

Simulation of a passenger aircraft flight with the wing tip cut

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From the history of military aviation it is well known that combat aircraft (for example A10) had lost a part of wing and some of them successfully landed. Losing the wing tip can also happen to passenger aircraft where redundancy with respect to aircraft control is usually much weaker than in the case of combat aircraft. So, the question can be asked how big passenger aircraft can recover from such hazardous state of flight and what is the probability of safe landing if it happened. In this paper the full nonlinear equations of motion were used for flight simulation after a part of wing is lost. In this analysis it was found that asymmetric rolling moment must be compensated by essential increase of pitching moment and aircraft goes into high angles of attack and high pitch angle. For reliable simulation the available aerodynamic characteristics must include angles of attack till 90 degrees when total flow separation occurs. Typically maximum angles of attack used in wind tunnel experiments are not higher than 25 degrees. The influence of limited range of experimental data on results of simulation will be discussed and a number of research plans for the future investigations will be presented.