

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

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INNOVATION TOWARDS CONCEPTION - HOW TO DESIGN THE FUTURE GENERATIONS OF  
SPACE TRANSPORTATION SYSTEMS.**Abstract**

The conceptual design (CD) phase is the most significant step towards development of a space transportation system. The decisions taken at this phase accounts for more than eighty percent of the overall life cycle cost. It is the gestation phase where alternate concepts are designed and evaluated before selecting the optimal one to be further developed and fabricated. In this regards this design phase plays a critical role towards innovation and creation of next generation of space transportation systems. Thus, innovation at this conception level is the primary requirement for innovation of new generation of space transportation systems. After all, a system cannot be built if it cannot even be conceptualized.

The history of space transportation systems design provides numerous examples of vehicles that failed due to lack of a proper assessment of technology-configuration-mission scenarios in the CD phase. The current paper addresses this crucial phase and develops a prototype best practice solution process to advance the current state of the art of the existing CD practices. Traditional CD methods have been developed such that a CD method is applicable for only a certain type of mission, configuration or technology. In contrast, the solution logic proposed in this paper is a generic process that can be applied to design any type of space transportation system irrespective of the mission, configuration, and hardware restrictions. This prototype design process is termed as the GDSP-STs, short for Generic Design Synthesis Process - Space Transportation System.

A logical solution architecture of the GDSP-STs is presented in this paper which is broadly presented in three segments. The first segment defines the static view of the solution where the primary top-level system modules of the GDSP-STs are defined and the implying connectivity between these modules is established. The second segment then describes the overall development process for the primary system modules and provides a dynamic view of the solution describing the information flow of the process. The development process is composed of four distinct steps called the System Development Processes (SDPs) leading to the creation of the GDSP-STs. The third segment describes the interconnection of the systems module and SDPs providing the overall Logical Solution Architecture of the GDSP-STs. The proposed solution is generic in nature as every constituent module and SDP is independent of the vehicle category and is thus applicable for any type of space transportation system.