

IAF SYMPOSIUM ON COMMERCIAL SPACEFLIGHT SAFETY ISSUES (D6)
Enabling safe commercial spaceflight: vehicles and spaceports (3)

Author: Dr. Francesco Santoro
Altec S.p.A., Italy

Dr. Alberto DEL Bianco
Altec S.p.A., Italy

Prof. Vito Albino
Politecnico di Bari, Italy

Prof. Nicole Viola
Politecnico di Torino, Italy

Dr. Roberta Fusaro
Politecnico di Torino, Italy

END TO END APPROACH TO FLEXIBLE AND SUSTAINABLE COMMERCIAL SPACEFLIGHT
INITIATIVES: EVALUATION OF OPERATIONAL SCENARIOS, SAFETY ASPECTS, SPACEPORTS
AND ASSOCIATED ECONOMIC ELEMENTS

Abstract

Multiple initiatives are going on today, aimed at developing new technologies for commercial exploitation of space. The potential benefits of widening up the access to space to a broader users community affect different applications ranging from space tourism to microgravity experimentation to astronauts and pilots training; moreover, in the new space economy users communities may include parties that do not traditionally operate in the space business but can take advantage of microgravity exploitation as an opportunity to carry out experimental activities with potential more significant outcome. The present paper initially approaches commercial access to space by evaluating different mission concepts, technologies and platforms such as suborbital spaceflight, orbital spaceflight, air launch and deployment of small satellites. In order to select the most promising alternative, trade off methodologies, making use of safety, cost and complexity as figures of merit are suggested. Moreover, the paper describes the outcome of simplified mission simulations, encompassing both suborbital vehicle as well as satellite air launch trajectories predictions. The trajectories simulations can also provide useful inputs to the vehicle design and performance analysis and are instrumental to planning air space operations after lift off from the launch site, as well as to assess logistics and operational aspects. Thus, simulations of really operating environment provide the link to the Spaceport selection process aiming at defining an adequate operating base and a set of proper ground infrastructures that efficiently support in integrated fashion the execution of the planned activities with the selected platforms. An integrated end to end approach is also described, that basing upon the specific users' needs identifies the appropriate platform and delivers the associated service matching the relevant goals. The paper finally discusses selected approaches to the development of a sustainable commercial spaceflight initiative, evaluating market analysis elements, business aspects, industrial commercial stakeholders and relevant funding bodies. Ideas for next activities are drawn too, mainly focusing on trajectory validation simulation with real data coming from the initial test campaigns.