

Quo Vadis - Space Launch?

*To find the right solution, you must first ask
the right questions*

Dr. Buzz Aldrin

June 21, 2001

Future Launchers Day

Air & Space Museum Le Bourget, France

We all want to see more space flight

- **To acquire more bandwidth**
- **To assure international security**
- **To inspire our young people**
- **To greatly expand opportunities for space travel**
- **To further develop the global economy**

What are the Questions we must address?

- The Market?
- The Path to Success?
- The Players?
- When?

What is the Market to be?

- **Conventional wisdom says it is small and shrinking:**
 - *“By the middle of the decade, worldwide launch capability could be more than twice projected demand.....”* Gen. Thomas S. Moorman, USAF Retired, Vice President, Booz Allen Hamilton, Inc. May 15, 2001 testimony to the U.S. Congress
- **Others foresee an “explosion” of demand:**
 - For increased usage of the *International Space Station*
 - For “Space Tourism”
 - For “Solar Power from Space”
 - For human journeys to the Moon and Mars
- **Who is correct?**
 - If we build it, will they come?

Urgency?

- **Are additional development efforts warranted?**
- **When should they begin?**
- **To what goals?**
- **What are the prerequisites to commit new technologies to full scale development?**
- **When are the results needed?**

Reusable or Expendable?

- Can the “Business Case” be closed for any *Reusable Launch Vehicle (RLV)*? Must it be?
- Can we best achieve the reliability needed:
 - By increased flight rate of expendable vehicles?
 - By repeated use of reusable vehicles?
- Which will be the more economical?
- Why?
- At what level of confidence?

Vehicle Purpose

- If we opt for the *RLV*, should we:
- Emulate NASA's decision of the 1970's: to place all functions in a single vehicle, e.g., the *Space Shuttle*? Or should we:
- Design and build customized cargo, passenger and other special purpose vehicles

Configuration Issues

- **Should we try again to achieve Single-Stage-to-Orbit or use multiple stages?**
- **Vehicle scale: “One giant leap” or stepwise evolution?**
- **If we go to two or more stages:**
 - What should be the *Booster* fuel?
 - The *Orbiter* fuel?
- **Is “engine-out” a necessity or a handicap?**

Propulsion Choices

- **Are air-breathing systems to soon be ready for deployment?**
- **If not, do we need to develop new rocket engines or refine the present ones – or both?**
- **How many engines should be used?**
 - For reliability & flight safety
 - For operational economy?
- **What engine life can we expect?**

And, most difficult of all:

- **How can we best balance cooperation and competition for the common good?**
- **What are the roles of government(s)?**
- **Of international corporations**
- **Of “entrepreneurial” firms**

Have you Addressed These Questions?

- We have, and our answers led us to the *StarBooster* architecture