

System Development of Impact Test at Subsonic Level for Simulation of Bird Strike Dynamics on Airplane

Atsushi SAKUMA*, Naoki TORII*, Akira MIZUSHIMA* and Hirokazu SHOJI†

* Division of Advanced Mechanical Systems Engineering
Institute of Technology
Tokyo University of Agriculture and Technology (TUAT)
2-24-16 Naka-cho, Koganei-shi, 184-8588 Tokyo, Japan
e-mail: asakuma@cc.tuat.ac.jp, web page: <http://www.tuat.ac.jp/~asakuma/>

† Operation and Safety Technology Team, Aviation Program Group
Japan Aerospace Exploration Agency (JAXA)
2-21-1 Osawa, Mitaka-shi, 181-8588 Tokyo, Japan
Email: shouji@chofu.jaxa.jp - Web page: <http://www.jaxa.jp/>

ABSTRACT

While the accident of bird strike is increasing year by year[1], miniaturization and lightening are advanced in order to improve economic efficiency, and the technology of safety design of the airplane becomes difficult. Then system of shock impact test by using airsoft rifle is developed to evaluate the design technology of anti-bird strike structure of airplane. Simple ball bullet is shot to specimen in the test by the airsoft rifle and stress response in load cell of the test system is evaluated by the modified Hertz contact theory and the wave equation which are used to analyse the viscoelastic characteristics of the specimen. In the results of experiment, the obvious relationship between quasi-static and impact responses of specimen is observed subjectively, and the effect of hardening by the impact is obvious in the results of muscles of chicken. The evaluated viscoelastic relationship is applied to simulate the impact test by using LS-DYNA with fundamental viscoelastic constitutive equation and the material parameters derived from the impact test, and the well similar behaviour has been simulated by the constitutive equation. By using the developed technology here, the phantom imitating real bird will be developed as standard specimen for a anti-bird strike test in future.

REFERENCES

- [1] FAA-USDA report, "Wildlife Strikes to Civil Aircraft in USA, 1990-2011", *Report of the Associate Administrator of Airports Office of Airports Safety and Standards, Airport Safety and Certification*, **6**, 8-13 (2012).