

ADDITIVE MANUFACTURING IN MUSICAL INSTRUMENTS

How can the cost and inaccessibility of musical instruments be decreased using new technologies?

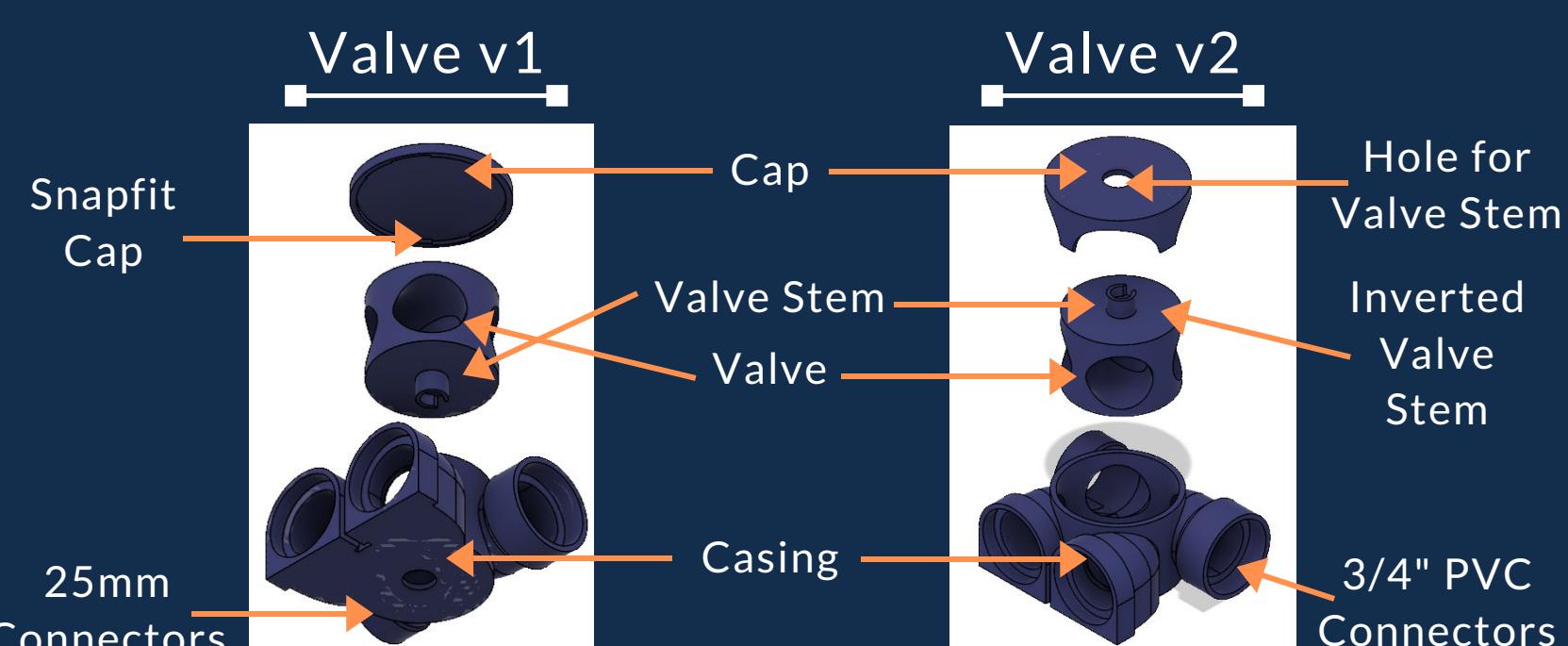
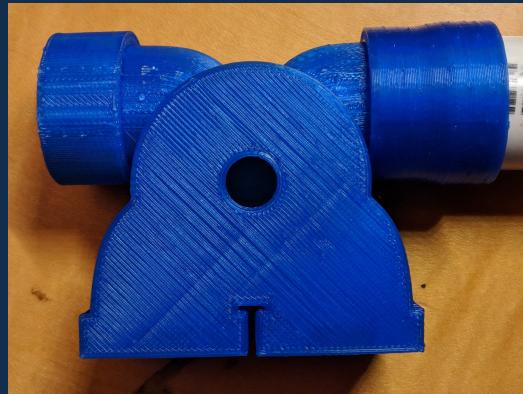
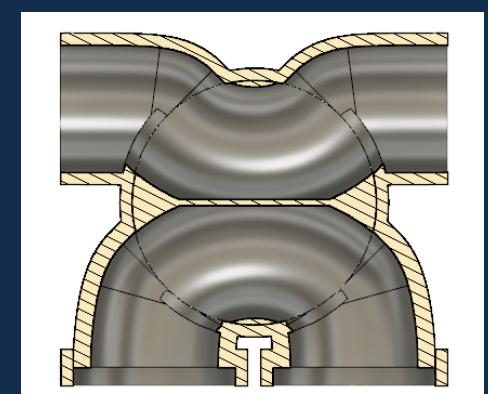
WHY?

Music is a powerful tool, whether used as a means of expression or a way of connecting with others. Learning music and choice of instrument should be an opportunity available to everyone. Instruments should be made more accessible by decreasing the prohibitive costs of purchasing

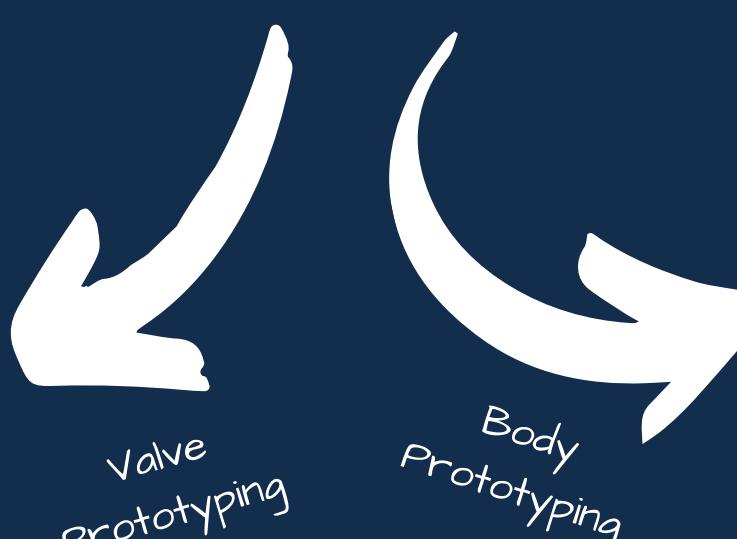
HOW IS ADDITIVE MANUFACTURING BEING USED?

VALVES

- Redirects air flow and decreases the pitch of the instrument
- Easily printable
- Custom designed to adapt to PVC piping



PROTOTYPING



THE EXPERIMENT

GOAL

Test the leakiness of the valves by measuring the decrease in air speed when a valve and its components are added.

TEST

TYPE T-test with matched pairs

CONDITIONS Paired data, randomization, 10% condition, nearly normal condition

VARIABLES

CONTROL Consistent fan speed, length of tube, and position of anemometer

DEPENDENT Air speed

INDEPENDENT Valves in place, cap in place, depressing the valve

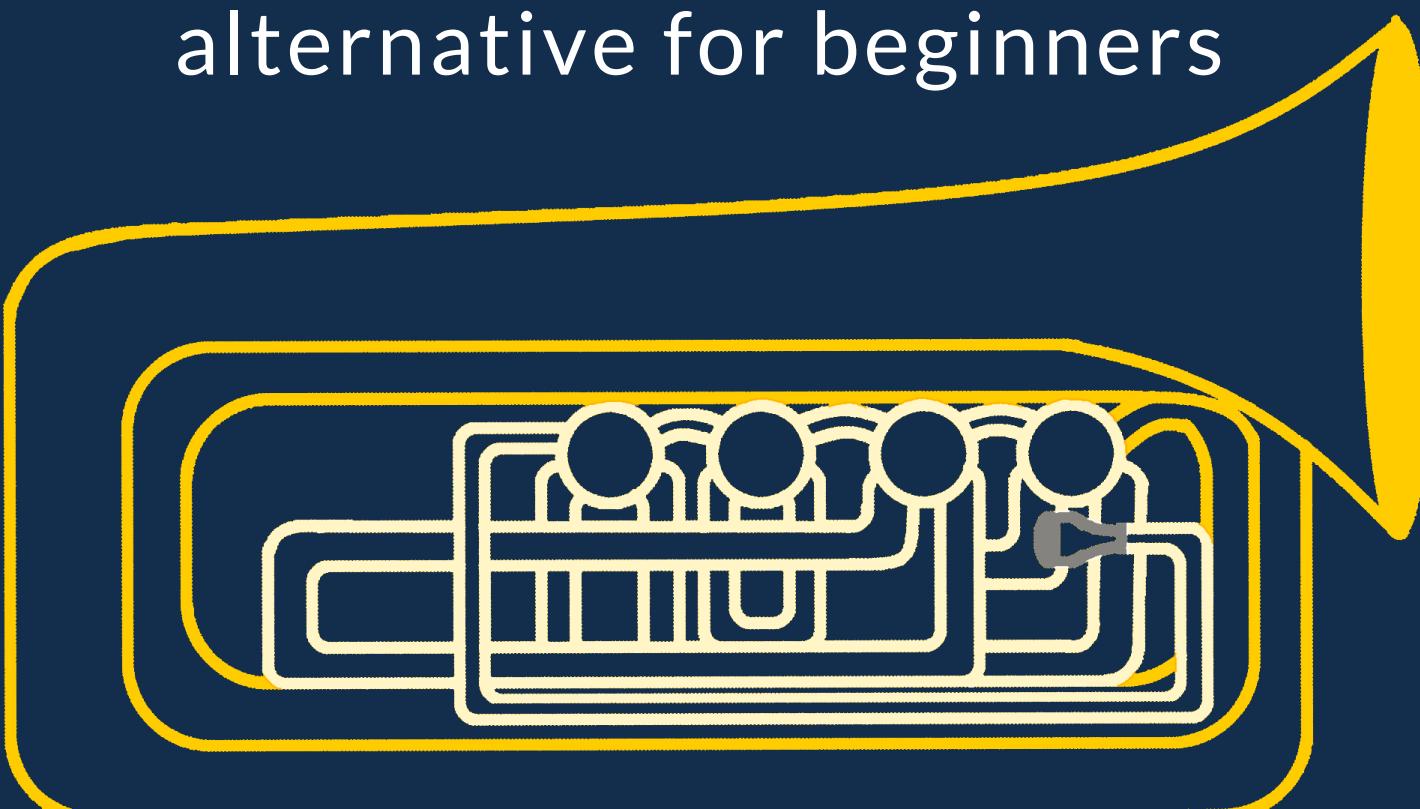
THE APPARATUS

- Top Left - anemometer to PVC adapter / connector
- Top Right - anemometer, which measures air speed
- Bottom Left - extra piping that air goes through when valve is depressed
- Bottom Right - control and valves



THE IDEA

Create a cheaper tuba alternative for beginners



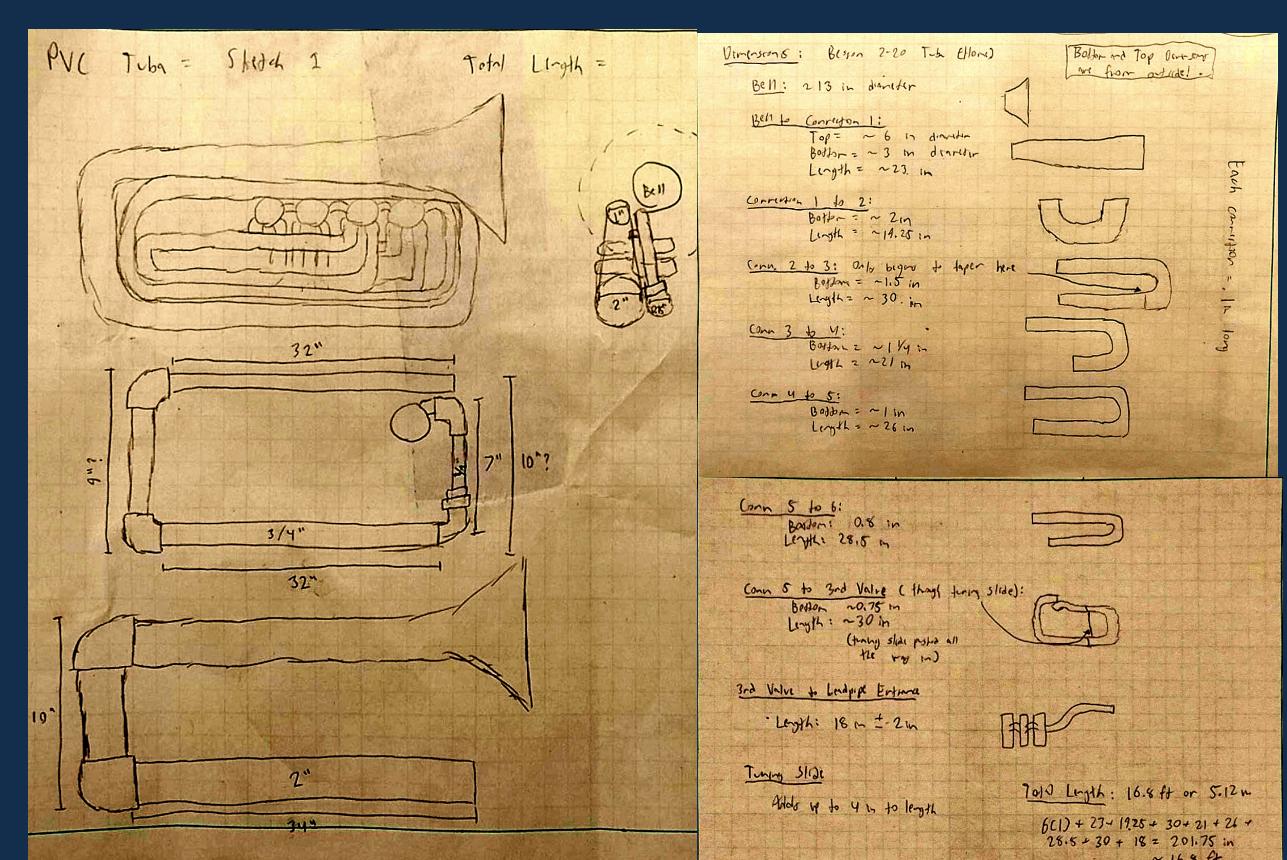
BODY

- Determines fundamental pitches of the tuba
- 16 feet of PVC piping
- Conical shape
- Designed as a marching tuba



First sketches for the PVC tuba body

Measurements of an actual tuba



RESULTS

Trials	Control	V1				V2			
		None	Cap	Dep	Cap Dep	None	Cap	Dep	Cap Dep
1	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.4 m/s	.5 m/s
2	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.4 m/s	.4 m/s
3	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.4 m/s	.5 m/s
4	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.5 m/s	.4 m/s
5	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.4 m/s	.5 m/s
6	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.5 m/s	.4 m/s
7	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.5 m/s	.4 m/s
8	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s
9	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s
10	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.4 m/s	.4 m/s
Average	1.1 m/s	1. m/s	1. m/s	.5 m/s	.5 m/s	1. m/s	1. m/s	.44 m/s	.45 m/s

Based on these trials, it can be seen that although none of the differences were statistically significant, there was a greater difference between the control and V1 dep, V1 cap dep, V2 dep, and V2 cap dep compared to the differences between the control and the other trials. In further testing, it will be useful to use a more precise anemometer to ensure that the standard deviation and standard error for the trials do not equal 0, hindering the ability to measure what is statistically significant. In addition, it must be guaranteed that in further testing to meet all conditions and conduct more trials for more precise results.

Presenting a valve to the Afghanistan National Institute of Music (ANIM)



Check out my website!

