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Author: Dr. Laurent Gomet  
ArianeGroup, France, laurent.gomet@ariane.group

## INVESTIGATION OF NEW IGNITION SYSTEMS FOR FUTURE LAUNCHER APPLICATION

**Abstract**

In combustion devices, and especially for rocket engine, the ignition system is of first importance. The reliability and robustness of this system is a prerequisite for the one of the combustion device itself. That is the reason why torch system was chosen all around the world for re-ignitable system. Such system is based on an initiator which is integrated in a small combustion chamber in order to create a flowfield able to amplify the energy generated by the initiator. The main drawback of these torch systems is that they need their own feeding system what imply a high cost. That is the reason why, in the framework of current project in which the cost is of first importance, such system seems not to be the best compromise.

From this analysis, it was obvious that Ariane Group had to work on initiator themselves and a way to use them without any amplification system. Two main tracks were investigated, the first one is based on an enhanced sparkplug called spark injector and the second one is based on laser used to create either plasma breakdown ignition or what is called ablative ignition.

The first part of the paper describes an overview of these two innovative ignition systems. The second part of the proposed paper deals with the applicability of these ignition systems to a flight-like injector configuration relevant of future launcher application, ie with LOX/CH<sub>4</sub> propellant. The chosen full scale gas generator setup is the ROMEO gas generator. It is made of seven coaxial swirl injectors, which provide a flow pattern significantly different from what is known from classical coax-shear injectors typically used in thrust chambers. The two ignition system have been first implemented and tested at single element level before transferring the setup to the P8 test facility of DLR in Lampoldshausen. Here, ignition tests have been performed applying realistic operating conditions and propellant mass flow transients.