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A NEW CONCEPT OF COMPACT END-TO-END PYROCHAINS INITIATOR SOLUTION INTEGRATING SAFE & ARM

Abstract

Facing always more challenging objectives the Space market calls for ever lighter, cost effective, easy handling and versatile solutions. Besides the long-proven advantages of pyrotechnics (high energy density in a reduced space, unmatched reliability over time and microseconds functioning time), Pyroalliance presents a new concept that improves the conditions of operations versus conventional pyrotechnic chains.

Compared to traditional architectures, this new concept:

- Shows a great compactness
- Is free of primary explosives and sensitive pyrotechnics
- Requires no routing of pyrotechnic lines
- Ensures the testability of detonator and Safe Arm function
- Offers a much lighter weight and cost

This new concept of compact end-to-end Pyrochains solution brings in a Detonator, a Safe and Arm Device, a Pyrotechnic line and a Relay onto a single 50*50*70mm box. It is based on the Low Energy Exploding Foil Initiator (LEEFI) technology, originally developed for nuclear applications (hence very reliable).

Once fully developed it will be the first European integrated ISD (Ignition Safety Device), specifically tailored to space needs and qualified to space environment and safety requirements. Very easily mountable, it will be directly pluggable into the current and future launcher terminal functions: solid rocket motor igniters, neutralizations, separations, pyrotechnic bolts, etc.

The resulting product will be fully interchangeable with current launchers pyrotechnic lines. This will allow flexibility in terms of introduction rank onto the launcher. The introduction pattern of this new technology may be a mix between the historical technology and the new one, depending on the selected end-functions.

The main benefits of this new concept lays in its high level of reliability, with few internal interfaces,

no moving parts, and a flight experience of 15 000 units of the same technology already in service on tactical applications.

The resulting product will be made in Europe, REACH-compliant and compliant with most current and future launchers specifications.

An additional cost benefit for the customer will be resulting from the outsourcing of the management of pyrotechnic interfaces since Pyroalliance will take responsibility for the qualification and performance of the full pyrotechnic chain.

In this paper, authors will present the detailed advantages of the future solution, the status of development through prototyping and testing performed since 2019 as well as the envisaged implementation roadmap.

Keywords: Exploding Foil Initiator, Flight Termination System, Ignition Safety Device, Pyrotechnics, Pyrochain, Safe & Arm Device