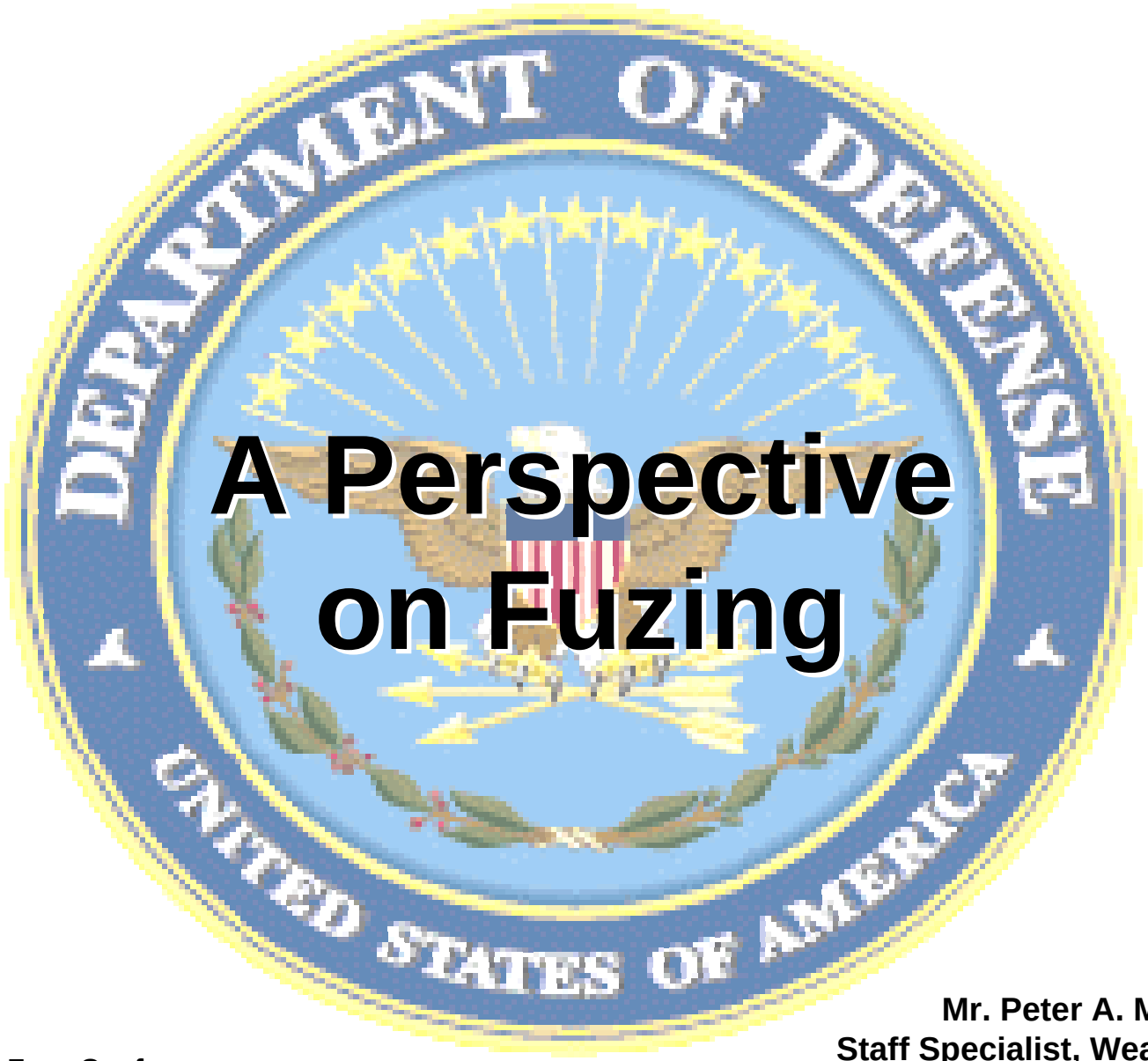

A Perspective on Fuzing

NDIA 50th Annual Fuze Conference
May 9, 2006
Norfolk Waterside Marriott,
Norfolk,VA May 9 - 11, 2006

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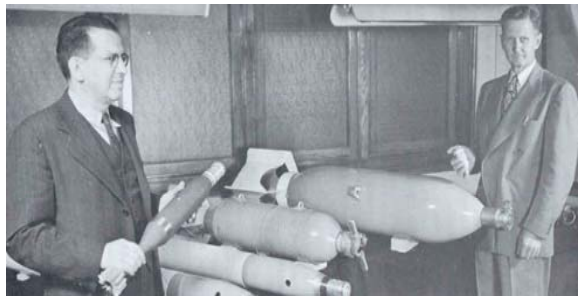
S&T Mission

To <u>ensure</u> that warfighters today and tomorrow have <u>superior</u> and <u>affordable</u> technology to support their missions and to give them revolutionary war-winning capabilities.

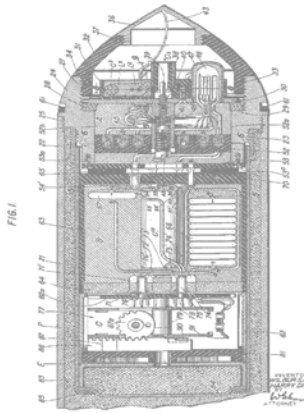
A *Historical Perspective on Adaptation to Needs*
Proximity Fuze Development and Production in WWII



<u>Problem:</u> Early in WWII, Proximity (VT) fuzes were prohibitively expensive, low performance and unreliable to counter air targets or ground targets with optimum effects at height above the ground.

<u>Development:</u>

- Development of proximity fuzes started in the summer of 1940
- The development effort involved an estimated number of at least 2,236 individuals
  - Efforts began at the National Defense Research Committee (NDRC) and Office of Scientific Research and Development (OSRD)
  - Two different developmental teams were made up of individuals from the Department of Terrestrial Magnetism, National Bureau of Standards, Johns Hopkins Applied Physics Laboratory, Military, academia
  - Initially, Civilian Scientists from the National Bureau of Standards (NBS) under the leadership of Harry Diamond were recruited and this work later transitioned to the US Army for various weapons systems

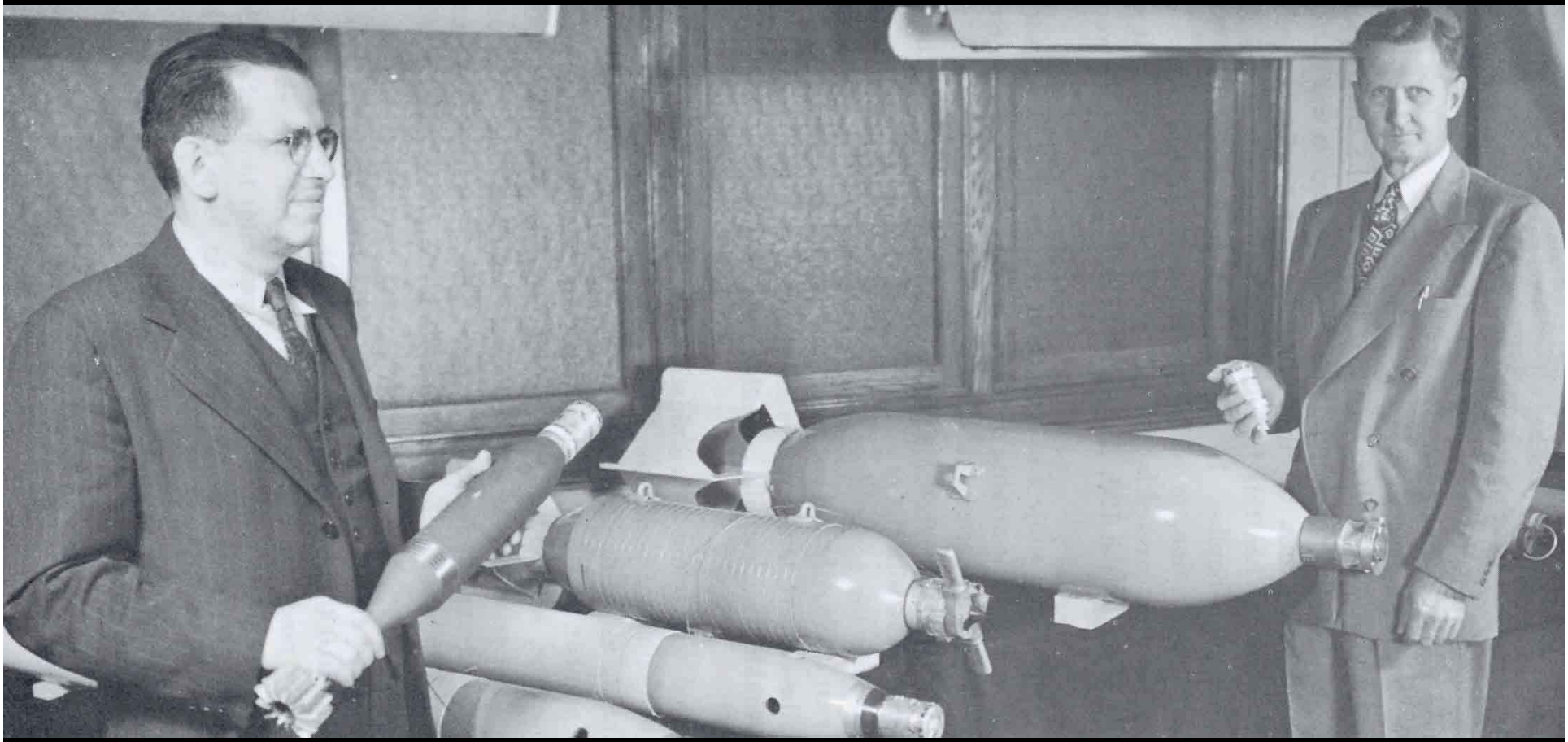


- Labor costs, from records, were estimated at approximately **$837,000,000** (2002 dollars)
- The War Department later described inventor Harry Diamond's proximity fuze as "one of the outstanding scientific developments of World War II ... second only to the atomic bomb" in military importance

<u>Production:</u>

- Actual costs per fuze was **reduced <u>from $732</u> in 1942 <u>to $18</u> in 1945**, permitting over **twenty-two million fuzes** to be purchased for about **$8.5 billion (in 2002 dollars.)** In March of 1945 alone, there were approximately 110 companies engaged in the production of VT fuzes for spinning rounds, bombs, rockets and mortars

We know where we've been…



Where are we going?

9/11 Changed Everything

From working to provide overmatching capability against any nation-state on the sea, in the air and on the land … to a global war on terrorism against an enemy who fights in the shadows…

"The concept of a virtual organization is essential to understanding how 21st Century business will work. Al Qaeda represents a new and dangerous kind of virtual organization and the rise of the virtual state. We are entering into an era in which a small number of people, operating without state sponsorship, but using the enormous power of modern computers, biogenetic pathogens, air transport, suitcase bombs, and even small nuclear weapons will be able to penetrate the tremendous vulnerabilities of contemporary open societies." - *Time,* 9 Sept. 2002

Changing Security Environment
- Four Challenges -

Irregular

- Unconventional methods adopted by non-state and state actors to counter stronger state opponents.
- (e.g., terrorism, insurgency, civil war, and emerging concepts)

Catastrophic

- Acquisition, possession, and use of WMD or methods producing WMD-like effects against vulnerable, high-profile targets by terrorists and rogue states.
- (e.g., homeland missile attack, proliferation from a state to a non-state actor, devastating WMD attack on ally)

Traditional

- Military capabilities and military forces in long-established, well-known forms of military competition and conflict.
- (e.g., conventional air, sea, land forces, and nuclear forces of established nuclear powers)

Disruptive

- International competitors developing and possessing breakthrough technological capabilities intended to supplant U.S. advantages in particular operational domains.
- (e.g., sensors, information, bio or cyber war, ultra miniaturization, space, directed-energy, etc)

VULNERABILITY

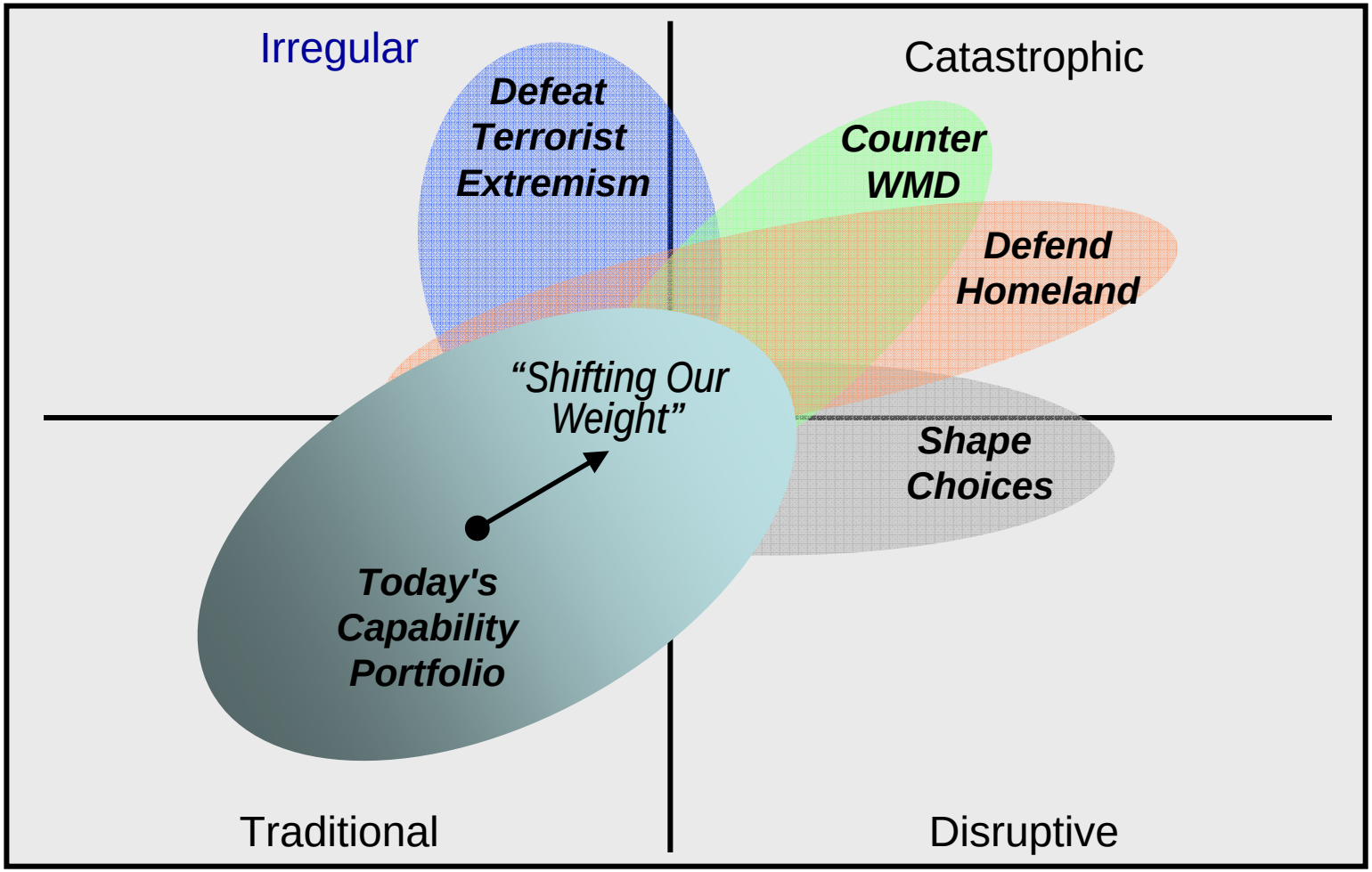
Lower *Higher*

Higher *Lower*

LIKELIHOOD

Uncertainty is the defining characteristic of today's strategic environment

QDR Re-balancing Future Force Capabilities

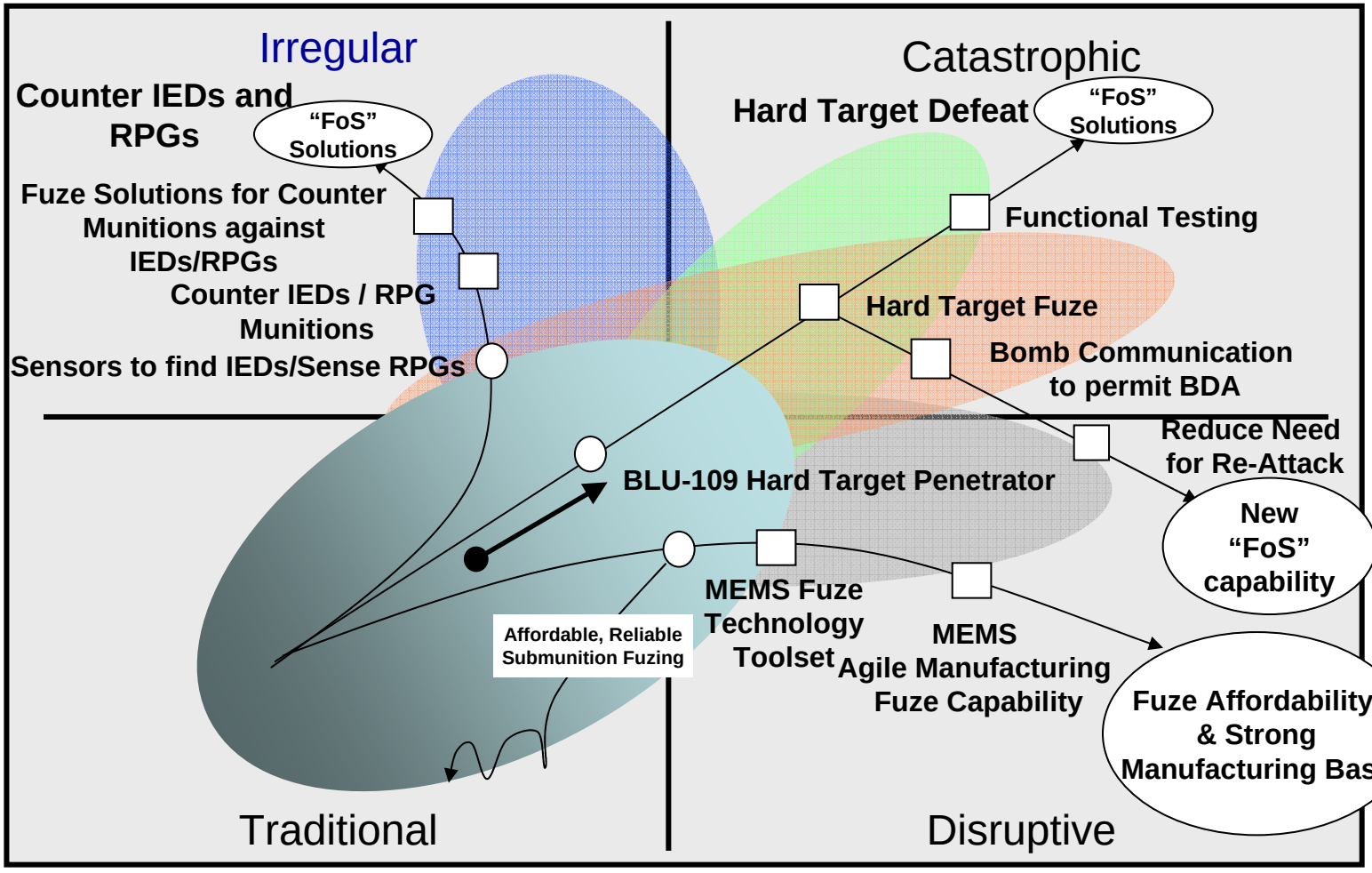


Continuing the reorientation of military capabilities and implementing enterprise-wide reforms to ensure structures and process support the President and the warfighter

QDR Re-balancing Future Force Capabilities:

A Suggested Path to Rebalance Fuzing Thrusts to Meet Future Capabilities

"Shifting Our Weight"



Munitions Procurement Trends

- **Affordability can not be ignored!**
- **Heavier emphasis being placed on Precision Munitions, Weapons for Autonomous Systems and Multi-Mission Weapons**
  - **Guidance systems increase munitions cost & Systems complexity**
  - **Can not afford to miss the hidden costs! (DOTMILPF*)**
- **Traditional munition inventories counts will be smaller and replenishment on use will be a "just in time" production issue**
- **Industrial Base will be affected:**
  - **Surge and Agility vs. Mass Produced Quantity Systems Approach**
  - **Requirements (such as IM) are driving AUR costs up**
    - **Will we be forced to buy Less?**
    - **Can we afford "Service requirements creep?" vs. Joint, Multi-Mission Roles**
  - **If fewer munitions are being bought, so mass production value is lowered: Cost goes up for start up, qualification.**
- **DoD perspective:**
  - **These issues will drive the acquisition cost of munitions systems**

The Department cannot buy what it bought before, and not at the same cost…

**** DOTMILPF**, Doctrine, Organization, Training, Material, Leadership and Education, Personnel, and Facilities*

DoD Fuze Ongoing Status/Update

- **OSD AT&L LW&M, DDR&E S&T, and DUSD/IP in active participation**
- **Services – PEO's/PM's, Laboratories involved and active**
- **DOE – Weapons Laboratories, DOE-DoD Technical Coordination Groups (TCG)**
  - **Active and Sharing Information Openly, Transparently**
- **Teams:**
  - **Fuze Technology – Joint Service Fuze Technical Panel***
  - **Acquisition data collection survey and update***
  - **Industrial Base Survey* (DUSD/IP, DCMA Study concluding 2006)**
  - **Policy**

** Details contained in Brief "Fuze IPT Perspective," by **Mr. Lawrence Fan**, Fuze and Microsystem Project Manager, NSWC*

Conclusions

- The Business Case has changed:
  - Lower munitions procurement budget trends
  - Fewer fuzes are expected to be bought
  - Precision munitions are driving costs up and quantities down
  - New requirements will need to be met
  - Can not ignore other Cost Drivers (DOTMILPF)

- The “shift” to Irregular, Disruptive and Catastrophic warfare is liable to change the focus or perspective of need for traditional munitions

- The proximity fuze was once heralded as one of the most significant technological accomplishments of WWII because it provided the “shift” that was needed at the time

- We need to be innovative, agile and adaptive to address changing threats and to meet requirements for modern munitions