Benefits to Science and Technology Communities From These Endeavors

Ellen Stofan, NASA Chief Scientist

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For Human Exploration, All Roads Lead to Mars

- NASA’s vision:
  - To reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind

- Why is Mars the new height?
  - It is the only destination if humanity is to leave the cradle of Earth

- How do we get to Mars?
  - Through science, technology, commercial, international and human endeavors
For Human Exploration, All Roads Lead to Mars

Like the Mercury Program:
Earth Reliant is solving the challenges of long duration spaceflight

Like the Gemini Program:
Proving Ground will practice living and working during long duration spaceflight

Like the Apollo Program:
Mars Ready is developing systems that will allow humans to explore Mars

Unlike the Apollo Program, this time we’re taking a sustainable, pioneering approach!
The Science Road to Mars: Charting the Course

**Identify & Solve Challenges**
How does weightlessness affect human and physical processes?

**Learn to Live & Work**
How do radiation and isolation affect human ability to live and work?

**Explore & Pioneer**
What’s the environment and how does it impact human habitability?

- Earth Reliant
- Proving Ground
- Earth Independent

**Science**
The Technology Road to Mars: Paving the Way

Identify & Solve Challenges
What technologies do humans need to survive for long durations?

Learn to Live & Work
How can humans, robotics, transportation, and ground control best work together in this environment?

Explore & Pioneer
How do we land, explore, live off the land, and return home?

Earth Reliant
Proving Ground
Earth Independent
The Commercial Road to Mars: Growing the Economy

**Identify & Solve Challenges**
How do we lower the cost of cargo/crew launch while also benefiting the economy through R&D in micro-gravity?

**Learn to Live & Work**
How do we lower the cost of cargo/crew transport and other en route services?

**Explore & Pioneer**
How do we lower the cost of cargo/crew landing, surface operations, and Earth return?

Earth Reliant
Proving Ground
Earth Independent

Commercial
The International Road to Mars: Exploring as a Species

**Identify & Solve Challenges**
How do we collaborate in all aspects of long duration spaceflight?

**Learn to Live & Work**
How do we distribute roles, responsibilities, and capabilities?

**Explore & Pioneer**
How do we explore and pioneer the new frontier as a species?
The Human Road to Mars: A Deeper Vision, One Step at a Time

Identify & Solve Challenges
How do we prove that we can solve these challenges?

Learn to Live & Work
How do we practice living and working in this environment?

Explore & Pioneer
How do we explore and pioneer the new frontier for all humankind?

Earth Reliant
Proving Ground
Earth Independent