Alliance for Space Development 2021

Citizens' Space Agenda

WHO WE ARE:

- Private U.S. citizens who advocate at our own expense for a bold and well-reasoned space agenda worthy of the U.S.

NON-PROFIT SUPPORTING ORGANIZATIONS:

- National Space Society
- Space Frontier Foundation
- Foundation for the Future
- Lifeboat Foundation
- Mars Foundation
- Mars Society
- Moon Society
- Students for the Exploration and Development of Space
- Space Development Foundation
- Space Development Network
- Space Development Steering Committee
- Space for Humanity
- Space Renaissance USA
- Space Tourism Society
- Waypaver Foundation

Alliance for Space Development Goals

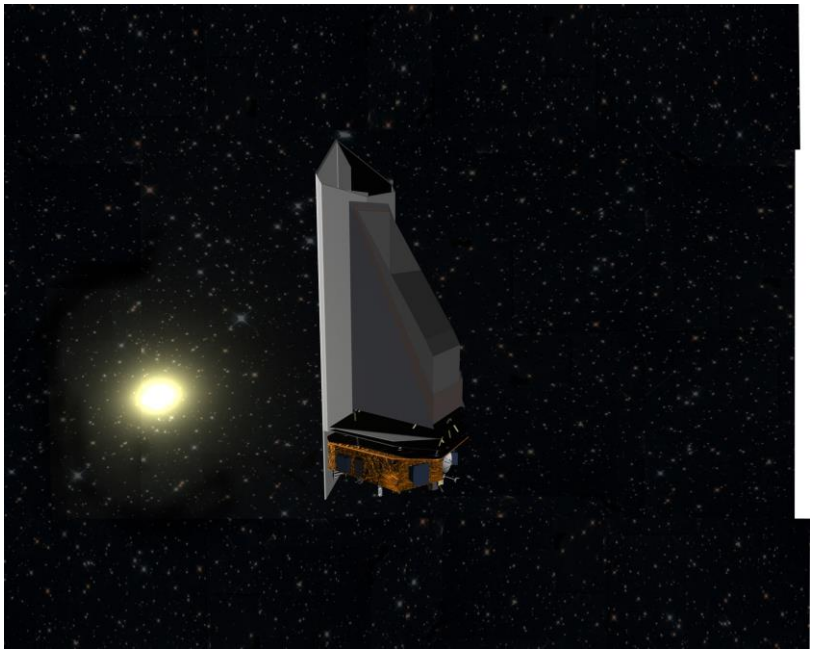
1. Reducing the cost of access to space
2. Stimulating and accelerating the growth of space industries and commerce
3. Making the development and settlement of space a clearly defined part of why we are sending humans into space

Alliance for Space Development 2021 Objectives

Citizens' Space Agenda

1. Support planetary defense by fully funding NEOSM
2. Support commercial development of Low Earth Orbit by fully funding the LEO Commercialization Program
3. Support commercial development of Cislunar Space
4. Start developing and demonstrating Space Solar Power

NEOSM & Planetary Defense



NEOSM Telescope (Source: NASA)

Chelyabinsk Meteor (Source: NASA)

Why is Planetary Defense Important?

- In 2013 an asteroid struck near Chelyabinsk, Russia damaging buildings, collapsing roofs, shattering windows, and hospitalizing hundreds of people
- About a million asteroids larger than the Chelyabinsk object (~60 ft) cross Earth's orbit. If we do nothing, roughly 20,000 of these objects are expected to eventually hit Earth
- Potential effects range from city killers to regional devastation to mass extinction
- The next major impact could be millennia or more in the future or just a few weeks from now
- Humanity has the technical capacity to discover, track and deflect the vast majority of dangerous objects at modest cost
- Detection of a potential hazard is the essential first step in planetary defense
- Once an object targeting Earth is found, funding deflection will be a snap
- The National Academies of Sciences, Engineering, and Medicine recommends a dedicated infrared space based telescope for this task

Why is NEOSM the next critical step in protecting our planet?

- Current NASA and international efforts to find dangerous Near Earth Objects (NEOs) using primarily ground-based instruments have inherent limitations:
  - Cannot see near the Sun, near the Moon, during daylight, or through clouds
  - The best frequencies for detection (infrared) are absorbed by the atmosphere
- An excellent addition to the search would be JPL/University of Arizona's NEOSM space-based infrared 0.5 meter telescope
  - NEOSM will be located at the Earth-Sun L1 point, allowing it to detect most football-field sized objects, those capable of regional devastation, well before they are near Earth impact
  - Total procurement cost, including launch, is approximately $600 million
- Objectives
  - Find 2/3 of all objects larger than 140 meters within five years
  - Find >90% of all objects larger than 140 meters within 10 years
- **Request: Will you support full funding NEOSM ($90M) for FY 2022?**

Commercial LEO Development

International Space Station (ISS) (Source: ISS)

Falcon 9 (Source: SpaceX)

Crew Dragon (Source: SpaceX)

Commercial LEO Development

- We have had a sustained human presence in Low Earth orbit (LEO) with the International Space Station (ISS) since 2000
- The ISS has a limited lifetime and will eventually be decommissioned. The US needs to ensure a continued presence in LEO when this occurs
- Companies are developing their own LEO platforms. Some start attached to ISS, some start independent of ISS. All expect to become independent space stations with a diverse customer base
- A robust commercial ecosystem in LEO can satisfy the Government's need for a LEO facility at a far lower cost than ownership
- Commercial LEO stations can provide a greater range of services to international partners than the ISS can currently support
- LEO products currently in development include:
  - Very high quality fiber optic cable
  - Artificial retinas
  - Artificial hearts and other organs derived from a patient's own cells
  - Single crystal semiconductor development
  - Media, entertainment, and private human spaceflight

Commercial LEO Development Program

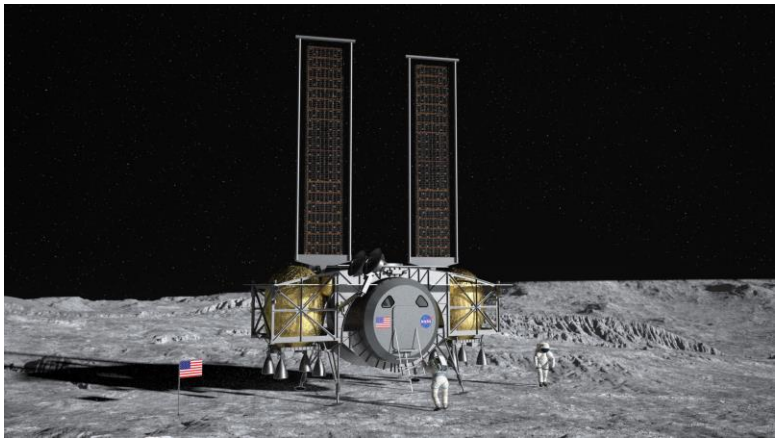
- The Commercial LEO Development Program
  - Supports commercial space industry efforts to develop a sustained commercial LEO presence and transition of LEO human space flight operations to commercial partners
  - Supports development of commercial destinations and capabilities for use by NASA and the private sector to enable a seamless transition from the ISS
- NASA recently massively increased the cost of ISS services, for example,
  - Upmass went from $3,000/kg to $20,000/kg
  - Crew time went from $17,500/hr to $130,000/hr
- These increases are a major hurdle for companies expanding into LEO

Request 1: Will you support increased funding ($150 million) for Commercial LEO Development in FY 2022 ($17 million for FY2021)?

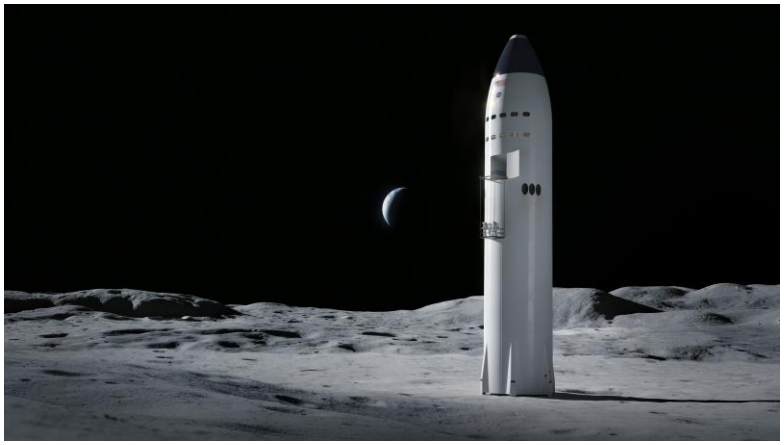
Request 2: Will you support asking NASA to reverse recent ISS services price increases?

Commercial Cislunar Development

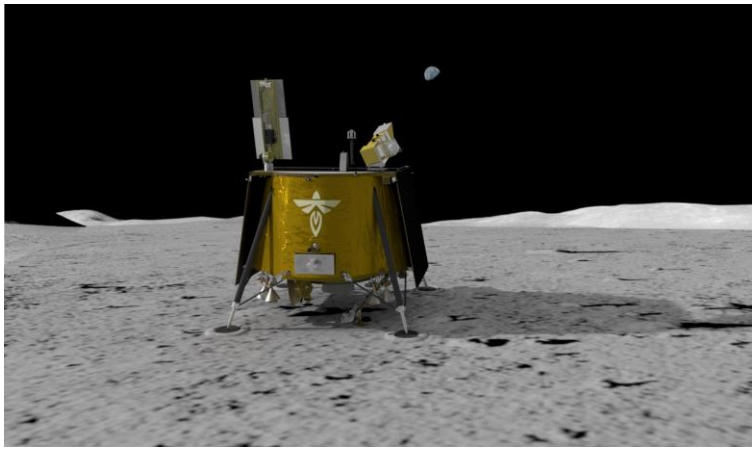
Integrated Lander Vehicle (Source: Blue Origin)



Dynetics Human Landing System (Source: Dynetics)



Starship (Source: SpaceX)



Blue Ghost (Source: Firefly Aerospace)

Commercial Cislunar Development

- Cislunar Space – The area of space around the Earth, including the Moon.
- Periodic cancellation of NASA exploration programs is harming America's position as a global leader in space. It is critical that we do more with less.
- Artemis does this by including commercial providers in programs such as the
  - Human Lander Systems (HLS)
  - Commercial Lunar Payload Services (CLPS)
- The Volatiles Investigating Polar Exploration Rover (VIPER) will look for commercially significant quantities of ice for propellant and other uses.
- "Living off the land" using permanent in-space infrastructure is the most cost-effective way of exploring cislunar space.
- Development of cislunar space using lunar resources and infrastructure is an investment that reduces future costs, including the exploration of Mars.

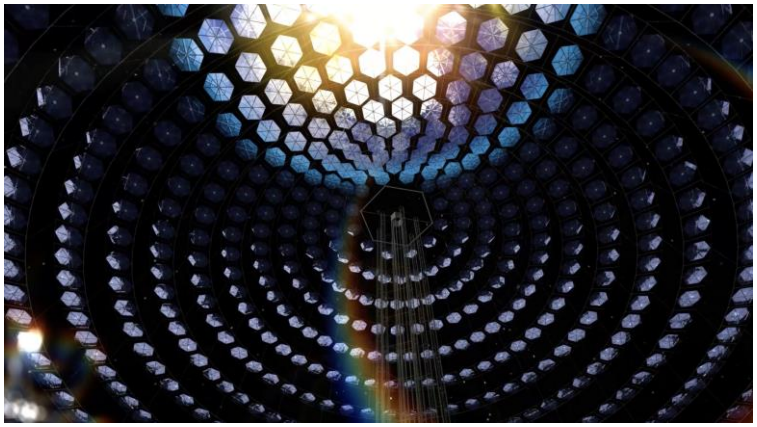
Commercial Cislunar Development

- The first steps toward an affordable, sustainable, and ultimately successful return to the Moon involve
  - being able to deliver payloads and humans to the surface,
  - identifying near-surface materials for propellant and construction,
  - and using commercial partners as often as possible
- The first target of lunar development should be a sustained presence on the lunar surface, much as the ISS has done in LEO.
- Present customers for lunar services may be primarily governments, but a wider customer base is needed for a vigorous permanent presence.

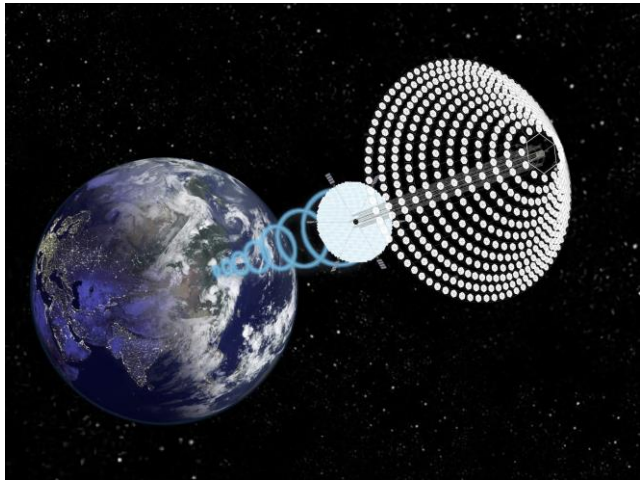
Request: Will you support continued FY 2022 funding for

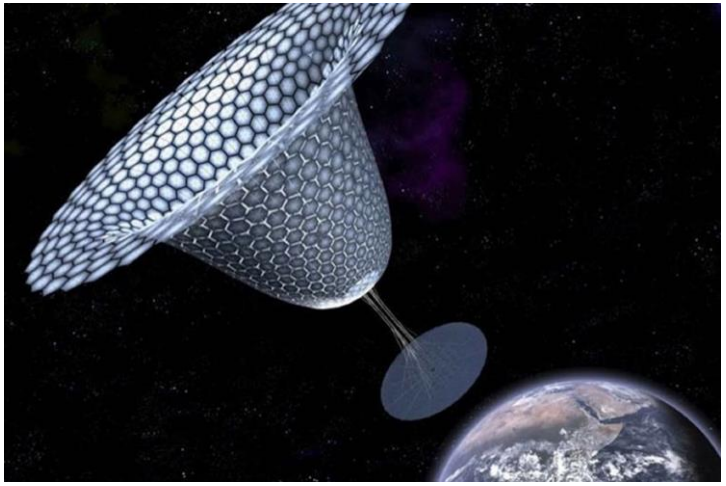
- **The Commercial Lunar Payload Services (CLPS) Program at $254M**
- **The Human Lander Systems (HLS) Program at $1.0B?**
- **The Volatiles Investigating Polar Exploration Rover (VIPER) Program**

Space Solar Power (SSP)



SSP Mirrors that reflect onto panels that take in sunlight on one side and put out microwaves on the other (Source: John Mankins)





Space Solar Power (SSP)

- SSP refers to gathering the Sun's energy in space and beaming it to Earth. SSP satellites could:
  - Supply extremely large quantities of reliable, predictable carbon free energy
  - Export energy to global markets
  - Supply substantial electrical power to remote areas
- Traditionally SSP has a hard time competing with ground production. However
  - Launch cost is a large fraction of SSP costs, it has dropped substantially in the last 10 years, and new vehicles in flight test today may reduce these costs a great deal more
  - SSP could supply predictable energy to green networked intermittent power systems substantially reducing energy storage requirements
- Much of the needed technology has been developed, but significant technical and financial risks remain. Most of this risk could be retired by sub-scale SSP demonstration plants

SSP Demonstration

- Sub-scale prototypes could be developed by public/private partnerships. A program to define such partnerships might include:
  - Funding at least two commercial partners to completion
  - Demonstrating all SSP systems, including supporting technologies (e.g., robotics)
  - Requiring significant financial input from partners
  - Making fixed price payments conditional on passing milestones
  - Delivering reasonable quantities of power from space to Earth for at least one year
  - Involving international partners to help with frequency allocation
- Prototype systems need not be profitable or full sized
- The energy market is so large that those who develop successful SSP will dominate near-Earth space. China, and others, are making significant investments in SSP

Request: Will you support funding in FY 2022 for

- **DOD USSF SSPIDR (Space Solar Power Incremental Demonstrations and Research) at $105M? (PE 1206857SF)**
- **DOD OECIF (Operational Energy Capability Improvement Fund) power beaming activities at $65M? (PE 0604055D8Z, P-code 457)**