

HANDCYCLE: Using Reverse Pedaling to Produce Forward Motion

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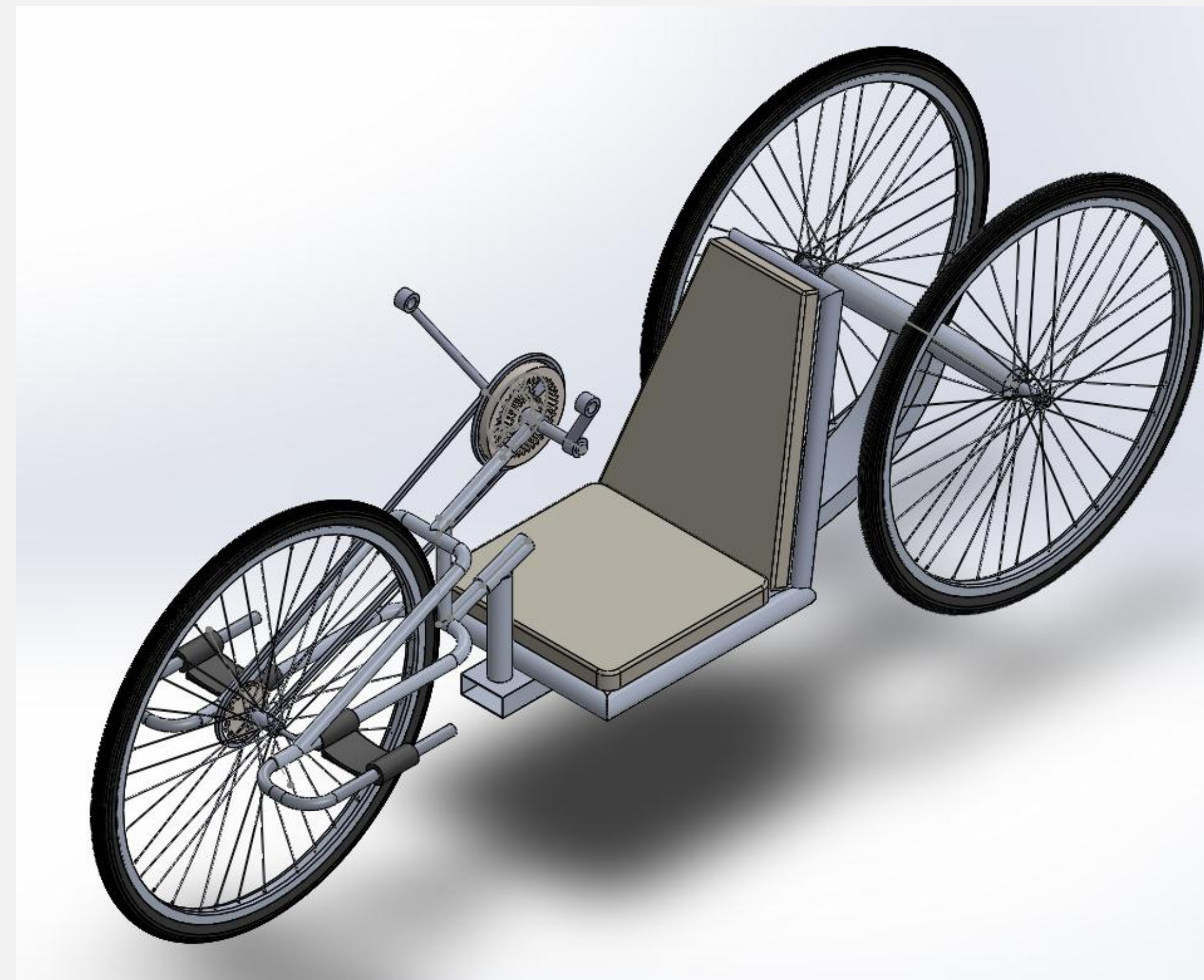
PROBLEM

Modern handcycles have the rider pushing their arms forward to pedal the cycle, which isolates the triceps brachii muscles. Since the triceps are a relatively small muscle the rider tires quicker than a bicyclist on a traditional bicycle, limiting the length of their excursion.

SOLUTION

The Reverse Motion Handcycle allows the rider to switch the direction that they pedal, moving the driving load from the triceps brachii to the biceps brachii. This is done using a planetary gear attached to a regular chainring. By changing the driving muscle set, the rider will be able to pedal for a longer distance before needing to rest.

FRAME



A handcycle uses a tricycle design for stability purposes. The cycle frame designed and fabricated is similar to that of commercial handcycles currently on the market. Keeping the center of gravity low is an important design constraint as it decreases the chance of the cycle tipping while turning.

FABRICATION

Through stress analysis and market research, aluminum 6061 was chosen for an optimal balance between strength and weight. The handcycle is composed of multiple pieces that were connected by tungsten inert gas (TIG) welding to ensure rider safety.

PLANETARY GEAR



The planetary gear consists of three components, the sun (1), the planets (2), and the annulus (3). The three planets rotate around their axes while remaining otherwise fixed. As a result, the annulus revolves around the entire system.

The sun gear is driven to rotate in the clockwise direction from the backward pedaling. Since the planet gears are fixed to keep from revolving around the sun, they will rotate about their own axes in the counter-clockwise direction. This will then drive the annulus in the counter-clockwise direction.

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