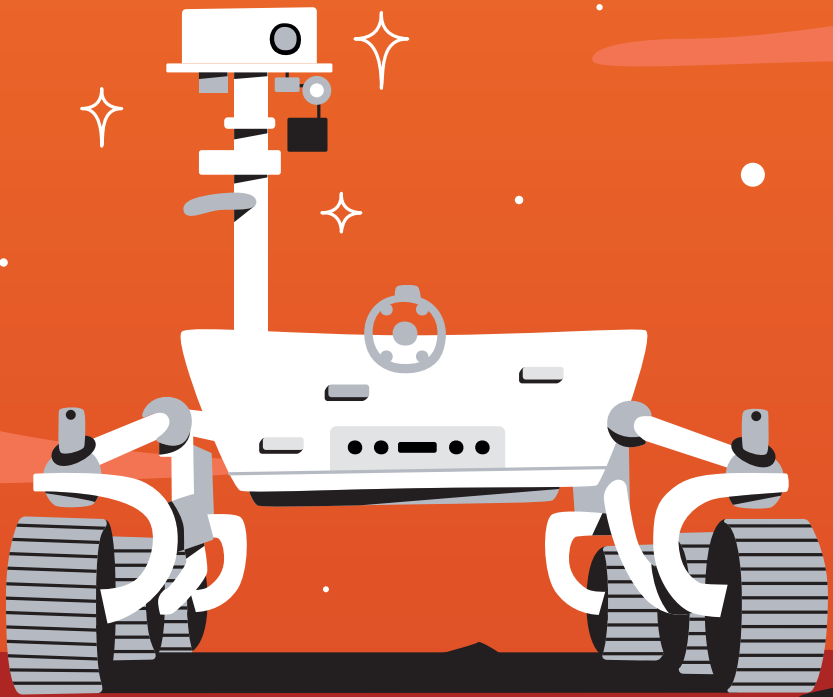


MISSION MARIJN

MARS ADVENTURES: RESEARCH INITIATIVE FOR JOURNEY & NAVIGATION



Hello, new recruit

Welcome!

You are about to embark on the mission:

**“Mars Adventures:
Research Initiative for Journey & Navigation” (MARIJN).**

You've just secured a spot with IAC (Important Aerospace Company), where your job is to work on the design of their new Mars rover vehicle.

IAC has hand-picked you for the MARIJN mission, with the task of gathering critical requirements for your rover.

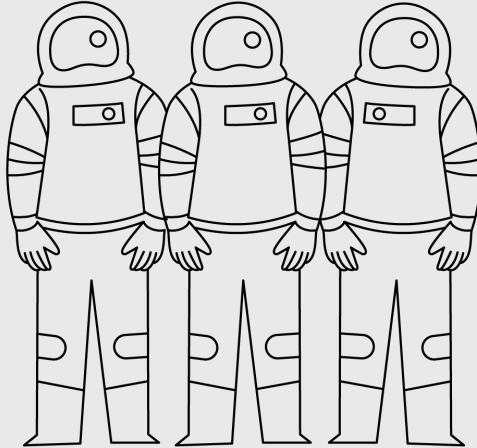
The three adventures in this mission will guide you in discovering essential insights from past Mars rover expeditions and the challenges posed by the mysterious Martian terrain.

LET THE ADVENTURES BEGIN!

CREW:

You're not alone on this Martian experience!

Join forces with one of the three crews and collaborate with your companions to conquer the mission together.



MISSION:

To be awarded the prestigious MARIJN mission sticker-badge, **you need to:**

- 1. Participate in all three adventures and**
- 2. Collect the three critical design requirements.** These are indicated by this symbol: ✦

Your journey involves uncovering information— you will find some within the adventure station and others in “the vast realm of cyberspace”.

Every great crew needs a legendary name!

Take 5 minutes to brainstorm with your team members and come up with a crew name worthy of being forever remembered in the history of the MARIJN mission.

CREW NAME:

— — — — —

Who are your crew members?

— — — — — — — — — —
— — — — — — — — — —
— — — — — — — — — —
— — — — — — — — — —

ADVENTURES:

The three Mars adventures are:

- The VR Mars Fleet;
- Let's Rock, Let's Bo(o)gie;
- Mars Geologists on Wheels.

There is no rigid sequence to complete the adventures and they are short, only **15 minutes each**. Your crew decides how to manage time at each station.

When time's up, get ready for a smooth transition to the next station.

Adventure: The VR Mars Fleet

What are the characteristics of previous Mars rovers?

Dive into the virtual realm to discover the secrets of past Mars rovers. There you will find **the array of rovers currently exploring the Martian landscape** (and an extra one, can you guess which one?).

Each of the rovers was designed for a different mission and therefore had to satisfy different design requirements.

Your crew's task? Complete the table by extracting information from the immersive VR environment (TIP: you can use the measuring tool) and from the Internet for additional insights.

Each intrepid crew member should have the chance to explore the VR Mars Fleet. Manage your time and collaboration wisely!

Rover name	Wheels diameter 	Body height from ground	Dimensions Rate from smallest = 1 to largest + 6	Is this rover on Mars?	Remarks: Any special science payload, equipment, anything that catch your attention
Sojourner					
Spirit					
Opportunity					
Curiosity					
Scarecrow					
Perseverance (+ Ingenuity)					

Adventure: Let's rock, let's bo(o)gie

How does the rocker bogie mechanism work?

The rocker-bogie system is NASA's favourite suspension arrangement for Mars rovers. You and your crew are about to find out why!

Activity 1: Take control of M.A.R.C.O., (Mars Analogue Rover for Comprehensive Observations*)

Drive it over rocks and other obstacles, but always remember that M.A.R.C.O. must arrive safely at its destination: the study area. Ensure the rover camera has a clear view of that area!



What is the biggest obstacle it can overcome?

$$H_{\text{rock max}} = \text{-----}$$

$$D_{\text{wheel}} = \text{-----}$$

What is M.A.R.C.O. average speed?

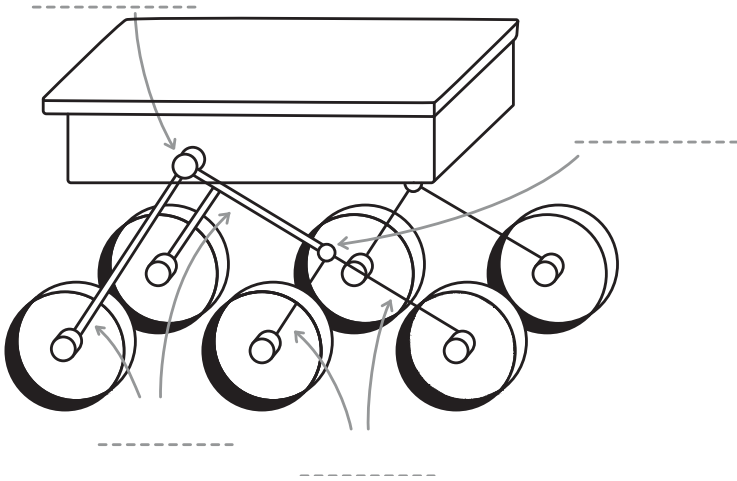
$$V_{\text{M.A.R.C.O.}} = \text{-----}$$

- Each crew member should get the opportunity to be behind the wheel. Time is of the essence—collaborate wisely!
- You could also take the chance to snap a group picture with M.A.R.C.O.'s camera!

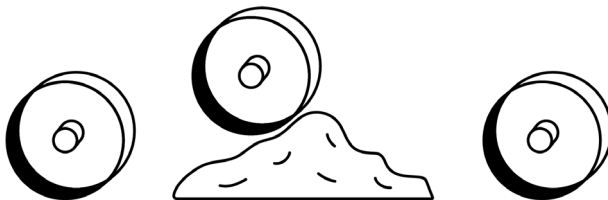
* M.A.R.C.O. is a remote-controlled 1:4 scaled model of the M2020 rover Perseverance.

Activity 2: While awaiting your turn to command the rover, it's your chance to understand the rocker bogie mechanism of M.A.R.C.O.

a. Can you name the different parts of the rover?



b. What does the rocker-bogie mechanism look like when one of the wheels is on a rock? Capture the moment with a sketch!



Adventure: Mars geologists on wheels

How does the Martian terrain influence the rover design?

Your IAC rover will land in the Gusev crater and then it will travel to the Columbia hills to collect rocks in search of biomarkers. In this context, **Mars rocks are both the science target and an engineering challenge.**

1. Mars geologists draw important inferences from rock observations. Can you pair some of the rock samples in the cabinet with their corresponding inferences?

Rock samples	Inferences
Conglomerate	Created by wind or water transport
Sand stone	Heat and water coexisted (ideal for life!)
Geyselite (opaline rock)	There used to be water eroding rocks

2. Meanwhile, the harsh **Martian terrain poses engineering challenges** as it chokes rovers with dust, roughs up their wheels, and interferes with their probes.

What can be learnt from past missions? Fill in the journey-wheel overviews of two past Mars rover expeditions!

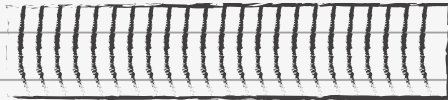
Perseverance

Landing site: JEZERO CRATER

Science target: LOOKING FOR BIOMARKERS
(SIGNS OF PAST LIVES)

Wheel diameter: 52.5 CM

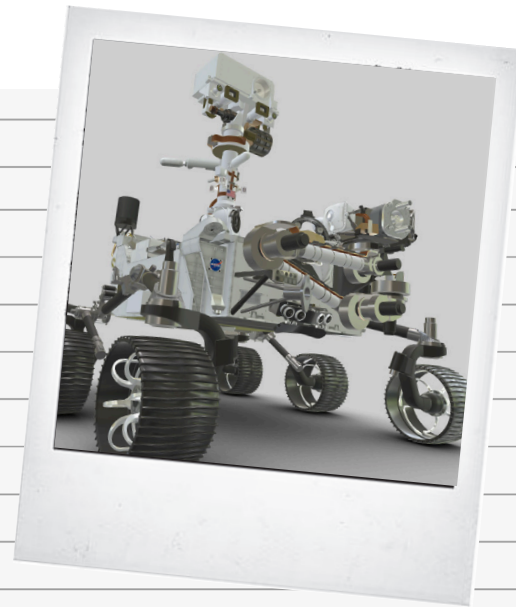
Grouser design (sketch):



Terrain hazards

(Did the rover encounter any problem/obstacle while on Mars):

**PERSEVERANCE HAD A HITCH—HIKING "PET ROCK" STUCK INSIDE
THE FRONT LEFT WHEEL FOR MORE THAN A YEAR**



Grousers are the protrusions on the surface of the wheel. They increase traction, but the pattern they leave on the Martian surface is also used for visual odometry!

(the rover uses images of these traces to determine if it has travelled as far as predicted, or if its wheels have slipped.)

Spirit

Landing site:

Science target:

Wheel diameter:

Grouser design (sketch):



Terrain hazards

(Did the rover encounter any problem/obstacle while on Mars):

Curiosity

Landing site:

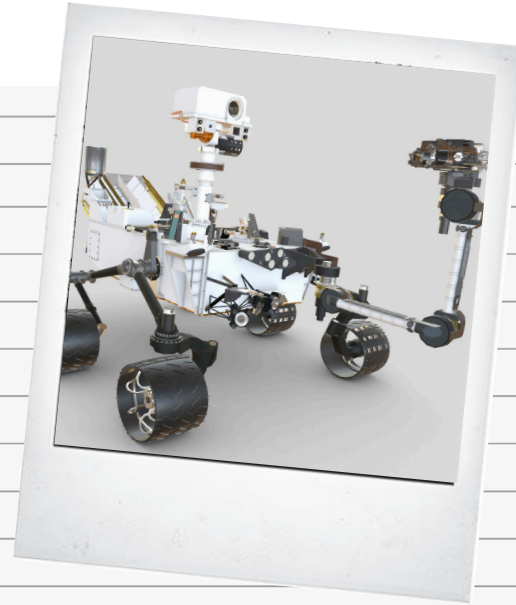
Science target:

Wheel diameter:

Grouser design (sketch):

Terrain hazards

(Did the rover encounter any problem/obstacle while on Mars):



Mission completed!





Do you want to continue
the mission?

Download the NASA app
SpacecraftAR



iOS



Android