NDIA FUZE CONFERENCE

Air Force Fuze Overview

9 April 2003

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Purpose of Briefing

• Why Are We Here:
  – Provide Lessons Learned on Fuze Systems

• What Do I Want From You:
  – Understand Fuze Challenges and, That to Survive, We Must Change Our Mindset
Outline

Precision Guided Munitions/Fuzes

• Challenges From Last Conference
• Challenges Today
• Challenges Tomorrow

Change our mindset to meet challenges of tomorrow
Challenges from Last Conference

- Availability and Reliability
- Collateral Damage
- Effectiveness of Defeat Mechanisms
- Multiple Event Requirements
- High G Environments/High Velocity
- Weapon/Aircraft Compatibility
- Miniaturization
- Versatility

Budgets for PGMs increased, but no provision for increased fuze quantities
Challenges Today

- Technical Complexity
- Production Capacity
- Manufacturing Capability
- Unit Cost

Not Only Are Fuze Designs Complex,...

..... They Are Extremely Hard to Build
Joint Programmable Fuze (JPF)

POC: Roy Suarez
(850) 882-9514x2237
roy.suarez@eglin.af.mil

Contractor: Kaman Dayron

FMU-152A/B
JPF System Description

- Single Fuze Compatible With Mk82, Mk83, Mk 84, BLU-109, BLU-113 for Use in AGM-130, GBU-10/12/15/24/27/28 and All JDAMs

- Can Be Used in Current FMU-139 and FMU-143 Applications

- Cockpit Selectable Arm/Delay Times
  - Arm 2-25 Seconds
  - Delay Instantaneous to 24 Hours

- Multi-function Capability
  - Hard Target Penetrator Weapons
  - Blast Fragmentation
  - Backward Compatibility With Current Weapons

JPF Provides Key Flexibility the Warfighter Desperately Needs
Challenges

• Technical Complexity –
  – High Altitude Low Airspeed (HALA)
    • Low Power Output From FZU Due to Inadequate Airflow

– Changes
  • FZU-55A/B Initiator - Improve Power Output
  • FMU-152A/B Fuze - Modify Fuze Logic to Handle Low Power Conditions
HALA Redesign results

- JDAM/B-52 Tests Feb 03

Great Success: 5 Released, 5 Performed
Challenges….Industry-wide

• Manufacturing Capability
  – Technology Dated
    – Labor Intensive
    – Tight Tolerances
  – Changes
    – Modernize Manufacturing Operations
      – Lean Manufacturing Principles – Creates Capacity
      – Cellular Factory Layouts
      – Focused Product Teams Employ Taguchi and Six-Sigma Methods
    – Characterize and Validate Activities such as
      – Detail & Sub-Assembly Operations
      – Component & Assembly Test Sets
      – Outsourcing

Ownership, Accountability, Responsibility at Cell
Hard Target Smart Fuze (HTSF)

POC: Tanya Lambert  
(850) 882-9514 x-2178  
tanya.lambert@eglin.af.mil

CONTRACTOR: ATK (Alliant Tech Systems)

FMU-159A/B
HTSF Description

- Electronic, In-Line
  - Accelerometer-based fuze
  - Void sensing
  - Hard layer count
  - Depth of burial
  - Back-up Timer
- Compatible with existing fuze wells
- Cockpit Programmable with JDAM interface
- Potential weapon systems
  - GBU-24, -27, -28, -37, -31
  - GBU-15, AGM-130, AGM-142,
  - AGM-86/D, Tactical Tomahawk Penetrator Variant

Precise, lethal targeting
HTSF Challenges

• Technical Complexity
  – Knows Where It Is Within the Target – **Not Just a Timer Anymore**
  – Must Survive Target Environment

• Manufacturing Capability
  – Labor Intensive

• Production Capacity
  – Low Quantity Does Not Incentivize Investment

• Unit Cost
  – Low Quantity Can’t Yield Learning Savings
DSU-33 Proximity Sensor

POC: Bill Yourick
(850) 882-9514 x-2204
john.yourick@eglin.af.mil

CONTRACTOR: ATK (Alliant Tech Systems)
DSU-33 System Description

- Low Altitude RADAR Proximity Sensor
  - Height of Burst (HOB) 20 Feet (Nominal)
  - Over all Water and Land Surface Conditions

- Provides Air Burst Proximity Fuzing for JDAM, Mk-80 Series & M117 GP Bombs

- Provides Fire Pulse Signal to the FMU-139 and FMU-152 Fuze

- Self Powered: Initiated by FZU or FFCS
  - DSU-33A/B: 60-90 Sec - GP Bombs
  - DSU-33B/B: 200 Sec – JDAM

- Employment on A10, F15, F16, F22, B1, B2, B52, F/A18, AV8, and F14 Aircraft
DSU-33 Challenges

- Technical Complexity
  - Parts Obsolescence
  - Change
    - Qualify New Parts

- Unit Cost
  - Stable Funding and Competitive Procurement Provided Meaningful Cost Reduction Incentives

“Green” Program – It is Meeting Cost, Schedule & Technical Requirements
Outline

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Change our mindset to meet challenges of tomorrow
Challenges Tomorrow
(AKA: Observations from Air Armament Summit)

• Affordability
• BIA/BDA: Weapon Data Links
• Plug and Play Capability
• System Interoperability

Mission Flexibility is Key
Air Armament Summit Sound bites

• Capabilities Panel: HDBT
  – Challenge of Targets That Are Deeper and Harder
  – Mission Flexibility – Ability to Reprogram Fuzes From the Cockpit

• Integrated Armament Panel: HDBT
  – Precision, Accuracy
  – Mission Flexibility but “Boutique” Programs

• S&T Panel:
  – Hypersonic Cruise Missile – Penetrating Fuzes, High G Smart Fuzes
  – Directed Energy Weapons: Pacer – Power Sources
  – Deeper Targets: Influence Fuze in Facility Denial Munition

• “Smart Weapons Reduce Collateral Damage”

Future fuzes must be flexible and interoperable
Moving Toward the Future….
….A theoretical case study

- All Future Fuzes
  - Low Unit Cost
  - High Reliability/Long Shelf-life
  - Standard Fuze Interface
  - Reduced Size
  - No FZU Dependency
  - Standard Architecture
  - Multiple Sources
  - In-flight Programmability
  - Cruise Missile Application

Common Architecture and plug and play
Low Unit Cost

- Increased Integration/Reduced Parts Count
- Manufacturable Design
- BIT Capability
- High Production Quantities
  - Modular Design
  - Flexible Architecture
  - Standardized Fuze Interface

Meet multiple weapon and Fuze Needs with cost effective module replacement
High Reliability/Long Shelf-life

- Increased Integration/reduced Parts Count
- No Mechanical Moving Parts (All Electronic)
- Hermetically Sealed
- BIT for Nondestructive Surveillance and Field Verification
Fuze Modular Integration Evolution
Standard Fuze Interface

- Standardizing Interfaces Not Unique
  - 1760/1553 Communications Interface
  - FFCS
  - Microsoft Windows
- Simplifies Both Fuze and Weapon Design
- HTSF Example of Fuze Interface Flowed Into System Requirements (AGM-86/D&TTPV)
Reduced Size

- Smaller munitions require smaller fuzes
- 2” fuze well with 3” fuze well compatibility
No FZU Dependency

- MIL-STD-1316 Compliance (Weapon Power and/or FFCS)—AGM-86/D and TTPV are Early Steps
- No Altitude/Airspeed Restrictions
- No Weapon Flight Characteristic Sensitivities
- Reliable Function
Multifunction

- Unitary-Unguided, Direct Attack, Standoff
- Proximity Fuzing
- Multi-Event Control
- Agent defeat
- BDA
- Hypersonic
- Area Denial
## Representative Schedule Could Be...

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**Standard Fuze Architecture**

- **Legend**: Funded - Green, Unfunded - Red
- **Other Symbols**: Blue arrows indicating sequence

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**Precision Strike SPO**

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**Notes**

- The schedule represents key fuze advancements over the years.
- Each task is marked for funding status (Funded or Unfunded).
- Blue arrows denote progression and dependencies.

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**Technical Summary**

- The schedule highlights critical milestones and production phases.
- Key tasks include advancements in fuze architecture and production.

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**References**

- [Technical Report on Precision Strike Fuze Development](#)
- [Fuze Architecture Whitepaper](#)
…. A Theoretical Case Summary

- Technology Exists for Standard Architecture
- More Economical for DOD
- More Profitable for Industry
- More Straight Forward for Safety
- Defined Interface for Weapons Primes

It Is Possible To Get More With Less
Recap

• Fuze Challenges Have Gone From No Funding for Increased Fuze Quantities To....

• Recognizing Challenges Of:
  – Technical Complexity
  – Manufacturing Capability
  – Production Capacity
  – Unit Cost
    And Must Go to...

• Future:
  – Affordability
  – BIA/BDA
  – Plug and Play
  – System Operability

Common Architecture and Plug and play
Purpose of Briefing

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Questions?