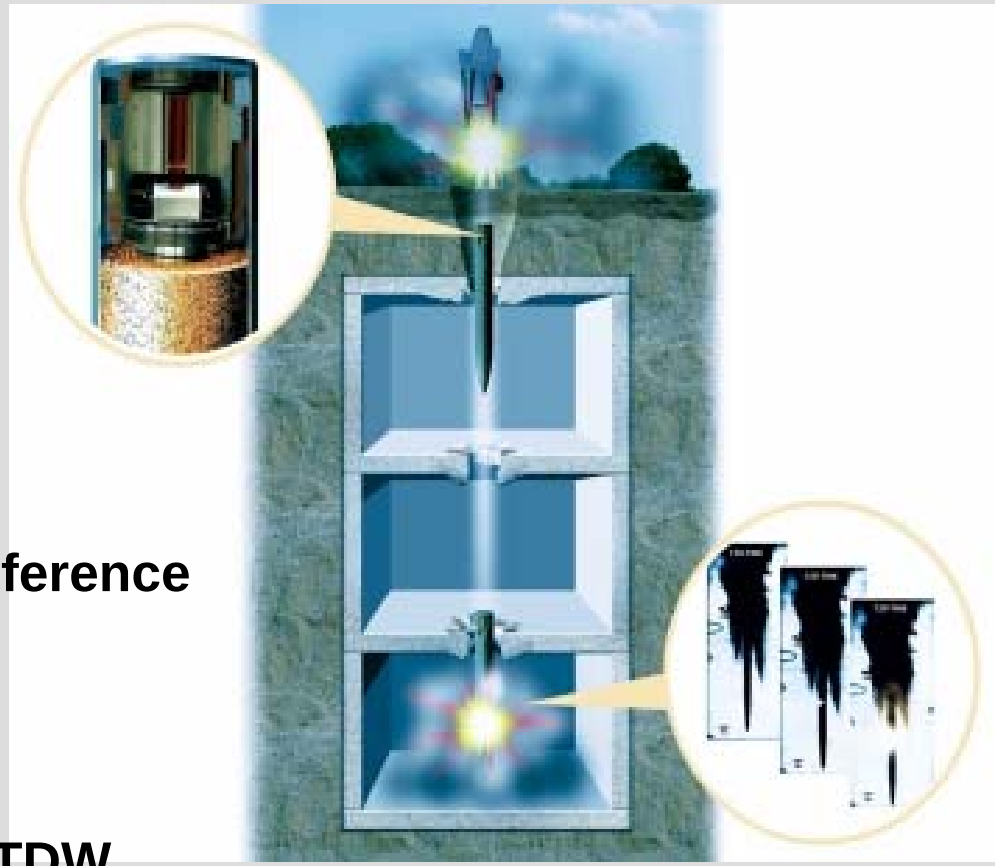
Buried Target Fuze



To: 49th Annual Fuze Conference

By: Dale Spencer, Kaman

Contributing Author:

Dr. Helmut Muthig, TDW

Presentation Overview

- The Buried Target Fuze (BTF) Team
- The Programmable Intelligent Multi Purpose Fuze (PIMPF) as the basis for BTF
  - Rationale, Benefits, Concept, etc.
- NAVY Foreign Comparative Testing for PIMPF

BTF Team

General Overview – BTF

- TDW has a qualified fuze (**PIMPF**) and is **in production** for the German **Taurus Missile** and the **Norwegian Naval Strike Missile**.
  - Hard target penetrator
  - Counts voids/ (hard) layers w/ back-up timer
  - Detonates at the prescribed condition

- Kaman is the producer of the **Maverick, BLU-116, JPF, SLAM-ER, Tomahawk, and JASSM "penetration" Fuzes**.

- The Kaman and TDW team are combining their Fuzing experience to:
  - Produce PIMPF in US for "New Warhead" applications, e.g. Tmhwk.
  - Re-package the PIMPF Function for applications in 3" US Fuze Well
    - Buried Target Fuze (BTF)
    - Retain PIMPF Void Sensing Electronics without modification

BTF Rationale

- **Opportunity to quickly meet Hard and Deeply Buried Target needs:**
  - **For New and Reworked Warheads use PIMPF Fuze-well design**
    - **Fuzes in the field in approx. <u>one year</u>**
  - **For existing warheads Re-Package into US Std. Fuze-well**
    - **Fuzes in the field in approx. <u>two years</u>**
  - **Design facilitates either Missile or Bomb Fuze configuration**

- **Provide Layer and Void Counting capability coupled with**
  - **Mission/ Cockpit Programmability**
  - **Back-up timer capability**
  - **Robust proven environmental worthiness**
  - **High Reliability**

BTF Benefits

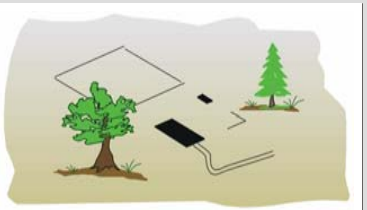
- **Reduced Risk for Layer and Void Counting Applications**
  - Proven/ In Production Technology
  - Fuze does not require tuning
  - Uses smart software to extract penetration events rather than double integrating sensor signals
  - Software handling mitigates instrument baseline drift bias in sensors as sensors experience multiple high “G” loads

- **Reduced Development Time --** Minimal Development Time, Repackage vs. Redesign utilizing proven, in-production Fuze

- **Maintain Safety – Compatible with “Out-of-Line”**
  - PIMPF meets STANAG 4187 NATO equivalent to US Mil-Std-1316.

The PIMPF/ BTF Threat: Target Spectrum

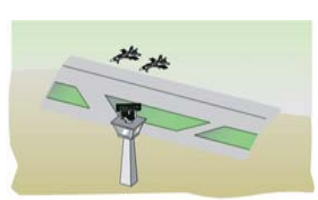
Point Targets **Area Targets**



Bunker: direct / indirect signature

Shelter

Taxiway & Runway

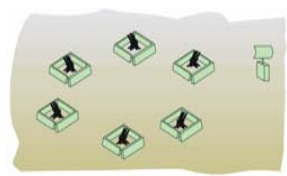


A/C in the Open

Ammunition Store

Bridge Pier

Ships in Port



Fixed SAM-Sites

The Initial BTF Concept

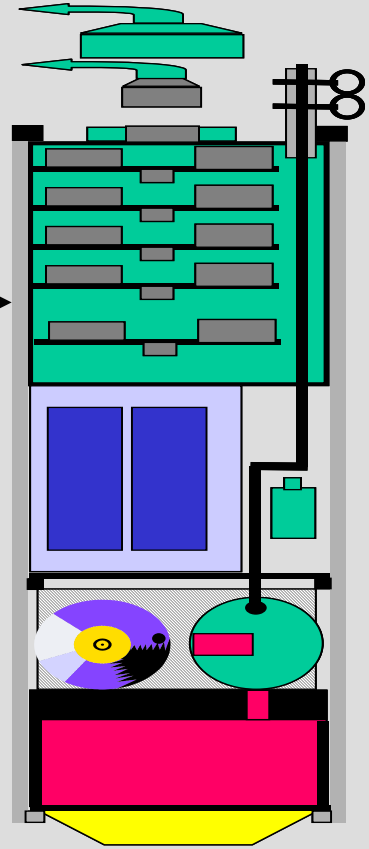
~4.5” to 3” Dia.

Retain Electronics

MSL to Bomb Fuze
Add Gag Rod

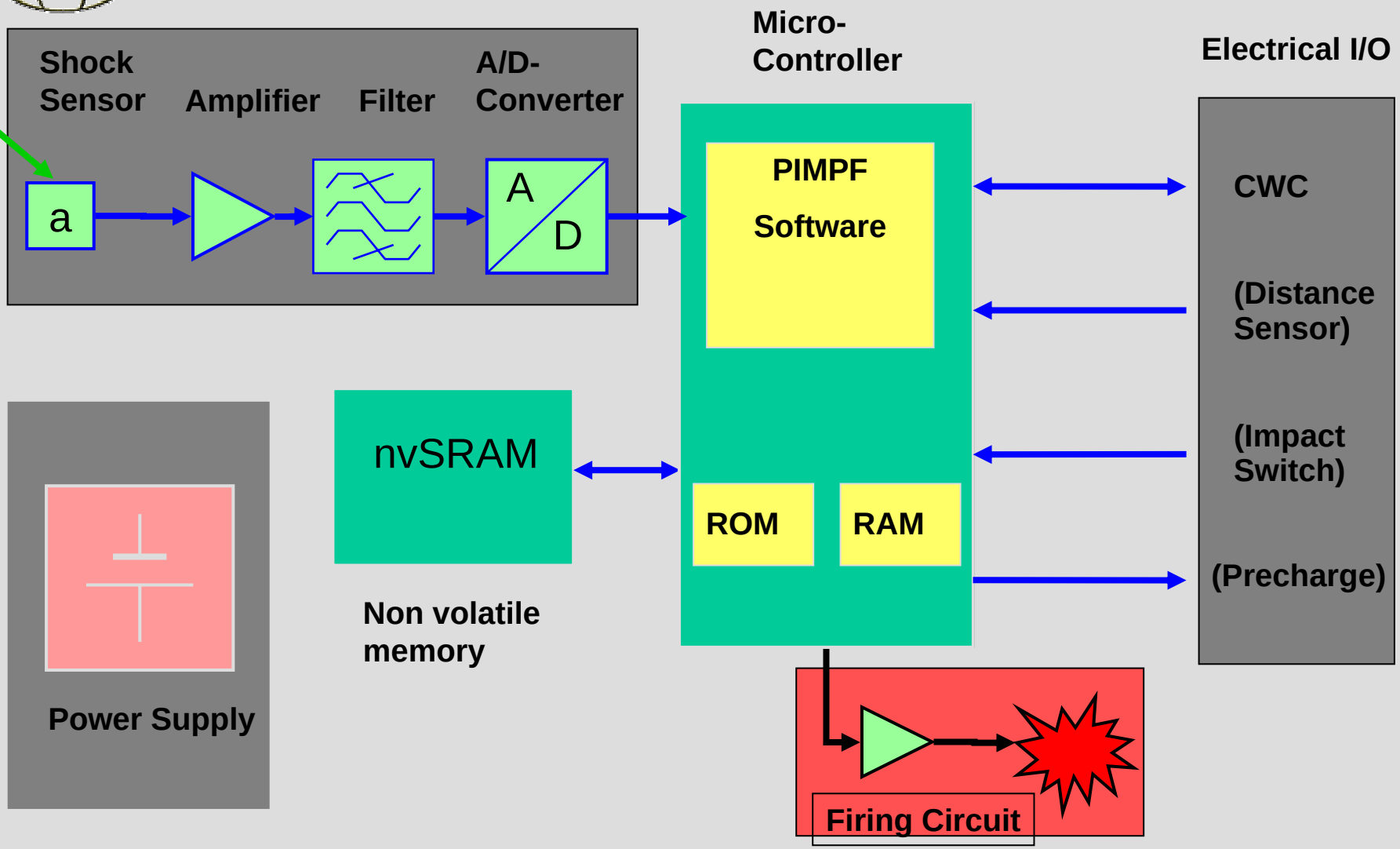
Re-Package S&A

Utilize FMU-143
Booster

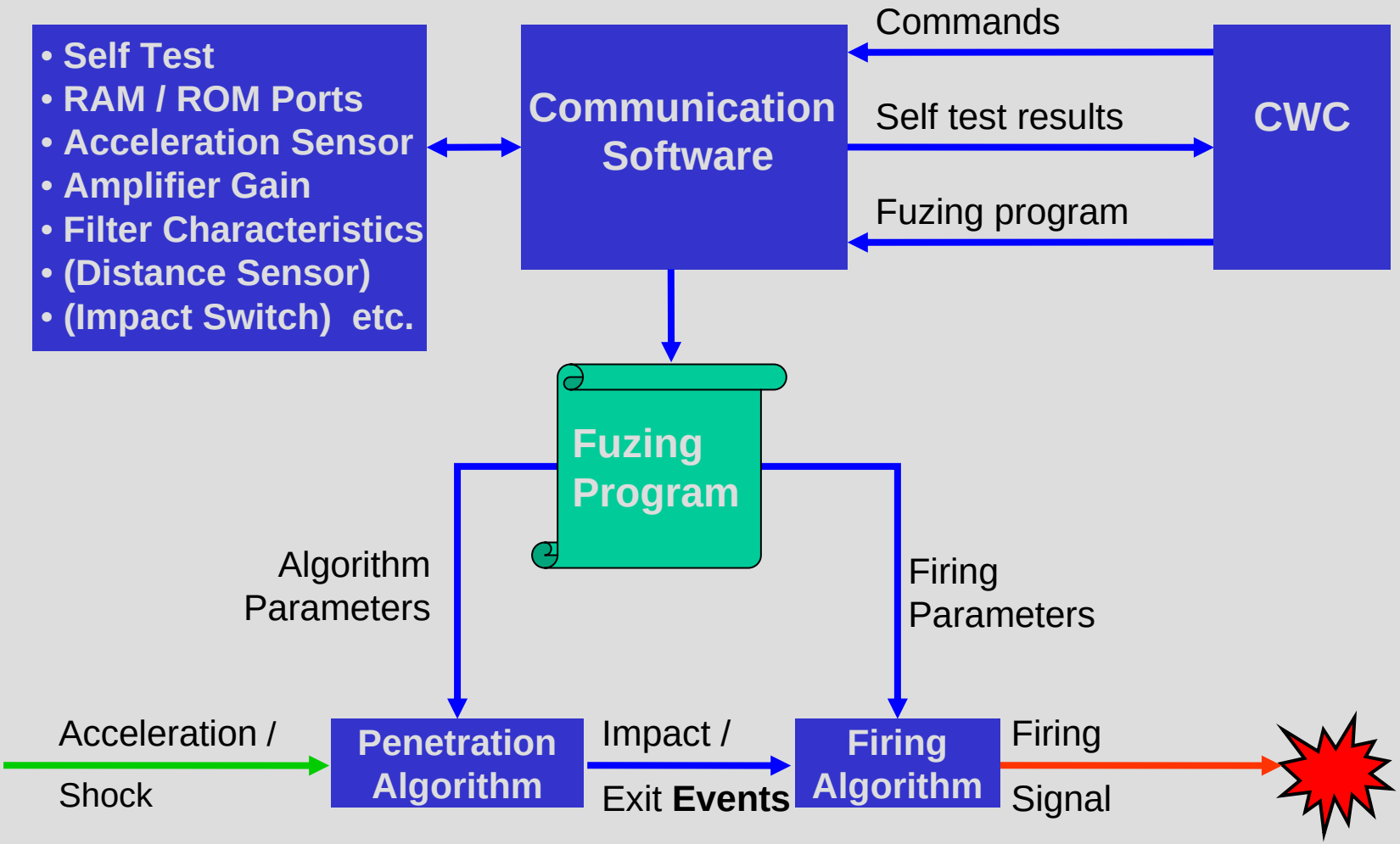


PIMPF → BTF

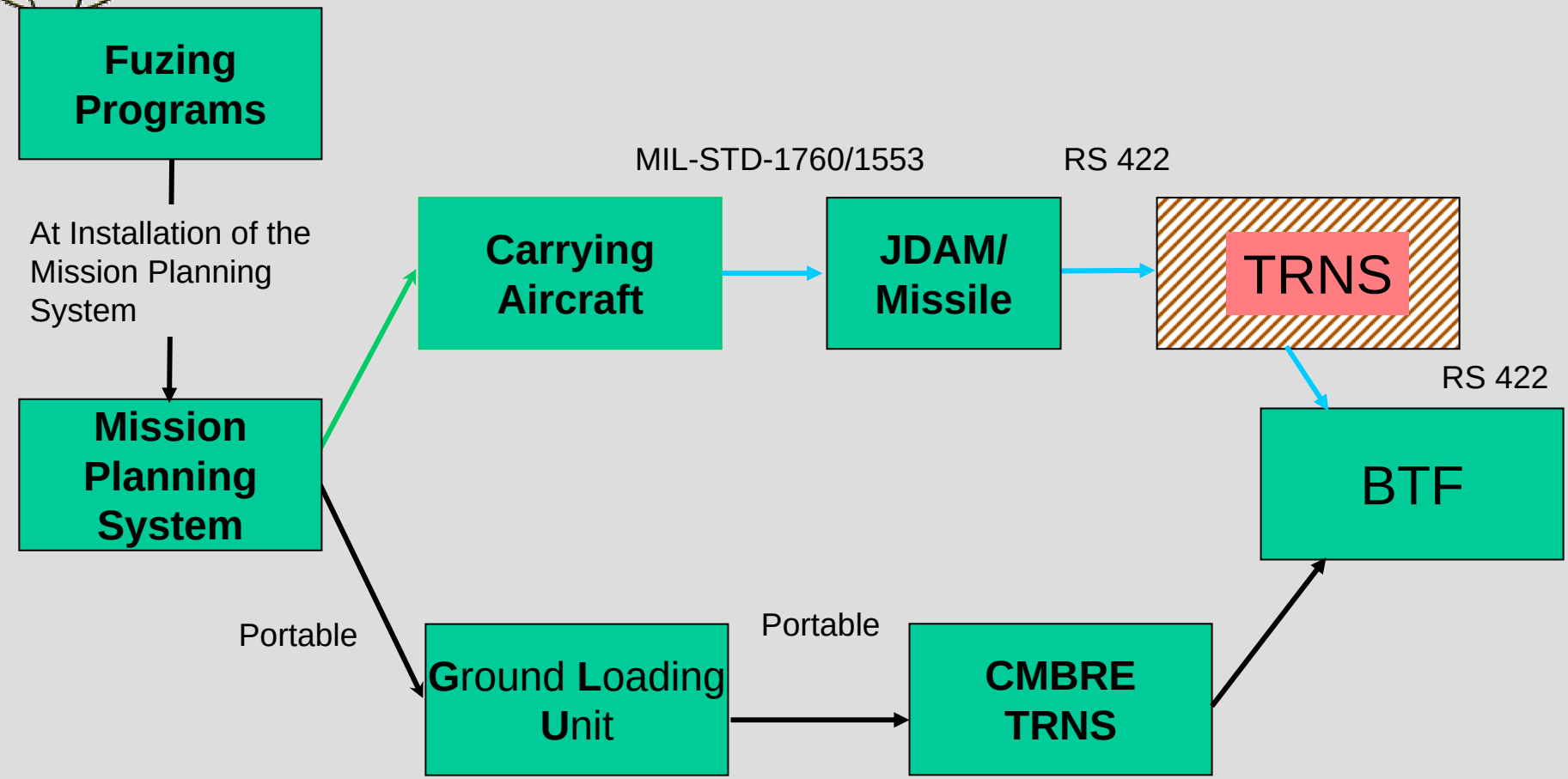
PIMPF Functional Block Diagram



Software Functions



BTF Program Flow for Bomb & Missile

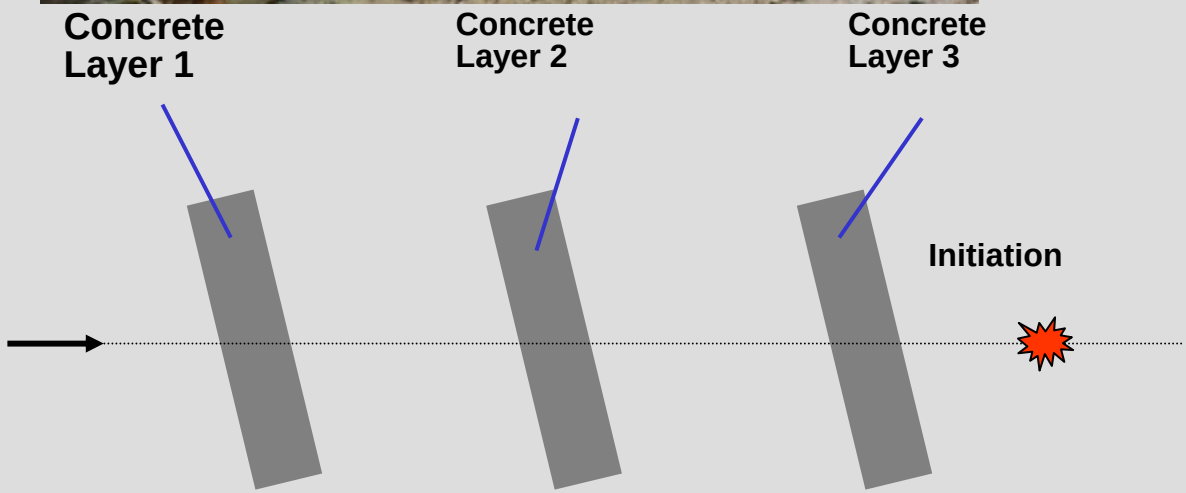


Experimental Results/ Number of Tests performed

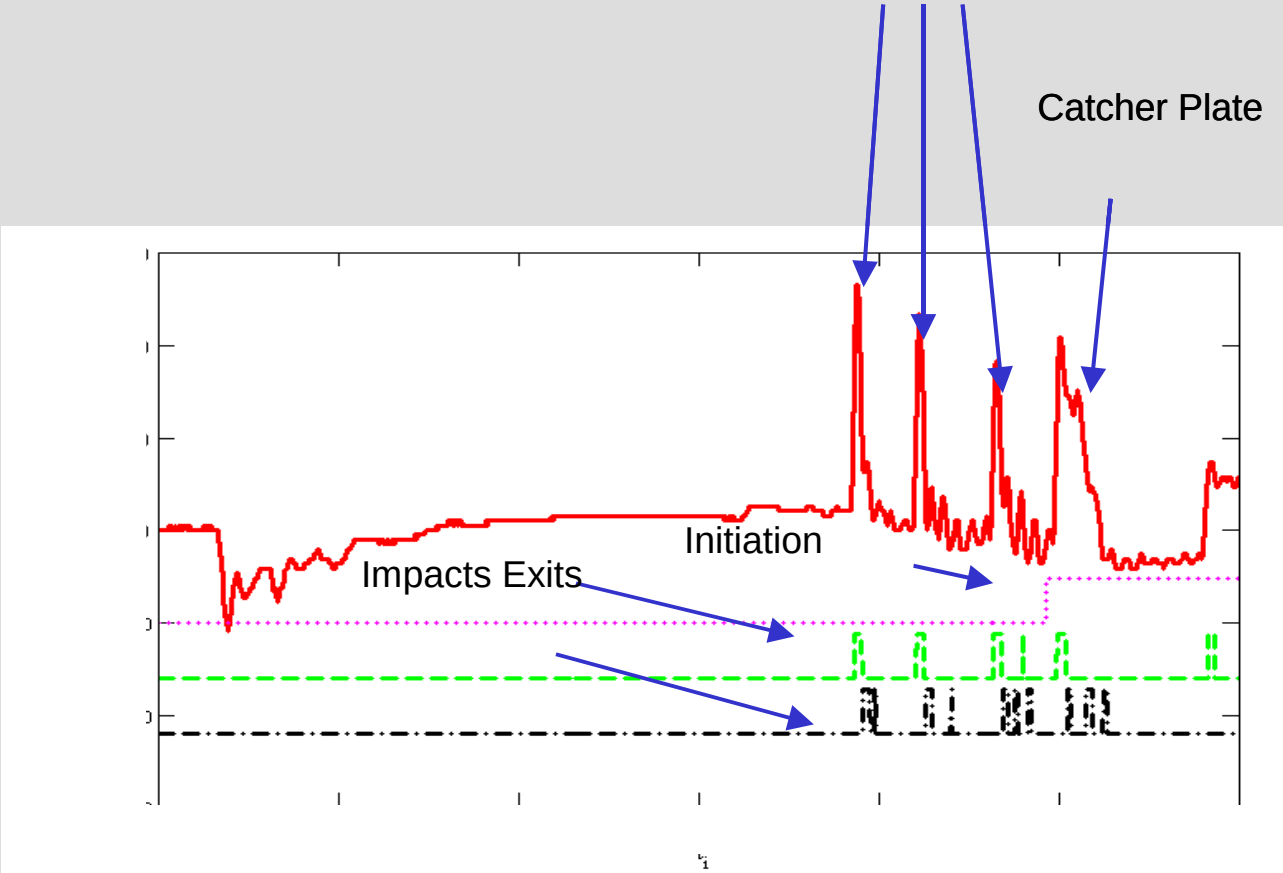
Target Type (MEPHISTO)	No. of Tests
"Bunker" 3 layers of reinforced concrete	**4**
"Shelter" (Sand / reinforced concrete / gravel / reinforced concrete)	**6**
"Heavy Bunker" (one massive layer of reinforced concrete)	**4**
"Ship" (2 steel plates)	**3**
	Total (full-scale): **17** (plus 8 half-scale)
"Ship Target" (NSM)	**7**
" Taurus Missile Live Fire"	**2**

Grand Total: 34 out of 34 Succesful Tests

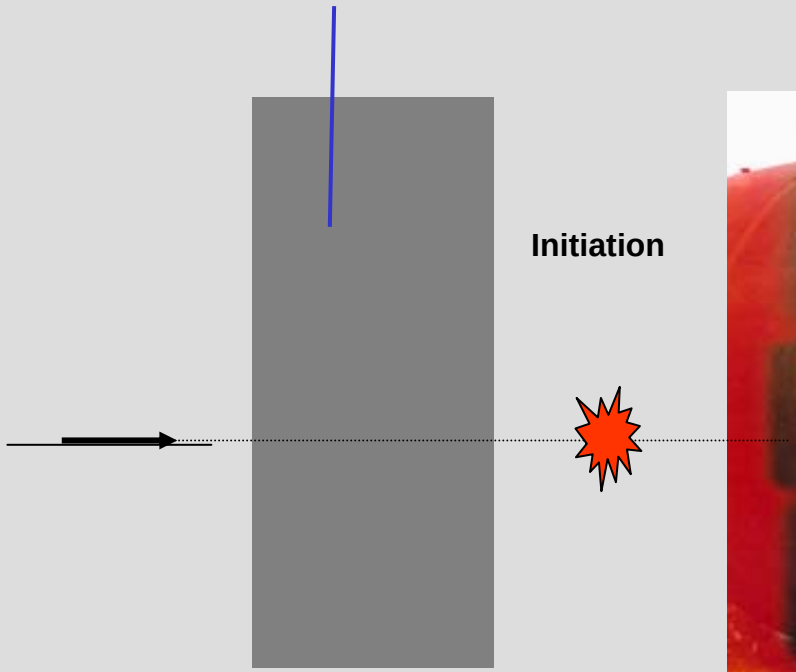
Test Results - "Bunker" Target

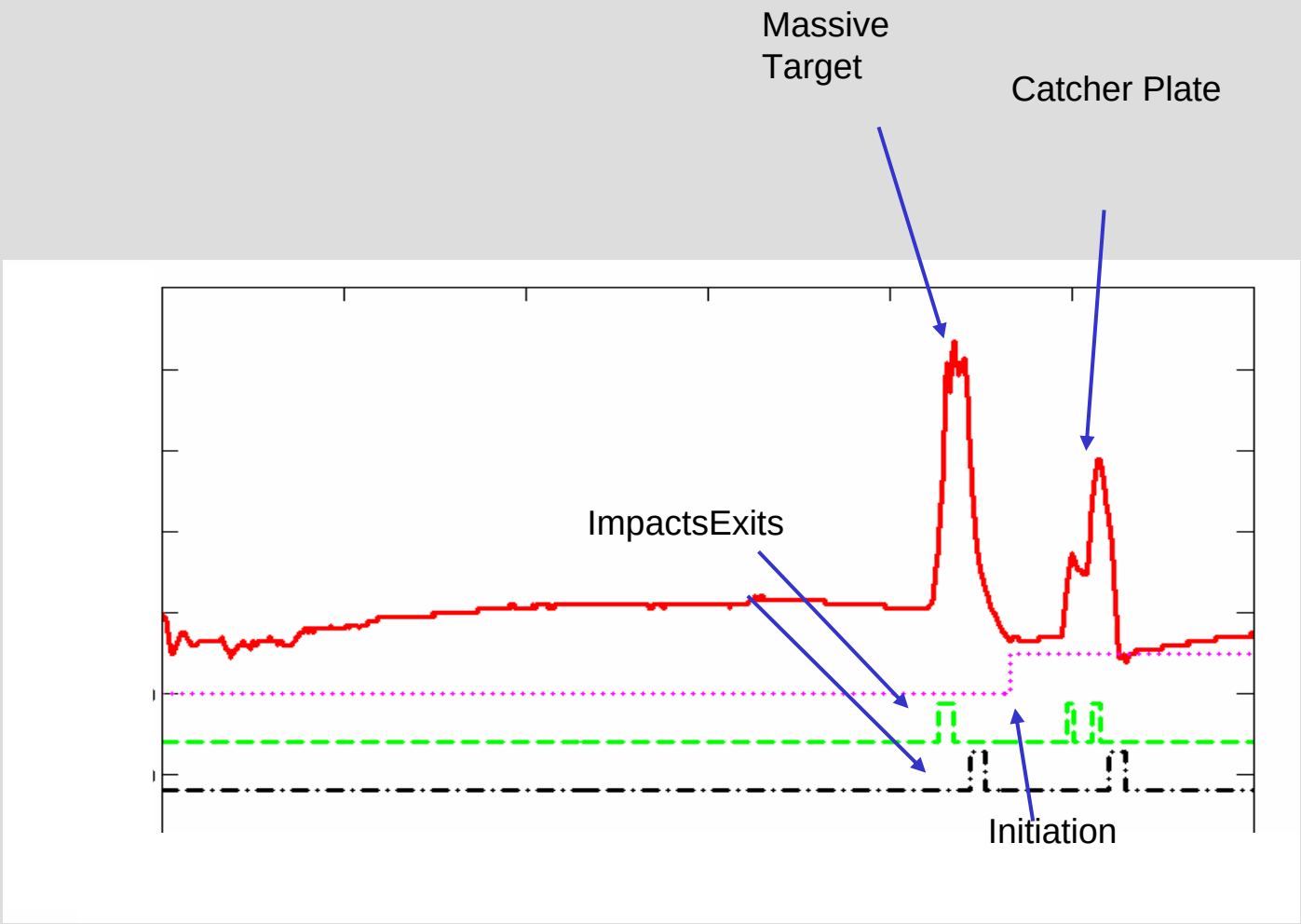


3 Concrete Layers

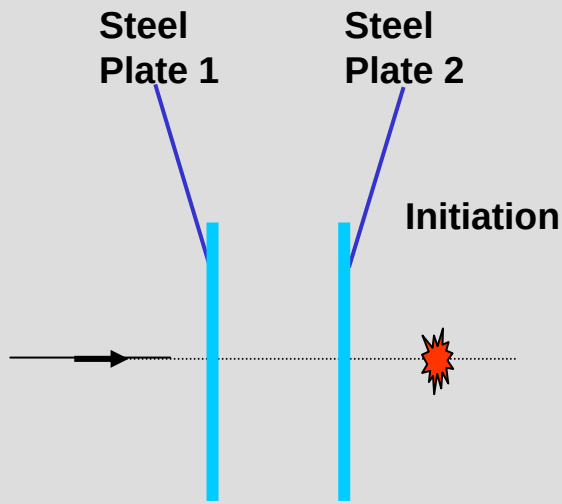


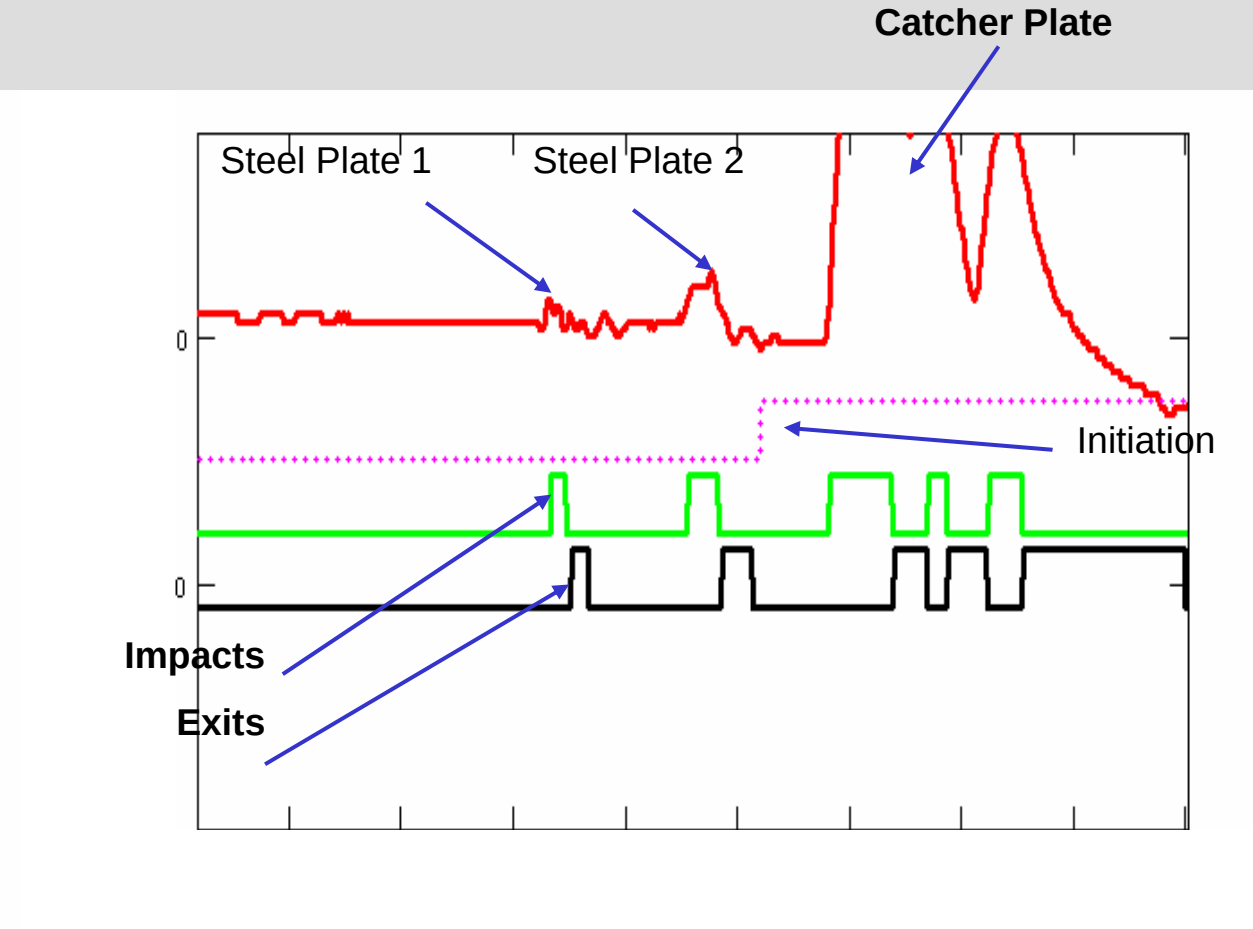
Test Results - "Heavy Bunker" Target





Test Results - "Ship" Target

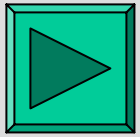




Key Qualified Requirements of PIMPF

- **Shock resistance:** **10,000 g / 10 msec axial**
  (required for Mephisto **8,000 g / 5 msec lateral**
  expected to withstand higher)
- **Operating temperature :** **- 40 °C to + 63 °C**
  (Electronics tested to -54°C)
- **Storage temperature :** **- 54 °C to + 71 °C**
- **Environmental Stressing:** **acc. to MIL-STD-331 and 810**
- **EMC Requirements :** **EUROFIGHTER and TORNADO**
- **Reliability (Predicted):** **calculated acc. to MIL-HDBK 217**
  - **85,000 hr storage** **0.9856**
  - **12 hr captive flight** **0.9999**
  - **45 min freeflight** **0.9998**

Foreign Comparative Test for PIMPF



Click on button to bring up FCT viewgraphs courtesy of NAWC/CL

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