

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Bradley Manucha  
University of Southern California, United States, manucha@usc.edu

Mr. Madhu Thangavelu  
University of Southern California, United States, mthangav@usc.edu

BUZZCRAFT: EVOLUTION OF STURDY CISLUNAR ARCHITECTURE IN SUPPORT OF 2024  
ARTEMIS LUNAR LANDING AND BEYOND

**Abstract**

As part of the Artemis program, NASA intends to have boots back on the moon by 2024, with help from the Gateway station in Lunar orbit. However, questions persist about the physiological consequences of prolonged exposure to deep space radiation on the crew, especially during the upcoming sunspot cycle 25 solar maximum period that will peak during Artemis mission execution. Furthermore, there is currently no cislunar infrastructure in place to aid with rescue missions in the event of an anomaly requiring crew extraction on the lunar surface, nor is there a reliable logistics channel and communications link to the Moon. BuzzCraft concept architecture is an alternative to the current Gateway station proposal that seeks to address both of these issues. BuzzCraft architecture will evolve over the course of four quick stages in rapid cadence between 2022 and 2024 and intends to put a woman and a man on the Moon by the end of 2024. The first stage is a SpaceX Dragon and NASA Orion module docked together in Low Earth orbit containing a Plant and Animal laboratory (PAL). PAL's initial phase in LEO within Earth's magnetosphere will serve as a control for study of biological tissue taken from plants and animals in the capsule. At this stage the teleorobotic systems needed for PAL operations and maintenance between crew assisted rack and sample changeouts are tested and certified. After this initial phase, PAL will move into phase 2: Geostationary orbit where it will be beyond the protection of Earth's magnetosphere and the biological tissue will be exposed to deep space radiation for prolonged periods of time. PAL will be relatively quickly accessible by crew in short visits to GSO for rack changeouts and collecting tissue samples. Phase 3: PAL will move back into LEO where other modules and fully reusable propulsion systems will be clustered with help from international partners. After the modular assembly of the constituent modules and propulsion are stacked, Buzzcraft will be injected into a free-return cislunar orbit. PAL will be attached to Buzzcraft to continue the biological studies, and other modules will carry cargo, landers, and crew into cislunar orbit. Once in this orbit, Buzzcraft will be a critical piece of cislunar infrastructure and will aid the Artemis mission in carrying payloads to the moon. This Buzzcraft cislunar Cypher would serve as a crew emergency and rescue system and also initiate the evolution of a cislunar logistics channel adding vital value to the Artemis effort. Eventually, Buzzcraft could also evolve into Gateway in different orbits including the near rectilinear halo lunar polar orbit (HALO) that is proposed currently. The architecture of BuzzCraft is composed of already existing commercial space technology, both human rated and non-human rated, including SpaceX's Dragon capsule, the Falcon 9 and Falcon Heavy launchers, as well as Boeing's Unity connection module. Tried and tested Apollo hardware including the Lunar Module (LM) and the Apollo lunar surface EVA suit can be quickly upgraded for the Artemis III mission. As a result, the first phase of BuzzCraft could be launched as soon as 2022. Operations in low Earth orbit enable both commercial and international partners to engage in quickly evolving Buzzcraft cislunar architecture. Furthermore, modules and payloads can be supplied by international partners such as the ESA, RosCosmos, CNSA, JAXA, and ISRO as well as emerging nations with space faring ambitions.