Mars Project

A guide to landing a rover on Mars

WCEC Project 2020-2021

Physics & Technology
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Objectives:

- Phase 1 : Take off from planet Earth
- Phase 2 : Traverse the space between planets
- Phase 3 : Land on the surface of Mars

Means:

- US gov & private sponsorship
- A team of Nasa experts
- Use of Atlas V-541 rocket
- Use of the J03 M4M4 rover

Team 1:
Codename: Team Skulduggery
Launching the rocket

Fiona M. P. H.- research and development head

MG - Lead rocket engineer and pyrotechnics head

What are we using to leave the Earth surface?

I. Newton's Laws of motion and Gravitation (F=ma; A= Fnet/M; Fa=-Fb,)

II. Rocket Engines that come with their own oxidizers

III. Rocket needs to be able to reach speeds of 25,000 M.P.H., or, in other terms, 40227 km/h or Mach 32

IV. Rocket used will be the Atlas V-541, used in the Mars 2020 Perseverance Rover project

Specific uses of Newton’s laws

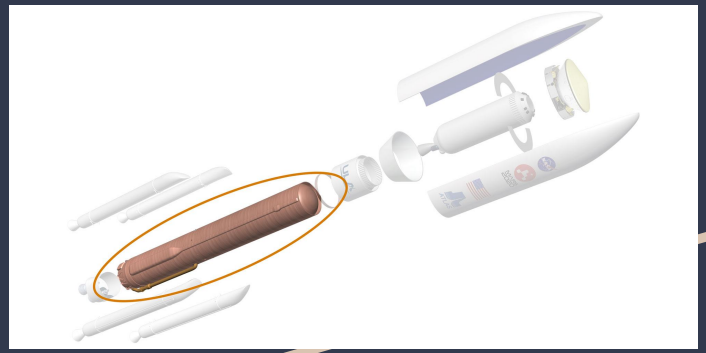
I. F=ma is used for calculating the force to leave the atmosphere

II. a=F/m is used to calculate the acceleration needed to leave the atmosphere

III. Fa=-Fb is used to calculate things like air resistance and propulsion

IV. Gravitation force

Atlas V-541



- Common core booster is 106.5 feet (32.46 meters) in length and 12.5 feet (3.81 meters) in diameter

- Uses throttleable RD-180 engines

- Uses fuel type RP-1

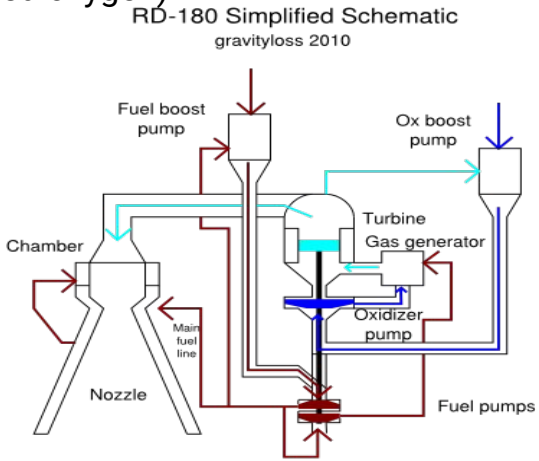
https://www.youtube.com/watch?v=jlxhM8tO66A

RD-180 engines

- Two thrust chambers

- Throttleable, the thrust is controllable via computer input

- High pressure system, using RP-1 fuel and LOX (liquidized oxygen)



Fuel type RP-1

- Highly refined form of kerosene, outwardly similar to jet fuel

- Has a lower Specific Impulse and less thrust per unit mass, but is cheaper and is easier to store

- causes much less pollution than other fuels

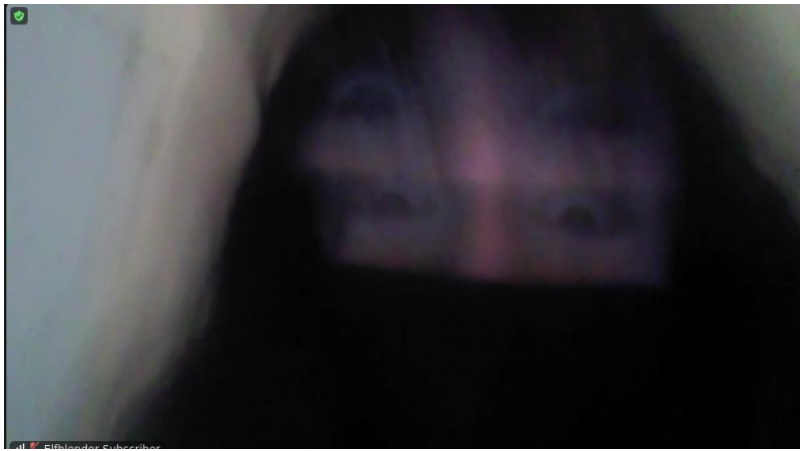
Team 2 :

Interplanetary trip

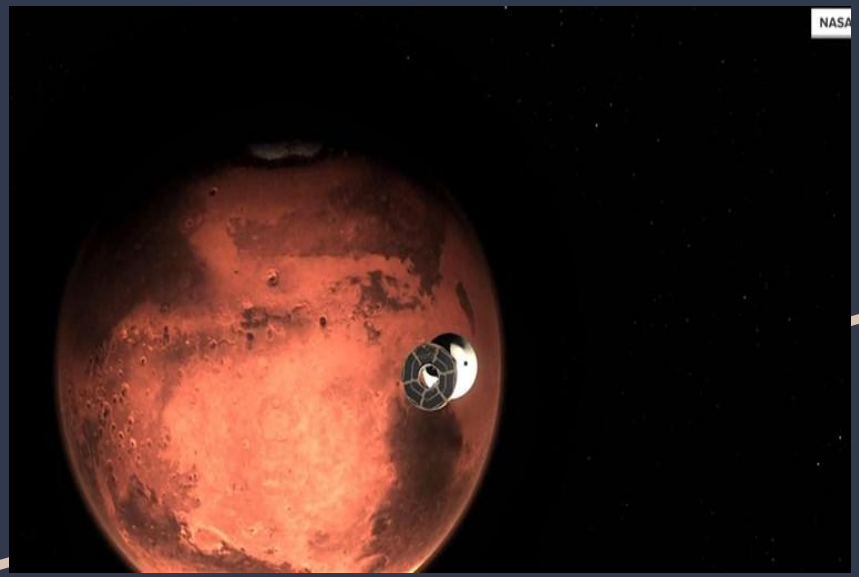
Saunceia & Zahra - rocket navigators & engineers

1- Travel in space

2- Navigate the rocket safely to Mars

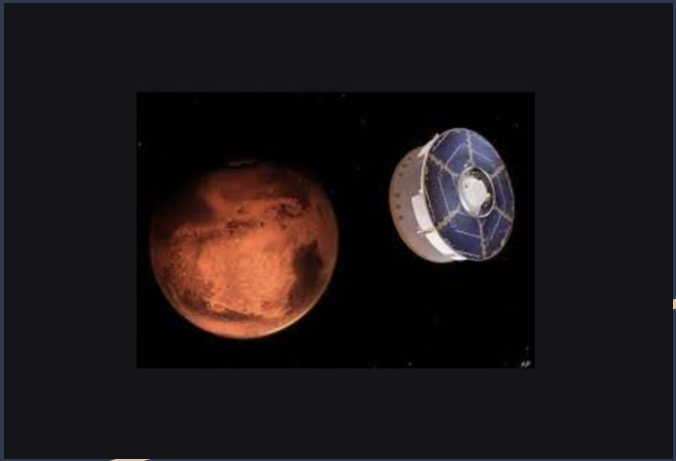


The Journey



- The spacecraft takes off from earth at about 24,600 mph
- The spacecraft will spend about 7 months total traveling to Mars from Earth and will travel 300 million miles
- The people operating the rocket will regulate the speed and direction and occasionally change the spacecrafts flight path as it goes, making sure everything is perfect and correct.

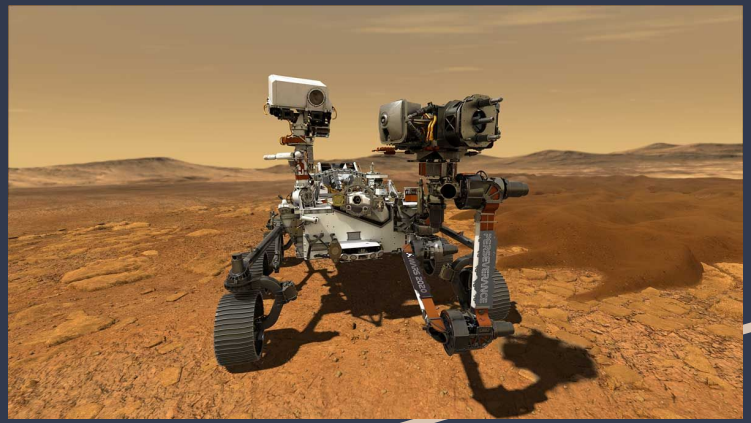
The Journey



- They will navigate it through the big scary space between earth and Mars, monitor it, point it towards mars, make sure everything is perfect before entering Mars’s atmosphere, and make sure the conditions are perfect for the rocket to finally land.

- The flight path will be refined every few weeks in order for the J03 M4M4 rover to arrive and land perfectly

Mars Rover



The real mars rover named Mars 2020 is an actual rover that was launched during July of 2020 and it’s a part of NASA’s Exploration Program.

Team 3 :
landing the rover

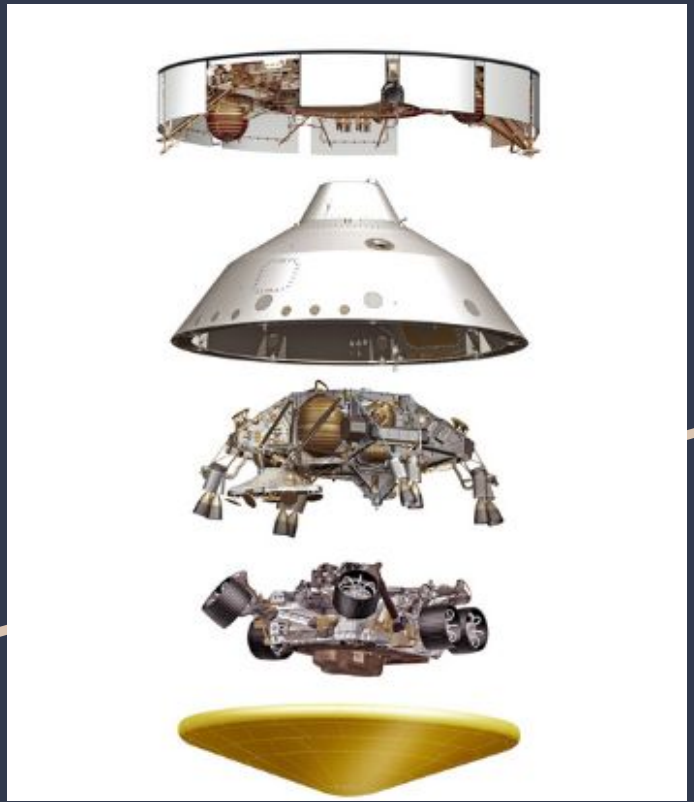
Ashton - Chief engineer of rover decent

Jelal - head of digital information and rover design

Landing the rover (1-6)

- **1:** Spacecraft Rotates
- **2:** Cruise Stage Separates
- **3:** the Spacecraft enters the martian atmosphere
- **4:** Parachute Deploys
- **5:** Heat Shield Jettisons
- **6:** Lander Separates

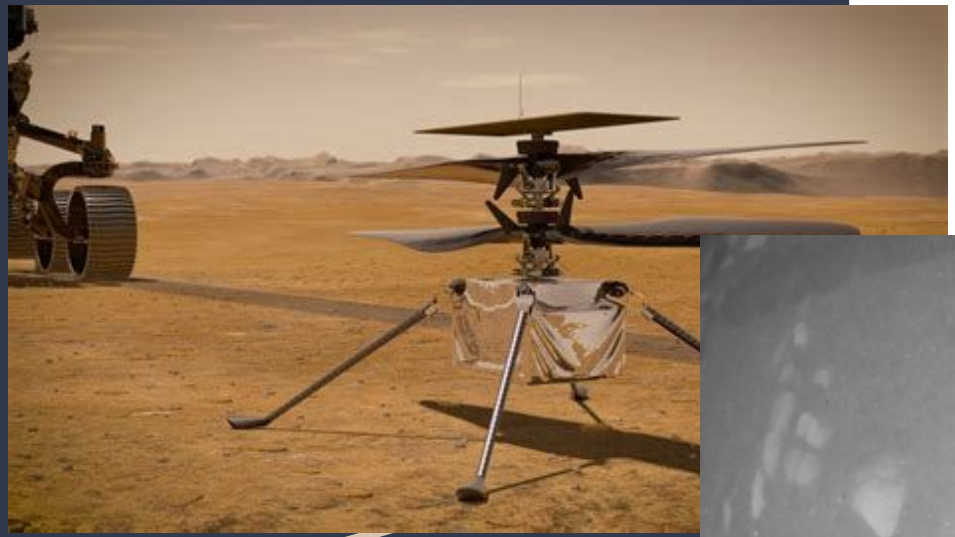
Landing the Rover (steps 7-11)

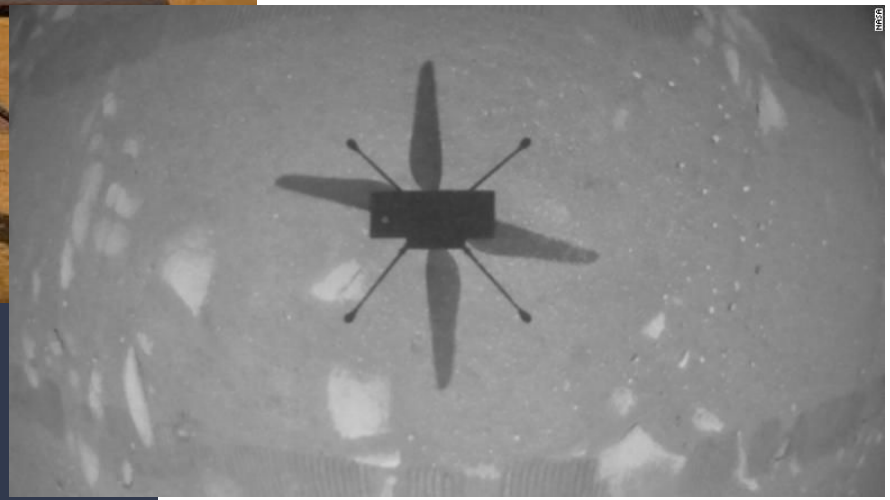


- **7:** Radar Ground Acquisition Begins
- **8:** Descent imager takes pictures of the surface
- **9:** Rover and Jetpack disconnect from housing
- **10:** Jetpack starts up and lowers rover the surface
- **11:** Jetpack flies off leaving rover on the surface of Mars

First flight on Mars

- **Drone flight on Mars @ 3:34 a.m. ET, Mon April 19, 2021**
- **4 pounds**
- **40 seconds**
- **Rose 10 feet**





Actual landing of the rover

Courtesy NASA

Perseverance Rover’s Descent and Touchdown on Mars (Official NASA Video)

https://www.youtube.com/watch?v=4czjS9h4Fpg

Bibliography

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