

Project Overview

The goal of the project was to optimize the performance and minimize baggage jams of the Checked Baggage Inspection System (or CBIS) at the Charlotte Douglas International Airport through Mechanical Improvements.

Scope of project included:

- Design, build, testing and implementation of the Tilt Table
- Design, build, testing and implementation of the Slide Table

General Requirements

- Design, build and test the Tilt Table and Slide Table.
- Create models in SolidWorks with alterations for improvement of selected mechanical areas within CBIS.
- Analyze drafted models and create prototypes using purchased materials to function in designated areas.
- Ensure prototype is designed to specifications and able to be installed onsite.

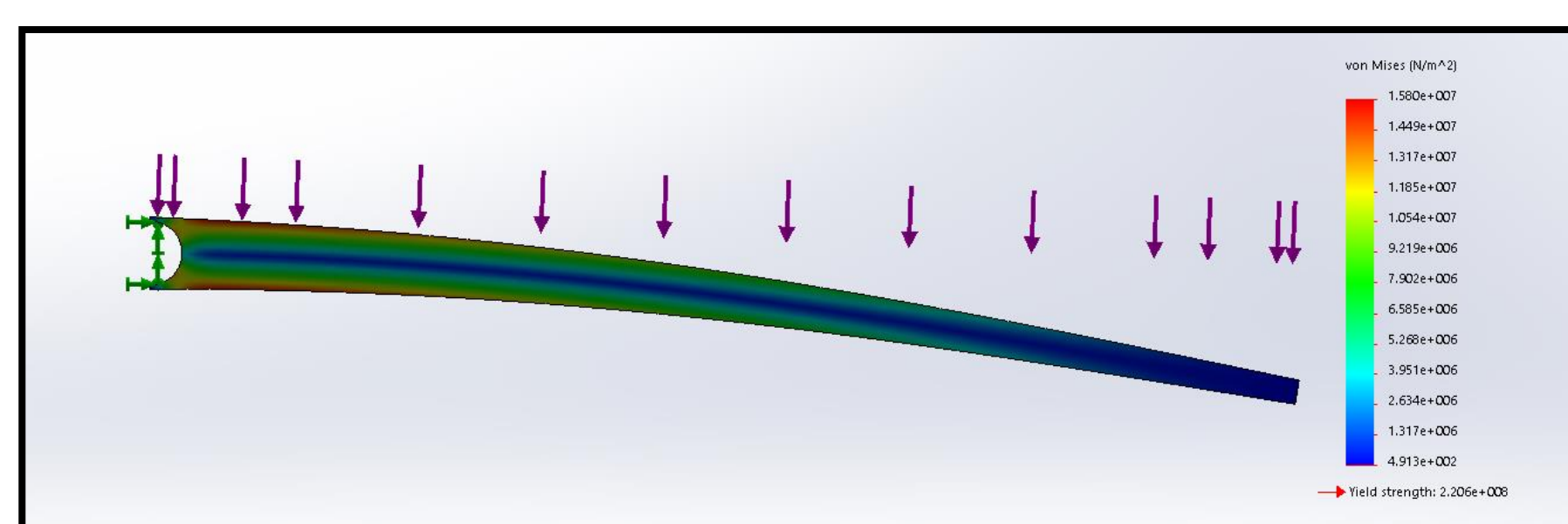
Performance & Testing

Performance Specifications

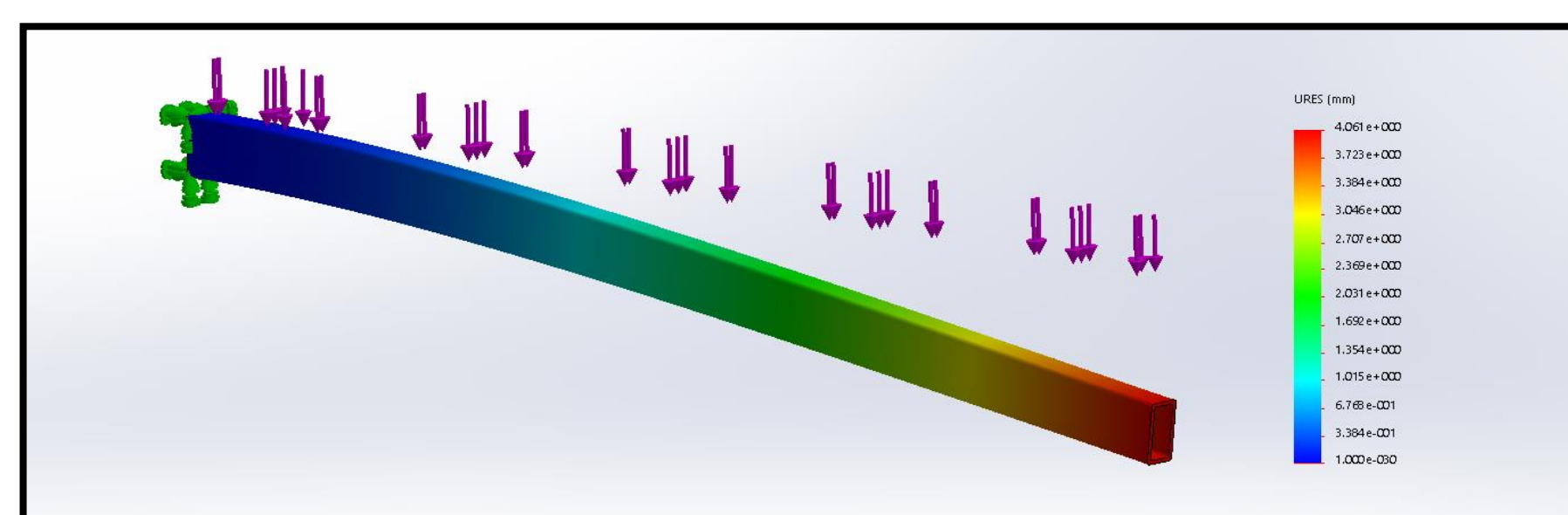
Designed and fabricated tables must allow seamless transfer of bags from upper belt to lower belt without jams on either belt. Tilt table, slide table and any other determined mechanical designs must be ready to install without modification and simple maintenance. Any incomplete mechanical projects will be prepared for easy transfer to next design team.

Performance Verification

- Stress Analysis: Finite Element Analysis (FEA) to ensure material strength with stress of weight distribution upon the design
- Feasibility: Designed to proper specifications based on current tables. Easy interchangeability of rollers for maintenance.
- Design of Experiments: Test trials were created to analyze functionality of tables through Minitab to eliminate bias.

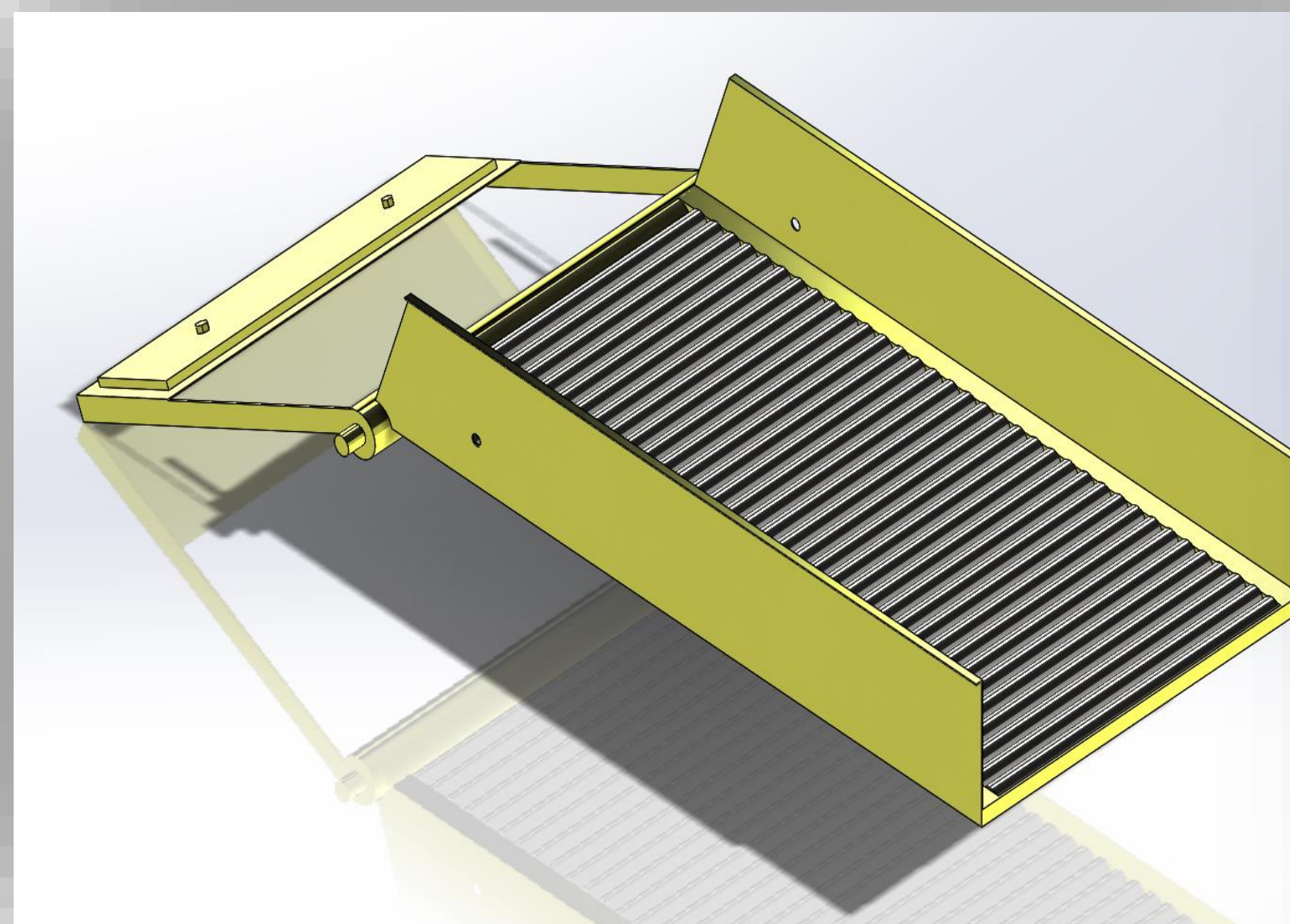


Strain of Support Arms



Displacement of Counterweight Arms

Design Methodology

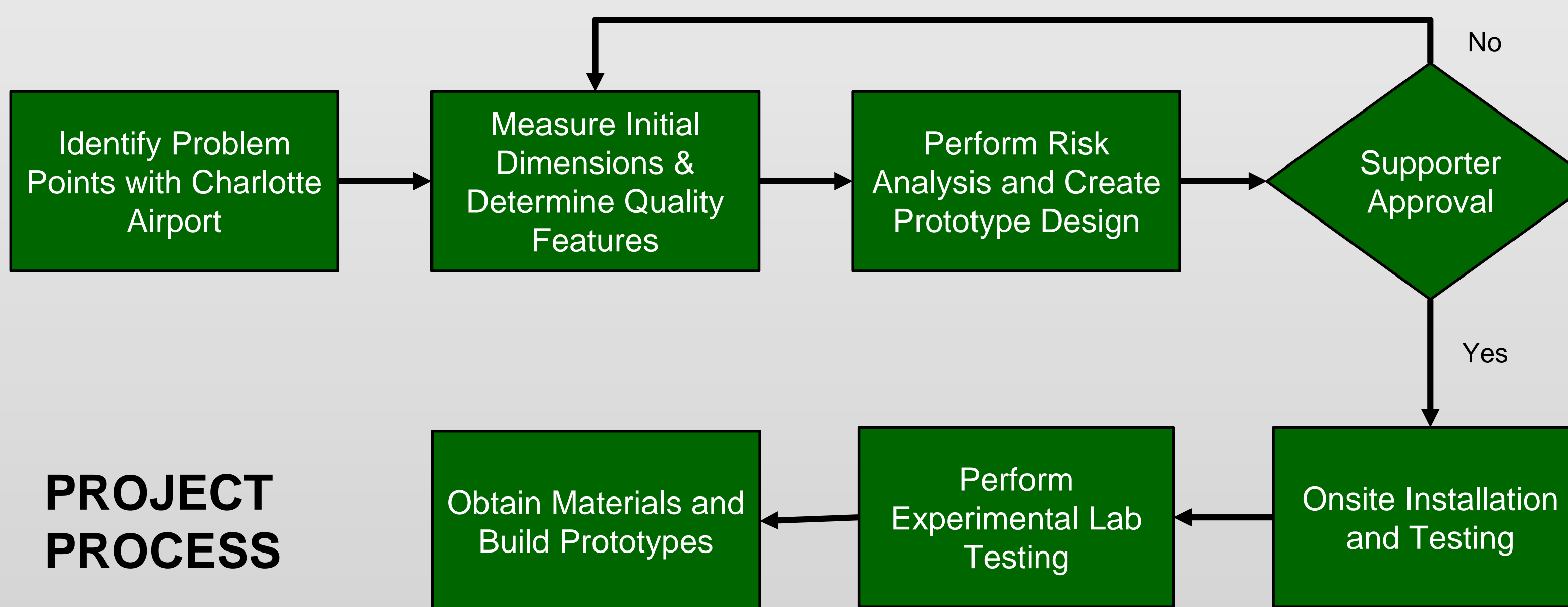


Design Features

- Counterbalance with static calculations to ensure stability and angle
- Replaced excess metal with rollers to improve dynamics of any luggage bag

Design Material

- Carbon steel was the selected material in order to flex and withstand fatigue
- Welds were used to connect the steel components



PROJECT PROCESS

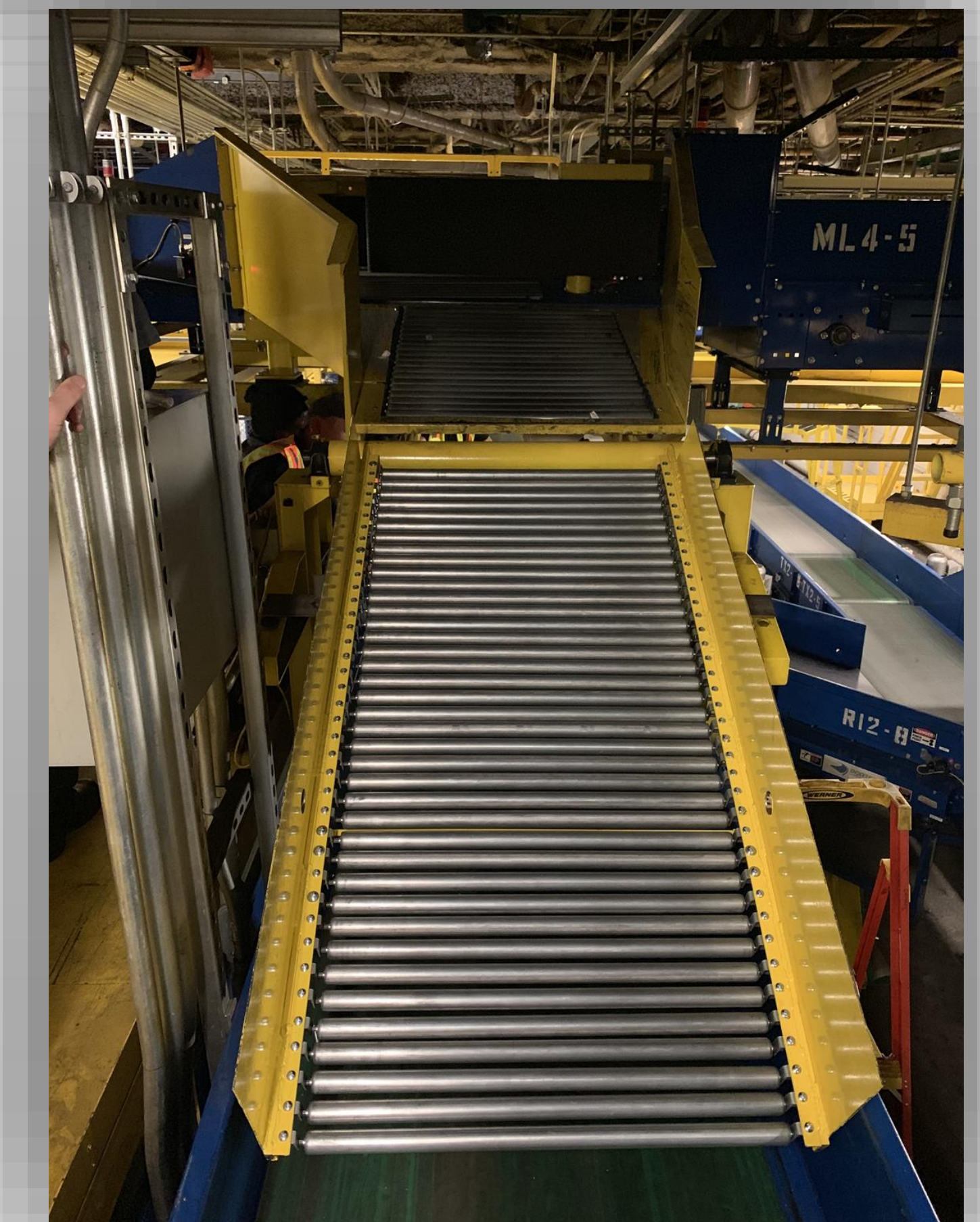
Install Process



Slide Table Installation completed February 5th 2019

The team was able to save CLT significant resource allocation expense by increasing utilization as result of the tilt table modification.

Charlotte Douglas has not encountered problems since install.



Impact

Ease of Work

With proper functioning mechanical parts, maintenance employees can focus on other responsibilities instead of repairing and monitoring current tables.

Cost Savings

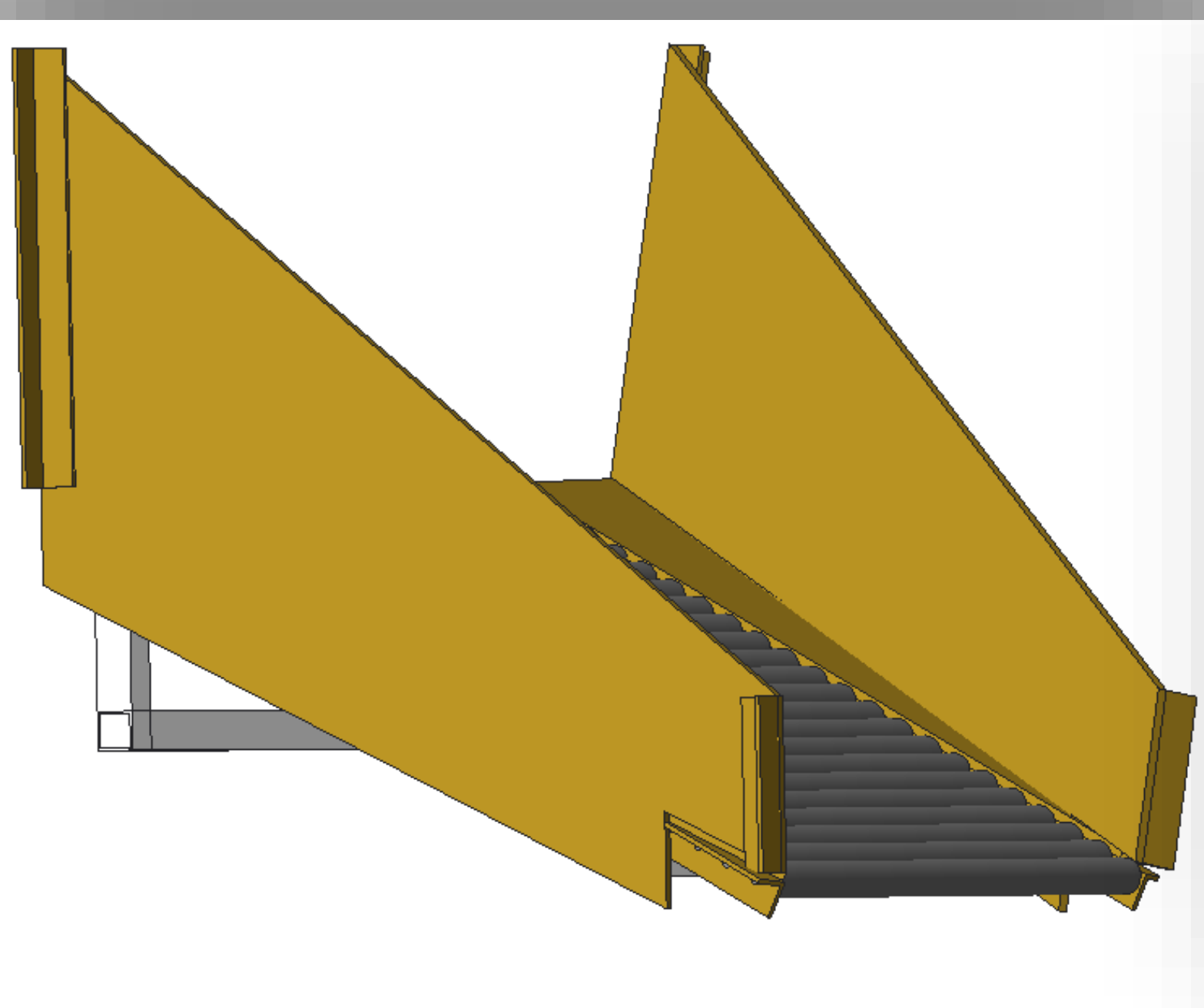
The increased efficiency will assure no maintenance employees have to stop or reroute this area of the CBIS, ensuring there will not have to be extra maintenance costs or employee costs.

Luggage Delay Minimization

Although the redesigned tables might not be a major cause of flight delays or luggage loss, the improved design could help to prevent system failure from impacting flyers and flight times. Any minimal changes to rerouting baggage as a result of a faulty table could impact many different people going to various locations.

Acknowledgements

We would like to thank the team at Charlotte-Douglas and our mentor for their support and assistance during the project.



Design Features

- Rollers for minimum friction between baggage and table

Design Material

- Aluminum was selected for its lightweight and strength capabilities