

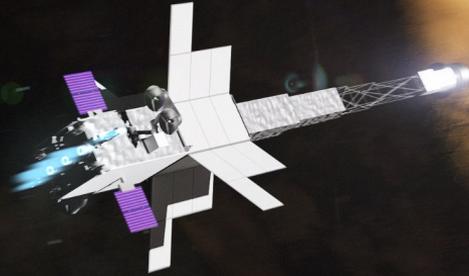
AMERICA UNDERWAY IN SPACE ON NUCLEAR POWER

Closing a 60-Year Gap in American Space Nuclear Power

Steve Sinacore
Space Reactor Office Program Executive

Space Reactor-1 (SR-1) Freedom: Nuclear Electric Propulsion to Mars, December 2028

The start of a sustained cadence of missions, technology development, and industrial readiness



WHY NUCLEAR

*Nuclear works in the shade, works in the dust,
and it works far away from the Sun.*

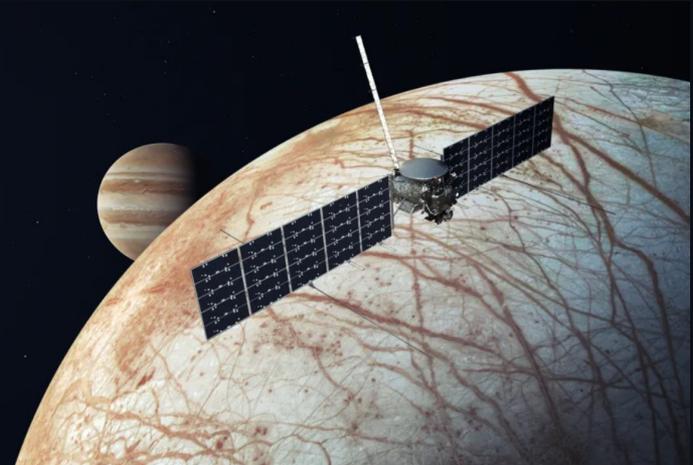
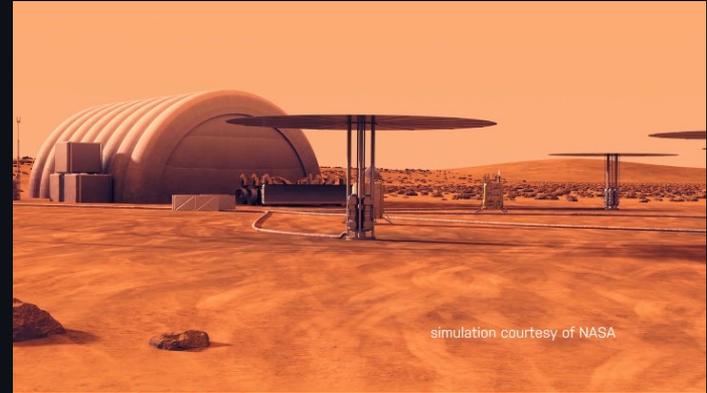
Extreme Energy Density

Keeps bases operationally alive through the lunar night and future Mars applications
Enables resource manufacturing

Enables Deep Space Exploration

Solar power drops to 4% at Jupiter
Highly efficient means of moving mass
Continuous propulsion opens more launch windows

**Innovation will lead to greater power,
more thrust, and other exotic forms of propulsion**



THE DIAGNOSIS

60 Years: One Flight Reactor Launched. >\$20 Billion Spent.

1

Flight reactor
(SNAP-10A, 1965)

12+

Flight Programs
attempted

\$20B+

Spent

An execution problem.



No sustained
mission pull



Overreach at
the outset



Timelines disconnected
from need



Fragmented
leadership



THE FIX

Focused missions: Beginning with SR-1 Freedom in 2028



No mission pull



Mars, December 2028

Real destination. Fixed deadline.
Directly extensible to future missions.



Overreach



>20 kWe. Existing technology.

Fly what works. Scale later.



Timelines slip



Orbital mechanics

The window does not negotiate.

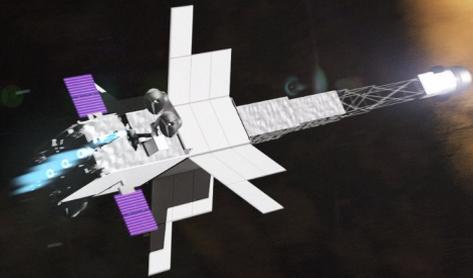


Fragmented leadership



NASA prime integrator

One manager. One schedule.



It is the first freight run on the transcontinental railroad of the solar system.

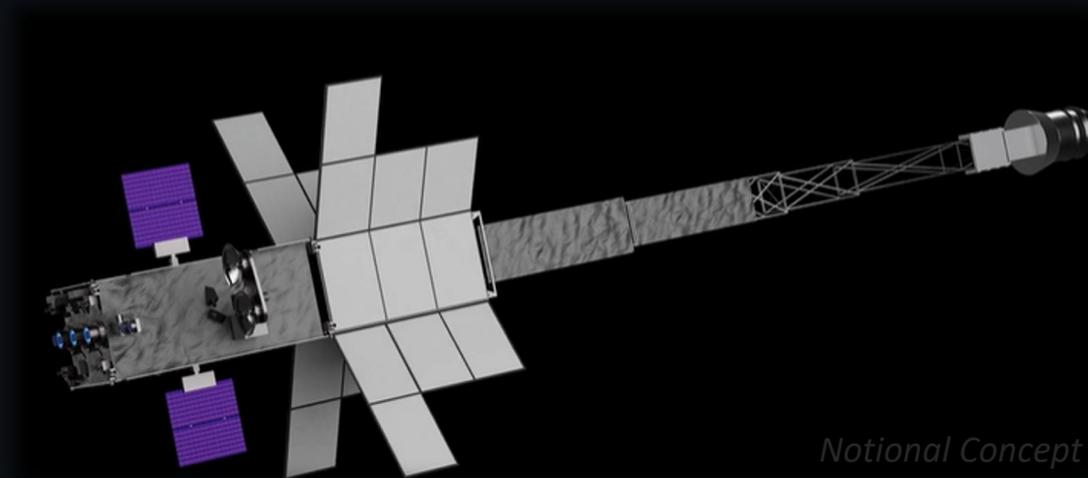
SR-1 Freedom closes a 60-year gap in American space fission flight heritage. Along with our Department of Energy and industry partners, it establishes the regulatory precedent, nuclear-qualified workforce, and flight-proven hardware that every future space nuclear mission will inherit.

MISSION OBJECTIVES

- 1 Demonstrate Nuclear Electric Propulsion
- 2 Launch in the Mars transfer window in December 2028
- 3 Leverage existing hardware for cost and schedule efficiency
- 4 Perform Mars-relevant science and transmit incredible footage back to Earth
- 5 Maximize extensibility to future higher power and longer duration missions

SPACE REACTOR 1 (SR-1) *FREEDOM*

Launch. Start Up. Thrust. Reach Mars.



Notional Concept



>20 kWe | 1-year operational lifetime | December 2028

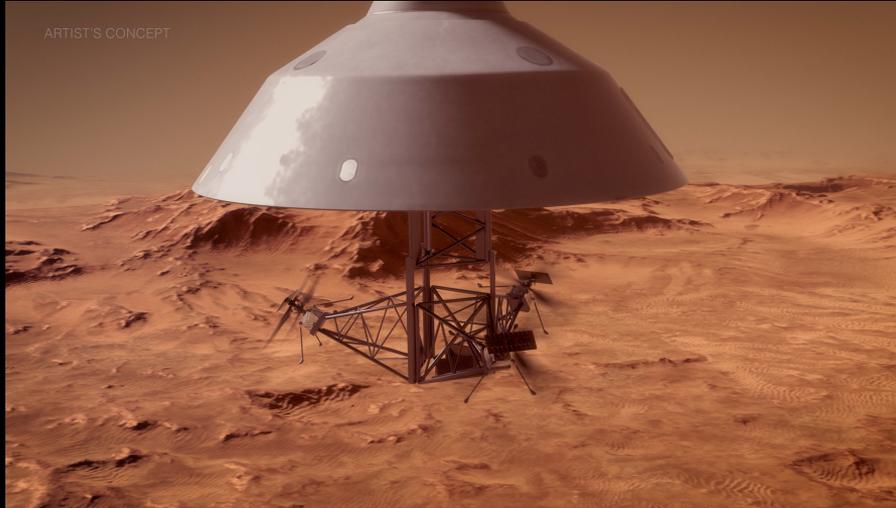
SKYFALL

M A R S H E L I C O P T E R S

ENABLING INSPIRATIONAL SCIENCE

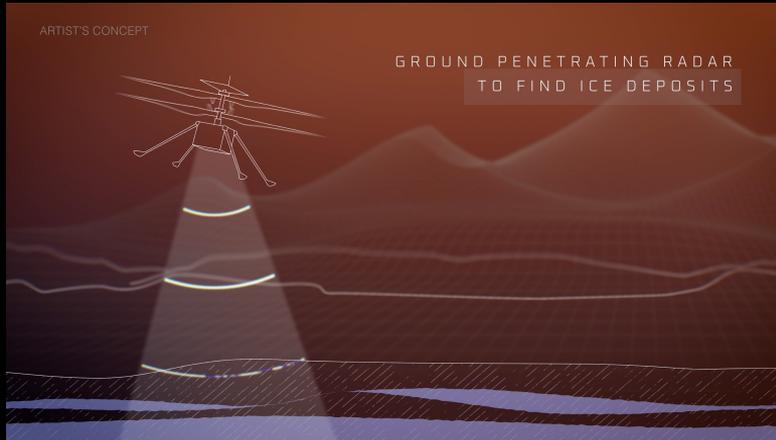
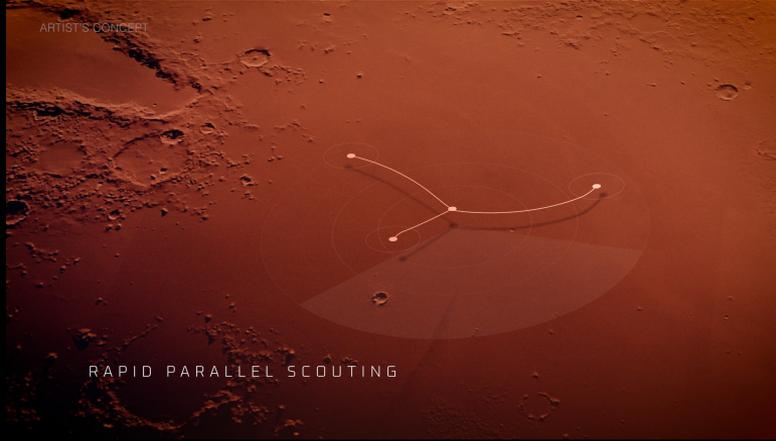
SR-1 Freedom enables science at the frontier and inspires the next generation of explorers.

SKYFALL: Mars Helicopters



Using a **daring mid-air deployment**, SkyFall will deliver a team of next-gen Mars helicopters to **scout human landing sites** and **map subsurface water ice**.

SKYFALL: Mars Helicopters



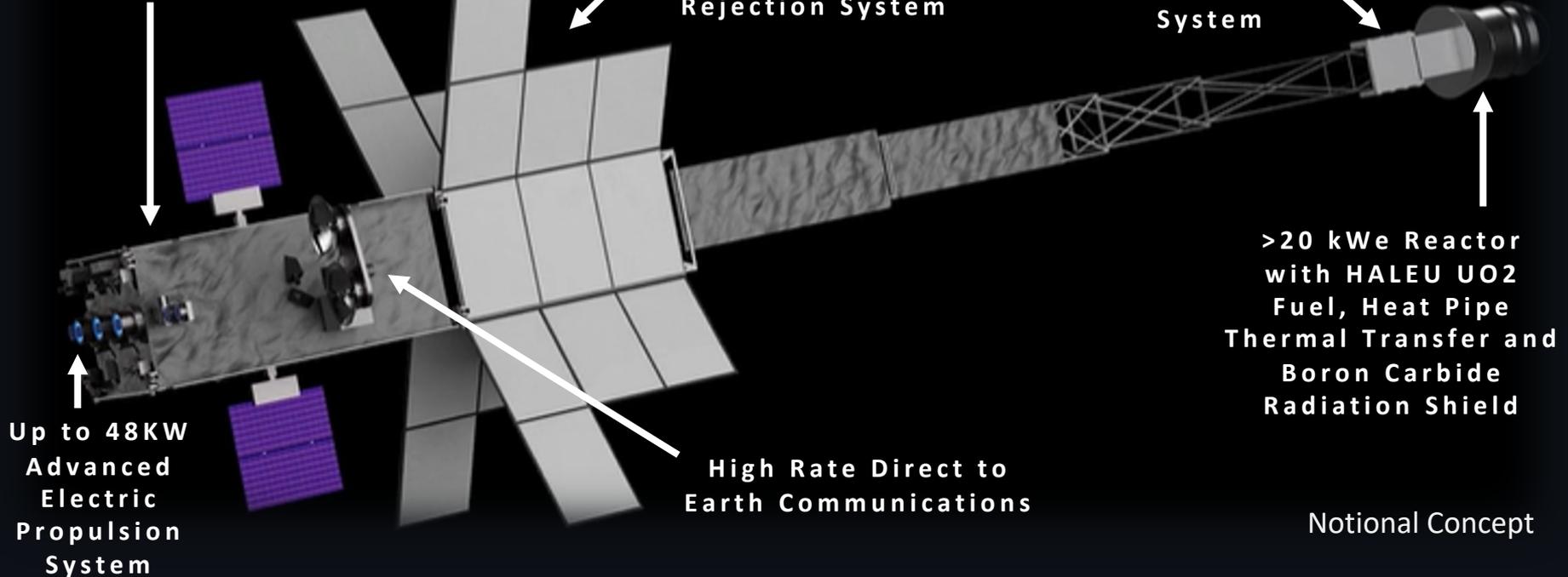
SR-1 FREEDOM: KEY SYSTEMS AT A GLANCE

Power & Propulsion Element

Spacecraft Bus

Potential Payload Location

Power Management & Distribution



FLY, LEARN, BUILD FORWARD

SR-1 is the pathfinder for future missions.

2028

SR-1 Freedom

Fly it. Learn.

- First nuclear electric propulsion demo
- Reactor + power conversion + thrusters
- Flight heritage established
- Regulatory and launch precedent set
- Industrial base activated for components & SMEs



2030

Lunar Reactor-1 (LR-1)

Trade reopens. Industry competes.

- New industry opportunity (RFI ~June 2026)
- Informed by SR-1 data
- Leverages SR-1 technology
- Adapted for lunar environment



2030s

Scale & Production

Proven technology. Repeatable.

- 100s kWe to MW-class
- Human missions to Mars
- Commercial participation
- Repeatable production
- Continued NEP/NTP development

WHAT SR-1 GIVES LR-1

- Ground & flight data on reactor and power conversion performance
- Regulatory and launch approval precedent
- Integration knowledge and lessons learned
- Activated industrial base and workforce
- Testing, integration, and launch infrastructure

WHAT REOPENS FOR LR-1

- Reactor and power conversion design trades
- Surface thermal rejection architecture
- Landing loads, dust tolerance, surface ops
- Balance of plant optimization
- Industry competition for build and delivery

POWERED BY AMERICAN INDUSTRY

In partnership with NASA and the Department of Energy

■ Industry ■ NASA ■ DOE

Reactor Subsystems



Power Conversion



Heat Rejection



Instrumentation & Controls



Power Mgmt. & Dist.



Launch

Reactor Design & Integration

Nuclear Fuel



Spacecraft Structure

Mission Operations

Spacecraft Bus

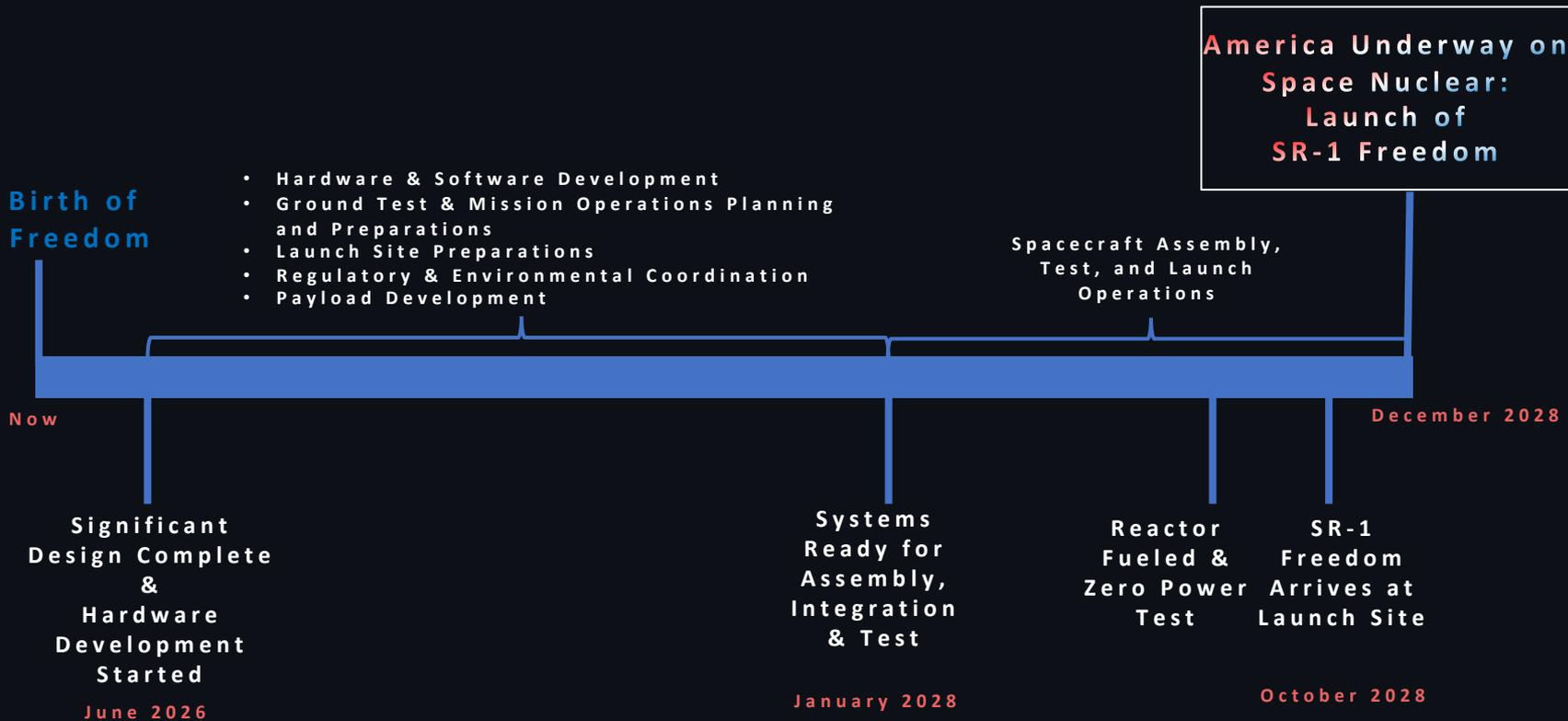


System Integration & Test

This is not a traditional government R&D project. It is an American industrial campaign.

NOTIONAL TIMELINE

The Birth of SR-1 Freedom



RFIs released for fast follow on FSP and NEP demonstrations

Space Reactor-1 Freedom will unleash American ingenuity to get America underway in space on nuclear power, enable extraordinary science on Mars with the delivery of Skyfall, and set a precedent for all future space nuclear endeavors.

SR-1 Freedom will put the United States of America in the drivers seat of this enabling technology.

