NIAG 117
Future Fuze Safety and Arming Technologies and Implications

Fuzing Timelines and Operational Sequencing

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NIAG 117 Thrust: Standardization

- Review of current standards – up to post launch separation.
- Requirements for new standards – beyond post launch separation.

Examining classic and evolving requirements and life cycle elements to which Fuze Systems are exposed.
NATO Industrial Advisory Group 117

- Follows Previous NIAG Study SG 89 Which Examined Future Fuzing Technologies For Air Launched Weapons For Ground Targets

- Reviewing Current International, NATO And National Standards Related To Fuze Safety And Arming

- Examining Applicable Enabling Architecture Technologies In Relation To Current Standards

- Identifying the Impact Of New Technologies On These Standards And Will Make Proposals For Changes to NATO Standards

- Liaising With National Safety Approval Authorities.
Simplified Timeline for Air Delivered Weapons

- Carriage
- Partially Armed
- Arm Enabled
- Terminal Flight
- Target Effects*

* Including Collateral Damage
Fuzing can not be considered -if it ever truly could- in isolation from the overall weapon system and the overall system operational sequence

- Arming and Rearming
- Programmability
- Guidance Integrated Fuzing
- Use on Unmanned Aerial Vehicles
- Expanded Safety and Enhanced Reliability Requirements
- Focus on Unexploded Ordnance and Explosive Remnants of War
Continuum Of Weapon Complexities

Non-Complex Gravity Bombs
- Unguided
- Impact Detonating
- Released From Manned Aircraft
- Blast/Frag Warheads

Higher Complexity

Very Complex Cruise Missiles
- Precise Guidance
- Powered/ Large Standoff
- Hard Target, Void Sensing
- Proximity Sensors
- Data Links, etc.

Complex Guided Weapons
- Precise Guidance
- Large Standoff
- Hard Target, Void Sensing
- Proximity Sensors
- Manned and Unmanned A/C
- Networked, etc.
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Increased Expectations To Decrease Collateral Damage and ERW

Very Complex Cruise Missiles
- Precise Guidance
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- Proximity Sensors
- Data Links, etc.
Definition of Fuzing System
STANAG 4187

- Ensures the safety of the initiation system of the munition payload throughout the logistic phases and operational usage as well as testing and inspection.
- Recognizes or determines the circumstances under which the munition payload is intended to function.
- Enables and initiates the munition’s payload.
- Where applicable, recognizes or determines the circumstances under which the munition payload is intended to be de-armed, sterilized, or to self-destruct.”
Fuze System Life Cycle Environments

- Pre-Carriage
- Captive Carriage and Return
- Launch and Free Flight
- Post Impact

Safety Is Of Utmost Criticality Throughout The Entire Fuze Life Cycle
Captive Carriage and Release

Captive Carriage → Captive Carry Programming → Captive Carry BIT (Go/ no Go)

No Go: Mission Cancelled/ Bad BIT

Return From Captive Carriage → Post Flight Checks → Weapon Download

Weapon Testing/ De-Programming

Weapon Disassembly → Fuze Test/ Reprogram

Fuze Ready For Reuse

Go

Aircraft/ Platform Launch

Unarmed <10⁻⁶
Launch and Free Flight - With Data Link

Aircraft/ Platform Launch

Minimum Arm Time & A/C Safe Separation

Environment 1

Armed Enabled

Arm Flight

Environment 2

Proximity Or Impact Sensed

Instant Or Delayed Fuze Function

Warhead Detonation

Failure to Detonate

Self Destruct, EOD or ERW

Unarmed <10^-6

Partially armed

Armed

Good Detonation

Partially armed

Armed
Post Impact Considerations

- **Target Accuracy**
  - Good
  - Bad

- **Weapon Detonation**
  - Good
  - Bad

- **Successful Mission**
  - **ERW**

- **Collateral Damage**
  - **ERW**

* With or Without Self Destruct
** Future Post Impact Information
Safety/Hazard Levels Must Be Maintained at <10⁻⁶ Until Safe Distance from Manned Aircraft

- Fuze Manufacture, Shipment, Storage, Weapon Assembly, Weapon Load
- Weapon Captive Carriage
- Weapon Release and Free-flight
- Weapon Target Detection, Payload Function, End of Mission Life
- Safe Separation Distance
Safety/Hazard Levels Defined in STANAG 4187, Required Safety Hazard Levels vs Specified Reliability

- Fuze Manufacture, Shipment, Storage, Weapon Assembly, Weapon Load
- Weapon Captive Carriage
- Weapon Release and Free-flight
- Weapon Target Detection, Payload Function, End of Mission Life
- Safe Separation from Release A/C
Summary

- NIAG 117 Very Active In Reviewing Existing STANAGs For Evolving Fuzing Requirements
  - Recommendations Forthcoming In The Near Future

- Fuzing Must Be Considered From A Total Weapon System Perspective
  - Future Fuzing To Face A Continuum Of System Complexities And Very Diverse Release Platforms

- Current Fuze System Safety Requirements Focus On System Safety Up Through Release Platform Safe Separation Distance

- Growing Expectations To Consider Unexploded Ordnance And Explosive Remnants Of War
Questions?
Backups