

Near-Term Mars Colonization

- DevelopSpace Project -

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Project Motivation

- For manifold reasons, it is our destiny as humans to expand our presence:
 - Since the existence of our species, we have expanded our habitat over almost the entire Earth
 - This expansion was enabled by using technology (e.g. living in central Europe or northern Minnesota and surviving the winter)
- The next logical step is to go beyond Earth
 - Requires more significant reliance on technology
- In addition to expanding our presence, there may be numerous other benefits from this:
 - Rekindling of frontier spirit, societal invigoration
 - Generation of new technologies, new knowledge
 - Backup of our species and its achievements

There are people who want to make it happen

Project Goals

- To determine what would be involved in implementing a sustained human presence on Mars in the near future
 - By way of one-way colonization
 - For minimum closure and maximum closure levels
 - For constant or growing population size
- To investigate the cost of providing the colony with the capability for emergency evacuation back to Earth
- To gain an understanding of the financial needs and the time phasing of a near-term Mars colonization program
- To further develop the DevelopSpace infrastructure through identification of infrastructure needs

Why Mars?

- Why would we want to expand to Mars, instead of other destinations such as the Moon?
- Of all the bodies of the inner solar system eligible for near-term colonization, Mars is the most suitable
 - Mars has an atmosphere, specifically a CO₂ atmosphere (GCR / SPR protection, feedstock for ISRU)
 - All the other elements necessary for sustained human existence are present in one form or another on the Martian surface
 - Nitrogen, hydrogen, oxygen, carbon, iron, aluminum, etc.
 - From a mass / energy perspective, the Martian surface is about as hard to reach as the lunar surface
 - Higher gravity level than on the Moon
- Major challenges of Mars are that it takes longer to get there and aeroentry / aerocapture is required

How to Colonize Mars

- Many ideas have been put forth (Zubrin, Case for Mars conference proceedings, etc.)
 - Might be good to read up on some of these things
 - But let's not be constrained by the ideas of others
- Here are some initial ideas for our project
 - Humans will be sent one way, possibly with an initial emergency Earth return capability
 - Return capability could be based on direct return
 - Re-supply will initially be provided from Earth, possible augmented with ISRU on Mars
 - Initially atmosphere-based ISRU
 - Possibly also greenhouses for growing food
 - The population of the colony will be assumed to grow over time
 - Maybe 4 crew initially, minimum of 2 additional every opportunity

Possible Areas of Work for Project

- Surface power: solar vs. nuclear + different secondary power generation and energy storage technologies **Chase?**
- Surface infrastructure other than power: habitation, surface mobility / transportation
- Logistics, life support, and ISRU: life support system closure, ISRU, re-supply from Earth **Wilfried?**
- Earth-Mars transportation, Mars EDL
- Return to Earth in emergency
- CAD modeling / visualization of concepts **Ryan?**
- Location, location, location! Where should the colony be located?
- Financial and management considerations: financing of project, operational management, program planning **Paul?**
- Integration of results into coherent strategy **Wilfried?**

Actions

- Everyone
 - Select the areas that you would like to work on, and formulate an initial set of tasks for yourselves
 - Think about tools we need for this project on DevelopSpace
 - Start the work!
- Wilfried
 - Set up project site on DevelopSpace
 - Prepare kick-off next weekend