

NEW FUZING SOLUTIONS FOR IMPROVED SAFETY AND OPERATIONAL CAPABILITIES

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JUNGHANS Defence
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- | Operational Capabilities / Terminal Effect - Trends
- | Challenges and Solutions For New Safety Requirements
- | Challenges and Solutions For New Operational Capabilities

JUNGHANS Defence – The Fuze Company



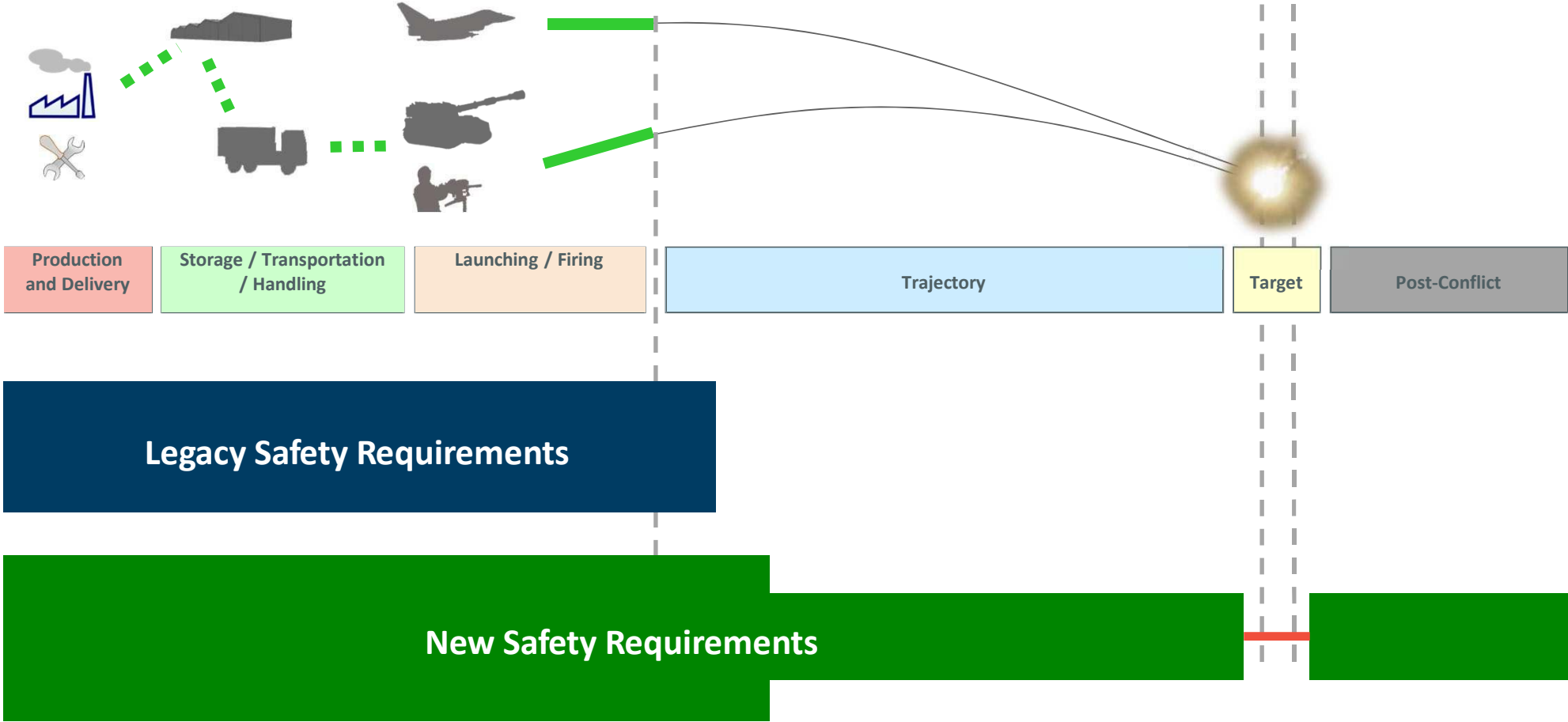
Complete Range of Fuzing Systems

- **Fuzes for all types of munitions**
- **Safety & Arming Devices and Fuzing Modules for Missiles and Complex Weapons**

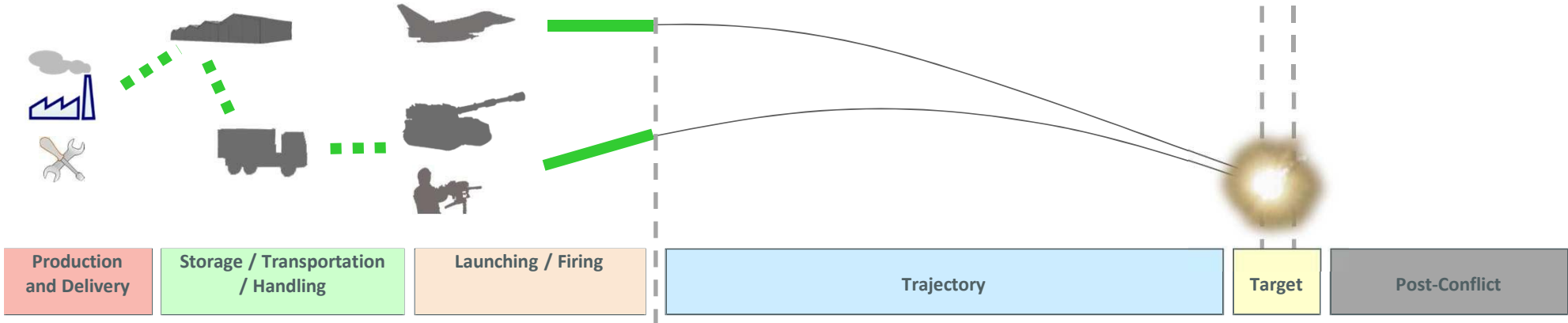
Key competences in Fuzing technologies, Micro-technologies and Ammunition electronics

Two Centers of Competences located in Germany and France

Safety Requirements - Trends



Safety Requirements - Trends



New Safety Requirements

Extended safe separation distance

STANAG 4187 Compliance – all munition fuzes

STANAG 4368 Compliance (Rocket Motor)

IM features

New Weapons Systems (automatic loading / ramming, extended range, new propulsion...)

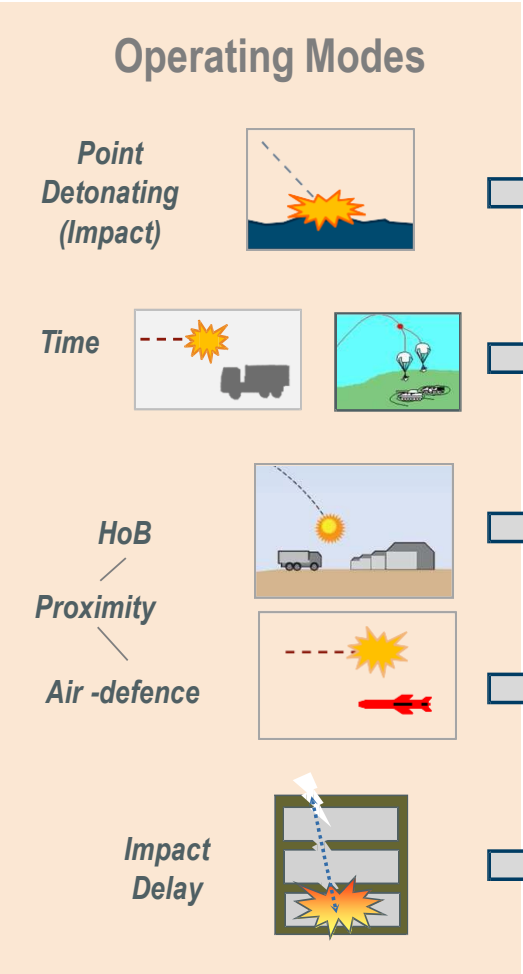
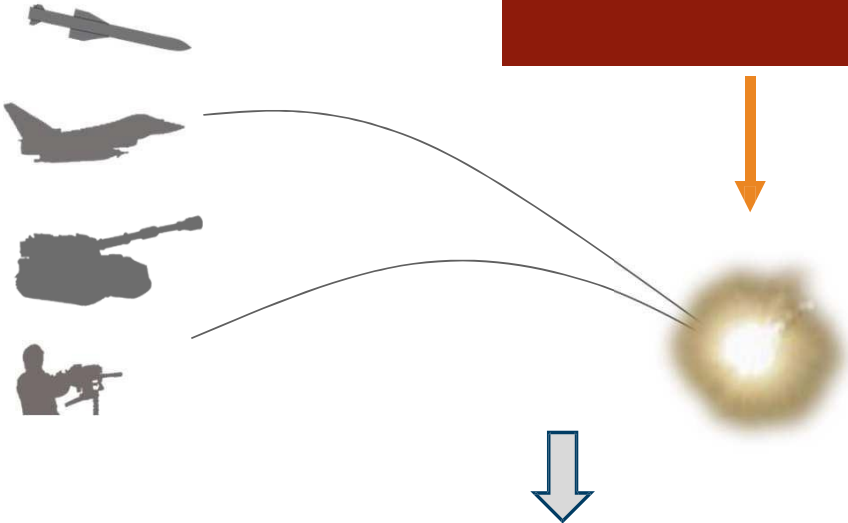
Enhanced overflight inhibition/safety

New Guided Munitions requirements (mission abort, arming control)

Post-conflict "Safety" (UXO, hazardous duds, Return to safe status, ...)

Operational Capabilities / Terminal Effect - Trends

Target Detection
Terminal Effect
Optimization



- Graze Impact
- Soft ground operation

- Time accuracy
- Direct fire / programmable airburst
- Easy integration of Fuze Setter

- HoB accuracy / type of surface
- HoB selection
- Implementation on new munitions

- "Tricky targets":
- UAV
 - Sea-skimmer missiles
 - Fast Inshore Attack Craft

- Hard Target Fuzing
- for A-G weapon, Tank ammo, rocket and missile



**SOLUTIONS FOR NEW
SAFETY REQUIREMENTS**

STANAG 4187 Compliance – Dual Safety Features

- Now required for all new munitions
- Still challenging to the fuze designer

Flight environment detection
in particular for non-spin or low-spin munitions



Relative wind measurement

- Wind-wheel (for mechanical fuzes)
- Wind generator (for electronic fuzes)
- Pressure / airflow sensors



Other flight characteristics measurement

- Low spin sensing (mechanical or electronic)
- Accelerometers / Signal processing
- Magnetic sensors

Space requirements for medium caliber fuzes



Small size / Miniaturization of S&A Devices and Firing trains



DM111S PD Fuze for Mortar Ammunition



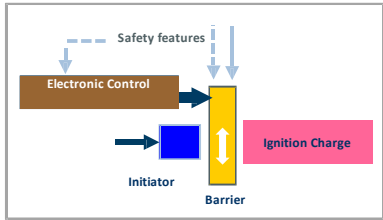
Dual Safe Fuze for Air-to-Ground Rocket (THALES 68mm)

STANAG 4368 Compliance – Motor Ignition Systems

- Ignition Safety Devices now required for all new generation rocket and missile motor ignition
 - Comparable to safety requirements for warhead S&A units
 - Capability to revert back to "non-armed" status

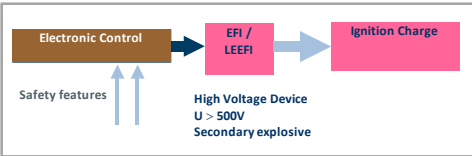
Interrupted train solutions
(pyrotechnic)

Electromechanical
ISD



In-line solutions
EFI/LEEFI-based

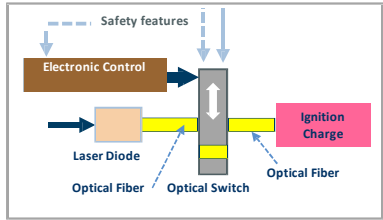
Fully electronic ISD



- Use of EFI (Exploding Foil Initiator) or LEEFI (Low Energy EFI)
- Possibility of multi-pulse ignition (dual stage motor)
- Adaptation to various form factors

Laser ignition
Optical interrupted train

Electromechanical ISD
(optical switch)



LEEFI-Based ISD with TBI
(JUNGHANS Defence – PYROALLIANCE)

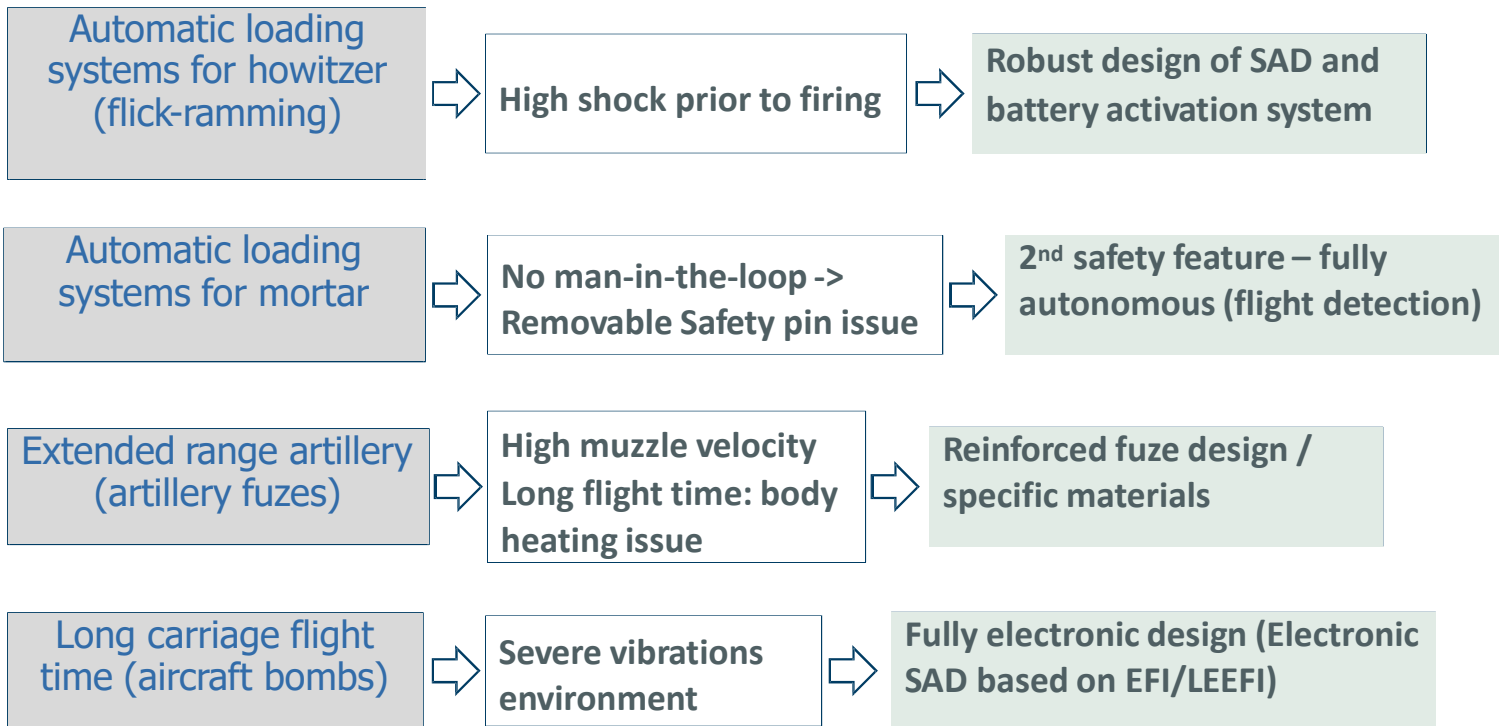


With TBI (Through Bulkhead Initiator)
or
Direct ignition of propellant



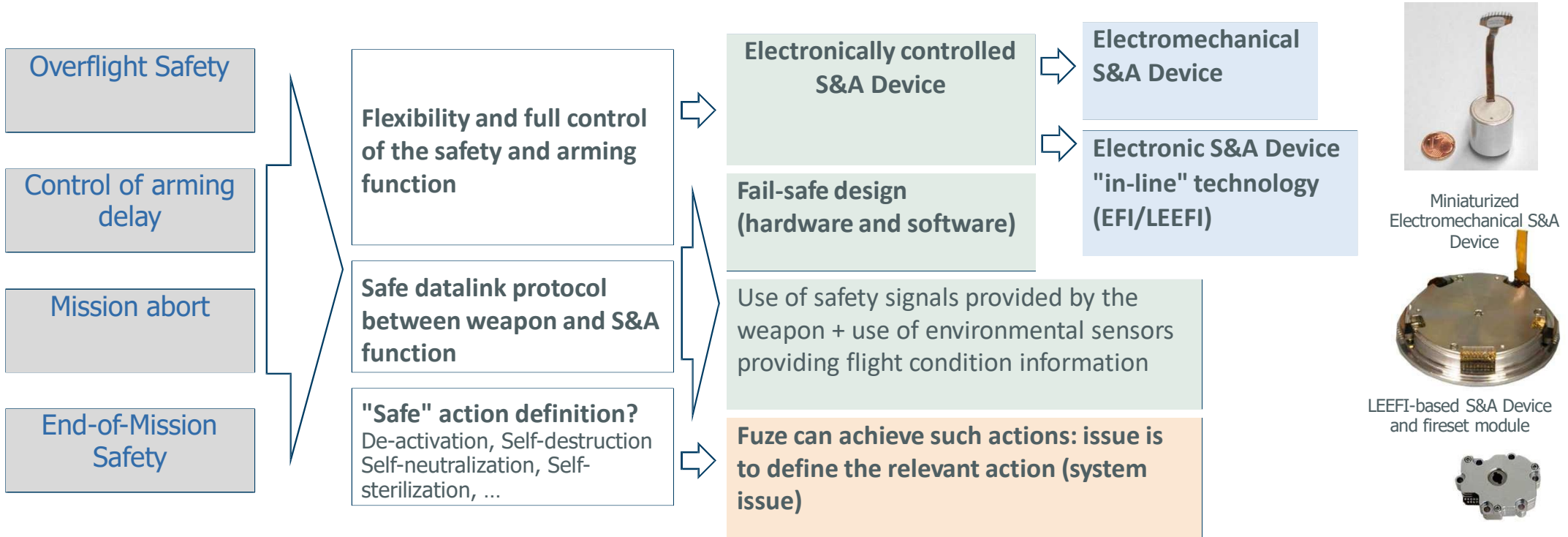
New weapons systems – Fuze Design and Safety Requirements

- New generation of weapon systems generate more severe firing environments
- This has an impact on fuze design, in particular regarding safety features



New Guided/Smart Munitions - New Safety Requirements

- New generation of munitions, as guided and "smart" munitions, provide new functionalities for new operational capabilities
 - These new functionalities lead to new requirements regarding safety management (+ possible impact on reliability)

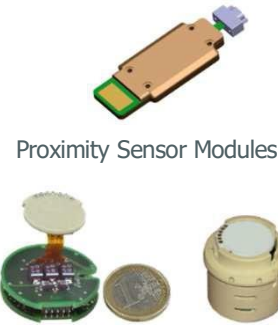
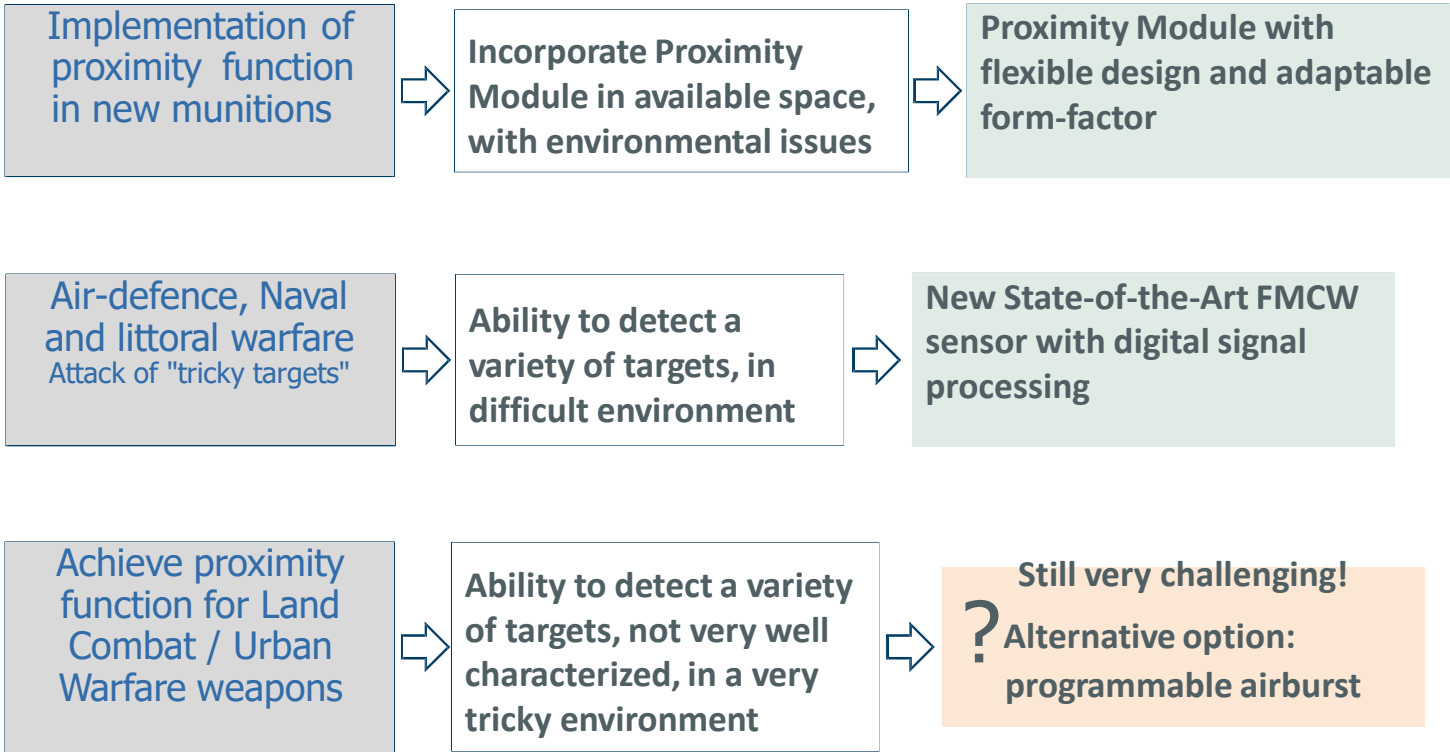




**SOLUTIONS FOR NEW
OPERATIONAL CAPABILITIES**

Optimizing Burst Position at Target – Proximity fuzing

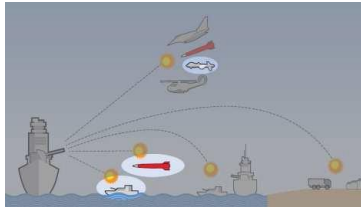
- Objective: provide optimum terminal effect at target, with fully autonomous fuze



Implementation on Air-to-Ground Guided Weapon

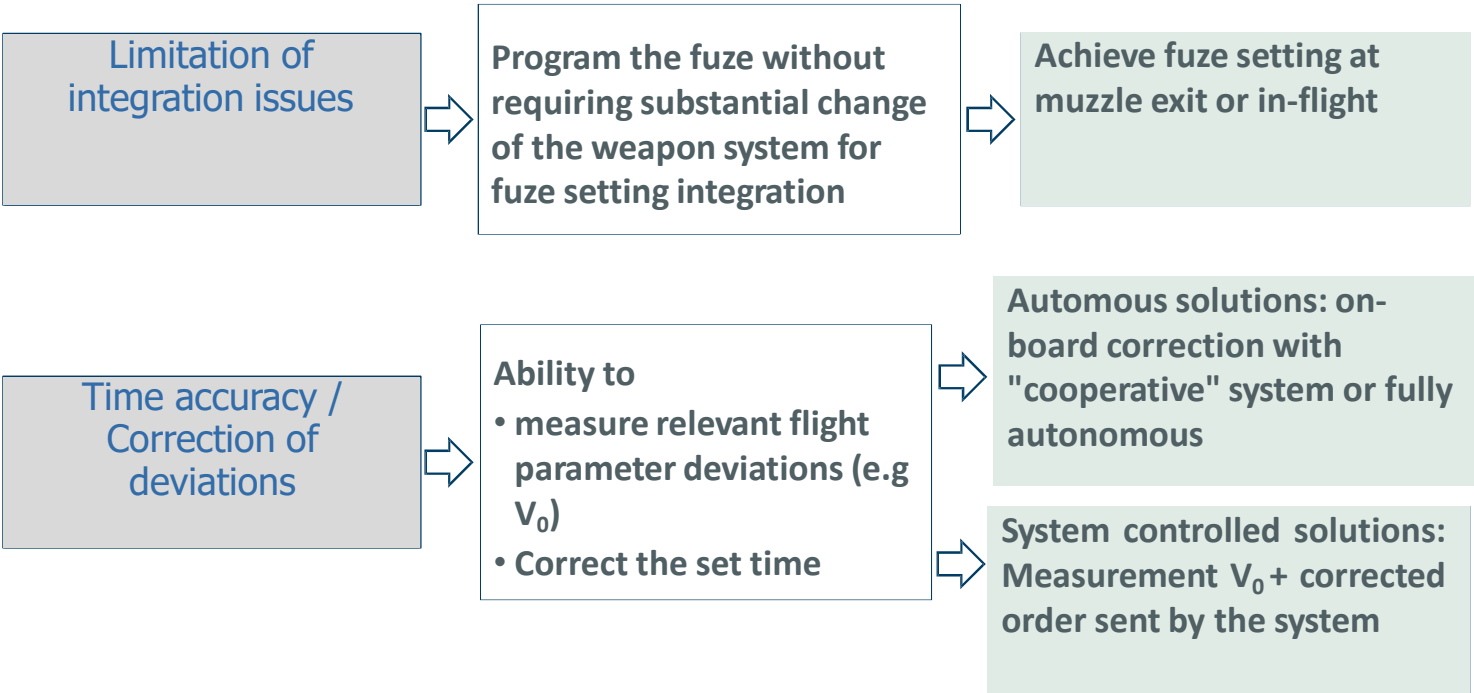
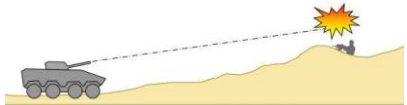


FREMEN New Generation Naval Fuze



Optimizing Burst Position At Target – Airburst Fuzing (Programmable Time)

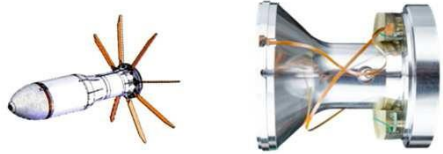
- Objective: provide optimum terminal effect at target by airburst operation, controlled with programmed time
 - Achieving "proximity" operation when proximity is difficult or not possible
 - e.g. land combat / urban warfare



Airburst Fuze for 40mm Infantry Grenade
Fuze setting by magnetic induction at muzzle exit



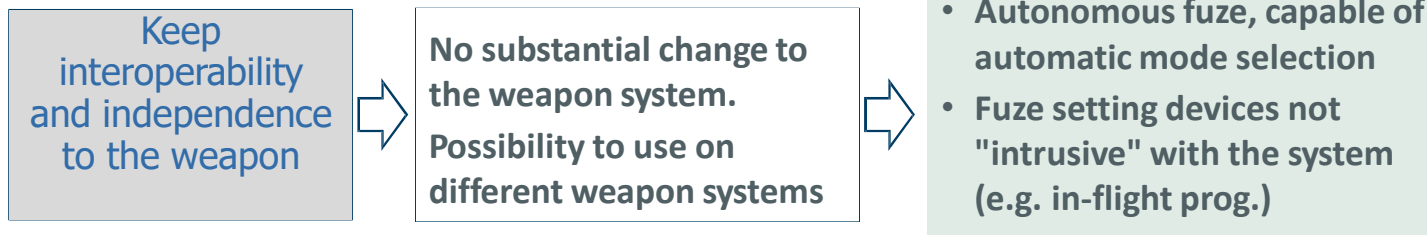
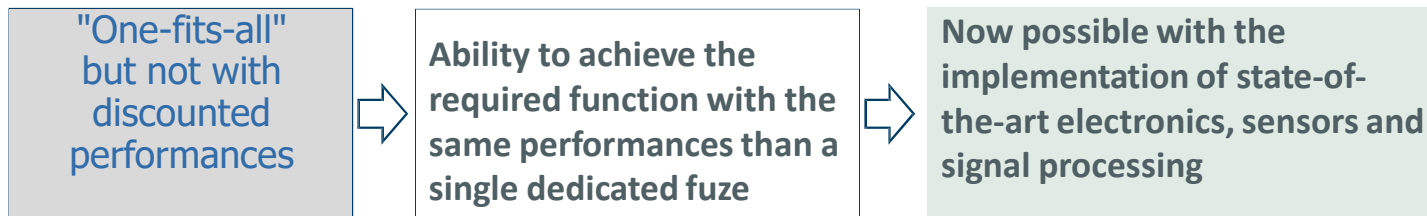
Dynamit Nobel Defence RGW90 LRMP
Shoulder-launched infantry weapon system



Airburst fuze with velocity correction
for RGW 90 LRMP munition

Multi-function Fuze Issue

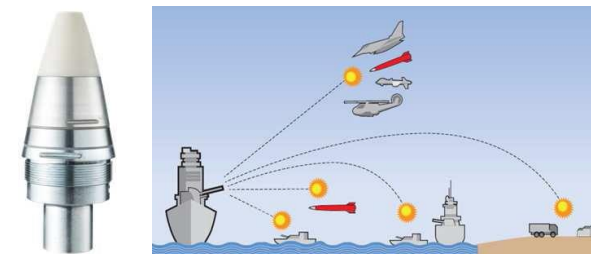
- Objective: to improve operational flexibility with fuzes able to achieve all operational missions, whatever the requested and relevant operating mode
 - Optimized value for money, from an overall mission perspective
 - Obvious benefits but possible trade-offs and challenges for the fuze designer



DM173 Tank ammunition fuze Airburst, PD and PD-Delay (hard target) for Rheinmetall 120mm DM11 round



FREMEN Naval Fuze (cal. 76mm, 100mm, 127mm) Autonomous Fuze for Air-defence / Littoral warfare (direct fire) as well as Fire Support (indirect fire)



Conclusion

- Fuzes and fuzing systems are fundamental contributors to safety and operational capabilities of munitions and missiles
 - Modern fuzes have to deal with new requirements in terms of operational effectiveness and safety features
- New technologies in micro-mechanical systems, electronics and sensors lead to significant improvements in new generation fuzes, providing solutions to meet these new requirements
- As a dedicated Fuze Company JUNGHANS Defence is able to
 - leverage and share such solutions for the benefit of various fuze applications
 - take up technological challenges to provide the war-fighter with state-of-the-art and efficient fuzes



YOUR TRUSTED PARTNER

for smart and reliable fuze solutions

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