

# COVID-19 Projects

## Ventilator + 3D Printing for Hospitals



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This project is evolving.  
Most up-to-date presentation at:  
[www.standagainstcovid.com](http://www.standagainstcovid.com)

# COVID-19 Ventilator: Background & Motivation

ICU Equipment for severe COVID-19 patients

Professional ventilation equipment,  
limited resources



Ventilators

+ Ventilator splitting systems  
(with their limitations)



anesthetic machines with  
ventilator features

Widely available,  
but manually operated



Self-inflated (“AMBU”) bags

# Affordable, mass-produced COVID-19 Ventilator

## Need:

- hospitals potentially overwhelmed with severe COVID-19 patients
- insufficient number of professional mechanical ventilation equipment
- insufficient number of healthcare workers able to manually ventilate the patients

## Approach:

- Device for automated, repeatable ventilation with an AMBU bag
- Using pressure, O2 and CO2 sensors to monitor patient state
- Intuitive device use with little training, one person monitoring a few patients

## Value:

### Hospital:

- Better use of basic, ubiquitous medical infrastructure (AMBU bags)
- Better work effectiveness while serving patients in need

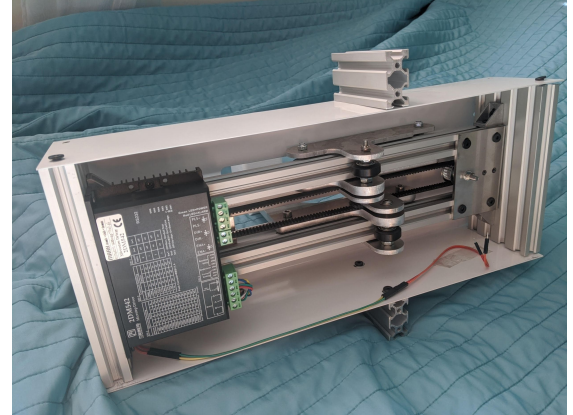
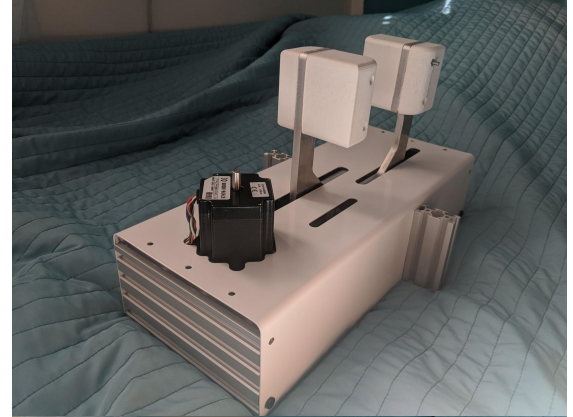
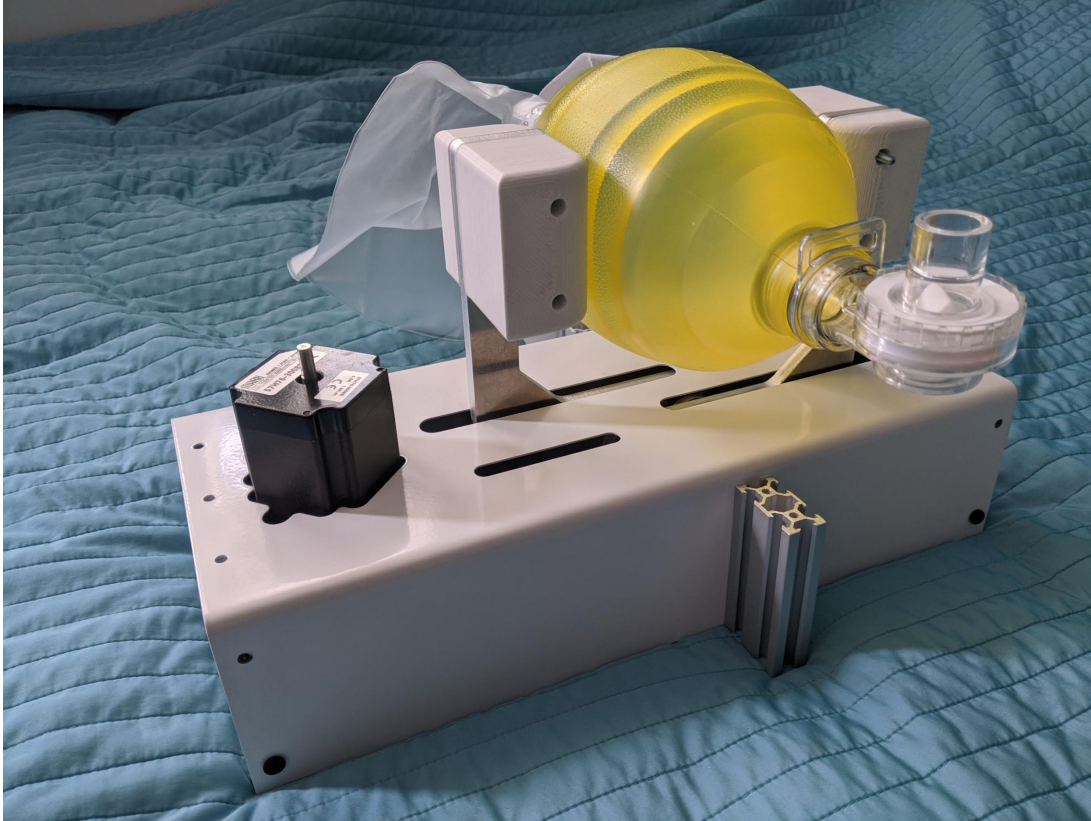
### Patient:

- Temporary ventilation device before real ventilator is available

## Competition:

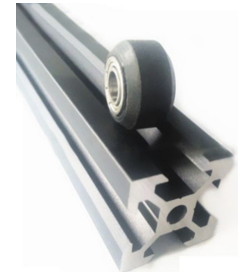
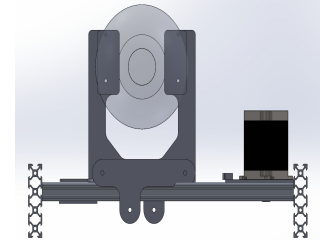
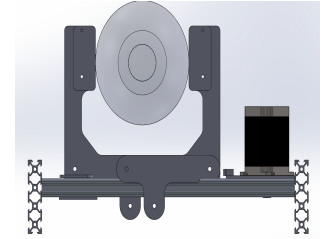
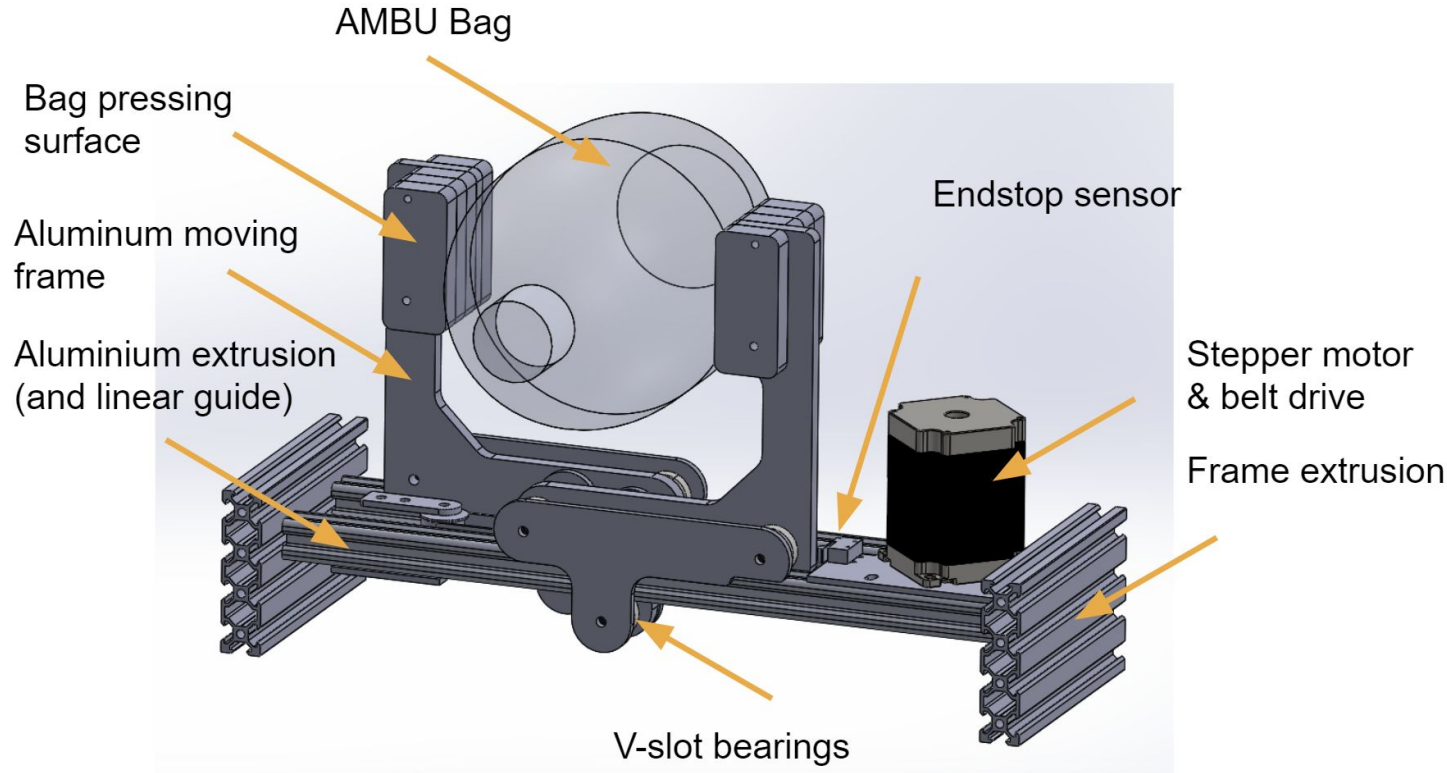
- Portable ventilators used for patient transport
- Other DIY solutions
- Ventilator splitting systems

# COVID-19 Ventilator Prototype

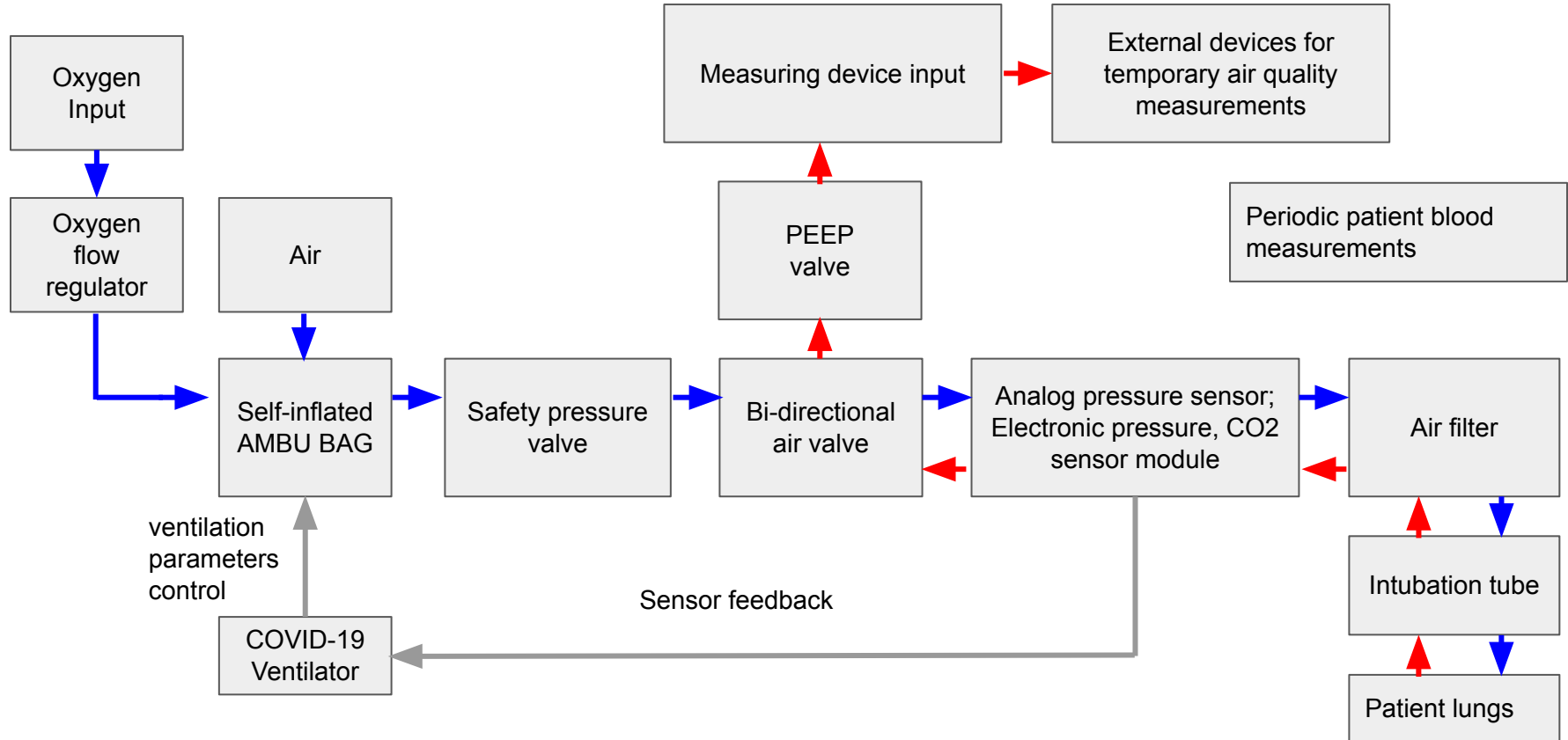




# Prototype Mechanical Design



# System infrastructure



# Core Ventilator Features

- **Cost-effectiveness:** 250 USD production cost
- **Mass production ready:** majority of parts can be laser-cutted and are available in large quantities
- **Patient safety:** existing, certified hospital infrastructure is used, the device mainly automates the squeezing process

Differentiation with other ventilator projects:

- More sensing modules for patient state monitoring, better process control
- Full-metal, durable and compact design for the device actuation unit
- Ability to provide mechanical protection for the volume of inflated air
- Reduced the number of 3D printed, potentially fragile components

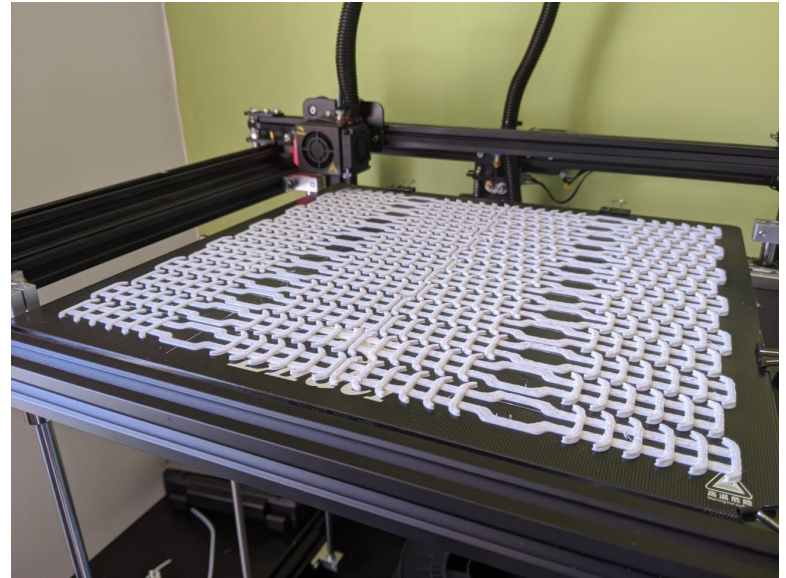


# 3D printing for Local hospitals

Using my 3D printers to support local hospitals with PPE



Printing snorkeling mask adapters for air filters



Printing face mask holders