Ballistics of Main Seat Ejection Cartridges for Aircraft Application

Authors : B. A. Parate, K. D. Deodhar, V. K. Dixit, V. V. Rao

Abstract : This article outlines the ballistics of main seat ejection cartridges for aircraft application. The ballistics of main seat ejection cartridges plays a vital role during the ejection of the pilot in an emergency. The ballistic parameters such as maximum pressure, time is taken to reach the maximum pressure, and time required to reach half the maximum pressure contributes to the spinal injury of the pilot. Therefore, the evaluations of these parameters are very critical during various stages of development. Elaborate testing was carried out for main seat ejection cartridges on seat ejection tower (SET) at different operating temperatures considering physiological limits. As these trials are cumbersome in nature, a vented vessel (VV) testing facility was devised to lay down the performance parameters at hot and cold temperature conditions. Single base (SB) propellant having hepta-tubular configuration is selected as the main filling. Gun powder plays the role of a booster based on ballistic requirements. The evaluation methodology of various performance parameters of main seat ejection cartridges is explained in this paper. Physiological parameters such as maximum seat ejection velocity, acceleration, and rate of rising of acceleration are also experimentally determined on seat ejection tower. All the parameters are observed well within physiological limits. This paper addresses the internal ballistic of main seat ejection cartridges, propellant selection, its calculation, and evaluation of various performance parameters for an aircraft application.

Keywords : ballistics of seat ejection, ejection seat, gas generator, gun propulsion, main seat ejection cartridges, maximum pressure, performance parameters, propellant, progressive burning and vented vessel

1

Conference Title : ICB 2021 : International Conference on Ballistics

Conference Location : Sydney, Australia **Conference Dates :** May 17-18, 2021