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Space Elevator Architecture's

Architecture Note #29

Space Elevator Architecture's "Call for Improvement" Approach

Sub - Topics:

- *Things Change*
- *Improving the baseline*
- *The importance of a System Performance Simulator*
- *Configuration Control responsibility*

Proposed

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Personal Prolog

This is an Architecture Note. It is the opinion of the Chief Architect. It represents an effort to document ongoing science and engineering discussions. It is one of many to be published over time. Most importantly, it is a sincere effort to be the diary, or the chronicle, of the multitude of our technical considerations as we progress; along the pathway developing the Space Elevator.

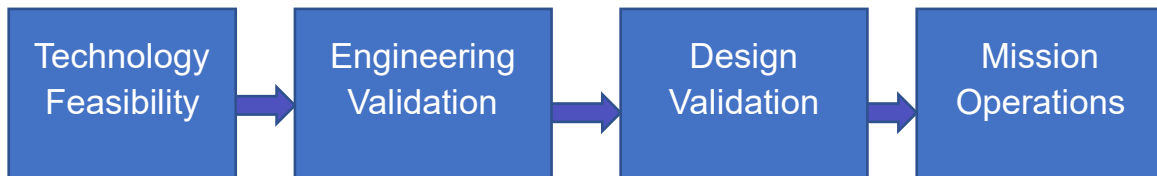
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Things Change

Sometimes it is hard to notice, but things change! As stewards of all things Space Elevator, it is our job to keep all that change stuff under control, and yet engender all the changes we can until we get the Space Elevator just right, just the way we want it. Whew! My intent here is to establish enjoyable stewardship, with a sufficient amount forward momentum.

First of all, let's delineate the notion of the Baseline. Right now, we have one baseline for the Space Elevator Transportation System, the concept baseline. It is what we have declared as "Tech Ready" as we exit the first phase of our development maturity roadmap. As we enter the Engineering Validation phase, ISEC will begin considerations of the engineering baseline and stimulate industry to get involved. This baseline reflects our understanding of how to build something that matches our concept baseline vision.

As ISEC (and industry!) continue examining the engineering; they will come headlong into solid queries of what is this Space Elevator Transportation System thing going to do; and for whom. As those forces meld with each other, clients and customers will levy their requirements and their needs on the Space Elevator Transportation System. A requirements baseline will take form.



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Finally, as we exit Engineering Validation Phase, the engineering baseline and the requirements baseline will merge; and the Design Baseline will be carried forward into our Third phase.

At that moment, ISEC and a few industry players, will have (in their view and in their memories) the baseline structure of the Space Elevator Transportation System and its legacy. The concept; the technology, the engineering, the requirements, and the design baseline; all of it. Proud as we all might be - **we must also see how to improve it**; starting now.

Improving the baseline

It is a bit like saying that we love our kids, and this is how they can be better. In fact, if you were to listen in on ISEC board meetings, you would hear just that --- how to make the Space Elevator Transportation System better. We all should realize that “understanding” is most always the best first step to improvement. So, in our role as stewards, we must foresee that moment at the end of the Engineering Validation Phase.

Whomever leads us into Design Validation must glean, from all the baselines, all the improvements hidden there. That leader will call for them to be brought forward. From the concept – the technology. From the engineering -- the test data. From the requirements -- the purposes. All of that will be brought forward in response to the “Call for Improvement”; with new configurations linked.

To some extent, the call has already been issued. We are hearing some sort of “fore-echo” of the Call. John Knapman leads a team empirically examining a new lower portion of the Tether, and a different interface at the connection to Earth. The Multi Stage Space Elevator had a singular beginning – proposing that we proceed even if the Single Crystal Graphene solution never matured. John’s fine efforts now show that a platform configuration “at altitude” has merit for other purposes.

In addition, discussions regarding how the Space Elevator Transportation System should fare in the face of the space debris, has given birth to lower altitude multi-leg tether configurations. The incorporation of a platform just above the debris regions could inspire new requirements. Pete Swan will discuss the multi-leg in the debris report due out in February 2020.

Further improvements will be identified over the coming several years and moved into the design baseline when matured. We see Space Elevator Transportation System improvements for overall logistics throughput, for support to interplanetary travel, research, tourism, and a range of enterprise support specifics.

The Importance of a System Performance Simulator

The whole notion of the “Call for Improvement” process is that the Space Elevator Transportation System is ... improved. In that spirit, we need to define some standard metrics, and some specific metrics; and then determine how those metrics will be measured. This isn’t as easy as it might seem, and the simulator that is capable of assessing whether an engineering improvement provides improved requirements satisfaction will be a challenge.

Configuration Control responsibility

In the spirit of the classic cynical commandment that “no good deed goes unpunished”; the Call will have some level of bureaucracy. Most of the bureaucracy will be to ensure that the Space Elevator functional configuration is not lost or diminished; all segments must work together.

The System has 6 segments and each segment interfaces to one or more of the other segments. That configuration will stay the same until the system design activity begins. The 6 Segments are:

1. Earth Port
2. GEO Region
3. Apex Region
4. Tether
5. Climber and
6. HQ/ POC

So, our scheme is to gather improvements during Engineering Validation phase; and reconfigure later. In fact, a Call for a “System Re-Configuration” is almost certain; (been there).

In closing,

As far as we have come, we are just getting started. The Space Elevator Transportation System is becoming an essential part of space

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transportation and the space infrastructure of the 21st Century. A little improvement is a good thing; and even necessary to match these endeavors.

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