# Mastercraft RV Sofa-Sleeper

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## INTRODUCTION

Mastercraft Inc. is the world's largest maker of recreational vehicle furniture. The company began in 1971 in Shipshewana, Indiana. The current designs for convertible Sofa Sleepers are unique and innovative. However, the company was in search of a way to make their product even safer by bringing new ideas and concepts into the industry. The newly conceptualized design created by the team allows for the Sofa Sleeper to be lighter, have a smoother transition and be aesthetically appealing. The Sofa Sleeper must meet all criteria and specifications set forth by the sponsor, while incorporating new features. Through interviews, concept generation, testing and implementation the design team created a Sofa Sleeper that would fully satisfy the needs of customers. The team designed a product that has smooth motion and at utmost importance is safe for the user to convert with ease.

## PROBLEM STATEMENT

Create a new convertible Sofa-Sleeper for use in a recreational vehicle that is safe, lightweight. The design should also be innovative, aesthetically pleasing and easy to use by all ages.

## CUSTOMER NEEDS

- Non-Hazardous
- Less Bulky/Lightweight
- Innovative
- Easy-to-Use
- Smooth Motion
- New Features
- Aesthetically Pleasing
- Comfortable

## SPECIFIC REQUIREMENTS

- 75" Bed Length
- 22" Seat Depth
- 18" Seat Height
- 18-19" Back Rest
- Supports one person for single size, 300 pounds or less.
- Supports two people for double size, 600 pounds total or less.
- Factor of safety of 2

## INITIAL DESIGN

The team used a weighted decision matrix to choose a design concept, after brainstorming multiple. Figure 1 shows a cardboard design of the concept the team chose.

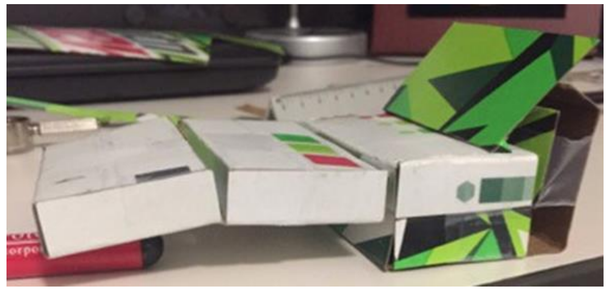

Figure 1: Cardboard Design Prototype

## SYSTEM-LEVEL DESIGN

The Sofa Sleeper system is comprised of four individual systems that enable it to function. There is also an additional system that is added for functionality and user satisfaction. The four functional systems include the mechanism (Figure 2), frame/support system (Figure 3), cushion structure (Figure 4), and sleeper support legs (Figure 5). The added system is the drawer (Figure 6).

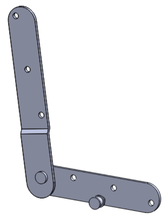

Figure 2: Click-Clack Mechanism

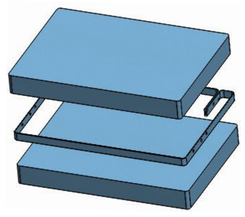

Figure 3: Cushions and Inner Support

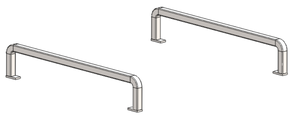

Figure 4: Frame

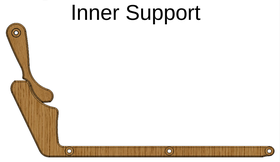

Figure 5: Leg Assembly

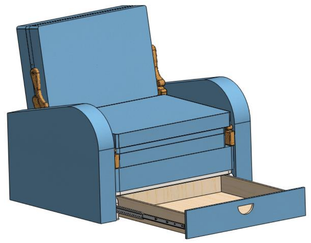

Figure 6: Drawer Configuration

## DESIGN CONCEPT

Figures 8 and 9 are the final SolidWorks models for the team's final Sofa-Sleeper design.

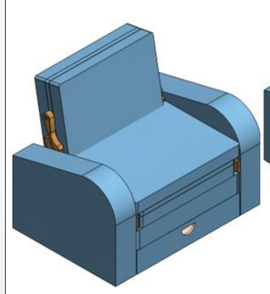

Figure 7: Sofa Position

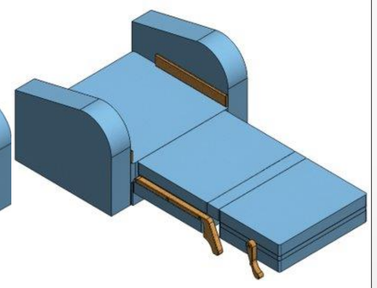

Figure 8: Sleeper Position

## TEST RESULTS

The team ran Finite Element Analysis (FEA) on the final design of the frame and did physical testing of the final prototype. Shown in Figure 9 is FEA testing. Applied is a 1000-pound force achieving a factor of safety of 1.9.

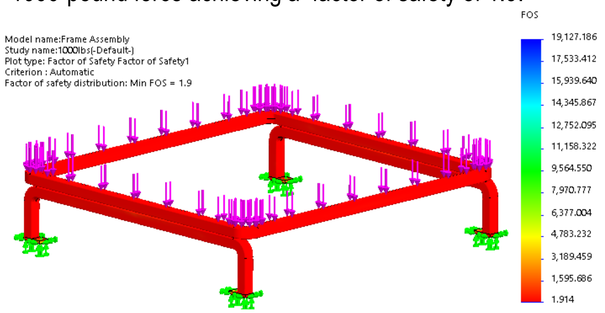


Figure 9: 1000 lb. Applied Force

## FINAL DESIGN

PICTURES OF FINAL PROTOTYPE INSERTED HERE.

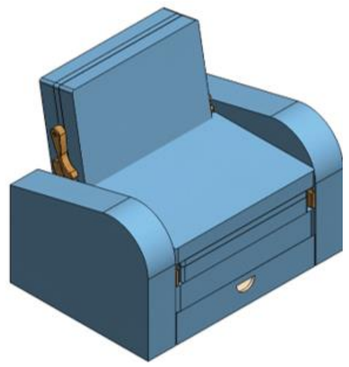

Figure 10: Finished Prototype Placeholder

## CONCLUSION

The team worked together to create a product that met all customer needs and could be implemented into various markets. The design has versatility and functionality that will allow for successful use in different implementations. Through design iteration, brainstorming and problem solving the team succeeded in creating an innovative, safe, easy to use and lightweight Sofa-Sleeper for the customer.

## LESSONS LEARNED

- The team learned how to communicate with a outside entity to effectively complete the project.
- Experienced the difficulties of the design processes as well as the rewarding aspects of creating a new product.
- Learned how to adapt to change throughout the design process.
- Learned how to communicate internally about initial ideas for the project and issues that arose during
- The team learned how to work around schedules and be flexible with meetings.
- Learned that time management, organization and communication are three of the most important aspects for success of a project.
- Learned that design iteration is the key to design success.
- The team learned that schedules and project calendars containing due dates and targets for progress are important to stay on track and hit deadlines.

## ACKNOWLEDGEMENTS

In concluding the design of this product the team would like to thank the following: Mastercraft Inc., Clifton Reynolds, Dave Toney, Doug Cline, Perry, Dr. Timothy Jenkins, Trine University, Joe Thompson, Tom Trusty, Sheri Thompson, Brian Thomas, Innovation One, Daso Custom Cabinetry, Kain Tool Inc., and Zebadiah Domer.