

## MORE ABOUT RIGA'S RELIABILITY SCHOOL<sup>2</sup>

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Most outstanding features of Riga's Reliability School were its applied orientation and stress on real-life data statistical analysis. A very important work was the monograph of Kh. B. Kordonsky and I. Gertsbakh, *Models of Failure*, published by *Sovietskoe Radio* (1966) in the Engineering Science Library series under B.V. Gnedenko editorship. It was translated later into English (1969) and Polish (1970).

This book investigates the connection between the lifetime distribution and failure model based on wear (fatigue) damage accumulation process. It stressed the necessity to analyze statistically the wear processes. Besides, *Models of Failure* presented a rather simple estimation approach of the parameters for a large family of lifetime distributions, and the use of probabilistic paper. (Normal, Lognormal, Gnedenko-Weibull).

Well ahead of time was Kordonsky's joint paper with Artamanovsky (for more details see *Kh. Kordonsky: Recollections and Short Review of Scientific Results* by I. Gertsbakh in No 1, 2006, of this journal).

Kh. Kordonsky's Ph.D. students (A.M. Andronov, I. Gertsbakh, Yu.M. Paramonov, P.Ya. Rozenblit) made important contributions to the Statistical Reliability Theory.

Below is a concise list of their most important publications related to the period 1970-1988 (in alphabetical order).

### A.M. Andronov:

- [1] Andronov A.M. (1970). On some generalization of Erlang's formulas. *Engrg. Cybern.*, **6**, 93 - 100.
- [2] Andronov A.M. (1971). Generalised reliability model with accumulation of damages. *Engrg. Cybern.*, **4**, 67 - 75.  
*For the first time a reliability model with accumulation of damages has been considered that later was rediscovered repeatedly.*
- [3]. Andronov A.M. and I. Gertsbakh. (1972). Optimum Maintenance in a Certain Model of accumulation of damages. *Engrg. Cybern.*, **10(5)**, 620 - 628.
- [4]. Andronov A.M., Kordonsky Kh.B., Rosenblit P.Y. (1972). Applications of unbiased estimate's theory to queuing problems. *Engrg. Cybern.*, **2**, 60 - 68.  
*It was the first paper that used nonbiased estimate's theory for statistical problems in queuing and reliability theory.*
- [5]. Andronov A.M. (1972). Load estimate of queuing systems with infinite numbers of servers. *Problems of Information Transmission*, **2**, 75 - 83.
- [6]. Andronov A.M., Rosenblit P.Y. (1972). Statistics of semi-Markov birth-death processes with applications to analysis of queueing systems. *Engrg. Cybern.*, **3**, 113 - 120.

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<sup>2</sup> This is additional information to the paper by Igor Ushakov "IS RELIABILITY THEORY STILL ALIVE?" delivered by well-known reliability specialist Ilya Gertsbakh.

[5,6] show how to apply regenerative approach to statistical problem's solving of queuing and reliability models.

[7]. Andronov A.M. et al.. (1974). *Operational Reliability and Technical Maintenance of Aircraft*. Transport, Moscow, Russia, - 304 p. (In Russian.)

*This book was the first manual for aviation engineers that described how to analyse statistical data on aircraft reliability.*

### **I. Gertsbakh**

[18] I. Gertsbakh, *Models of Preventive Maintenance*, North Holland, 1977.

*An extended translation of Russian Modeli Profilaktiki (1969), a systematic and unified approach to a wide range of preventive maintenance problems.*

### **Yu. M. Paramonov**

[12] Yu.M. Paramonov, G.P. Mussonov. Probability boundary for guaranteed forecast. - *Economics and Math. Methods*, 1983, **5**, pp.922-924 (in Russian)

[13] Yu.M. Paramonov et al. Safe life at given reliability. In: "Reliability of Automatic System and Its Items", Riga: Zinatne Press, 1976, pp.3-12. (in Russian)

[14] Yu.M. Paramonov. Bayesian risk in two cases of sequential analysis. - *Probability Theory and Its Applications*, 1970, **2**, pp.364-370

[15] Yu.M. Paramonov. Unbiased quasi-bayesian estimation, - *Probability Theory and Its Applications*, 1977, **2**, pp.372-380

[16] Yu. M. Paramonov, *Applications of Mathematical Statistics to the Aircraft Fatigue Life*, Riga, Zinatne, 1992, 248 p. (in Russian)

### **P. Y. Rosenblit**

[8] Rozenblit, P, Ya. Statistical Estimation of Reliability and Efficiency Characteristics of Complex Systems, *Zinatne*, 275 p., Riga, 1979 (in Russian)

*An important and original monograph. Presents unique results on unbiased estimation of queuing and reliability system parameters, density functions, and distribution moments. Summarizes and generalizes the results of [4], [9],[10], [11].*

[9] Rozenblit, P. Unbiased estimation of some queuing system parameters, *Eng. Cybernetics*, 1972, **No 4**, 108-113.

[10] –P.Y. Rozenblit, A problem of estimating optimal maintenance policies, *Eng. Cybernetics*, 1963, **No 5**, 48-52.

[11] P.Ya. Rozenblit, Unbiased Estimation of reliability characteristics described by renewal processes, *Automatika i vychisl. Tehnika*, 1977, **3**, 36-43 (in Russian).

In the late 80-ies Kh. B. Kordonsky initiated the study of a very fundamental problem in Reliability Theory- the choice of the "best" time scale for reliability analysis and monitoring. In the period 1990-1999, he published on this issue (in coauthorship with I. Gertsbakh) a series of eight papers. For more detailed exposition and full list of references see the above mentioned "Recollections".