About Gateway

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Abstract: After several postponements or even giving up, NASA finally decided to prepare and launch the long-delayed Moon space station Gateway, which had to be postponed for financial, technical reasons, but also for reasons and calculations about the possibility of assembling it in space and the way of transporting the main components in space, the main problem being the rockets capable of carrying such huge components in space. Today it seems that NASA has managed to solve all these problems and to finalize and in a real way all the details regarding such a complex undertaking.

Keywords: Nasa, Gateway, Space, Moon Space Station

Introduction

Man has always wanted to fly. Late he managed to do it and even in safer conditions and he thought that he should start exploring the cosmic space and in the future even conquer it. But how to conquer so immediately at least our universe that has about 2,000 billion galaxies, each with about 2,000 billion solar systems? With what to start with you ask yourself and the obvious answer is first with your galaxy and first of all with your own solar system where you are. Obviously, the easiest seemed to start with our satellite Luna, which we suspect (still) that is a natural one.

Although it seemed very easy to conquer the moon, even today man has not yet managed to do so. However, several decades after the first landing with a human crew on the Moon, NASA finally plans to return there with space stations, ships, research robots, related vehicles and the necessary crews today made up of specialized humans and robots. Various exploration tools, increasingly sophisticated devices, specialized weapons, vital protection systems will be needed. We already have the combined experience of terrestrial space stations that have been orbiting the Earth for many years, but also robots and spacecraft sent to the Moon, Mars, or for space exploration. It can be said now that we have some experience and equipment, money and technology, so the moment long-awaited by all mankind to have space stations around the Moon but then also on the Moon, seems to be fast approaching.

The moon is an astronomical body orbiting planet Earth, being its only permanent natural satellite. It is the fifth-largest natural satellite in the Solar System and the largest of the planetary satellites relative to the size of the planet it orbits (its primary object). According to Jupiter's satellite, Io, the Moon is the second densest satellite of those whose densities are known.

The Moon is thought to have formed about 4.51 billion years ago, not long after Earth. There are several hypotheses for its origin; the most accepted explanation is that the Moon was formed from the remains left after a huge impact between the Earth and a body the size of Mars, called Theia.

The moon is in synchronous rotation with the Earth, ie it always shows the same face towards it, the visible part being marked by dark volcanic lunar seas, which fill the spaces between the high areas of the crust and the more prominent impact craters. Seen from Earth, it is the second celestial object visible from Earth in brightness after the Sun. Its surface is actually dark, although compared to the night sky it looks very bright, its reflectance being only slightly higher than that of used asphalt. Its gravitational influence produces ocean tides, land tides and a slight extension of the day.

The current orbital distance of the Moon is 384,400 km or 1.28 light-seconds. This value is about thirty times the diameter of the Earth, the apparent size in the sky being almost as large as that of the Sun, as a result, the Moon covers the Sun almost perfectly during total solar eclipses. This visual appearance match will not continue in the distant future, because the distance between the Moon and the Earth is slowly increasing.

The Soviet Union's Moon program was the first to reach the Moon with unmanned spacecraft in 1959; NASA's Apollo program in the United States has completed the only human missions to date, beginning with the first orbit of the moon by Apollo 8 in 1968 and continuing with six landings between 1969 and 1972, the first being the Apollo 11 mission. These missions brought lunar rock that was used to develop a
geological understanding of the Moon’s origin, its internal structure and more recent history. Since the Apollo 17 mission in 1972, the Moon has been visited only by unmanned spacecraft.

In human culture, both the natural prominence of the Moon in the Earth’s sky and its regular phase cycle as it appears from Earth have provided cultural references and influences for human societies and cultures since time immemorial. Such cultural influences can be found in language, lunar calendar systems, art and mythology (Rulkov et al., 2016; Agarwala, 2016; Babayemi, 2016; Gusti and Semin, 2016; Mohamed et al., 2016; Wessels and Raad, 2016; Rajput et al., 2016; Rea and Ottaviano, 2016; Zurfi and Zhang, 2016a; Zheng and Li, 2016; Buonomano et al., 2016a; 2016b; Faizal et al., 2016; Ascione et al., 2016; Elmeddahi et al., 2016; Calise et al., 2016; Morse et al., 2016; Abouobaida, 2016; Rohit and Dixin, 2016; Kazakov et al., 2016; Alwetaishi, 2016; Riccio et al., 2016a; 2016b; Iqbal, 2016; Hasan and El-Naas, 2016; Al-Hasan and Al-Ghandi, 2016; Jiang et al., 2016; Sepúlveda, 2016; Martins et al., 2016; Pisello et al., 2016; Jarahi, 2016; Mondal et al., 2016; Mansour, 2016; Al Qadi et al., 2016; Campo et al., 2016; Samantaray et al., 2016; Malomar et al., 2016; Rich and Badar, 2016; Hirun, 2016; Bucinell, 2016; Nabilou, 2016b; Barone et al., 2016; Chisari and Bedon, 2016; Bedon and Louter, 2016; dos Santos and Bedon, 2016; Minghini et al., 2016; Bedon, 2016; Jafari et al., 2016; Chiozzi et al., 2016; Orlando and Benvenuti, 2016; Wang and Yagi, 2016; Obais et al., 2016; Ahmed et al., 2016; Jauhari et al., 2016; Syahrulllah and Sinaga, 2016; Shanmugam, 2016; Jaber and Bicker, 2016; Wang et al., 2016; Moubarek and Gharsallah, 2016; Amani, 2016; Shrvki, 2016; Pérez-de León et al., 2016; Mohseni and Tsavdaridis, 2016; Abu-Lebdeh et al., 2016; Serebnennikov et al., 2016; Budak et al., 2016; Augustine et al., 2016; Jarahi and Seifilaleh, 2016; Nabilou, 2016a; You et al., 2016; AL Qadi et al., 2016a; Rama et al., 2016; Sallami et al., 2016; Huang et al., 2016; Ali et al., 2016; Kamble and Kumar, 2016; Saikia and Karak, 2016; Zeférino et al., 2016; Pravettoni et al., 2016; Bedon and Amadio, 2016; Chen and Xu, 2016; Mavukkandy et al., 2016; Yeargin et al., 2016; Madani and Dababneh, 2016; Alhasanat et al., 2016; Elliott et al., 2016; Suarez et al., 2016; Kuli et al., 2016; Waters et al., 2016; Montgomery et al., 2016; Lamarre et al., 2016; Petrescu, 2012b; Aversa et al., 2017a; 2017b; 2016a; 2016c; 2016d; 2016e; 2016f; 2016g; 2016h; 2016i; 2016k; 2016l; 2016m; 2016n; 2016o; Petrescu and Petrescu, 2016; 2015a; 2015b; 2015c; 2015d; 2015e; 2014a; 2014b; 2014c; 2014d; 2014e; 2014f; 2014g; 2014h; 2014i; 2013a; 2013b; 2013c; 2013d; 2013e; 2013f; 2013g; 2013h; 2013i; 2013j; 2005a; 2005b; 2005c; 2005d; 2005e; 2003; 2002a; 2002b; 2000a; 2000b; 1997a; 1997b; 1997c; 1995a; 1995b; Petrescu, 2018; 2015a; 2015b; 2012; Petrescu et al., 2016; 2017a; 2017b; 2017c; 2017d; 2018a; 2018b; 2018c; 2018d; Petrescu and Calautit, 2016a; 2016b; Daud et al., 2008; Taher et al., 2008; Zulkifli et al., 2008; Pourmahmoud, 2008; Paniriselvam et al., 2008; Ng et al., 2008; El-Tous, 2008; Akhesmeh et al., 2008; Nachiengtai et al., 2008; Moezzi et al., 2008; Boucetta, 2008; Darabi et al., 2008; Semin and Bakar, 2008; Al-Abbas, 2009; Abdullah et al., 2009; Abu-Ein, 2009; Opañunso et al., 2009; Semin et al., 2009a; 2009b; 2009c; Zulkifli et al., 2009; Ab-Rahman et al., 2009; Abdullah and Halim, 2009; Zotos and Costopoulos, 2009; Feraga et al., 2009; Bakar et al., 2009; Cardu et al., 2009; Bolonkin, 2009a; 2009b; Ndahakumur et al., 2009; Odeh et al., 2009; Lubis et al., 2009; Fatallah and Bakar, 2009; Marghany and Hashim, 2009; Kwon et al., 2010; Aly and Abuelnasr, 2010; Farahani et al., 2010; Ahmed et al., 2010; Kunanoppadon, 2010; Helmy and El-Taweel, 2010; Qubodin, 2010; Pattanasethanon, 2010; Fen et al., 2011; Thongwan et al., 2011; Theansuwan and Triratnasirichai, 2011; Al Smadi, 2011; Tourab et al., 2011; Raptis et al., 2011; Momani et al., 2011; Ismail et al., 2011; Anizan et al., 2011; Tsolakis and Raptis, 2011; Abdullah et al., 2011; Kechiche et al., 2011; Ho et al., 2011; Rajbhandari et al., 2011; Aleksic and Lovric, 2011; Kaewnai and Wongwises, 2011; Idarwazeh, 2011; Ebrahim et al., 2012; Abdelkrim et al., 2012; Mohan et al., 2012; Abam et al., 2012; Hassan et al., 2012; Jalil and Sampe, 2013; Jaoude and El-Tawil, 2013; Ali and Shumaker, 2013; Zhao, 2013; El-Labban et al., 2013; Djalel et al., 2013; Nahas and Kozaitis, 2014).

Materials and Methods

Several variants of mechanisms have been proposed that would have led to the formation of the Moon 4.51 billion years ago and about 60 million years after the origin of the Solar System. Among these mechanisms was the fission of the Moon from the Earth’s crust, by centrifugal force (which would require too much initial kinetic moment of the Earth), the gravitational capture of a previously formed body (which would require the Earth’s atmosphere too large to dissipate the energy of the passing body) and the formation of the Earth and the Moon together from the primordial accretion disk (which does not explain the lack of metals on the Moon). However, these hypotheses cannot explain the great kinetic moment of the Earth-Moon ensemble either.

The predominant hypothesis is that the Earth-Moon system formed as a result of the impact of a body the size of Mars (called Theia) with the proto-Earth (giant impact), which brought the material into Earth’s orbit, which then gathered by gravity, to form the current Earth-Moon system.

The far side of the moon has a crust, 48 km thicker than that from Earth. It is believed that this is due to the fact that the Moon resulted from the amalgamation of two different bodies.
Fig. 1: Full Moon in the darkness of the night sky

Fig. 2: The moon, colored in red, during a lunar eclipse

Full Moon in the darkness of the night sky. It is patterned with a mix of light-tone regions and darker, irregular blotches and scattered with varying sizes of impact craters, circles surrounded by out-thrown rays of bright ejecta (Fig. 1).

In the Fig. 2 can be seen the Moon, colored in red, during a lunar eclipse.

This hypothesis, although not perfect at all, probably best explains some of the evidence found. Eighteen months before a conference in October 1984 on the origins of the moon, Bill Hartmann, Roger Phillips and Jeff Taylor challenged fellow researchers on the moon: “You are eighteen months old. Go back to the Apollo data, go back to the computers, do whatever it takes, but make up your mind. Don’t come to our conference if you don’t have anything to say about the birth of the moon.” At the 1984 conference in Kona, Hawaii, the giant impact hypothesis became the most popular, but not the safest yet.

Before the conference, they were partisans of the three "traditional" hypotheses, plus a few who were beginning to take the giant impact seriously and among them was a large apathetic group that did not think any conclusion could be reached. After that, there were essentially only two groups left: The giant impact camp and the agnostics.

Giant impacts are thought to have been common in the early Solar System. Computer simulations of a giant impact produced results in accordance with the mass of the moon's core and the current kinetic moment of the Earth-Moon system. These simulations also show that much of the Moon resulted from the body with which the proto-Earth collided and not from the proto-Earth. More recent simulations suggest that a larger fraction of the Moon resulted from the initial mass of the Earth. The study of meteorites from bodies in the inner Solar System, such as Mars and Vesta, shows that they have very different compositions on oxygen and tungsten isotopes compared to Earth, while Earth and Moon have almost identical isotopic compositions. The isotopic equalization of the Earth-Moon system could be explained by the post-impact mixing of the vaporized materials that formed the two, although this hypothesis is still being discussed.

The large amount of energy released from the impact and subsequent re-accretion of those materials in the Earth-Moon system would have melted the Earth's outer shell, forming an ocean of magma. Similarly, the newly formed Moon would have been affected and had its own lunar ocean of magma; its depth estimates range from about 500 km to its entire depth (1,737 km).

While the gigantic impact hypothesis would explain many lines of evidence, there are still some unresolved issues, most of which involve the composition of the Moon.

In 2001, a team at the Carnegie Institution in Washington reported the most accurate measurement of the isotopic signatures of lunar rocks. To their surprise, the team found that the rocks in the Apollo program bore an isotopic footprint identical to the rocks on Earth and that they were different from almost every other body in the Solar System. Because much of the material that went into orbit to form the Moon was thought to have come from Theia, this observation was unexpected. In 2007, researchers at the California Institute of Technology announced that there was less than a 1% chance that Theia and Earth had identical isotopic signatures. Published in 2012, an analysis of titanium isotopes from samples collected from the Moon by the Apollo mission showed that the Moon has the same composition as Earth (Astrobiology Magazine, 2012), which contradicts what was expected if the Moon -would
have formed far from Earth's orbit or Theia. Variations in the giant impact hypothesis may explain these data.

The moon is a differentiated body: It has a geochemically distinct crust, mantle and core. The moon has an inner core rich in iron with a radius of 240 kilometers (150 mi) and an outer core liquid, mainly made of liquid iron, with a radius of about 300 km. Around the core is a partially melted boundary layer with a radius of about 500 km. This structure is thought to have developed through the fractional crystallization of a global ocean of magma shortly after the Moon formed 4.5 billion years ago. The crystallization of this ocean of magma would have created a mafic mantle from the precipitation and sinking of the minerals olivine, clinopyroxene and orthopyroxene; after about three-quarters of the ocean's magma crystallized, smaller-density plagioclase minerals would have formed, which floated above, forming a crust. The last liquids that crystallized were initially trapped between the crust and the mantle, with a large abundance of incompatible and heat-producing elements. Consistent with this view, geochemical mapping made from orbit suggests that the crust is mostly an orthogenic. The monthly rock samples of the lavas that erupted on the surface from the partial melting in the mantle confirm the mafic composition of the mantle, which is much richer in iron than that of the Earth. The bark is, on average, about 50 kilometers thick.

The moon is the second densest satellite in the Solar System, after Io. However, the inner core of the Moon is small, with a radius of about 350 kilometers or less, about 20% of the Moon's radius. Its composition is not well defined, but it is probably metallic iron alloyed with a small amount of sulfur and nickel; analyzes of the Moon's time-varying rotation suggest that it is at least partially melted (Williams et al., 2006).

NASA specialists are beginning to present the amazing results of older space missions and experiments conducted on the surface of the Earth's natural satellite.

During Apollo space missions, over time, 14 astronauts conducted research and experiments on the surface of the Moon in the field of seismology, writes an article posted on Friday on the official website of NASA.

Renne Weber, the coordinator of the research team at NASA's Marshall Space Flight Center in Huntsville, Alabama, said that "using modern techniques and data from previous space missions, (we can say that) the Moon has a core similar to that of Earth ".

American specialists processed the data collected during the selenium missions, carried out between 1969-1972, when 4 seismometers were placed, which recorded the activity of the month until the end of 1977.

At the same time, another team of scientists from Arizona State University, the University of California at Santa Cruz and the Institute of Earth Physics in Paris, France, published their findings in the online edition of the journal Science.

Also this year, NASA, together with experts from Germany, will launch a new GRAIL space mission, which involves launching space probes, which will enter in tandem in an orbit around the Moon, for detailed measurements of the star's gravitational field.

Figure 3 shows the structure of the Moon.

NASA is planning another mission to the Moon, called Gravity, with a module for recovering seismometers.

Moreover, together with the other space agencies, NASA is launching a new large-scale project, the Lunar International Network, which consists of placing geophysical monitoring stations on the Moon's surface (Fig. 4).

More similarities begin to appear between the Moon and the Earth that bring them closer even than we expect in the sense that it is increasingly difficult to think even of the theory of the Moon breaking from the Earth, after which it formed its own structure similar to the Earth in which came off.

The topography of the Moon was measured with laser altimetry and stereo image analysis. The most visible topographic features are the huge South Pole – Aitken basin on the hidden face, about 2,240 km in diameter, the largest crater on the Moon and the second largest confirmed impact crater in the Solar System.

At a depth of 13 km, its bottom is the lowest point on the Moon's surface. The highest altitudes on the Moon's surface are located directly to the northeast and it has been suggested that they may have been thickened by the oblique impact that led to the formation of the South Pole – Aitken Basin. Other large impact basins, such as Imbrium, Serenitatis, Crisium, Smythii and Orientale, also have low altitudes and high regional edges. The hidden part of the lunar surface is, on average, about 1.9 kilometers higher than the visible one.
Fig. 4: NASA makes new revelations about the internal structure of the Moon. The lunar crater Daedalus on the hidden hemisphere of the Moon

The discovery of fault slopes by the Lunar Reconnaissance Orbiter suggests that the Moon has shrunk in the last billion years, by about 90 m. Similar features of contraction exist on Mercury.

The darker monthly plains and relatively devoid of features clearly visible to the naked eye, are called seas, as they were once thought to be full of water; it is now known that there are vast basins of solidified basaltic lava. Although similar to terrestrial basalts, lunar basalts have more iron and lack modified water minerals. Most of these lavas erupted or flowed into depressions associated with impact craters. Several geological provinces containing shield volcanoes and volcanic domes are located near the seas in the visible hemisphere.

Almost all seas are on the visible side of the Moon and cover 31% of the surface of this hemisphere, compared to 2% of the hidden hemisphere. It is considered to be caused by the concentration of heat-producing elements under the visible crust, seen on the geochemical maps obtained by Lunar Prospector's gamma-ray spectrometer, which would have heated the mantle below, melting it, raising it to the surface and erupting. Most of the moon's marine basalts erupted in the Imbrian period, about 3-3.5 billion years ago, although some radiometrically dated evidence is even 4.2 billion years old. Until recently, the oldest eruptions, dated by counting craters, appear to have been only 1.2 billion years ago. In 2006, a study of the Ina crater, a small depression in Lacus Felicitatis, found some sharp, relatively dust-free landforms that, due to the lack of erosion propagated by falling materials, appeared to be only 2 million years. Monthly earthquakes and gas emissions also indicate continued activity on the Moon. In 2014, NASA announced "widespread evidence of young lunar volcanism" in 70 irregular sea portions identified by the Lunar Reconnaissance Orbiter, some less than 50 million years old. This raises the possibility that the lunar mantle is much warmer than previously thought, at least in the near hemisphere, where the deep crust is substantially warmer due to a higher concentration of radioactive elements. Shortly before that, evidence was presented of a 2-10 million-year-old basaltic volcanism inside Lowell Crater, the East Sea, located in the transition zone between the visible and hidden hemispheres of the Moon. An initially warmer mantle and/or a local enrichment of the heat-producing elements in the mantle could be responsible for a longer duration of these activities and in the remote part of the East Sea.

The lighter regions of the moon are called terrae, or more commonly mountains because they are higher than most seas. Radiometric dating indicates an age of 4.4 billion years and may represent plagioclase "accumulated" from the lunar ocean of magma. Unlike the Earth, it is believed that no large mountains formed on the Moon as a result of tectonic events.

The concentration of seas in the visible hemisphere probably reflects the substantially thicker crust of the mountains of the hidden hemisphere, which may have formed in a low-speed impact with a second satellite of the Earth several tens of millions of years after their formation.

The other important geological process that has affected the moon’s surface are impact craters, craters formed when asteroids and comets collide with the moon’s surface. The Moon is estimated to have about 300,000 craters larger than 1 km on the visible face of the Moon alone. The monthly geological scale is based on the most important impact events, including Nectaris, Imbrium and Orientale, structures characterized by several rings of raised material, with diameters between hundreds and thousands of kilometers and associated with a wide belt of deposits of ejected materials that form a regional stratigraphic horizon. The lack of an atmosphere, its associated erosion factors and the lack of recent geological processes mean that many of these craters are well preserved. Although only a few multi-ring basins have been accurately dated, they are useful for assigning those geological eras. Because impact craters accumulate at an almost constant rate, the number of craters per unit area can be used to estimate the age of the surface. The radiometric ages of the impact-melted rocks collected during the Apollo missions are mainly between 3.8 and 4.1 billion years. Based on this information, the hypothesis of a large late bombardment was launched.
craters at the poles of the Moon. Computer simulations suggest that up to 14,000 km² of the surface could be in permanent shade. The presence of useful amounts of water on the Moon is an important factor in making the colonization of the Moon a feasible plan in terms of costs; the alternative of transporting water from Earth would have a prohibitive cost.

Later, traces of water were found on the surface of the Moon. In 1994, the bistatic radar experiment on the Clementine spacecraft indicated the existence of small, frozen pockets of water near the surface. Subsequent radar observations by Arecibo suggest, however, that these discoveries are rather rocks ejected from recent impact craters. In 1998, the Lunar Prospector spacecraft’s neutron spectrometer showed that high concentrations of hydrogen were present in the first meter deep of the regolith near the polar regions. Volcanic lava balls brought to Earth aboard the Apollo 15 spacecraft have small amounts of water inside them (Saal et al., 2008).

The Chandrayaan-1 spacecraft launched in 2008 later confirmed the existence of surface water with its Moon Mineralogy Mapper tool. The spectrometer observed lines of absorption common to the hydroxyl radical in reflected sunlight, which is an indication of the presence of large amounts of ice on the surface of the Moon. It has been shown that concentrations could even reach 1000 ppm. In 2009, LCROSS sent an impact object with a mass of 2,300 kg into a permanently shaded polar crater and detected at least 100 kg of water in a column of ejected materials. Another examination of the LCROSS data showed that the detected water could be rather 155±12 kg.

In May 2011, 615-1410 ppm of water was reported embedded in the monthly sample 74220, the famous “orange glassy soil” rich in titanium, of volcanic origin, brought by the Apollo 17 mission in 1972. These were formed during some explosive eruptions on the moon about 3.7 billion years ago. This concentration is comparable to that of magma in the Earth’s upper mantle. Although of considerable selenological interest, this announcement does not comfort the Moon’s colonization enthusiasts - the sample comes from a depth of many kilometers and the substance is so difficult to access that it was found only after 39 years, with a sophisticated tool, ion microextraction.

The gravitational field of the Moon was measured by tracking the Doppler displacement of radio signals emitted by a spacecraft from orbit. The monthly gravity shows large positive gravitational anomalies associated with some of the impact craters, produced in part by the denser flow of basaltic lava from the seas that fills these craters. The anomalies greatly influence the orbit of the ships around the Moon. There are also some riddles: The lava flow alone cannot explain the entire gravitational signature and there are masks that are not related to volcanism in the seas.


Discussion

Decades after launching the first and last man on the moon, NASA plans to build the lunar orbital platform in the 2020s.

As reflected in NASA's Exploration Campaign, the next step in manned spaceflight is to establish a US presence in space by deploying a lunar orbital platform - LOP-G, according to an agency statement. Together with the Space Launch System (SLS) and Orion, the lunar station or "gate" is essential for advancing and sustaining manned space exploration goals and is the unifying point of our architecture for human lunar operations, lunar surface access and missions, on Mars, according to the quoted source.

"I think it's a big step for us and for everyone. Now you can see that things are getting very, very serious. The White House is very supportive of the initiative and we spent a few years talking about it and dreaming of a concept and now it's finally happening," said Philippe Schoonejans, head of the robotics and future projects department and coordinator for ESA's Meteron project.

The LOP-G will be like a space station in orbit around the moon and is planned to be ready for human hosting by 2023. The platform will consist of at least one element of power and propulsion, habitability, logistics and docking possibilities. To be assembled in space in time (like the International Space Station or ISS), the first module will be a power and propulsion system, which is destined for launch in 2022.

It will use "high power electric propulsion" to maintain the position of the platform in a stable lunar orbit but also for changes in orbit, closer or farther from the Moon, depending on scientific and exploratory objectives. Another capability of this module will allow it to function as a high-tech communications platform to transmit between Earth, space, moon and other spacecraft, as well as to transfer large amounts of data using lasers.

Currently, five companies are completing their studies, as part of NASA's public-private partnership, to develop this power and propulsion module in an affordable way.

The space agency is also considering partnerships for other elements of the gateway, such as logistics, airlocks and housing modules. Launching elements into space for assembly could be done using NASA's future Space Launch System and Orion spacecraft or commercial rockets.

The human habitation module will be launched in 2023 if everything goes according to plan. While the partnership with private companies will require them to be informed about some of the capabilities of this module, for possible cooperation, it will also benefit from the knowledge already gained from using the ISS and its partners at the International Station. This module would allow the station crew to live and work in deep space for 30-60 days on a mission.

The docking and access module outside the lunar station will allow the crew to travel in space and also attach future elements that will become part of the gateway. Power missions through the access gate will be made using commercial spacecraft.

The team onboard the platform will undertake scientific, commercial and exploratory activities not only around the Moon but also on the lunar surface. NASA will also work on developing increasingly complex robotic missions, which will be carried out on the surface of the moon before a human crew goes there. The LOP-G could be placed in what scientists call an almost Rectilinear Halo Orbit (NRHO), an orbit in space that could serve as a waiting area for future missions.

Such orbits, which pass close to the moon and then loop far away from the satellite, have the advantage of being close to the moon, but always keep the station in line with the flight controllers on Earth, as well as in sunlight for solar panels.

The station's unique point of view will allow astronauts to operate telerobots on the lunar surface, said Harley Thronson, a senior technologist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. This could include exploring the youngest craters on the moon or arranging radio antennae to examine hydrogen-generated radio emissions when the universe was very young, he said.

"The earth itself could become a target for LOP-G observation," Thronson said. "Inexplicably, there have been very few space observations of the entire Earth that repeat exactly how Earth-like planets could appear in future astronomical observatories." The platform should be in orbit on the moon by 2025, said Gerstenmaier, a NASA veteran who oversees human exploration and operations.

Lunar Orbital Platform-Gateway has also received numerous criticisms from several space professionals who claim, more or less elegantly, that the objective does not have a true scientific purpose (Fig. 6).

Fig. 6: Lunar Orbital Platform-Gateway
The Gateway platform is an important part of NASA’s long-term space exploration plans. The Gateway platform was considered fundamental to a new landing on the Artemis program, however, due to problems with some delays it was removed from NASA’s plans. However, Ars Technica notes that the agency’s current plans provide for the core of this platform to be launched in 2023.

Doug Loverro, director of NASA’s manned flight program, said the first two elements of the platform will be launched together and that means the elements that provide power and propulsion and habitat, produced by Maxar and Northrop Grumman, respectively. they will be assembled on the ground and will be launched with the help of a private rocket.

Experts explain that federal law requires such a contract to be put up for auction, however, NASA has calculated the size and mass of these items that would be launched so that they could be transported by Falcon Heavy, one of the most powerful missiles from the commercial space fleet. "We made sure that it could be done (n.r. launch) with Falcon Heavy," Loverro said. "We have not yet selected the launch vehicle, but we had to make sure that there will be at least one vehicle for it. And that's how we know Falcon Heavy can do it and we know that because it has to meet the requirements of the Department of Air Force Defense for an extended core. So there could be several options, but we had to check at least one ", he adds.

Most likely, the core elements of the Gateway will be assembled in the second half of this year, stating that the achievement of this goal depends on a multitude of factors (Fig. 7).

Conclusion

It seems that the time has finally come when we will begin the careful exploration and surveillance of the Moon, our natural satellite that has been orbiting the Earth for billions of years.

The Gateway orbital space station, which is meant to rotate around the Moon, will finally be built, transported into space and finally assembled to begin its humanitarian mission of rotating around the Moon and to constantly monitor it in order to obtain important new data on features more secret of the Moon, the natural satellite of the Earth which we want to colonize in the near future starting with the construction of human bases on the Moon.

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Author’s Contributions

All the authors contributed equally to prepare, develop and carry out this manuscript.

Ethics

Author declares that are not ethical issues that may arise after the publication of this manuscript. This article is original and contains unpublished material.

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Fig. 1  https://en.wikipedia.org/wiki/Moon#/media/File:FullMoon2010.jpg

Fig. 2  https://en.wikipedia.org/wiki/Moon#/media:Lunar_eclipse_October_8_2014_California_Alfredo_Garcia_Jr_mideclipse.JPG

Fig. 3  https://ro.wikipedia.org/wiki/Luna#/media/9ier:Moon-craters.jpg

Fig. 4  https://ziare.com/magazin/spatiu/nasa-face-noi-dezvaluiri-despre-structura-interna-a-lunii-1067144

Fig. 5  https://ro.wikipedia.org/wiki/Luna#/media/9ier:Reiner-gamma-clem1.jpg

Fig. 6  http://www.prisma-online.ro/wp/wp-content/uploads/2018/08/statia-lunara-640x356.jpg

Fig. 7  https://storage0.dms.mpinteractiv.ro/media/401/321/5109/19118707/1/gateway2-nasa.jpg?width=618&height=361