The Chaos Landings

Planned during the event:

Nasa Space Apps 2018

By:

Team Chaos

The Eastern See Explorer

Aim

The Chaos Landings aim to explore the far side of the moon and collect soil samples by the use of various rovers will help to study the variations in the lunar soil. Ten rovers sent to the moon to retrieve the soil samples of the Far Side of the Moon, with the help of a one of a kind peer-to-peer network.

The places which are never explored before by another rover or a human. With the completion of this mission, humans will have

The rovers are deployed around The Mare Orientale crater of the Moon which is evenly distributed among the near and the far side of the moon. Two of these rovers will act as transmitters to the ones that are sent to the far side to extract soil samples.

The purpose of these rover deployments is to retrieve soil samples from the far side of the moon and study them in depth. These samples will also be compared with those from the near side of the moon and the lunar terrain variations can then be studied.

Not only we study the far side of the moon, but these rover landings help us achieve another milestone that is : Internet connectivity on the moon.

Not just an Internet Connection, a "Decentralized network". By achieving this, we accomplish the goal of 100% data retrievability even from the far side of the moon.

And that is the vision of Team Chaos. "Centralizing the human race, Decentralizing the Space around us"

Abstract

The payload aboard on the Saturn V Rocket will travel a distance of 384,000 km to deploy a system of lunar rovers aboard a Saturn V Lander.

It takes about three days for a spacecraft to reach the Moon from Earth. The mission is planned at such a time when

There are three stages of the Spacecraft traversed during he trajectory. Each stage of this powerful rocket uses 5 heavy propulsion engines.

The first stage uses five F1 engines. The Rocketdyne F-1 is a gas-generator cycle rocket engine which has served as the main launch engine for the Apollo program.

The second stage of Saturn V uses five J-2 engines. The J-2 was a liquid-fuel cryogenic rocket engine used on NASA's Saturn IB and Saturn V launch vehicles.

The J-2 burned cryogenic liquid hydrogen (LH2) and liquid oxygen (LOX) propellants, with each engine producing 1,033.1 kN (232,250 lbf) of thrust in vacuum.

The third stage of Saturn V uses only but a single J2 engine which is mainly used for landing purpose and also for minor trajectory setting purposes if needed.

The Career: Saturn V

-A powerful rocket, that successfully completed many missions both Geosynchronous and Trans-Lunar Injection. The rocket will be used to transfer the Stage 3 Engine and payload from the Outer earth orbit to Trans Lunar Orbit.

The height of the rocket is 110.6 meters //(Spacecraft:82 ft and Saturn Launching Vehicle:82ft)

and the weight is 2.7 million kgs. The diameter of the rocket is 12.2 feet (3.7 m)

The Saturn V Rocket works in three stages and they are:

Stage 1 (S-IC) :

To launch the rocket we are using five Rocketdyne F-1 engines,

the thrust-to-weight ratio is 94:1 and the value of thrust in vacuum and sea level

is 1,746,000 lbf (7,770 kN) and 1,522,000 lbf (6,770 kN) respectively. The chamber pressure

needed is 70 bar\s (1,015 psi; 7 MPa). The dry weight of the rocket is 18,500 pounds (8,400 kg).

The burn time is 2.5 minutes and by that time, the rocket takes payload to an altitude

of 38 miles.

Stage 2 (S-II):

At this stage five Rocketdyne J-2 engines are used

in a similar arrangement to the S-IC. The thrust-to-weight ratio is 73:18 and the value of thrust in vacuum and sea level

is 486.2 kN (109,302 lbf) and 1,033.1 kN (232,250 lbf) respectively.

The nozzle ratio is 27.5:1 and the chamber pressure required is 5,260 kilopascals (763 psi).

The burn time of fuel is 6 minutes that takes the payload to an altitude of 115 miles.

Stage 3 (S-IVB):

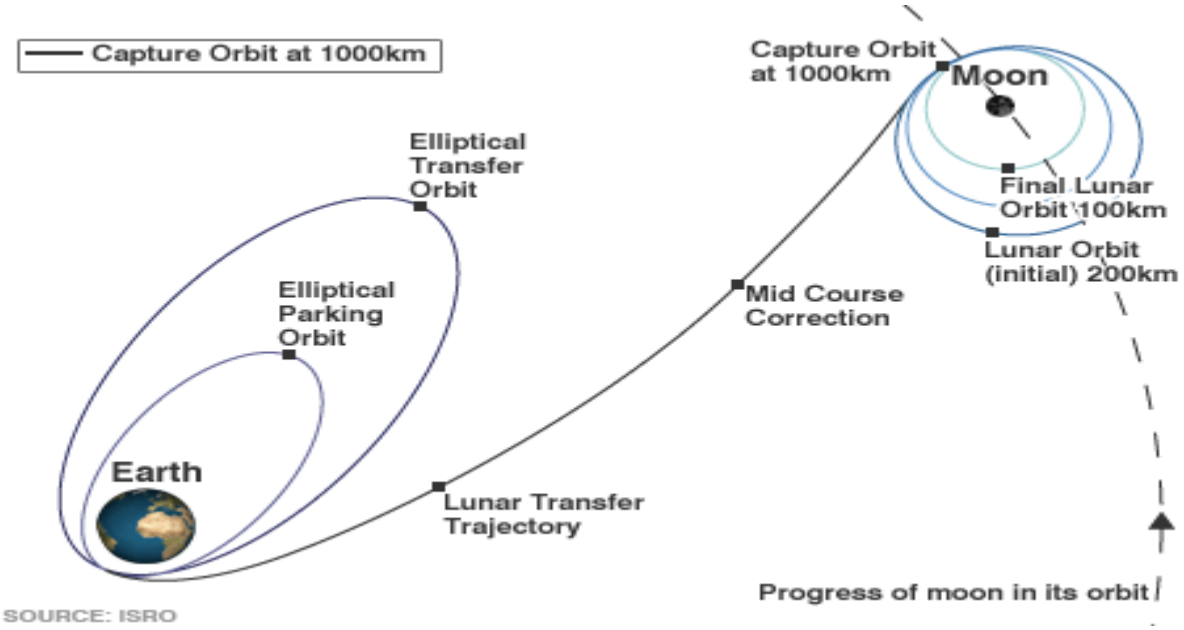
It has one J-2 engine and uses the same fuel as the S-II. It's thrust-to weight ratio is 73:18.

The thrust value on sea level is 486.2 kN (109,302 lbf) and in vacuum is 1,033.1 kN (232,250 lbf).

The nozzle ratio is 27.5:1 and the chamber pressure is 5,260 kilopascals (763 psi).

The fuel burn out time is 2.75 minutes which provides the payload an altitude of 115 miles.

After the rocket escapes the earth's atmosphere it's orbital velocity becomes 17500 mph.



Elliptical Parking orbit:

A parking orbit is a temporary orbit used during the launch of a satellite or other space probe. A launch vehicle boosts into the parking orbit, then coasts for a while, then fires again to enter the final desired trajectory.

There will be three stages in the Saturn V

1 stage Lift up to 40 miles.

2 stage lifts up to 106 miles.

3 stage lifts to Elliptical Parking Orbit.

Trans-lunar injection(TLI) ?

A trans-lunar injection is a propulsive maneuver used to set a spacecraft on a trajectory that will cause it to arrive at the Moon

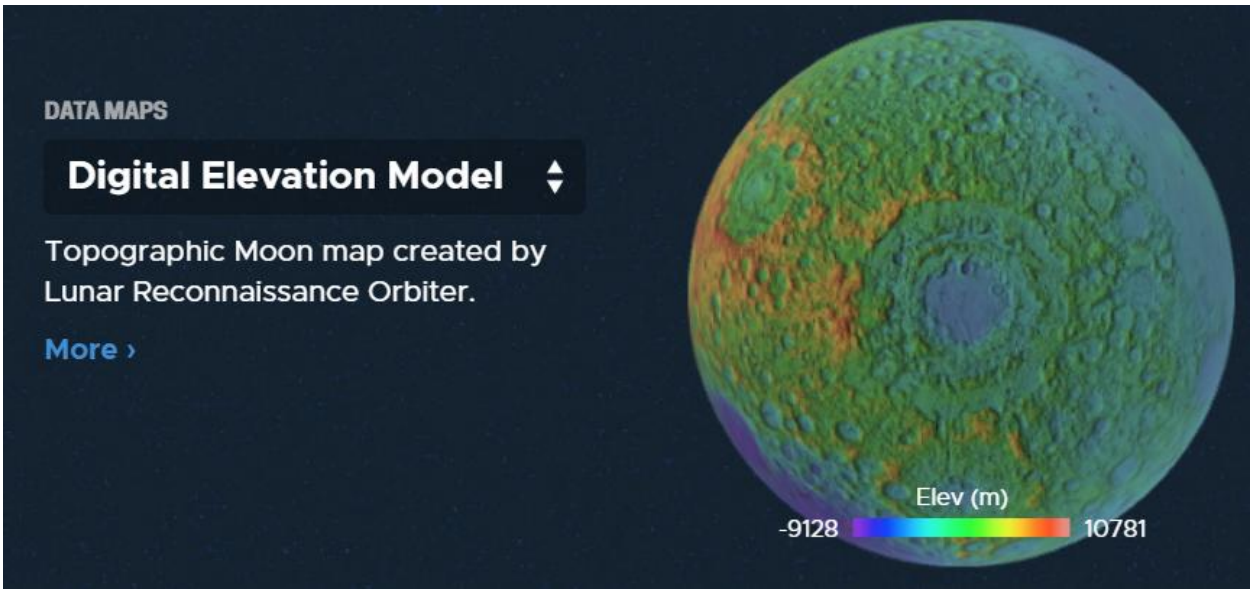
Once Escaped from gravity of earth -> 3 days till TLI

Then Saturn V will move in the orbit of the moon and will slowly lose its speed and then it would land on the desired spot.

Landing Sites

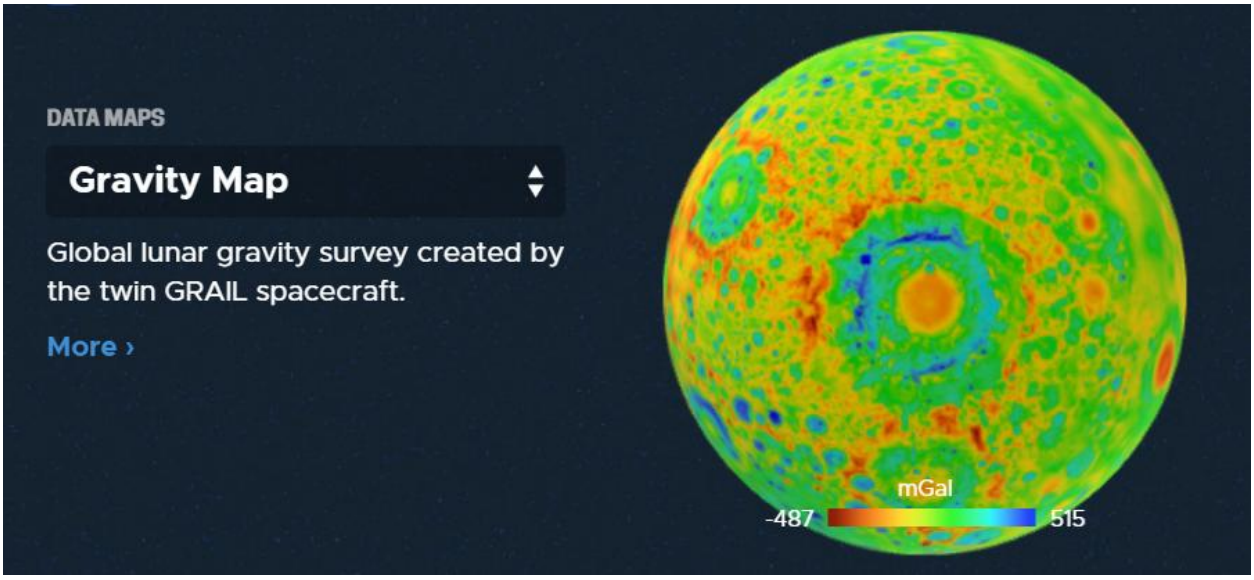
The primary landing site chosen for this mission is the "Mare Orientale" basin. The Orientale Basin is located near the western limb of the lunar nearside and is only partially visible from telescopes on Earth. Lunar Orbiter images provided the first good look at this basin, which is 930 kilometers in diameter.

The Chaos Mission aims to send a total of ten rovers aboard the Saturn V Spacecraft with a dedicated aim of finding water on the far side of the Moon as well as collecting soil samples to test the variations in the Soil Profile of the Moon. All the data will be backed up by high profile thermal images captured by the rovers.



Digital Elevation of Mare Orientale being shown

Mare Orientale has an overall altitude of about 8000 meters. The surrounding sites seem to be a optimal spot for the touchdown process as they have a lesser altitude than the Basin itself. Thus travelling to the far side of the moon would be easier.



Gravity distribution nearby the Eastern Sea

The touchdown co-ordinates of the Lander are proposed to be -24.4707, -77.07941.

From here the rovers will travel a distance of about 8.6 km and here two rovers will stay at the landmark -29.74417, -84.81379

The rest of the rovers will move ahead to the mission end point, but before that the rovers will launch the charging sequence and will completely charge their batteries. Similar process is followed for all of the following co-ordinates:

-33.08402, -95.7022

-27.6348, -110.82941

-18.84573,-117.15753

-9.35355, -126.64972

At each point the two rovers that are deployed will search for any signs of water based elements or minerals in the soil profile.

The Rovers

Lunar Rover:

Lunar Rover is a space exploration vehicle that is used to move across the surface of the moon.

In our mission, we will be using various lunar rovers deployed on the moon that are going to perform specific tasks.

The Rover are continuously communicating with each other and exchanging data and would be capable to exchange data from the far side of the moon. The rovers we are going to use are provided with different sensors but their specifications will remain same except a little changes. The average weight of each rover is 900-1100 kg and material used is carbon iron i.e. stainless steel.

Steel is used as it is resistant to corrosion and have good strength even at elevated temperatures and has a melting point of 1370 degree Celsius (2500°F).

The tires used in our rovers spun aluminum hub and an diameter of 81.8 cm. Titanium chevrons cover 50% of contact area to provide traction. Each wheel has its own electric drive, DC series wound 190 w motor capable of 1000 rpm. Each wheel uses Rocker-Bogie suspension.

Every rover has three cameras attached with it for image capturing, video making and thermal imaging. Our rovers are powered using rechargeable batteries and solar power. Every rover has an additional sensor attached for obstacle measurement that uses infrared waves.

Each rover has an inbuilt Single Side Board(SSB). These SSB's will bind the data collected by the rover onto the carrier signals which are Radio Waves. These waves will transmit the data from every rover to every rover.

Decentralized Network:

The rovers themselves form a Peer-to-Peer network which is decentralized in nature. This is the first ever built network on the moon which supports data collection from all the rovers deployed on the near and far side of the moon using a **peer-to-peer connection**. Data will be coupled with Radio waves and sent from rover to rover which in turn will be transmitted to the **Alpha and Beta rovers**- those deployed at the **first stage** of deployment.

Since the network built by the Rovers is completely autonomous, therefore after accomplishing this mission the Humans will be able to say that "**The Moon belongs to Anyone and Everyone**".

Future Scope

We intend to collect a lot of data from numerous potential geographical sites that will guide us to study the variations in the lunar soil profile and plan and execute future missions efficiently.

A machine learning model is to be trained with the data set as captured by the rovers sent to the Far Side of the Moon. The data retrieved will not be from a single location but from a number of locations, and that too from the far side.

We intend to use CART Algorithm to classify various geological and physical parameters and generate a Regression Tree which will help us decide the probability of finding a certain mineral or element on the Lunar Surface.

Machine learning algorithms can help us determine a relatively better landing site on the moon.

Blockchain can be implemented on shoulders of the Decentralized System that we have planned.

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