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Rolatube Deployment System

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Rolatube Deployment System

MNE 515 | **Team Members:** Zachary Allin, Zachary Ratliff, Nathaniel Trepatschko, Jeffery Wilson | **Faculty Adviser:** Dr. John Speich | **Sponsor:** Newport News Shipbuilding | **Sponsor Advisers:** Allen Cognata, Robert Heisler, Jeff Hogge, Allen Valencia, Rose Yankoski

Scope

The team has been tasked with designing a compact mechanism capable of deploying and retracting Rolatube horizontally and vertically at a controlled rate in confined spaces. The mechanism will allow for deploying tools, stringing lights, keeping wires organized, and delivering hoses and tubes.

Evolution of Design

The system has undergone significant changes since the initial design. Gear systems have been tested, multiple frame options taken into consideration, and different power methods considered. Various shelving options were also tested.

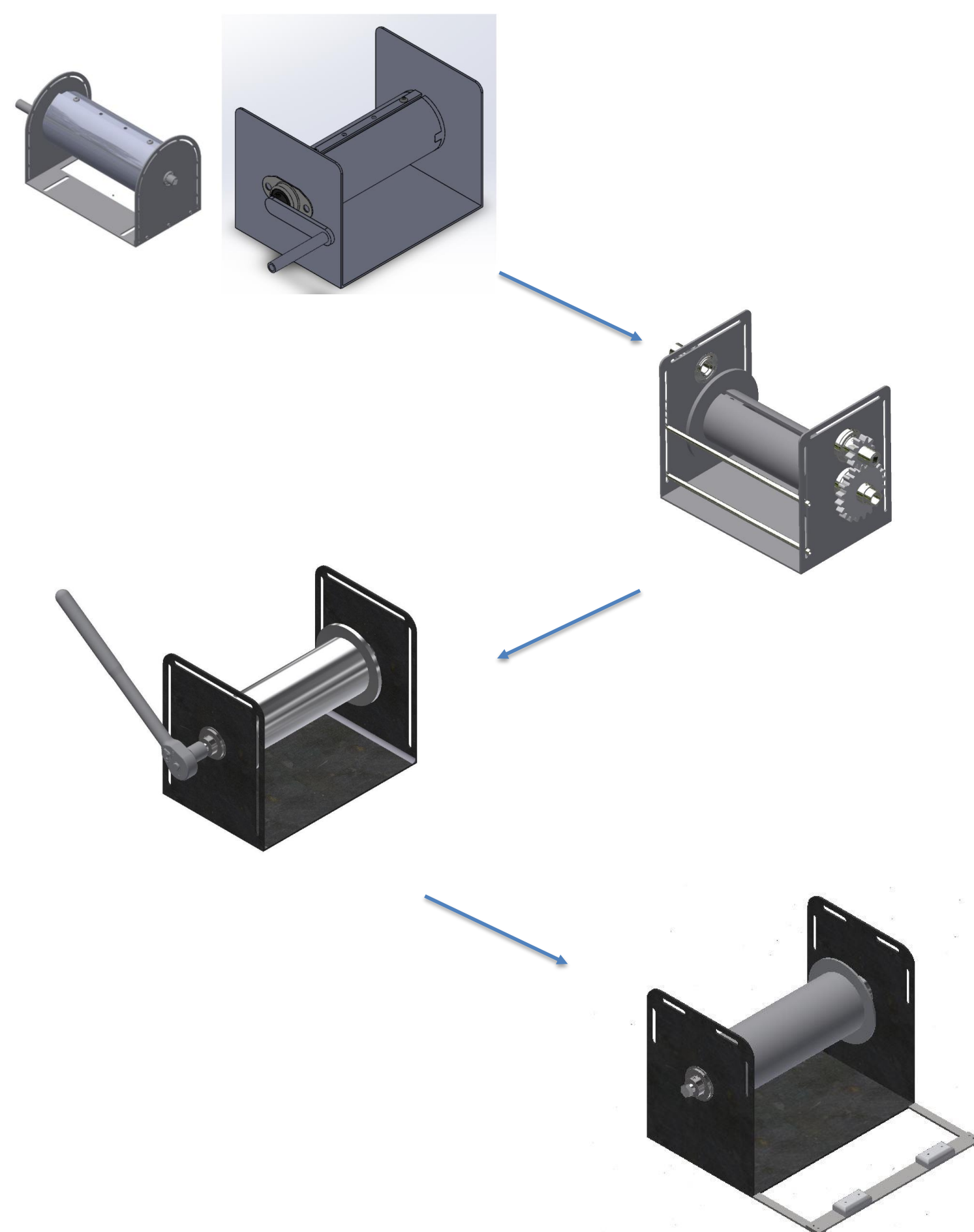


Figure 1: Design Iterations Over Time

Table 1: Parts List

PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	Shaft Screw
2	1	Shaft
3	1	Frame - Base
5	2	Shelf - Beam
6	1	Spool - Center
7	4	1/4 - 20 by 1/2 Set Screw
8	4	1/4 - 20 by 5/8 Drive Screw
9	2	Spool - End Cap
10	2	Frame - Sides
11	2	Bearings
13	1	Shelf - Support

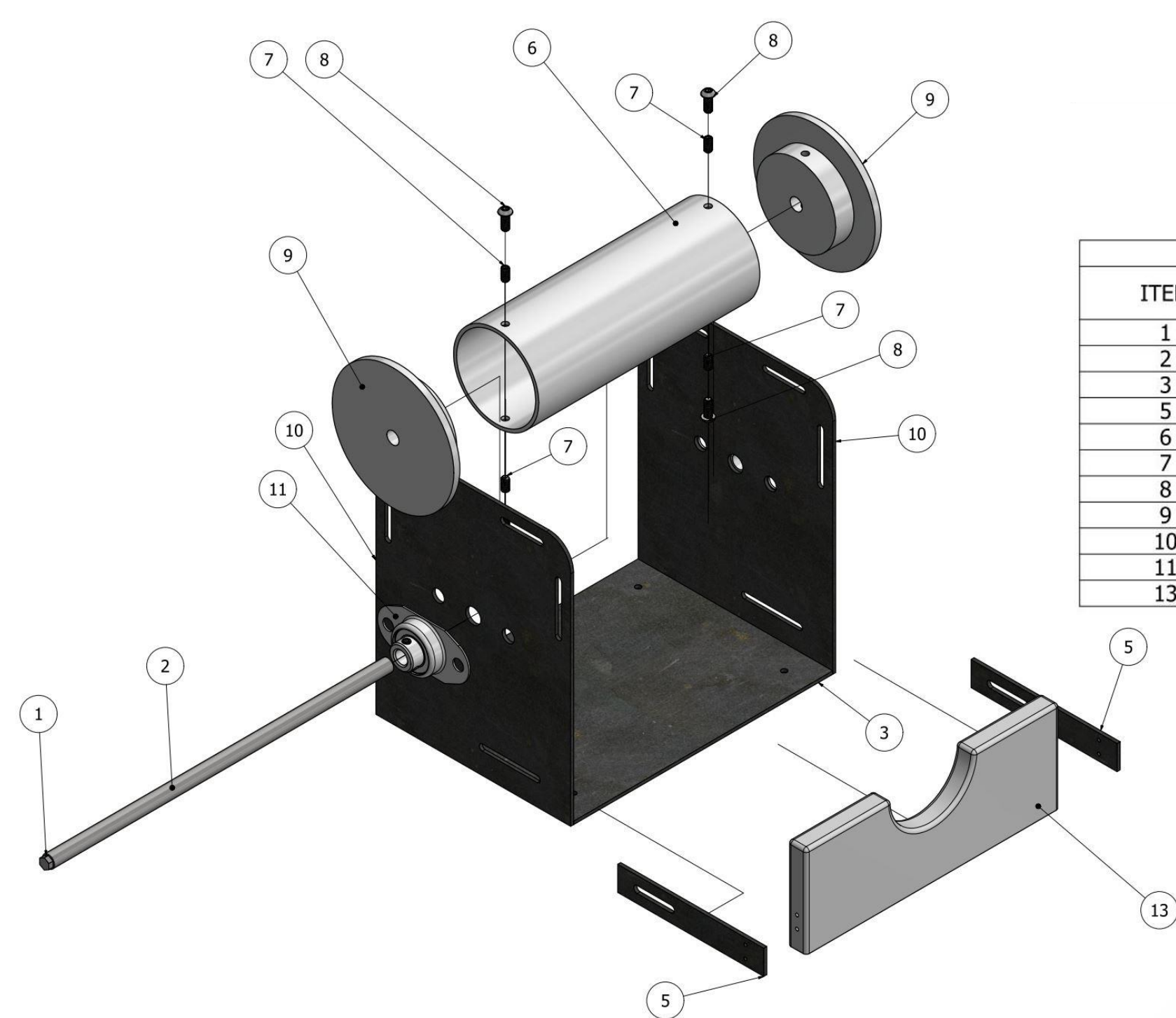


Figure 2: List of All Final Design Components

Design Constraints

- Extend and retract 11 foot sections horizontally or vertically
- Total weight <15 lbs.
- Can extend or retract in a controlled manner in <60 seconds
- Withstand 1 year of use or 100 deployments
- Withstand drops and falls
- Tubes are replaceable and interchangeable
- Ability to deploy tools and cameras
- Mountable
- Tube is detachable from mechanism

Deflection Analysis

An analysis was run on the system with the tube fully deployed. A weight of 10 pounds was placed on the end of the tube, allowing for 10.7 inches of deflection with a shelving unit attached. Exceeding this weight results in excess deflection and stresses.

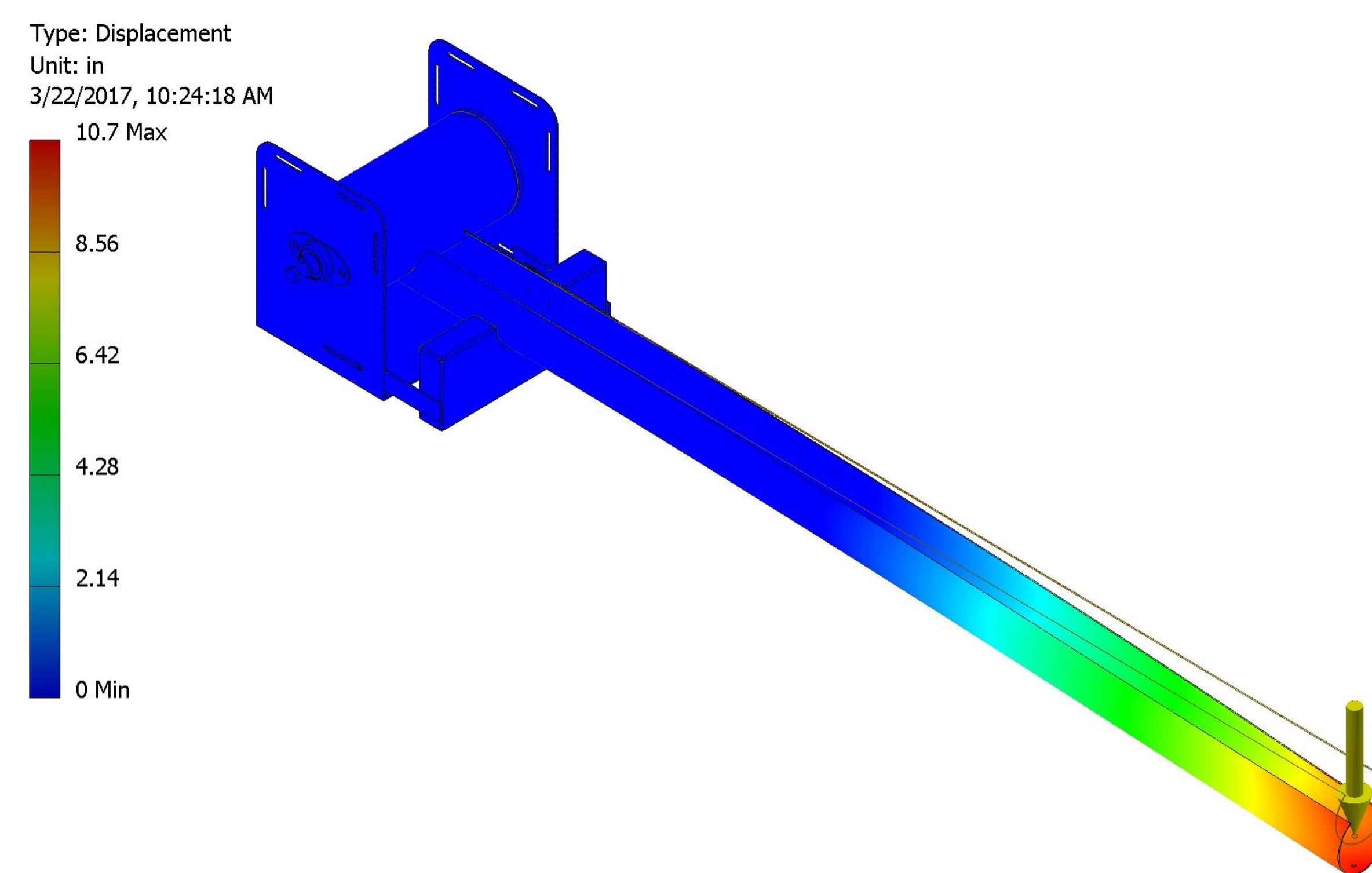


Figure 3: Finite Element Analysis of Applied Weight

Final Design

The current design is configured to allow for easy deployment of the Rolatube. The tube is attached to a spool, and a ratchet is used to extend and retract the tube. A shelf has been designed in order to reduce deflection.

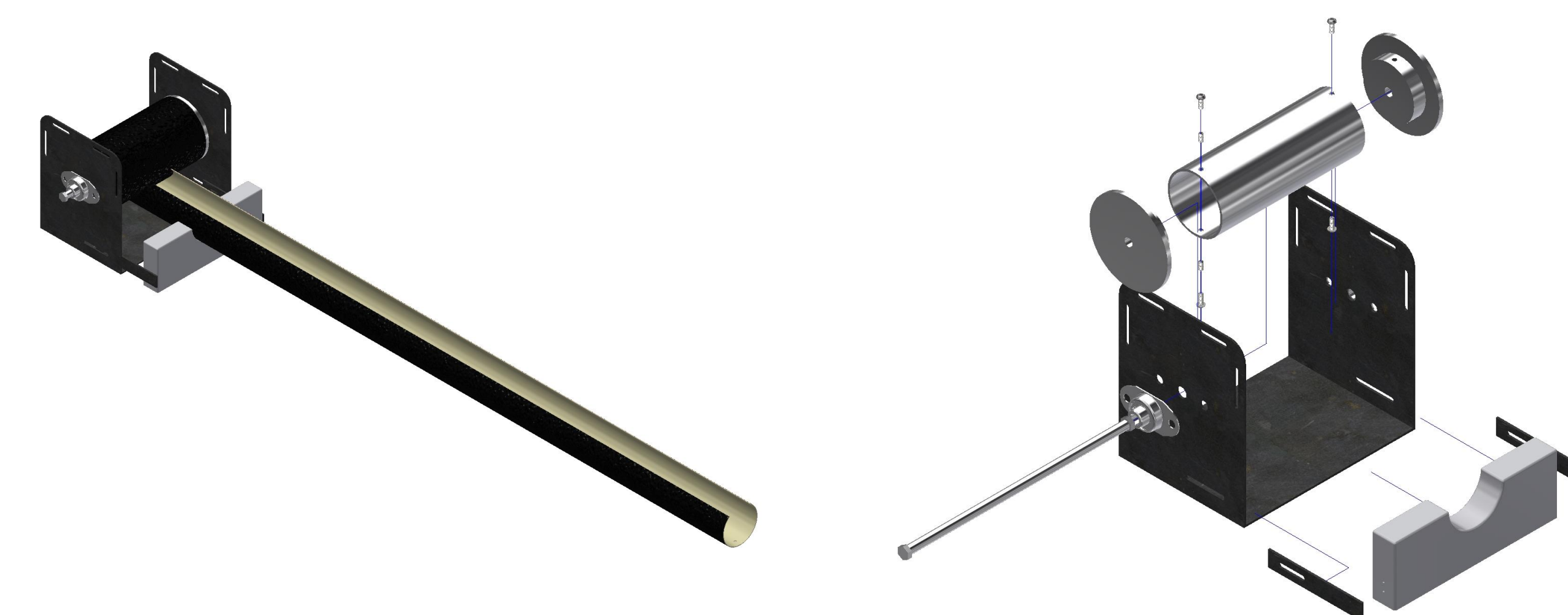


Figure 4: Current Design of Rolatube Deployment System

Spool and End Caps

Initially, the end caps were designed using roll pins to secure the caps to the spool. A simplified model was designed utilizing a lip on the end cap with set screws. This design allows for easier machining and simplifies the assembly.

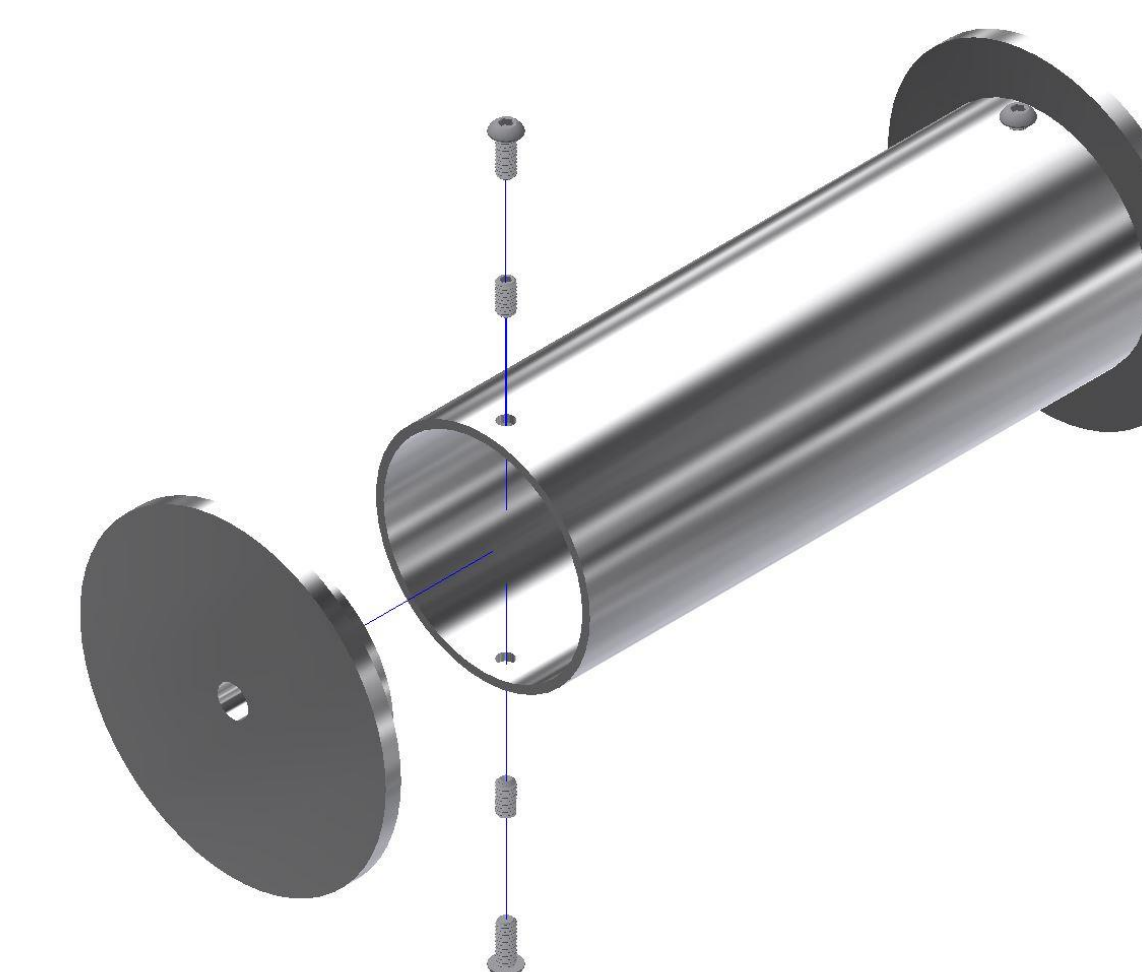


Figure 5: Spool and End Cap Design

