



Maintaining Our Technological Advantage in an Era of Uncertainty

Al Shaffer

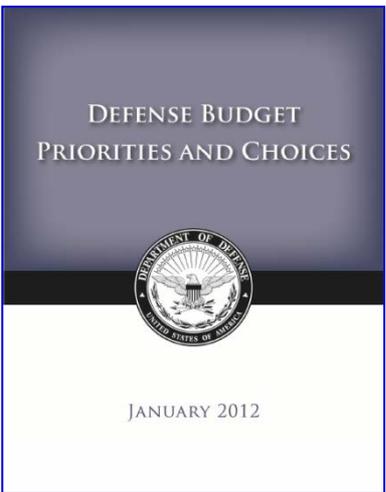
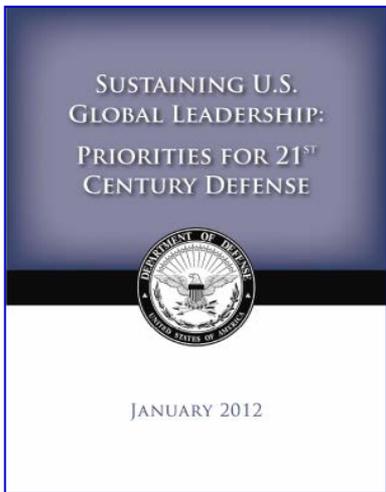
**Principal Deputy Assistant Secretary of Defense
for Research and Engineering
August 2014**



Key Elements of Defense Strategic Guidance



- The military will be smaller and leaner, but it will be **agile, flexible, ready and technologically advanced**.
- Rebalance our global posture and presence to emphasize the Asia-Pacific region.
- Build partnerships and strengthen key alliances and partnerships elsewhere in the world.
- Ensure that we can quickly confront and defeat aggression from any adversary – anytime, anywhere.
- Protect and prioritize key investments in **technology and new capabilities**, as well as our capacity to grow, adapt and mobilize as needed.





DoD at Strategic Crossroads



Secretary Hagel

Budget Roll-Out Brief
24 Feb 2014

“The development and proliferation of more advanced military technologies by other nations means that we are **entering an era where American dominance on the seas, in the skies, and in space can no longer be taken for granted**”

The strategic question is – will the force of tomorrow be:

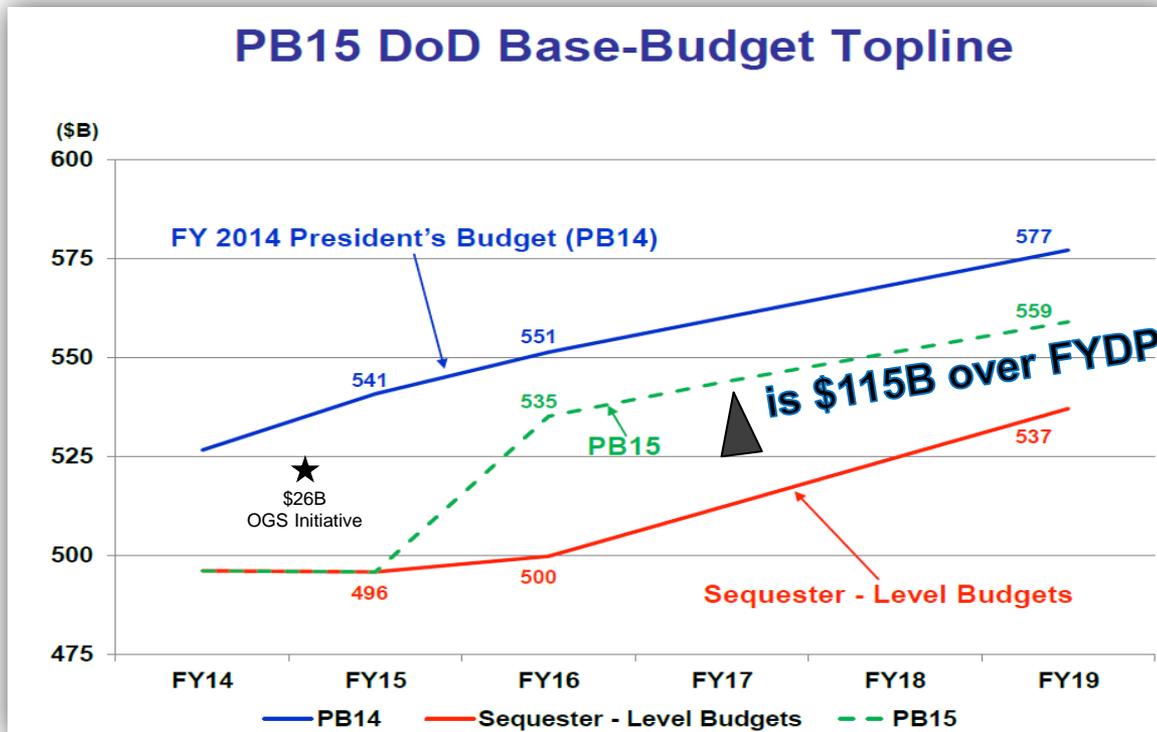
- Larger with diminished capability or,
- Smaller with more technologically advanced capabilities



Strategic Future and Fiscal Uncertainty



- If Budget Control Act holds over President's Budget the Department will face reduced capability at sequester-level budgets
- In FY16-19, the DoD is asking for funding that exceeds the current budget caps by a total of \$115B to meet defense requirements



3 Budget Levers:

- Force Structure
- Readiness
- Modernization

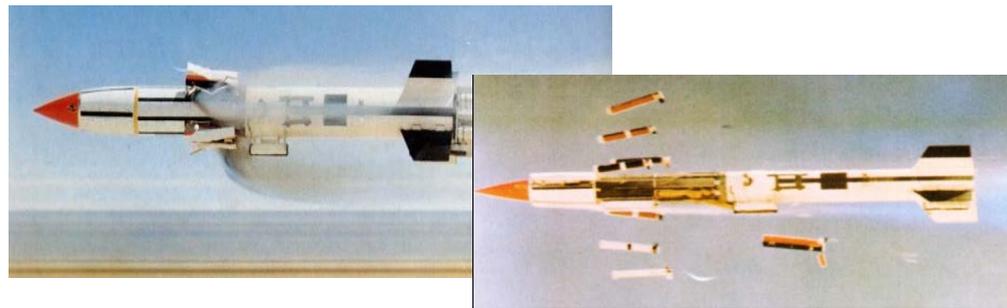


This gap increases **Risk**



Technology Offset

- **Deputy Secretary of Defense Work Proposes Using Technology to Offset Manpower**
 - Will not be Instantaneous
 - Requires New Capability Sets
 - Previous Offsets:
 - *Technical Nuclear Assault Breaker Program*
 - *Stealth & Precision Guided Munitions (PGM)*
 - *What is next?*





Shaping the DOD S&T Portfolio

Future Threats

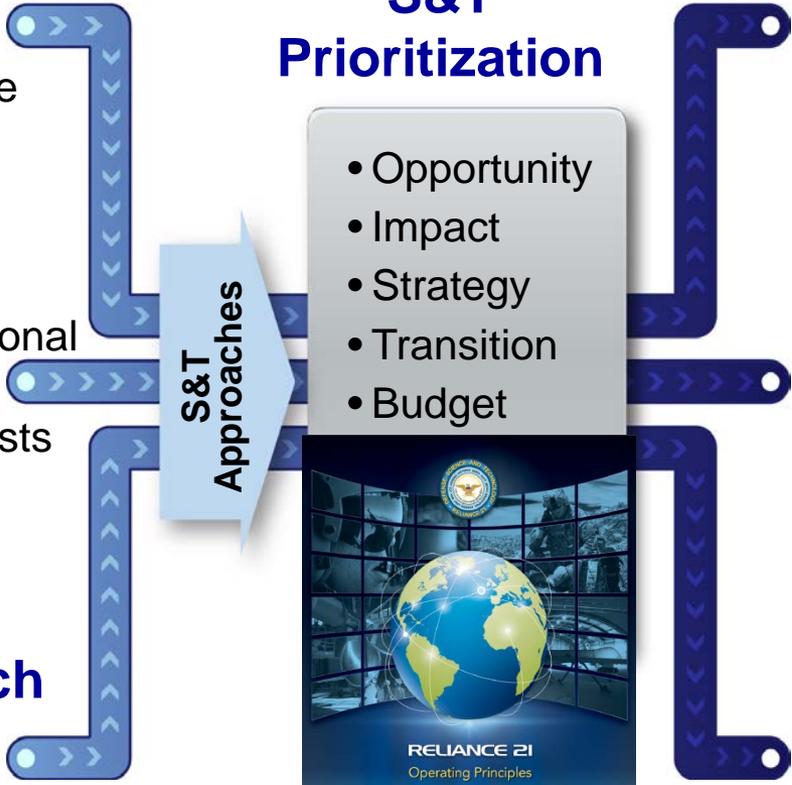
- Net Assessment
- Quadrennial Defense Review (QDR), Intel
- Advisory Boards

Current Fight

- Joint Urgent Operational Needs (JUONs)
- Integrated Priority Lists (IPLs)
- Lessons Learned
- COCOMs

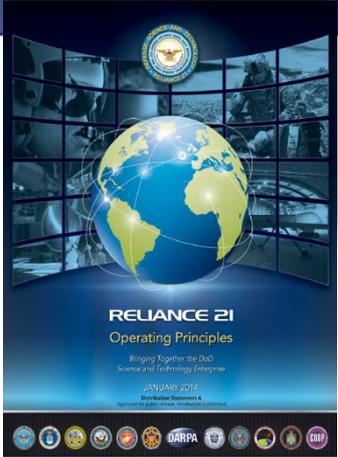
Emerging Research

- Publications
- Grand Challenge
- University Initiative Studies
- Global sector
- Private sector



S&T Prioritization

- Opportunity
- Impact
- Strategy
- Transition
- Budget



Reliance-21

Tech Surprise

- Transform the operational battlespace

Tech Readiness

- Technical implementation
- Successful acquisition programs

Core Technologies

- Research Triple (government, university, industry)
- World class, engaged scientific workforce



Defense R&E Strategy



1. Mitigate new and emerging threat capabilities

- Cyber
- Counter Space
- Missile Defense
- Electronic Warfare
- Counter-WMD

2. Affordably enable new or extended capabilities in existing military systems

- Systems Engineering
- Capability Prototyping
- Interoperability
- Modeling and Simulation
- Developmental Test & Evaluation
- Power & Energy

3. Develop technology surprise through science and engineering

- Autonomy
- Human Systems
- Quantum Systems
- Data-to-Decisions
- Hypersonic

Technology to offset manpower

Technology Needs

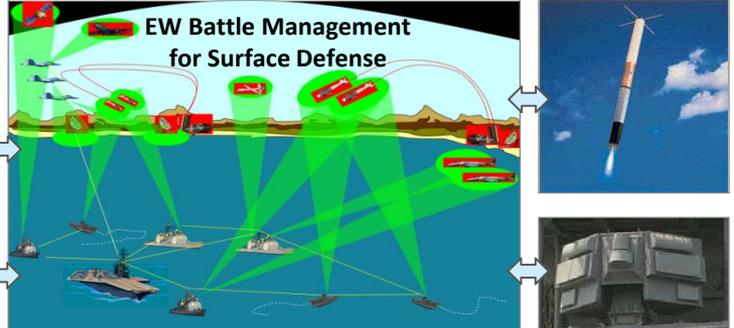
- Cyber / Electronic Warfare
- Engineering / M & S
- Capability Prototyping
- Protection & Sustainment
- Advanced Machine Intelligence
- Anti-Access/Area Denial (A2/AD)



Mitigate: EW, Cyber, Counter-Space, Counter-WMD

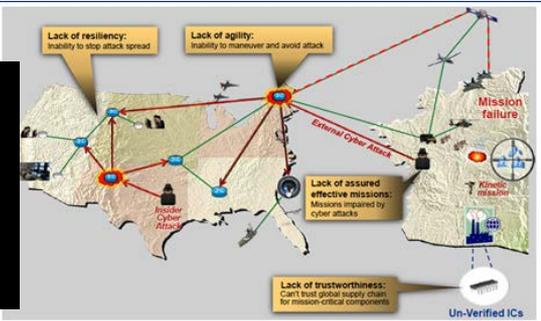
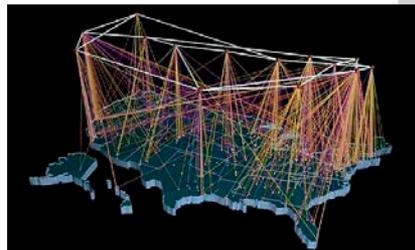
Electronic Warfare & Protection

- RF/Mixed Signal Component Technologies
- EO/IR Component Technologies
- Underlying technology enablers



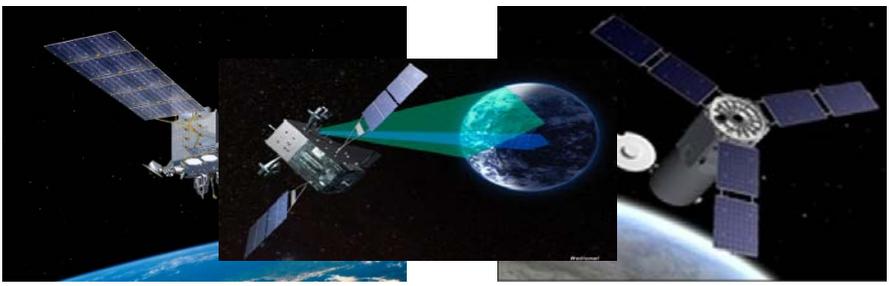
Cyber Science and Technology

- Assuring Effective Missions
- Resilient Infrastructure Trust
- Cyber Experimentation & Measurement
- Agile Operations



Counter-Space

- Contested domains with critical importance
- Gaining and maintaining space superiority
- Future enemies deny U.S. operational access



Counter-WMD

- Sensors
- Network Analytics
- Data Integration
- Predictive Tools

 Reduce & Secure	 Locate & Monitor	 Track	 Interdict/Defeat	 Tactical Warning	 Characterization/Decision-Making	 Hardening	 Medical Pretreatment
 Detonation Release			 Medical Treatment	 Forensics/Attribution	 Consequence Management	 Restoration	



Tech Surprise:

Human Systems, Data-to-Decisions, Autonomy

Human Systems

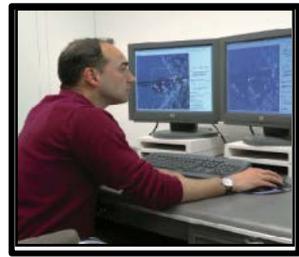
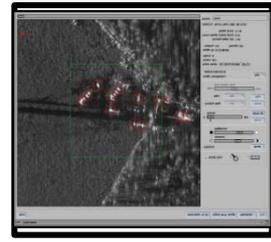


- System Interfaces
- Personnel & Training
- Protection & Sustainment
- Social & Cultural Understanding

Data-to-Decisions

- Data Management
- Analytics
- User Interface

Multi-Layer Approach



Autonomy

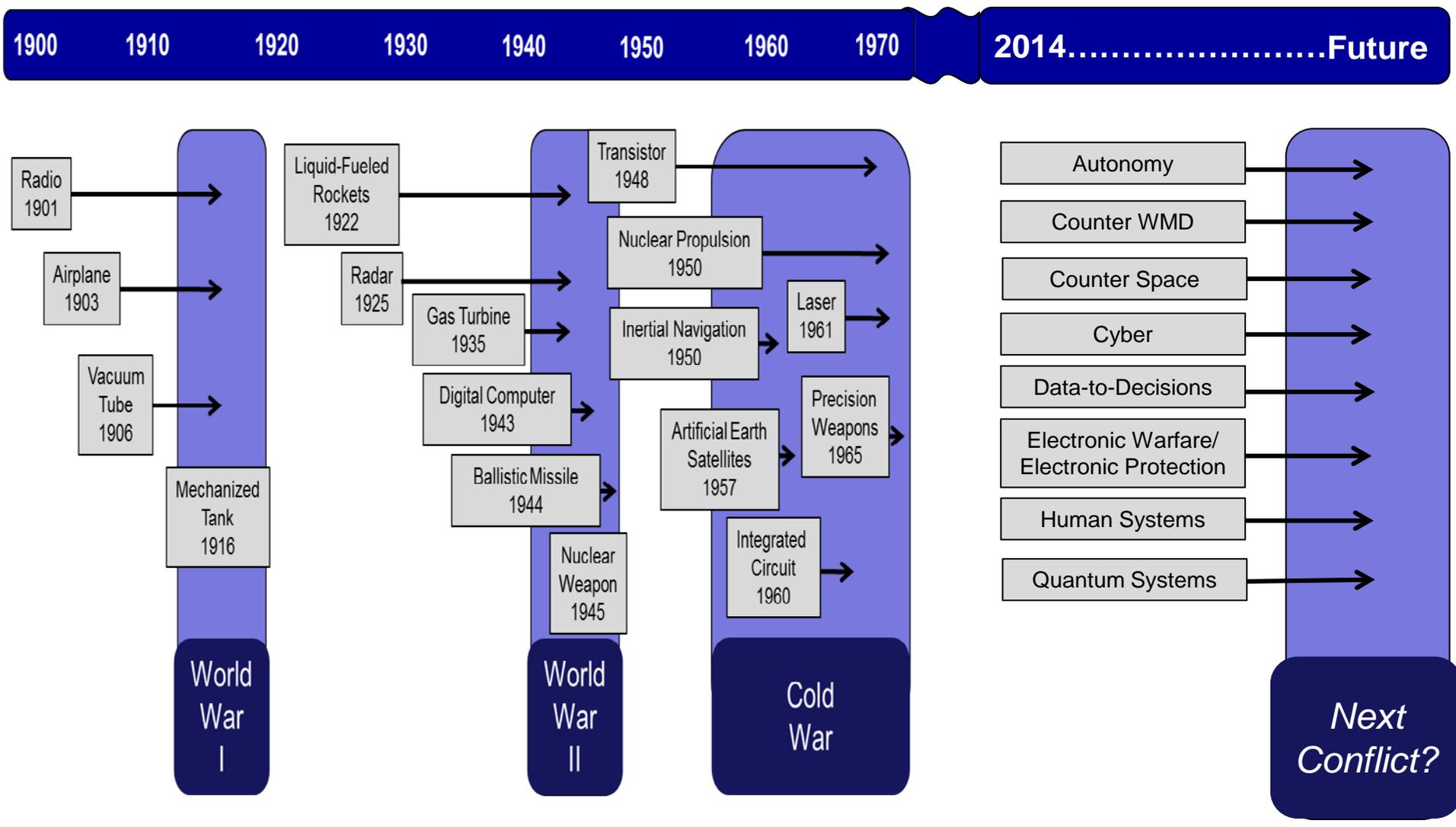
Advanced Machine Intelligence for Missions in Complex and Dynamic Environments

- Human/Autonomous Systems Interaction and Collaboration
- Scalable Teaming of Multiple Autonomous Systems
- Machine Reasoning, Perception and Intelligence
- Optimized teaming between operators and their machine "partners"
- Scalable operations across air, land, sea, cyber, and space domains
- Predictable system safety and mission effectiveness





Prototyping





Capability Prototyping Proof of Concept: "X"- Plane Prototyping



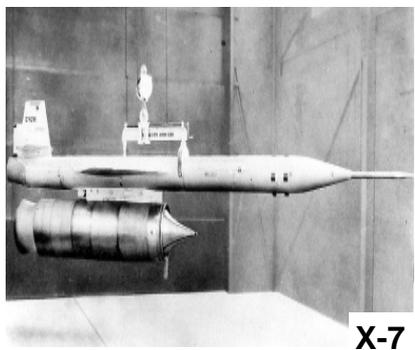
X-1

First flight: 1947
Speed: Mach 1.26



X-2

First flight: 1952
Speed: Mach 3.2



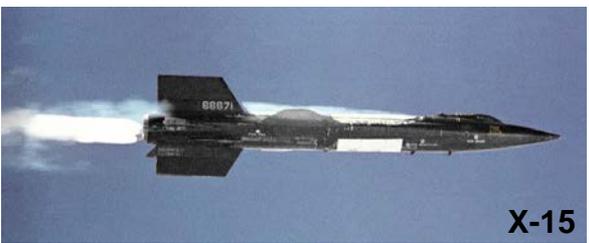
X-7

First Flight: 1951
Speed: Mach 4.31



X-10

First Flight: 1953
Speed: Mach 2



X-15

First Flight: 1959
Speed: Mach 6.7



X-43

First Flight: 2001
Speed: Mach 6.83



X-51

First Flight: 2010
Speed: Mach 5.1

The Department can cost-effectively drive innovation in aviation, space, maritime and ground combat systems through prototyping



Summary

- DoD S&T aligned to meet priorities for a 21st Century security environment
- DoD Strategic Framework.....lays the foundation for S&T commitments
- Asia-Pacific rebalance is the foundation of the R&E strategy
 - Mitigate
 - Affordability
 - Technology Surprise