Chapter 3
Nuclear Weapons Program Force Structure

3.1 *Overview*

The U.S. nuclear force structure associated with the U.S. Nuclear Weapons Program is composed of both U.S. nuclear weapons and the delivery systems associated with them. The number and types of weapons and delivery vehicles are a function of many considerations, including resources – financial, human, and material. The U.S. nuclear force structure supports overall U.S. military strategy and defense objectives. These objectives are periodically delineated by the U.S. government and confirmed or modified through regular defense reviews.

The size and composition of the current U.S. nuclear weapons stockpile have been determined by a number of relevant factors over time. First, the make-up of the stockpile conforms to national security requirements and is a constituent element of the overall U.S. military capability. Second, the number of warheads of each warhead-type in the stockpile is commensurate with the delivery vehicles associated with each weapon and is consistent with international treaties and agreements.

The number of nuclear weapons and associated delivery systems has always been driven by the combination of national security strategy, doctrine, and war planning requirements. The United States ended production of new nuclear weapons in 1991; since that time, the U.S. nuclear stockpile and force structure have undergone significant changes and reductions. Figure 3.1 details the stockpile and force reductions from 1992 to the present.

This chapter offers a summary of current U.S. defense objectives and a brief description of the most recent U.S. defense reviews. This chapter also describes the categories of the U.S. nuclear weapons stockpile and the delivery systems associated with the weapons.

3.2 *U.S. Defense Objectives*

Over the past 15 years since the end of the Cold War, there has been a continuing shift in deterrence policy, away from a "one-size-fits-all" notion toward a more tailored approach appropriate for advanced military competitors,

- Stockpile Reductions
  - From 1992 to the present, the stockpile has been reduced by more than 50%.
  - Commitment in 2004 to reduce the total size of the U.S. stockpile by nearly one-half from the 2001 level – smallest stockpile since the Eisenhower administration era.
  - Moscow Treaty – reductions in operationally-deployed strategic nuclear weapons to 1700-2200 by end of 2012.
  - All Army tactical nuclear weapons withdrawn and retired – nuclear artillery shells, Lance missile warheads.
  - All naval surface ship weapons withdrawn and retired – naval nuclear depth bombs, gravity bombs onboard aircraft carriers, surface ship nuclear cruise missiles.
- All naval cruise missiles offloaded from attack submarines.
- 13 nuclear warhead-types have been retired from the stockpile in the past 15 years.
- Force Reductions
  - Entire ICBM delivery system, the Peacekeeper Missile, eliminated.
  - Non-strategic nuclear forces reduced by 90% and removed from all Army ground-launched systems, surface ships, submarines, and naval aircraft carriers and bases.
  - Conversion of four of SSBNs to SSGNs, with expected completion in 2007.

Figure 3.1 U.S. Stockpile and Force Reductions from 1992 to the Present

regional WMD states, and non-state terrorist networks.[1] The future force will provide a fully balanced, tailored capability to deter both state and non-state threats – including WMD employment, terrorist attacks in the physical and cyber domains, and opportunistic aggression – while simultaneously assuring allies and dissuading potential adversaries.

The New Triad of capabilities was developed during the 2001 Nuclear Posture Review. The traditional *Nuclear Triad* is just one key element of the New Triad. The force capabilities of the New Triad include a wider range of non-kinetic and conventional strike capabilities while maintaining a robust nuclear deterrent. Also, force capabilities include integrated ballistic and cruise missile defenses and a responsive infrastructure. These capabilities are supported by a robust and responsive national Command and Control (C^2) system, advanced intelligence,

[1] Quadrennial Defense Review Report, February 6, 2006.

adaptive planning systems, and an ability to maintain access to validated, high-quality information for timely situational awareness. The traditional U.S. Nuclear Triad and the New Triad are illustrated in Chapter 1, *The U.S. Nuclear Weapons Program*, Figure 1.5.

To ensure U.S. preparedness for new or emerging threats, national policy makers periodically conduct national security reviews and subsequently modify national defense objectives, strategies, and doctrines. The 2006 Quadrennial Defense Review (QDR) represents the most recent effort of U.S. defense planners to ensure that U.S. defense strategies and objectives reflect evolving circumstances in the national security environment. The foundation of the QDR is the *National Defense Strategy*, published in March 2005, which called for continuing reorientation of DoD capabilities to address a wider range of challenges. To operationalize the strategy, DoD senior civilian and military leaders identified four priorities as the focus of the QDR:

- Defeating terrorist networks;
- Defending the homeland in depth;
- Shaping the choices of countries at strategic crossroads; and
- Preventing hostile states and non-state actors from acquiring or using WMD.

The future force will include a wider range of non-kinetic and conventional strike capabilities. This does not mean, however, that the nuclear component of our deterrent is any less important. Nuclear weapons must remain accurate, safe, reliable, and tailored to meet modern deterrence requirements.

3.3 Employment of Nuclear Weapons

The decision to employ nuclear weapons requires the authority of the President of the United States. To date, nuclear weapons have been employed in combat only two times, both in 1945. The use of nuclear weapons would constitute a significant escalation from conventional warfare and would involve many considerations. Planning and employment factors include: political objectives; the strategic situation; the type and extent of operations to be conducted; military effectiveness; damage-limitation measures; environmental and ecological impacts; and calculations concerning how such considerations may interact.

While planning for the employment of nuclear weapons in the 21st century presents unique challenges, the basic methods and concepts for such planning have not been substantially modified from historical practices. Nuclear weapon planning is based upon: knowledge of enemy force strength and disposition; the number, yields, and types of weapons available; and the status/disposition of

friendly forces at the time. Employment planning considers the characteristics and limitations of the nuclear forces available and seeks to optimize both the survivability and combat effectiveness of these forces.

Presidential decisions on national security matters are issued through National Security Presidential Directives (NSPD). NSPDs provide the President's general direction on how to plan for the employment of nuclear weapons. This is further amplified through the DoD Nuclear Weapons Employment Guidance (NUWEP) and the Joint Staff Nuclear Supplement to the Joint Strategic Capabilities Plan (JSCP). The Combatant Commanders take this guidance and formulate their operational plans, which may or may not include nuclear weapons, to support their objectives. Figure 3.2 delineates the various lines of authority, documents, and purposes associated with nuclear weapons employment planning.

Authority	Document	Purpose
President	National Security Presidential Directives (NSPD)	Nuclear weapons employment guidance
President	Nuclear Weapons Stockpile Plan (NWSP)	Plan for weapon quantities (production and retirement)
Secretary of Defense	Nuclear Weapons Employment Policy (NUWEP)	SECDEF amplifying guidance on nuclear weapons use
Chairman of the Joint Chiefs	Joint Strategic Capabilities Plan-Nuclear (JSCP-N) Supplement	Amplifying guidance to the NUWEP
Combatant Commanders	Operational Plans	Nuclear weapon plans in support of theater objectives
Nuclear Weapons Council	Requirements & Planning Document (RPD)	DoD stockpile planning projections

Figure 3.2 Nuclear Weapons Employment Authorities and Related Documents

The warhead requirements necessary to implement Presidential guidance are translated into the annual Requirements and Planning Document (RPD). The RPD is a joint Department of Defense (DoD)/Department of Energy (DOE) document that sets forth policy, military requirements, programmatic actions, and stockpile projections over the long-term. It provides the basis for the proposed Presidential Nuclear Weapons Stockpile Plan (NWSP). The NWSP is a six-year plan for the exact quantities of nuclear weapons, by warhead-type, and by year, for the entire U.S. stockpile of active and inactive warheads.

3.4 U.S. Nuclear Stockpile Composition

Weapons in the nuclear stockpile are divided into two categories: Active Stockpile (AS) warheads and Inactive Stockpile (IS) warheads. The Active Stockpile and the Inactive Stockpile are further divided into specific sub-categories. These categorical distinctions provide the necessary flexibility to accommodate a variety of contingencies and to protect current and future operational quantities.

Active Stockpile warheads are strategic and non-strategic weapons maintained in an operational, ready-for-use configuration. Tritium bottles and other Limited-Life Components (LLCs) are installed and the latest warhead refurbishment modifications and safety features for that weapon-type are incorporated into AS weapons. These warheads are assessed regularly to ensure reliability and safety. The AS includes: operationally deployed warheads; AS augmentation warheads; and AS logistics warheads.

Operationally deployed warheads are weapons intended to be: maintained in an operational status; located at an operational base; and ready, when authorized, to be employed immediately or within a few days.

AS augmentation warheads are weapons intended to be: maintained in an operational status; located at either an operational base or a depot; and ready to serve as operationally deployed weapons in less than six months, when authorized. AS augmentation warheads are never uploaded onto delivery vehicles or launch platforms while in this category.

AS logistics warheads are weapons intended to be: maintained in an operational status; located at either an operational base or a depot; and used to replace operationally deployed or AS augmentation warheads for logistical purposes. Such purposes include the replacement of a warhead undergoing maintenance or being sampled for quality assurance. AS logistics warheads may be in various stages of disassembly to serve logistical requirements.

Inactive Stockpile warheads are strategic or non-strategic weapons intended to be maintained in a non-operational status with tritium bottles and other LLCs removed as soon as logistically practical. The IS includes: IS augmentation warheads; IS logistics warheads; Quality Assurance and Reliability Testing (QART) replacement warheads; and reliability replacement warheads.

IS augmentation warheads are weapons intended to be: maintained in a non-operational status; located at a depot; and ready after a minimum of six months to serve as AS operationally deployed weapons, when authorized. IS augmentation warheads are never uploaded onto delivery vehicles or launch platforms while in this category.

IS logistics warheads are weapons intended to be: maintained in a non-operational status until authorized for reactivation to serve as AS logistics warheads associated with reactivated augmentation weapons.

QART replacement warheads are weapons intended to be: maintained in a non-operational status until authorized for reactivation to replace AS warheads selected as QART samples. QART replacement warheads are located at a depot and may be used to replace AS or IS weapons that develop significant safety, reliability or yield problems.

Reliability replacement warheads are weapons intended to be: maintained in a non-operational status until authorized for reactivation to replace AS or IS weapons that develop significant safety, reliability or yield problems.

3.5 Nuclear Stockpile Quantities

Nuclear weapon stockpile quantities and deployment outside the U.S. are authorized by Presidential direction through the NWSP and the Nuclear Weapons Deployment Authorization (NWDA), both of which are developed and approved annually.

From 1945 until 1962, U.S. stockpile quantities increased dramatically as the United States and the Soviet Union competed during the Cold War. By 1961, the total U.S. stockpile exceeded 20,000 warheads, the majority of which were short-range, non-strategic warheads. The large number of U.S. non-strategic warheads was required to off-set a huge imbalance of conventional forces. In 1963, the U.S. began a significant shift toward emphasizing strategic systems for nuclear deterrence. Since 1963, the U.S. has unilaterally decreased the number of its non-strategic warheads. The quantity of strategic warheads continued to grow until the mid-1980s and the START I Treaty. Since that time, the number of strategic warheads has been decreased three times, for the START I and II Treaties, and again for the Moscow Treaty.

The United States has developed many warhead-types since the Manhattan Project. Historically, warhead-types entered the stockpile for a limited time and were then retired or replaced by more modern designs (see Figures 3.3 [a] and 3.3 [b]).

3.6 U.S. Nuclear Weapons Delivery Systems

A nuclear weapon delivery system is the military vehicle (ballistic or cruise missile, airplane, or submarine) by which a nuclear weapon would be delivered to its intended target in the event of authorized use. Most nuclear warheads have been designed for specific delivery systems.

FATMAN	Bomb
LITTLEBOY	Bomb
MkIII	No Designated System/Common Name
MkIV	No Designated System/Common Name
B4	Bomb
T-4	ADM
B5	Tactical Bomb
W5	Matador Missile
B6	No Designated System/Common Name
B7	Tactical Bomb/Depth Charge
W7	Corporal/Honest John Tactical Missile
B8	No Designated System/Common Name
W9	No Designated System/Common Name
B11	No Designated System/Common Name
B12	No Designated System/Common Name
B14	No Designated System/Common Name
B15	Bomb
B17	No Designated System/Common Name
B18	No Designated System/Common Name
B19	280mm Atomic Projectile
B21	No Designated System/Common Name
W23	No Designated System/Common Name
B24	No Designated System/Common Name
B27	Tactical Bomb
W27	Regulus SLCM
B28	Strategic/Tactical Bomb
W28	Hounddog ASM
W30	TALOS AAW
W31	NIKE/HERCULES/Honest John SAM
W33	8 in. AFAP
W34	ASTOR ASW/Hotpoint Tactical Bomb
B36	Bomb
W38	Strategic Bomb
B39	Redstone Tactical Missile
W40	BOMARC Strategic SAM/La Crosse Tactical Missile
B41	Strategic Bomb
W42	Hawk/Falcon/Sparrow
B43	Strategic/Tactical Bomb
W44	ASROC
W45	MADM/Little John/Terrier
W47	Polaris A1/A2 SLBM

This list is in chronological order according to entry into Phase 2A (when a warhead receives its designated name)

Figure 3.3 [a] Historical List of Warhead-Types and Descriptions

W48	155mm AFAP
W49	Thor/Atlas/Jupiter/Titan Missiles
W50	Pershing 1a SSM
W52	Sergeant SSM
B53	Strategic Gravity Bomb
W53	TITAN II ICBM
B54	SADM
W54	Falcon AAM/Davy Crockett
W55	SUBROC
W56	Minuteman II ICBM
B57	Tactical Depth Charge/Bomb
W58	Polaris A3 SLBM
W59	Minuteman Y1 ICBM
W60	Typhoon (Not Deployed)
B61 *	Strategic/Tactical Bomb *
W62 *	Minuteman III ICBM *
W64	Lance SSM (Not Deployed)
W66	Sprint SAM
W67	Minuteman III/Poseidon SLBM (Not Deployed)
W68	Poseidon C3 SLBM
W69	SRAM ASM
W70	Lance SSM
W71	Spartan SSM
W72	Walleye Tactical Bomb
W73	Condor (Not Deployed)
W74	155mm AFAP (Not Deployed)
W75	8 in. AFAP (Not Deployed)
W76 *	Trident II D5 SLBM *
B77	Bomb (Not Deployed)
W78 *	Minuteman III ICBM *
W79	8 in. AFAP
W80 *	ALCM/SLCM *
W81	Standard Missile-2 (Not Deployed)
W82	155mm AFAP (Not Deployed)
B83 *	Strategic Bomb *
W84	GLCM SSM
W85	Pershing II SSM
W86	Pershing II SSM (Not Deployed)
W87 *	Minuteman III ICBM *
W88 *	Trident II D5 SLBM *

This list is in chronological order according to entry into Phase 2A
(when a warhead receives its designated name)
* Currently in the U.S. force structure.

Figure 3.3 [b] Historical List of Warhead-Types and Descriptions

Weapons in the U.S. nuclear arsenal include: gravity bombs deliverable by Dual Capable Aircraft (DCA) and long-range bombers; the Tomahawk Land Attack Missile/Nuclear (TLAM/N) capable, deliverable by submarines; cruise missiles deliverable by long-range bombers; Submarine Launched Ballistic Missiles (SLBM); and Intercontinental Ballistic Missiles (ICBM). These systems provide a wide range of options that can be tailored to meet desired military and political objectives. Each system has advantages and disadvantages and effectively provides one part of the New Triad deterrent against the threat of nuclear and other WMD attacks on the U.S. and its allies. Figure 3.4 is a list of the current U.S. nuclear warheads and their associated delivery systems.

BOMBS

Type	Description	Carrier	Laboratories	Mission	Military Service
B61 3/4/10	Tactical Bomb	F-15, F-16 and Tornado	LANL/SNL	Air to Surface	Air Force
B61 7/11	Strategic Bomb	B-52 & B-2	LANL/SNL	Air to Surface	Air Force
B83 0/1	Strategic Bomb	B-52 & B-2	LLNL/SNL	Air to Surface	Air Force

WARHEADS

Type	Description	Carrier	Laboratories	Mission	Military Service
W62	ICBM Warhead	MM III ICBM	LLNL/SNL	Surface to Surface	Air Force
W76	SLBM Warhead	D5 Missile, Trident Sub	LANL/SNL	Underwater to Surface	Navy
W78	ICBM Warhead	MM III ICBM	LANL/SNL	Surface to Surface	Air Force
W80-0	TLAM/N	Attack Sub	LANL/SNL	Underwater to Surface	Navy
W80-1	ALCM/ ACM	B-52	LLNL/SNL	Air to Surface	Air Force
W87	ICBM Warhead	MM III ICBM	LLNL/SNL	Surface to Surface	Air Force
W88	SLBM Warhead	D5 Missile, Trident Sub	LANL/SNL	Underwater to Surface	Navy

Figure 3.4 Current U.S. Nuclear Warhead-Types and Associated Delivery Systems

3.6.1 Bombers

The U.S. bomber force serves as a visible, flexible, and recallable national strategic asset. The active U.S. inventory of B-52s (Figure 3.5), which are located at Barksdale Air Force Base (AFB) in Louisiana and Minot AFB in North Dakota, have been the backbone of the strategic bomber force for more than 40 years. The B-52 "Stratofortress" is a heavy, long-range bomber that can perform a variety of missions. It is capable of flying at sub-sonic speeds at altitudes of up to 50,000 feet, and it can carry precision-guided conventional ordnance in addition to nuclear weapons.

Figure 3.5 B-52 "Stratofortress"

The B-2 "Stealth Bomber" (Figure 3.6) entered the bomber force in April 1997 and significantly enhanced U.S. deterrent forces with its deep penetration capability. The B-2 is a multi-role bomber capable of delivering both conventional and nuclear munitions. The B-2 force is located at Whiteman AFB in Missouri.

Figure 3.6 B-2 "Stealth Bomber"

The B-52 is the only aircraft that can carry both gravity bombs and cruise missiles. Nuclear planners must consider multiple tradeoffs when deciding which weapon and delivery system to use. The advantages and disadvantages of gravity bombs are outlined below:

- Gravity Bomb advantages:
  - Aircraft provide flexibility and can be recalled prior to weapon release/launch;
  - Aircraft range can be increased with air to air refueling;
  - Weapons may be employed against mobile targets;

- Various weapon yields available from megaton to subkiloton; and
- Aircraft can be launched from the Continental United States (CONUS).

- Gravity Bomb disadvantages:
  - Aircraft crew is at risk in high-threat environment;
  - Lead-time is required for planning and transit; and
  - Significant combat and ground support infrastructure may be required depending on scenario.

Cruise missiles have different advantages and disadvantages:

- Cruise Missile advantages:
  - Weapons can penetrate heavily defended areas without risk to the aircraft and crew;
  - Weapons can be launched from international airspace; and
  - Bomber aircraft range is significant.

- Cruise Missile disadvantages:
  - System may be vulnerable to modern air defense systems; and
  - Terrain factors may limit employment flexibility.

3.6.2 Submarines

There are two types of nuclear capable submarines, ballistic missile submarines (SSBN) and attack submarines.

SSBNs

Nuclear-powered SSBNs are designed to deliver ballistic missile attacks against assigned targets. These submarines carry Submarine Launched Ballistic Missles (SLBMs) which are the most survivable leg of the Nuclear Triad because of the ability of their SSBN delivery platforms to hide in the ocean depths, coupled with the long range of the missiles. Constantly on patrol, SSBN Trident missiles provide a worldwide launch capability, with each patrol covering an area of more than one million square miles.

Each U.S. SSBN (Figure 3.7) is capable of carrying 24 Trident missiles. SSBNs are deployed from the West Coast in Bangor, Washington and from the East Coast in Kings Bay, Georgia. These SSBNs carry the Trident II D5 missile. As outlined in the 2001 Nuclear Posture Review (NPR), the U.S. has reduced its SSBN force from 18 to 14 submarines.

Figure 3.7 SSBN

- SLBM advantages:
  - Weapons can penetrate heavily defended areas without risk to the crew;
  - Weapons can be launched in international waters;
  - Weapons can be on target in minimal time;
  - Maximum stealth and surprise can be maintained prior to launch;
  - System provides flexible targeting capability; and
  - The missile can carry multiple warheads.
- SLBM disadvantages:
  - Missiles are not recallable after launch; and
  - Multiple warheads present additional planning challenges.

Attack Submarines

All of the early-model U.S. attack submarines are capable of launching Tomahawk Land-Attack Cruise Missiles/Nuclear (TLAM/N). However, as a result of the President's 1991 Nuclear Initiatives, all TLAM/N nuclear weapons have been removed from U.S. Navy vessels. The United States retains the option to re-deploy TLAM/N on attack submarines, if necessary.

- TLAM/N advantages:
  - Heavily defended areas may be penetrated without risk to the crew;
  - Highly mobile platforms in international waters may serve as launch sites;
  - Weapons are very accurate;
  - Launch platform is recallable;
  - Overflight of third-party nations alleviated depending on launch location; and
  - Maximum stealth and surprise can be maintained prior to launch.
- TLAM/N disadvantages:
  - Weapons not recallable after launch;
  - Lead-time required to generate and transit to desired launch point;

- System may be vulnerable to modern air defense systems;
- Terrain factors may limit employment flexibility; and
- Launch platform must receive updated data transfer device in order to update a mission plan.

3.6.3 ICBMs

U.S. nuclear forces include Inter-Continental Ballistic Missiles (ICBMs), which are launched from stationary silos. ICBMs are on continuous alert, cost-effective, can provide immediate reaction and can strike their intended targets within 30 minutes of launch.

Currently, the U.S. ICBM force consists of Minuteman III. Minuteman III missile bases are located at: F.E. Warren AFB in Wyoming; Malmstrom AFB in Montana; and Minot AFB in North Dakota. Figure 3.8 shows a Minuteman III missile in a silo.

Figure 3.8 MMIII in a Silo

- ICBM advantages:
  - Weapons can penetrate heavily defended areas without risk to the crew;
  - Weapons can be on target in minimal time;
  - Planning time is short; and
  - The missile can carry multiple warheads.
- ICBM disadvantages:
  - Missiles are not recallable;
  - Booster may fall on U.S. or Canadian territory; and
  - Multiple warheads present additional planning challenges.

3.6.4 Dual Capable Aircraft (DCA)

In addition to its strategic nuclear forces, the United States has CONUS-based and forward-deployed DCA consisting of the F-15 (Figure 3.9) and the F-16 (Figure 3.10). DCA are able to deliver conventional munitions or non-strategic nuclear bombs from the B61 family.

The United States also maintains forward-based DCA assigned to the U.S. European Command. Some of these DCA are available to support our North Atlantic Treaty Organization (NATO) allies in combined-theater nuclear operations.

Figure 3.9 F-15

Figure 3.10 F-16

3.7 DoD Strategic and Non-Strategic Operational Bases

Figures 3.11 and 3.12 depict U.S. DoD strategic and non-strategic operational bases in the continental United States. The United States also has nuclear weapons depots, where it stores non-operational weapons for logistical, augmentation, or replacement purposes.

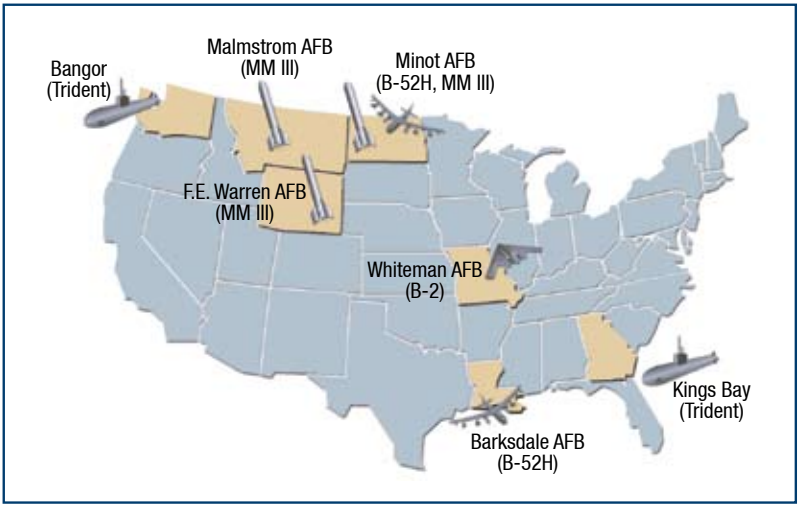

Figure 3.11 DoD Strategic Operational Bases

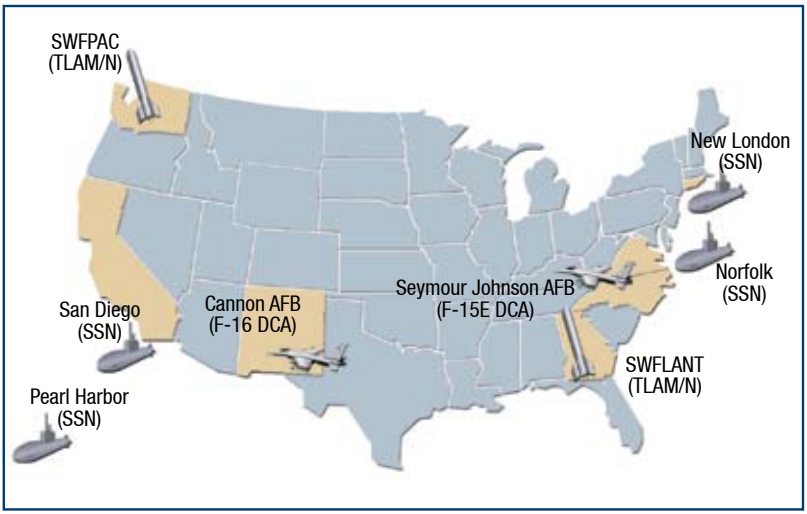

Figure 3.12 DoD Non-Strategic Operational Bases