mise the gravitational perturbations during performance of other scientific experiments. Considering that the energy of solar batteries is used for this type of PS, and only the propulsive mass (xenon) is consumed, this method of ISS orbit stabilisation is rather cost-effective one.

Within the framework of co-operation between the SDB «Fakel» (SPT manufacturer), the Rosaviacosmos and the IMSP, this experiment is accepted for feasibility study. It is intended to use the standard PS, namely the batch SPT-70 with the power of 700 W (1.5 kg mass) and SPT-100 with the power of 1350 W (3.5 kg mass). The consumption of the working gas (xenon) in the design mode is up to 2.8 mg/s for SPT-70 and up to 5.5 mg/s for SPT-100. It is also possible to use various tanks for the working gas depending on the purpose of the work (test of the cathode-neutraliser and/or compensation of the braking moment) and on the ability to replace them (for example: a) V = 1 l, M = 1 kg, M_{Xe} = 1.78 kg; b) V = 15 l, M = 6 kg, M_{Xe} = 1 kg; c) V = 50 l, M = 15 kg, M_{Xe} = 78 kg).

When SPT of other types are used, the power rang can be increased up to 1500 W (for each thruster).

For carrying out this study under the conditions of the ISS, it is possible to define the following two technical problems:

1) Study of the behaviour of the thermal emission elements made from lanthanum hexaboride. The initiation moment is the most critical for the serviceability and operating life of the cathode-neutraliser. From this point of view, it is desirable to provide the multiple switching on/off of the SPT with various modes of heating, operation and cooling. This will provide a substantiation for extension of the experience of ground-based tests to SPT operation under the space conditions.

2) Use of the EJPS for stabilisation of the orbit and/or control of the position of the ISS with the operation time of not less than 8000 hours.

«Optocoupling» Experiment

FIBER OPTIC ROTARY JOINTS FOR NON-CONTACT TRANSMISSION OF INFORMATION TO AND FROM ROTATING EQUIPMENT

Svechnikov S. V., Shapar V. N.

Institute of Semiconductor Physics, NAS of Ukraine
45 Nauka Ave., Kyiv 03028 Ukraine Tel: (380) +44 +2657081

The purpose of the experiment is to develop, study, and manufacture high-quality pilot models of the multipass fiber optic rotary joints (FORJs). The FORJs are designed for optoelectronic transmission of different digital and analog data from the rotating objects installed onboard the ISS to the stationary objects.

To date, the contact, capacitance, and inductance slip rings have been used for data transmission from rotating to stationary equipment. Contact slip rings have been mostly used as the simplest and cheapest ones. The advancement of information technologies has been accompanied by the impetuous increase of transmitted information scope and by introduction of fiber optic sensors and communication lines on rotating equipment. Due to this factor, the traditional application of electrical slip rings in modern facilities has become more and more problematic and in some cases impossible because of their principal disadvantages. For example, the number of physical channels in electrical slip rings for transmission of large volumes of information amounts to as much as several hundreds of channels because of lack of sufficient bandwidth. Thus, the weight of these devices can be up to several hundred kilograms. A high level of noise, as a result of friction and sparking of contacts, and a high sensitivity of contact slip rings to the electromagnetic barrier, cause serious problems in their use in equipment where strong electromagnetic fields are present. Besides, both sparking and the possibility of self-ignition of contacts create unsafe conditions for slip rings use in facilities where explosion hazard exists.

Development and introduction of fiber optic rotary joints instead of the traditional slip rings as their functional analog is the alternative solution of the problem of information transmission from rotating equipment.

The creation of FORJs is of great importance in such developed countries as the USA, Canada, Japan, and the United Kingdom. In the USA, the development of FORJs for instrumentation is one of the top priorities.

A considerable contribution to this field has been made at the Institute of Semiconductor Physics of the NASU [1-3]. It was developed a unique method of signal transmission between objects, which move relative to each other, by means of step-by-step compensation of velocities and directions of light beams (Invention certificate No 1832395, 1992). The developed method opens up the possibility to create multipass FORJs for dozens of optical fibers of different modifications. In addition, multipass FORJ on the basis of a graded-index optical compensator with unique characteristics has been designed (not less than 500 MHz bandwidth; not more than 2.5 dB insertion width; not more than 0.5 dB actual rotational variation; up to 10 channels; not more than 5...7 cm overall dimensions; less than 250... 300 grams weight).

A great bandwidth of a FORJ's channel, which is thousand times greater than that for an electrical channel, compactness and low weight, reliability and long service life, as well as no need for adjustment for several years are the principal advantages, which exactly meet the requirements to space equipment.

The most promising trends for the FORJ's usage onboard of a space vehicle are the following: space robotics, radar antennas, remotely operated vehicles, cranes and turrets, telemetry of rotary objects, and other fields, where there is a necessity to transmit information to and from the rotating equipment. The designed multipass FORJs and preliminary research allow us to confirm the applicability of the devices for the above purposes.

It is, however, necessary to study the influence of space emissions, high vacuum, as well as low temperatures on optical and operating characteristics of FORJs for their direct usage onboard the space vehicles. Investigation of these factors permits selection of the materials needed and development of special designs of FORJs for operation in a space environment.

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«Factor» Experiment

PROSPECTS FOR STUDY OF STRENGTH OF STRUCTURAL MATERIALS AT THE OSS

Stryzhalo V. O., Skrypnyk Yu. D.

Institute for Strength Problems, NAS of Ukraine
2 Timiryazevska St., Kyiv 03014 Ukraine
Tel: (380) +44 +2962657, Fax: (380) +44 + 2961684

The near-earth space factors (NESF) adversely affect the strength of metal structural materials for space industry. These factors are classified into the following groups: vacuum, chemical composition of the atmosphere, corpuscular radiation, electromagnetic radiation, meteors and cosmic dust, and temperature. The NESF effect on structural materials is primarily exerted through their surface layers and also through the mechanisms of radiation damage. The simulation of the aforementioned set of NESF and its long-term confinement under the laboratory conditions is, in essence, an unsolvable problem. For this reason, there is a necessity to carry out mechanical tests directly in raw space using special equipment mounted on the outer surface of the OSS.

The goals of the experiment are as follows:

- qualitative and quantitative assessment of the NESF effect on the load-carrying capacity of structural elements during their long-term operation;
- development of specifications for design of load-carrying structures operating under space conditions for a long time;