FSGC NASA Human Powered Vehicle

Team 509:

Ryan Floyd, Nicolas Picard,

Ninett Sanchez, Andrew Schlar

Presenters: Ryan Floyd, Andrew Schlar

Andrew Schlar

NASA Human Powered Vehicle Team 509

Ryan Floyd
Project and Materials Engineer

Nico Picard
Design Engineer

Ninett Sanchez
Point of Contact and Design Engineer

Andrew Schlar
Team Leader and Design Engineer

Andrew Schlar

Sponsor and Advisor

Florida Space Grant Consortium

Dr. Shayne McConomy

Special thanks to Dr. Shayne McConomy for advising and mentoring the team

Andrew Schlar

Project Scope

- Objective
- Market
- Background
- Assumptions
- Key Goals
- Stakeholders

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Objective

The objective is to design and manufacture a human powered vehicle to traverse exoplanetary terrain in a NASA hosted competition.

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Project Background

- Apollo 14 lunar mission complications
- Annual NASA Human Exploration Rover Challenge Competition

Apollo 14 Flight Crew [1]

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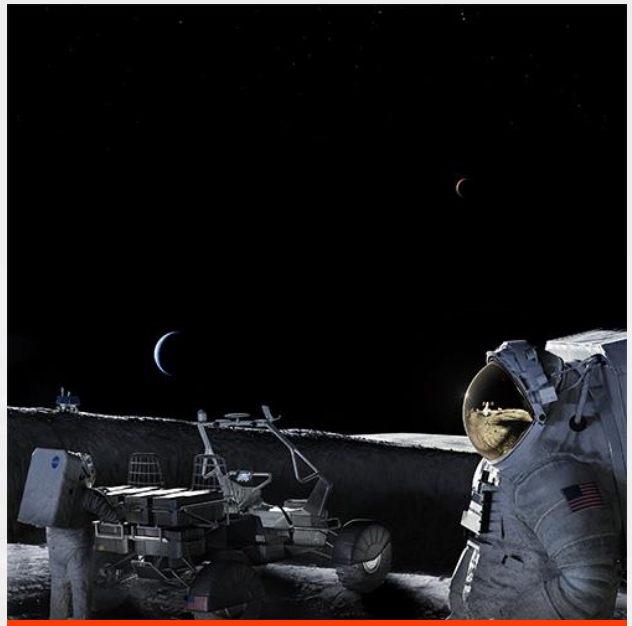
Project Background

- Artemis Moon Program
  - Lunar Mission 2024
  - Sustained Settlement 2028



NASA Artemis Mission [5]

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Competition

- 14 obstacles simulate lunar terrain
  - 11 have a bypass option
- 5 optional tasks similar to what astronauts perform during missions
- 8-minute time limit represents theoretical oxygen supply

Student competitors completing competition challenge [7]

Ryan Floyd

Key Goals

- Deliver a fully functioning human powered vehicle for two riders that can participate in all the available events at the NASA competition
- Rover capable of traversing challenging exoplanetary terrain
- Enter in as many of the challenges as possible and gain the maximum amount of points

Student competitors in the 2019 competition [2]

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Markets

1. Primary
   - NASA Human Exploration Challenge competition
2. Secondary
   - Endurance competitions/ races by human powered vehicles
   - Space-faring organizations and companies
   - Outdoor recreational activities
   - Alternative mode of transportation for unmotorized road areas

Student competitors crossing the finish line [4]

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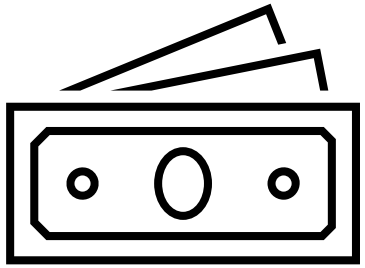
Assumptions

- CAD, modeling, and simulation software provided by FAMU-FSU College of Engineering
- Access to on-site engineering machine shop
- Calculations and testing done with respect to earth conditions



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Stakeholders

- Dr. Shayne McConomy
- Murray Gibson, Dean of Engineering, FAMU-FSU College of Engineering
- FAMU-FSU College of Engineering
- National Aeronautics and Space Administration (NASA)

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Customer Needs

Dr. Shayne McConomy & Competition Guidelines

Interpreted Needs

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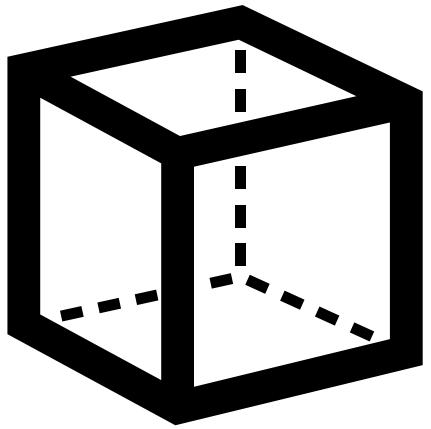
Customer Needs/ Interpretation

Competition Needs

- Non-pneumatic wheels
- Vehicle will be completely human powered
- Width is less than or equal to specified dimensions
- Collapse to a volume less than or equal to specified dimensions



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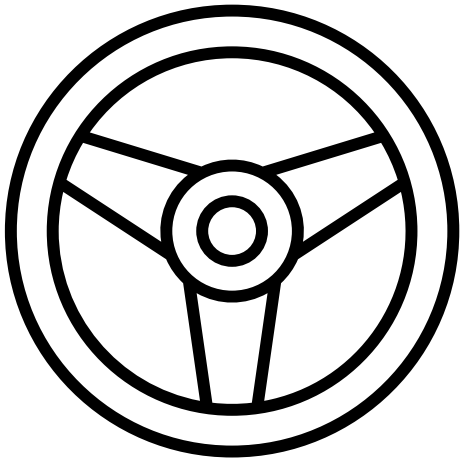
Customer Needs/ Interpretation

Sponsor Needs

- High priority placed on steering and powertrain
  - ➢ Areas of high importance based off of previous teams' projects
- Implementation of systems integration
  - ➢ Subsystems to be designed simultaneously



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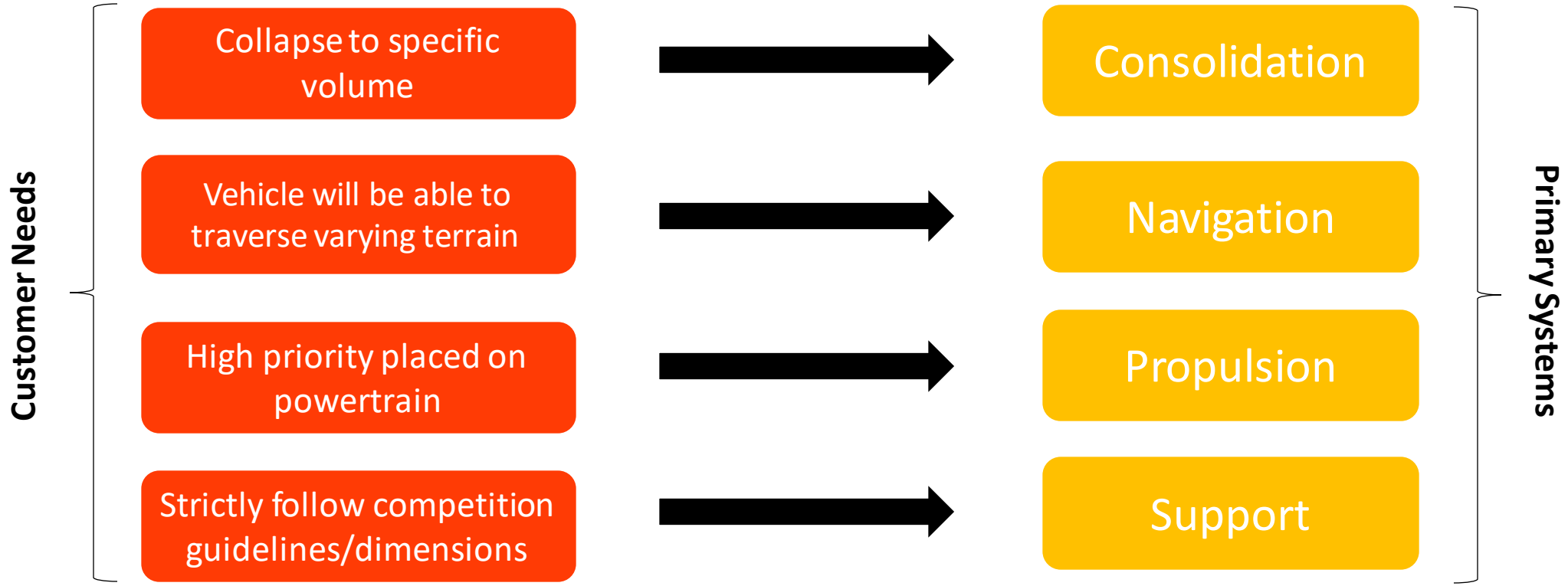
Customer Need - Functional Decomposition



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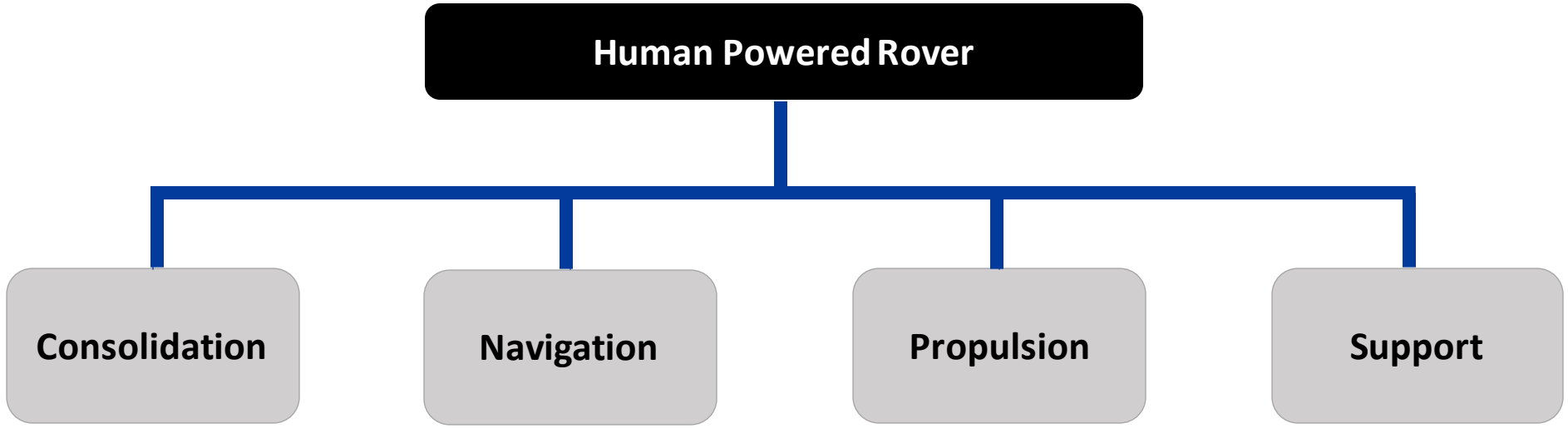
Functional Decomposition



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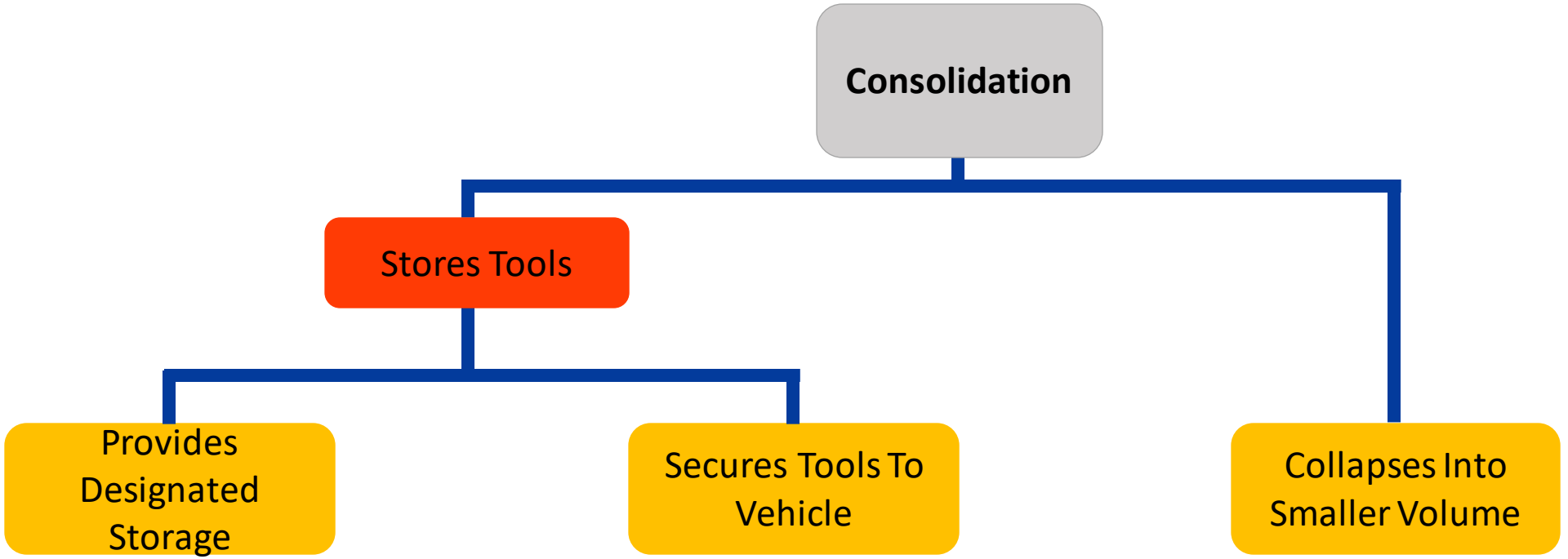
Functional Decomposition Subsystems



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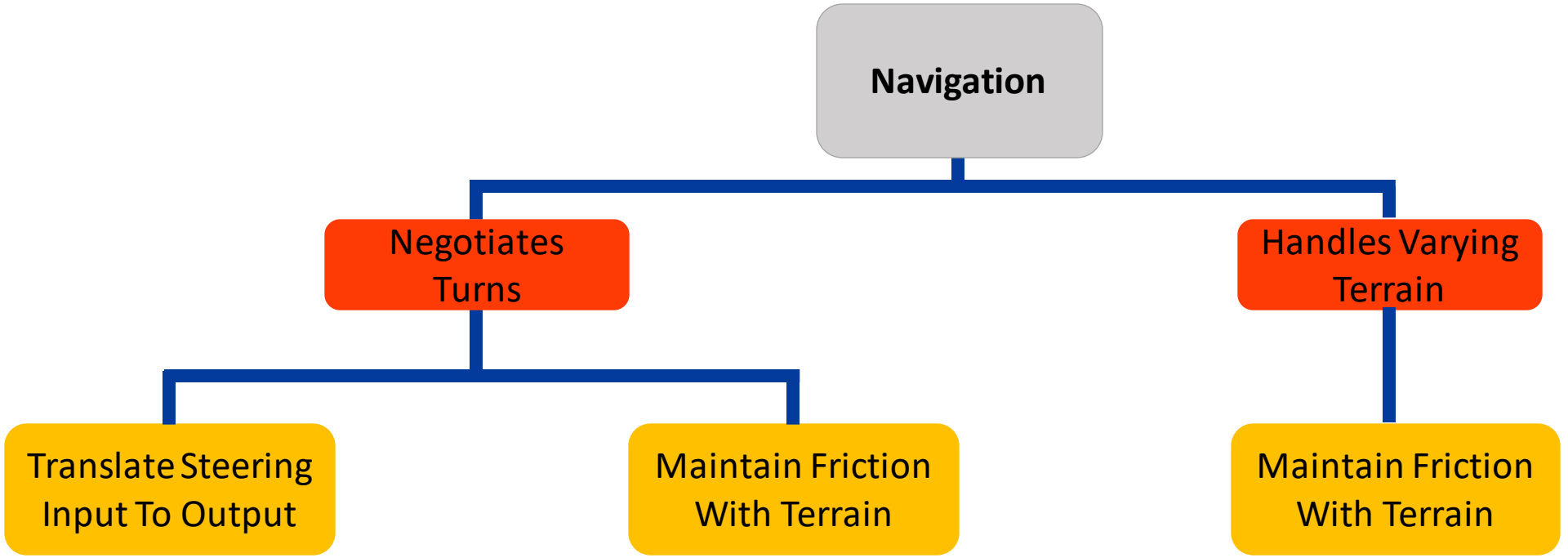
Functional Decomposition Subsystems



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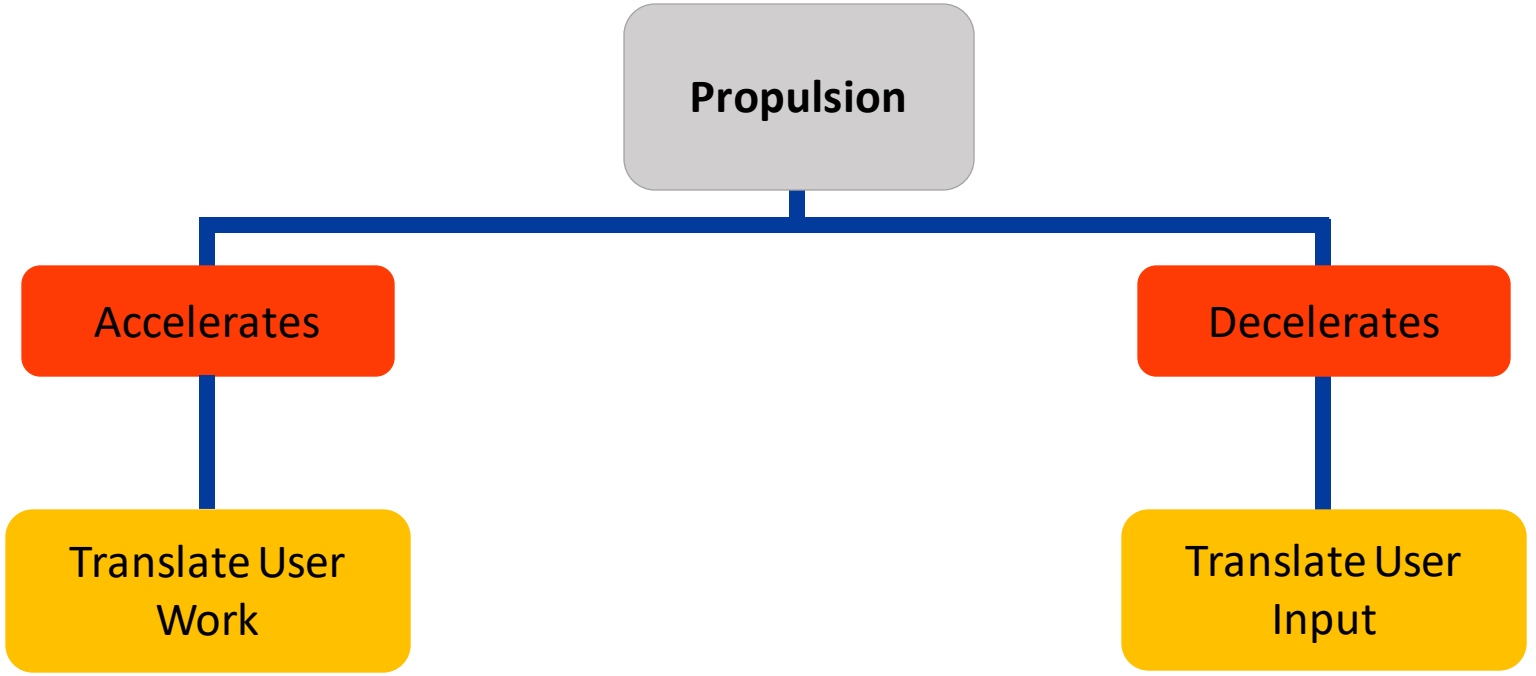
Functional Decomposition Subsystems



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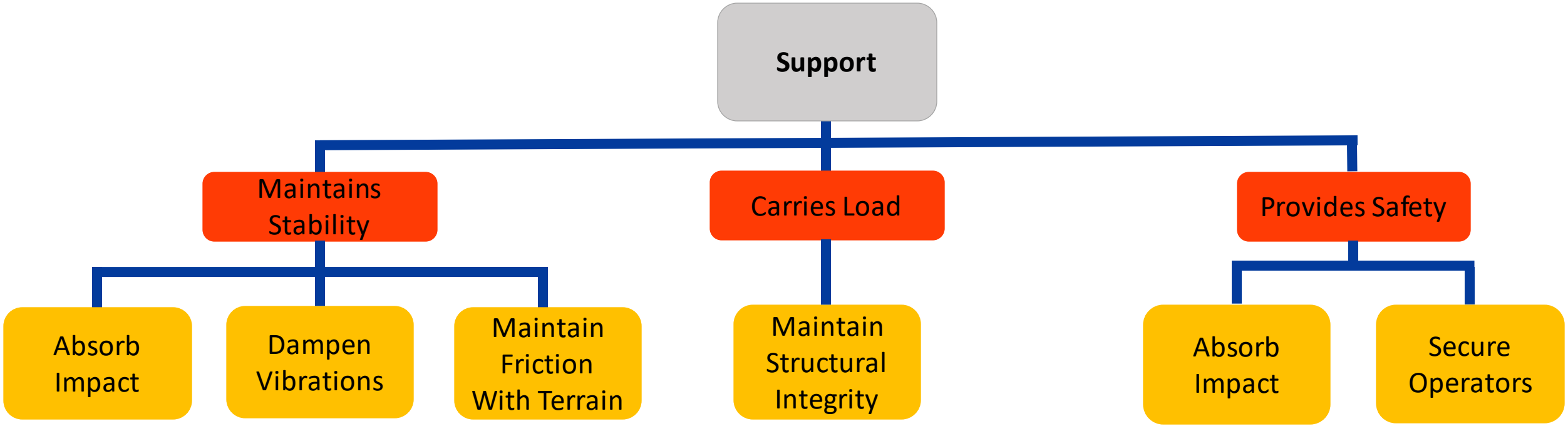
Functional Decomposition Subsystems



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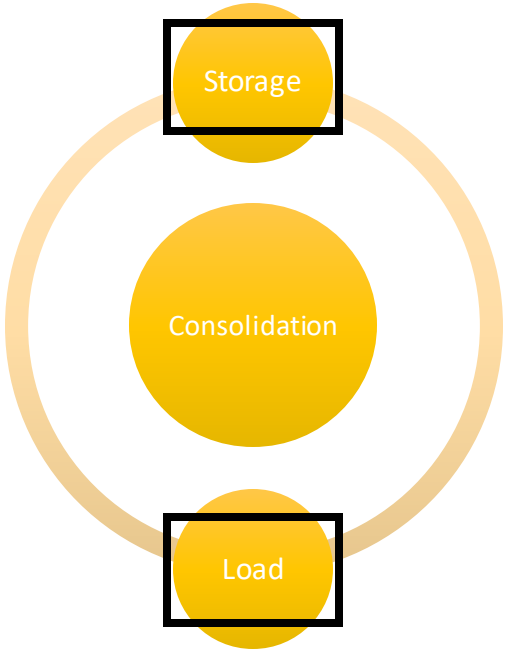
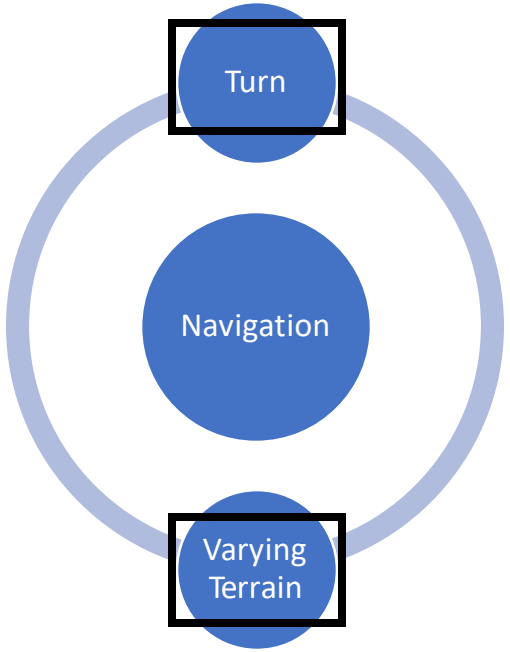
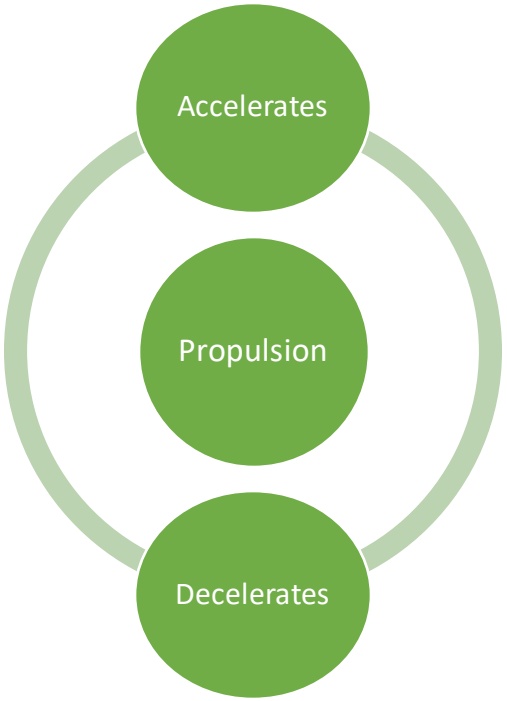
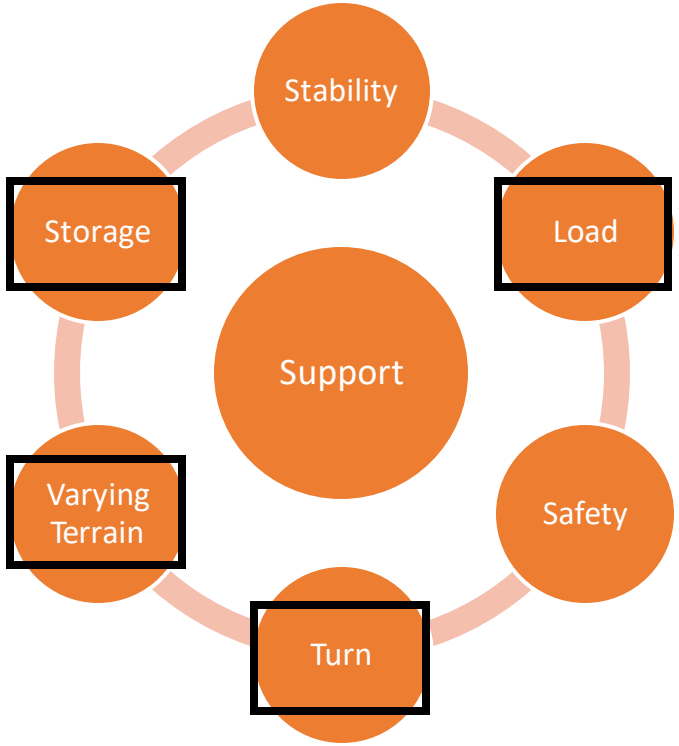
Cross Reference Analysis









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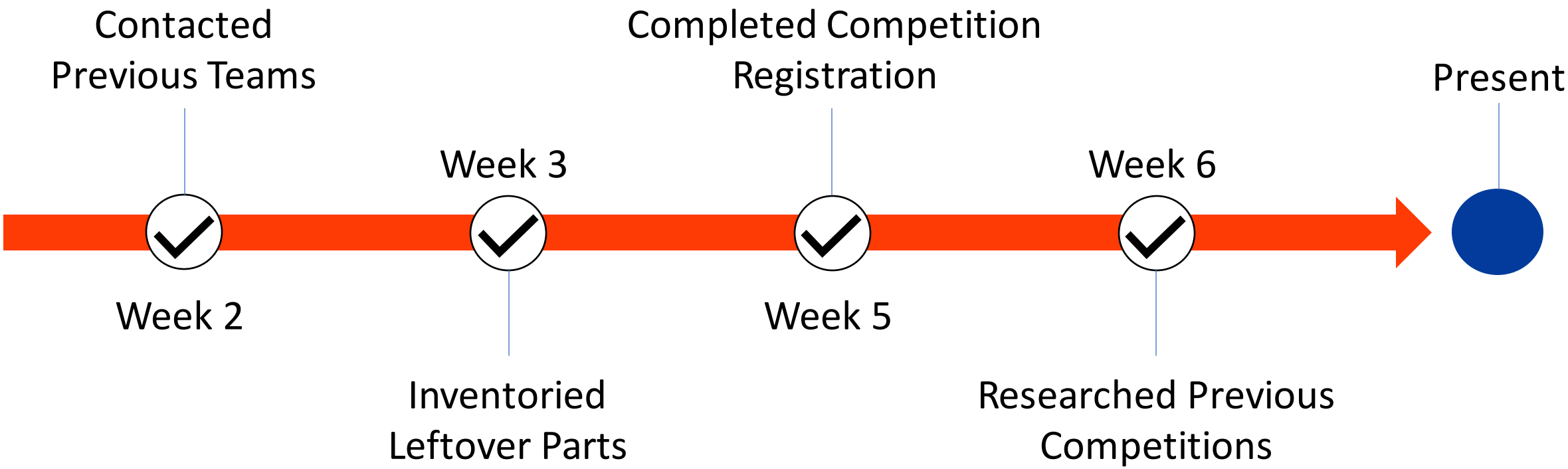
Project Progress



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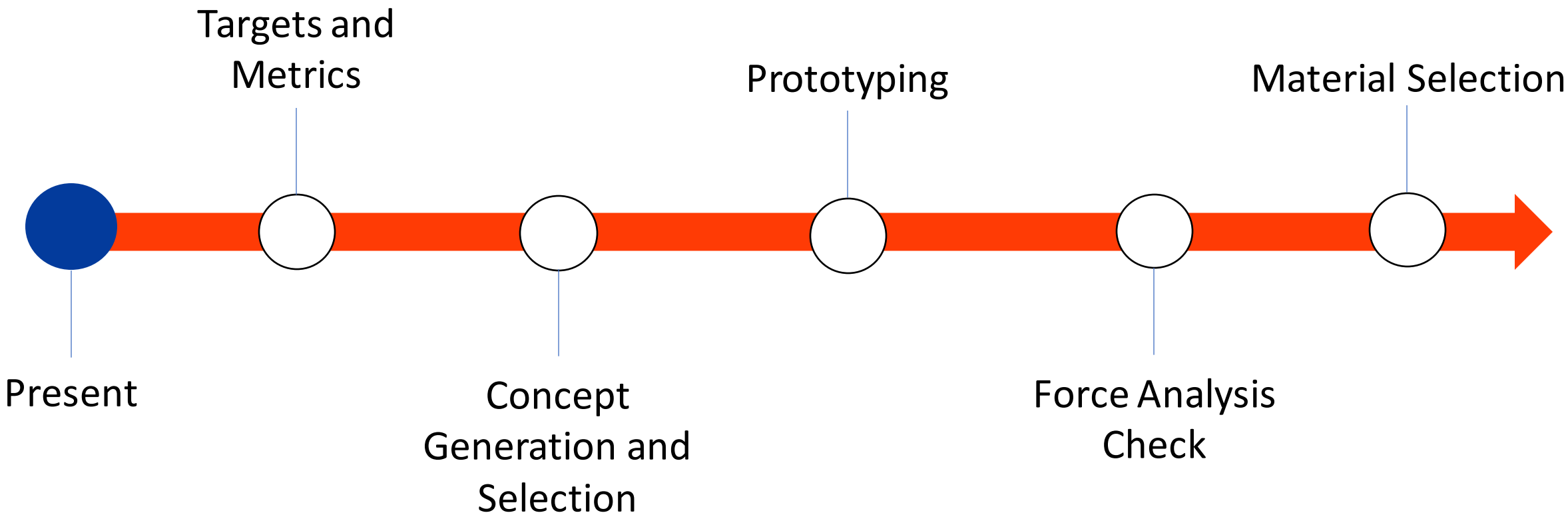
Future Work



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Acknowledgement

- ✓ Florida Space Grant Consortium
- ✓ Special Thanks to Dr. Shayne McConomy
- ✓ Dr. Patrick Hollis
- ✓ Jessica Meeker

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Questions?

FSGC NASA Human Powered Vehicle

Our job is to design and manufacture a human powered vehicle to traverse exoplanetary terrain in a NASA hosted competition.

Feel free to ask us any questions.

Ryan Floyd

Section Links

Project Scope

Customer Needs

Functional Decomposition

Project Progress

Future Work

Acknowledgements

References

Ryan Floyd

References

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[2] Archive, N. (2019, May 15). NASA Celebrates 25th Anniversary Human Exploration Rover Challenge. Retrieved October 15, 2020, from https://www.flickr.com/photos/nasamarshallphotos/40890053883/in/album-72157705115914232/

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[5] Registration Open for NASA's Human Exploration Rover Challenge. (2020, October 8). NASA.Gov. https://www.nasa.gov/centers/marshall/news/releases/2020/registration-open-for-nasa-s-human-exploration-rover-challenge.html

[6] Shear, E. (2016, February 7). Apollo 14's Edgar Mitchell passes away at age 85. SpaceFlight Insider. https://www.spaceflightinsider.com/space-flight-history/apollo-14s-edgar-mitchell-passes-away-at-age-85/

Backup Slides

Customer Needs

Question	Customer Statement	Interpreted Customer Need
What are your expectations for the project aside from the competition's expectations?	"Would like to see the project finished, actively participating in the competition. Ideally the team would have the design finish in the events we compete in."	The project will be fully completed to ensure the team's participation in the competition.
Would you like us to focus on specific design areas with an emphasis on funds correlated to them?	"Would like to see placement within CAD for the design and everything must be designed simultaneously."	Systems integration will be utilized in the design process.
What areas of the past design do you think need the most improvement?	"Steering and powertrain are always the part that gets overlooked, build always gets main focus, DO the engineering first."	A high priority will be placed on designing the steering and the powertrain of the vehicle.
Are there any safety, or security concerns that you have for the project/competition?	"None outside the rules, just general rules for manufacturing and build. Do not dimension for exact guidelines."	The competition guidelines will be followed. The vehicle will be designed according to specification requirements.

Dr. McConomy Customer Statements and Interpretations

Vehicle will collapse into a volume less than or equal to the specified guidelines.
Track width of the vehicle will fit onto the competition course.
Vehicle will be able to traverse varying and uneven terrain
Per safety guidelines, sharp edges in the design will be eliminated or guarded
Vehicle will be capable of traversing hills and inclined pathways
Vehicle will have a small turning radius within competition guidelines
Vehicle wheels will be designed and fabricated by the team
Vehicle wheels will be non-pneumatic
Vehicle will be completely human powered

Interpreted Customer Needs from Competition Guidebook

Team 509

Functional Decomp Support

Team 509

Cross Reference Table

Cross Reference Table	Support	Propulsion	Navigation	Consolidation
Maintains Stability	X			
Carries Load	X			X
Provides Safety	X			
Accelerates		X		
Decelerates		X		
Negotiates Turns	X		X	
Handles Varying Terrain	X		X	
Stores Tools	X			X

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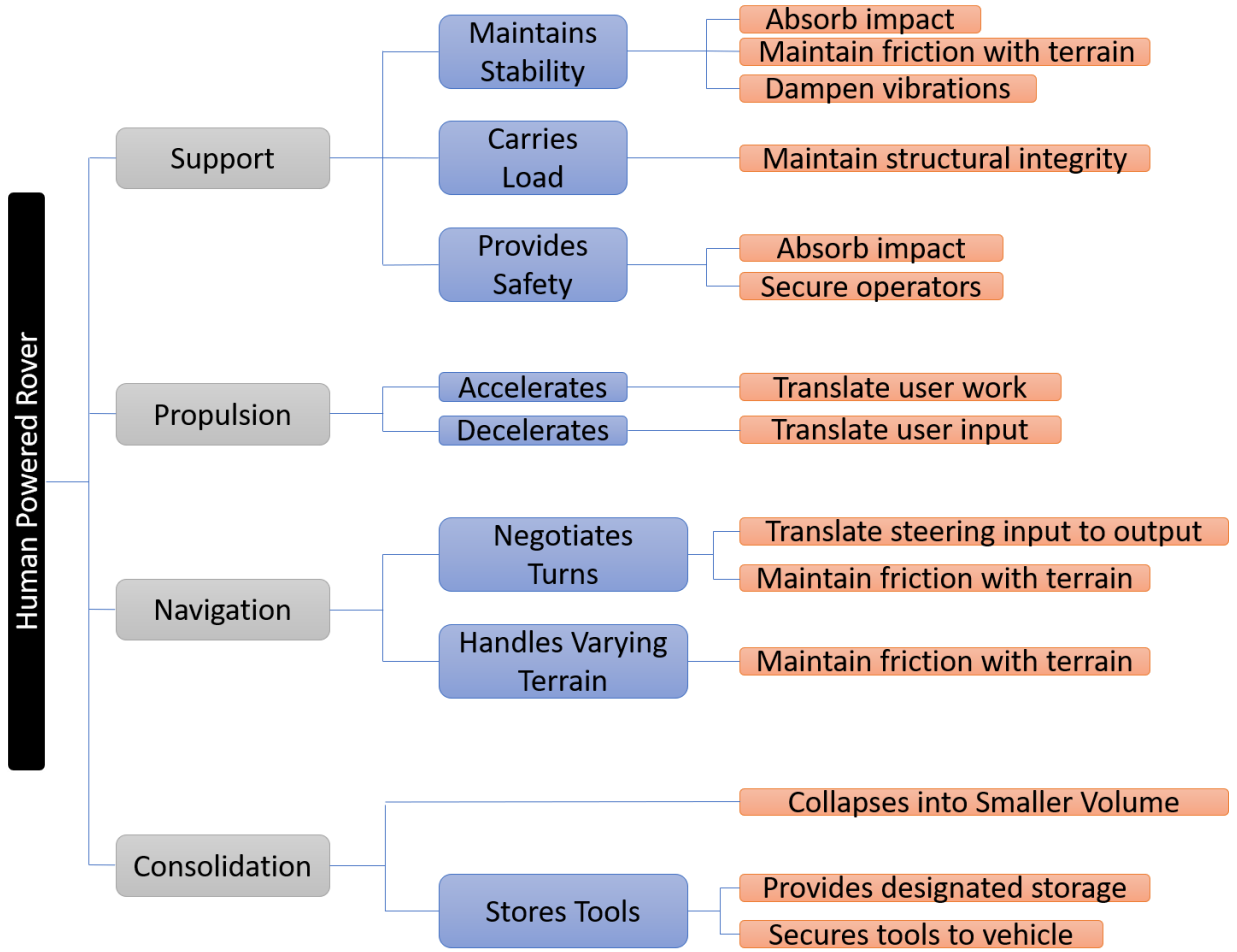
Hierarchical Chart



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