

**Multidisciplinary Senior Design  
Project Readiness Package**

<b>Project Number:</b> (assigned by MSD)	P18031 Accessible Motorcycle Sidecar
<b>Primary Customer:</b> (provide name, phone number, and email)	Mark Covert (585)356-9175 mcovert@rochester.rr.com
<b>Sponsor(s):</b> (provide name, phone number, email, and amount of support)	Mark Covert (585)356-9175 mcovert@rochester.rr.com Up to \$3000
<b>Preferred Start Term:</b>	Fall 2017
<b>Faculty Champion:</b> (provide name and email)	Technical mentor or individual who has a particular interest in the project ( Dr. Alan Nye? someone else in transportation...)
<b>Other Support:</b>	TBD
<b>Project Guide:</b> (assigned by MSD)	Gary Werth (expressed interest)

Jakob Krzyston  
Prepared By

8 May 17  
Date

Received By

Date

## Project Information

### \* Overview:

Please provide a brief (2-3 paragraphs) overview of the background on the problem to be solved, the motivation for solving it, the short-term goals for the proposed project, and the long-term goals for any program the project may support.

- Physical disabilities may prevent individuals from participating in a multitude of activities. The specific issue this project will address is the ability of a person with physical disabilities to go for a ride as a passenger on a motorcycle. Although entering and exiting a sidecar motorcycle passenger compartment (tub) is perhaps easier than climbing onto the back of a motorcycle, it is still an impossible feat for persons with certain physical limitations.
- As a motorcycle enthusiast, I have personally known several people who would have enjoyed the opportunity to ride but could not due to the physical limitations imposed by their conditions (CP, advanced age, cancer related injury, etc). I have had conversations with other enthusiasts who expressed having known people in similar circumstances. Considering that my own experience is not unique, there must be others with a desire to share the motorcycle experience with those unable to mount a standard rig.
- The goal of this project is to design and deliver one prototype of a sidecar tub that will allow ease of access for a person with physical disabilities. Long term, I'd like to be able to make this available to other motorcyclists at as low of a cost point as possible.

### \* Preliminary Customer Requirements (CR):

What attributes does the customer seek in the final project? Each CR should map to one or more ER (see below).

CR-1: This design shall be based on the Ural Patrol motorcycle sidecar. Note: The sponsor will provide a 2009 Ural Patrol for the chassis which will be used as the basis for this design.

CR-2: The sidecar passenger compartment (tub) shall open to allow the seat and footrest to move to a point where a transfer from wheelchair height would be possible.

CR-3: Once transferred to the sidecar seat, the passenger's feet shall be able to be raised and the seat return to the stowed position, allowing the tub to be closed.

CR-4: The passenger loading/unloading operation shall be able to be completed by one able-bodied person.

CR-5: The tub shall have provisions to stow equipment used for passenger mobility at stops

CR-6: The appearance of the tub shall blend with the overall appearance of the existing sidecar. (Note: The goal here is to have it look interesting and fun to the passenger. It should not look like a medical device, nor like something that draws attention to the fact that it is a device built specifically for accessibility).

**\* Preliminary Engineering Requirements (ER):**

Include both metrics and specifications. Each ER should map to one or more CRs (see above).

Metrics: what quantities will be measured in order to verify success?

Specifications: what is the target value of the metric that the team should design to?

- ER-1 The tub shall not exceed 180 lbs in weight (design goal: 110 lbs)
- ER-2 The maximum dimensions shall not exceed 84” long x 22” wide x 18” height
- a. Note 1: The height does not include the seat back or windscreen.
  - b. Note 2: The maximum width has some flexibility, but it must retain clearance for the operator of the motorcycle, the handlebars of the motorcycle, and fit within the confines of the existing chassis.
- ER-3 The design shall accommodate a passenger weighing up to 250 lbs.
- ER-4 The tub shall provide stowage for a portable walker or crutches.
- a. Design Goal: Provide stowage for Medline Transport Wheelchair MDS808210ARE or equivalent.
- ER-5 Design Goal: The tub should appear “aesthetically pleasing”, fitting with the overall feel of the motorcycle. “Steampunk” style elements are acceptable.

**\* Constraints:**

List any external factors that limit the selection of alternatives, e.g., allowable footprint, budget, required use of legacy hardware/software.

- The design is to make use of the provided 2009 Ural sidecar chassis. (The hope is that it will be extensible to other footprints, but that is not a requirement.)
- The ultimate goal of this development is to provide accessible sidecar tubs to other enthusiasts, motorcycle clubs, etc., at as low of a cost point as possible. With that in mind, the use of (presumably less expensive) manual methods to assist with the loading/unloading of the passenger are preferred over methods requiring powered devices.
- The Ural is an underpowered machine (by comparison to modern motorcycle designs). Due to this, the aerodynamics of the tub, while not specified as a requirement, are a constraint on the overall performance of the final product.

safety belt in a sidecar? DMV laws and regulations

bike specifications

Hogs club (certified Harley mechanics)

frames are tuned

wheel chair?

slide in - wheel chair into van (climb up, not lifted) define the disease of interest

- future iterations to accommodate other ailments

elaborate on current issues with sidecars (specifically in his experience)

does the sidecar require a spare tire (could the wheelchair be where the tire is)

### **Sponsor notes:**

- The sidecar chassis is permanently attached to the motorcycle. The rig is very stable and is able to be rolled easily by one or two people.
- The sponsor will make the rig available as necessary for measurements, examination/removal of the existing tub, fitting, etc.

### **\* Project Deliverables:**

Minimum requirements:

- All design documents (e.g., concepts, analysis, detailed drawings/schematics, BOM, test results)
- working prototype
- technical paper
- poster
- All teams finishing during the spring term are expected to participate in ImagineRIT

Additional required deliverables:

- Any fixtures or jigs used for fabrication and/or assembly

### **† Budget Information:**

Include total budget, any major cost items anticipated, and any special purchasing requirements from the sponsor(s).

- The sponsor will provide up to \$3000 for support of this design and the construction of one prototype.

### **\* Intellectual Property:**

Describe any IP concerns or limitations. According to RIT policy, students have the right to retain any IP they generate during a course, but some students voluntarily agree to be placed on projects where they will be asked to assign their IP. If a sponsor wishes to have a team assign their IP, we need to know ahead of time so that we can place appropriate students on the team.

In order to ensure that students can discuss their projects openly during presentations and job interviews, we ask that no more than ~20% of the project be considered confidential.

- The sponsor wishes to retain the rights to the IP for this design.

## Project Resources

### † Required Resources (besides student staffing):

Describe the resources necessary for successful project completion. When the resource is secured, the responsible person should initial and date to acknowledge that they have agreed to provide this support. We assume that all teams with ME/ISE students will have access to the ME Machine Shop and all teams with EE students will have access to the EE Senior Design Lab, so it is not necessary to list these. Limit this list to specialized expertise, space, equipment, and materials.

<b>Faculty</b> list individuals and their area of expertise (people who can provide specialized knowledge unique to your project, e.g., faculty you will need to consult for more than a basic technical question during office hours)	<b>Initial/ date</b>
<b>Environment</b> (e.g., a specific lab with specialized equipment/facilities, space for very large or oily/greasy projects, space for projects that generate airborne debris or hazardous gases, specific electrical requirements such as 3-phase power)	<b>Initial/ date</b>
<b>Equipment</b> (specific computing, test, measurement, or construction equipment that the team will need to borrow, e.g., CMM, SEM, )	<b>Initial/ date</b>
<b>Materials</b> (materials that will be consumed during the course of the project, e.g., test samples from customer, specialized raw material for construction, chemicals that must be purchased and stored)	<b>Initial/ date</b>
<b>Other</b>	<b>Initial/ date</b>

### † Anticipated Staffing By Discipline:

Indicate the requested staffing for each discipline, along with a brief explanation of the associated activities. “Other” includes students from any department on campus besides those explicitly listed. For example, we have done projects with students from Industrial Design, Business, Software Engineering, Civil Engineering Technology, and Information Technology. **If you have recruited students to work on this project (including student-initiated projects), include their names here.**

Dept.	# Req.	Expected Activities
BME		
CE		
EE		

ISE	1 or 2	Ergonomics, safety, machine processing, DFx
ME	2 or 3	CAD, machining, aerodynamics, stress/vibration testing
Other	1 ID	Aesthetics, ease of use considerations