

Program: Back to the Moon To Stay

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Attendance: 134

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In 2017, President Trump re-created the National Space Council (It had been suspended in 1972 after no more Apollo launches.) In March 2019, the President announced a goal of returning astronauts to the moon in the next five years "by any means possible". NASA's Space Launch System (SLS) is over budget and hasn't yet flown, so it may not be the "means". The US may decide to use commercial means. Note that 32 different US companies and 33 countries are launching things into space. The space race is going on now.

Why go back to the moon?

- Establishes American leadership and strategic presence
- Proves technology and capabilities for sending humans to Mars
- Leads civilization changing science and technology
- Expands the U.S. global economic impact
- Broadens U.S. industry & international partnerships in deep space
- Inspires a new generation and encourages careers in STEM

In 2016 the National Science Foundation surveyed 15 year olds around the world: US was 36th in Math, 28th in Science (and Indiana was 26th!). China dominated the list!

Blue Origin vs. NASA

Blue Origin:

- Jeff Bezos is the founder of Amazon and Blue Origin
- In partnership with NASA, they expect in mid 2020 or maybe later this year to drop off onto the moon components needed to commence construction of somewhat permanent facilities (The Blue Moon lander can carry 3.6 metric tons of cargo inside and 6.5 metric tons on top and still land on the surface of the moon). It can land four large rovers on the moon in one flight.
- Blue Origin has a very large facility at Cape Canaveral.

NASA's plan -- Project Artemis

- A decade long plan that includes 37 launches with a mix of private and NASA rockets – including a mix of robots and humans. Orion Exploration module should be launched late this year or early next year and carry 6 passengers (twice as many as Apollo)
- Plan to use the NASA SLS launch system (www.nasa.gov/sls)
- Plan is for a Deep Space Gateway (DSG) -- a space station that will orbit the moon. The moon is 3 days away from Earth. DSG would be a few hours away from the moon and will provide for medical facilities, a safe harbor for the astronauts, etc.

It's been 47 years since last humans were on the moon – why now?

- Lots of natural resources – especially energy – helium-3 or heavy helium is rare on earth. Nuclear fusion reactors can use helium-3 to generate energy. It is possible that for investment of \$15B (about the same as invested in the 70s in the trans-Alaska pipeline) we can have a “safe, clean” energy source. It wasn't until NASA sent a geologist, Dr. Harrison Schmitt, up to the moon on Apollo 17 that we understood the possibilities. The samples Harrison Schmidt brought back from the moon have many elements we can use.
- Possibility of manufacturing in space. Pollutants not an issue in space. Lots of potential.
- Fusion produces 1 million times more energy than a combustion source. It needs deuterium, found in sea water, and helium-3 -- 1 million tons are estimated to be on moon's surface. Just heat the surface “soil” to 600 degrees centigrade and extract the helium-3. Estimated to be worth \$3B/ton. Researchers believe that three shuttle mission loads of helium-3 would supply the world's energy needs for a year.
- Fusion reactor technology is currently in the prototype stage, hopefully it will be perfected in the next year. It's hard to get helium-3 on Earth to test the process. It was stated that while difficult, it takes only 3 atoms for helium-3 fusion -- which are somewhat easily contained. This is not fission, so there are no radioactive isotope by-products.
- Most of the fusion experiments today are done using hydrogen components – helium-3 can be fused much easier than hydrogen.
- China already has a robotic lander on back side of the moon. The assumption is that they want to establish a helium-3 monopoly.

How will exploration and “mining” be regulated/controlled?

- The Antarctica Treaty System could provide an example. It sets aside Antarctica as a scientific preserve, establishes freedom of scientific investigation, and bans military activity on the continent. The treaty and related agreements regulate international relations. There were originally 12 signatories; currently 54 states are party to the treaty; 7 countries have territorial rights.
- There are cooperative agreements now regarding moon initiatives with Russia, the Europeans, Japan and India. China is notably missing! An Indian vehicle will land on the moon in a couple of weeks with a rover built by NASA and with a month-long mission to look at helium-3 production and the amount of water on the moon, among other things.

Regarding the International Space Station

NASA would like to get out of it and believes it could be turned into a commercial venture. For example, some have said that for a \$52,000,000 ticket anyone can go to the ISS. Goal is for that to be possible by 2026 or shortly thereafter. There may also still be a need for the ISS as a research facility.

The Lunar Reconnaissance Orbiter pictures of very high resolution images for ten years. (Wikipedia has lots of pertinent information and photos.)

The US can make a difference and we need to start now.

LINK Mission

Changing lives, changing the world thru LINK's education programs. Schools can sign up for \$1/student/month. Link is a non-profit focusing on inspiring STEM (Science, Technology, Engineering and Math). The arts and humanities are also involved in the design and planning for space flights. Additional resources are available through the NASA web site in their educational archives.



Kurt Williams