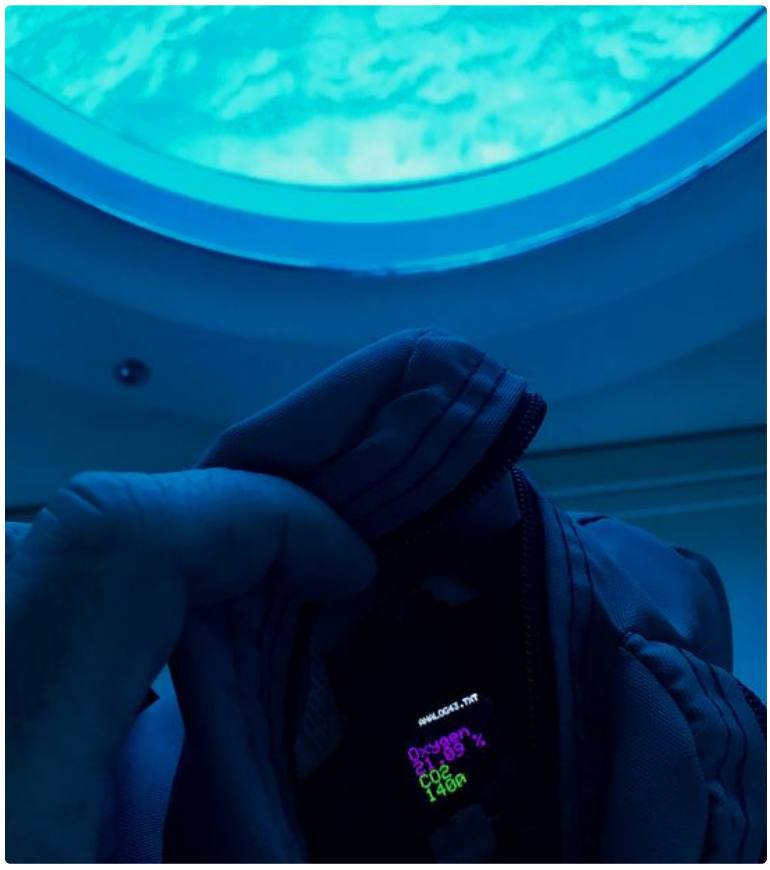
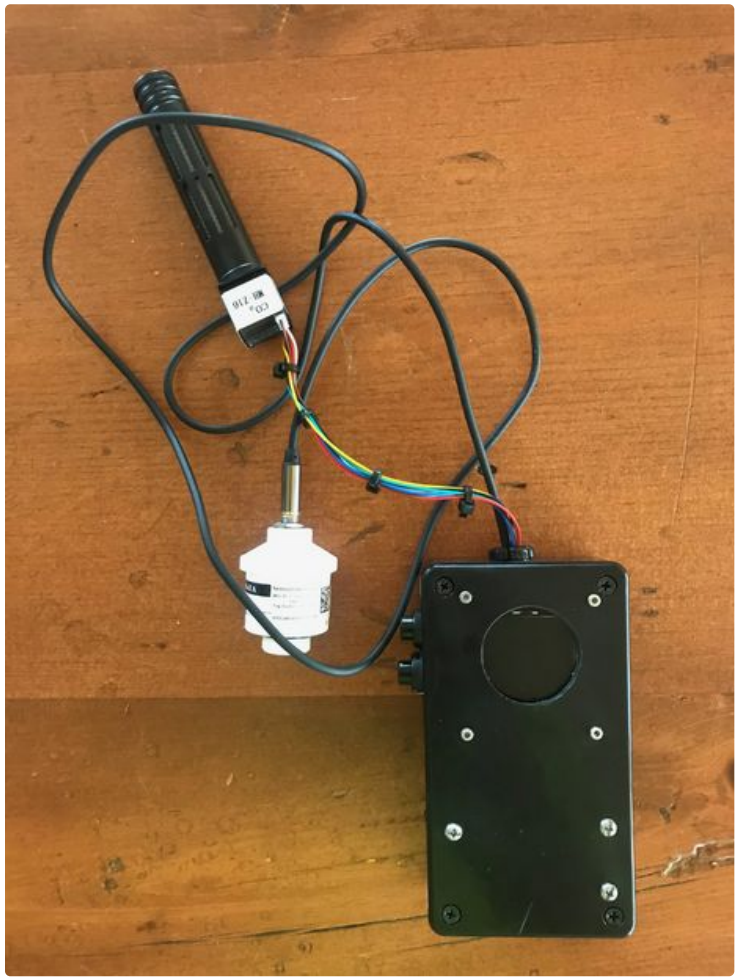
Snorkel Sniffer

by rabbitcreek

The doors were closed on the flight and just like many other similar flights an overwhelming drowsiness overcomes you. As we were taxing, I was jolted awake by a woman in front of us screaming "help him!" "help him!!!!" "STOP!" -- as this was a flight to Maui from the cold winter of Alaska this was not greeted with universal charm and understanding. The woman's husband had gone limp and unresponsive. He was young and in good health and rapidly responded to the reality of being kicked off the flight for medical management ... his wife not so concerned that she would leave a flight to Maui...good call. Both my incredible recurrent drowsiness and his unconsciousness were probably a result of the rapid decline in O2 levels inherent in all air travel. Princess Leia would probably be alive today if not for the combination of depressed respiration and low O2 on the flight--even in first class.

This Intstructable is to document a small portable instrument that will enable you to evaluate with accuracy whether the air around you is good to breath. It is easily and relatively cheaply built, has a built-in battery for portability, a Micro SD card for data, a charger for extended use and a small TFT screen for viewing results.





Step 1: Gather Your Materials

The materials are the same as I used in my other sensor units for snorkeling: https://www.instructables.com/id/CO2-Measurement-in-Snorkels/ with the addition of the TFT display enclosure and on/off and reset buttons

1. Adafruit ads1015 breakout board https://www.adafruit.com/product/10832.

2. SS-11A Replaces: Teledyne R17 & MSA 406931https://www.sensoronics.com/collections/medical-oxygen- sensors

3. Adafruit Feather 32u4 Adalogger--A wonderful board very easy to use.

4. Lithium Ion Polymer Battery - 3.7v 1200mAh

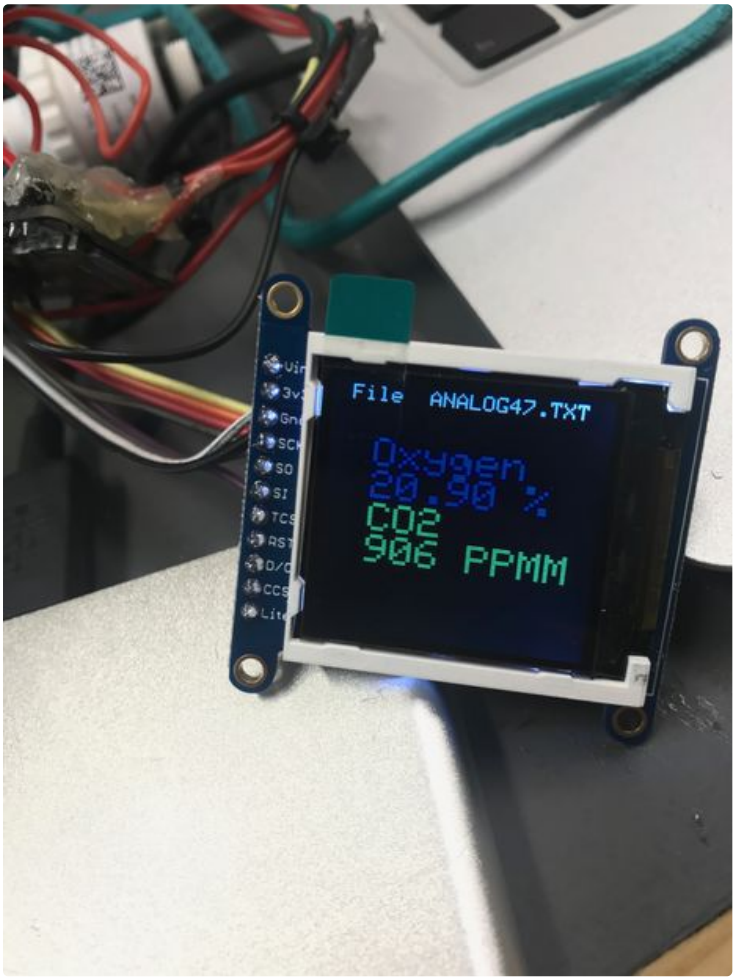
5. PowerBoost 1000 Basic - 5V USB Boost @ 1000mA from 1.8V+

6. http://sandboxelectronics.com/?product=50000ppm-m...

7. Adafruit 1.54" 240x240 Wide Angle TFT LCD Display with MicroSD - ST7789

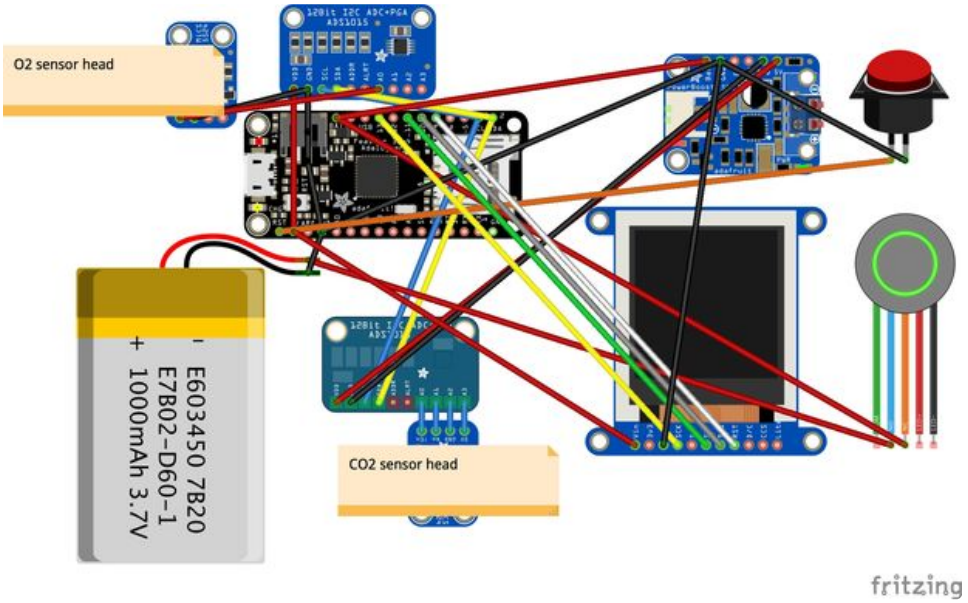
8. 16mm Illuminated Pushbutton - White Latching On/Off Switch Adafruit

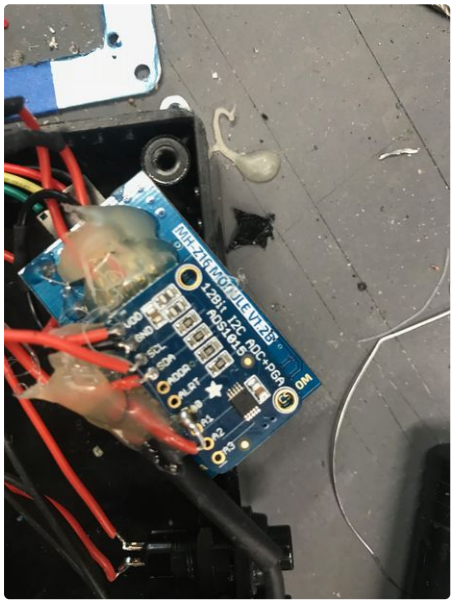
9. 16mm Illuminated Pushbutton - White Momentary Adafruit

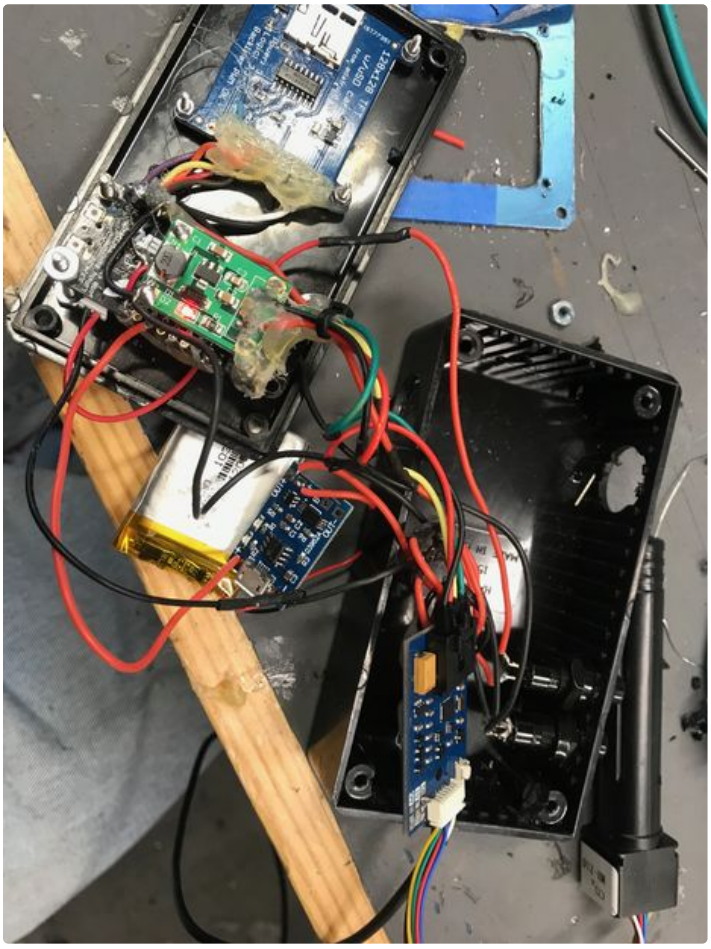


Step 2: Wire It Up and Build It

The fritzing diagram should be followed. The TFT screen has multiple connections but works well. The two sensors share I2C inputs but have different addresses so there is no conflict. You can get a lower level CO2 sensor but the one that measures to 50,000 is the most useful because even a slightly stuffy room can easily go over a 1000. The electrical components can go into any small project box. I did not do a 3D print of one at this time. The two buttons control on and off and reseting the card file. When building it you have to lead the wire for the O2 sensor and the CO2 sensor out of the box through small adjacent holes. The O2 sensor wire is just a speaker wire connector and you can make it almost any length. I believe the CO2 sensor wire is more sensitive to extension and probably should not be lengthened much. The screen is mounted with a round hole in the cover for viewing and the Adalogger board is mounted next to exterior holes that allow battery charging, programming and the insertion and removal of the data card through the case.


O2 sensor head
CO2 sensor head
E603450 7B20
E7B02-D60-1
1000mAh 3.7V
fritzing





Step 3: Program It

The programming is the same same that I used for the prior snorkel investigation with the addition of code for the TFT screen. With each boot a new file is created on the SD card. The words Snorkel Sniffer appear on the screen after each boot and then the appropriate file is listed followed by the O2 and CO2 levels. If it fails to locate a good file it indicates its state and then you have to reboot. The O2 sensor will deteriorate after a year so inner checks of its competence are done on each boot. The CO2 monitor has internal standardization and should last a long time.

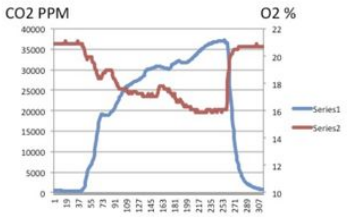
https://www.instructabl...

Download

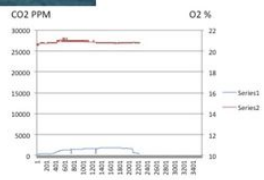
Step 4: Use It

I have already described its use in the testing of snorkel equipment--https://www.instructables.com/id/Oxygen-Measurement-in-Snorkels/ and this is one of the reasons I built this standardized unit that anyone can use and is open source and portable. The interesting part is how our breathing world reveals itself when you walk around and test it. That sort of vague feeling of "not good air" is usually correct. It was interesting to find the workout room had a very high CO2 content from all the huffing and puffing going on in there. Stay away from church basements with a lot of people.....The maui submarine trip here on the Island had super good air for the whole hour trip with 15 other people at the bottom of the sea. Weirdly enough the worst air occurs just on cocooning up in your comforter over your face in your own bed--don't do that. They did prior studies to see if this could cause SIDS and the results were about the same as mine. And that super drowsy feeling you get when they close the door of the plane--well there is a reason for that too.

Five minutes under the comforter produced this worrisome picture of air depletion:



The submarine ride in Maui had perfect air—the same as being outside.



Series 1 -- CO2
Series 2 -- O2

Everyone on this plane will experience this fall in oxygen in the first five minutes