

ABSTRACT

Dometic makes many different products for millions of people around the world. One way Dometic improves mobile living is through building ventilation systems. Dometic currently makes roof vents for most RVs in the industry like the one in Figure 1. These fans work great but



Figure 1: Current Dometic Fan Design Example

have issues that make them undesirable, like being too noisy and rather high cost for a plastic fan. The design team was tasked with creating a new universal concept proposal for Dometic's RV roof vent project. This includes making it quieter, having connectivity and costing the customer less money between the different tier systems. The new design will be able to fit all RV's universally and be more efficient. Through many meetings and different phases of work, the team has produced a design that will meet the requirements of the sponsor's needs. The new design has a brushless motor and Bluetooth connectivity to make it more user friendly.

CUSTOMER NEEDS/SPECS

Dometic wants to make a new product line of roof vents with added features and better performance than the current models. These include noise mitigation, more connectivity, reduce part count, utilize a three-tier system, and allow for a universal fit. Tables 2 and 3 show these requirements.

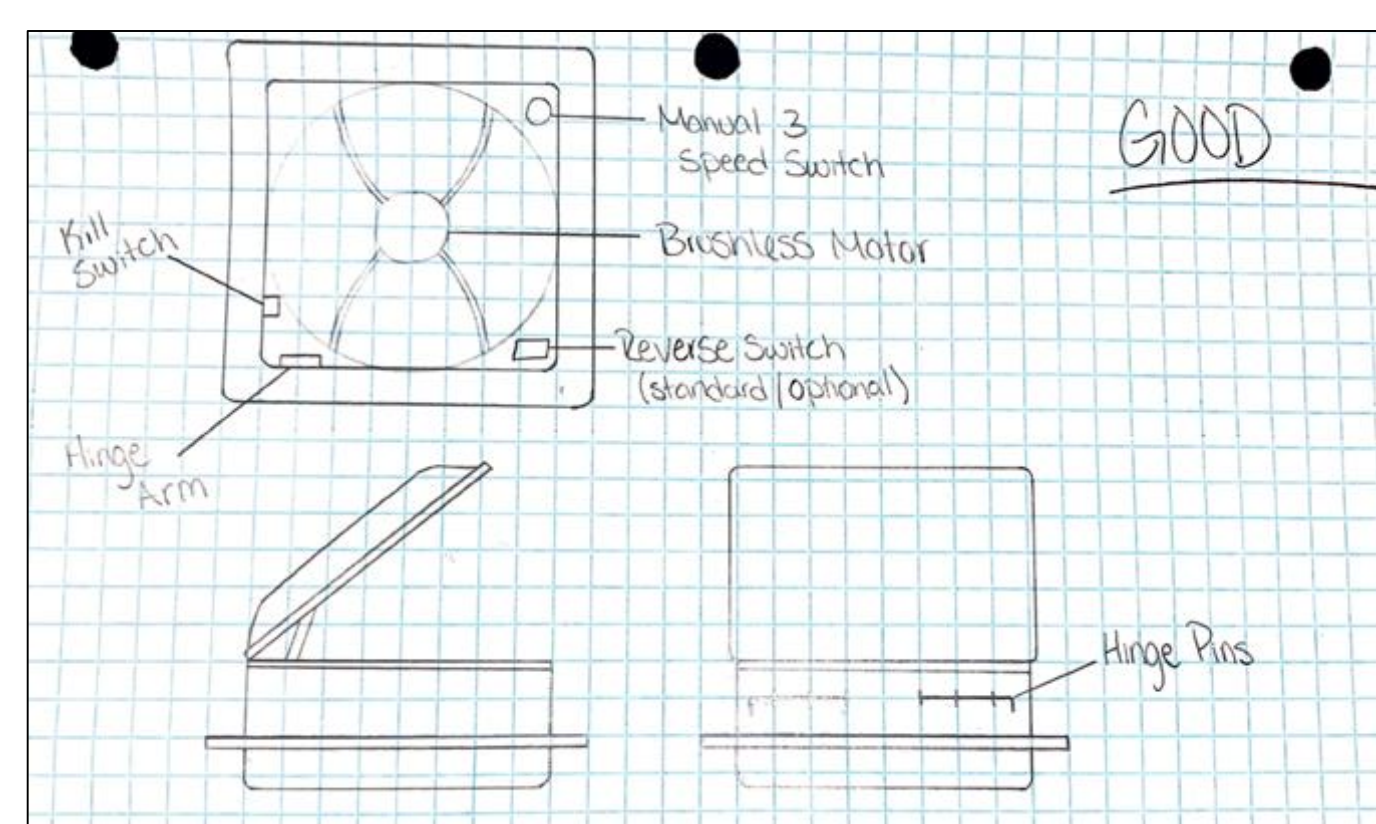
Table 1: Needs

Table 2: Specifications

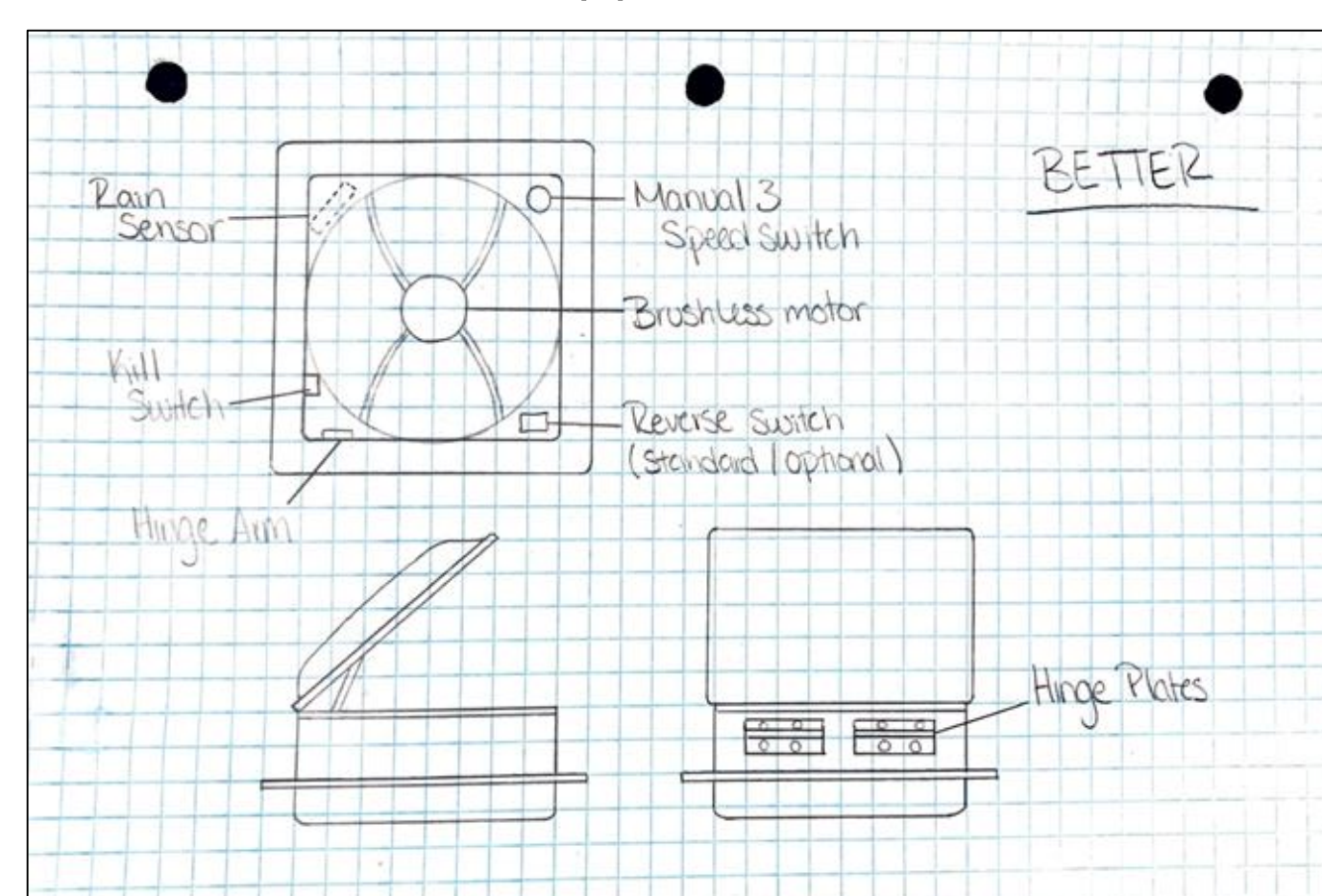
Customer Needs	Specifications
Reduce Complexity	Noise <50dB
Reduce Noise	14"x14" Frame
Connectivity	Roof Thickness 1/4"-8"
Universal Fit	12v Motor
Good, Better, Best Tier System	Reduce SKUs by 75% in Finished Goods

DESIGN CONCEPTS

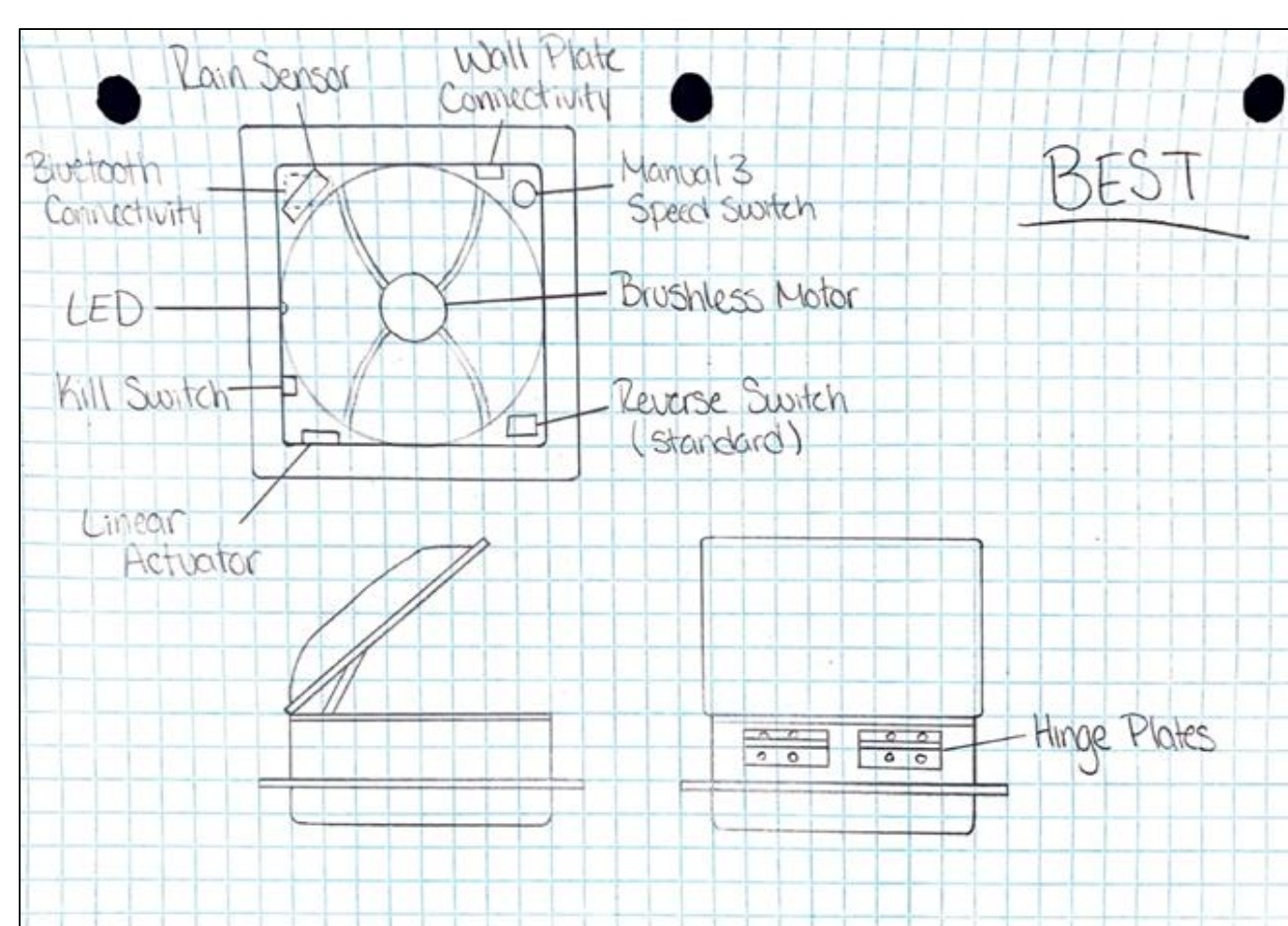
The team created a few concept ideas for the new roof vent design. Three designs needed to be selected for the three-tier system (Good, Better, Best). The designs needed to be spacious enough to fit in all the extra features of the vent. Some concepts had the fan centered and off-center. The centered fan design was selected. A type of motor had to be selected that would help to reduce the noise, so a brushless motor was chosen. All designs consistently had the common components including the reverse switch, kill switch and speed switch. A Bluetooth modular device and LED lights or an LED bulb were included for the better designs. Figure 2a-c show one set of the tiered ideas.



(a): Good



(b): Better



(c): Best

Figure 2a - c: Three Tier (Good, Better, Best) Initial Concept Drawings

DESIGN ITERATIONS

An initial design is shown in Figure 3. The fan design took several iterations through the building stage. Some issues arose; including printing parts that were too thick, switches that were loose fitting due to incorrect hole size, the motor mount had to be changed to hold a motor that Dometic wants to use. The lid thickness was reduced to have less bulkiness and overall weight. The building stage was a trial-and-error process, and the parts were redrawn to be reprinted to overall work better together. Figures 3-5 show some of the design errors that required fixing.

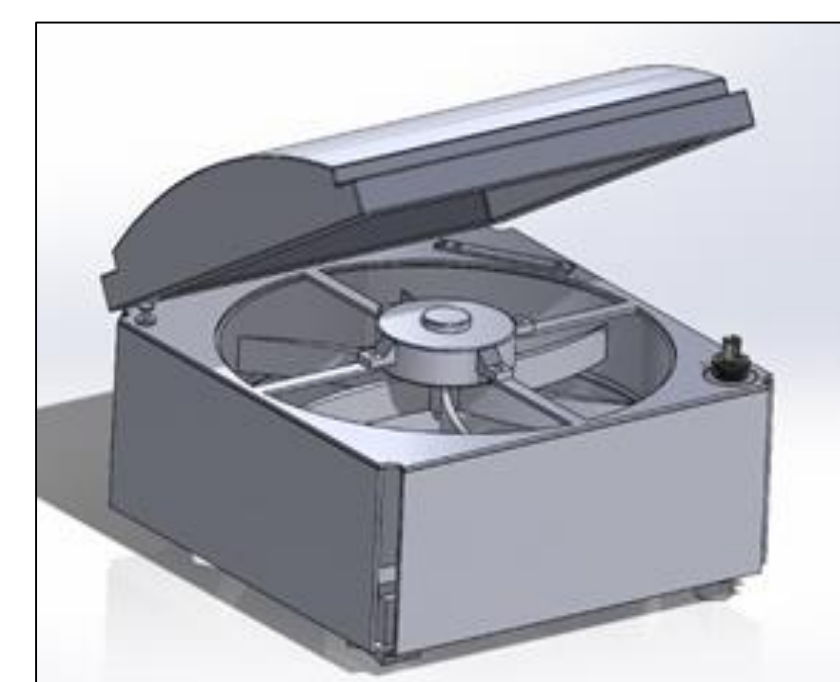


Figure 2: Initial Concept Model

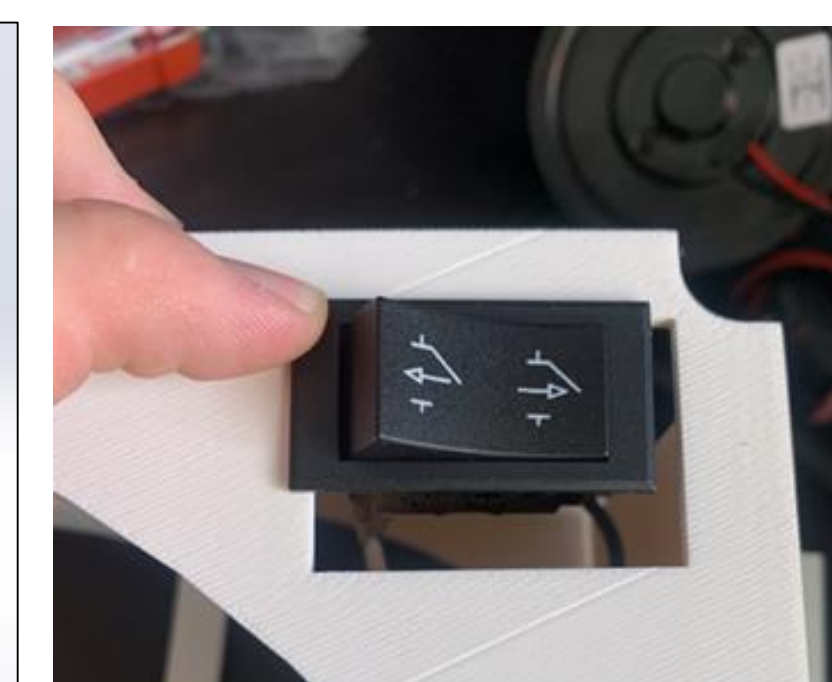


Figure 3: Reverse Switch Size Issue



Figure 4: Printed Parts too bulky



Figure 5: Kill Switch Hole Size Issue

TEST RESULTS

The fan design still needs to be updated based on fitment, Figures 6-7. This includes correcting the hole sizing for the motor mount switches and making the lid less thick, so the overall design is not as bulky. The fan works and operates when connected to the motor. And the fan blades produce good air flow. The noise however is not reduced as much since the old motor is still being used.



Figure 6: Bottom View



Figure 7: Top View

FINAL DESIGN

The final design of the New Fantastic Roof Vent, Figures 8-9, includes proper frame mounting and switch hole sizes, an added rain hood and rain sensor. There will also be a thinner lid to help make the overall design less bulky as well as reducing the weight. Dometic's brushed motor that is used in other fan models is used in this design.



Figure 8: Top View of Final Fan Design



Figure 9: Bottom View of Final Fan Design

CONCLUSION

The team has designed a new roof vent for Dometic. The team utilized the 6 design phases to develop a functioning, quieter fan with added connectivity. The part count was reduced by combining previously separate parts into one. The motor has switched from a brushed to brushless motor. The frame was designed to fit into the typical 14"x14" frame for RV roofs. The fan has successfully been assembled and the team believes that this design will meet the needs of the customer as well as the needs of Dometic.

LESSONS LEARNED

During the process of the project, the team had learned:

- Communication between the team and sponsor/manager is essential.
- Time management is very important.
- The first concept won't always be the correct one.
- Brainstorm as many possible ideas.

ACKNOWLEDGEMENTS

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