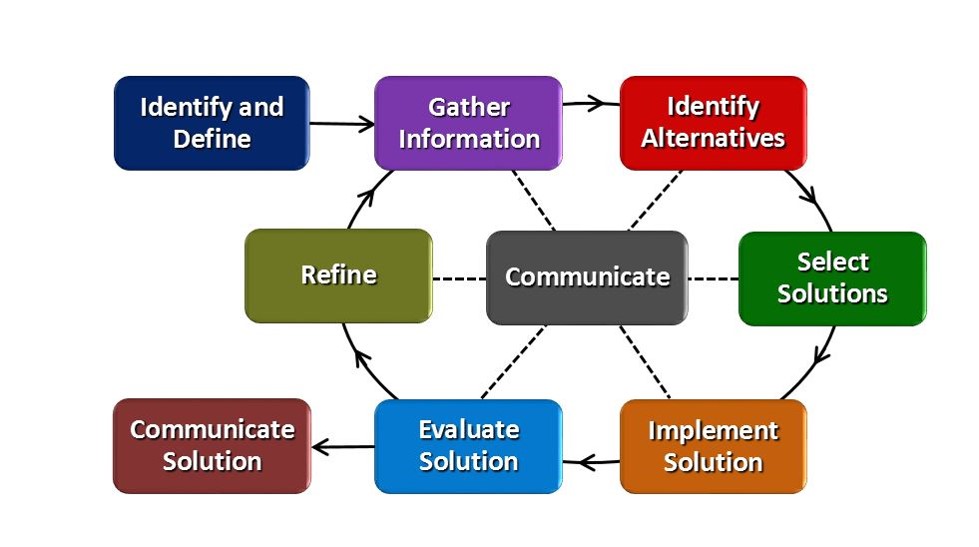
Name: Spencer Smith Title of this Project: Apollo 13 Pandemic Challenge



**Identify and Define: (Problem Statement) (10 points)**

In the text box below, type 1 paragraph (at least 4 correct sentences) that states the problem you are trying to solve.

**Identifies** the criteria for a successful solution, and **defines** any constraints. Make a listing of both after the problem statement.

**Criteria** includes: Measurable standard ie: weight, size, gear ratio… Could be used in a grading rubric.

**Constraints** is a limitation or condition that must satisfied by the design. Restrictions that keep something from being the best it can be. Problems that arise or issues that come up. Time, Cost, Materials

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| **Statement: I have to design a protective mask to prevent the spread of diseases**  **Criteria: The mask must:**   * **Be breathable** * **Prevent outside sprays and droplets from coming in** * **Prevent sprays and droplets coming out from the inside** * **Minimize pollen and bacteria from reaching the nose and mouth** * **Allow most breath to flow through the mask, not out the sides**   **Constraints: Time, materials, money** |

**Gather Information: (Research) (50 points 10 for each source)**

In the text box below, create an annotated bibliography (at least 5 sources) to **gather information** for your final design.

Each entry should include a URL (web address) and 1-2 sentences describing how the source could be useful. Include a picture and sentences describing what you learned (if anything) from these sites.

Google images is not a website.

You must go to the site. Copy a picture AND write what you learned. Not learning anything is not acceptable. Something not helpful to your project is acceptable.

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| Source 1:  URL: <https://www.healthline.com/health/how-to-make-a-mask-out-of-fabric#how-to-make>  Photo:    1 – 2 sentences about what you learned from this site:  This website showed a way to fold the mask that allows rubber bands to be used without making holes.  Source 2:  URL: <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>  Photo:    1 – 2 sentences about what you learned from this site:  This website shows how to make a face mask using only the cloth to secure it to your face  Source 3:  URL: <https://pksafety.com/3m-n95-disposable-respirator-with-exhalation-valve-8210v-box-10/>  Photo:    1 – 2 sentences about what you learned from this site:  The N95 mask uses a bendable metal strip that rests on the bridge of the nose to create a better fit. I could use something like a pipe cleaner to do the same.  Source 4:  URL: <https://www.popularmechanics.com/science/a32111235/diy-face-mask-pandemic/>  Photo:    1 – 2 sentences about what you learned from this site: This website shows that you can sew a fold on both ends of your facemask that you can run a string through  Source 5:  URL: <https://www.cnet.com/how-to/will-homemade-face-masks-keep-you-from-getting-coronavirus-heres-what-we-know/>  Photo:    1 – 2 sentences about what you learned from this site:  This mask has the cloth straps sewn right into the sides of the mask. This could also be done with elastic if I have any. |

**Identify Possible Solutions: (Brainstorm) (50 points 10 for each solution)**

In the text box below, **identify** at least **FIVE** **ways** you might consider as a possible solution. These ideas can be descriptions, pictures, diagrams, or sketches. Any graphics must have accompanying labels and a short summary of the possible solution. You could draw sketches on sketch or graph paper then take pictures of these ideas and add the pictures with descriptions in the box below. Draw sketches dark so they will show up.

Do not make these sketches less than ½ the size of a piece of typing paper. So approximately 8.5” wide by 6.5” tall. Label each drawing with a number or letter. ie: idea #1, #2…

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| Solution #1:    Solution #2:    Solution #3:    Solution #4:    Solution #5: |

**Select Solutions: Choose the best idea from above (Refine the idea) (30 points)**

In the text box below, identify which alternative (from the previous step) you have chosen to proceed with.

Include 3 sentences explaining **WHY** you chose that particular solution **(be sure to include language from the criteria and constraints).**

This step must include a finished drawing, including sizes, and materials you are going to use.

This drawing can be in a CAD program or it can be a detailed drawing using instruments. Sizes must be included in this drawing. This drawing should not be smaller than half scale of the project.

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| I chose this idea because of how simple it was to make, while still being able to meet the criteria. Since the mask is made by folding, no sewing is required at all. The folds make the mask extra thick on the sides. This helps prevent air from coming out of the sides. The folds can also be moved to fit snugly around the nose and chin. |

**Implement Solution: (Prototype) (50 points)**

In the text box below, create a set of “before-during-after” photos and explanations of how you created your solution.

You should have **at least** 5 photos with captions (1 before, 3-5 during, 1 after). More photos can be used if your project is more complex.

\*\*\*Take a picture at the end of each day to show your progress.\*\*\*

**Each day you work in class, you need to enter the date and 2 or 3 sentences of what you did in class that day**. Be specific. Put down tools used, sizes cut, materials used. This information will be used for your daily grade in class. If you give very little detail, you grade will reflect that.

**DETAILS DETAILS DETAILS!!**

**If you test your project and find it not working and change your idea you must document this in Refine box below.**

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| Date: 5/4/2020    I started with a thin washcloth    I folded the top and bottom of the cloth so they met in the middle    I then folded the top and bottom of the cloth again so they met in the middle as well    I looped a rubber band around the cloth approximately two inches in from the sides    I then folded the sides over the rubber bands. These folds rest on the cheeks and the rubber bands go around the ears. The flaps in the middle can be pulled to fit around the nose and chin. |

**Evaluate Solution: (test the results) (5 points)**

In the text box below, record the results to at least 3 preliminary tests. Test results should include data and speculation as to why those results were achieved. DATA = DETAILS. What worked and what did not work at the end of the project.

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| I started off trying to use a thicker washcloth in my first test. I chose to use a thinner washcloth because all of the folds caused the mask to become too thick and too hard to breathe through. The thinner cloth is much more breathable. At first I didn't think the design would work because it didn't fit over the nose, but I found out the flaps on the inside can be pulled out to cover the nose and chin. The design works very well because it fits snugly all around the face. This allows almost no air to pass through the sides and top/bottom. It directs all of the air through the cloth. |

**Refine: (Iterate your design) (5 points)**

**When you make a change to your prototype, document those changes here.**

In the text box below, write AT LEAST 5 complete, correct sentences that describe:

-how the results from the evaluation can provide information on further improvement of your project

-at least 3 possible ways to make the improvements happen and Why it would help it improve

-how you would have (or will) make the improvement happen

-how you will test to see if the improvement worked or not

-how you predict the improvement will affect the original solution

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| After evaluating the design, I would use larger rubber bands or even hair ties. I would do this so that it didn’t hurt the ears as much, and it would likely be more durable with something thicker than the rubber bands I used. To make the improvement I would just switch out the old rubber bands with thicker ones. This would make my mask much more comfortable since the pressure is more spread out with a thick rubber band, and it would be less likely to break. |

**Communicate:** Lastly, at the end of each project you will be required to give a PowerPoint presentation OR Verbal presentation. The presentation outline will follow the Engineering Design Process you just documented. You can use information and photographs from this document to make your presentation.