

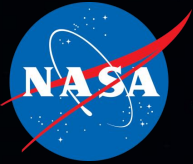
Human Research Program at NASA Glenn Research Center

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BACKGROUND AND EXPERIENCE

- Project manager for both human research program and biological and physical sciences programs during career
- Test as you fly – analogs a significant driver for success
- Use of computational mathematical models to inform risk posture through quantitative values
- Mass, volume, power, knowledge constraints
- Autonomy for devices and interfaces across systems from data or image collection to storage and access





Human Research Program

STEPS TO MARS



EARTH:

Simulated spaceflight hazards
in Ground Analogs | :envihab |
Antarctic Stations | NEK | HERA |
Space Radiation Lab

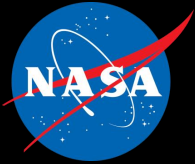
LOW EARTH ORBIT:

International Space Station –
A unique testbed to study micro-
gravity and environment hazards,
with varying mission durations

LUNAR MISSIONS:

Decreasing Earth-dependence
around and on the lunar surface.
Provides insight into deep space
radiation; behavioral health, and
gravity transitions





HAZARD EXPOSURE INCREASES WITH DISTANCE FROM EARTH



International Space Station

Gateway

Boots on the Moon

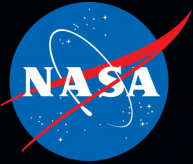
Mars Transit

CURRENT STATE

- 180-day to 360-day mission duration
- Strong consumables resupply
- Real-time communications
- Regular sample returns to Earth
- Emergency evacuations possible
- Limited onboard medical care (Earth-reliant)

EXPLORATION CLASS MISSION

- 650-day to > 900-day mission duration
- Zero consumables resupply
- No real-time communications
- No sample returns to Earth
- No evacuations possible
- Limited onboard medical care (crew/vehicle-reliant)



WHAT DOES AUTONOMY MEAN FOR MEDICAL CAPABILITIES?

- Progressive Earth independence
- New paradigm compared to LEO

Examples:

- In-situ analysis vs. sample collection & return to Earth
- Enhanced medical procedure in-mission support
- Advanced computing tools to support onboard clinical decision-making
- Efficient & novel uses of onboard resources to minimize resupply needs

