

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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THE ITALIAN UNMANNED SPACE VEHICLE FTB-1 BACK TO FLY: EXPERIMENTAL
OBJECTIVES AND RESULTS OF THE DTFT-2 MISSION

Abstract

USV is a national R&T program addressed to future re-entry space transportation and hypersonic vehicles. In parallel to the development of peculiar flight technologies, a family of Flying Test Beds has been conceived as laboratories to carry out in-flight experiments in the fields of aerodynamics, flight mechanics and control, aero-elasticity. When applied to rapidly changing flight patterns typical of atmospheric re-entry, from hypersonic up to low subsonic regime, the modelling used in design and analysis process, still suffers from large uncertainties and reliable data for validation are needed.

The first phase of the USV Program consisted in the design and realisation of two units of the first Flying Test Bed (FTB-1), named “Castore” and “Polluce”, based on a winged slender-body aerodynamic concept, addressing low atmosphere manoeuvred flights in supersonic, transonic and low subsonic (Drop Transonic/Supersonic Flight Test).

The DTFT missions are carried out in the flight space over the Tirrenian Sea behind East Sardinia (about 200 x 200 Km extension), that is part of the Italian Inter-force Test Range (PISQ), based at Salto di Quirra. The civil airport of Arbatax-Tortolì is used as base for ground operations and the flight chain lift-off. The first mission (DTFT-1) was performed on February 2007, using the first FTB-1 unit “Castore”.

The FTB-1 vehicle is released at a target altitude ranging from 20 to 35 Km, using a carrier system based on a large stratospheric balloon, then performing the autonomous experimental flight, accelerating up to transonic or low supersonic speed, and then decelerating up to subsonic speed. In the termination phase, FTB-1 is parachuted on the sea for successive recovery. The present paper will focus on the second mission DTFT-2, to be carried out in the 2010 Flight Campaign in Sardinia by the FTB-1 “Polluce” unit. As compared to the DTFT-1 mission, the second one represents a step ahead toward a Terminal Area Management flight capability, typical of re-entry systems. The main experimental objectives of the flight will be described along with the major modifications implemented into the “Polluce” unit, as lesson learned of the first flight.

The aero-structural experiments rely on either direct measurements, through a number sensors distributed all along the vehicle, and data obtained from post-flight elaboration of inertial measurements. In-flight demonstration of GN&C technologies is the subject of a specific paper.

The main results available from preliminary post-flight analysis will be shown and discussed as lesson learned.