



-Notes behind the design-

I built this pneumatic cannon hastily over two weeks of leave at my parent's house, 2007Dec-Jan08.

Originally I had planned on casting an aluminum reducer, but the wax mold proved too much work so I just added more reinforcing plastic to the end caps, with extra on the valve side for safety.

The barrel is 2 inch white pvc, rated at 300 psi, 4 feet long, coupled to a 24 inch long cellular core, black PVC pipe. (Because that's what I had). The coupling is inside the chamber. Two sets of radial spokes were glued to the barrel.

The valve is 1.5 inch cellular core PVC. 1 'o' ring is used to seal the pipe to the end cap. Several 1.5 inch dia. end caps were cut to produce several rings, one on each side of the end cap, permanently sealing the O ring inside. One ring and rubber disk forms the valve seat.

As shown in the bitmap drawing, the 6 inch diameter end cap is cut, and a 2 inch length of 6 inch pipe is glued to the inside of it (this is what the spokes are glued to).

The cut off part of the end cap was glued to the 5 foot long pipe with the intention that the two could be bolted together, and disassembled as desired.

Murphy's law says DIY pipe couplings leak and it did.

Originally I screwed the valve to the end-cap-pipe-coupling with 36 short wood screws.

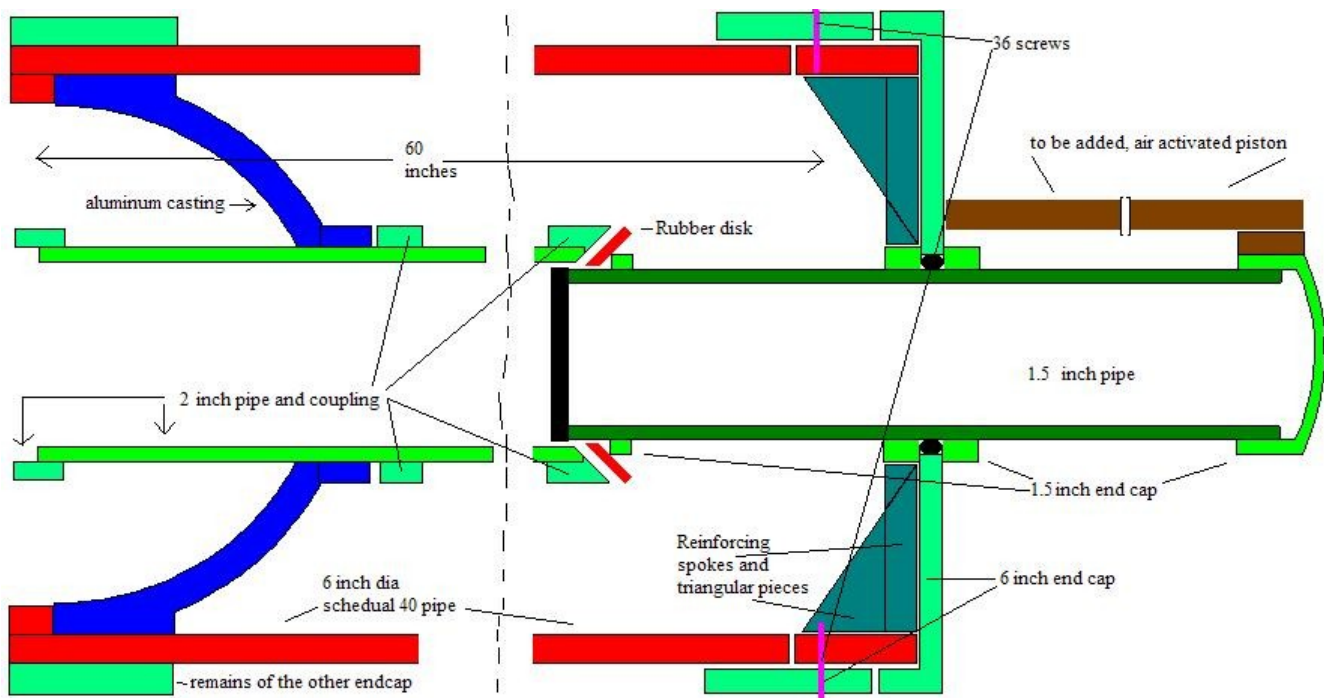
-I don't know where I got that idea-

Of course it leaked, but a little water dumped into the chamber would temporarily seal all the holes.

The difference in area between the inside of the 2 inch dia barrel and the outside of the 1.5 inch dia valve is what pushes on the valve seat. Below 30-50 psi, this isn't enough, and about 50 pounds of force was needed to seal the valve, when filling with air.







The plastic reducer exploded at 70 +/-5 Psi after a few launches, taking the black PVC portion of the barrel at the coupling with it and got launched a few hundred feet into the air.

A few changes...

The reducing end cap was replaced with vacuum degassed cast aluminum . It's about 1/8th inch thick at the thinnest part. The ring holding the aluminum back, glued to the inside of the chamber is 1 inch wide.

The barrel was centered/supported with 4 sets of radial spokes, (the slight curve in the pipe caused the joint to crack, causing some of the air leak, this was obvious looking at the glue).

To the valve was added the reinforcing spokes, and to these spokes was glued 1/8th inch thick triangular PVC pieces. (Not shown in the photo.) The valve seat was rebuilt and ground with a corundum based valve seat compound so it seals much easier. (The photo of the valve doesn't show the new valve seat, nor the aerodynamic piston face).

Other notes: the spokes and triangular pvc reinforcement were cut from a pvc Apple II housing, it's a little softer than PVC pipe, but thats a good thing, because the flat end cap still flexes outward about 1/16th of an inch @ 65 psi. I should have made an aluminum valve, but I don't have a lathe yet.

To be added is an air activated valve, by encasing the piston in a pipe, and adding an air valve, all you would have to do is pull a trigger activated valve and piston response time would be pretty much zero. As it is now, a rope is used to absorb the shock of the piston traveling backwards, and another cord and a 5 pound weight is used to pull the piston back.

I do not intend to pressurize it beyond 100 psi, because 2 inch pipe is rated at 300 psi.

If I wrap the entire 5 foot long chamber in a 10+ layers of pretensioned epoxy/aluminum foil, or one layer of 19 gauge bailing wire, 200-250 psi should be safe, assuming an aluminum piston.