Make Sense out of Mars

2020 High Impact Long Duration Ecospheric Monitoring System

HILDa EMS

Purpose:

HILDa EMS is designed to be a long-duration Ecospheric monitoring device to aid with the colonization and terraforming of mars. HILDa EMS measures the vital signs of Mars to relay information up to a cluster monitoring satellite to be relayed back to Earth, or one of Mars’ colonies.

The sensors on-board of HILDa EMS, and a short explanation of each, include:

* Ambient Light Sensor
  + Will have a conical topper to reduce the influence of debris, however, it will have the same coating as the solar panels to simulate the influence of debris on the transmission of light
* Moisture Sensors
  + The humidity sensors test the moisture levels of the soil as well as the local atmosphere to inform scientists
* Soil Composition Sensors
  + Ph Sensor
* Light Spectrometer
  + Measures atmospheric composition
* Barometer
  + Used to calculate altitude and surface pressures for weather data
* Wind Sensor
  + Measures wind speed of the surrounding atmosphere.
* Accelerometer
  + In-Flight statistics as well as detection of seismic activity or meteor strikes
* Temperature Sensor
  + In-Flight Altitude calculations and

Other, Non-Sensor instruments and subsystems include, but are not limited to:

* MCU
* Battery Charger and Balance
* Radio Antenna
* Solar Panel Array
  + Due to dust storms on mars, HILDa EMS, The solar panel array is designed to rotate to clear the solar panels of dust and debris when the ambient light sensor detects a sufficient light levels to power the system.

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19750004806.pdf>

Paper:

* Why
  + InSight shows us the material of Mars
* But where do marsquakes come from?
* What areas form them most frequently?
* How does Mars’ crust conduct shakes?
  + These can be answered by an array of sensors across the surface that can calculate both magnitude, location, and how waves travel through the surface

Mars Temp Data: <https://www-k12.atmos.washington.edu/k12/modules/soils/mars_data.html>

Wind Sensor

* + The wind sensor measures wind speed and of the surrounding atmosphere. Like many of the other sensors, this helps to build a model of the atmospheric conditions near the Martian surface to generate the maps seen on this site.

Solar Panel Array

* + The Solar panel array is designed to power the sensors and charge the onboard batteries. Servos allow the arrays to tilt to improve the amount of light absorbed by the panels.
  + Due to dust storms on mars the solar panel array is designed to rotate to clear the solar panels of dust and debris when the ambient light sensor detects a sufficient light levels to power the system. This is a lesson that was learned from the Curiosity rover and reduces the reliance on martian wind conditions, which only happen at particular times of year.

The Printed Circuit Board is housed inside the payload and consists of the following components that meet our scientific objectives: Ambient Light Sensor, Light Spectrometer, Barometer and Accelerometer. The Ambient Light Sensor allows the payload to understanding lighting conditions, remain active and operate during certain light conditions. The Light Spectrometer breaks down the Sun’s spectrum to better understand Mars’ atmosphere and is complementary to the Barometer, which measures altitude during deployment and atmospheric pressures. The Accelerometer will detect seismic activity, allowing the data to pinpoint locations and intensity of meteor strikes and marsquakes.

//Printed Circuit Board

The printed circuit board includes the following sensors:

* Ambient Light Sensor
  + The ambient light sensor allows HILDa to understand lighting conditions, and allows the sensor to decide when to be active, in order to allow it to operate as long as possible.
* Light Spectrometer
  + The light spectrometer breaks the light coming from the sky into bands of light. Scientists use this data to figure out what’s in the atmosphere of Mars.
* Barometer
  + The barometer is used to measure HILDa’s altitude during deployment, and can also help with improving weather information by providing local atmospheric pressures to help forecast weather, much like what is done on earth by weather forecasters.
* Accelerometer
  + The accelerometer provides in-flight statistics as well as detection of seismic activity or meteor strikes. Used in a cluster, this data can be used to pinpoint the location and intensity of meteor strikes or marsquakes.

DONE: The combined ground spike and payload body ensures maximum safety for the payload due to the extreme forces exerted on the payload on impact. It also provides a way for sensors to safely monitor the Martian Soil. The Sensors integrated into the ground spike include a temperature sensor to provide important atmospheric and geologic data during deployment, as well as moisture and soil sensors to notify scientists of the soil conditions in order to plot where future ideal farmland may be, while improving weather information.

//Ground Spike and Payload Body

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* Temperature Sensor
  + The temperature sensor provides data to better calculate HILDa’s altitude during deployment, as well as providing important atmospheric and geologic data.
* Moisture and Soil Sensors
  + The humidity sensors test the moisture levels of the soil as well as the local atmosphere to inform scientists of the local soil conditions to determine the local conditions and to best plot where future ideal farmland may be, as well as improving weather information.

WEBSITE TEXT:

Purpose:

HILDa EMS (HILDa for short) and the Envision mission are designed to be a long-duration Ecospheric monitoring device and mission to aid with the colonization and terraforming of mars by providing invaluable data to scientists, colonists, and those at home.

HILDa measures the vital signs, such as the geologic and weather data of Mars, then relays information up to a monitoring satellite to be relayed back to Earth or one of Mars’ colonies.

The Envision mission as a whole is designed to make data, once difficult to understand by the average person, accessible to those at home by providing a simple and easy to understand interface.

TRAVEL TO MARS:

Envision will endure the vacuum of space and travel at escape velocity to find it’s home on a new planet. While on it’s way to Mars it will have enter the void, dodge meteorites which block its path, but it’s toughest battle will be bearing the responsibility of caring for its future astronauts. and upon entering the atmosphere of Mars it will find a new home.

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* Temperature Sensor
  + The temperature sensor provides data to better calculate HILDa’s altitude during deployment, as well as providing important atmospheric and geologic data.

Other, Non-Sensor instruments and subsystems include, but are not limited to:

* MCU
  + The MCU, or Micro-Controller Unit, is the brain of HILDa. It performs all of the calculations and makes all the decisions for the payload.
* Ground Spike
  + The ground spike is designed to provide a way to decrease the amount of force necessary to embed itself about 5 inches into the martian soil. This reduces the speed that the payload must impact at, increasing the likelihood the payload will survive deployment. It also provides a safe enclosure for instruments that measure soil conditions.
* Battery Charger and Balance
  + It would be difficult for HILDa to operate without power, so the solar array charges the batteries so that each sensor can (hopefully!) operate for decades.
* Radio Antenna
  + The antenna communicates with the orbiter to relay data and instructions.
* Solar Panel Array
  + Due to dust storms on mars the solar panel array is designed to rotate to clear the solar panels of dust and debris when the ambient light sensor detects a sufficient light levels to power the system. This is a lesson that was learned from the Curiosity rover and reduces the reliance on martian wind conditions, which only happen at particular times of year.

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**Part One**

**Marsquakes**

**InSight**

**Geology**

We are Envision. We created a sensor package and webpage so we can better understand marsquakes. Unlike the well-studied tectonic plates of Earth, marsquakes are a result of pressure build up caused by concentrated thermal activity. The surface of Mars is shaped by marsquakes and weather. Understanding marsquakes will not only shed light the formation of rocky planets but provide insight on how Earth came to be.

We need information to determine how much of an impact geological activity will have on astronauts as they colonize Mars terrain. Data such as this will allow us to evaluate colony locations prior to arrival so we can build a habitat that will withstand dust storms and other weather conditions.

Envision is our sensor instrument package aimed to further our understanding of geologic properties across the Universe. 4 identical sensor payloads will deploy and embed themselves at different locations just beneath the surface in order to take atmospheric and geological data. Solar array panels extend the life of these instruments, allowing us to understand our impact on the Martian environment over time. The data gathered by our sensor system will compliment data collected by InSight, a NASA lander, which is sending a heat probe to measure internal temperatures in November.

**Part Two**

Envision’s webpage allows users to see data in real-time that demonstrates weather and marsquakes. While at their home away from home, Envision will serve as an observation device in which their loved ones can monitor the conditions in which they are living in. The tool is available to everyone including scientists, students, astronauts and their families in order to better predict future conditions, ensure a safe environment for our astronauts, and fuel public interest in space.

Envision: “See the far away from home.”

DRAFT: 150 characters:

WHY:?

Envision is a scientific payload mission designed to observe geological activity, specifically marsquakes, using a website collecting data in real time.