



COVID19 R&D PROJECT

Rapidly Manufactured Ventilation Systems (RMVS)

ABSTRACT

The fight against the COVID19 pandemic requires engineering solutions to solve the shortage of medical equipment. This document is a short proposal of how MTC can join the global effort in fighting this pandemic. Included here is a list of active global projects to take part in and a preliminary plan for initiating the project.

Dr. Almajd Alhinai

Senior Lecturer (Aeronautical)

Introduction

There is no doubt that COVID19 is causing a major shortage in the supply of ventilators for patients (1). In addition, the WHO expressed alarm at reports from around the world of large numbers of infections among health workers, which appeared to be the result of a shortage of adequate personal protective equipment (2). This outlines the dire need for low cost rapidly manufactured ventilation systems for both health workers and patients.

In an article published by Robert L. Read (PhD), the founder and head coach of the Public Innovation¹ charity in Austin TX, he states that:

“At this moment, there are thousands of intelligent, diligent, well-meaning engineers trying to help the design of open source ventilators to address a possibly imminent life-threatening shortage caused by the COVID-19 pandemic. This wealth of creative technical energy is currently disorganized, scattered, and unfocused. Rather than being a tremendous force for saving lives that it may become, energy and time is currently being wasted on oversimplifications of the problem and the belief that the projects are closer to deployable than they really are.” (3)

In this article, he outlined a roadmap for the deployment of COVID19 ventilator DIY designs utilising Free Open Libre Source Software (FLOSS), shown in Figure 1.

Possible COVID-19 FLOSS/DIY Ventilator Deployment

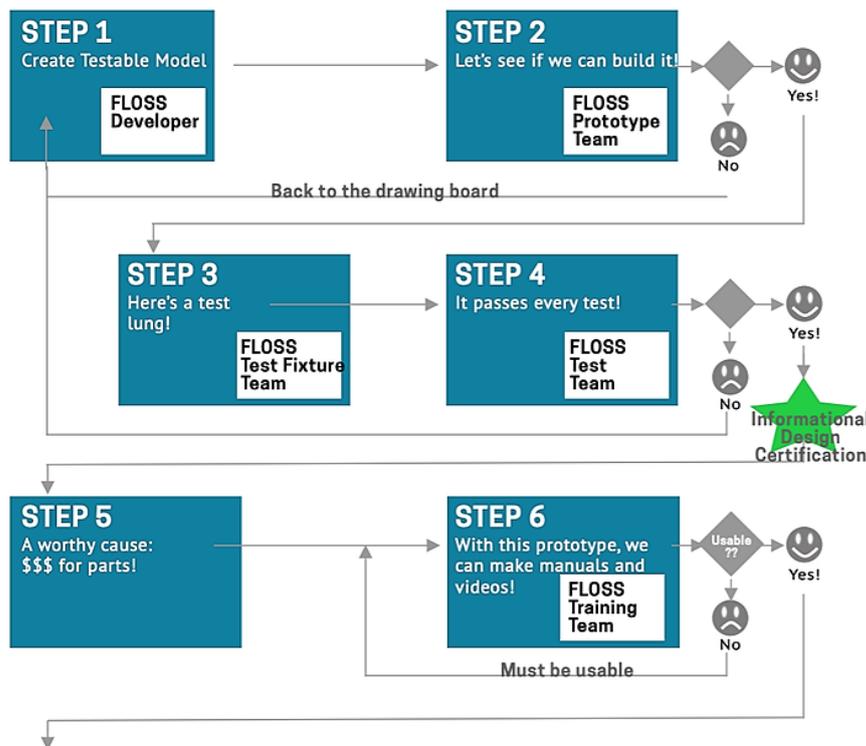


Figure 1 Road map for the deployment of DIY/FLOSS ventilators (3)

¹ <https://www.pubinv.org/>

This document will discuss the current and legacy RMVS projects and to produce a tentative road map for the research and development of such systems at the Military Technological College. The overall aim of this project is to join the global efforts in the fight against the COVID19 pandemic.

Current Global Projects

The projects related to RMVS could be divided based on the end users; health workers and patients. Here we will discuss briefly such projects and their current state:

- Health Workers: Low cost RMVS 's in this category are generally focused around developing a Powered Air Purifying Respirator (PAPR) to be used in the field. The development of such devices must be based around the Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Settings [5] issued by the Centre for Disease Control and Prevention (USA).
- Patients: There are a number of Low resource/cost Bag Valve Mask (BVM) ventilators. This type of design has gone through several iterations and there are a number of active projects developing it listed below.

Project	Type	Comments	Weblink
Ventilator (USA)	PAPR	Buildable, pressure tested, and active. We recommend that project and its creator, Johnny Lee, be given all the money and volunteer assistance it needs (3).	https://github.com/jcl5m1/ventilator
oxyGEN (Protofy: Spain)	BVM	Buildable and active but not pressure tested.	https://www.oxygen.protofy.xyz/
OSV (Ireland)	BVM	well-organized, active, fully open project, but as of this writing not buildable.	https://opensourceventilator.ie/

Recommendations

- A team from MTC should volunteer in aiding the projects listed above. In addition to being part of the global effort in the fight against COVID19, the college will also enhance its research capabilities and raise its profile among other research institutions in the country.
- Complete a full design iteration starting with PAPR, based on Figure 1, within the study suspension period (expected to end 19th of April but is likely to be extended).
- Further R&D into BVM needs to be carried out during this period.
- Please refer to the core team organizational chart and equipment list in the appendix.
- Designs must meet the Requirements from [Gov.UK - Rapidly Manufactured Ventilator System](#) (UK)

Bibliography

1. **John, Miller and Elvira, Pollina.** World News. *Reuters* . [Online] 21 March 2020. [Cited: 24 March 2020.] <https://www.reuters.com/article/us-health-coronavirus-ventilators-insigh/army-joins-the-production-line-as-ventilator-makers-scramble-to-meet-demand-idUSKBN2180JU>.
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