Objective

Concept Generation

Prototype and Testing

Test Results and Future Work

Traditional rolling bags only have two wheels. This allows for maneuverability, but requires that the user apply significant upwards force while pulling the bag, which can be uncomfortable and inconvenient. A rolling luggage with extendable, additional legs could support its own weight and significantly improve the overall user experience.

At any given moment in the US, there are around 7,500 flights in the air. But that is not how many flights happen per day. Some of those 7,500 flights are for moving stuff (not people), or military (not civilian), and so on. The National Air Traffic Controllers Association reports that there are, on average, between 25,000 and 30,000 passenger flights in the US per day. (http://www.natca.org) Let’s estimate conservatively and pick 25,000. Estimate that each airplane on average has 20 rows of people and each row can hold 5 people on average. Then another guess is that on average a flight is 75% full, so we have:

25,000 * 20 * 5 * 0.75 = 1,500,000 people per day.

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For the initial prototype, the team modified an existing bag to focus on the addition of legs rather than the design of the luggage as a whole. The legs are attached to the existing framework of the bag, which was enhanced to accommodate the additional stress. The support bars are made from aluminum tubing because of its high strength to density ratio. The design implemented prefabricated incremental locking hinges. The next step in the design process would be to integrate the legs into the manufacturing process of the bag. This process could include internalizing much of the frame as well as the hinges, making the legs more streamlined and less obtrusive and thus requiring fewer supports because the bag could be engineered with the applied loads in mind. Additionally, the addition of a lock control mechanism in the handle would significantly improve the ease of deployment of the legs and wheels. Implementing these improvements in a mass manufacturing setting would reduce prices and provide resources needed to optimize the design. Throughout the design process, the most useful steps towards a successful prototype were House of Quality, Concept Generation, and DFM&DFA.

Based on the research which our team has conducted, the limit which flight companies set for their customers are 50lb. There are already 2 existing wheels on the bottom of the luggage which support the 50 lbs. Therefore, our attachment needs to support a portion of that force, which in worse case would be the entire force. Based on the research which we have done, average user will hold the luggage in a way in which there will be 100° between the folding component. The 50lb are set on the cross bar vertically as the image to the right depicts.

Based on the results from the Finite Element Analysis, the additional support of the luggage is capable of supporting the 50lbs of the luggage. As the Von Mises results shows the maximum stress is applied to aluminum with 3.1x10^4 psi which is less than the maximum aluminum yield strength.