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SPACE LOGISTICS

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Logistics — is a science and area of applied activity that forms and controls stream environments and their impulses of kinetic processes in natural, artificial, nature like, and combined systems involved in intellectual, innovative, economic, social, cultural, engineering, political and military spheres [1].

It is obvious that logistics plays the key role in aerospace industry. Delivery of cargoes to the orbital stations is one of the most important components of its stable functioning and existence in general. That is why this paper deals with the main aspects of space logistics and suggests some new ideas.

Firstly, let us introduce some definitions in the sphere of space engineering.

Space System (SS) – combination of multifunctional spacecraft that includes orbital spacecraft and reusable launch vehicles.

Multitask capability of a SS is stipulated by the functions of the systems involved. Each system is designed to solve its own tasks regardless of the tasks set for the SS in general.

Space Transportation System (STS) – reusable space system intended to carry out transportation.

Reusability of STS means that some main subsystem assemblies of STS can be used again after testing and maintenance [2].

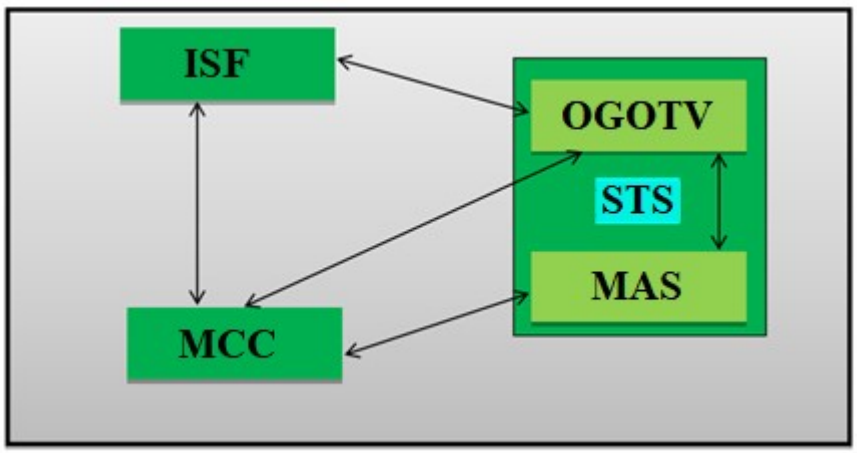

Fig. 1. Block diagram of SS and STS:
Double-headed arrows show interrelation of SS and STS components

Analysis of modern logistics stage has revealed that there are three main approaches to formation of logistics environments, systems, and supply chains.

First approach can be called conditionally ‘operational’, oriented to the improvement of range various processes, operations, and activities in national and international logistic systems.

Second approach can be called conditionally ‘flexible’. Its essence is in operative, fast and high-quality performing of assigned tasks.

Third approach can be conditionally called ‘integrated and harmonized’. This approach concentrates on integration, harmonization, coordination, and optimization of the final result of work of all the participants of logistic chains and units in the framework of national or international levels of logistic systems. This approach also concentrates on the complex of all logistic streams as processes of mutual transformation.

It should be noted that in modern conditions logistics is to meet the requirements of all these approaches simultaneously [3].

At present, the following underlying principles of international logistics of space and boundaries can be formulated:

– rational and civilized combination of efforts of governments and representatives of various levels and business to exchange tangible and intangible assets, professional personnel, and innovations between the countries;

– adequate transparency and clearness of international and cross-border business for the personnel, partners, customers, and governmental authorities;

– progressive increase, propagation and penetration of business culture, environmental safety, achievements of management, marketing, logistics, control of delivery chains, trade andcommodity distribution networks of outsourcing, outstaffing, information technologies, and e-commerce in international economic relations;

– economic defense of states and their business in scientific and other activities;

– humane, legal approach to reach the balance, compromises, and solution of commercial disputes in international research activity.

Let us consider an example of SS logistics when all three approaches are used to form the functional environment:

– if quantity of operations and processes in the system is just increased, it will result in partial cooperation between Industrial Space Facility (ISF) and Multipurpose Aerospace System (MAS) due to technical reasons, but the main relations will not be affected;

– if only quantity and execution task rate are improved, it will result in autonomous work of the system, but will not affect the other system performance;

– if advanced system operation is reached, interrelation between Mission Control Center (MCC) of the SS and Orbit Group of Orbital Transfer Vehicles (OGOTV) can be naturally brought down to a minimum.

To join all possible advantages, it is suggested to accumulate all available resources of the SS using all three approaches. Moreover, it is necessary to introduce independent communication between SS MCC and STS to provide due control on keeping the rate of mode readjusting of the SS.

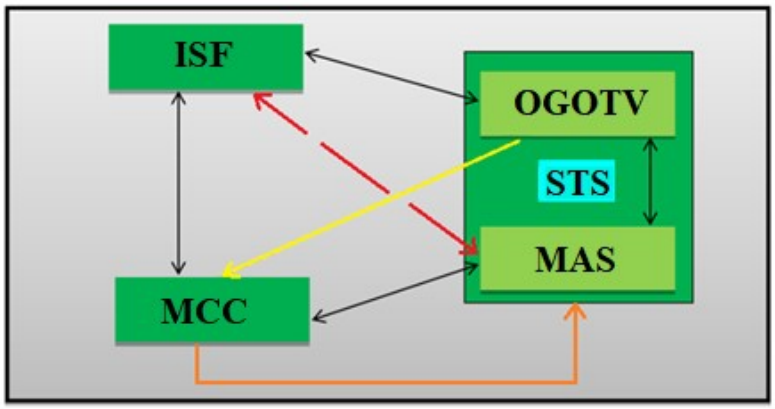

Fig. 2. Improved block diagram of SS and STS:
Arrows show different relations of SS components

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