CDC Z2W271

Nuclear Weapons Craftsman

Volume 1. History, Career Field, and Supervisory Responsibilities

Air Force Career Development Academy

The Air University

Air Education and Training Command

Z2W271 01 1401 Edit Code 03

AFSC 2W271

Author: MSgt Jon J. Sombrero
363d Training Squadron
USAF Nuclear Weapons Technical Training School (AETC)
363TRS/TRR
520 Missile Road (Stop 244)
Sheppard Air Force Base, Texas 763-2261
DSN: 736-4669
E-mail address: Jon.Sombrero@us.af.mil

Instructional Systems Specialist: Steve McCarver

Editor: Sherie A. Davis

Air Force Career Development Academy (AFCDA)
The Air University (AETC)
Maxwell-Gunter Air Force Base, Alabama 36118–5643

Material in this volume is reviewed annually for technical accuracy, adequacy, and currency. For SKT purposes the examinee should check the *Weighted Airman Promotion System Catalog* to determine the correct references to study.

AS A NUCLEAR weapons craftsman, you are responsible for supervising, directing, and, managing the assembly, testing, maintenance, and modification of nuclear weapons under your control. This also includes the associated test and handling equipment and various programs pertinent to the career field. The knowledge and skills needed in this career field are listed in the 2W2X1 Career Field Education and Training Plan (CFETP). We provide the information you need for upgrade in each required line item of the CFETP in this Career Development Course (CDC). This CDC consists of two volumes and and an end-of-course exam for each volume.

Unit 1 of Volume 1 covers the history of nuclear weapons and the various organizations that make up the nuclear community. Next, Unit 2 deals with the supervisory responsibilities to include the maintenance management of nuclear weapons.

Volume 2 covers nuclear surety, safety, and health programs; reports, records, and forms; and weapons accounting and shipping processes including the use control program.

A glossary is included for your use.

Code numbers on figures are for preparing agency identification only.

This volume contains material that cannot be released to unauthorized persons. When you no longer need this volume, destroy it in an appropriate manner to prevent its reconstruction.

The use of a name of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

To get a response to your questions concerning subject matter in this course, or to point out technical errors in the text, unit review exercises, or course examination, call or write the author using the contact information on the inside front cover of this volume.

NOTE: Do not use the IDEA Program to submit corrections for printing or typographical errors.

If you have questions that your supervisor, training manager, or education/training office cannot answer regarding course enrollment, course material, or administrative issues, please contact Air University Educational Support Services at http://www.aueducationsupport.com. Be sure your request includes your name, the last four digits of your social security number, address, and course/volume number.

This volume is valued at 9 hours and 3 points.

NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then complete the unit review exercises.

Page

Unit 1. Nuclear Weapons History and the Career Field

ON AUGUST 15, 1945, Japan surrendered following the dropping of atomic bombs on two cities: Hiroshima and Nagasaki. This action shortened the war and greatly reduced the potential for further casualties since the US had planned to invade and land troops on Japanese soil. This remains the only time that nuclear weapons have ever been used in a time of war.

Of course, the employment of nuclear weapons shifted the global balance of power—America became a superpower. One outcome was the need to fully develop nuclear technology in order to deter aggression from any other (nuclear) superpower. This created a whole new community, not only in industry but in the government as well. We, as a career field, give the resulting nuclear technology our absolute attention. This unit covers recent events that are part of our history, the nuclear weapons community, and the 2W2 duties.

1–1. History, Operations, and Functions of Nuclear Weapons

Our purpose in this section is not to recount the conventional history presented in American history books, but to cover recent events that have directly shaped our career field. The lessons are about learning our responsibilities as noncommissioned officers, knowing whether it was the right call or not, and understanding the outcome of some bad choices, good choices, and, often, the choices that we should have made. As you begin your craftsman journey, never lose sight of our past as you step forward into a more responsible role as a supervisor and, more importantly, a leader with great responsibilities. We begin with a lesson that recounts two significant events that negatively impacted the proud heritage of our nuclear weapons community.

001. Continued history of nuclear weapons

Over the course of the last decade, the Department of Defense (DOD) has received credible reports of declining focus leading to an eroding nuclear enterprise. One of these occurred on 31 August 2007 when a B–52 aircraft, call sign "Doom 99," transported six inadvertently loaded nuclear warheads across the US.

The perfect storm

On 14 March 2007, Minot and Barksdale AF bases received a repositioning order (REPORD) directing the reposturing of preselected advanced cruise missiles (ACM).The reposturing task consisted of removing the warheads from selected ACMs and replacing them with nonnuclear tactical ferry payloads (TFP). The retrofitted ACMs were to be transported back to Barksdale AFB. The major commands (MAJCOM) directed that the nuclear-inert missiles be transported by B–52 aircraft in a process called *tactical ferry*, or tac ferry. The decision for using a tactical ferry as opposed to ground transportation was due, in part, to Air Force draw downs and the financial constraints faced by every military organization including the nuclear weapons community. Some of the reasons advocating for tactical ferry versus ground transportation were:

- Projected elimination by 1 July 2009 of personnel assigned to the 2W2X1 and 2M0X1 career fields. The reposturing program could not be accomplished without their involvement.
- Tactical ferry is a proven method for transporting ACMs and air-launched cruise missiles (ALCM).
- Tactical ferry mode would take less time; 8 months versus 24 months for completion using ground transportation.
- Ground shipment would require an additional 27,600 man-hours for the required extra handling and testing.
- Above all, the tactical ferry mode would save the Air Force $1.6M.

With an approved plan in place, executing the directive followed. The result was that on 30 August 2007, the Air Force inadvertently transported nuclear warheads from Minot AFB to Barksdale AFB in violation of AFI 91–111, *Safety Rules for US Strategic Bomber Aircraft*, and the MAJCOM commander's REPORD. One witness described this event as the "perfect storm" that could have been avoided. Little did this individual know that the warning systems that could have prevented this were either turned off, ignored, or never designed by the two air wing's supervision or leadership—a breakdown in training, discipline, supervision, and leadership.

From Minot to Barksdale

Figure 1–1 illustrates the procedures for moving a nuclear weapon or nuclear loaded ACM from a storage structure to tac ferry aircraft. The process illustrated in the figure is derived from existing instructions, checklists, and discussions with leadership in both bomber wings.

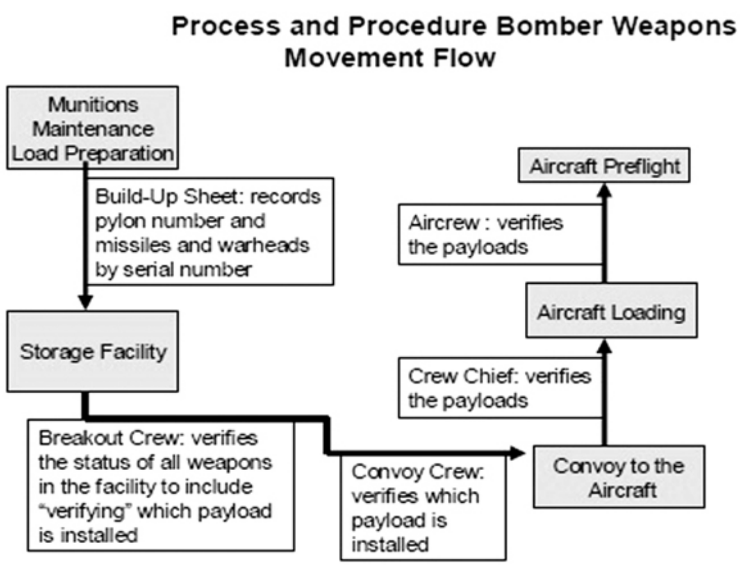

Figure 1–1. Bomber weapons movement flow.

Normally, a handling team is composed of an A-Lock, B-Lock, sole vouching authority, munitions close-in sentry (MCIS) and two tow drivers. Any time a handling team accesses a structure, they are required to perform a missile safe status check on the missiles before performing any maintenance or handling operation. These checks, which verify the type of payload each missile contains, requires using a flashlight to read the appropriate markings through a small, diamond shaped window. It also requires that the team verify that all missiles are not leaking jet fuel, inspect for any visible damages, indicate SAFE, and that nothing precludes further maintenance actions. Furthermore, the tow drivers are required to perform the same missile safe status check before hooking up the trailer to the pylon identified for transport. Once complete, the pylon is then transported to the aircraft where, again, the payloads are verified before the crew chief accepts the load. Once the payloads are verified and accepted, the load crew then follows the loading procedures for the missiles and checks the status of each missile after completing the load. Once the loading is complete the aircrew must check each weapon on each pylon to verify the payload in each of the missiles and the safety status of each missile before accepting the load. So what actually occurred?

The sequence of events started on 29 August 2007. Personnel of the 5th Munitions Squadron, in preparation for the day's movement, prepared two cruise missile pylons; each pylon was to be loaded with six TFPs ready for shipment to Barksdale AFB. Subsequently, Minot personnel changed the plan. In lieu of one of the planned pylon of missiles, they selected a pylon of missiles closer to the expiration dates for limited life components (LLC) to prepare and transport. Although this change was reflected on the movement plan, it was not reflected in the source documents produced by the scheduling process. The documents produced from this process and used in daily operation continued to list the originally scheduled pylons of ACMs. As a consequence, one of the originally scheduled pylons of cruise missiles was not prepared for tactical ferry and the remaining one still contained nuclear warheads. The Minot munitions control section issued a workorder to move the two pylons to the flightline and load the missiles on the aircraft. However, the munitions crew substituted one of the two pylons scheduled for reconfiguration with another in order to eliminate an upcoming periodic inspection on that pylon. But they did not formally coordinate the schedule change. When the handling team accessed the structure, they did not verify the status of the weapons which would have revealed that the ACMs still contained a nuclear warhead. Once the trailer was hooked up, it was transported to the flightline by the convoy team never suspecting that warheads accompanied them. According to routine procedures, the convoy team is to position the two loads of missiles in front of the left and right side of the B–52's nose to allow the load crews to back straight up to their respective wings for uploading. Instead, the convoy team unhooked the trailers and left the ACMs in front of the B–52 for the load team to complete the task of attaching the pylon-mated missiles to the aircraft. Upon arrival the load team is not required to check for the presence of a payload. However, when all pylons are attached to the B–52, they must complete a full missile systems check and then confirm that each and every missile is SAFE, which means that the ARM-DISARM device was checked for a SAFE indication (white "S" on a green background). Again, technical manuals do not require verifying the presence of a payload prior to loading.

During the early morning of 30 August 2007, the aircrew arrived at their aircraft to prepare it for the flight back to Barksdale AFB. Technical procedures require that both the radar navigator and navigator verify the status of the missiles during aircraft preflight inspections when dealing with nuclear weapons. Instead, only the radar navigator on "Doom 99" performed preflight inspections on the missiles. The radar navigator ignored the checklist requirements and only spot checked one missile on the right pylon. That missile contained the tactical ferry payload but the rest of the missile load was not checked. Although the requirements were partially complete, the aircraft departed Minot AFB for its Barksdale AFB destination. Once "Doom 99" arrived at Barksdale AFB, it was parked on the tarmac unguarded for 9 hours before the aircraft maintenance squadron arrived. When the Barksdale handling crew came to unload and transport the missiles to the storage area, they followed the checklist and performed the required missile safe status check. When checking the small access window, they discovered the presence of nuclear warheads. The crew immediately alerted Barksdale leadership.

Propellants that accelerated failure

Further analysis of the incident revealed that the catalyst for this failure began with the scheduling process. The suspected problems were the supervisors, mainly the NCOs and senior NCOs, who failed to do their assigned duties. They were the considered the "propellant that accelerated the wing's failure to meticulously track daily scheduled maintenance events." Bottom line, there was "too much trust and no verification." In other words, everyone believed the other was doing their job but made no attempt to verify the accuracy of the key information received. The take away of this entire situation is the catastrophic failure of supervisors and leadership to properly follow the requirements of the publications and technical orders (TO) that direct every facet of our actions. As craftsman technicians, one of our most important charges is to follow written guidance and procedures and *never deviate from them*!

Taiwan incident

Another highly publicized incident that shook the nuclear community again actually occurred before the Minot-Barksdale event; however it only came to light the following year. In August 2006, the Air Force mistakenly sent four classified forward sections used on the intercontinental ballistic missile (ICBM) instead of the helicopter batteries actually ordered by Taiwan. More critically, the nose cones contained fuses that are actually designed to trigger the Minuteman III intercontinental ballistic missiles.

Fuses vs. batteries

Twice a year, the Air Force directs a world-wide supply inventory using the computer-based process called the Readiness Based Leveling (RBL). In February 2005, the RBL inventory highlighted a requirement for 11 forward sections (fig. 1–2) of the mark (MK) 12 reentry vehicles used on Minuteman III ICBM at FE Warren AFB, Wyoming. Because the supply system identified only one forward section at FE Warren, it automatically generated a ship transaction for an additional 10 forward sections in order to bring the balance to 11. Four days later, an inexperienced item manager (IM) determined that FE Warren had too many MK–12 forward sections and directed FE Warren to ship the excess forward sections to the Defense Logistics Agency (DLA) at Hill AFB, Utah, because inventory indicated that FE Warren was overstocked. The FE Warren Traffic Management Office (TMO) prepared the forward sections for shipment. They placed the shipping documents inside the shipping container without following special packaging instructions (SPI) requirements and marking the exterior with the national stock number (NSN). On March 2005, the FE Warren TMO shipped the forward sections (fig. 1–3) by Air Express without notifying the DLA office that classified items were underway. Once the classified items arrived at Hill AFB, receiving personnel attempted to scan the shipping label to determine its NSN. However, the scanner failed to scan and Hill personnel relied on hazard classification for the nomenclature to determine the shipment contents. For unknown/undetermined reasons, the forward sections were erroneously identified as helicopter batteries and stored in an unclassified site instead of a secure area designed for storing classified components. During the entire process, the package was never opened for inspection of contents and shipping documents in order to verify that the contents matched the documentation. Additionally, no receipt was signed and returned back to the sender at FE Warren to indicate confirmation that shipment was received by Hill.

Figure 1–2. Forward section.

Figure 1–3. Packaged forward section.

Foreign sale

Over a year later in June 2006, Taiwan submitted a foreign military sale (FMS) request through the Army Security Assistance Command (ASAC) for four battery packs (fig. 1–4) used in H–1 helicopters. On 1 August 2006, personnel at Hill AFB took the forward sections labeled as helicopter batteries from storage and shipped the “requested batteries” to Taiwan by ship (fig. 1–5). In November 2006, the mistakenly classified packages thought to be batteries were received by the Taiwanese military and placed in their local storage site. A couple months later, in January 2007, Taiwanese officials opened all four packages and determined that they had received the wrong items. A discrepancy report was submitted to ASAC, who in turn notified the DLA IM to look up a particular national stock number. However, according to the database, the item in question was nonexistent. So, the DLA IM directed ASAC to dispose of the questionable items and that message was relayed to the Taiwanese officials. On March 2008, Taiwan replied to ASAC that the questionable items could not be disposed of because they were classified items. On 21 March 2008, the US Army immediately contacted the US Air Force and determined that ICBM forward sections had been mistakenly delivered to Taiwan and had gone undetected for almost 20 months.

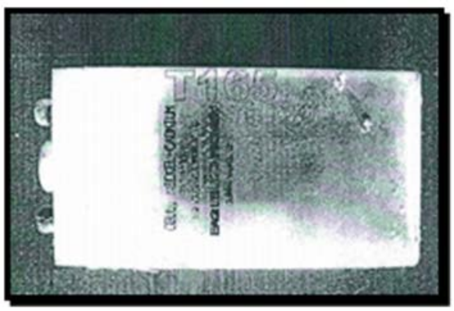

Figure 1–4. Helicopter battery.

Figure 1–5. Packaged helicopter battery.

Bigger impact

Sending the wrong item to any military organization is a mistake, but sending a classified item to a foreign nation can be dangerous. At the time of this event, Taiwan had recently started a cruise missile program in order to deploy satellites into space. This was evidenced by a successful test fire in March 2007 which indicated that Taiwan had the capability of striking major cities along the east coast of China. Although the intent of researching and building a space launch vehicle to deploy satellites seems credible and innocent, the idea that the same vehicle can be used as a ballistic missile with a different payload can prove even more dangerous.

002. Nuclear theory, operation, and function

Nuclear weapons depend upon the potential energy locked away inside the nucleus of *elements* such as uranium and plutonium. In this lesson we discuss some of the science of the atomic world.

Nuclear theory

For the purposes of this discussion, matter is composed of *atoms* that are made up of *electrons, protons,* and *neutrons.* In the atoms of the very heavy elements that serve as fissile material in nuclear weapons, the positively-charged protons and electrically-neutral neutrons (collectively known as *nucleons)* together form the enormously dense *nucleus* of the atom that is located at the center of a cloud of negatively-charged electrons. Electron interactions determine the chemical characteristics of matter while nuclear characteristics depend upon the composition of the nucleus. An element can be identified by the number of protons in an atom. For example, every atom with eight protons belongs to the element called oxygen and every oxygen atom has eight protons. There are 92 naturally occurring elements.

Atoms are electrically neutral when the number of negatively-charged electrons orbiting the nucleus equals the number of positively-charged protons within the nucleus. When the number of electrons is greater than or less than the number of protons in the nucleus, atoms are not electrically neutral and carry a net-positive or net-negative charge. They are then called *ions* that are chemically reactive and tend to combine with other ions of opposite net charge. When atoms are combined in molecules, they may share electrons to achieve stability of the electron shell structure.

The term *atomic number* describes the number of protons in a nucleus, and because the number of protons determines the element, each different element has its own atomic number. Atoms of different elements have different numbers of protons in their nuclei. The total number of protons and neutrons in an atomic nucleus is referred to as the *atomic mass.* Although all the nuclei of a given element have the same atomic number, they may have different atomic masses because they may contain different numbers of neutrons. Generally, differences in atomic mass do not affect the chemical properties of the different atoms because the numbers of electrons are the same. However, these differences do have profound effects on the nuclear stability of the different atoms. Atomic species that have identical atomic numbers but different atomic mass are called *isotopes.*

Radioactive decay

Some isotopes are unstable and have a well-defined timeline for *radioactive decay,* which is the process of nucleus breakdown and resultant particle and/or energy release. These are known as *radioisotopes.* Radioisotopes have several decay modes including alpha, beta, gamma, and spontaneous fission. The rate of decay is often characterized in terms of *half-life,* which is the amount of time required for half of a given amount of the radioisotope to decay; or *activity,* which is the number of decays that occur in a given time. Half-lives of different isotopes range from a tiny fraction of a second to billions of years.

Nuclear operation

The splitting apart of atoms, called *fission,* and the fusing together of atoms, called *fusion,* are key examples of nuclear reactions or reactions that can be induced in the nucleus. *Fission* occurs when an element with a very large nucleus, such as uranium, is split into smaller pieces. This may occur spontaneously or it may occur when a subatomic particle, such as a neutron, collides with the nucleus and imparts sufficient energy to cause fission. The fission that powers both nuclear reactors and nuclear weapons is typically the neutron-induced fission of isotopes of uranium (element 92) or plutonium (element 94).

Fusion occurs when two elements, each with a small nucleus, such as hydrogen, collide with enough energy to fuse two nuclei into a single larger nucleus. Fusion occurs most readily between nuclei with just a few protons, as in the isotopes of hydrogen (element 1 on the periodic chart).

Fission

During nuclear fission, a nucleus splits into two or more large fragments which are almost always *radioactive* (prone to radioactive decay). Fission releases a large amount of energy—millions of times more energy than the chemical reactions that cause conventional explosions. Fission may also liberate a small number of neutrons that can, in turn, cause other nuclei to fission—this is known as a *chain reaction.*

Criticality describes whether the rate of fission increases (supercritical), remains constant (critical), or decreases (sub critical) in a particular situation. In a highly supercritical configuration, the fission rate increases very quickly, which results in a very rapid release of energy and an explosion. For this reason, the fissile material in a nuclear weapon must remain subcritical until detonation is required. Criticality depends not only on the nature and quantity of the material, but also on its purity, shape, and density. Criticality also depends on the presence of moderators and reflectors, which are design factors that affect the number of neutrons available to cause fission.

Only a handful of isotopes can support a chain reaction. The most important of these *fissile* isotopes are uranium-235 (U^{235}) and plutonium-239 (Pu^{239}), neither of which occurs naturally in a usable form. Obtaining significant quantities of fissile material has historically been the greatest challenge to a country seeking to build nuclear weapons. Natural uranium consists of approximately 99.3 percent uranium-238 (U^{238}), approximately 0.7 percent uranium-235 (U^{235}), and very small amounts of other uranium isotopes. For use in weapons, the U^{235} fraction must be *enriched* relative to the more abundant U^{238} isotope. There are many enrichment processes, but all of them require significant technical expertise and energy.

Plutonium is another fissile material used in nuclear weapons, and does not occur naturally in practical quantities. Plutonium is produced in nuclear reactors when U^{238} nuclei absorb a neutron and become U^{239}. The resulting nuclei decay to Pu^{239}, which is the plutonium isotope desired for nuclear weapons. The plutonium must then be chemically separated from the other elements in the "spent" nuclear fuel, and extracted for use as fissile material for a nuclear weapon.

Fusion

In general, fusion may be regarded as the opposite of fission. Nuclear fusion is the combining of two light nuclei to form a heavier nucleus. For the fusion process to take place, two nuclei must be forced together by sufficient energy so that the strong, attractive, short-range, nuclear forces overcome the electrostatic forces of repulsion. Because the positively charged protons in the colliding nuclei repel each other, it takes a large amount of energy to get the nuclei close enough to fuse. It is, therefore, easiest for nuclei with smaller numbers of protons, such as the isotopes of hydrogen, to undergo fusion. One of the most important reactions of this type occurs between two isotopes of hydrogen, *deuterium* (H^2) and *tritium* (H^3), resulting in helium-4 (He^4) and a high-energy *free neutron*, which is a neutron unattached to a nucleus.

Design functions

A variety of names are used for weapons that release energy through nuclear reactions—atomic bombs, hydrogen bombs, nuclear weapons, fission bombs, fusion bombs, thermonuclear weapons, as well as physics package, warhead, and device. For this reason it is necessary to address terminology.

The earliest name for a nuclear weapon appears to be *atomic bomb* or *A-bomb.* This has been criticized as a misnomer because all chemical explosives generate energy from reactions between atoms. Specifically, when exploded, conventional explosives release chemical energy that had been holding atoms together as a molecule. Technically, a fission weapon is a "nuclear weapon" because the primary energy release comes from the nuclei of fissile atoms; it is no more "atomic" than any other weapon. However, the name is firmly attached to the pure fission weapon and well accepted by historians, the public, and by the scientists who created the first nuclear weapons.

Fusion weapons are called *hydrogen bombs* or *H-bombs* because isotopes of hydrogen are the principal components of the nuclear reactions involved. In fact, in the earliest fusion bomb designs, deuterium was the sole fusion fuel. Fusion weapons are also called *thermonuclear weapons* because high temperatures are required for the fusion reactions to occur. Because the distinguishing feature of both fission and fusion weapons is that they release energy from the transformations of the atomic nucleus, the best general term for all types of these explosive devices is *nuclear weapon.*

Gun assembly weapon

At the time of the detonation, some method must be employed to make the mass of fissile material supercritical by changing its configuration. Two general methods have been developed for quickly converting a subcritical mass into a supercritical one.

In the first method, two pieces of fissile material, each of which is less than a critical mass, are brought together very rapidly to form a single, supercritical mass. This gun-type assembly (GA) may be achieved in a tubular device in which an explosive is used to drive one sub critical piece of fissile material from one end of the tube into another sub-critical piece held at the opposite end of the tube (fig. 1–6).

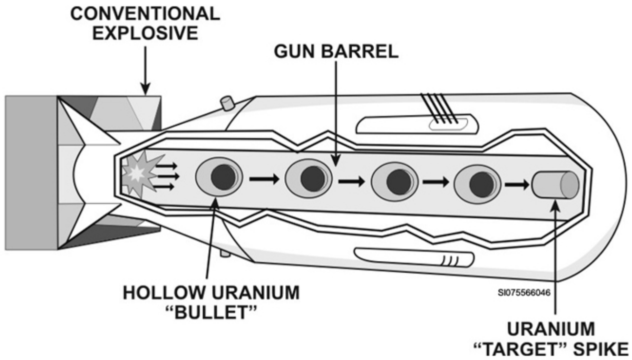

Figure 1–6. Gun type weapon.

When the two fissile components are brought together, they form one supercritical mass of fissile material capable of sustaining a multiplying chain reaction of fission events.

In general, the GA design is less technically complex than other designs, and it is the least efficient.

Implosion assembly weapon

In the second method, used to design an implosion-type assembly (IA) weapon (fig. 1–7), a subcritical mass of U^{235} or Pu^{239} is compressed to produce a super-critical mass capable of supporting a multiplying chain reaction. This compression is achieved by the detonation of specially designed high explosives surrounding a subcritical sphere of fissile material. When the high explosive is detonated, an inwardly-directed implosion wave is produced. This wave compresses the sphere of fissile material.

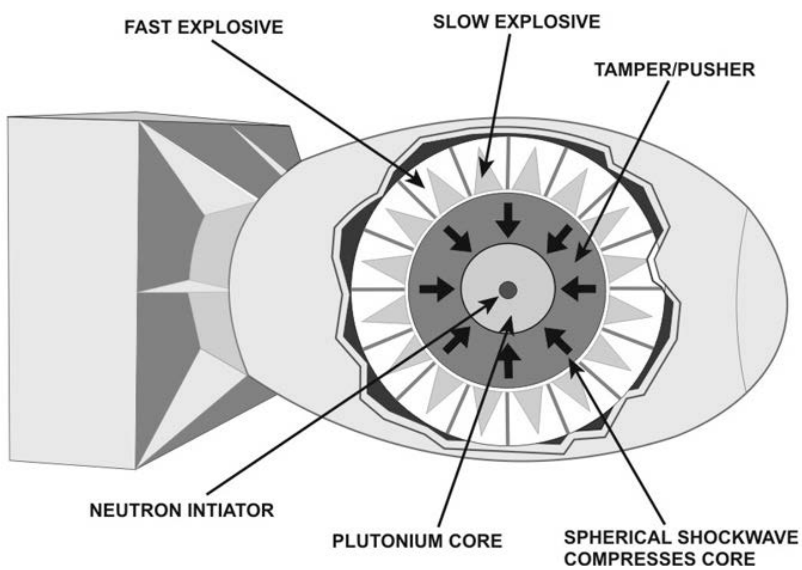

Figure 1–7. Implosion type weapon.

The decrease in surface-to-volume ratio of this compressed mass plus its increased density is then sufficient to make the mass supercritical because the fissile nuclei is much closer together, which increases the probability that any given neutron may cause a fission event while simultaneously decreasing the probability that a neutron may escape the critical mass rather than cause a fission event. In general, the implosion design is more technically complex than the GA design, and it is more efficient.

Boosted weapon

Efficiency and yield can be increased for a weapon of the same volume and weight when a small amount of material suitable for fusion, such as deuterium or tritium gas, is placed inside the core of a fission device. The immediate fireball, produced by the supercritical mass, has very high temperatures and creates enough heat and pressure to cause the nuclei of the light atoms to fuse together. A small amount of fusion gas (measured in grams) in this environment can produce a huge number of fusion events. Generally, for each fusion event, one high-energy neutron is produced. These high-energy neutrons then interact with the fissile material (before the weapon breaks apart in the nuclear explosion) to cause additional fission events that would not occur if the fusion gas were not present. This approach to increasing yield is called *boosting* and is used in most modern nuclear weapons to meet yield requirements while remaining within an overall size and weight limit. In general, the boosted weapon design is more technically complex than the implosion design, and it is more efficient.

Staged weapon

A more powerful and technically complex version of a boosted weapon uses fission and fusion in stages. In the first stage, a boosted fission device called the *primary* releases the energy of a boosted weapon, including a large number of X-rays. The X-rays produced by the primary stage compress the secondary stage, causing that material to undergo fusion, which releases large numbers of high-energy neutrons. These neutrons interact with the fissionable material to cause a large number of fission events produced by the secondary stage, and significantly increase the yield of the whole weapon. In general, the two-stage weapon design is more technically complex than the boosted weapon design, and the two-stage design can produce much larger yields.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

001. Continued history of nuclear weapons

1. What advantages did the tactical ferry have over the ground transportation?

2. What did the Air Force violate in transporting nuclear warheads across the United States?

3. What was the handling team supposed to do once they had access to the storage structure?

4. How did the handling team retrieve the wrong pylon?

5. Should the load team have discovered the presence of payloads *prior to* handling the ACMs?

6. What computer-based process began the steps to make balance adjustments of forward sections?

7. Why were the forward sections labeled as helicopter batteries at Hill AFB?

8. What should have occurred once the forward sections arrived at Hill AFB?

9. What command directed the Air Force to ship batteries to Taiwan?

002. Nuclear theory, operation, and function

1. The atoms of which elements serve as *fissile material* in nuclear weapons?

2. What does the number of *protons* in an atom identify?

3. What does the *atomic number* describe?

4. What is the *atomic mass*?

5. What is *half life*?

6. How long is the half-life of different isotopes?

7. Define *fission*.

8. Define *fusion*.

9. When does *fission* occur?

10. What are moderators and reflectors?

11. Name the two *most important fissile isotopes* that can support a chain reaction?

12. Why does it take a large amount of energy to get the nuclei close enough to fuse in the fusion process?

13. Define a free neutron.

14. Why are *fusion* weapons called *hydrogen* bombs?

15. Beside hydrogen bomb, what is another name used for *fusion* weapons?

16. What are the two general methods developed for quickly converting a subcritical mass into a supercritical one?

17. What type of nuclear weapon design is the *least efficient* and the *least technically complex*?

18. In an implosion-type assembly weapon, how is *supercriticality* achieved?

19. In a nuclear weapon, how can the *efficiency and yield be increased* for a weapon of the same volume and weight?

20. Name the approach used to increase the yield in a nuclear weapon.

1–2. Destructive Power of Nuclear Weapons

Today's nuclear warheads are smaller, lighter, and more efficient than the massive bombs that ushered in the Atomic Age. They can be deployed using a wide variety of weapons and delivery systems. Their output can also be tailored to increase their ability to destroy specific types of targets.

A typical nuclear weapon explosion generates extremely high temperatures. The remainder of the energy is released as kinetic energy, radioactive debris, and ionizing radiation. The primary products of a nuclear explosion are kinetic and internal energy and radioactive debris, gamma rays, neutrons, and thermally generated X-rays.

003. Effects of a nuclear weapon detonation

An explosion of any kind generates tremendous force by releasing a large amount of energy into a limited amount of space. This sudden release of energy increases the temperature and pressure of the immediate area to such a degree that all materials present are transformed into hot, compressed gases. As these gases seek equilibrium, they rapidly expand outward in all directions creating a shock wave or *blast wave* that has tremendous destructive potential.

Energy release from a nuclear explosion

The energy distribution percentages of nuclear weapons are also a function of weapon design, yield, and height of burst (HOB). The yield of a nuclear explosion is normally expressed in terms of an equivalent amount of conventional explosive. A 1 kiloton (kt) nuclear explosion releases the same amount of total energy as 1,000 tons (2 million pounds) of TNT or approximately 10^{12} calories of energy.

Both nuclear and conventional (chemical) explosions generate a shock wave. However, the energy produced in a nuclear explosion can be millions of times greater than the energy produced by the chemical reactions that cause conventional explosions. As a result, nuclear explosions give off considerably more energy in the form of heat and light than do conventional explosions.

For this reason, thermal radiation and blast energy constitute an appreciable amount of the energy released from a nuclear detonation. Accompanying the blast energy and thermal radiation is some amount of nuclear radiation given off within the first minute of the explosion. This initial nuclear radiation takes the form of X-rays, gamma rays, and neutrons. In addition to this initial or *prompt* nuclear radiation, the fission process within a nuclear detonation can create products such as weapon debris or fallout that can emit nuclear radiation for some time after the explosion. *Fallout* is the precipitation of radioactive particulate matter from a nuclear cloud down to the surface of the Earth. The amount of fallout is minimal if the fireball does not interact with the ground or a significant structure. However, if the fireball does come into contact with the ground or a significant structure, then the amount of fallout in the area of the detonation is very significant, and the area around Ground Zero and downwind remains highly radioactive and is a significant personnel hazard for weeks.

Residual nuclear radiation can also take the form of induced radiation. *Induced radiation* is caused when the neutrons that are produced during a nuclear detonation are absorbed by light metals in the soil or atoms in the air. Absorbing the neutrons creates a heavier radioactive isotope of the same element. This radioactive isotope gives off gamma radiation. If the detonation occurs on or near the Earth's surface, induced radiation creates a circular pattern around Ground Zero that can be highly radioactive for several days. The nature and intensity of the nuclear environment at any point around a nuclear explosion is a function of the type of weapon, its yield, the altitude of the explosion, and the target area. When the target and the explosion are both in the vacuum of outer space, the target is exposed primarily to thermal and nuclear radiation effects.

X-rays

The intensity of the X-rays, neutrons, gamma rays, and other forms of radiation reaching the target is only diminished by moving away from the radiation source (*the intensity decreases as the distance from the detonation increases*). When the target and the explosion are within the Earth's atmosphere, the *primary radiation products* (X-rays, neutrons, and gamma rays) interact with the surrounding air molecules where they are absorbed and scattered as they move out from the explosion. These interactions produce a variety of *secondary products* that include thermal radiation, air blast, secondary gamma radiation, and a pulse of electrical energy known as an *electromagnetic pulse*

(EMP). The X-rays are absorbed within a very short range; the neutrons and gamma rays travel considerably farther.

X-rays that are immediately absorbed by the air around the explosion heat the air to several tens of millions of degrees. This forms an expanding fireball that radiates ultraviolet rays, visible light, and infrared radiation. As the expansion of the fireball slows, a large portion of the energy deposited by the X-rays is released as a shock wave. This shock wave is joined near the edge of the expanding fireball by the debris shock wave from the exploding weapon, creating a composite shock wave. Initially, the *composite shock wave* moves away from the explosion at several times the speed of sound with overpressures above 1,000 pounds per square inch (psi). As the shock wave travels outward, the speed of its leading edge decreases to the speed of sound, and its pressure steadily decreases.

Neutrons and gamma rays

The primary neutrons and gamma rays also interact with the air surrounding the explosion, but many of them still manage to travel considerable distances before being absorbed or scattered out of the target line. Some of the primary neutrons interact with the air and generate secondary gamma rays. Gamma rays are also produced by the decay of the radioactive debris. The primary gamma rays interact with the air to produce *Compton electrons* that generate a localized electromagnetic pulse referred to as source region EMP (SREMP). In high-altitude bursts, the primary gamma rays interact with the upper atmosphere and, through the Compton Effect, generate high-altitude EMP (HEMP). The HEMP propagates down to the surface of the Earth affecting electronic systems over a wide area, which can extend to thousands of square kilometers in size.

Three principle categories

Thermal radiation, blast energy, and nuclear radiation constitute the three principal categories of nuclear effects used for targeting and defensive calculations within the US military. Blast energy accounts for approximately 50 percent, thermal radiation accounts for roughly 35 percent, and nuclear radiation accounts for about 15 percent of the total energy released in a nuclear explosion. A number of other effects such as EMP and transient radiation effects on electronics (TREE) may also occur as a result of a nuclear detonation. Keep in mind, however, that nuclear weapons effects vary significantly with the HOB and yield of the weapon.

Thermal radiation

Thermal radiation is electromagnetic radiation in the visible light spectrum. The proportion of thermal radiation increases rapidly with increasing temperatures. At the moderate temperatures attained in a conventional explosion, the amount of thermal radiation is relatively small. Because of the higher temperatures in a nuclear explosion, however, a considerable proportion of the energy is released as thermal radiation. Thermal radiation can ignite wood frame buildings and other combustible materials at significant distances from the detonation. Anything that casts a shadow including buildings, trees, and dust from the blast wave offers some protection from burns or ignitions to objects within the shadow. Any solid or opaque material between a given object and the fireball acts as a shield and provides more protection. Transparent materials, such as glass or plastic only slightly attenuate thermal radiation. Flash burns and flash blindness are also typical results of a nuclear detonation. *Flash burns* result from absorbing high intensities of thermal radiation and are most severe closest to the explosion. Flame burns are caused indirectly by fires from material ignited by the thermal radiation. *Flash blindness* results when people happen to be looking directly at the fireball. Temporary flash blindness occurs when people do not look directly at the fireball. Thermal radiation is extremely lethal and may be responsible for the largest number of casualties in exposed people on a clear day. The thermal heating can drive temperatures up to 3,270°F or more at 3,200 feet away from the blast. This heat softens exposed structures and increases their susceptibility to the blast wave. For these reasons, thermal radiation from a nuclear detonation presents a clear threat to people, buildings, and equipment.

If equipment is expected to survive at some distance from a nuclear detonation, it must be designed to survive the nuclear thermal radiation and to minimize the synergistic effects of the air blast. Thermal hardening can be achieved with protective enclosures, proper material selection, and thermal protective coatings. Thermal protective coatings include intumescent coatings that swell and char when exposed to flame as well as ablative paints that act like a melting heat shield. Temperature-sensitive metals like aluminum should be avoided in favor of less sensitive materials like steel. Higher-temperature resins should be used in forming fiberglass structures. Light colors and reflective paints should be used to reduce the absorbed energy, and the use of combustible materials should be minimized. In addition, items prone to melting such as rubber gaskets, O-rings, and seals should be protected from direct exposure.

Blast and shock

Blast and shock account for most of the material damage in a nuclear explosion. As stated earlier, approximately 50 percent of the energy released in a nuclear explosion is attributed to blast and shock. A shock wave is characterized by a rapid rise in pressure, temperature, and density at its front accompanied by a steady decrease of these parameters in its wake. The pressure immediately behind the shock front is referred to as the *peak overpressure* and is the parameter used to characterize a shock wave. The peak overpressure is measured in psi above ambient pressure at sea level. The positive duration of a nuclear shock wave at a target is a function of both the distance from the target to ground zero and the explosive yield of the weapon. The duration of the positive phase from a large-yield weapon may be several seconds long. The shock front is followed by a blast of wind. The velocity of the wind reaches its maximum just behind the shock front and steadily decreases in the wake of the shock wave. The force exerted on an object by the wind is called the *dynamic pressure.* As the shock wave sweeps over, objects in the path experience an overpressure as well as a drag force from the blast of wind. The primary effect of air blast is structural damage resulting from crushing, collapse, bending, breaking, or rollover.

Shock is also induced by the air blast and can be transmitted to equipment and people inside the target area. Exposed equipment must be structurally hardened to survive the effects of air blast. Most blast hardening involves using more robust designs, stronger materials, and stronger structural members. Housing in a protective enclosure may also harden equipment. For example, radomes are frequently used to protect radar antennas from air blast. When this technique is used, the enclosure must be designed to survive at the required levels and the protected equipment must be mounted so that it survives the air blast-induced shock. Streamlining targets to reduce the drag force can minimize the effects of dynamic pressure. Rollover can be prevented by using tie-downs and by lowering the center of gravity in vehicles.

Underwater shock

A nuclear explosion underwater generates a shock wave in water similar to a shock wave in the air. The water shock wave is characterized by a sharp raise at its front and by a much slower rate of decay in its wake when compared to the wake of an air shock. The water shock wave can also be distorted by surface and bottom reflections. Under normal conditions, the primary shock front is quickly followed by a surface reflection wave that acts to cut off the primary shock. The cut off is often followed by the arrival of shock waves from the bottom. The intensity and shape of the shock wave at the target is a function of weapon yield, the depth of the water and the explosion, the bottom conditions, and the distance as well as the position of the target. Shallow bottom interactions may reinforce the shock effect. Surface interaction generally mitigates the shock effect. Equipment must be designed and mounted to protect it from shock damage over the specified shock spectra. Ruggedized design and shock mounts are normally used to harden equipment against shock.

Ground shock and cratering

Ground shock is generated by subsurface, surface, and near-surface bursts. The ground shock wave can travel considerable distances and can impart acceleration forces to ground-based equipment and structural damage to underground facilities and structures. The requirements to protect equipment from shock induced forces are somewhat similar to those used for underwater shock. Hardening measures are much the same; however, the direction of the shock and the different shock spectra may require adjustments to the general techniques used for shock mitigation. Ground shock is produced by two primary mechanisms: directly coupling energy to the ground in the area of Ground Zero and pressure from the air blast as it travels over the surface. Ground shock is transmitted through the ground downward and outward. For a low air burst or a near-surface burst, the air blast pressure at the surface (*airslap*) damages surface structures and causes a shock wave that is transmitted to shallow depths beneath the surface. This shock wave creates most of the stress experienced by shallow underground structures outside the crater area.

Explosions on or near the ground surface form displacement craters, which are created when soil is vaporized, displaced, or compressed. The effect varies with yield and depth of burst. Soil is vaporized, carried up into the fireball, and then eventually appears as fallout. Considerable material is displaced or thrown out by the air blast. Some of these materials fall back into the crater but most of the remainder forms the lip of the crater. The huge pressure from the detonation also compresses the soil.

Deeply buried targets are attacked most effectively with a shallow, subsurface nuclear detonation using an earth-penetrating warhead. In this case some or most of the energy, that would have formed a shock-wave of air had the detonation been above the surface, "couples" with the material on the surface and under the ground, producing a "reflection" that reinforces the ground shock. This reinforced ground shock travels away from the detonation producing a fracture, or *rupture zone,* which extends significant distances into the ground. Because of this effect, underground structures may be damaged at significant distances from the detonation.

Nuclear radiation

Nuclear radiation is ionizing radiation that consists of neutrons, alpha and beta particles, as well as electromagnetic energy in the form of gamma rays capable of producing ions (electrically charged particles) directly or indirectly in its passage through matter.

Gamma rays are high-energy photons of electromagnetic radiation with frequencies higher than visible light or ultraviolet rays. Neutrons are produced from fission and fusion events. Gamma rays and neutrons travel great distances out from the fireball. In less than 1 minute after detonation, the initial radiation consists mainly of neutrons and gamma rays. As the neutrons travel though the air, they lose energy in collisions with air molecules. These collisions may produce gamma rays called *secondary gamma rays. Radioactive fission fragments* or *fission products* are also produced in a nuclear explosion. The radioactive decay of these fission products starts immediately after the burst and produces alpha particles, beta particles, as well as gamma rays.

Ionizing radiation is detrimental to the human body and can cause fatalities. It is the fundamental radiation harmful to humans primarily because it damages cellular DNA. Adverse physiological effects, including death, can result. The degree of damage is related to the level of exposure and can range from developing additional wrinkles; to increased risks of cancer; to radiation sickness (nausea, vomiting, fatigue, weakness); to death immediately or soon after very high levels of exposure. Adults in good health exposed to an acute exposure exceeding 600 rems of ionizing radiation would experience serious illness and, in a great majority, death could occur within a few weeks. If a similar group were exposed to 200 rems, most of them would likely suffer severe, but rarely fatal, radiation sickness. Nuclear radiation can be divided into *initial* and *residual* radiation.

Initial nuclear radiation

Initial nuclear radiation is the radiation produced within the first 60 seconds after a nuclear detonation and generally consists of alpha and beta particles, gamma rays and neutrons, as well as X-rays. Normally, when the weapon yield is large, the yield of the initial nuclear radiation is also large. Alpha particles have an extremely limited range in the air, little ability to penetrate the skin, and are of minor significance unless they are inhaled or ingested. X-rays are rapidly attenuated in the air but their effects do not dominate in the lower regions of the atmosphere. On the other hand, neutrons and gamma rays have a long range in the air and are highly penetrating. Beta particles are much less penetrating than gamma rays; however, a beta-emitting substance ingested or deposited on the skin can be extremely harmful.

In a standard fission weapon detonated at or near the ground, approximately three percent of the total energy generated from a nuclear explosion is initial nuclear radiation. Gamma radiation is the most difficult to shield; it is the main cause of radiation casualties, along with neutrons, and it is the major radiation dosage received from radioactive fallout.

Residual nuclear radiation

Residual nuclear radiation is defined as radiation that is emitted later than 1 minute after the instant of the explosion. It consists chiefly of beta particles and gamma rays. The radiation is emitted mainly by fission products and other bomb residue in the fallout or neutron-induced radioactive isotopes and it can persist for some time following a nuclear explosion. Early fallout occurs within the first 24 hours and delayed fallout occurs days to years following a nuclear explosion. Fallout patterns vary with terrain, wind speed, and direction. The biological effects of residual nuclear radiation are similar to those caused by initial nuclear radiation. The beta, gamma, and neutron effects of residual nuclear radiation are similar to those defined for initial nuclear radiation.

Electromagnetic pulse

X-rays, gamma rays, and neutrons produced by a nuclear detonation are major threats to the survival of military systems because they ionize material, generating an electric charge. The alpha and beta particles produced during a nuclear explosion are not as serious of a problem for most combat systems because of their inability to penetrate material. The ionizing radiation effects on electronics are collectively known as TREE.

EMP is a time-varying electromagnetic radiation which is characterized by a sharp pulse through a very broad spectrum of frequencies but mainly in the long wavelength region. The intense electric and magnetic fields produced can damage unprotected electronic equipment such as communication systems and radar over a large area. Antennas and telephone wires may carry the pulse to even greater distances. During a high-altitude burst, the interaction of prompt gamma rays with the upper atmosphere produces a large EMP source that transmits a high-intensity, high-altitude EMP towards the surface of the Earth. This can generate significant field strengths over a continental sized area. EMP cannot efficiently penetrate metal enclosures the way that gamma rays and neutrons can; therefore, using well-maintained metallic shields without openings to form a barrier provides electronics with protection against EMP. Without shielding, EMP induced signals can effectively penetrate through any point of entry.

The voltage and currents induced by the EMP can be conducted into equipment where they electrically upset circuit function and burn out sensitive components. The induced currents and voltages generated on equipment cables by the EMP vary with the cable and equipment configuration. Typical surge-protectors or power strips used at home or in the office are useless against EMP. These devices are designed to protect equipment from electrical surges caused by lightning but they cannot defend against the pulse generated by a nuclear detonation because it is thousands of times faster (of shorter duration) than the pulse of lightning.

The primary objective of EMP hardening is to reduce the electrical pulse entering a system or piece of equipment to a low enough level to prevent component burnout or operational upset. This is normally accomplished with radio frequency (RF) shielding and shielded enclosures, good grounding practices, and shielded cables.

Transient radiation effects on electronics

A nuclear detonation causes transient initial nuclear radiation, specifically gamma rays and neutrons, which can affect electronics systems and associated circuitry including radios and computers. Although the initial nuclear radiation may pass through material and equipment in a matter of seconds, it can cause significant or permanent damage to those systems.

There are two situations where TREE consequences are most significant. The first is in the event of a high-altitude burst, where space systems may receive large doses of prompt, initial nuclear radiation in the form of gamma rays and neutrons. The second is following a low-yield surface or near surface (low air) burst when the gamma rays and neutrons can reach targets not damaged by blast and thermal radiation.

Gamma rays travel at the speed of light toward their target and can induce stray currents of electrons. The movement of these free electrons can generate harmful electromagnetic fields similar to EMP. In contrast, neutrons are larger particles that are heavier than electrons, and they travel 10 to 70 percent of the speed of light. Neutrons penetrate matter and can collide with electronic materials such as silicon to damage its crystal (chemical) structure and change its electrical properties. While all electronics are susceptible to the effects of TREE, smaller, solid-state electronics, such as transistors and integrated circuits, are most vulnerable to these effects.

004. Safety features of nuclear weapons

A nuclear weapon must be designed to withstand extreme conditions, such as impact and fire, without detonating its nuclear payload. As such, a variety of safety and control features are built into weapons in an effort to prevent detonation in an accident or at the hands of an adversary.

The most sophisticated of the early safety and control systems, environmental detection sensors (EDS) demanded that the weapon undergo the expected sequence of physical motions before the warhead is completely armed. Many weapons use environmental sensing as both an interlock and a fuse. For instance, a gravity bomb may arm only if it first reaches a specified altitude, then begins freefall, and subsequently detonates once it reaches a different altitude or experiences a sudden deceleration. Modern weapons are designed both to withstand the severe environments which may accompany an unintended release or crash, and to thwart the efforts of the most determined and technologically sophisticated adversary.

Nuclear weapons systems safety

Nuclear weapons systems safety addresses two primary concerns: an unintended nuclear detonation and the dispersal of radioactive material. The first concern is paramount in the conduct of safety activities because the consequences of an accidental nuclear weapon detonation are potentially catastrophic. Notably, an accidental or unintended nuclear detonation has never occurred in the entire history of the US nuclear weapons program. However, several significant radioactive material dispersal accidents have occurred. These accidents spread radioactive material through a chemical explosion of the conventional high explosive within the warhead.

The DOD and National Nuclear Security Administration safety programs

In the early 1960s, the DOD and the Department of Energy (DOE) established separate safety standards for their nuclear weapons operations that closely paralleled each other. DOD safety standards are located in DOD Directive (DODD) 3150.2, *DOD Nuclear Weapons Systems Safety Program.* In 1997, the DOE revised its standards through DOE Order 452.1B, *Nuclear Explosive and Weapon Surety Program,* to emphasize its responsibilities for nuclear explosive operations. The DOD and National Nuclear Security Administration (NNSA) standards continue to share many similarities.

Enhanced nuclear detonation safety

Enhanced nuclear detonation safety (ENDS) involves the incorporation of nuclear safety principles such as *isolation, inoperability, incompatibility,* and *independence.* This feature also involves *exclusion region* concepts that use physical barriers, weak links and strong links, as well as environmental sensing devices that respond to unique signal stimuli and discrimination.

Nuclear weapons design criteria were formally established in 1962 and specify that if a nuclear weapon is involved in an accident (abnormal environment), the probability of the weapon producing a nuclear yield is less than one in one million (1 in 10^6). The current design method for achieving this in an abnormal environment is to use the *weak-link and strong-link exclusion region* principle coupled with the inherent *one point safety* of the physics package. One point safety requires that if a warhead experiences a high explosive (HE) detonation at a single point on its outer surface, the resulting nuclear energy is less than the equivalent of four pounds of trinitrotoluene (TNT).

Safety-critical components are encased in an exclusion region that provides electrical isolation as well as resistance to abnormal environments (fig. 1–8). Electrical access to the exclusion region is controlled by strong links, which can only be activated with unique codes transmitted by the weapon system crew members and the environmental sensing devices.

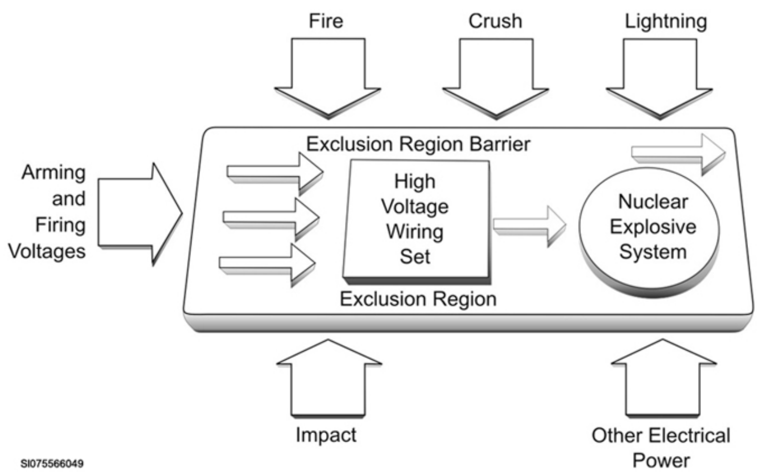

Figure 1–8. Isolation.

The strong-link switches are cased in high-strength steel and high temperature-resistant insulation materials. Coupled with special design actuation mechanisms, these features make sure of electrical isolation between input and output terminals in abnormal environments resulting from a fire or a crash, for example (fig. 1–9).

During such an event, it is possible that stray electrical signals may be applied to the strong-link terminals *outside* the exclusion region. This can happen because it is impractical to make every weapon system circuit that is outside the exclusion region resistant to abnormal environments.

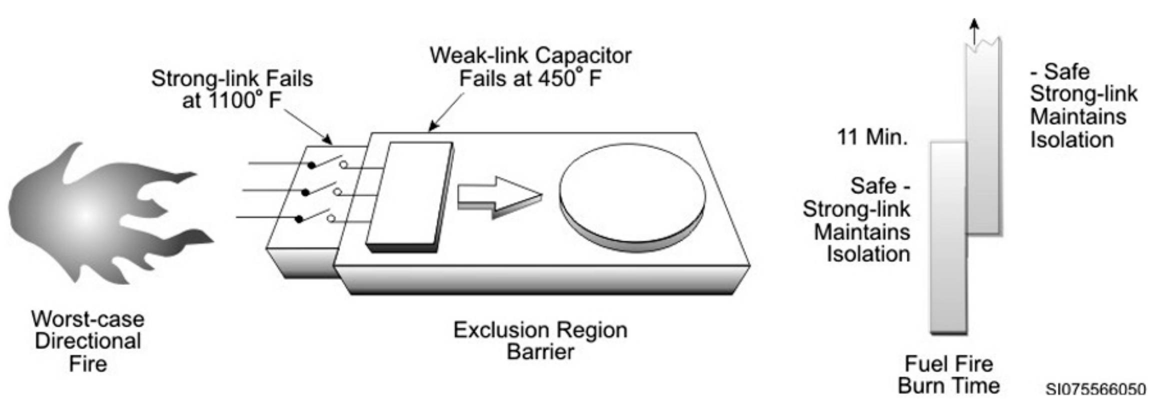

Figure 1–9. Inoperability.

Arming a nuclear weapon with ENDS requires producing the unique arming signal, assuming additional interlocks such as permissive action link (PAL) have already been unlocked. Like PAL, the ENDS isolation scheme is designed to make detonation of a nuclear weapon physically impossible until the proper arming sequence has occurred (fig. 1–10).

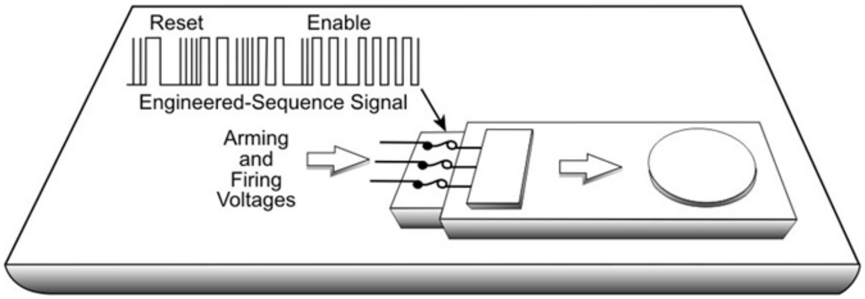

Figure 1–10. Incompatibility.

ENDS mechanisms, therefore, are designed to disconnect or separate components necessary for detonation until the weapon is armed. As a result, ENDS functions for both control and safety; by causing physical changes within the bomb, this implementation severely reduces the likelihood of an accidental nuclear detonation, but it also makes the use of a weapon without the proper PAL access codes and unique signals effectively impossible. It is important to realize, however, that strong links are first and foremost safety devices, designed to make detonation in atypical environments impossible.

Insensitive high explosive

Another feature of nuclear weapons design safety is the use of insensitive high explosive (IHE) as opposed to conventional HE. IHE is highly resistant to accidental detonation and represents a great advance for plutonium scattering safety.

Fire resistant pit

A third feature of nuclear weapons design safety is the fire resistant pit. In an accident, plutonium (Pu) can be dispersed if it is aerosolized by intense heat, such as ignited jet fuel. To prevent this, the nuclear weapon pit can be designed with a continuous barrier around it such as a metal shell with a high melting point. This barrier contains the highly corrosive, molten Pu for a period of time sufficient to extinguish the fuel fire. Since such a safety mechanism is only serviceable if the conventional explosives do not detonate. Fire resistant pits are intended for use with insensitive high explosives which should not detonate in a fire.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

003. Effects of a nuclear weapon detonation

1. What are the *primary products* of a nuclear explosion?

2. What affects the energy distribution percentages of nuclear weapons?

3. A one kiloton nuclear explosion releases the same amount of energy of how many tons of TNT?

4. The energy produced in a nuclear explosion can be how many times greater than the energy produced in a conventional explosion?

5. In a nuclear detonation, what constitutes an appreciable amount of energy released?

6. What is *initial* nuclear radiation?

7. Define fallout.

8. What affects the amount of fallout from a nuclear explosion?

9. How is *induced radiation* caused?

10. The X-rays that are immediately absorbed by the air around a nuclear explosion heat the air to what temperature?

11. What does the expanding fireball *irradiate*?

12. Initially how fast does the composite shock wave move away from the explosion?

13. What three categories are used within the US military for targeting and defense calculation?

14. What is the percentage of blast, thermal, and nuclear energy released in a nuclear explosion?

15. Electromagnetic radiation in the visible light spectrum is defined as what?

16. During a nuclear explosion what can *thermal radiation* cause?

17. When do *flash burns* result?

18. Describe the difference between flash blindness and *temporary* flash blindness?

19. How may thermal hardening be achieved?

20. How is *peak overpressure* measured?

21. What is the positive duration of a shock wave from a large yield weapon?

22. Name the primary effects of air blast.

23. How is *ground shock* generated?

24. Ground shock is produced by what two primary mechanisms?

25. How are deeply buried targets most effectively attacked?

26. What is *nuclear radiation*?

27. What are gamma rays?

28. How far can gamma rays and neutrons travel from the fireball?

29. Why is ionizing radiation detrimental to the human body?

30. Nuclear radiation can be divided into what two types of radiation?

31. What does *initial radiation* generally consist of?

32. Which radiation is the most difficult to shield from?

33. Define *residual radiation*.

34. What affects the fallout pattern?

35. Define EMP.

36. What can EMP induced voltage and currents do to *unshielded* equipment?

37. Why can’t typical surge protectors or power strips protect against EMP?

38. How is EMP *hardening* normally accomplished?

39. Which electronic equipment is the most susceptible to TREE?

004. Safety features of nuclear weapons

1. Why is a variety of safety control features built into nuclear weapons?

2. What do environmental detection sensors demand?

3. Nuclear weapon safety systems address what two primary concerns?

4. Has an accidental or unintended nuclear detonation ever occurred in the history of the US nuclear weapons program?

5. When did the DOD and DOE establish safety standards that closely parallel each other?

6. List the safety principles that ENDS incorporates.

7. Nuclear weapon design criteria established in 1962 specify what about a nuclear weapon involved in an accident?

8. What does one point safety require?

9. What are strong-link switches encased in?

10. Is it possible for stray electrical signals to be applied to the strong-link terminals *outside* the exclusion region during an abnormal environment like a crash or fire? Why?

11. What does arming a nuclear weapon with ENDS require?

12. What are ENDS mechanisms designed to do?

13. List a characteristic of IHE.

14. Is a fire resistant pit in a nuclear weapons design considered a *safety feature*?

15. In an accident, how can plutonium be aerosolized?

16. To preclude detonation fire, resistant pits are intended to be used with what?

1–3. Nuclear Weapons Community

The nuclear weapons community plays a vital role, aiding in accomplishing US national security objectives. In doing so, nuclear technology was fully developed in order to deter aggression from any other attacker—especially those having nuclear weapons. This created a community not only in industry but also in the government as well. The lessons in this section cover that community and how it functions.

005. Department of Energy

The DOE is the major government agency responsible for the research, design, development, production, stockpile surveillance, and transportation of nuclear weapons and/or components. DOE has its headquarters in Washington DC. Government-owned, contractor-operated production plants were established in several locations throughout the country. These plants were constructed during the initial stockpile buildup from the 1940s through the 1960s. DOE is also involved with several national laboratories such as Los Alamos, Lawrence-Livermore, and Sandia National Laboratories (SNL).

The NNSA

The NNSA is a semiautonomous agency within the US DOE that is responsible for enhancing national security through the military application of nuclear science. The NNSA also maintains and enhances the safety, reliability, and performance of the US nuclear weapons stockpile, including the ability to design, produce, and test in order to meet national security requirements. It works to reduce global danger from weapons of mass destruction (WMD), provides the US Navy with safe and effective nuclear propulsion, and responds to nuclear and radiological emergencies in the US and abroad. The NNSA has inherited the DOE stockpile stewardship role which includes:

- Manufacturing, maintaining, refurbishing, surveillance, and dismantling the nuclear weapons stockpile.
- Research, design, development, simulation, modeling, and nonnuclear testing of nuclear weapons.
- Stockpile planning, assessment, and certification of safety and reliability.

The DOE's Office of Secure Transportation (OST) is responsible for transporting special nuclear materiel within the US using specially constructed safeguards transporters (SGT).

These vehicles are designed with special deterrent and denial measures as well as safety features that provide a high resistance to fire and crash damage. Highly trained and armed federal officers (couriers) accompany all highway shipments. During these shipments, high-frequency security communications systems maintain continuous, reliable contact between the shipment and a control center located in the OST complex.

006. Department of Defense

As we mentioned above, DOE is the key player in the production and testing of nuclear weapons and components. In this lesson, we focus on DOD's interaction with the DOE and DOD's role in the nuclear weapons community.

Because DOD is an immense organization encompassing many agencies, our discussion will focus on the main agencies that deal with nuclear weapons programs. DOD is responsible for the weapon design parameters, routine maintenance of nuclear weapons, and shares control of nuclear weapons with the DOE.

Defense Threat Reduction Agency

Defense Threat Reduction Agency's (DTRA) work covers a broad spectrum of activities that range from shaping the international environment in order to prevent the spread of weapons of mass destruction, to responding to military requirements to help the US deter, withstand, prevail against and recover from the use of such weapons, as well as preparing the warfighter to counter the full spectrum of future WMD threats.

The DTRA provides operational and analytical support for critical nuclear and other WMD defense matters to DOD and other organizations. It is responsible for the Defense Department's stockpile stewardship duties and provides technical support for all nuclear weapons in DOD custody. Agency personnel assist and support the development and publishing of DOD standards, requirements, and operational procedures dealing with reliability, safety, security, use control, logistics management, and disposal of nuclear weapons or components. The nuclear support role also includes emergency response for matters involving WMD and radiological events. The Agency operates the DOD Joint Nuclear Accident Coordination Center and the Defense Nuclear Weapons School, and conducts independent nuclear surety inspections of units responsible for assembling, maintaining, and storing nuclear weapons systems and components. Additionally, DTRA serves as the DOD's focal point for the research, development, testing, evaluation, and production of radiation-resistant microelectronics, materials and electro-optics, and for the integrated hardening of such components against the full spectrum of ionizing radiation and electromagnetic threats.

Higher headquarters

The Air Force's nuclear weapons responsibilities are assigned to the Deputy Chief of Staff for Logistics, Installations and Mission Support, Directorate of Logistics, Nuclear Weapons, Munitions and Missile Maintenance Division (AF/A4LW). AF/A4LW is responsible for logistics plans and policies and is the Air Force lead for conventional and nuclear munitions, armament maintenance, ICBM, air-launched missile, space-launch maintenance, and munitions information systems.

Air Force Higher HQ Nuclear Weapons Responsibilities	
Component	**Description**
AF/A4LW Air Force career field managers	The Air Force's A4LW career field managers (AFCFM) develop munitions, nuclear, missile maintenance, and armament systems policy. They perform duties related to force development including the accession, education and training, retention, and optimum utilization of the active duty, Air Force Reserve, Air National Guard, and civilian workforce. The AFCFMs work with members of the Office of the Secretary of Defense, AF Secretariat, Air Staff, and MAJCOMs to develop and present AF positions on munitions, nuclear, missile, and armament maintenance training, and personnel management issues. The AFCFMs also conduct the utilization and training workshops (U&TW), develop career field education and training plans (CFETP), and ensure formal courses are developed to meet field requirements.
AF/A4LW functional area manager	The functional area manager (FAM) develops sourcing, sequencing, prioritization, and posturing guidance for the 2W, 2M, and 21M communities; develops, manages, maintains, and identifies resources to fill aviation, space, and missile unit type codes (UTC). This activity ensures the Air Force capabilities defined within mission capability statements in associated UTCs are viable.
Assistant Chief of Staff, Strategic Deterrence and Nuclear Integration	The Assistant Chief of Staff, Strategic Deterrence and Nuclear Integration (AF/A10) is responsible for sustaining the focus on nuclear operations, policy, plans, requirements, strategy guidance, integration and synchronization of the nuclear enterprise.

MAJCOMs

The MAJCOM oversees nuclear weapons employment, maintenance, and storage activities. MAJCOMs assist with weapons system sustainment activities and provide all planning agencies with current information on weapon availability, compatibility, and capability. They coordinate technical support and provide guidance on maintenance issues beyond unit capabilities. In addition, MAJCOMs will:

- Ensure weapon and equipment resources are managed to comply with operational testing, DOE quality assurance and reliability testing (QART), and all Air Force testing programs.
- Forward LLC expiration date extension requests, weapons maintenance delay waivers that exceed timelines, early LLC maintenance requests that exceed timelines, and unsatisfactory report (UR) or deficiency report (DR) repair action delays to the Air Force Nuclear Weapons Logistics Division. Ensure LLC expiration date extension requests are clearly justified to warrant extension or delay. They also ensure maintenance delay waivers and UR/DR repair action delays contain scheduled completion dates.
- Identify unit taskings in the maintenance capability letters (MCL). MCLs identify all weapons maintenance capabilities including day-to-day mission requirements, unique certifiable tasks to support contingencies, and/or reconstitution taskings.
- Ensure units develop and implement standardized training outlines for all certifiable tasks, component packaging, H1616, and chaff operations. This includes the nuclear weapons training program (NWTP) course curriculum and tests to ensure consistency between units.

Air Force Nuclear Weapons Center

The Air Force Nuclear Weapons Center (AFNWC) oversees the Air Force nuclear weapons stockpile, stewardship, including AF requirements, program planning, system development, and stockpile life extension and sustainment programs. The AFNWC also provides support for reentry systems (RS), gravity weapons, warheads, cruise missiles, and weapons storage and security system (WS^3). Finally, it serves as the primary point of contact on matters pertaining to weapons development and resolution of weapons maintenance issues.

Missile Sustainment Division

The Missile Sustainment Division is the cruise missile and ICBM program office. It provides status to the AFNWC and the Air Force Materiel Command (AFMC) on nuclear issues in work or requiring resolution including sustainability of current programs in use by the field. It also provides the AFNWC Nuclear Weapons Logistics Division with disposition instructions for DOD-designed items requiring evaluation based upon their interface with DOE designed items. Disposition instructions must be included with any UR or DR response.

Nuclear Weapons Logistics Division

The AFNWC Nuclear Weapons Logistics Division is the service logistics agent for all nuclear weapons assigned to the Air Force. Also, it represents the Air Force as a member of the Nuclear Reports Management Group. Additionally, it will:

- Ensure weapons stockpile quantities align with the nuclear weapons stockpile memorandum (NWSM), and are available to meet operational mission requirements. It also directs charge code changes through either the Nuclear Ordnance Shipping Schedule (NOSS) or other means. And it is authorized to direct additional necessary inspections and maintenance of nuclear weapons and/or components, within the scope of approved technical procedures, as necessary to ensure availability of weapons to meet operational requirements, logistics plans, and other stockpile management requirements.
- Manage the stockpile flight test (SFT) selections and provide stockpile lab test (SLT) candidates to NNSA as required.
- Develop fiscal year LLC forecasts and provide DTRA with AF requirements including retrofit requirements.
- Fund procurement and transportation for military spares and type-3 trainers and special equipment.

- Serve as the focal point for the nuclear accountability and reporting section (NARS) support; provide units and MAJCOM assistance; and coordinate with DTRA and NNSA, as required, to resolve nuclear management, technical, and sustainment issues.
- Provide TO, supply support, test and handling equipment, and training devices.
- Ensure weapon trainers are serviceable and in the latest configuration that includes funding requests for procurement of parts for fielded trainers, refurbishments, and unique nuclear support and test equipment. It also develops life cycle plans for trainers and coordinates with applicable MAJCOMs on availability of trainers for shipment to Kansas City Plant (KCP) for repair/refurbishment. Lastly, it ensures that trainers under its control are inspected, maintained, and repaired.
- Serve as the focal point for code management system (CMS) development, procurement, and support. Provide DOD repair activity for Use Control equipment.
- Serve as the Air Force’s single point for managing and coordinating nuclear weapons and associated equipment material defects and deficiency UR program. It collects, disseminates, and resolves issues concerning unsatisfactory conditions and forwards corrective actions to units and MAJCOMs. It also approves or disapproves UR/DR repair action delay requests and forwards the approval or disapproval to the requesting unit and MAJCOM.
- Coordinate with applicable organizations to provide support and guidance on maintenance issues beyond unit capability.
- Publish a monthly time change item/support schedule. This schedule identifies LLC component/support kits scheduled for delivery to each unit.
- Approve or disapprove weapons maintenance delay or early LLC maintenance requests and forwards the approval or disapproval to the requesting unit and MAJCOM. It also approves or disapproves LLC extension requests and forwards approved requests to DTRA for approval by NNSA.
- Serve as the Air Force executive agent and single point of contact for managing and coordinating change proposals affecting Joint Nuclear Weapons Publication System (JNWPS) documents.

NOTE*:* All change proposals affecting AF policy must be coordinated and approved by AF/A4LW.

007. Wing, group, and squadron functions

Major wing functions are divided among a few principal subordinates, each accountable for carrying out a specific part of the wing mission. Responsibilities are clearly defined and duplication is avoided.

Wing commander

The wing commander provides storage, security, control, and custodial responsibility for all nuclear weapons and nuclear components. He or she authorizes all nuclear weapons movements outside a restricted area. Nuclear weapons will not be moved outside a restricted area during hours of darkness or in severe weather conditions unless necessary to meet mission requirements.

Maintenance group commander

The maintenance group commander (MXG/CC) informs the applicable MAJCOM if a unit does *not* meet MCL requirements. In addition, the MXG/CC will:

- Validate unit requests to exceed timelines established for nuclear weapons maintenance. If a request is valid, the MXG/CC forwards the request with justification and scheduled completion dates to the applicable MAJCOM.
- Validate unit requests to extend LLC expiration dates or to perform LLC exchanges more than 6 months in advance of due date. If a request is valid, the MXG/CC forwards the request

documenting circumstances requiring maintenance to be performed outside the normal window and length of any requested extension to the applicable MAJCOM.

- Validate unit requests to delay nuclear weapon UR/DR repair actions outside established timelines. If a request is valid, the MXG/CC forwards request with justification and scheduled completion dates to the applicable MAJCOM.
- Ensure quality assurance (QA) attends maintenance scheduling meetings. This allows QA the opportunity to schedule/perform required evaluations.

Maintenance or munitions squadron

Some of the duties that maintenance or munitions squadrons perform are maintaining aerospace ground equipment (AGE), munitions, off-equipment aircraft, and support equipment components; performs on-equipment maintenance of aircraft; and fabricates parts. The squadron also provides repair and calibration of test, measurement, and diagnostic equipment (TMDE). In the following table, we take a look at the responsibilities of personnel within the maintenance/munitions squadron.

Maintenance/Munitions Squadron Responsibilities	
Position	**Responsibilities**
Squadron commander	The squadron commander performs administrative and command duties that allow considerable latitude in their management approach when adapting to varying squadron missions, size, location, and resources. In addition, the following are functions performed by the squadron commander: • A commander may delegate authority but may never delegate the responsibility to get maintenance "on line, on time, and by the book." • The commander relies on the maintenance superintendent for technical supervision to oversee maintenance production.
Operations officer/ maintenance superintendent	The MX/SUPT is responsible for the overall management of the weapons and munitions flight and provides broad policy guidance. The scope of the responsibility concentrates on safe, secure, and efficient use of people and materiel resources, while maintaining the highest degree of weapons and/or munitions capability, reliability, and accountability. The ultimate goal is maintaining a combat readiness. Some of the MX/SUPT responsibilities are: • Appoint, in writing, a minimum of two qualified/certified instructors to establish, implement, and sustain the NWTP. • Interview potential candidates as certifying officials and document this in the individual's AF Form 623A or equivalent. Then formally appoint in writing the qualified individuals as nuclear weapons certifying officials for nuclear weapons maintenance and handling tasks. • Ensure the condition of storage facilities is inspected. This inspection includes a walkthrough of each storage location to ensure no environmental or defective conditions exist that could lead to weapon or equipment damage if not corrected. Also ensure adequate lighting and proper housekeeping of the facility. • Ensure type-3 trainers that are not on the weapons maintenance custody account are controlled, inspected, maintained, and repaired in accordance with an agreement between the squadron and owning agency. • Ensure all type-3 trainers (A/B/C) are inspected in per -1 manuals after receipt and before shipment and applicable Inspection Record Card (IRC) entries are made. Also ensure deficiencies discovered

Maintenance/Munitions Squadron Responsibilities	
Position	**Responsibilities**
	are reported. • Periodically observe maintenance tasks. Every effort should be made to observe tasks on different teams and shift. • Review and submit requests to the MXG/CC to extend LLC expiration dates, perform LLC exchanges more than 6 months in advance of due date, and exceed established timelines for maintenance or UR/DR repair actions.
Flight commander/ flight chief	The flight commander and flight chief are responsible to maintenance supervision for the leadership, supervision, and training of all assigned personnel. In addition, the flight commander or chief will: • Review the location inventory listing (LIL) and LLC forecasts for assigned weapons systems. Ensure requests for LLC extensions and early maintenance are fully justified with details explaining why the operation cannot be performed and an estimate of when conditions preventing maintenance will be resolved. • Inform supervision immediately of any significant nuclear weapons related issue negatively impacting mission requirements. Issues include conditions resulting in nonoperational weapons/systems, rejectable parts/components, manning shortfalls, or an inability to meet mission requirements requiring a UR/DR, mishap report, or maintenance assist requests. • Interviews all newly assigned NWTP primary and alternate trainers. Ensure these interviews are documented in the individual’s AF Form 623A or equivalent. Only one interview is required prior to the individual’s trainer proficiency evaluation. • Observes maintenance tasks on a frequent basis to ensure quality of work performed by different teams, and on different shifts.
Section/ element commander/ NCOIC	The section/element commander or NCOIC is responsible for the daily supervision of all maintenance personnel performing nuclear weapons/systems maintenance including: • Ensuring the oldest LLCs are installed first by the maintenance section. Also ensures H1616 containers are shipped prior to their expiration dates. • Verifying the accuracy of scheduled and unscheduled maintenance actions and applicable serial numbers on all work orders prior to starting the work. Ensuring all actions are accomplished and reported as required. As a note, any corrections to the job control number, serial number, identification number, work center, location, discrepancy or work center event narrative blocks are not authorized. The work order will be re-accomplished. Documentation errors committed during work accomplishment may be corrected on the work order. • Ensuring the nuclear accountability and reporting section (NARS) is notified when movements change the Defense Integration and Management of Nuclear Data Services (DIAMONDS) Storage Location and Planning Report for all assets that were moved or secured. • Ensuring availability of current publications to meet work center needs. This includes DIAMONDS publications. This validation will be scheduled in the quarterly, monthly, and weekly forecasts and schedules. At the same time, develop and implement a process to inform applicable work centers technicians, in detail, of policy and technical data changes/revisions.

Maintenance/Munitions Squadron Responsibilities	
Position	**Responsibilities**
	• Periodically observe maintenance tasks and perform proficiency checks as required. Every effort should be made to observe tasks and perform proficiency checks on different teams and shifts.

Plans and scheduling

The unit plans and scheduling (P&S) section serves as a focal point to the supported wing plans, scheduling, and documentation (PS&D) administered program. It assigns local ID numbers as required for end items according to the TO 00–20 series TO and updates the master ID listing. P&S also manages the awaiting maintenance (AWM), awaiting parts (AWP), and time compliance technical orders (TCTO). P&S members attend the monthly TCTO reconciliation meeting as needed. P&S plans, schedules, and coordinates with the munitions accountability and maintenance supply liaison on all TCTO requirements.

Prepare forecasts, plans, and schedules

P&S authorizes the performance of maintenance on nuclear weapons/systems by assigning a job control number (JCN) and initiates a work order through the integrated maintenance data system (IMDS) for each scheduled maintenance task, storage inspection, modification, munitions movement, handling operation, and equipment maintenance actions (e.g., servicing, inventory, periodic inspections, functional tests, and acceptance inspections). Munitions control, missile maintenance operations center (MMOC), or P&S will issue job control numbers for all unscheduled tasks. Additionally, P&S prepares a quarterly rolling forecast, monthly plans, and weekly schedules which may be published by electronic means provided that operations security (OPSEC) is maintained.

Schedule changes

Once the weekly schedule is approved, it becomes the final planning guide for maintenance and the basis for deviation reporting. Weekly schedules are included in the supported wing maintenance plan. All actions on the weekly schedule must be completed. Any change to the approved weekly schedule, which adds or removes nuclear weapons or affects another organization, will require an AF Form 2407, Weekly/Daily Flying Schedule Coordination, (or equivalent). Additions and removals of nuclear weapons actions (i.e., maintenance, mate/demate, handling, and final assembly tests) are subject to source document verification. Minor adjustments to the schedule, such as changing the day on which nuclear weapons action(s) is/are completed, does not require completing an AF Form 2407 (or equilvant) as long as the action(s) occurs in the same approved week. The agency requesting the change to the weekly schedule initiates the AF Form 2407 (or equivalent) and coordinates it through the affected agencies. At a minimum, the OO/MX SUPT approves the change to the weekly schedule.

008. 2W2 duties

As a 7 level, you have many more duties and responsibilities than those listed in AFECD, *Air Force Enlisted Classification Directory*. This directory lists the basic job description for the 2W2 nuclear weapons career field. You may or may not perform all of the duties listed below; it depends where you get stationed and what rank you become. In addition to those listed below, there are many other duties not listed that you could perform.

Progression in career field

Adequate training and timely progression from the apprentice to the superintendent skill level plays an important role in the Air Force's ability to accomplish its mission. In addition to the basic duties in the career field as you progress, you might have to plan, schedule, inspect, and evaluate nuclear weapon maintenance actions, including related components and specialized and handling equipment. You might also have to perform weapon inventory, accountability, PAL operations, and verification procedures using special weapons inventory management system, establish production control, performance standards, and maintenance priorities, coordinate maintenance actions with other maintenance and munitions organizations, and make sure of conformance to prescribed standards of quality, safety, and security. Your duties might also include conducting periodic inspections to provide assistance in solving maintenance and supply problems or performing in-process inspections.

Craftsman (2W271)

Technicians are awarded this skill level upon completion of 12 months experience as a trainee in upgrade training and this time requirement can be accumulative providing the minimum time requirement is met. Additionally, individuals must be certified for a minimum of 12 months as a weapons maintenance team chief on weapons maintenance, mate/demate, or handling tasks. The transport and final assembly test certifications are not used to satisfy this requirement. Units that do not possess war reserve (WR) weapons use training assets to fulfill upgrade training requirements. The intent of this upgrade training is to ensure an individual gains experience supervising tasks such as inspecting, maintaining, storing, handling, and repairing nuclear weapons, components, and related equipment. The training business area (TBA) journal entry is used to document the team chief experience.

Gaining experience is not all that is required for award of the craftsman skill level. Individual must also complete the 2W271 career development course (CDC) and the 7-level Nuclear Weapons Craftsman Course. The unit training manager (UTM) requests the CDCs and the Air Force Personnel Center (AFPC) schedules attendees to the 7-level in-residence course as they approach their 12th month in upgrade training. Additionally, the AFCFM has specified that the *minimum* passing score for all progress checks and exams in the 7-level in-resident course is 80-percent.

Superintendent (2W291)

All 9-skill-level training for nuclear weapons is gained through on-the-job training (OJT). There is no formal career field training required for the superintendent level; individuals are awarded this skill level upon SMSgt sew-on.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

005. Department of Energy

1. How does the NNSA meet national security requirements regarding the nuclear weapons stockpile?

2. What part of DOE transports special nuclear materiel within the United States in specially constructed SGTs?

3. What features of the SGT makes it ideal to transport nuclear material with the United States?

006. Department of Defense

1. Who is responsible for the Defense Department's stockpile stewardship duties and provides technical support for all nuclear weapons in DOD custody?

2. What inspections does the DTRA conduct?

3. Who conducts the U&TW, develops the CFETP, and ensures formal courses meet field requirements?

4. Who develops sourcing, sequencing, prioritization, and posturing guidance for the 2W community?

5. What agency identifies unit taskings in the MCL?

6. Why do MAJCOMs ensure that units develop and implement standardized training outlines for all certifiable tasks, component packaging, and NWTP courses curriculum and tests?

7. Who provides the AFNWC Nuclear Weapons Logistics Division with disposition instructions for DOD-designed items?

8. Who serves as the service logistics agent for all nuclear weapons assigned to the Air Force and is a member of the Nuclear Reports Management Group?

9. How are stockpile quantities aligned to meet operational mission requirements?

10. Who does the AFNWC Nuclear Weapons Logistics Division coordinate with for repair and refurbishment of trainers?

11. How does the AFNWC Nuclear Weapons Logistics Division manage the UR program?

007. Wing, group, and squadron functions

1. When can the wing commander approve weapons movement outside a restricted area during severe weather conditions?

2. Who must validate unit requests to extend LLC expiration dates?

3. Why does the MXG/CC ensure QA attends the maintenance scheduling meetings?

4. How does the squadron commander tailor his/her management approach when performing administrative and command duties?

5. Who interviews potential candidates as certifying officials prior to formally appointing them in writing?

6. What is the MX/SUPT inspecting for when walking through each storage facility?

7. Who must ensure any requests for LLC extension are fully justified with details?

8. The flight chief should brief supervision on what type of nuclear weapons issues?

9. What action, if any, must the section NCOIC take when a work order contains the wrong location but correct serial number?

10. Who is responsible for notifying everyone that a policy was revised?

11. What tasks require a work order?

12. What type of change to the weekly schedule does *not* require a formal request and coordination using the AF Form 2407?

008. 2W2 duties

1. What is the importance of adequate training and timely progression within the 2W2 career field?

2. What must an individual be certified on, and for how long, in order to be awarded the craftsman skill level?

3. What alternatives, if any, do units have for those individuals in upgrade training and do not have WR weapons on hand?

4. Who is responsible for requesting CDCs for upgrade to 7-level?

5. Who is responsible for scheduling individuals for the in-resident 7-level nuclear weapons craftsman course and when does it normally occur?

6. What training requirement must be met in order to acquire the superintendent skill level?

Answers to Self-Test Questions

001

1. It would take 8 months to complete instead of 24 months; ground shipment would take an additional 27,600 manhours; and the tactical ferry would save the Air Force $1.6M.
2. AFI 91-111 and the MAJCOM REPORD.
3. Perform the missile safe status check on the missiles.
4. Change was reflected on the movement plan but was not reflected in the source document produced by the scheduling process.
5. No, since the loaders are not required to verify presence of a payload.
6. RBL.
7. Scanner failed to scan therefore personnel reverted to the hazard classification for the nomenclature to determine its contents.
8. Package should have been opened to reveal the contents and the shipping documents in order to accurately verify the contents and documentation.
9. ASAC.

002

1. Very heavy elements.
2. The element it belongs to.
3. The number of protons in a nucleus.
4. The total number of protons and neutrons in an atomic nucleus.
5. The amount of time required for half a given amount of the radioisotope to decay.
6. Fractions of a second to billions of years.
7. Splitting apart atoms.
8. Fusing together atoms.
9. When an element with a very large nucleus is split into smaller pieces.
10. They are design factors that affect the number of neutrons available to cause fission.
11. Uranium-235 and plutonium -239.
12. Because the positively charged protons in the colliding nuclei repel each other.
13. A neutron unattached to a nucleus.
14. Because isotopes of hydrogen are the principle components of the nuclear reactions involved.

15. Thermonuclear weapon.
16. Gun assembly and implosion assembly weapons.
17. Gun assembly weapon.
18. By detonating specially designed high explosives surrounding a subcritical sphere of fissile material.
19. Placing a small amount of material suitable for fusion such as deuterium or tritium gas inside the core of a fission device.
20. Boosting.

003

1. Kinetic and internal energy and radioactive debris, gamma rays, neutrons, and thermally generated X-rays.
2. Function of weapon design, yield, and height of burst.
3. 1000 tons (2 million pounds).
4. Millions of times greater.
5. Thermal radiation and blast energy.
6. Nuclear radiation given off within the first minute of the explosion; takes the form of X-rays, gamma rays, and neutrons.
7. The precipitation of radioactive particulate matter from a nuclear cloud down to the surface of the earth.
8. If the fireball comes into contact with the ground.
9. When neutrons that are produced during a nuclear detonation are absorbed by light metals in the soil or atoms in the air.
10. Tens of millions of degrees.
11. Ultraviolet rays, visible light, and infrared radiation.
12. Several times the speed of sound.
13. Thermal radiation, blast energy, and nuclear radiation.
14. Approximately 50 percent blast, 35 percent thermal radiation, and 15 percent nuclear radiation.
15. Thermal radiation.
16. It can ignite wood frame buildings and other combustible materials at significant distances from the detonation.
17. When absorbing high intensities of thermal radiation.
18. Flash blindness results when people happen to be looking directly at the fireball; temporary flash blindness occurs when people do not look directly at the fireball.
19. Protective enclosures, proper material selection, and thermal protective coatings.
20. In pounds per square inch above ambient pressure at sea level.
21. It may be several seconds long.
22. Structural damage resulting from crushing, collapsing, bending, breaking, or rollover.
23. By sub-surface, surface and near surface bursts.
24. Directly coupling energy to the ground in the area of Ground Zero; and pressure from the air blast as it travels over the surface.
25. With a shallow, subsurface nuclear detonation using an earth penetrating warhead.
26. Ionizing radiation that consists of neutrons, alpha and beta particles as well as electromagnetic energy in the form of gamma rays capable of producing ions (electrically charged particles) directly or indirectly in its passage through matter.
27. High energy photons of electromagnetic radiation with frequencies higher than visible light or ultraviolet rays.
28. Great distances out from the fireball.
29. Because it damages the cellular DNA.
30. Initial and residual radiation.

31. Alpha and beta partials, gamma rays and neutrons, as well as X-rays.
32. Gamma radiation.
33. Radiation that is emitted later than 1 minute after the instant of the explosion. It consists of chiefly beta particles and gamma rays.
34. Terrain, wind speed and direction.
35. Time varying electromagnetic radiation characterized by a sharp pulse through a very broad spectrum of frequencies but mainly in the long wavelength region.
36. They can electrically upset circuit function and burn out sensitive components.
37. They are designed to protect equipment from electrical surges caused by lighting, but pulse generated by a nuclear detonation is thousands of times faster (of shorter duration) than the lightning pulse.
38. With radio frequency shielding and shielded enclosures, good grounding practices, and shielded cables.
39. Smaller solid-state electronics such as transistors and integrated circuits.

004

1. To prevent detonation in an accident or at the hands of an adversary.
2. That the weapon undergoes the expected sequence of physical motions before the warhead is completely armed.
3. Unintended nuclear detonation and dispersal of radioactive material.
4. No.
5. Early 1960s.
6. Isolation, inoperability, incompatibility, independence, and exclusion region concepts.
7. It would have a probability of less than one in one million of producing a nuclear yield.
8. That if a warhead experiences a HE detonation at one point on its outer surface, the resulting nuclear energy is less than the equivalent of four pounds of TNT.
9. High-strength steel and high temperature resistant insulation materials.
10. Yes. Because it is impractical to make every weapon system circuit that is outside the exclusion region resistant to abnormal environments.
11. Producing the unique arming signal assuming additional interlocks such as PAL have already been unlocked.
12. To disconnect or separate components necessary for detonation until the weapon is armed.
13. It is highly resistant to accidental detonation and represents a great advance for plutonium scattering safety.
14. Yes.
15. By intense heat.
16. Insensitive high explosives which should not detonate in a fire.

005

1. Enhance the safety, reliability, and performance including the ability to design, produce, and test nuclear weapons stockpile.
2. OST.
3. Contains special deterrent and denial features as well as safety features that provide high resistance to fire and crash damage.

006

1. DTRA.
2. Independent nuclear surety inspections.
3. AFCFM.
4. FAM.
5. MAJCOM.
6. Ensures consistency between units.

7. AFNWC Missile Sustainment Division.
8. AFNWC Nuclear Weapons Logistics Division.
9. NWSM.
10. KCP.
11. Collect, disseminate, and resolve issues concerning unsatisfactory conditions and forwards corrective actions to units and MAJCOMs. It also approves or disapproves UR/DR repair action delay requests and forwards the approval or disapproval to the requesting unit and MAJCOM.

007

1. Meet mission requirements.
2. MXG/CC.
3. Allows QA the opportunity to schedule/perform the required evaluations.
4. According to the squadron’s mission, size, location, and resources.
5. MX/SUPT
6. No environmental or defective conditions exist that could lead to weapon or equipment damage. Also ensure adequate lighting and proper housekeeping of the facility.
7. Flight commander or flight chief.
8. Conditions resulting in nonoperational weapons/systems, rejectable parts/components, manning shortfalls, or an inability to meet mission requirements requiring a UR/DR, mishap report, or maintenance assist requests.
9. Work orders will be re-accomplished, no exceptions.
10. Section/element commander/ NCOIC.
11. Scheduled maintenance task, storage inspection, modification, munitions movement, handling operation, and equipment maintenance actions (e.g., servicing, inventory, periodic inspections, functional tests, and acceptance inspections).
12. Minor adjustments such as changing the day on which nuclear weapons action is/are completed as long as the action(s) occurs in the same approved week.

008

1. Enable the Air Force’s ability to accomplish its mission.
2. Certified as a weapons maintenance team chief on weapons maintenance, mate/demate, or handling task for a minimum of 12 months, which can be cumulative.
3. Use training assets.
4. UTM.
5. The Air Force Personnel Center schedules it as they approach their 12th month in upgrade training.
6. There is no formal career field training.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (001) The call sign of the B–52 that mistakenly transported six nuclear warheads across the United States was
   a. Terrible 00.
   b. Doom 99.
   c. Crazy 88.
   d. Buffy 01.

2. (001) What directed reposturing of advanced cruise missiles (ACM) on 14 March 2007?
   a. Repositioning order (REPORD).
   b. Unsatisfactory disposition (UNDIS).
   c. Redirected instructions (REDISTRO).
   d. Unsatisfactory mandate policy (UNMANPO).

3. (001) Which of the following statements concerning the advantages or disadvantages of a tactical ferry of advanced cruise missiles (ACM) in 2007 is *true*?
   a. Personnel assigned to 2W0X1 and 2W1X1 career fields were projected to be eliminated.
   b. Tactical ferry would take 8 months to complete instead of 24 months for ground transport.
   c. Air transportation would take an additional 27,600 man-hours due to extra test requirements.
   d. Tactical ferry mode of transportation would save the Air Force $1.6B in travel expenditures.

4. (001) What system directed FE Warren to return overstocked forward sections back to the Defense Logistics Agency (DLA)?
   a. Defense Integrated and Management of Nuclear Data Services.
   b. Nuclear Munitions Command and Control.
   c. Integrated Maintenance Data System.
   d. Readiness Based Leveling.

5. (002) When are atoms electrically *neutral*?
   a. When the number of *electrons equals the neutrons* within the nucleus.
   b. When the number of *electrons equals the protons* within the nucleus.
   c. When the number of *protons equals the neutrons* within the nucleus.
   d. Atoms are always electrically neutral.

6. (002) The total number of protons and neutrons in an atomic nucleus is referred to as
   a. an isotope.
   b. atomic mass.
   c. atomic number.
   d. an electronic shell.

7. (002) The process that occurs when an element with a very large nucleus is split into smaller pieces is called
   a. fusion.
   b. fission.
   c. radioactive decay.
   d. partial delineation.

8. (002) It takes large amounts of energy to get nuclei close enough to fuse because the
   a. positively charged protons in the colliding nuclei *repel* each other.
   b. positively charged protons in the colliding nuclei *attract* each other.
   c. negatively charged electrons in the colliding nuclei *repel* each other.
   d. negatively charged electrons in the colliding nuclei *attract* each other.

9. (002) One of the two general methods developed for quickly *converting a subcritical mass into a supercritical mass* is called
   a. neutron boosting.
   b. gun-type assembly.
   c. rail-type assembly.
   d. gamma ray production.

10. (003) The precipitation of radioactive particulate matter from a nuclear cloud down to the Earth's surface is called
    a. fallout.
    b. nuclear winter.
    c. fireball propagation.
    d. radioactive precipitation.

11. (003) What is electromagnetic radiation in the *visible light spectrum* called?
    a. Neutron flux.
    b. Thermal radiation.
    c. Electromagnetic pulse.
    d. Residual nuclear radiation.

12. (003) Pressure from a nuclear air blast traveling over the surface of the earth causes
    a. air shock.
    b. hardening.
    c. ground shock.
    d. a rupture zone.

13. (003) What type of ionizing radiation or electromagnetic energy travels great distances out from the fireball?
    a. Alpha particles.
    b. Beta particles.
    c. Neutrons.
    d. X-rays.

14. (003) Ionizing radiation is detrimental to the human body because it can cause
    a. decreased risk of cancer.
    b. repair of cellular DNA.
    c. reduced wrinkles.
    d. serious illness.

15. (003) Radiation that is emitted more than 1 minute *after* the instant of a nuclear explosion is called
    a. residual nuclear radiation.
    b. initial nuclear radiation.
    c. fluorescence radiation.
    d. transient radiation.

16. (004) One of the concerns that the nuclear weapons systems safety addresses is
    a. intended nuclear detonation.
    b. dispersal of radioactive material.
    c. the placement of fireball on designated target.
    d. interaction and characteristics of atomic elements.

17. (004) How many *unintended* nuclear detonations have occurred in the history of the United States nuclear weapons program?
    a. None.
    b. Two.
    c. Three.
    d. Several with significant radioactive material dispersal.

18. (004) Nuclear safety principles incorporated in the Enhanced Nuclear Detonation Safety (ENDS) involve isolation,
    a. operability, compatibility, and independence.
    b. operability, incompatibility, and independence.
    c. inoperability, incompatibility, and dependence.
    d. inoperability, incompatibility, and independence.

19. (004) One point safety requires that if a warhead experiences a high explosive (HE) detonation at one point on its outer surface, the resulting nuclear energy will be *less than* the equivalent of how many pounds of trinitrotoluene (TNT)?
    a. 4.
    b. 5.
    c. 9.
    d. 10.

20. (004) Safety-critical components are encased in an exclusion region that provides
    a. electrical isolation.
    b. aquatic segregation.
    c. acoustical seclusion.
    d. resistance to vibration.

21. (005) The National Nuclear Security Administration (NNSA) meets security requirements for nuclear weapons stockpiles by
    a. providing security, protection, and counter measures of nuclear weapons.
    b. enhancing the safety, reliability, and performance of nuclear weapons.
    c. developing new nuclear weapons, components, and bypass systems.
    d. educating the American public on nuclear awareness and programs.

22. (005) What government agency is responsible for transporting special nuclear material within the US in specially constructed safeguards transporters (SGT)?
    a. Department of Defense (DOD).
    b. Office of Secure Transportation (OST).
    c. Department of Homeland Security (DHS).
    d. Defense Threat Reduction Agency (DTRA).

23. (006) Who conducts the utilization and training workshops (U&TW), develops career field education and training plans (CFETP), and ensures formal courses meet field requirements?
    a. Air Force Deputy Chief of Staff for Logistics (AF/A4L).
    b. Air Force Unit Training Manager (AFTM).
    c. Air Force Career Field Manager (AFCFM).
    d. Functional area manager (FAM).

24. (006) Who develops sourcing, sequencing, prioritization, and posturing guidance for the 2W2 community?
    a. Air Force Deputy Chief of Staff for Logistics (AF/A4L).
    b. Air Force Unit Training Manager (AF/UTM).
    c. Air Force Career Field Manager (AFCFM).
    d. Functional Area Manager (FAM).

25. (006) Major commands (MAJCOM) are responsible for
    a. forwarding early limited life component (LLC) maintenance requests to Air Force Nuclear Weapons Logistics Division.
    b. identifying and approving wing taskings in the maintenance capability letters (MCL).
    c. ensuring units develop and implement standardized upgrade training programs.
    d. approving expiration date extensions for respective field units.

26. (006) What division develops fiscal year limited life components (LLC) forecasts and provides Defense Threat Reduction Agency (DTRA) with Air Force requirements?
    a. Nuclear weapons logistics division.
    b. Nuclear certification division.
    c. Missile sustainment division.
    d. Plans and programs division.

27. (007) The maintenance group commander is responsible for
    a. forwarding unit requests to extend limited life component (LLC) expiration dates to Nuclear Weapons Logistics Division.
    b. approving unit request to perform LLC exchanges more than 6 months in advance of due date.
    c. validating unit requests to delay nuclear weapon unsatisfactory report (UR) repair actions.
    d. ensuring that quality assurance (QA) chairs maintenance scheduling meetings.

28. (007) Who appoints, in writing, a *minimum* of two qualified/certified instructors to establish, implement, and sustain the nuclear weapons training program (NWTP)?
    a. Maintenance group commander.
    b. Maintenance superintendent.
    c. Squadron commander.
    d. Flight chief.

29. (007) Who interviews all newly assigned, primary and alternate, nuclear weapons training program *trainers*?
    a. Maintenance group commander.
    b. Maintenance superintendent.
    c. Squadron commander.
    d. Flight chief.

30. (007) Who, if anyone, is authorized to assign job control numbers for *unscheduled maintenance*?
    a. Special weapons section.
    b. Munitions control.
    c. Weapons support.
    d. No one.

31. (007) What type of change, if any, requires submitting an AF Form 2407 to change the schedule?
    a. Change that requires rescheduling maintenance to another day, different week.
    b. Change that requires rescheduling maintenance to another day, same week.
    c. Change that does not affect another organization.
    d. All changes require an AF Form 2407.

32. (008) What job may you *not* perform as part of your career field progression?
    a. Aircraft engineering.
    b. Schedule maintenance.
    c. Establish production control.
    d. Evaluate specialized equipment.

33. (008) Technicians are awarded the craftsman skill level after being certified for 12 months as a certified team
    a. member on weapons mate/demate operation.
    b. member on weapons maintenance operation.
    c. chief on final assembly test certifications.
    d. chief on weapons handling task.

34. (008) Who is responsible for requesting the 7-level career development courses (CDC)?
    a. Air Force Career Field Manager (AFCFM).
    b. Air Force Personnel Center (AFPC).
    c. Unit training manager.
    d. Element commander.

35. (008) Who is responsible for scheduling attendees to the 7-level Nuclear Weapon Craftsman course?
    a. Air Force Career Field Manager (AFCFM).
    b. Air Force Personnel Center (AFPC).
    c. Unit training manager.
    d. Element commander.

Please read the unit menu for unit 2 and continue ➔

Unit 2. Supervisory and Maintenance Management Responsibilities

THE AIR FORCE is one of the largest military organizations in the world. It has thousands of members along with a tremendous amount of resources and equipment. Managing all of these people and materials would not be possible without organization. Simply put, organizing brings order out of potential chaos. As a supervisor, you occupy a key position in the effective control of your assigned position within the organization. You should have a basic understanding of the concepts of organization and how it operates. You also have to be precisely aware of what your responsibilities and duties as a manager are.

2–1. Training

As a supervisor, you want qualified and proficient technicians working for you. You do not want individuals who have not been sufficiently trained or who have received the wrong kind of training. You will be directing others by issuing orders and making demands, and leading them to specific accomplishments through personal example. Each member of the Air Force is a potential supervisor. As fully qualified supervisors leave the service due to attrition and cut backs, we need to ensure that others are prepared to step in and fill the gap. Training is a major aspect of ensuring that we have individuals ready to step up and meet the challenge of supervision.

009. Training and maintaining training records

One of the very basic organizational concepts is having a common purpose or goal. The Air Force mission is to provide aerospace forces with the capability to support our nation’s objectives in peace and war. You can think of it simply as “protecting your country.” The overall mission is further divided into “subgoals” and “subgroups.” Each has its own responsibility in contributing to completing the overall mission. For example, your squadron has a particular mission, and your unit shop has its own specific mission. That mission might be providing combat-ready weapons or maintaining missiles and associated equipment. Whatever it is, you must know precisely what it is, and make sure that those under you do too.

Responsibility

Supervisors have the single greatest impact on mission accomplishment. You must share your experiences and expertise in order to meet mission requirements and to provide a quality training program for your trainees. As a supervisor you must plan, conduct, and evaluate training. Let's look at what you should be aware of concerning managing and documenting training. You may have already done some of these tasks, but did you do them correctly? Remember, your trainee's career is in your hands.

When someone is new or has just transferred to your work center, you determine which tasks they are assigned in their duty position. Once you determine this, you conduct and document an initial evaluation of the trainee's qualifications within 30 days of initial assignment, either permanent change of station (PCS) or permanent change of assignment (PCA). Document the evaluation on AF Form 623A, On-the-Job Training Record-Continuation Sheet, and file in the on-the-job training (OJT) record. As a *minimum* the evaluation should include:

- Air Force specialty code (AFSC), duty position (including core and home station training tasks), deployment and/or unit type code (UTC) requirements.
- Career development course (CDC) requirements.
- Formal and/or informal training requirements, such as skills, knowledge, or classroom instruction. Supervisors evaluate technical school graduates on all tasks identified in the specialty training standard (STS) portion of the career field education and training plan (CFETP) taught in the initial skills course.
- Other local or unique training requirements.
- Supervisor and trainee responsibilities as outlined in other governing directives, and the CFETP.

The work center training requirements is the sum total of individual training requirements for all work center personnel. The only way to keep track of each person's training history is by documenting it. Documentation helps senior leadership assess mission capability and readiness, and it defines requirements for individual career progression.

Evaluate personnel to determine training needs

Training your people is a continuous endeavor. Complicating training is the requirement to make sure that new personnel are properly upgraded to the next skill level. We refer to upgrade training as formal training; don't confuse it with informal training. Formal training refers to courses offered by Air Education and Training Command (AETC) and other major commands (MAJCOM) that have Air Force approval. Included in this are CDCs like this one.

Informal training (OJT) refers to the type of training done in the maintenance bay that prepares an individual to perform a particular task such as B61 General Maintenance (GM). This training is required to prepare an individual for a certified weapons maintenance task—not to be confused with task certification within the CFETP. Likewise, we must not take personnel training lightly. The long-term impact affecting broad areas in the individual's future is at stake, not to mention the impact on your next Nuclear Surety Inspection (NSI). Start your new apprentices off on the right foot. The reward for investing the effort is well worth the attention and labor that you devote to the task.

Prepare job qualification standards

The AF Form 623, On-The-Job Training Record, (usually just called the 623 or training records) has been around for quite some time and has served us well. The 623 reflects past and current qualifications, and is used to determine training requirements. It is intended to be a complete history of past training and current qualifications. As a supervisor, you make sure that all documentation is accurate and comprehensive. The 623 may contain the following documents, in addition to any locally determined requirements:

- CFETP.
- Air Force Job Qualification Standard (AFJQS).
- AF Form 797, Job Qualification Standard Continuation/Command JQS.
- AF Form 623A, On-the-Job Training Record -Continuation Sheet.
- CDC enrollment card, answer score sheets and scorecards (if enrolled in CDCs).
- AETC Form 156, Student Training Report (maintain until 5 skill level UGT is completed).
- AF Form 2096, Classification/On-The-Job Training Action (or automated product).

NOTE*:* All forms contained in the AF Form 623 may be automated with the approval of the Air Force Career Field Manager (AFCFM). However, if forms and the CFETP are automated, they must meet the same documentation requirements (dates and initials of trainee, trainer, and/or task certifier) as hard copy forms.

Automated training records, such as Cover Train, may be placed on a disk for mobility purposes. When properly used, it shows a person's qualifications and the "history" of an individual's training throughout his or her career. You'll find the instructions for correctly using the 623 in AFI 36–2201, *Air Force Training Program.* When faced with either new or transferred personnel, your action depends on what the trainee already knows or doesn't know. So how do you know what they know? Training records! Hopefully you can see how valuable they are. This applies not only to your trainees but also to you. Since we move from base to base, we need thorough documentation on what our past and current qualifications are. It's also beneficial to maintain a personal file of your old and outdated records for future use.

The AFCFM stipulates in the CFETP the permissible alternatives to the AF Form 623.

Conduct and evaluate training

The initial worker qualification evaluation is crucial because new workers want to know how they fit into the organization. It's important to sit down with all newly assigned people so that they know what your expectations are and what they need to do to satisfy them. You should complete an initial evaluation on both recent formal school graduates and reassigned people.

AF Form 623A

The AF Form 623A is used to document an individual's training progression. This form reflects training status, counseling, and breaks in training. Both the supervisor and trainee must sign and date all entries. Enter the date the counseling and/or entry is made, the statement or entry, and the trainee's and supervisor's signature. These requirements apply to all AFCFM approved training forms, regardless of format. Examples of entries included in the 623A are: initial CDC issue, CDC completion schedule, explanation of delays in CDC completion and/or training requirements, problems encountered with task certification (if any), and any training related counseling statements. When used for training-related counseling, include strengths, weaknesses, areas to improve, and means to improve. Maintain the AF Form 623A as long as it pertains to the current training objective (i.e., award of the skill level or completing qualification training). The supervisor determines if any additional AF Forms 623A should remain in the training record.

AF Form 797

The AF Form 797 is a continuation of the CFETP, Part II, or AFJQS. It defines locally assigned duty position, home station training, and deployment and/or UTC requirements *not* included in the CFETP, Part II. It is also used to develop the AFJQS and the command job qualification standard (CJQS) as determined by the AFCFM. Disposition of the AF Form 797 is the same as the CFETP and AFJQS.

When used to expand a section of the CFETP or to add duties not listed in other documents, a master copy should be placed in the section master training plan. The AF Form(s) 797 are then placed in the training records of the person(s) performing that duty.

AF Form 2435

Use AF Form 2435, Load Training and Certification Document, to record certifications and proficiency training. Because of the critical nature of the certification, and to avoid conflicting certification data, the AF Form 2435 is used as a stand-alone document to validate current certification and proficiency status and is not meant to be used for historical purposes. The certifying official's signature on the AF Form 2435 is the formal act of certification. Automated systems may be used to monitor certifications and recurring proficiency training. Keep the AF Form 2435 in the individual's work center for easy access by supervisors, certifying officials, and dispatchers. No alterations to entries are authorized except Block 2. Use figures 2–1 and 2–2 as a guide.

As follows, complete the AF Form 2435 in ink or type (Block 2 in pencil):

Completing AF Form 2435

Blocks	Action
1–4	Self-explanatory.
5–6	Not applicable.
7	Enter weapon type and task as listed in AFI 21–204 or as directed by MAJCOM. Enter "TC" for team chief or "TM" for team member position.
8–11	Self-explanatory.
12	Enter the information from block 7 plus the current year. Enter a "C" for certified, a "P" for proficiency checks, or a "D" for decertification, or an "X" (in pencil) for the due date, under the corresponding month, year and task.

Transcribe the AF Form 2435 by copying the applicable information from Blocks 1 through 8 and Block 12 of the old form to the new form. Enter "Transcribed" in Block 11 of the new form. The Flight Chief or above enters, signs, and dates a statement on the new form attesting to the accuracy of the transcribed entries. The original AF Form 2435 is then destroyed. Carry forward the last proficiency check completed for each certified task.

Due to decertification then subsequent recertification, if the recertification date of any prerequisite task (i.e., B61 GM, 4 Feb 07) is after the certification date(s) for any subsequent tasks (i.e., B61 LLC, 22 Aug 06), enter the original GM certification date (15 May 06) in block 8 on the line as the task. Enter the recertification date on the line immediately below the original date. Place the word "transcribed" in block 11 on the same line as the recertification date. In this case, proficiency checks do not need to be carried forward on the reverse.

LOAD TRAINING AND CERTIFICATION DOCUMENT

1. NAME (*Last, First, Middle Initial*)	2. GRADE	3. AFSC	4. ORGANIZATION	5. AIRCRAFT	6. CREW NUMBER/POSITION
McMANAMAN, Jacob L.	SSgt	2W2XX	5 MUNS	N/A	N/A

7. MUNITION/TASK/ LOAD CONDITION	8. DATE CERTIFIED	9. DATE DECERTIFIED	10. REASON FOR DECERTIFICATION	11. SIGNATURE AND GRADE OF CERTIFYING OFFICIAL
Cert Examples:				
B83 GM TC	20061018			*Daniel A Franco* TSgt
B83 LLC TC	20061020			*Daniel A Franco* TSgt
Decert Examples:				
B61 PC TC	20061108	20070201	No Longer Required	*Joseph Hall* MSgt
Transport	20061206	20070401	Overdue Proficiency	*Joseph Hall* MSgt
Upgrade Examples:				
W78 GM TM	20061213	20070206	Upgrade to TC	*George H Bradley* MSgt
TC	20070206			*Michael J Gwodz* MSgt
W78 LLC TM	20061218	20070209	Upgrade to TC	*George H Bradley* MSgt
TC	20070209			*Michael J Gwodz* MSgt
Transcription Example:				
B61 GM TC	20060515			
	20070204			TRANSCRIBED
B61 LLC TC	20060822			TRANSCRIBED
			The above information was	
			transcribed and verified as	
			accurate.	
			Signed: *Michael Moran* MSgt	
			Date: 28 Feb 07	

AF IMT 2435, 19740401, V1

PAGE 1 OF 2 PAGES
SI075566056

Figure 2–1. Sample, AF Form 2435 (front).

12. **LOADINGS**

MUNITION/TASK/LOAD CONDITION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
B83 GM TC 2006										C		
2007	P			P								
2008												
B83 LLC TC 2006										C		
2007	P			P								
2008												
B61 PC TC 2006											C	
2007	D											
2008												
Transport 2006												C
2007				D								
2008												
W78 GM TM 2006												C
TC 2007		D/C			P							
2008												
W78 LLC TM 2006												C
TC 2007		D/C			P							
2008												
B61 GM TC 2006												
2007		C										
2008												
B61 LLC TC 2006												P
2007												
2008												

AF IMT 2435, 19740401, V1 *(REVERSE)* PAGE 1 OF 2 PAGES

SI075566055

Figure 2–2. Sample, AF Form 2435 (back).

AF Form 1098

The AF Form 1098, Special Task Certification and Recurring Training, form is used to document selected tasks requiring recurring evaluation or training requirements, such as nuclear surety and safety. It can also be used to document permissive action link (PAL) training as well.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

009. Training and maintaining training records

1. Who has the single greatest impact on mission accomplishment?

2. How soon must supervisors conduct and document initial evaluation of trainee's qualification following a PCS or PCA?

3. Why is documentation of training records important?

4. What does *informal* training refer to?

5. What documents may be contained in the AF Form 623?

6. Who approves automation of all forms contained in the AF Form 623?

7. Where can you find additional information for the AF Form 623?

8. Who should you complete an initial evaluation on?

9. What are some examples of entries on the AF Form 623A?

10. What does the AF Form 797 define?

11. What is the formal act of certification on the AF Form 2435?

12. What block of the AF Form 2435 do you enter the letter “C”, “P”, or “D” on the corresponding month, year and task?

13. Who signs and dates the new AF Form 2435 attesting to the accuracy of the transcribed entries?

14. What form is used to document PAL training?

2–2. Team Chief and Bay Chief Responsibilities

Getting the right person in the right job can be a tremendous advantage in getting the work out efficiently and on time. Using the duty analysis process, you can clearly define as well as designate all the jobs within your unit or section. Knowing exactly what the job is makes it easier to get the right person in each position. As a team chief, you may have the opportunity to assign workers to various positions, even if it is only a small crew. For example, you may be responsible for picking your assistant team chief. If your crew has been assigned additional duties, you can assign a crew member to look after these responsibilities. If you are filling a bay chief position, you may have to assign people to individual teams.

010. Team chief duties and responsibilities

Assigning work is a supervisory responsibility that falls between preparing a plan and completing the job. It is actually issuing instructions or directions to subordinates—the who, what, when, where, and how of the job. Your work assignments must be such that they contribute to the mission objective and also increase the morale and proficiency of your subordinates. There are no set rules in making work assignments, however, we do discuss how some work assignments could be made, and will list some suggestions that could help you.

Work assignments

When you make work assignments, use the skills of each individual as much as possible, but do not deprive the person of the opportunity to train on new tasks. It is up to you to guide each trainee from mastering one task to another so that your organization is constantly aware of each trainee’s proficiency. Using a rotational method for assigning tasks is quite often effective. It allows you to broaden the skills of each member so that the departure of an individual does not hinder your mission accomplishment. Through this practice, no single individual becomes absolutely essential to the continued operation of your organization. As a supervisor, try to distribute tasks and skills to achieve the flexibility essential to your unit’s operation. The following additional suggestions may help you in making work assignments:

- Be well-informed about each task you assign, and make an honest attempt to answer all questions relating to the assignment.
- Be certain that you know the capabilities of each subordinate. Ask the worker about some of the tasks within the area. If any of these tasks are unfamiliar to the worker, assign a trainer to guide the person.
- Make work assignments through proper channels. Do not violate lines of authority.
- Emphasize the importance of teamwork.

Bay preparation

All reports, forms, parts requisition, technical orders (TO), tools, test, and handling equipment availability, or any other task related actions are the responsibilities of the individuals being evaluated. You should assign individuals that can gather all the items necessary to perform the required operation. Most work centers have quick reference lists for each operation. The table below is an example of a bay preparation list for reentry vehicle assembly. It is followed by other tables illustrating additional requirements for this process.

Bay Preparation for Reentry Vehicle Assembly	
Sequence	**Actions**
Steps accomplished before the operation:	• Pre-task briefing. • Work order opened through Munitions Control. • Certification and qualification of personnel verified using the AF Form 623 and AF Form 2435. • Emergency doors are clear, unlocked, and functioning properly. • Emergency eyewash was inspected. • Fire Extinguishers are available and serviceable. • Required tools, test equipment and handling equipment are available, inspected and/or checked out, nuclear certified, and serviceable. • Torque wrenches are calibrated, verified, inspected, and cycled. • The hoist has been inspected and signed off. • The emergency hoist shut off switch area is clear. • No-Lone Zone sign is posted. • Explosive and personnel limits posted. • Breech joint set-screws have been inspected and tested. • All components were tested and/or inspected and placed in handling gear. • Explosive set circuitry test set (ESCTS) self tested and cable ID verified. • Breech joint threads are inspected and Aft section adapter positioned with lifting lugs up and IFD tool installed. • Nuclear status decal verified against permanent marking. • All serial numbers of components verified against build-up sheets and location inventory listing (LIL) as required. • Limited life component (LLC) in-process inspection (IPI) complied-with (C/W).
Steps accomplished after the operation:	• All paperwork accomplished. (Work order, electronic inspection record card [eIRC], Defense Integration and Management of Nuclear Data Services [DIAMONDS]). • Required corrective maintenance actions not accomplished are deferred & work order created. • Update Munitions Control with the line number.

Bay Preparation Required Documents and TOs	
Documents	**TOs**
• Work order. • Inspection record card (IRC). • AFTO Forms 244. • In-process inspection (IPI) Sheet. • Build-up sheets. • LIL. • Team chief book.	• 11N–W78–1, *Operation and Maintenance Procedures.* • 11N–35–51, *General Instructions Applicable to Nuclear Weapons*. • 11N–35–51A, *Supplement with Consumable Listing*. • 11N–20–7, *Nuclear Safety Criteria*. • 11N–20–11, *General Fire Fighting Guidance*. • 11A15–1–167–1, *Explosive Assemblies LGM–30*. • 11N–RV12A–2, *Reentry Vehicle Maintenance*. • 11N–RV12A–4, *Reentry Vehicle IPB*.

Bay Preparation Required Documents and TOs	
Documents	**TOs**
• Material Safety Data Sheet (MSDS).	• 11N–H–61, *Operation and Maintenance Instructions with Illustrated Parts Breakdown*. • 11N–HRV5022–2, *Reentry Vehicle and Reentry System Support Equipment.* • 11N–HRV5026–2, *Beam Type Sling, Type HLU–121/E and Interface Adapter Sling*. • 33D9–38–15–21, *Intermediate Maintenance Instructions Explosive Set Circuitry Test Set*. • MNCL, *Equipment Authorized for Use with Nuclear Weapons*.

The table below lists the required tools, test, and handling equipment for this operation:

Required Tools, Test, and Handling Equipment			
Nomenclature	**Quantity**	**Nomenclature**	**Quantity**
Flashlights	3	Mirror	1
1 ⅜” crowfoot adapter	1	.002” feeler gauge	1
350 & 410 in-lb torque wrench	1	9/16” socket	1
Diagonal cutter	1	3” steel ruler	1
Needle nose pliers	1	1” deep well socket	1
3 in-lb torque wrench	1	¼” drive handle	1
¾” socket	1	¼” drive adapter	1
⅜” to ½” step up	1	H1223B forward ring	1
2” x ¼” extension	1	Plastic measuring device	1
3/32” hex adapter	1	H1303 torque adapter	1
004” feeler gauge	1	HLU–121 beam type sling	1
Soft jaw pliers	2	GSU–239/E RV torque fixture	1
⅜” open end 8 in-lb torque wrench	1	ADU–293/E beam type sling adapter	1
9/16” open-end wrench	1	MSU–123/E RV maintenance stand	1
10 & 15 in-lb screwdriver torque wrench	1	HLU–198/E RV hoisting adapter	1
⅜” drive ratchet wrench	2		

Required Expendables, Safety Equipment, and Chemicals	
• Disposable wipes. • Abrasive cloth. • Isopropyl alcohol. • Tongue depressors. • .020 safety wire.	• Q-tips. • Surgical gloves. • Safety goggles and/or glasses. • Safety step ladder.

Deviations allowed: **None**

As you can see from these lists, good bay preparation is not something to be taken lightly—it takes planning and a comprehensive review of the operation being performed. How bay preparation is assigned and performed may vary according to local base requirements. It is *not* just grabbing tools and technical data to get the job done. Remember, when doing bay preparation you must comply with all the regulations and requirements specific to the particular operation you are about to perform.

Record reviews before task start

Personnel are not to perform war reserve (WR) operations until they have completed the required training and the nuclear weapons certifications. Whenever training and certification occurs it is always documented. Several of these documents are the CFETP, the AF Form 2435, Load Training and Certification Document, AF Form 797, Job Qualification Standard Continuation/Command JQS, and the AF Form 1098, Special Task Certification and Recurring Training. It is essential that you review the records of individuals involved in the tasking *before* the operation. Make sure that they have completed the required training, nuclear weapons certifications, and that none of the requirements are overdue.

TO usage

Maintenance discipline involves integrity in all aspects of the maintenance process. Maintenance personnel are responsible for complying with all written guidance in order to make sure that required repairs, inspections, and documentation are completed in a safe, timely, and effective manner. As a supervisor you are responsible for enforcing and establishing a climate that promotes maintenance discipline. Remember, all people who fail to maintain maintenance discipline standards are held accountable.

Nuclear weapons TOs provide information on handling, transporting, maintenance and inspection of nuclear weapons and nuclear weapons specific support equipment. When using TOs, words such as "*shall, must, and will*" can have a big impact on the outcome of the operation. The following definitions apply:

- ***Shall, Must, Will —*** Indicate *mandatory requirements*. (Will is also used to express a declaration of purpose for a future event.)
- ***Should —*** Indicates a *preferred method* of accomplishment.
- ***May —*** Indicates an *acceptable or suggested means* of accomplishment.

Before starting any task, all applicable TOs must be reviewed for familiarization with the latest procedures. During use, all TO users must review TOs for accuracy, currency, and security classification. Review the verification status pages (VSP), when present, to check the verification status before attempting to use any procedure. You must have the correct TO on hand, and using the prescribed technical data to maintain weapons and equipment is a mandatory requirement. Every level in the chain of command, from the maintenance group commander right down to you, as a supervisor, is in charge of enforcing strict adherence to TOs and operational procedures. Make sure that all supervisors and technicians understand the importance of using current TOs and advocate their use at all times.

As the maintenance team chief or handling supervisor, it is mandatory that you give a pretask crew briefing before starting operations involving a WR nuclear weapon or warhead. Your briefing must include, *as a minimum*:

- An outline of the operation.
- Designation of personnel assigned to the task.
- Nuclear surety according to AFI 91–101, *Air Force Nuclear Weapons Surety Program*.
- Necessary safety, emergency and intrinsic radiation procedures.
- The requirement for the two-person concept.

Team chief task requirements

A certified team chief (TC) is required to direct every maintenance task performed on WR weapons. As a TC, you can only direct one operation at a time; therefore, each weapons operation must have its own team chief. MAJCOMS may require that a TC direct every WR weapons handling task. Use demand-response procedures when performing nuclear weapon maintenance and handling tasks. In this process you, as TC, read the steps required, including all cautions and warnings. Team members then acknowledge the directions and perform the applicable procedures. Then as the TC you verify and check off the steps after they have been completed. Covering the pages with plastic facilitates checking off the steps. If the operation is halted for any reason, mark the last step accomplished. Resume a maintenance operation only after reviewing the checklist or TO in order to determine the operation restart point. If team members are using technical data and checking off steps as they perform them (such as cleaning person on limited life component exchange [LLCE] operations), the TC must verify that all steps have been completed before weapon and/or component reassembly.

The certification program

Certification is a term that applies to nuclear weapons related tasks. The certification program is a requirement over and above the qualification and certification procedures contained in AFI 36–2201, and takes precedence over all other publications in the area of weapons certification and evaluation. MAJCOMs identify additional weapons system specific certifiable tasks in addition to tasks listed in AFI 21–204, *Nuclear Weapons Maintenance Procedures*. If you are certified in the TC position you may perform as team a member.

For certifying on transfer and transport operations, you must be able to demonstrate proficiency in all task areas that you are qualified to perform. This includes use and application of all associated technical data. MAJCOMs may elect to certify the TC and team member separately, if so, a TC supervises all tasks and is responsible for the team member’s performance.

As members of a PAL recode team you do not require PAL certification but training must be documented. As a PAL team member you are authorized to open and close access doors, connect and/or disconnect PAL cables and adapters, and perform visual monitoring if included in the training. Command disable system (CDS) recodes, activation, and strike enable plug (SEP) removal or installation also do not require certification. You only need to be job qualification standard (JQS) qualified.

If you are involved in a one-time contingency handling and movement of non-assigned weapons such as Prime Nuclear Airlift Force (PNAF), Department of Energy (DOE) SAFE HAVENs, and so forth, you must be transfer and/or transport certified and qualified to operate the required equipment such as a tow vehicle or forklift needed to support the mission. You do not require JQS qualification on nonassigned weapons. This is the only exception to normal weapons certification and JQS qualification requirements.

Surface defect evaluation techniques and/or requirements

When performing maintenance as a TC, you need to be very familiar with TO 11N–35–51 and/or the applicable TOs so that you can ensure that defects are properly identified. When a defect that causes rejection of a weapon or major component is discovered, maintenance operations are halted. Immediately contact the bay chief, nuclear maintenance element/section NCOIC, flight chief, operations officer, or maintenance superintendent to inform them of the rejectable condition. He or she, in-turn, contacts an individual in the grade of MSgt or above who has completed the supervisory certification before continuing the maintenance operation. This supervisory certified individual intervenes anytime a rejectable component or weapon is encountered, or evaluates unknown or unusual weapon or major component condition and makes a final determination whether to continue operations based on careful review of the facts and circumstances. The operation can be completed if the weapon is safe and no other damage will occur. However, after the determination by the supervisory certified individual, if the technical data does not provide you with appropriate procedures or does not adequately address the issue, contact the MAJCOM who will coordinate with the appropriate agency to resolve the situation. In some situations an on-site DOE representative may direct continuation of the maintenance operation (e.g., PAL operation, defect acceptance) when authorized procedures are not available in the governing TO. However, unit personnel must report any defects according to TO 11N–5–1, *Unsatisfactory Reports*, and/or AFMAN 91–221, *Weapons Safety Investigations and Reports*, as applicable.

Bringing up defects for review

It is imperative that any task be stopped and the TC notified when conditions are detected that would jeopardize safety, security, weapon and/or system reliability, and/or equipment damage. If you do not identify these defects, and you are under evaluation, the evaluator will stop or interrupt the task. Your failure to identify and stop the operation will be reported to supervision. The section and/or element supervisor, flight commander/chief, or MX/SUPT will decertify individuals for:

- Failure to perform required proficiency checks.
- Failure to demonstrate required technical proficiency. Demonstrating lack of technical proficiency to such a degree that the task being evaluated cannot be completed without direct supervisory intervention. This does *not* include abnormal conditions requiring supervisory assistance.
- Failure to use the required technical data during weapons maintenance or handling tasks (i.e., no book or checklist, or wrong book or checklist).
- Failure to detect a safety or reliability deficiency in the weapon, component, or support equipment.
- Committing a procedural error that, if not corrected, would likely result in an unreliable weapon, unsafe or insecure environment. This includes violations of weapon system safety rules.

The section and/or element supervisor, flight chief/CC, or MX/SUPT determines, after a review of the facts, if decertification is appropriate. As a *minimum*, remedial training will be conducted and documented.

Line number reporting

Make sure munitions control is notified of fire symbol, line number, or munitions changes affecting weapons storage and/or maintenance facilities as soon as possible after they occur. Use the line numbers from TO 11N–20–11, *General Firefighting Guidance*, when reporting these changes. Munitions control provides this information to the fire department.

011. Bay chief duties and responsibilities

As the bay chief you are responsible for all maintenance that is accomplished in the bay. You are responsible for training, establishing work methods and job instructions, assigning jobs, and supervising people. In addition to providing sound supervision and training you are the technical expert within your area. You are responsible for all assigned enlisted people and must obtain maximum performance from each individual. You must make sure that the mission is efficiently and effectively accomplished and continuously strive to broaden your supervisory techniques and your own, as well as your subordinates', technical expertise. You must understand, implement, and enforce all the standards required of a TC.

Directing and instructing

As the bay chief, you are the immediate supervisor of many individuals. You have direct responsibility for determining and directing the daily activities of your subordinates. They will be under your constant surveillance. Just as proficiency is dependent on experience, it is also dependent on training. You, as a bay chief, must supervise a continual upgrade training program; therefore, your ability as a teacher reflects in your overall capacity as a supervisor.

Instructing or training subordinates is not restricted to the technical procedures of a specific job assignment. Although the prime job assignment must be met first, you must be adaptable to all situations where a need for training is recognized. An increase in mission requirements could demand new skills to compensate for changes to plans, equipment, or procedures. Consider also the effect that stagnation and boredom would have on the morale of a unit if the challenge of learning were discarded. You must ensure that instructions are clear and concise—one major issue in regards to issuing orders is not the order themselves, but the language used to convey the orders. Supervisors with a vast knowledge of the military way of life under many years of experience possess a different language than someone with half that. Ensure the language is simple and understood.

Reviewing completed work, besides assuring a quality product, is your opportunity as the bay chief to evaluate your personnel. Here, more than any other area, you can distinguish between those with inconsistent work habits and those who are the true craftsmen. Weak areas, where further instruction is needed, are identified. Your analysis of quantity and quality of production may generate changes in planning and personnel assignments.

In-process inspections

An in-process inspection (IPI) is an additional supervisory inspection or verification step at a critical point in the installation, assembly, or reassembly of a system, subsystem, or component. These inspections are either TO, major command (MAJCOM), or locally directed. The operations officer or maintenance superintendent complies a list of squadron tasks requiring IPIs that includes the work unit code (WUC), task title/description specific TO, paragraph, and step number within the TO task where the IPI is called for. Once complete, the unit submits the list to quality assurance (QA) for consolidation, group commander's approval, and publication as the group IPI listing. IPIs must be approved and published every two years by the group commander. There is no requirement to include TO-directed IPI tasks in the local listing. As a *minimum*, the individual performing the IPI must be a 7-skill level and JQS qualified on the maintenance task and be listed on the unit's special certification roster. The group commander may authorize a few highly qualified 5-skill level (SrA or higher) for tasks normally required for a 7-skill level to complete in order maximize production effort. Those individuals waived under this should be closely monitored and kept to an absolute minimum.

Special certification roster

The special certification roster is a management tool that provides supervisors with a clear and concise listing of personnel appointed to perform, evaluate, and/or inspect work of a critical nature. Normally, only maintenance requirements that have a definite potential for personnel injury or damage to equipment are included in the special certification roster. Other tasks requiring special training or qualifications may be managed on the special certification roster. Ensure this roster is reviewed quarterly to verify all entries are current and accurate, and prerequisites including applicable training, testing, evaluation, or other requirements for task certification have been completed. The operations officer or maintenance superintendent sign the special certification roster signifying personnel listed are certified and qualified to accomplish tasks requiring certification and inspector authorizations.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

010. Team chief duties and responsibilities

1. What is a supervisory responsibility that falls between preparing a plan and completing the job?

2. Why is a rotational method of assignment effective?

3. What is one of several suggestions that may help you in making work assignments?

4. When performing an operation, what is the requirement regarding reports, parts requisition, technical orders, and tools?

5. What requirements must be completed before personnel can perform WR maintenance?

6. What is the essential step before starting an operation?

7. In technical orders, what does “should” indicate?

8. List the *minimum requirements* that must be included in a pre-task crew briefing.

9. Explain the demand-response procedure.

10. When team members are using technical data and checking off steps, when does the team chief verify that all steps have been completed?

11. Who identifies additional weapons system specific certifiable tasks in addition to tasks listed in AFI 21–204?

12. What must you be able to demonstrate when certifying transfer and transport operations?

13. What are you authorized to do as a team member of a PAL operation?

14. What action do you take upon discovery of a defect that causes rejection of a weapon or major component?

15. What action, if any, is required after an on-site DOE representative accepts a rejectable defect not covered in the TO?

16. What should occur if an individual fails to detect a safety or reliability deficiency in the weapon?

011. Bay chief duties and responsibilities

1. As a bay chief, what are you responsible for?

2. What must the language of a bay chief’s order or instructions be?

3. What does reviewing completed work give you an opportunity to do?

4. What is the definition of an in-process inspection?

5. How often is the in-process inspection list reviewed?

6. What is the minimum qualification requirement for an individual performing in-process inspections?

7. How often is the special certification roster reviewed?

2–3. Inspection and Evaluation Programs

The military importance and political sensitivity of operations with nuclear weapons require that all units and individuals maintain the highest possible standards of performance. The inspection system for nuclear weapons must be professional and thorough so that the nuclear capability of each unit is assured.

012. Higher headquarters inspections

DOD policy is to conduct nuclear weapons technical inspections (NWTI) on all DOD nuclear-capable units. NWTIs are intended to evaluate nuclear weapons system technical assembly, maintenance and storage functions, logistics movement, handling, mating, and the safety and security directly associated with these functions. During the course of an inspection, the inspecting team may evaluate and rate any observed item(s) that affects the safety, security, or reliability of a nuclear weapon system and the unit's ability to effectively perform its assigned nuclear mission. The Air Force may implement additional directives governing NWTIs in order to meet specific nuclear surety requirements and include functional areas not specified in CJCSI 3263.05, *Nuclear Weapons Technical Inspections*.

Major graded areas

Prior to a unit receiving its overall rating, each of the major graded areas (MGA) receives an adjectival rating (e.g., outstanding, excellent, acceptable, marginal, or unacceptable). The inspection consists of the 10 MGAs discussed below.

Management and administration

The management and administration (M&A) consists of the following areas:

- Current directives and technical publications applicable to the NWTI. A check is made to ensure that changes are being received and posted, and that the unit is *not* receiving unauthorized publications pertaining to nuclear weapons.
- Unit standard operating procedures, plans, and instructions implementing DOD and AF requirements in the areas of security, safety, nuclear accident/incident response, command disablement, emergency evacuation, supply support, and logistics movement, as required.
- Key and lock control (including WS^3 code module program and associated COMSEC program), encompassing letters of designation, inventory, audit, transfer procedures, maintenance and disposition, as well as demonstrated proficiency in these areas.
- Organizational processes to ensure personnel are properly qualified and/or certified to perform their assigned nuclear weapons duties.
- Control and handling of classified plans, mission materials, manuals, records, reports, and components directly associated with the scope of the NWTI, including verifiable control procedures (VCP) for permissive action link (PAL), and the coded module system (CMS).
- Required records maintained and evidence of reports pertaining to nuclear weapons accomplished/submitted and records maintained in production control, MUNS control, or QA.
- Accountability and/or custody records, including courier receipts, shipping documents, and records of audit. Designation in writing of accountable and/or custodial officers and verifying officers. Stockpile reporting including weapon status reports (WSR) and semiannual inventory reports (SIR).

Technical operations

Nuclear-capable units will demonstrate each technical operation required to accomplish its nuclear weapons mission. Additionally, the following limitations apply:

- Units having multiple weapons capability may not be required to demonstrate a complete operation for each area if some of the operations are comparable.
- If training weapons are used, operations must be performed in the same safe and secure environment as WR weapons. Obviously there are differences between a trainer and WR; therefore, units may perform steps not normally required with WR, or must omit procedures that are normally required with WR weapons. NWTI inspectors must ensure that any deficiency noted during the operation with training assets would not have occurred if the unit was using WR weapons; therefore, if a trainer is simulated as WR, then it must be used as a WR from start to finish. If the simulated WR weapon contains any rejectable defects, the maintenance team must identify it and allow the inspector to accept or reject the condition before the inspection may continue.

Tools, test, tiedown, and handling equipment

The tools, test, tiedown, and handling (TTT&H) equipment are inspected for adequacy, condition, proper marking, calibration status, and load test, as applicable. The weapons maintenance truck and associated hoist is included in this category. Also, if a piece of equipment is restricted "for training use only" and is used during a simulated WR weapon operation, the maintenance team will identify it and allow the inspector to accept or reject the condition before the inspection can continue.

Condition of the stockpile

The NWTI inspectors inspect the compatibility of items stored or maintained including observing the explosives and active material limits. Additionally, the following apply to the listed assets:

Condition of the Stockpile	
Items	**Inspection Description**
Weapons and components	The inspection consists of questioning personnel and examining items in storage including those items stored in WS^3 vaults. Items are not moved or disassembled for the inspection except to the extent allowed for authorized maintenance. Exposed only the minimum quantity of weapons needed to accurately gauge the condition of the stockpile. NWTI inspectors are required to report the percentage of weapons inspected and *not the actual quantities*.
Weapons and components stored in containers	Containers are not opened for the purpose of the inspection. However, when the state of the item or the condition or accuracy of records is questionable, the container is opened and a visual inspection of the item and record entries made, if required. The determination to open containers is made by the NWTI chief inspector. Any opening or resealing of containers must be within the inspected unit's capability or assistance must be requested from a support unit that has the capability. All seals will be properly replaced if containers are opened. Condition and marking of containers is inspected whether or not they are opened.

Storage and maintenance facilities

Facilities used to store, maintain, and secure nuclear weapons will be inspected for the following:

- Adequacy of storage and maintenance structures including its interior lighting and all nuclear certified hoists and cranes that are an integral part of the facilities.
- Number and type of safety and explosive exceptions, approved waivers/deviations, and actions taken to eliminate conditions requiring exceptions or waivers/deviations.
- Lightning protection systems, records, and demonstration of required system tests. The fire detection, suppression, and notification systems and associated inspection and testing records will be inspected in this category too.

Security

Although security forces are the focal point for this inspection item, we still play an important role in maintaining security of nuclear weapons. NWTI will determine a unit's ability to meet the nuclear weapons security standard by observing three areas described in the table below.

Weapons Security Standard Observation Factors	
Factor	**Description**
Performance	The integrated security system will be evaluated to ensure its operational effectiveness in various environmental conditions. Also, personnel performances will be evaluated through local tasks. This includes, but is not limited to, daily duties, emergency duties, specialized duties, and use/care of equipment.
Compliance validation	Validate compliance with existing requirements and specifications through random sampling and, where practical, in conjunction with performance evaluations and exercises.
Exercises	Exercises provide a realistic assessment of a unit's ability to meet security standards. They will be representative of the environment where nuclear weapons are located. Air Force nuclear-capable units will undergo at least two exercises in the following security areas: above ground facilities, underground facilities, WS^3 areas, land-based missile launch facilities, nuclear force regeneration areas, on- or off-base weapons movement areas, and military airlift operations (includes using actual aircraft). As a note, at least one of the exercises will evaluate the unit's ability to conduct recapture operations.

Safety

The inspection is conducted to ensure compliance with the two-person control and with the safety requirements/precautions specified in pertinent directives. The nuclear surety program will be inspected including implementation, knowledge of, and compliance with the nuclear weapons systems safety rules. Also, the safety practices and unit fire prevention program will be inspected for compliance.

Supply support

The following are inspected only as they pertain to nuclear weapons, DOE-furnished components, and items required for maintenance, storage, and handling:

- Status of nuclear weapons associated equipment and authorized repair parts.
- Adequacy of replacement procedures (requisitions and follow-up action).
- Status of authorized and required items of equipment as reflected in the nuclear weapons allowance list/authorized stockage list.

Personnel reliability program

Personnel reliability program (PRP) is assessed using a balanced inspection approach including a review of records (medical, dental, and personnel), interviews, and other direct contact methods as appropriate. The number of records reviewed will be of sufficient quantity to properly assess the status of the PRP. Additionally, the following will be inspected:

- Procedures including PRP screening, certification, suspension, decertification, and continuing evaluation.
- Knowledge and awareness of PRP by personnel in the program.
- Communication process between PRP certified individuals, supervisors, supporting agencies, and certifying officials.

Logistics movement

All Air Force nuclear-capable units supporting or having responsibility for logistics movement are subject to NWTIs. Wartime emergency resupply movements will not be evaluated during the Defense Nuclear Surety Inspection (DNSI). However, noncustodial units will be required to demonstrate an approved procedure for nuclear weapon tiedown of each weapon system for which the unit has a stated mission. Deficiencies associated with logistics movements will be attributed to this category or the other nine MGAs as determined by the chief inspector.

Special interest items

DTRA may be tasked by the Joint Staff to evaluate special interest items (SII) that may or may not be consistent with the scope of NWTIs. DTRA and other DOD components, or the Air Force may also propose SIIs but these must first be coordinated with the Joint Staff before being submitted to DTRA. And DTRA will notify the inspected unit of the SII prior to the inspection.

013. Quality assurance

Quality maintenance is the basic responsibility of individual maintenance technicians, supervisors, and commanders. The primary role of QA is to determine equipment condition, to evaluate personnel proficiency (including quality of training), and to perform certification of technicians.

Task certification requirements

The objective of the certification program is threefold: to make sure initial certification is conducted using training items; to make sure non-certified individuals are *not* permitted to perform nuclear weapons tasks (handling, storage, maintenance, and mate/demate operations) on war reserve weapons; and to make sure individuals performing nuclear weapons tasks use proper technical data, maintenance procedures, and techniques. Using weapons maintenance trainers, QA certifies technicians to perform or supervise nuclear weapons maintenance tasks as team member or team chief, before allowing them to work on war reserve weapons.

The 2W271 quality assurance technician(s) are certifying officials by virtue of their position. The MX/SUPT appoints technically qualified 2M07X or 2WX7X personnel, in writing, as Nuclear Weapons Certifying Officials for nuclear weapons handling tasks and 2W271 or 2M072 for weapons maintenance tasks. Prior to performing certifications, all individuals appointed (including QA) must have current JQS qualification and a current Evaluator Proficiency Evaluation (EPE).

Other QA responsibilities

Some other QA responsibilities include:

- Establishing a program to monitor and assess the quality of maintenance performed.
- Providing assistance, advice, and authoritative references to maintenance supervisors.
- Managing deficiency reporting and TO improvement reporting programs.
- Making sure technical data and local guidance is current, applicable, and usable.

- Maintaining the central 11N series TO file.

QA also inspects in-use TOs during technical inspections in order to make sure that they are serviceable and up to date. When revisions are necessary for the files in use throughout the maintenance complex, QA advises all affected activities. They are responsible for maintaining the TO improvement program, which includes processing all AFTO Form 22, Technical Manual Change Recommendation and Reply. They must review and validate each report to make sure that any recommended changes are positive. They maintain a suspense file of all *approved* AFTO Forms 22 until they are incorporated in the TO. QA also performs a critical review of all disapproved reports to decide if additional data should be submitted. Using quality control, the evaluation program encourages maintenance people to use standard maintenance practices and to comply strictly with accurate technical data.

Certification qualifications

People assigned certifying official responsibilities must be knowledgeable and JQS qualified on the assigned weapons, weapons systems, NARS, command disable system (CDS), and PAL procedures of the task being certified. The individual must be capable of accurately observing job performance, determining condition, and identifying deviations from established standards.

Prior to performing certifications, the QA superintendent, chief inspector, NCOIC, or MX/SUPT must make sure that each newly assigned certifying official is JQS qualified in the task to be evaluated or area to be inspected and has received an initial evaluator proficiency evaluation (EPE) while performing a personnel evaluation.

QA Superintendent, chief inspector, NCOIC, or MX/SUPT must make sure that all certifying officials receive a semiannual EPE on a personnel evaluation. If a certifying official is overdue the semiannual EPE, the individual is restricted from performing evaluations until the EPE is completed. Certifying officials must *not* certify themselves. Evaluations are only accomplished while observing actual task performance. Evaluators are *not* part of the task being performed. When certifying an individual in the TC or TM position, individuals must perform the entire operation, including all documentation required for the task.

014. Maintenance Standardization and Evaluation Program

The QA staff evaluates the quality of maintenance accomplished in the maintenance organization and performs necessary functions to manage the organization’s Maintenance Standardization and Evaluation Program (MSEP). The MSEP is an objective sampling of both the quality of equipment and the proficiency of maintenance personnel.

MSEP program

The MSEP is both a MAJCOM and wing and/or unit program designed to make sure that maintenance organizations comply with AF, MAJCOM, and unit directives. MSEPs may be combined with Logistics Standardization and Evaluation Programs (LSEP) which focus on supply, transportation, and logistics plans functions. However, the MSEP must have separate evaluation and/or inspection criteria and checklists. MAJCOMs establish an office to implement, manage, and execute the command’s MSEP. The MAJCOM develops criteria and creates a Maintenance Standardization and Evaluation Team (MSET) to evaluate subordinate wings and/or units for compliance. The MAJCOM MSET conducts recurring unit evaluations to make sure that maintenance technician proficiency, equipment condition, and other command-developed focus areas comply with AF, MAJCOM, and local maintenance and munitions policies and directives. The MAJCOM MSET evaluations are not intended to duplicate MAJCOM IG Unit Compliance Inspections (UCI). However, there is normally some overlap of evaluated areas. MAJCOM MSETs may or may not provide an overall grade. If an overall grade is given, MAJCOM MSETs should use objective ratings (Outstanding, Excellent, Satisfactory, Marginal, and Unsatisfactory).

When a maintenance activity receives a rating of “unsatisfactory” or “marginal” during a MAJCOM LSEP/MSEP inspection, MXG/CC directs QA to perform follow-up inspections. Areas receiving an “unsatisfactory” rating are re-inspected within 30 days or within 60 days after receiving a “marginal” rating. The MXG/CC forwards the results of follow-up inspections to the MAJCOM LSET/MSET office.

Unit MSEP

The unit MSEP must be designed to provide maintenance managers with a method to evaluate the unit’s compliance with AF, MAJCOM, and local maintenance directives and policies. Units are responsible for developing their MSEP and conducting local inspections to make sure that their programs, maintenance technician proficiency, equipment condition, and other focus areas comply with AF, MAJCOM, and local directives. Units use MAJCOM-approved checklists or develop standard functional checklists from AF and MAJCOM directives for use at the unit level. For evaluations of technician proficiency and equipment condition, applicable technical data is the evaluation standard.

QA develops an evaluation and inspection plan showing areas, types, and numbers of inspections, and evaluations that must be conducted. When developing the plan, QA OIC/SUPT addresses areas of concern identified by maintenance managers and the Wing Weapons Manager. QA tailors the plan for each squadron, flight, or section. QA is responsible to the MXG/CC and serves as the primary technical advisory agency for maintenance, and assists work center supervisors in managing the maintenance effort. QA personnel implement and administer the MSEP and other programs. Because the MSEP is executed by QA, it permits the MXG/CC to focus the unit program on problem areas where improvements are needed.

Purpose

The purpose of the unit MSEP is to measure how well units meet or exceed standards. QA assesses how well units are meeting compliance goals and look for areas of opportunity for improvement. Some of the areas that must be addressed include the following:

- Compliance with and currency of TOs and directives.
- Aircraft and equipment forms documentation.
- Aircraft and equipment inspections.
- Compliance and management of safety, environmental, and housekeeping programs.
- Training.
- Unit directed programs.
- Routine inspection list.

The Routine Inspection List (RIL) is list of maintenance actions and tasks that require evaluation on a routine basis. MAJCOMs may define additional RIL actions and tasks. QA consolidates inputs and suggested changes from the Operations Officer and MX SUPT, and obtains MXG/CC approval. Additional requirements for nuclear capable units are detailed in AFI 21–204. Tasks are *not* removed from the RIL without MXG/CC approval.

Some of the items the RIL must contain, if applicable to the group, are as follows:

- Housekeeping.
- Environmental compliance.
- Technical data use and currency.
- Consolidated tool kit (CTK) program.
- Aerospace ground equipment (AGE) maintenance.

- AGE flightline use.
- Aircraft and equipment forms and/or Maintenance Information System (MIS) documentation.
- Test, measurement, and diagnostic equipment (TMDE) calibrations when the performing work center is not a Precision Measurement Equipment Laboratory (PMEL).
- Vehicles (including AFTO 244, Industrial/Support Equipment Record, and/or AF Form 1800, Operator's Inspection Guide and Trouble Report).

QA must coordinate with the munitions activity to make sure that all required inspections are performed according to AFI 21–200 series publications. Additionally, QA, while coordinating with the munitions flight CC and/or chief (or operations officer and/or MX SUPT in a MUNS), must develop the following quarterly standards:

- Munitions accountability.
- Munitions storage practices and safety.
- Munitions inspections.
- Munitions material handling and test equipment.
- Munitions stockpile management.
- Tactical missiles records system.
- Munitions infrastructure (e.g., adequacy of lightning protection and grounding systems, bonding of facility doors, adequate power conversion equipment).
- Munitions training programs.

High-missed items from Personnel Evaluations (PE) and Quality Verification Inspections (QVI) are included in the unit's monthly MSEP summary. A *high-missed item* is defined as any work card item missed at least three times during a one-month period. Units should use the high-missed carded items to enhance maintenance-training programs, detect trends, and improve the quality of maintenance. Maintenance data systems analysis section reviews items to identify any relationships with repeat, recur, and Can Not Duplicate (CND) trends.

Inspection requirements

The following requirements support the MSEP: Personnel Evaluations (PE), Quality Verification Inspections (QVI), Special Inspections (SI), Management Inspection (MI), Detected Safety Violations (DSV), Technical Data Violation (TDV), Unsatisfactory Condition Report (UCR) and when directed, other inspections. These inspection terms may differ based on MAJCOM-approved QA databases. The table below provides a more in-depth look at each of these.

MSEP Evaluations and Inspections	
Type	**Description**
Personnel Evaluations (PE)	A PE is an over-the-shoulder evaluation of a maintenance action or inspection by an individual or team. A PE is used to evaluate job proficiency, degree of training, and compliance with technical data. QA makes sure a PE is accomplished on all technicians that perform maintenance. QA rates each PE based on acceptable quality level (AQL) standards that denotes the maximum allowable number of minor findings that may be charged for a task to be rated "Pass." A *minor finding* is defined as an unsatisfactory condition that requires repair or correction, but does not endanger people, affect safety of flight, jeopardize equipment reliability, or warrant discontinuing a process or equipment operation. A *major finding* is defined as a condition that would endanger people, jeopardize equipment or system reliability, and affect safety of flight or warrant

MSEP Evaluations and Inspections	
Type	**Description**
	discontinuing the process or equipment operation. If a failed evaluation occurs, the evaluator must provide on-the-spot feedback. If the work center supervisor determines that an individual should be restricted from performing the task unsupervised, the supervisor annotates the technician's Job Qualification Standard (JQS) or CFETP according to AFI 36–2201. Personnel evaluations (PE) encompass the following operations as a *minimum* (MAJCOMS determine inspection frequency): • General maintenance (GM). • Limited GM. • Limited life component (LLC) exchange. • Parachute (PC) exchange. • Time compliance technical order (TCTO) or alterations (ALT). • Transfer. • Transport. • Safeguards transporter (SGT) loading and/or unloading. • Special Assignment Airlift Missions (SAAM). • Permissive Action Link (PAL).
Quality Verification Inspections (QVI)	A QVI is used to evaluate the condition of weapons, weapon systems, and equipment in terms of technical order configuration, condition, serviceability, installation, operation, etc. It can also be verification that a technician or supervisor properly completed an inspection or repair action. QVIs are charges to the using workcenter (owning workcenter when using workcenter cannot be determined). QVIs are rated "pass" or "fail" by comparing the number of discrepancies with the established AQL standards. A QVI is documented in the MAJCOM-approved QA database.
Special Inspections (SI)	SIs are inspections *not* covered by QVIs, PEs, or MIs. SIs may include, but are not limited to, equipment forms inspections, document file inspections, CTKs, TO files, vehicle inspections, housekeeping, safety practices, FOD Program, etc. SIs may be condition, procedural or compliance oriented. AF Form 2419, Routing and Review of Quality Control Reports, or the MAJCOM-approved QA database is used to document special inspections. SIs can be non-rated. If the SI is rated, a "Pass" or "Fail" is assigned based on established acceptable quality level (AQL) standards. As a *minimum*, QVIs and/or SIs are conducted annually on 100 percent (at a rate of approximately 25 percent per quarter) of the following areas: • Test and handling equipment. • Industrial and/or support equipment and special tools. • Hand tools, Consolidated Tool Kits (CTK) (or other tool control programs), and test, measurement, and diagnostic equipment (TMDE). • Nuclear certified munitions trailers assigned to munitions maintenance activity. • Nuclear certified vehicles assigned to the munitions maintenance activity.

MSEP Evaluations and Inspections	
Type	**Description**
	• Stockpile. • Type 3 trainers. • Historical records (AFTO Form 244s and 95s, Significant Historical Data, electronic inspection record card (eIRC), etc.). • Storage and maintenance facilities. • High Security Key and Lock Program (semiannually). • PAL and/or command disable system (CDS) management program and operations (semiannually). • Nuclear Accountability and Reporting Section (NARS) programs (semiannually). • Nuclear Weapons Training Program (semiannually).
Management Inspection (MI)	Perform these inspections to follow-up on trends, conduct investigations, or conduct research to get to the root cause of problems. MXG/CC, SQ/CC, or work center supervisors may request MIs. Report MI results to the requester, and allow them latitude to explore options before implementing corrective actions. MIs can be nonrated and may be counted in QA trends.
Detected Safety Violations (DSV), Technical Data Violations (TDV), and Unsatisfactory Condition Reports (UCR)	This category represents observed events or conditions with safety implications or technical violations *not* related to an inspection or evaluation and are considered unsafe, not according to established procedures, or in the case of equipment, unfit to operate. • A DSV is an unsafe act by an individual, and the inspector must stop the unsafe act immediately. • A TDV is an observation of any person performing maintenance without the proper technical order available and in use. • A UCR is an unsafe or unsatisfactory condition, other than a DSV, chargeable to the work center supervisor. UCRs may be documented even when it is not possible to determine who created the condition.
Acceptance Inspections	Owning work centers perform acceptance inspections to determine equipment condition and adequacy of depot or contractor maintenance as prescribed by TO 00–20–WA–1, *Web Access - Aerospace Equipment Maintenance Inspection, Documentation, Policy and Procedures*. The unit performs acceptance inspections when receiving newly assigned equipment or as a result of aircraft transferring from another unit, command, or depot. Personnel who perform acceptance inspections should be familiar with the general work requirements and knowledgeable of how to report discrepancies found during acceptance inspections and how to monitor the corrective actions. Deficiency reports are sent to the appropriate ALC and appropriate MAJCOM functional manager.

015. Conducting evaluations and inspections

Evaluators must afford reasonable opportunity for maintenance technicians to detect a defect or deficiency. An evaluation is accomplished only while observing actual task performance or inspecting equipment or documentation. Every effort must be made to coordinate evaluations with maintenance activities; however, "no-notice" inspections may be accomplished. QA must perform at least one no-notice evaluation on a maintenance activity on *each work center each month*. Evaluators verify technicians' qualifications. Evaluators brief all personnel to be evaluated before the start of the evaluation. If a task is already in progress, notify the evaluatees that they are under evaluation and brief them as soon as possible. The briefing covers:

- Evaluation system, procedures, error and deficiency criteria, and grading scale.
- Normal responsibilities such as reports, forms, parts requisition, technical order availability, or any other task related actions that are the evaluatee's responsibilities.
- You may ask for technical help from people and/or agencies normally available in the conduct of day-to-day maintenance, but excessive outside intervention that demonstrates a lack of technical proficiency may result in the task being rated "Fail."
- The evaluator may or may not be a part of the two-person team.
- The evaluator must be notified of any policy, procedure, or configuration changes, or simulations affecting the evaluation.
- All deviations, simulations, and previously complied with (PCW) steps are agreed on by the team chief and evaluator before the start of any evaluation and/or certification.
- Evaluator may ask questions to determine the evaluatee's knowledge of the task under evaluation. Defer questions of this type to the end of the operation. Evaluatees may refer to technical guidance when answering questions.
- Evaluators stop or interrupt a task if conditions are detected that would jeopardize safety, security, weapon and/or system reliability, or equipment damage. The evaluator may only stop the task after all reasonable chances to detect the condition have passed.
- Team chiefs are charged with any error that goes undetected or uncorrected.

  NOTE: Failure to read a warning or caution is a minor error, provided the warning and/or caution is *not* violated.
- The evaluator must be notified at the start and when the task is completed, and if any delays occur.

Proficiency checks

Proficiency checks, or pro-checks, are accomplished at least quarterly for each certified task on which an individual is certified. A technically qualified QA, Bay Chief, section or element supervisor, or flight chief will observe proficiency checks. Proficiency checks may be accomplished during maintenance on WR weapons, in conjunction with a personnel evaluation, or by a higher headquarters evaluation or inspection. Proficiency checks are performed on positions certified (i.e., team member [TM] or team chief [TC]). Team chiefs may accomplish evaluations while performing as team members. Proficiency checks must be accomplished before the end of the third month. For example, the last proficiency check for B–61 LLC was accomplished in July 2014; the next evaluation must be accomplished not later than (NLT) the last day of October 2014. Document the pro-checks on AF Form 2435, Load Training and Certification Document.

Local evaluations and exercises

In addition to a MAJCOM or a commander of a combatant command exercises and/or evaluations, wings and munitions squadron (MUNS) and/or munitions support squadrons (MUNSS) conduct their own local evaluation and/or exercise to help prepare for the upcoming higher level evaluation and/or exercise. Local exercises provide wing, group, and squadron commanders an in-house assessment of their ability to meet wartime tasking without the MAJCOM's presence.

Initiate QA documentation

The QA office uses the AF Form 2419, Routing and Review of Quality Control Reports, or equivalent, to document the inspections and evaluations performed. The routing of reports is determined locally, but *as a minimum*, all reports are routed, in-turn, through the responsible NCOIC, flight chief, and maintenance superintendent to provide an opportunity for comment and/or review.

Any inspections or evaluations that result in a failed task are routed to the group commander. QA retains reports with comments for a *minimum* of 18 months.

Additionally, the AF Form 2419, or equivalent, identifying major findings, technical data violations, unsatisfactory condition reports, direct safety violations and any “failed” ratings for nuclear certified tasks or nuclear certified equipment inspections must be routed through the squadron commander and group commander. QA produces evaluation and/or inspection reports that identify positive efforts as well as underlying causes of substandard quality. Although it is suggested to make recommendations when applicable, however, ensure the evaluated/inspected activity remains free to choose the solution that best fixes the problem. For proficiency evaluations, ensure that the following points are covered:

- Document the strengths and weaknesses of the technician or team.
- Ensure errors and discrepancies are properly categorized and supported by a technical or publication reference. Use the established AQLs to determine the grade of the operation.
- Provide an impact assessment for each error noted. The evaluator knows best the significance of each observed error and must translate that significance so that management has a clear perspective of actions observed. The intent is to inform management of all observations and identify those errors that may require significant retraining versus those noted only for possible trend analysis.
- If possible, use on-the-spot training.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

012. Higher headquarters inspections

1. What is the intent of the NWTI?

2. What category of the MGA ensures that unit procedures and plans implement DOD requirements in the areas of emergency evacuation and command disablement?

3. Under M&A, what does the key and lock control encompass?

4. If training weapons are used during technical operations, what must a maintenance team do upon discovery of a *rejectable defect*?

5. During NWTIs TTT&H equipment inspected for what?

6. What conditions warrant opening a container during a condition of stockpile inspection?

7. What MGA does the inspection of lightning protection system and its records fall under?

8. What three areas make up the nuclear weapons security standards?

9. What MGA does the compliance with the two-person concept fall under?

10. How many medical records must be reviewed during NWTIs?

11. What is *not* inspected during a *logistics movement*?

12. Although the Air Force can propose special interest items (SII), who must SIIs be coordinated with first?

013. Quality assurance

1. Who has the basic responsibility for quality maintenance?

2. What is the primary role of QA?

3. What is the objective of the certification program?

4. Who are certifying officials by virtue of their position?

5. How does QA maintain the TO improvement program?

6. What must a person assigned as a certifying official be responsible for?

7. What must you make sure that each newly assigned certifying official is qualified to perform?

8. Can certifying officials certify themselves?

014. Maintenance Standardization and Evaluation Program

1. What does the MSEP provide?

2. Are MAJCOM MSET evaluations intended to duplicate MAJCOM IG UCIs?

3. Areas rated “unsatisfactory” during a MAJCOM LSEP/MSEP should be reinspected within how many days after the initial inspection?

4. What do unit MSEPs provide maintenance managers?

5. What is the evaluation standard for technicians proficiency and equipment condition?

6. Because the MSEP is executed by QA, it permits the MXG/CC to focus on what?

7. What is the purpose of the unit MSEP?

8. What is the RIL?

9. Define a *high-missed* item.

10. List the types of evaluations, inspections, and observations that support the MSEP.

11. When must an evaluator provide on-the-spot feedback?

12. A QVI is used to evaluate what?

13. When are MIs performed?

14. What violation is committed when an individual is performing maintenance without the proper TO available?

015. Conducting evaluations and inspections

1. Can QA perform no-notice evaluations? If so, how many?

2. When must evaluators brief personnel that they are under evaluation?

3. Explain QA’s briefing regarding “asking for technical help.”

4. When are proficiency checks or pro-checks accomplished?

5. Where do you document proficiency checks?

6. Why does a wing or MUNS/MUNSS conduct local exercises or evaluations?

7. What form does QA use to document inspections and evaluations?

2–4. Processing and Controlling Material

Maintaining all of the maintenance data generated on a daily basis is a truly monumental task. The Air Force invested millions in developing the Core Automated Maintenance System (CAMS) system that you may have used in the past; now you may be using its replacement, the Integrated Maintenance Data System (IMDS). You will use it for managing inspection intervals, maintenance and inspection history, condition and/or status, and work performed on all nuclear weapons and supporting system components and/or equipment. In this section’s lessons we will cover IMDS; test, measurement, and diagnostic equipment (TMDE); due-in from maintenance (DIFM); and mission capable (MICAP) procedures.

016. Maintenance Management Systems

Two data tracking systems are used within our career field to ease tracking and accountability of resources: the IMDS and the Nuclear Munitions Command and Control (NMC2) sharepoint. Each of these systems evolved over the years from using a chalk board, to a dry-erase board, and eventually a dedicated, advanced system using World Wide Web technologies.

IMDS

IMDS is a large, dynamic, on-line data system used at base level to manage aerospace vehicles, maintenance equipment, and personnel resources. It provides much of the maintenance data needed by MAJCOMs and other agencies, including Air Force Materiel Command and Headquarters USAF, to manage and track maintenance resources worldwide. IMDS took over this role from a previous system called Core Automated Maintenance System (CAMS).

CAMS was developed along with the Reliability and Maintainability Information System (REMIS) to work with one another to achieve this objective. In this lesson you'll get an overview of the major aspects of IMDS.

IMDS is now the standard Air Force system for maintenance production support and the collection and processing of equipment maintenance information. All information supporting maintenance functions must be accessible via IMDS for collection, storage, and dissemination of critical data for repair and improvement of our weapon systems and equipment. Eventually, IMDS is planned to function as a "single" logical database to accommodate historical and legacy data currently stored in other databases. The IMDS design is flexible to support changes in logistics infrastructure size, quantity, and mission orientation whether at home base or deployed.

Background information

When CAMS was first introduced in the Air Force, it did away with numerous computer systems that had been used to collect maintenance data. At that time, these systems were not compatible with each other, and interface programs were not very effective in transferring information between these systems. Also the process of retrieving information took a long time. CAMS became the standard maintenance information system for bases with aircraft, communication-electronics, and missile systems. With CAMS, interfacing was faster and efficient in data sharing with other systems. As a result a central depository of essential weapons systems information became a reality. However, the demand for instant information access is becoming the standard military operations. Since network technology provides quick access, integrating the database is the solution that meets both demand and technology requirements. IMDS uses a powerful central database system to reduce data redundancy and supports faster information processing in contrast to CAMS. However, it did not completely do away with the old database structure; it improved it by merging another database system to increase its efficiency.

Fundamentals

IMDS takes over for CAMS for the same four purposes:

1. IMDS provides the capability for maintenance personnel to communicate to a central, base-level computer by way of remote terminals in virtually all maintenance work areas. All remote terminals, using PC desktops or portable PCs, are located in the maintenance workcenters and offices where IMDS is used.
2. IMDS automates maintenance data collection and maintenance work order systems through online remote terminals connected to a single Standard Base-Level Computer (SBLC) system throughout the maintenance complex. IMDS updates information for other users to use. Data entered in one program from one workcenter automatically updates the database; another user from another workcenter or agency can inquire about system entries.
3. IMDS automates aircraft history, aircraft scheduling, aircrew debriefing processes, and provides a common interface for entering base-level maintenance data into other standard logistics management systems. Users from other organizations using a different information system that's related to aircraft are able to interface with IMDS. Examples are supply (i.e., Standard Base Supply System [SBSS]), operational, and engine information.
4. IMDS enhances the front end design of new weapon systems and increases the readiness and sustainability of existing weapon systems. A centralized database system improves the

availability, accuracy, and flow of essential maintenance, operational, and supply information. This is critical to the wartime readiness and operational support of aircraft, communications-electronics, missile maintenance, and support equipment.

Operating concept

IMDS is an event-oriented system. In most cases, data is entered to update the database as a result of an activity that occurred in the maintenance environment. Retrieving information from the database is dictated by the functional user's needs. This operating concept is implemented through online processing of data and the use of a networked database structure.

Online processing capability is provided by accessing IMDS using remote terminals located in the work areas. The user may enter data or retrieve information as the need arises. As a result, the database is maintained in a current state at nearly all times and information retrieval reflects up-to-date conditions.

Use of a networked database enhances the online processing of the data by permitting data that has been recorded one time to be accessed and used by multiple subsystems. This reduces the amount of data the user would otherwise be required to maintain in the system. Furthermore, since commonly used data occurs only once in the database, the accuracy is improved.

Security

Security is an extremely important issue when it comes to computer software, especially databases. Since a database can contain sensitive or classified information, you must take steps to restrict and control access to it. IMDS is a sensitive but unclassified (SBU) information system because it contains sensitive information about people as well as weapon systems status and condition data.

Becoming familiar with the IMDS

The objective of the IMDS detailed in the Air Force Computer Systems Manual (AFCSM) 21–series is to provide users with information necessary to effectively use IMDS. These manuals are organized by volumes, and each volume addresses a different IMDS subsystem or function. The manuals are available online through the Internet at the IMDS web site. The Air Education and Training Command (AETC) online learning system also offers courses that provide training in IMDS. A few of the areas covered by the online training include: Job Data Documentation, IMDS navigation, work center events, serially tracked components, reviewing maintenance workload, equipment history and maintenance status inquiry, loading serially controlled components, and unit work codes.

Nuclear Munitions Command and Control

The Nuclear Munitions Command and Control (NMC2) system is designed to give field units a snap-shot of resource availability. The maintenance officer and/or maintenance superintendent are responsible for ensuring all flights are using the NMC2 to populate the database with pertinent information to determine the health of the organization. Although every shop has a responsibility to update the NMC2, the primary users of this system are the munitions controllers in munitions (MUNS) control.

Fundamentals

MUNS Control maintains a current status of squadron resources through visual aids. The serial numbers, storage location, and condition of nuclear weapons or component data are *not* used in NMC2 since this system is *not authorized for classified information*. All units must use the mandatory field (* items) identified in the NMC2. All units must use NMC2 to track the following information:

- Personnel data and status.
- Munitions material handling equipment status. This includes tracking the munitions trailer status using the applicable data points for trailers in NMC2. As a note, IMDS is used for tracking the maintenance and inspection management.

- Vehicle status.
- Facility capability and maintenance status.
- Events tracking.
- Work order status.
- Retrofit order (RO) status, as applicable. As a note, ROs and special procedures for nuclear weapons *cannot* be tracked by NMC2.
- Pylon and launcher status.
- Reentry system status.
- Nuclear fire line numbers.
- Fire department notifications
- Security forces notifications.
- Unsatisfactory reports, dull swords, deficiency reports, and engineering technical assistance requests (ETAR) status, as applicable.
- Track cruise missile status and location.

017. Test, measurement, and diagnostic equipment management

The Air Force Metrology and Calibration (AFMETCAL) Program is a program that provides measurement standards and equipment to professional and technical work centers, Precision Measurement Equipment Laboratory (PMEL) facilities, measurement equipment users with calibration data and integrated planning. AFMETCAL This program provides for the calibration and repair of test, measurement, and diagnostic equipment (TMDE) and ensures measurement traceability of TMDE through Air Force Primary Standards Laboratory (AFPSL) to the National Institute of Standards and Technology (NIST) or other approved sources. To accomplish this traceability, the AFMETCAL program requires users to obtain calibration services from PMEL. AFMETCAL must approve calibration service from other sources.

TMDE user responsibilities

"User" refers to the using activity or owning organization responsible for calibration and maintenance of items designated as "USER" in the Calibration Measurement Summary (CMS) or TO 33K–1–100–2, *TMDE Calibration Notes, Calibration Interval, Technical Order, and Work Unit Code Reference Guide*. In most cases, the *user* and the *owner* are the same with one exception; the *user* is the activity that physically uses the item. The *owner* is the organization that owns the item via a supply account. The user performs USER calibrations or coordinates with PMEL for assistance when resources are not available. PMEL help identify required equipment or approved sources of support and at times, may perform the calibration as a last resort. The *owner* is responsible for all funding associated with this effort. Additionally, the *user* is responsible for the following:

- Appoint a TMDE coordinator. A TMDE coordinator is not required at locations where PMEL supports only one organization. Ensure TMDE coordinator maintains a current TMDE Master ID Listing (fig. 2–3) which is produced quarterly from PMEL.
- Calibrate, certify and repair any TMDE listed as USER in CMS TOs or TO 33K–1–100–2 at the specific interval. If the USER organization does not have the capability, they may obtain calibration and maintenance support from the lowest echelon organization having the capability. If no organization has the capability, PMEL may assist by providing training, workspace, technical assistance or support, as resources allow.
- Request approval from AFMETCAL through local PMEL prior to obtaining calibration of TMDE from outside sources.

September 07, 2007 13:37 (GMT -5), Base: SHEPPARD AFB — Page 1 of 11

Revision: 1.16

MASTER ID FOR FNUKS

MAJCOM: 0J Unit: 363 TRS Org/Off-Sym: 363 TRS / TTMN 244

Primary Monitor: SSGT JAMES EBERHART Duty Phone: 676-7746

Sort: OWC, Label Number

Label Nbr Certification Lab	Part Number	Warranty / Date	Serial Nbr	Nomenclature Manuf	SRD	Source	On Site	WUC	CAL T.O.	Location	Cal Int	Cal Area	Date Due Cal	Remarks	Date Last Cal	In-Srvc AWP	MOB	WRM	TDY	DPLY	MICP	SPRM
E145380 FPMEL-SHEPPARD AFB	8025B	N	6805091	Digital Multimeter FLUKE89538	HTE	K100		WGXSA	33K8-4-14-1	BLOCK 4	NPC	8			14-NOV-97	N	N	N	N	N	N	N
E176536 FPMEL-SHEPPARD AFB	QC SERIES	Y	0200400098	Torque Wrench SNAPN55719	HTE	K100		ZCLMU	33K6-4-2193-1		NPC	T		+/- 4% CW ONLY	07-MAY-02	N	N	N	N	N	N	N
E176566 FPMEL-SHEPPARD AFB	QC SERIES	N	0698502955	Torque Wrench SNAPN55719	HTE	K100		ZCLMU	33K6-4-2193-1		13	T	23-FEB-08	+/- 4% CW ONLY	23-JAN-07	N	N	N	N	N	N	N
E176604 FPMEL-SHEPPARD AFB	QC SERIES	Y	0700402771	Torque Wrench SNAPN55719	HTE	K100		ZCLMU	33K6-4-2193-1		NPC	T		60"lbs	30-MAY-02	N	N	N	N	N	N	N
E176781 FPMEL-SHEPPARD AFB	QD SERIES	N	0602307505	Torque Wrench SNAPN55719	HTE	K100		WAAWJ	33K6-4-2193-1	1025	NPC	T		+/-4% CW ONLY	09-AUG-02	N	N	N	N	N	N	N
E176782 FPMEL-SHEPPARD AFB	QD SERIES	N	0502503001	Torque Wrench SNAPN55719	HTE	K100		WAAWJ	33K6-4-2193-1	1025	NPC	T		+/-6% CW ONLY	27-MAR-07	N	N	N	N	N	N	N
E176783 FPMEL-SHEPPARD AFB	QD SERIES	N	0302602209	Torque Wrench SNAPN55719	HTE	K100		WAAWJ	33K6-4-2193-1	1025	NPC	T		+/-4% CW ONLY	09-AUG-02	N	N	N	N	N	N	N
E176880 FPMEL-SHEPPARD AFB	31240	N	209886	Torque Wrench JSTEC62016	HTE	K100		ZBMEX	33K6-4-3014-1	M1	NPC	6		+/-6% CW ONLY	12-AUG-02	N	N	N	N	N	N	N
E176917 FPMEL-SHEPPARD AFB	QTS135	N	0637	Torq Scdr-Before 1 Aug 99 SNAPN55719	HTE	K100		WGXGV	33K6-4-3014-1	BLK 5	NPC	T		+/- 6% C/W ONLY	13-AUG-02	N	N	N	N	N	N	N
F226031 FPMEL-SHEPPARD AFB	QC SERIES	Y	0499303181	Torque Wrench SNAPN55719	HTE	K100		ZCLMU	33K6-4-2193-1		13	T	23-FEB-08	+/- 4% IV C/W ONLY	23-JAN-07	N	N	N	N	N	N	N
F226068 FPMEL-SHEPPARD AFB	401SM	N	0103100055	Torque Screwdriver CONDE08194	HTE	K100		WAHFZ	33K6-4-3014-1	1025	NPC	T		+/-6% CW ONLY PER MFG SPECS	30-APR-03	N	N	N	N	N	N	N
F226069 FPMEL-SHEPPARD AFB	401SM	N	0103100072	Torque Screwdriver CONDE08194	HTE	K100		WAHFZ	33K6-4-3014-1	1025	NPC	T		+/-6% CW ONLY PER MFG SPECS	30-APR-03	N	N	N	N	N	N	N

SI075566054

Figure 2–3. TMDE Master ID Listing

- Return all TMDE listed in CMS TOs or TO 33K–1–100–2 to PMEL upon receipt from supply, when scheduled for calibration, or for unscheduled maintenance. Commanders and supervisors are responsible for ensuring TMDE is not used unless it has been calibrated and that is removed from service once the calibration due date has expired.
- Consider alternatives of limited calibration such as Calibrate Before Use (CBU) or No Periodic Calibration (NPC) where possible. Calibration limitation must be approved by the user's shop chief or designated 7-skill level. And ensure individuals authorized to approve limitations and sign or initial certification labels are listed on the special certification roster. Keep in mind, the TMDE coordinator and calibration limitation approving official are two distinctly separated duties.
- Deliver TMDE to PMEL with all ancillary equipment (e.g., power supplies, adapters, cables, etc.) needed for the calibration. PMEL cannot perform a full calibration service and may return the item without any action if ancillary equipment and/or TO are not readily available.
- Provide proper care, handling, cleanliness, and transportation of TMDE.
- Ensure notes contained in the SPECIAL block of certification labels are read and understood.
- Refer measurement standards authorized for use by outside activities to PMEL for calibration. The base PMEL either calibrates these items or requests assistance. PMEL is responsible for ensuring measurement standards meet certification requirements.

- Maintain technical data file for equipment owned. Provide technical data with the TMDE when requested by PMEL. The TMDE user ensures adequate maintenance and availability of technical data exist for each TMDE.
- Identify and/or coordinate any requirements for limited or special calibrations with PMEL. Place authorizing signature or initials on AFTO Form 99, Limited/Special TMDE Certification, or AFTO Form 398, Limited TMDE Certification.
- Remove AFTO Forms (108, 394, 99, or 398) from TMDE that are returned to supply stocks and then notify PMEL of the turn-in. AFTO Forms 108, 394, 99, or 398 (figs. 2–4 and 2–5) on items withdrawn from supply are invalid except for those on Redistribution Order actions. The AFTO Forms 65 and 66 stay on the equipment.

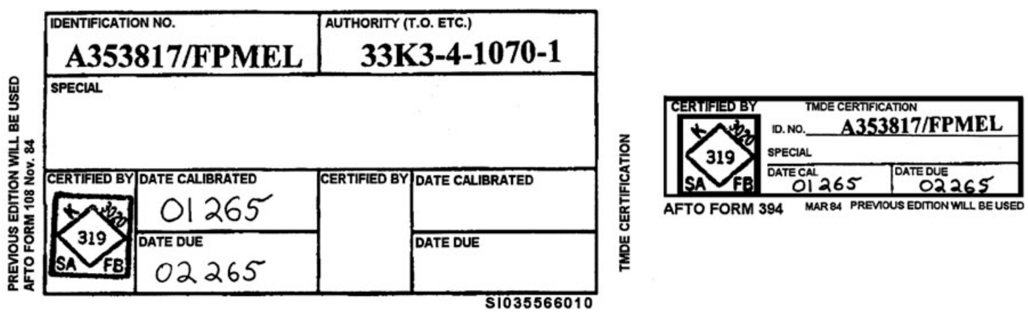

Figure 2–4. Sample AFTO Forms 108 and 394.

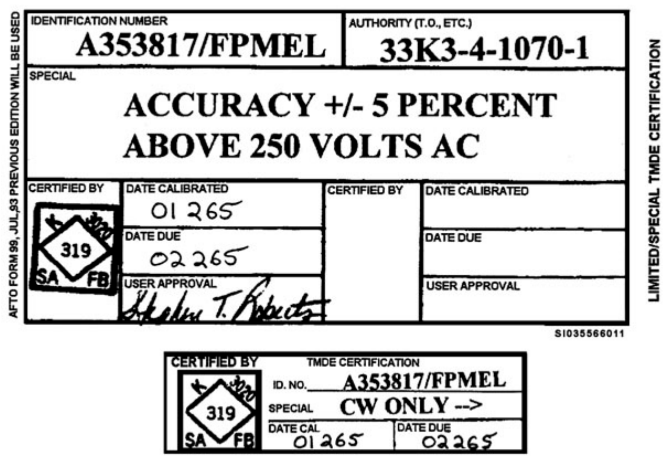

Figure 2–5. Sample, AFTO Forms 99 and 398.

- Leave all condition tags and other documentation including warranty tags (except the receipt) on TMDE being forwarded to the PMEL for initial calibration or acceptance testing and retain shipping containers. The initial calibration is a serviceability check on items from a vendor, technical repair center, or other base. Discrepancies found by PMEL during initial calibration are reported to the user so they can submit deficiency reports back to the source of supply. A calibration procedure can serve as a guideline for an acceptance check.
- Ensure torque-indicating devices, as listed in the CMS TO or TO 33K–1–100–2, are sent to PMEL for scheduled calibration or unscheduled maintenance. Torque indicating devices are considered TMDE and PMELs are primarily responsible for calibration and repair.
- Identify special weapons unique requirements and applicable guidance (such as Nuclear Certified Equipment) which could impact calibration, calibration interval, documentation, etc. to PMEL.

- Ensure Skydrol fluid pressure gauges are calibrated using a Skydrol fluid pressure standard. The gauge user is responsible for calibrating these gauges.
- Ensure users do not reset adjustments sealed with an AFTO Form 255, Notice Certification Void When Seal is Broken. Any TMDE discovered with a broken AFTO Form 255 must be removed from service and submitted to PMEL for recalibration.
- Prior to a local purchase of TMDE, coordinate with PMEL to verify there is no existing TMDE that can be used to satisfy the requirement. Make sure TMDE is already listed in CMS or TO, and if not, assist PMEL in completing the Request for Calibration Responsibility Determination and provide the necessary commercial data.
- Provide PMEL with mission impact statements for awaiting parts follow-up.
- Perform all periodic maintenance or inspection as directed by maintenance TOs.
- Ensure all forms, labels, and calibration correction charts received from PMEL are complete and accurate. Notify PMEL of any errors.
- Maintain warranty information on all TMDE and document start and stop dates and other warranty conditions.
- When notified by PMEL of an “out-of-tolerance” TMDE item, the owning work center (OWC) should determine the impact of the out-of-tolerance condition on shop production and what steps, if any, they should take (customer notification, recall of production items, etc.).

Input priority system

TMDE submitted to PMEL use the following priority system based on category and first-in, first-out within each category. Customers may request the following *calibration or repair* priorities:

Calibration or Repair Priorities	
Priority	**Description**
Emergency	One-of-a-kind TMDE that is inoperable or due calibration and for which a critical job is at a work stoppage. A letter of justification signed by the maintenance supervision or equivalent must accompany the TMDE. The letter may be handwritten to prevent delay and telephone coordination between OWC and PMEL is encouraged. PMEL accepts the emergency TMDE and immediately places it into calibration or repair until it’s completed. The PMEL may require *users* provide a technician familiar with the TMDE to accompany it and remain on-site to provide technical assistance as necessary and to retrieve the TMDE once calibration or repair is completed.
Mission essential	One-of-a-kind, or one-deep, TMDE that is critical to daily peacetime operations, or TMDE assets falling below critical availability levels. A letter of justification signed by the OWC flight chief or equivalent must accompany the TMDE. The OWC flight chief, or equivalent, may pre-identify by letter, which TMDE meets the mission essential definition as approved by PMEL. PMEL accepts mission-essential TMDE any time during duty hours and schedules it with sufficient priory to ensure calibration/repair is completed by the date/time specified by the customer. The OWC or using organization picks up the TMDE immediately upon notification.
Routine	TMDE not categorized as emergency or mission essential as in this category. PMEL accepts TMDE during normal turn-in and pick-up hours. This is equivalent to the normal processing of TMDE in PMEL.

018. Supply management

In the Air Force, resources are at a premium. We all must understand how to correctly and efficiently requisition, use, and turn-in equipment and/or parts at our respective levels. Managers across the spectrum are fighting for resources, and it’s your responsibility to know how to maximize your piece of the pie through a sound understanding of the supply system.

Due in from maintenance

Let’s take a look at a critical link, which understands the expendability recoverability reparability codes (ERRC) (fig. 2–6).

ERRC DESIGNATOR	ERRC CODE	EXPENDABLE*	REPARABLE	CONDEMNATION LEVEL**	MANAGEMENT/ CHARACTERISTICS
XD1	C	Yes	Yes	Depot	Serialized Control and Reporting System (SCARS)
XD2	T	Yes	Yes	Depot	Recoverable Assembly Management Process (RAMP/D035C)
XF3	P	Yes	Yes	Intermediate	Stock Fund (except Munitions) C001
XB3	N	Yes	No	User	Stock Fund (except Munitions) C001
ND2	S	No	Yes	Depot	AF Equipment Management System (AFEMS)
NF2	U	No	***	Intermediate Non-prime Depot	AF Equipment Management System (AFEMS)

* This is a special AF term dealing with materiel accountability. (See AFMAN 23-110)

** Represents the lowest maintenance level at which condemnation is normally accomplished. Does not preclude condemnation at a lower level when the item meets the “condition condemned” criteria. (The lowest condemnation level will also represent the highest maintenance level at which repair is normally accomplished.)

NOTES:

1. Using the above table as an example, the definition of the ERRC Designator (equivalent to the ERRC Code) is:

a. First position. N - nonexpendable; X - expendable. This position has a special meaning and reference must be secured from the regulation; e.g., should not be confused with such terms as “consumed” (although included) or “refer low cost” (no price limitation on expendable items).

b. Second position. Identifies recoverable items through repairs and the lowest maintenance/repair level to condemning an item, etc.

Figure 2–6. ERRC codes.

Simply because an item in need of replacement starts with an “X” in its ERRC designator *does not* mean that you can throw it away. You must look at the second digit as well. The “B” in XB3 means that if you can’t repair the item, you can condemn and throw it away. If the code is an “F” or “D,” the item can be repaired or condemned only at a higher level. In the supply system, these items are called *due in from maintenance (DIFM)* items. You must turn them in when you are issued a replacement. The codes “NF” and “ND” are assigned to equipment items; like the “XF” and “XD” items, you must turn them in when you are issued replacements.

Once a DIFM part has been issued to you, a transaction is automatically placed against your work center under a DIFM status, against that part number, with base supply. This effectively starts a clock against that part number and gives you x-number of days to turn it around and get the old or replaced part or equipment back to supply for turn-in, which turns the clock off, thus clearing the DIFM status against that part number and, ultimately, against your work-center.

If a work center takes too long to turn the part around, usually 30 days, supply account personnel start asking the section for status and aggressively try and “push” the item back to supply. DIFM printouts showing the status of all your work centers DIFM are provided at least monthly or any time requested from supply. Issue requests for DIFM items may be entered into the Standard Base Supply System (SBSS) on a terminal or on AF Form 2005, Issue/Turn-in Request, which is processed through demand processing or through the main system. Output DD Form 1348–1A, DoD Single Line Item Release/Receipt Document, is distributed. Major commands may specify optional distribution for remaining copies of the output documents.

When a firm demand (this means you paid for it) for a replacement item results in a due-out (backorder) and the malfunctioning item is repaired or replacement is no longer required, a due-out cancellation must be prepared to delete the due-out and/or DIFM detail records; this updates the demand data and repair cycle data. Due-out cancellations result in a credit to the customer for the amount originally obligated. This is important for budgeting so that your section gets those valuable budget resources back!

When discrepancies are discovered on the DIFM printout, get with your supply point (interface with Base Supply) and start aggressively working the problem. Always, refer to AFMAN 23–110, *USAF Supply Manual*, CD for precise guidance on DIFM and the supply chain. Let's move into another important subject, how we get supply items fast by way of mission capable (MICAP) action.

MICAP

The MICAP section has a lot of information contained in it for good reason. You might ask yourself why is the process so complicated if I'm going to need a mission essential part right now? When you send a lightning strike up the supply chain that "overrides" all other people using the supply system and commits the base supply system to your need, it must be justified and by the book! The following information explains how to acquire and report on parts needed on a high or highest priority basis. MICAP procedures are used to secure materiel needed to repair mission essential equipment of the highest priority. The MICAP system provides a method of obtaining the kinds of items required by AF organizations to maintain mission capability. For this reason, all people involved in the MICAP system should be familiar with all of the procedures.

Reporting MICAP requirements is based on a start/stop concept; the report period starts at the time the item is requisitioned and stops at the time of termination. Termination can result from the item being due-out released or the requirement being downgraded or canceled. The system provides for automated error corrections. It permits interrogations from AFMC on the status of a MICAP requirement. The system also provides AFMC with information on requisition supply status bases receive from other sources.

MICAP is to be used only after all efforts are made to resolve materiel shortage problems through other local resources. A check of all base-level resources must be carried out before MICAP requisitions are initiated.

Once a MICAP requisition is initiated, managers at all levels are required to intensively manage the MICAP requisition and reporting system. The AF Supply System is designed to help make sure that necessary supplies are available to maintain a high level of mission capability. As we discussed in this lesson, there are times when a base may understandably fall short of supplies.

Before a MICAP requisition is submitted, supply and maintenance personnel must make sure that all possible base-level resources are exhausted. They must determine whether a substitute item can be used, search for items issued for time change and TCTO kits, check bench stocks, check supply point details, check items listed on component parts and/or repair lists, consider cannibalization or items due-in from maintenance not awaiting parts, and assess the possibility of priority repair.

A MICAP condition is confirmed at base level only after maintenance verifies that the end item is *not* mission capable. Supply and maintenance personnel verify that the requirement cannot be satisfied using base-level resources. When the initial materiel search has been carried out and it is certain that the item is *not* available through base resources, a MICAP condition can be confirmed at base level.

At this point, a MICAP issue request is processed. Upon input of valid data, a MICAP start, stop, or change report is submitted to AFMC, and a due-in is established.

A MICAP is terminated at the time of due-out release, due-in or due-out cancellation, or downgrade to non-MICAP. All data required for reporting are contained on the due-out and due-in records. As you can see, MICAP is watched very closely and work centers must use it with care and justification. However, if you have a mission impact situation, this is the process to use to resolve those unique situations.

019. Nuclear weapons related materiel

The guidance and procedures outlined in AFI 20–110, *Nuclear Weapons-Related Materiel Management*, apply to all nuclear support activities directly or indirectly involved in nuclear weapons related material (NWRM) management. This includes Air Force supply (base, depot), transportation, maintenance (base, depot contract/organic), munitions, depot storage, disposal, demilitarization, and anywhere NWRM is managed, located, stored, and used.

NWRM discrepancies

The successful application of NWRM procedures requires the full cooperation of all personnel associated with the storage, shipping, transshipping, and receiving of all hazardous/non-hazardous and classified/unclassified NWRM assets. If you discover a NWRM discrepancy or guidance deviation, you will immediately notify the applicable responsible officer (RO), NWRMAO, munitions accountable systems officer (MASO), or the local LRS/CC/director. Some examples of NWRM discrepancies or guidance deviations requiring notification are:

- Loss of in-transit visibility (ITV) for a period exceeding 72 hours.
- Physical loss of NWRM item.
- AF NWRM asset found outside DOD controls or a NWRM asset found in DOD control not accounted for according to AFI 20–110.
- NWRM found incorrectly stored.
- Incorrect quantity shipped, incorrect serial number loaded or shipped, incorrect NSN loaded or shipped.

All items which are NWRM will have NWRM preceding all nomenclatures in the applicable accounting system.

Security and access control

Maintaining security and controlling access to NWRM facilities helps guarantee physical inventory control, protection, and accountability of NWRM. The following requirements apply to government-owned facilities such as cages, containers, rooms, buildings, vaults, bays, supply points:

- NWRM is afforded priority for indoor storage.
- Clearly mark classified and unclassified NWRM storage areas.
- Record and update NWRM storage locations in the appropriate inventory management system.

Segregate NWRM assets in storage as follows:

- Serviceable from unserviceable by condition code.
- Classified from unclassified. If unclassified is stored in the same facility as classified NWRM, then it must be segregated using ropes, tape, placards, painted lines, or other visible means.
- Assets awaiting demilitarization from other serviceable and unserviceable assets.

Packaging

Individuals packaging NWRM ensure that it is packaged according to AFI 20–110. In addition, individual(s) prepare appropriate documentation according to AFI 24–203, *Preparation and Movement of Air Force Cargo.* It is mandatory to use AF Form 4387, Outbound Transportation Protective Service Material Checklist, when you package NWRM material. In addition, DD Form 1500–series condition tags are completed for all NWRM. Any time a piece of NWRM is packaged or repackaged a new DD Form 1500–series condition tag must be completed.

NOTE: Opening the container to retrieve documents does *not* require completing a new DD Form 1500–series condition tag.

Shipping

When preparing NWRM assets for shipment and you are the shipping originator, make sure that the NWRM assets are properly packaged and marked according to AFI 20–110. Also make sure that the required shipment information is documented on a DD Form 1348–1A, *Issue Release/Receipt Document*. Include standard entries on the DD Form 1348–1A for classified items, along with a printed serial number list with the shipping document. A separate serial number list is *not* required when all the serial numbers are printed on the DD Form 1348–1A. If you are the individual who created or printed the DD Form 1348–1A, stamp it with the statement **—Classified NWRM Item** or **—Unclassified NWRM Item,** in red ink. When you ship nuclear weapon TYPE trainers, include standard entries on the DD Form 1348–1A according to AFI 21–203, *Nuclear Accountability Procedures*.

Receiving NWRM shipment

NWRM assets are in-checked immediately upon receipt. The unit commander appoints individuals, in writing, who are trained and qualified to verify the nomenclature, national stock number, quantity, and serial number on the DD Form 1500–series condition tag with data shown on the shipping document. Do *not* inspect the NWRM asset for the sole purpose of serial number verification. In order to be able to inspect or verify the contents of the packages where a discrepancy exists or there is evidence of tampering, you must be trained, qualified, and appointed in writing by the commander, and you also must be placed on the special certification roster according to AFI 21–101, *Aircraft and Equipment Maintenance Management.*

Inventories

Inventories must be performed on all NWRM assets to ensure asset balances are accurately reflected on each account. A complete physical inventory count of NWRM by serial number and/or unique item identifier is conducted semiannually according to procedures in AFMAN 23–110, Volume 1, Part 1, Chapter 6, *Physical Inventory and Inventory Adjustments*. All NWRM assets on supply accountable records must be inventoried. All Air Force members and employees can be held liable for the loss, damage, or destruction of government property proximately caused by their negligence, willful misconduct, or deliberate unauthorized use.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

016. Maintenance management systems

1. What is IMDS used to manage at base level?

2. The IMDS took over the role to manage and track maintenance resources worldwide from what previous system?

3. What is the standard Air Force system for maintenance production support and the collection and processing of equipment maintenance information?

4. Did the IMDS totally do away with the old database?

5. Name one of the four purposes of the IMDS.

6. Who or what dictates retrieval of information from the IMDS database?

7. What is the classification of the IMDS?

8. What is the objective of the IMDS AFCSM 21–series?

9. Who provides online training to learn about IMDS?

10. Who is responsible for ensuring that all flights use the NMC2?

11. What information must never be stored in the NMC2?

12. Although the NMC2 is designed to track RO status, what information *cannot* be tracked by the NMC2?

017. Test, measurement, and diagnostic equipment management

1. What does the AFMETCAL program provide work centers?

2. How does AFMETCAL ensure measurement traceability of TMDE through the Air Force Primary Standards Laboratory to the NIST?

3. What is the difference between *user* and *owner* in regards to TMDE?

4. What organization helps units identify required equipment or approved sources of support and may perform the calibration as a last resort?

5. How often is the TMDE Master ID listing produced from PMEL?

6. How does a user know if they are responsible for the calibration, certification, and repair of TMDE?

7. Who is responsible for ensuring TMDE is not used once the calibration due date has expired?

8. What are two possible alternatives you may consider for limited calibration?

9. Are the duties between the TMDE coordinator and calibration limitation approving official the same?

10. Why is it important to provide PMEL with all ancillary equipment for TMDE?

11. What form(s) must remain on the TMDE if it is returned to supply stock?

12. What action must the owning work center perform, if any, once notified of an “out-of-tolerance” TMDE item?

018. Equipment account management

1. What does the term ERRC stand for?

2. If a part or piece of equipment has a “D” in the second position of the ERRC designator, can it be thrown away at your level? Why or why not?

3. What’s the normal amount of time allotted to turn around a DIFM part?

4. Who may specify optional distribution for remaining copies of DIFM output documents?

5. When a discrepancy arises with your DIFM printout, who do you contact for resolution?

6. What does the MICAP system provide?

7. Before a MICAP requisition is submitted, what must Supply and Maintenance personnel make sure of?

8. When is a MICAP terminated?

019. Nuclear weapons-related materiel

1. What guidance applies to all nuclear support activities directly or indirectly involved in NWRM management?

2. Who ensures the successful application of NWRM procedures?

3. Who must be notified of loss of ITV for a period *exceeding* 72 hours?

4. What are the security and access controls required for NWRM stored in government-owned facilities?

5. What form(s) are required for packaging NWRM?

6. What must be stamped on the DD Form 1348–1 for NWRM?

7. What must be verified upon receipt of NWRM?

8. How and when are NWRM inventories conducted?

Answers to Self-Test Questions

009

1. Supervisors.
2. 30 days.
3. Helps management assess mission capability and readiness, and it defines requirements for individual's career progression.
4. Type of training done in the maintenance bay that prepares an individual to perform a particular task.
5. CFETP, AF Form 797, AF Form 623A, CDC enrollment card, answer score sheets and scorecards (if enrolled in CDCs), AETC Form 156, and AF Form 2096.
6. AFCFM.
7. AFI 36–2201.
8. Recent formal school graduates and reassigned people.
9. Initial CDC issue, CDC completion schedule, explanation of delays in CDC completion and/or training requirements, problems encountered with task certification (if any), and any training related counseling statements.
10. Locally assigned duty positions, home station training, and deployment and/or UTC requirements not included in the CFETP, Part II. It is also used to develop the AFJQS and the CJQS if deemed necessary by the AFCFM.
11. Certifying official's signature.
12. Block 12.
13. Flight chief or above.
14. AF Form 1098.

010

1. Assigning work.
2. It broadens the skill of each member so that the departure of an individual does not hinder your mission accomplishment.
3. Be well informed about each task you assign and make an honest attempt to answer all questions relating to the assignment.

   Being certain that you know the capabilities of each subordinate. Ask the worker about the task and assign a trainer to guide if necessary.

   Make work assignments through proper channels. Do not violate lines of authority.

   Emphasize the importance of teamwork.
4. Availability, or any other task related actions are the responsibilities of the individuals being evaluated.
5. Required training and the nuclear weapons certifications.
6. Review the records of individuals involved in the tasking *before* the operation. Make sure that they have completed the required training, nuclear weapons certifications, and that none of the requirements are overdue.
7. A preferred method of accomplishment.
8. An outline of the operation; designation of personnel assigned to the task, nuclear surety according to AFI 91–101; necessary safety, emergency, and intrinsic radiation procedures; and the requirement for the two-person concept.
9. You read steps required, including all cautions and warnings. Team members acknowledge and perform the applicable procedures. You then verify and check off the steps after they have been completed.
10. Before weapon and/or component reassembly.
11. MAJCOMs.
12. Proficiency in all task areas that you are qualified to perform.

13. Open and close access doors, connect and/or disconnect PAL cables and adapters, and perform visual monitors if included in the training.
14. Operations are halted.
15. Unit personnel must report any defects according to TO 11N–5–1 and/or AFMAN 91–221.
16. Decertify the individual.

011

1. All maintenance that is accomplished in the bay, training, establishing work methods and job instructions, development of all assigned enlisted personnel, and obtaining maximum performance from each subordinate.
2. Simple and understood.
3. Beside the assurance of a quality product it allows you to evaluate your personnel. Here, more than any other area, you can distinguish between those with inconsistent work habits and those who are the true craftsmen.
4. An additional supervisory inspection or verification step at a critical point in the installation, assembly, or reassembly of a system, subsystem, or component.
5. Every two years.
6. 7-skill level and JQS qualified on the maintenance task and be listed on the unit's Special Certification Roster unless a 5-skill level is authorized by the group commander to perform IPIs.
7. Quarterly.

012

1. To evaluate nuclear weapons systems technical assembly, maintenance and storage functions, logistics movements, handling, mating, and the safety and security directly associated with these functions.
2. Management and administration.
3. Letters of designation, inventory, audit, transfer procedures, maintenance and disposition, as well as demonstrated proficiency in these areas.
4. Identify it and allow the inspector to accept or reject the condition before the inspection may continue.
5. Adequacy, condition, proper marking, calibration status, and load tests, as applicable.
6. When the state of the item or the condition or accuracy of records is questionable.
7. Storage and maintenance facilities category.
8. Performance, compliance validation, and exercises.
9. Safety.
10. Sufficient quantity to properly assess the status of the PRP.
11. Wartime emergency resupply movements.
12. Joint staff.

013

1. Individual maintenance technicians, supervisors, and commanders.
2. To determine equipment condition, to evaluate personnel proficiency (including quality of training), and to perform certification of technicians.
3. To make sure that proper technical data, maintenance procedures, and techniques are used by individuals who are performing maintenance, storage, handling, and logistics movement of nuclear weapons.
4. 2W271quality assurance technicians.
5. They process all AFTO Form 22s; review and validate each report; maintain a suspense file of all approved AFTO Form 22s until they are incorporated in the TO; and perform a critical review of all disapproved reports.
6. Knowledgeable and JQS qualified on the assigned weapons, weapons systems, NARS, CDS, and PAL procedures of the task being certified. The individual must be capable of accurately observing job performance, determining condition and identifying deviations from established standards.

7. JQS qualified in the task to be evaluated or area inspected and received an initial Evaluator Proficiency Evaluation (EPE) while performing a personnel evaluation.
8. No.

014

1. An objective sampling of both the quality of equipment and the proficiency of maintenance personnel.
2. No. However, there is normally some overlap of evaluated areas.
3. 30 days.
4. A method to evaluate the unit's compliance with AF, MAJCOM, and local maintenance directives and policies.
5. Applicable technical data.
6. On problem areas where improvements are needed.
7. To measure how well units meet or exceed standards.
8. A list of maintenance actions and tasks that require evaluation on a routine basis. MAJCOMs may define additional RIL actions and tasks.
9. Any work card item missed at least three times during a one-month period.
10. PEs, QVIs, SIs, MIs, DSVs, TDVs, UCR and when directed, other inspections. These inspection terms may differ based on MAJCOM-approved QA databases.
11. If a failed evaluation occurs.
12. The condition of weapons, weapon systems and equipment in terms of technical order configuration, condition, serviceability, installation, operation, etc. It can also be verification that a technician or supervisor properly completed an inspection or repair action.
13. To follow-up on trends, conduct investigations or conduct research to get to the root cause of problems. MXG/CC, SQ/CC, or work center supervisors may request MIs.
14. Technical data violation.

015

1. Yes. At least one no-notice evaluation on a maintenance activity on each work center each month.
2. Prior to the start of the evaluation. If a task is already in progress, notify the evaluatees that they are under evaluation and brief them as soon as possible.
3. You may ask for technical help from people and/or agencies normally available in the conduct of day-to-day maintenance, but excessive outside intervention that demonstrates a lack of technical proficiency may result in the task being rated "Fail."
4. At least quarterly for each certified task on which an individual is certified.
5. On an AF Form 2435, Load Training and Certification Document.
6. To help prepare a wing or MUNS for an upcoming commander of a combatant command evaluation and/or exercise or provide the wing, group, or squadron commander an assessment on their ability to meet wartime tasking.
7. AF Form 2419 or equivalent.

016

1. Aerospace vehicles, maintenance equipment, and personnel resources.
2. The CAMS.
3. The IMDS.
4. No, it improved it by merging another database system to increase its efficiency.
5. 1. It provides the capability for maintenance people to communicate to a central, base level computer by way of remote terminals in virtually all maintenance work areas. 2. IMDS automates maintenance data collection and maintenance work order systems through online remote terminals connected to a single SBLC system throughout the maintenance complex. 3. IMDS automates aircraft history, aircraft scheduling, aircrew debriefing processes, and provides a common interface for entering base-level

maintenance data into other standard logistics management systems 4. IMDS enhances the front end design of new weapon systems and increases the readiness and sustainability of existing weapon systems.

6. The needs of the functional user.
7. SBU information system because it contains sensitive information about people as well as weapon systems status and condition.
8. To provide users with information necessary to effectively use IMDS.
9. The Air Education and Training Command online learning system.
10. Maintenance officer and/or maintenance superintendent.
11. Serial number, storage locations, and condition of nuclear weapons or component data.
12. ROs and special procedures for nuclear weapons.

017

1. Measurement standards and equipment with calibration data and integrated planning.
2. By requiring users to obtain calibration services from PMEL.
3. The user is the activity that physically uses the item and the owner is the organization that owns the item via supply account.
4. PMEL
5. Quarterly.
6. CMS TOs and TO 33K–1–100–2 list USERS for the TMDE.
7. Commanders and supervisors.
8. Calibrate Before Use or No Periodic Calibration.
9. No.
10. PMEL cannot perform a full calibration service and may return the item without any action.
11. AFTO Forms 65 and 66.
12. Determine the impact of the "out-of-tolerance" condition on shop production and what steps, if any, they should take (customer notification, recall, or production items, etc.).

018

1. Expendability Recoverability Reparability Codes.
2. No; it must be repaired or condemned only at a higher level.
3. 30 days.
4. MAJCOMs.
5. Supply point (base supply).
6. A method of obtaining the kinds of items required by AF organizations to maintain mission capability.
7. Ensure all base level resources are exhausted.
8. At the time of due-out release, due-in or due-out cancellation, or downgraded to non-MICAP.

019

1. AFI 20–110, *Nuclear Weapons-Related Materiel Management*.
2. All personnel associated with the storage, shipping, transshipping and receiving of all hazardous/non-hazardous and classified/unclassified NWRM assets.
3. Applicable responsible officer, NWRM accountable officer, MASO, or the local LRS/CC or director.
4. Afforded priority for indoor storage, clearly mark classified and unclassified NWRM storage areas, and record & update NWRM storage locations in the appropriate inventory management system.
5. The AF Form 4387 and applicable DD Form 1500 series condition tags.
6. "Classified NWRM Item" or "Unclassified NWRM Item" in red ink.
7. Nomenclature, NSN, quantity, and serial number on the DD Form 1500–series condition tag with date shown on the shipping document.
8. By serial number and/or unique item identifier; conducted semiannually.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

36. (009) What is an example of *informal* training used to prepare trainees for on-the-job tasks?
    a. B61 general maintenance.
    b. Career development course (CDC).
    c. Graduate of Nuclear Weapons Technical Training.
    d. Enrollment in Community College of the Air Force (CCAF).

37. (009) Who stipulates the alternatives to the AF Form 623, On-the-Job Training Record, in the Career Field Education and Training Plan (CFETP)?
    a. Air Force Career Field Manager (AFCFM).
    b. Air Force Personnel Center (AFPC).
    c. Unit training manager.
    d. Flight commander.

38. (009) Which of the following does *not* require an initial worker qualification evaluation?
    a. Reassigned personnel.
    b. Newly assigned personnel.
    c. Skill-level upgrade to 5-level.
    d. Recent formal school graduates.

39. (009) What form do you use to identify local or command requirements that are *not* contained in Air Force Training Standards?
    a. AF Form 623A.
    b. AF Form 797.
    c. AF Form 1098.
    d. AF Form 2435.

40. (009) What document do we use to record certification and proficiency training and is also considered a stand-alone document because of the critical nature of the certifications?
    a. AF Form 623A.
    b. AF Form 797.
    c. AF Form 1098.
    d. AF Form 2435.

41. (010) Which method of assigning tasks is often effective in broadening the skills of each member?
    a. Arranged.
    b. Rotational.
    c. Calculating.
    d. Synchronized.

42. (010) What may help you make work assignments?
    a. Make work assignments on your own.
    b. Know the capabilities of each subordinate.
    c. Answer most questions relating to the assignment.
    d. Emphasize the importance of getting the job done.

43. (010) In order to complete an operation, the requirement for tools and supplies is that
    a. everything must be in the weapons storage area.
    b. everything must be able to be ordered from the 708 NSS.
    c. equipment availability is the responsibility of the individuals being evaluated.
    d. as long as you are mission capable (MICAP) and have what is needed during the operation you may continue.

44. (010) Who is responsible for complying with all written guidance and ensuring that required repairs, inspections, and documentation are completed in a safe, timely, and effective manner?
    a. Bay chief.
    b. Shop chief.
    c. Team chief.
    d. All personnel.

45. (010) Who will be held accountable for failing to maintain maintenance discipline standards?
    a. Bay chief.
    b. Shop chief.
    c. Team chief.
    d. All personnel.

46. (010) How many operations can a team chief direct at a time?
    a. 1.
    b. 2.
    c. 3.
    d. As many that can be safely supervised.

47. (010) Before resuming maintenance after an operation was halted, you must review the technical order (TO) to determine
    a. the operation restart point.
    b. the latest interim changes posted.
    c. upcoming warnings and cautions.
    d. the published date matches the TO library listing.

48. (010) Who identifies additional weapons system specific certifiable tasks in addition to those listed in AFI 21–204, *Nuclear Weapons Maintenance Procedures*?
    a. Maintenance group commander.
    b. Career field manager.
    c. Quality assurance.
    d. Major command (MAJCOM).

49. (010) What is *not* required if you are involved in a one-time contingency handling and movement of non-assigned weapons such as Prime Nuclear Airlift Force?
    a. Job qualification standard (JQS) qualification.
    b. Qualified to operate the required equipment.
    c. Transport certification.
    d. Transfer certification.

50. (011) Which is *not* a responsibility of a bay chief?
    a. Developing all assigned enlisted people.
    b. Obtaining maximum performance from each subordinate.
    c. Making sure that the mission is efficiently and effectively accomplished.
    d. Striving to broaden and perfect only your subordinates technical expertise and supervisory techniques.

51. (011) How often does the group commander approve and publish the in-process inspections (IPI)?
    a. Only as changes occur.
    b. Every 18 months.
    c. Every 2 years.
    d. Annually.

52. (011) How often is the special certification roster reviewed to ensure entries are current and accurate?
    a. Annually.
    b. Semiannually.
    c. Quarterly.
    d. Monthly.

53. (011) Who signs the special certification roster signifying the personnel listed are certified and qualified to accomplish assigned tasks?
    a. Flight chief.
    b. Operations officer.
    c. Flight commander.
    d. Squadron commander.

54. (012) Discrepancies against a unit's standard operating procedures covering command disablement and emergency evacuation fall under which *major* graded area?
    a. Tools, test, tiedown, and handling equipment.
    b. Management and administration.
    c. Condition of stockpile.
    d. Technical operations.

55. (012) Discrepancies against the unit's inability to control and handle classified materials and reports fall under which *major* graded area?
    a. Tools, test, tiedown, and handling equipment.
    b. Management and administration.
    c. Condition of stockpile.
    d. Technical operations.

56. (012) Which *major* graded area ensures that units having multiple weapons capability demonstrate a complete operation?
    a. Tools, test, tiedown, and handling equipment.
    b. Management and administration.
    c. Condition of stockpile.
    d. Technical operations.

57. (013) Which is a primary role of quality assurance (QA)?
    a. Evaluate squadron commander.
    b. Evaluate personnel proficiency.
    c. Maintain munitions account database.
    d. Process Weapon Status Reports (WSR).

58. (013) Who must review and validate each AFTO Form 22, Technical Manual Change Recommendation and Reply Report, to ensure that recommended changes are positive?
    a. Maintenance supervisor.
    b. Munitions operations.
    c. Squadron commander.
    d. Quality assurance.

59. (014) The *maximum* allowable number of *minor* findings that may be charged during a Personnel Evaluation of a weapons handling task, and the task still be rated “Pass” is
    a. no more than two.
    b. no more than three.
    c. one with one major.
    d. two with one major.

60. (014) Quality Verification Inspections (QVI) are charged to the
    a. member.
    b. team chief.
    c. using work center.
    d. individual who performed the task.

61. (014) As a *minimum*, Quality Verification Inspections (QVI)/Special Inspections (SI) are performed
    a. monthly on 10 percent of stockpile.
    b. semiannually on 100 percent of hand tools.
    c. annually on 100 percent of test and handling equipment.
    d. according to the QVI and SI individual minimum inspection criteria.

62. (015) Which is *not* part of the briefing quality assurance (QA) gives before the start of an evaluation?
    a. The evaluator will or will not be a part of the two-person team.
    b. Evaluation system, procedures, error and deficiency criteria, and grading scale.
    c. Evaluator cannot ask questions to determine the evaluatee’s knowledge of the task under evaluation.
    d. If a team member does not detect a deficiency they are in a position to detect, the individual and the team chief is charged with an error.

63. (015) Which of the following provides wing, group, and squadron commanders with an *in-house* assessment of their ability without the major command (MAJCOM) presence?
    a. Nuclear Surety Staff assistance visit (NSSAV).
    b. Local exercise/evaluation.
    c. Numbered AF inspection.
    d. Compliance inspection.

64. (015) What is the *minimum* time period quality assurance (QA) retains AF Form 2419, Routing and Review of Quality Control Reports, with comments?
    a. 18 months.
    b. 12 months.
    c. 6 months.
    d. 1 month.

65. (016) The Integrated Maintenance Data System (IMDS) replaced what previous system?
    a. Air Force Data Management Service.
    b. Special Weapons Information System.
    c. Core Automated Maintenance System.
    d. Defense Integration and Management of Nuclear Data Services.

66. (016) The Integrated Maintenance Data System (IMDS) utilizes a powerful central database system to reduce redundancy and
    a. did not completely replace the old database structure.
    b. completely replaced the old database structure.
    c. supports slower information processing.
    d. none of the above.

67. (016) What is the classification of the Integrated Maintenance Data System (IMDS)?
    a. Secret.
    b. Confidential.
    c. For Official Use Only.
    d. Sensitive but unclassified.

68. (017) Which forms must *remain* on the test, measurement and diagnostic equipment (TMDE) items that are returned to supply stock equipment?
    a. AFTO Forms 65 and 66.
    b. AFTO Forms 99 and 398.
    c. AFTO Forms 108 and 394.
    d. All forms must be removed.

69. (017) Which of the following is *not* part of the input priority system used by precision measurement equipment laboratory (PMEL)?
    a. Mission-essential.
    b. Emergency.
    c. Urgent.
    d. Routine.

70. (017) Which of the following precision measurement equipment laboratory (PMEL) priorities requires maintenance supervision, or equivalent, to sign a handwritten letter of justification for inoperable test, measurement and diagnostic equipment (TMDE) to resume a work stoppage?
    a. Mission-essential.
    b. Emergency.
    c. Urgent.
    d. Routine.

71. (017) Which of the following precision measurement equipment laboratory (PMEL) priorities requires the flight chief to sign a letter of justification for test, measurement and diagnostic equipment (TMDE) that falls below critical levels?
    a. Mission-essential.
    b. Emergency.
    c. Urgent.
    d. Routine.

72. (018) A due-out *cancellation* results in a
    a. memo.
    b. due-in.
    c. debit.
    d. credit.

73. (018) Upon input of valid data, a mission capable (MICAP) start, stop, or change report is submitted to
    a. Base supply.
    b. Air Combat Command (ACC).
    c. Nuclear Weapon Logistics Division.
    d. Air Force Material Command (AFMC).

74. (019) How are nuclear weapons-related materiel (NWRM) segregated in storage?
    a. War reserve from trainer assets by size.
    b. Military spares from base spares by lot number.
    c. Serviceable from unserviceable by condition code.
    d. National stock number (NSN) from part number by quantity.

75. (019) Who must appoint trained and qualified individuals to verify the contents of packages suspected of tampering?
    a. Wing commander.
    b. Group commander.
    c. Deputy commander.
    d. Squadron commander.

Student Notes

Glossary of Abbreviations and Acronyms

ACM	advanced cruise missile
AEC	Atomic Energy Commission
AECS	advanced entry control system
AETC	Air Education and Training Command
AFCFM	Air Force career field manager
AFHCP	Air Force hazard communication program
AFJQS	Air Force job qualification standard
AFKAO	Air Force cryptological aids operations
AFMC	Air Force Materiel Command
AFNWC	Air Force Nuclear Weapons Center
AFOSH	Air Force Occupational Safety and Health
AFPC	Air Force Personnel Center
AFSC	Air Force specialty code
AFSEC	Air Force Safety Center
AFSSI	Air Force systems security instruction
AGE	aerospace ground equipment
AIDR	Acceptance Inspection Deficiency Report
AK	adaptation kit
ALCM	air launched cruise missile
ALCS	airborne launch control system
ALO	Albuquerque operations office
ALT	alteration
AMAC	aircraft monitor and control
AMHS	automated message handling system
AOR	area of responsibility
APC	automated PAL controller
AQL	acceptable quality level
ARG	accident response group
ASAC	Army Security Assistance Command
ASCI	accelerated strategic computing initiative
AWM	awaiting maintenance

AWP	awaiting parts
BCE	base civil engineer
BS	base spares
BSSE	bench stock support element
CAP	code activated processor
CAR	container asset report
CAT	category
CBU	calibrate before use
CCP	command control point
CCs	combatant commanders
CD	command disablement
CDC	career development course
CDS	command disable system
CES	code enabling switch
CF	carried forward
CFETP	Career Field Education and Training Plan
CJCSI	Chairman Joint Chiefs of Staff instruction
CJQS	command job qualification standard
CMS	code management system
CMS	calibration and measurement summary
CMS	code management system
CNWDI	critical nuclear weapon design information
COMSEC	communication security
CONUS	continental United States
CRD	confidential, restricted data
CRO	COMSEC responsible officer
CSM	code storage modules
CSS	combat support section
CTK	consolidated tool kit
CTU	code transfer unit
DI	disable
DIAMONDS	Defense Integration and Management of Nuclear Data Services
DIFM	due in from maintenance
DIRNSA	Director, National Security Agency
DLA	Defense Logistics Agency

DNSI	defense nuclear surety inspection
DOD	Department of Defense
DOE	Department of Energy; due-out exists
DOR	dropped object report
DOU	due-out
DR	deficiency reporting
DRAAG	design review and acceptance group
DREAMS	deficiency report entry and mail submitter
DRU	direct reporting unit
DS	dull sword
DSV	detected safety violations
DTRA	Defense Threat Reduction Agency
DTRA/AO	Defense Threat Reduction Agency Albuquerque Operations
EAL	entry authorization list
ECP	entry control point
EDS	environmental detection sensors
EIDS	extremely insensitive explosive articles
eIRC	electronic inspection record card
EMP	electromagnetic pulse
ENDS	enhanced nuclear detonation safety
EOD	explosive ordnance disposal
EPE	evaluator proficiency evaluation
ERRC	expendability, recoverability, and reparability code
ES	exposed site
ESCTS	explosive set circuitry test set
ESD	environmental sensing device
EST	enlisted specialty training
FAM	functional area manager
FMS	foreign military sale
FOA	field operating agency
FOUO	For Official Use Only
FP	field processor
FRD	formerly restricted data
FSC	federal stock class
FSG	federal stock group

FT	field tester
GA	gun-type assembly
GM	general maintenance
GSA	General Services Administration
HAP	high accident potential
HCP	hardness critical procedures, hardness critical point
HE	high explosive
HEMP	high-altitude EMP
HOB	height of burst
HPC	headquarters code processor
HPS	headquarters processor system
HQ USAF	Headquarters United States Air Force
HWMP	hazardous waste management plan
IA	implosion-type assembly
IAV	inventory adjustment vouchers
IAW	in accordance with
IB	inhabited building
ICBM	Intercontinental ballistic missile
ICO	initial calibration only
ICP	initial control point
ID	identification
IDEA	innovative development through employee awareness
IDS	intrusion detection systems
IG	inspector general
IH	in hand
IHE	insensitive high explosive
IM	item manager
IMDS	integrated maintenance data system
IMT	information management tool
INSI	initial nuclear surety inspection
INSS	interim safety study
IOC	initial operational capability
IPB	illustrated parts breakdown
IPI	in-process inspection
IR	infrared

IRC	inspection record card
ISS	initial safety study
ITV	in-transit visibility
JCN	job control number
JNACC	Joint Nuclear Accident Coordinating Center
JNWPS	Joint Nuclear Weapons Publication System
JQS	job qualification standard
JS	Joint Staff
JTA	joint test assemblies
KCP	Kansas City Plant
kt	kiloton
KUMMSC	Kirtland underground munitions maintenance Storage Complex
LANL	Los Alamos National Laboratory
LED	lift emitting diodes
LIL	location inventory listing
LLC	limited life component
LLCE	limited life component exchange
LLNL	Lawrence-Livermore National Laboratory
LLRW	low level radioactive waste
LMF	local monitoring facility
LNSI	limited nuclear surety inspection
LOC	location code
LPS	lightning protection system
M&A	management and administration
MAJCOM	major command
MAQ	maximum authorization quantity
MASO	munitions accountable supply officer
MASS	munitions accountable systems section
MC	major component
MCCS	multiple code coded switch
MCCSS	multiple code coded security switch
MCIS	munitions close-in sentry
MCL	maintenance capability letter
MDC	maintenance data collection
MDR	materiel deficiency report

MET	multiple code coded switch encryption translator
MFR	menu for records
MHAP	mishap deficiency reports
MI	management inspection
MICAP	mission capable
MK	mark
MMOC	Missile Maintenance Operations Center
MNCL	master nuclear certification list
MOD	modification
MOU	munitions dummy units
MRA	maximum reserve authorization
MS	military spares
MSDS	material safety data sheet
MSEP	Maintenance Standardization and Evaluation Program
MSET	Maintenance Standardization and Evaluation Team
MTO	material transfer order
MUNS	munitions squadron
MUNSS	munitions support squadron
MX/SUPT	operations officer / maintenance superintendent
MXG/CC	maintenance group commander
NAC	national agency check
NARS	nuclear accountability and reporting section
NATO	North Atlantic Treaty Organization
NCE	nuclear certified equipment
NCR	no calibration required
NdA	nondisclosure agreement
NFPA	National Fire Protection Association
NIIN	national index identification number
NIPRNET	non-secret internet protocol router network
NNSA	National Nuclear Security Administration
NOSS	nuclear ordnance shipping schedule
NPC	no periodic calibration required
NRTS	not reparable this station
NSA	National Security Agency
NSI	nuclear surety inspection

NSN	national stock number
NUCREP	nuclear (weapon) report system
NWPSC	nuclear weapons product support center
NWSM	nuclear weapons stockpile memorandum
NWSSG	nuclear weapons system safety group
NWTI	nuclear weapons technical inspection
NWTP	nuclear weapons training program
O&I	organizational and intermediate
OCA	original classification authority
OCONUS	outside continental United States
OJT	on-the-job training
OMA	other major assemblies
OPREP	operations report
OPSEC	operations security
OSR	operational safety review
OSS&E	operational safety, suitability, and effectiveness
OST	Office of Secure Transportation
OUIC	operational unit identification code
P&S	plans and scheduling
P/N	part number
PAL	permissive action link
PAS	protective aircraft shelter
PCA	permanent change of assignment
PCS	Permanent change of station
PCW	previously complied with
PDME	portable data module emulator
PE	personnel evaluations
PES	potential explosion site
PIM	product improvement manager
PM	program manager
PMEL	precision measurement equipment laboratory
PNAF	prime nuclear airlift force
POM	program objective memorandum
POSS	preoperational safety study
PQDR	product quality deficiency report

PROM	programmable read only memory
PRP	personnel reliability program
PS&D	plans, scheduling, and documentation
psi	pounds per square inch
PSS	preliminary safety study
Pu	plutonium
QA	quality assurance
QART	quality assurance and reliability test
Q-D	quantity-distance
QSR	QAST status report
QTP	qualification training package
QVI	quality verification inspections
R	recode
RAC	rapid action change
RBL	readiness based leveling
RC	recommended changes
RCN	report control number
RCRA	Resource Conservation and Recovery Act
RD	restricted data
REMIS	reliability and maintainability information system
REPORD	repositioning order
RF	radio frequency
RIL	routine inspection list
RMF	remote monitoring facility
RO	retrofit order
RS	reentry system
RUIC	reporting unit identification code
SA/ALC	San Antonio air logistics center
SAAM	special assignment airlift mission
SAF/IG	Secretary of the Air Force Inspector General
SBU	sensitive but classified
SCM	supply chain manager
SCP	shelter control panel
SCR	status change report
SCV	stock change vouchers

SDM	source data module
SDT	second destination transportation
SE	support equipment
SECDEF	Secretary of Defense
SEP	strike enable plug
SEV	stockpile emergency verification
SFRD	secret formerly restricted data
SFT	stockpile flight test
SGT	safeguards transporter
SI	special inspections
SIPRNET	secret internet protocol router network
SIR	semiannual inventory report
SLA	service logistic agents
SLT	stockpile lab test
SM/IM	system manager/item manager
SNL	Sandia National Laboratories
SOP	standard operating procedures
SPI	special packaging instructions
SRAN	stock record account number
SRD	secret, restricted data
SREMP	source region EMP
SS	source and special
SSAN	social security account number
SSBI	single scope background investigation
SSRS	secure recode system
SSS	special safety study
STS	stockpile-to-target sequence; specialty training standard
SVA	sole vouching authority
SWDR	software deficiency report
SWMS	strategic weapons maintenance section
T&H	test and handling
TBA	training business area
TC	team chief
TCM	technical content manager
TCTO	time compliance technical order

TD	time delays
TDI	tamper detection indicators
TDV	technical data violation
TFP	tactical ferry payloads
TM	team member
TMDE	test, measurement, and diagnostic equipment
TMO	traffic management office
TNT	trinitrotoluene
TO	technical order
TPC	two-person concept
TREE	transient radiation effects on electronics
TSS	transportation safety study
TTI	test and training item
U&TW	utilization and training workshop
U^{235}	uranium-235
UA	user agencies
UC	use control
UCR	unsatisfactory condition report
UIF	unfavorable information file
UR	unsatisfactory report
URC	universal release code
USAFE	United States Air Forces in Europe
USAL	unit spares authorization listing
USECOM	United States European Command
USSTRATCOM	United States Strategic Command
UTC	unit type code
UTC	unit type code
UTM	unit training manager
UTM	unit training manager
VCP	verifiable control procedures
VIDS	very insensitive explosive substances
VSP	verification status pages
WCL	weapons custody list
WDD	wing data disk
WES	weapon electrical system

WIR	weapon information report
WMD	weapons of mass destruction
WR	war reserve
WS3	weapons storage and security system
WSA	weapons storage area
WSAAL	weapons storage area authorization list
WSR	weapon status report

Student Notes

Student Notes

AFSC 2W271
Z2W271 01 1401
Edit Code 03