



PHASES OF DEVELOPMENT

12 – The Initial Permanent Crew

SUMMARY

This chapter describes a scenario of the first permanent crew to settle down on the Moon. Ideally, these would be four couples without children back on Earth and so, free to sell their homes on Earth and move indefinitely to the Moon. In other words, they are the first humans to begin spreading beyond Earth -- true settlers. Their jobs, hypothetical national origins, languages, and talents are described. If chosen well, the Crew of eight should be able to speak to at least 75% of the world in a language that they would be able to understand.

HUMANITY'S FIRST PERMANENT FOOTHOLD

The Initial Crew

We need to understand just how close we are to humanity taking its first permanent steps off Earth. It doesn't take as much as many people presume. The Plan for Sustainable Development laid out in this book describes a proposed Initial Permanent Crew and how such a group could be the very historic, first of humanity beginning to spread beyond Earth.

While the lunar lander is becoming human-rated by landing cargo on the Moon, it could either land as the StarHab and then be horizontalized as described in chapter 17 or it could deliver a large, inflatable InstaBase. Telerobots would cover either with lunar dirt prior to crew arrival. With the indoor centrifuge providing a full gee of artificial gravity several hours a day, the very first crew should be able to remain on the Moon for at least three years and quite possibly much longer. If crew are able to move off Earth for an indefinitely long period of time, then this is the beginning of human migration beyond the Earth.

This Initial Crew (let's say eight people) will go down in history at the level of Christopher Columbus and the Pilgrims. We would know up front that we are writing history. What story will we choose to write?

Social Status

Biosphere 2 in Tucson, Arizona served as a two-year experiment from September 1991 to September 1993. During this experiment, there were eight "biospherians" who lived inside this hermetically sealed facility. At the time, two of the biospherians were dating and went on to get

married. Why are the social statuses of the Initial Permanent Crew so important?

If we are going to intentionally write the story of how the first humanity started expanding beyond Earth, then the social status of that very first crew would begin to dominate how long they could remain on the Moon. If a crew member had a dependent child or even a spouse back on Earth, they would likely feel the need to return to Earth even before their radiation levels or bone density required them to. Sending a bunch of single individuals to work and live together for years could result in some interesting situations which could negatively affect crew morale. Two gals showing an interest in the same guy (or vice versa) could make for some great reality TV but could seriously harm the ability of the crew to do their work.

Eventually, as the population of the base grows, there will be all types of people moving to the Moon. But initially, the people to go down into the history books as those humans to first move off Earth need to be those who can stay there essentially indefinitely. Ideally, they would go as couples in which their social status is resolved. Just like on Earth when a job requires someone to move away for years, they take their family with them. Same situation here. What we're talking about is the beginning of actual space settlement -- on a small scale.

Crew Diversity

The Plan envisions that the Initial Crew be private workers of a company that is funded by NASA using American tax dollars. As such, the crew should be Americans, and the common language should be English. But the crew members would not necessarily have been born in the United States because many Americans are naturalized citizens enjoying all of the same legal privileges of American born citizens. Doing so would illustrate that being American isn't based upon one's ethnicity or national origin but is based upon our shared values and beliefs. Indeed, it would be to the distinct advantage of the program if the crew members could broadly represent the world through their diversity of backgrounds and speak to as many people in the world as possible in languages that they understand. It would also be beneficial if there was a diversity of faith, personalities, and talents. Talents could include musical abilities, dance, gymnastics, and arts. So, even though the Crew are Americans, they would be broadly representative of the world.

Selection Criteria

So, the educational and talent criteria for selection should be specified to people of a certain age around the world. As people pass through the process of selection, at some point they would need to become naturalized American citizens. The educational criteria would be published but training in the specific protocols needed would be provided to the finalists. A process somewhat like that followed by the Mars One organization could be employed. This could include the submission of video pitches, video interviews, but also videos of athletic performances, live video music performances, and the results of language proficiency tests.

INTRODUCING THE CREW



Right now, we don't know who would make up the initial crew of eight. But let's imagine an ideal, hypothetical scenario where the first crew of eight have been selected. Here they are:

- **The Commander-Farmer** - Your prototypical astronaut. He's former military. A pilot. Great at organizing people and managing the team. But he's also a farmer and his day-to-day job is working in the hydroponic greenhouse section.
- **The Biologist** - The Commander's wife, is going to be the primary one responsible for animal studies including those designed to determine how much artificial gravity is needed for healthy gestation and childhood. She is cross-trained in the medical protocols. She and her husband own the dog which is the ninth team member.
- **The Engineer** - He is responsible for setting up and maintaining all of the hardware. He also works with the Machinist-Metallurgist as they develop replacement parts from local resources.
- **The Physician** - Responsible for the health of the crew. She monitors everyone to determine if they exceed certain biomedical criteria requiring them to return to Earth. She works with the Biologist in the animal studies.
- **The Machinist-Metallurgist** - The patron saint of blue-collar workers. He extracts metallic micrometeorite bits from the regolith, melts them using concentrated sunlight, removes the dross, casts and machine the metals to make basic metal parts. He works with and is cross-trained to do the work of the roboticist. Only he knows what will be his first CNC machined and 3D-printed pieces.
- **The Chemist** - Demonstrating the small-scale production of new chemicals nearly every day from the organic chemicals in the ice and from the geologist's samples. Later, as the base grows and there are dedicated manufacturing habitats, she works to set up larger-scale chemical processing facilities. She is cross-trained with the Geologist.
- **The Geologist** - Receives rock samples from telerobotic missions from selected sites around the Moon. Besides being the first to closely examine the samples, he works with the chemist to extract elements and chemicals from the rocks for use producing and increasing array of materials.
- **The Roboticist** - In charge of the primary job of the base which is to maintain and expand the telerobotic ice-harvesting workforce

to grow the propellant-producing system to increase the quantity and lower the cost of all follow-on travel to the Moon.

- **The Android** - Perhaps the tenth member of the team would be a bipedal, humanoid robot whose AI would allow it to perform helpful tasks and interact with crew while having its own personality.
- **The Dog** - And if that is not inspiring enough, a female dog could be the ninth member of the team. Later, the dog's mate could be sent leading to you know what -- Yes, Moon puppies!



LANGUAGES

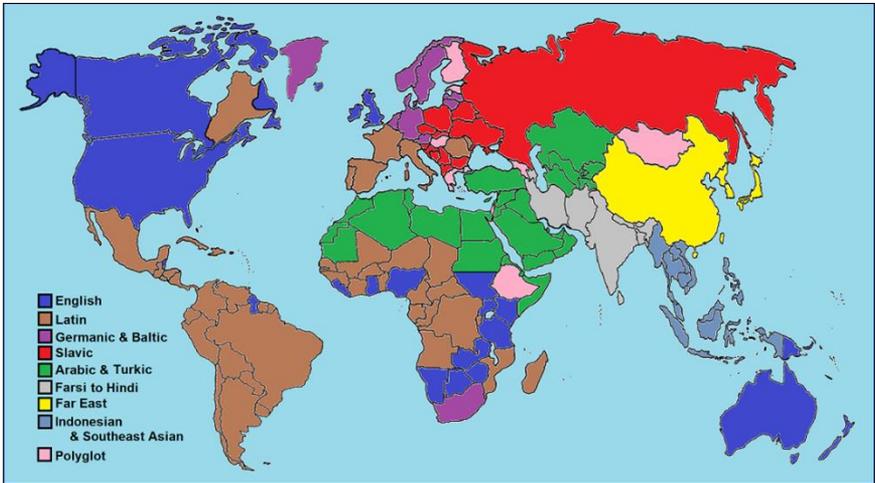
The Advantage of Diverse Languages

The Plan proposed in this book includes that the Initial Permanent Crew each know a set of languages. The purpose of doing this would be to further enhance the world's connection to this American led and funded phase. Although Americans are taking the lead, in a sense this diverse Initial Crew including with their wide variety of languages means that these first permanent steps are being taken by the representative of humanity. Through the crew's languages, each country would, in a sense, have their representative connection within the Initial Crew. The two ways that the Crew's languages would connect them to the countries would be through news interviews and being broadcast within the classrooms of those countries.

The benefits of connecting the Initial Crew with countries throughout the world include:

- Demonstrating that the United States is a country based not upon ethnicity but upon principles applicable to people around the world.
- Demonstrating that American leadership in space is something not to be feared but a blessing to the other nations.
- Similarly, preventing other nations whose nationalism poses some dangers from taking the lead in space.
- The crew demonstrating the point that Americans of diverse backgrounds can get along together.

- Eliciting international goodwill and influence as young people from around the world know that America is providing them with a (small) chance of establishing humanity's first, permanent, off-Earth foothold.
- Providing representatives from the Initial Crew which can communicate in the language of follow-on international exploration teams.
- Just the enjoyment of watching a crew whose diversity provides variety.



Language Groupings

All crew members would need to speak English as the common language within the Team. If young people from around the world knew what languages would increase their likelihood of being selected, they could pursue the acquisition of those specific languages. Gifted students could become fluent in several different languages. Here is a scenario of what other languages each of the crew could speak if this were a selection criterion:

- Commander: Indonesian-Malaysian, Indochinese languages
- Biologist: The major Latin-based languages
- Engineer: Polyglot (e.g. Amharic, Greek, Hungarian, Mongolian, etc.)
- Physician: Arabic & Turkish
- Machinist-Metallurgist: Mandarin, Japanese, Korean
- Chemist: Hindi, Pashto, Farsi
- Geologist: The Germanic languages
- Robotacist: The Slavic languages

A polyglot (someone who can easily pick up another language) could significantly increase the number of languages represented among the initial crew. So, what percentage of the world's population could a crew of eight speak to in their language? In conversations with linguistics faculty, it is estimated that the Initial Crew knowing the above languages would be able to speak to about 75% - 80% of the world.

Special thanks to linguistics professors Heidi Harley (University Arizona – Tucson) and Armin Schwegler (University California Irvine) for concepts included in this section.

EXTENDING CREW STAY

The Benefits of Extending Crew Stay

If we can extend the length of how long the crew can remain on the Moon, this would result in several benefits. It could either cost less since there would be fewer launches necessary to maintain (or grow) the population of the base. Secondly, each time we rotate crew, there is a danger to their lives and consequently a danger to the program. The Challenger and Columbia accidents illustrate this concept.

Biomedical Return Criteria

How long can we remain on the Moon and how can we know when the crew must return. Several biomedical criteria could be established. The crew should be periodically monitored for these biomedical indicators by the Physician. If they are nearing any of the criteria, then they are sent back to Earth. Bone mineral density is a good example but there are several other indicators that would be monitored. On the Moon, we wouldn't need to know beforehand how long the crew could remain before the criteria are met. They would remain as long as possible until they are met. With exercise and artificial gravity, perhaps the crew could remain on the Moon for a long time. See the author's paper on this topic by scanning the QR code to the right.

Radiation Not the Limiting Factor

Between 50-70 cm thick of uncompacted lunar dirt on top of the UniHab would provide full protection against solar storms and would reduce the radiation levels of the galactic cosmic rays by about 30%. This would allow for the crew to remain on the Moon for about years before they reached a notional career limit of 1,000 mSv. They would then have plenty of time to maintain the telerobots to push even more dirt on top of the habitat. Therefore, it is not the radiation exposure which would limit the length that the crew could stay. Rather, it is the health effects of reduced gravity of the Moon that would likely determine how long the crew could stay.

