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UN Committee on the Peaceful Use of Outer Space
(UNCOPUOS)

Ensuring Peaceful Exploration & Research of the Planet Mars

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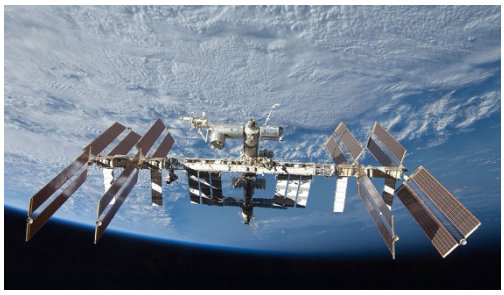
Introduction

Within the new few years or decades, human exploration of Mars is likely to become a reality. Mars has always been a source of curiosity for humans and scientists of all nations. Thanks to the advancement in technology, robotics missions have explored the planet and found evidence of water, although the presence if life remains a mystery.

Prior missions to the red planet have proven than both Earth and Mars share similar characteristics and history, but the striking differences are yet to be understood, hence the reason humans want to investigate Mars's geological evolution. Future missions to this planet provide humanity a promising opportunity to live for extended periods beyond earth's orbit. The future technology required to transport explorers will drive for innovation, resulting in technology that has substantial advantages.[1]

Previously, The United Nations Committee on the Peaceful Use of Outer Space (COPUOS) has focused mostly on the use of near outer space, the region of the Earth's orbit around the sun. Now it faces the challenge of ensuring peaceful exploration of Mars, to encourage nations around the world to cooperate to achieve such an endeavor. But there is the risk that UN Member States will dilute the possibility for interplanetary travel by insisting on purely national programs. Without international census, exploration could be slowed or unachievable, risk and expenses increased, with the danger of turning humanity's next great challenge into a disaster.



The greatest achievement of international cooperation to date: the Interional Space Station in low Earth Orbit

To maximize the prospects for next steps in space exploration, international concensus is necessary. Measures to ensure peaceful exploration and use of space include milestone agreements like the Outer Space Treaty. This and similar precedents established that all nations should have free access to space, and none can claim control claim celestial bodies.[2] The International Space Station is among the greatest proof that nations can cooperate when it comes to advanced technology. It has shown collaboration will highlight our common interests and provide a global sense of community.[3]

Background to UNCOPOUS

[1] Wiles, Jennifer. "Why We Explore." NASA.

[2] Grush, Loren. "How an international treaty signed 50 years ago became the backbone for space law." The Verge

[3] "Why We Explore." NASA.

The Soviet Union's launch of Sputnik in 1957, the first human-made object orbiting the Earth, was the catalyst for international action. The UN General Assembly established the COPUOS in 1959. It was made to regulate the use and exploration of all aspects of outer space for the greater good of humanity. It is also tasked to monitor the technical advancement in space exploration, the evolving use of space science and technology for sustainable development.

Since its creation, the committee's membership has continued to expand. In 1959, the General Assembly founded the COPUOS with 24 members. It has since grown to 84.

In addition to countries, multiple international organizations, including both intergovernmental and non-governmental organizations, have observer status with COPUOS and its Subcommittees.

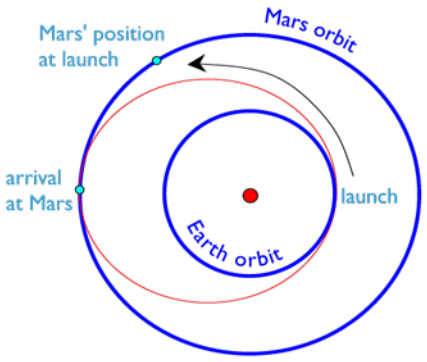
Background to Mars

Because of its great distance from Earth, Mars was not an early taregt for space exploration. But it is the msot pormising planet for human exploration, and an obvious target. Initially, attention focus on closer regions, especially Earth orbits and the Moon.

The Mars joined the agenda about ten years later. During the Cold War the USSR was the first nation to reach its surface in 1971, with their Mars 3 mission lander. It only functioned for 20 seconds after landing before losing contact. The next landing, by the NASA Viking 1from the United States, was more successful in 1976.[4]

It may be the closes planet to Earth, but Mars is still a long way away. Any mission to Mars—automated or with astronauts takes six to eighteen months to reach the planet. The total journey time from Earth to Mars takes approximately 150 to 300 days depending on the speed of the launch, the alignment of Earth and Mars, and the length of the journey the spacecraft. The shortest human missions to Mars have round-trip flight times of 400 to 450 days, plus time in Mars orbit or on the surface.

Because of the distances and the need for precise navigation, there seem to be endless possibilities for things to wrong. For decades virtually every probe sent to Mars failed. Space engineers spoke of a *Mars Gremlin* that doomed many missions. Probes missed the planet completely, crashed into it, went into orbit but went silent, crashed on the surface or arrived and stopped communicating. Mars is a demanding target.



Hohmann transfer trajectory

[4] Duncan, Pamela, and Paul Scruton. "Forty years of missions to Mars."

There is currently a multitude of missions and future projects to Mars. Most involve specially designed exploration craft. NASA has lead much of this work, most visibly with its Curiosity

The Mars One colony as imagined by Bryan Versteeg

rover on Mars. A human mission would be extremely costly. Estimates are vague, but numbers like USD 500 billion are widely used.

There also are major issues about safety, especially the problem of shielding astronauts from solar radiation. But interest is keen. America planning focuses on its space agency, NASA. It has plans—currently unfunded—for a journey to Mars in the 2030s. However, they have been criticized for lacking details and deadline. They have a goal but no funding and no schedule. Instead, NASA's work cocnenrtates on feasibility studies to better understand how such a journey can be done. They have divided this review into three phases: first is to test life support, second is to develop and test spacecraft, and third to send humans to Mars.

Other major possibilities include private businesses. A prominent name is Space X, a private space exploration company led by the entrepreneur and billionaire Elon Musk. His company's goal is to create a fleet of reusable rockets to send humans to Mars and back again for a relatively low price. Space X already has had successful test flights with their reusable rockets in low Earth orbit, typically reaching an altitude of 500 km. The firm plans a Mars probe for the years 2016. But planning for human mission appears to be less advanced.[5]

Another prominent name is Mars One, a non-profit led by a Dutch Entrepreneur named Bas Lansdorp. His company wants to send six groups of four astronauts each on one-way trips and Mars to establish a permanent settlement. It has a tentative schedule to send the first crew by 2024. Mars One claims this can be accomplished using existing technology. But they have repeatedly been criticized for lacking funds, technology and serious designs.[6]

Current cooperation and the International Space Station (ISS)

The greatest achievement of international cooperation in human space exploration so far is the International Space Station (ISS). Presently the ISS has United States, Canadian, European Japanese and Russian funding through the year 2024. Funding beyond 2024, however, is less certain, as Russia and the United States both plan for separate replacements of the ISS. While the United States is guardedly optimistic about future Russian cooperation, Russia has made no commitment to invest in a United States-led replacement.

Role of the United Nations

All exploration of Mars, and any human mission, would be governed in large part by interional law of outer space. To ensure peaceful uses of space and international cooperation, UN Member States of the have ratified a series of

[5] Becker, Rachel. "The race to Mars: here's how SpaceX ranks against the competition." The Verge.
[6] Ibid.

space-related agreements, or space laws. These agreements are the basis for all international cooperation. Note that these treaties are only legally binding for those countries that have signed and ratified them.

Much like general international law, space law comprises a variety of international agreements, treaties, conventions, United Nations General Assembly and UNCOPOUS resolutions as well as rules and regulations of international organizations.[7]

Space law constitutes international laws and principle governing the uses of outer space. It addresses a variety of matters, such as the preservation of space and Earth environment, liability for damages caused by space objects, the settlement of disputes, the rescue of astronauts, the sharing of information about potential dangers in outer space, the use of space-related technologies, and international cooperation. Some fundamental principles guide the conduct of space activities, including the notion of space as the province of all humankind, the freedom of exploration and use of outer space by all states without discrimination, and the principle of non-appropriation of outer space. Space law also covers private sector activity.[8]

International space law makes it clear that only Member States have full control over their astronauts, stations, equipment and vehicles sent to Mars or other celestial bodies. Private businesses or interional groups involved in a Mars project would fall under international and relevant national law.

UN bodies have expanded these precedents to include any state or business operating outside the Earth's atmosphere. The rules and law apply to private companies carrying out activities in outer space. For example, Article VI of the Outer Space Treaty states that "*The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.*"[9]

UNCOPUS has a vital role to play, establishing the boundaries on what kind of activity is acceptable, what is not, what kind of cooperation is desirable. While the UN and UNCOPOUS have established precedents that apply to Mars exploration, it has yet to address Mars missions specifically.

Landmark UN Resolutions

The United Nations has been active in outer space matters for many years, establishing a strong precedent for international action. Many provisions of the General Assembly resolutions related to outer space have become widely accepted by the international space community, including the resolution elaborating the concept of the "launching State" (59/115), the resolution endorsing the Space Debris Mitigation Guidelines developed by the Committee on the Peaceful Uses of Outer Space (62/217), the resolution enhancing the practice of States in registering space objects (62/101) and the resolution on recommendations on national space legislation (68/74).

More recently, the General Assembly has been clear in its promotion only of peaceful uses of outer space, with a resolution entitled *International cooperation in the peaceful uses of outer space*, of 2016.[10] UNCOPOUS also has

[7] "United Nations Office for Outer Space Affairs." COPUOS.
[8] Ibid.
[9] "Outer Space Treaty of 1967." NASA.
[10] *International cooperation in the peaceful uses of outer space*, A/RES/71/90, 2016. http://www.unoosa.org/res/oosadoc/data/resolutio

been active, with its *Guidelines for the long-term sustainability of outer space activities*, passed by UNCOPOUS in 2017.[11] The principles and language in that resolution should be part of any future UNCOPOUS resolution.

In addition to these resolutions, a system of international treaties on outer space forms the foundation which gives UNCOPOUS decisions exceptional strength:

- The "Outer Space Treaty" of 1967, the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*. [12]
- The "Rescue Agreement" of 1968, the *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*. [13]
- The "Liability Convention" of 1972, the *Convention on International Liability for Damage Caused by Space Objects*. [14]
- The "Registration Convention" of 1976, the *Convention on Registration of Objects Launched into Outer Space*.[15]
- The "Moon Agreement" of 1984, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.[16]

Country Positions

China is competing internationally with a space program funded for USD 6 billion a year. Although that is almost USD 1billionn more than Russia, it is much less than the American space budget of around USD 40billion a year. Despite its large budget, the US made only 19 successful space launches in 2013, compared with China's 14 and Russia's 31. With numbers like this, it is clear that China has arrived in space, and is set to become stronger.[17]

Space Analyst Brian Harvey believes that China only wants to be seen as equal and be recognized by the world's space community. This has worked to some extent up to plan because China has been successfully collaborating with European Space Agency (ESA) to launch satellites into space and have much more to come. Chinese officials value collaborations beyond the science. "We are the newcomers in space science, and don't have much experience," says Wang Chi. "International collaborations are the shortcut for China to catch up with the world. Also, science, especially space science, should be the responsibility of all humans around the globe. International collaboration is the effective way to obtain the maximum science return from any space mission."[18]

Whereas in contrast, the U.S. refuses to collaborate with China. The most obvious result has been the exclusion of China from the International Space Station. But this has not discouraged the Chinese nevertheless from launching their space station, which will be open for collaboration. The *Tiangong 2*, a Chinese made test space station, was launched in September of 2016 and it has been signed by the UN Office for Outer Space Affairs to open that station for experiment and astronauts from UN

ns/2016/general_assembly_71st_session/ares7190_html/N1642782.pdf

[11] *Guidelines for the long-term sustainability of outer space activities*, A/AC.105/C.1/L.362, 21 June 2017. http://www.unoosa.org/res/oosadoc/data/documents/2017/aac_105c_1l/aac_105c_1l_362_0_html/AC105_C1_L362E.pdf

[12] A/RES/2776(XXVI) (1971).

[13] A/RES/2345(XXII) (1967).

[14] A/RES/2777(XXVI) (1971).

[15] A/RES/3235(XXIX) (1974).

[16] A/RES/34/68 (1979).

[17] Clark, Stuart. "China: the new space superpower." The Observer.

[18] Ibid.

member states, specifically developing countries that find space too expensive.[19]

The European Space Agency has found a way to allow collaboration without the loss of control. It is "an elegant solution," says astrophysicist Graziella Branduardi-Raymont at University College London, who is working on Smile. "China builds the basic spacecraft and sends it to Europe. ESA and its collaborators then attach the payload module, which holds the science instruments, and launches the mission.[20] Now China finds itself competing in the race to Mars. It has planned to start its own Mars program and to send a rover in 2020.

Europe: The 28 Member States of the European Union (UN) are heavily invested in all forms of space exploration, largely through the European Space Agency. More than many other countries, the members of the EU are used to international collaboration, and view it as the normal way to achieve major goals. France often is eh European leader, because it controls space launches through its facility in French Guyana, on the coast of South America. But all planning and decision-making is cooperative. The best known European projects are major space science probes, such as the *Kepler planetary observatory*. European countries expect to play a major role—financial and scientific—in any international Mars program.

India has a major space exploration program, with major launch capabilities. In 2014 an Indian unmanned space vehicle reached Mars's orbit in just ten months. "India [was] the first country in the world to insert a spacecraft into the Martian orbit in a maiden attempt if the operation succeeds," ISRO scientific secretary V. Koteswara Rao told reporters, "and also the first Asian country to reach the Red Planet's sphere."[21]

It was a substantial success because India had never attempted interplanetary travel before and was able to achieve it with a whole budget of just USD 70 million, a fraction of the cost of a typical Mars missions. India's prime minister, Narendra Modi, has hailed the country's low-cost space program, pointing out that a domestically made rocket that launched four foreign satellites into orbit in June had cost less to make than the Hollywood film *Gravity*.[22]

Non-Aligned Movement (NAM). The NAM is the largest voting bloc in the United Nations, made up of states that do not wish to align with any major powers. These states are predominantly in Africa, Asia, and Latin America. These states are less affected by treaties related to outer space, with the exception of India, and are therefore more likely to approve of resolutions limiting the proliferation of space or Mars. On the other hand these states might make their cooperation contingent upon receiving support for their own resolutions. These might include supporting resolutions that help NAM states solve domestic crises or increase regional development. Furthermore, NAM states are more likely to have not signed or ratified the five resolutions identified below. Therefore, certain concessions or agreements should be made to maximize their support.

Russia is not a signatory of the Moon Agreement, nor is the United States, but like the US, Russia has agreed to be constrained by the other agreements. Russia shares operation of the International Space Station (ISS) with the Canada, the European Space Agency, Japan, and the US. Ensuring future cooperation partly

[19] Ibid.
[20] Ibid.
[21] P, A. F. "India scents victory in Asian space race to Mars." The Guardian.
[22] Ibid.

depends on Russia's cooperation in peaceful space missions.

Like the United States and other countries, Russia 's military relies on outer space for intelligence gathering, communications and navigation satellites. But Russia, more clearly than the United States, also has shown a commitment to prevent *weaponization* of outer space, as it showed when voting in favor of a 2014 draft UN resolution preventing any state from being the first to place weapons in space and the resolution preventing any state from entering into a space-based arms race.

Russian space explorations science is of the highest quality. Russia has the ability to contribute to any Mars missions. But its space funding has been dominated by Earth orbit activity for several years. Nevertheless, Russia would insist on playing a major role in any international agreement or activity.

United States. With the exception of the Moon Agreement (see below), the United States is a signatory to every major resolution regarding the non-proliferation of space, including the Partial Test Ban Treaty. The US's position on the moon complicates any potential for cooperation on a resolution ensuring peaceful exploration of Mars. The US government objects to the Moon Agreement's provision that resources mined from celestial bodies must be shared with the international community. Because the US is party to the other relevant resolutions, it *de facto* and *de jure* abides by the Moon Agreement's non-proliferation clause.

Historically the United States has experimented with space-based anti-ballistic missile programs, such as the Project Excalibur, which attempted to use lasers to track and destroy nuclear-armed intercontinental ballistic missiles. These defensive technologies, if realized, have offensive capabilities. If a laser can target a missile, it has the potential to target the earth.

While this technology is difficult to achieve, President Donald Trump has stated a desire to focus NASA on strengthening the country's military missions, which might include a renewal of the Project Excalibur program or other weapon-based space programs.[23] While this is presently uncertain, Trump has explicitly stated he wants to increase land-based anti-ballistic missile programs. Under the Trump administration the US could also withdraw from international agreements prohibiting nuclear weapons in space, and other forms of space cooperation.

The United States has a long tradition of maintaining these agreements because by doing so it ensures other nuclear powers will also abide by them. Furthermore, the US long recognizes the role nuclear deterrence plays in maintaining global order. Weapons-based space programs undermine deterrence and are, therefore, outside the scope the American view of international norms.

In 2014 the United States further voted against two Unite Nations resolutions prohibiting nuclear weapons in space. The first prohibited states from being the first to place weapons in space.[24] The second prohibited states from engaging in a space-based arms race.[25]
In summary, the US's position is complicated.

The United States wants to increase the military utility of its NASA missions, but it also wishes to maintain or increase the role deterrence plays in maintaining its position as a global power. The difficulty is that anti-ballistic missile programs decrease deterrence. Any language

[23] "Hillary Clinton and Donald Trump weigh in on U.S. space policy." Space News.
[24] A/RES/69/32 (2014): Press Briefing
[25] A/RES/69/31 (2014): Press Briefing

strengthening peaceful exploration of space will have to address both needs, despite them being potentially contradictory.

Going to Mars? Essential Questions for UNCOPUOS

The UNCOPUOS has played a role facilitating space exploration and utilization for sixty years. But new possibilities in exploration and business rquire new interional guidance, guidance accepetd by all members of the international community. Major issues that any resolution from UNCOPOUS on exploration of Mars needs to cover include:

- Should UNCOPUOS work to promote further interional cooperation on exploration of Mars and other celestial bodies?
- Will one country be allowed to dominate exploration of Mars? This might ensure exploration happens more quickly, but also could raise controversy.
- Or should the Member States of the UN act to ensure cooperation in ensure that all aspects of Mars exploration is cooperative?
- How can the Members States of the UN prevent militarization of space from extending to celestial bodies such as Mars?
- What role should private companies play in distant space exploitation? Is their only legitimate role as contractors to government? Or should they be allowed to play an independent role?
- How does current UNCOPOUS action address the issue? Is their more it can do?
- And perhaps the trickiest issue of all, how to finance international cooperation on a project of the scale of Mars exploration or colonization? Should all Member States be asked to contribute, only those involved Mars exploration, or should particular countries play specific roles? Are there funding sources UNCOPOUS should stress?

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