

Missiles & Weapons Market in Perspective

Jeff Ryder
BAE Systems, Inc.
January 23, 2008

Introduction

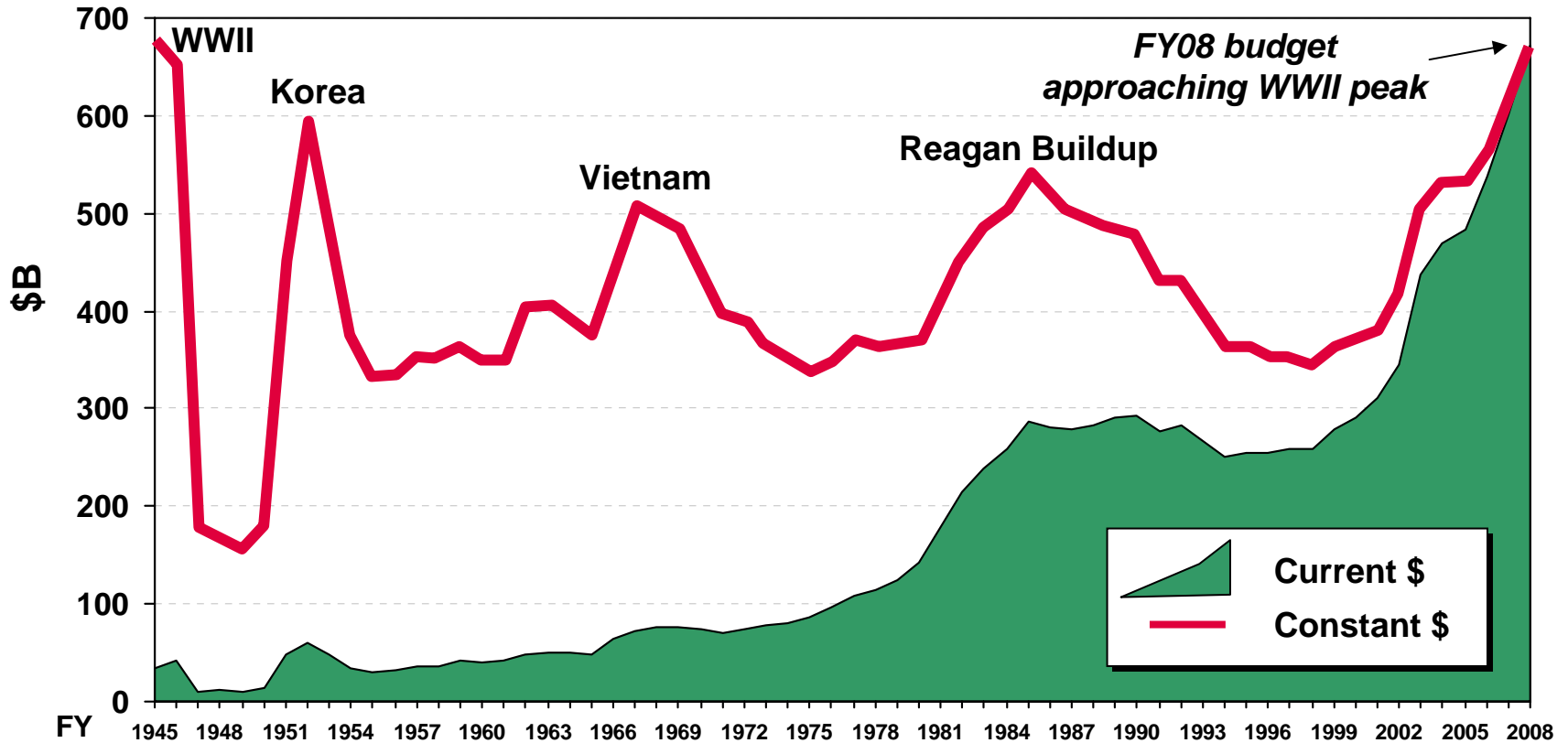
- 1** US defense budget outlook
 - Scenarios
 - Drivers
- 2** Missiles & Weapons budget outlook
 - Missiles, PGW, munitions and ordnance
 - Market forecast
- 3** Trends to reorient capabilities
 - Capability gaps
 - Future scenarios

Approach

- GEIA: interview based, cross-industry analysis
- Defense budget analysis

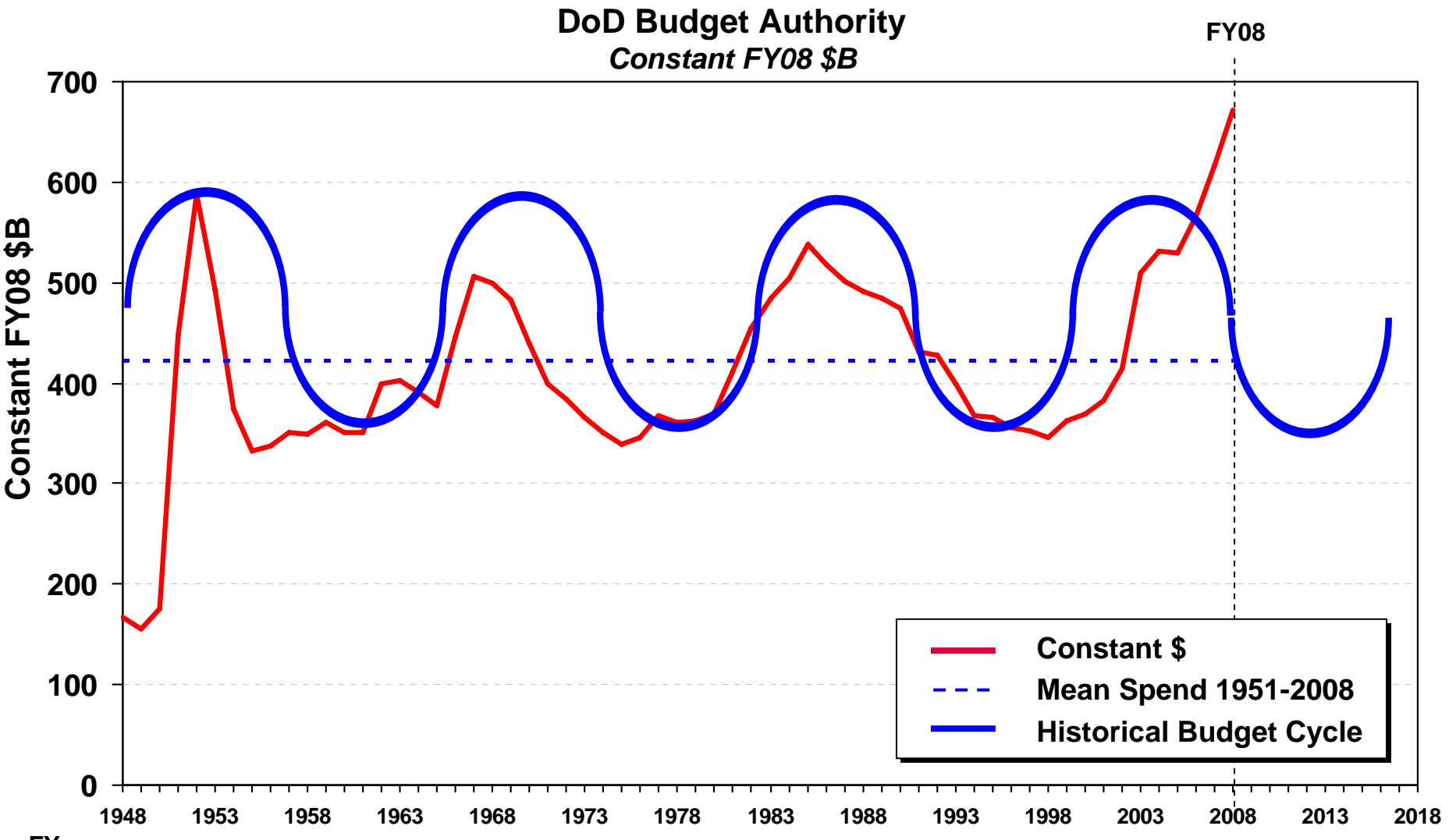
The defense budget is approaching record-breaking levels

DoD Budget Authority
Current and Constant FY08 \$B



Source: DoD Greenbook

The budget is currently “off cycle” – a return to historical cyclicity would suggest a decline is imminent



Source: DoD Greenbook

A number of factors shape the budget outlook – threat perception, politics and economics matter most

Primary budget-shaping factors:

- Threat
- Politics
- Economics



Factors that pressure the budget:

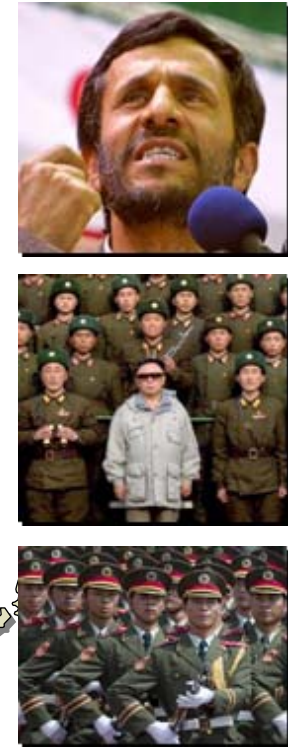
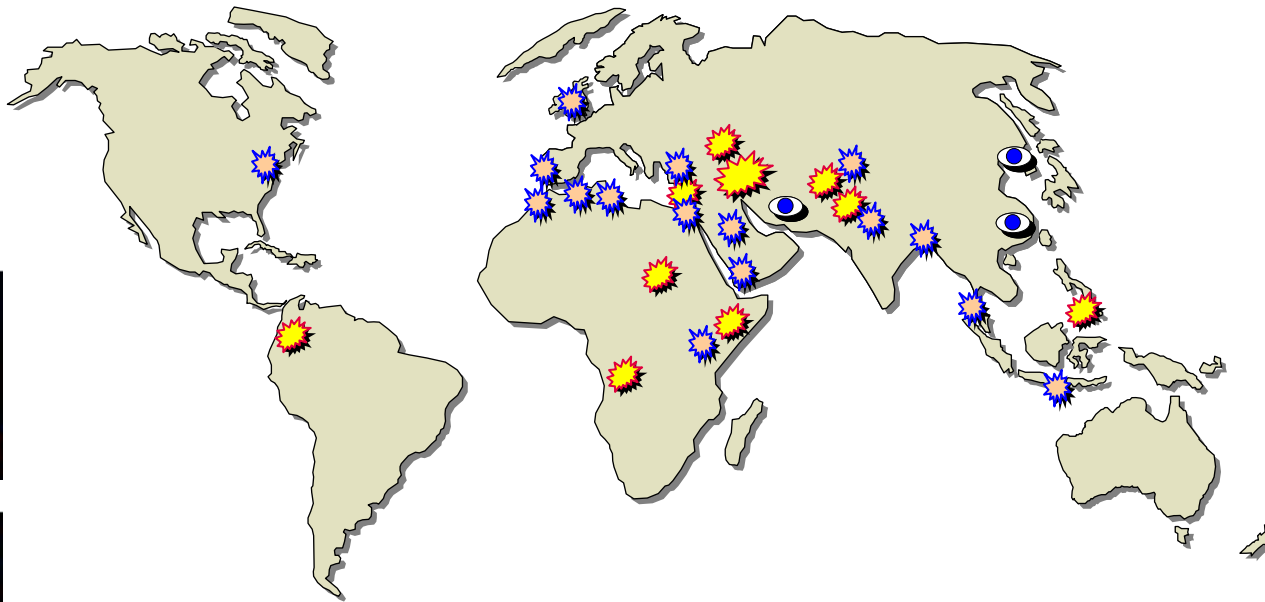
- Withdrawal from Iraq
- Increase in mandatory spending
- Popular disapproval of defense spending

Factors that buoy the budget:

- High Optempo
- Rising Operations & Support (O&S) costs
- Reset requirements
- Investment requirements

The security environment has become increasingly complex

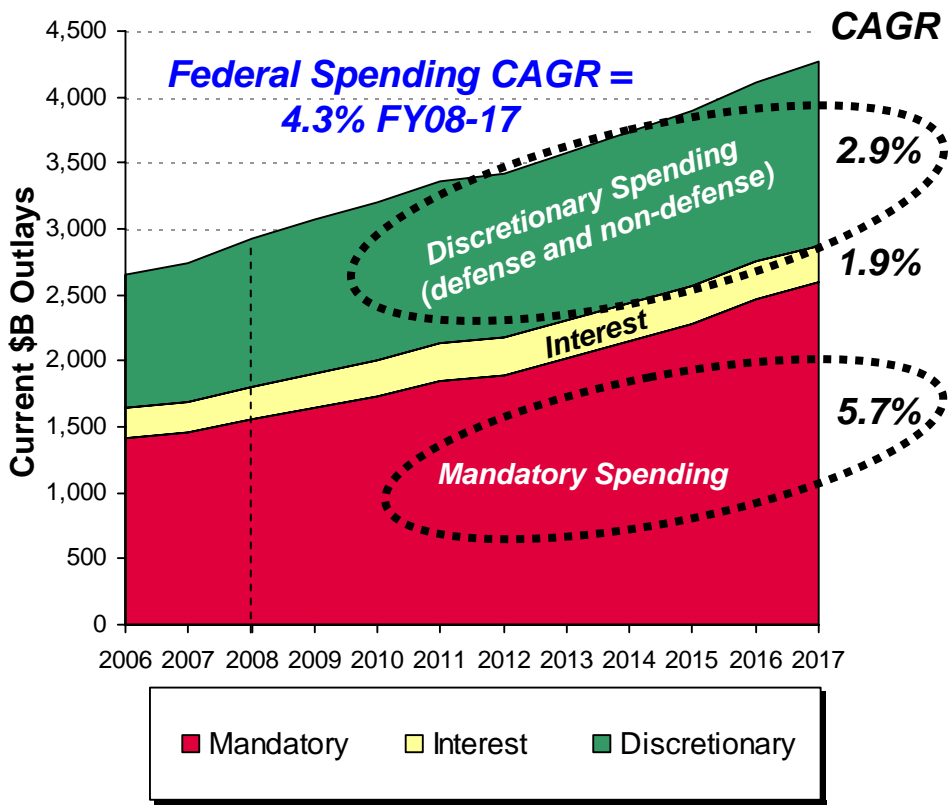
Global Security Environment



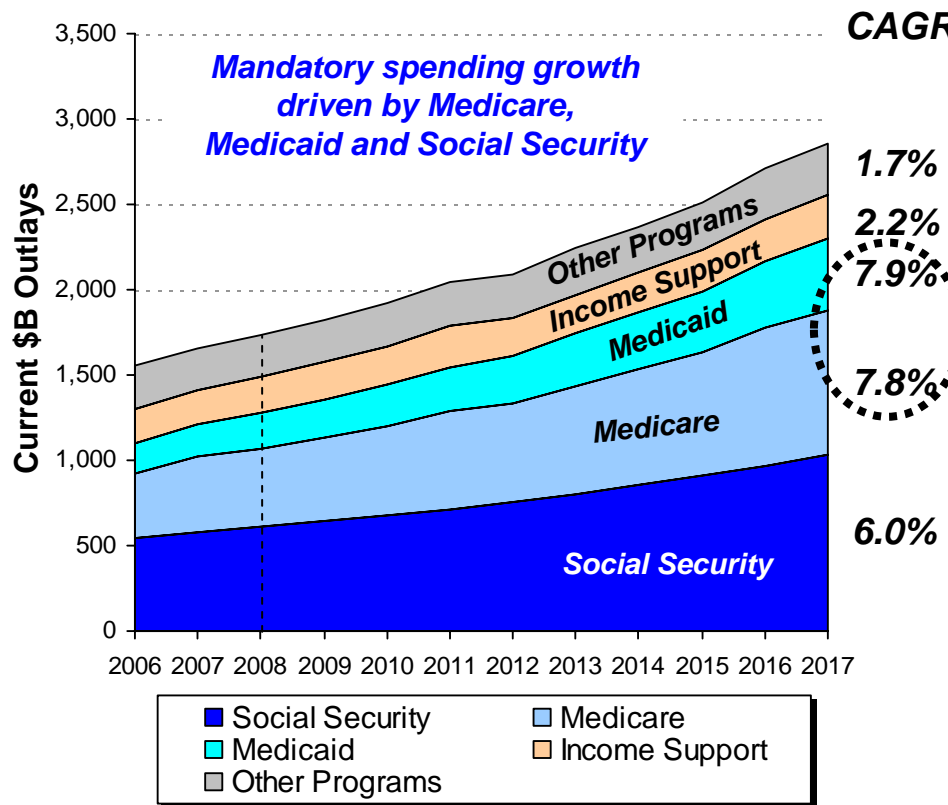
-  Al Qaeda Attack
-  Conflict Zone
-  Ongoing Concern

A key economic/fiscal factor in the defense forecast is the rapid growth in mandatory spending accounts

**Federal Spending
by Major Category 2006-2017**



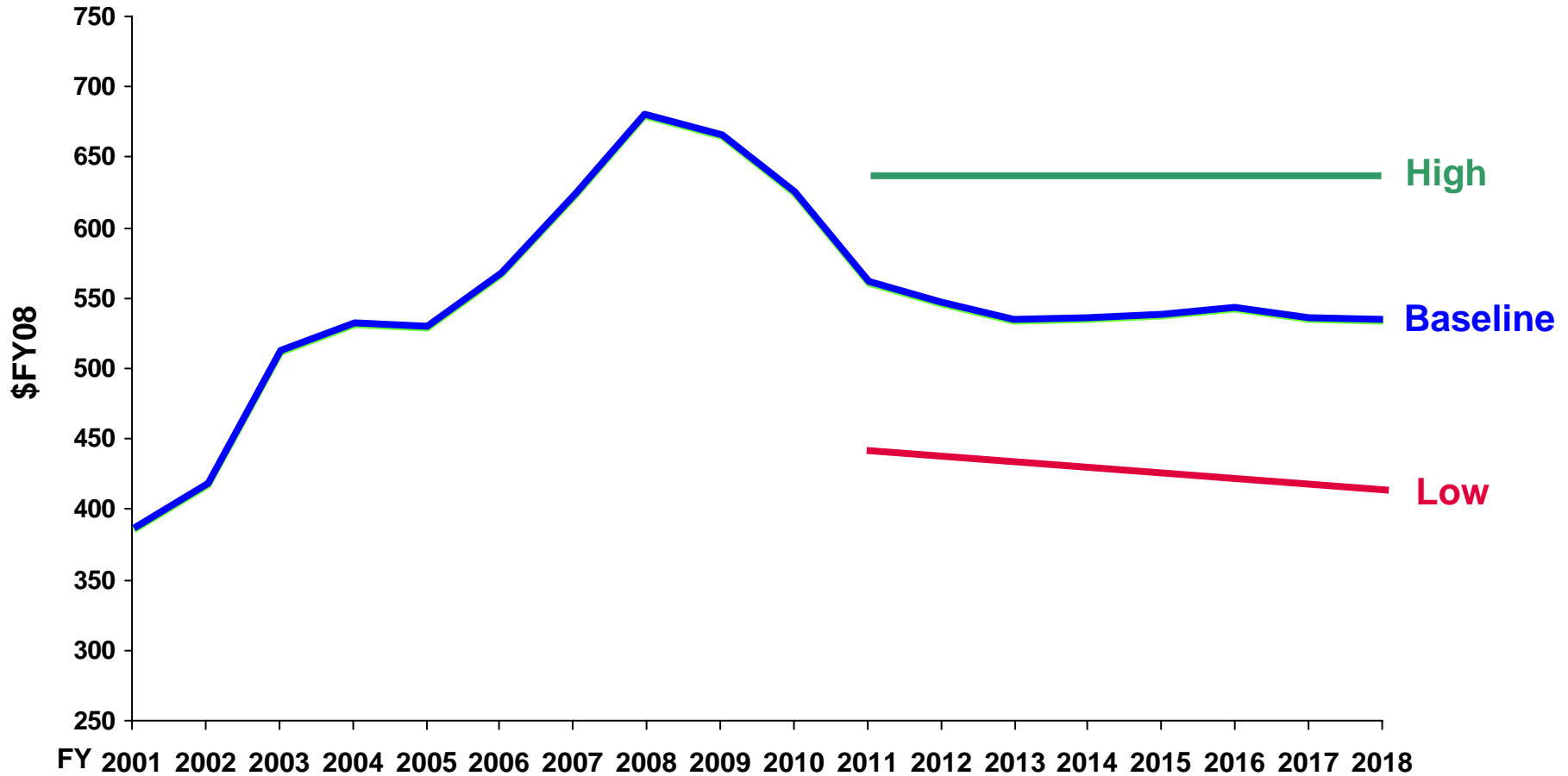
**Mandatory Spending
By Account 2006-2017**



Source: CBO projections, August 2007

Future spending will likely remain high by historical comparison

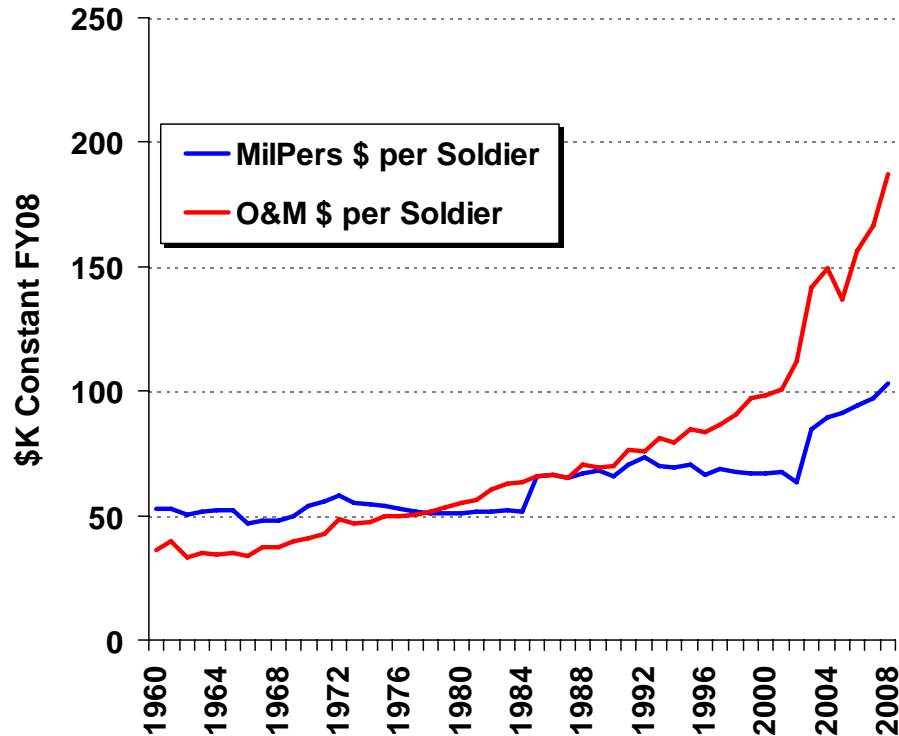
US Defense Budget Scenarios vs. Budget Benchmarks
Budget Authority, Constant \$FY08



Source: DoD Greenbook FY08, GEIA, BAE Systems, Inc.

Upwards budget pressure is driven by the inexorable rise in Operations & Support costs

Spending per Soldier: MilPers vs. O&M
Budget Authority, Constant \$FY08

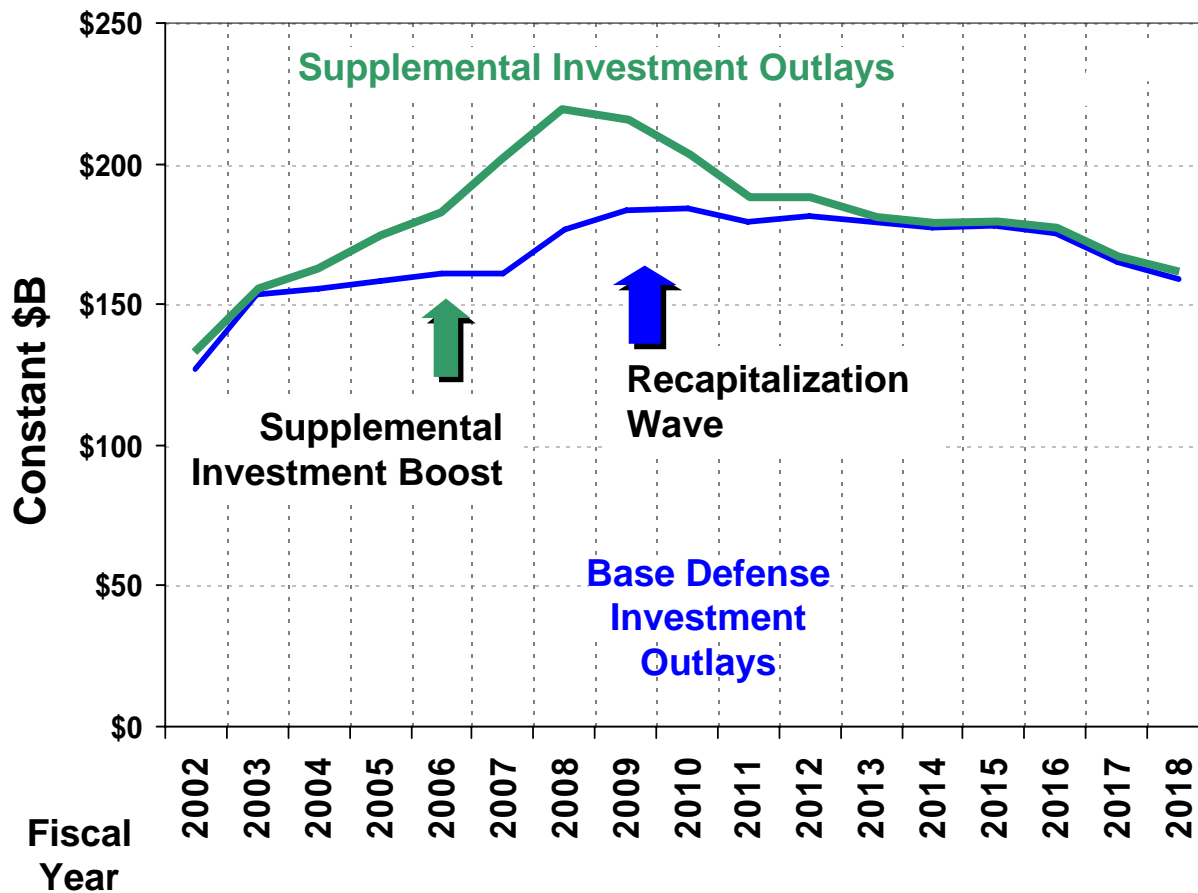







- O&M drivers
 - High Optempo
 - Aging fleets
 - Increasing complexity of weapons
 - Rising fuel costs
 - Increasing use of industry contractors
- MilPers drivers
 - Force augmentation (+92,000)
 - Healthcare (costs doubled 2000-2005)
 - Rate of military retiree and dependents increased 6.0% per year 2001-2005
 - Upwards pressure on compensation due to private-sector benchmarking

- Risk that O&S costs will erode investment accounts
- The only historical means to curb O&S growth has been to reduce end strength

Investment spending will decline in real dollars

Investment = Procurement + RDT&E
Budget Authority, Constant \$



-  Current investment funding forecast insufficient to fully fund current portfolio
-  Cost increases, (historically 15%) could add a \$25B burden
-  May see additional Service requests
-  O&S budget intrusion
-  Portfolio trades will continue, placing premium on program performance

Source: DoD Greenbook FY08, GEIA

The Services indicate investment prioritization on platforms

Service Investment Priorities

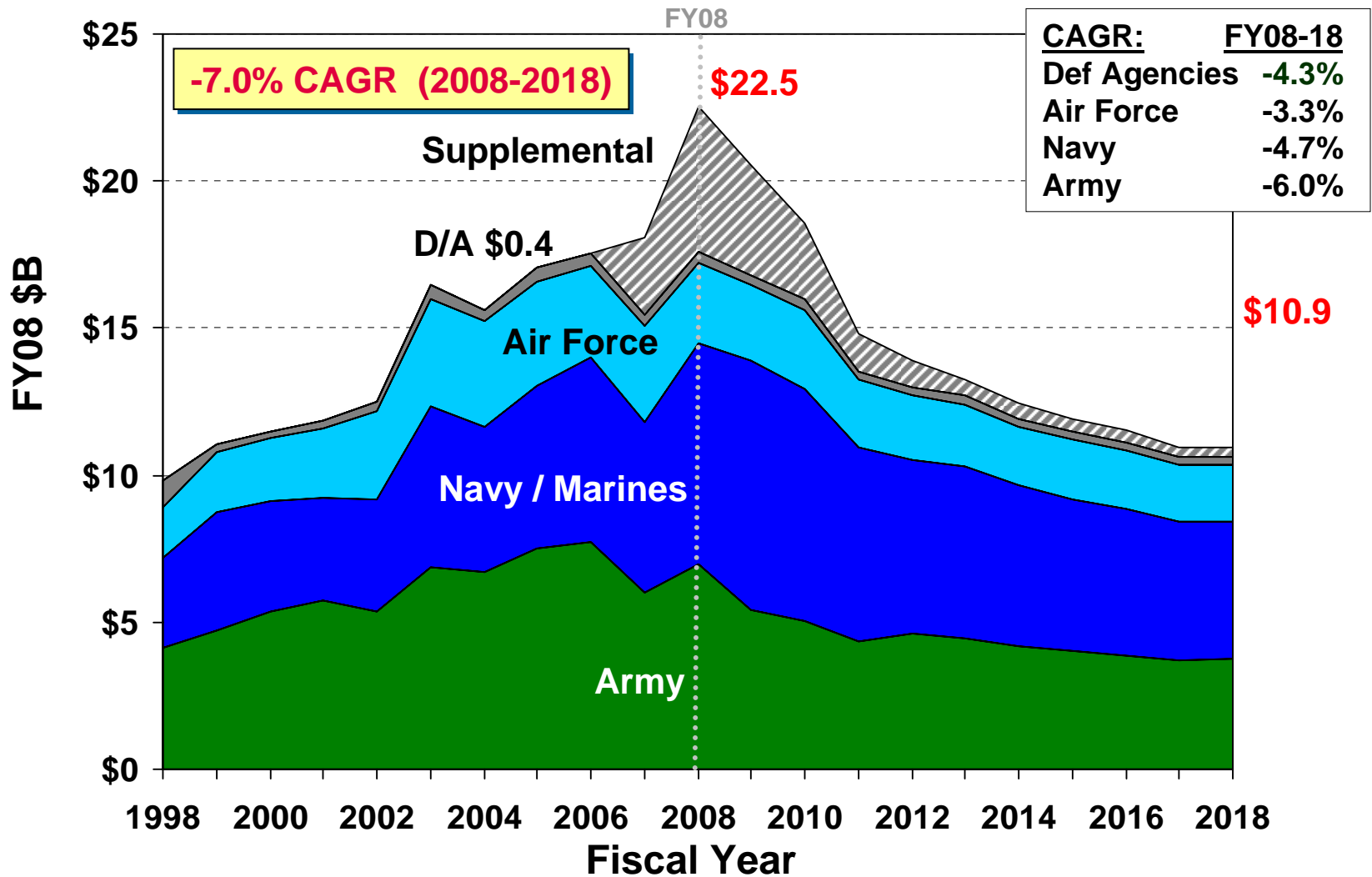
Service	Investment Priorities
Air Force	<ul style="list-style-type: none"> • F-22 • KC-X • C-17/C-5 • CSAR-X • JSF • LRS • SBIRS • TSAT • Space Radar
Navy	<ul style="list-style-type: none"> • Shipbuilding (CVN-78, DDG-1000, LPD-17, LHA(R), Virginia) • Aircraft modernization (JSF, F/A-18 E/F, EA-18G, BAMS, MMA/P-8A)

Service	Investment Priorities
Army	<ul style="list-style-type: none"> • FCS • FMTV/JLTV • Helicopter modernization • MRAP • Force augmentation
Marine Corps	<ul style="list-style-type: none"> • JSF • Expeditionary Fighting Vehicle (EFV) • Light Armored Vehicle (LAV) • Amphibious shipbuilding • V-22 • CH-53K • Force augmentation

Missiles & Weapons budgets will decline over the next decade, with emphasis on upgrades as opposed to new starts

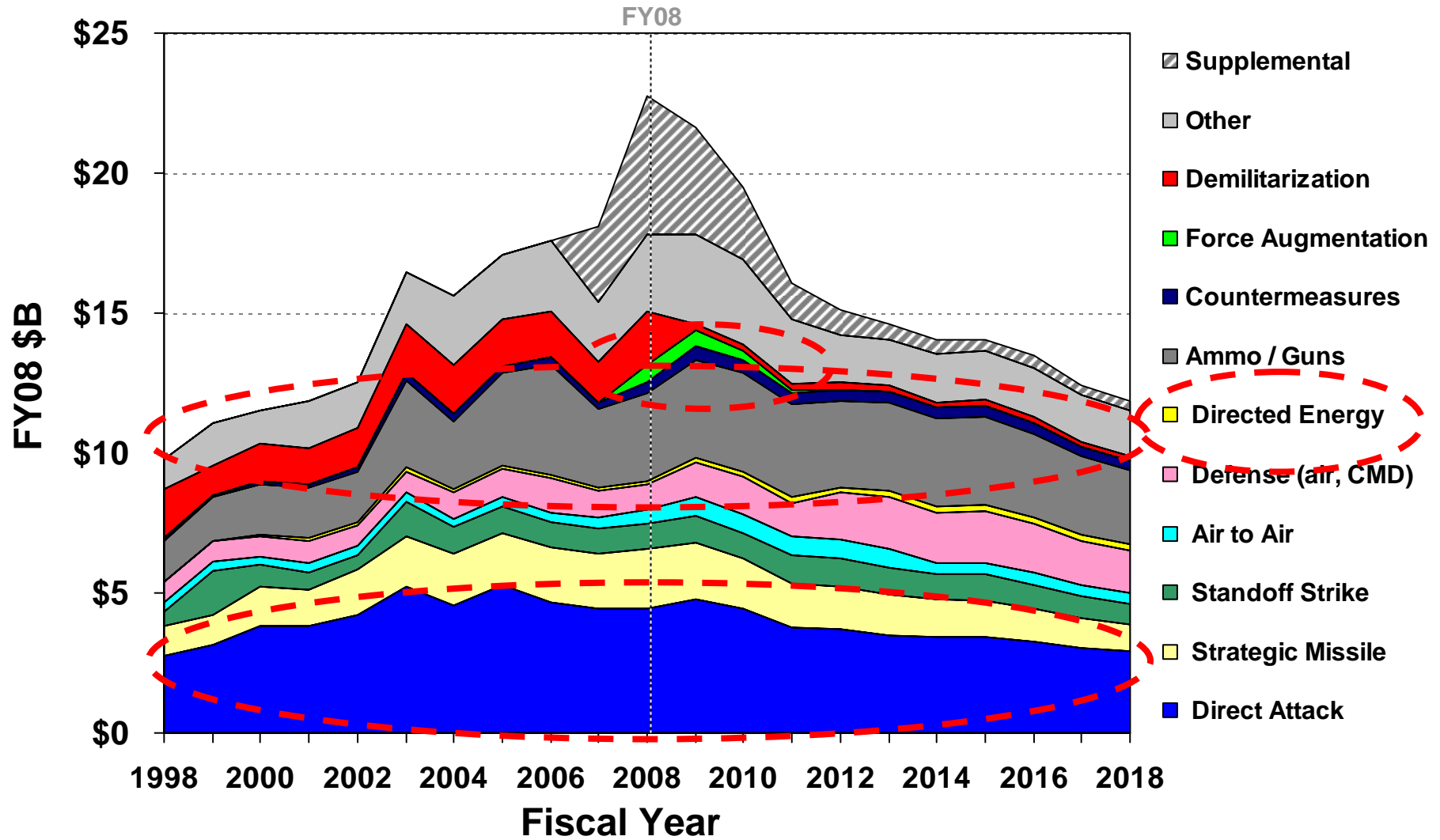
- Missiles & weapons budget will decline over the forecast period
 - Pressure on topline and between Services
 - Supplemental war funding expected to drop off in near term
 - Several major programs have/will be winding down
 - Concern weapons will become bill payer for platforms
- Spending profile shows few new program starts
 - Emphasis on improving and upgrading legacy systems
 - Iraq/GWOT driving primary requirements and capability gaps
 - Replenishment for expended ordnance and fatigue
 - Force Augmentation (Army, USMC) in near term

Market Forecast: By Military Service



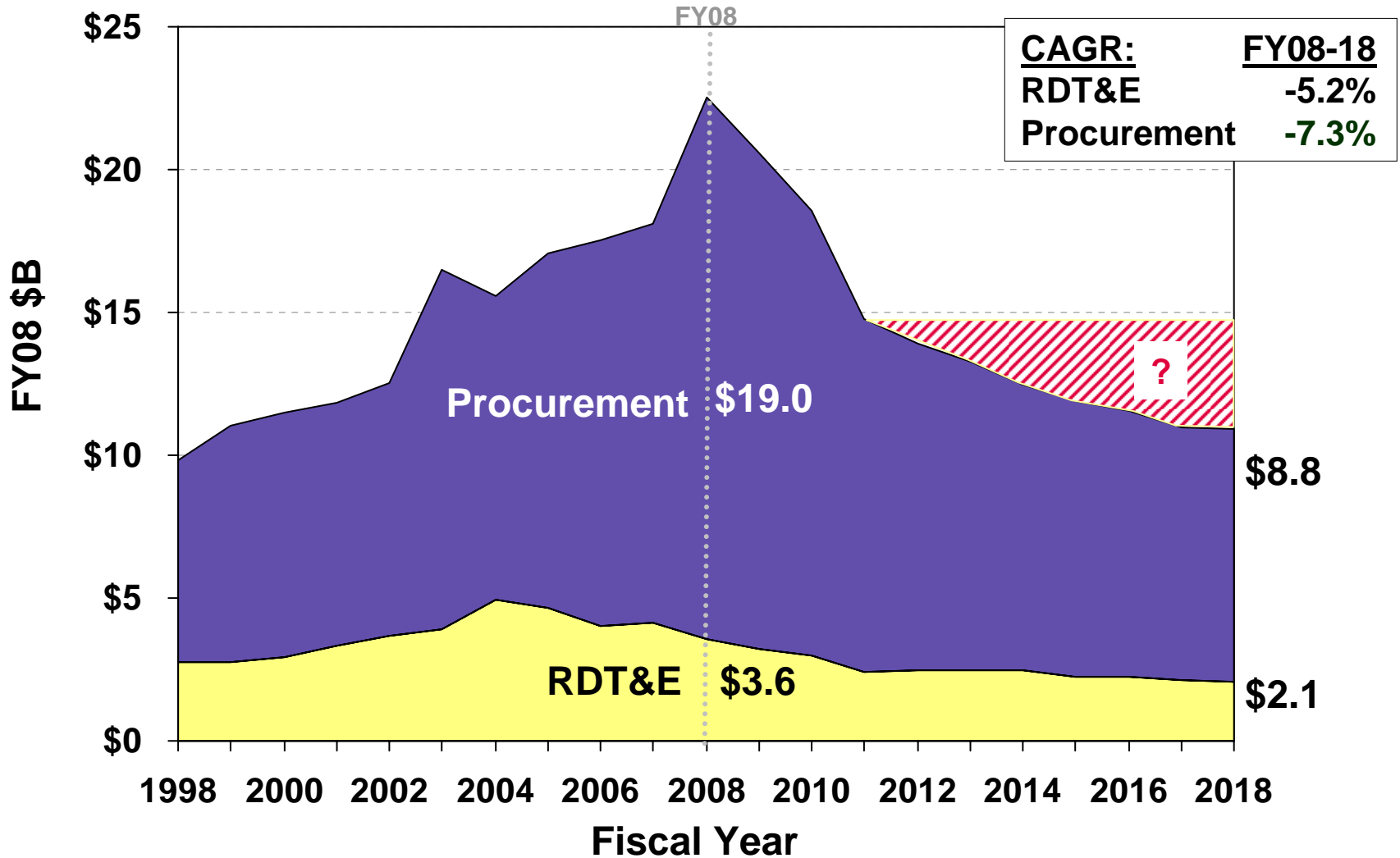
Source: GEIA

Market Forecast: By Segment



Source: GEIA

Market Forecast: Procurement vs. RDT&E



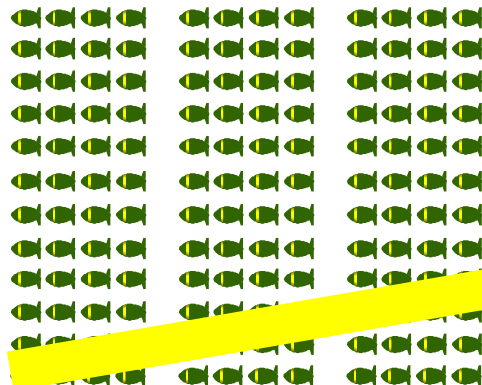
Source: GEIA

Evolution of precision engagement drives perception of missiles and weapons versus other defense investment segments

1943



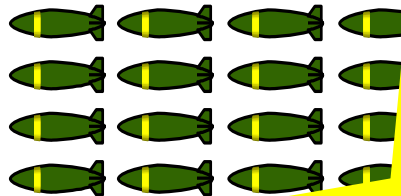
1500 B-17 sorties
9000 bombs
3300 ft CEP
One 60' x 100' target
WWII



1970



30 F-4 sorties
176 bombs
400 ft CEP
One Target
Vietnam



Accuracy
1991



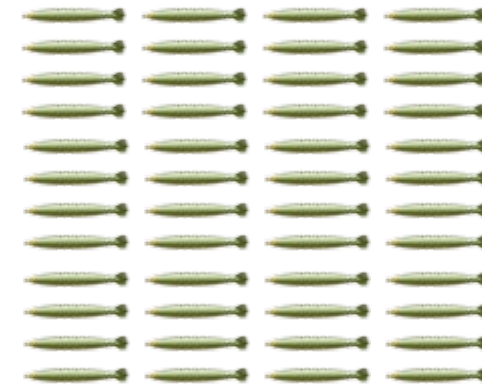
1 F-117 sortie
2 bombs
10 ft CEP
Two Targets per Sortie
Desert Storm



2003



1 B-2 sortie
80 bombs
<20 ft CEP
80 Targets per Pass
All Weather



Accuracy

Source: USAF

Despite today's battlefield challenges, US forces are using existing weapons for desired effect...



...the real issue is targeting and networking

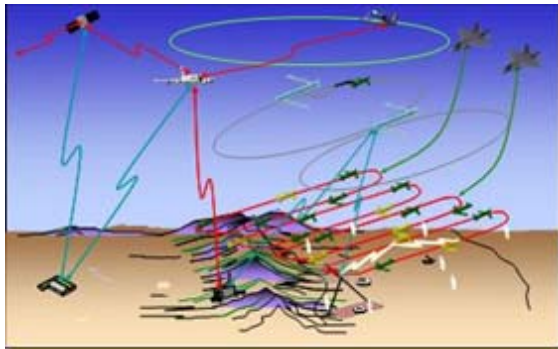
Iraq is driving many of the capability requirements

- Moving targets, fleeting targets
- Precision engagement in all weather
- Urban Close Air Support (CAS)
- Shortened kill chain
- Improved reliability
- Low collateral damage
- Non-lethal effects
- GPS interrupted / denied environments
- Hard and Deeply Buried Targets (HDBT)
- O&S assumptions built into design due to captive carry



Current Environment: Key Technologies

- Multi-mode seekers
- Datalinks
- Sensor fuzing
- Flexible warheads, scalability
- Hypersonic
- Smart fuzes
- Directed energy



Smart technology insertion needed to achieve cost-friendly, balanced capability portfolio

Numerous potential opportunities...

Near term <2010

- JAGM
- Smart artillery, mortars, rockets, tank rounds
- Direct attack moving target capability (DAMTC)

Mid-Term 2010-2015

- FCS Precision Munitions
- Weapons for UAVs
- Hard and Deeply Buried Targets
- Tactical Laser
- High Power Microwave
- Over-the Horizon Anti-Surface Warfare Weapons
- Swarm Ship Defense
- Joint Dual Role Air Dominance Missile (AA, AG)
- Long-range strike weapon
- Next-gen Torpedoes
- Non-Lethal Effects

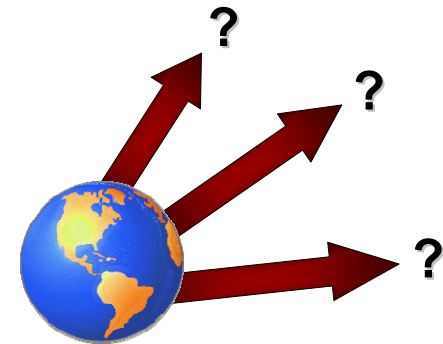
Far-Term 2015+

- Directed Energy
- Future Cruise Missile
- Electro Magnetic Rail Gun
- Autonomous Target ID

...but no clear roadmap

Impact of a “Global Terrorism” vector

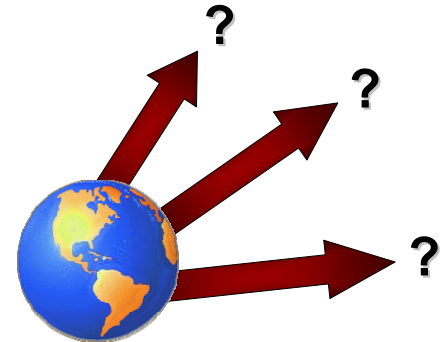
- Emphasis on CAS in any environment with small, high-speed, precision weapons
- Requirements may expand for:
 - Fleeting target capability
 - Sensing and discriminating low-profile targets
 - Networking of all ISR platforms to rapid strike
 - Emphasis on speed over range
 - Low collateral damage
 - Scalability
 - Precision in all environments
 - Directed energy for non-lethal effects
 - Loitering weapons
 - Weaponizing UAVs



No appreciable difference versus baseline budget, though requirements may shift

Impact of a “Multipolar Alignment” vector

- Technology development to prepare for near-peer challenge:
 - Increased emphasis on baseline requirements (i.e. moving targets, all weather, networked weapons, etc.)
 - Emphasis on range as well as speed – fast, standoff weapons
 - Over-the horizon surface warfare
 - Advanced torpedoes
 - Cruise missiles
 - Hypersonic propulsion technology
 - Directed energy for force application / protection
 - UCAV weapons



**Budget increases, though missiles & weapons
will continue to compete with platforms**

Potential disruptions

- Directed Energy
 - DE expected to be complementary to kinetic weapons
 - Technology development may come in advance of CONOPS / policy evolution
 - User pull required
 - ABL shutdown (FY 09) and ATL, HEL tech demonstration programs may indicate how quickly DE evolves operationally
- Cyberspace
- Convergence with or divergence towards other domains and sciences
 - Nano
 - Robotics
 - Bio

Messages to Industry

- Contractors are doing a good job developing technology and addressing capability gaps
- Make the dumb weapons smart and the smart weapons cheap
- Don't try to add capability when it's not needed
- Emphasize realistic cost estimates

Thank You