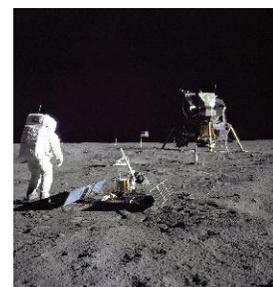
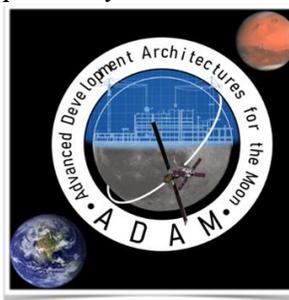
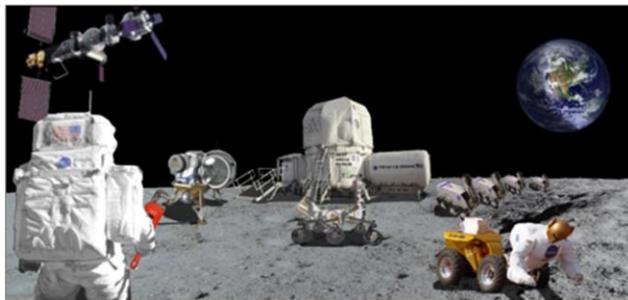


**RETURN TO THE MOON 2024: RECOMMENDATIONS OF THE 2018 USC ADVANCED DEVELOPMENT ARCHITECTURES FOR THE MOON(ADAM) PROJECT FOR QUICK AND SUSTAINABLE LUNAR ACTIVITIES** M.Thangavelu<sup>1</sup>, D.Nguyen<sup>2</sup>, I.Figueroa<sup>3</sup>, D.Waters<sup>4</sup>, M.Greco<sup>5</sup>, C.Alexander<sup>6</sup>, Z.Bates<sup>7</sup>, J.Asher<sup>8</sup>, A.V.Sullivan<sup>9</sup>, R.Antypas<sup>10</sup>, <sup>1</sup>Conductor ASTE527 Graduate Space Concept Synthesis Studio, <sup>2-10</sup>Graduate Student Astronautical Engineering Department, Viterbi School of Engineering, University of Southern California, Rapp Research Building, University Park, Los Angeles, California 90089-1191 [mthangav@usc.edu](mailto:mthangav@usc.edu)

*"Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities. Beginning with missions beyond low-Earth orbit, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations;"* – **White House Space Policy Directive #1**



**Introduction:** The US administration has laid out, in the clearest terms yet in many years, what the nation expects NASA to do in the immediate term: Return people to the Moon asap(2020s timeframe) with the goal of building the technological and operational infrastructure to conduct a safe human Mars expedition within the next two decades(2030s).

A fresh new space policy outlook drives an invigorated agency impetus to incorporate homegrown private space companies, that are chomping at the bit with creativity and new visions for utilizing human spaceflight for commerce and profit, and NASA is already showing signs of nurturing many more commercial entities into the core of this vital national endeavor, so the United States can continue to be preeminent in spaceflight, particularly in human space activity. The goal to develop and field the next generation of human occupied space station, one that can safely keep her crew and reliably operate beyond the protective cocoon of the Earth's magnetic field is logically the next step along the critical path for evolving a Mars expedition vehicle, one that has to weather the interplanetary environment, before crew can be safely delivered to the surface of Mars.

While large, heavy lift launch vehicles and planetary landers are being developed, integrated and tested, are there ways to speed up human spaceflight activity? What projects can we do with existing human spaceflight assets that are aligned with administration space policy directives? The ADAM Project attempts to explore options available in the immediate term, to satisfy the national space policy goals set forth by the current administration, while encouraging new visions for human space activity, utilizing existing space technology

to accelerate real space commerce for the immediate benefit of all society.

The USC 2018 ADAM Project continues in a long line of past lunar projects that make the case for speedy lunar return. Earlier projects may be accessed at : <https://sites.google.com/a/usc.edu/aste527/home>

**USC 2018 ADAM Project Recommendations**

- 1)Follow US Administration Policy
- 2) Build Lunar Orbiting Station(Gateway)
- 3) Speedy Buildup in Low Earth Orbit
- 4) Build and Test and Certify Lunar Orbiting Station(Gateway) at or near ISS
- 5)Versatile Upper Stage Needed for TLI – Full Reusability preferred
- 6) Strategic Logistics and Caching
- 7) Lunar Orbiting Station(Gateway) - Raison d'etre – Deep Space Radiation
- 8) Lunar Orbiting Station(Gateway)Location–Nearside Earth-Moon LPoint EML-1.
- 9) Kilopower Nuclear Fission Reactor Testbed for Power and Propulsion Element
- 10) Low Lunar Orbit for Lunar Orbiting Station(Gateway) Advantages
- 11) Global Lunar Prospecting and Sample Return to Lunar Orbiting Station(Gateway)
- 12) Lunar Lava Tube Exploration - Top Scientific
- 13) ISRU for Consumables and Agriculture.
- 14) Tourism – Key to Truly Self-Sustainable Human Space Activity in the Immediate Term.

The above recommendations are depicted as engineering concepts in the USC 2018 ADAM project using SPD#1 as the guide.

**References**1)White House(2017)SPD#1-Presidential Memorandum on Reinvigorating America's Human Space Exploration Program, 2)White House(2018) SPD#2-Streamlining Regulations on Commercial Use of Space, 3)White House(2018)SPD#3Space Policy Directive-3, National Space Traffic Management Policy.