# Comparative Characteristics of the PC ASONIKA-K and Reliability Calculations Programs

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*Abstract* - **In this paper the comparative characteristics of the program complex (PC) ASONIKA-K and PM of reliability calculations are given.**

*Keywords* – **Electronic equipment, Reliability, Design, Program system, ASONIKA-K.**

## I. Introduction

Providing requirements for reliability and reproducibility of results of calculations of reliability of the radio-electronic equipment practically isn't possible without software application. At the same time, achievement of these purposes requires application of the programs focused on requirements of national standards and qualification of users.

## II. Comparative Characteristics of the Reliability Calculations Program

Universal introduction of CAE-systems in engineering practice of design of electronic equipment gradually leads to that calculations of indicators of reliability all are more shifted to shoulders of direct developers (it concerns first of all a settlement assessment of reliability of Electronic Modules of the first level EM1). Such tendency is quite explainable as they possess the fullest information on elements and modes of their application in EM1, and methods of calculation and reliability prediction forecasting rather simple and therefore don't demand special knowledge in the field of reliability theory.

It can brings that fact into confirmation that in a row of CAD-systems are included modules of forecasting of non-failure operation (for example, a subsystem Reliability manager CAD Mentor Graphics).

Integration of Russia into world economic space, performance of work by foreign orders, CALS-technologies already led to that for ensuring reproducibility of results of calculations methods of foreign standards are entered into domestic programs (for example, the same ASRN-2006, ASONIKA-K-SCh), or software of the foreign producers which leaders in the Russian market are A.L.D. Group («RAM Commander») and PTC (Windchill Quality Solutions system - before «Relex») are used.

In comparison with system ASRN-2006 (22 CSRTI MoD RF) which represents the «simple» appendix under Windows OS, the system of calculation reliability indicators of electronic modules - ASONIKA-K-SCh (see figure 1) significantly surpasses it as in the volume of help data on [1] reliability characteristics electronic components (EC) foreign production and components of the computer equipment, and in a set of service functions, and its realization in the form of the «client-server» appendix and work from uniform database guarantees reproducibility of results [9].

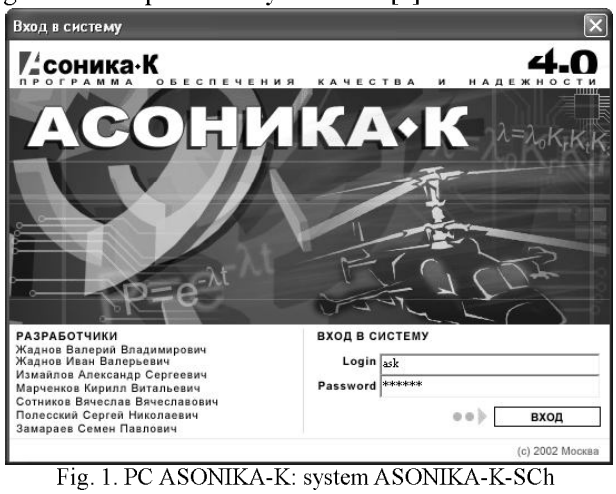


Fig. 1. PC ASONIKA-K: system ASONIKA-K-SCh

Besides, as mathematical models of failure rate contain in program code of system ASRN, it leads to that at the same time with an exit of new edition of the Reference book «Dependability EC» leaves also the new version of system ASRN, while for system ASONIKA-K-SCh of it it isn't required that completely answers with the provision of the concept of realization of CALS-technologies [2, 6, 7].

In comparison with Package of Applied Programs (PAP) «MNS-3.98» (22 CSRTI) in which though the method of statistical modeling but only for which electronic equipment, Reliability Block Diagram (RBD) it can be presented in the form of «series-parallel» connection of components is realized, the system of calculation of indicators of reliability of redundant electronic equipment - ASONIKA-K-SI (see figure 2) surpasses it since allows to carry out reliability calculations for much wider RBD which can be presented in the form of «Groups Tree».

The «Groups Tree» represents hierarchical connection "standard redundant groups of the following types:

- Consecutive connection

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- The loaded reservation
- Not loaded reservation
- The sliding loaded reservation
- The sliding not loaded reservation
- Five-element mastic connection
- Majority connection (2 of 3)
- Majority connection (2 of N)
- Reservation with management of replacement


Fig. 2. PC ASONIKA-K: system ASONIKA-K- SI

In comparison with PAP «KMN-3.98» (22 CSRTI) in which the method of statistical modeling is also realized, but only for electronic equipment which structure remains to a constant at components refusals, it is obvious that the system of calculation of indicators of reliability of components with reconfigurable structure (ASONIKA-K-RES) only therefore surpasses it. In comparison with PAP «ROKZERSIZ» (22 CSRTI) in which the standardized methods of calculation are realized, same, as well as in system of calculations of indicators of sufficiency of ZIP-systems - ASONIKA-K-ZIP (see figure 3), but due to program realization of these methods the system allows to solve more precisely optimization problems, and, therefore, also surpasses it.

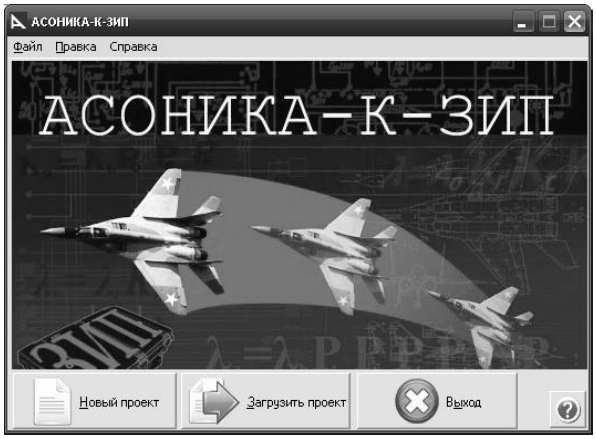


Fig. 3. PC ASONIKA-K: system ASONIKA-K- ZIP

Besides, all this PAP are created under the DOS operating system and therefore to compare them to systems of a program complex of calculation of indicators of reliability of electronic equipment from the point of view of service opportunities simply senselessly.

If operation of technology consists more than of one action, from positions of system approach such «operation» also can be considered as «technology» in relation to «action».

Therefore «The technology of the Automated Structural-logical Modeling (ASM)», developed in JSC SPIK SZMA, in fact, represents only one operation of Reliability-Focused Design Technology.

Created for automation of processes of «ASM-Technology» the program complex (PC) «ARBITR», PC «BARS», PC «CRISS 4.0», etc., realizes an analytical method of the minimum sections (ways) with all restrictions inherent in it and assumptions.

Thus, and the system of calculation of indicators of reliability of redundant electronic equipment (ASONIKA-K-SI), and system of calculation of indicators of reliability of electronic equipment with reconfigurable structure (ASONIKA-K-RES) surpass it at least because in them the method of statistical tests is realized.

All above fully can be carried to the PC UNIVERSAL (ASRI MoR RF) and to the module NADEZhNOST of a Tool Modeling Complex for an Assessment of Quality of Functioning of Information Systems KOK [3].

As foreign analog of technology it is possible to consider recommended in IEC 60300-1:2003 «Dependability management systems». However this system is much wider not that than the Program of Ensuring Reliability when Developing, but also all «Programs of ensuring reliability», together taken.

Therefore also we will carr out comparison of technologies on the example of the foreign software created in its providing with such companies, as A.L.D Group (RAM Commander), Parametric Technology Corporation (Windchill Quality Solutions, ReliaSoft Corporation (Blocksim), etc. [1]).

In comparison with modules "Reliability prediction" program systems of these companies from which only the module of system Relex is realized in a look of «the client-server technology», the system ASONIKA-K-SCh also surpasses them since not only contains characteristics of reliability of electronic components of a domestic production, but also allows to carry out calculations of indicators of a keeping, to control the reached level of reliability directly during carrying out calculation, etc.

In comparison with modules «Reliability Block Diagram» the system ASONIKA-K-SI [2, 8] surpasses them in possibility of verification of reliability block diagram since though in the module Reliability Block Diagram of system Windchill Quality Solutions and there is a possibility of creation of «assemblies» (analog of «standard» redundant groups), but «assemblies» are created by the user (instead of chooses from library).

Therefore the problem of verification of models of such «assemblies» on compliance to criteria of refusals remains open, and its decision entirely depends on qualification and (or) «conscience» of the user.

Direct analogs of system ASONIKA-K-RES [10, 11] among specialized software of calculations of reliability aren't present. From the closest on approaches it is possible to call only the modules «Markov Analysis», realizing methods of the Markov processes theory.

As analogs of system ASONIKA-K-RES it is more correct to consider specialized languages (see figure 4) of imitating modeling (and, more precisely, tool environments - GPSS [4], etc.).

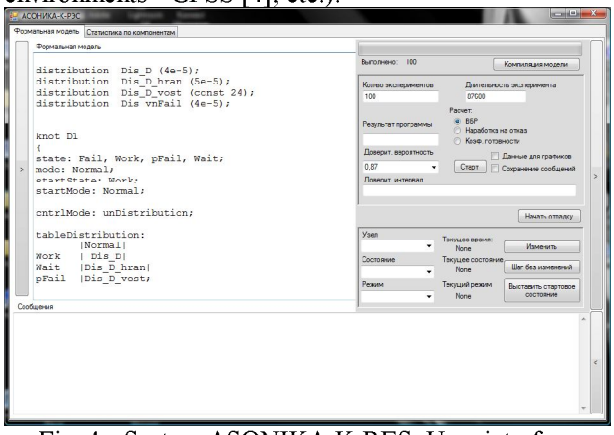


Fig. 4 - System ASONIKA-K-RES: User interface

However for calculation of reliability of electronic equipment these languages have no specialized models since are intended for modeling of systems of mass service. It results in need to develop conceptual model within these languages that for ES with reconfigurable structure very difficult, and often it is simply impossible.

The closest foreign analogs of system ASONIKA-K-ZIP [12] are modules «Maintainability Prediction». However in them the mathematical methods given in MIL-HDBK-472 [5] which significantly differ from the methods of Russia Standard and therefore ASONIKA-K-ZIP system in this plan also surpasses them regarding adaptation to requirements of the Russian military standards, which are realized.

## III. Conclusion

Thus, it is possible to draw a conclusion that program complex ASONIKA-K of ensuring reliability of electronic equipment, both in the scientific plan, and in program and methodical providing significantly surpasses domestic analogs and doesn't concede foreign, and on separate indicators of a program complex (the Russian-speaking interface, the nomenclature of electronic components, containing in a database, structures of the ZIP-systems, converters of data, etc.) surpasses foreign analogs since meets the requirements of a complex of the state Russia military standards.

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