

# NASA NCAS Mars Rover Design

## Hermes

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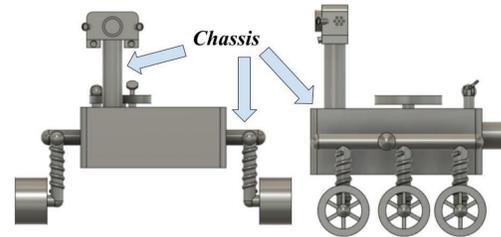
### Introduction

The purpose of my Mars rover Hermes is to be a scout rover. In the next 20 years, there will be humans on the surface of Mars. Although we have covered most of the surface thanks to the Mars rovers, such as Curiosity, Spirit, and Opportunity, there will still be unknown territory and variables that the astronauts need to be prepared for. According to the Kennedy Space Center, NASA is building and testing a new "concept vehicle designed for navigating the demanding landscape of Mars: the Mars Rover Vehicle Navigator, or MRVN." Hermes would be a great addition to this vehicle because the astronauts can send out Hermes to survey the area, drill areas, pick up samples, and return the samples to the MRVN, since the MRVN will also have a laboratory inside. It can help the astronauts determine if they want to go out and explore that area of Mars or if they should continue to another area. Hermes can also scout during the night for samples and return in the morning to the base for the astronauts to collect.

### Scientific Objectives

1. The first scientific objective is to collect samples of rock, dust, sand, and other materials. Curiosity has done a similar objective except it only collected samples of sand, dust, and powder from the rocks. Hermes would have the capacity to collect actual rocks and bring it back to the astronauts so that they can do specific experiments and not have to solely rely on a rover.
2. The second scientific objective is to dig up and collect samples of methane and possibly water. There are areas on Mars that NASA has found to have high amounts of methane and even traces of water. The team of astronauts could send Hermes on a long journey to scout these areas and search for methane or water, or the team could drive in the MRVN 3 to those areas, deploy Hermes, then collect any samples when it returns and do experiments in the MRVN.
3. The third scientific objective is to record and take pictures of Mars and everything that the team of astronauts is doing. Although Curiosity, Spirit, and Opportunity have already done this objective, it takes up to 40 minutes to send all that imagery back to Earth. With the astronauts on Mars, they can compile either a weekly or monthly report that includes all the important videos and images back to Earth in one go. Not only that, if Hermes goes out scouting on its own and it finds something interesting or important, it can record and take a picture of that object and send it back to the astronauts so they can review the findings.

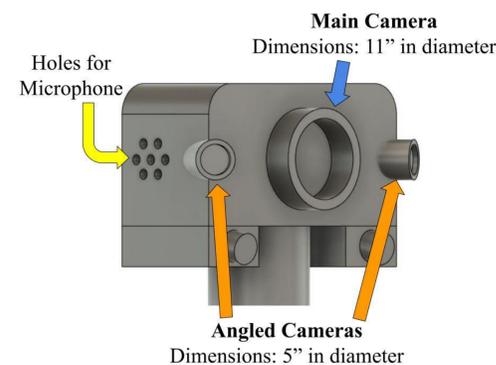
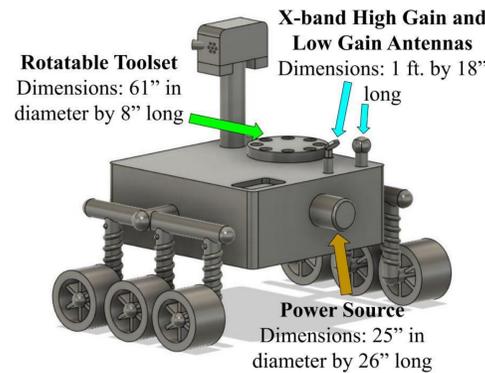
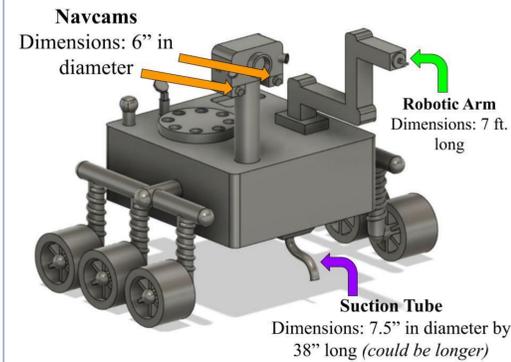
### Design



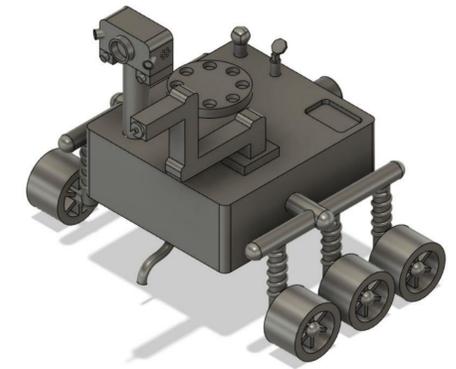
Dimensions: 19 x 13 x 22 ft.

The chassis will be bigger than the chassis of Curiosity. Since the purpose of Hermes will be to collect samples, such as rocks, it needs more space to store all those items. The chassis will include a vault inside of it so that if anything happens to Hermes, the samples will be in perfect shape when the astronauts find Hermes. The chassis would have to be made of a lightweight, yet durable aluminum alloy so that it can carry the extensive weight and handle the environment. The tires will have to be more durable, probably bigger, and include springs on the ends so that it can retract some of the weight.

Hermes will be using an eMMRTG power source, an enhanced version of the current MMRTG power source that Curiosity is using right now. According to a NASA article called Radioisotope Power Systems: The Power to Explore, "Using these skutterudite materials could allow an 4 enhanced MMRTG to produce 30 percent more power at the beginning of a mission, and because performance degradation is less, as much as 50 percent more power than the current MMRTG". With the amount of weight and materials Hermes will be carrying, it will need more power to drive at a constant speed. Not only that, the astronauts won't have to worry about charging Hermes because of its greater lifespan with the eMMRTG.



The rotatable toolset on top of Hermes's chassis will consist of multiple tools that can be used for different scenarios, such as drill, drill bits, a shovel, a scooper, and a robotic claw. It will act similarly as a CNC machine, where it rotates to a different tool bit based on what the user wants. This instrument is to help with the first scientific objective, which is to collect samples. If Hermes need to collect samples of rocks, it can use the robotic claw or shovel to pick up samples. If it needs to collect samples of dust or sand, Hermes can use the shovel or scooper to scoop up the samples. Lastly, if Hermes needs to collect samples of powder from certain rocks, it can use the same drill method as Curiosity.



### Results

Hermes is a well-rounded rover that is situated for almost any situation on Mars. It will have technology from its predecessor that is already proven useful and can work amazingly within Mars atmosphere. Not only that, it will contain new technology, such as the eMMRTG power source to improve its survivability and usefulness. Although it is close to the same size as the current Mars rover Curiosity, it will weigh less because it won't be carrying as much tools and will include a significant amount of empty space for the vault inside of the rover.

### Conclusions

We humans have learned so much about our universe ever since we started looking at the stars. We observed Mars for a very long time now, but even with years worth of discoveries, Mars is still an unknown territory. Hermes will be a great scout rover and partner during the manned missions to Mars because of his toolset, his enhanced power source, and being lighter than the previous rovers. Furthermore, Hermes will be a great addition to the Mars Rover Vehicle Navigator, since Hermes can collect samples and bring it back to the lab within MRVN. For Future Directions on Hermes:

- Look over specifications on Curiosity and how Curiosity was built
- Create a prototype of the robotic arm and rotatable toolset

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### References

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