Fuzing at Dahlgren

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14,000 MK 432 fuzes passed LAT

- Fuzes were set and fired from the MOD 4 Gun
  - For 10 second settings
    - Mean = 10.000, SD = .010
  - For 40 second settings
    - Mean = 40.011, SD = .014

Two tasks remain to close out effort

- Final Hazard Classification
- Issue a close-out report
Mk 432 ET Fuze’s 1st Mission: 5-Inch Shotgun (BB) Projectile

Existing HIFRAG

Shotgun Projectile

Twice the Lethal Area
Test Results
“Navalized” version Army’s MOFA uses same approach as Mk 432 fuze.
  - “Change as little as possible”

**Navalizing effort**
- Inductive set software & hardware for Gun setter compatibility
- Increase min arming to 400’

**Status**
- Risk reduction efforts nearly completed on S&A, EMV testing, & setting power
- Fuze software being written, tested and documented
- RFP issued
- Schedule: On-track for May 05 PIP completion
Multi-function Fuze (M FF) Update

- Failed FAAT led to Fixes
  - Sea Clutter algorithm tweaked and validated at sea.
  - S&A binding issue gone.
  - Detonators passed after weld seal quality was improved.
  - Still working a fix for inductive coil wire break during trans’ vibration test.

- Schedule
  - FAAT retest in April.
  - LAT #1 September 2003.
  - TECHEVAL – OPEVAL Fall ’03
Objective
- Develop battery to replace MFF’s lead acid battery
- Integrate battery into MFF

Approach
- Investigate two battery designs
  - ATK’s MOFA
  - Thales’s UA 6275/821
- Conduct Electrolyte research for MOFA battery
  - Increase the rise time and current carrying capability
  - Most significant research into electrolyte risetime for many years.
- Enhance test capability
  - Now able to test gun fired fuze batteries with simulated fuze electrical load profile.
MOFA Battery Design Requirements

Army’s MOFA
Post Launch Battery
5.6-11.7 V

Baseline design

MK 43 MOD 0 RE
used in MK 404,
MK 418, MK 417
30 volts min

Navy’s MFF+
“modMOFA-2”
12.5-20.0 volts min

Requirements

MK 44 MOD 0 RE
used in MK 419,
11.6 volts min
Initial Design of new MOFA Battery

Current Army MOFA battery

“modMOFA-2 Battery”

More power

More electrolyte

New Navy modMOFA-2 battery

2x3

.660"

2x6

.910"
High Rate Electrolyte Study

- Compared the properties of 12 electrolytes to determine best candidates to conduct preliminary testing on.
- Down selected two which will be railgun tested in standard MOFA battery with a MFF electrical load profile.
Improved Test Hardware

- 4 separate fuze-load simulation circuits on 2 boards.
- Lucy Switch senses gunfiring and starts time to simulate load profile during flight.
Improved Test Hardware

- On board power supply for load simulation circuit
Batteries for Future Munitions:

- Autonomous Naval Support Round
  - Guided projectile using GPS & INS
  - Program is in Demo Phase
  - No plans to develop a reserve battery
  - COTS active battery planned

ANSR Wind Tunnel Testing (LTV)
Batteries for Future Munitions:

- NSWC has no plans to develop any new batteries for gun fired munition other than what is currently being developed.
- Current thinking is that COTS battery technology is good enough for the future smart gun-fired munitions.
- Demo programs are not concerned about suitability of low risk items such as batteries:
  - Sponsors of some Demo programs may not have adequately considered the impact to the logistic system.
- Navy has continuing need for 76mm ammunition.
- Procurement of 13,000 MK 417’s in FY 03.
- First Article testing in progress at Dahlgren – parts obsolescence slowing progress.
Next Procurement of 76mm fuzes expected in FY06-07 – MK 417 will be obsolete

Therefore, need to develop replacement now
  – Update electronics & RF design.
  – IM Booster Required.
  – New Battery Required.

“Sources Sought” letter issued
  – Air Target is Highest Priority.
  – Close-in Surface Targets also get attention
Guidance Integrated Fuze (GIF)

A 2-d, Low-cost, Competent Munition

Effectiveness Enhancement for Stockpile Projectiles
**What is GIF?** GIF is a low-cost, fuze-sized module that is intended to replace a “NATO standard” fuze on existing stockpiled Army and Navy Ammunition.

**What Does it Do?** GIF corrects the ballistic trajectory of the projectile, resulting in a small terminal miss distance. GIF provides “*First Round - Steel on Target*”.

**What Difference Will It Make?**

GIF Technology will greatly reduce the number of rounds (20:1) required to defeat a given enemy threat. GIF is applicable to *literally millions* of existing projectile, mortar and rocket systems. GIF will enhance “*Maneuver Warfare*” by reducing the time required to neutralize threats and minimizing logistic and re-supply burdens.
How Does GIF Work?

Guided Impact

- Initialize Fuze
- Predict Miss
- Deploy Controls
- Steer to Target

Unguided Impact At Target

- DeSpin Nose
- Acquire GPS
- Ballistic Solution
- Initialize Fuze

GPS Satellites
**Approach**

- Army *MOFA* is the Baseline
- Retain Radar, S&A, Explosive Train if Possible
- **Quick, Simple, Cheap**
  - COTS
  - Add Complexity as a Last Resort.

3D Modeling of Actual Components