Creating Skipper II: A Photo Journal

Photos and commentary provided by Paul Huffman Jr.

Based on Paul's measurements of a 3-inch field rifle, a pattern was cut out of wood. In the photo to the left, the pattern undergoes finishing touches.

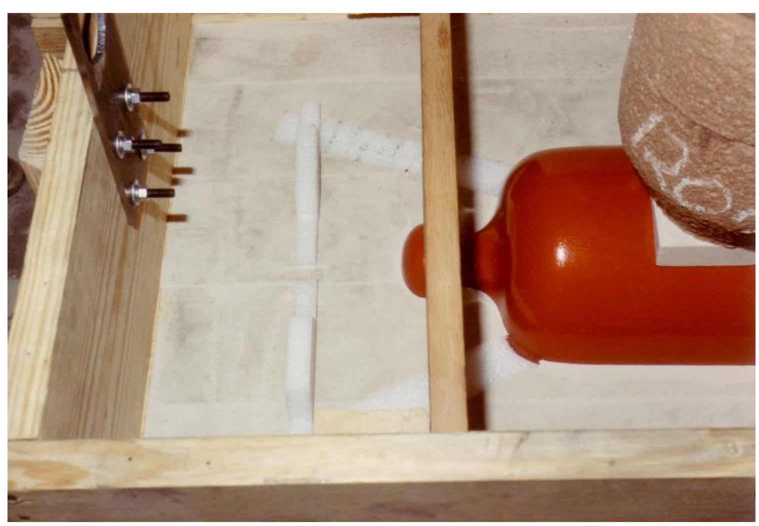
Each half of the pattern was placed in a wooden flask built especially for that pattern. Shown below is the drag, or the bottom half of the pattern, in its flask with styrofoam gating in place.

A gating system allows molten metal to flow into the casting cavity. The system also provides a reservoir of molten metal to counteract shrinkage of the metal during solidification.

When most metals go from a liquid phase to a solid phase, they shrink in volume. This volume contraction requires a reservoir (riser) of molten metal to backfill so that as the metal shrinks, more molten metal feeds into the casting cavity.

Calculations must be done for the gating system so that the gating freezes before the molten reservoir (riser) freezes. If that riser freezes off before the casting cavity does, there will be porosity or voids in the casting, and it will be defective.

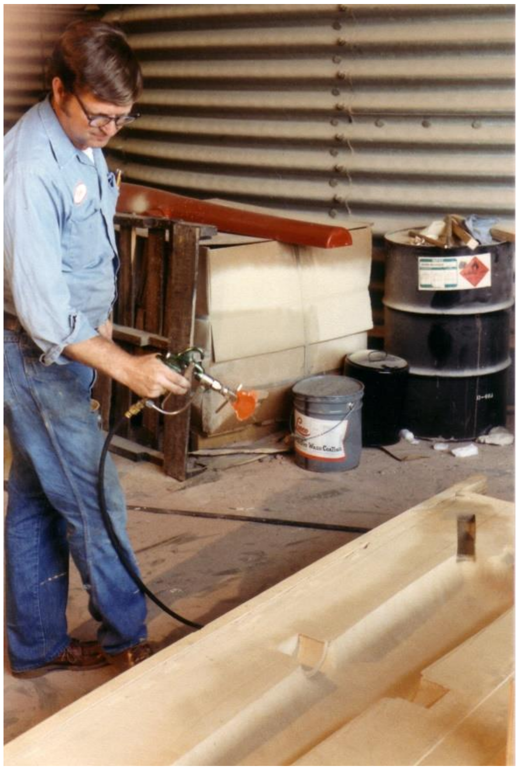
Cope (top half) with reservoirs (risers)



Cope with Styrofoam gating

Making the mold. Sand is poured into each flask and molded by hand around the pattern. A method known as "nobake molding" was used, where chemicals are added to the sand to cause the mold to set up as hard as concrete.

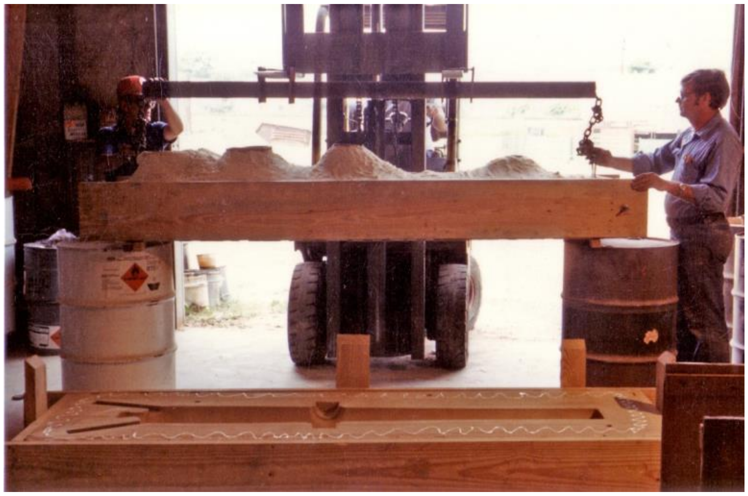
Below: The completed mold for the drag (bottom half)



The completed molds are sprayed with a ceramic coating to prevent the molten metal from penetrating the sand mold. Zircon, a very high-temperature refractory material, is mixed with alcohol for this purpose. It is sprayed on the mold and then the alcohol is burned away.

Putting the mold together (below). An adhesive is applied between the halves, and the cope is lowered onto the drag (left). The halves are then strapped together and weights are placed on top (right) to ensure that the halves hold together to form one whole casting cavity.

When the molten metal is poured, hydraulic pressure will try to force the mold apart. So force in the form of lots of weight is used to counteract this pressure.



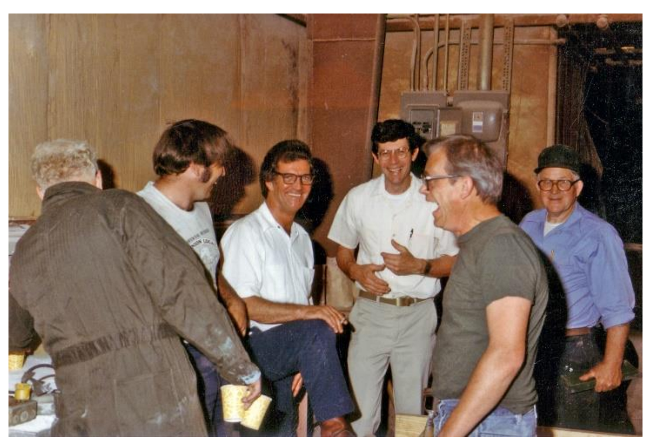
Heating the metal. Gray iron was the main metal used to create Skipper II. Paul Jr. calculated the correct chemistry for the metal based on the required section thickness, the cooling rate of the casting, and the desired tensile strength of 40,000 psi. To increase the strength of the gray iron, alloys were added: chromium, copper, nickel, and molybdenum. In the photo on the left, Paul Huffman Sr. is standing to the right of the mold, while the metal is heating up inside an induction furnace.

Below left, tapping the furnace. Foundry workers tap molten metal into a pouring ladle. Below right, preparing to pour.

Pouring! Paul Huffman Jr. stands to the right (white shirt) with fingers crossed.

Below, as the metal was poured into the mold, foundry workers gathered to watch. Paul Jr. says he didn't announce that the Skipper was being cast, but word got out and the entire foundry came to a standstill to come down and watch.

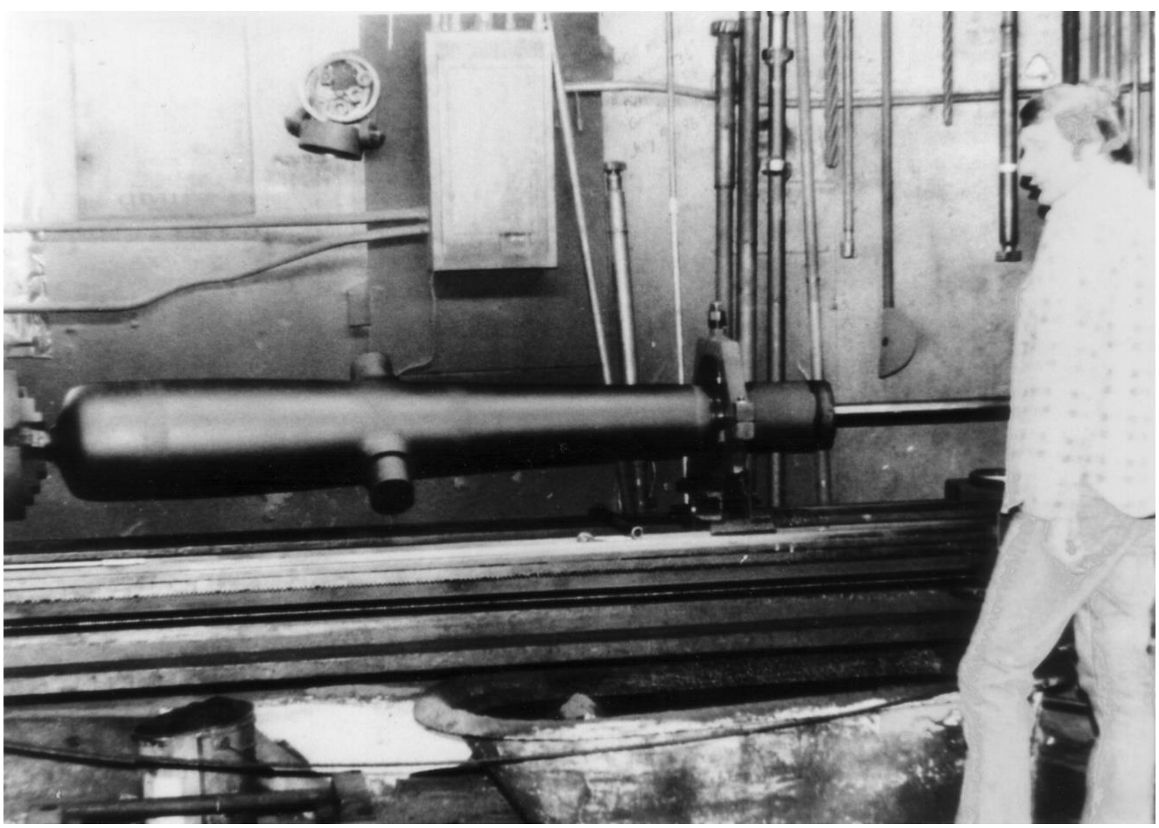
Success! Everyone who helped make Skipper II a reality got together to celebrate a job well done.



A first look at the finished casting of Skipper II, after the gating pieces have been sawed away and the surface has been sanded to remove imperfections.

Father and Son, Paul Huffman Sr. and Paul Huffman Jr., with the solid casting of Skipper II

The completed solid casting was shipped to Ft. Wayne, Indiana, where the center was gun-drilled out and a stainless steel sleeve inserted to provide extra strength.



The Virginia Tech community and Hokie fans everywhere join together in expressing our heartfelt gratitude to three cadets from the Class of 1964, the Virginia Tech Corps of Cadets, and the Huffmans for creating and keeping alive a wonderful Virginia Tech tradition.