THE RESOURCE QUESTION

> **A major thrust of this examination is to lower launch costs.** This is ***the key*** to the affordable use of space. We must work this as a #1 priority. In concert with civil and commercial interests, we must move from a low earth orbit cost of thousands of dollars per pound to hundreds of dollars per pound by 2015. Economies of this scale will enable us to transfer investment to ***doing things in space*** vice ***paying to get there.*** Cost reduction will result from technological improvements and competition among expendable launch systems and eventually between expendable and reusable systems.
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> *USCINCSPACE*
> *27 February 1998*

Past experience suggests that by this point in any long range plan, readers start thinking beyond the analysis and toward the hard realities of resources and execution. The competition for scarce resources casts a shadow over all roadmaps–how are we going to pay for this, what are the trade-offs, who suffers in a cut drill, etc.? At the height of the Cold War, planners nearly disregarded these constraints because of the threat to national survival. In developing this plan, we chose common sense as our constraint. We looked at each trend and carried it to a reasonable conclusion–but no further. We outlined what space requires–but refrained from over-promising. Although we don't want to debate budgets or alternatives here, the resource question can't be ignored. But we can describe the context for resolving the funding issue and give our insights on broad trade-offs that show the most promise of achieving our vision.

To frame the resource question, it's helpful to recall the French philosopher, Vauvenargues, who said in his Reflexions: "Necessity delivers us from the embarrassment of choice." Often our nation has stood at a crossroads or strategic pause, struggling with choices, when necessity dictated action. For example, the United States built a navy, sustained a frontier army, and created an air force. In these areas, maritime commerce, western expansion, and the advent of the nuclear age outweighed the budget debates of a nation struggling to be independent, united, neutral, and even solvent.

Clearly, flourishing businesses and nations recognize basic realities, make the best choices, and find the resources. The driving necessity underlying this LRP is the firm belief that the United States is already well on its way to becoming a spacefaring nation, that we are already into an Information Age, and there is no turning back.

Consider our growing dependence on space. In the commercial sector, the space industry has grown at an annual rate of 20 percent in the 1990s. We expect companies will spend about half a trillion dollars on space from now until the turn of the century. Space products affect virtually every industry and every citizen. In the military arena, combat operations rely on information provided by space forces. The bottom line is that every credible vision for economic prosperity and military effectiveness by 2020 depends on space-based capabilities.

The practical result of this dependence is threefold. First, space will become an economic and military center of gravity. Second, our strategy for waging war, as outlined in *Joint Vision 2010,* relies on information superiority, mostly from space. These systems are essential to gathering, processing, and moving information while linking all the members of the joint team. Finally, competitors will notice when we increase investment in, and dependence on, space. This vulnerability will inevitably bring threats, driving a need to protect our assets. Moreover, the clear conventional superiority of the United States will encourage aggressors to achieve their aims asymmetrically–targeting space assets, using space systems to guide long-range weapons, etc. Our citizens won't accept that their military was unprepared to protect our troops from an enemy's free use of space. When we match the reality of space dependence

against resource trends, we find a problem. Missing in the military program is the commercial sector's sense of urgency and shift in priorities. The US military is shaping itself for a new way of warfare guided by *Joint Vision 2010*–a strategy that uses dramatically fewer forces, yet maintains superpower effectiveness. The strategy resolves this apparent paradox by assuming an unprecedented level of information dominance that is impossible to achieve without space. Cutting forces *before* the enabling technologies are in place invites one of two outcomes: we either make good on the promise of space, or we fight the next war using the classic strategies, but with half the forces. This plan defines the capabilities our military needs for the future. Our experience in developing it points to five broad areas offering the best chance of answering the resource question.

Continue to Migrate Missions to Space

As the technologies outlined in this plan mature, we can migrate more capabilities to space. Developing nations have already recognized space's potential to leapfrog traditional paths to modernizing infrastructure such as using communications satellites instead of wiring the countryside. Communication, navigation, and weather systems have largely transitioned to space-based platforms. In some cases, this migration has spawned entire new industries. As current, terrestrial-based, legacy systems age, advances in technology, such as space-based radars and other surveillance systems, will create opportunities for space-based replacements or migration to space in some mission areas.

This LRP identifies capabilities to guide research and technology development that must occur well ahead of programmed replacements or upgrades to existing systems. We can't emphasize enough that senior leaders must seize opportunities to recapitalize. Decisions to lay the groundwork for migrating missions to space must occur before systems stop operating and before we spend a lot of time and money on similar, next-generation replacements of these systems. Leaders must choose within the traditional cycles for replacing equipment.

Determine Space's Full Impact

No adequate trade-off decision is possible without knowing how space affects US capabilities. Our plan points to creating better tools for space modeling and simulation so we can analyze the contributions, dependencies, and vulnerabilities of current and proposed systems. These tools must also give us enough flexibility to test changing assumptions and developments. They will help characterize resources across all space systems.

Leverage Advances in Other Sectors

The US military doesn't monopolize the use of space. So we must leverage advancements in other sectors through active global partnerships with civil, commercial, and international space programs. Of course, certain technologies will require military investments, but we can gain significantly from leveraging, buying, or leasing capabilities from other sectors. Such efforts also tighten the linkages across all national and international space capabilities, opening new opportunities for shaping the strategic environment of the future. If we keep up our end of the association, we can get better capabilities and the best return on national investments.

Find New Ways to Fund Programs

An alternative funding strategy may be to charge customers for services provided. The Department of the Interior and the National Park Service charge a fee for entering our national parks. The Federal Aviation Administration charges commercial carriers a landing fee for each flight. In the launch business, customers reimburse part of the range costs for a particular launch. It may be worth studying the value of a fee schedule for providing some space services, such as navigation or space surveillance.

Perhaps there are some services that lend themselves to the establishment of a working capital fund–Defense Business Operating Fund (DBOF).

Another imposing challenge is to shift priorities so funding for space programs can increase. Not

without precedent, it may be useful to consider the establishment of a separate budget authority for military space.

Strive for Continuous Improvement

Finally, this plan offers strategies to make space operations more efficient. Using best business practices, fostering competition, and tightening margins will drive down total costs for operations and maintenance, thus ensuring scarce resources go mostly to providing valuable services to warfighting. These efforts also complement our other options. The Evolved Expendable Launch Vehicle, for example, is expected to reduce the cost of accessing space by about 50%. The effect of shifting resources from access to operations is a much greater incentive to migrate missions to space and provides more opportunities to cooperate with commercial ventures.

- Optimize payload configuration (e.g., if we field satellites that give us only the minimum to meet our needs we will not achieve best value for the dollar). For a relatively small increase in cost, large gains in capabilities are possible (particularly true for intelligence satellites).
- Develop a common bus to which all our various satellites mate.
- Examine new technologies and procedures to reduce the costs of integrating the payload to the booster.

Although we've tried to reconcile this resource question without poisoning the plan, there still remains some lingering concerns about specific choices. But these trade-offs are best left to other, more appropriate forums. This plan recognizes that we can't turn back the clock. The Information Age is upon us, and the rush to space is unmistakable. Given the lead time required to use cutting-edge technologies in military operations, today's budget decisions won't begin to influence future capabilities for another 15 years–more than halfway to the USSPACECOM Vision for 2020.