

«Penta-Tribos» Experiment**STUDY OF THE ADEQUACY OF THE FRICTION AND WEAR DATA
OBTAINED FOR ANTIFRICTION AND WEAR-RESISTANT MATERIALS
DIRECTLY IN SPACE AT ORBITAL STATIONS
AND IN LABORATORY CONDITIONS****Gamulya G. D., Ostrovska O. L., Yukhno T. P.***Special Research and Development Bureau for Cryogenic Technologies of the ILTPE, NAS of Ukraine**47 Lenin Ave., Kharkiv 61164 Ukraine**Tel/fax: (380) + 572 +322293, e-mail: sktb@ilt.kharkov.ua*

The necessity of development of a new generation of space equipment which will be capable of safe and stable operation in near-earth orbit, as well as under the conditions of atmospheres of Solar system planets and in interplanetary space created a need for generation of valid information on friction-and-wear properties of structural materials and coatings intended for use in friction units of mechanisms and systems of space vehicles and OSS. Availability of such information is of special importance due to the fact that various faults and failures in spacecraft systems become increasingly frequent because of failures of friction conjunctions during the long-term flights. It is very difficult to implement tribological research of promising materials directly under the space conditions for technical and economic reasons. This circumstance has led to development of scientifically-grounded methods for determination of friction-and-wear characteristics of materials in ground-based laboratories, using special equipment for simulation of the influence of near-earth space factors on the friction pairs.

In this experiment, it is proposed to carry out a series of comparative tribological research under the flight conditions onboard the ISS and in a ground-based laboratory. Special on-board 6-module space tribometer will be used for this purpose.

Three tribometers will be used to realize one series of experiments. The astronaut-researcher will set up these tribometers one after the other on a special platform, which will be mounted on the ex-

ternal surface of the ISS. During one series of experiments it is planned to study 18 pairs of wear-resistant and antifriction materials and coatings. The duration of one tribometer operation is 3-5 hours (in the continuous or cyclic modes). Monitoring of experiments, recording of friction parameters and transmission of the results to Earth will be carried out with the help of a unified «PENTA» system for remote control and data processing.

When the program of experiments is completed, the tribometers are taken back to the Earth for diagnostic of the friction surface condition, establishment of wear parameters and mechanisms. Ground-based laboratory research will be carried out under the conditions of simulated space factors.

Comparative study of the data obtained in space and on the ground will allow revealing the adequacy of tribological research under various conditions.

Preliminary study and selection of materials, as well as development, manufacturing and testing of space tribometers, is planned in co-operation with specialists from the IMSP NASU and the Yangel State Design Office «Pivdenne».

The results obtained in «Penta-Tribos» experiment will permit prediction both the frictional behaviour of friction units and the safe and durable operation of space vehicles. This study will also allow certification of laboratory tribometers for space applications and will provide an opportunity for international certification of materials that are promising for use in spacecraft friction units.