Human Powered Vehicle Challenge

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Operations Manual

Document

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The following operations manual details the basic operation of the vehicle, vehicle maintenance procedures, and important safety information. For any topics not covered in this manual or questions relating to the material described here, contact the following email or phone number to set up an appointment.

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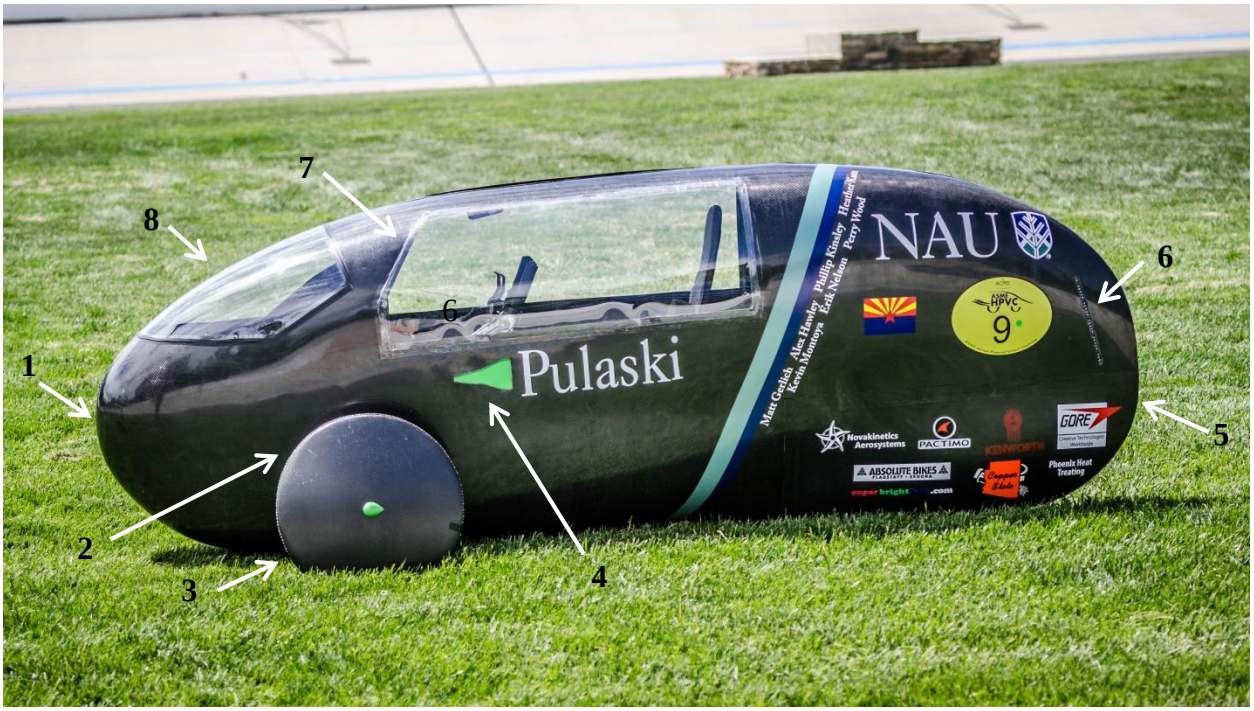
VEHICLE OVERVIEW

A view of the entire vehicle with important components is labeled and detailed below.



LEGEND

1	Front Headlight	5	Removable Maintenance Door
2	Turn Signal	6	Brake Lights
3	Wheel Cover	7	Side Window
4	Servo Operated Vents	9	Front Window

VEHICLE INTERNAL DETAILS

An internal view of the vehicle with important components is labeled and detailed below.

LEGEND

1	Front Crank Set	9	Horn Button
2	Step-up Gear Set	10	Adjustable Seat
3	Steering Bell Crank	11	Seat Belt Buckle
4	Reverse Cable Splitter	12	Front Wheel
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VEHICLE OPERATION

BASIC OPERATION

Vehicle is operated by placing feet on pedals at the front of the vehicle and peddling in a forward circular motion. To steer the vehicle, push one steering arm, located in front of the rider's chest, and pull the other to move in the desired direction. In order to stop the motion of the vehicle, pull the black lever on the left steering arm handle. To move in reverse, come to a complete stop, pull red lever on right steering arm handle, and pedal backwards. All electrical components, such as the complete lighting system, horn, and vents, can be operated by pressing the control buttons located on the ceiling of the vehicle and the tops of the steering arms.

START UP

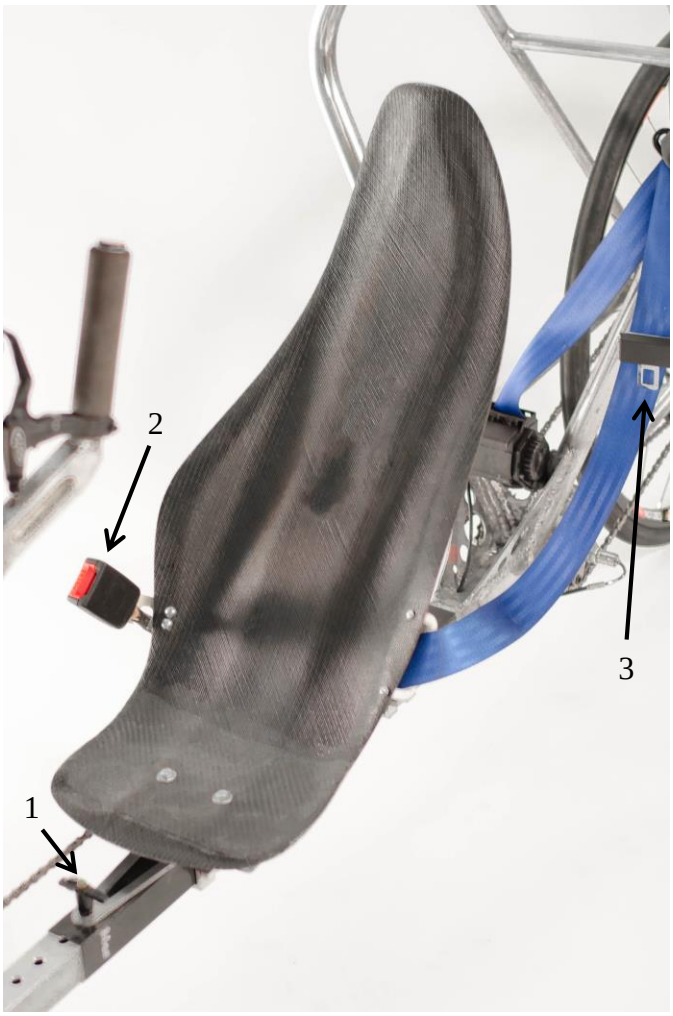
Pulaski takes very little time to setup for operation. Following these steps will ensure that the vehicle's features and safety equipment are used properly.

1. To open the vehicle door, depress the circular metal button near door rear seam.
2. Pull the now extended door handle to open the vehicle's door.
3. Once the door has been open be sure to depress the door handle button once more to put it in the stowed position.
4. After removing the seat pin, slide the seat to a location that allows for a comfortable range of leg operation. Put the seat pin into the appropriate hole location to fix the seat position.
5. (If you do not wish to operate the vehicle with its electrical features proceed to step 6) Locate the vehicle power button and switch into the on position. A red light near the button indicates the vehicle is powered on.
6. Enter the vehicle. Once in the seat, be sure to activate the seat belt. The seatbelt can be found by reaching behind the left shoulder.
7. Close the vehicle door by pulling on the interior door handle. This handle is located beneath the right ventilation duct.
8. Once the door is closed, latch it shut using the overhead door latch.
9. If operating the vehicle at night, be sure to illuminate the headlight prior to operation.
10. Pedal!

ENTRY AND EXIT

To enter the vehicle, locate the metal button on the right side of the fairing. The button is located near the rear of the vehicles door, half way up the fairing. Upon locating the button, depress and the knob will reveal itself. Pull on the knob and the door will open. Before entering the vehicle, be sure to press the handle back into its home position to ensure that the vehicle will not catch on anything while in operation. To close the door, pull on the silver handle located on your right until the door is completely flush with the vehicle. To lock the door, locate the brass latch on the top of the fairing and lock it together. To exit the vehicle, repeat the process in the reverse order.

SEAT POSITION AND SEAT BELT



Seat Belt:

Always wear seat belt before operating vehicle.

Pull blue strap over left shoulder and insert tongue (3) into buckle (2) until a click is heard. Pull on shoulder strap to tighten seat belt to proper fit. To release seat belt, push red button on buckle and allow strap to retract. Beware of exposed metal as it may be hot and keep clear of retracting hardware.

Seat Adjustment:

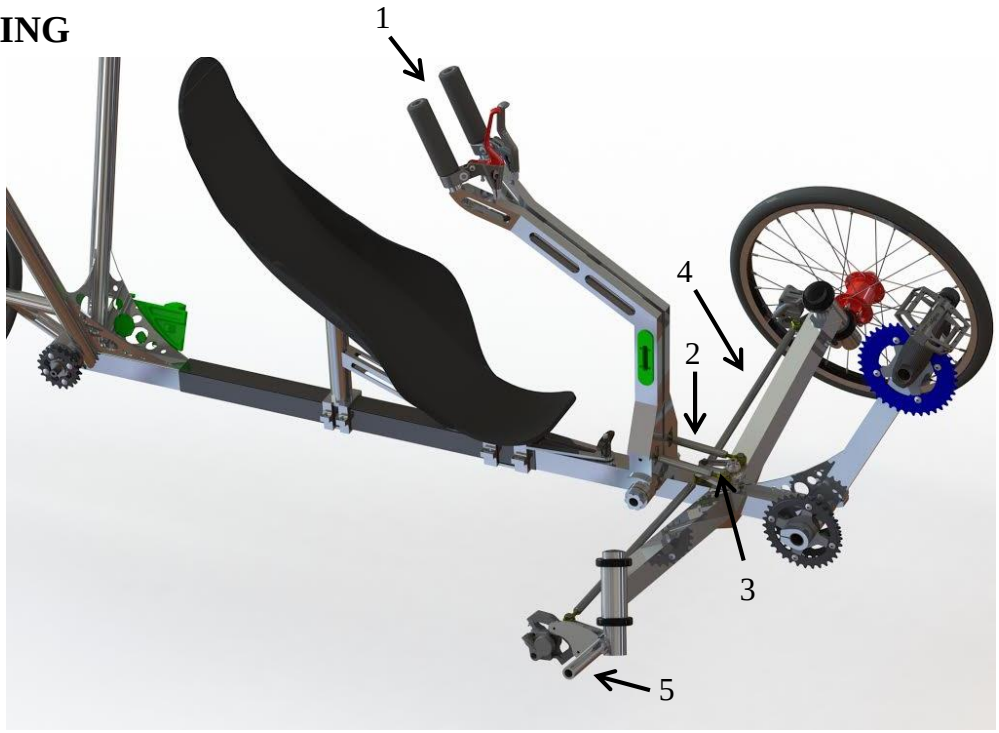
It is recommended that the seat be adjusted before entering the vehicle. To adjust seat for proper fit in vehicle, push down the button on the top of the pin (1) while pulling upward on the handle of the pin. Push seat forward or backward as needed and reinsert pin into the proper hole by pushing down on both the pin and the button. Keep hands clear of seat bracket while seat is in motion.

DRIVETRAIN

The vehicle's drivetrain operates in the same manner as a traditional bicycle. To power the vehicle, the operator pedals the front cranks and shifts gears on the right steering arm. Turn the shift handle clockwise to shift up and counterclockwise to shift down. The vehicle's brakes are located on the left steering arm.

In addition to the traditional functionality of a bicycle, Pulaski has a cable actuated reverse mechanism. The reverse mechanism is activated by pulling the red lever on the right steering arm. While the lever is pulled, the operator pedals backwards and the vehicle will travel in reverse. The vehicle must be at a complete stop before activating the reverse mechanism. Activating the reverse mechanism while traveling forwards, may result in mechanical failure or malfunction.

STEERING



Steering Operation:

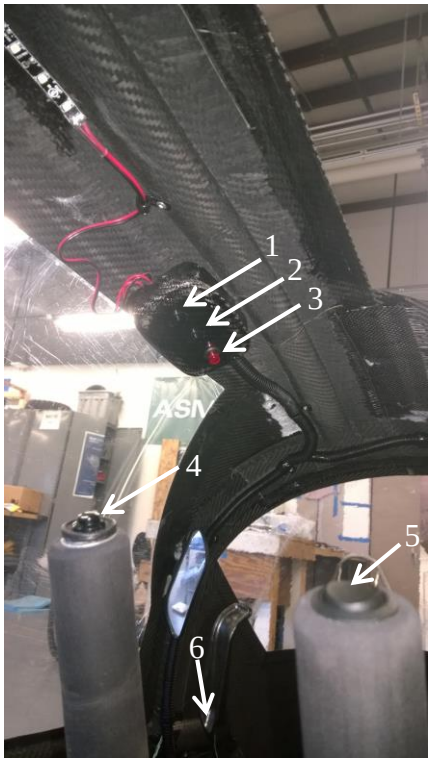
1. After entering the vehicle grasp each steering arm with the respective hand.
2. The handling operates by pulling on the right arm to turn right and pulling left to go left.

Steering Components:

The first component of the steering is the steering arms (1). These are attached to the rest of the steering using short linkages (2). These are connected to a centrally rotating bell crank (3). The bell crank is attached via the tie rods (4) which are attached to the steering knuckles (5). The wheels are attached to the steering knuckles.

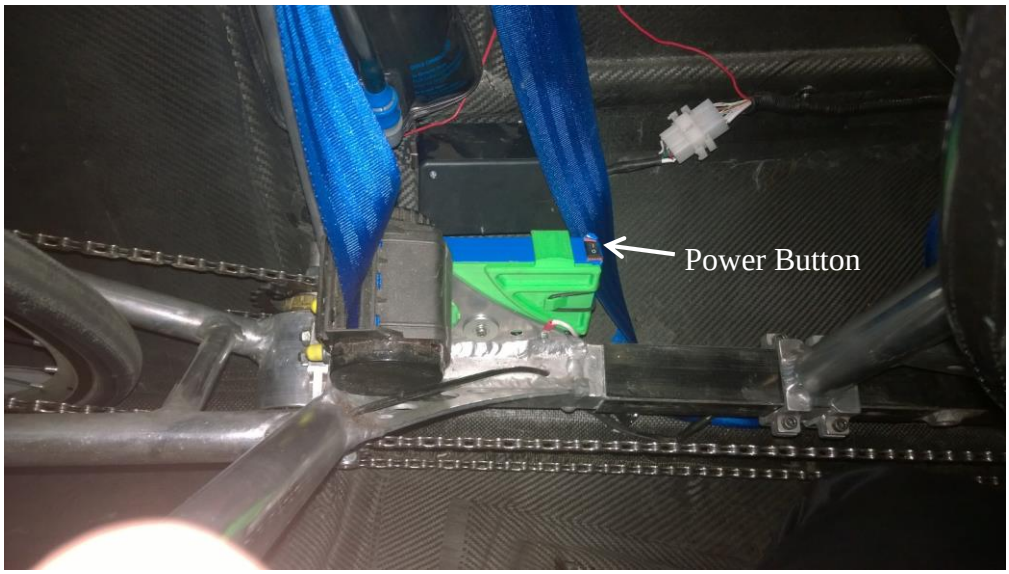
LIGHTING AND VENT OPERATION

The vehicle features turn signals, brake lights, running lights, a headlight, a horn, a dome light, and a pair of climate control vents. All of these features are operable during regular vehicle use. The figure below shows the control layout within the vehicle cabin.



1. Vent operation button – press this button once to close the ventilation system. Press the button again to open the ventilation ducts.
2. Headlight button – Press this button once to turn on the head light. Pressing this button repeatedly cycles the light through varying brightness. To turn off the headlight, hold this button until the headlight shuts off.
3. Dome light button – In the event the operator needs more light within the cabin, pressing this button will turn on the vehicle's internal light. Pressing the button a second time will turn off the internal light.
4. Horn button – To operate the horn, press and hold the button on the top of the left steering arm for the duration that a horn signal is desired.
5. Turn signal control – The turn signals are operated with a single, three position switch at the top of the right control arm. When the switch is located in the center position, no turn signal is flashing. To indicate a left turn, depress the left side of the switch or depress the ride side to indicate a right turn. Once the turn is completed, return the switch to center.
6. Brake lights – The brake and running lights do not require extra input from the operator. Simply pull the brake lever when stopping is desired and the red lights at the rear of the fairing will switch from running to brake lights.

Pulaski's electrical components operate on a small 12 volt lithium ion battery. The battery should last roughly 3 hours of continuous operation. If the power switch is in the on position and no lights illuminate, remove the battery and charge it with the included battery charger. The figure below shows the location of the vehicle power button.



VEHICLE MAINTENANCE

STEERING ALIGNMENT

1. Remove wheel bolts and attach alignment jigs to both sides of vehicle using the provided alignments bolt.
2. Using a tape measure, check straightness between closest and farthest points.
3. Loosen jam nuts on tie rods. Adjust and check alignment jig until points on the jig are the same width.
4. Tighten jam nuts on tie rods.

CHAIN REPLACEMENT AND ADJUSTMENT

Pulaski uses a traditional bicycle style chain based drive system. Proper maintenance of this system is critical to vehicle longevity. To adjust the tension in any of the drive chains, follow the instructions given below.

1. Each of the vehicle's 4 drive chains has an adjustable chain length. Locate which chain you would like re-tension and its corresponding tensioner location.
    a. For the front most drive chain, the eccentric crank location on top of the crank boom is used for chain tension adjustment.
    b. For the middle drive chain that passes under the driver seat, an eccentric reverse housing is used for chain tension adjustment.
    c. The right hand rear drive chain is self-tensioning and does not need adjustment.
    d. For the left hand reverse chain, the rear wheel location within the frame is adjustable via sliding dropouts with allen head setscrews located on the interior of the dropouts.
2. To tension the front and middle drive chains, proceed to step 3. To tension the reverse chain, proceed to step 4.
3. Each of the eccentric mount locations are loosened by a 4mm allen wrench located on the rotating inner shell. Loosen this bolt, rotate the inner shell until the desired chain tension is achieved and retighten the 4mm allen bolt.
4. Removal of the vehicle's rear wheel allows access to the wheel location adjustment bolts. Once these bolts are located, tighten or loosen these bolts to allow the wheel to sit further forward or backward. Once rear wheel position and alignment are satisfactory, replace the reverse chain.

On a rare occasion, one of the vehicle drive chains may need to be removed for further maintenance or replacement. To perform this maintenance, follow the steps outlined below.

- This procedure should be performed with an official Pulaski chain removal tool.
    1. Locate the quick removal link in the drive chain that you wish to remove. This link is black in color.

2. Once located, position the closing teeth of the chain removal tool into the corresponding chain gaps on each side of the quick link. Squeezing the tool grips should remove the quick link and allow the chain loop to be broken.

REVERSE CABLE TIGHTENING

1. Use hex key to loosen one of the set screws in the brass cable splicer, located in the right steering arm inside the green plastic splitter.
2. Pull cables until taught.
3. While keeping tension on the cables, tighten previously loosened set screw.
4. Check for proper engagement of reverse gear. If not functioning properly, repeat previous steps.

IMPORTANT SAFETY INFORMATION

- Seat belt and helmet must be worn at all times while operating the vehicle. Failure to comply may result in serious injury or death.
- Engaging the reverse gear during forward operation could cause serious damage to the vehicle and result in vehicle operation error.
- Door must remain closed and latched during all operation to protect vehicle occupant from other vehicles and operating environment.
- Proper use of vehicle light indicators, turn signals, brake lights, and headlight must be used in accordance with state laws.
- Vehicle should not be operated if any equipment malfunctions are present during start up procedure or operation.
- Improperly aligned wheels or brakes could result in serious injury or death. If problems are present please fix or take vehicle in for maintenance.