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Abstract

Current backpacks on the market are not well suited to the needs of college students. Our backpack addresses issues of comfort, efficiency, durability and capacity. New features include easy to use hip support, a suspension system, and optimized item storage.

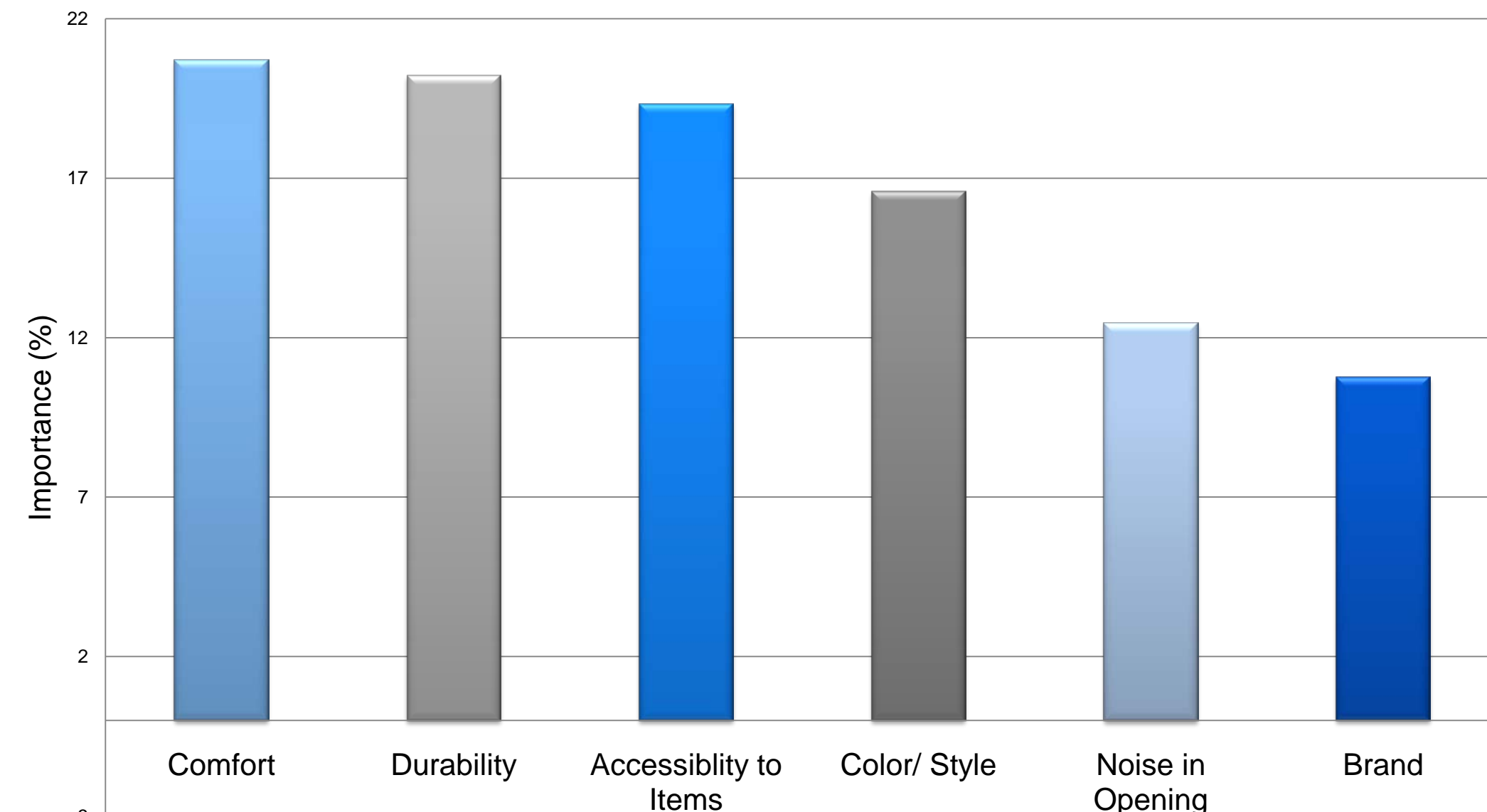


Figure 1: Results of the customer survey

Research and Testing

Several papers were reviewed which studied the physiological effects of backpack use. Our market research included a survey given to a number of students to determine the importance of a selection of features. The *JanSport Spring Break* was selected as a benchmark because it is the most popular backpack for our target market. Our Laboratory testing measured critical design properties such as the damping coefficient of foams, percent load distributed on the shoulders, and the center of mass location of the benchmark.



Figure 2: Failed buckle from tensile test on the benchmark

Design Features

- Spring-Damper System
- Hip Clasp
- Modular Pockets
- Filing system in main compartment
- Optional protected laptop compartment
- Optional insulated lunchbox
- Silent access



Figure 3: Artist's rendering of our backpack

Weight Distribution

Research indicates that the optimal location to support weight is at the hips. Unfortunately, most hip straps are difficult to use and often ignored. Our design implements hip clasps that can be easily clicked into place when the user puts the backpack on. FEA indicates that under typical loading conditions ABS plastic will provide a safety factor of three.

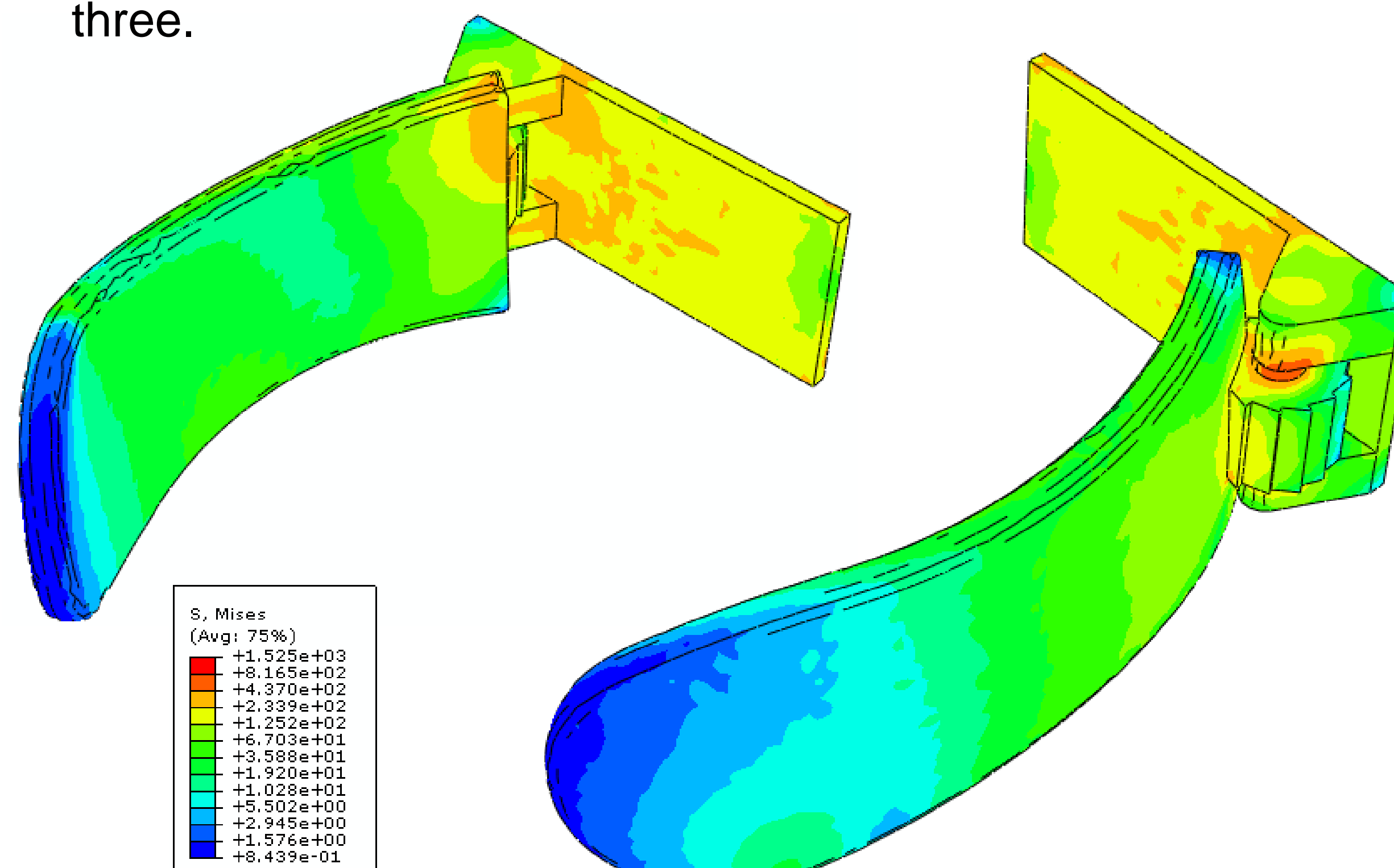


Figure 4: Stress analysis of the hip clasp (Psi)

Suspension

Walking, running, or climbing stairs causes conventional backpacks to jostle uncomfortably. To isolate the backpack from the back, our design uses two vertically sliding Delrin parts connected by a spring and foam damper. The spring-damper acts like the suspension of a car by absorbing the vertical motion of the user. By isolating jostling from the user and keeping the backpack stable, the user experiences a more constant weight and has a more comfortable experience. This design was demonstrated with a proof of concept model.

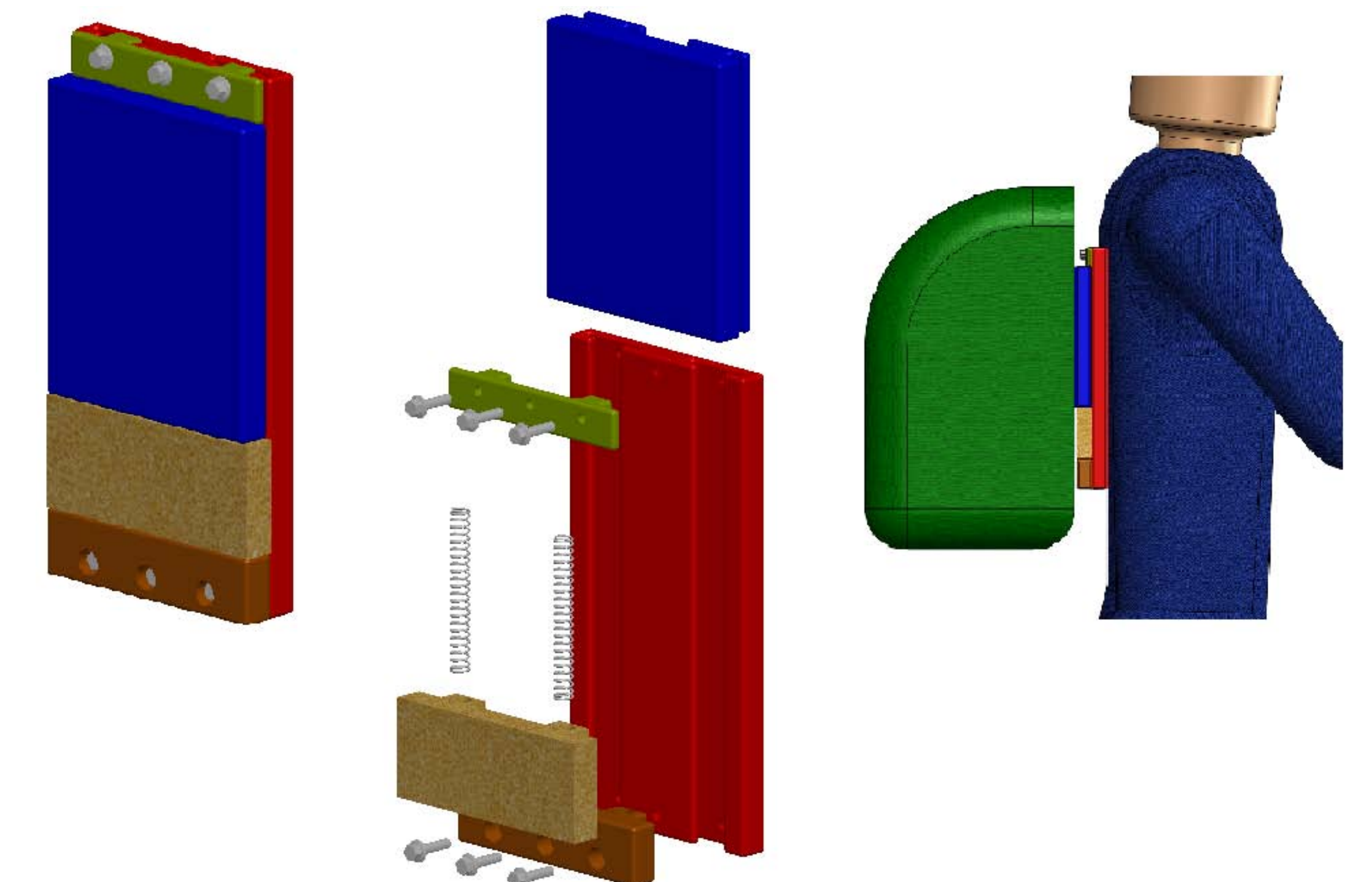


Figure 5: CAD modeling of the spring-damper system

Conclusions

Our backpack design makes several improvements tailored to college students. The hip clasp combined with the spring-damper system offer superior comfort for students on the go. Modular pockets and a filing storage system are designed for efficient storage and retrieval of documents and items. This design lays a foundation for future iterations into a production-ready product.

Acknowledgments :

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References :

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- Pascoe, David D. Influence of carrying book bags on gait cycle and posture of youths, 1997.