# The Apollo 13 Pandemic Challenge

Houston, we have a problem!

The astronauts who were part of the Apollo 13 mission found themselves socially isolated and environmentally challenged. Sound familiar?

At about 56 hours into the flight of Apollo 13, an oxygen tank exploded. Photos taken near the end of the flight revealed the extent of the damage - one whole side of the spacecraft was missing. With the command module losing power fast, the astronauts had to move into the lunar module to use it as a lifeboat. Designed for two, the lunar module's cabin was a tight fit for three people. It did not have enough carbon-dioxide-scrubbing chemical canisters to keep the air breathable for three men all the way back to Earth. But the damaged command module did. The astronauts had to build a crude adapter using spare parts on board, to make use of those canisters and save their own lives.

Can you imagine that challenge – using only the materials aboard your space craft, to build yourselves a life-saving filtration device to make the air breathable?

Are you willing to take on a similar challenge?
Let's do it! And remember - necessity is the mother of invention 😊

A lethal respiratory virus has become a pandemic. You are quarantined in your home. You dare not go outside in case you encounter someone who is infected, but your supplies are dangerously low. No food, no medicine, no toilet paper! Your only hope is to engineer a protective mask. Your mask must meet the following criteria:

- Allow you to breathe (duh)
- Prevent other people's cough sprays and droplets from passing through from outside to inside (gross)
- Prevent your secretions from passing from inside to outside (yuck)
- Minimize pollen and maybe even bacteria from reaching your mouth or nose (obviously)
- Allow most of your breath to pass through the mask instead of sneaking out the sides

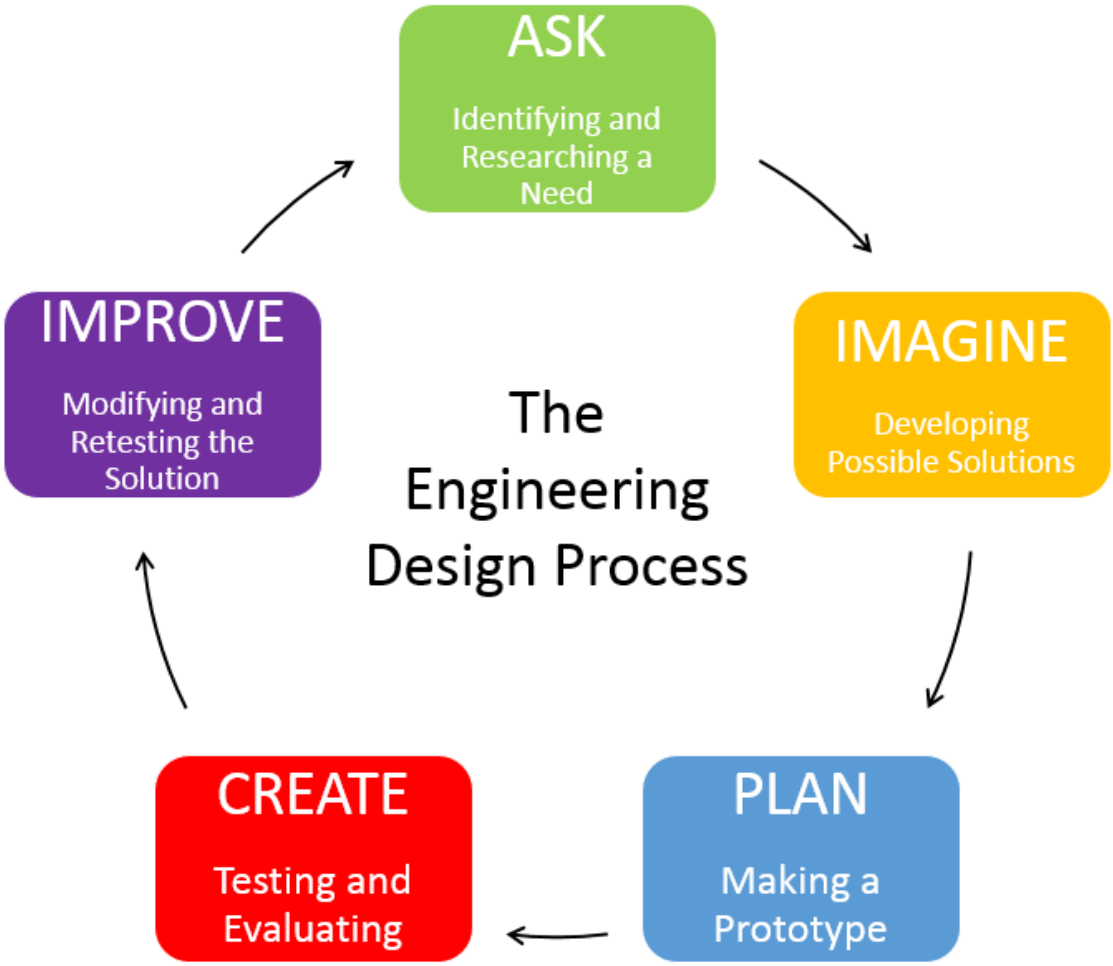
Like the astronauts, you may use any items you find INSIDE your house. You might want to test your individual materials as you construct your mask to make sure they can help you meet the challenge criteria. And most importantly, you should always ask your grownup for permission before you take anything to use in your design or before you go into any cabinets or storage places you aren't normally allowed to access.

Like all good engineers, you should follow the engineering design cycle (see page 2) and if at first you don't succeed, don't give up. Just redesign and try, again!

The last point to make is this: these masks may not be 100 percent effective at stopping the spread of potentially harmful airborne particles, but they can help reduce the risk of contamination by blocking the spray from other people when they cough or sneeze. So, go for it!

https://smartairfilters.com/en/blog/diy-homemade-mask-protect-virus-coronavirus/

Now, show me what you got.




How to test your mask design for air flow:

To see if air can move through any of the materials, blow through them and see if you can make the flame on a candle move or blow out. You can also hold up a piece of tissue paper, then blow through the material to see if it moves. If you light a candle, make sure you have adult supervision.

How to test your mask design for water repellency:

To see if water beads up on any of your materials or soaks through, place a sheet of absorbent paper on a surface then lay your material on top of it. Carefully drop a few pea-size beads of water on the material. Wait and carefully watch to see if it remains in a bead, on the material, soaks into the material, goes through the material.

How to test your mask for bacterial contamination:

To see if your mask can minimize pollen or bacteria from reaching your mouth and nose, grind up some cheesy crackers or puff, put on your mask and try to inhale through the mast. You can also use flour. If any of the orange crumbs or flour get behind your mask, then bacteria will probably be able to also.