

BEAP TEST BENCH: ADAPTATIONS AND IMPROVEMENTS FOR THE NEW EUROPEAN LAUNCHERS ARIANE 6 AND VEGA C

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Abstract: the BEAP (Banc d'Essai des étages d'Accélération à Poudre) is the test bench for solid propellant rocket motors at Europe's Spaceport (Guiana Space Centre). Starting from 1993, it has allowed over the years to develop, qualify and monitor the solid rocket boosters of Ariane 5 through 13 firing tests (7 qualification tests between 1993 and 1995, plus 6 production follow-on tests in the period 2000-2016). In 2006 and 2007 it was used also to perform the 2 tests of VEGA's first stage motor P80.

In the perspective to pave the way for the new family of European launchers, in November 2014 ESA Ministerial Council deliberated to develop a new solid rocket motor, the P120C, intended to be the Common Solid Propulsive Module to be used as strap-on booster on Ariane 6 for both 62 and 64 configurations and as first stage for Vega Consolidation and Vega Evolution launch vehicles (VEGA C and VEGA E). The development and qualification plan for this new motor was based on three firing tests, to be carried out at the BEAP. The versatility required to the motor, to be capable of meeting the needs of two different launch systems (Ariane 6 and VEGA C), was also demanded to the BEAP: the DM and QM1 bench firings (2018, 2019) were performed in VEGA C stage configuration, while QM2 (2020) in Ariane 6 stage configuration. Mechanical adaptations were performed in order to accommodate P120C, having a different motor length and larger diameter with respect to Ariane 5 MPS and VEGA P80. On top of this, many activities were carried out to adapt the test bench making it more modern and flexible, capable of handling different interfaces in terms of mechanical, fluidic, pyrotechnic and avionic systems, depending on the configuration to be tested. The test bench was improved to be able to manage two different kinds of electronics and software interfaces (TTE and 1553), two different pyrotechnic systems (standard pyrotechnics for VEGA C and the new Ariane 6 opto-pyrotechnic system), two different types of batteries (standard batteries tested on DM and QM1, new thermal batteries tested on QM2). In addition, the cameras were changed, the use of drones was introduced, and the measurements system was converted to digital.

The article will present the activities performed at BEAP during the development and qualification of P120C, and will provide a first insight of the further modifications that will be implemented in the coming months to allow the testing of the new evolution of P120C, called P120C+, which will further improve the performance of Ariane 6 and VEGA C.