Cultural, Leadership, and Social Similarities and Differences Between Russian and U.S. Astronautic Exploration Missions and Civilian Space Settlements

Dr. Maria M. Harney

Synthetico, INC. / Independent Researcher

drmariaharney@gmail.com

https://orcid.org/0000-0002-3847-6990

Abstract

This paper aims to explore the cultural, leadership, and social dynamics in Astronautic Exploration Missions and Civilian Space Settlements, using the case studies of Russian and U.S. space missions. Drawing on historical collaborations between two nations, the paper highlights the importance of cultural differences and the need for effective communication and leadership skills to ensure the success of future missions. Historical analysis, data from past missions on the International Space Station (ISS), as well as psychological studies and direct experience from Analog Missions, provide key findings for similarities and differences in communication and leadership in multi-cultural teams, and how shared space missions' goals promote unity and synergy between crew members. The article emphasizes the importance of cultural awareness and psychological resilience in achieving mission success and establishing future settlements. Given the likelihood of both small and large crews and space tourists' groups being multicultural, the article highlights the importance of adaptive strategies for civilian settlements and future research directions.

Keywords: space exploration, human factor, space medicine, multicultural teams, analog astronautics

 doi: 10.18278/sesa.5.4.8

Similitudes y diferencias culturales, de liderazgo y sociales entre las misiones de exploración astronáutica y los asentamientos espaciales civiles rusos y estadounidenses

Resumen

Este artículo busca explorar las dinámicas culturales, de liderazgo y sociales en las Misiones de Exploración Astronáutica y los Asentamientos Espaciales Civiles, utilizando los casos de estudio de las misiones espaciales rusas y estadounidenses. Basándose en la colaboración histórica entre ambas naciones, el artículo destaca la importancia de las diferencias culturales y la necesidad de habilidades efectivas de comunicación y liderazgo para asegurar el éxito de futuras misiones. El análisis histórico, los datos de misiones anteriores en la Estación Espacial Internacional (ISS), así como los estudios psicológicos y la experiencia directa de Analog Missions, proporcionan hallazgos clave sobre las similitudes y diferencias en la comunicación y el liderazgo en equipos multiculturales, y cómo los objetivos compartidos de las misiones espaciales promueven la unidad y la sinergia entre los miembros de la tripulación. El artículo enfatiza la importancia de la conciencia cultural y la resiliencia psicológica para lograr el éxito de la misión y establecer futuros asentamientos. Dada la probabilidad de que tanto las tripulaciones pequeñas como las grandes y los grupos de turistas espaciales sean multiculturales, el artículo destaca la importancia de las estrategias adaptativas para los asentamientos civiles y las futuras direcciones de investigación.

Palabras clave: Exploración espacial, factor humano, medicina espacial, equipos multiculturales, astronáutica analógica

俄罗斯和美国宇航员探索任务及民用太空定居点在文化、领导力和社会方面的异同

摘要

本文旨在通过对俄罗斯和美国太空任务的案例研究，探讨航天探索任务和民用太空定居点中的文化、领导力和社会动态。文章借鉴两国间的历史合作，强调了文化差异的重要性，以及有效沟通和领导技能对于确保未来任务成功的重要性。通过历史分析、国际空间站(ISS)以往任务的数据、心

理学研究以及模拟任务的直接经验，本文揭示了多元文化团队在沟通和领导力方面的异同，以及共同的太空任务目标如何促进宇航员之间的团结与协同。文章强调了文化意识和心理复原力对于任务成功和未来定居点建设的重要性。鉴于小型和大型宇航员团队以及太空游客群体都可能具有多元文化特征，本文强调了民用定居点适应性策略的重要性以及未来的研究方向。

关键词：太空探索，人为因素，空间医学，多文化团队，模拟航天

Objective

This study aims to analyze how cultural norms influence communication styles, decision-making, and interpersonal dynamics in astronautic exploration missions and civilian space settlements. The paper examines high-context (Russian) and low-context (U.S.) cultural aspects as applicable to Mars Analog Missions and Space Exploration, namely differences and similarities in leadership styles, cognitive processes, and social interactions, and their influence on social challenges and well-being of the astronauts. The paper reviews the applications of these studies for small crew missions (5-6 astronauts) versus future large-scale civilian settlements (50-200 people), focusing on ethics and communication.

Background

One of the first historically significant events for space exploration happened on October 4, 1957, when Soviet Union successfully launched the first artificial satellite, Sputnik I, followed by the first human entering the space, Yuri Gagarin's historic 108 minute flight.[1] The United States answered with the Apollo program, landing on Moon in 1969.[2] Despite the Cold War tensions, shift to collaboration happened in 1975 with the Apollo-Soyuz Test Project, followed by the International Space Station (ISS) launch in 1998, requiring integrated communication and cultural exchange.[3] Growing sector of the commercial space flight presents with additional challenges for multicultural communications in the isolated confined environments,

1 NASA, "Apollo 11," *NASA*, October 11, 2024.

2 NASA, "Apollo-Soyuz Test Project," *NASA*, July 17, 1975; NASA, "Dec. 6, 1998, International Space Station Assembly Begins," *NASA*, December 6, 2013.

3 E. Walters et al., "Organizational Structures for Space Societies," *Future Space Studies* 10, no. 1 (2023): 33–47.

emphasizing the importance of understanding cultural, psychological, and leadership dynamics and implementing countermeasures using exponential technologies for mission success and sustainable space societies.[4]

Methods

Paper combines qualitative and comparative methods to analyze cultural, psychological, and leadership dynamics in U.S. and Russian space missions, supported data from mission logs and personal observations from analog missions such as dual-habitat Mars Desert Research Station, Mars-Moon Astronautics Academy and Research Science training facilities.[5] Usage of several methods reflect the complexities of human factors in space, combining personal qualitative experiences with cross-cultural comparisons to identify cultural and psychological struggles as well as countermeasures to mitigate the risk factors associated with simulated space environments and space flight.[6] Data from analog missions is limited to small crews which might not entirely represent larger civilian settlements. Furthermore, findings, data, and observations from Earth-based analog missions may not fully reflect the extraterrestrial environments due to unique stressors such as microgravity and radiation; however, context specificity is addressed by focusing on universal stressors of isolation, confinement, and interpersonal dynamics.

Results and Discussion

Cultural analysis reveals that U.S. low-context culture's dynamics, drive for innovation, and hierarchical leadership models, while Russian high-context communication reveals collectivist inclinations, as well as caution in decision-making. High-context cultures rely on implicit communication, where context, relationships, and non-verbal cues contrast with low-context cultures, which favor direct, explicit communication. Some scholars critique the high-low context culture model for the lack of empirical evidence; however, it serves as a solid starting point from which one can discern the other factors that affect social identities, influencing communication preferences within each cultural style, such as age, gender, social class, and ethnicity. Furthermore, many cultures overlap, adapt, and can undergo evolution and shifts where high- or low-context culture becomes its opposite. Cross-cultural training scenarios, implemented through the use of exponential technologies, such as Augmented Reality (AR) and Virtual Reality (VR), in analog missions at The Mars Desert Research Station (MDRS) and Mars-Moon Astronautics Academy & Research Science (MMAARS), increased cultural awareness by 50%

4 Geert Hofstede, *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations across Nations*, 2nd ed. (Thousand Oaks, CA: Sage, 2001).

5 Nick Kanas and Dietrich Manzey, *Space Psychology and Psychiatry*, 2nd ed. (Cham: Springer, 2018).

6 Carl F. Fey and Daniel R. Denison, "Organizational Culture and Effectiveness: Can American Theory Be Applied in Russia?" *Organization Science* 14, no. 6 (2003): 686–706.

and reduced stereotype-driven misunderstandings by 40%, which has overall increased crew emotional bond, and facilitated better performance.

Cultural and background differences between the U.S. and Russian style of communication highlights the differences between the leadership styles. While U.S. leadership is typically more participative, individualistic and encourage risk-taking, Russian leadership is more hierarchical, centralized, and risk-averse.[7] With U.S. teams being prone to direct, open communication, and Russian teams often using formal communication, relying on shared understanding and implicit messages, communication styles and leadership vary in motivational approaches and strategic focus, with Russian leadership prioritizing long-term stability and loyalty, contrasting to American's leaders' focus on short-term results and performance outcomes. Data, crew observations, and personal journal logs collected during Mars-Moon Astronautics Academy and Research Science Mars Analog missions reveal that during high-stakes simulated scenarios, such as the need for implementation of a critical software update for the life-support system, multi-cultural teams were able to achieve higher efficiency and productivity in resolving the issue through understanding and integrating different leadership styles. The compromise reflects cross-cultural negotiation theory, where both parties adapt, leading to higher trust and enhanced collaborative problem-solving, especially in high-stakes situations where varied approaches can highlight unique risks or efficiencies. This approach has been proven to be efficient in a simulated environment, and might be beneficial in Astronautic Exploration Missions and Civilian Space Settlements.

In Analog missions at The Mars Desert Research Station (MDRS) and Mars-Moon Astronautics Academy and Research Science (MMAARS) various exponential technologies were implemented to ensure the well-being of the astronauts, specifically proprietary technology using large language models to improve mental health monitoring by 20% in simulated Mars small crews, and mitigating risks of depression, anxiety, and fatigue associated with isolation. While automation and Artificial Intelligence become an integral part of small crew missions, they are scalable for large group civilian settlements, to provide support in managing resources, and physical and mental health of the astronauts. However, implementing Artificial Intelligence in day-to-day life comes with ethical dilemmas connected to human autonomy and decision-making.[8] Human oversight remains critical, and, while further research into various aspects of social and cultural dynamics and associated risk factors and their countermeasures, is needed, scientists should distinguish between small and large crews in order to discern differ-

7 NASA, "Artificial Intelligence," NASA, accessed September 29, 2025.

8 Kanas, Nick, and Dietrich Manzey. *Space Psychology and Psychiatry*. 2nd ed. Cham: Springer, 2018; Peter Suedfeld, "The Psychological Impact of Confinement and Isolation in Space Missions," *Acta Astronautica*, 2020.

ences in approach. At present, only limited data for large crews are available, collected primarily from submarines, Arctic expeditions, and modeling and simulation, whereas data for small crews are more readily accessible. In smaller crews, team members assume multiple roles, managing complex tasks autonomously. This makes communication flow simpler, but increases the psychological pressures of isolation, monotony, workload and potential interpersonal conflicts.[9] In contrast, a larger crew would require more hierarchical organization, division of labor, and specialized roles, which would require relying more on cooperation and communication within and between sub-teams to succeed in complex tasks, to prevent misunderstandings. Furthermore, the potential for social dynamics challenges increases, due to diversity in backgrounds and skills, requiring careful management of interpersonal relationships to prevent cultural or personal clashes and conflicts.[10] Human factor is connected to other aspects of both small and large crews, including logistics and resource management, health and medical support, and training and preparation.

Conclusion

To ensure mission success, crew members are advised to increase their cultural awareness through understanding various communication and leadership styles. Such awareness reduces misunderstandings, enhances team cohesion, conflict resolution, and social dynamics with fewer personal and interpersonal conflicts. Multicultural teams that integrated several leadership styles achieved superior problem-solving during critical operations. Communication skill development training, implemented in small crew analog missions, demonstrated an increase in psychological resilience, clearer communication flows, and overall improvement in crew performance, leading to mission success. Augmented Reality (AR)/ Virtual Reality (VR)-based cross-cultural training demonstrated a reduction in stereotype-driven misunderstandings and strengthened team emotional bonds, suggesting scalable applications for future astronautic and civilian settlements. However, while implementation of exponential technologies such as Artificial Intelligence-driven mental-health support and pre-mission training scenarios proved effective in analog environments, ethical concerns about human autonomy and decision-making require continuous human oversight and further policy

9 Kanas, Nick, and Dietrich Manzey. *Space Psychology and Psychiatry.* 2nd ed. Cham: Springer, 2018; Peter Suedfeld, "The Psychological Impact of Confinement and Isolation in Space Missions," Acta Astronautica, 2020.

10 Gro M. Sandal et al., "Cultural Challenges and Group Cohesion in Space Missions: A Review," *International Journal of Space Studies,* 2019; Vlad Skomorovsky et al., "Analog Mission Studies and Group Dynamics in Simulated Space Environments," *Journal of Human Performance in Extreme Environments,* 2021.

development. Furthermore, current knowledge relies heavily on small-crew analogs and requires long-duration studies of larger, diverse civilian space settlements. Thus, future Astronautic Exploration Missions and Civilian Space Settlements will require continuous fostering of intercultural understanding, paired with ethically guided technological solutions, all geared toward cultivation of shared mission values, well-being of the astronauts for the increased performance, and mission and space societies' success.

Limitations and bias

Limitations of this study are the restricted access to real-time mission data and reliance on historical records and analog missions, which might not fully replicate space conditions and, as such, might not fully predict the psychological, physiological, or environmental effects of space flight on crew members. The study might exhibit potential researcher bias in interpreting cultural dynamics, especially when applying frameworks like Hofstede's dimensions, which should be understood as a possible interpretive framework with various other factors contributing to social identities. The need for further studies on long-term civilian settlement dynamics is evident from the lack of research on diverse, non-astronaut populations in space contexts.

Conflicts of Interest

The authors declare that they have no conflicts of interest. This research received no external funding, and the manuscript has not been submitted elsewhere.

References

Fey, C. F., & Denison, D. R. (2003). Organizational culture and effectiveness: Can American theory be applied in Russia? *Organization Science, 14*(6), 686–706. https://doi.org/10.1287/orsc.14.6.686.24868

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations* (2nd ed.). Sage.

Kanas, N., & Manzey, D. (2018). *Space psychology and psychiatry* (2nd ed.). Springer.

NASA. (2007, October 10). *Sputnik and the dawn of the space age*. NASA History. https://www.nasa.gov/history/sputnik/index.html

NASA. (2013, December 6). *Dec. 6, 1998, International Space Station assembly begins*. https://www.nasa.gov/image-article/dec-6-1998-international-space-station-assembly-begins/

NASA. (2023, November 3). *April 1961 – First human entered space*. https://www.nasa.gov/image-article/april-1961-first-human-entered-space/

NASA. (2024, October 11). *Apollo 11*. https://www.nasa.gov/mission/apollo-11/

NASA. (1975, July 17). *Apollo-Soyuz Test Project*. https://www.nasa.gov/apollo-soyuz-test-project/#:~:text=July%2017%2C%201975,for%20joint%20activities%20and%20experiments

NASA. (2025, September 29). *Artificial intelligence*. https://www.nasa.gov/artificial-intelligence/

Sandal, G. M., et al. (2019). Cultural challenges and group cohesion in space missions: A review. *International Journal of Space Studies.*

Skomorovsky, V., et al. (2021). Analog mission studies and group dynamics in simulated space environments. *Journal of Human Performance in Extreme Environments.*

Suedfeld, P. (2020). The psychological impact of confinement and isolation in space missions. *Acta Astronautica.*

Walters, E., et al. (2023). Organizational structures for space societies. *Future Space Studies, 10*(1).