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CENTRAL RESEARCH INSTITUTE OF ARMS
OF THE ARMED FORCES OF UKRAINE

**COORDINATION PROBLEMS OF MILITARY TECHNICAL
AND DEFENSIVE INDUSTRIAL POLICY IN UKRAINE.
WEAPONS AND MILITARY EQUIPMENT
DEVELOPMENT PERSPECTIVES**

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Bigun S.*State Enterprise «Design Bureau» Yuzhnoye «***Skokov A.***State Enterprise «Ukrainian Research Design-Technological Institute of Elastomer Materials and Products».**SE «URDTI «DINTEM»***DEVELOPMENT OF THE METHODOLOGY OF ESTIMATION OF THE RELIABILITY OF THE SLEEVE HOSES OF THE THERMOSTAT SYSTEM**

In the process of creating the docking nodes (CC) of thermostating systems for the LCS, the question of reliability evaluation first arose. According to the terms of reference for the Cyclone-4 spacecraft, the following reliability requirements were imposed on the SS hoses:

1. The probability of failure-free operation during the supply of thermostating air is not less than 0.9999.
2. Assigned resource - not less than 203 cycles with a total number of starts not less than 80 during the service life of not less than 15 years.
3. Continuous supply of thermostating air at a flow rate up to 3850 m³ / h under overpressure up to 20 kPa.
4. Tightness and integrity.

The task of calculating reliability consists in identifying the basic conditions of operability and quantifying all the above requirements imposed on the sleeves of the US.

The first condition of operability is equivalent to the fact that the strength of the sleeve is higher than the voltage, which creates an overpressure of 20 kPa in the material of the sleeve.

The second condition of operability is equivalent to the fact that the sleeve tension caused by the deflection of the boom of the installer always exceeds the force value of 2.5 kgf.

The third condition of operability is equivalent to the statement that the force of disconnection of the sleeve of the US from the neck of the ILV creates a stress in the sleeve material that is less than the allowable stresses of the strength of the material of the sleeve.

1. As a result of bench tests of analysis and calculation, it is established that the sleeve of the US maintains its integrity and tightness for 72 hours with a probability almost equal to unity.

2. The integrity of the CSS sleeve when it is disconnected from the throat of the thermostating of the RCV by the deflection of the boom of the installer to the starting angle is stored with a probability of 0.9999999, ie, practically equal to unity.

3. Indicators of reliability of the hose of the CC of the thermostating system of the RKN, calculated at the stage of release of the RDD, meet the requirements of the technical assignment with a guaranteed margin.

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NON-DESTRUCTIVE STRENGTH AND HERMETIC SEAL DIAGNOSTICS AND PREDICTION OF SUPER-HIGH-FREQUENCY ELECTRONIC MODULES

The special place in electronic industry is taken by the equipment which is installed onboard of airplanes, rockets or other type of transport and hence exposed to harsh environment that is likely to cause variety of defects and breakdowns. The objectives of the current research are super-high-frequency (SHF) sealed electronic modules whose enclosure case is made from aluminum. The research is focused on the static and dynamic strength and hermetic seal of their cases in conditions of excessive atmospheric pressure and temperature impacts. The following experiments aimed at achieving the research goal have been conducted:

- research of excessive pressure and temperature impacts on hermetic seal of the welded joints;
- research of super-pressure cycling loads at increased temperature;
- identification of depressurization pressure in sealed cases;
- finding dependence of residual strain and stress progression on number of load cycles applied to the sealed cases.

For conducting experiments the measuring train has been developed. The train consists of the following instruments: tensometry, acoustic emission (AE), thermal and pressure systems. The tensometry system is purposed for receiving signals from strain gauges that deliver information about static and dynamic strain in stressed cases. AE

system reads signals from piezoelectric transducers. Thermal and pressure system provides temperature and super-pressure tests on the researched objects.

The experiments subjected cases to the following tests:

- thermal cycling in the range from -60 deg C to +80 deg C in three cycles under inner super-pressure of 0.4 atm. and normal external pressure;
- super-pressure load of 1.6 atm. in normal environmental conditions;
- cycling load by inner super-pressure from 0 to 1.6 atm. at the temperature of +85 deg C in up to 100 cycles.

The welded joints are considered to be the most risky part of any metal construction due to likely technological defects such as lacks of fusion, cracks etc. Presence of such defects was proved by tensometry data indicating strains in tested objects. Besides, cracks progress in welded joints much easier than in basic material what can be indicated by using AE methods. AE data was processed after tests by special programs to plot graphs of AE parameters time progression and their planar location. For each tested case the following graphs were obtained:

- AE activity versus time;
- AE amplitude versus time;
- AE power time rate versus time;
- AE amplitude distribution;
- AE signals linear location;
- 3D diagrams of AE activity, amplitude and power.

Obtained experimental results were used for developing methods for non-destructive strength and hermetic seal tests of SHF electronic module cases.

The main results are:

1. The non-destructive strength and hermetic seal diagnostics and prediction method has been developed for SHF electronic module cases by static non-destructive inner super-pressure. The tested case complies with the standard in specified pressure diapason if AE activity does not exceed the acceptable limit, otherwise the case is rejected.
2. The non-destructive depressurization prevention method of acoustic emission has been developed for warning risks of depressurization in SHF modules installed onboard of aircrafts when they are exposed to pulsing cyclic pressure drops during takes off and landing which are likely to cause damages in welded joints and hence depressurization of the case. Keizer effect what appears as ceasing AE signals after the first cycle testifies of sufficient strength of the case. Regaining AE during some of the next cycles indicates or "warns" of the beginning of fatal destruction process which will lead to case depressurization in 6-10 cycles of takes off and landing.
3. The portable onboard AE signaling device has been developed for indicating beginning of case depressurization or destruction of monitored parts or units fling onboard.

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ENHANCEMENT OF ACCURACY OF MEASUREMENT CURRENT COORDINATES AND COAT SPEED GOALS LOCATED BEFORE THE SEA SURFACE

Many years of experience in using radar shows that when detecting air targets above the sea, there is the possibility of their observation outside the line of sight, in the so-called tropospheric radio waves. According to researches, the greatest time of existence of this phenomenon occurs in the summer season. Due to the presence of tropospheric inhomogeneities on the highway Propagation fluctuations arising informative parameters of radar signals, resulting in increased measurement error target coordinates, including Angular velocity and angular coordinates of the target.

The report using experimental data substantiates that the fluctuations of the phase of the signal reflected from the target that located outside radiohorizon in tropospheric radiowaveguide, normally distributed. However, with increasing distance from the target to the radar, together with non-correlated phase fluctuations, the effect and correlated components of phase fluctuations increases.

The report emphasizes that the presence of phase fluctuations causes a deterioration in the accuracy of measuring the parameters reflected from the target signal. Worsening accuracy of measuring radio signal parameters in the case in question due to the fact that the phase fluctuations lead to the rejection of the main maximum of the error and reduce the severity of her face.

These results of analysis of variance fluctuations maximum radiation pattern and concluded that the measurement error of angular target coordinates observed within the troposphere radiowaveguide due to the presence of phase fluctuations correlated components of the radar signal reflected purposes.