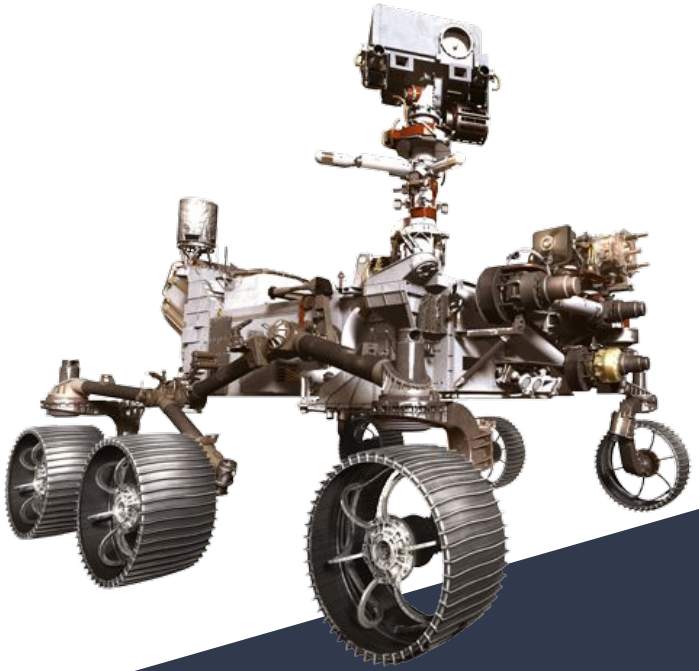
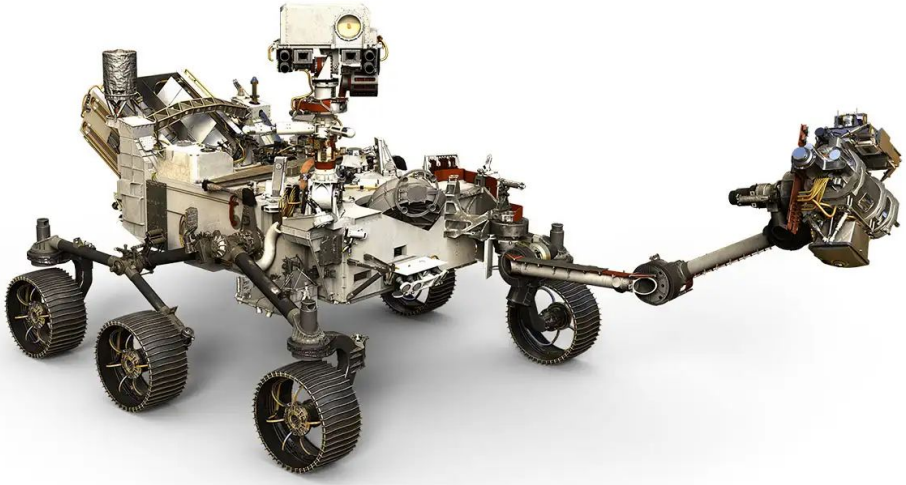


MARS Rover

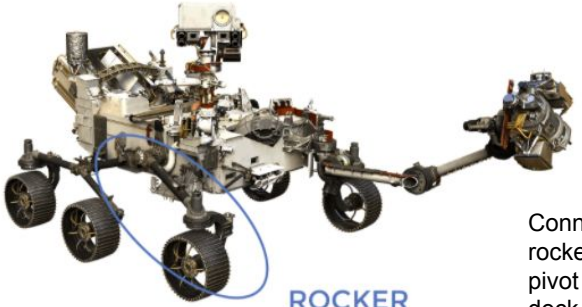
Hull Design

- warm electronics box (WEB)
  - keeps the rover's vital organs protected and temperature-controlled
  - protects the rover's computer, electronics, and batteries
- Legth : 10 feet
- Width : 9 feet
- Height : 7 feet
- Weight : 1,025 kilograms
  - Lighter than a compact car



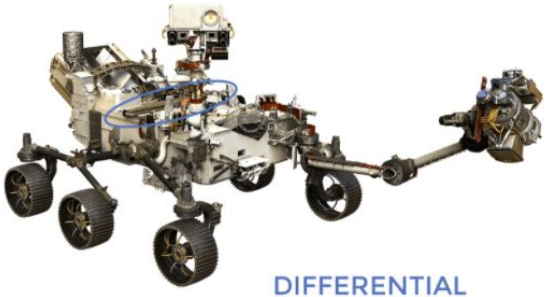
Locomotion System

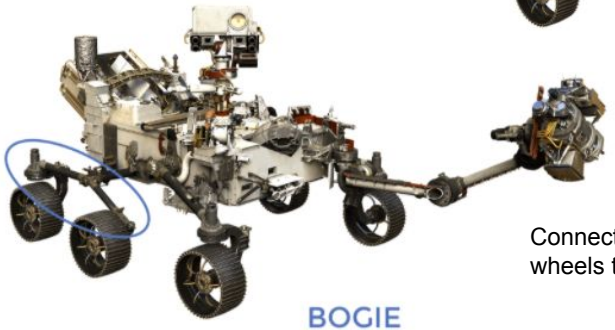
- 6 wheels with each own motor
- two front and two rear wheels also have individual steering motors
- four-wheel steering also allows the rover to swerve and curve, making arcing turns.
- to drive over knee-high rocks
- Material
  - Legs : titanium tubing
  - Wheels : aluminum, with cleats for traction and curved titanium spokes for springy support



Connects to the left and right rockers and to the rover body by a pivot in the center of the rover's top deck.

One each on the left and right side of the rover. Connects the front wheel to the differential and the bogie in the rear

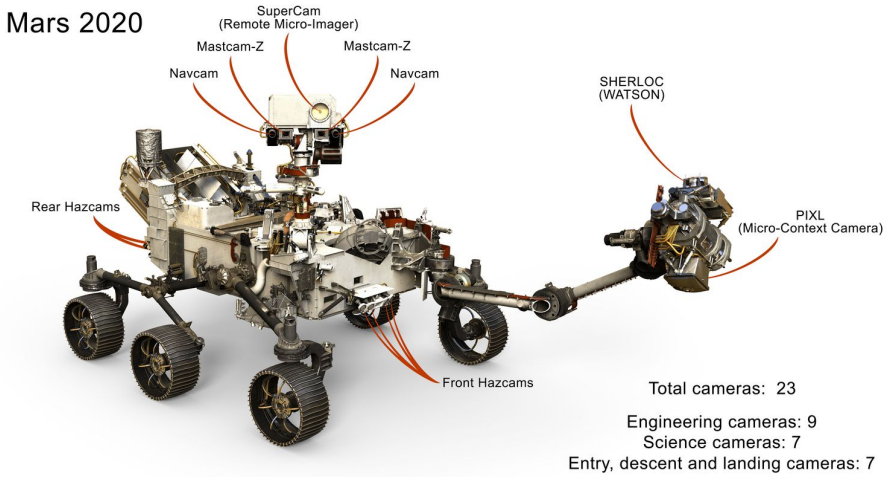




Connects the middle and rear wheels to the rocker

Navigation System

- Hazard Avoidance Cameras (HazCams):
  - Aid in autonomous navigation
  - detect hazards to the front and back pathways of the rover, such as large rocks, trenches, or sand dunes
- Navigation Cameras (Navcams):
  - Aid in autonomous navigation
  - Two color stereo Navigation Cameras
  - help engineers navigate Perseverance safely, particularly when the rover operates autonomously, making its own navigation decisions without consulting controllers on Earth.
- CacheCam
  - single camera that looks down at the top of the sample cache
  - takes pictures of sampled materials and the sample tubes as they are being prepared for sealing and caching
  - watch over" the samples as they are being obtained, and keeps a record of the entire process for each sample collected.



Data Collection

Communication

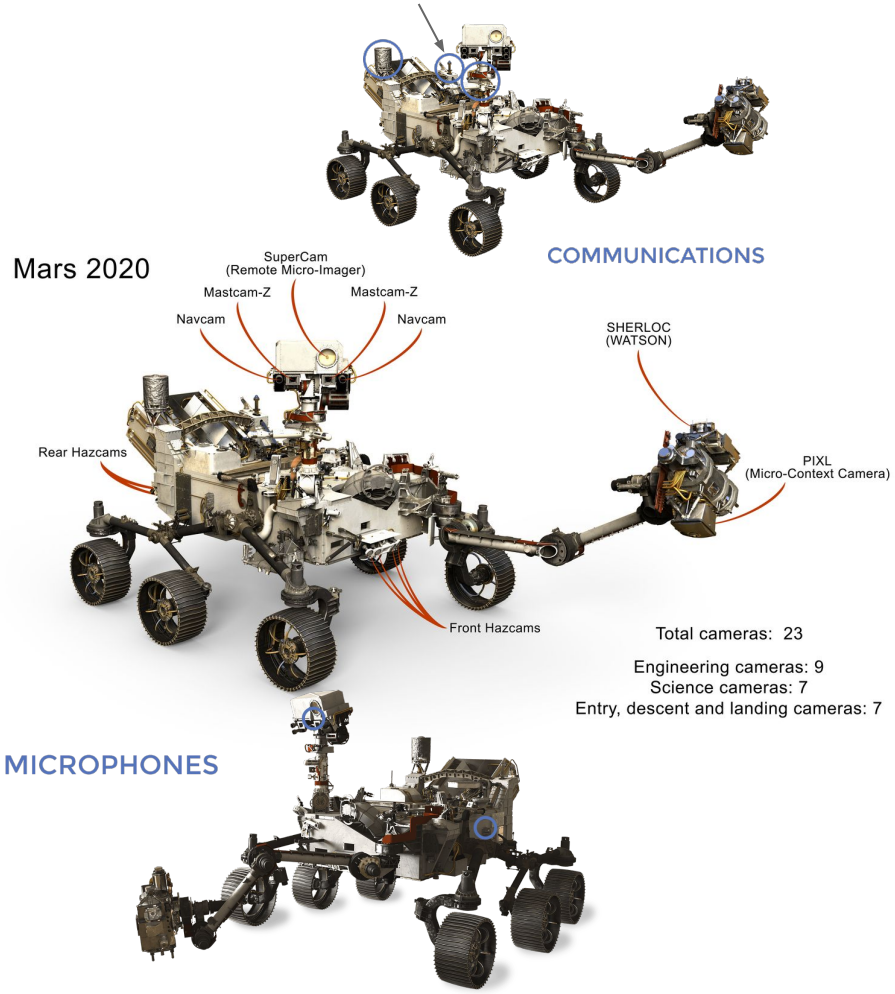
- The X-Band Low-Gain Antenna
  - Main Job : Receiving Data
  - Radio Frequency : X band (7 to 8 gigahertz)
  - Reception Rates : Approximately 10 bits per second or faster from the Deep Space Network's 112-foot-diameter antennas

Camera

- Mastcam-Z
  - a pair of cameras that takes color images and video, three-dimensional stereo images, and has a powerful zoom lens
- SuperCam
  - fires a laser at mineral targets that are beyond the reach of the rover's robotic arm, and then analyzes the vaporized rock to reveal its elemental composition
- PIXL
  - uses X-ray fluorescence to identify chemical elements in target spots as small as a grain of table salt
- SHERLOC Context Imager
  - main tools are spectrometers and a laser, but it also uses an integrated "context" macro camera to take extreme close-ups of the areas that are studied
- WATSON
  - one of the tools on the "hand" or turret at the end of Perseverance's robotic arm. It is almost identical to the MAHLI hand-lens camera on the Curiosity rover

Microphone

- SuperCam Microphone
  - Main Job : To help study Mars rocks
  - Listening when : when the SuperCam instrument is on, for a few milliseconds at a time. Or to listen to wind and for rover sounds for about 3.5 minutes at a time.
  - What it can hear : the staccato pop caused when the laser studies rock, wind, and rover noises
- EDL Microphones (Entry Descent and Landing)
  - Main Job : To record the sounds of landing
  - Recording: the sounds of descent, friction from the atmosphere, dust blown up by the thrusters as the rover descends



Data Transmission

Communication

- Ultra-High Frequency Antenna
  - Main Job : Transmitting Data to Earth through Mars Orbiters
  - Main Job : Transmitting Data to Earth through Mars Orbiters
  - Transmission Rates : Up to 2 megabits per second on the rover-to-orbiter relay link.
  - takes about 5 to 20 minutes for a radio signal to travel the distance between Mars and Earth,

- The X-Band High-Gain Antenna
  - Main Job : Transmitting Data to Earth through Mars Orbiters
  - Radio Frequency : Ultra-High Frequency (UHF) band (about 400 megahertz)
  - Transmission Rates : Up to 2 megabits per second on the rover-to-orbiter relay link.

Power Management

Electrical Power

- Multi-Mission Radioisotope Thermoelectric Generator (MMRTG)
  - produces a dependable flow of electricity using the heat of plutonium's radioactive decay as its "fuel."
  - 45 kilograms
  - Uses 4.8 kilograms of plutonium dioxide as the source of the steady supply of heat
  - 110 watts at launch, declining a few percent per year
  - Two lithium-ion rechargeable batteries to meet peak demands of rover activities when the demand temporarily exceeds the MMRTG's steady electrical output levels.
  - 14-year operational lifetime