Artemis and Ethics Workshop Lessons Learned

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1. **Introduction**

As NASA lays out its Artemis activities, it expects to set precedents in spaceflight for decades to come. Artemis is a far more ambitious program than even Apollo, aimed at developing a sustained human presence on and around the lunar surface, in preparation for Mars exploration. As a result, considering ethical and social concerns in the discussion and design of Artemis is vital to ensuring the future worlds we create are ones where humanity collectively wants to live. By understanding how to reflect on these issues as NASA makes decisions related to Artemis, NASA can avoid unintended consequences stemming from cultural perceptions of human exploration of the solar system that may harm society.

We recognize that a diverse range of groups need to be part of this conversation. There are many different views about the work that should happen in space. We recognize that NASA does not hold sole responsibility for determining the ethical path forward in space, as decisions made by commercial, international, and intergovernmental partners play a major role. Inclusive conversations help inform that work. Others have already argued that social scientists and engineers need to work together with inputs from stakeholders to design the future [1].

To begin to answer this need, NASA’s Office of Technology, Policy, and Strategy (OTPS) hosted an Artemis and Ethics Workshop. This workshop was held in Washington, DC from April 12th-14th 2023 and brought together invited experts in social science fields and NASA managers to discuss ethical, legal, and social aspects (ELSA) of Artemis and human exploration in general. The goal of the workshop was to discuss issues and build connections that NASA managers can consider across variety of ethical issues surrounding Artemis.

1. **Workshop Overview**

The workshop lasted 2.5 days and covered a specific schedule of topics. Themes for the workshop included past government-funded ethics studies and current issues surrounding Artemis. It also explored who is responsible for making decisions around societal and ethical implications and what options NASA has to address the issues that it is responsible for.

Participants included domestic and global scholars from various cultures, backgrounds, and opinions, and representatives from the NASA mission directorates and centers. NASA employees attended in a primarily listening capacity. Getting input from people of different backgrounds can help NASA consider a wide range of public views and values, helping NASA to think outside its box, and NASA saw great value in hearing all viewpoints as part of its commitment to Diversity, Equity, Inclusion, and Accessibility. NASA is not qualified to be the only source of ethical information – that comes from everyone around the globe. Each speaker’s thoughts and opinions were entirely their own and did not necessarily reflect those of NASA. NASA will make decisions regarding which elements of the discussion are appropriate for future action.

We held a virtual pre-workshop meeting to bring speakers and discussants up to speed on NASA’s current Moon to Mars plans in order to promote deeper conversation during the workshop itself. The meeting featured presentations by representatives from the three key Mission Directorates for Moon to Mars activities, the Exploration Systems Development Mission Directorate, the Science Mission Directorate, and the Space Technology Mission Directorate, and provided an overview on the current state of NASA’s Moon to Mars objectives. Participants were invited ask questions and make comments on those plans, and organizers identified topical areas for future discussion at the workshop.

The first day of the workshop consisted of a series of presentations aimed at giving participants an overview of the purpose of the workshop and reviewing lessons learned from past ELSA activities in other technology fields, such as nanotechnology and the human genome project. The afternoon included more presentations and dedicated brainstorming sessions that brought all of the participants together to discuss some of the issues presented earlier in the day. Issues to be discussed include the ethics of opportunity costs in space exploration, the allure and harms of the colonial narrative with regards to space exploration, sustainable exploration and resource utilization, and prioritization of land use for different applications, as well as equity and inclusion of for both who flies to space and who makes the decisions.

The second day included a guided tour of the National Air and Space Museum to provide additional context to participants and to encourage networking in a lower-stakes environment as an important outcome of the workshop was to build a community around space exploration ELSA. The afternoon included more detailed presentations and additional time for brainstorming.

The third and final day was a half day with presentations and a final brainstorming session to allow participants to reflect on everything that they absorbed throughout the previous two days.

1. **Expected Results**

This workshop marked an initial foray into a topic that NASA has not engaged with historically in a structured way outside of a few selected areas, such as astrobiology and planetary protection. Beginning this conversation around Artemis and Ethics is a significant step toward helping NASA learn how to engage more with ethical and social issues in the future. One outcome of the workshop is an OTPS-produced summary report that describes the ethical issues discussed at the workshop and suggest possible frameworks for how NASA might address these issues in the future.

 This paper will go beyond that initial summary report to focus more broadly on lessons learned in the process of planning, executing, and sharing results of the workshop. Enabling discussions of ethical perspectives represents a cultural shift in the aerospace profession, and our lessons learned provide insights on how to think about the role of ethics in spaceflight. The ultimate purpose of this paper is to inform any future study designers about best practices and potential pitfalls around holding such a workshop, and to explore potential alternatives for how to continue such discussions. We believe that practitioners attending AIAA ASCEND represent a vital part of how such ethical discussions can become embedded in future engineering practice.

# Supporting Materials

## References

[1] Smith, K., “Social Issues in Space Exploration: A Call for Broader Dialogue,” The Bridge [online journal], Vol.51,

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