

S'CREAMER!

MINIATURE HYBRID
ROCKET MOTOR

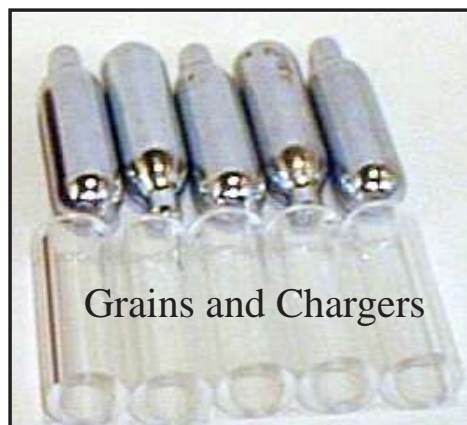


SCRM-1

This is the Aerocon S'Creamer, a nitrous oxide/acrylic hybrid motor designed to use readily available whipping cream chargers as the oxidizer and simple acrylic tubing as the fuel. At the right you can see a side by side comparison with a Sharpie Marker, the S'Creamer is slightly bigger and significantly faster on the draw. Below is a cutaway of the fully assembled motor. The various parts are detailed on page SCRM-2 of instructions and in the image at the bottom of this page.



Included in the kit are 5 acrylic fuel grains, 5 nitrous oxide cartridges (or chargers), a rebuild kit including an allen wrench, additional burst disks plus a supply of O-rings. Also included is an Aerocon exclusive: the Speedy O-ring lubricator. This lubricator has been specially manufactured for the S'Creamer and contains over 6 grams of Krytox® oxygen safe grease. Use this lubricator on all your other hybrid rocket motors.



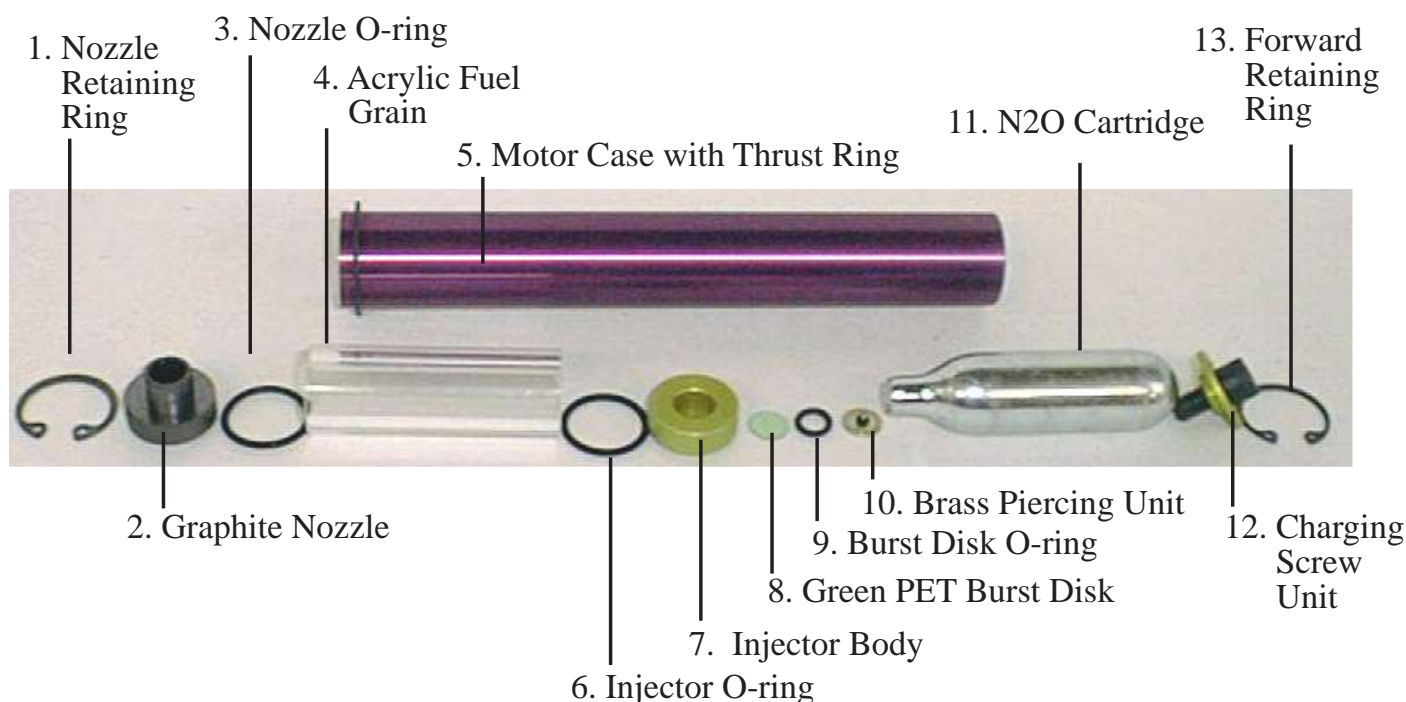
Grains and Chargers



Krytox® Speedy
Lubricator



Rebuild Kit



Warning: All liability waived! Rocketry is an inherently dangerous undertaking. Make your choices and take personal responsibility for the outcome of your experiment! Protect your privilege to fly rockets by not making the headlines or becoming a statistic.

Small Hybrid Rocket Motor Operating and Maintenance Procedures

1. **Use only oxygen safe lubricants!** An Aerocon Speedy O-ring lubricator loaded with Krytox© oxygen safe grease has been included in your kit. To use the Speedy O-ring lubricator place the O-rings in the lubricator body and reinstall the lid. Give the lid a couple of twists and your O-rings will be perfectly lubricated with just the right amount of grease.
2. Remove all combustion deposits from fired motor using a toothbrush and warm water. Vinegar may also be used for cleanup followed by a clean water rinse to prevent pitting. Remember that what ever you use, it must not leave a flammable residue behind.
3. Inspect snap-ring grooves for wear.
4. Inspect and replace O-rings as needed. The nozzle O-ring (1) will need to be replaced after every firing. Since the injector (6) and nozzle (1) O-rings are identical, move the injector body O-ring to the nozzle, and install a new O-ring in its place. The burst disk O-ring (9) should be replaced at the end of the day, and the piercing unit O-ring (10) might not ever need to be replaced.
5. Visually inspect nozzle (2). Nozzles last thirty runs or more, the more careful the user is when handling this fragile piece the longer it will last.
6. Remove Forward retaining (snap) ring (13) from top end of motor. Always take motor apart from the top end to avoid excessive nozzle wear.
7. Remove contents. If necessary use a pencil to push out contents, being careful not to damage the graphite nozzle (2).
8. Clean all parts as needed.
9. Install nozzle (2).
10. Install nozzle O-ring (3) on nozzle. Use a 3/4" inch dowel rod or a spare fuel grain to push the O-ring home.
11. Install fuel grain (4). Make sure that the preheater slug is facing the injector body. See below for preheater grain information.
12. Install injector O-ring (6).
13. Make injector body (7) ready.
 - a. Install green plastic burst disk (8).
 - b. Install O-ring (9).
 - c. Install brass piercing unit with O-ring (10).
14. Install assembled injector body in motor case (7)
15. Install N2O cartridge (11). Make sure to point open end in a safe direction when sliding the cylinder in place, tilt the motor case at an angle so cylinder slides slowly.
16. Install charging screw unit (12).
17. Install snap-ring (13). Be sure that the locating dowel on the charging screw unit is positioned between the ends of the snap-ring.
18. **Visually double check both snap-rings (1) + (13) ensuring that they are properly seated. Improperly seated O-rings MAY cause the unit to disassemble in your hands once the unit is pressurized. Improperly seated snap-rings WILL cause a CATO.**
19. When charging the motor, keep both ends pointed in safe direction, and tighten screw until no more N2O can be heard escaping. Do not overtighten.

Fuel/Preheater Grain Preparation Procedures

The preheater grain provides two functions, it burns the burst disk so the nitrous can escape from the charger and it is the ignition source for the nitrous oxide/acrylic hybrid motor. For more information on hybrid motors you might consider purchasing the Bill Colburn "Manual for Hybrid Propulsion System Design" available here on the Aerocon website:
<http://www.aeroconsystems.com/literature/index.htm>

If you want to manufacture your own cast-in-place preheater you will need the following:

1. Six ping-pong balls.
2. 6 oz. acetone.
3. One pound container of Pyrodex RS "the FFg equivalent".
4. 3/4" OD x 1/2" ID x 2 1/8" plastic tube fuel grain. Acrylic is preferred but any appropriate plastic or paper tube will work.
5. 3/4" OD dowel rod about 3 long.

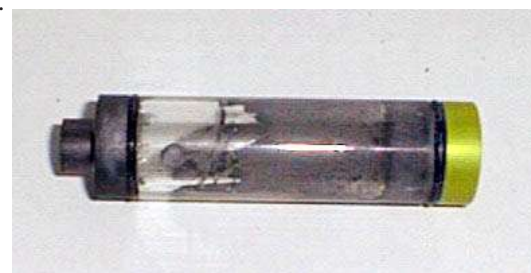
1. Cut the ping-pong balls into pieces, and put them in 6 oz. of acetone. Use a glass jar, and let them soak until they are dissolved. This preparation is called Nitrocellulose lacquer or NC lacquer for short.
2. In a separate glass jar put about a 1/4 cup of Pyrodex.
3. Add enough NC lacquer to the Pyrodex to get a slurry that has the consistency of day old oatmeal. Six ping-pong balls should be enough for 3/4 cup Pyrodex.
4. Position an Acrylic fuel grain (4) vertically on a piece of old newspaper.
5. Insert a portion of the Pyrodex/NC slurry into the Acrylic grain (4).
6. Tamp it down with the dowel rod.
7. Continue to add the slurry till the measured the height of the tamped slurry is about 1/4 inch. If too much slurry, punch out the tamped slurry and adjust accordingly. This is essentially a trial and error process but it's easy after the first unit.

8. Set aside to dry until hard to the touch.
9. Drill a 1/16 hole through the center of the slug using a hand drill or power drill on the lowest speed.
10. Make sure the ends of the fuel grain are smooth enough for the injector O-ring (6) to seat against.

If the preheater burns too fast causing the motor to not light reliably, add more ping-pong balls to the slurry. Conversely, if the preheater is difficult to ignite, add more Pyrodex to the slurry.

Casting the preheater grain directly into the fuel grain seems to be the most economical / reliable method, but this is an experimental motor so by all means experiment.

An Aerotech RMS 18mm reload grain will also work. Insert the reload into fuel grain about 1/4", slice off with razor knife, and ensure there is a hole at least 1/16" diameter near the center of the preheater to melt the burst disk. On some acrylic grains it may be necessary to peel the paper off the solid grain before insertion.



Assembled Motor with Pyrodex Preheater

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