

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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COMPREHENSIVE METHODOLOGY FOR TECHNOLOGY ROADMAPS GENERATION AND
UPDATE FOR THE EUROPEAN HYPERSONIC AND RE-ENTRY SPACE TRANSPORTATION
SCENARIO

Abstract

In past few years, commercial private initiatives have developed space transportation vehicles, partially reusable, capable of missions including Earth re-entry. The interest in this kind of systems has been recently increased, considering not only the number of new technological developments relevant to hypersonic flight, but also private initiatives towards the same goal. For this lack of synergy in the European scenario, Europe is still at the beginning of the learning process in the field of controlled re-entry for manned transport, even if Europe has performed technological demonstrations such as Intermediate eXperimental Vehicle (IXV). Indeed, there is today an important momentum, at international level, for developing demonstrators or experimental vehicles targeting different kinds of hypersonic missions both in private and institutional scenarios. Being the mastering of technologies associated to robotic and human hypersonic transportation and re-entry a mandatory requirement for Europe to remain competitive in this innovative and dynamic worldwide environment, it is important to promote partnerships at European or international level, able to simplify the technological development. Based on the European background and the expected evolution of the different mission scenarios' requirements, the conditions exist for ESA to coordinate a set of activities for technology development and in-flight validation of hypersonic and re-entry space transportation systems in a unique roadmap. The paper presents the results of a research activity carried out by Politecnico di Torino and ESA for the elaboration of hypersonic and re-entry space transportation systems roadmap. This research activity focuses on the development of a logical methodology based on a combination of System Engineering tools and ad-hoc developed tools to derive, track and manage the Technology Roadmap basic pillars (Technology Areas, Operational Capabilities, Mission Concepts and Building Blocks) and their features. The proposed methodology is supported by two ad-hoc tools: roadmap derivation tool and a database of hypersonic initiatives. First, the paper describes the main settings of the database that manages all relevant initiatives for technological development of hypersonic systems, categorizing them according to the roadmap pillars. Secondly, the paper presents the tool used to derive, track and manage the pillars and consequently to generate the technology roadmaps using as example the IXV mission. The paper then presents and discusses the results, analysing main

activities expected in the near and far future to enhance hypersonic technologies and proposing a TRL increase path in terms of missions and activities to perform, and in which schedule to carry out them.