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A REALISTIC VISION OF THE MARS EXPEDITION: HOW MANY PEOPLE MUST GO?

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Outline

- The number of people and competencies required for the three-year Mars trip;
- People and systems requirements at the destination;
- Interpersonal dynamics and their effect on space ship habitability;
- Architectural considerations.

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Exploration

Investments and resources

Great Silk Road

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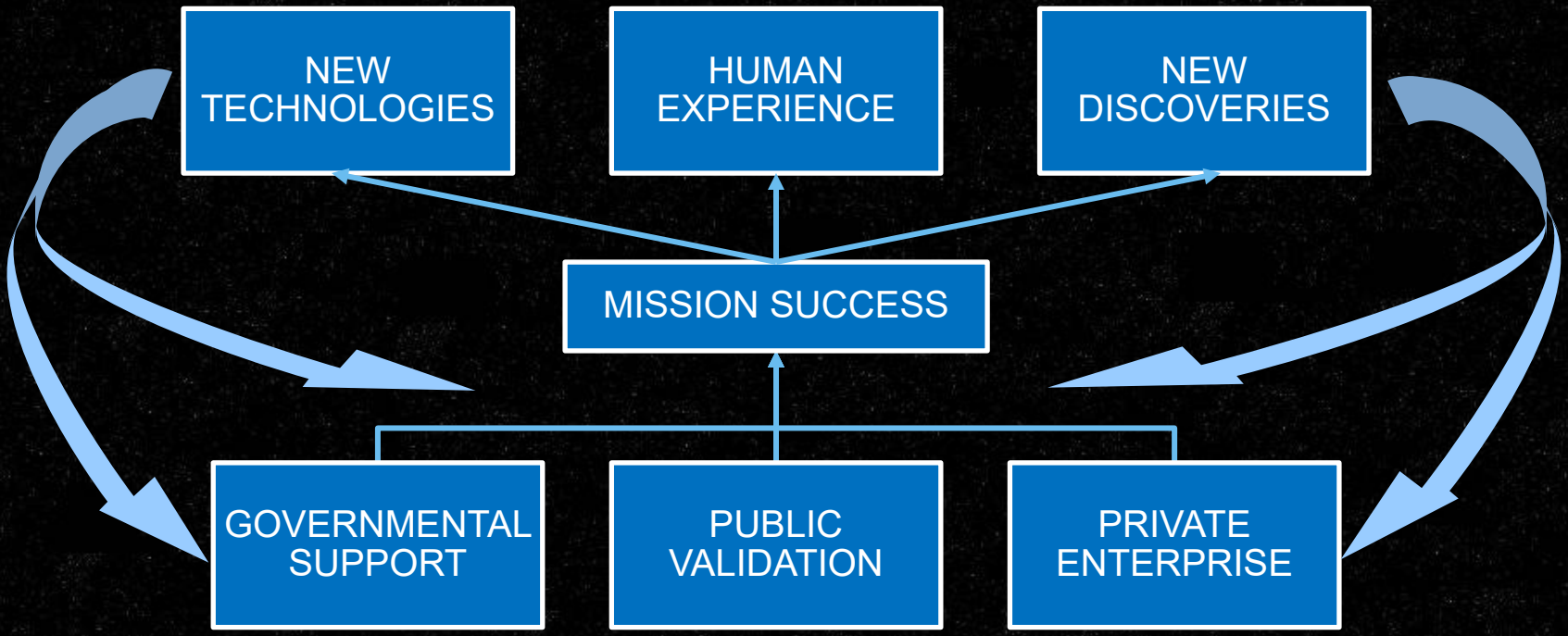
Exploration

Investments and resources: relationships and outcomes



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Exploration

Historical overview and comparison

Aspects	Earth Exploration (historical)	Space Exploration (up to now)	Space Exploration (future)
Level of expectancy	Not really known/some limited knowledge	Initially very limited, now high level of knowledge	Some information is available but high level of unknown
Mission timeframe	Several months up to years	Days, up to more than a year on orbit	Several years
Potential danger, hazards & challenges	Deceases, natural risks, lack of familiar resources & tools	100% dependency on supplies from Earth	Maximize ISRU & independence from supplies from Earth
Diversity: • Social • Cultural • Gender	 • Similar social class • Mixed/mission based • Mixed	 • No diversity • Some diversity • Very limited	 • Mission based (e.g. client-service) • Mixed • Mixed

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Who must take the trip

Mission support disciplines at minimum:

- Aerospace engineering
- Electrical engineering
- Computer science and software engineering
- Thermal engineering
- Material science
- Telecommunications
- Optics
- Navigation and control systems engineering
- Instrumentation
- Radar science

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Who must take the trip

Necessity for additional disciplines will depend on crew members' and mission objectives' diversity.

Some mission objectives & support	Required specialties
Extended science	Geology, geophysics, chemistry, physics, astronomy, astrophysics, meteorology, hydrology, biology
Surface exploration	Electrical, thermal and mechanical engineering, telecommunications, navigation
Medical care	ObGyn, orthopedic or surgical, dental.

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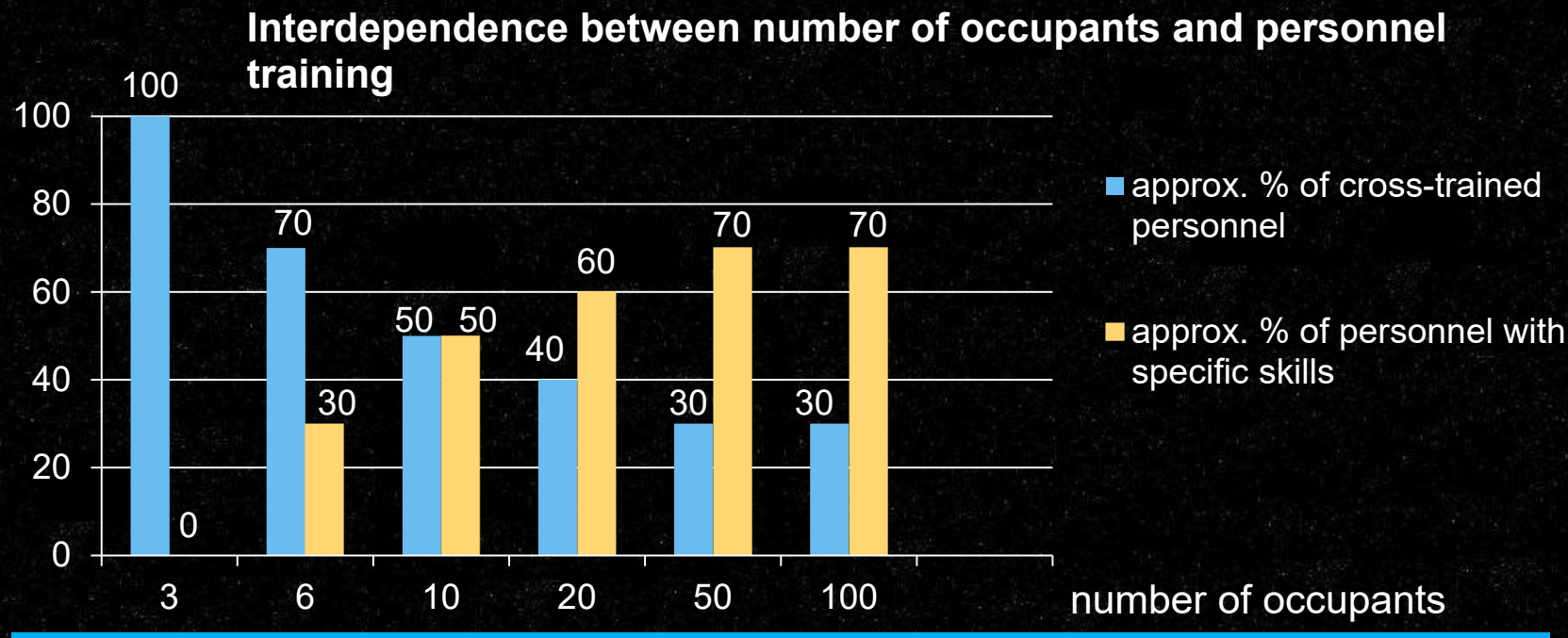
How many must go

Number of cross-trained personnel will depend on a number of inhabitants and their occupational range.



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How many must go

Crew number selection influencing factors:

- Quantity of mission goals and objectives;
- List of functions to be performed during the mission;
- Level of expected/required work quality;
- The number of crew needed to complete the function;
- Crew morale support during long-term Mars missions.

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The architectures

Main architectural objectives:

- Provide protection means from external environmental risks;
- Afford internal safety (fire hazards, any type of contamination etc.);
- Ensure health safety (physical and psychological);
- Optimize interior environment arrangements to maximize crew work performance.

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The architectures

Operational design considerations:

- Human factors;
- Crew systems and subsystems;
- Man – machine interactions;
- Functions allocations.


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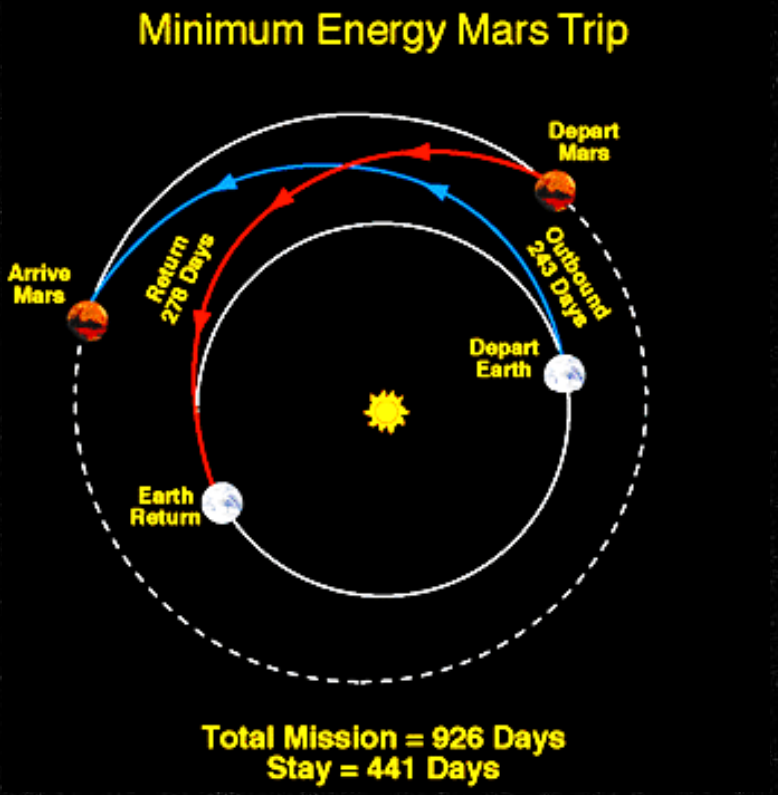
The architectures

Assembly considerations:

- Ship systems and subsystems integration;
- Propulsion systems;
- Launch systems;
- Interfaces.



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Conclusions

Making the *real* needs be commonly known, and explaining how current and projected future technologies will contribute to satisfying those needs, can help build appreciation and understanding of the long-term commitment required to explore our solar system.