CLASSIFICATION
Transport regulation:

	Detonator	Detonating Transfer Line	Linear Shaped Charge
UN Number	UN0323	UN0384	UN0288
Proper shipping name	CARTRIDGES, POWER DEVICE	COMPONENTS, EXPLOSIVE TRAIN, N.O.S	CHARGES, SHAPED, FLEXIBLE, LINEAR
Division / Compatibility group	1.4S	1.4S	1.1D

Not restricted by ITAR regulations

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CERTIFICATIONS SSE
ORGANISMES CERTIFICATEURS
SECURITE PYROTECHNIQUE ET ENVIRONNEMENT

MINISTÈRE DES ARMÉES — arianeGROUP — BUREAU VERITAS NF EN ISO 14001

CERTIFICATION QUALITE

ISO 9001 DEKRA — EN 9100 DEKRA

Contact

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SCAN ME

NEW SPACE

GUARD&FLY® – Flight Termination Systems (FTS) for launchers

Pyroalliance designs and manufactures pyrotechnic systems involved in different actuation functions for space applications. A typical application is the Flight Termination function required for space launchers.

The overall dimensions as well as the nature of the structures to be severed to terminate the flight can be very heterogeneous. Our solution is then customized depending on the requirements. Based on a generic architecture presented hereafter, we can accommodate a large portfolio of severance solutions to elaborate the appropriate design and optimize the performance while limiting weight and size of the embarked equipment.

More generally, Pyroalliance delivers complete pyrotechnic chains adapted to its customers' needs. They are designed and manufactured under Pyroalliance design authority.

GUARD&FLY® FEATURES

Operating mode

A Flight Termination System is made of a chain of components designed and assembled to operate a termination sequence. It is typically made of electro-pyro detonators, a safe & arm device, pyrotechnic transfer lines and destruction charges.

As depicted in the diagram, our generic solution is based on a set of redundant detonators that will receive from the avionics the flight termination order under the form of an electrical signal and convert it into detonating orders.

The manual safe & arm device previously activated before take-off will authorize the transfer of the detonating signals down to a couple of linear shaped charges designed to severe critical parts of the launcher (usually fuel tanks in the case of liquid propulsion or motor cases in the case of solid propulsion).

Our generic solution can accommodate different quantities and lengths of linear shaped charges.

Available options

Build your own solution with available bricks

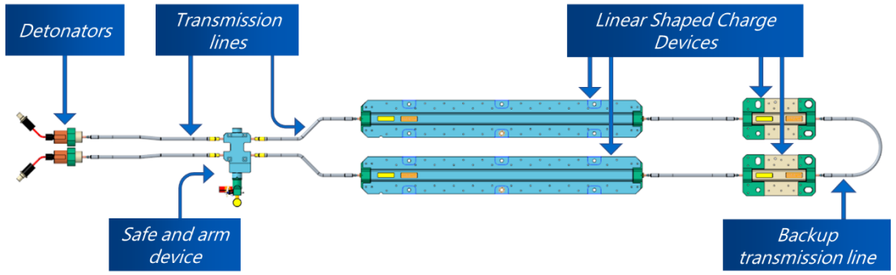


Diagram of the generic architecture including optional combinations of several aligned LSCDs and a backup transmission line closing the loop

This generic architecture can be tuned by:

- Selecting the **number and size of Linear Shaped Charge Devices (LSCD)** among the options available (see Table)
  The overall assembly can be made of a succession of LSCDs places in series.

- Adapting the **length of the Detonating Transfer Lines (DTL)** of each segment of the overall assembly so as to adapt to the hosting design and integrate the LSCDs at the most convenient location on the launcher architecture. Length of those DTLs range from 0,2m up to more than 12m;

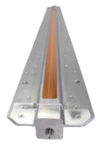
- Adding **detonators and Safe & Arm** proposed by Pyroalliance (or possibly other sources). Benefit of choosing Pyroalliance sources is that interfaces are natively qualified.

- Adding one **additional DTL** to the architecture as a back-up initiation in case one of the two channels would be defective. Such option improves the overall reliability of the FTS assembly.

Options matrix

Choice of LSCD **Available qualified options**	220mm 850mm 1340mm
Lengths of DTLs	From 0.2m to 12m
Detonator / S&A	Pyroalliance or External sources
Back-up line	Yes/No

Detonator



Linear shaped charge Device

Safe and arm device

Transmission line

Benefits

- **Actuation time**
  By nature pyrotechnic actuators allow a very low actuation time and associated to a low standard deviation of such equipment is extremely short, thus perfectly fitted for the responsiveness expected from a Flight Termination function.

- **Reliability**
  High reliability of the solution is granted by the implementation of highly reliable elementary parts and combined with qualified interfaces securing a secure signal transmission from one part to the next. On top of that, redundancy and physical separation of two distinct initiation chains usually contribute to the extreme reliability of the function.

- **Simplicity / ease of integration**
  Our generic solution is energetically autonomous and takes its massive source of energy from the energetic materials instead of external sources like batteries. Its integration into most common launcher architectures is easy and straightforward.

- **Compliance to usual environment and standards**
  The design of our generic FTS solution is compliant with the RCC 319 Commonality Standard as well as with European space standards usually made applicable to most launch sites
  Appropriate pyrotechnic components are also selected so as to meet the environment constraints – especially temperatures – associated to the mission profile.

- **Lead time and production rate**
  Pyroalliance offers off-the-shelf designs that lead to a reduced lead time for the first item delivery (typically 6 months). Non Recurring adaptation efforts, an optimized proposal will be established so as to qualify the related options set. In terms of production rate, Pyroalliance is equipped with a dedicated and stream-lined production workshop.

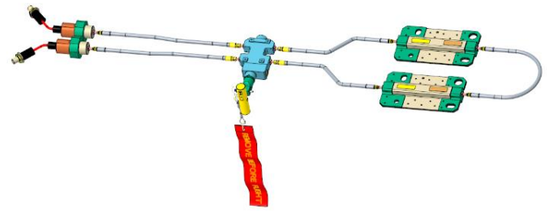
Applications

- Flight Termination of solid rocket boosters
- Flight Termination of Liquid propulsion stages (main or upper stage)

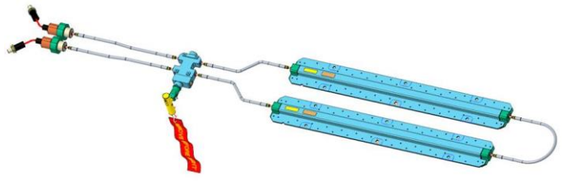
Typical performances and features

Off-the-shelf available lengths for linear shaped charges	Typical sizes are 220mm, 850mm and 1340mm
Cutting performances	Up to 22 mm steel and 35 mm carbon composite
Range of operating temperatures	Typically from -50°C to +110°C
Reliability	Better than 0.999 at 95% confidence
Mass of the set	Depending on size and number of charges

** Indicative typical performance elements*
Please consult us for customization



Example of design with "small" LSCDs and a back-up line



Example of design with "long" LSCDs and a back-up line