Congressional Alternatives

Congress could choose to support the development of many different types of space transportation vehicles. To determine which of these alternatives is most appropriate and most cost-effective, Congress must first make some broad decisions about the future of the United States in space. A **commitment to key space program goals will entail a similar commitment to one or more launch vehicle systems. Although highly accurate cost estimates do not exist, the analysis in this study suggests that some launch systems are more economical than others to accomplish specific missions.**

If Congress wishes to:	*Then it should:*
Limit the future growth of NASA and DoD space programs:	*Maintain existing launch systems and limit expenditures on future development options.* **Current capabilities are adequate to supply both NASA and DoD if the present level of U.S. space activities is maintained or reduced.**
Deploy the Space Station by the mid-90s while maintaining an aggressive NASA science program:	*Continue funding improvements to the Space Shuttle (e.g., ASRM and/or LRB)* and/or begin *developing Shuttle-C:* **The current Space Shuttle can launch the Space Station, but will do so more effectively with improvements or the assistance of a Shuttle-C. Although Shuttle-C may not be as economical as other new cargo vehicles at high launch rates, it is competitive if only a few heavy-lift missions are required each year.**
Send humans to Mars or establish a base on the moon:	*Commit to the development of a new unpiloted cargo vehicle (Shuttle-C or Transition launch vehicle or ALS) and continue research and funding for Shuttle II and the National Aerospace Plane.* **A commitment to piloted spaceflight will require a Shuttle replacement shortly after the turn of the century. Large planetary missions will also need a new, more economical, cargo vehicle.**
Continue trend of launching heavier communications, navigation, and reconnaissance satellites and/or pursue an aggressive SDI test program to prepare for eventual deployment:	*Commit to the development of a new unpiloted cargo vehicle (Transition launch vehicle) by the mid-to-late 1990s.* **In theory, current launch systems could be expanded to meet future needs; however, new systems are likely to be more reliable and more cost-effective.**
Deploy SDI and/or dramatically increase the number and kind of other military space activities:	*Commit to the development of a new unpiloted cargo vehicle (Transition Vehicle or Advanced Launch System).* **Current launch systems are neither sufficiently economical to support SDI deployment nor reliable enough to support a dramatically increased military space program.**

Meeting the space transportation needs of specific programs is only part of the reason for making changes to the current launch systems. Congress may wish to fund the development of critical new capabilities or improvements to the "quality" of space transportation, or Congress may wish to ensure that funding serves broader national objectives.

If Congress wishes to:	*Then it should:*
Maintain U.S. leadership in launch system technology:	*Increase funding for space transportation basic research, technology development, and applications.* **Maintaining leadership will require an integrated NASA/DoD technology development program across a range of technologies. Focused technology efforts (ALS, Shuttle II, NASP) must be balanced with basic research.**
Improve resilience (ability to recover quickly from failure) of U.S. launch systems:	*Fund the development of a new high capacity, high reliability launch vehicle (Transition launch vehicle or ALS) or expand current ground facilities or reduce downtime after failures or improve the reliability of current launch vehicles.* **At high launch rates, developing a new vehicle is probably most economical.**
Increase launch vehicle reliability and safety:	*Aggressively fund technologies to provide: 1) improved subsystem reliability; 2) "engine-out" capability for new launch vehicles; 3) on-pad abort and in-flight engine shutdown for escape from piloted vehicles; and 4) redundancy and fault tolerance for critical systems.*
Reduce environmental impact of high launch rates:	*Limit the use of highly toxic liquid fuels and replace Shuttle and Titan solid rocket boosters with new liquid rocket boosters or clean-burning solid boosters.* **The United States will be relying on Shuttle and Titan vehicles through the turn of the century. As launch rates increase, the environmental impact of the Shuttle solid rocket motors and the solid and liquid Titan motors will become more important.**