The Future of Small Missiles

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First, A Bit of History

- Many of the Army’s Current Inventory of Tactical Missiles Were Designed or Envisioned During the Cold War

- Many Tactical Missiles Were Designed to Defeat Main Battle Tanks (TOW Family, HELLFIRE/LONGBOW, Javelin)

- Guidance Techniques Have Evolved –
  
  TOW – Command Guidance (1960’s)
  HELLFIRE – Semi-Active Laser Guidance (1970’s)
  LONGBOW – LOBL / LOAL RF Active Terminal Homing (1980’s)
  Javelin – LOBL Fire-and-Forget Passive Terminal Homing (1990’s)

How Successful?

- **Desert Storm I**
  HELLFIRE Viewed as Very Successful Although “Overkill” on “Highway of Death” Retreat from Kuwait

- **Operation Enduring Freedom (Afghanistan)**
  PREDATOR UAV + HELLFIRE Combination Very Successful

- **Operation Iraqi Freedom**
  HELLFIRE with Mod K Warhead
  TOW 2A / TOW “Bunker Buster” Warhead
  Javelin – Battle of Debecka Pass by Special Forces

**10 – 40 Year-Old Technology Proven Very Effective**
As Far as Army S&T Is Concerned - We Want to Get There -

Today’s Tactical Missile Capability

IBAS

TOW 2A

ITAS

TOW 2B

TOW Bunker Buster

AT4

Javelin

The Question Is – Where Are We Going?
Evolving Army Transformation

Current to Future Force – Accelerate fielding of select Future Force capabilities to enhance Effectiveness of Current Force, Army Transformation is part of constant change.

Current

- MLRS
- M270A1
- ITAS
- IBAS
- HYDRA 70
- JAVELIN
- ATACMS
- HIMARS
- LONGBOW
- HELLFIRE/ PREDATOR

Future

- NLOS LS
- NLOS LS
- GMLRS
- PAM
- LAM
- LOSAT
- CKEM
- JAVELIN
- APKWS
- VIPER/UAV
- JAVELIN P3I
- Controllable Thrust
- Propulsion
- Countermeasures
- Multi-mode Seekers
- IM Warhead & Propulsion
- Multi-mode
- Warhead
- ATA Algorithms

Developing the Future Force while Simultaneously Spiraling Future Capabilities into the Current Force

-- “The Way Ahead”
Is This Where We’re Going?

Future Combat Systems (FCS)

- NLOS-LS
- PAM & LAM
- CKEM

Collaborative C2
Mobile Communication
Information Management
Information Assurance
Combat Systems & Logistics
IRREGULAR
Those seeking to erode U.S. influence and power by employing unconventional methods, such as:
• Terrorism
• Insurgency
• Civil War
• Emerging concepts, such as “unrestricted warfare”

Likelihood: very high
Vulnerability: moderate, if not effectively checked

TRADITIONAL
Those seeking to challenge U.S. power by military operations, such as:
• Conventional air, sea and land attacks
• Nuclear forces of established nuclear powers

Likelihood: decreasing (absent pre-emption) due to historic capability-overmatch and expanding qualitative lead
Vulnerability: low, if transformation is balanced

DISRUPTIVE
Those seeking to usurp power and influence by acquiring breakthrough capabilities, such as:
• Sensors
• Biotechnology
• Miniaturization on the molecular level
• Cyber-operations
• Space
• Directed-energy and other emerging fields

Likelihood: low, but time works against U.S.
Vulnerability: unknown; strategic surprise puts U.S. security at risk

CATASTROPHIC
Those seeking to paralyze U.S. leadership and power by employing weapons of mass destruction or WMD-like effects in surprise attacks on symbolic, critical or other high-value targets, such as:
• Sept 11, 2001
• Terrorist use of WMD
• Rogue missile attack

Likelihood: moderate and increasing
Vulnerability: unacceptable; single event could alter American way of life

Higher vulnerability

Lower vulnerability

More likely

Less likely
NLOS-LS

Networked Lethality – Very Dependent on Networked Sensors
Precision Engagement Options: From Sledgehammer to Scalpel

Joint Air to Surface Strike Missile (JASSM)
2250 pounds, 14 Feet Long
Big Platforms

Hellfire Longbow
108 Pounds, 5.75 Feet Long
Medium/Small Platforms

TOW
50 Pounds, 4 Feet Long
Crew-Served

Javelin
35 Pounds, 3.5 Feet Long
Manportable

The 21st Century Missile

- How Small?
- How Much Range?
- BLOS / NLOS?
- What Target Set?
- How Autonomous?
- How Much Will It Cost?
Target Sets Are Changing

From This -

To This -

Light Armor
Earth and Timber Bunker
8” Reinforced Concrete and 12” Triple Brick
Survivability is a BIG Focus

Extended Area Protection System

- Layered Protection from Top-Attack from Rockets / Artillery / Mortars
- Area Protection vs. Point Protection
- Guided Bullet & Missile Interceptors

Close-In Active Protection System

- Protection Against ATGMs & RPGs
- Prototypes Being Integrated on Stryker Vehicles
- Next Generation Technology for Smaller & Reduced Fratricide
Key Technology Component Investment Areas

- Batteries*
- NLOS-LS Comms
- Chip-Level Electronics Integration
- Auto Target Acquisition
- Power Datalink
- Processing
- Seeker
- Rocket Propulsion
- Actuators & Controls
- Navigation
- Payload/Warhead(s)
- Insensitivity (IM)*
- MBARS
- Hi-g MEMS*
- Uncooled IR
  Gimbal-Free in SAL, RF
- Improved Resolution (EPAM)
- Very-Low-Cost Seekers
- LADAR
- Insensitivity (IM)*
- Multipurpose Fuzes*
- Multipurpose Warheads*
- Smaller Warheads*

* Mostly Joint with Army Research Lab and/or Armaments RDEC
Trends

Shorten the engagement cycle (detect, track, identify, assign, engage, BDA)

- Decrease the number of people in the cycle
- Speed the connections between the people in the cycle
- “One shot, one kill” (…or more)
- Perpetually “on station”
- Available (it works “all” the time)
- Few war-winning targets; many war-losing targets. (“regret avoidance” is key)
- Improved target ID / Friend-Foe-Neutral
Key Technology Enablers

- **Reduce Cost** (both incremental reductions and fundamentally cheaper guidance technologies)
  - Make Technologies “Easier to Build” for More Vendors – Including Less Hi-tech
  - Common Components (given a good business case)
  - More Open Hardware and Software Architectures, Standards
- **Reduce Weight and Size**
- **Autonomous Target Recognition / ID / IFF**
- **Improve adverse-weather and MOUT capabilities (IIR, RF, MMW, etc.)**
- **Increase Reliability**
- **Retain few-meter accuracy**
The Future of Missiles?

- Multi-Mission
- Multi-Effects Warheads (Including Non-Lethal)
  With Intelligent Sensing / Fuzing
- Beyond Line-of-Sight / Non Line-of-Sight
- Autonomous / Smart
- Cargo Carriers / Payload Deliverers
- VERSATILE
- AFFORDABLE