# THE NUMERICAL ANALYSIS OF A PZL-106 KRUK WING SLAT TOLERANCE FOR A BIRD STRIKE DAMAGE

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**Abstract**: Collisions of aircraft and airborne objects are inevitable in aviation. Birds are unalterably among the major threats to aircraft in low level flight. Possible consequences of a bird strike have been analysed and described in this paper.

A fixed slat segment of a Polish designed PZL-106 *Kruk* aircraft wing has been chosen for analysis (*Fig. 1)*. It is particularly susceptible to bird strikes due to its placement on the wing's leading edge as well as the agricultural utility of the aircraft of interest. The finite element model of the analysed part has been created (*Fig. 2)*. Bird models of various weight have been tested according to the framework found in aeronautical certification standards. Smooth Particle Hydrodynamics (SPH) formulation has been used for generation of the bird finite element model. The simulations were performed by the LS Dyna explicit finite element analysis software. Used methods have been validated by performing a sample simulation and subsequent comparison of obtained results with the experimental data available in literature. A number of test cases have been analysed which differed in parameters such as impact velocity, initial velocity vector direction, place of impact and bird mass. The results have been presented and potential influence of the deformed slat on the remaining parts of the wing has been discussed (*Fig. 3)*. Subsequently, loads acting on slat fixings during the bird strike have been analysed and the possibility of slat segment detachment from the wing has been examined (*Fig. 4)*.

The simulation outcome gives the manufacturer a better insight into the behaviour of this particular aircraft part in case of a bird strike without carrying out expensive tests using real aircraft components.

***Figure 1.*** *PZL-106 Kruk wing slat segment*

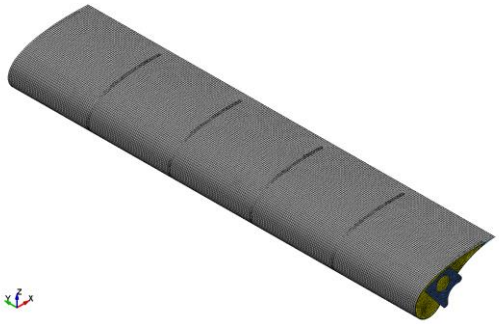

***Figure 2****. Finite element model*

***Figure 2****. Deformed shape of the analysed part*

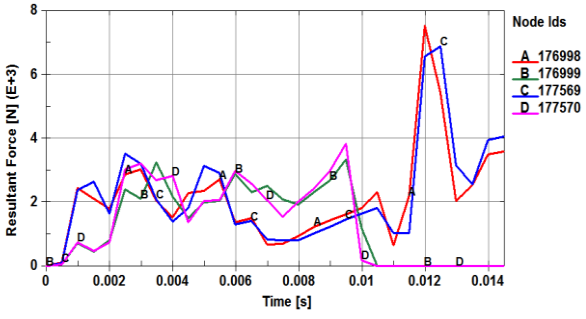


***Figure 4.*** *Support reactions graph*