Missiles & Weapons Market in Perspective

Jeff Ryder
BAE Systems, Inc.
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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

FY08 budget approaching WWII peak

Source: DoD Greenbook
The budget is currently “off cycle” – a return to historical cyclicality 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.

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

- **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**

Source: DOD Greenbook
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

<table>
<thead>
<tr>
<th>Service</th>
<th>Investment Priorities</th>
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<tbody>
<tr>
<td>Air Force</td>
<td>• F-22&lt;br&gt;• KC-X&lt;br&gt;• C-17/C-5&lt;br&gt;• CSAR-X&lt;br&gt;• JSF&lt;br&gt;• LRS&lt;br&gt;• SBIRS&lt;br&gt;• TSAT&lt;br&gt;• Space Radar</td>
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<tr>
<td>Navy</td>
<td>• Shipbuilding (CVN-78, DDG-1000, LPD-17, LHA(R), Virginia)&lt;br&gt;• Aircraft modernization (JSF, F/A-18 E/F, EA-18G, BAMS, MMA/P-8A)</td>
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<td>Army</td>
<td>• FCS&lt;br&gt;• FMTV/JLTV&lt;br&gt;• Helicopter modernization&lt;br&gt;• MRAP&lt;br&gt;• Force augmentation</td>
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<td>Marine Corps</td>
<td>• JSF&lt;br&gt;• Expeditionary Fighting Vehicle (EFV)&lt;br&gt;• Light Armored Vehicle (LAV)&lt;br&gt;• Amphibious shipbuilding&lt;br&gt;• V-22&lt;br&gt;• CH-53K&lt;br&gt;• Force augmentation</td>
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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

Source: GEIA
Market Forecast: By Military Service

CAGR: FY08-18
- Def Agencies: -4.3%
- Air Force: -3.3%
- Navy: -4.7%
- Army: -6.0%

Source: GEIA
Market Forecast: By Segment

Source: GEIA
Market Forecast: Procurement vs. RDT&E

CAGR: FY08-18
- RDT&E: -5.2%
- Procurement: -7.3%

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
- **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

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

Source: GEIA
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

Source: GEIA
Numerous potential opportunities…

<table>
<thead>
<tr>
<th>Near term &lt;2010</th>
<th>Mid-Term 2010-2015</th>
<th>Far-Term 2015+</th>
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<tr>
<td>– JAGM</td>
<td>– FCS Precision Munitions</td>
<td>– Directed Energy</td>
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<td>– Smart artillery, mortars, rockets, tank rounds</td>
<td>– Weapons for UAVs</td>
<td>– Future Cruise Missile</td>
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<tr>
<td>– Direct attack moving target capability (DAMTC)</td>
<td>– Hard and Deeply Buried Targets</td>
<td>– Electro Magnetic Rail Gun</td>
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<td>– Tactical Laser</td>
<td>– Autonomous Target ID</td>
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<td>– High Power Microwave</td>
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<td>– Over-the Horizon Anti-Surface Warfare Weapons</td>
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<td>– Swarm Ship Defense</td>
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<td>– Joint Dual Role Air Dominance Missile (AA, AG)</td>
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<td>– Long-range strike weapon</td>
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<td></td>
<td>– Next-gen Torpedoes</td>
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<td>– Non-Lethal Effects</td>
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…but no clear roadmap

Source: GEIA
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.

Source: GEIA
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

Source: GEIA
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 shootdown (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

Source: GEIA
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

Source: GEIA
Thank You