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Architecture Note
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A Discussion about our Strategic
Approach with a Space Industry
Innovator

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Personal Prolog

This is an Architecture Note. It is the opinion of ISEC's Chief Architect. It represents an effort to document ISEC's ongoing science and engineering discussions, and 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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Our Long-Term (30+ year) Planning Horizon

It may be the hurdle to possible venture funding or other funding from industry

Introduction

This note will be a discussion about how we can seek support from industry funding sources. These sources provide funding grants for development of new technologies and new concepts. These same sources are seeking predictable return on their investments. They invest in technical concepts that will be systems and architectures in the future; or a key part of the same. It is important that we understand their financial motivation and their financial strategy. We would make a deal when their investment strategy matches with our technical strategy and performance.

The Planning Horizon and a Strategy to attract investors

Our "strategic approach" is to link the Space Elevator Transportation System to the Space Elevator Enterprise System; within a Unifying Vision: the Galactic Harbour. We see that happening by 2040 or 2050. Investors see the timing of the payback as an important element of their decision. They won't openly question our technical competence; but they are curious about the likelihood of "payback"; and are wary of the "present value" of that payback. I'll cite 2047 as the payback year.

If an investor's payback in 2047 were to be \$1000, the present value of that amount in 2017 would be less than \$100 for normal bank rates (a

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loan) and less than \$25 for risk investment grants. The 30 year duration really kills us. If the duration was reduced to 6 years, that \$25 present value grows to over \$400; a 1600% improvement!!

A ha! A strategy emerges!!! We need to reduce the duration of the payback period from 30 years to 6 years. As a result, the present value available to angels grows substantially; by 1600% in my example. We could accomplish this miracle by segmenting our strategic approach into five 6 year plans; with a valuable product at the end of each segment. This valuable product must be something the investor wants.

By Coincidence ...

In late April, I had lunch with an innovator in the commercial space industry. He got an interesting look on his face when I mentioned our 30 year planning horizon. His basic position was that – from his industry’s planning standpoint -- 30 years was just too long. He cited his cycle; prescribe a level of performance to a satellite provider - who builds the satellite in 5 years; and it operates for 15 years. He pointed out that even DARPA- the Defense Advanced Research Projects Agency – doesn’t have a planning horizon 30 years long; 7 years maybe, 5 years more likely. If a company cannot get DARPA’s attention with a project concluding in 5 or 7 years, that company will not receive DARPA funding. The same was largely true of independent research within companies.

I listened intently. After lunch, it hit me! The technical advice I was getting was the same as the fiscal advice; segment our next 30 years into 5 planning periods or development phases. Each of these phases concludes with an available technology or technical product that someone else also wants. We want it to progress to our long-term destination; the other party wants it because it is part of their future vision. By segmenting our journey in this manner, we become more “interesting” to our sources of funds.

A Way to Proceed

We now have two strong hints that the ISEC’s next 30 years should be composed of 5 six-year planning phases. With six-year planning phases, we can improve the respective “Present Value” of the products of each phase; and we can offer each prospective investor a more reliable prediction of our pending technical success. Further, that timing correlates

with the planning cycles of other potential industry partners and government funding sources. (Before anyone gets excited -- ISEC is still not looking for government funding! -- But, our prospective partners might be).

So, what are these phases? In truth, we don't exactly know; but we have some good ideas and a few criteria to consider. For now, the phases will be like these six initial suggestions:

1. An on-orbit demonstration that is climber and tether operations related.
2. Earth Port prototype construction project; in the mid-Pacific (near Hawaii - to lure partners to paradise).
3. Materials – environmental assessments
4. GEO Node stressing CONOPS of small service space craft.
5. Tether deployment and / or repair.

It is likely that there are more than 6 phases, and different timing than these phases; but more about that in a subsequent Architecture Notes.

Some thoughts about the five phases

ISEC needs to examine what products these 5 efforts would deliver and identify potential partners with interest in the preliminary offerings:

- An on-orbit demonstration that is climber and tether operations related.
 - ISEC needs more information about the Tether – Climber interactive dynamic environment. The product of this period would be improved dynamic statistics and probably some “wear & tear” insights.
 - Potential Partners → Space Operations Industry members; perhaps within their internal research efforts.
- Earth Port prototype construction; in the mid-Pacific (near Hawaii - to lure partners to examine).
 - There are several Earth Port considerations – Sea Floor attachment; Tether Reel in - Reel out operations, Tether Terminus movement, and extended sea state, weather & climatology understanding. Recall – the Earth Port's region is 40 kilometers high; at least.

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- Potential Partner → The Maritime and Port Industry members.
- Materials – environmental assessments
 - Materials technologies will be exploding as we approach our pre-IOC years. ISEC is (or will be) interested in a wide variety of long lasting, light weight, repairable materials for the Space Elevator Transportation System deployment and construction.
 - Approaching the Transportation System IOC, the Space Elevator Enterprise System will have an insatiable appetite for new materials with similar criteria. In addition to all that, all involved will be seeking information about the utility and efficiencies of the new materials produced in the newly accessible space environment.
 - Don't forget about additive manufacturing; see 3-D printing.
 - Potential Partners → There will be many!
- GEO Node stressing CONOPS of small service space craft.
 - Proximity Operations in crowded GEO space needs improvements. The improvements will be based on sensing technology, sensor data reduction technologies, and Artificial Intelligence guided proximity operations management.
 - Potential Partners → Space Industry operators are very interested; now!
- Tether deployment and / or repair.
 - By the time we drop the seed Tether from GEO ...; ISEC will need mature technologies that will enable deployment and, later, repair of the Tether.
 - Future clients will be interested in deploying rigid tethers.
 - Prominently, ISEC needs a special remotely piloted vehicle ... to fly the earth-bound end of the Tether to the Earth Port locale; snaring it there - to start the whole tether build process.
 - Potential Partners → JAXA NASA, ESA, UAE

Other Bases to touch

- Defense Advanced Research Projects Agency
 - DARPA loves demonstrations ... with “legitimacy” due to common objectives.
 - DARPA also sees itself as enabling business closure. ISEC should talk about this.
- The Robotic Servicing of Geosynchronous Satellites program industry members
 - Contact the companies involved & those that were not selected; seeking partners.
- Small Business Innovative Research programs in the government
- Japan’s various players
- United Arab Emirates Space Agency

Other thoughts

- ISEC should construct plans for demonstrations and experiments per phase. These detailed plans clarify our objectives and offer potential partners the substance they need.
- Achieving “business case closure” must be presented in any discussion with companies; and in a different way – discussed with government entities.

In closing

ISEC must get off its island. It needs to meet with those of common purpose and partner with them. Our strategic approach must be shared with others; especially those that would fund our efforts. See you next month.

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