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# Mars Atmospheric and Climatic Survey System

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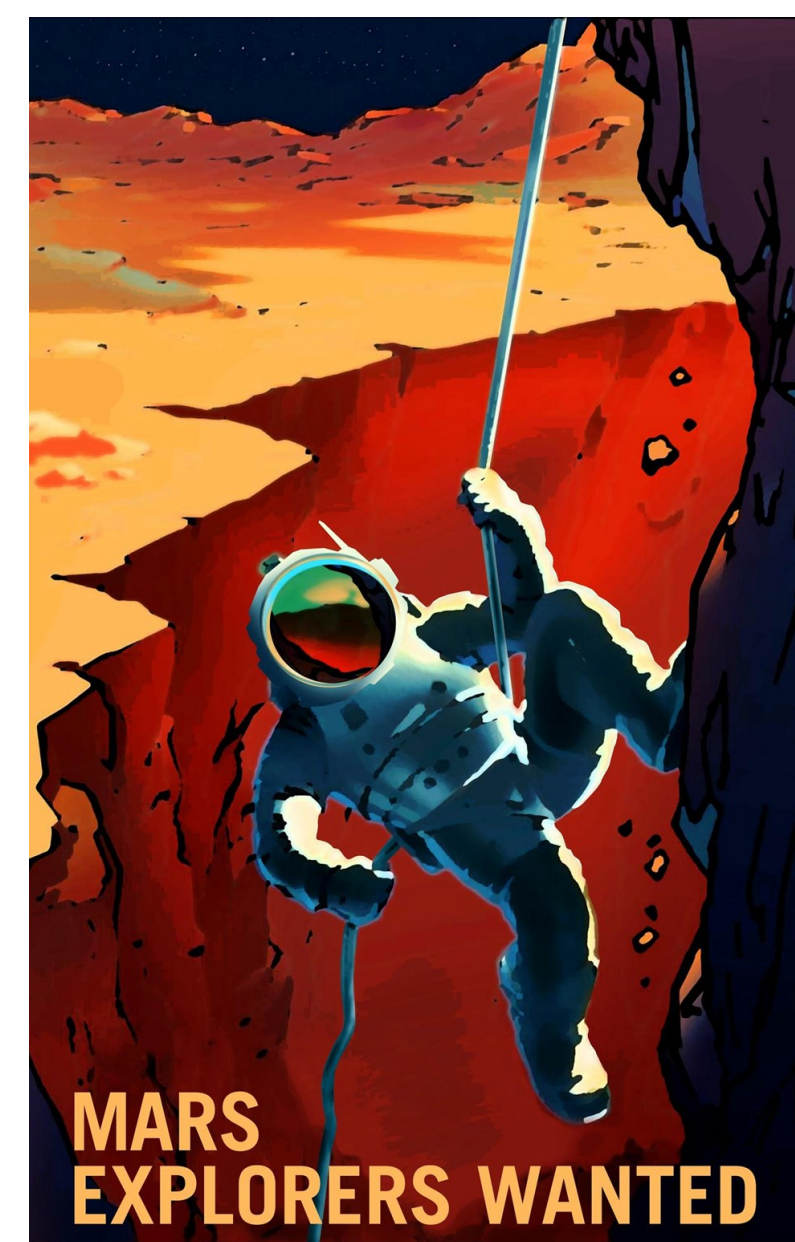
# Mars Atmospheric and Climatic Survey System

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## Objective

The Mars Atmospheric and Climatic Survey System (**MACSS**) aims to provide a predictive model of global climate patterns across Mars. Through the deployment of weather station probes, data regarding temperature, wind speed, pressure, and relative humidity can be collected.

In NASA's *Journey to Mars*, MACSS is a part of the second, or Proving Ground, phase.



## Considerations

MACSS's probes are designed with two main considerations:

- » Endure through Martian conditions
  - Extreme temperatures
  - Electrostatic dust particles
- » Be easily deployable
  - Compact and lightweight
  - Deployable as-needed

## Instrumentation & Components

Each weather station probe is a 10-cm<sup>3</sup> cube containing the following:

### Sensors

#### » Relative humidity sensor

- Mars relative humidity can rise 80 to 100 percent at night

*Model part:* AM2302 temperature-humidity sensor

#### » Pressure sensor

- The Martian atmosphere is about 1% that of Earth's at sea level

*Model part:* I2C barometric pressure sensor

#### » Temperature sensor

- Temperatures on Mars range from -133 °C to 27 °C, averaging -63 °C (-81 °F)

*Model part:* DS18B20 digital temperature sensor

#### » Wind speed sensor

- Wind speeds on Mars can go up to 60 mph

*Model part:* n/a

### Components

#### » Communication: X-band radio

- Allows communication between MACSS, Mars Rovers and Orbiters, and Earth

*Model part:* Broadcom WICED Wi-Fi chip



#### » Data storage: Solid state drive

- Withstands shock, vibrations, and extreme temperatures

*Model part:* (Simulated via real-time data upload)

#### » Power source: Solar panel and battery pack

- A sustainable energy source with a battery to store backup power

*Model part:* Gearonic Solar Panel Battery Pack

#### » Processor: RAD750 processor

- The "brain" of the probe; the RAD750 has been used on previous missions to Mars

*Model part:* Photon software development kit

### Other Features:

- » Compact cubic design (10 cm<sup>3</sup>)
- » Aluminum chassis
- » Aerogel insulation
- » Modular concept

## Impact

While NASA continues to work toward getting us to Mars, MACCS will work on collecting the data that allows us to remain there safely. The impact of MACSS includes:

- » Providing a comprehensive account of weather patterns on Mars
- » Mapping the development and movement of dust storms and related global events
- » Forming a predictive model of Martian climate

## Future Development

Continued development of MACSS will consider:

- Implementing a pitot-static tube to record wind speeds
- Developing a cleaning system for the solar panel
- Formally testing for stresses, vibrations, and other forces associated with space travel
- Optimizing sensors and overall device design

