Lunar Habitation Funding – Part III, Methodology

by

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From the get-go, we established the Lunar Colony Fund organization to address the challenges in raising funds for space activity. It is practical; we defined it as non-profit, nongovernmental and secular. It is current. We use the Internet together with all its 'cloud' so as to minimize our footprint on Earth. It is concise. We've defined a goal that can be classified as a project, i.e. with a defined end state. That is, our organization ends once a lunar colony is in place and is self-sufficient. And, it is legitimate; we've shown the need for humanity extending their presence onto the Moon. With these, our Lunar Colony Fund organization has established the basis for its goal.

The following points put some perspective upon the goal.

A) Look at the one analogy. The Apollo program created a rocket to successfully loft 48,000 kg to a lunar orbit. The payload was contained in a conical-like shroud with diameter of 6.6 to 3.6 meters and a height of 20 meters. The capability to loft a payload of this size and mass hasn't been demonstrated since. Nevertheless, let's tentatively set these as the limiting dimensions.

B) We have a recent corollary, the International Space Station. Its crew complement is 6 people. Its living accommodation has approximately 1000 metres of pressurized space. It captures its own energy requirements of up to 90 kilowatts from solar panels. It receives supply missions at the rate of almost once every month. An estimate of the annual supply is 20,000 kilograms per year. The first module was launched in 1998. Its completion, after more than 100 launches, was in 2011 though plans exist to add more components. Even though the space station is a research laboratory rather than a comfortable living environment, we can draw a corollary from it.

C) We have a succinct project; a lunar colony but we have many unknowns. The general location is known; the Moon's southern pole as it harbours water-ice and should support heat pumps. But, nothing has validated specific locations to support the transportation and the structures. The knowledge of wear and tear on material is poor; there are no building codes for the Moon. The applicability of in-situ

utilization hasn't been gauged. Unknowns and risks are not insurmountable, after all that's what humans have been accomplishing in our civilization. However, while projects can inherently address risks, they do so typically by increasing cost hence we do the same.

In consideration of the three preceding points, we envision a long term schedule of many decades and probably multi-generations in order to fund and emplace a self-sufficient lunar colony. The duration is needed to amass the infrastructure, material and knowledge to support people on the lunar surface. As the limits identified in point A) above restrict the payload mass per delivery then we know that many deliveries are required. We can expand the information in point B) above to estimate the number of deliveries needed. We leave this for a future study. As well, in consideration of the risks of point C) above, we expect sub-contractors to apply cost premiums to address them. As well, we will utilize a flexible schedule to allow for feedback and continual improvement. With this gradual, building block by building block approach, the Lunar Colony Fund will ensure steady progress to completing this project.

As with other successful projects, we will use a cyclical approach to acquire experience and knowledge with which to apply later. For example, our first step is to enable a communication link. This initial part of the colony's infrastructure will include many other capabilities. It will trial an Earth-Moon energy transfer technology. It will confirm the siting for a near-continuous line-of-sight link between the Earth and the Moon. It will contain a logical data store thus enabling a Moon asset. And, it will have a video imager so as to enable a Moon based revenue stream. Of course, this capability will need Earth based functionality. That is, it will need a communication receiver on Earth (or use existing space communication bandwidth). It will need an Earth based energy transmit and receive capability. And, it will need continuous automatic monitoring as well as occasional manual monitoring. These functions and capabilities, together with testable metrics, will constitute the acceptance criteria for this building block of our project. Once we've accepted the block, we can review our experience and upgrade our processes as desired so as to apply toward our next block.

Note, we at the Lunar Colony Fund will concentrate upon fund raising. The definition of capabilities and even the acceptance testing will be completed via a sub-contract(s). Our control of the infrastructure development will be via milestone payments. Yet, while we expect that some outlay may occur while a particular building block is in development, for the most part, we will be making the majority of any payment only upon completion of an acceptance test. In this manner, we obtain optimum technical services via open source bidding and we only pay for acceptable provisions. That is, we shift the majority of the technical risk onto the

sub-contractor. Though we will keep abreast of technological developments and possibilities, we keep our focus upon raising funds.

From our perspective, we see a somewhat slow build-up of infrastructure as we establish our funding streams world-wide. The initial phase will require a relatively small financial outlay. Once we have a solid support base, we will begin toward defining and contracting for stand-alone building blocks. Each building block will be constrained by the limits of the launcher's rockets, as with the Apollo program. This in turn will limit the cost for each building block. This build-out phase will have an increased but steady financial outlay that can be scheduled to match the funding rate. When the maturing infrastructure on the Moon becomes human rated and occupied then the frequency of deliveries may escalate to near-monthly hence requiring a continual, strong funding stream. Eventually, people will live on the Moon for extended durations, much as on the International Space Station. This live-in phase will probably see the most significant funding requirements as the residents must be supported as well as the infrastructure expanded. However, this phase will also see the greatest amount of in-situ knowledge accrual and profiting. That is, the people on the Moon will be making rapid advances to becoming self-sufficient. With their advances, their supply needs will decrease. Equally, with their advances, the need for more infrastructure decreases. This maturing phase will see funding needs decreasing. Eventually, with attainment of self-sufficiency then the need for funding will end and the project will close with people successfully living self-sufficiently upon the Moon.

We accept that estimating a dollar figure on this project's total cost will be a challenge. We are preparing one. Our overhead costs will be low. We aim to meet or decrease the typical 15% overhead for well-run charitable groups. We aim to maximize the use of contract services so as to minimize our footprint on Earth; our expenditure of Earth's resources. And, we will avoid research and development. That is, we will be contracting for existing capability (TRL 9 or above). Our aim is to emplace proven capability on the Moon. Via this, the Lunar Colony Fund will optimize progress toward completing our project of a self-sufficient colony on the Moon.