racing length is 40 feet, many rockets did not finish the event at this size. So, we are recommending that the race be shortened to 30 feet, which should allow more satisfaction for the Scouts seeing their rockets crossing the finish line. The 30 feet should be measured from the front 2x4 crossbar on the launcher assembly to the cloth finish line. The actual length of line from eye-screw to eye-screw will be about 34 feet.

A cloth strip tied loosely to the racing line should display the racing finish line for each lane. The propellers can spin very quickly. They need to hit a soft barrier to stop them without breaking the propeller or the rubber bands inside the rocket. A cloth strip about six or eight inches long that is tied loosely around the racing line will stop the rocket/propeller and also display the finish line for the spectators. They will need to be reset after each race because the speeding rockets will push them back from their starting position. Once the 30-foot finish line has been measured and the cloth strips attached to the line, a small length of string should be cut that measures the distance from the end sawhorse to the cloth strip. This string can then be used after each race to reset the cloth finish lines.

Be sure to use the 50-lb. sandbags prepared this year to weigh down the sawhorses that make up the launcher and track. Without the sandbags, the tension on the tightly strung racing line will actually pull the sawhorses off of the ground. There should be 4 sandbags.

Make sure that all 4 lines are level in elevation and also in relation to each other. Remember that the carriers need to be hung on the line when it is threaded through the eye-screws. Only one length of line threaded through all bolts continuously should be used; four separate lines for each track should not be used. One line allows the tension to be increased or decreased on all four lanes simultaneously.

Rather than tying the line to the last eye-screw, a loop at the end of the line should be fed through the eye-screw and a snap-lock (like those used for dog leashes) attached to the loop. The snap-lock should be bigger than the eye-screw so it can't be pulled through. This avoids difficult or time-consuming knot tying. The snap-lock used in 1999 should still be attached to the eye-screw.

## **Construct a Test Rocket**

Ideally, the person who will run the construction day should be the person to make a space derby rocket. This needs to be done simply so that questions about appropriate sanding, insertion of the hanger, which end of the propeller is the front, etc. can be answered. Additionally, the person who will inspect and/or repair rockets on the day of the races will need advice on what is proper and allowable.

This step may cause the construction rules to be modified if the committee feels that something needs to be stressed or changed in the making of the rockets. So, this step should be done very early in the process of planning the derby.

## **Tour Permits**

To make sure that there are no problems in the event of an injury claim that happens at the space derby or lead-up events, tour permits should be filed for all activities at which the children will be present. That means that three separate tour permits need to be filed. Ideally, but not strictly, the council requires two weeks notice before an event in order to approve a tour permit. Just make sure that you have filed a tour permit before the actual event.

The first tour permit is for the construction day. Obviously there is a danger of children sanding themselves, dropping tools on themselves, cutting themselves with a whittling knife, or damaging themselves in all sorts of inventive ways. This activity is the one at which there is the most probability for injury and the pack needs to be safeguarded from a lawsuit because a family needs to pay for medical services. The insurance that the pack has is only in force during certain times (not when the kid is in school or just playing with friends who happen to be scouts). The tour permit shows that the council has approved an activity and the insurance will be in full effect.

The second tour permit is for the run-through day. There is little opportunity for injury here, but all activities that do not occur at regularly scheduled den or pack meetings held in their normal places must have a tour permit.

The last tour permit is for the race day itself. Even though this event will probably be held at our sponsoring facility, Chapel of the Cross, it makes sense to have a tour permit because it is not a regular pack meeting.

Whenever a child is being escorted to an event by someone other than his own guardian, the tour permit must include the car insurance information for the person bringing the child. The membership committee chair should have a list of all parents and their car insurance. Simply ask for this list and include it with each tour permit. Make the tour permit for the maximum number of possible attendees. This way, the permit covers everyone no matter which kids are car-pooling with whom.

## Selecting Volunteers

This can be a stressful job. However, it is necessary because there are a number of positions that must be filled and the committee members cannot do everything (nor should they. You'd never get anyone to volunteer for committee that way). Since the committee members will have to jump in and fill in for anyone who fails to show up, fill all positions with non-committee volunteers except, perhaps, the race charting which requires some time to understand. Each position should have two volunteers. This is obviously to have a back up in case someone else does not attend. Some jobs actually need more than one person, though.

**Construction Day Host:** This will probably be a committee member, but can be a handy parent in the den. The person needs to open his or her home to a bunch of fun-loving scouts trying to sand and paint their little hearts out.

**Run-through Day Host:** This will probably be a committee member, but can be anyone in the pack. The person needs to allow kids to come and race rockets in their yard while volunteers are briefed on their race day duties. Since the rocket launcher is stored at the church, it may actually be the location to choose for this if they feel that it is okay.

**Master of Ceremonies:** This should be the Cubmaster or Assistant Cubmaster. Because they are already leaders they should be easy to recruit for this task. They simply need to know how things will be run on race-day. They will announce upcoming races and results. They also need to come prepared with material to fill time during lulls in the racing.

**Registration:** There should be two people doing registration on the day of the race because there are several steps required.

**Inspection:** Someone needs to verify that a rocket is ready on the day of the race. This may require adjustments or repairs to be made.

**Rubber band installation:** This is a set-up activity. Each rocket that is brought to the race will need to have three rubber bands installed. The rubber band that is currently being used to hold the plastic dowel on the rocket can be put in a discard/recycle pile. Although only one person needs to do this on the day of the race, they definitely need to understand how to install the rubber bands ahead of time.

**First Aid:** This will probably be the tour leader on the tour permit if it isn't the chair. Scrapes and bumps are common and probably won't even be brought to anyone's attention. The only serious consideration will probably be dehydration or heat exhaustion if someone hasn't been drinking water and is overly active. The danger of this should be miniscule, however.

**Rocket repair:** Two people should be assigned this task. The committee will need to recommend or provide tools for this job. Currently, we only needed pliers, needle-nosed pliers, wire cutters, superglue, an exacto knife, and sandpaper besides the spare parts. This position also will definitely require advanced preparation.

**Race starter:** The race is started when the balanced launch frame is pulled down which allows the rockets to speed down the line. Someone needs to do this. The race starter is also the only person who can recommend a race be rerun. An additional duty of the race starter is to place the rockets on the carriers and prepare them for the start. This will make them the final inspector of whether a rocket is ready to race or not. This year, the starter was able to predict which rockets had rubber bands that had slipped or broke undetected prior to the start of the race.

**Race Judge:** There should be only one race judge. The race judge must only determine which rocket finished first. This person must be decisive and willing to stand by his or her decision. The race judge is also responsible for resetting the finish line stop-cloths after each race.

Rocket removal: These volunteers will remove rockets from the line after each race and return them to the display table. There should be two.

Rocket Appearance Judge: This person will have a list of prepared categories on which to judge rockets. Each rocket will receive a participation ribbon and a unique recognition so that each kid feels like a winner no matter what place their rocket finishes. There should be a back up, but it is easiest if only one person performs this job.

Race charting: The pack uses double-elimination charting to determine the winner and runner-up for each den. Those two will advance to a pack-wide competition whose winner and runner-up are also determined by double-elimination. The person who performs the charting duties must understand how it is done and therefore will require training prior to the event.

Decorating: This can be a sub-committee given a budget to determine the best way to decorate for the event. This year it was a sub-committee of three where one failed to show up on race day, but the decorating was finished anyway.

Launcher set-up: The rocket launcher/racetrack needs to be set up on the day of the event.

Table/chair setup: The tables for registration, rocket display, den display, and rocket inspection/repair need to be set up prior to the event with enough chairs to make the volunteers comfortable. The committee must be responsible for obtaining tables and chairs for them to set up. The church may provide them, the pack may provide them, or they may be rented.

Rocket winders: There should be eight rocket winders. This allows four rockets to be wound and readied for racing while the next race of four is prepared at the same time. This keeps the event going smoothly with fewer interruptions.

Den Display: Each den should bring something to display at the race. Typically, this is done at pack meetings, but then people are anxious to get their children home at 8pm or later. A den display will give each group a chance to show off one of their activities. Each den leader needs to be responsible for his or her own den.

Clean up: Put the tables, chairs and launcher away. Trash and decorations need to be cleaned up so that the location is neater than it was when we got there.

Does it sound like too many volunteers? Don't be too sure. The rocket winders are the most numerous positions to fill, but they all volunteered themselves this year when the winding went awry. A handy person has no problem with rocket repair and almost all other positions except for launcher set-up are very easy. Still, it may need to be necessary to combine positions. For instance, rocket inspection and rocket repair were the same people for the 1999 event. The MC was also the race judge. The winders served as rocket removers, too. Two people accomplished launcher set-up, one of whom stayed on and became the race starter.

However, it's not as bad as it sounds. When the actual racing occurs many of the jobs are already over. Registration and appearance judging are done. Inspection and rubber band installation have been finished. All set-up has been accomplished. Den displays are already displayed. Decorating is done and the first aid person is actually a spectator unless something happens that requires his attention.

Still, the large number of working volunteers is a good thing. It promotes widespread pack attendance to the event if the person is responsible for something. Even though we had a couple of last-minute drop-outs in 1999 many of the parents attending were working the event and had a good time doing so (of course we had the committee filling positions, too).

Either the space derby committee can divide up the pack list or position list and try to call people up to fill positions or one person can take on the responsibility. We recommend the second option. It avoids multiple

calls to the same people or overfilling any position. Besides, if this comprises the bulk of one committee member's duties, then they simply have about one week of calling to do to fill the positions from the 30 or 40 phone numbers in the pack. It is easiest if you already have a job in mind for a person when you call. "Would you be willing to wind up rockets on the day of the race? We can show you how at the run through day". By the way, dads loved doing the winding. We don't know why, but that's just the way it happened.

## **Construction Day**

The person who hosts the construction day must be comfortable with many kids on his/her lawn or garage. In 1999, only six Scouts attended the construction day although 22 Scouts attended the race day itself. So, it may not be a great number of kids.

The host should themselves be good working with models or wood or know someone who can be there who is good with those things. Kids will be lost. Some parents will be, too. They'll need advice on what to do. The committee should consider supplying sandpaper and paint supplies for this event or letting parents know to bring their own supplies.

This event will probably last three to six hours depending on how much is being accomplished.

Two registered adult leaders must be in attendance at this event to meet the requirements of the WLACC BSA tour permit. There should definitely be someone there who can answer nagging questions about rocket construction (how smooth does it need to be, what kind of paint should I use, how do I cut off the excess wire, etc.).

## **Run Through Day**

Unless this person is also the one who will be doing a race-day job, this host has almost no duties. They simply need to make their home available to the pack on one day so that the launcher can be set-up on the lawn and kids can test their rockets out.

In order to minimize the number of meetings that the committee needs to have with each and every volunteer, any supplies or training should be given on this day. This means that committee members who need to supply these things need to be there, too. Of course, they will anyway because their own children will be participating in the space derby, but they may need to remain longer than their own time period.

Each den should be give one hour to test rockets, unless there are only one or two participants in a particular den. Then, that den testing should be done at the same time as another. There should be a half-hour break between testing to allow for time over-run or simply breaks on the part of the people running the event.

This is the opportunity to teach the winders exactly how to wind. The committee should bring all paperwork to the race, but it can be shown to the registration people during the run-through so that they are familiar with it.

Each rocket tested will need three rubber bands to power it. Since you can test four rockets at the same time, you need at least 12 rubber bands for rocket testing. You'll need more, of course, in case the rubber bands break and need to be replaced. These testing rubber bands should be pre-treated in the same manner that the rubber bands on the race-day will be pre-treated. The same rubber bands will be used for testing all rockets.

There are some nagging problems remaining with the space derby. There is no reasonable explanation for the strange phenomenon of twisting the 1999 event experienced. Occasionally, the rocket will spin counter to the propeller spin around the racing wire instead of racing along it to the end. Calls to the rocket vendor and others who have performed this event yielded no answers. The run through day will allow the next committee to try to determine the nature of the problem, if experienced. Possible reasons are: the rocket is too light (not reasonable because it didn't happen to all light rockets), the hanger extends into the interior of the rocket and is somehow interfering with the unwinding rubber bands and creating a strange torque that moves the entire rocket (unlikely but possible), the line needs lubrication (both oil and baby powder were suggested. Neither sounds really right since it was brand-new BSA line that was being used), the propeller is on backwards (not likely since we tested rockets with propellers on both ways and had no problems), fin placement (we're not aerospace engineers so we don't know if this is reasonable), and maybe the wire loops on the carrier were getting caught and the rocket spun around when it couldn't move forward (it's possible, but wasn't observed). The only thing we noticed in 1999 was that it only happened to light rockets. Not all of them had this problem, but no heavy rockets did. Also, the same rocket that could have the spinning problem could also be rewound and fly with no problem. This tends to lead to the reason being a combination of the rocket weight and the wire loops, but this is just a wild guess.

In any event, the run through day is the easiest way to test, have meetings, and do training all at the same time.

## **Master of Ceremonies**

The MC will keep the crowd informed of what is happening and keep them entertained when there are lulls in the racing. The first hour and a half of the event is registration and rocket appearance judging while families have lunch. This may be a time for the MC to fill time with games or other activities. This is a matter of personal taste and the 1999 committee has no recommendation to make on what should be done during this time. This year, we allowed the kids to mingle without any other structure and it worked out fine. In the future, however, the MC should advise Scouts and parents to observe den displays.

The MC will officially start the event when it is time to race. A flag presentation or other appropriate opening ceremony will be the responsibility of the MC.

The MC will need to work closely with the double elimination charter since this person will supply the MC with the names of the current contestants and will need to know the winners of each race.

When in doubt, the MC can walk up to the rockets, read the number from the stem and match that to his or her list in order to announce winners or simply participants.

After all racing has been concluded, the MC will ask for participation ribbons from the rocket appearance judge. The MC will present all of the ribbons to the scouts congratulating them on their winning categories.

## Registration

The registration process is one of the more complex responsibilities, but is actually easy because it is divided between several people and forms should be supplied by the committee which make it a simple matter of filling in the blanks and checking things off.

First, the scout will present his rocket. The scout's name must be written on a list that has a number next to each line. This is the number assigned to the rocket. The number stickers previously removed from the derby kits will be used to apply the number to the hanger stem of the rocket. On another list, the scout's name is located on a roster and the number is written into the appropriate box next to his name with a checkmark to note that his rocket has been accepted.

Next, the rocket is given over to the rocket inspector to determine if all rules have been observed and if any adjustment need to be made. A small amount of graphite will be added to the rocket to allow the propeller to turn easier. After inspection and possible repair, the rocket is given back to the registration table with a passing grade.

The registration checks off that this particular rocket has passed inspection and hands the rocket over to the individual who installs rubber bands.

The rubber band installer will remove the current rubber band and put three pre-treated rubber bands in its place. The rocket is given back to registration.

The registration official notes that the rubber bands have been installed for this rocket and gives the rocket to a winder for testing.

The winder will verify that all three rubber bands are properly attached to the propeller assembly. The propeller will be wound repeatedly and incrementally to loosen up the rubber bands. Then it will be wound fully and placed on the racing line. Multiple rockets can be run at the same time, but it is not necessary. The race launcher releases the rocket to determine if it will race properly. Any problems can be diagnosed immediately and sent back to inspection/repair if something can be done or retested if it seems to simply be a matter of loosening up the rubber bands.

When a rocket has been fully tested, it is given back to registration. This person notes that the rocket has been tested and places the rocket on the display table next to its number where it will remain until racing begins.

When all rockets have been registered, the filled-out forms are given to the person who will be charting and the MC (the list with pre-printed names and written numbers is give to race charter. The list with pre-printed numbers and written names is give to the MC). Registration is done and they sit and enjoy the races.

Because this position requires coordination between many people, the registration person needs to feel comfortable about the procedure so prior training is essential.

The next few pages have samples of the forms/procedures to use:

### **Registration Procedure**

1. Identify Cub Scout on Checklist
2. Check mark next to scout's name when rocket presented
3. Assign a number to rocket, write it on checklist
4. Write scout's name next to his number on assignment list
5. Give rocket to inspector
6. After inspector's approval, check mark inspection
7. Give rocket to rubber band installer
8. After rubber bands added, check mark rubber bands added
9. Give rocket to rocket winder
10. After test flight is announced successful, check mark test flight successful
11. Place rocket on display table with number for judging
12. All rockets checked in? Give rocket number list to MC by 1pm
13. Give name list to race charter
14. Sit down and have fun watching the race



# Space Derby Rocket Number Assignments

Number Assigned To

1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
11	_____
12	_____
13	_____
14	_____
15	_____
16	_____
17	_____
18	_____
19	_____
20	_____
21	_____
22	_____
23	_____
24	_____
25	_____
26	_____
27	_____
28	_____
29	_____
30	_____
31	_____

## Rocket Assignment Numbers for Rocket Display

<b>1</b>	<b>14</b>	<b>27</b>
<b>2</b>	<b>15</b>	<b>28</b>
<b>3</b>	<b>16</b>	<b>29</b>
<b>4</b>	<b>17</b>	<b>30</b>
<b>5</b>	<b>18</b>	<b>31</b>
<b>6</b>	<b>19</b>	<b>32</b>
<b>7</b>	<b>20</b>	<b>33</b>
<b>8</b>	<b>21</b>	<b>34</b>
<b>9</b>	<b>22</b>	
<b>10</b>	<b>23</b>	
<b>11</b>	<b>24</b>	
<b>12</b>	<b>25</b>	
<b>13</b>	<b>26</b>	

<b>1</b>	<b>14</b>	<b>27</b>
<b>2</b>	<b>15</b>	<b>28</b>
<b>3</b>	<b>16</b>	<b>29</b>
<b>4</b>	<b>17</b>	<b>30</b>
<b>5</b>	<b>18</b>	<b>31</b>
<b>6</b>	<b>19</b>	<b>32</b>
<b>7</b>	<b>20</b>	<b>33</b>
<b>8</b>	<b>21</b>	<b>34</b>
<b>9</b>	<b>22</b>	
<b>10</b>	<b>23</b>	
<b>11</b>	<b>24</b>	
<b>12</b>	<b>25</b>	
<b>13</b>	<b>26</b>	

## **Rocket Inspection**

Rocket inspection is part of registration. This person will make sure that everything looks good with the rocket and will apply the graphite that is supplied to him or her by the committee. This person will also need the spare parts obtained by the committee in case anything needs to be replaced or repaired on a scout's rocket. This is the checklist for rocket inspection.

Graphite is applied to the small section where the plastic propeller spins against the brass fitting. Try to use the same amount of graphite on all rockets.

1. Verify hanger glued securely
2. Verify fins glued securely
3. Ensure propeller assembly not glued/painted on
4. Check that hook assembly is facing the proper direction (some people put it on backwards with the hook over the propeller)
5. Check for red plastic cover on rubber band hook
6. Verify enough space between plastic cap and hook to fit rubber bands
7. Verify brass fitting on plastic cap
8. Check for secure wire bent over propeller - won't slip off when wound
9. Ensure that bent wire won't touch plastic cap when propeller is spinning
10. Verify that rocket has a dowel
11. Verify that rocket has adequate dowel groove in the back
12. Inspect inside of rocket for possible hanger obstruction of rubber bands
13. Apply graphite to propeller assembly
14. Inspection satisfactory, return rocket to registration

Some of these steps need to be shown to be easily understood which makes it important for the person to attend the run-through where they can be trained on this procedure.

## **Rubber Band Installation**

Rubber band installation is a little tricky. The rubber bands must be tied to the dowel, not simply looped over. The reason for this is twofold. If the next committee decides to again try to use a winding tool, it is necessary for the dowel to be tied. Otherwise, the rubber bands slip off the dowel when winding. The other reason is so that if the dowel slips and is pulled inside the rocket body, it can be hooked and pulled out quickly without have to fish for all three separate rubber bands. This is done with a simple through-the-loop-tying maneuver we've all done with rubber bands at some time or another.

1. Rubber bands should not drip with coating
2. 3 rubber bands are to be used on each rocket
3. Tie rubber bands to plastic dowel
4. Pull rubber bands up through front of rocket
5. Install rubber bands on propeller assembly hook
6. Ensure dowel is seated in groove
7. Ensure propeller assembly fits in rocket nose
8. Installation satisfactory, return rocket to registration

Because the tying maneuver can be a little tricky if you are unfamiliar with it, it needs to be taught ahead of time.

## **First Aid**

Someone with a current Red Cross or equivalent level first-aid certification needs to be asked to handle first-aid duties. With tools being used in rocket repair and the hot weather that may accompany the event, it is necessary to consider this.

## **Rocket Repair**

Since all in attendance will be parents who have had to work on rockets with their children, rocket repair should not be beyond any of them. However, someone who is handy and comfortable with doing general repairs or model assembly is the best. These people will most likely have to install broken rubber bands and re-hook them onto the propeller assembly. But they may also need to glue fins back on or replace a broken propeller hook. A drastic repair might be the replacement of a dowel that disappeared when the rubber bands broke. Tools that would be helpful for these jobs are: pliers, needle-nosed pliers, wire cutters, superglue, an exacto knife, and sandpaper besides the spare parts.

## Race Starter

This position sounds innocent enough, but it is actually quite powerful according to our recommendations. The race starter is the last person to touch the rocket before it is actually raced and is the only one in a position to determine if a false start has occurred. So, although the most obvious part of their duties is to move the launch rack in order to start the rocket race there is more to it.

The race starter knows better than anyone which lanes have been used for racing. Therefore, it is the starter's responsibility to rotate rockets on the lanes. Unlike the pinewood derby, we have determined that there is no lane favoritism in rocket racing. Although it would seem that there could be defects in the race line or rocket carriers, these are very easy and inexpensive to replace. Therefore, the run-through will determine if replacement of these items is necessary. Still, in order to provide even wear-and-tear on the line, the lanes should be rotated when less than 4 rockets are being raced with the open lane(s) being changed according to whichever was not used last.

The race charter can note which lane a particular rocket has raced on, but it is the starter who will note which lane was open last and rotate the next open lane.

The starter will be the person to place a wound rocket on the starting line. Having one person do it provides complete consistency in this matter. Also, feeling the tension on the propeller for all four rockets being raced gives the starter a better opinion to make a snap determination that a rocket may not have all three rubber bands fully hooked. This past event proved that the race starter could accurately predict which rockets would be removed and shown to have less than all three rubber bands hooked on the propeller assembly. Verifying the rubber bands are hooked is tricky when there is full tension on the rubber bands because the nose cap and propeller assembly must be pulled out of the rocket body in order to observe the wire hook to count the number of rubber bands, but it can be done. This is one of the responsibilities of the race starter.

If the race starter has slowly lowered the starting gate and therefore interfered with the race, the starter is the only one who knows. Due to the large number of possible reasons for restarting a race (counter clockwise line spinning, unexpected stopping, etc.) we recommend that only false starts that are the fault of the starter should be re-raced. Any of the unexpected and inexplicable problems we had with the racing should not be grounds to re-race. With setup of one race taking 2 or 3 minutes, re-racing quickly bores the audience and makes parents and scouts upset when the determination is made to do one re-race and not another. So, only starter faults should be re-run and these are based on the admission of the starter only.

## **Race Judge**

Because our pack should use double-elimination racing, the judge has an easy job, relatively. Only the winning rocket needs to be called. It doesn't matter who comes in second, third, or fourth. The judge simply needs to be a person who is willing to make a quick determination and stick to it.

We had no judging complaints this past year when the MC was the judge, even in the case of a few close calls. As long as the judge is willing to make a firm decision, this is one of the easiest jobs on race day.

## **Rocket Removal**

When a race is over, the rockets need to be removed from the carriers and returned to the display table. The carriers need to be slid along the race line back to the starting gate. There should be two people with this responsibility in order to minimize the down time between races. The race judge is a good person to double on this responsibility.

## **Rocket Appearance Judge**

The judge for rocket appearance will spend the half-hour between the close of registration and the beginning of racing to determine the winning category in which to place a scout's rocket. There should be an equal number of winning categories and scouts (or more winning categories to give the judge a choice on what to assign to a scout).

The appearance judge will use two lists to perform his or her duties. One list is a printout of labels with the winning categories to choose from. The other is a list of rocket numbers to note the winning category and later to note the Cub Scout's name. At first, all the judge sees is the display table with rockets that have numbers, but no names. Once the judge has assigned categories to all rockets, the judge consults with the MC to note the names of the scouts that correspond to the rocket numbers. This is the list that was given to the MC by registration.

The appearance judge then must apply the labels to the back of the provided ribbons and note the scout name on the label. This can be done in the half-hour interval or during racing. The ribbons should be separated by den for presentation and given to the MC when requested.

The categories can be either specific or vague: best paint job, sleekest design, most original fins, astronaut's choice, alien's choice, etc.

A document is provided on the next pages with the form used for judging.

## Space Derby Participation Ribbons

Rocket Number	1
Cub Scout's Name	
Winning Category	

Rocket Number	2
Cub Scout's Name	
Winning Category	

Rocket Number	3
Cub Scout's Name	
Winning Category	

Rocket Number	4
Cub Scout's Name	
Winning Category	

Rocket Number	5
Cub Scout's Name	
Winning Category	

Rocket Number	6
Cub Scout's Name	
Winning Category	

Rocket Number	7
Cub Scout's Name	
Winning Category	

Rocket Number	8
Cub Scout's Name	
Winning Category	

Rocket Number	9
Cub Scout's Name	
Winning Category	

Rocket Number	10
Cub Scout's Name	
Winning Category	

Rocket Number	11
Cub Scout's Name	
Winning Category	

Rocket Number	12
Cub Scout's Name	
Winning Category	

Rocket Number	13
Cub Scout's Name	
Winning Category	

## Race Charting

Space Derbies take a while to prepare each race. Unlike the pinewood derby where the only thing that needs to be done is to locate the car to race and set it on the track, the rockets must have their propellers wound 100 times to prepare for the race. This takes anywhere from 30 to 90 seconds depending on the person doing the winding. If the person loses count or gets interrupted, they must start over again which means the time can be almost doubled. If the rocket's rubber bands break or slip, the rocket must be repaired before it can be wound. When the rocket is about to be placed on the racing line, the starter may need to inspect the rocket if the torque feels inadequate. If he or she discovers that a rubber band is missing or broken the rocket will need to be repaired and rewound. Placing the rocket on the racing line is a little tricky because the hanger must fit snugly into the carrier that is attached to the racing line. The rocket must be positioned on the starting gate taking care not to accidentally dislodge other rockets waiting to start.

Taking all of this into account, the method that requires the fewest number of races to win without absolutely sacrificing all objectivity is what we considered when determining how we would declare a winner in the space derby. Race preparation can take 2 to 5 minutes per rocket when running a heat. Hopefully, all rockets in a race are being prepared simultaneously. Still, keeping the event interesting and without large amounts of lag time between heats is a challenge.

We rejected the round robin method of racing because of the very large number of races required. For 30 rockets, the standard round-robin programs that generate charts for racing recommended something in the neighborhood of 120 heats to determine a winner. Single elimination was deemed too harsh because a boy may see their rocket race only one time and sit out the rest of the event without even being able to race any more and they only got to race against 3 other kids. Double elimination was novel enough to the scouts so that they would be intrigued by the method and remain engaged because they were not immediately eliminated. Also, alternating dens when racing helped to draw out the amount of time their rockets remained in competition. So, we recommend the double-elimination method in determining the winner of the competition.

Each den should be raced separately using the double-elimination method to determine a winner and a runner-up. These two rockets will advance to pack-wide competition. When all winners and runners-up have been determined, the double-elimination method is used in the pack-wide competition to determine the overall winner and runner-up.

Although we recommend getting a commitment from all scouts regarding their participation in the space derby prior to the race day, we recognize that last minute drop-outs or even last-minute add-ins will occur. For this reason, blank charts are provided to accommodate any number of participants per den (actually from 3 to 12).

On the day of the race, the race charter will need to fill out the forms for each den and another for the pack-wide competition. Since the rockets will be identified only by number, but the MC will need to know the names of the boys competing for announcement, the charts need to include both numbers and names. Although the committee was agreed that lane assignment was irrelevant due to the uniform nature of the race line for space derby, we still recommend tracking lane assignments simply for the sake of placing them on different lanes in the event that parents/scouts request it. There was no concern or request during the 1999 race. The starter made an attempt to mix up the lane assignments when he recognized rockets racing repeatedly, but it was not a priority.

The main responsibility of the race charter is to work with the rocket winders and the MC to prepare rockets for racing and to announce current participants. The most apparent responsibility of the charter is to note winners and schedule upcoming races.

Since each den will race separately to determine the winner and runner-up per den, double-elimination charts should be made in advance with anywhere from 3 to 12 participants listed (we've never had more than 12 scouts in one den). Dens with only 1 or 2 scouts should be merged with another den of similar age

range. For instance, in 1999 we were prepared to merge our 1 Tiger in with our Wolf den for den competition.

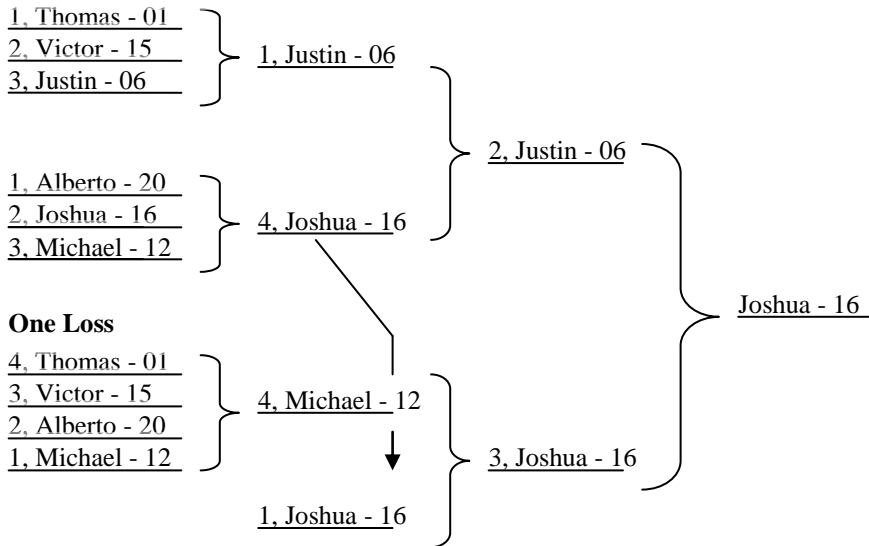
Make multiple copies of the charts because separate dens may have the same number of participating scouts.

Double elimination is defined as follows by Pack 273 on their web site <http://www2.inow.com/~wag/derby/dblelim.html> : "In a double-elimination Pinewood Derby race, cars remain in competition until they sustain two losses. After the second loss, cars are eliminated from competition". Obviously, we're using it for space derby, but it's the same. "In a double-elimination race the only place that matters in each heat is first place, regardless of the number of cars in the heat. The first place winner in each heat advances to the next level. All the other cars in the heat move to the losers' bracket, or if they are already in the losers' bracket, having already sustained 1 loss, are eliminated. Not having to keep track of second, third and fourth places in each heat is one of the major advantages of double-elimination". This web site has some excellent examples of double-elimination, but our charts are different from theirs because it seemed more easily understood the way we did it.

Charts help keep track of who is advancing, who has lost and also to mix up competition between scouts (making them race against others they haven't raced before). Charts of the results of our 1999 competition should illustrate how this occurs.

**No losses**

Track Number, Scout Name - Rocket Number

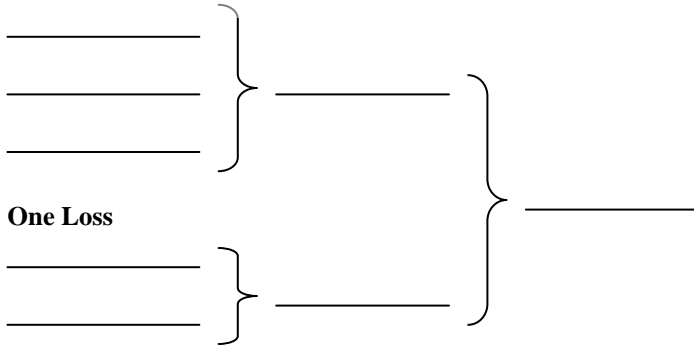


This chart illustrates our Den 4 space derby race. Because the den consisted of 6 boys and we only have 4 lanes on which to run the races we ran 2 groups of 3 instead of one group of 4 and one group of 2. In the first race, Justin won and advanced to the next run. Likewise, Joshua outperformed the scouts in his heat. Because the others had only sustained one loss, they advanced to the next bracket and raced against each other. Now, there were only 4 contestants so they were all raced against each other. Michael won this race and advanced to the next bracket. In the race between the winners of the first heats Justin beat Joshua. Since Joshua had only lost once he advanced to the bracket which already contained the winner of the one-loss rockets, Michael. In the race between Michael and Joshua, Michael was eliminated after his second loss, his first being against Joshua in the beginning round. This brought Justin and Joshua into competition against each other again. Joshua beat Justin once, but Justin had now only sustained one loss. After another race, Joshua won again to prove his rocket the winner. Justin had suffered two losses to Joshua's one loss. It is important to remember that one race does not determine the winner. Two losses are the determining factor when figuring when a rocket has been eliminated. So, Joshua needed to beat Justin twice in order to win. Conversely, Justin would have only needed to beat Joshua once in that final round to be declared the winner since Joshua had previously lost against him in an earlier round. 7 races were needed to determine a winner in this den of 6.

### Double Elimination Chart for 3 Scouts

**No losses**

Track Number, Scout Name - Rocket Number

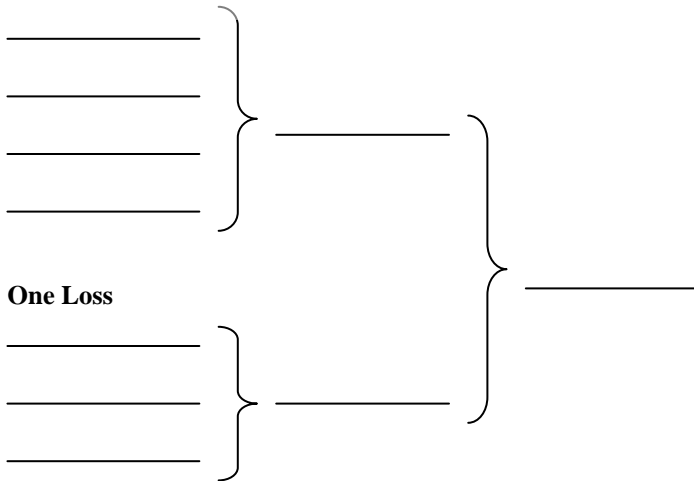


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 4 Scouts

**No losses**

Track Number, Scout Name - Rocket Number

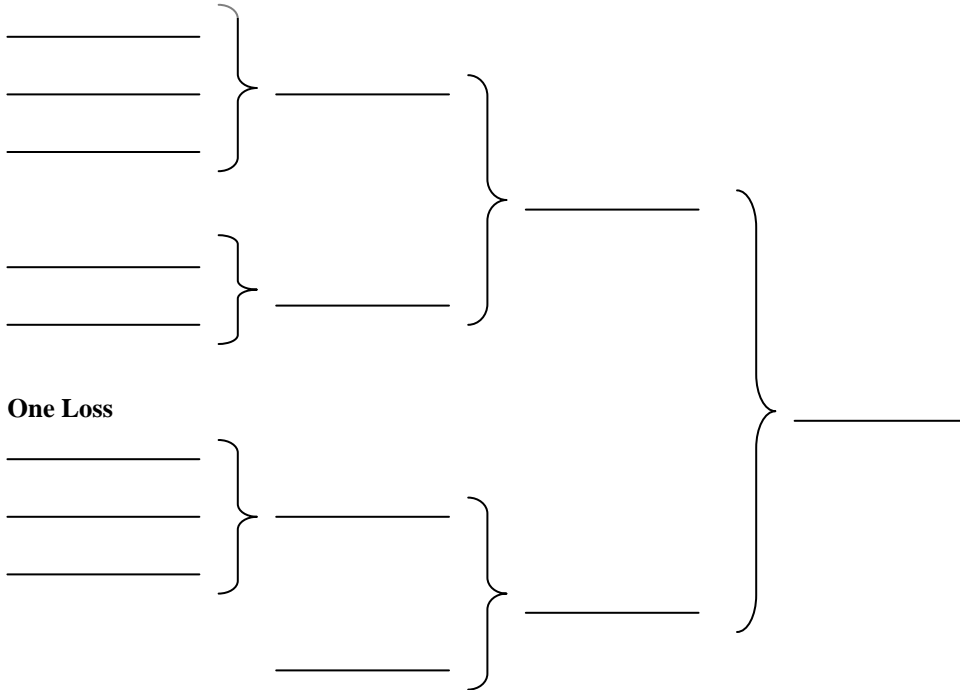


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 5 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

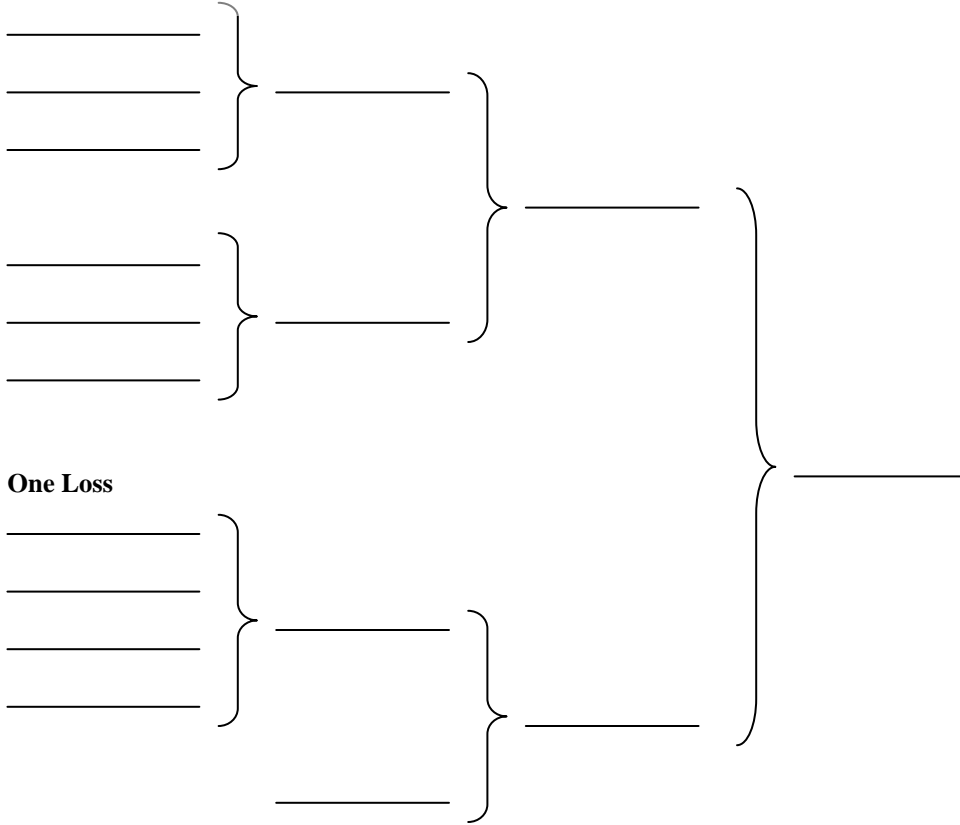


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 6 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

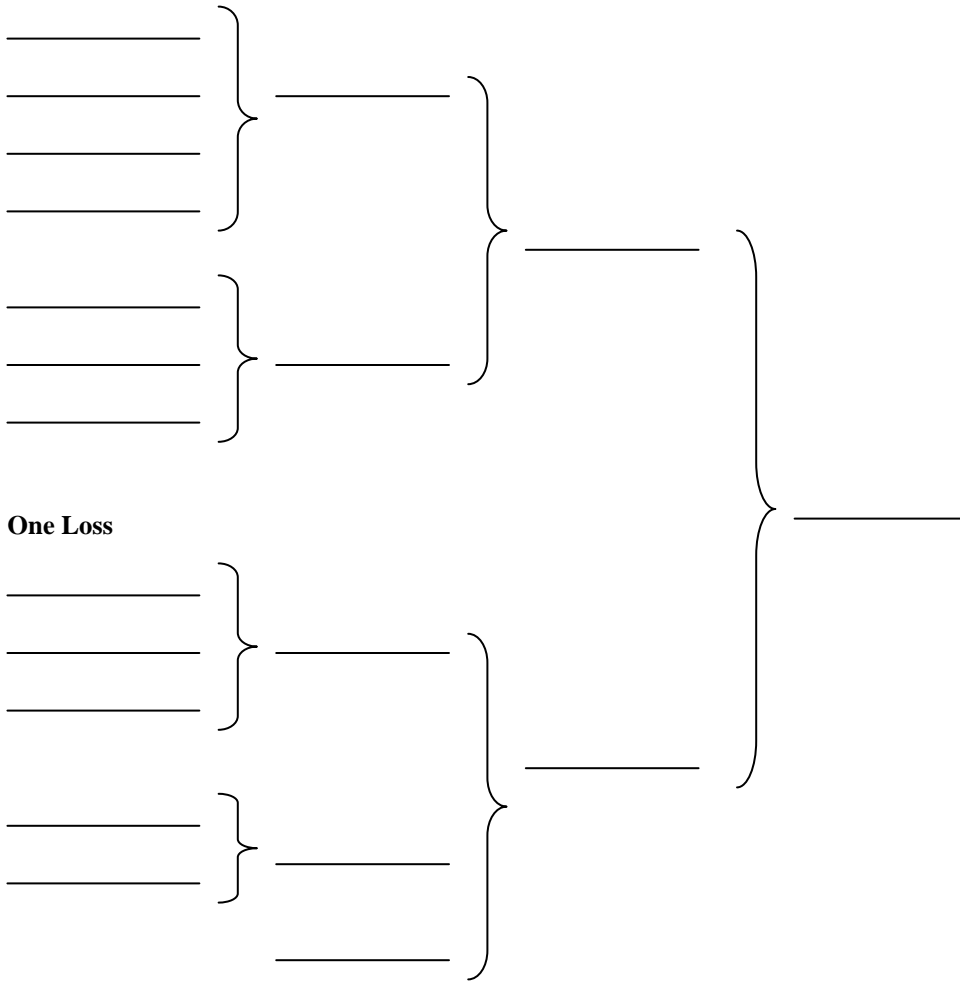


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 7 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

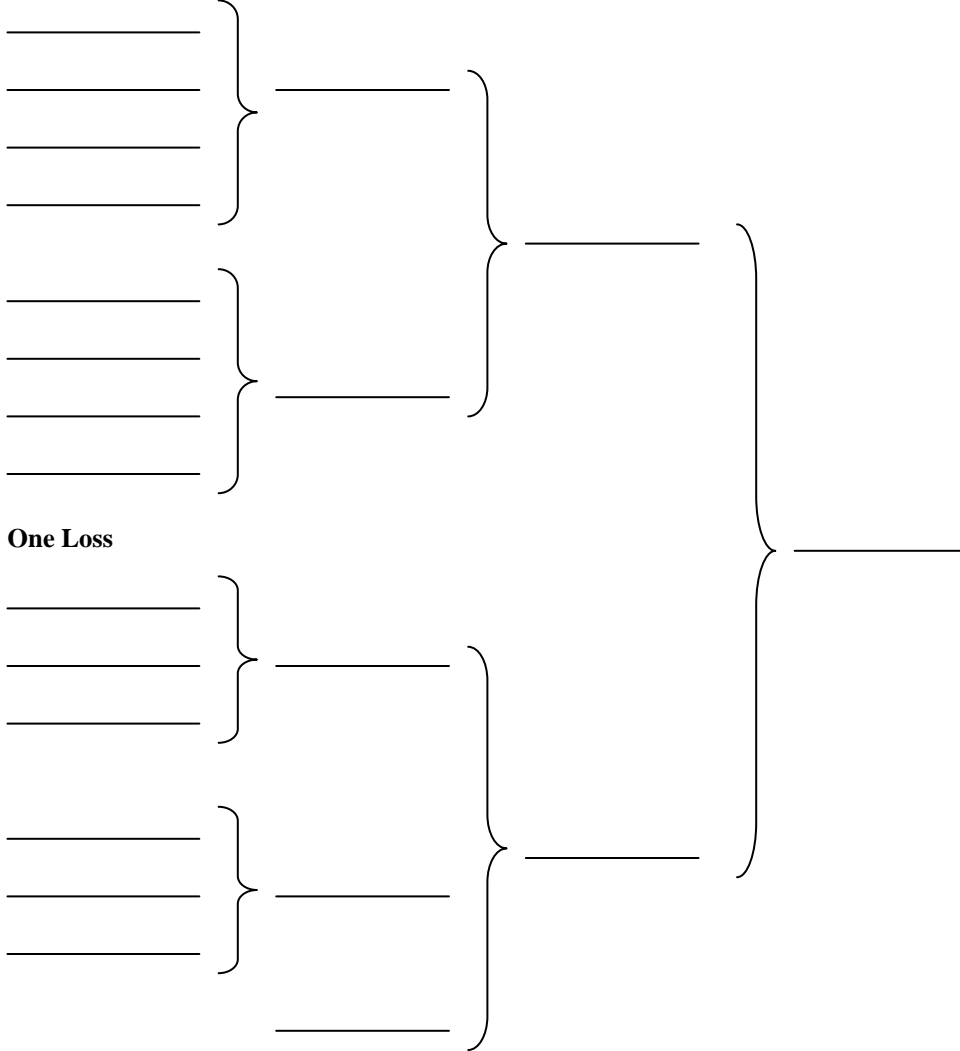


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 8 Scouts

**No losses**

Track Number, Scout Name - Rocket Number

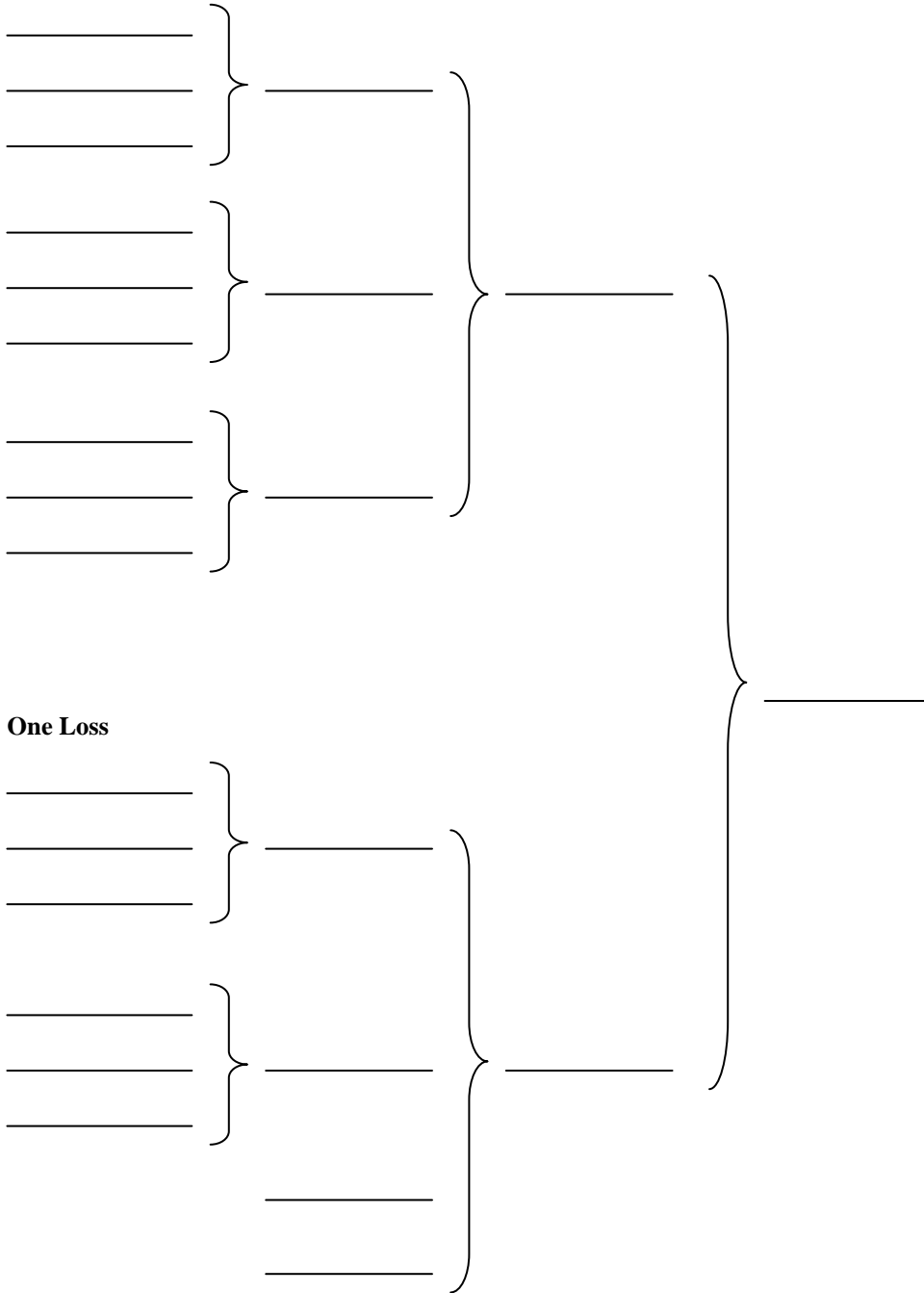


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 9 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

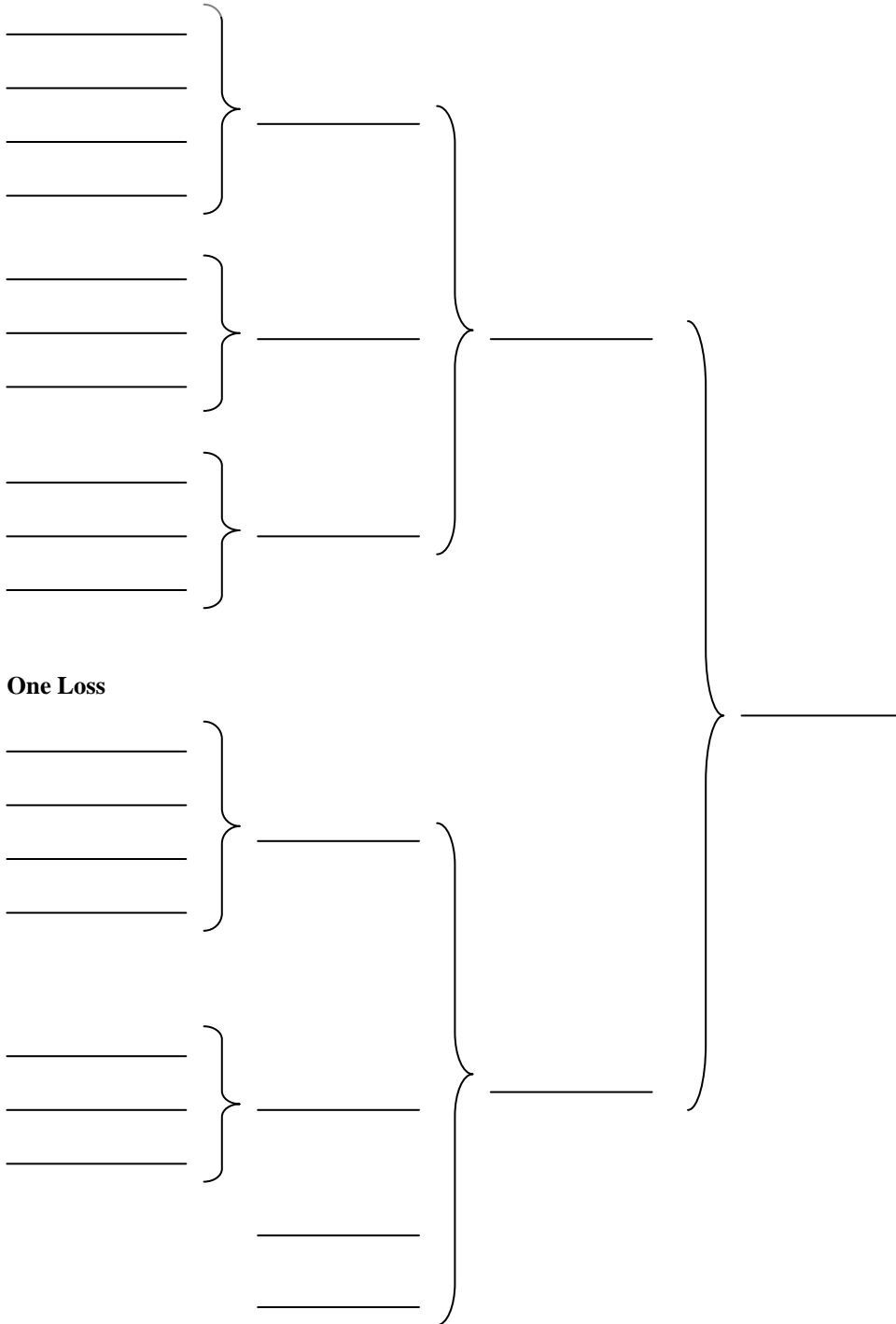


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 10 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

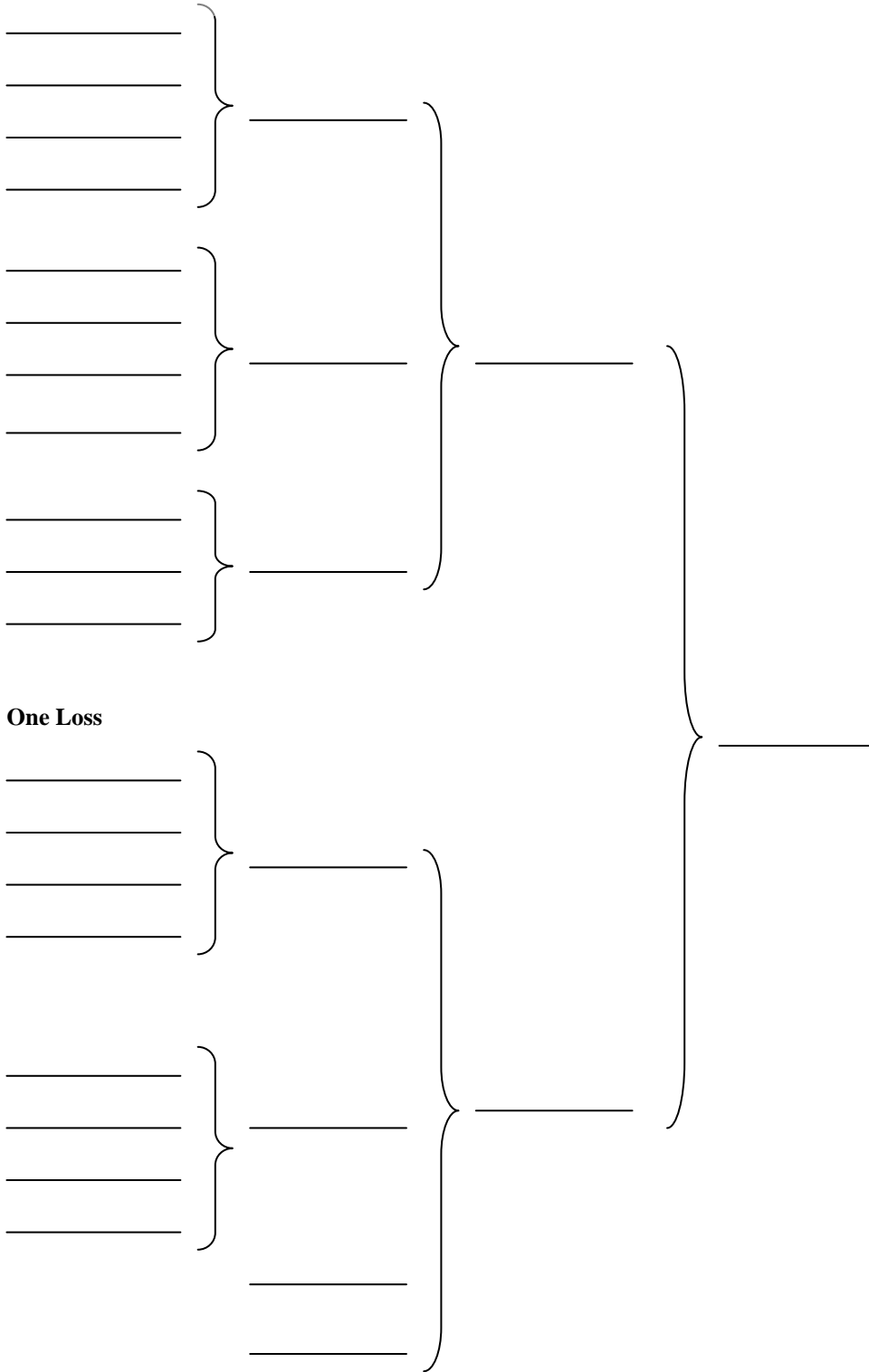


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 11 Scouts

#### No losses

Track Number, Scout Name - Rocket Number

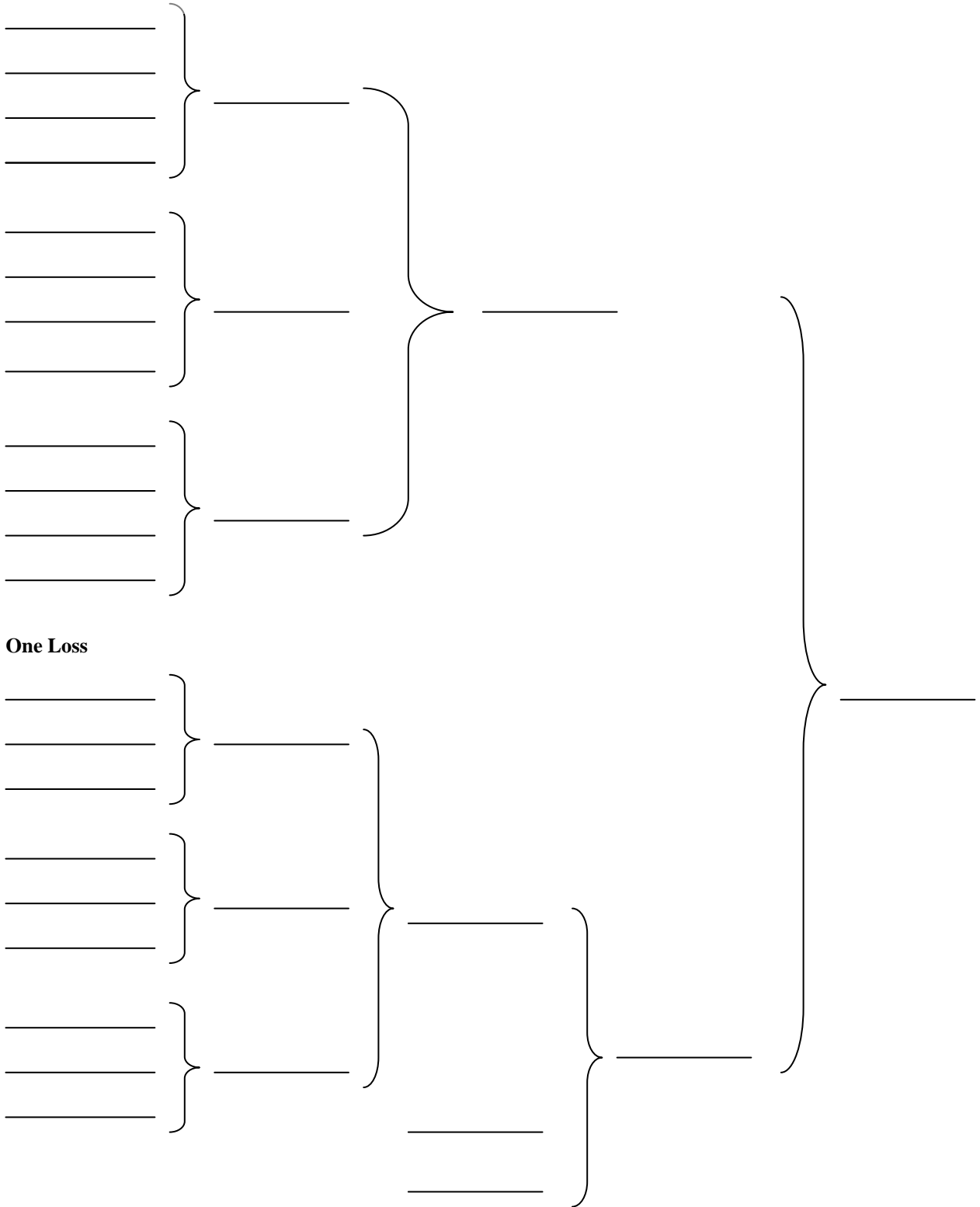


Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

### Double Elimination Chart for 12 Scouts

#### No losses

Track Number, Scout Name - Rocket Number



Note: In the final race to determine the winner, the defeated rocket must have lost a total of **two times**.

It is recommended that dens be alternated when running races, if possible, because it keeps rockets active longer and because a subsequent race in the first den may depend on the results of the current race. For example, after the race when Justin competed against Joshua and then Joshua lost, the next scheduled race for that den was for Joshua to race against Michael. Since Joshua's rocket had just finished a race, it still needed to be wound up for that race before it could happen. If there was a race from another den that was all wound up and ready to be placed on the track then racing could continue with very little interruption. Meanwhile, Joshua's rocket is wound up as well as Michael's (if it wasn't already wound) so that they are ready to go after the other den's race.

In 1999 we had a Wolf den of 4 who needed to race and a Bear den of 7 who needed to race. If you remember the double-elimination chart for a group of 4, you note that when the 4 finish their race, the 3 who lost need to be wound up and raced against each other. If the race charter is on his or her toes, the 4 wolves can be wound at the same time as the first race for the bears (4 rockets). So, you prepare 7 rockets at the same time, race the first four of the wolves and then race the first four bears. While the bears are being placed on the racetrack and their rubber bands are being double-checked by the race starter, the charter should tell the winders to ready the 3 wolves who lost the race so they will immediately be ready to go after the bear race. While they are being raced, you can have the other 3 bears getting wound up.

Although one could obviously alternate the starters in every den before moving on to the next bracket for each den, we recommend alternating between two dens only if possible. There is no rationale for this other than keeping those two dens interested in the racing because they know that either the current race or the one directly after that will involve their den. Try to start with your biggest dens first. The novelty of the very first races will keep all scouts interested and then when the competition continues you'll be moving to the smaller dens which means you will finish up the den competitions faster. After that comes the pack-wide competition which should interest all dens.

The race charter will need to work closely with the rocket winders, pointing out which rockets need to be readied for an upcoming race. The number of rocket winders will determine how far in advance you will be able to prepare. Since there are 4 lanes on the racing track, a total of 8 winders should be sufficient to keep the activity going fairly smoothly. This means that the race charter only needs to schedule out one race ahead of the current one to keep everyone busy without confusing the charter. Refer to rockets by number to the winders since this is how the rockets are labeled during registration.

The MC will need to know, however, the name of the scout being raced. The charter should have this information and can give it to the MC easily. Also, the MC should have the rocket number/scout name list in order to match the rocket numbers with the scout name. However, the MC will still need to check with the charter in order to announce upcoming races.

The charter will be fairly busy during the racing as he or she schedules races, tells winders which rockets to prepare, and gives announcement information to the MC. It may be a little rough during the first few races, but it should soon become easier as they continue.

## **Decorations**

This is where each committee can really make itself distinct. Although the full committee could concern itself with the decorations, there will generally be enough other duties to keep them busy. This committee recommends a sub-committee for decorating with the chair of the sub-committee being one of the regular committee members (but not the chair of the regular committee). This will involve more parents in the preparation of the event in a way that doesn't put too much responsibility on them and gives them the option to be a gopher or creator. Some parents will help out, but only if they are specifically told what to do. Some like to speculate on ideas, but don't know how to accomplish them. Because decorations can be a time-consuming job with advance preparation and racing day set-up, making it a sub-committee keeps the regular members free to accomplish all the other tasks of preparation and last-minute filling-in for people who may not show up.

In 1999 we spent less than \$9 on decorations although we allowed a budget of \$25. Although the crepe paper and balloons helped make the event more festive more was probably needed. There are many ideas from other packs and Internet resources about obtaining decoration donations from local businesses. Also, it is expected that the decorating committee will attempt to stretch their dollars as far as possible by creatively using whatever materials they may have on-hand at home or in their dens.

## Launcher Set-up

Launcher set-up may require moving it from the storage location to someone's house for run-throughs and then moving it back for race day. Since it is about four feet wide by six feet high, we recommend someone with a truck although it could easily be carried on top of a car.

We recommend using a standard level and a line level when setting up the launcher/race-track. You will also need to be able measure 30 feet accurately. If you do not have access to a long tape measure, you can use a standard tape measure (which generally goes about 10 feet) and a length of string to measure a 30 foot length of string. This becomes your race length measure. Place one racing sawhorse at your desired ending point. This sawhorse will obviously not be the one with the launcher frame. Measure 1 foot from the sawhorse and use that point to measure out 30 feet. At 30 feet, place the other racing sawhorse. This is your starting point. Verify you have placed the launcher where you wish it to be.

The standard level will be use to verify that one side of the sawhorse is not higher or lower than the other side. The line level will assure that you do not have one of the ends of the racetrack higher or lower than the other.

Be sure to place all four sandbags, two per sawhorse, on the crossbar near the ground before installing the racing line (looks like fishing line). This will prevent the sawhorses from being pulled out of position when you increase tension on the racing line.

There are two nails on the launcher sawhorse halfway down on the inside of one of the legs. This is where the racing line spool will be placed after the tension has been adjusted. On that side of the launcher thread the racing line through the eye-screw. Next, thread the line through one of the rocket carriers and then 31 feet away into the opposite side eye-screw. From there, thread the line into the next far-end eye-screw and then back to the launcher side corresponding eye-screw. Before threading through this eye-screw, put the line through another rocket carrier. Continue in this threading until you reach the last eye-screw, which will be the last eye-screw on the launcher sawhorse. This should have a snap-lock, like those used to secure dog leashes. Tie a loop into the end of the racing line and thread it through the last eye-screw. Then put the snap-lock through the loop of the line. The snap-lock is too big to fit through the eye-screw so you have effectively tied down the line without actually having to knot the line onto the last eye-screw. You should have four parallel racing lines with four rocket carriers.

If you have not yet experimented with the wire loops versus no wire loops versions of the carriers, you should do the following (assuming that you have the wire loops still in because we left them there at the end of the 1999 races). Bend the wire loops back slight toward the launcher. This should make them slide more easily along the racing line. If you have determined that you do not want to use the wire loops then this point is moot. Hopefully, you listened to the previously documented recommendation and twisted the loops so the racing line has less of a chance of becoming trapped between the wires where they close.

Now, begin to take up the slack in the line on the racing line spool. There is no set torque amount for how tight to make the line. The line should feel tight and give a satisfactory twang sound when you snap it. There should not be any noticeable bow in the line. Place the spool on one of the nails of the launcher and position it so the other nail will prevent it from unwinding. Verify that the line is level. Note that the line is extremely strong. If you didn't have sandbags on the sawhorses, it would drag the sawhorses from their positions as you tightened it before it would break. So, be confident enough to make the line tight.

The propellers of the rockets will be placed flush or very slightly ahead of the front beam of the launcher frame. So, measure 30 feet from the front beam along the racing line. The point 30 feet down is the finish line. At this point, tie a rag or hang a few cloth strips on each racing line. This will stop the rockets as they finish.

Place wound rockets on each lane at the starting point to verify that the launcher frame is not preset too high or too low. You may need to remove the wood chips that are screwed in if the frame is too low to prevent the rocket propellers from spinning. Quickly move the launcher frame down, out of the way of the

rocket propellers. They should all begin spinning without getting caught on the dowels in the launcher frame. They will race to the end, the ones that make it all the way that is, and stop when they touch the cloth marking the finish line. The launcher is now set-up.

Because the finish lines will be moved each time a race is run, they will need to be reset. It is easier to measure a short string from the end sawhorse to the finish line after the initial set-up rather than measuring 30 feet from the launcher each time.

### **Racing Line Suggestions**

In an attempt to determine what was causing some problems for us in 1999 we contacted many people. It was suggested that we do something to the racing line to make the rocket carriers slide along it more easily. One suggestion was to use some kind of wet lubricant. We tried using the treatment for the rubber bands that comes in a box when you buy spare rubber bands for the rockets. This may have worked, but it didn't eliminate our problem. It was also suggested to use baby powder, talc, to dust the line, sort of like the graphite used on the propellers. We didn't try this approach. We leave these suggestions for the next derby to ponder. The only drawback is that this line preparation would need to be done periodically during the racing since the carriers will obviously remove whatever lubricant, wet or dry, is placed on the line as races progress.

## **Set-Up**

There will need to be tables set up for the following: registration, rocket display, and rocket modification (inspection, repair, and rubber band installation). There should be enough chairs so that the people working at these jobs have a place to sit. Try to set-up the tables in the shade if at all possible or set-up shelters or tarps to provide shade.

Provide a number of extra chairs for the rocket winders. Winding is a tedious job and all that standing around can be a pain in the back.

Dens should be bringing crafts or photos to share with everyone. Depending on what they are bringing, a table or two may need to be set up for them.

The table set up for rocket display must be divided into separate boxes for each rocket. The committee should provided printed numbers that can be taped to the table to note the position of the rocket with that number on its stem. Duct tape worked well for us in dividing the table into little boxes. Masking tape would probably leave less residue, but it isn't silver colored.

## **Rocket Winders**

One of the most tedious and most important jobs at the space derby will be winding up the rockets so that they can propel themselves down the race line. The recommended tension for each rocket is 100 turns on the propeller. This is strong enough to make the propeller spin very quickly without putting too much strain causing the rubber bands to break.

There are recommendations in the How-To book and in accessory paperwork for using a manual drill to perform the winding. We recommend against this because we tried 3 different winders of this type and all of them malfunctioned. We recognized that it may be slower and take more manpower, but just plain winding the rockets by hand is fast enough and the most reliable way to get the job done.

When winding a rocket that has just received new rubber bands, you must prepare them first. Wind the rocket propeller 25 times and then let it unwind. Next, wind it 50 times and then let it unwind. Next, wind it 75 times. Finally, wind it 100 times and let it unwind. Now the rubber bands are prepared to be used in the race.

Each rocket winder should attempt to have a rocket to wind at all times. This will not always be possible, mostly because many races will be taking place with less than 4 rockets. However, when a winder finds his hands empty, he should double-check with the charter to see if there is a rocket that needs to be prepared.

No one reported any problems during winding in 1999, so there is no additional advice to give. Each winder needs to find her own rhythm and use some method to keep track of how many turns on the propeller have been done. For fairness sake, the winder must be sure that he or she has given the propeller precisely 100 turns. It doesn't matter how fast this occurs as long as the winder is confident.

There should be 8 winders. This allows for the maximum of two races with 4 rockets each being prepared at the same time. If the charter is especially sharp, the winders may even be setting up races occurring after the next two.

It is rather important that the winder go to the run-through day. This will give the person a sense of what they'll be doing on race day without having to worry about figuring it out last minute.

## **Clean Up**

This is very easy, but needs to be scheduled anyway. At least a couple of people need to be pegged for clean up duty. The launcher is the biggest problem in this regard because the rocket carriers need to be put in a safe place as the racing line is removed and wound and access to the storage unit is necessary after it has been folded.

The tables and chairs need to find themselves to the proper locations, which may be someone's car or truck depending on where they came from. All papers need to be handed over to the committee chair so he or she can sort out if they need to be saved. The tape needs to be removed from the display table. The den leaders should be responsible for clean up of the den displays.

Make sure the decorations are removed and given to either the committee chair or the decorations sub-committee chair to determine if they need to be saved. All trash should be collected and disposed of properly. Pack 104's reputation is to leave a site cleaner than we received it.

## **Awards**

Someone on the committee will need to purchase the awards. We recommend some awards be given on the day of the event and some given at the next pack meeting. The awards given the day of the event should be participation ribbons. Space derby participation ribbons are available at the scout shop. On the back of the participation ribbons should be placed labels noting that the scout is the best in some category. This is handled by the rocket appearance judge.

At the next pack meeting, the winners of the races should be awarded their ribbons. The winner and runner-up for each den should be given a ribbon. The winner and runner-up for the entire pack should be given a space derby medal (available at the scout shop). Each ribbon should note if it was den or pack level and winner or runner-up and should have the year of the event.

Each scout who has not participated in a Pack 104 space derby should be awarded a space derby patch. Those who have previously participated in a space derby should be given some simple certificate recognition. This needs to be coordinated between the den leaders and the award/advancement chair.

## **Rubber Band Preparation**

There were several methods discussed in the How-To book about preparing rubber bands for the space derby so that they will not break. Glycerin was a pain to obtain. Castor oil was impossible to find in any great quantity. So, we simply used a 50/50 solution of dish soap (Dawn) and water. We had only one or two rubber bands break that day, if any. So, we recommend going low-tech with soap and water. Soak the rubber bands for 24 hours prior to the event. Dry them off just before they are installed.

### **Adult and Sibling Participation**

Since there was only one non-cub scout rocket made in 1999, this was not a big concern for us. We allowed challenge matches and the sibling racing to occur after the closing while other clean up was being done. This worked well for us so we will leave it as a recommendation for the next space derby.

## **History**

The event needs to be documented with honesty. This allows the next committee to decide if something needs to be continued or changed. Also, if you procrastinated and didn't implement the previous recommendations, it can be noted so that a determination is made on whether or not to try them again.

Generally, this can be done in one or two hours by the committee chair with solicited information from other committee members. It needs to be done as soon as possible after the event while the memories are fresh. This is common sense, but needs to be reiterated.

## **Wrap-up and Recommendations**

Although this is the first time we're aware of that a wrap-up meeting has been documented for posterity, it should be the normal practice. Only the current committee will be able to determine if current methods of doing things work or don't work. Those recommendations need to be written down and given to the next committee.

When we make the work easier on the next committee, the next Cub Scouts to have a space derby will enjoy it more. The last duty of the committee will be to meet and talk about what went right and what went wrong. Publish recommendations so that the next committee won't feel lost when they get started. Take our advice and have the meeting somewhere pleasant like the Blue and Gold committee did. It's an incentive to spend the proper amount of time hashing out the details. The committee chair will still be responsible for making sure that the winning ribbons and patches are handed out at the next pack meeting, but the wrap-up meeting is essentially the end of the event.

Good luck on your space derby.

Joshua Godinez  
Committee Chair

Steve Lindahl  
Committee member and Racetrack constructor

Al Arroyo  
Committee member

Alex Zuniga  
Committee member

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