



Develop Cislunar Space Next

The Goal: Recover American leadership in space by creating a cislunar space transportation system.

The Strategy: Incremental, cumulative steps outward from low Earth orbit with people and machines.

The Implementation: Develop a space transportation system using existing assets to the extent possible, build new reusable vehicles to transit cislunar space, develop lunar resources with the aim of propellant production, employ staging nodes in LEO (use existing International Space Station), geosynchronous orbit (GEO), Earth-Moon L-1, low lunar orbit (LLO) and on the lunar surface.

The Rationale: America needs and Americans expect a vital, active and supportable space program that fundamentally contributes to national economic, scientific and security needs.

- Our society is dependent on space assets for weather monitoring, positioning, global communications, remote sensing, national security surveillance, and countless other purposes.
- Satellites are located in a variety of orbits, ranging from low Earth orbit to distances beyond the Moon. We currently cannot access these assets for repair, upgrade or removal.
- The Shuttle and Station programs proved that people and machines working together can assemble, maintain, repair, and create new large, distributed, highly capable space systems.
- Earth's Moon contains the material and energy resources needed to create a permanent, reusable and extensible space transportation system.
- Developing lunar resources allows us to create a sustainable cislunar transportation system, unleashing new opportunities for economic and industrial expansion into space.
- Undertaking this new direction can be accomplished under existing and likely constrained future budgets by creating an architecture that uses small, well-defined, incremental yet cumulative steps.

The Purpose: Advance our scientific knowledge and technological base, increase our wealth and secure the nation and the world by expanding into space beyond LEO.

- America must lead this movement of humanity into space lest other powers that do not share our values and belief system fill this leadership vacuum.

A Compelling Case for Developing Cislunar Space Next and Soon

Realizing Economic, National Security, and Scientific Advantage for the United States and our International Partners, sooner rather than later.

Our national space program is in crisis

The United States Space Program is going nowhere fast. No Space Shuttle, no American access to space, a cancelled Constellation program, massive layoffs of a skilled technical workforce, an International Space Station at risk of a possible catastrophe, recent Russian launch failures (currently the only possible way to get to and from the ISS), dependence on unproven and receding commercial transport and an expensive NASA Heavy Lift Launch Vehicle with no defined purpose and first crewed flight a decade away, if ever.

What's the way out of this bad situation?

Sustainability

In an era of limited resources, our challenge is to create a worthwhile space program with an expenditure rate that falls at or below a supportable level of approximately 0.4% of the Federal budget. Given this reality (regardless of assertions about projected deep space destinations) it is highly likely that cislunar (or Earth-Moon) space will be the sphere of human space operations for the foreseeable future. The questions should be: What are we doing in space and why are we doing it? Attempting a series of space exploration "firsts" (flags-and-footprints forever) implies one set of activities and missions. Incrementally developing a permanent space transportation infrastructure, one that creates an expanding sphere of human operations, suggests a different approach.

The real debate

The real debate is not about launch vehicles or spacecraft or even destinations; it is about the long-term purpose of our space program. One approach requires mega-rockets to distant targets for touch-and-go missions, the "Apollo" template. Another approach is an incremental, go-somewhere-to-stay-and-then-expand-onwards mind set – call it the "Shuttle" approach. The one that you adopt and follow depends on what purpose you believe human spaceflight serves.

Mars?

Because Mars may harbor former or existing life, NASA has presumed that it is our "ultimate destination" in space. In effect, the human spaceflight effort is rationalized as "The Quest for Life" (which means maybe finding a fossil or bacterium, not ET). Thus, debate about what to build, where to go and how to do it is always formulated towards massively expensive missions to Mars.

This unspoken assumption has been at the root of most space objective studies for the past 20 years. Mars was the end point of President George H.W. Bush's Space Exploration Initiative, President George W. Bush's Vision for Space Exploration, of former Lockheed-Martin President Norm Augustine's two reports, and a myriad of space groups and societies. From the 1990s to the present, a multi-billion dollar robotic campaign has sent mission after mission to Mars, each discovering that the red planet once had liquid water. The mania for Mars and preoccupation with searching for life there has limited our perceptions of the space program and distorted our reality of what is possible or attainable on reasonable time scales with available resources – the simple fact is that Mars is unreachable in both technical and fiscal terms now and will remain so for the foreseeable future.

Real Goals and Objectives

In the long term, the goal for human spaceflight is to create the capability to go where we choose, for as long as we need, and do what we want. For the sake of argument, if one accepts such a goal, which model makes more sense as a step to implement it: the Apollo template (flags and footprints) or the Shuttle template (an expanding, incremental extension into space)?

We need a navy to "sail on the ocean of space,"

If our goal is to "sail on the ocean of space," we need a fleet. Navies don't operate with just one class of ship because one class isn't capable of doing all the various and necessary jobs. Not all ships will look or operate the same because they have different purposes and destinations. Needed are transports, way stations, supply depots, the International

Space Station, and ports. In space terms: spacecraft to get people and equipment to and from Low Earth Orbit, to and from points beyond LEO, to way stations and outposts at Geosynchronous Earth Orbit, to stable Libration Points that are located at the equilibrium of the Moon and Earth gravity, to low lunar orbit, and to the lunar surface. To fuel and provision our space fleet, we require supply and propellant depots in LEO, L-1 and on the lunar surface. Ports of call are all the places we may go. Initially, those ports are satellites in various orbits, which require service, maintenance and replacement with larger, more capable systems. Later, our harbor will be the surface of the Moon, to harvest its resources, thereby creating more capability and provisions from space. Reliable and frequent access to any place in Solar System, not singular trips to a couple of destinations, should be our ultimate goal.

By designing and building mission-specific vehicles and elements (the "Apollo" template) forfeits going everywhere and doing everything. In contrast, adopting the "Shuttle" model does not preclude going to Mars; it enables missions to Mars in an affordable manner that sustains repeated trips, using the infrastructure and propellant resources provided by a space faring navy. Building a series of one-off spacecraft – huge launch vehicles to dash to Mars for expensive, unsustainable extravaganzas – will keep us locked into our current predicament.

The Space program needs rethinking

It is the mind set of the space program that needs re-thinking – not the next destination, not the next launch vehicle, and not the next spacecraft. How can we change the discussion? First, we need to understand and articulate the true choices so that people can see and evaluate the different approaches and requirements. Second, we need to develop sample architectures that fit the requirements for "sustainability." Finally, we need to get such plans in front of the national leadership. There is no guarantee that they will accept it or even listen to the arguments. But right now, they have no alternatives to consider because they are not hearing the case for any.

A cost-effective, sustainable human spaceflight program must be continuous, incremental and cumulative. Our space program must continually expand our reach, creating new capabilities over time. Moreover, it should contribute to compelling national economic, scientific and security interests. Building a lasting and reusable space transportation system does that, whereas a series of limited "PR stunt" missions will not. The original intended vision of the Shuttle system was to incrementally move into the Solar System – first a Shuttle to-and-from LEO, then a Space Station as a jumping off platform and then go beyond LEO into cislunar space. The Shuttle-derived heavy-lift cargo variant was always envisioned to go beyond LEO and on to the Moon. Decommissioning the Shuttle Program, the only proven operational heavy lift human launch capability without a replacement to get U.S. astronauts to space is a terrible mistake.

The right answer

The right answer is to adopt the principle that we are going somewhere with the purpose of gradually, yet continuously expanding human reach. Initially, our domain is cislunar space. We should develop an architecture using smaller assets, launching more frequently, working together to build up new and expanded capabilities throughout cislunar space. America can fly spacecraft, create new commercial markets, access and protect the International Space Station and expand beyond LEO. By developing cislunar space next, our values and the societal paradigm of free markets, rule of law and democratic pluralism will prevail on the new frontier of space.

To stand down the development of cislunar space for a decade or more is detrimental to our national interests. Ceding this territory to others endangers our nation and the world and puts the future economic development of the Solar System in hazard.

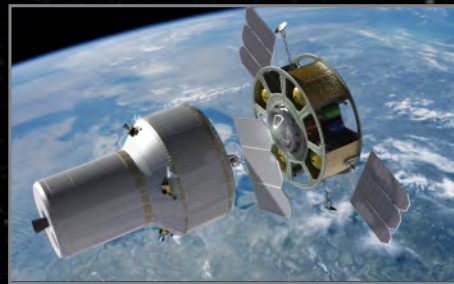
For more information: www.cislunarnext.org

A Compelling Case for Developing Cislunar Space Next and Soon:

Realize Economic, National Security, and Scientific advantage for the United States and our partners



Full utilization and servicing of ISS in concert with International partners and commercial providers prepare for exploration beyond Low Earth Orbit



Propellant depots increase payload capability of current and future Launch Vehicles and refueling of reusable In-space Transportation



Hybrid reusable transportation infrastructure support for EM/L1/2, crew and cargo for Lunar exploration, and Satellite deployment & servicing



L1/L2 Gateway transportation node location for propellant depot and access to and from the Lunar surface



Lunar In-situ Resources Utilization produces water for rocket propellants and for sustaining surface operations with air and water



Construction and servicing of advanced telescopes and other In-space assets

