A Finite Element Model of the THOR-k dummy for aerospace and aircraft impact simulations

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The THOR dummy has been developed and continuously improved by NHTSA to provide an advanced tool for use in the assessment of the injury risk of vehicle occupants in crash tests. Recently, a series of modifications were completed to improve the bio-fidelity of THOR-NT dummy. To assess the response of the updated THOR dummy, THOR-K, a series of tests under three impact configurations were performed by NASA at the Wright Patterson Air Force Base (WPAFB).

A computational finite element (FE) model of the THOR dummy has been developed in LS-Dyna software and integrated from various sources. Recently, the body parts of the dummy FE model were updated based on the modification kit of THOR-K dummy. The paper will briefly discuss the modeling methods used, the positioning tree developed, and the validation of the model under various certification tests. The main focus of this paper will be the model assessment against the test results from vertical, lateral, and spinal impact conditions (WFAFB sled tests) using rating methods (e.g. CORA). The validated dummy FE model will be used in the future to analyze existing human databases to develop new NASA standards and requirements for occupant protection. Furthermore, the dummy FE model may be used in the future to investigate and improve the design of aircraft seats.