Self-Destruct Fuze Design

Presented By:

John Yoo
Sr. Project Manager

communications
BT Fuze Products Division

51st Fuze Conference
May 22-24, 2007
Nashville, TN

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

Self-Destruct Fuze Design

Why the self-destruct fuze?

- Un-eXploded Ordnance (UXO)

	Reliability (%)					
Deployment Sensor	100.0	99.8	99.6	99.4	99.2	99.0
S&A Mechanism	100.0	99.8	99.6	99.4	99.2	99.0
Target Detector	100.0	99.8	99.6	99.4	99.2	99.0
Overall	100.0	99.4	98.8	98.2	97.6	97.0

Self-Destruct Fuze Design

Achieve 1% or less UXO rate

- Optional Approaches:
  - Develop New Fuze
  - Improve Existing Fuze Design
  - Self-Destruct Addition
- Factors Influencing the Decision:
  - Time
  - Cost
  - Technology

Self-Destruct Fuze Design

Pros and Cons

Optional Approaches		Pros	Cons
New Design	New Mission Profile	Most effective if technology is available	Demands time and cost
Improved Design	Add Back up Train ○ Fully Independent ○ Inter-dependent	Increases mission effectiveness	Significant design and testing efforts
Self-Destruct Design	Add Delay Function Train ○ Function initiated at deployment ○ Bypasses S&A and Target Detection ○ SD if S&A is armed ○ SN if S&A is safe	Demands least time, cost and technology	No direct improvement in mission effectiveness

Self-Destruct Fuze Design

Number of UXOs for Subsystem Reliability of 99%

	Primary Only	Primary w/Back Up (Independent)	Primary w/Self-Destruct	All Three Combined
Deployment Sensor	.99	.99	.99	
S&A Mechanism	.99	.99	1.00	
Target Detector	.99	.99	1.00	
Overall Function Rate	.99^3 = .970	1 - (1-.970)^2 = .999	1-((1-.970) x (1-.99)) =1.000	1-((1-.970)^2 x (1-.99)) =1.000
UXO	30 in 1,000	1 in 1,000	1 in 1,000	0 in 1,000

Self-Destruct Fuze Design

Fuze Function Reliability

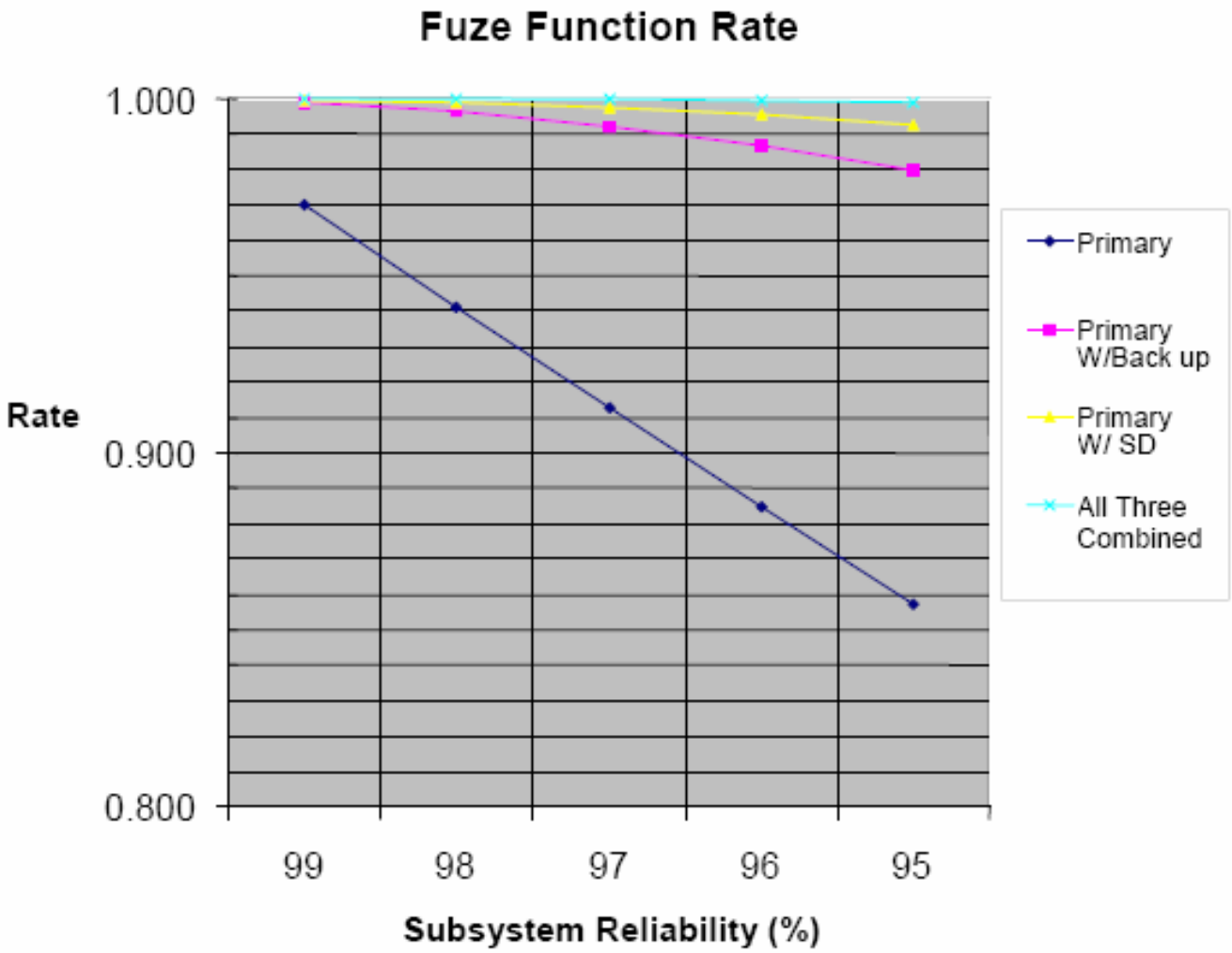
Subsyst. Reliability (%)	Primary Only	Primary w/Back Up	Primary w/Self-Destruct	All Three Combined
99	.970	.999	1.000	1.000
98	.941	.997	.999	1.000
97	.913	.992	.997	1.000
96	.885	.987	.995	.999
95	.857	.980	.993	.999

Self-Destruct Fuze Design

Number of UXO in 1,000

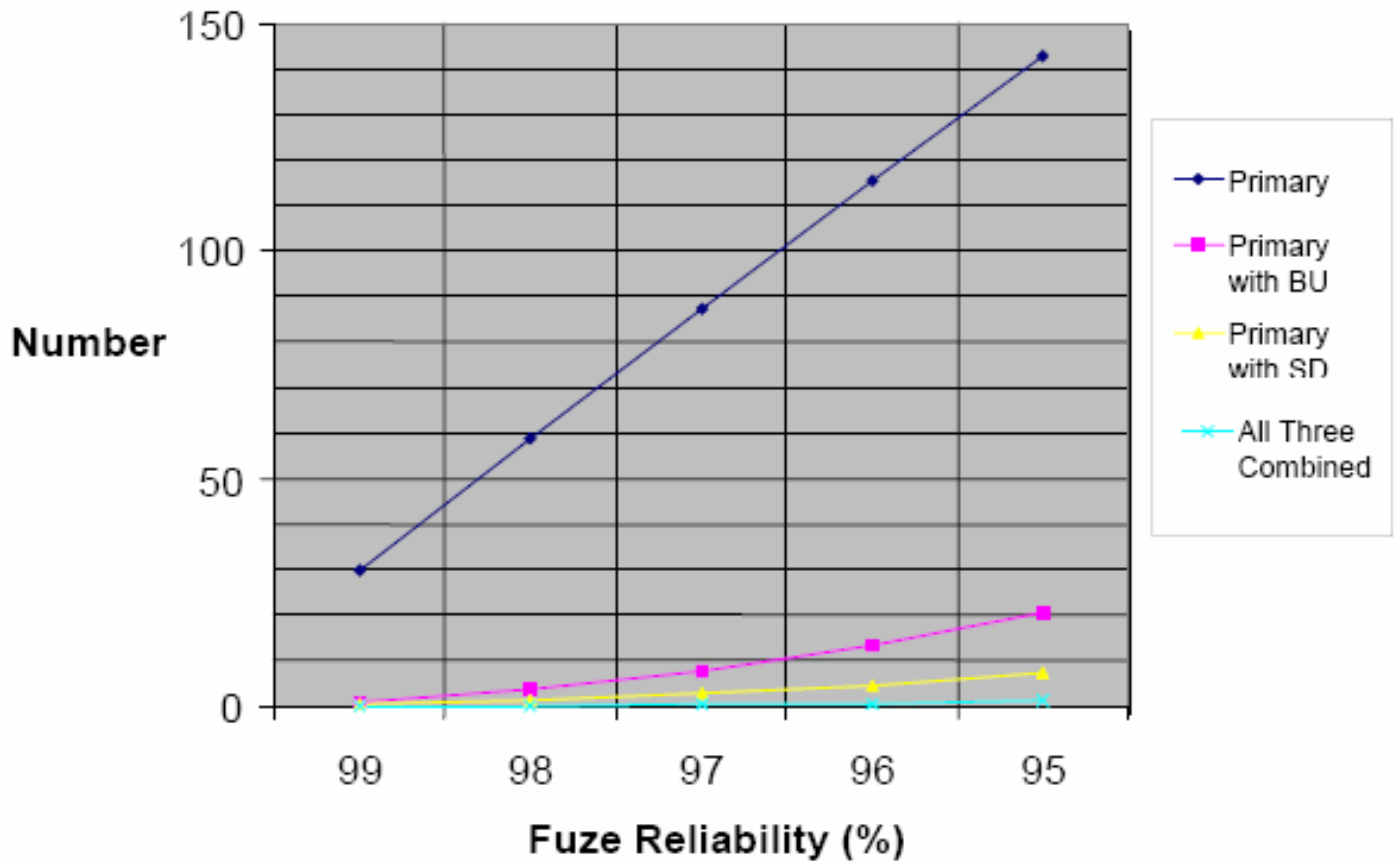
Subsyst. Reliability (%)	Primary only	Primary w/Back Up	Primary w/Self-Destruct	All Three Combined
99	30	1	0	0
98	59	3	1	0
97	87	8	3	0
96	115	13	5	1
95	143	20	7	1

Self-Destruct Fuze Design



Self-Destruct Fuze Design

Number of UXOs in 1,000



Self-Destruct Fuze Design

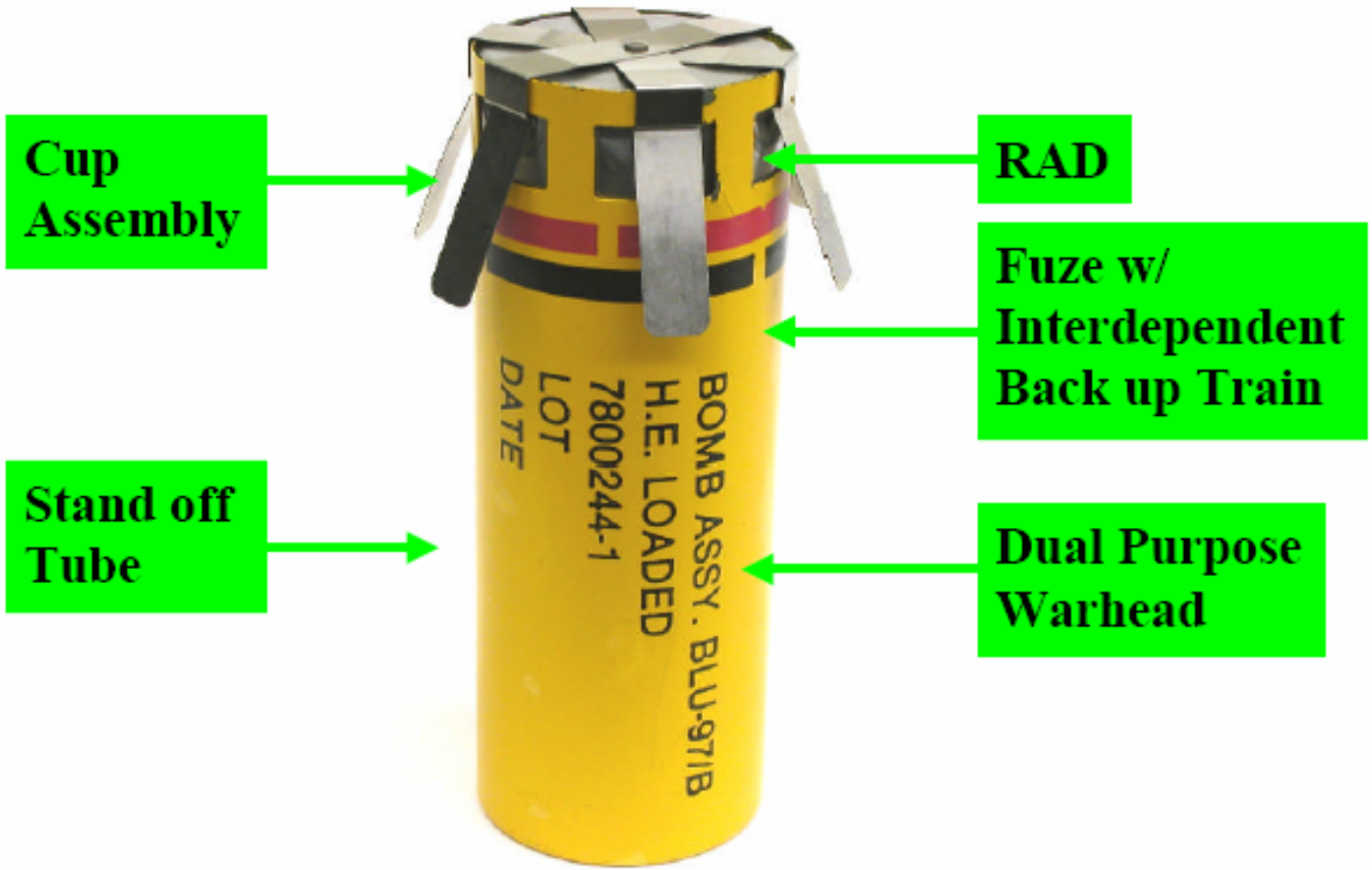
SD/SN Train

	Advantages	Disadvantages
Mechanical Train	Low Cost	Bulky
Electronic Train	High Precision	High Cost
Pyrotechnic Train	Simple Design	Reputation

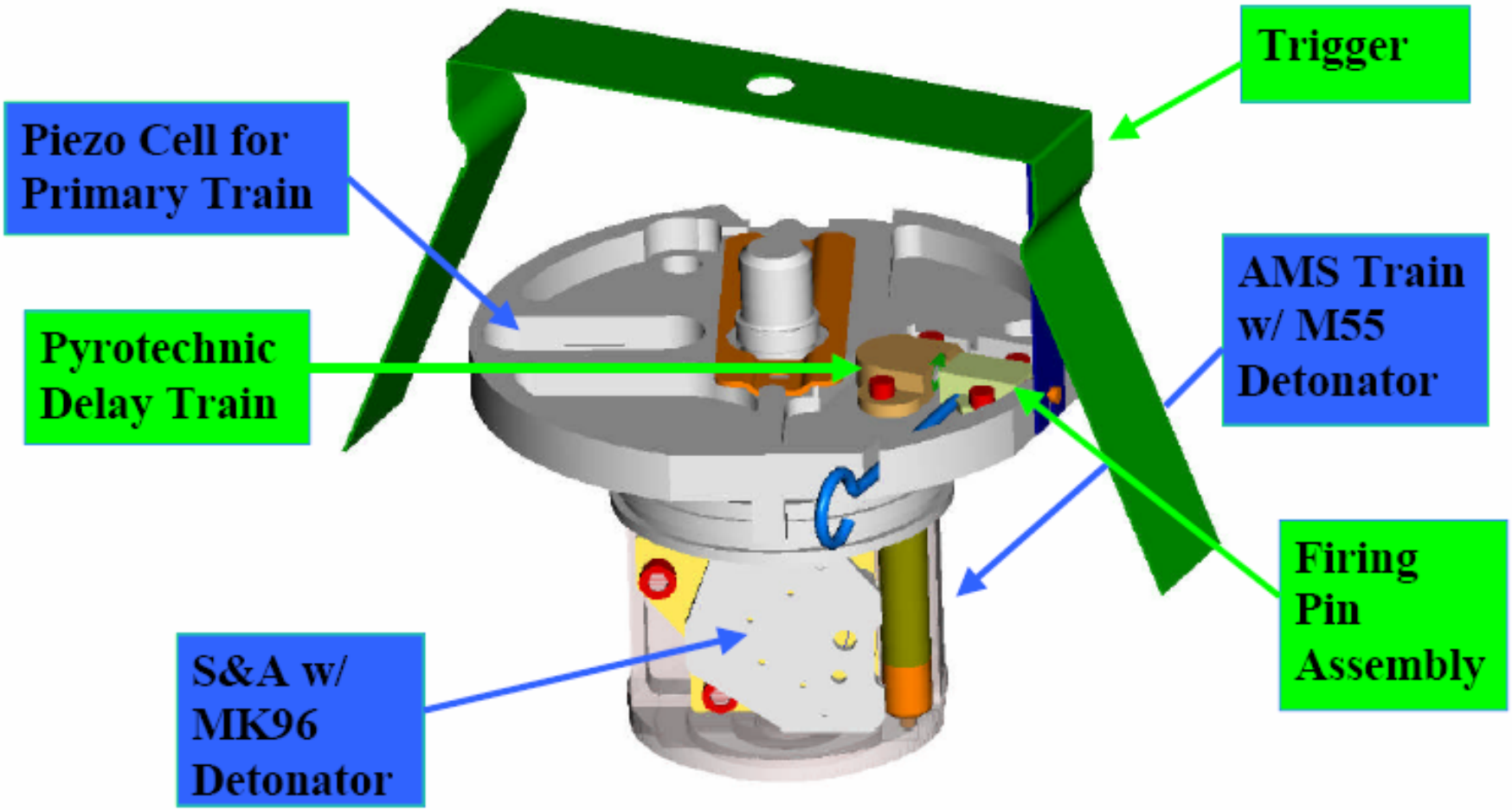
Self-Destruct Fuze Design

UXO Rate – 6%
Design Objective – 1% or less

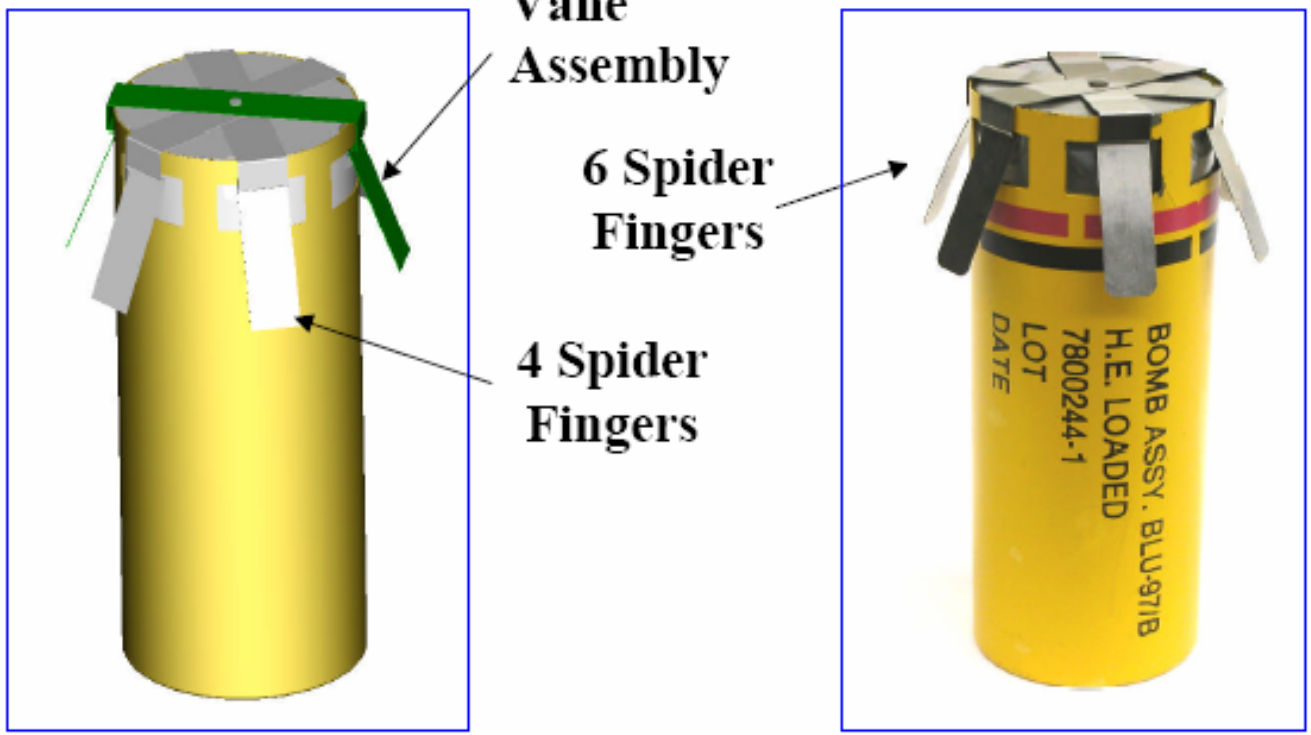
Self-Destruct Fuze Design



Self-Destruct Fuze Design



Self-Destruct Fuze Design

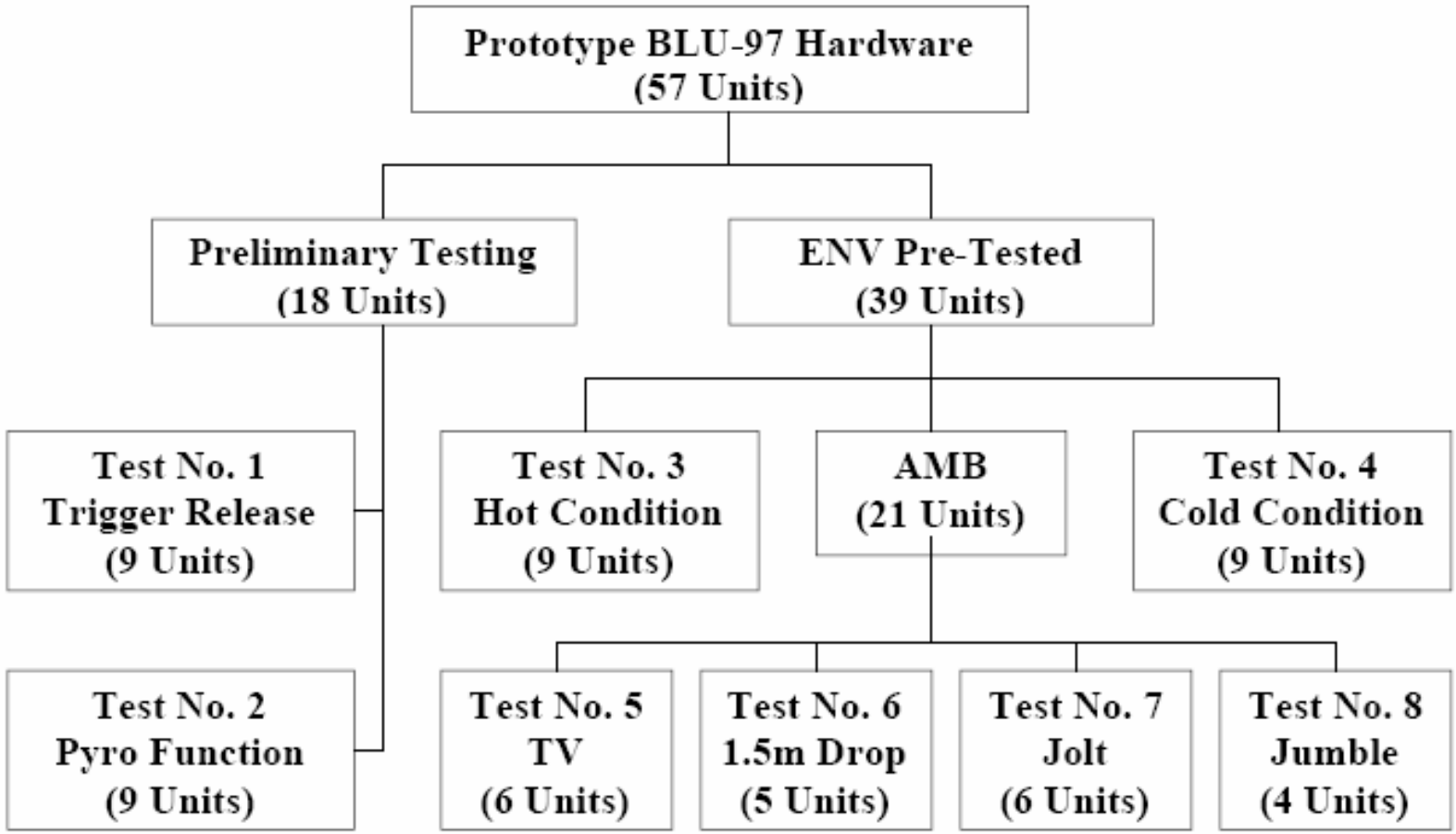


SD Configuration Incorporated

6-Finger Configuration

Self-Destruct Fuze Design

BLU-97 UXO Reduction Testing



Self-Destruct Fuze Design

Test Results

- Trigger Release Testing - 50 to 100 Knots
- Pyrotechnic Function:
  - 10 to 15 seconds Delay
  - Positive output after environmental pre-conditioning
- Testing achieved a Technology Readiness Level of TRL 5
- To advance to the next level requires airgun and wind tunnel testing.

In Closing

- Eglin Air Force Base funded the BLU-97 SD program
  - John Yelverton, PM
  - john.yelverton@eglin.af.mil
  - (850) 883-0581

- Bill Kamper, BT Fuze Marketing Director
  - bill.kamper@l-3com.com
  - (717) 286-9425 or (717) 735-0300