

**Final Summing Up – Reach to Space Conference
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Concepts suggested as keys to future space success included:

- ❑ A new vision of our objectives in space that go beyond the now “bankrupt” vision of space offered by Von Braun. That vision pursues the bold objectives of Gerard O’Neill and others who perceive the opportunities of a new high frontier;
- ❑ “Creative destruction” that comes from breakthrough technologies and new approaches to markets—especially commercial initiatives that are not bound by past strictures of governmental projects;
- ❑ Entrepreneurial talent, challenges and competition as offered by the X-Prizes, the Bigelow America’s Challenge, or the Google Moon Challenge; and
- ❑ Improved business models suited to the different types and levels of commercial space development. Startups need to be agile and able to adapt to new conditions, while established business may need to grow and partner with others to achieve economies of scale.

Synergy Among the Commercial Space Sectors is Lacking

Synergies do not seem to exist among the various space commerce actors. At least three major sectors are today involved in commercial space. These are:

- (i) the established service providers engaged in the provision of space services, such as satellite communications and geospatial services. These entities offer competitive services vying against terrestrial alternatives in the marketplace. In this sector, having terrestrial terminals that are user friendly and not overly technical will be critical to success;
- (ii) the “space warriors” who need to protect space assets and who are major consumers of commercial space services are wrestling with such issues as “space weaponization” and
- (iii) the “space based” services such as space tourism, access to space habitats, and possibly hypersonic executive transport being sought by the new visionaries.

Only a few enterprises that seek to provide commercial and space tourism, human access to orbit, low cost defense-related space access and lower cost cargo access to orbit appear to have a constructive and integrative role to place with regard to all three types of space-related commercial activities. Elon Musk’s Space X is an example. On the other hand, competition among the various governmental and defense-related providers of space services and a lack of creativity among the defense users of satcom services create

institutional and technological problems in the dual use sector of the commercial satellite telecommunications market.

Challenges to Commercial Space

Among the challenges facing commercial space are:

- ❑ Government licensing and export control (ITAR) regulations;
- ❑ Obtaining sufficient capital;
- ❑ Developing business plans that provide incentives for up front investments while waiting years to achieve a revenue stream;
- ❑ Highly competitive markets that involve many mergers and acquisitions and high debt/equity ratios;
- ❑ Need to obtain, use and exploit new technology without finding oneself on the “bleeding edge of technology,” such as lower cost launcher systems, low cost and user- friendly user terminals, on-board processing systems to allow advanced broadband networking services;
- ❑ To address international requirements for licensing and landing licenses while meeting trade agreements and intellectual property requirements;
- ❑ Providing for insurance, risk management and space safety needs; and
- ❑ Coping with different market characteristics of the various regions including the particular challenges of the developing world and the difficult market structures of Asia.

Short and Longer Term Space Opportunities

Commercial space has a number of opportunities for growth on the horizon with accompanying elements of risk. These opportunities include:

- ❑ Conventional satellite services that leverage economies of scale and integrated markets that use multi-purpose platforms to offer a variety of services;
- ❑ New offerings such as mobile satellite services with alternative terrestrial components (i.e. Terrestrial and Mobile Satellite Ventures);
- ❑ Dual use systems that meet commercial and defense-related communications and geo-spatial service needs;
- ❑ New launch capabilities that come from sources in addition to the NASA COTS program;
- ❑ Advanced launch system capabilities yet to be invented;
- ❑ Diverse geospatial applications and services yet to be developed as a commercial market;
- ❑ New space applications with solar power satellites perhaps having the greatest potential, and
- ❑ Space tourism and hypersonic transportation that will evolve over time. (This new market may very well start from a recreational commercial base but can and will broaden from this start-up mode.)