

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)  
Future Space Transportation Systems Technologies (5)

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TECHNOLOGICAL DEMONSTRATORS TEST RESULTS

**Abstract**

Since several years, CNES has initiated a technological demonstration programme addressing Propulsion and Cryogenic Upper Stage technology fields. As most of the demonstrators development are achieved, this paper will provide an overview of the main results obtained during the last months as well as the last expected results at completion.

The propulsion demonstrators address LOX/LH2 sub-systems compliant with VULCAIN 2 engine functional domain and interfaces. After successful development phase, the main propulsion demonstrators are achieved and under testing.

- o The GGPX, new gas generator demonstrator, was tested at PF-52 test plant (SNECMA VERNON) 6 times alone and functional results are quite satisfying.

- o The TP-X, new Turbo Pump demonstrator, is currently under testing in cold gas conditions at PF-52

- o The next step, to be achieved in 2010, is the coupling of these 2 main demonstrators through the Power-Pack GP-X

- o Beside these main demonstrators, additional technologies were tested: The electrical hot gas valve VGC-X was successfully tested during GGPX tests as well as the DIADEM that is an open loop Health Monitoring System. These subsystems will be also part of the GP-X tests.

- o The last was the successful full scale sandwich nozzle extension (SNE-X) test performed twice during the VULCAIN 2 campaign at DLR.

On the other hand, the HX addresses key technologies for Cryogenic re ignitable Upper Stage. The first target and main driver for the HX Demo programmatic is the A5ME programme that is an ARIANE 5 evolution voted in late 2008 at the ESA Ministerial Council. HX is a technological programme that includes:

- o HXT: Technology development and testing at component/subsystem level in order to reach a TRL up to 4

- o HXG: is a macro demonstrator under developed for testing in late 2010. It is derived from 2 elongated ARIANE ECA RLOX tanks separated by a common bulkhead. HXG will allow to test about 12 innovative technologies from HXT, System and Functional objectives in representative environment on ground and in altitude simulation with solar fluxes simulation. The goal is to reach TRL 6 beginning of 2011.

This paper will address the current status and main results obtained during development and test of cryogenic insulation concepts in LH2 environment up to 1/4th scale in the frame of HXT. The new validated technologies such as the Open Cell external insulation and the Nitrogen compatible insulation will be described as well as the HXG development status.