Abstract number: 17726

Testing Capabilities
and
Instrumentation Strategies

TDW, Christian Euba

July 7-9, 2015
NDIA, 58TH Fuze Conference

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an MBDA company

1) TDW's legacy in smart hard target fuzing
2) ESAD based Hard Target Fuze
3) Simulation of Hard Target Fuze Shock Environment
4) Component level testing
5) Conclusion & Final Hard Target Fuze verification


NDIA
PIMPF - The German
Hard Target Fuze is ready
Helmut Hederer
Dr. Helmut Muthig (*)
TDW - Gesellschaft für verteidigungs-
technische Wirksysteme mbH
Schrobenhausen, GERMANY
„THE WORLD OF FUZING"
THE 46TH ANNUAL FUZE CONFERENCE
April 29 - May 1 2002
San Antonio, Texas


Taurus Systems GmbH


MEPHISTO – The MWS for TAURUS
Distance
Sensor
Precursor
Shaped Charge
Penetrator Charge
PIMPF
TDW GmbH


NDIA
FUZE
"Changing Fuze Standards"
May 22-24, 2007 Nashville, TN
Successful Execution of the PIMPF
Foreign Comparative Test for CALCM
Authors: Michael Bredehoeft
705th Missile Sustainment Squadron (MSUS), Tinker AFB, OK
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TDW Gesellschaft fuer verteidigungstechnische Wirksysteme mbH,
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MBDA
MISSILE SYSTEMS
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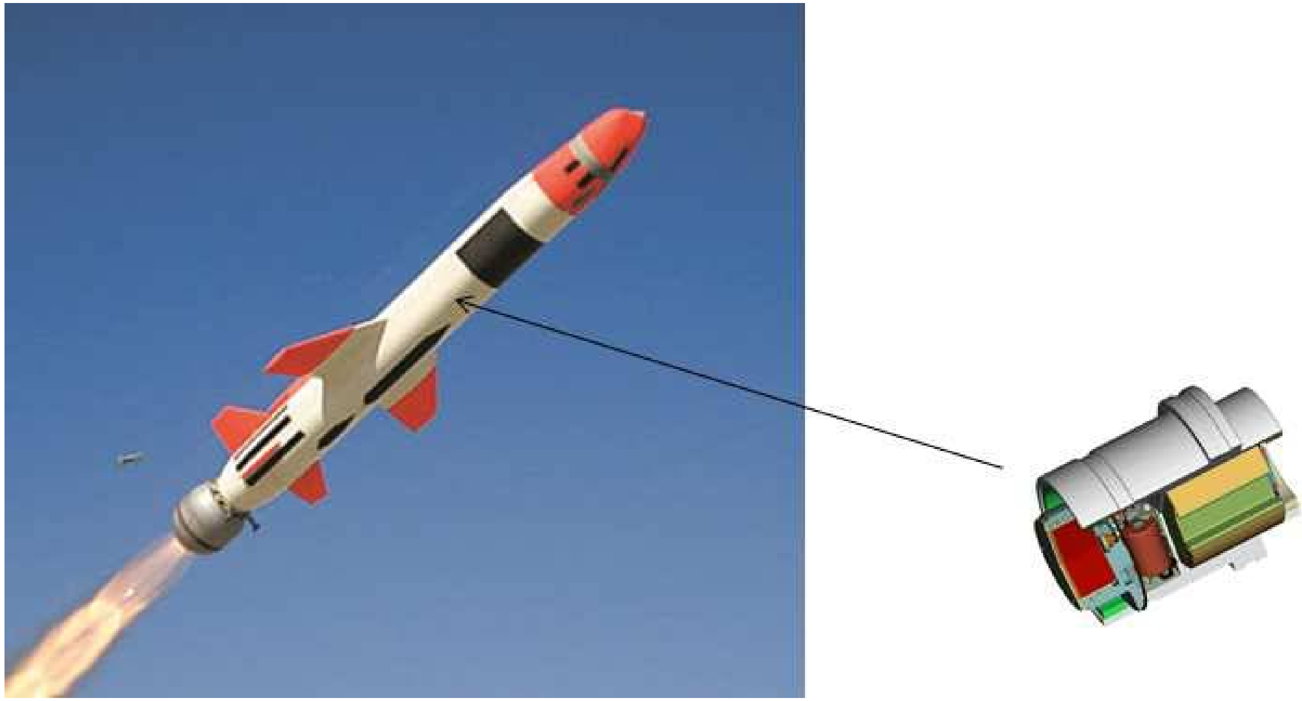
PIMPF's second Application:

NSM - The new Anti-Ship Missile from KONGSBERG



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TDW's legacy in smart hard target fuzing

Void Sensing Fuze
Product Improvement Program

53rd Annual Fuze Conference
Lake Buena Vista, FL, 2009

Dale Spencer, Kaman Fuzing
Dr. Helmut Muthig, TDW
Jim Guthrie, DTRA

Void Sensing Fuze Product (VSF) Improvement Program, Transition of German Technology to Meet American Warfighter Needs

55th Annual Fuze Conference, Salt Lake City, UT, 2011

Dale Spencer, Kaman Fuzing
Dr. Helmut Muthig, TDW
Jim Guthrie and Jon Rice, DTRA

- Repackage the Programmable Intelligent Multi-Purpose Fuze (PIMPF) into a 3-inch form factor compatible with US weapon fuze wells
- call it **"Void Sensing Fuze" (VSF)**
  - Program Sponsor – DTRA
  - Industry
    - TDW (German Fuze Manufacturer)
    - Kaman Fuzing (TDW's US partner)
  - Subject Matter Experts
    - NAWC-WD
    - AFRL-MN
    - Northrop Grumman
    - SAIC
  - Government Test Planning
    - DTRA
    - NAWC-WD
    - AFRL-MN
    - PMA-280

VOID SENSING FUSE
VSF

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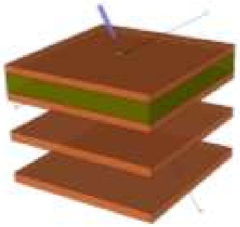
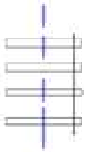
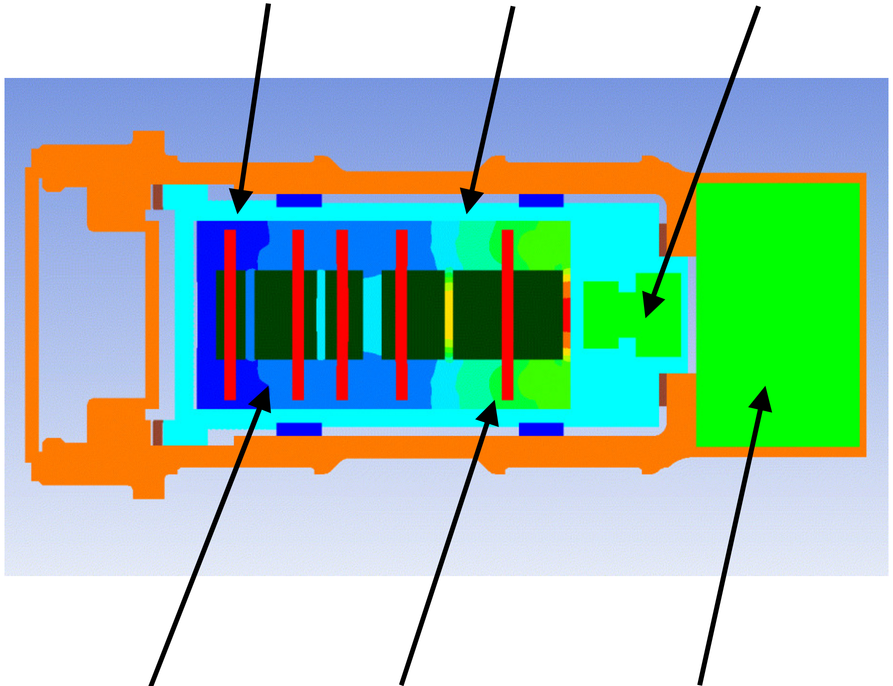
The task of a **hard target fuze** is to **initiate** the Warhead inside of the target at the **desired location.**

The key requirement on components in a hard target fuze is to **survive and operate during** the shock or even the sequence of multiple shocks.

Extensive testing at components level is necessary to determine the shock characteristic and shock sensitivity (and even shock limit).







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Component level testing - Comparison of TDW acceleration / shock facilities

Facility	(Centrifuge*)	(Shaker*)	Drop Table*	Gas gun*	Explosives	Sled
Shock	30g	500g	20000g	20000g	100000g	Real harsh high-g working environment
Number of tests	unlimited	unlimited	15 per hour	3 per hour	1 per day	2-3 per week

*) Easy testing with powered devices

Number of tests

Cost






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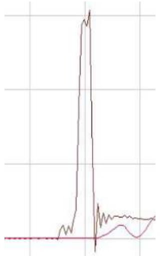
High test frequency
(up to 15 drops per hour)

Low costs

Low maintenance effort

Flexible component testing in white color



- Testing with powered units
- Testing with integrated shock sensors
- Extreme reproducible shocks
- Extreme easy instrumentation

High firing frequency
(up to 3 shot per hour)

Low costs (gas, working hours)

Low maintenance effort

Highly variable

Flexible component testing in white color

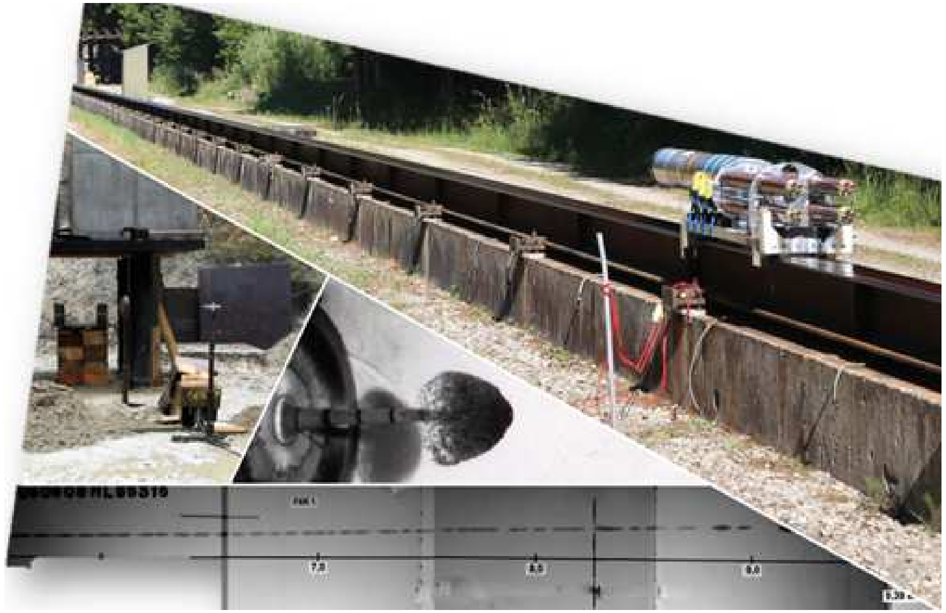
Increased shock duration.

- Powered device
- Velocity measurement at muzzle
- Velocity measurement near target via electric eye
- High speed video
- Integrated sensors

Low test frequency
(up to 3 per week)
High costs
High maintenance effort

Real high-g working environment

Testing in blue color



Acceleration distance	160 m
Mass of system including sled	60 kg (up to 190 kg)
Transport of high explosive	5kg
Target dimension	4x4x4m
End diagnostic	High speed video and/or flash x-ray

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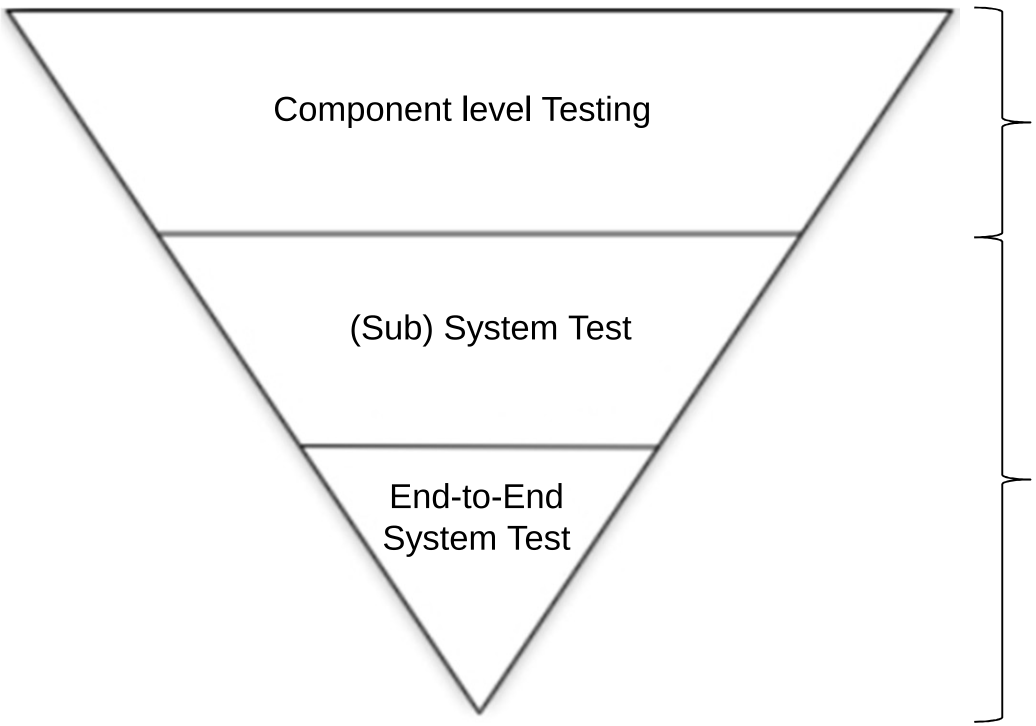
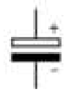
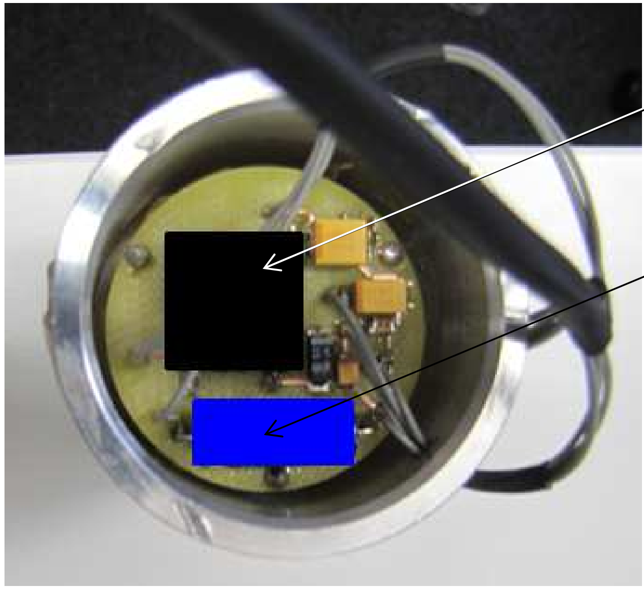




C**omponent level** testing means the focusing on the functionality of the component.
(without considering how it works with others).

(Sub)System level testing means that you are verifying the Hard Target Fuze against requirement at the top level.
(and looking for the harmony with all different components)**.**



Test Component A (capacitor of technology A)

Test Component B (capacitor of technology B)

Test objective:

- Determination of shock characteristic and shock limit of the new component when powered (under real condition).

- Two capacitors (A and B) are charged and shocked.

Components shocked stepwise from 2000g to 18000g.

Part A survived each shock. The capacitor was charged prior, during and after the impact.

Part B survived the shock till 4000g. By shocks higher than 4000g was the capacitor discharged after the shock.
→ Part B is now classified as "shock sensitive".

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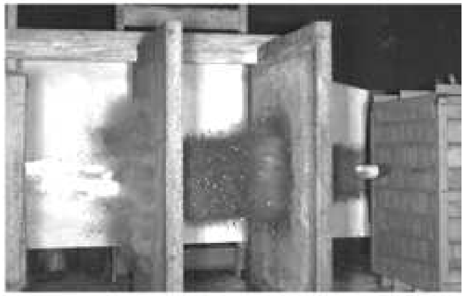

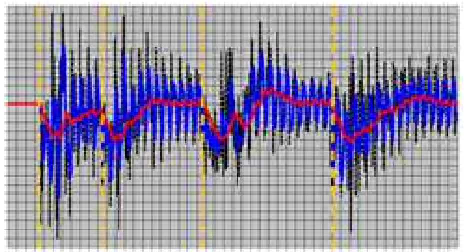

The presentation gives an overview of the basics and techniques testing on component level prior integration these components into the fuze.

- This approach allows to analyzing the characteristic of a component level performance **without interface restriction** and verifies at the same time that the component survives the shock.
- In the case of a detected shock limitation the design could be **adapted and considered in simulation models** or the component could be sorted out.
- This strategy also helps in the context of a **fault localization** and to **shorten the development cycle.**
  (deducing of a component observation to a system observation)
- Increase the reliability and durability of the design.

Contact

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