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AUTOPSY

10" Double Petal Ball Shell

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Figure 1: Outer casing with rising comet.

Manufacturer:	*Lidu*
Shell Weight:	*6342 g*
Lift Charge:	*Unknown*
Outer Burst:	*1000 g BP on cotton seed*
Inner Burst:	*256 grams BP on cork bits*
Outer Stars:	*1" red to blue peony stars*
Inner Stars:	*1/2" silver streamer stars*
Hemi I.D.:	*8-13/16"*
Hemi O.D.:	*9-3/16"*
Case Thickness:	*3/16"*
Time Fuse:	*Dual Chinese time fuse -5.8 second*

Figure 2: Hemispheres separated showing tissue liners.

Construction:
The following autopsy provided nothing out of the ordinary. The shell was laid out just as you would expect. You can see in Figure 1 that a small sheet of glassine paper is held in place with a small rubber band over the comet. This paper is to cover the exposed prime composition for safety reasons during shipping and handling, while the firestorm of blow-by gases that engulf it during lift will easily burn the paper away and ignite the comet.

There is a loop of string protruding from the top of the shell which the lowering cord is attached. These loops are usually present on all Chinese shells, but become particularly important for shells larger than six inches when lowering them into the mortar. The string is wrapped around the hemispheres before any pasting is applied, then pasted over with all the layers of paper to insure that the string does not tear out when lowering these heavy shells. While the the string loops have proven to be quite strong, the cord attached to this loop has been known to break when dropping large shells, giving quite a scare as the shell plunges to the bottom of the gun. Jute twine is particularly prone to unexpected breaking. Some higher quality manufacturers have switched to a nylon type cord for these larger shells in order to prevent this problem.

Figure 3: Tissue paper cut away to show separate petals and break charges.

Figure 4: Inner break charge removed to reveal inner petal stars

Figure 5: Outer break charge removed to reveal passfire tubes in lower hemisphere.

Cutting open the shell casing reveals a hefty 3/16" thickness of pasted paper over a set of 3/16" thick hemispheres, giving a total case thickness of 3/8". This provides solid confinement so the shell will break hard using only a simple BP break charge. The Chinese tend to use a thinner weight of "blonde" type kraft paper for pasting all their shells, and it is quite difficult to figure out exactly how many layers are applied since there are difficult to count once stuck together.

Like all previous ball shell autopsies, the internal contents seem to have been packed damp such that everything is stuck together in a clump. The dried and shrunken tissue paper seen folded down in Figure 2 provides further evidence that everything was damp at some point. The rigid clump resulting from this damp loading probably goes a long way toward providing a clean pattern with good symmetry, since the stars can not easily shift around and fall out of place during the long boat ride and bumpy handling it must endure before finally making it into a mortar.

Figure 3 shows the tissue paper cut away to reveal a total of three liners between the various layers. The shell is first loaded with 3096 grams (6.8 pounds) of 1" diameter color changing peony stars to form the outer petal, which change from red to blue. A cross section of one of these stars can be seen in Figure 6, revealing what looks like a pretty thin outer prime. Several of these stars were shot hard from a star gun and lit without failure, so the prime seems to get the job done.

Next a tissue paper liner was placed over the outer petal and filled with a burst charge of BP coated cotton seeds. The second tissue liner is formed into a 5-5/8" cavity in which the inner petal stars are placed. There is no rigid type of inner hemisphere used to hold the inner petal stars, only the thin tissue liner. The worker must use a 6" hemisphere to form a cavity with the tissue conformed to the exterior. The outer break is inserted around this hemisphere and packed tightly in place. Then the hemisphere is removed leaving the tissue paper cavity ready to be lined with the inner petal stars.

The inner petal was filled with 1/2" silver stars that burn fierce and fast, probably an aluminum/perc flitter mixture. Another tissue liner is placed over these stars and the remaining space is filled with an alternate burst charge that is made from bits of cork coated with BP. The cork bits are smaller than the cotton seeds, approximately the size of 2FA after being coated. There seems to be an advantage to having a slightly stronger burst charge in the center petal of double petal shells, as this is the second time this has been found during autopsies. During the 8" Saturn shell autopsy, we found that the inner petal had an even stronger burst charge that switched over to KP coated hulls. In the shell seen here, the smaller core size would only produce a marginally stronger burst charge since they are still coated

Figure 6: Cross section of 1" outer petal star reveals layers of color changing composition.

with BP.

All three layers of tissue are gathered to the center and pushed down flat. It is not known weather the shell is first dried out before assembling the halves or just assembled and force dried in a heated oven, with the moisture escaping through the empty passfire tubes. I suspect it is this second method, as the shell would not be able to settle when being closed if the contents were all dried and locked into place.