DESIGN, FABRICATION AND CRASHWORTHINESS ANALYSIS OF MODIFIED AIRCRAFT FUSELAGE WITH SINE-WAVE BEAM

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Crashworthiness is to resist the structural damage and improve the energy absorption during landing and it can dissipate the impact kinetic energy. A double layer sine wave beam with and without stringers is proposed for crashworthiness of fuselage structure for structural rigidity and safety limit loads. Designing the fuselage structure with exact dimension is beyond the scope. So a scaling factor of 1/20 is incorporated for our fuselage design.The parameters concerned for comparative studies are deformation, acceleration and velocity. The scaled fuselage structure is modelled using CATIA software and the discretized model is analysed using Ansys Explicit Dynamics. The material propounded for the model is Aluminium alloy under the grade of Al 6082, Al 5052.The inner and outer fuselage structure is fabricated by use of Al 6082 sheets, the sine wave portion of fuselage structure is composed of Al 5052 sheets and the stringers is modelled with Al 5052 sheets. The sine wave and fuselage structure is adhered by MIG welding to achieve ample structural stability. The fabricated fuselage structure has been tested with the aid of DROP TESTER facility. When comparing with the contemplated structures double sine wave beam with stringers shows an effective structural rigidity. The deformation mode is reduced to around 95% from the conventional and single sine wave beam fuselage. The deformation in the proposed structures is within the elastic limit. Deformation mode of the simulated and experimental results has an error of 12.87% and also has only one peak acceleration of 13g which is less than others.There is around 13.33% reduction in acceleration.

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