

Mortars

Making a Small Paper Shell



Start with Styrofoam balls or a golf ball. Make sure that you have a tube that is about 1/4" bigger than the ball you start with. This is a rough guess - experiment a bit for your case. For instance, a golf ball is just under 1 3/4" so it makes a 2" shell that is fairly tight fitting. Cover the ball in cellophane before you wrap it.



Wrap them in newspaper strips that have been coated with glue (Paper Mache that hasn't discomboobilated into sludge). Any glue will do but wood glue seems to work the best. Make the wraps as smooth and even as possible and watch out for size. Stop when they are still undersize but seem to have a sturdy coating of newspaper (three or four layers) I dry mine in a food dryer but they can be dried outdoors or in a warm spot in the basement - it will just take a while longer. Make sure they are fairly dry before cutting them open with a sharp knife. If they are still damp when opened, then set them aside and let them dry some more. They will be quite stiff and sturdy when dry.



Drill a fuse hole, put a 1/2" strip of masking tape around a piece of Visco (33 seconds per foot stuff). Use wider tape if more delay is needed. With ignition and other things, 1/2" is about a 2 second delay which is ok for a 1 3/4" mortar. Ring the fuse with wood glue and let dry.



You now have a shell in two pieces with a fuse on the bottom. Put your garnish in the shell, surround with BP (or rice hulls and BP) and glue the two pieces together. If you want the shell to break, just putting BP in it might not be enough - add a gram of whistle or flash (no more!) to the filler and you'll see a nice break. The 'garnish' in the above shell is Purina Dog Chow. ;-}



Making the paper shells is time consuming and sometimes a bit messy. I like to look for expedient methods that are just as good. Here is an interesting one - it happens to be my second Easter Egg shell - the first one worked great so I decided to make another and do a photo tour for my notes. This one has the stars loaded loosely - but you can place 1/4" stars on the outside of the egg and get a symmetrical break (at least the first one worked). Edit - while cruising Best of AFN II, I found a short article on using Easter Eggs - they were wrapping them in tape and paper and shooting them from 2" mortars - I suspect the eggs they used were a bigger variety than the ones in this section.



Get a plastic Easter Egg. They make a bunch of different sizes so pick one that is close to the tube size you have. They are usually fairly pliable (not brittle). Use plastic glue (PVC cement doesn't work on my eggs). Put a fuse with a 1/2" to 5/8" masking tape wrap into the egg - I like to use the long end of the egg as the fusing end.



Put your garnish in the egg. Here you can see a 3/4 gram of flash has been dropped on top of the Rice Krispie and BP filler. The stars are some charcoal based 3/8" ones that have been asking me for a photo opportunity. ;-} They were made from sparklers and they aren't all that hot - but they are great stars for a test shell. I also added in some strobes and some Bleser #1 with PVC (see compositions.html)



Seal the egg and let dry. The egg on



When dry, trim and prime the fuse and you are ready to

the right is a dummy egg for testing the tube and powder combinations. It is filled with dog food.

celebrate Easter.



I used a 1.4g artillery shell tube left over from the 4th of July to launch the test egg - the fit was slightly loose but still pretty good.

Since the powder gets dumped into the tube, a fuse hole was necessary.



Click on the image and see a movie of the results - there wasn't quite enough flash to make it a round break, but it was still ok for my second live shell mortar shot with Easter Eggs. It was as good as most of the 1.4g shells I have - if not better. The large stars made you feel like you were really close to the break - not a feeling you get with 1.4g stuff.

The reds dominate over the strobes - you have to watch it a couple of times to see them. I still liked the effect. Since the shell was fairly packed and had big stars I put in 6.5 grams of 2F BP for lift. It was still a little low so I should have increased the delay (extended the masking tape by 1/4"). You should have been there with the camera - pretty cool when that stuff jumped out!

Updates to Easter



I have found that putting a soda straw up the center of the egg helps pipe fire to the center of the mix and it gets a better break (more stars ignite, it has a stronger burst, and it is more symmetrical)



Fill the straw with fine BP and cap it with a bit of tissue so it won't leak out. Mount the time fuse on the other end and hot glue it.

Film Cans



Two Inch Canister Shells

How to dump a lot of stuff into the sky!



Canisters are easy to work with and hold quite a lot of composition. Compare the 1.75 inch ball in the photo above - that is the 1.4g size. The ball on the left is a 3" one and the canister holds almost as much as it does. A two inch canister is a nice step up from the 1.4g sizes!

[Click on the image to see one of my early 2" mortar shells. It used Veline Green 3/8" stars.](#) It also used 3 grams of Benzolift for the lift charge and the shell itself was a canister purchased from Cannonfuse but you can get them from several places. The break charge was made of rice hulls and BP with three grams of whistle and about 2 grams of Benzolift.

A PVC mortar tube was used that was well separated from viewers - PVC may explode into shrapnel so it has to be shielded. Xylene was used to seal the canister. The brand name for xylene around here is Xylol and it is available in hardware stores and lumber yards.

To make a fuse delay of about 3 seconds a 3/4" x 4" piece of masking tape can be used as the timer and Chinese Visco the fuse but American Visco would work fine, too. These Viscos are the 'cannon fuse' variety with a

speed of about 30 to 33 seconds a foot. If you do the math, you see that 3/4" is about 2.5 seconds but the ignition and general 'coming up to speed' use up about .5 seconds so you'll get a solid 3 seconds out of 3/4" of tape. Watch the movie and see what I mean. Whatever fuse you use, be sure it will pass fire through the masking tape and canister hole. I had a dud when I tried to use flying fish fuse as the delay fuse. It seemed like a great idea (nice red trail going up) but what I got was a dud shell that I had to find and then worry about. Just wrap the tape tightly around the center of the fuse, split one end to the tape edge and stick the other into the shell hole. Prime the split end just like with the Easter Eggs and paper shells at the top of this page. It is sealed into the top of the can with plastic glue or hot glue. I used hot glue. The stars are packed around the sides of the can and held there with powder/rice hulls in the center.

It is hard to get a round break with a canister - use the round shells for that. Canisters are great for dumping a lot of stuff into the sky at once.

One of my favorite loads for a canister shell is [hummers \(tourbillions\)](#). Here is a step by step using hummers I stole from a 1.4g Roman Candle called 'Happy Bees' - it takes almost two Candles to get enough hummers for the shell. They are easy to take out, just remove the tissue paper, unsnap the fuse from the side of the case and the whole string just comes out. You can make your own hummers using 1/4" salute tubes. Go small with the tubes. See [misc.html](#) for a look at a 3/8" hummer - which is a bit big but it would still work. The effect of this shell is pretty good - add a few stars in the center along with the break composition and everything gets busy up there! I used Benzolift for the break material. No whistle or flash. Put NC paste on the hummer fuse and dip it in meal to make sure the hummers light.



Hummers stolen from 1.4g fireworks. The right one is primed and ready to load.



Middle tube will be removed - it's there to hold lower layer of hummers in while they're being inserted. Note primed sides

of the
hummers are
up.



A few stars
added to the
center helps
make the
scene even
busier.



Rest is filled
with fast BP
(or, in this
case, slow
Benzolift)



Fuse, glue, and label



Powder Chamber for 2" Mortar



Ready to be coated with epoxy



Epoxy coated chamber inside mortar

If you are lifting with a bag or lifting by pouring the powder into the tube, the results will be different. It seems to take less powder if using a bag - at least that is what a couple of us have deduced. I prefer pouring the powder into the tube - but I use a powder chamber at the bottom of the tube. A powder chamber is just a wooden plug with a hole in it to hold the powder in a smaller confinement (see pictures above). The fuse hole goes through the outer wall of the tube, the wooden plug, and into the chamber. This chamber consolidates the powder into a smaller but higher pile. This is good when the amount of powder you drop into a 2" mortar is only 3 grams (in the case of [Benzolift](#)). The result is a higher lift - but it is a subjective evaluation so your mileage may vary.

How Much BP for the Lift Charge?

See also: [tables.shtml](#)

See [tables.shtml](#) for a general "rule of thumb" for lift charges. **Warning:** There is a table of lift charges posted in Pyrotechnica IX that uses 2Fa powder. The table is often posted as a guide to lift powder use. Unfortunately, most of us amateurs can only easily get 2Fg which is much more powerful for mortar use. Using the Pyrotechnica tables and 2Fg powder might result in serious overloading of the mortars.

With commercial 2Fg powder, start with 5 to 6 grams of FFg for a 2" shell. That will probably do it for a 35 gram load. The [charcoal_tests.html](#) page shows consistent 6-7 second flights (150-200 feet) with 2 grams of commercial BP in a 1.5" mortar (35 gram load) so 5 grams in a 2" mortar should be plenty to start with! In any case, always make a dummy shell and load it with dog food, and test new powder batches. My homemade BP isn't very hot because it is made with commercial airfloat - but it is just what I want for almost everything else. If I use homemade stuff for lift, I use a wood that makes a more reactive charcoal (see [blackpowder2.html](#)).

There is a recent addition to the amateur pyro's tool kit - a hybrid lift powder called [Benzolift](#). Its power is somewhere between BP and whistle. It is a good solution for those who can't get commercial BP or find commercial BP too darn expensive. Note that [Benzolift](#) has whistle mix at its core so it can be quite powerful. Benzolift is a refreshing change from the need to find special woods for making homemade charcoal. [Benzolift](#) can be made in about 20 minutes. It does not detonate in small batches (<100 grams) but burns fiercely like a super hot BP. I used 3 grams for a 2" mortar and it lifted the shell quite high. Four grams was too much. Three grams was also used on the shots in the section below (the green star shots). The mortar was a 1 3/4" 1.4g size. You can see that the shells are pretty high and a little less would have still worked fine.

How Much BP for the Small Shell Break?

Fill the shell tightly full of compositions. Put the stars on the outside and use rice hulls and BP (or Rice Krispies and BP) to fill the center and hold the stars in place (just build it up one layer at a time). Sprinkle BP into any voids. At the end put 1 or 2 grams of whistle or flash in the center of the load. Pipe fire into the center (see Easter Egg shells above). If your shell is tightly wrapped and is a small shell, you don't need the flash or whistle. However, it is usually easier to just toss in a bit of the nasty stuff - it does make for an efficient break. Sometimes, a crisper break makes for a more symmetrical break. The first 1 3/4" break below is just BP (and some [Benzolift](#)), the second, exact in almost everyway with the first except it has 1 1/2 grams of whistle in it, has a more symmetrical (round) look. Click on either image to see the movie of both breaks. This is an Easter Egg shell - the movie was color corrected to get the light green to come out (was washed to white before).



[Click on the above picture \(or on the one to the right\)](#)



[Click on the above picture \(or on the one to the left\)](#)