

Aircraft Seat Installation and Tracking

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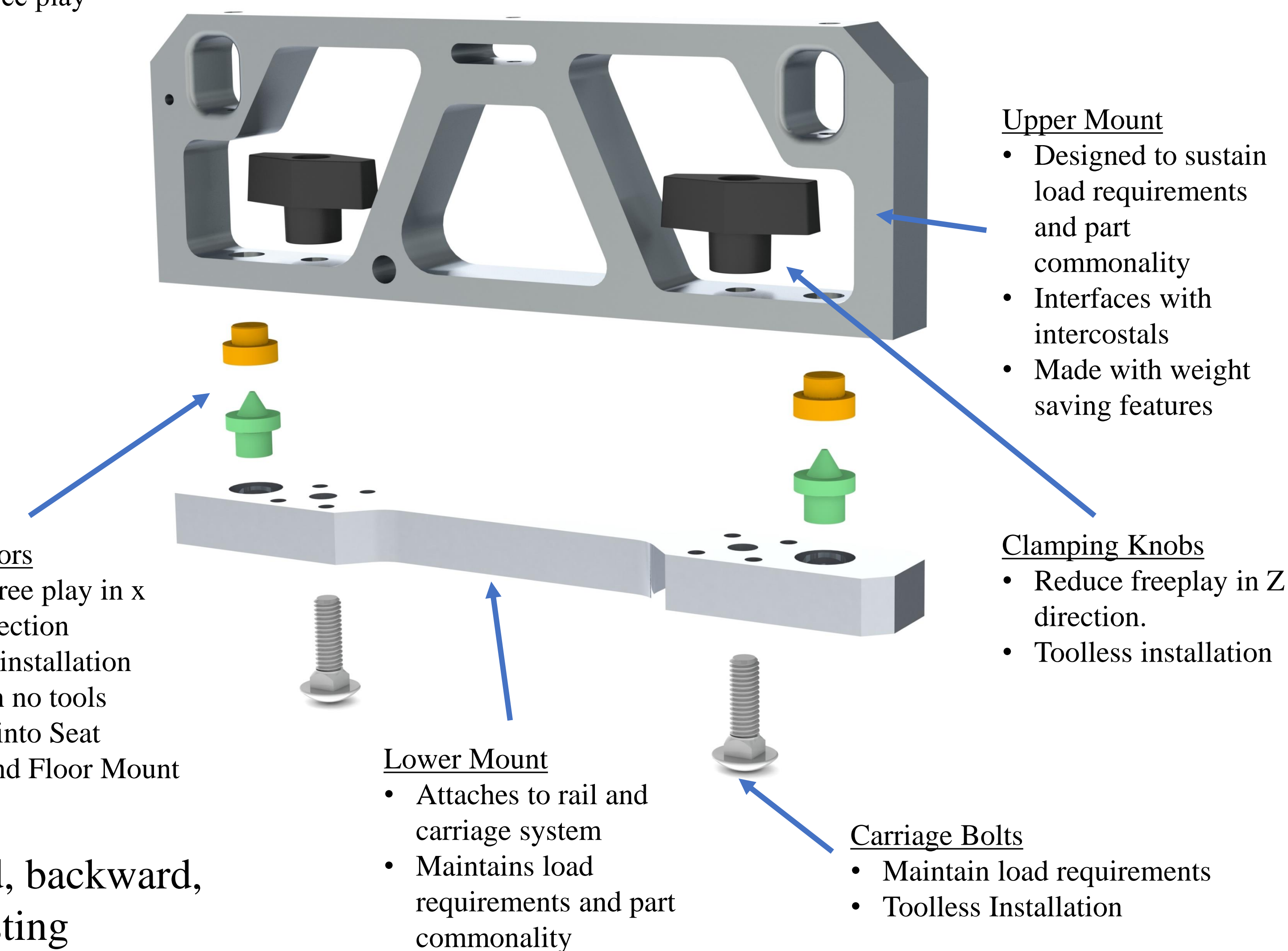
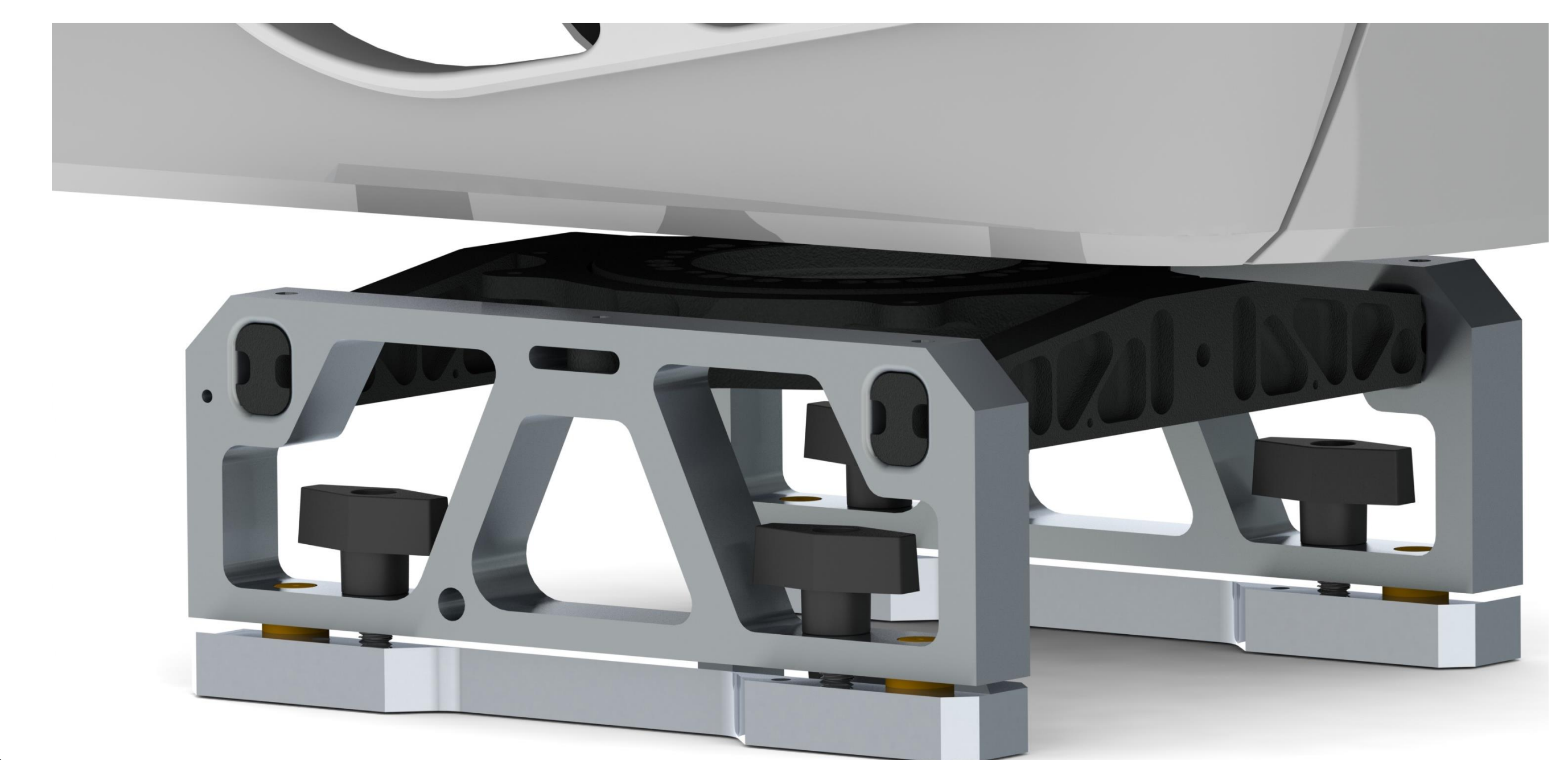
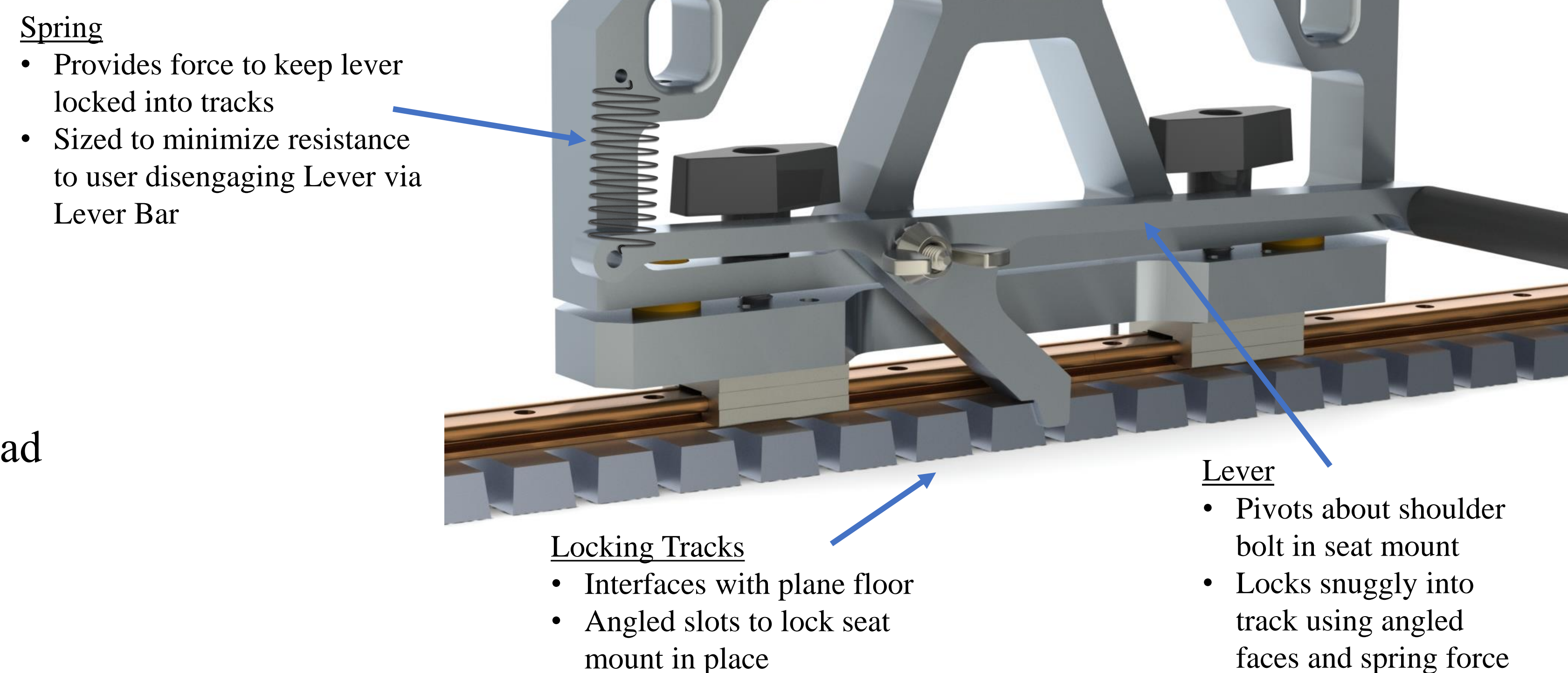
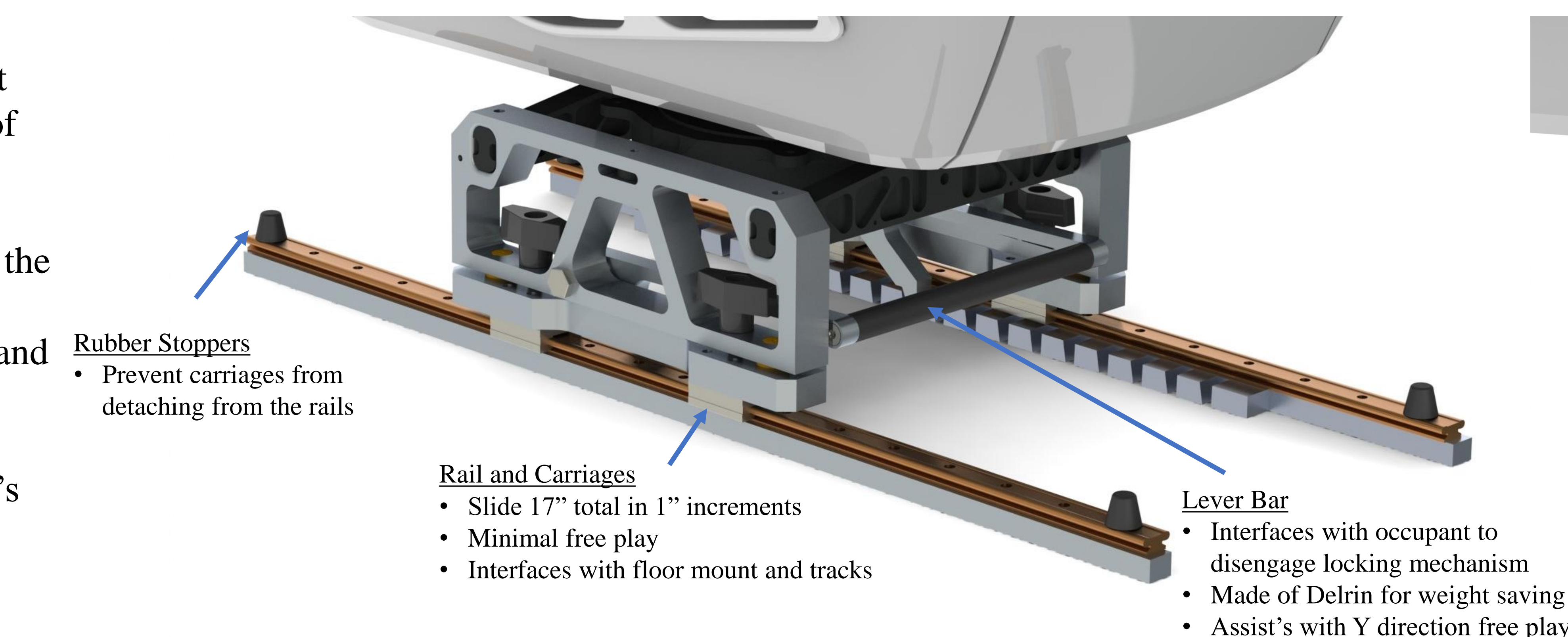
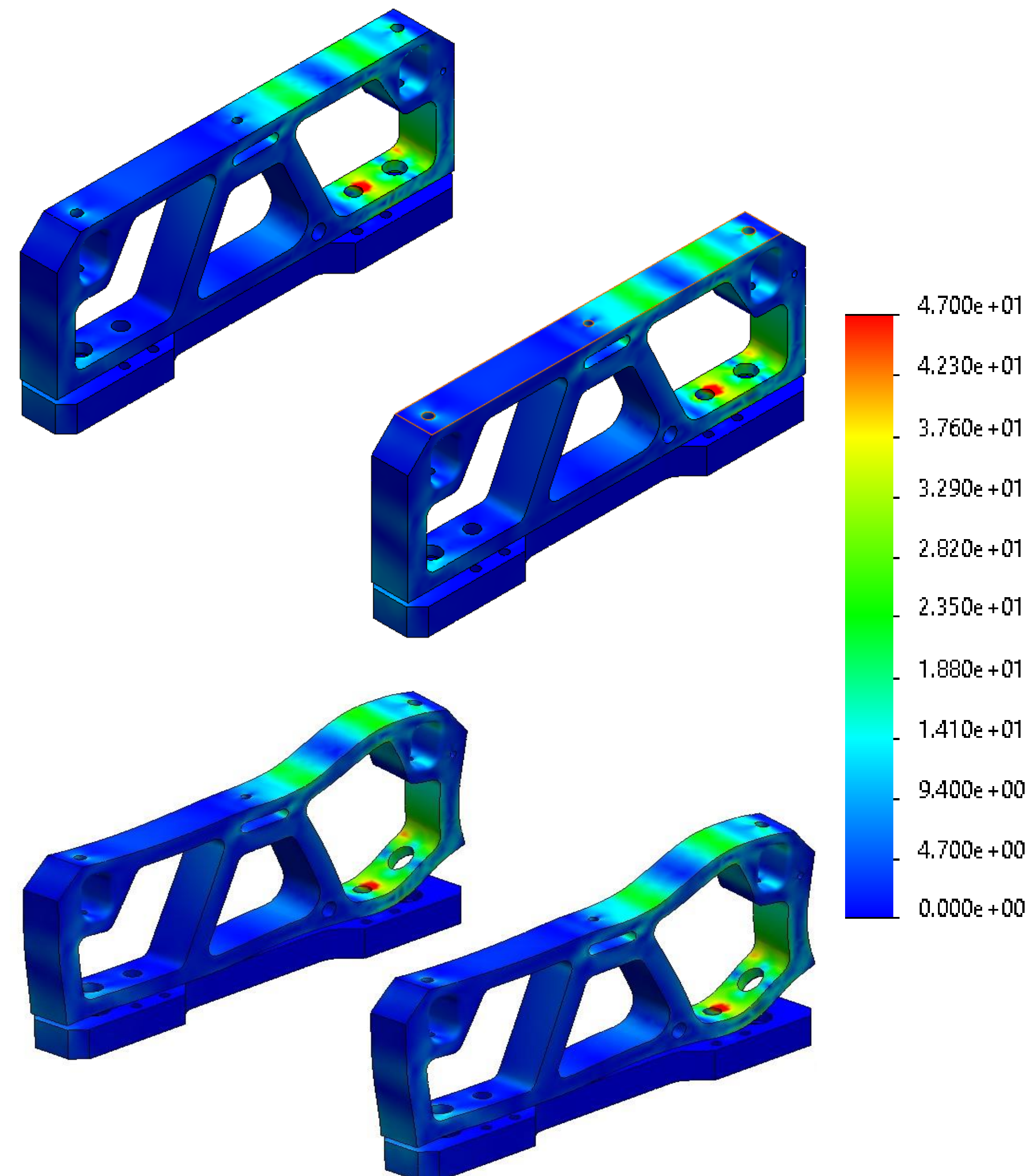
Background and Requirements

- New passenger seat mount for Citation CJ4 Gen2 aircraft
- Must have customer perception and quantitative results of minimal free play
- Meet FAA requirements for structural safety
- Seat mount installed with *no tools* in less than 1 min. for the fixed design and less than 3 min. for the tracking design
- Meet weight targets (6 lbs. for fixed, 9 lbs. for tracking) and fit within 13"x12"x4" box
- Ease of use for consumers
- Design, build, and test seat/floor mounts against Textron's current design for minimal free play

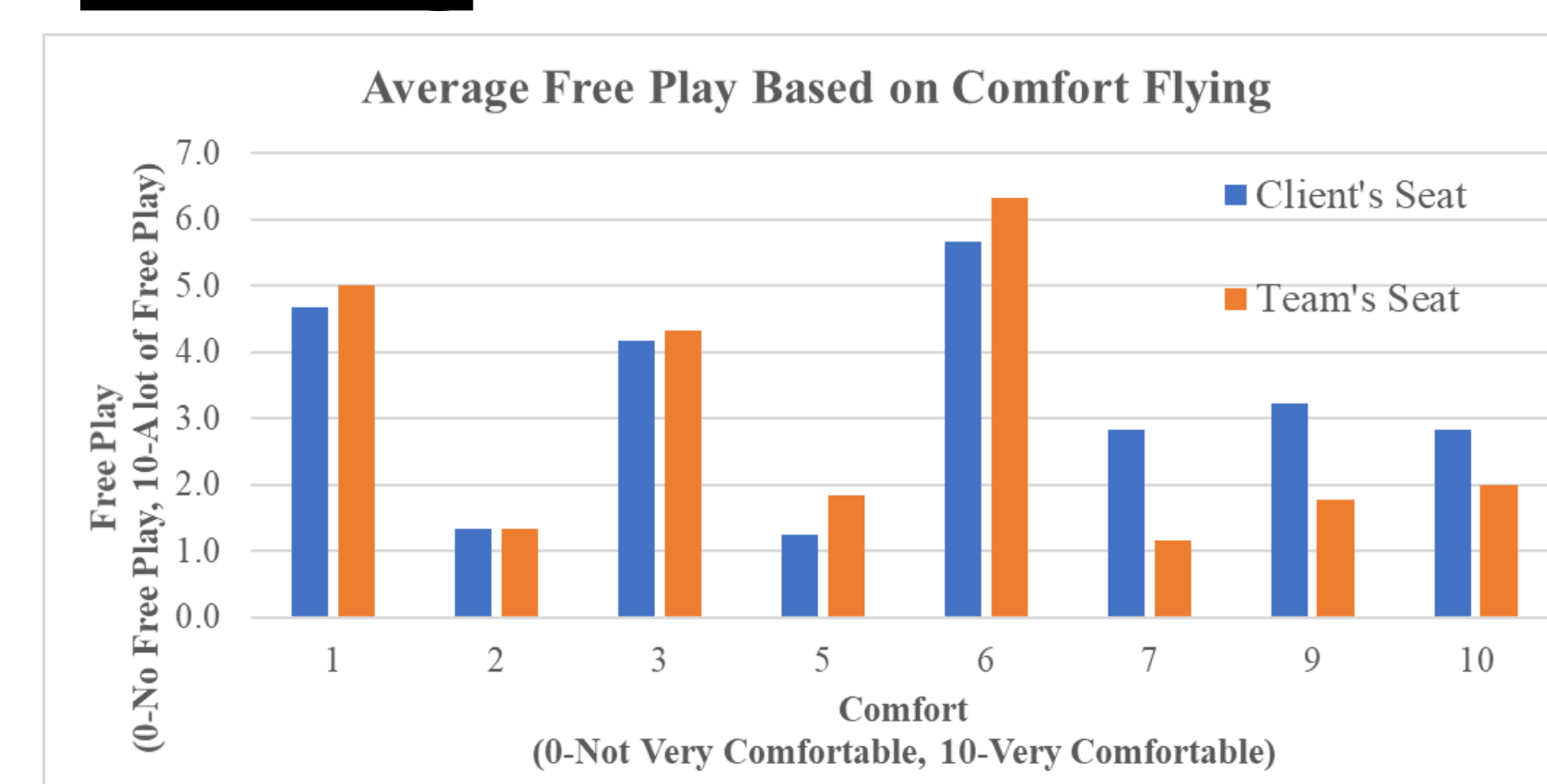


Analysis

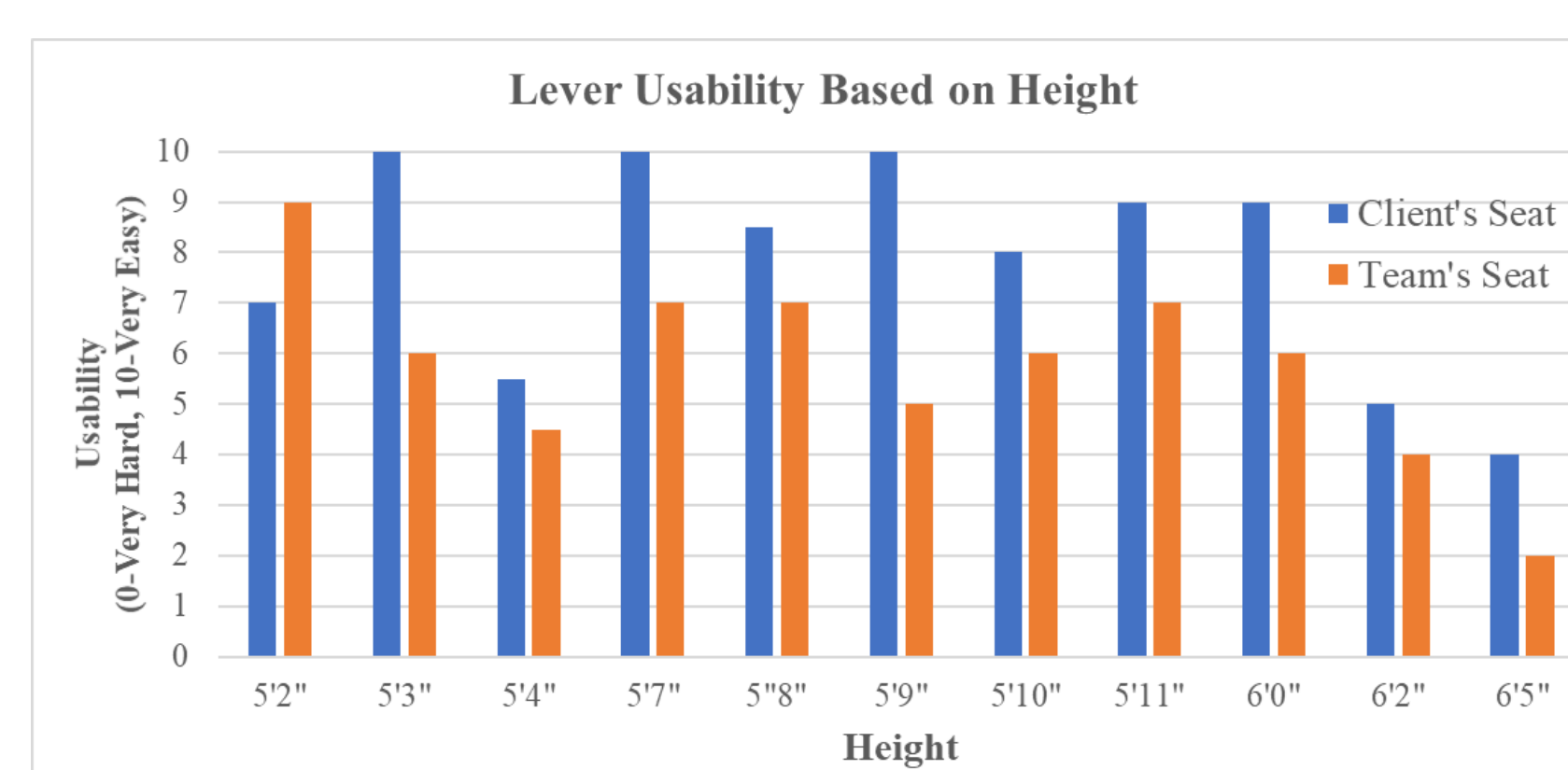
- SolidWorks FEA simulation for Aluminum 2024
- Must not fail under the following static loads: Forward, 9.0g; Downward, 6.0g; Upward, 3.0g; Sideward, 1.5g
- Seat mount's structure is maintained under the highest load
- Deformation set to 38 for 9.0g (2,026 lbf) forward load



Testing



	Client's Free Play	Team's Free Play
Forward	0.026 in	0.007 in
Left	0.024 in	0.008 in
Right	0.029 in	0.010 in



- Averages from free play in the forward, backward, and sideward directions as well as twisting
- Test considers that the seat has free play
- Participants uncomfortable with flying perceived both seat to have very similar free play
- Participants who are more comfortable flying perceived client's seat to have more free play

- Calipers measured displacement
- Comparison of only the tracking seat
- Test conducted on the lowest part of the seat mount
- Team's seat has less free play in all directions

- Participants felt that client's seat was easier to use
- Tracking forward and aft in both seats were equally as easy and very smooth regardless of weight
- Locking the seat in place for both seats were equally as easy regardless of height

Conclusions

- Performance of our designs compared to Textron's shown in testing and analysis sections
- FAA requirements tested and met within FEA
- Average installation time fixed design: 52 sec.
- Average installation time tracking design: 1 min. 32 sec.
- Total weight fixed design: 4.51 lbs.
- Total weight tracking design: 9.81 lbs.
- Design fits within the specified bounding box

Future Recommendations

- Roller bearings instead of friction rails
- Extend lever arm forward for ease of use; requires extending bounding volume forward
- Use custom spring for attaching seat mount to lever
- Use clamping knobs with more thread engagement

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