International Space Station Logistics Approach: Partnership and Dialog for a Successful Future

Presentation for the 35th Annual International Logistics Conference
August 6 – 10, 2000
New Orleans, Louisiana

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Abstract

This article seeks to investigate trends and challenges for establishing a successful partnership in a multi-cultural Logistics environment. The U.S. - Russian relationship in the field of space studies is used as the model for this inquiry. Case studies of culture-specific responses to a variety of Logistics situations developed during the initial phase of this cooperation are discussed.

Introduction

The International Space Station is an unprecedented joint venture in human space exploration, an ambitious vision requiring the technical expertise of 22 nations. The future of interplanetary travel and technological advancement in the 21st century depends on its success. Logistics Processes take front seat in assuring smooth transition into the era of international space cooperation.

The veritable task of developing and fostering an environment of mutual trust, respect and collaboration is significantly complicated by the globalization of the workplace and the number of international participants involved. As the two main players, United States and Russia have been running highly visible and successful space exploration programs completely independently from each other for over thirty years. While in some cases the approaches used by both countries in resolving specific tasks are remarkably similar, the non-integrated development of these space programs and obvious lack of communication between U.S. and Russian scientists during the Cold War era contribute significantly to the complexity of the transition to a cooperative multi-national venture, and understandably restrain rapid achievement of joint Logistics goals and objectives.

U.S. – Russian Space Partnership Development in the last decade of the 20th Century.

The foundation for developing the International Space Station (ISS) was laid in the early part of the nineties, when the U.S. and Russia joined their efforts in a joint space research endeavor. A NASA program encompassing 11 U.S. Space Shuttle flights to the Russian Space Station "Mir" over a four-year period was the first step towards multifaceted space cooperation. This program, commonly referred to as ISS Phase 1, utilized assets of both countries, operating under a complicated logistical scheme. Between March 1995 and May 1998, the Mir Station hosted a series of NASA astronauts as crewmembers. In the 39-year history of human space flight, no previous program has required so many transport vehicles, so much interdependency between various organizations, and so much precise planning. ISS Phase 1 experience allowed NASA and its international partners to learn about all aspects of living and working in low-Earth orbit for an extended period, thus preparing successful transition to ISS assembly in Phases 2 and 3.

Space Station Logistics in the United States

The main logistics approach of the United States draws on this country's political philosophy, its military logistics experience, and its space quests using the returnable Orbiter vehicle. In addition, a free enterprise system and mass production play a critical role. As the result, the U.S. version of the Space Station Logistics is developing as a new and independent branch of logistics science.

Political philosophy of a given society frequently determines the need for any exploration. The overall history of space research in the 20th century can be viewed as a good example of this determination.

Military logistics experience accumulated by the United States while developing space defense systems against Eastern Block countries proved a valuable and logical step in progression towards peaceful international space cooperation.

Since the Space Shuttle is presently utilized by the United States exclusively for fulfilling its space research needs, space logistics support to date has been predominantly Shuttle-based.

A typical Orbiter mission rarely lasts longer than two weeks. The relatively short duration of the on-board stay, combined with Shuttle's large cargo carrying capacity and few launches per year, enables crews to have essentially all their logistics needs fulfilled prior to flight or carry enough spares on board for possible repairs. A Shuttle mission, in a way, could be likened to a two-day touring trip in an RV – plenty of opportunities to explore, but the vehicle is air-conditioned and filled not only with all the necessary items but with a few pleasant "extras" as well.

In contrast, the Space Station, with its constant human presence and long-duration flights, presents a different challenge. Moving from Shuttle to Station is like making a marathon runner out of a sprinter champion – it requires considerable determination. Planning and designing strategies become more important, since a short burst of energy would not suffice at a place where long endurance is necessary. Station logistics requires development and utilization of depots where spares can be stored and repairs performed, along with maintaining an extensive database of maintenance and resupply information.

Some of the Station hardware may come from various commercial manufacturers and be used in space either with prior NASA modifications or in "as is" condition, so called "Commercial Off-The Shelf" (COTS) products. A factor to consider here is a fine balance between buying too many spares "just in case" and possibly overcrowding the depot, or keeping a particular company (companies) on the vendor list and hope that it would not discontinue production of the needed item, or go out of business altogether.

The general mobility of the workforce adds to the complexity of the task. Rooted in individuality as the main U.S. founding principle, society encourages people to attempt various moves and changes in their career paths. This, in turn, necessitates a need to design positions that may be re-staffed relatively simply with proper on-the job training provided. Thus, Space Logistics training and development becomes very important. All in all, replacing an experienced U.S. Space Logistician is quite difficult, but not impossible.

Logistics in Soviet and Post-Soviet Russia

In contrast, the driving force behind the Soviet and Post-Soviet space program appears remarkably different. The only definite common trait of Soviet and U.S. logistics approaches lies in its dependency on the political climate of its time.

From the beginning, all Soviet space endeavors were considered a matter of national pride and given highest priority and almost unrestricted funds. The infrastructure of the Soviet Union in all its 15 republics supported space research, development, procurement, production and storage of all items necessary for successful flights.

The official ideology of interdependence and teamwork in one big Socialist family of nations was clearly showcased in the Soviet Union space program. The otherwise somewhat leaky social net of services and government support was lavishly spread around Soviet rocket scientists and space researchers. The system of selection and education of young people with high potential for the benefit of the Soviet space program produced a plethora of talented specialists. The major drawback of such selection was its rigidity: at 17 or 18, a young person would have to decide which career path to select and to follow until retirement. Changing majors in college was not customary. However, excellence in the chosen task, such as space research, was usually highly rewarded. A 22-23 year old graduate of Moscow Technical University (a.k.a. "The Bauman College" in the Soviet time), or of the Moscow Aviation Institute, was virtually guaranteed a well-paid, high-esteemed, secure position within the Soviet space industry.

With time, each specialist became a veritable conduit of knowledge and information in a particular field. Performing the same function for many years and knowing the system and its most intricate details made every researcher, developer and engineer irreplaceable and indispensable. Non-mandatory character of retirement, possibility to combine retirement pay with regular work compensation, and the exciting nature of the job led to "niche-marketing" and provided for a very difficult replacement procedure. In addition, performing the same function for several decades rendered several written documents obsolete: since the developer knew all the details and could recite them from memory on any given day, why bother to write them down? Similarly, no need for specific contracts with vendors and suppliers was ever demonstrated: the

infrastructure of the Soviet space industry was devoted solely to advances in Soviet space exploration. It was a miniature, self-sufficient "country" within a country.

Certainly, logistics responsibilities were part of the overall program, but logistics as a science was never considered. It was always too self-evident, too obvious: logistics tasks had to be completed during every flight, maintenance had to be performed, and spares had to be available. The "great oral tradition" of the Soviet space program stood in the way of developing streamlined logistics approaches.

Very early on, long duration flights became a priority for the Soviet space program. Consequently, sending humans into orbit for up to six months at a time required a philosophy of approach quite different from short-duration flights. Continuing the analogy of U.S. Shuttle flights being similar to and RV trip, a Soviet space station flight was more like a full-fledged hiking and camping expedition in the wilderness: only the most necessary items were taken, and ability to overcome unexpected difficulties were high in demand. Teamwork and interdependency were demonstrated in this setup as well. A "Soyuz" space vehicle is capable of carrying three cosmonauts, and every crew of three would undergo a careful psychological evaluation for compatibility prior to every recommendation to a flight.

The system worked like clockwork and produced impressive results – until the collapse of the Soviet Union. All of a sudden, the well-developed infrastructure began to crumble: the newly independent countries replaced the old republics, and nearly every one of them wanted to be immediately reimbursed for their contributions. Simultaneously, government support for space exploration was drastically reduced. To top everything off, the majority of the young, energetic engineers and scientists who started the program forty years ago were approaching retirement.

Merging Approaches: Working Together For Mutual Benefit

Understandably, joining forces after so many years of non-coordination was a complex and involved task. Several issues had to be addressed on all levels, from Governmental Agreements between U.S. and Russian Presidents, all the way down to the working group levels. Very frequently, especially in the early stages of the U.S. – Russian space cooperation, the feeling of strong national pride each country expressed in its own space program became a concern and sometimes delayed reaching common goals in a more expedient and efficient manner. The whole process was not unlike merging households of two independent, confirmed bachelors who decided to split the rent and utilities of a jointly owned larger house.

Contemporary advances in all branches of science make space research imperative. If humankind is ever to wander beyond the boundaries of Earth, projects like the Station are both necessary and logical. The currently flying Russian Space Station "Mir", though fully functional, is well advanced in age, and cannot efficiently comply with all the technological requests required for the 21st century. A new station is needed to continue human presence in microgravity. Yet the International Space Station is simply too large for any one country to handle on its own. Thus, international space cooperation reaches paramount importance. U.S. – Russian relations are the first, very convincing step in this direction.

Fostering Logistics Understanding Among Russian Partners

One of the major problems encountered by both countries in the process of becoming partners was the initial Russian reluctance to accept Logistics as an independent discipline. Not surprisingly, this problem was largely terminological. When U.S. Space Logisticians succeeded in presenting their point of view in such a fashion that it became important to their partners in Russia, all further negotiations gained momentum. In addition, initial Russian perception of the joint Space Station logistics efforts being something frivolous, something reserved for people with larger funds, something requiring additional costs and labor without producing obvious benefits for Russia, also played a role in the joint Space Station Program discussion. Fortunately for both sides, after a long and sometimes very frustrating time, the common sense prevailed, and joint efforts for developing the first-ever International Space Logistics System are now underway.

Enriching Each Other's Experience

Both countries are confident that there is much to give and to receive. One of the main questions, of course, is accessing each other's resources without infringing on the partner's know-how, intellectual rights and proprietary information. The road to success is still somewhat rocky, but after almost six exciting and trying years, the two countries have definitely developed an atmosphere of cooperation and mutual trust. This, by far, does not mean that U.S. and Russia agree on every aspect of space research. Sometimes the best anyone can do is to state the main points of disagreements and record them in a meeting protocol. But mostly, the U.S. – Russian cooperation has been very successful and served as an example for developing international space relationships for other participating countries. With every new Space Station launch, the world is coming closer and closer to a common understanding of many space-related issues, including Space Logistics. In essence, U.S. and Russia design and define the initial stage in the development of this exciting new discipline.

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Introduction

- International Space Station : a New Era of Cooperation
- International Space Relations
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U.S. – Russian Space Cooperation

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Fostering Logistics Understanding Among Partners

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Enriching Each Other's Experience

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- Challenges
- Developing Space Logistics As a New Discipline

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Information Release Request

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15. REMARKS	See Comments p. 1

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