SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)
Future Space Transportation Systems (4)

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CONCEPTS AND PROBLEMS OF REALIZATION OF AIR LAUNCH OF LAUNCH VEHICLES: UKRAINIAN ASPECT

Abstract

Yuzhnoye State Design Office (YSDO) which is a main enterprise of Ukraine's space rocketry branch, also carries out the studies of various aviation and space com-plexes (ASC) projects together with organizations of cooperation of different branches of industry and potential Customers. Those ASC projects provide launch vehicles (LV) air landing in a wide range of their launch mass (from 6 up to 250 ton). Selection of a concept of the air launch of space launch vehicles is a complex problem. Solution of that problem requires complex system studies of a great number of various technical tasks on elaboration of schematic and design decisions, simula-tion and criterial evaluation of basic parameters which influence the efficiency of the system. Results of complex investigations of design schemes for ASC realization are presented with account of the experience and concepts chosen. Tasks of researches were: schematic and structural analysis of method and device of landing for dif-ferent types of airplanes – carriers (AC); selection of AC modes and flight parameters during LV landing; provision of a principal probability of LV guaranteed drop; provision of acceptable loads on LV (commensurated with flight loads) dur-ing transportation with AC and during landing and also provision of permissible ef-fects on AC from the LV drop system; selection of a method of LV attitude stabilization after separation from AC; provision of safe distance between LV and AC if there is LV explosion dur-ing the starting of stage 1 engine; provision of LV and AC safe separation at the initial portion of LV flight; provision of maximum adaptability of the launch system to a probable change (during elaboration and modernization) of LV characteristics and AC type. Analysis of results of studies has been performed for the basic criteria of effi-ciency: achievement of the minimum of LV power losses caused by the air launch; provision of the maximum safety (minimum probable emergency situations) during LV landing; achievement of the minimum cost of the landing system. Some different methods, schemes and units for the air launch have been devel-oped in the process of investigations; a comparative analysis has been performed and basic advantages and disadvantages have been shown. Results can be used for deter-mination of the logic for selection of a variant depending on conditions of a specific task, a type of an airplane carrier and LV class.