

OTC Shell

Materials

1 Toilet paper tube
18" of 2" pipe
A heavy grocery bag (heavy Kraft)
A lighter lunch sack (light kraft)
Stars ~1/4-1/8" in diameter/cut length
Elmer's Glue
Fast Flash powder
3ply string
Wallpaper paste
Visco Fuse
Aluminum foil
Lift Powder
2 Paper Ketchup cups
Non-corrugated cardboard

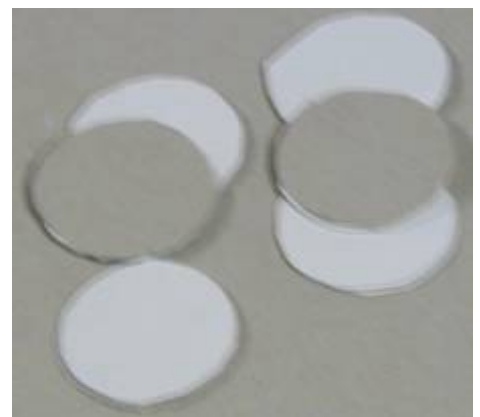


Components

1. **Shell casing:** Cut your Toilet Paper tube to a length of 2". All toilet paper tubes are of a standard size so that is not a factor. It should be 1.5" across anyway. Make sure to get even cuts. A crooked edge could make for trouble later and an uneven break.



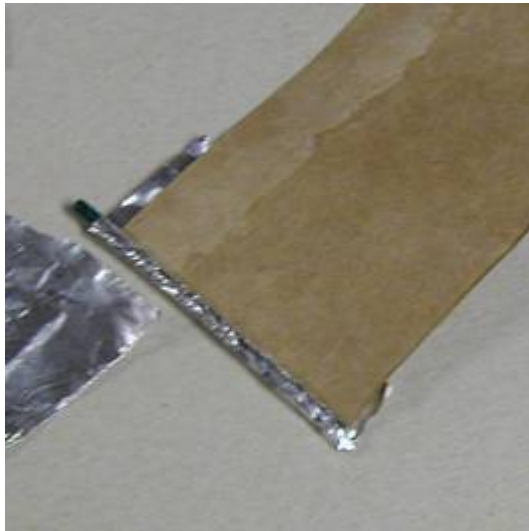
2. **End Disks:** Cut out 4(6 if thin cardboard) circles roughly the size of the TP tube. Trace the outside of the TP tube in pencil on a sheet of cardboard. I used a gift box. It probably held some sort of clothing item. Stagger the circles so the go into the gaps between the lower row of circles. You'll get about 3 more rows per sheet of cardboard this way. Don't be afraid to go over creases. Creases are on, perforations are not. Glue together 2 of the pieces(3 if thin cardboard). Smear the glue on one side of the circle, and place the other one atop it. Turn it 90 degrees for a full coverage with glue. Let set aside over night for full setting of the glue before use. Placing a weight on top of the circles will make sure no corners come up.



3. **Flash Bag:** Wrap a piece of heavy around a sharp, or similar sized object for 2-3 turns. It should be around $\frac{1}{2}$ " in diameter. Smear glue on paper and glue together. Bunch end up and add more glue to seal. Place in something tight to hold bunch together. I used the "hinge" from a contact solution bottle. Should look like a cigar wrapper at this point. May also put extra glue on the end and put something heavy on top. Placing in a vice will also be acceptable.



4. **Time fuse:** Take a length of visco, and make sure it's straightened out if off a roll. Wrap with 3 layers of Aluminum foil in a strip so about $\frac{1}{2}$ " at end of visco is left uncovered. Leave a $\frac{1}{2}$ " lip on the Aluminum foil. Glue a piece of heavy kraft to the lip, so the kraft is under the Aluminum foil. Wrap an additional 3-4 layers of kraft, gluing it together as you go. Hold together until it sticks on it's own. Making several of these is needed the first time so you can do burn rate tests.



All of the steps above need to be dried before the Assembly can commence.

Assembly

1. Glue 1 end disk into bottom of shell casing. Trimming may be necessary. Put a bead of glue on the outside and inside of disk. If seal not solid put on a second layer. *Allow to dry. Don't go past step 5 if not dry*



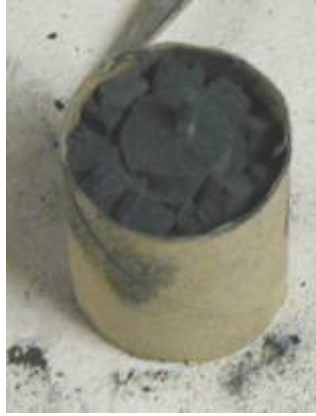
2. Punch hole just big enough for time fuse to fit through in the center of the second end disk.



3. Cut flash bag to 1 3/4" length. Fill flash bag 3/4 full with fast flash powder. I used KMnO₄/Al/S. You can use a Nitrate based flash for 100% OTCness.
4. Cut your time fuse to the correct length. About 2-3 seconds. Cut a V into the side where the flame will propagate the burst. The power core should be exposed. Cut off the paper and Al foil covering on the rest of the fuse past this point. Cut off excess past 1/2" extra.
5. Insert time fuse into flash bag so 3/4" is above rim of flash bag. Pack tissue around the fuse lightly to hold the flash in. Put a layer of hot glue over the tissue to hold everything in. Cut off any excess time fuse if fuse core can't fit in bottom.



6. Place flash bag in center of salute casing. Fill around it with stars to the top of the flash bag. Add a few spoonfuls of granulated meal powder to the stars. Tap to allow powder to reach to the bottom.



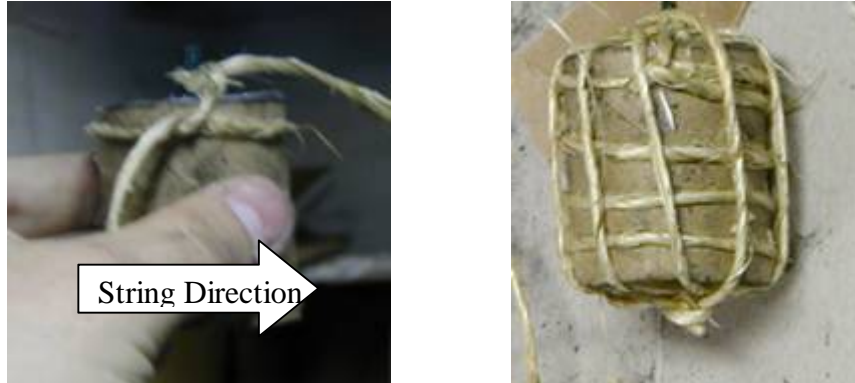
7. Glue on second end disk, placing time fuse through hole. Place a bead of glue around time fuse as well as to hold in place.



8. Fill one ketchup cup with 7g of granulated lift BP. Place the cup with the BP in it, into the second cup. Glue in a piece of cardboard into the top to hold the BP in. Place a hole in the cardboard for the time fuse to fit in loosely. You may paste a piece of kraft over this if you wish to hold the cardboard in for better compression. Place the edges of the paper in between the two cups.



9. Paste the shell once all glue is dry. Run the string through wheat paste and wipe off excess. Loop around time fuse and make horizontal and vertical crosses. I personally use double lines of string spiraling down. Hold the string on the edge of top, and wrap the string around the shell once. Loop it under the string you're holding, and paste horizontally the opposite way (*figure 1*). I use 4 rows of double string down, and 8 vertical stripes. Tie off string, and let set a bit.



10. Cut a piece of the heavy kraft so it is a 1 ¼" longer than the shell on the top, and about 3" longer on the bottom. It should be the length of a broad side of the bag at 6 ¼" wide. It's about 24" long. Slather on the wheat paste to one side. Roll the shell up, you'll get about 3 turns. Squeeze the sides of the over hang together so they stick.
11. Slightly moisten the exposed end on the time fuse with your fingers which are undoubtedly covered in wheat paste. Wash them off, and press some BP up against it. This serves as the prime. Press the BP lift cartridge onto the time fuse. It should go flush against the shell(or spiking string in this case). Crumple the excess on the bottom over the lift charge into a cone. Tie the cone together with a piece of string.



12. Poke a hole in the side of the kraft paper and lift charge. Widen to allow passage for fuse with pencil. Place 20" of fuse into casing. Black match can be used too. Bundle end paper together and tie off with string or something to close it.
13. Take a finger hold of a side of the top excess. Press down against the shell. This should form a "U" shaped indent. Take one of the corners of the "U" and press down onto the shell. Repeat with the other side. Press the final piece down against the shell. May want to remoisten the inside of the excess. Press onto shell to stick down. Place something on top to hold until the paste sets. I used a vice.



14. Cut the bottom off of a lunch bag. It will fold at one point, cut along this line. Cut or tear along the seam in the paper. Slather one side with wheat paste again. Roll shell up with fuse coming out the top. Press the sides of the excess together like before. Tie off excess on top with string(fuse comes out middle). Cut off any large excesses on top. Do the same with the bottom.



15. Let dry. Placing under standard reading lamp with quicken the process.

Firing

1. Plug one end of the PVC pipe. Plaster, concrete, wood, anything hard will work. Drill screws into bottom of PVC to hold plug in place. Drill afterwards if using wood, and before if using something else. Plug should be an inch or two thick.
2. Rough bottom up if using some sort of moldable substance. Sand inside of lip at a slight taper outward. Cutting tends to make burs and small lips jutting inward. A dremel tool makes this process very easy.
3. Allow to dry, and test slide the shell. Should fit close to perfectly.
4. Dig hole in ground about 6" to anchor pipe. Prevents shrapnel incase of explosion too.
5. Light fuse, get back, and enjoy.

Note From Author: This was an entirely original piece by Mumbles. The design base was taken from a standard cylindrical shell, but modified for complete OTC availability. This design has been tried and tested, and has been proven by me to work. This file was written for the [Amateur Pyrotechnics and Chemistry Forum\(APC\)](#). If this file is located elsewhere please contact me. If you came into possession of this document, it is understood that you are not to distribute to anyone. If you know of someone else who would like a copy, they may contact me by [e-mail](#). If you notice a typographical error or and error of another sort please e-mail me too so I can get it fixed. If there is any images, additional info, or something else useful that you think may fit nicely into this file, please contact me as well, and we'll see what we can work out. You will of course be given credit.

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