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

TDW ... when the payload counts ®

is the acknowledged **„Center of Excellence“**
for **Lethal Packages / Warheads** within EADS

Short History on TDW's Hard Target Fuzes

ADPA's 38th Annual
Fuze Conference, 1994

Deutsche Aerospace

Layered Hard Target Detection
- Made Simple

Hans-Dieter Ackermann
Dr. Helmut Muthig

Deutsche Aerospace
Schrobenhausen Plant

BWB WF I 5

Intelligent Hard Target Fuze

DaimlerChrysler Aerospace
TDW Gesellschaft für verteidigungs-technische Wirksysteme mbH

„Flexibility In Fuzing"
&
„Technology Advancements in Munitions Manufacturing"

PIMPF:
The Intelligent Hard Target Fuze for the MEPHISTO Multiple Warhead System

44th Annual Fuze Conference
&
Munitions Manufacturing &
Technology Symposium VII

Dr. Helmut MUTHIG*, Friedrich SAUERLAENDER+,
Andrè FEUSTEL* and Helmut HEDERER*

* TDW GmbH, + BWB WF I 5

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Pleasanton, CA
April 10 - 12, 2000

TDW-1

What is PIMPF?

P rogrammable
I ntelligent
M ulti-
P urpose
F uze

PIMPF (as it is ready for use today)

= Intelligent Hard Target Fuze

for the ***MEPHISTO*** Penetrating **Multiple Warhead System (MWS)**

of the German ***TAURUS KEPD 350*** Stand-Off Weapon System

PIMPF - The German Hard Target Fuze is ready

Overview

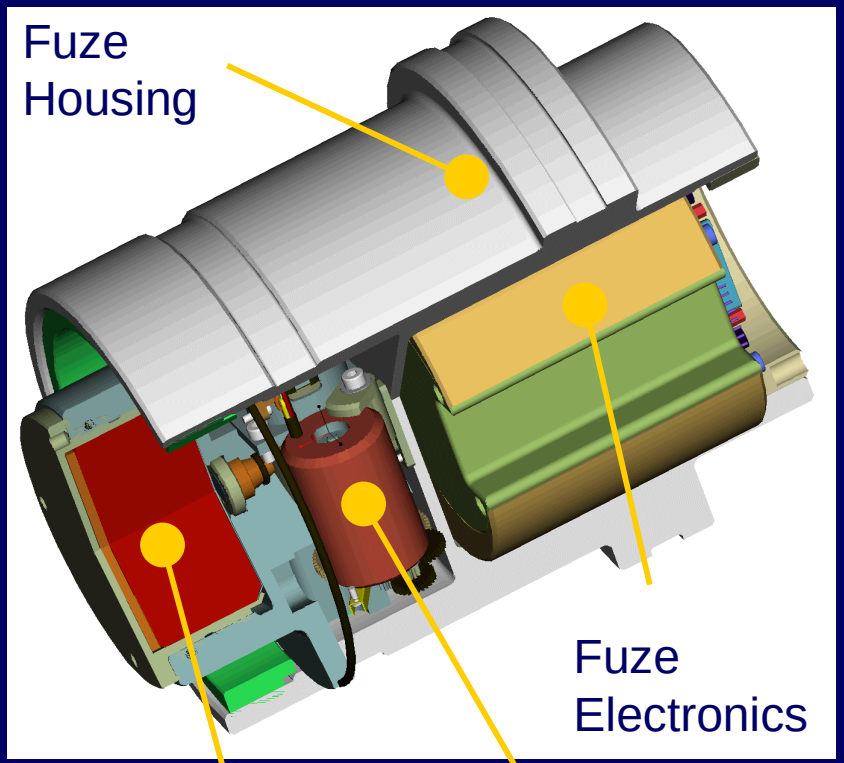
1. Introduction / Key Features of PIMPF
2. **PIMPF - The German Hard Target Fuze is ready**
   - Qualification Testing
     - Summary of Environmental Testing
   - Experimental Results against
     - hard reinforced concrete layers
     - steel structures
   - Application in a modern Anti-Ship Missile
3. The Way to a 2" PIMPF

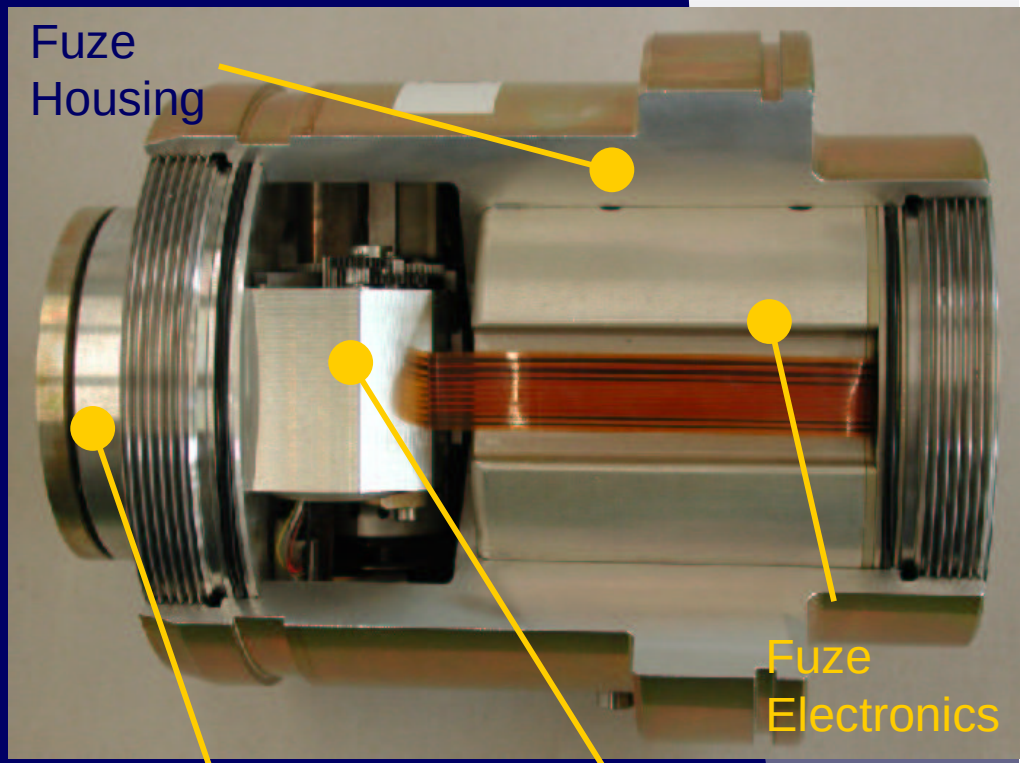
1. Introduction / Key Features of PIMPF

Key Features of PIMPF

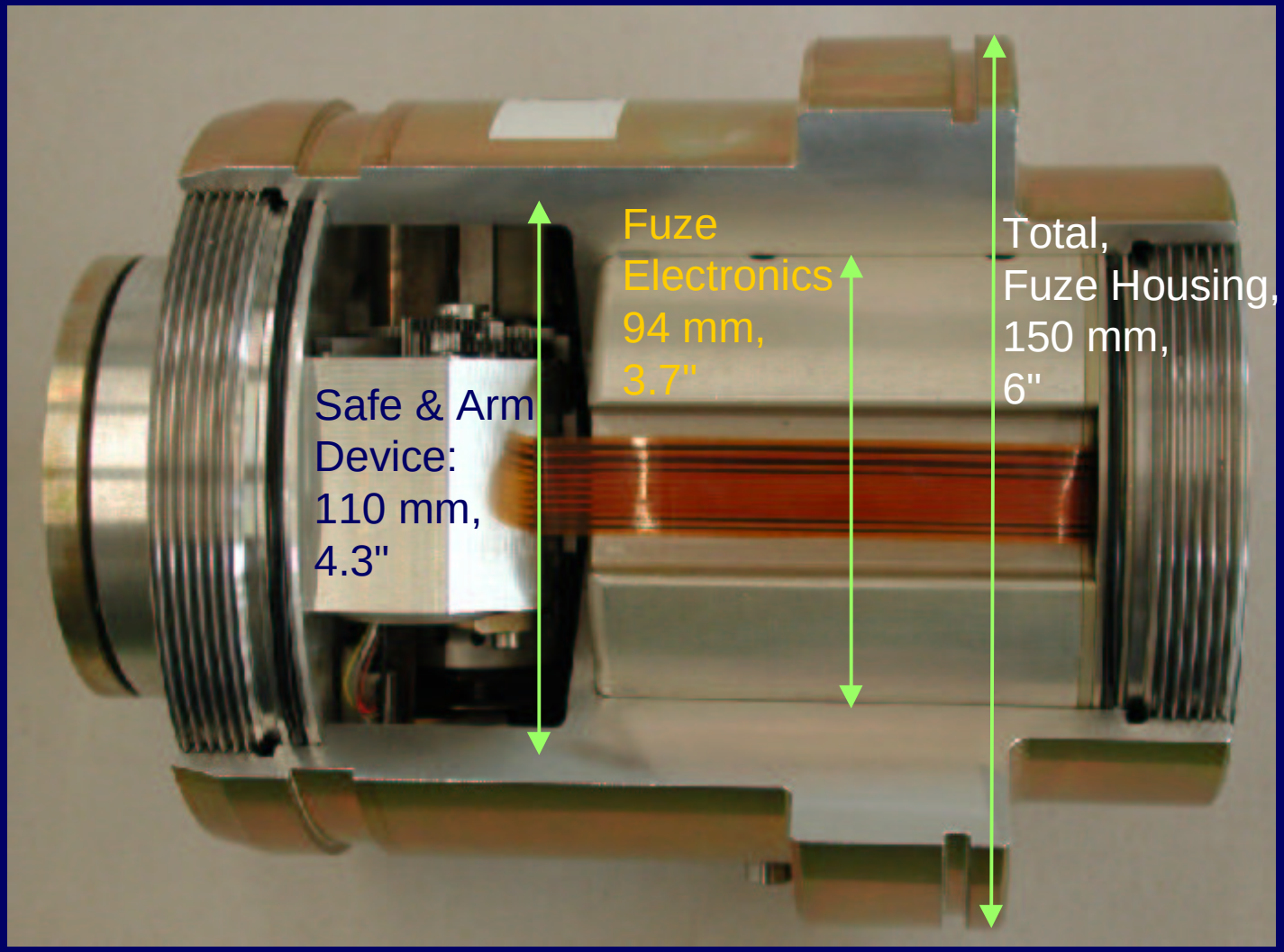
- Shock sensing and intelligent signal processing
- Detection of hard and soft layers:
  ⇒ *event detection* and *layer counting* capability
- Void detection
- Programmable pre-selection of target types
- Optimum fuzing point determination according to actual target structure and mission planning
- Built-in-Test capability
- High g-load resistance

PIMPF for MEPHISTO Overall Design





PIMPF for MEPHISTO Diameters



PIMPF Fuze Electronics / Realized Variants

- Diameter: 94 mm / 3.7“
- Length: 78 mm / 3“

- Diameter: 64 mm / 2.5“
- Length: 120 mm / 4.7“

Key Features of PIMPF for MEPHISTO

	PIMPF Fuze (compl., incl. SAD)	PIMPF Electronics (SPU + Batteries)	
• Diameter :	150 mm (~6")	94 / 64 mm	**(3.7" / 2.5")**
• Length :	175 mm (~7")	78 / 120 mm	**(3" / 4.7")**
• Total mass :	appr. 5 kg	appr. 0.9 kg	
• Shock resistance:	10.000 g / 10 msec axial		
(demonstrated)	8.000 g / 5 msec lateral		
• Operating temperature :	- 40 °C to + 63 °C		
• Storage temperature :	- 54 °C to + 71 °C		
• Power Consumption:	12 VDC - 15 W max. (Electr. Supply)		
	28 VDC - 1 W (Firing circuit)		
• Environmental Resistance:	acc. to MIL-STD-331 and 810		
• EMC Requirements :	EUROFIGHTER and TORNADO		

PIMPF Fuze Electronics / Characteristics

Self-sufficient Power Supply

Signal Processing Unit (SPU)

- Shock sensor (range: 60.0000 g)
- Microprocessor-based Signal Processing Unit (SPU)
- Self-sufficient Power Supply (Lithium-Battery)
- Firing circuit
- Serial Interface, TTL-Level, (RS 422)

2. PIMPF - The German Hard Taget Fuze is ready

Qualification Testing and Experimental Results

Qualification Testing / Succesfully Performed

- Transportation Vibration: MIL-STD-810D, Method 514.3, Procedure I
- Flight Vibration: MIL-STD-810D, Method 514.3, Procedure IV
- Mechanical Shock: MIL-STD-810D, Method 514.3, Procedure I+V
- High Temperature: MIL-STD-810D, Method 501.2, Procedure II
- Low Temperature: MIL-STD-810D, Method 502.2, Procedure I+II
- Temperature Shock: MIL-STD-810D, Method 503.2, Procedure II
- Humidity: MIL-STD-810D, Method 507.2, Procedure II
- Transportation Vibration: MIL-STD-331B, B1
- Temperature and Humidity: MIL-STD-331B, C1
- One and One-Half Meter Drop: MIL-STD-331B, A4.1
- Temperature Shock: MIL-STD-331B, C7
- Primary Explosive Component Safety: MIL-STD-331B, D1

Qualification Testing / Formal Validation
(to be finalized)

- *Jolt: MIL-STD-331B, A1*
- *Jumble: MIL-STD-331B, A2*
- *Twelve Meter Drop: MIL-STD-331B, A3*
- Transportation Vibration: MIL-STD-331B, B1
- Temperature and Humidity: MIL-STD-331B, C1
- One and One-Half Meter Drop: MIL-STD-331B, A4.1
- Temperature Shock: MIL-STD-331B, C7
- Humidity: MIL-STD-331A, PV 108
- Primary Explosive Component Safety: MIL-STD-331B, D1

MIL-STD 331B: FUZE COMPONENTS, ENVIRONMENTAL AND PERFORMANCE TESTS FOR
MIL-STD 810D: ENVIRONMENTAL TEST METHODS AND ENGINEERING GUIDELINES

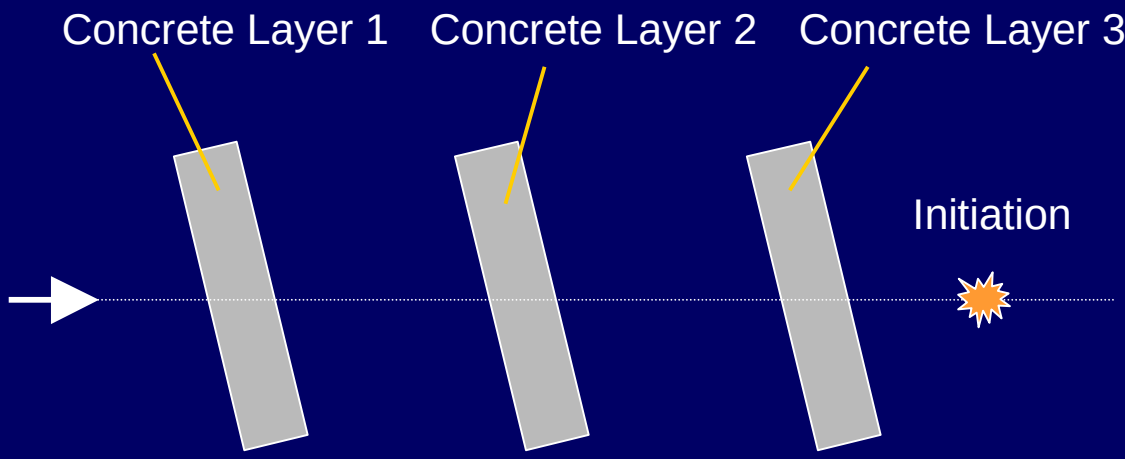
Experimental Results / "Full-Scale Tests" (1)

Test Set-up: 1:1 Penetrator + PIMPF + Precharge (Tandem WH)

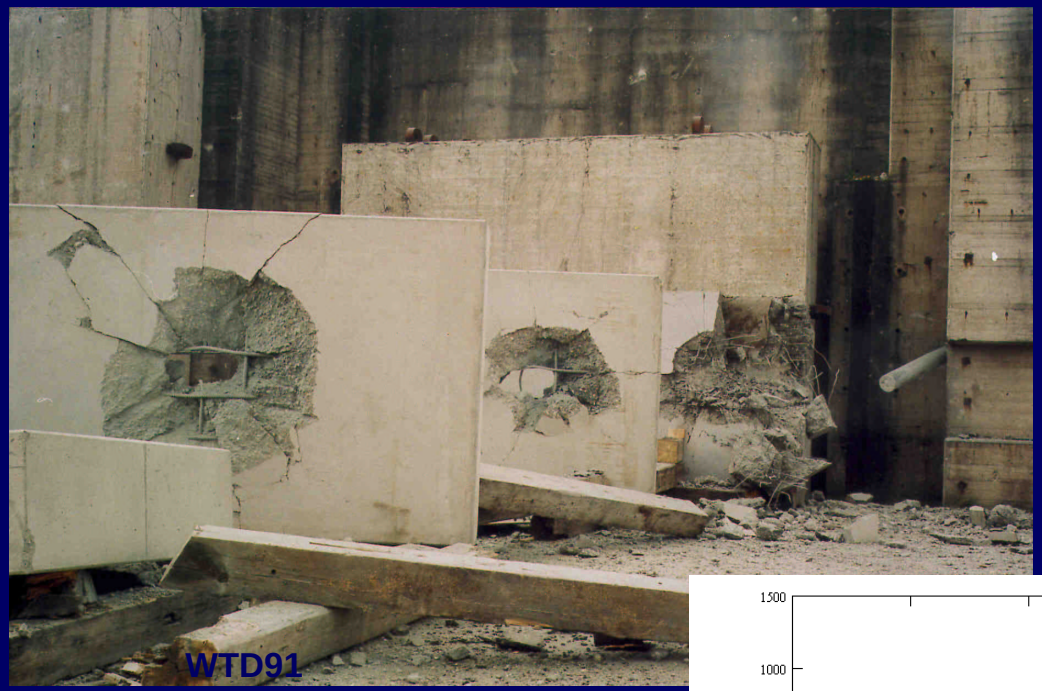
Target Type	No. of Tests	with Precharge
"Bunker" 3 layers of reinforced concrete	**2**	**+ 1**
"Shelter" (Sand / reinforced concrete / gravel / reinforced concrete)	**1**	**+ 3**
"Heavy Bunker" (one massive layer of reinforced concrete)	**1**	**+ 1**
"Ship" (2 steel plates)	**3**	

Total (full-scale): **12** (plus 8 half-scale)

Test Results - "Bunker" Target (1)

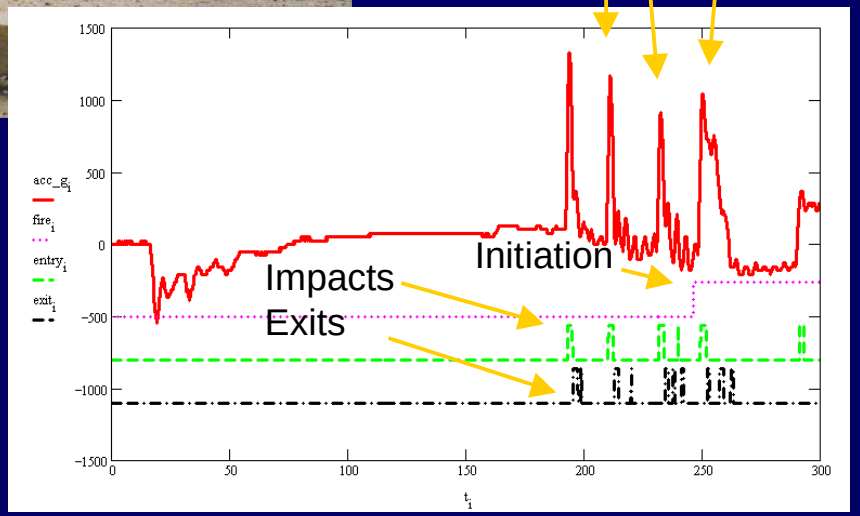


Test Results - "Bunker" Target (2)

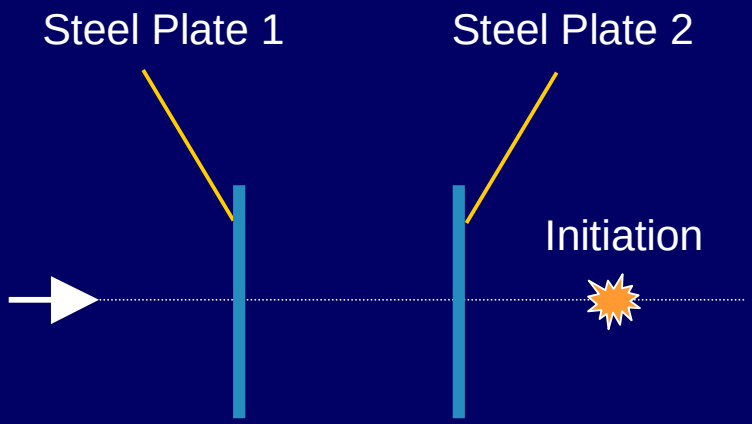


3 Concrete Plates

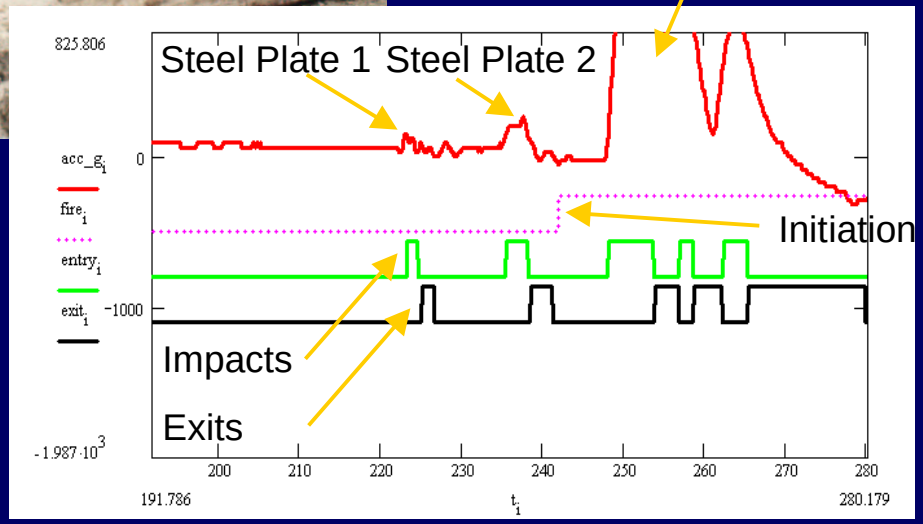
Catcher Plate



Test Results - "Ship" Target (1)



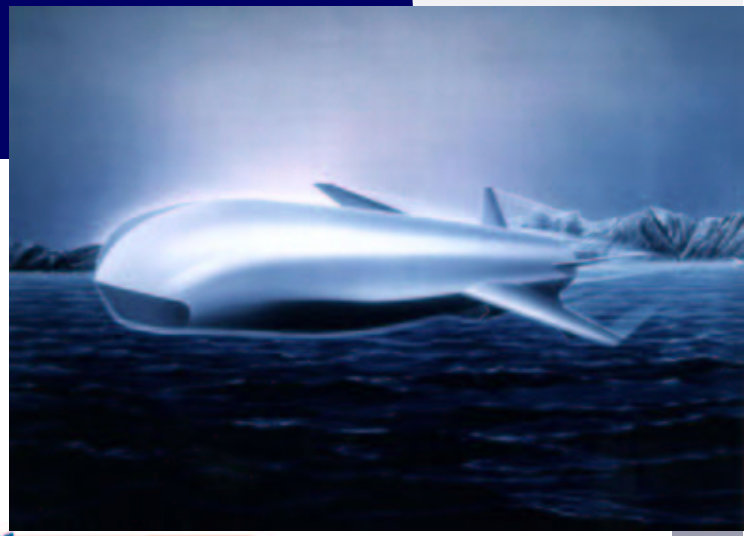
Test Results - "Ship" Target (2)



2. PIMPF - The German Hard Taget Fuze is ready

Application in a modern Anti-Ship Missile

PIMPF‘s second Application: NSM - The new Anti-Ship Missile from KONGSBERG



PIMPF for NSM

3. The Way to a 2" PIMPF

The miniaturized PIMPF

Solution:

Combination of a miniaturized PIMPF Fuze Electronics / Signal Processing Unit with → A

a miniaturized shock resistant, 2" compatible SAD (electro-mechanical SAD or ESAD) → B

Result : **Smart 2" Programmable Hard Target Fuze**

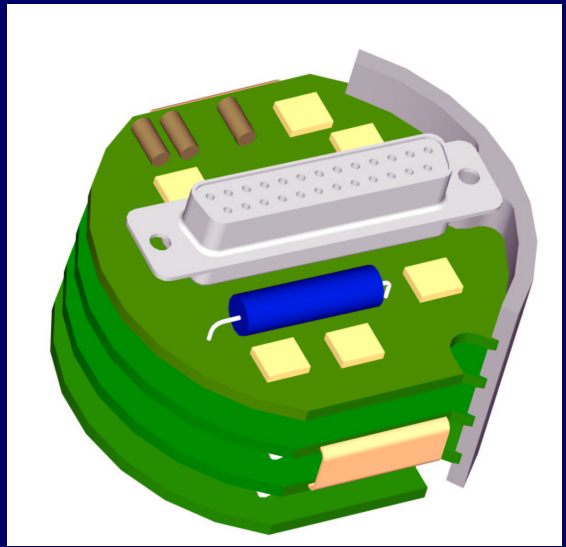
Time frame (for Validation): 1.5 - 2 years

The miniaturized PIMPF

A Miniaturized Fuze Electronics / Signal Processing Unit

- Realization is initiated by TDW (self funded)
- Area / space determining elements are identified
- Alternative PCB layout with smaller sized components is completed
- Two Connectors are reduced to one

Envisaged Diameter : **1.8"**



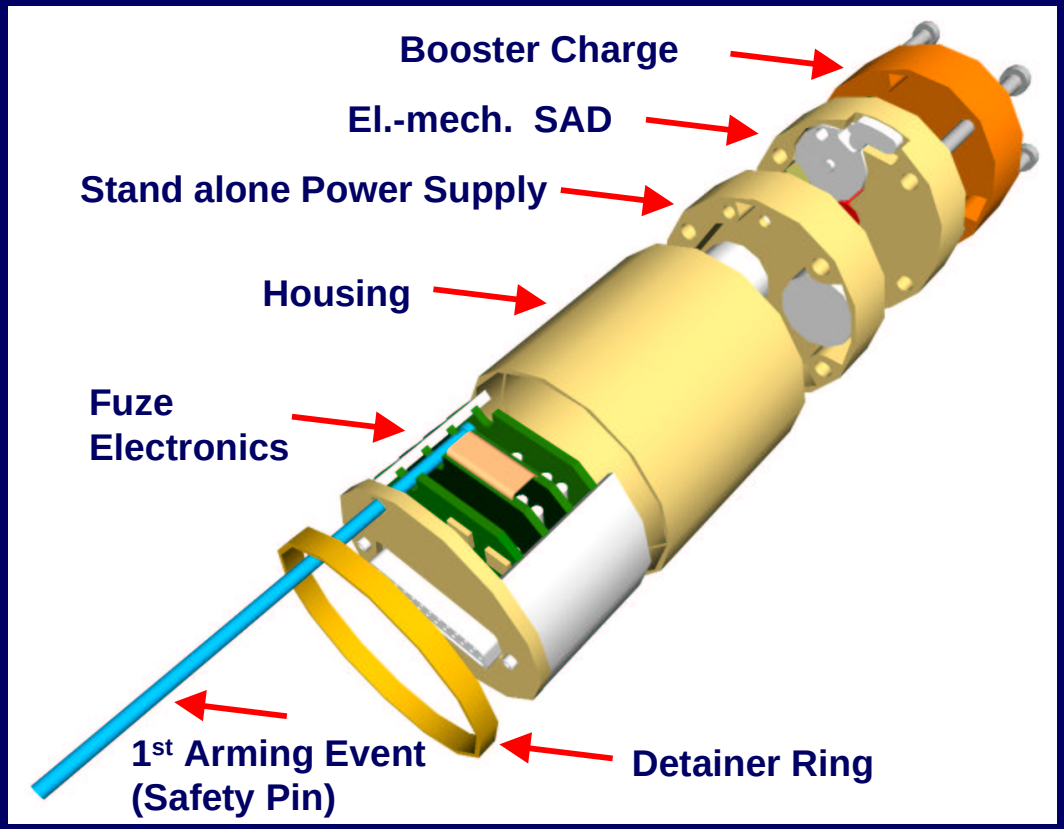
The miniaturized PIMPF

→ B Miniaturized 2" compatible Safe & Arm Device

1:
Electro-mechanical version derived from TDW's proven 2.8" SAD

2:
existing and qualified SAD provided by somebody else (electro-mechanical or shock proof ESAD) and integrated by TDW (or partner)

The miniaturized PIMPF



Result : **2" Smart, Programmable Hard Target Fuze**

with low risk, because it is derived from existing, qualified fuzes with moderate modifications

The miniaturized PIMPF