PROBABILITY PREDICTION OF THE APPEARANCE OF OVERLOAD CYCLES OF VARIABLE LOAD CASE IN PARTS OF THE AIRCRAFT CHASSIS

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Abstract: Distribution function of the maximum values of voltage overload cycles in some aircraft parts is proposed. Based on the data from the flight experiment, more than 100 records of random load case processes were schematized and processed statistically. The proposed model of the distribution of maximum load cycles and processed experimental data has been verified.

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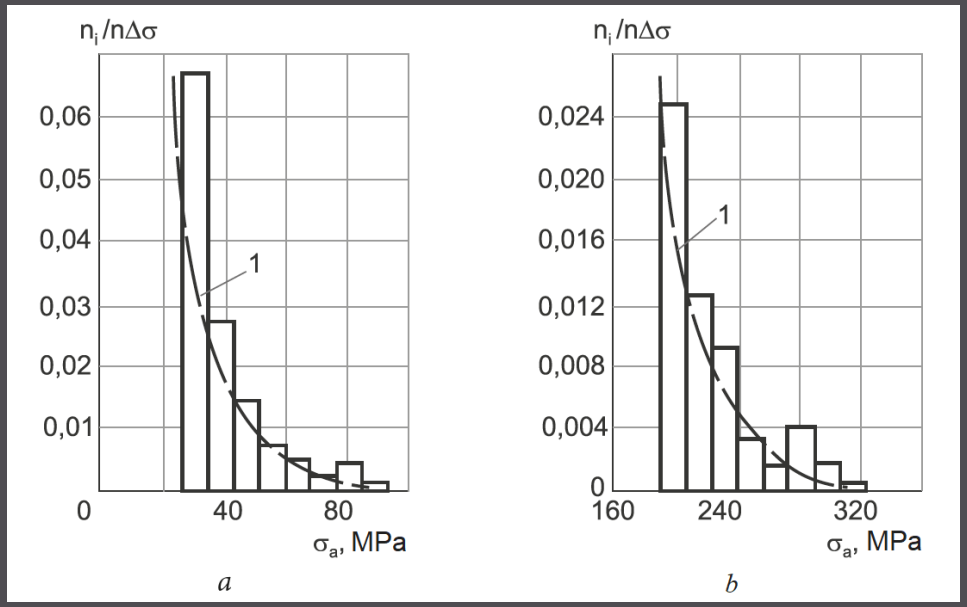
The studies are based on the results of processing and analysis of experimental data on the variable load case of the chassis parts of Russian transport aircraft. These data are obtained from a flight experiment based on strain gauging of typical parts of the main landing gears under various conditions and airplane movement regimes on the airfield. In total, more than 100 realizations of operational loading processes of individual parts of the chassis of 4 types of aircraft were recorded and processed.

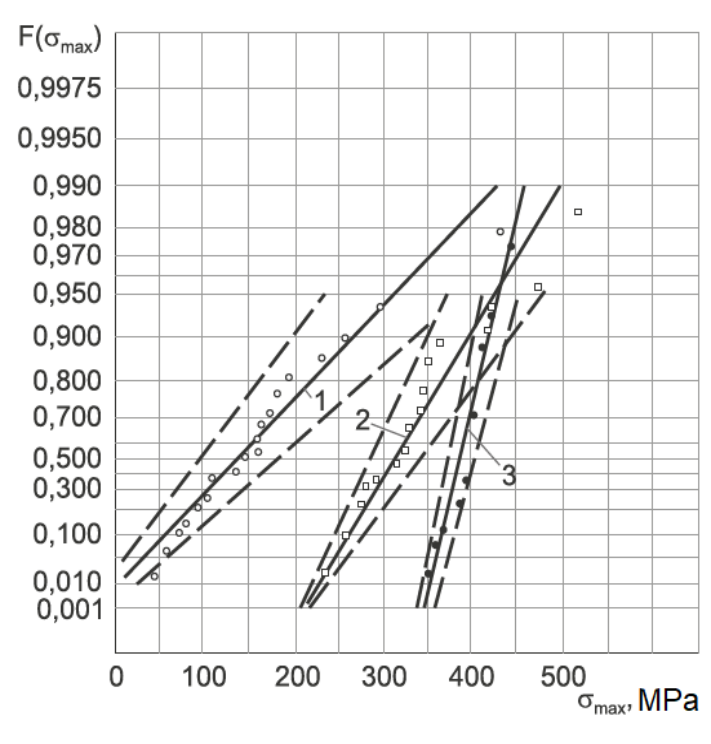
The program and the results of the eyes' fatigue tests.



Conformity assessment of the empirical distribution to the theoretical one was carried out according to the Kolmogorov criterion, selectively, for 25 realizations of the load case process. The calculations showed that for most implementations with a significance level of 0.2, the hypothesis that the empirical distribution of dress amplitudes corresponds to the two-parameter exponential distribution law is not inconsistent.

Distribution parameters of the maximum voltage amplitudes in the chassis details

Chassis detail	Number of implementations	Parameters of equation 2.9		Correlation coefficient	Pearson criterion		
		α	β		χ^2	f	$\chi^2_{0.95}$
Brake rod	31	0.02165	297.0	0.97	6.7	11	12.6
Beam of the cart	19	0.06765	382.6	0.97	10.8	10	18.3
Slot-joint shelf	23	0.01350	102.5	0.96	19.5	12	21.0
Front strut	68	0.05630	130.0	0.99	5.9	3	7.8



In figure, on the probability paper corresponding to the distribution law (6), there are the empirical and theoretical distributions of the maximum stress amplitudes on smooth parts.

Distribution of maximum stress amplitudes in chassis parts: 1) ○ - shelf of slot-joint shelf; 2) □ - brake rod; 3) ● - beam of the cart; - - theoretical distributions according to the law (6); ---- - confidence intervals if P_{conf}=0,95

Based on the studies, the following conclusions can be made:

1. Based on the studies, there are the following conclusions:

1. Proposed function (6) describes quite accurately the distribution of maximum over case voltage cycles in the power components of the aircraft chassis during operation.

2. In the structural and technological design of highly loaded parts operating under variable loading conditions and having significant stress concentrators, it is desirable to consider the likelihood of high overload cycles and the possibility of their influence on the bearing capacity, since in operation local stresses in high concentration zones can even reach slightly exceed the value of the conditional yield strength of the material.

Thank you for your attention!