Defense Science Board

DSB

1956 2016

60 YEARS

Celebrating Innovation for National Security

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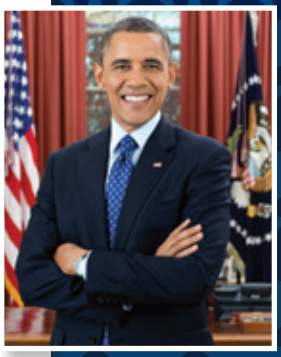
THE WHITE HOUSE
WASHINGTON

August 29, 2016



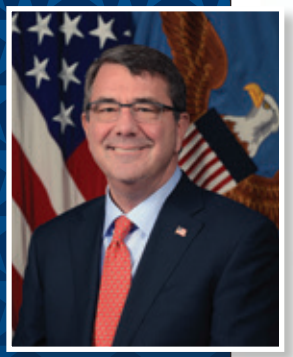
I am pleased to join in celebrating the 60th anniversary of the Defense Science Board.

For the past six decades, the Defense Science Board has worked to protect our Nation against threats posed by weapons of mass destruction, cyber attacks, enemy states, and non-state actors. Understanding the changing landscape of the world we live in, you have contributed critical analysis and fostered important development of our Nation's defense capabilities—helping us mitigate threats before they arise and ready our military for the future. In celebrating your 60 years of service, we are reminded of how far our Nation has come since the Defense Science Board was founded and of how experts like you are keeping our people—and people around the globe—safe and free.

As you mark this special occasion, I wish you the best.

THE SECRETARY OF DEFENSE
WASHINGTON

Message for the Defense Science Board 60th Anniversary



I am proud to recognize the Defense Science Board's contribution over sixty years of progress in defense science and technology and its relationship to the national security of the United States.

As a former member of the Board and often as one of its sponsors and customers, I have a particularly deep appreciation for the value of the impartial and objective advice provided by the Defense Science Board. From its earliest days, the Board has focused on critical defense issues at the strategic and tactical levels. During my tenure as Secretary of Defense, the Board's advice has provided an important input to the Department in meeting the new challenges facing our Nation – from preparing for new dimensions of war to new initiatives for streamlining the operation of our Nation's defense establishment.

Clearly the Nation and the Department of Defense will continue to call on the Defense Science Board for its wise counsel and advice in the days ahead. You have my full support for such critical work and my heartiest congratulations on six decades of dedicated and creative service to your country.

With best wishes,

Ash Carter

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON

Message for the Defense Science Board 60th Anniversary

I want to extend my greetings to the Defense Science Board as you gather on the occasion of your 60th anniversary.

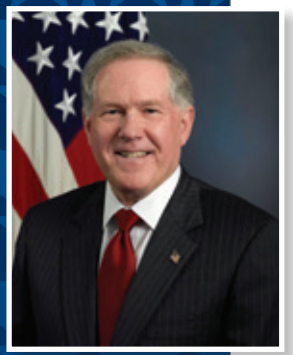
For the past six decades, you have provided top notch, independent advice to the Department of Defense. At this critical point in the history of our Nation, the United States has the opportunity to use new technologies to allow humans to make better decisions, perform better in combat, and be more effective in the defense of our Nation. As we work to refine our policies and processes to support this goal, your efforts are more important than ever.

You have my appreciation and respect for your valuable contributions to our country's security. I wish you all the best for your anniversary celebration.

Sincerely,

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, DC 20301-3010

ACQUISITION, TECHNOLOGY AND LOGISTICS



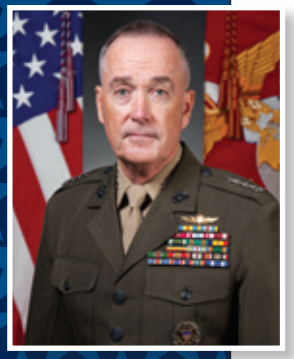
My first serious involvement with the Defense Science Board was precisely half of its remarkable 60 year history ago. In 1986 I was asked by the first USD(A), Richard Godwin, to be the Executive Secretary for a Defense Science Board task force on President Reagan's Strategic Defense Initiative. This was the first of many ensuing opportunities I've had to work with some of the giants and legends of the defense technology, engineering, and acquisition management fields.

After 30 years of involvement with the DSB; as a government advisor, as a participant in several studies, and as a customer for the DSB's products, I remain in awe of the intellectual talent, experience, and wisdom that the DSB provides, on a pro bono basis, to helping the Department of Defense address its most difficult problems. The contributions of the DSB are many, but for me, the opportunity to work with, learn from, and sometimes be mentored by such outstanding individuals is an exceptional privilege.

Congratulations to all current and past members for 60 years of amazing contributions to our national security, and to peace and stability in an ever changing, but always dangerous world. Well done!

Frank Kendall
Under Secretary of Defense for
Acquisition, Technology, and Logistics

CHAIRMAN OF THE JOINT CHIEFS OF STAFF
WASHINGTON, D.C. 20318-9999



To the Defense Science Board,

I extend my congratulations to the Defense Science Board on your record of important contributions to the Department of Defense for the past 60 years.

Over the Board's history, the security landscape of a once bipolar world has transitioned to what many suggest is the most complex and volatile security environment since World War II. The transregional and multi-domain conflicts and threats we see today are indicative of the rapidly changing character of war. These types of challenges will likely persist well into the future.

Today's security environment demands that the Joint Force maintains its global competitive advantage across functions and domains. The Board's recommendations regarding innovation, future changes in science and engineering, operational applications of technology, and management will be especially useful as we confront an increasingly complex set of challenges.

Best wishes to all former and current members of the Defense Science Board as you mark a significant anniversary, and thank you for your important inputs to the military enterprise.

Sincerely,

JOSEPH F. DUNFORD, JR.
General, U.S. Marine Corps

VICE CHAIRMAN OF THE JOINT CHIEFS OF STAFF
WASHINGTON, D. C. 20318-9999

To the Defense Science Board,

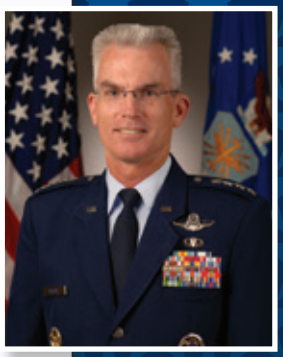
Warm greetings to all the past and current members and staff of the Defense Science Board as you gather to celebrate your 60th anniversary.

Over the past 60 years, the Defense Science Board has performed an invaluable role as an impartial and objective advisory group for the Department of Defense on issues vital to the security of the United States. Your expertise on advanced technology applications, new military operational concepts, and international business practices has enabled us to strengthen our national security infrastructure during a period of dramatic change.

In the coming years, efficiently capturing this Nation's robust science and technology resources—whether within the Department's direct resources or in the private or university sectors—will be one of our most important challenges. The Defense Science Board has been and remains a leading agent in helping us meet that challenge, and I want to commend all of you for your outstanding service to the Department and to the Nation on this special occasion.

Sincerely,

PAUL J. SELVA
General, U.S. Air Force



History of the Board

The Defense Science Board serves as the Federal Advisory Committee chartered to provide Department of Defense leadership with "independent advice and recommendations on science, technology, manufacturing, acquisition processes, and other matters of special interest to the DoD... and [to] ensure the identification of new technologies and new applications of technology in those areas to strengthen national security."

The Board was established in 1956 in response to recommendations of the Hoover Commission: *The Assistant Secretary of Defense for Research and Development will appoint a standing committee, reporting directly to him, of outstanding basic and applied scientists. This committee will canvass periodically the needs and opportunities presented by new scientific knowledge for radically new weapons systems.* The original membership of the Board, totaling twenty-five, consisted of the chairman of the eleven technical advisory panels in the Office of the Assistant Secretary of Defense for Research and Development, the chairmen of the senior advisory committees of the Army, Navy, and Air Force, the Directors of the National Science Foundation, the National Bureau of Standards, and the National Advisory Committee for Aeronautics (predecessor of the National Aeronautics and Space Administration), the President of the National Academy of Sciences, and seven members at-large drawn from the scientific and technical community.

The Board met for the first time on September 20, 1956. Its initial assignment concerned the program and administration of basic research, component research, and the advancement of technology in areas of interest to the Department of Defense. On December 31, 1956, a charter was issued specifying the Board as advisory to the Assistant Secretary of Defense for Research and Development. Following the consolidation of the offices of the Assistant Secretaries of Defense for Research and Development and Applications Engineering in 1957, the Board reconstituted as advisory to the Secretary of Defense through the Assistant Secretary of Defense for Research and Engineering. Its membership was increased to twenty-eight, including as *ex officio* members, the Chairmen of the President's Science Advisory Committee and the Scientific Advisory Committee in the Office of Guided Missiles, Office of the Secretary of Defense (OSD). A revised Board charter was issued on October 30, 1957.

In accordance with the Department of Defense Reorganization Act of 1958, which stipulated the responsibilities, functions, and authority of the Director of Defense Research and Engineering (DDR&E), the Board's charter was revised on November 23, 1959. This revision harmonized the role and mission of the Defense Science Board with DDR&E's responsibilities, prescribing eight members-at-large and modifying *ex officio* membership to conform with the establishment or dissolution of advisory panels in the office of the DDR&E. In the course of organizing his staff, the DDR&E appointed assistant directors for several types of warfare systems. Following this action in late 1959, the Board made a study of the structure of scientific and engineering advisory bodies. Its report on this study was implemented by DoD Directive 5129.22, "Defense Science Board Charter," dated April 10, 1961. This directive was revised and reissued on February 17, 1971.

History of the Board

In 1978, the title, Director of Defense Research and Engineering, was changed to Under Secretary of Defense for Research and Engineering (USDRE). On July 1, 1986, the title, Undersecretary of Defense for Research and Engineering, was changed to Under Secretary of Defense for Acquisition USD(A). On January 1, 1990, the Defense Manufacturing Board, which had reported directly to the USD(A), merged into the Defense Science Board, adding manufacturing issues to the list of items of interest. In 2011, the title, DDR&E was changed to Assistant Secretary of Defense for Research and Engineering, ASD(R&E). The Board reports directly to the Secretary of Defense through the USD(AT&L) while, at the same time, working in close coordination with the ASD(R&E) to develop and strengthen the Department's research and development strategies.

In recognition of the outstanding advice provided by the DSB to the Department over the past forty plus years, the Secretary of Defense established the Eugene G. Fubini award in 1996 for Outstanding Service to the Defense Community in an Advisory Capacity. This special honor marked yet another important milestone in the Board's long and distinguished history of service to the department and the nation.

Currently, the Board's authorized strength is forty-eight members and seven *ex officio* members, including the chairs of the Army, Navy, and Air Force advisory committees, and the Defense advisory committees on Policy, Business, Health, and Innovation. The Board's forty-eight members are appointed for terms ranging from one to four years and are selected on the basis of their preeminence in the fields of science, technology and its application to military operations, research, engineering, manufacturing and the acquisition process. The Board operates by forming task forces consisting of Board members and other experts to address those tasks referred to it by formal direction. The products of each task force typically consist of a set of formal briefings to the Board and appropriate DoD officials, and a written report containing findings, recommendations and a suggested implementation plan.

Over the past 60 years, the DSB has advised senior leaders on pressing and complex technology issues facing the Department of Defense in research, engineering, and manufacturing in combination with strategy, tactics, operational concepts, and other factors. Through addressing the Department's most irksome, consequential, and unstructured problems that involve science and technology, the Board has a rich history of identifying new technologies and applications in many areas that strengthen national security.

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1957 | 1958 | 1959 | 1960 | 1961

Dwight D. Eisenhower *1953–1961*

John F. Ke

U.S. PRESIDENT

Ongoing: Cold War: 1945–1991

Eisenhower Doctrine

Civil Rights Act of 1957

Soviets launch Sputnik; "space race" begins

NASA formed

The integrated circuit is invented

ARPA formed

National Defense Education Act (NDEA)

Cuban Revolution

Alaska and Hawaii become U.S. states

Space Race: 1957–1975

U-2 plane shot down over the USSR

Civil Rights Act of 1960

National Front for the Liberation of Vietnam formed

Vietnam War, U.S. i

Eisenhower's "military-industrial complex" farewell addreess

Bay of Pigs Invasion

Berlin Crisis

Vietnam War officially begins

SECRETARY OF DEFENSE

Mr. Neil H. McElroy *1957–1959*

Mr. Thomas S. Gates, Jr. *1959–1961*

Mr. Rober

B-66

M50 Ontos

F-4 Phantom

USS George Washington

AFSAM-7

MIM-14 Nike Hercules

M103

BMEWS

F-104A

M60

Polaris A-1

Sidewinder

M79 granade launcher

DSB CHAIR

Dr. Howard P. Robertson *1956–1961*

MAJOR DSB REPORTS

Limited War

The Technology of Human Behavior

Government In-House Laboratories

Structure of Scientific and Engineering Advice

Biological and Chemical Weapons Development

1962 | 1963 | 1964 | 1965 | 1966

nnedy *1961–1963* **Lyndon B. Johnson** *1963–1969*

involvement: 1962–1973

John Glenn is the 1st American to orbit the Earth

Cuban Missile Crisis

1st industrial robot introduced

Atomic Test Ban Treaty

Martin Luther Kink, Jr. "I have a dream" speech

President Kennedy assassination

Gulf of Tonkin Resolution

The Beatles vault to #1 in America starting the British Invasion

Civil Rights Act of 1964

Mariner 4 space probe is launched to photograph Mars

U.S. involvement in the Vietnam War escalates

Voting Rights Act

Gemini 5 1st one-week manned space flight

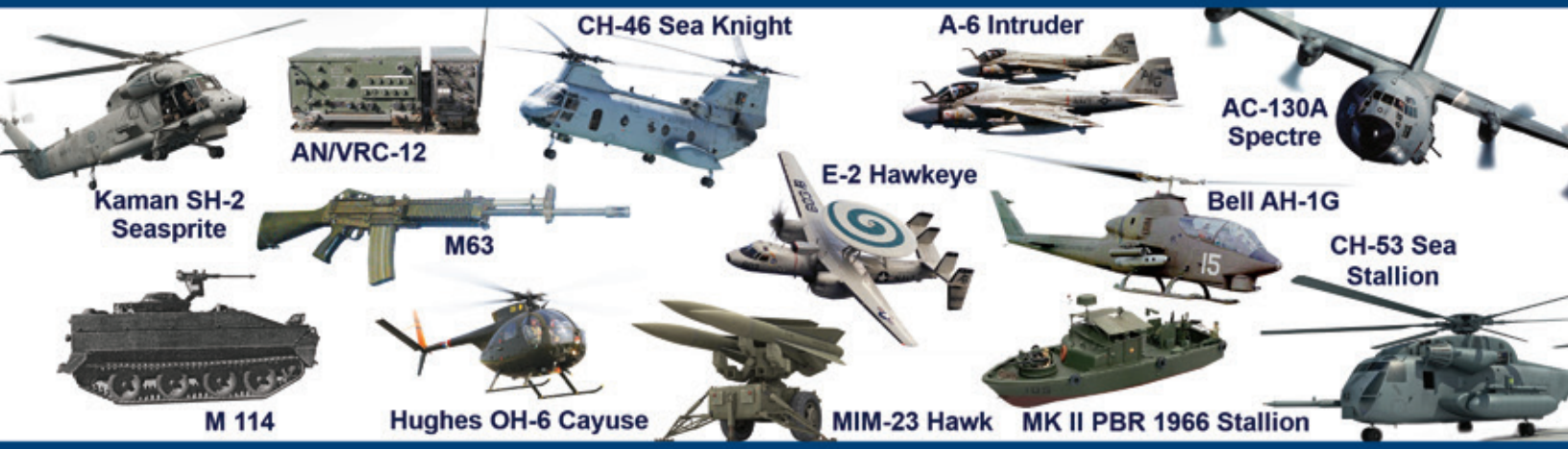
1st SR-71 "Blackbird" goes into service

"Miranda rights" established

Surveyor 1 becomes the first U.S. spaccraft to soft-land on another world

The Freedom of Information Act

t S. McNamara *1961–1968*



Dr. Clifford C. Furnas *1962–1963* **Dr. Frederick Seitz** *1964–1968*

Encouragement of Innovation

Scientific and Technical Information

Ballistic Missile Defense

Policy in Support of Basic Research

The Military Role in Space

DoD Basic Research Policy

Research in DoD on Internal Conflict and Insurgency in Developing Countries

West Ford Communication Techniques

Project "Agile"

Technical Military Personnel

Management of R&D

Civilian Technical Personnel in the DoD

Review of IDA Reports

Management of Electronic Warfare

Ballistic Missile Defense

Vulnerability

Federal Contract Research Centers

In-House Laboratories

Incentive-Type Contracting in the Procurement of RDTE

1967 | 1968 | 1969 | 1970 | 1971

Lyndon B. Johnson *1963–1969* — **Richard M. Nixon** *1969–1974*

U.S. PRESIDENT

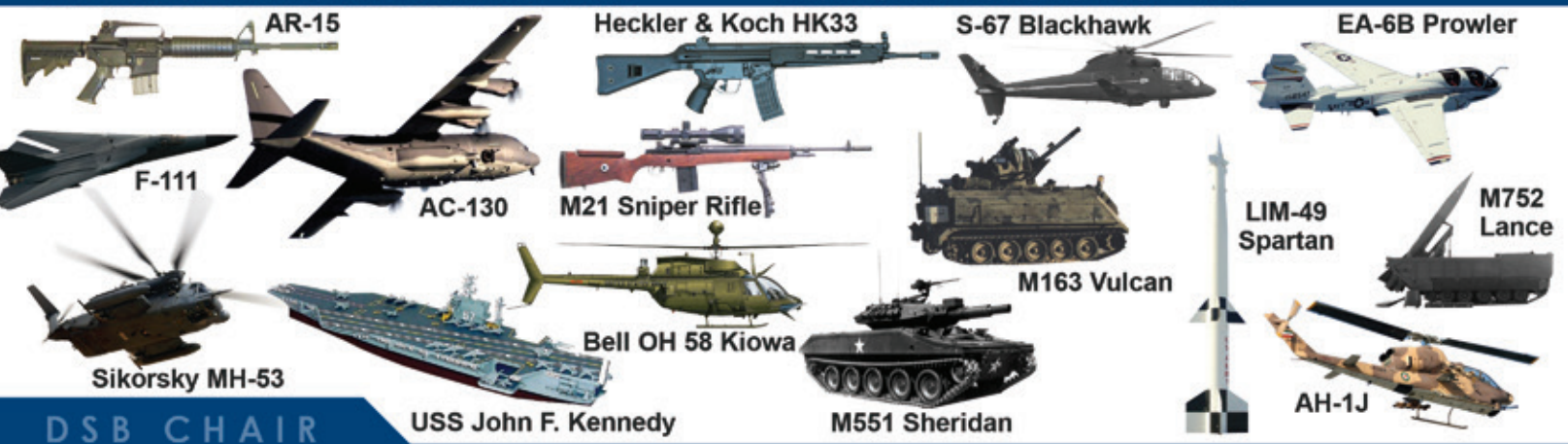
Space Race: 1957–1975 — **Vietnam War, U.S. involvement: 1962–1973**

- First Super Bowl
- Six-Day War
- X-15 sets a speed record of Mach 6.7
- Anti-war protests & Summer of Love event
- Tet Offensive
- U.S. signs Nuclear Non-Proliferation Treaty
- Martin Luther King, Jr. is assassinated
- NASA launched Apollo-7, (1st Apollo manned mission)
- Apollo-11 Lunar Module Eagle lands on the Moon (1st human landing)
- Soviet submarine K-19 collides with U.S. submarine USS Gato
- Nixon Doctrine
- EPA Founded
- First U.S. female generals: Anna Mae Hays and Elizabeth Hoisington
- American Top 40 radio program premieres
- Vietnamization
- Gold Standard ended
- Voting age lowed to 18 years old
- Intel releases for 1st commercially available microprocessor
- Walt Disney World opens

SECRETARY OF DEFENSE

Mr. Clark M. Clifford *1968–1969*

Mr. Robert S. McNamara *1961–1968* — **Mr. Melvin R. Laird** *1969–1973*



DSB CHAIR

Dr. Frederick Seitz *1964–1968* — **Dr. Robert Sproull** *1969–1970* — **Dr. Gerald**

MAJOR DSB REPORTS

- Independent R&D
- Project Sanguine
- Polaris Vulnerability
- Penetration
- In-Silo Vulnerability of MINUTEMAN
- Assured Destruction
- Research and Exploratory Development
- Southeast Asia
- Defense Social and Behavioral Sciences
- Mobile Very Low Frequency Relay Programs for Communication with Submarine Forces
- Fees for Federal Contract Research Centers
- Anti-Submarine Warfare: Fixed Sonar Systems
- Military Satellite Vulnerability
- Basic Research Policy of the DoD
- Anti-Submarine Warfare: Sub vs. Sub Exercises
- The Behavioral Sciences
- Fighter Aircraft
- Submarine Noise Levels
- Research Policy
- Lessons Learned in Southeast Asia
- Tactical Aircraft
- Tactical Warning and Sentinel
- Behavioral Sciences
- R&D Programs Required to Achieve Training of Military Advisory Groups
- Relationships Between Foreign Area R&D Programs in DoD and in Other Agencies
- MINUTEMAN Vulnerability and Hardness
- Potential of High Energy Laser
- Defense Posture
- STRAT-X Revisited
- Nuclear Survivability of the Sentinel System
- Tactical Systems
- Penetration and Electronic Warfare: Expendable Jammers
- Arms Control
- Defense Posture
- R&D Management: Systems Acquisition
- Subgroup on Electronic Warfare Effectiveness Evaluation
- Advanced Tactical Warning
- Security Controls for Computer Systems
- Nuclear Test Detection Research and Development
- Civil Defense
- Secrecy
- Weapon-System Simplification and Supplement
- Ocean Surveillance
- Net Technical Assessment
- Arms Control, US/Soviet ABM Equivalence
- The Poseidon Program
- Underwater Launched Missile System
- Manpower Research and Management in Large Organizations
- ABM Capability of Soviet SA-2s
- Defense Suppression
- Ocean Control
- Remotely Piloted Vehicles
- Ocean Surveillance

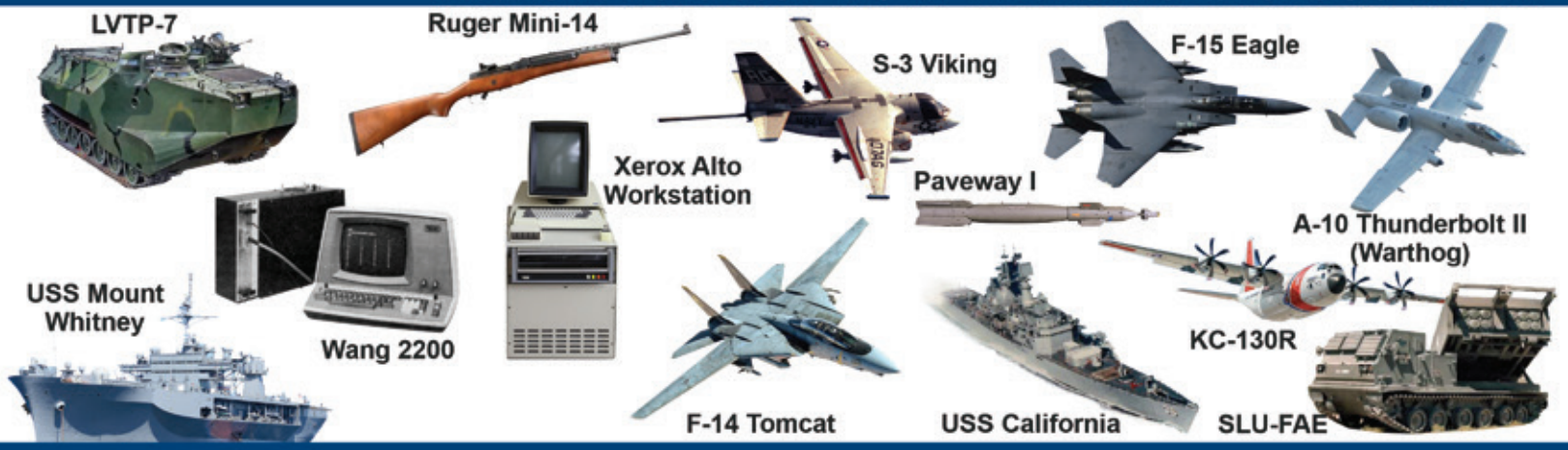
1972 1973 1974 1975 1976

Gerald R. Ford *1974–1977*

Ongoing: Cold War: 1945–1991 Détente: 1969–1979

- President Nixon visits China
- Watergate scandal
- SALT I Treaty signed
- The last U.S. ground troops withdrawn from Vietnam
- Roe v. Wade Supreme Court Ruling
- Skylab launch
- 1st hand-held cellular phone call is made
- The World Trade Center officially opens
- President Nixon resigns
- Arab Oil Embargo 1st Oil Shock
- India test detonation of their first nuclear weapon
- Fall of Saigon
- Microsoft is founded
- Apollo and Soyuz orbital docking
- Saturday Night Live premieres
- President Ford survives two assassination attempts
- American Bicentennial
- The first 4.6 miles of the Washington, D.C. Metro system opens
- Apple Computer Company founded
- Construction of the 1st space shuttle, *Enterprise*, completed

Mr. James R. Schlesinger *1974–1975*
Mr. Elliot L. Richardson *1973–1974* Mr. Donald H. Rumsfeld *1975–1977*



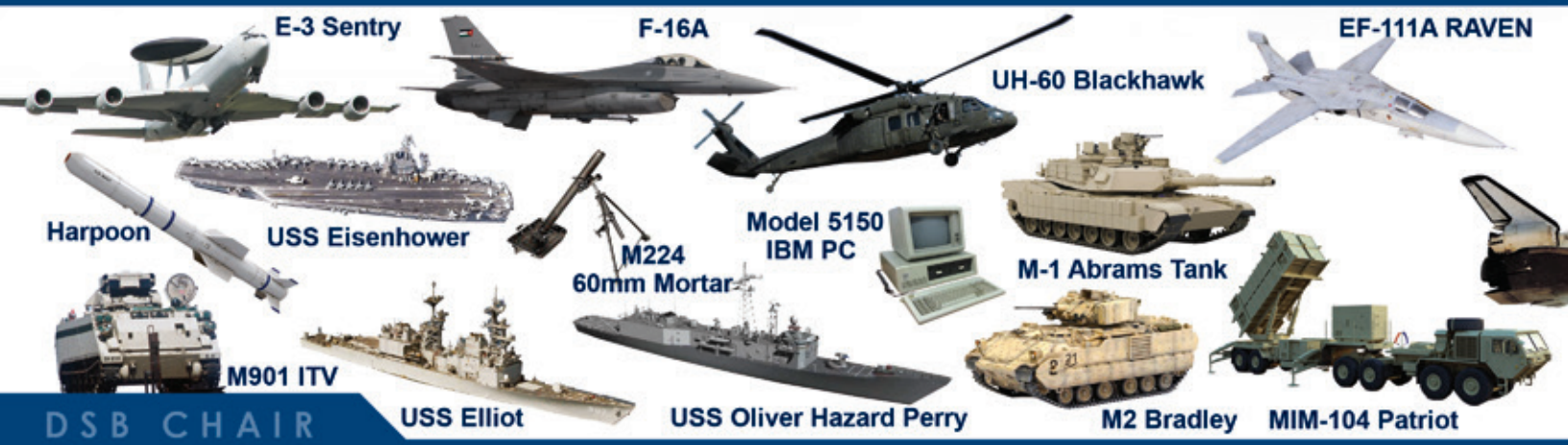
Tape *1971–1973*

- Review of Safeguard Vulnerability
- Tactical Warning
- Review of the B-1 Bomber
- Management of ELINT Resources
- Remotely Piloted Vehicles
- Special Defensive Systems
- Strategic C^3
- Avionics
- Tactical Warning and Attack Assessment
- Reducing Costs of Defense Systems Acquisition
- Net Assessment of Unidentified R&D Activities

Dr. J. Solomon Buchsbaum *1974–1977*

- Tactical C^3
- Test and Evaluation
- Electronics Management
- Net Assessment of Critical Deficiencies
- Side-Looking Radar
- Systems Vulnerability Report on Fratricide
- Positive Control Launch of the B-52 Programs
- Evaluation of Tactical Weapons Development Programs
- The 1973 Middle East War
- Electronic Battlefield: Target Activated Ground Sensors
- Surface Naval Warfare
- Analysis of Independent R&D Bid and Proposal
- Large-Scale Electro-Magnetic Pulse Simulators
- Gun System Acquisition
- Critical Intelligence Questions
- Net Technical Assessment
- DoD Dependence on Space Systems
- An Analysis of Export Control of US Technology
- DoD Space Shuttle Utilization
- Training Technology
- Federal Contract Research Center Utilization
- Verification: Cruise Missiles
- Identification Friend, Foe or Neutral
- Theater Nuclear Forces R&D Requirements
- Net Technical Assessment of Soviet Civil Defense
- KC-135 Tanker Hardness Review
- Surface Naval Warfare
- Verification of National Technical Means
- Technology Base Strategy
- Fundamental Research in Universities
- Strategic Cruise Missiles
- Industrial Readiness Plans and Programs
- ICBM Accuracy

1977	1978	1979	1980	1981
James "Jimmy" Carter *1977–1981*				Ronald Rea
U.S. PRESIDENT				
Ongoing: Cold War: 1945–1991			Détente: 1969–1979	1970s energy crisis: 19
1st home PC, Commodore PET, released	Camp David Accords	The United States and China establish full diplomatic relations	Operation Eagle Claw, a comando mission to rescue American hostages in Iran, is aborted	Ronald Reagan becomes the 40th U.S. President
Voyager 1 and 2 are launched	WAC abolished; women integrated into regular Army	Three Mile Island nuclear accident	Mount St. Helens erupts	Iran releases American hostages
The movie, Star Wars, is released	U.S. Senate votes to turn over control of the Panama Canal to the Panamanian	Iran hostage crisis begins	CNN is officially launched (1st 24-hour news service)	President Reagan survives an assassination attempt
		Soviets invade Afghanistan		Space Shuttle Columbia launched (STS-1)
SECRETARY OF DEFENSE				
Dr. Harold Brown *1977–1981*				Mr. Caspe



DSB CHAIR		
Dr. Eugene Fubini *1978–1980*		Mr. Norman R. Augustine *1981*

MAJOR DSB REPORTS

- Conventional Counterforce Against Warsaw Pact Attack
- Use of Off-the-Shelf Electronic Test Equipment
- Test and Evaluation Policies
- Specifications and Standards
- Review of Defense Intelligence
- Theater Nuclear Forces Research and Development Requirements
- PATRIOT Vulnerability
- Approaches to the Countering of Warsaw Pact (Counter C3) Systems
- Acquisition Cycle
- Command and Control Systems Management
- Improving Intelligence Support to Tactical Forces from Space Systems
- ICBM Basing
- Achieving Improved NATO Effectiveness Through Armaments Collaboration
- The Strategic Nuclear Balance
- NATO Family of Weapons
- Navy Counter C^3
- US Ballistic Missile Defense
- Surface Ship Vulnerability
- Enduring Strategic C^3
- Strategic Planning and the Maritime Balance
- Vertical/Short Take-Off and Landing Aircraft
- Capabilities for Theater Nuclear Forces
- High Energy Lasers
- Soviet Ballistic Missile Defense
- Reducing the Unit Cost of Equipment
- Comprehensive Test Ban
- M-X
- Particle Beam Technology
- Cruise Missile
- Electro-Magnetic Pulse Hardening of Aircraft
- Chemical Warfare
- Industrial Responsiveness
- Anti-Tactical Missiles
- Review of the DoD Space-Based Laser Weapon
- Space Applications
- Water Support to US Forces in an Arid Environment
- Standoff Target Acquisition System
- Strategic Defense
- Technology Base
- Monopulse Countermeasures

1982 1983 1984 1985 1986

agan *1981–1989*

73–1980 Iran hostage crisis: 1979–1981 Iran-Contra affair (1985–1987)

Vietnam Veterans Memorial dedication ceremony

U.S. peace-keeping mission in Lebanese Civil War

241 U.S. Marines killed by suicide bomb in Lebanon

U.S. invades Grenada

The Apple Lisa personal computer released

STS-7: Sally Ride became the 1st American woman in space

U.S. Marines withdraw from Lebanon

The Space Shuttle Discovery takes off on maiden voyage

1984 Summer Olympics are held in Los Angeles

Microsoft released the first version of Windows, Windows 1.0

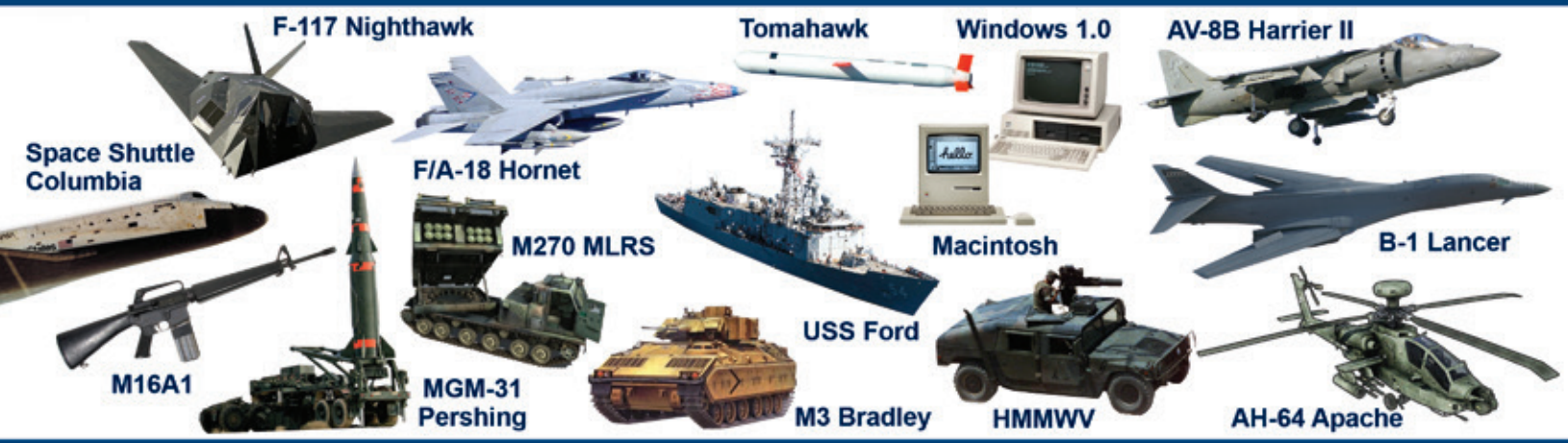
President Reagan and Soviet Union leader Gorbachev meet for the first time

The Space Shuttle Challenger disaster

The Iran-Contra Scandal Breaks

The centenial of the Statue of Liberty

r W. Weinberger *1981–1987*



–1983

Mr. Charles "Bert" Fowler *1984–1987*

University Responsiveness to National Security Requirements
Very High Speed Integrated Circuits
Defense Nuclear Agency Technology Base Program
Forward Area Laser Weapons
Operational Readiness with High Performance Systems
Structural Hardening of the B-52
Technology for US Rapid Deployment Forces
New Weapons Concepts
Training and Training Technology
Mapping, Charting and Geodesy
Contractor Field Support During Crises
Electronic Warfare
Embedded Computer Resources Acquisition and Management
M-X Closely Spaced Basing
AUTODIN II

Continuous Patrol Aircraft
Application of High Technology for Ground Operations
Command Support Tactical Deception in Air-Land Warfare
Industry-to-Industry International Armaments Cooperation
Anti-Tactical Missiles
Joint Service Acquisition Programs
NATO TacAir Ground Survivability
Transition of Weapons Systems from Development to Production
Reconnaissance Regimes

Conventional Munitions and the Nuclear Threshold
Joint Service Acquisition Programs
Industry-to-Industry International Armaments Cooperation
Space-Based Radar and Infrared Detection
Long Endurance Aircraft
Improved Defense Through Equipment Upgrades
Fire Support for Amphibious Warfare
Military Applications of New-Generation Computing Technologies

Urban Warfare
Journal of Defense Research
Defense Data Network
Chemical Warfare/Biological Defense
Armor Anti-Armor Competition
Improving Acquisition for Ground Attack Munitions
Tactical Directed Energy Weapons
On-Site Inspection Technologies

Practical Functional Performance Requirements
Small Intercontinental Ballistic Missile Modernization
Implications of Third World Urban Involvement
Defense Nuclear Agency Management
LHX Requirements
Soviet Imprecisely Located Targets for Strategic Systems
Airborne Reconnaissance

1987 | 1988 | 1989 | 1990 | 1991

Ronald Reagan *1981–1989* — **George H. W. Bush** *1989–1993*

U.S. PRESIDENT

Ongoing: Cold War: 1945–1991 | **Iran-Contra affair (1985–1987)** | **Iraq no-fly zo**

Iran-Contra affair investigation

President Reagan challenges Soviet Premier Gorbachev to tear down the Berlin Wall

Intermediate-Range Nuclear Forces Treaty between the U.S. and USSR goes into effect

U.S. Navy retaliates for the USS Roberts mining with a day of strikes against Iranian oil platforms

Fall of the Berlin Wall

Exxon Valdez oil spill

First flight of the B-2 stealth bomber

Hubble Space Telescope launches aboard Space Shuttle Discovery

U.S. invades Panama

President Bush and Soviet Premier Gorbachev sign the Chemical Weapons Accord

Iraq invades Kuwait

The Gulf War: Operation Desert Storm

The World Wide Web is publically debuted as an Internet service

The Cold War ends as the USSR disolves

SECRETARY OF DEFENSE

Mr. Frank C. Carlucci *1987–1989* — **Mr. Richard "Dick" B. Cheney** *1989–1993*

M981 FIST-V

LCAC Air Cushioned Landing Craft

F-15E Strike Eagle

USS Comfort

USS Wasp (LHD-1)

HMMWV Avenger

USS Abraham Lincoln

AGM-129 ACM

Trident II

1st full scale GPS satelites begin service

USS Miami

USS Arleigh Burke

M93 Fox

PowerBook

DSB CHAIR

Mr. Robert Everett *1988–1989* — **Dr. John Foster, Jr.** *1990–1993*

MAJOR DSB REPORTS

- Use of Commercial Components in Military Equipment
- Defense Semiconductor Dependability
- Mine/Countermine Warfare
- Special Operations Forces Research and Development
- Electronic Combat
- Follow-on Forces Attack
- Command and Control Management
- Defense of US Forces in NATO
- Technology Base Management
- Non-Nuclear Strategic Capabilities
- Military Software
- Detection and Neutralization of Illegal Drugs and Terrorist Devices
- Technology Surprise
- Non-Nuclear Strategic Capabilities
- PACOM Air Defense
- Technological and Operational Surprise
- Strategic Air Defense Research and Development
- Strategic Arms Reduction Treaty Verification Procedures
- Computer Applications to Training and Wargaming
- Strategic Air Defense
- Tactical Directed Energy Weapons
- PACOM Air Defense
- National Aerospace Plane
- Military System Applications of Superconductors
- Defense Industrial and Technology Base
- Defense Mapping Agency
- Countering Soviet Fire Support Systems
- Image Recognition Systems
- Assured Military Use of Space
- Review of the Strategic Force Modernization Program
- Use of Commercial Components in Military Equipment
- Defense Industrial Cooperation with Pacific Rim Nations
- SDIO Brilliant Pebbles Space Based Interceptors
- Improving Test and Evaluation Effectiveness
- National Space Launch Strategy
- Low Observable Technology
- Noncooperative Identification
- R&D Strategy for the 1990s:
- Scenarios & Intelligence
- Strategic Forces & Supporting C3
- Tactical Forces & Supporting C3
- Technology and Technology Transfer
- High-Leverage Technology Support for Operation Desert Shield
- Strategic Sensors
- Weapon Development and Production Technology
- Defense Technology Strategies
- Ballistic Missile Defense
- Feasibility of Employing Pit-Reuse in the Production of Alternate Warheads for Trident II/MK-5
- Microelectronics Research Facilities
- Anti-Submarine Warfare
- National Aero-Space Plane
- Strategic Defense Initiative Countermeasures

1992 1993 1994 1995 1996

William "Bill" J. Clinton *1993–2001*

ones (1991–2003) **Operation Uphold Democracy (1994–1995)**

Russia stops targeting U.S. cities with nuclear weapons

Maiden voyage of the Space Shuttle Endeavor

U.S. Marines land in Somalia for UNITAF peacekeeping mission

President Bush and Boris Yeltsin sign START II treaty

A truck bomb explodes in a parking garage under the North Tower of the World Trade Center

Space Shuttle Endeavor is launched to repair The Hubble Telescope

The Superhighway Summit was the 1st conference to discuss the growth of Internet telecommunications

1st conference devoted entirely to the commercial potential of the World Wide Web was held in San Francisco

Oklahoma City Bombing

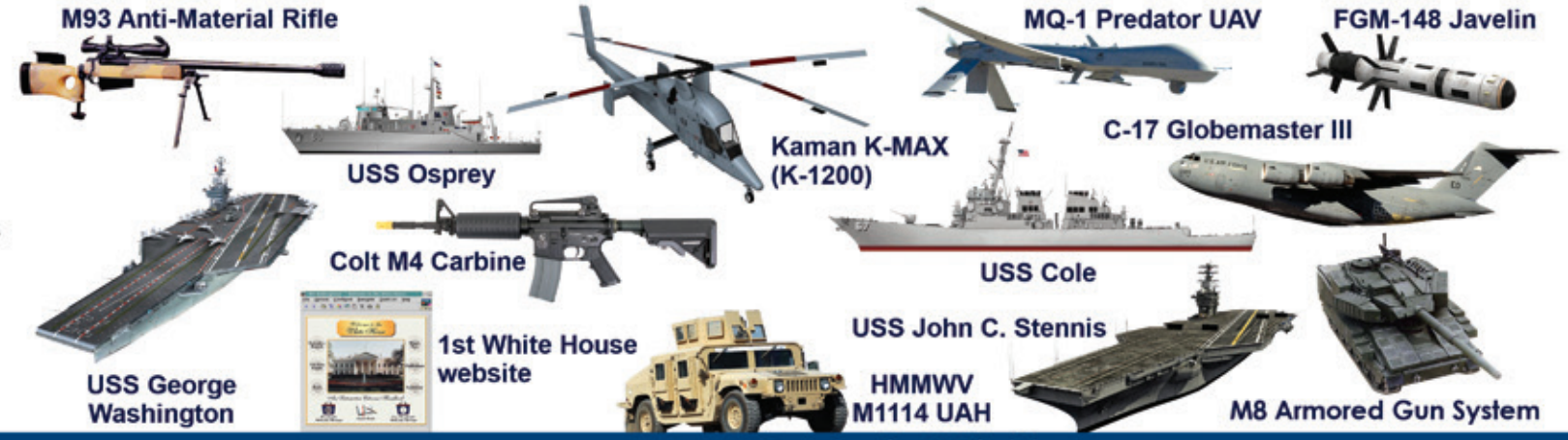
Space Shuttle Atlantis docks with the Russian space station *Mir* for the first time

Microsoft releases Windows 95

President Clinton signs the Comprehensive Nuclear Test-Ban Treaty

U.S. troops arrive in Bosnia for peacekeeping operations

Mr. William J. Perry *1994–1997*
Mr. Les Aspin *1993–1994*



Dr. Craig I. Fields *1994–2001*
Dr. Paul G. Kaminski *1993–1994*

- Simulation, Readiness and Prototyping
- Aircraft Assessment
- Low Observable Technology
- Technical Military Capabilities for Future Contingencies
- Engineering in the Manufacturing Process
- Lessons Learned During Operations Desert Shield and Desert Storm
- Defense Nuclear Agency
- FY 1994–99 Defense Plan
- Defense Acquisition Reform
- Tactical Aircraft Bottom Up Review
- Defense Manufacturing Enterprise Strategy
- Tactical Air Warfare
- C-17 Review
- Global Surveillance
- Antitrust Aspects of Defense Industry Consolidation
- Depot Maintenance Management
- Tracked Vehicle Industrial Base
- Defense Laboratory Management
- Defense Acquisition Reform
- Readiness
- Jet Engine Commercial Practices
- Persian Gulf War Health Effects
- Joint Precision Interdiction
- Acquiring Defense Software Commercially
- Joint Advanced Strike Technology Program
- Information Architecture for the Battlefield
- Military Operations in Built-Up Areas
- Cruise Missile Defense
- The Role of FFRDCs in the DoD Mission
- Concurrency and Risk of the F-22 Program
- Environmental Security
- Use of DNA Technology for Identification of Ancient Remains
- Unique Surveillance Technologies
- Defense Mapping for Future Operations
- Breakthrough Technologies
- Investments for 21st Century Military Superiority
- Quality of Life
- Global Positioning System
- Depot Maintenance Management
- Achieving an Innovative Support Structure for the 21st Century Military Superiority
- Technology and Tactics for 21st Century Military Superiority
- Defense Acquisition Reform
- International Armaments Cooperation
- Space and Missile Tracking System in an Era of Coalition Security
- Theater Missile Defense
- Combat Identification
- Military Personnel Information Management
- Strategic Mobility
- Logistics Modernization
- Improved Application of Intelligence to the Battlefield
- Outsourcing and Privatization

1997 | 1998 | 1999 | 2000 | 2001

William "Bill" J. Clinton *1993–2001* — **George W.**

U.S. PRESIDENT

Iraq no-fly zones (1991–2003) — **Ongoing: Iraq War (2003–2011)** — **War in Afgha**

- NASA's Pathfinder probe lands on Mars
- Steve Jobs returns to Apple Computer
- Madeleine Albright becomes the 1st female Secretary of State
- The DoJ and 20 states file an antitrust case against Microsoft
- U.S. embassy bombings in Tanzania and Kenya linked to Osama bin Laden
- U.S. Congress passes the Iraq Liberation Act
- NATO bombing of Yugoslavia during the Kosovo War begins
- The Cox Report details China's nuclear espionage against the U.S. over 20 years
- U.S./world prepare for possible effects of the Y2K bug
- USS Cole is bombed in Yemeni waters
- The 100th Space Shuttle mission is flown
- The first crew arrives at the International Space Station
- The dot-com bubble peaked
- U.S. forces carry out bombing raids on Iraq to disable air defenses
- September 11th terrorist attacks
- The U.S. invades Afghanistan in Operation Enduring Freedom

SECRETARY OF DEFENSE

Mr. William Cohen *1997–2001* — **Mr. Donald H**


B-2 Spirit


USS Harry S. Truman


USS Seawolf


USS Connecticut


AGM-154 Joint Standoff Weapon


F/A-18 Super Hornet


M1117 Guardian ASV


ArmaLite AR-50 AT/AMR


Mk 15


RQ-4 Global Hawk


AAI RQ-7 Shadow


USS Iwo Jima

DSB CHAIR

Dr. Craig I Fields *1994–2001* — **Dr. William**

MAJOR DSB REPORTS

- Deep Attack Weapons Mix Study
- FFRDCs and UARCs
- C4ISR Integration
- GPS Phase II
- Vertical Integration and Supplier Decisions
- Image Based Automatic Target Recognition
- Aviation Safety
- Land-Attack Cruise Missile Defense
- DoD Responses to Transnational Threats
- Deep Attack Weapons Mix Study
- Satellite Reconnaissance
- Defense Acquisition Reform
- Year 2000
- Unexploded Ordnance Clearance and Explosive Ordnance Disposal Programs
- Underground Facilities
- Defense S&T Base for the 21st Century
- Submarine of the Future
- Nuclear Deterrence
- Open Systems
- Joint Operations Superiority in the 21st Century
- DoD Logistic Transformation
- Control of Military Excess and Surplus Materiel
- Price Based Acquisition
- Tritium Production Technology Options
- Advanced Modeling and Simulation for Analyzing Combat Concepts
- Investment Strategy for DARPA
- Acquisition Reform
- DoD Warfighting Transformation
- Test and Evaluation
- 21st Century Defense Technology Strategies
- Globalization and Security
- Tactical Battlefield Communications
- Space Superiority
- Human Resources Strategy
- National Imagery and Mapping Agency
- Patriot Anti-Cruise Missile
- Air Force Space Launch Facilities
- Technical Capabilities of Non-DoD Providers
- GPS Phase III
- Psychological Operations (PSYOP) in Time of Military Conflict
- DoD Supercomputing Needs
- Managing RF Spectrum to Meet DoD Needs
- Defense Software
- Efficient Utilization of Defense Labs
- Test and Evaluation Capabilities
- Impact of Acquisition Policies on Health of Defense Industrial Base
- DoD S&T Program
- Training Superiority and Training Surprise
- Options for Acquisition of the Advanced Targeting FLIR Pod
- Sustaining US Military Dominance
- Future DoD Airborne HF Radar Needs/Resources
- More Capable Warfighting Through Reduced Fuel Burden
- Biological Defense
- Logistics Transformation
- High Energy Laser Weapon Systems Applications
- Managed Information Dissemination
- Precision Targeting
- Protecting the Homeland
- Defensive Information Operations
- Unconventional Nuclear Warfare Defense
- Defense Against Biological Weapons

2002 2003 2004 2005 2006

Bush *2001–2009*

nistan (2001–2014)

1st detainees arrive at Camp X-Ray

The Iraq Resolution is authorized by a majority of Congress

The U.N. passes Resolution 1441 giving the Iraqi President a final opportunity to comply with weapons inspectors

DHS begins operations

The Space Shuttle Columbia disintegrates upon re-entry

The U.S.-led Iraq War begins

Operation Red Dawn results in the capture of Saddam Hussein

NASA's Spirit and Opportunity rovers land on Mars

NASA's hypersonic Scramjet reaches a record breaking velocity of Mach 9.6

Construction of the Freedom Tower begins in NYC

North Korea accounces that it possesses nuclear weapons

Social networking websites grow in popularity

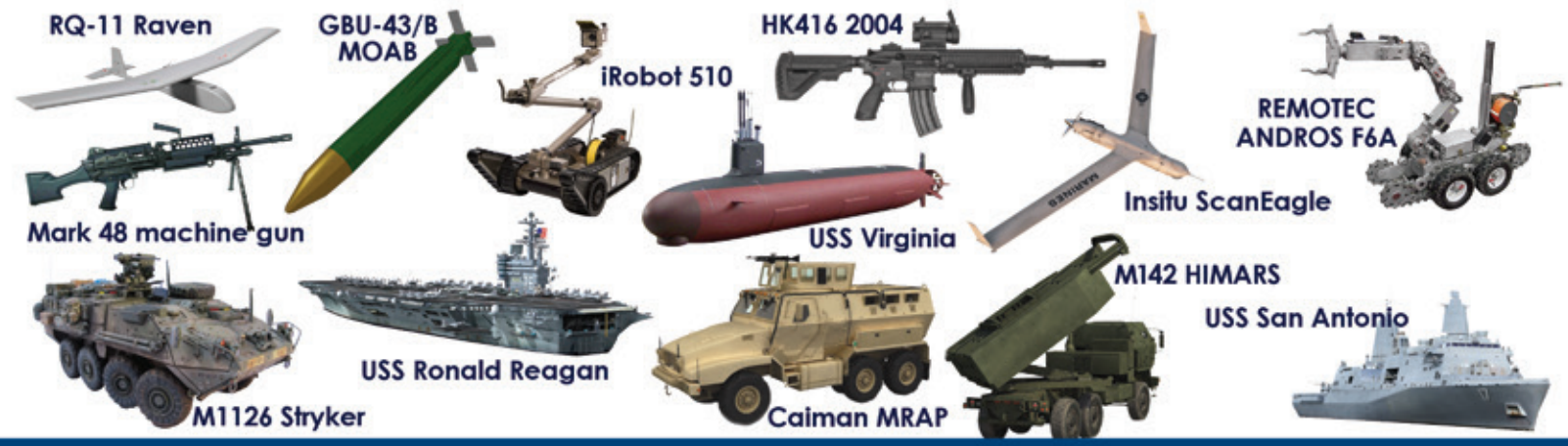
Hurricane Katrina

F–35 Lightning II Joint Strike Fighter successful first flight

Subprime mortgage crisis begins

NASA launches New Horizons probe

H. Rumsfeld *2001–2006*



Schneider, Jr. *2001–2009*

Intelligence Needs for Homeland Defense

Defense S&T

The Impact of e-Business on DoD Acquisition Processes

Operation Enduring Freedom Lessons Learned

Future of the Aircraft Carrier

Homeland Defense Against Bioterrorism

Missile Defense

Special Operations and Joint Forces in Support of Countering Terrorism

B-52H Re-Engining

Training for Future Conflicts

Acquisition of National Security Space Programs

Dynamic Access to Mobile Information Networks

Enabling Joint Force Capabilities

The Role & Status of DoD Red Teaming Activities

Sea Basing

Discriminate Use of Force

Intelligence Support to the War on Terrorism

Technology Investment for DARPA

Rebalancing Ends Versus Means in the Conduct of Intelligence within DoD

DoD Roles & Missions in Homeland Security

Unexploded Ordnance

Future Strategic Strike Forces

Operation Iraqi Freedom Lessons Learned

Unmanned Aerial Vehicles and Uninhabited Combat Aerial Vehicles

Missile Defense Phase III—Modeling and Simulation

Smallpox Downselection

Aerial Refueling Requirements

Preventing and Defending Against Clandestine Nuclear Attack

Space Based Radar for Missile Defense

Strategic Communication

DoD Roles in Homeland Security

Corrosion Control

Employment of the National Ignition Facility

Transition to and from Hostilities

Patriot System Performance

High Performance Microchip Supply

Missile Defense

Management Oversight in Acquisition Organizations

Nuclear Weapon Effects Test, Evaluation, and Simulation

Mobility

Munitions System Reliability

Institutionalizing Stability Operations Within DoD

Aerial Targets

The Roles and Authorities of the DDR&E

Future GPS

Identification Technologies of the Future

Reducing Vulnerability to Weapons of Mass Destruction

Transformation: A Progress Assessment

Manufacturing Technology Program: Affordably Equipping the Future Force

Defense Critical Technologies

Force Protection in Urban and Unconventional Environments

Future Strategic Strike Skills

Nuclear Capabilities

Information Management for Net-Centric Operations

21st Century Strategic Technology Vectors

2007 | 2008 | 2009 | 2010 | 2011

George W. Bush *2001–2009* — **Barack Obama** *2009–present*

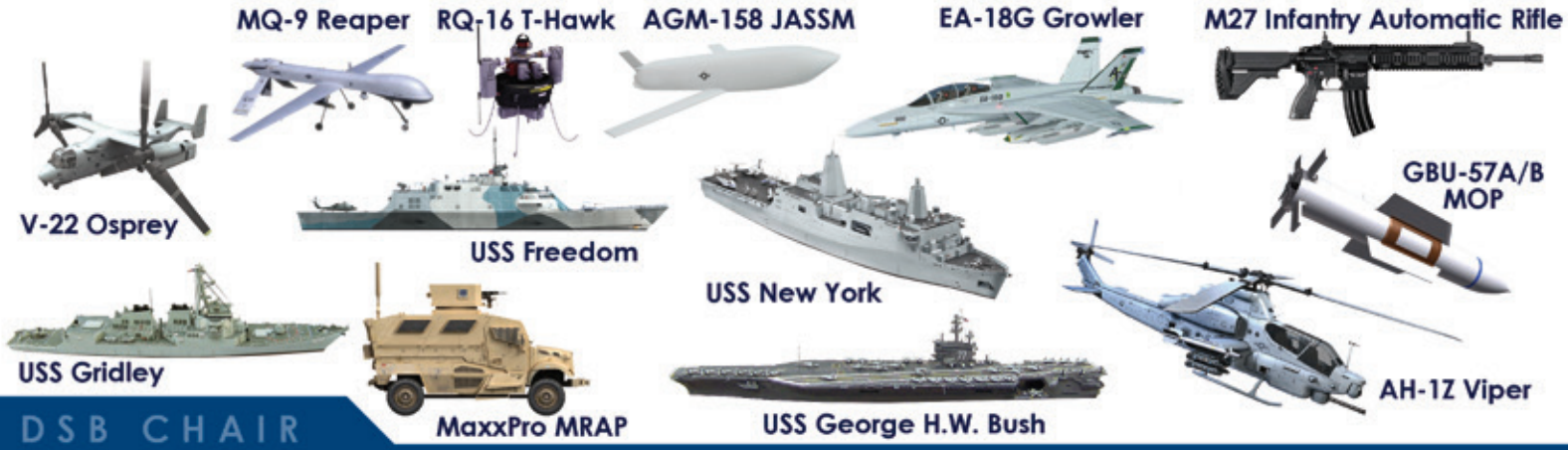
U.S. PRESIDENT

Iraq War (2003–2011) | **War in Afghanistan (2001–2014)** | **Ongoing: U.S. airstri**

- President Bush orders a troop surge to Iraq
- U.S. mortgage crisis
- The 1st iPhone is released
- U.S. oil prices reach a record $147 per barrel
- Global financial crisis begins
- SpaceX Falcon 1, The world's 1st privately developed space launch vehicle to make orbit
- President Obama orders a troop surge to Afghanistan
- Congress authorizes a $787 billion stimulus package, the 2nd largest in U.S. history
- The Great Recession officially ends
- Deepwater Horizon oil spill becomes the worst oil spill in U.S. history
- President Obama declares an end to combat operations in Iraq
- The Affordable Care Act signed into law
- U.S. forces kill Osama bin Laden
- The 30-year Space Shuttle program ends
- The Arab Spring/ U.S. involvement in Lybian Civil War
- Syrian Civil War begins

SECRETARY OF DEFENSE

Mr. Robert Gates *2006–2011* — **Mr. Leon Pa**



DSB CHAIR

Dr. William Schneider, Jr. *2001–2009* — **Dr. Paul G. Kaminski** *2009–2014*

MAJOR DSB REPORTS

- Directed Energy Weapon Systems and Technology Applications
- Deployment of Members of the National Guard and Reserve in GWOT
- Mission Impact of Foreign Influence on DoD Software
- Future Need for VTOL/STOL Aircraft
- Reducing Vulnerabilities to Weapons of Mass Destruction
- Information Management for NetCentric Operations
- Defense Biometrics
- 21st Century Strategic Technology Vectors
- Critical Homeland Infrastructure Protection
- Nuclear Weapons Inspections for the Strategic Nuclear Force
- Challenges to Military Operations in Support of U.S. National Interests
- Integrating Sensor-Collected Intelligence
- Nuclear Deterrence Skills
- Defense Imperatives for a New Administration
- Creating an Effective National Security Industrial Base for the 21st Century
- Developmental Test and Evaluation
- Report on the Unauthorized Movement of Nuclear Weapons
- DoD Energy Strategy, More Fight - Less Fuel
- Strategic Communication
- Capability Surprise
- Fulfillment of Urgent Operational Needs
- Nuclear Weapons Effects National Enterprise
- Department of Defense Biological Safety and Security Program
- Creating a DOD Strategic Acquisition Platform
- Understanding Human Dynamics
- Advanced Computing
- DoD Policies and Procedures for the Acquisition of Information Technology
- Time Critical Conventional Strike from Strategic Standoff
- Unconventional Operational Concepts and the Homeland
- Creating an Assured Joint DOD and Interagency Interoperable Net-Centric Enterprise
- Buying Commercial
- Operations Research Applications for ISR
- Trends and Implications of Climate Change
- Survivability of DoD Systems to Electromagnetic Pulse (EMP)
- S&T Issues of Early Intercept Ballistic Missile Defense Feasibility
- Counterinsurgency (COIN) Intelligence, Surveillance, and Reconnaissance (ISR) Operations
- Independent Assessment of The Air Force Nuclear Enterprise
- Improvements to Services Contracting
- Enhancing Adaptability of our Military Forces

2012 2013 2014 2015 2016

ikes against ISIS targets in Iraq and Syria (2014–present)

President Obama visits Myanmar, pushes for Democracy

NASA and Lockheed Martin unveil the 1st Orion spacecraft

Superstorm Sandy

The ban on women serving in combat is lifted

The North Korean crisis

Edward Snowden, publication of classified data

Crimea annexed by the Russian Federation

Russian military intervention in Ukraine

American-led airstrikes agsinst ISIS begin in Syria and Iraq

China builds islands in the South China Sea for military bases

Tesla Model X introduction

U.S. and Cuba restore diplomatic relations

New Horizons probe sends 1st close-up pictures of Pluto

Syrian Refugee Crisis in Western Europe

Brexit

Hillary Clinton, 1st female U.S. Presidential candidate

anetta *2011–2013* **Mr. Chuck Hagel** *2013–2015* **Dr. Ashton Carter** *2015–present*


ARES-16


Avenger (Predator C)


USS Cornado


USS America


RQ-21A Blackjack


Flyer-72 ALSV


USS Gerald R. Ford


F-35B Lightning II


ScanEagle 2


USS Zumwalt


F-35A Lightning II


XM25 CDTE

Dr. Craig I Fields *2014–present*

Predicting Violent Behavior

The Role of Autonomy in DoD Systems

Basic Research

Technology and Innovation Enablers for Superiority in 2030

Air Force Nuclear Enterprise Follow-On Review

Resilient Military Systems and the Advanced Cyber Threat

Cyber Security and Reliability in a Digital Cloud

Contractor Logistics in Support of Contingency Operations

Assessment of Nuclear Monitoring and Verification Technologies

Strategic Surprise

21st Century Military Operations in a Complex Electromagnetic Environment

Autonomy

Energy Systems for Remote and Forward Operating Bases*

Defense Strategies for Advanced Ballistic and Cruise Missile Threats*

Cyber Defense*

Air Dominance*

Cyber Deterrence*

Next-Generation Unmanned Undersea Systems*

Deterring, Preventing, and Responding to the Threat or Use of Weapons of Mass Destruction*

Defense Strategies for Ensuring the Resilience of National Space Capabilities*

Cyber Supply Chain*

Military Satellite Communication and Tactical Networking*

Defense Research Enterprise Assessment*

* in progress

The Board Today

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DSB in its 6th Decade

The following themes and descriptions of major recent studies undertaken by the Board are illustrative of its continuing focus on issues of greatest concern to the nation's security.

Protecting the Homeland: Against non-state actors; against enemy states in time of war; against weapons of mass destruction and cyber

Since 9/11, the US can no longer be considered a sanctuary. The highest priority for the DoD is protection of the homeland. The DSB has undertaken a series of studies to help clarify the DoD's roles and to assess its posture for both defending the homeland and protecting it from new forms of threats that have evolved since the Cold War. The DoD's dependence on critical infrastructure, the supporting capabilities it will need to provide to civil authorities, and shortcomings in the interagency have been highlighted.

With respect to the threat to the homeland, the DSB has produced over 20 years of studies characterizing how the threat has evolved since the end of the Cold War. Actors have proliferated beyond nation states, and so too have their tools. Missiles with range or delivery mechanisms to threaten the US homeland are in the hands of more nations. The cyber threat is growing exponentially in its presence and can be promulgated with serious harm by individuals. Advances in technology can place even weapons of mass destruction—nuclear, chemical, and biological—in the hands of any state or non-state actor that desires them. What to do about these threats, both defensively and offensively, at home and abroad, has been a subject of routine DSB investigation.

Preventing large scale war: Nuclear deterrence

Despite the "peace dividend" at the end of the Cold War, the DSB has been uncertain that downplaying the nation's nuclear deterrent would lead other nations to do the same, even as advances in our non-nuclear warfighting capabilities proved their effectiveness. In fact, US conventional dominance demonstrated in Bosnia, Iraq, and Afghanistan appears to have catalyzed a greater interest in nuclear weapons by others who do not have the resources to overmatch us otherwise.

The Board has maintained steady attention for two decades on the health of the US nuclear enterprise, the advances and modernization efforts being undertaken by Russia and China, nuclear weapons proliferation to other nation states, and advances in technology that could both detect and hide proliferation. With the relatively recent recognition by DoD leadership of threatening nuclear capabilities and doctrine by many unfriendly to the US, a renewed commitment to the nation's nuclear deterrent is being made. The DSB's history in this area is helping the Department to re-teach a largely atrophied knowledge base to support both modernization of our forces and operational readiness to deter nuclear aggression.

DSB in its 6th Decade

Preparing for the new kind of war: War short of all-out war is becoming the norm

As nations have realized that they cannot match the US with conventional military might, they have adopted strategies and tactics designed to stay below the threshold of a major international armed response; witness Russia in the Crimea, China's island-building in the South China Sea, and North Korean provocations. Their tools and techniques include information operations, using both disinformation and strategic communication aimed at their populace, neighbors, and the world at large; ambiguity of forces ('little green men', proxies, and naval forces labeled 'coast guard'); and coercion involving economics, energy, and political corruption. The DSB has undertaken studies to identify the options for DoD in addressing this "new normal" category of threats and to highlight the role of other parts of the government critical to successfully countering such strategies.

Preparing for a new dimension of war: What the information infrastructure is enabling—for adversaries and for us

Information has become a decisive and discriminating enabler of modern warfare, and information superiority a potent deterrent. The DSB has undertaken a series of studies highlighting how DoD can achieve and maintain information superiority, focusing on intelligence collection and analysis, the use of unclassified 'big data', and the rapidly advancing technologies of information and communication infrastructures.

The criticality of information—its assured availability and integrity, and the vulnerabilities in providing it—has been realized by both us and our adversaries. The Board has advised on both offense and defense in this domain, including the growing threats and opportunities in electronic warfare and in cyber. As an example, the Board's cyber efforts have addressed: matching our defenses to the sophistication of the threats and criticality of the target; managing cyber defense so as to make optimal use of funding and of scarce technical human resources; identifying the challenges and opportunities of cyber relative to new technologies, such as cloud computing; identifying strategies to mitigate cyber corruption of the supply chain, especially foreign supplied microelectronics; and how to deter cyber attacks when defenses are inadequate.

Anticipating new ways to wage war: Numbers and disaggregation; range; autonomy; danger on and above the surface is driving us under the sea

The unmatched capabilities of our joint forces depend on relatively small numbers of extremely capable, high value assets; e.g., the world's most potent aircraft carriers. Predictably those unique assets have become lucrative targets of adversary states, calling into question some of our foundational operational tenets such as air dominance. The DSB's work in this area has advocated ways to operate at greater range from the adversary to increase safety; use of large numbers of inexpensive assets to augment small numbers of costly assets ("quantity has a quality all its own"); and use of carefully managed autonomous systems to

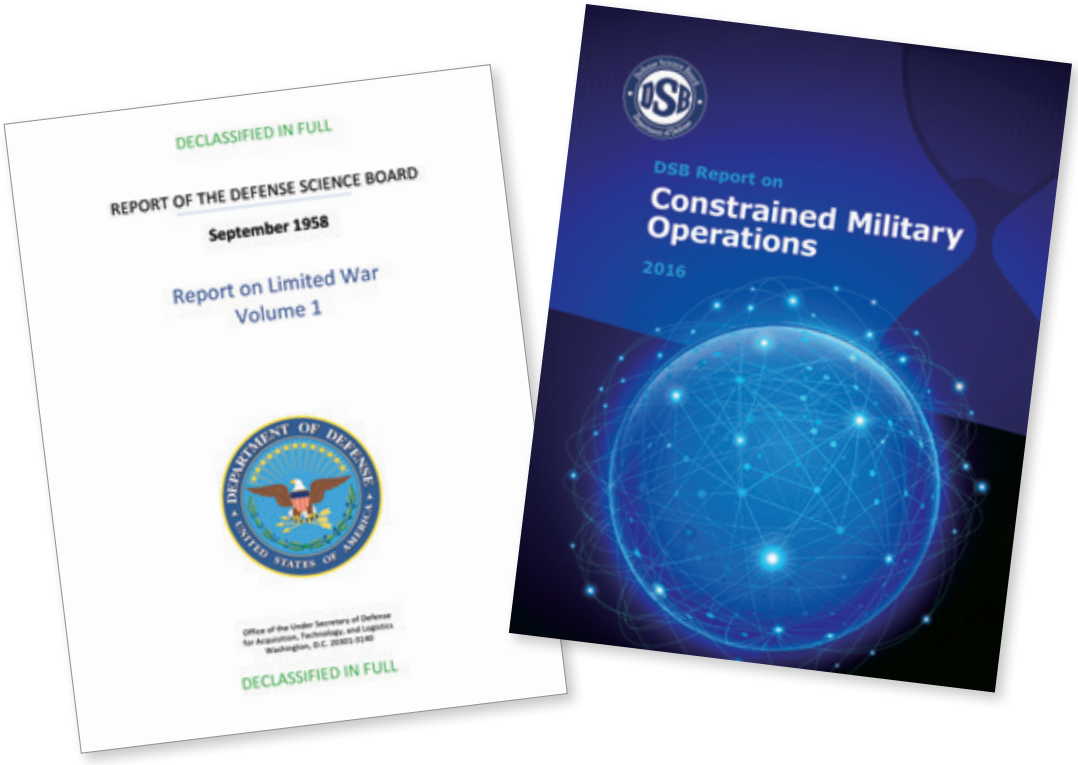
keep Service personnel out of harm's way. In addition, capitalizing on our undersea dominance, the DSB has identified ways to maintain that superiority for some time to come through the use of large numbers of inexpensive unmanned undersea vehicles to conduct operations that would otherwise have to be undertaken with greater risk from the air, sea or land.

Supporting stabilization, reconstruction, peace keeping, and nation building

Taking lessons from history, the DSB has highlighted the importance of comprehensive planning and preparation before, through and after conflict in order to secure both short and longer term stability once hostilities cease. Issues the Board has addressed include: identification of the information and intelligence required to successfully conduct stabilization and reconstruction operations; best use of the National Guard and Reserves with their civilian sector skills; language and cultural training; and campaign planning and exercising for stabilization and reconstruction missions on par with what we do for combat missions.

Preparing for surprise: To us and by us

The world is an unpredictable place, and the galloping advance of technology is making it more so. No matter how well DoD plans and prepares, there will be surprises—and there is the ever present value of inflicting surprise on our adversaries. The DSB has provided studies advising DoD on how the Department can be better poised to swiftly respond to surprise with agility, adaptability and resilience (e.g., having a technology infrastructure which can be swiftly and inexpensively revectored to meet changing needs and threats; using more red teaming and free play in training and exercises). The Board has also identified potential technological surprises and advised on hedging strategies should those occasions arise.



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For Outstanding Contributions to the Department of Defense in an Advisory Capacity

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Eugene G. Fubini

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Mr. Charles A. (Bert) Fowler

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Dr. James R. Burnett

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Mr. James R. Schlesinger

2010
Mr. Dan Fink

2011
(No Selection)

2012
Dr. Richard Wagner

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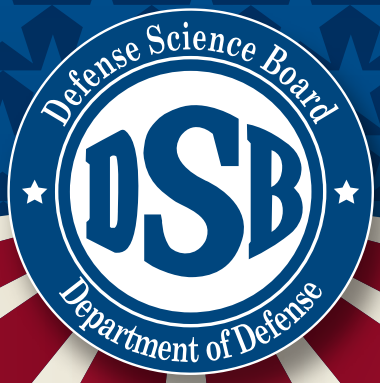
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