	Data	Signatures	
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Verif.:			
Aprov.:			

1. Scope

The scope of this document is to present the EAR project in a simplified way.

2. Document Control

- 22/03/2020: Emissão R00 – Portuguese BR
- 22/03/2020: Release R01 – English
    - added slight helmet pressure for PEEP effect
    - added decontamination possibilities
    - added adult model in AMBU type

3. References

- Open Source COVID19 Medical Supplies facebook: https://www.facebook.com/groups/670932227050506/

- COVID-19 Air BRASIL - Fast production of assisted ventilation devices https://www.facebook.com/groups/235476464265909/

- RDSV200320 Emergency Automatic Respirator Specification R00 - Preliminary

4. Simplified Description

This project was born in international CoVid19 group and it's an AMBU automation system.

There are many AMBU automation solutions available, why do we need another one? The reason is simple: all available AMBU automation solutions were based in materials found in research centers, not available in lower income places (NT: in emerging countries like Brazil 60% of the cities do not afford a ventilator system). So those places can't build and maintain these solutions in the first moment.

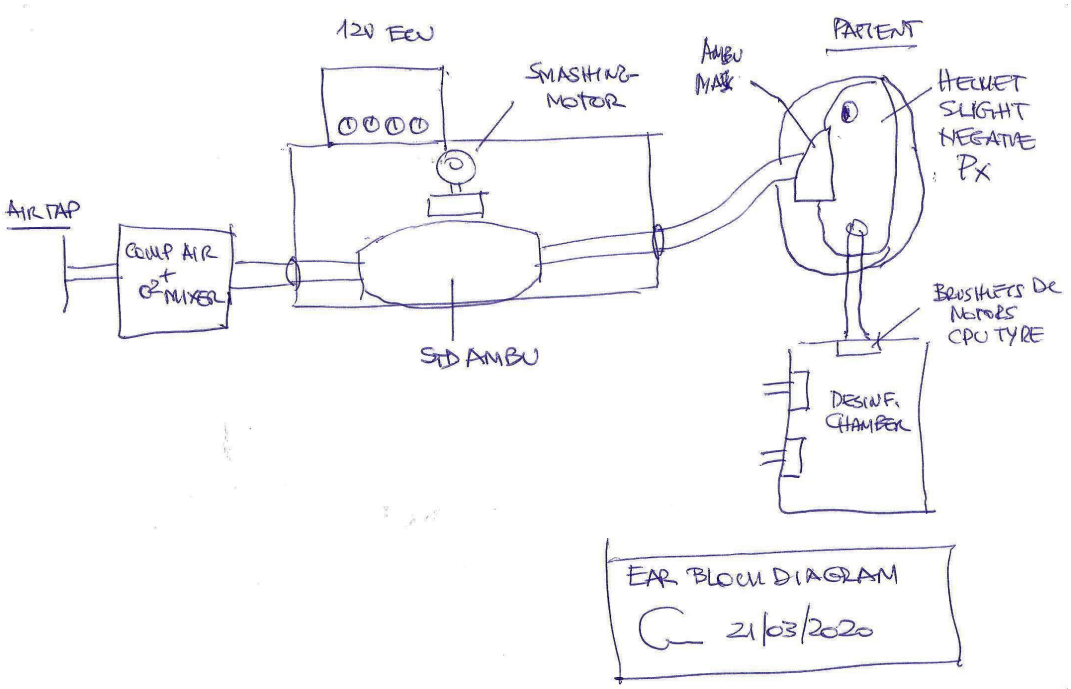
The focus of this Project is to build an equipment for resourceless regions. It could be simply described as a mechanical hand for pressing an AMBU. **Warning: there was a change in AMBU pressure method regarding initial specification because compressed air was not available in some healthcare places (NT: e.g. hospital corridors).**

This "mechatronic hand" is an arm moved by a 12Vdc passenger car electric window motor. We use this component for years and use it in other products, and it has known failure modes and we know how to address them. The motor is available locally (NT: in Brazil) in aftermarket for around USD 10.

- a 12Vdc control board, designed to be built manually by electronic repair technicians. PCB is single sided on first version so DIY manufacturing is possible. The microcontroller is na Arduino, which has the largest developer's base worldwide speaking. This board has short-circuit protection for the motor because of known failure mode of internal short circuit. This failure becomes more frequent with motor use. As software is able to monitor motor current, preventive maintenance is possible before catastrophic failure. This board also controls motor speed, defined applied pression on AMBU.

The AMBU type is a common adult model, fed by an O2 + air mixer. As AMBU's patient's exhaust valve delivers contaminated air to the ambient, there's a need for a helmet type container so we can deliver the contaminated air for a desinfection camera. **UPDATED: some doctors say that due to Coronavirus we have to apply slight positive pressure on this helmet for PEEP-like procedure so maybe we'll have an intake low pressure air input and the air output for decontamination chamber. The decontamination chamber could use UV, high temperature, soap solution, chemicals or a combination of these agents.**

All setup can be fed by automotive batteries fed by AC line, to provide energy in power failures. (NT: emerging countries infrastructure problems).



EAR solution sketch

Guide to using the
3M Qualitative Fit Test Kits

Possible helmet type