Russian Practice to Provide Safe Operation of Airplane Structures with Long-Term Operation

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The article presents some general approach to provide safe operation of aging aircraft structures including those with long-term operation (Fig 1). The article gives the data on increased service life values of aged aircraft in Russia. Methods to detect and eliminate the structural corrosion damages are discussed. Statistical data on distribution of typical defect in civil aircraft structures are given including some results on statistical analyses of the duration of corrosion depth increase (Fig. 2) in wing and fuselage skins of IL-86 wide-body passenger aircraft. Approaches to prevent the failure of aircraft structures due to widespread fatigue damage are presented (Fig.3). Provided is the statistics on the multiple site fatigue damages in panel joint of the upper wing surface of Il-62M civil airplane identified both while full-scale tests of aircraft and taken from operation. The results are given of experimental research on degradation (change) of strength, fatigue, and crack growth resistance of long-term-operated airframes. (Fig. 4).

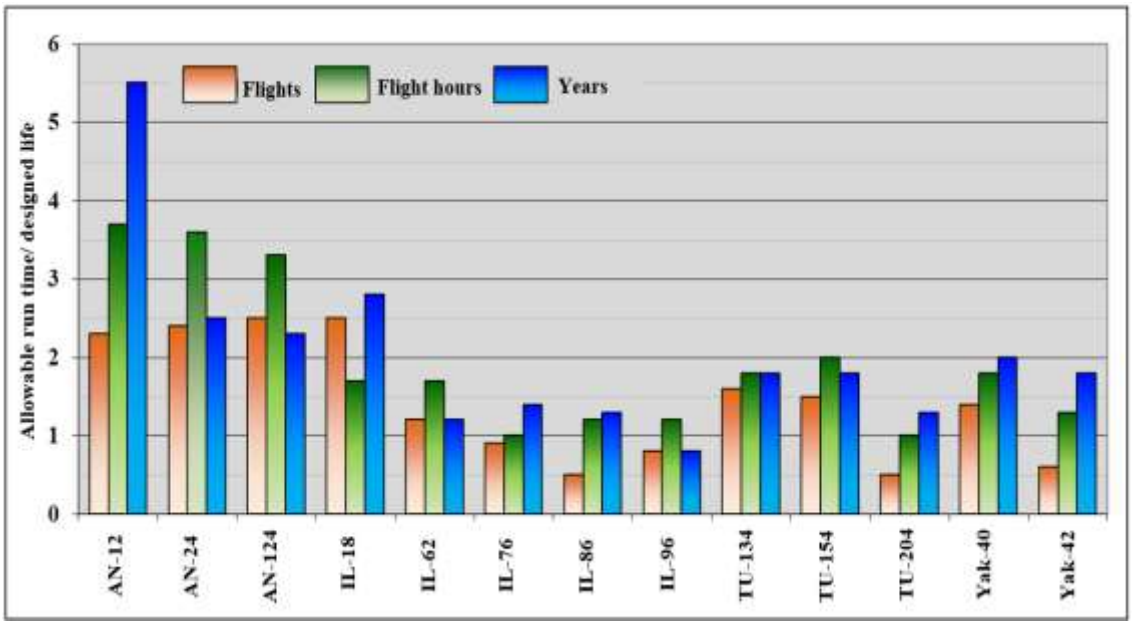

Figure 1. Russian aircraft fleet with long-time operation

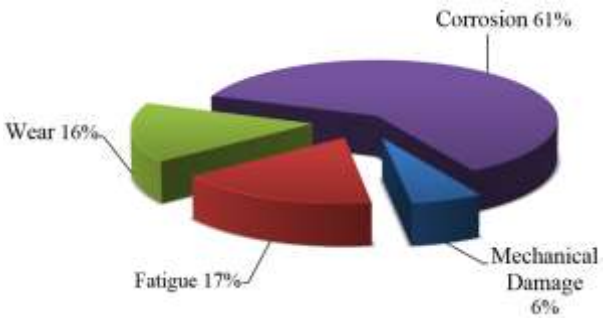

Figure 2. IL-86 type airframe operational damages

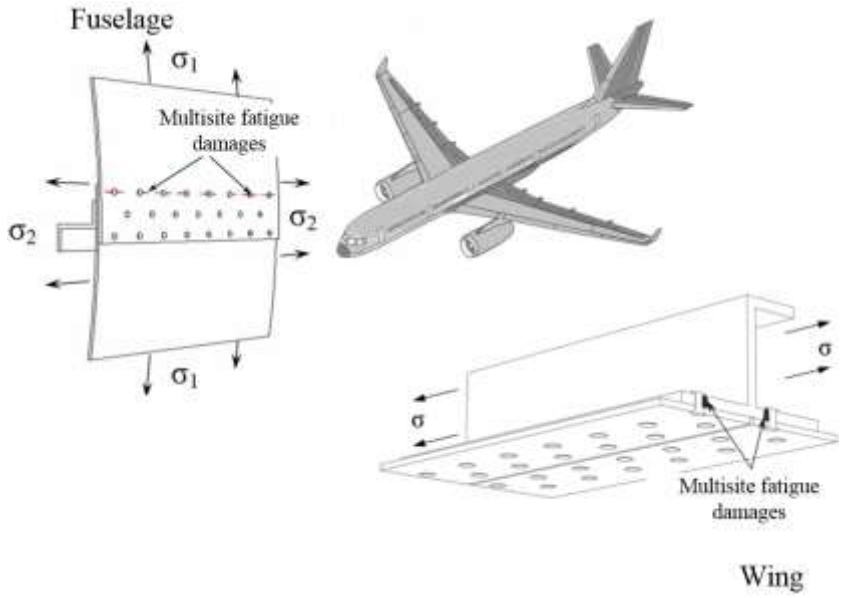

Figure 3. Standard multisite fatigue damages of wing and fuselage

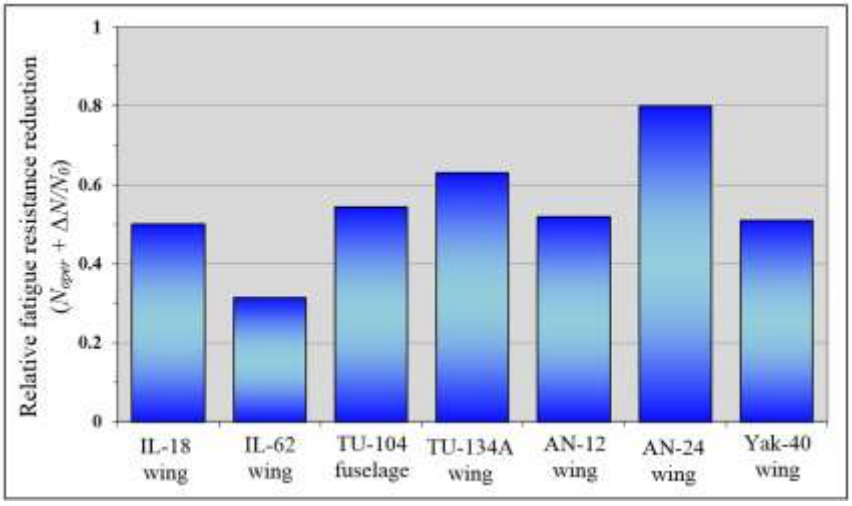

Figure 4. Reduction of fatigue resistance of Russian long-term operated transport airplanes. Results of testing the airplanes with operational run time.

Keywords: aging aircraft, widespread fatigue damage, WFD, multiple site damage, MSD, the limit of validity LOV, corrosion of the airframe, frequency of inspection, duration of crack growth, fatigue strength, degradation of material properties