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AUTOPSY

3" Tourbillion w/Report and Red Stars

Manufacturer:	*Vulcan*
Shell Weight:	*379g*
Lift Charge:	*50g 4Fg black powder*
Outer Burst:	*54 g KP on rice hulls*
Flash Bag:	*2g slow flash (dirty flash)*
Stars:	*9/32" dia. round stars*
Tourbillions:	*3.75" long, 9/16" O.D., 3/8" I.D.*
Casing:	*Spiral wound, 6.5" long, 2.5" O.D., 1/8" wall*
Time Fuse:	*Single chinese time fuse, 2.5 sec delay time*

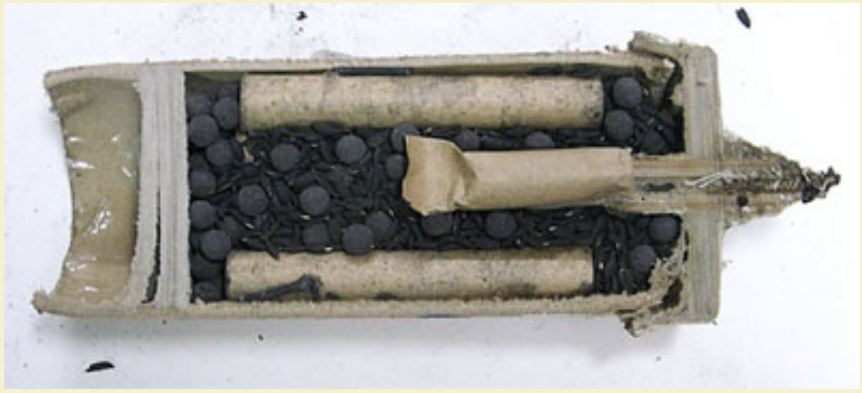

Figure 1: No pasting, no spiking, just a simple spiral wound tube plugged at both ends.

Autopsy Report:
This 3" shell is part of a new line of canister shells from Vulcan that are now on the market. Some of the internal inserts are made in Germany, but the shell itself is assembled in China.

Vulcan's shells have been pretty high quality lately, with each shell wrapped in a plastic bag with a moisture absorption packet. Their leaders are also coated in a plastic similar to packing tape, as is the fuse cap, making them extremely resistant to moisture. If you fire shows in a damp climate or rainy season such as in Florida, then you may find Vulcan's moisture resistant packing reduces the number of shells left in the guns at the end of a show during which rain occured sometime after setup.

On the outside this shell looks like your typical Italian style 3" shell, although at a length of 8" it is a bit on the long side. A 40 weight paper covers the outside, which is folded and taped down on the bottom and tied off around the leader on the top. The leader runs down the side into a stiff cardboard lift cup at the bottom.

Figure 2: Outer disk held on with masking tape.

Removing the outer wrap reveals the surprise shown in Figure 1, which is a shell completely devoid of any spiking twine or pasted paper whatsoever! The liberal use of masking tape would make old Italian shell builders wince, and I'm sure the Orientals who were assigned to assemble these shells found them quite peculiar as well!

This shell is basically a spiral wound tube with a triple disked plug on both ends, as seen in the cutaway above. The top disk taped onto the shell in Figure 2 probably adds nothing to the burst containment and is only there to cover the void beneath it.

Figure 3: Triple disk inner plug held in place with lots of white glue.

Figure 3 shows how the end is plugged, which is really more substantial than it might first appear. A liberal amount of glue covers the tube wall above the disk, which is a laminated set of 3 disks that total 1/2" in thickness. The glue braces the disk at the edges and prevents it from blowing out easily. The non-brittle nature of the dried white glue makes it ideal for this purpose.

Figure 4 shows the lift cup removed from the shell, which contains 50g of fine 4Fg type black powder in a plastic baggie tapped onto the shell leader. Note this is roughly twice as much as the ounce per pound rule would dictate for traditional canister shells.

Figure 4: Bottom fused with plastic lift bag. Note the amount of glued string wrapped around the time fuse base.

The plug on the bottom fused end of the shell was substantially less secured, and it surprises me that the contents of this shell don't just blow out the bottom. A thick cap is fitted with three disks like the other side, but the cap is just glued onto the end of the tube and was easily pried off with a screwdriver.

Figure 5 shows the details of the interesting fusing method devised for this shell. A piece of regular Chinese time fuse is half covered in masking tape and then inserted half way into a spolette tube that was probably first glued into the shell cap. Cotton string soaked in glue is then used to build up a conical seal around the time fuse and the tube, which prevents the lift gases from leaking around them and also insures that they don't get blown into the shell. The time fuse is cross matched through the masking tape, then a piece of fast burning visco coated with black powder is threaded through and tied around the time fuse in a knot to keep it from falling out during lift.

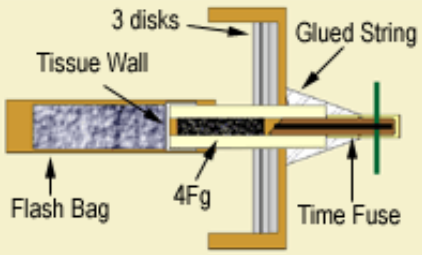

Figure 5: Details of time fuse and flash bag components.

On the internal passfire side of the fuse, the tube is filled with 4Fg black powder and closed with a sheet of tissue paper. A few turns of light kraft are used to form a flash bag that gets taped onto the tube. The bag is filled with 2g of a slow burning flash (no thump when lit) and pinched closed.

Note that this method of using time fuse and a spolette tube combined would allow the use of very short pieces of time fuse that normally couldn't reach from the inside of the shell to the outside if used in the typical way. This is one way time fuse could be adapted for use in multi-break shells with short timing between breaks. While it is more work than simply ramming a spolette, the risks of blow through would be less on short timings.

Figure 6: Fused end cap removed, looking down at the tourbillions. Note the yellow plastic end plugs.

Figure 7: Tourbillions "crossmatched" with black powder coated fast visco.

Figure 8: Break pattern is surprisingly round with no signs of blowing out one end.

Figure 6 shows the tourbillions lining the wall of the canister as expected. A break charge of KP on Chinese rice hulls is mixed about 50/50 with the stars that filled the rest of the shell.

The yellow plastic end plugs used to plug the tourbillions show tell-tale signs of European manufacturing. The tourbillions were also fused completely through the casing with a fuse running through like cross match. It would seem that two opposing jet streams would not allow the tourbillion to do much spinning, but it works none the less.

After seeing this construction method, no doubt considered a hack by any self respecting Italian shell builder, it is surprising just how well the shell actually breaks. Figure 8 shows the shell in action, which looks pretty good for such a small shell! But like any low confinement break system, the shell must be slammed hard by an energetic break for it to work. This requirement prevents this technique from being used to produce a softer, denser color break of equal symmetry.