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# Moonship - 1 project proposal

# SKY WEB

Sky Web is a commercial space start-up company which was started in hope of sending humans to LEO and outer space again to make mankind a multi-planetary space civilization. These are the main objectives of Sky Web for next 6 years (2024-2030).

* Create a LEO(Low Earth Orbit) station that will act as a starting point for deep space and moon missions.
* Send humans to moon and create a moon base.
* Send humans to mars and beyond.

SKYWEB is still at the startup stage. But with a correct vision and solid ideas, we have full confidence that we can achieve the goal of putting Europe as the pioneer of the future of space exploration. Following document is about how SKY WEB hopes to help ESA’s Terrae Novae 2030+ strategy.

INTRODUCTION

Space exploration is one of the main conquest mankind will never stop to love. Exploring space, exploring other planets, leaving the solar system and beyond are our current main purposes of space missions. One of the quotes from famous movie ‘Interstellar’ is that quote,” mankind was born on earth, but never meant to die here.”

Space exploration can be simply defined as the exploration of celestial structures in outer space by means of continuously evolving and growing space technology. Humans first observed space from the earth and it’s known as the science of Astronomy. But with the rapid development of rocketry in the 20th century has helped mankind to leave the earth surface and reach LEO(Low Earth Orbit) and beyond. t

Currently, space exploration has reached a new breaking point. Many organizations from different countries and continents are continuously trying to achieve the status of frontier of space exploration. With involvement of private sector, it has increasingly advanced during last 15 years.

Like other nations, European space agency is actively working on improving and empowering their presence as a leading role of the space industry and space exploration. ESA already have developed a detailed idea about the future of space exploration.

1.System and Mission Requirements

The moon is the nearest space object near to earth and it is the only natural satellite earth has. Distance from earth to moon is 384,400km. But mankind reached the moon during 60’ and 70’s.

Moonship – 1 is a concept design for ESA ‘s upcoming lunar mission program under the ‘Terrae Novae Strategy’. The primary goal of the Moonship -1 is to successfully land on the moon and return to earth with the storage.

Moonship -1 has these main objectives.

* Reach the moon’s south pole/PSR area.
* Moon landing.
* Deploy the lunar-I rover to moon surface.
* Deploy other mission crafts. (additional)
* Moon launching.
* Return to earth

Mission Requirements

NASA’s apollo program has a Lunar Module (LM) aka ‘EAGLE’ was the first crewed vehicle to land on the moon. It was a manned mission.

So, we must design a moonship module for landing on the moon and relaunch from the moon.

The purpose of the mission is to Design a moon landing and relaunching module as a beta test program for future missions.

Progress and data of this mission will be the main factor for future moon landing and launching missions.

Moonship – 1 has these mission requirements.

1. Functional –

Main mission objective to land moonship on the moon surface and successfully relaunch.

To meet this requirement, we must create the module, with good landing procedures/maneuvers and relaunching maneuvers.

Main challenges for the functions of the rover system are vacuum space, surface of the moon, finding a suitable area to land near south pole.

1. Operational –

Main operational maneuver of the landing module is to successfully land on the moon surface and successfully relaunch from the moon surface.

Successfully enter the earth’s atmosphere and reach the earth’s surface.

1. Constraints –

Moonship will be the first module type for future unmanned missions. Moonship will demonstrate the mission operations of landing of moon, relaunching from the moon, enter the earth atmosphere and successfully reach the earth surface.

System Requirements

Moonship should meet several system requirements to perform with 100% accuracy in landing, relaunching and return flight to earth.

1. Performance (expecting) and design –

Main performance of this demo version is to reach moon, successfully land on the moon, relaunch from the moon, reach and land on the earth.

To perform these duties, spacecraft must have a perfect engineering process including many systems.

Moonship will include with pre-programmed onboard computer system to perform the main tasks of all these events.(in any emergency, ground control can control the space craft manually.)

Moonship will include a propulsion unit with up to 3 descent engines and thrusters to adjust the angle of the space craft on the upper side.

Moonship will have a camera system to actively observe the environment around covering different angles.

Adjustable 4-leg stand system for landing.

Solar panels for energy needs while on the moon.

A Heat shield on the front for entering back to earth.

2.Design and justification

Moonship- 1 will be the beta test module for future unmanned missions to the earth. This module will be developed with inspiration from apollo Lunar Module. This module will be developed into a transportation module for moon missions in the future after first flight.

The moonship will be designed and build based on the data and outcomes of apollo crewed missions.

Moon doesn’t have an atmosphere. So, when the moonship will reach the moon surface, rockets propulsion system will active, and it will slow down the space craft.

Moonship must have two separate stages for landing and relaunching.

Moonship will include a camera system to observe the environment throughout the process of landing and relaunching.

Moonship will include onboard computer system that can perform most of the manoeuvres automatically as pre-programmed.

But the ground command unit will carefully observe the performances and will conduct a manual landing/relaunch if necessary.

Moon ship will have a solar energy unit to cover its energy needs.

One of the main factors we must consider for the design is the fuel for the landing and relaunch and coming back to earth.

To reduce the fuel energy moonship demo version will only use as a carriage ship for lunar-I rover.

Only mission this demo version will demonstrate is land on the moon, deploy the rover, relaunch from the moon and return earth atmosphere.

3.Misson design and development plan

First, we must define the initial purpose of this mission. That is successfully sending and receiving back a carriage to and from another space object.

After the mission handover,

First 2 months – recruiting the initial team.

2-6 months – advanced designing of the full mission and space craft.

6-7 months – building process begins.

7 – 14 months – building and testing of the propulsion system.

9 – 15 months – building and testing of the computer and software system.

18 months – completing the first prototype and test set -1.

18 -25 months - completing the suggested errors from the test set -1.

24 – 29 months - completing the development of propulsion system

27 – 30 months - completing the construction of heat shield.

30 months – send the prototype -1 with completed propulsion system for a test landing.

30 – 34 months – check and correction of any suggested error/s.

34 – 39 months – completing the solar panel and the other system requirements.

38 – 41 months – finishing all the proposed system requirements.

41 – 44 months – complete test set 2 and 3 for all proposed systems.

44 – 47 months – complete any suggested error/s.

48 months(maximum 4 years) – finishing the proposed project.

After 4 years – preparing for the launch.

4.Concept of Operation

Moonship first version will be built as a demo version to check the usage of advanced unmanned carriage/supply space craft that can help for future mission for the moon.

Moonship will have an onboard computer system that can perform most of the maneuvers throughout the mission.

Fuel status will act as the main factor to consider when building the moonship.

We will try to make the ship lighter without fuel and make every necessary step to save conserved fuel capacity at every stage of the mission.

Moonship will have two separate engine processes for landing and relaunching stages.

Moonship will have a 4-leg stand system that can deploy during the landing and packdown during the relaunching.

After reaching the moon orbit, moonship’s main power system will turn-on.

Onboard computers will send the current mission status and wait until ground control will confirm the next step.

Onboard computers will be pre-programmed to do the maneuvers automatically.

But onboard computers will broadcast the mission status with ground control frequently.

The camera system will actively observe the environment around the moonship and selected landing zone.

When the moonship is about 50,000ft up from moon surface and 500km range from landing zone, descent stage will active. Engines will be positioned and prepared for burnout.

Engines will burn for 30seconds max to bring spacecraft from 50,000ft to 10,000ft.

Moonship will still be about 45degree angel from vertical stage.

So, thruster in the upper area of the spacecraft will burn and adjust the angel to vertical when it reaches 700ft above the moon surface.

Descent engines will burn to reduce the acceleration towards surface (computers will calculate and the burning energy release for the landing.)

When space craft is above the 500ft from the landing zone, legs will automatically deployed for the landing.

After the successful landing, moonship will send the full mission status to the ground control.

Ground control will decide when to deploy the rover from the moonship.

All the power supplies except necessary power requirements will be shut down.

To recharge the batteries, moonship will deploy solar panels.

After the rover return to the moonship, all the systems will activate, and onboard computers will inform the ground control.

After checking the system status and fuel status, mission control will confirm the relaunch.

5.Estimated cost analyze.

Estimated cost analysis for the Moonship.

Employee salary – 5 – 8 million euros(max range)

Equipment development – 8 million euros(max)

Testing Set 1,2,3 – 7 million euros.

Test flight – 2.5 million euros

Other parts and development – 6 million euros

Computer and software – 2 million (max)

Mission maintenance – 2.5 million

Total mission cost (without launch cost) – 36 million euro.

