
ABSTRACTS

On the state space program of Ukraine

V. P. Gorbulin, A. P. Zavalishyn, O. O. Negoda, and Ya. S. Yatskiv

Space Science and Technology, 1995, 1, N 1, P. 7—11 (in Ukrainian).

Conceptual basis of the state space programme of Ukraine is discussed. Characteristics of lines of research and main projects are given.

Scientific and technological trends in designing spacecraft in the M. K. Yangel' Yuzhnoe Design Office

S. N. Konyukhov

Space Science and Technology, 1995, 1, N 1, P. 12—34.

The paper describes the conditions which permitted the Yuzhnoe Design Office to become a leading enterprise in the field of producing launch vehicles and spacecraft. Previously the Yuzhnoe specialized in the development of ICBM complexes. A short list of spacecraft designed by Yuzhnoe is presented as well as a review of space investigation programmes realized in the period from 1962 to 1995 using these spacecraft. Principal characteristics and design features of the spacecraft developed in the Yuzhnoe at different stages of its operation are given. Considerable attention is given to problems of development and improvement of spacecraft support equipment. The paper shows contribution of the Yuzhnoe Design Office to resolving the scientific and technological problems in the development of several spacecraft generations. It reflects also Yuzhnoe's role in the investigations and exploitation of space environment within the "Cosmos" and "Intercosmos" programmes and later within the scope of the state space programme of Ukraine.

Concept of developing control system for automatic spacecraft of "Spectr" series

Ya. E. Aizenberg

Space Science and Technology, 1995, 1, N 1, P. 35—46.

Automatic spacecraft (ASC) orientation is described with an orientation quaternion defined by the platform-free inertial system algorithms using data from gyroscopic meter of angular velocity vector (GMAVV). Redundancy of the GMAVV data allows detecting failures and turning off faulty sensors (up to 2 of 6). GMAVV deflections proportional to time are estimated by the ASC position optical sensor readings with the help of Kalman filter. A telescope orientation accuracy of 30 arcsec is reached by using data of optical sensors mounted directly on the telescopes. The example of such a sensor is "TAUVEX" (Israel) mounted on the telescope "SODART" (Denmark), this sensor data being used in "Spectr-RG" ASC Control System (CS). Scientific telescope angular stabilization accurate to 0.25 arcsec and angular velocity accurate to 10 degree per second is reached by using Kalman estimation of ASC phase coordinates and of its disturbing moments when forming flywheel control signals. During one observation session the CS of power gyroscopic system ensures tenfold automatic telescope reorientation with taking into account restrictions on its position relative to the Sun, the Moon, and the Earth. The autonomous navigation algorithms based on integrating equations of the ASC mass center motion allow the direction of a transmitting aerial towards the Earth measurement point with a 3 angular minute accuracy.

The “Spectrum-UV” space project

R. E. Gershberg, A. M. Zvereva, P. P. Petrov,
V. I. Pronik, and N. V. Steshenko

Space Science and Technology, 1995, 1, N 1, P. 47–56.

The “Spectrum-UV” Project, an international ultraviolet space observatory, is described. The observatory will include 1.7 meter aperture ultraviolet telescope equipped with a set of spectrometers of high, medium, and low resolutions and an imaging camera operating in the 912–3500 Å wavelength region. High-apogee (up to 300 000 km from the Earth) orbit will make it possible to carry out long time series of astrophysical observations.

**Complex investigations of physical and mechanical properties
of light-absorbing coating materials
of the Mars-96 and Regata space vehicles
under the influence of outer space factors**

V. V. Abraimov, N. N. Agashkova, L. Bohne, I. V. Budnyak, N. I. Velichko,
A. V. Krevsun, V. I. Kostenko, F. Lura, and A. M. Markus

Space Science and Technology, 1995, 1, N 1, P. 57–68.

Physical and mechanical properties of four types of light-absorbing coating materials were investigated comprehensively under the conditions closely approximating those of the outer space. The physico-chemical processes occurring in irradiated materials are shown to depend on the radiation type as well as on the radiation energy and dose, the structural and chemical composition of the polymer. Based on the experimental results, the Kapton is proposed as a base for the light-absorbing coatings as well as for other composites intended for use in the outer space. In addition to its maximum resistance to radiation, it features plasticity at 4.2 K in contrast with other polymer materials. The Kapton plasticity is supposed to be of quantum nature at $T = 4.2$ K.

**Space vehicle navigation
by means of GLONASS and NAVSTAR GPS signals**

A. A. Zhalilo, P. A. Kot, I. N. Minervin, I. G. Nozdrin,
V. V. Piskorz, and L. P. Rofvarg

Space Science and Technology, 1995, 1, N 1, P. 69–73.

There is a tendency to use widely the equipment of Global Positioning Systems (GPS) GLONASS and NAVSTAR for different applications. One of these applications is the test and control of space vehicles. If the GLONASS and NAVSTAR are used together, the navigation field at altitudes of more than 5000 km is not continuous. In this case a pseudolite or a range and rate measuring device have to be used for accurate and reliable GPS positioning. Simulation estimates of GDOP probability and positioning accuracy of a space vehicle launched to the geosynchronous orbit are presented in this paper. The paper also outlines the features of operation with navigation satellites entering and leaving the Earth shadow.

**Structure algorithm organization and reliability models
of reserved systems**

A. I. Krivonosov, A. A. Kulakov, N. K. Baida,
V. S. Kharchenko, and N. P. Blagodarny

Space Science and Technology, 1995, 1, N 1, P. 74–79.

The paper presents the results obtained in the investigations of the structural organization of on-board operating computing systems with reserved architecture and the influence of the amount of general-purpose equipment upon the reliability characteristics of unadapted reserved architectures. Reliability estimates of adapted reserved architectures with interchannel and external control are given. Some results obtained in the realization of specialized computers at the “Khartron” company in Kharkov are described.

**Cryogenics in space research:
Developments of B. Verkin Institute for low-temperature physics
and engineering of National Academy of Sciences of Ukraine**

S. I. Bondarenko and A. M. Kislov

Space Science and Technology, 1995, 1, N 1, P. 80–95.

We present some results of investigation and engineering of cryogenic electron-optical, mass-spectrometric, and super-conducting devices for space research, ground-based infrared devices for studying space objects, on-board cryostat systems, cryogenic vacuum imitators of the outer space, materials and technologies for investigations in the outer space.

**Investigations of the ionospheric precursors
of earthquakes project “Poperedzhennya”**

N. Ya. Kotsarenko, V. E. Korepanov, and V. N. Ivchenko

Space Science and Technology, 1995, 1, N 1, P. 96–99 (in Ukrainian).

Disturbances in the ionosphere related to seismic phenomena are discussed, special attention being paid to earthquake precursors. The necessity to study these precursors is shown, and the ionospheric parameters which might be used for short-term earthquake predictions in the global system of seismic activity prediction are identified. Main parameters of the space vehicle and scientific equipment of the international “Poperedzhennya” project are presented. The project is developed within the framework of the state space program of Ukraine.
