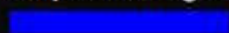


NASA Cancels Most Space Transportation and Human Spaceflight Programs

Cancelled Program



Completed Program



Incomplete Program



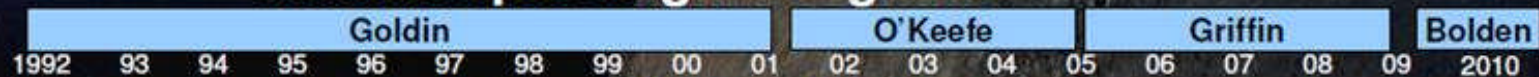
Partially completed



Commercial content
(Program italicized)

Only space transport and human spaceflight programs are shown. Aeronautics and science programs are not included.

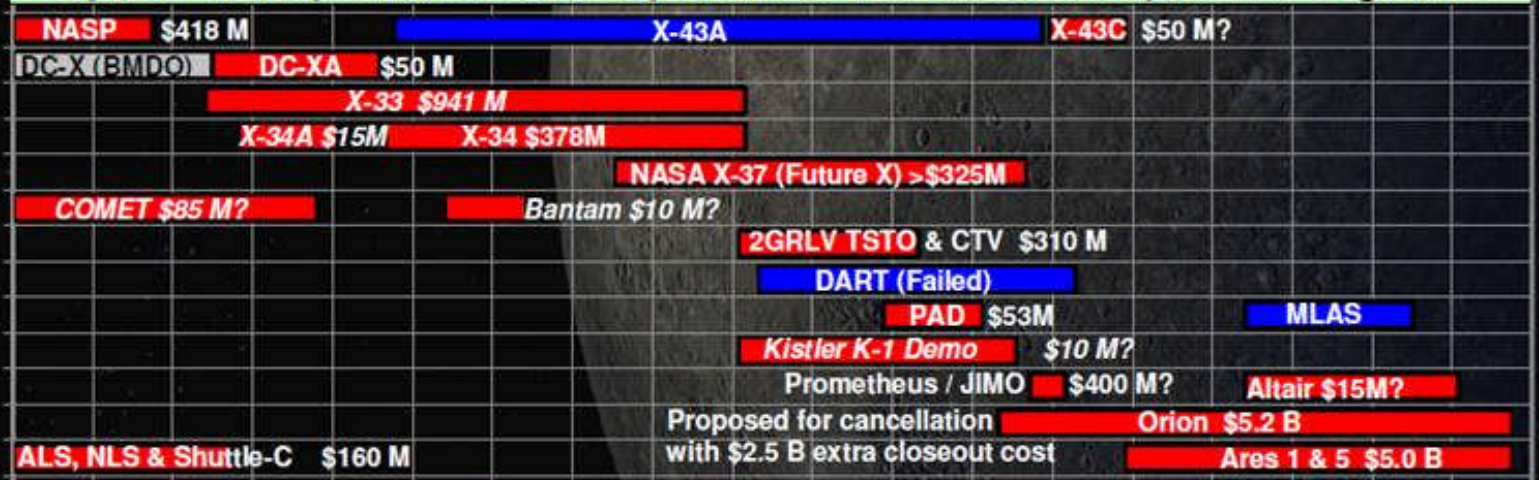
Dollar values shown are sunk cost to NASA at the time of project cancellation. Unspent future allocations and several \$ billion in DoD & industry investment are excluded (e.g. for NASP or DC-X).



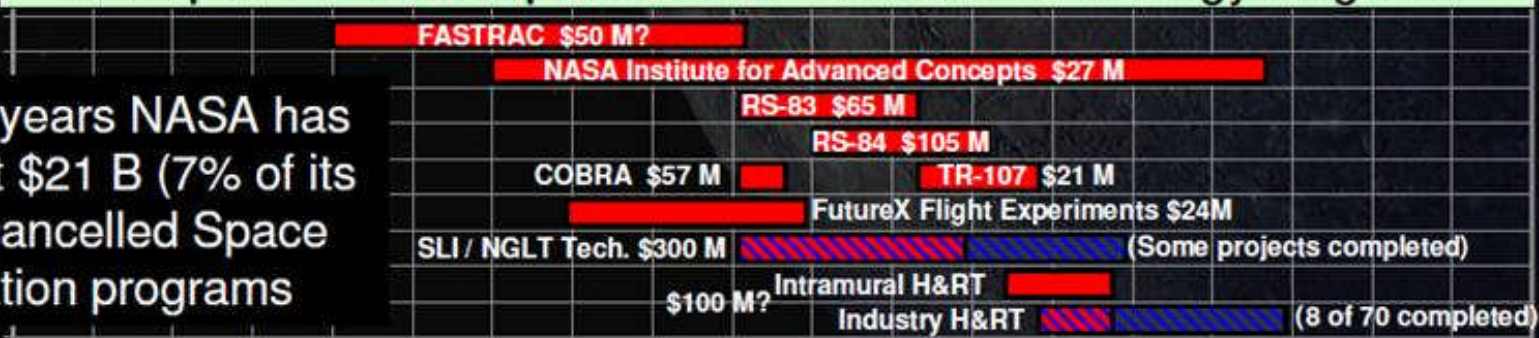
Shuttle Upgrades, ISS, and Visiting Vehicle Development Programs



Space Transportation and Exploration Vehicle Development Programs



Transportation and Exploration Research and Technology Programs



In the last 20 years NASA has spent at least \$21 B (7% of its budget) on cancelled Space Transportation programs

Contending Visions for Space Exploration

1. Previous Baseline: NASA responds to the 2004 Presidential Policy and the 2005 and 2008 NASA Authorization Acts
2. Technology First: The Nation should make the funding and development of new technologies the first priority and not commit to a specific architecture until several years from now. Argues that the U.S. does not have the technology, to return to the Moon and travel to Mars, at least in a way that will sustainable and affordable
3. Science First: Supporting peer-reviewed science should be the highest priority of NASA and that by implication, exploration efforts are little more than government-funded “tourism”
4. Commercial First: The government is so incapable or grossly inefficient in the creation of space capabilities, especially compared with the private sector, that it should take an entirely different approach to human spaceflight
5. Regional Interests: The primary concern lies with where the government spends its money

International Issues and Questions

- U.S. reliance on Russia for human access to space during the gap. Sharing of information on space objects.
- Will India scale up to larger space systems? Will they align with Russia in preference to the United States?
- Next steps for China – options for human lunar capabilities and being a responsible stakeholder in space
- How will changes in Japan’s Space Basic Law translate into actual dual-use capabilities?
- Will Europe create a military space capability outside of NATO? How will Space Situational Awareness cooperation evolve?
- International frameworks for space commerce: orbital debris, financing, insurance, and property rights. Continuing impacts of export controls
- Does international cooperation in space offer lessons for other major efforts such as climate change and international development?
- Will space exploration develop in a more integrated or fragmented manner compared to today? Will cooperation be preferred among “common value” countries, new entrants, or all?

What is the Future of Humans in Space?

1. *Can humans “live off the land” in space and function independently of Earth for long periods?*
2. *Are there economically useful activities in space that can sustain human communities in space?*

	Nothing commercially useful	Commercially sustainable
Live off the land	Antarctica	Settlements
Cannot live off the land	Mt. Everest	North Sea oil platform

See also Harry L. Shipman "Humans in Space: 21st Century Frontiers"

- We don't know which of these outcomes represents our long-term future. Advocates and skeptics may believe one outcome or another is most likely, but no one actually knows
- Determining the actual future of humans in space would be a watershed event for the United States and humanity

Example HSF Questions

- Immediate promising opportunities?
 - live off the land
 - commercial opportunities
 - Places for robots or humans?
- Destination architecture depending on time horizon
 - Opportunities and timing
 - NEO example: engineering demo, science, planetary defense?
 - Mars example: Go faster or countermeasures or shield/spin
- Respond to Policy gaps
 - How to support technology development with relevance
 - Mission pull or Tech push?
 - Requirement for Assured (U.S.) Human Access to Space
 - Portfolios for government, commercial, international options
- Identify and prioritize partnership opportunities
 - Other agencies (DoD, NIH)
 - Private sector
 - International