H.E.R.C

Human Exploration Rover Challenge

IEEE Aerospace & Electronic Systems Society

IEEE Tunisian Students & Young Professionals Congress

TSYP 11th Silicon Valley

2019 IEEE ISSATM STUDENT BRANCH

PLAN:

1-Rover’s overview

2-Body and Material

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4-Areal Exploring

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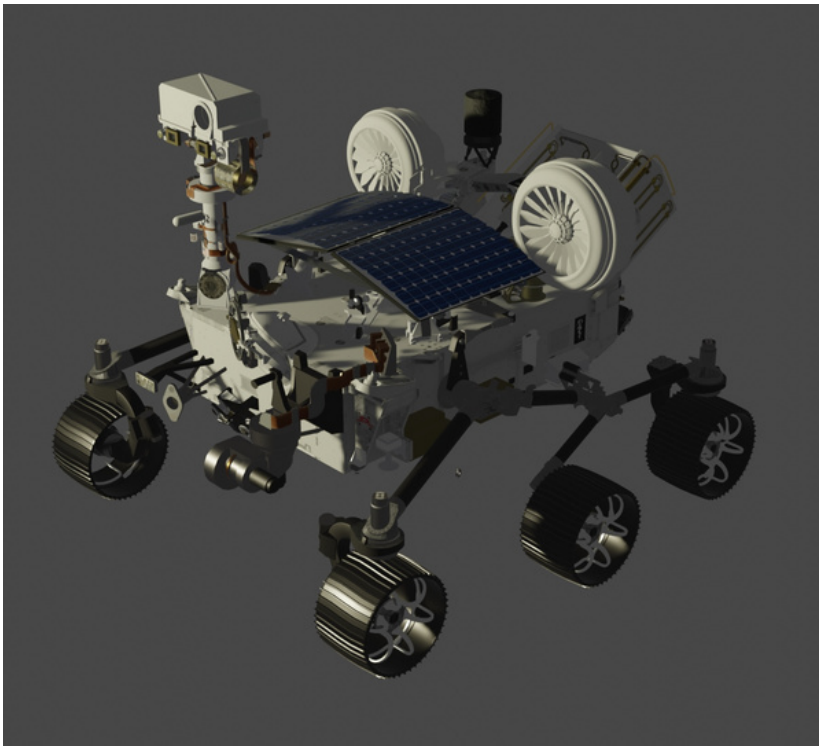
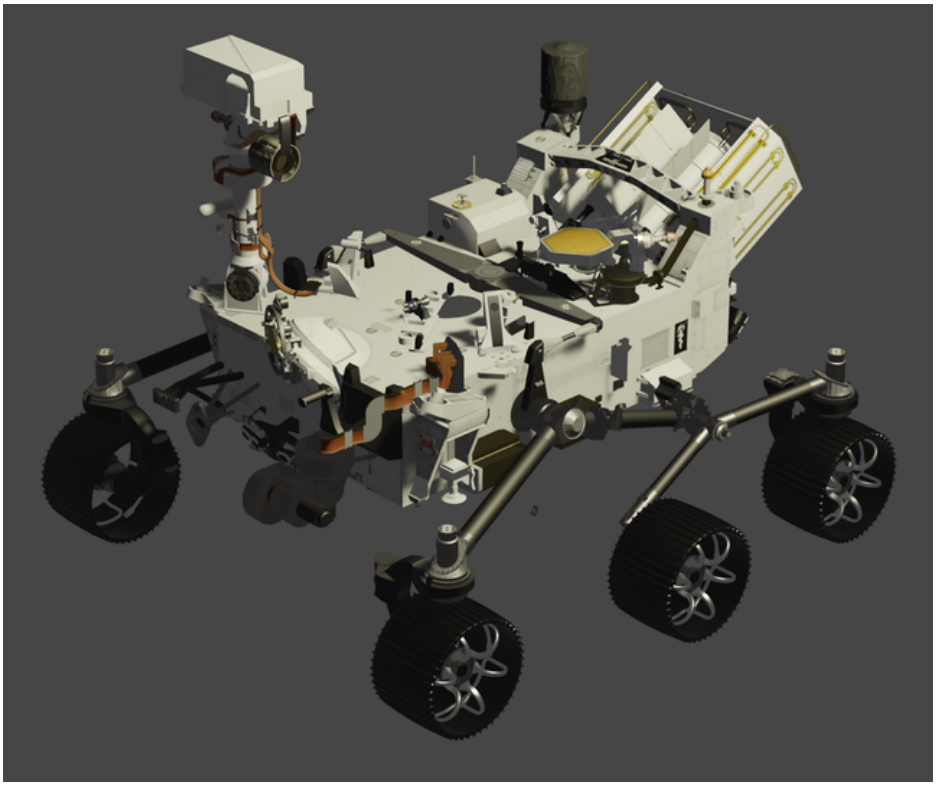
6-Communications with Earth.

1-Rover’s Overview:



The Carthago rover is an autonomous 6-wheeled vehicle specifically designed to overcome the challenging conditions on Mars while maintaining communication with Earth. It is based on the design of the Perseverance Rover, but with upgraded features and concepts to enable it to fulfill its mission. The rover is equipped to navigate and explore the red planet, drawing from the success of previous rovers such as the Opportunity Rover. The Carthago rover would be a significant advancement in the field of space exploration, as it is tailored to operate in the harsh Martian environment and ensure seamless communication with Earth throughout its mission. The design and features of the rover are optimized to enhance its functionality and efficiency, building upon the proven capabilities of previous successful rovers. The Carthago rover's 6-wheel configuration is a common design choice for rovers due to its stability and ability to navigate rough terrain. This, combined with its advanced communication systems, makes it a promising asset for the exploration of Mars. The rover's autonomy and enhanced features are a testament to the continuous evolution of space exploration technology, allowing for more sophisticated and capable missions.

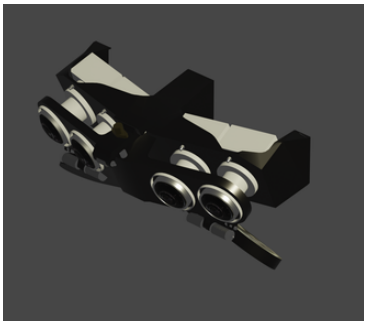
2-Body and material:



Carthago's body is mainly made of Forged Carbon fiber which is a high-performance material known for its strength, lightness, and unique appearance. It is commonly used in a variety of applications, including automotive components, body kits, and interior trims. Unlike traditional carbon fiber, which is layered, forged carbon fiber is produced using a different manufacturing process that results in a swirled or marbled pattern, giving it a distinctive look. This material is favored for its exceptional strength-to-weight ratio, making it ideal for enhancing performance and reducing overall vehicle weight. Additionally, its aesthetic appeal has made it a popular choice for both exterior and interior customization of vehicles, offering a modern and distinctive appearance. The use of forged carbon fiber in automotive applications reflects its versatility and ability to combine form and function, making it a sought-after material for enthusiasts and manufacturers alike and that would be an the most helpful asset in our trip on the red planet.

3-Main Navigation Sensors:

A- HazCam:



These cameras are designed to provide image data used by the rover's computer to build range maps, perform onboard hazard detection and avoidance, and support science operations for selecting near-field targets

B- MastCam - Z:

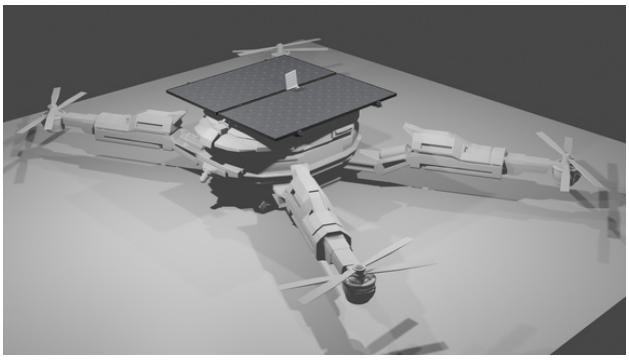
The Mastcam-Z's 3.6:1 zoom capability and ability to take high-definition video, panoramic color, and 3D images with a zoom lens make it an essential tool for detailed examination of distant objects and terrains on Mars.

C- NavCam:

The Navcams are mounted on the rover's remote sensing mast and consist of two cameras that provide a stereo view. They have a 45-degree horizontal and vertical field of view and a 67-degree diagonal field of view. The Navcams are primarily used to provide terrain context for mobility planning, and they also support science operations for selecting near-field targets and robotic arm operations.

4- Areal Exploring:

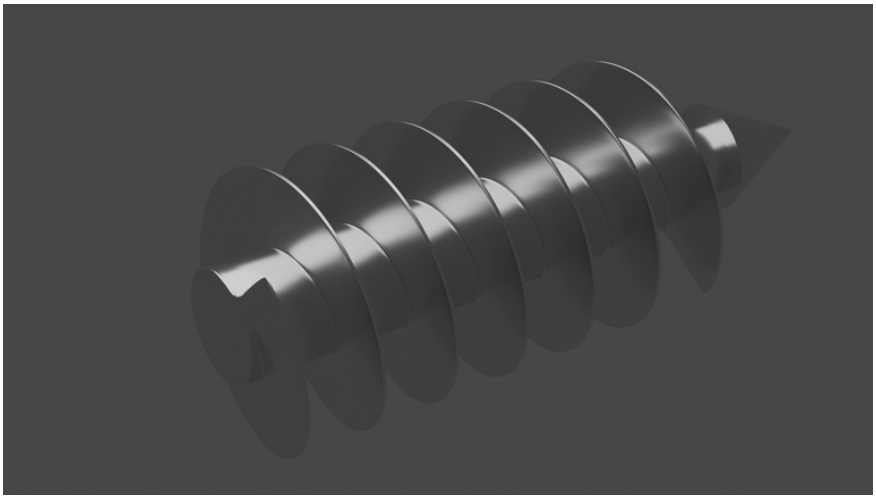
Hannibal



The Hannibal Drone, the protector of Carthago would be a drone attached to the belly of Carthago rover and its flights are autonomous, piloted by onboard guidance, navigation, and control systems running algorithms developed by the team at JPL. The rotorcraft's imagery is being used to directly support the Perseverance rover's exploration of Mars, previewing areas of Mars of possible interest for the rover to explo

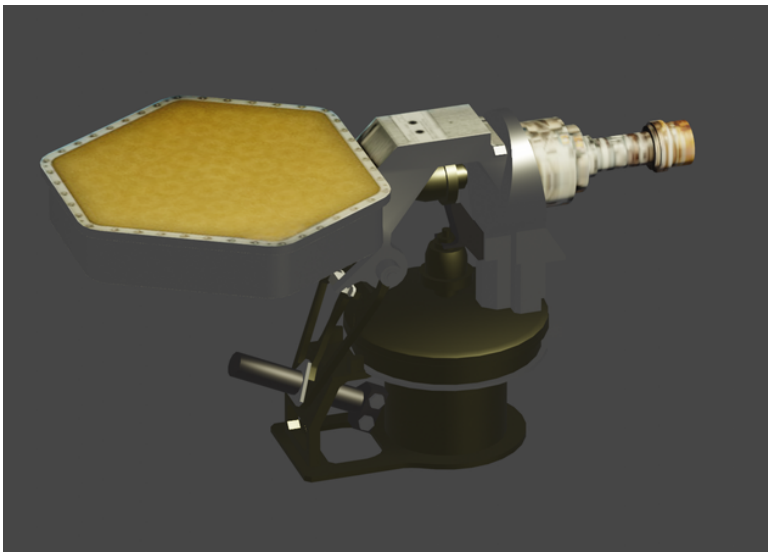
5- Undersurface Exploring

Archimede’s Screw



The device consists of a screw-shaped surface inside a pipe, with one end placed in a low-lying water source and the other end tilted up into a higher discharge point. The principle behind the Archimedes' screw is that of a positive-displacement pump, which traps fluid from a source and forces the fluid to move through the pump

6- Communications with earth



Communicating with spacecraft on Mars from Earth is a complex process that involves the use of antennas and specialized communication systems. The Deep Space Network (DSN) is a critical component of this process, consisting of a network of large antennas located around the world that are used to communicate with spacecraft at Mars and other distant destinations. The rovers exploring Mars communicate with each other, with orbiters, and the DSN through X-band UHF antennas, which are close-range antennas used at low power. The communication between Earth and Mars is affected by the distance between the two planets, which varies depending on their relative positions in their orbits. At the closest point, it takes about 3 minutes and 7 seconds for a signal emitted by the DSN to reach Mars, while at the farthest point, it takes about 20 minutes and 57 seconds. The Mars rovers have multiple antennas, including a low-gain antenna (LGA), a UHF antenna, and a high-gain antenna (HGA), which are used for different purposes. The HGA is used to send a "beam" of information in a specific direction and is steerable, allowing it to move to point itself directly to any antenna on Earth. The communication between Earth and Mars is a critical aspect of space exploration, enabling the transmission of scientific data and the control of spacecraft and rovers on the Martian surface.