Instructional video for HALO PAPR theory, assembly, and usage including donning and doffing.

Additional instructions and information on main project page.
https://bunnyscience.dozuki.com/Guide/HALO+Respirator+(Buildable+PAPR)/4

Usability Proven
Bunny Science Halo PAPR worn during 11 hours continuous hours of operating room work (intubation, extubation, line placement, regional block placement, monitoring, patient transfers)

This device is not yet regulatory approved. It is presented as a humanitarian aid to my fellow health workers during the 2020 PPE shortage. Function and safety are not guaranteed. Use is at your sole risk and discretion.

Why not a face shield and N95 Mask?

COVID-19's corona virus is different from the usual infective risk. It is able to spread via aerosolized particles, not just droplets. Droplets are the larger spray that people envision. Aerosols are MUCH finer. It's more accurate to think of aerosolized risk like fog. When we place or remove airway instrumentation, aerosols are generated. This coronovirus is able to spread via aerosols generated by even talking or singing.

Think about how a face shield protects you against fog touching your face. It doesn't. Fog (aerosol) readily travels around a face shield. It's better than nothing, because face shields do protect against droplets, but ultimately your only protection against aerosols is your N95 perfectly sealing nose and mouth.

A hooded PAPR is preferred because it completely excludes aerosols from reaching your head. Eyes, nose, mouth, everything isolated. PAPR hood isolates via positive pressure, so you don't have to worry whether you have a perfect face seal. Is there a small leak around my N95? Have I created a leak the mask by talking? Are my straps tight enough? Those worries go away.

For lower risk, non-aerosol generating procedures, lesser protection is adequate. For what I routinely do in the operating room, aerosols are a likely product. In most facilities, you don't get permission to use a PAPR despite the elevated risk. There are not enough PAPR's and they are too expensive. Risk management and economics force facilities to strictly limit access to their PAPR's.

The Bunny Science Halo PAPR completely alters the supply and cost issue. It allows deployment of a hooded PAPR based on desired level of

protection rather than economics and limited supply.

What is a PAPR?

Powered Air Purifying Respirator - Is an enclosed air chamber around your face or entire head that provides clean breathing air via a fan powered filtering unit. PAPR's are much more comfortable than a face mask and (unlike a mask) function properly without requiring a continuously perfect face seal. Fully enclosed PAPR's protect against aerosols and splash from all directions.

Why Don't we Always Use PAPR's?

PAPR's are orders of magnitude more expensive compared to an N95 mask. Facilities cannot afford to supply PAPR's to everyone. Even if a facility has multiple PAPR units, they cannot afford enough units or disposables for widespread usage. In poorer nations, a PAPR is completely unaffordable. N95 + face shield is an economical way of providing fair protection, but PAPR's are preferred protection doing high contamination risk procedures.

The COVID-19 Pandemic has created far more high contamination risk situations than ever anticipated. Even well stocked facilities cannot provide PAPR's for the new reality and providers often need permission to use limited availability PAPR's.

The Bunny Science Halo PAPR dramatically increases PAPR availability. Now, providers can use a PAPR when needed rather than be limited by supply.

What are Some Advantages of a PAPR over a Mask?

Masks require perfect seal. Any leak, whether around the mask periphery, beard stubble, through porous 3D prints, or around make-shift filter material defeats a mask. PAPR's create isolation via positive pressure rather than a tight seal.

Maintaining a good seal with a mask often requires high band tension. After several hours of usage, bruising or skin damage can occur. PAPR's don't use a tight seal nor high band tension.

PAPR's reduce wearer fatigue by doing the work of drawing air through filter.

Considerations PAPR Safety

PAPR's must have effective filtering. The Bunny Science Halo PAPR uses known effective, FDA approved anesthesia circuit viral filters. As a tight fit PAPR, it keeps minute flow low so the filter can tolerate the flow rate.

Flow rate and pattern must clear expired CO2. Fail to do that and user suffers hypercapnea. Bunny Science Halo PAPR has been verified with specific fans to achieve steady state EtCO2 levels below 42 . Careful measurement and monitoring of EtCO2 and respiratory rate must be performed if using airflow fans other than ones I have verified as adequate flow.