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## Designing a Locally Manufacturable Wheelchair for Nepal

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**Authors**

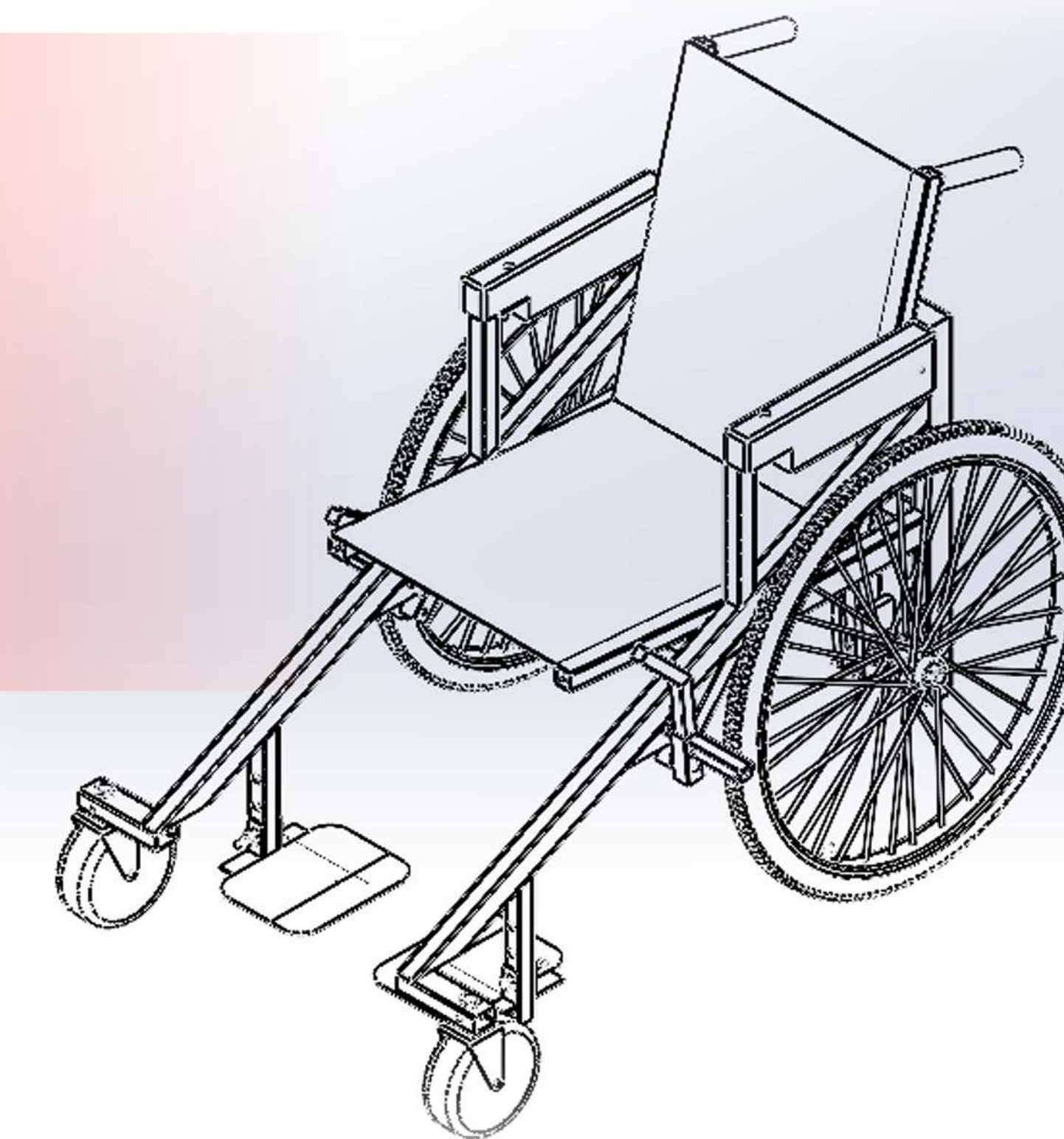
Ethan M. Barnes, Levi D. Hauger, Cade K. Bender, Harrison J. Crosley, Riley Harro, Joshua J. Holley, Peter C. Hopkins, and Timothy J. Van Dyke

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# DESIGNING A LOCALLY MANUFACTURABLE WHEELCHAIR FOR NEPAL

2021 SCHOOL OF SCIENCE, ENGINEERING AND HEALTH SYMPOSIUM  
ETHAN BARNES & LEVI HAUGER



## CLIENT

International Nepal Fellowship (INF) aims to bring sustainable improvements in health and quality of life of people and communities. INF currently has 11 locations throughout Nepal. One of the ways that INF provides support is through supplying wheelchairs to persons with disabilities.

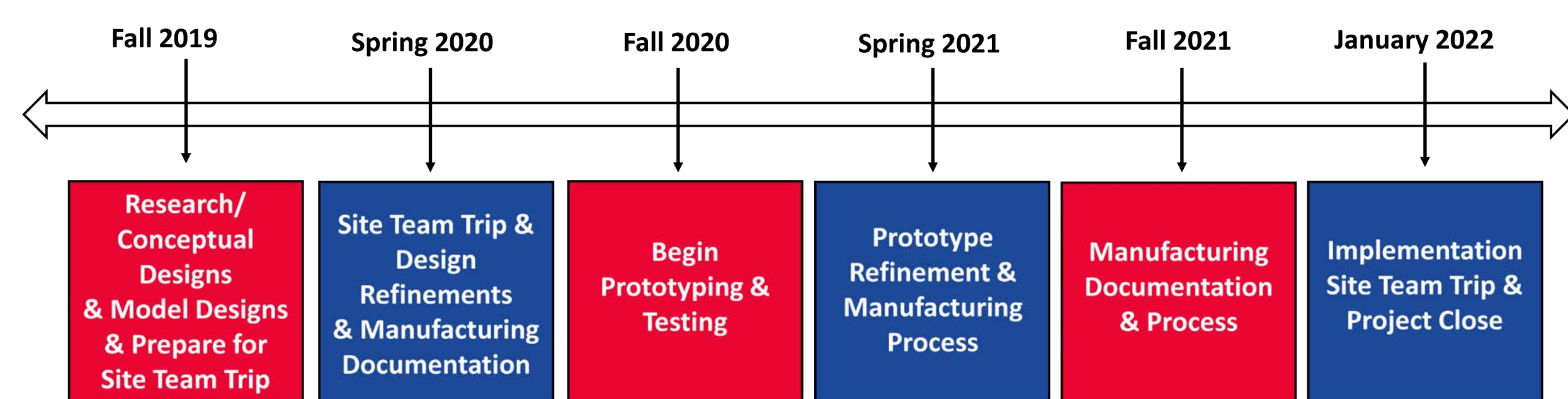


## PROBLEM STATEMENT

The wheelchair kits that INF currently uses are expensive, difficult to import, and can be held up at the border for up to 18 months. Replacement parts for imported wheelchairs are nearly impossible to find. INF needs a way to overcome these obstacles in a cost and time efficient manner.

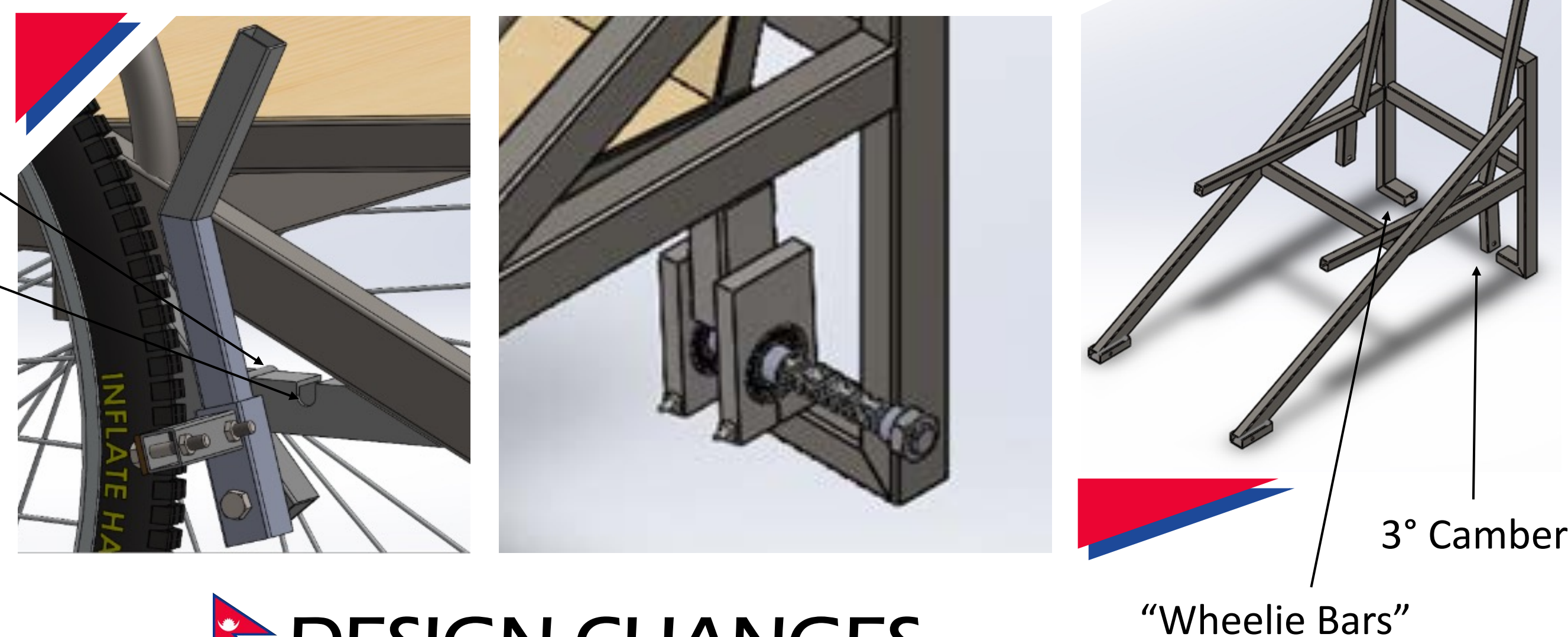
## PROJECT GOAL

Our team aims to provide International Nepal Fellowship (INF) with a wheelchair design, and manufacturing documentation for it, that can be produced in Nepal by INF staff. The wheelchair must be adjustable to fit specific patients and enable users to engage in their community.



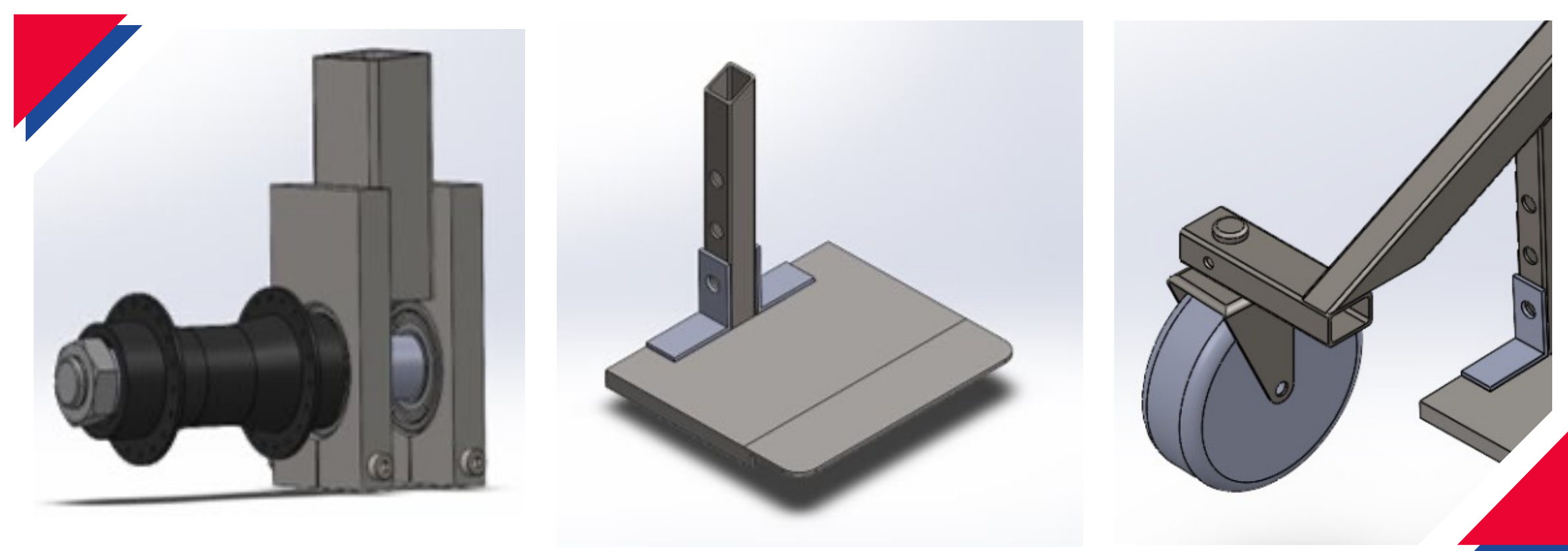
## PROTOTYPING

- A prototype was constructed based on our design
- Allowed for better insight on manufacturing process and to benefit development of future components
- Elements completed this year: central frame, wheel lock, footrest, wheel mounting assembly & armrest fixtures



## DESIGN CHANGES

- Axle reinforced due to cantilevered mountain bike axle failure
- Footrest redesigned to one vertical member based on client feedback due to manufacturing concerns and overall simplicity
- Front wheel assembly mounting member rotated outward to allow for better footrest clearance



## CURRENT DESIGN

- Our current design is based on a simple triangular frame that is constructed from materials found in steelyards and shops in Nepal
- Adjustable and foldable footrests allow for crucial patient customization and ease of use
- 3° of rear wheel camber provides added stability
- "Wheelie Bars" allow for assistance in climbing stairs
- Armrests & cushioned seat for comfortable usability
- Wheel lock for secure patient transfers on and off

## CONCLUSIONS

- The Nepal Wheelchair Team has been able to develop and prototype a functional design that reflects feedback from our client and is well on its way to fulfilling the project goal. We have constructed a complete prototype and are now ready to move into further testing and prepare a manufacturing manual going forward.
- The team believes that the work done this year will allow for the global goal of designing, testing and developing manufacturing documentation for a wheelchair suitable for the Nepal terrain will be met in the coming years.

## ACKNOWLEDGMENTS

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**Derek ("The Coke") Plante** – Electrical Technician  
**Harrison Crosley** – Student Project Manager  
**Peter Hopkins** – Senior Project Member  
**Cade Bender** – Senior Project Member  
**Ethan Barnes** – Project Member  
**Levi Hauger** – Project Member  
**Josh Holley** – Student Volunteer  
**Riley Harro** – Student Volunteer  
**Alex Vollert** - Student Alumni  
**John Meyer** – Workshop Supervisor  
**Raywanta Magar** – INF Wheelchair Technician  
**Dhan Nepali** – INF Wheelchair & Prosthetics Manager  
**Meghan Baker** - INF Occupational Therapist  
**Arjan Knulst** – INF Engineer

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