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NEW GENERATION PYROTECHNICS FOR LAUNCHERS - COMBINING HERITAGE AND  
INNOVATION INTO AN INTEGRATED APPROACH

**Abstract**

Facing always more challenging objectives, the Space Launchers market calls for lighter, cost effective, easy handling and versatile solutions. Keeping benefit of the long-proven advantages of pyrotechnics (high energy density in a reduced space, unmatched reliability over time and ms functioning time), Pyroalliance has developed a new generation of pyrotechnic products meeting the above mentioned challenges and ready to prove their efficiency in the near future. Over the last decades, Pyroalliance has indeed been a trusted partner of the outgoing generation of European launchers-Ariane 5 and Vega- and successfully delivered series of pyrotechnic equipment for solid rocket motor ignition (Through Bulkhead Initiators), order transmission (pyrotechnic detonating lines and manifolds), stage separation (detonating cords for frangible joints and separation rings for solid boosters), flight termination (linear shaped charges) and payload separation (pyrotechnic separation nuts). Though being extremely reliable (recording a 100% success rate to meet those challenges Pyroalliance has lead Research and Technology activities long before the related launcher programs were initiated and been able to offer new technologies to support the development of new products perfectly fitted for this new generation of launchers. Among these the following innovations shall be highlighted: - Lead-free linear shaped charges for which the historical lead envelope is replaced by copper; - Lead-free transmission cords for which the historical lead envelope is replaced by aluminium. These technologies comply with more ambitious specifications (extended temperatures, improved flexibility, higher performances. . . ) and have been made possible by a complete reshaping of the manufacturing processes. Such innovations lead to a major advantage of being X-Ray controlled in house (instead of being N-Ray controlled in external public facilities), thus reducing industrial cycles and related costs. The replacement of lead also releases hazard and safety constraints and secures the long term compliance with evolutions of the regulation (in particular with REACh). In this paper, authors will present a comprehensive view and the detailed advantages of these new technologies and how they met the associated development and qualification challenges up to reaching their complete flight-readiness.

Keywords: pyrotechnics, detonating cord, detonating line, manifold, linear shaped charge