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Military Space: Global Change in the 21st Century

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Introduction

The observation of how rapidly the world is changing as a result of technological and economic pressure is to state the obvious. Predicting the present magnitude and rate of the change would have been impossible; projecting into the future will be an equally daunting task. Reflection upon the previous forty years of technological advancement is almost as hard to imagine as what the next forty years will bring in terms of technological products and capability. Yet, from an integrated business standpoint, it would be hard to envision a future with any major industrial business solely owned within any one national border or large economic consortiums which is not totally international.

Commercial and military space systems are an ever increasing part of the "Global Economic Change" picture. The world has become increasingly more reliant on commercial and military space to deliver needed products such as communications, surveillance, navigation, weather, and environmental monitoring. The projections into the 21st century for an increase in space system utilization is significant (ref. Figure 1). Some increased utilizations are obvious, such as increased

Space Utilization Will Increase Significantly in the 21st Century

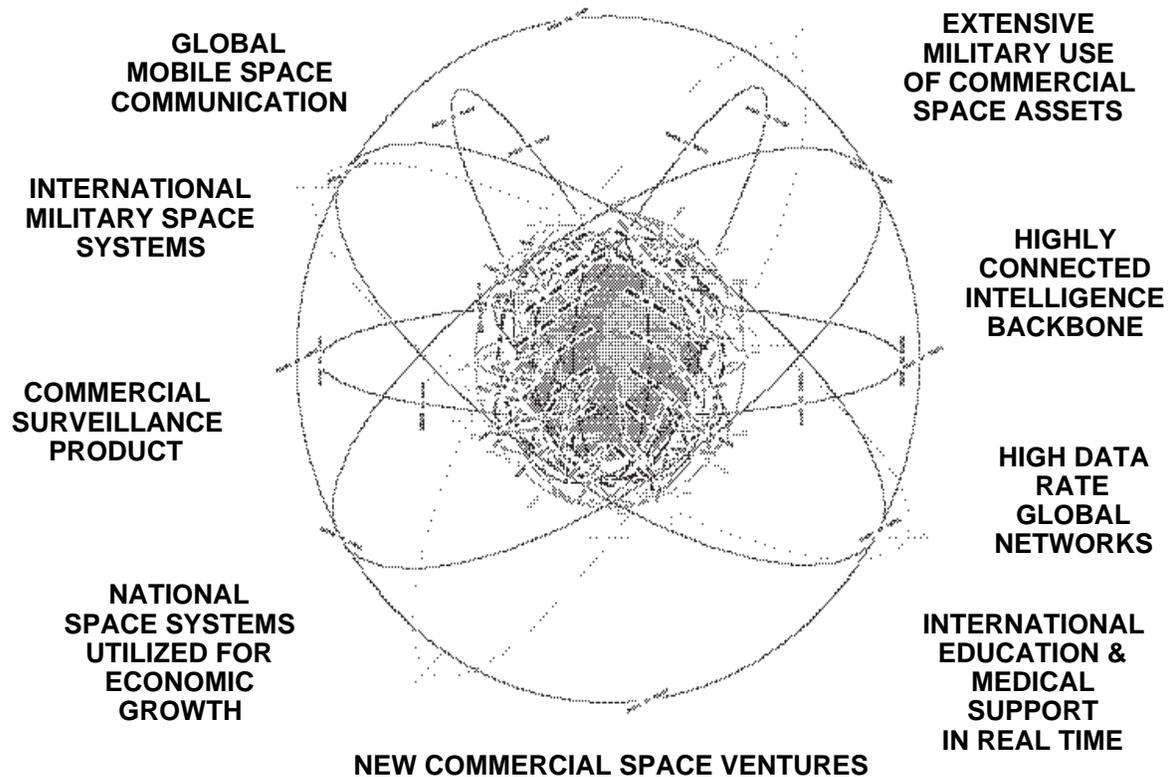


Figure 1.

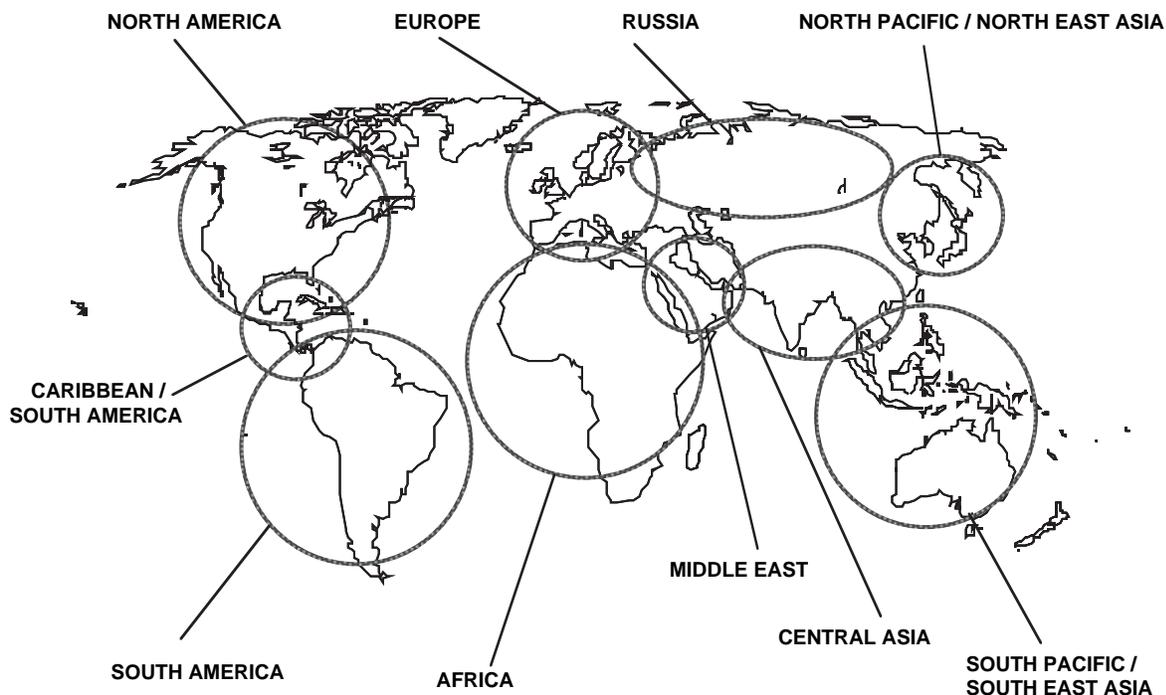
global mobile communications and worldwide surveillance and navigation. Other potential applications, which involve international cooperation and integration of multi-national resources, are not so obvious. However, the global budget climate may force such alliances and international consortiums beyond what we can presently reason. There also will be ventures which may produce global economic benefits and establish entirely new industries not yet imagined. As an example, worldwide Federal Express and travel anywhere in the globe under two hours may be an industry base which will generate significant international economic benefit.

The focus of this paper is to consider the specific subset of changes which will affect military space as well as how existing and/or evolving commercial space assets may be part of the mix.

The environment of global military forces and their place in the emerging world order has changed substantially from their role during the Cold War. Not since the end of World War II have we seen such far reaching changes. Dramatic downsizing in force structure and cuts in funding affecting almost all sectors of the military budget are daily reminders that the Cold War planning framework is gone, apparently for good. Space military missions and planning for future space systems cannot escape impacts from the overall restructuring going on in the U.S. military.

It is becoming extremely difficult to understand and address how such radical downsizing impacts should be handled in the military space arena. One such approach in addressing the issue is to envision how future military, commercial, and international space assets can be cooperatively used and how to identify near-term items or steps which, subsequently, will be needed as well as realistically implemented.

Distributed Multi - Level Global Threat



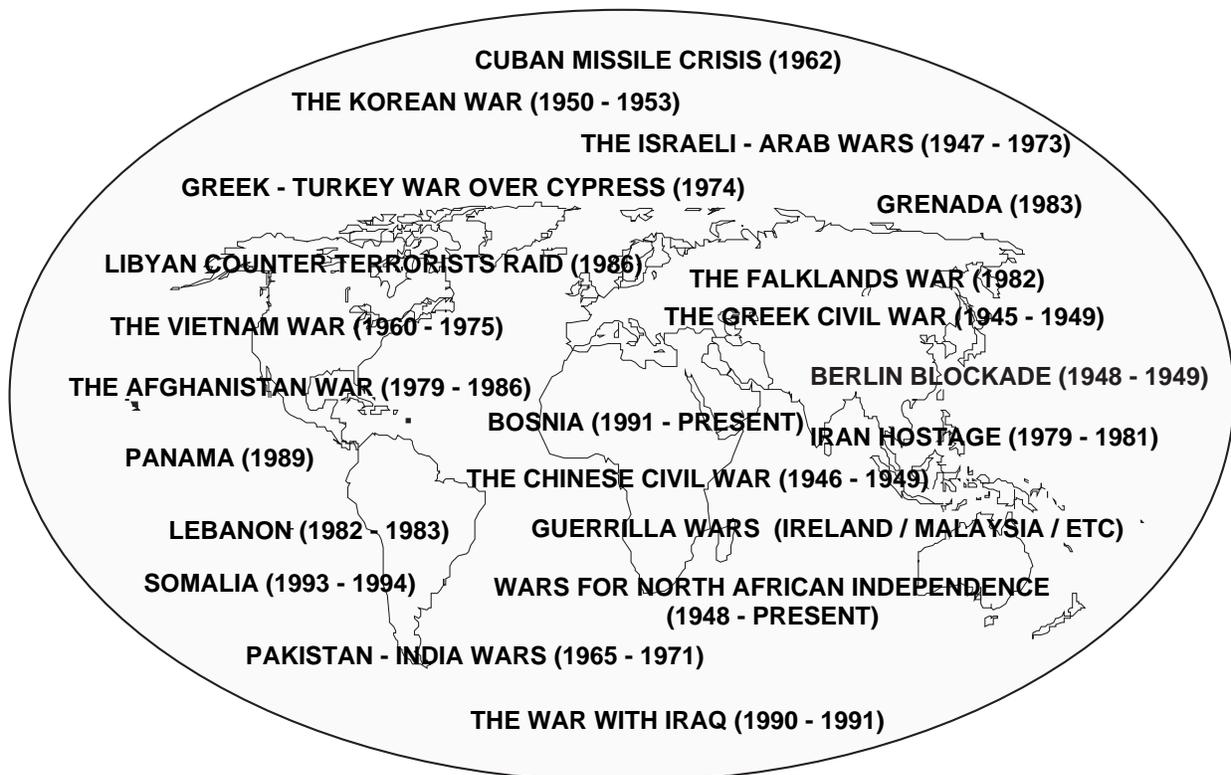
Domestic ----- International ----- Tactical ----- Strategic

Change

Many of the assumptions underlying the planning and usage of military space assets have changed significantly since the collapse of the Soviet threat. Also, the argument about the military value of space has ceased as a result of the extensive utilization of space connectivity and intelligence information during Desert Storm. In fact, almost to a fault, more and more military user requirements of space assets to support the warfighter are creating excessive demands of the system during a diminishing budget environment. To compound this issue, from a military requirements standpoint, it is becoming clear that primary drivers in the future include a much more distributed threat or conflict base and significant uncertainty as to where such conflicts will have to be addressed. Figure 2 reflects major areas of the world where distributed, multilevel global threats could occur. This threat differs significantly from what the military complex was addressing for the last half century. Instead of being able to focus on a few isolated geographical areas with major force structure, the climate now requires global capability against a very diversified threat base. Another aspect of the distributed nature of the threat is the type of threat. We are moving from a single, monolithic strategic threat planning to more regional, tactical international and geopolitical threat to our domestic support functions. Such a distributed threat base is, in fact, much more difficult to address from a finite force structure because it is oriented to major regional conflicts.

Closely related to the distribution of such threats is the uncertainty of knowing the specific nature of the conflict, locations and how existing, developing space system requirements and interface utilization should be developed in such regions. When the past threats were more singu-

Must Have Worldwide Robust Capability



The Past has Proven we don't Know the Real Requirements

Figure 3

lar and of a specific nature, it was much easier to establish requirements which eventually could focus in on and steer military space system acquisition, technology, and deployment. But as recent history has shown (Figure 3), worldwide robustness capability is becoming much more important. As important as the military requirements and planning process are, it is unrealistic to try to project exactly where and how future force structure will be utilized.

These two factors, the shift to a distributed lower level of conflict and the inability to predict conflict location, are negatively impacting our ability to develop military space systems and the supporting technology in the classical development cycle. The whole question of how one justifies acquisition programs and their budget based on “generic user goodness”, rather than hard traceability to documented DoD military needs and requirements, will be an issue that warrants our attention. Whatever the accepted process proves to be, the argument for adaptive, flexible capability will be a paramount issue.

Military Space Utilization in the 21st Century

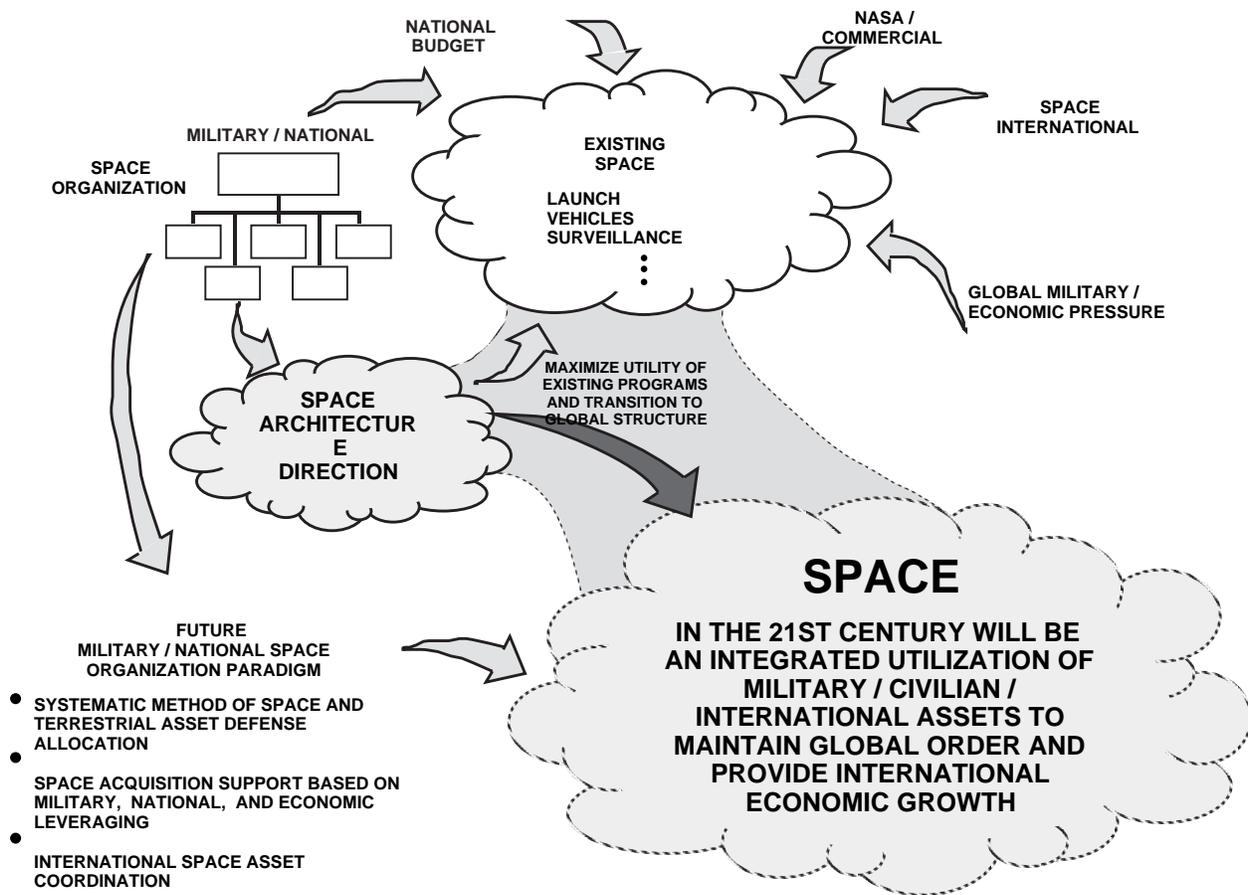


Figure 4

The Future

Presently there is a large body of studies and analyses directed at the aforementioned issues. In fact, new space architecture organizations are presently formulating how to integrate all service space needs and to strategically develop a far term plan and implementation. Figure 4 is representative of current aspects of military space systems and also sets forth a future projection of how space will eventually be utilized. Beyond the near term restructuring and budget consolidation is a major paradigm shift in the basic nature of military space systems. This shift deals with both from an acquisition justification standpoint and also the need to integrate international space and terrestrial assets to maintain global order and provide worldwide economic growth. Clearly stated, these two items represent a major change in the military space business base. The classical program office approach of arguing for a unique “stovepipe” system specifically tailored to only military requirements is over. It will become increasingly difficult to argue a new military system when there is available commercial capability which can meet a significant number of the development requirements. There will continue to be a “hard core” need for survivability and security which must be met by unique military assets, but the majority of requirements may be addressed more economically by commercial or international space providers.

The other major element which will be a driver in this paradigm shift is how to argue and support new budgets for military space acquisition based on the space asset while simultaneously satisfying unique military requirements as well as demonstrating significant national and international economic benefits. Such benefits would provide value added to established worldwide support functions such as disaster response, education, transportation, environmental monitoring and world health. This dual functionality has already been demonstrated by the deployment of a worldwide DoD navigation system, GPS. The time has come to recognize the capability of a new military space acquisition system to generate economic growth potential in new developing technical markets. We cannot allow the genie to be put back into the bottle!

Key Elements

Up until this point the focus has been on the projected ensemble of changes the military space complex may be forced to address. Now it is time to narrow the range of issues and identify key elements which should be facilitated to accommodate the change. The first element is the method by which we approach space system developments and architecture. We can no longer afford to consider separate acquisition on individual aspects of the total architecture picture. If we are going to recognize the changes needed and optimize, to some extent, the cost of a system development then all elements of Figure 5 must be an initial part of the system trade space. The philosophy of first developing the space payload concept independent of a firm understanding of the concept of operation, coordinated user interfaces and integration, and, data infusion and tasking, will now be hard to support. Additionally, available launch capability, both military and commercial as well as the incorporation of commercial space and technology will be of significant importance. There will be little flexibility, from a cost standpoint, to allow weight growth beyond a fixed launch capability. If your goal is to design to cost and not to 100% requirements, parametric trade capability across all elements of system operation and deployment will be required.

Another paradigm shift which will contribute to cost reductions, is the modular standardization of military satellite functions and technology development. Unique, tailored satellite design to meet the last one percent of user requirements must change. In a limited acquisition budget climate, designing to cost may dictate a radical new approach. Figure 6 is reflective of a concept which modularizes MILSATCOM payloads and technology. Such a concept is a radical departure from the present MILSATCOM architecture and development approach. However, such an implementation, if properly developed, could meet many of MILSATCOM user requirements and realize appreciable cost reductions. Independently, major aerospace contractors are now standardizing on spacecraft bus structure which have multiple applications across a commercial spectrum plus military application.

Another key element which would have significant value in addressing future issues is the adoption of a space system interconnect standard. Such a standard, which is similar to the terrestrial open system interconnect standard, is shown in Figure 7. Although commercial and military space users are presently developing separate elements of such an architecture standard, what may be needed is a national or international level thrust which unifies all appropriate elements of both the commercial and military user communities. In general, the business of standards is an extremely difficult task under the best of controlled environments. The mere mention of adopting universal standards which will accommodate both the military and commercial space industries sparks immediate resistance in the development community. In fact, the benefits of standardization are obvious in the very computer equipment used by the satellite developer to formulate a rebuttal of such standardization.

Space Architecture Requires a Total System Perspective

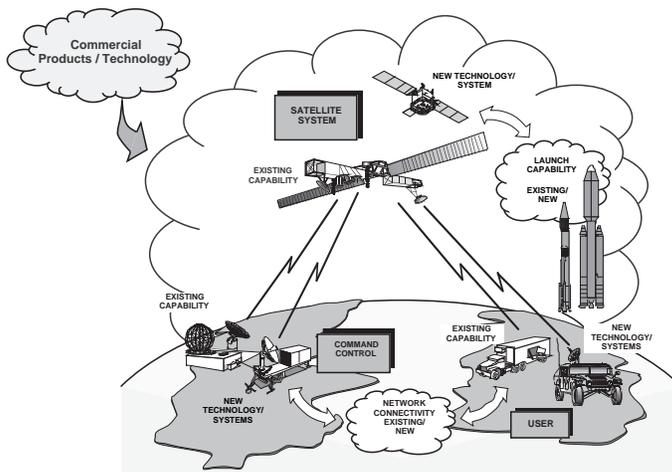
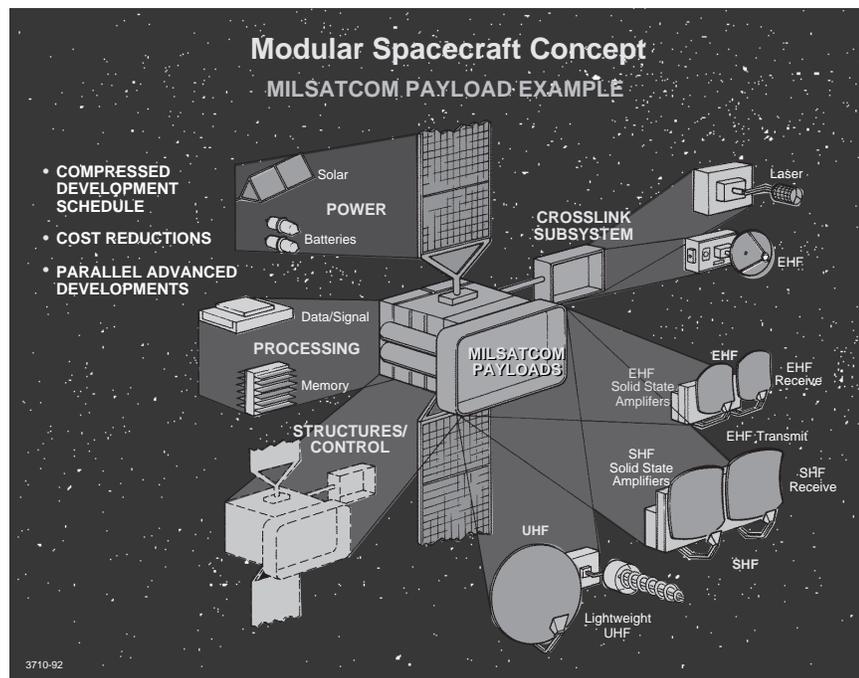


Figure 5.

Figure 6.



Space System Open Interconnect Standard

MILITARY AND COMMERCIAL INTEROPERABILITY

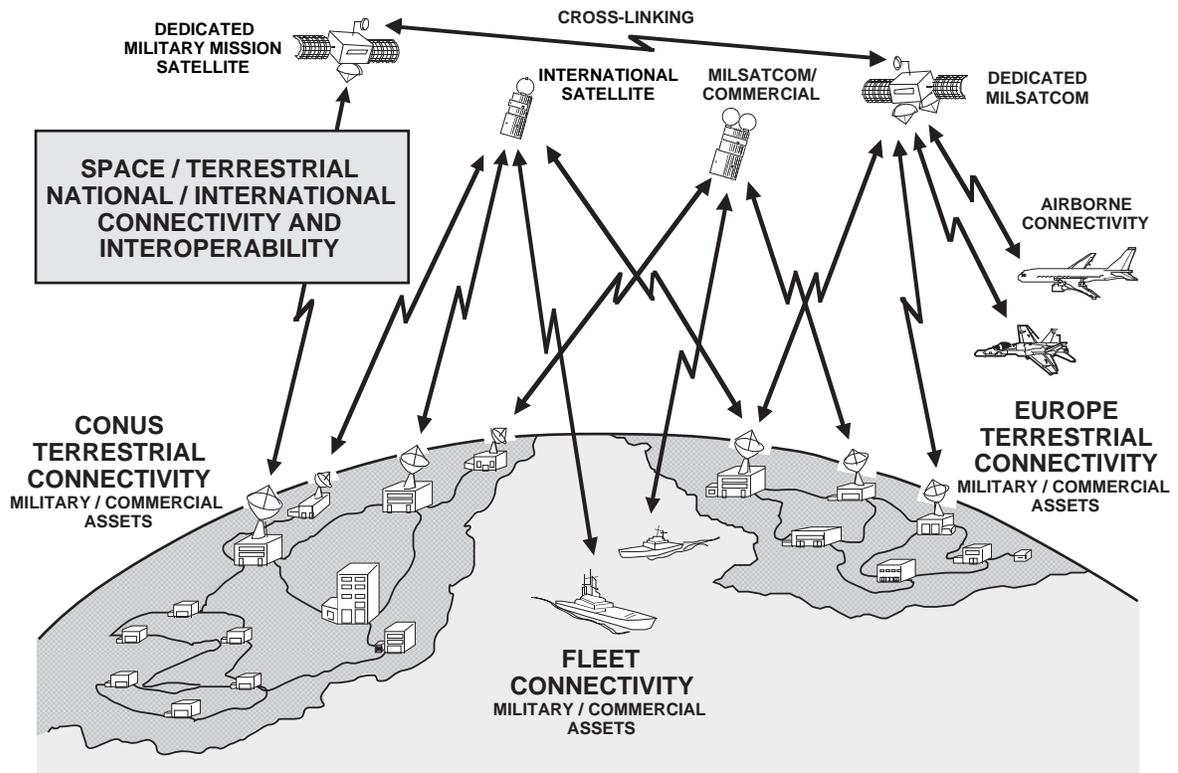


Figure 7

For space applications, if we can start to assume and develop the same commercial terrestrial standardization mentality to networking in space, the benefits could be far-reaching into the 21st century.

Summary

The purpose in presenting these ideas was to illustrate some of the many key factors which will create pressure on our present military space business to change. The reduction in military budget expenditures and the changing nature of a worldwide distributed threat level are primary factors. Other factors, which are more implicit in nature, such as world acceptance of military space systems benefiting world economics, will be modifying factors in terms of new space acquisition. Value added from a military space system to support both specific military user needs and provide new national economic growth will be of paramount importance when arguing for funding support.

There has been a significant amount of time and effort spent over the past several years in an attempt to transition the military from a space “stove-pipe” architecture mentality to a new functionality philosophy which may require the integration of commercial space assets with unique and dedicated military space platforms. The primary rationale for such an architecture shift is the necessity to show significant cost reductions in the development and operation of military space systems. Expenditures in the military space budget are no longer available to continue “business as usual”.