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IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations - IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (IP)

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FEASIBILITY OF AN AUTOMATED STREAMLINED BODY FOR LAUNCH VEHICLES AND LEO TRANSPORTATION

Abstract

Objects in LEO encounter atmospheric drag from gases in thermosphere as well as exosphere, depending on orbit height. A substantial amount of energy is lost in overcoming this drag decreasing the overall effectiveness of the vehicle. Launch vehicles on the other hand experience huge atmospheric drag after take-off and during flight in lower altitude. The concept of an automated streamlined body involves bodies that can auto adjust itself with respect to the flight regime and flow conditions, enabling it to operate at optimum efficiency. The idea is to conceptualize streamlined bodies that could be operated at low earth orbits as well as low altitudes at any flight speed ranging from low to high subsonic and supersonic speeds. The present work attempts to develop such streamlined bodies that are operational irrespective of the regimes. To achieve this it is necessary to understand and establish the relation between various energies associated with streamlined bodies operating at such flight conditions which are aerodynamic, electromagnetic, vibration and rotational. The understanding of these energies as a whole will lead to the idea of developing an automated body. Tests include wind tunnel experiments over the streamlined bodies while running high voltage electricity over the bodies' surface, vibrating the body, rotating and twisting the body at different chord locations, also performing coupled tests of the above experiments. It can be anticipated that the above test will have both positive and negative results but collectively these results will lead towards the method of obtaining an automated wing. The work can be extended to supersonic speeds as well the work will also study the interaction of electro-thermal forces with aerodynamic forces. The observed data will then be compared with the data from the tests without running electricity or rotating vibrating and twisting the body. The novelty of the work is that the results will be used for designing a structure that adjusts itself according to the flow conditions, flight conditions at Leo and below thus eliminating the need for different structures for various flight regimes and flow conditions. The idea comprehensively can be applied on space shuttles or landing capsules for interplanetary missions. Additionally it can be used for designing flight structures of crafts that will operate for Leo space transportation.