

COMMANDER'S
GUIDE
TO
NUCLEAR
SURETY
AND
EXPLOSIVES SAFETY



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1. Importance of, and Need for, US Nuclear Capability.

Despite the collapse of the Soviet Union, there is still a need for a US nuclear capability. The primary purpose for US nuclear capability is to deter war by making the consequences of war too high for any rational adversary to accept. The key word of that last sentence is "rational." Many third world countries continue to pursue their own nuclear programs or attempt to obtain weapons from other sources. This means that the primary threat has changed from an eyeball-to-eyeball confrontation with the former Warsaw Pact to Third World proliferation. Possible scenarios include North Korean development of nuclear weapons, or an oil-rich Middle Eastern country acquiring nuclear technology/weapons from a cash-poor former power. Consequently, it is vital that the US maintains its nuclear capability.

2. Nuclear Mishap Prevention Responsibilities of those who work with nuclear weapons.

a. These can best be summed up by the four DoD Nuclear Safety Standards:

There shall be positive measures to prevent nuclear weapons involved in accidents or incidents, or jettisoned weapons, from producing a nuclear yield.

There shall be positive steps to prevent DELIBERATE pre-arming, arming, launching, firing, or releasing of nuclear weapons, except upon execution of emergency war orders or when directed by competent authority.

There shall be positive measures to prevent INADVERTENT pre-arming, arming, launching, firing, or releasing of nuclear weapons in all normal and credible abnormal environments.

There shall be positive measures to ensure adequate security of nuclear weapons, pursuant to DoD Directive 5210.41, *Security Policy for Protecting Nuclear Weapons*, September 1988.

b. The Air Force Nuclear Surety Program is the program designed to ensure that the DoD mandates are met by Air Force units. You are responsible to know and understand all facets of the nuclear surety program that apply to you and your job. This commander's guide is designed to do that.

3. Possible Adverse Impacts in the Event of a Serious Nuclear Mishap.

a. These are not difficult to imagine. If a weapon produced a nuclear yield, the consequences are unacceptable. From the destruction wrought from the fireball itself, to the residual effects of the fallout produced, the actual consequences would be grave indeed. Even if there were a non-nuclear detonation, the resulting spread of radioactive material would leave an environmental nightmare for hundreds if not thousands of years. The political ramifications of such a catastrophe would be equally grave. In all likelihood, demands that we de-nuclearize to prevent recurrence would skyrocket. At the very least, more safeguards would be added which would increase costs on the DoE and DoD. Nuclear weapons must be afforded special protection

on all levels due to their destructive potential, high cost, and political ramifications. Providing the special protection necessary is the function of the Air Force Nuclear Surety Program.

4. Weapon System Safety Rules.

a. The weapons system safety rules are covered in AFI 91-series publications. Following are the highlights from these rules:

(1) Safety rules always apply, even during war.

(2) The commander **may** deviate from a specific rule in an emergency, but **may not** expend a nuclear weapon until authorized by emergency war order.

(3) Do not use weapons to trouble-shoot faults.

b. Verify basic weapon configuration using applicable technical data.

c. As a potential sole vouching authority in the area, you are responsible for the safety and security of the resource. Here is an abbreviated checklist:

(1) Adequate security established (entry controller (EC), rear guard, doors shut).

(2) Ensure EC verifies your credentials prior to entry.

(3) Ensure EC searches hand carried items prior to team entry.

(4) Maintain two-person control.

e. The only time power may be applied to a nuclear weapon is to perform authorized permissive action link (PAL) operations or to monitor the weapon.

5. Security Requirements.

a. Because of their political and military importance, their destructiveness, and the consequences of an unauthorized nuclear detonation, nuclear weapons are considered to face a special threat.

b. Priority A resources--the highest priority possible. Examples include:

(1) Nuclear weapons.

(2) Command, Control, Communications, and Computers (C⁴) systems that directly support nuclear missions.

(3) Designated space and launch resources.

(4) Aircraft designated to transport the President of the United States.

c. Priority B resources--the second highest priority. The major component of weapons systems that are not on alert, but are on installations from which they would be launched for direct strikes or engagement with the enemy or systems that are expensive, limited in number, or one of a kind.

d. Priority C resources--the third highest priority--combat aircraft and missiles not on alert but that can be brought to alert status.

e. Personnel entry into a restricted area will be severely limited at all times. Only persons needed to perform essential official tasks will be allowed to enter.

(1) Unescorted entry is based on frequency of need.

(2) Escorted entry applies to all personnel who may be needed within the restricted area, but who do not qualify for unescorted entry.

(3) The official document to grant a person unescorted entry is the Restricted Area Badge, AF Form 1199 series.

(a) The badge must be displayed on the outer clothing whenever inside the restricted area and must never be displayed outside the restricted area.

(b) The person to whom the badge is issued is responsible for its security and must notify the issuing official if the badge is ever lost.

f. Personnel requiring escorted entry must be authorized into the restricted area by an escort official. Escort officials will have an "E" next to the open areas on the line badge where they have escort authority

(1) Personnel under escort must be continuously under surveillance.

(2) Escort officials are responsible to explain the rules of movement within the restricted area.

(3) The escort or sole vouching authority may specifically designate another person to escort and remain with the person or team being escorted.

g. Entry control procedures will be strictly adhered to by both security and other associated personnel of a restricted area. Single badges are used for entry into areas containing priority "B" and "C" resources as well as some priority "A" resources. Single badge procedures can be defeated relatively easily, so supporting identification and verification procedures are used:

- (1) Personal recognition.
- (2) Signature/credential check.
- (3) Telephone or radio verification.
- (4) Sign/countersign system.

h. Priority areas have locally prescribed duress code words or signals. Use of these words or signals alerts others you are being held against your will. These codes and signals are classified confidential IAW governing directives. Assigned personnel are responsible for knowing these words and understanding their use.

i. The entry controller controls all restricted area entry.

j. Sole vouching authorities are identified by the restricted area badge and one of the following:

- (1) USAFE Form 324 (for pilots).
- (2) Restricted Area Badge-Numbering System (RAB -NS).
- (3) Munitions Entry Authority List (MEAL).

k. Transfer of sole vouching authority between two authorized individuals is permitted provided the close-in sentry (entry controller) is notified of the transfer.

l. Close-in security areas are only associated with priority "A" resources. Inside restricted areas containing this type of resource, individual close-in security areas (no-lone zones) will be established unless the restricted area and close-in security area are one and the same.

(1) Sheltered resources will have a boundary formed by the physical confines of the facility itself (walls, door, roof, etc.)

(2) Exposed resources will have a close-in boundary completely encompassing the resource from a distance between 10 and 60 feet inclusive. Resources are considered exposed when removed from permanent storage structures.

(3) The close-in boundary for exposed resources are marked in one of the following manners:

(a) Painted red line, 4 to 6 inches wide.

(b) Red or orange chain, tape, or rope laid on the ground or supported by stanchions.

(c) Aircraft shelters are marked by elevated rope or tape stretching across the front doors.

(d) During temporary periods not to exceed 30 minutes, armed security forces or munitions personnel may be used to cordon an area in lieu of a barrier.

(4) All entry to and exit from a no lone zone must be through a single entry control point.

m. Security reports:

(1) **Helping Hand:** An unclassified message from anyone who detects an unusual incident, possibly hostile, that affects priority resources. The installation command post shouldn't immediately relay the information to higher headquarters.

(2) **Covered Wagon:** An unclassified message to inform higher headquarters that an unusual incident affecting priority resources, probably or actually hostile, occurred at an installation or dispersed site.

(3) **Avoid Amber:** An incident or condition which may affect site security.

(4) **Avoid Red:** An incident has occurred or is in progress which is a direct threat to site security.

(5) **Threat Condition Alerting Message (TCAM):** A down-channel alerting message sent in response to evaluated Covered Wagon reports or current intelligence information. TCAMs don't trigger a theater-wide or AF-wide THREATCON. They give a summary of the situation and offer a recommended course of action. When the TCAM directs a THREATCON, you must implement it.

6. Two-Person Concept.

a. The two-person concept is a key ingredient to the Air Force nuclear surety program. The two-person concept requires that a minimum of two authorized people be granted access to a weapon within a close-in security area. A two-person concept team will consist of at least two people who meet certain requirements. Each must be familiar with the safety and security requirements of the task to be performed and each must be capable of detecting an incorrect or unauthorized act by their counterpart. Momentary breaches of visual contact are possible provided no opportunity for tampering exists or if such breaches are required by technical data due to space constraints.

b. If an incorrect or unauthorized task is detected, the team member is responsible to take positive actions to terminate the act, remove the offending individual from the area, and notify a supervisor.

c. As stated earlier, deviations from the two-person concept are authorized in emergency situations when there is an immediate threat to the safety or security of nuclear weapons or components. However, custody of US weapons and components must be maintained.

7. Sealing of Nuclear Components.

a. Safing is a method used to protect a nuclear weapon/weapon system, switch, cover, handle, and/or critical component from **inadvertent** activation or entry.

b. Sealing is the method used to **provide evidence** of activation of or tampering with nuclear weapon/weapon system, switch, cover, handle, or critical component.

c. A seal is a device used in sealing which, by its unique design and/or markings, minimizes the possibility of counterfeiting, substituting, removing or reinstalling a seal.

d. A crimping device and die is used to apply the seal. Each crew will be issued a unique crimper which will apply a distinctive design or marking to a lead seal. The seals themselves are accountable items. Crimping devices require controls for receipt, storage, issue, inventory, and disposal of controlled dies. Seals and dies are maintained by individuals other than those responsible for their installation. Training seals will be readily distinguishable from operational seals.

e. If a broken seal is discovered an Avoid Amber report is filed and an investigation is conducted. Any suspect systems will be completely rechecked prior to application of a new seal.

f. If an individual inadvertently breaks a seal in the performance of other duties they will immediately stop the operation in progress, inform their supervisor, and guard the component until the appropriate personnel can verify the system and apply a new seal.

g. Seal integrity is always checked using the two-person concept.

h. Only certified loading or maintenance personnel are authorized to apply and remove seals. Assigned pilots are authorized to remove seals for strike/launch execution only.

i. All imprinted seals will be mutilated to preclude imitation after use. Seals will be returned to the load crew chief for mutilation.

8. Personnel Reliability Program (PRP).

a. PRP is an important adjunct to the two-person concept. PRP ensures that individuals are reliable physically, emotionally, and psychologically to perform tasks with nuclear weapons. The program sets up screening and evaluation procedures involving immediate commanders, Military Personnel Flight, the director of base medical services, and the chief of security force.

b. The purpose of this program is to ensure that personnel with access to or knowledge of nuclear weapons meet the highest standards of personal reliability. The program applies to all

active duty Air Force personnel who are presently assigned or selected for assignment to duties involving control, handling, or access to nuclear weapons, weapon systems, or critical components.

c. An individual holds either a critical or controlled position in PRP based upon their assigned duties:

(1) A critical position can be simply defined as **having technical knowledge** of a weapon or weapon system. Examples include pilots, crew chiefs, and weapons loaders.

(2) A controlled position is one in which the individual's duties require them to be in close proximity to the weapon or weapon system, but no technical knowledge is required. Examples include security forces and weapons handling teams.

(3) A commander holds a PRP position which is equal or greater than the type of position they are authorized to certify. So, if a commander certifies critical positions, he/she holds a critical position also.

d. The commander interviews and evaluates the individual prior to their assignment to nuclear weapons duties. During the interview the commander should stress the significance of the assignment, prohibitions involved, and the need for the individual's dependability and stability. The commander also has properly qualified medical personnel review the individual's medical records. Other requirements are:

(1) If the commander can not find any derogatory information within the person's records or during the interview, he/she is accepted by the commander.

(2) The individual must have the proper investigation and security clearance.

(3) The individual signs an AF Form 286 indicating they understand the intent of the program. The commander signs the same form granting clearance.

e. Once qualified, individuals on PRP are continually evaluated by commanders, supervisors, Air Force medical personnel, and co-workers. If an individual's behavior indicates a problem, they should be temporarily or permanently eliminated from the program.

Decertification from PRP is never used as a basis for punishment or disciplinary actions.

(1) **Suspension** from PRP is used for a period of time not to exceed 30 days which cannot be renewed/extended. Suspension applies when an individual's reliability is not in question, only that circumstances do not allow them to perform PRP functions. A good example is an individual temporarily on some type of medication.

(2) **Temporary Decertification** is used when an individual's reliability is in question. The authorized duration is 180 days, but the certifying official can extend it in 30-day increments, not to exceed 270 days total. A good example for temporary decertification is an individual under investigation by the OSI.

(3) **Permanent Decertification** is used to remove an individual completely from PRP. An individual diagnosed as suffering from alcohol abuse or dependence is a good example of a candidate for permanent decertification.

NOTE: A permanently decertified individual can be reinstated in cases where there is enough justification that the disqualifying problem no longer exists and the problem would not return under any stressful situations.

f. The commander has the final word on suspending or temporarily decertifying an individual from PRP. However, the commander should seek advice from the individual's supervisor, the base hospital, mental health, social actions, co-workers, the chaplain, or the individual themselves.

9. Nuclear Mishap and Hazard Reporting. Flag words are used to classify nuclear weapon/weapon system mishaps or deficiencies. They are defined below in decreasing order of importance:

a. **NUCFLASH:** An accidental or unauthorized launching, firing, or use by US forces or US supported allied forces, of a nuclear-capable weapon system which **could risk the outbreak of war**. These include:

(1) Detonation of a nuclear weapon.

(2) Launch of a nuclear or nuclear-**capable** missile.

(3) Unauthorized deviation from an approved flight plan by a nuclear-armed or nuclear-**capable** aircraft with the capability to penetrate the airspace of the former Soviet Union (Commonwealth of Independent States).

b. **Broken Arrow:** An **accident** or unexpected event involving nuclear weapons, warheads, or nuclear components resulting in any of the following:

(1) Detonation of a nuclear weapon.

(2) Non-nuclear detonation or burning of a weapon.

(3) Public hazard, actual or implied.

c. **Empty Quiver:** Loss, theft, seizure, destruction of a nuclear weapon.

d. **Bent Spear:** A significant **incident** or unexpected event involving weapons, warheads, or components which does not fall into the Broken Arrow category. These include:

(1) Damage to a nuclear weapon or component to the extent that major rework, complete replacement, examination or re-certification by the design agency is required.

(2) Requires immediate action for safety or weapon security, or may result in adverse public reaction (national or international) or premature release of information.

(3) Has such potential consequences as to warrant the interest or action of officials or agencies outside the Air Force.

e. **Dull Sword:** A nuclear safety **deficiency**. Dull Swords are the most common type of reports, are used to identify a situation, event, or condition not reportable as a Broken Arrow, Empty Quiver, or Bent Spear which could or does degrade nuclear surety. A Dull Sword normally involves an unusual event or significant problem that cannot be properly resolved by the reporting unit. Dull Sword reports bring these problems to the attention of those agencies which can evaluate the problem and correct it if necessary. Additionally, Dull Sword reports are crossed to units with like equipment so they can check their inventories and correct deficiencies

before they become mishaps. Events or conditions classified as Dull Swords include the following:

- (1) Damage, malfunction, or failure of a nuclear weapon or warhead.
- (2) Exposure of weapon or warhead to unusual or severe environments such as flood, earthquake, lightning, etc.
- (3) Inadvertent release, launch, loss, or destruction of a nuclear training weapon or ballast dummy warhead.
- (4) Unauthorized tampering, attempted break in, or other unusual security related events at nuclear weapon operational or storage facilities.
- (5) Security deficiencies observed during logistic movement of nuclear weapons.
- (6) Nuclear-certified equipment (listed in TO 00-110N-16) damaged, malfunctions, or fails by other than normal wear.

f. Each individual should be alert for hazards in their work areas. If a hazard is discovered, the following procedures apply:

- (1) Stop the task or operation if the hazard endangers life, could cause injury, or damage equipment.
- (2) Report the hazard.
- (3) Notify the safety office.
- (4) Follow procedures to have the hazard corrected ASAP.

10. Local Situations.

a. Convoy movements are when weapons are most vulnerable. Prior to convoy movements, all personnel will be briefed as to the convoy routes, terrorist threat and security procedures.

b. Terrorist groups exist in Turkey. Incirlik AB has been identified as a potential target area from intelligence/OSI reports. Recent actions against these groups may cause the terrorist activity to become more violent and less predictable. These groups appear to be led by intelligent, highly trained individuals who organize the individual cells. Due to recent world events these groups have lost their major source of funding; however they are still considered a threat.

c. Incirlik has several potential target areas, these are:

- (1) Command Post.
- (2) Hot Cargo Pads.
- (3) Convoys.
- (4) Aircraft Parking Loops/Areas.

11. Support of Logistical Movements of Nuclear Weapons and Critical Components.

a. A logistical movement of nuclear weapons is the movement of nuclear weapons and/or components between installations. The logistic movement of nuclear cargo is one of the Air Force's highest priority tasks and must be given protection from mishaps and terrorist or subversive threats. Commanders must be aware of estimated time of arrival, the nature of cargo aboard, and the requirements for priority handling of all aspects of the mission from arrival to departure to include security, servicing, billeting, clearances, and ground transportation. Each Primary Nuclear Airlift Force (PNAF) movement will have an on-scene coordinator assigned. This officer will be able to resolve difficulties and elevate problems if needed. Typically, this individual will be the logistics group commander or support group commander. Other senior officers and staff will be available to assist the on-scene coordinator. PNAF support will be the number one priority on the base.

b. The on-scene coordinator will ensure (IAW AFJI 11-204 and MCR 55-18, Vol 1):

- (1) Proper security is in place prior to beginning the movement.
- (2) Fire fighting equipment is in place prior to beginning the movement.
- (3) Adequate maintenance support is available.
- (4) All nuclear surety policies are adhered to.

12. Summaries of Past Nuclear Mishaps.

a. A B-47 was on a simulated combat mission that originated at Homestead AFB, FL. While near Savannah, GA, the B-47 had a midair collision with an F-86. The B-47 attempted three times to land at Hunter AFB, GA, with a weapon on board. Due to the condition of the aircraft, airspeed could not be reduced enough to insure a safe landing. The decision was made to jettison the weapon rather than subject Hunter AFB to a potential HE detonation. The weapon was dropped off Tybee Beach near Warsaw Sound. Despite an extensive search, the weapon was never found.

b. A B-47 departed Hunter AFB, GA as number three of a four ship deployment to an overseas base. After level off at 15,000 ft, the aircraft accidentally jettisoned an unarmed nuclear weapon. The bomb's HE exploded on impact. The detonation caused property damage and several casualties on the ground.

c. An F-100 was parked on a revetted hard stand in ground alert configuration. The external load consisted of a weapon on the left intermediate station and three fuel tanks. When the starter button was depressed during a practice alert, an explosion and fire occurred when the external fuel tanks inadvertently jettisoned. Fire was put out in seven minutes. Fortunately a capsule was not in vicinity of the aircraft.

d. A B-52 and KC-135 collided during a routine high altitude air refueling operation. Both aircraft crashed near Palomares, SP. The B-52 had four weapons on board. After extensive search, one was recovered on the ground and one from the sea. Two of the weapons' HE material exploded on impact releasing some radioactive materials. About 1400 tons of contaminated soil were removed from the scene for storage at an approved site in the US. Representatives of the Spanish government supervised the cleanup.

e. A B-52 from Plattsburgh AFB, NY crashed and burned some seven miles southwest of the runway at Thule AB, Greenland. The bomber carried four nuclear weapons all of which were destroyed by fire. Some contamination occurred at the crash site which was primarily sea ice. 237,000 cubic feet of contaminated ice, snow, and water were removed to an approved site in the US for storage. Representatives of the Danish government supervised the operation.

f. In response to these, and other mishaps, Strategic Air Command suspended flying airborne alerts (citing rising costs). Also, better safeguards were developed for aircraft flying weapons ferry missions. As you can see, it does not take much to warrant the attention of foreign governments when weapons are involved.

13. Safe Haven Procedures. Safe Haven is a term associated with CONUS units. It is their plan to provide security to transient nuclear cargo, which may be forced to stop there temporarily. At Incirlik, it is used to denote the safe areas the convoy may evacuate to during an attack while performing logistics movements.

14. Intrinsic Radiation Safety Program.

a. INRAD is the acronym used for intrinsic radiation.

b. ALARA is the acronym used for "As Low As Reasonably Achievable." Within the constraints imposed by logistics, weapons safety, and security requirements, use the following methods to achieve ALARA:

- (1) Minimize the time individuals spend in the vicinity of the weapon system.
- (2) Increase personnel distance from the weapon systems.
- (3) Use shielding.
- (4) Take a combination of these actions.

c. The goal of the Air Force INRAD program is to safeguard personnel from the harmful effects of ionizing radiation. The types of radiation that can be emitted from a weapon system include:

- (1) Alpha particles - extremely weak, no penetration.
- (2) Beta particles - somewhat stronger, cannot penetrate much past the skin.
- (3) Gamma particles - rare, can penetrate your entire body.
- (4) X-ray particles - rare, can penetrate your entire body.

d. Normally, you pick up more ionizing radiation on a sunny day by being outside than you can collect from a weapons system. However, all personnel need to be aware of the INRAD program and the steps you need to take to protect yourself from it. Also, female personnel who know or suspect that they are pregnant must tell their supervisor and be temporarily reassigned to other duties.

15. Electromagnetic Radiation (EMR) Program.

a. Many explosive items are initiated electrically. Some will initiate if exposed to only a small amount of radiated power. To prevent such an event, the wing weapons safety office maintains a map containing locations and operating parameters of permanently assigned emitters. Potential power densities are calculated and unsafe areas are plotted on the map.

b. Emitter locations and types are compared annually with the base frequency manager's records. If your unit is going to have an emitter installed, please contact the safety office. Let them know the requested location and pertinent information about the emitter including operating frequency range (MHz), transmitter power (Watts), and antenna gain (Decibels).

c. One last item to consider is hand-held radios and cellular telephones. These should never be used within the vicinity of any explosives.

EXPLOSIVE SAFETY

1. A Brief History of Why Explosive Safety Exists:

a. While some explosive safety standards existed prior to 1926 (most notably the American Table of Distances developed for the American Railroad Association), military explosive safety standards trace their origin to the Lake Denmark disaster of 1926. Lake Denmark, NJ was a navy ammunition storage base. In 1926, a stack of the World War I era munitions stored at the base detonated as the result of a lightning strike. Nearby stacks went "high order" either sympathetically or as a result of fragmentation. The explosions and ensuing fires killed 21 and injured 51 others. The resulting public outcry led Congress to direct the Department of the Army and Department of the Navy to form a board to investigate the disaster.

b. The investigation board surveyed ammunition storage areas throughout the country. After some time they recommended that New Jersey laws be adapted as standards. Both the Army and Navy formed their own explosive safety command functions. With the creation of the Air Force and the Department of Defense in 1947, all explosive safety issues were "purple-suited" to preclude one service following different standards from the other services. This body is called the Department of Defense Explosive Safety Board (DDESB).

2. Explosives Safety and the Law:

a. The DDESB reports to the Deputy Assistant Secretary of Defense for Family Support, Education, and Safety. They are the OPR for DoD Standard 6055.9, *Standard Ammunition and Explosives Safety Standards*. This standard is the legal basis for explosives safety. DDESB pronouncements are considered an extension of the will of Congress and as such they have the power of law.

b. The Air Force standard for explosive safety is AFMAN 91-201, *Explosive Safety Standards*. This regulation is an extension of DoD 6055.9 and provides further guidance for Air Force specific explosive safety issues. This manual is also considered an extension of the will of Congress and also has the power of law.

c. The 39WG/CC is responsible for ensuring that all known US and NATO rules are followed within his command. To assist him in these endeavors is the weapons safety office. This office must ensure compliance with all known explosive safety standards. If a unit knowingly violates these rules, it is not considered a violation of the UCMJ, but of US Public Law. This means no court martial, but a civilian trial instead.

3. Some Terms Defined:

a. Storing Explosives: Any facility used to store explosives must have either an explosive site plan or an explosive license. Weapons Safety prepares the site plans, and the explosive site plan package is approved by the DDESB after coordination by USAFE and the Air Force Safety Center (AFSC). The explosive license is less stringent due to the quantity and

types of explosives stored. The facility explosive license is approved at the wing level by the Weapons Safety Office.

b. Potential Explosive Site (PES): Any place where an explosive mishap could occur or where explosives are normally stored. Examples include Hardened Aircraft Shelters (HASs) and Earth Covered Igloos.

c. Exposed Site (ES): Any location that can be affected due to a mishap at a PES. Note that a facility can be both an ES and a PES.

d. Quantity-Distance (Q-D): The relationship between the amount of explosives stored at a PES and the distance to a specific ES. Certain targets (ES) can be placed in closer proximity to a PES due to the use of the facility. It must be noted that meeting all Q-D criteria does not provide complete protection, only that the level of risk is acceptable in order to perform a wing's combat mission.

e. K-Factor: This is shorthand for safety factor. The term comes from the equation $D=KW^3$ (cube root of NEW) where D=distance in feet, K=a safety factor constant and W=the net explosive weight. K-factors vary depending on what the ES is used for. For example, an engine test cell can be placed at a K-factor of 18 from a HAS while a child development center must be at a K-factor of 40/50. K-Factors are determined by AFMAN 91-201, Table 3.3.

f. Inhabited Building Distance: The distance that provides the most protection to a facility or personnel. It is the greatest required distance and is shown as a red ring (or the outside ring) on any explosive map.

g. Public Transportation Route (PTR) Distance: Since people on roads are targets of a transient nature, separation factors are slightly relaxed for them. Typically, PTR distance is 60% of inhabited building separation.

h. Related Facility Distance: The separation factor required for a facility which provides direct support to a specific PES. An example is a hush house from a HAS. Note that the same hush house does not provide direct support to munitions storage areas and would therefore require Inhabited Building Separation.

i. Inter-Magazine Separation: The required separation between two explosive storage facilities, typically two earth covered igloos. This distance is considered great enough to prevent simultaneous detonation or propagation. **This separation factor can not be waived or exempted under any circumstances.**

j. Propagation: An explosion at one site causing explosives at other sites to also detonate.

k. Net Explosive Weight (NEW): The total explosive weight of an explosive item. Seldom will this number correspond to the total weight of an item. For example, a MK -82 500 lb. bomb has an NEW of only 192 lbs.

l. Waiver: Used for temporary deviation from explosive Q-D requirements. The approval is based on the type of risk, type and location of the ES, and the time it will be required. The waiver should be used for any condition a unit expects to correct within 5 years.

m. Exemption: These are long-term (normally permanent) deviation of Q-D which the unit believes will not be corrected within 5 years but are necessary to conduct operations.

n. Risk Assessment: This is a document prepared by weapons safety for the wing commander. It provides to the commander an accurate representation of what will happen at an ES should there be a mishap at a PES. This information is derived from tables in AFMAN 91-201. The tables are the result of experiments conducted by DDESB of actual facilities that were built then destroyed.

o. Deviation: These are for noncompliance with non-Q-D issues and are approved by the USAFE/CC for the minimum time required. A good example is the command deviation for defensive fighting positions built into barricades (violates the rule banning foreign substances on or in a dirt barricade).

p. Three-Tier Siting: This is a practice developed within USAFE to provide for the variations between peacetime, exercise/contingency, and wartime sited NEWs at a PES. Basically, more facilities are at risk when conducting wartime operations than peacetime operations. In essence, this allows siting at higher weights, but facilities may have to be abandoned when higher weights are in the area. This is not considered a problem since the affected personnel are not considered essential to the war-fighting task or will be assigned to other duties in other locations.

4. USAF Mishap Prevention Program:

a. The goal is to assist commanders in accomplishing the mission by preserving resources.

b. Objectives:

(1) Provide a safe, healthful working environment for all USAF personnel.

(2) Prevent flight, ground, and weapons mishaps.

(3) Minimize the extent of property damage and severity of personal injuries caused by mishaps.

(4) Prevent damage to private or public property and injuries to non-Air Force personnel as a result of Air Force operations.

(5) Eliminate design deficiencies, unsafe acts, and unsafe conditions.

(6) Ensure compliance with all USAF Nuclear Surety Program elements.

c. A major program element of the mishap prevention program is the AF Form 457 that enables anyone to report an unsafe condition. Unsafe conditions should also be reported to supervisors, unit commanders and the safety office so that an evaluation can be made.

5. Cost of Mishaps:

a. The direct costs of a mishap are obvious and include:

(1) Repairing or replacing damaged or destroyed equipment.

(2) Paying for damage to private and public property.

(3) Paying death benefits, disability compensation, and lost productivity of injured people.

(4) Cost of training invested in Air Force personnel.

b. There are also several indirect costs associated with mishaps. These include:

(1) On-scene rescue, treatment, wages of other personnel who provide help.

(2) Cost of damage recovery, reclamation, and salvage.

(3) Cost of investigating and reporting.

(4) Cost of loss of mission capability resulting from damaged equipment or injured personnel.

6. Mishap Causes.

a. **Most mishaps are the result of a chain of events that usually include one or more unsafe acts or conditions.**

b. The theory is to "break the chain" by eliminating just one unsafe act or condition.

7. Responsibilities for Mishap Prevention:

a. Commanders: Set safety policy and support the development of the safety program.

b. Functional Managers: Are responsible for implementing the mishap prevention program directed by the commander, and ensuring the commander's policies are enforced by each supervisor.

c. Supervisors:

(1) Prevent damage and injury. They are the closest link in the management chain to the people who do the work.

(2) The attitudes of workers toward mishap prevention are likely to reflect the attitude of the supervisor.

d. Individual:

(1) Must comply with all applicable Air Force safety and health standards.

(2) Must make supervisors aware of hazards or unsafe conditions.

8. Responsibilities for Explosive Safety:

a. All personnel in the Air Force who operate or work near an area where explosives are kept are responsible for explosive safety.

b. Commanders are responsible for directing development of the explosive safety program in his/her squadron.

c. Supervisors are responsible for instructing workers on the safe handling of explosives and ensuring that workers comply with all explosive safety standards.

d. Operating personnel are responsible for reporting unsafe conditions, equipment, and materials; warn others who are endangered; comply with all explosive safety standards; and report injuries to their supervisors.

9. Safety Precautions When Handling Explosives:

a. Ensure only trained and qualified personnel handle explosives.

b. People who handle, transport, maintain, load, or dispose of explosives require recurring explosive safety training.

c. Written standards (OIs) must be prepared and followed when explosives are involved in operations. These OIs require weapons safety approval prior to implementation and annually reviewed thereafter.

d. Limit exposure to the minimum number of people to the minimum amount of explosives for the minimum amount of time. This is the cardinal rule of explosive safety.

e. Know the explosive hazards of the devices being used.

(1) Munitions items with a two-inch yellow band contain high explosives.

(2) Munitions items with a two-inch blue band are inert.

(3) Ammunition color bands provide further information about how the munitions item is configured and what the primary hazards are.

f. Flame producing devices such as matches, lighters, etc. are prohibited from being taken into an area containing explosives (except when permission has been granted by the installation commander).

g. Smoking is prohibited within 100 feet of a vehicle transporting explosives.

h. Vehicles, other than those being loaded/unloaded, will not be parked closer than 25 feet to any explosive facility.

10. Fire Protection for Explosives:

a. Fire is probably the greatest hazard to explosives. Because of this, all personnel involved with explosives must be trained in fire protection. Flammable liquids will not be used for cleaning within an area containing explosives.

b. Munitions come in several different "flavors" depending on the primary hazard associated with each one. These "flavors" are known as "class/divisions." Class/divisions provide information to the fire department concerning hazards and what their actions will be if responding to a fire where munitions are involved. **Munitions Control and MOC must keep the fire department alarm room informed as to which facilities have what class/division munitions stored there.**

(1) Class/division 1.1: Mass detonating explosives. Primary hazard is blast and propagation. Examples include general purpose bombs, warheads, demolition materials. The fire department will not fight any fire when 1.1 munitions are engulfed in flames. Rescuing survivors will be at the discretion of the on scene commander.

(2) Class/division 1.2: Fragmenting munitions. Primary hazard is fragments produced when weapon explodes. Examples include 2.75 rocket warheads (HE and WP), tactical missiles, and cluster bombs. The fire department may attempt to fight the fire or rescue survivors at the discretion of the on-scene commander.

(3) Class/division 1.3: Primary hazard is mass fire. Examples include aircraft and signal flares. Fire department will attempt to fight these fires.

(4) Class/division 1.4: Moderate fire hazard. Examples include small arms munitions and impulse cartridges. Fire department will attempt to fight these fires.

c. Withdrawal distances for non-essential personnel in the event of a fire as follows:

(1) Class/division 1.1 -- 4000 feet.

(2) Class/division 1.2 -- 2500 feet.

(3) Class/division 1.3 -- 600 feet.

(4) Class/division 1.4 -- 300 feet.

d. When explosives are **not involved in the fire**, clear the area initially to a distance of 300 feet. The on-scene commander will adjust the withdrawal distance for non-essential personnel.

e. Fire extinguishers suitable for the hazard must be available when explosive operations are in progress.

(1) Class A extinguishers are used on materials such as wood, paper, rubbish, or grass.

(2) Class B extinguishers are used on materials such as oil, gasoline, grease, or paint.

(3) Class C extinguishers are used on fires originating from electrical sources.

11. Publications:

a. Guidance and procedures for establishing and maintaining a weapons safety program are contained in several publications. What follows is a list of the most pertinent, but is by no means all inclusive:

(1) AFI 36-2104, *Nuclear Weapons Personnel Reliability Program*.

(2) AFJI 11-204, *Operational Procedures for Aircraft Carrying Hazardous Cargo*.

(3) AFI 31-101, Vol 1, *The Physical Security Program*.

(4) AFI 31-101, Vol 2, *The Air Force Nuclear Security Program Standards*.

(5) AFI 90-201, *Inspector General Activities*.

- (6) AFI 91-101, *Air Force Nuclear Weapons Surety Program.*
- (7) AFI 91-104, *Nuclear Surety Tamper Detection and Control Programs.*
- (8) AFI 91-108, *Air Force Nuclear Weapons intrinsic Radiation Safety Program.*
- (9) AFI 91-112, *Safety Rules for US Strike Aircraft.*
- (10) AFI 91-202, *The US Air Force Mishap Prevention Program.*
- (11) AFI 91-204, *Investigating and Reporting US Air Force Mishaps.*
- (12) AFMAN 91-201, *Explosives Safety Standards.*
- (13) T.O. 00-110N-16, *Equipment Authorized for Use with Nuclear Weapons.*
- (14) T.O. 11N-20-7 (C), *Nuclear Safety Criteria.*
- (15) T.O. 11N-20-11 (C), *General Firefighting Guidance.*
- (16) T.O. 11A-1-10, *Munitions Serviceability Procedure.*
- (17) T.O. 11A-1-33, *Handling and Maintenance of Explosives Loaded Aircraft.*
- (18) T.O. 11A-1-46, *Management Data and Ammunition Complete Round Chart.*
- (19) DoD 6055.9-STD, *DoD Ammunition and Explosive Safety Standard.*

12. Awards Programs:

a. Commanders' involvement in the awards program is essential. Currently there are quarterly awards for both weapons safety and nuclear surety. Nominations must be submitted to the weapons safety office for each category on the last week of the quarter. Nominations should include a listing of that person's accomplishments pertaining to weapons safety or nuclear surety for that quarter.

b. This program is not limited to your additional duty people. It can be anyone in your squadron. This is a great way to get your superior safety/surety performers recognized.

13. Explosive Safety Training.

a. Everyone who stores, handles, transports, loads, or otherwise deals with explosives is required to have explosive safety training. Topics covered in this training should be tailored to that person's explosive related duties. In other words, a Security Forces person will have significantly different training than an ammo troop. Suggested topics include:

(1) The individual's role and specific responsibilities in the unit weapons safety program.

(2) Toxic, explosive, and hazardous aspects of the specific weapons system.

(3) Proper use of personal protective equipment.

(4) Unique handling and transportation problem areas.

(5) Lessons learned from past mishaps.

(6) Requirement of TO 11A-1-33 for personnel involved in explosives loaded aircraft operations.

(7) Mishap and hazard notification procedures.

(8) General safety requirements when working with munitions, aircraft, and missiles with an emphasis on cockpit switches, ejection seat hazards, and forward firing munitions.

(9) Fire protection precautions.

(10) Emergency procedures.

b. Explosives safety training should be given initially and annually thereafter.

14. Some Essentials to Remember:

a. Management is responsible! Commanders, supervisors, and leaders control resources. You establish work methods, procedures, and policies. Your reaction to noncompliance with required procedures will determine how your subordinates act.

b. Accidents are preventable. Accidents are normally the result of a long chain of events. Break the chain at any point and the mishap can be prevented.

c. Personal involvement by management is essential. Safety programs that are not backed by management will be recognized for what they are--hollow, "square fillers."

d. Training is essential. Properly trained workers can recognize hazards and hazardous actions and understand the consequences. The well-trained worker is less likely to become involved in an accident.

e. Don't fall prey to the "we're at war" mentality. When handling large quantities of live munitions to support a contingency, safety is most important. The consequences of a mishap under these circumstances could be catastrophic in terms of contingency support.

f. Wing Commanders must:

(1) Select the best people to fill key positions, especially the job of Weapons Safety Manager. The WSM should be a dynamic individual who is forceful in driving home the weapons safety message. This person should also not live in "awe of rank;" his/her job is to ensure all explosives operations comply with all known standards and US public law.

(2) Ensure WSMs are properly trained before assuming their duties and they receive command support in carrying out those duties.

(3) Not assign additional duties to WSMs which will detract from their primary duties.

(4) Emphasize all areas related to weapons safety and ensure that supervisors are reinforcing this command emphasis throughout the unit.

(5) Take immediate and aggressive action to correct all weapons safety deficiencies.

g. Squadron Commanders must:

(1) Properly train and certify their people to meet weapons safety requirements.

(2) Include weapons safety considerations as part of each pre-task briefing.

(3) Publicize the need to report all actual or potential weapons safety problems as a means of avoiding more serious problems through early detection and correction.

(4) Keep people informed of changes that affect any part of the weapons safety program or their duties.

(5) Know what to look for and how to take action before accidents occur.

(6) Commit and prioritize resources for the achievement of a safe environment.

(7) Indoctrinate new workers and continually re-educate all personnel including supervisors and managers.

(8) Make sure training programs are current and pertinent.

(9) Understand the wing's combat mission and anticipate the hazards. Emphasize risk education prior to combat.

(10) Incorporate combat missions into the training program.

- (11) Promote maximum safety consistent with operational requirements.
- (12) Realize you will have to accept risk.
- (13) Encourage and expect supervisors to get involved.
- (14) Stay away from band-aid fixes.

LESSONS LEARNED

The preparation process for a Nuclear Surety Inspection (NSI) doesn't begin when you implement your 9-10 month preparation schedule; it really begins when you complete your last NSI. A very important, although sometimes forgotten, part of the preparation process is looking at what you did wrong or could have done better during the just completed NSI. Lessons learned can be very valuable in preparing for your inspection. They can keep you from making the same mistake and can also help out by serving as "fine points" to remember while completing your preparations. The following are some "lessons learned" from past SIs.

1. Personnel Reliability Program:

a. PRP is the commander's program. All agencies that have input into the PRP (i.e., medical, mental health, family advocacy, and MPF) exist so the commander can make valid decisions.

b. Potentially Disqualifying Information (PDI) is just that--the commander decides if the member is suspended. All information that could potentially affect PRP status should be passed to the commander. One piece of information, though not disqualifying in itself, may be what the commander needs to show an individual needs to be suspended.

c. Support agency PRP representatives (i.e., medical, mental health, etc.) are not decision makers, their job is management and administrative. Caregivers and commanders make the decisions.

d. Dental records contain statements of general health--check them. They have contained disqualifying statements in the past (e.g. "I am an alcohol abuser.").

e. Screening of the Unit Personnel Record Group is the basic measuring stick to determine the status of the program. Continual screening of new records, as they are produced, and a couple of 100% records checks go a long way in making sure they are up-to-date. Flawless records will leave the inspectors with an impression that the wing has paid great attention to detail and that the administrative portion is done by the book.

f. Security clearances must be continuously scrutinized to ensure no individual has access to weapons without the proper clearance.

g. Have all items to be inspected (i.e., all case files, suspension log, rosters, PRP management book, etc.) readily available for the inspectors--don't wait until asked to search for these items.

h. Annotations on the reverse of the AF Form 286 need to be held to a minimum. Make entries on the inconsistencies and verify any inconsistencies on the front of the form. Ensure any entries on the reverse are signed and dated by the PRP monitor and/or certifying official.

2. Battle Staff:

a. The Mission Director position is critical. All critical information coming into or out of the battle staff should flow through him.

b. Write down, word for word, any exercise inputs that come in, as well as noting the source they come in on. This is particularly critical during the recapture exercise. **Terrorist demands must be copied word for word**

c. You know what four exercises will be run; be spring-loaded to these scenarios.

d. Ensure on-duty controllers are aware of any changes in weapons locations (particularly trainers).

e. Project into every scenario. Treat every input as real world. Don't simulate anything that's not in the simulations package.

3. Civil Engineering (CE):

a. Identify CE requirements early. In this compliance-oriented inspection, it is critical for all units to identify their CE requirements early and flag them as "NSI related" so the work can be planned and finished in a timely manner.

b. Vehicles are critical. Evaluators look very hard at fluid levels, tire pressures, and all related details.

4. Security Forces:

a. Review and update applicable Security Force Operating Instructions and plans to ensure across-the-board compliance is maintained.

b. Conduct complete sensor checks of the WSA/WS³. This will include checks of the AF Form 340, *Sensor Alarm Data*; USAFE Form 492, *Munitions Structure Opening/Closing Log*; and the AFTO 781A, *Maintenance Discrepancy and Work Document*. This test should also include Performance and Maintenance Inspections by BISS personnel.

c. Have BISS personnel and tools/equipment present during the system test.

d. Provide augmentation force (30-in-30) training to include WS³ deployment tactics for individuals/teams on foot or in vehicles; set up actions for denial/recapture scenarios, including the primary hot cargo pad; convoys and protective aircraft shelter (Safe Haven) procedures.

e. Participation by other base agencies (i.e., command post, maintenance personnel, fire department, EOD, etc.) is vital to ensure realistic scenarios and proper coordination/execution of the actions by all agencies involved in these types of operations.

f. Perform post checks/visits to ensure post briefings are standardized and job knowledge is foremost in the minds of the security forces. All security force personnel need to take an active part in the training process.

g. Evaluate weapons knowledge on a continual basis to maintain the highest standards. Have M-60 gunners and assistants conduct day/night barrel changes (use a training weapon for personnel on the posted response force). Ensure personnel know how and are able to open sealed ammunition cans.

5. Maintenance:

a. Make sure sub-assemblies of nuclear certified equipment (NCE) are compatible with the main assembly as listed in T.O. 00-110N-16. (e.g. forklift tines, hooks, and attaching bolts)

b. Make sure the weight you use to weight-test NCE meets the weight requirement for the test.

c. Have a back up for every person, every vehicle, and every piece of equipment you intend to use.

6. Command Post:

a. Prior planning is critical. Develop a scheme giving all controllers specific areas of responsibility ranging from simple things, like housekeeping duties, to complex items, like creating lesson plans. Creating a sense of ownership strengthened morale and aided in our success

b. Break down everything you do into specific blocks and train. Don't deviate during the inspection.

7. Communications:

a. Do not issue new exercise/contingency checklists or procedures two weeks before the NSI. Furthermore, ensure all aspects of the checklists and procedures used during the NSI are known to all.

b. Position contingency equipment (i.e., DCG comm reaction package) outside the potential exercise/contingency area.

c. Emergency Action Comm Support includes hot lines, STU-III support, and LMRs. Ensure these are included in all preparatory efforts.

d. Automate LMR network diagrams so as to ease change on this ever-changing base.

e. Customer questionnaires are a useful tool to measure our customers' satisfaction as well as demonstrating to the NSI team our sensitivity to their needs.

f. Equipment breaks and bad things happen during inspections. The key is to not panic but take immediate corrective actions, on the spot, to demonstrate our responsiveness to problems.

g. Don't hide things from the inspectors and be open to their inputs and comments. They have much to offer and most the time are more than willing to share information.

h. Flow of information on the status of the inspection is essential on a daily basis at all levels of the squadron. Daily debriefs by flight/branch chiefs and commander/flight chiefs help the crossfeed of information and ensure everyone is updated at all times.

I. A good "self-look" two to three months before the inspection was helpful. A SAV from another unit having just done well on an NSI, implementation of squadron self-inspection program, or a specially requested QC "look" were helpful in identifying less obvious problem areas and giving time to correct as necessary.

j. If you produce a local operating instruction or directive, make sure you are in compliance with all its taskings.