

TEST FACILITY P5 – PREPARED FOR NEXT GENERATION ENGINES

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Abstract:

The test center DLR Lampoldshausen provides unique testing capabilities in Europe. With its wide range of test facilities it enables testing of space propulsion components and full systems from TRL 1 to TRL8.^[1] The test facility P5 was originally built for development of the main engine of Ariane 5 rocket, the LOX/LH2 engine Vulcain. It received technical upgrades for testing of Vulcain 2 and Vulcain 2.1 engines. Currently significant modifications are performed to answer to future testing needs of advanced engine developments.

In preparation for test campaigns with the engine precursor Prometheus,^[2] the modifications contain as well the installation of new systems as also the update and expansion of existing systems:

- A new supply system with 200 m³ run tank and feed line, as well as peripheral equipment is installed to enable usage of LCH4 as fuel.
- Exhaust systems need to be modified to cope with LCH4 as fuel, to answer to the different characteristics of methane compared to hydrogen and allow for safe testing as well as complying with environmental regulations.
- Prometheus will be throttleable in a wide range from 30 to 100 % of the nominal thrust of 1000 kN. To enable fine-tuning of the engine parameters, a thrust measurement system has been developed for recording of thrust gradients during engine tests.
- As so-called all-electrical engine, Prometheus is equipped solely with electrical flight valves. The test facility is providing reliable power supply for these increased electrical needs.
- Measurement and control systems are updated to enable testing of engines with their own on-board controller.
- Enlargement of the gas ejection system together with the already existing cooling capacities allows performance of several hot runs during one single test, thus enabling the simulation of a complete toss-back flight.

With these modifications the test facility P5 is highly versatile, allowing for full engine tests with a variety of fuels, high range of thrust and new digital control solutions while retaining control and safety of the test specimen.

References:

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