BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE OCCUPATIONAL SAFETY AND HEALTH STANDARD 91-100

1 MAY 1998

302 AIRLIFT WING Supplement 1

7 AUGUST 2004

Safety

AIRCRAFT FLIGHT LINE - GROUND OPERATIONS AND ACTIVITIES

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Supersedes AFOSH Standard 127-100, 30 November 1992

Pages: 85

Distribution: F

The criteria in this standard are the Air Force's minimum safety, fire prevention, and occupational health requirements. Major commands (MAJCOM), direct reporting units (DRU), and field operating agencies (FOA) supplement this standard when additional or more stringent safety, fire prevention, and health criteria are required. Refer to Air Force Instruction (AFI) 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program,* for instructions on processing supplements or variances. Report conflicts in guidance between this standard, federal standards, or other Air Force directives through MAJCOM, DRU, or FOA ground safety offices to Headquarters Air Force Safety Center, Ground Safety Division, Safety Engineering and Standards Branch (HQ AFSC/SEGS), 9700 Avenue G, SE, Suite 222, Kirtland AFB NM 87117-5670.

This standard applies to all US Air Force organizations, including all US Air Force Reserve personnel and when Air National Guard personnel are on federal service. It includes general safety information applicable to aircraft ground handling, servicing, and inspections. The standard addresses safety, fire prevention, and health protection requirements associated with ground handling, servicing, inspection, and maintenance of aircraft, engine runup, and vehicle and support equipment (SE) operations on the flight line. Sources of additional or more specific guidance are shown in parenthesis throughout the standard. It does not apply to combat quick turns. Technical Order (TO) l-1-3, Inspection and Repair of Aircraft Integral Tanks and Fuel Cells, will be used for aircraft fuel cell tank repair system to include related areas and facilities. Not included are safety, fire prevention, and health requirements addressed in specific equipment TOs. This standard implements regulatory provisions of several Occupational Safety and Health Administration (OSHA) Standards and also Air Force criteria not addressed in the OSHA standards.

(302AW) The office of primary responsibility (OPR) for this supplement is 302 AW/SEG (MSgt Smith). This Supplement implements and extends the guidance of Air Force Safety and Health Standard (AFOSHSTD) 91-100, *Aircraft Flight Line - Ground Operations and Activities*, paragraph. **7.2.3.** 1 May

1998. It establishes procedures for the operation of powered and non-powered hangar doors within the 302 Airlift Wing (AW). This supplement is applicable to all personnel under the functional control of the 302 AW Commander only while on Peterson Air Force Base.

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

Administrative changes have been made to update this standard to electronic format. References have been updated as required. Spark arrester (paragraph **1.2.3.1.**) and cardiopulmonary resuscitation requirements (paragraphs **1.2.5.1.**and **1.2.5.5.**) are updated. Reference to job safety analysis (JSA) as a management tool and a suggestion to secure metal-framed eyeglasses are added (paragraphs **1.2.7.2.**, **1.2.7.1.2.**, **8.2.9.**, and **8.3.2.11.**). Aircraft grounding requirements are modified to bring them into line with TO requirements (paragraph **4.2.1.**). Adverse weather condition requirements are added (paragraph **1.2.15.**). Towing supervisor may allow tow vehicle operators to look over their shoulder when towing a vehicle (paragraph **2.2.3.2.**). Tail walker proficiency testing and qualification requirements are waived if towing procedures are their only task (paragraph **2.2.3.5.**). Criteria for taxiing operations (paragraph**2.3.**), passengers in vehicles (paragraph **6.4.6.**), means of egress from hangars, and clear space requirements around hangars (paragraph **7.2.4.**) are changed. Fall protection requirements are updated to incorporate AF-wide variances previously in effect (paragraph **8.2.5.**). AGE towing requirements are better defined (paragraph **8.3.4.2.**). Restrictions on the use of cordless screwdrivers and drills are added (paragraph **8.3.9.**). Parachute Shops are added (paragraph**8.4.**). A glossary of references, abbreviations, acronyms, and terms is included at **Attachment 1** and checklists at **Attachment 2** through **Attachment 13**are updated. Changes are annotated by a bar (|). NOTE: AFOSH 127-series standards are being converted to 91-series standards and the 161-series to 48-series standards. However, not all standards have been converted as of the effective date of this standard. To help you locate these documents, references to AFOSH standards are stated in the updated series and standard number, with the outgoing series and standard number stated as “formerly designated as” in the references section of **Attachment 1**.

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Chapter 1

INTRODUCTION

1.1. Hazards and Human Factors:

1.1.1. Hazards. During ground operations, various hazards are encountered due to the nature of the work and the equipment and tools involved. Other factors involve the variety of weather conditions, the different conditions during day and night operations, mission priorities, and the various aircraft systems. Before examining safety precautions, it is appropriate to outline the major sources of maintenance hazards. Aircraft and flight line areas present potential fire and explosion hazards. Gasoline, explosives, jet fuel, cleaning solvents, oxygen, ejection seats, and powered support equipment are typical of these hazards. Falls present another source of injury to personnel. The potential for falls increases while performing maintenance at elevated levels and during winter or high winds (AFOSH Standard 91-22, *Walking Surfaces, Guarding Floor and Wall Openings and Holes, Fixed Industrial Stairs and Portable and Fixed Ladders*). Engine operation may expose personnel to dangers such as burns, high noise levels, jet blast from the exhaust, and suction from intakes. Electrical shock ranging from the minor shock of static electricity to electrocution from ground power units is another potential hazard. Fuels, cleaning compounds, and fire extinguishing agents can be toxic and harmful when inhaled or contact is made with the skin. Improper lifting procedures while handling tires, brakes, and other aircraft parts can cause back and muscle strains. Handtools and power tools are potential sources of injury if used improperly. Air compressors are potentially hazardous if operated without regard for established safety standards.

1.1.1.1. Personnel who work around aircraft must be alert for hazards from protruding controls, surfaces, antennas, static wicks, pitot tubes, open access hatches, and other projections. Fixed-bayonet static discharges on jets and turboprop aircraft are examples of sharp appendages that can cause injury if contacted.

1.1.1.2. Bumping hazards are created by dropped leading and trailing edges, speed brakes, pylons, pods, and other devices that extend below the main wing surface and fuselage.

1.1.1.3. Many tripping hazards are present around the aircraft and on the ramp. Examples are auxiliary power cables, grounding cables, tie-down ropes or chains, fuel hoses, ladders, and air conditioning ducts.

1.1.1.4. The cause of many falls can be attributed to slipping hazards from oil, deicing fluid, hydraulic fluid, grease spills, and weather conditions. Fuel spills can cause, not only a very slippery surface on the ramp, but also a fire hazard.

1.1.1.5. The potential for serious burns exists while working around aircraft. Areas to be alert for are exhaust areas, pitot tubes, hot brakes, and lights. Also, the exhaust from Aerospace Ground Equipment (AGE), such as auxiliary power and air conditioning units, can burn. Immediately after engine shutdown, the exhaust nozzles and reactor areas are extremely hot and personnel can receive moderate to severe burns. Other sources of burns from aircraft are from support electrical equipment.

1.1.1.6. Jet engine electrical systems can give a severe electric shock. Aircraft electrical systems can be a potential ignition source, which could result in a serious fire if an arc occurs when flammable fuel vapors are present.

1.1.1.7. A potential for serious injuries and fatalities exists during tire inflation and wheel changing on aircraft.

1.1.1.8. Personnel working on or near operating jet aircraft are potentially exposed to the most intense and sustained noise exposures experienced in the Air Force. Possible adverse effects of noise exposure include hearing loss, interference with speech communications, and disruption of job performance. In addition to hearing loss, there are suggestions that noise can cause other physical and psychological disturbances. However, noise exposure limits designed to protect against noise-induced hearing loss should also control these other potential adverse health effects. The most serious aspect of noise exposure is that it can produce permanent hearing loss without recognizable symptoms of ill health or pain. The Air Force hearing conservation program prescribed by AFOSH Standard 48-20, *Hearing Conservation Program,* and OSHA 29 Code of Federal Regulations (CFR) 1910.95, *Occupational Noise Exposure*, establishes procedures for monitoring personnel who are potentially exposed to hazardous noise, in order to detect early signs of hearing loss.

1.1.1.9. Personnel are subject to potential injury from environmental temperature extremes. Injuries resulting from cold weather exposures in northern climates can be serious. Heat exhaustion, sunburns, and strokes are potential concerns in hot and humid climates, especially when combined with physical activities. Fatigue, disorientation, and other physical and mental effects may contribute to mishaps if proper personal protective equipment (PPE), adequate rest periods, and other considerations are not addressed in locally developed guidelines for operational and maintenance tasks.

1.1.2. Human Factors. Human factors may also affect work. Human factors fall into two major categories: mental, such as attitude, emotion, job or domestic pressure, distractions, job knowledge, or hurrying; or physical, such as fatigue, physical strength, and reactions to prescription medications or drugs. These factors can affect workers who, by their commission (what they do) or by their omission (what they fail to do), can contribute to or cause a mishap. Some examples are:

1.1.2.1. Ignoring directions from supervisors.

1.1.2.2. Improper operation of equipment while angry or distracted.

1.1.2.3. Distractions from job while thinking of personal problems.

1.1.2.4. Not following proper procedures or taking shortcuts because of a feeling of being hurried.

1.1.2.5. Drowsiness or hyperactivity on the job caused by prescription medications, alcohol, or illegal drugs.

1.1.2.6. Use of equipment although not qualified.

1.2. General Requirements :

1.2.1. Guidance:

1.2.1.1. Most hazardous situations can be avoided by simply following procedures, asking for help when needed, and using PPE. Potential safety, fire, and health hazards can be effectively con-

trolled by proper training before job accomplishment, appropriate work procedures, and supervisory controls.

1.2.1.2. Guidance contained in AFI 91-202, *The US Air Force Mishap Prevention Program,* and AFI 91-301 can be used by supervisors and managers in identifying, assessing, and abating hazards within their areas of responsibility. A working knowledge of these two instructions, TOs, and other AFOSH standards applicable to aircraft maintenance activities are expected to make supervisors and managers aware of the hazards associated with their areas of responsibility.

1.2.2. Fire Prevention. Fire and explosion are potential hazards associated with aircraft maintenance and servicing operations. Servicing and maintenance operations will be performed in facilities conforming to the requirements of Air Force design criteria or equivalent Air Force-approved engineering guidance. Contractor aircraft maintenance facilities will conform to the requirements of this standard and the National Fire Codes. Also see paragraph **1.2.18.** for additional guidance on contractor operations.

1.2.3. Flight Line Potentially Hazardous Areas and Operations:

1.2.3.1. Flammable Fuel Vapor Areas. The supervisor will ensure all personnel are aware of potentially flammable fuel vapor areas and the restriction against bringing sources of ignition into these areas. Fuel vapors are heavier than air and will settle to ground level and enter below-ground areas. Some examples of hazardous fuel vapor areas are fuel pits below ground level, and areas within 10 feet of aircraft fuel vent systems and fuel spills. Spark arresters are no longer required on general or special purpose vehicles that operate on the flight line and in and around aircraft. However, these Air Force vehicles are not designed, certified, or authorized to operate in flammable fuel vapor areas. Personnel whose duties include requirements to work in flammable fuel vapor areas will receive specialized training with emphasis on the hazards associated with these operations. See Air Force Manual (AFMAN) 91-201, *Explosive Safety Standards*, paragraph 2.71.6. for requirements of spark arresters on general or special purpose vehicles within the vicinity of structures containing exposed explosives.

1.2.3.2. Electrical Receptacles. Electrical receptacles, located on the flight line, are only required to be protected from environmental weather conditions. Aircraft fueling and defueling operations should not be conducted in areas where outside electrical receptacles are installed. If because of space constraints this separation is not possible, the receptacles in the immediate area of the fueling or defueling operations will be deactivated, using lockout and tagout procedures according to AFOSH Standard 91-45, *Hazardous Energy Control and Mishap Prevention Signs and Tags*.

1.2.3.3. Aircraft Maintenance Operations. Aircraft maintenance operations conducted within hangars, aircraft shelters, or docks (closed or semi-enclosed), on the flight line or outside maintenance areas such as wash racks will be accomplished according to Air Force guidance or other Air Force-recognized national consensus standards. MAJCOMs, operating in overseas or remote areas, may supplement this standard to provide additional guidance to meet international or host country safety requirements or unique environmental working conditions.

1.2.3.3.1. Electrical Devices and Power Equipment. All fixed and installed electrical devices and fixed power equipment in hangars, shelters, or docks will comply with the Air Force design criteria or equivalent Air Force-approved engineering guidance. Portable electrical equipment, used in Class I, Division 1 and Class I, Division 2 locations, will be explosion-proof or intrinsically safe. Any equipment not meeting this requirement may be tempo-

rarily approved by the installation fire chief. This approval will be provided prior to the use of the equipment and documented in writing which will state the area, nature, duration, and the reason for the exception. If the working environment has been tested and determined to contain flammable fuel vapors, all maintenance activities will be discontinued until the hazardous condition has been eliminated and a safe working environment restored. Equipment, that is located in an area which has a high potential for flammable fuel vapor release and that may become energized automatically when unattended, will be considered for explosion-proof or intrinsically-safe design.

1.2.3.3.2. Smoking. Smoking is prohibited in aircraft maintenance facilities, the flight line areas, and weapons storage and maintenance areas except where designated by the installation fire chief in coordination with the functional manager and (or) supervisor.

1.2.3.3.3. Aircraft Fuels Management and Servicing. Maintenance of fuel systems and fuel servicing operations will be done according to TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding*, AFOSH Standard 91-38, *Hydrocarbon Fuels General,* and other applicable TOs. Aircraft fuel cell and integral tank inspections and repairs will be accomplished according to TO 1-1-3.

1.2.3.3.4. Cleaning Parts. At no time will maintenance personnel clean aircraft parts, hangar floors, equipment, or clothing with gasoline or unauthorized solvents. Cleaning will be done with approved high flashpoint or nonflammable solvents or cleaning compounds whenever possible. If an operation requires the use of low flashpoint solvents, the operation will be considered as potentially hazardous and will be done in a facility or area compatible with the characteristics of the substances. Flammable liquids, when stored in buildings, will be in approved containers (marked to identify contents) and stored in areas specifically approved by the fire chief (AFOSH Standard 91-43, *Flammable and Combustible Liquids*). Wiping cloths, oily waste, and other combustible materials will be placed in suitable, self-closing metal containers which will be available in the immediate work area. These containers will be emptied and contents disposed of according to established local procedures. Proper ventilation will be maintained and proper protective clothing will be used when working with solvents. See AFOSH Standard 48-21, *Hazard Communication,* for program requirements for handling and using hazardous materials.

1.2.3.3.5. Welding on Aircraft. Welding on aircraft should be done outside of hangars if possible. An AF Form 592, **USAF Welding, Cutting, and Brazing Permit**, shall be issued prior to all aircraft welding operations. Welding will only be done on aircraft system components specified in the technical data applicable to each aircraft (AFOSH Standard 91-5, *Welding, Cutting, and Brazing*). Welding operations in hangars will meet the requirements of National Fire Protection Association (NFPA) 410, *Aircraft Maintenance*, chapter 6. Information on the qualifications of aircraft welders is contained in AFI 21-105, *Aerospace Equipment Structural Maintenance*. The requirement for industrial ventilation during welding on aircraft will be according to AFOSH Standard 161-2, *Industrial Ventilation.*

1.2.3.3.6. Fire Extinguishers. A suitable fire extinguisher will be placed within easy reach of the operator and close to ground power equipment. For additional information on fire extinguishers, refer to AFOSH Standard 91-56, *Fire Protection and Prevention*.

1.2.3.3.7. Nondestructive Inspection (NDI). NDI operations involving ionizing radiation (normally X-ray operations) will be conducted as specified in TO 33B-1-1*, Nondestructive Inspection Methods*, and AFOSH Standard 91-110, *Nondestructive Inspection and Oil Analysis Program*. Normally, flight line X-ray procedures and locations must be approved by the bioenvironmental engineer (BEE), in coordination with fire protection and ground safety officials.

1.2.4. Confined Spaces. Supervisors will ensure the requirements established in AFOSH Standard 91-25, *Confined Spaces,* are complied with when entering confined spaces. The definition of a confined space is in the reference section of **Attachment 1.**

1.2.5. Cardiopulmonary Resuscitation (CPR):

1.2.5.1. CPR is required training for all personnel (assigned to aircraft maintenance areas) who install, maintain, relocate, inspect or repair electrical systems and (or) equipment, or perform duties as safety observers. This training will include bleeding control (bloodborne pathogens training and disposal instructions), shock management, and emergency care of persons having open wounds and burns.

1.2.5.2. CPR training is required by TOs (e.g., TO 1-1-3) for certain maintenance processes.

1.2.5.3. Local authorities may identify other job tasks that may require CPR training due to potential hazards associated with the job.

1.2.5.4. Unit CPR instructors are usually trained by host installation medical personnel. If the host installation cannot provide the support, unit personnel may be certified through the American Red Cross or the American Heart Association.

1.2.5.5. All personnel requiring CPR training, as identified in the paragraphs above, will receive refresher training at least every 2 years.

1.2.6. Wearing Apparel. Hats or caps will not be worn in an engine intake danger zone, as defined by the specific aircraft TO, while engines are operating. When working around hot exhaust or tail pipes, maintenance personnel should wear heat-resistant gloves and long-sleeve shirts to prevent burns. Bump caps may be worn when working in and around aircraft, for protection from minor bumps and lacerations. Bump caps will not be worn during engine starts and runups unless the engine inlet ducts are equipped with inlet duct runup screens. Hair fasteners (constructed of metal, plastic, or leather materials) and wigs will not be worn by on-duty personnel engaged in aircraft maintenance. A rubber band or hair net that holds the hair wrapped in a bun at the back of the head may be worn, providing the hair net has no metal parts. Metallic shoe cleats and taps pose spark generation and foreign object damage (FOD) hazards and will not be worn on the flight line. Except when assisting passengers on arriving or departing aircraft during inclement weather, umbrellas will not be permitted on the operational flight line. When aircraft or equipment TOs do not provide specific guidance for PPE, criteria established in AFOSH Standard 91-31, *Personal Protective Equipment,* will be used. When in doubt, installation ground safety and bioenvironmental engineering (BE) personnel will be consulted. **NOTE:** Helmets for the protection of workers from impact and flying objects must meet American National Standards Institute (ANSI) Standard Z89.1-1986, *Standard for Personnel Protection - Protective Headwear for Industrial Workers - Requirements.* (Refer to AFOSH Standard 91-31 and 29 CFR 1910.135, *Head Protection.*)

1.2.7. Finger Rings and Other Jewelry:

1.2.7.1. Finger Rings:

1.2.7.1.1. Finger Rings will not be worn by personnel engaged in the following activities or operations:

1.2.7.1.1.1. Climbing, ascending, or descending where the individual might fall with their ring catching on an object, resulting in an injury. Some examples include personnel working on elevated surfaces (ladders, scaffolds, platforms, roofs, high reach vehicles, etc.) or personnel ascending or descending from large vehicles (petroleum, oil, and lubricants [POL] trucks, wreckers, sweepers, dump trucks, stake bed trucks, etc.).

1.2.7.1.1.2. Performing maintenance on aircraft or ground support equipment, including civil engineering-type maintenance.

1.2.7.1.1.3. Certain materials handling operations. Examples include supply workers, parts handlers, equipment operators, personnel attaching and detaching equipment to tow vehicles, etc.

1.2.7.1.1.4. Any type of work where individuals are exposed to moving machinery, rotating or revolving parts, or activities that could result in their hands being caught by a moving part causing any injury (for example, machine or equipment operators or inspectors).

1.2.7.1.1.5. Any type of work or inspection where an individual is exposed to an energized electrical circuit.

1.2.7.1.2. Individual supervisors will identify those tasks where wearing a ring is prohibited. In some instances the supervisor may elect to determine that individuals will not wear rings while engaged in work activities in general, instead of identifying individual tasks, or conduct a job safety analysis (JSA) according to AFI 91-301, Attachment 2.

1.2.7.1.3. Supervisors will include this information as part of their employee briefing required by AFI 91-301.

1.2.7.1.4. Supervisors will ensure prohibitions on the wearing of rings are enforced. (This prohibition applies only to personnel actually performing the work and is not intended for administrative and support personnel assigned to or visiting these areas.) **WARNING:** The practice of placing tape over rings is insufficient protection and does not satisfy the requirement for removing the ring.

1.2.7.2. Other Jewelry. The potential for catching, snagging, pulling, and tearing exists in and around most industrial operations. Because of this, controls should be exercised over the wearing of watches, bracelets, necklaces, or other items of jewelry. Metal-framed eyeglasses should be secured by a band or cord to prevent them from falling into energized electrical circuits. The supervisor should evaluate all jewelry before an individual begins work in an industrial area.

1.2.8. Reflective Materials. Light-reflective and luminescent materials are particularly effective for reducing mishaps caused by poor visibility or darkness. Reflective coatings are available in the primary safety code colors so standard signs and markings can be made with these materials. Material will reflect light when wet.

1.2.8.1. Wearing by Personnel. Personnel exposed to vehicle or aircraft traffic on the flight line during hours of darkness or periods of reduced visibility will be provided reflective accessories or will use organizational clothing with sewn-on reflective tape (red or orange reflective colors pro-

vide better contrast in a snow or white environment). Security police flight line operations are exempt from this requirement at the option of the local security police commanders in coordination with the installation ground safety manager. Reflective tape will not be sewn on the subdued fatigue uniform (AFOSH Standard 91-31 and AFIs 91-207, *The US Air Force Traffic Safety Program,* and 36-2903, *Dress and Personal Appearance of Air Force Personnel*).

1.2.8.2. Vehicle and Equipment Marking. Reflective materials for marking vehicles and ground servicing and ground powered equipment will be used to the maximum extent authorized by appropriate TOs such as 36-1-3, *Painting, Marking, and Lighting Requirements for USAF Vehicles*, and 35-1-3, *Corrosion Prevention, Painting, and Marking USAF Equipment*. Additionally, hazardous obstacles existing on or adjacent to the flight line will be marked with reflective material.

1.2.8.3. Bicycles. All bicycles (Air Force and privately owned), when authorized to operate on the flight line during the hours of darkness, will be equipped with a suitable headlight (turned on) and reflective markings front and rear. Also see paragraph **6.4.3.3.**

1.2.9. Flight Line Maintenance Stands. See paragraph **8.3.4.10.**

1.2.10. Lifting Devices. Improper handling and lifting of heavy parts presents a potential for injury and extensive damage to aircraft components. Engines and other heavy parts will be handled with the assistance of hoists, approved hoisting slings, and other similar equipment. Maintenance personnel will be familiar with the directives and the general safety standards established for the equipment being used. Safe loading capacities will be stenciled on all hoists and will be strictly observed by operating personnel. At no time will personnel work under loads suspended by hoists. Inspections of hoisting equipment will be done according to AFOSH Standard 91-46, *Materials Handling and Storage Equipment,* TOs, ANSI standards, and (or) the manufacturer's manual. The hoist will be locked and (or) tagged out of service if found to be defective. The hoist will remain out of service until repairs are completed (AFOSH Standard 91-66, *General Industrial Operations*). Weight testing of all lifting devices will be according to AFOSH Standard 91-46 and (or) applicable TOs.

1.2.11. Compressed Air. Compressed air is used in many flight line operations. When handled with care and according to accepted safety standards, compressed air can be used safely.

1.2.11.1. Eye protection will be used at all times when cleaning with compressed air. A diffuser nozzle shall be provided and pressure will not exceed 30 pounds per square inch, (psi) for cleaning. Compressed air will not be used to clean clothing on the body.

1.2.11.2. Only qualified and authorized personnel will be allowed to operate air compressors and (or) repair or adjust pressure-regulating equipment.

1.2.11.3. Before servicing any aircraft unit, such as tires, air bottles, or landing gear struts, mechanics will:

1.2.11.3.1. Inspect all chucks and valve stems for serviceability to ensure safe servicing;

1.2.11.3.2. Take care not to over-inflate these components; and

1.2.11.3.3. Install pressure regulators to prevent over-pressurization of components being serviced.

1.2.11.3.4. Have proper eye protection available and wear the equipment according to TO requirements or when a potential for injury exists.

1.2.11.4. A drain pipe and valve shall be installed at the lowest point of the air receiver to provide for the removal of accumulated oil and water. The drain valve on the air receiver shall be opened and the receiver completely drained daily, if not automatic, to prevent the accumulation of excessive amounts of liquid in the receiver. Workers will:

1.2.11.4.1. Avoid bending or kinking air hose lines.

1.2.11.4.2. Place air hose lines where they do not create a tripping hazard and are protected against damage caused by equipment or vehicles rolling over them.

1.2.11.4.3. Inspect air lines and fittings before each use for defects.

1.2.11.4.4. Ensure non-interchangeable chucks and connections are used on high- and low-pressure equipment to preclude servicing low-pressure systems with high-pressure equipment.

1.2.11.5. Compressed air used for breathing air will meet requirements of AFOSH Standard 48-1, *Respiratory Protection Program*.

1.2.12. Oxygen and Nitrogen (Liquid and Gaseous):

1.2.12.1. General Information. The wide use of oxygen in Air Force operations presents many serious safety problems. There is the possibility of injury to workers, but there is the more serious possibility of fire and explosion. While oxygen itself is not flammable, it will support combustion. If oxygen is permitted to contact petroleum products, a fire or explosion may result. Another source of danger occurs if oxygen systems are subjected to pressures that cause excessive stress on lines and tanks which may result in rupture and explosion. Nitrogen depletes oxygen in unventilated, confined areas. Liquid oxygen (LOX) and liquid nitrogen (LIN) are extremely cold and can cause serious burns, and can freeze skin upon contact (AFOSH Standard 91-67, *Liquid Nitrogen and Oxygen Safety*).

1.2.12.2. Personnel Training and Safety. Only fully trained and qualified personnel shall operate oxygen and nitrogen equipment or service aircraft systems. Servicing personnel shall understand the system being serviced, the operation of their equipment, precautions, and instructions for handling liquid or gaseous oxygen and nitrogen. A trainee may service only if directly supervised by a qualified supervisor or operator. Personnel engaged in oxygen handling and servicing operations will strictly observe pertinent safety standards and TOs.

1.2.12.3. Mobile Servicing Unit or Bottles. The mobile servicing unit or bottles used to service aircraft or components shall be carefully positioned and shall not be left unattended after hook-up and during filling.

1.2.12.4. Personal Protective Equipment. When transferring LOX or LIN, personnel shall wear:

1.2.12.4.1. Head covering (AFOSH Standards 91-31 and 91-67);

1.2.12.4.2. Face shield (National Stock Number [NSN] 4240-00-542-2048);

1.2.12.4.3. Gloves, heat protective, leather welder's gauntlet cuff, Federal Specification KKG486, Type 11 (NSN 8415-00268-7860), medium with insert-cloth, work, cotton knit (NSN 8415-00-964-4760), medium; or leather (NSN 8415-00-268-7871) with insert, wool (NSN 8415-00-682-6673);

1.2.12.4.4. Apron (NSN 8415-00-715-0450);

1.2.12.4.5. Cuffless trousers and long-sleeve shirt or jacket or coveralls, cotton, white (NSN 8405-00-037-9274); and shoes with rubber soles and heels which fit closely around the top.

NOTES:

1. Stock numbers are informational only and may change.

2. All items shall be clean and free of grease, oil, and fuel (TO 00-25-172 and AFOSH Standards 91-31 and 91-67).

3. The above NSN data are for gloves sized medium. Other sizes may be ordered as required but all sizes will meet the criteria of the federal specification and military specification identified above.

1.2.13. Powered Aerospace Ground Equipment (AGE). Operators will be thoroughly familiar with the handbook of operating instructions for the equipment involved and know emergency shut-down and other precautionary measures, including the use of fire extinguishers. They will review maintenance records and inspect the equipment for leaks, damage, or malfunction before operation. (See paragraph **8.3.4.** for additional guidance on AGE.) **WARNING:** Danger Area. Personnel will not stand in line with the painted stripe on AGE that designates the plane of rotation of the turbine wheel.

1.2.14. Parking Aircraft. Strict adherence to standards will ensure the safety of parked aircraft. Personnel engaged in parking operations will comply with all pertinent guidance. (Refer to AFMAN 91-201, and TO 11A1-33, *Handling and Maintenance of Explosive Loaded Aircraft,* for parking of explosives loaded aircraft.)

1.2.14.1. Parking Spaces. Specific parking locations will be designated for each aircraft as outlined in Air Force Handbook 32-1084, *Facility Requirements*. Generally, the distances to be left between parked aircraft will be enough to allow immediate access of emergency vehicles in case of fire and also to permit free movement of equipment and materials.

1.2.14.2. Temporary Parking. If it is necessary to temporarily park aircraft with any portion extending into an active taxiway, a ground observer (qualified in the task) will be strategically placed to warn oncoming traffic of the hazard. During hours of darkness, the ground observer will be equipped with a high-visibility reflective vest and a warning light (red preferred) and in the daytime, a suitable flag. The observer will remain with the aircraft until it is moved to a safe location.

1.2.14.3. Wheel Chocking. Wheel chocks, fabricated according to US Air Force specifications, will be placed fore and aft of the main landing gear or as specified in applicable aircraft TOs.

1.2.14.4. Clean Parking Areas. During periods when maintenance equipment, workstands, loose aircraft parts, and materials are not actually required for work in progress or planned, they will be removed from the aircraft parking area to designated storage locations. Equipment remaining outside buildings will be adequately secured with tie-downs and (or) chocks or an integral brake system to prevent movement by winds or engine blasts. When not being transported, mobile work platforms and stands will be secured to prevent collision with aircraft, vehicles, or other equipment. Designated flight line support equipment storage areas will be approved by the appropriate group commander in coordination with ground safety officials.

1.2.14.5. Guide Lines. Adequate guide lines will be painted on ramp and taxiway parking areas, and where necessary in hangars, to aid in the safe movement of aircraft and vehicle traffic. Parking guide lines should have spots painted where the nose or forward wheel of the aircraft will be positioned. This is mandatory when helicopters are parked inside the hangar, to prevent the blades from making contact with the hangar walls. Where a portion of a large hangar is used for helicopter maintenance parking, guide lines and rotor blade lines will be painted on the floor. When numerous types of aircraft use the same facility and multiple paint lines would be confusing, lines are not required, providing local procedures include the marking and identification of fixed objects, the use of wing and tail walkers during hangaring, and the marking of rotors or wingtips with streamers. Spots will be painted where each wheel of aircraft will be positioned in nose docks or other maintenance facilities to prevent aircraft from striking portions of the building during docking and undocking. Guide lines will be painted on outside wash rack pavement to aid in positioning aircraft.

1.2.14.6. Mooring or Tie-Down of Aircraft. This will be accomplished according to applicable aircraft TOs. When ropes are used, they will be tied to designated mooring fittings on aircraft. Normally, square knots or bowline knots will be used to prevent slippage and to provide secure fastenings. Just enough slack should be allowed to prevent excessive stress on the wings, fittings, and rope due to tire or strut expansion or deflation and to prevent contraction of the tie-down ropes due to moisture or wetness. The mooring points on the ground should be as close as possible to being directly under the respective mooring points on the aircraft.

1.2.14.7. Aircraft Emergency Removal. Emergency procedures to remove endangered aircraft in the event of fire on the flight line or in hangars will be developed. These defined responsibilities and procedures will eliminate confusion and expedite the evacuation of aircraft should it become necessary. (Also, see paragraph **7.2.9.**)

1.2.15. Adverse Weather Conditions. The base weather station (BWS) is responsible for making the initial notification to pre-determined support agencies of adverse weather conditions. Adverse weather conditions include: strong surface winds, heavy rain, freezing precipitation and thunderstorms (i.e., frequent dangerous lightning, damaging winds, and hail).

1.2.15.1. General Lightning Safety for All AF Activities and Operations:

1.2.15.1.1. When lightning is detected or observed within the immediate vicinity of any activity or operation, do not go out of doors or remain out unless it is absolutely necessary.

1.2.15.1.1.1. Seek shelter as follows:

1.2.15.1.1.1.1. Dwellings or other buildings that are protected against lightning;

1.2.15.1.1.1.2. Protected underground shelters;

1.2.15.1.1.1.3. Large metal-framed buildings;

1.2.15.1.1.1.4. Enclosed automobiles, buses, aircraft, and other vehicles with metal tops and bodies;

1.2.15.1.1.1.5. Streets that may be shielded by nearby buildings.

1.2.15.1.1.2. Certain locations are extremely hazardous during thunderstorms and should be avoided:

1.2.15.1.1.2.1. Hilltops and ridges;

1.2.15.1.1.2.2. Areas on top of buildings;

1.2.15.1.1.2.3. Under isolated trees;

1.2.15.1.1.2.4. Near electrical appliances, telephones, plumbing fixtures, and metal or electrically conductive objects; and

1.2.15.1.1.2.5. Aircraft dry bays, tanks, and wheel wells.

1.2.15.1.2. Each Air Force installation will develop a local procedure to ensure key personnel and agencies involved in high weather risk activities and operations are notified according to the installation support plan. Normally, these agencies are those having aircraft, POL facilities, open air work and recreational activities, and underground utilities work. Key personnel, in turn, will advise all on-duty supervisors to take proper precautions and timely actions.

1.2.15.1.3. Each installation will employ a lightning safety program with a two-tiered notification system to minimize personnel exposure to lightning hazards.

1.2.15.1.3.1. A *Lightning Watch* is in effect 30 minutes prior to thunderstorms being within a 5 nautical mile (nm) radius of any pre-determined location or activity as forecast by the BWS. **NOTE:** Lightning is a direct product of a thunderstorm. During a Lightning Watch, accomplish the following:

1.2.15.1.3.1.1. Operations or activities may continue; however all personnel must be prepared to implement Lightning Warning procedures without delay.

1.2.15.1.3.1.2. Be alert for any lightning activity, to include audible thunder, and advise supervisory personnel of any observations.

1.2.15.1.3.2. A *Lighting Warning* is in effect whenever any lightning is occurring within a 5 nm radius of the pre-determined locations and activities. Personnel in affected locations or engaged in affected activities will take the following actions:

1.2.15.1.3.2.1. Cease all outside activities and seek shelter.

1.2.15.1.3.2.2. Recommended locations that provide safe shelter and locations to avoid are listed in paragraph **1.2.15.1.1.**

1.2.15.1.4. If lightning does not occur within a 5 nm radius at the valid (forecast) time of the Lightning Watch, BWS will reassess the Lightning Watch and amend as needed. Lightning Warnings will be canceled when the thunderstorms have passed beyond the 5 nm radius of the location or activity. A Lightning Watch will not be canceled if there is potential for more thunderstorms within 30 minutes.

1.2.15.1.5. All aircraft fuel servicing and maintenance activities (including LOX servicing) will cease whenever a Lightning Warning is in effect. **EXCEPTIONS:** Vehicle movements (including refuelers) and pipeline transfers (including bulk storage to hydrant tanks). (Refer to AFI 23-201, *Fuels Management*.)

1.2.15.2. Safeguarding Aircraft During High Winds. Serious structural damage to aircraft can be caused by high velocity surface winds. When possible, aircraft will be evacuated to safe weather areas when tornadoes, hurricanes, or unusually high winds are predicted. Locally established high

wind safety precautions or plans will be developed and observed along with the guidance presented below:

1.2.15.2.1. Taxiing Aircraft. Taxiing aircraft during unusually high winds will be avoided. They may be taxied at the discretion of the wing commander when the action will lessen the possibility of aircraft damage.

1.2.15.2.2. Outside Parking. If possible, light aircraft will be parked inside hangars. Those parked outside will be faced into the wind and tied down. Wing spoilers will be used to reduce airfoil lift. Transient aircraft will be tied down as directed by the aircraft commander.

1.2.15.2.3. Extremely High Winds. When wind velocity exceeds 30 knots (sustained or gusts), light aircraft in temporary docks or extending outside the hangars will be towed clear and parked in compliance with applicable aircraft TOs. When wind velocity exceeds 50 knots (sustained or gusts), medium or heavy aircraft in temporary docks or extending outside the hangars will be towed clear and then parked in compliance with applicable aircraft TOs.

1.2.15.2.4. Work Materials. All maintenance equipment, workstands, loose aircraft parts, and materials not in use will be removed from the parking area and stored in a safe area. Equipment remaining outside will be secured against wind movement.

1.2.15.2.5. Personnel. When winds reach hazardous velocities, activities other than those required to safeguard the aircraft will be avoided. Guidance for actions involving electrical storms is found in paragraph **1.2.15.1.**

1.2.16. Aircraft Engine Operation. Engine starts and runups present hazards to both personnel and other aircraft. The fire hazard is particularly acute because fuel vapors may be ignited by exhaust flames. Rotating propellers are dangerous to personnel and can cause extensive equipment damage. Except for turboprop aircraft, personnel will not hand-pull the propeller of an engine that has been recently operated. The ignition switch of reciprocating or electric start engine aircraft will be in the OFF position when engines are not operating, and the master battery switch will be turned off when no longer required. For C-130 aircraft, personnel will not be in the vicinity of (or go through) the static propeller arc if bleed air is applied to the aircraft. Personnel will not stand in line with the stripe that designates the plane of the turbine wheel and propeller operation, which is painted on the fuselage or engine nacelles of aircraft. **WARNING:** Danger Area. Personnel will not be in the vicinity of or go through the static propeller arc of reciprocating and turboprop aircraft or helicopters unless absolutely necessary in the performance of duties. Radio contact with the control tower will be maintained at all times during engine operations or taxiing. If engine runs are necessary while the control tower is not operating, radio contact will be maintained with job control. Maintenance Operations Center (MOC) will be prepared to request assistance from the fire department or medical services as needed.

1.2.16.1. Aircraft Chocks. Before starting engines, the aircraft will be properly chocked and parked according to applicable TOs and handbooks. Suitable wheel chocks, manufactured to Air Force specifications, will be used at all times. Functional managers will ensure only those chocks approved for the specific aircraft are used. When aircraft engines are in operation, chocks will be removed with the utmost caution after the proper signal has been given. Personnel will approach the aircraft from the safest direction with regard to the location of propellers and jet intakes and exhausts.

1.2.16.2. Personnel on Exterior Portions of Aircraft. Personnel will NOT be allowed on any external portion of an aircraft during engine start or when the aircraft is being taxied. Qualified person-

nel may stand on the external portion of an aircraft ONLY during instruction on ground operation procedures and necessary adjustments. Qualified personnel may service hydraulic fluid and engine oil or make minor adjustments on multi-engine aircraft with engines operating on the opposite wing as long as the engines on the wing being worked are shut down and the engines on the opposite wing remain in idle. Interphone or radio contact will be maintained with the cockpit operator, if possible. If effective interphone or radio contact can not be maintained, personnel on the wing will be under the direct observation of another crewmember, team member, or fire guard, who has direct communication with the cockpit operator. Aircraft wing lights and formation lights will be turned on to warn all personnel the aircraft engines are in operation (AFI 11-218, *Aircraft Operation and Movement on the Ground*).

1.2.16.3. Fire Guard. A qualified (trained) fire guard will be positioned, if required by the aircraft TO, prior to starting the engines. This individual will stand by in readiness until all engines are operating and the danger of fire no longer is present. If no fire guard is specifically identified in the aircraft TO data, the following will apply:

1.2.16.3.1. On aircraft having internal fire fighting capability, a ground observer will be in position on interphone to monitor and report any problems (e.g., fire, fuel leakage, aircraft movement) and will remain in position until released by the individual operating the engine.

1.2.16.3.2. On aircraft not equipped with interphone capability, a ground fire guard will be stationed to observe the starting engine process. After the engine starts, the fire guard will remain in clear view of cockpit personnel and observe the aircraft and area during engine operation. **WARNING:** Extreme caution will be exercised to ensure all personnel remain clear of propeller arc and (or) jet intakes and exhaust during ground operation.

1.2.16.4. Qualified Engine Operation Personnel. Only those personnel trained and certified according to instructions in AFI 11-218 will be authorized to start and run up aircraft engines. The individual in charge of engine runup operations will be responsible for inspecting the surrounding area to ensure it is clear of equipment, personnel, and materials that might cause or be subject to FOD. Equipment or materials, that may be subjected to engine blasts or blown into other equipment, will be repositioned or secured (AFI 21-101, *Maintenance Management of Aircraft*).

1.2.16.5. Observers for Jet Engine Starts. A ground crewmember, stationed in front of and to one side of the jet engine being started, will be in contact by interphone at all times with the person operating the engine controls. On aircraft not so equipped, a ground crewmember will be stationed to observe the start and give necessary signals to the person in the cockpit.

1.2.16.6. Cockpit Checklist. Personnel starting, operating, and testing aircraft engines will use the appropriate cockpit checklist before, during, and after the operation.

1.2.16.7. Foreign Object Jet Engine Damage. Damage caused to jet engines by foreign objects and debris sucked through inlet ducts can be reduced by the use of inlet duct runup screens on certain aircraft types. Operational needs may require installation and removal of these screens while engines are running. Tests have shown this can be accomplished safely if the engine is idling and due caution is exercised following TO procedures (AFI 21-101).

1.2.16.8. Noise-Suppression Devices. In noise hazard areas (as determined by the installation BEE) crew members and maintenance personnel will wear ear defenders or other approved noise-suppression devices required and provided to them. Failure to wear ear protection may result in permanent loss of hearing.

1.2.16.9. Rotary Wing Aircraft. During engine runup by ground personnel, the collective pitch stick will be locked in the full low position. Personnel and equipment will be kept clear of rotary wing aircraft at least a distance equal to its length, to prevent injury and damage during a quick excessive throttle start which might swing the tail rapidly.

1.2.16.9.1. Personnel will exercise caution when approaching the plane of rotation of the main rotor blades, because they tend to droop at decreased speeds.

1.2.16.9.2. The main rotor blades will be tracked only when an experienced pilot is at the controls. Under no circumstances will engine runup be accomplished by fewer personnel than are specified in TOs for the type of aircraft concerned.

1.2.16.9.3. Whenever approaching or leaving a helicopter with the blades rotating, all personnel shall remain in full view of the pilot or helicopter operator and keep in a crouched position. Personnel shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there. No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.

1.2.16.9.4. When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to maintain clearance from the main and stabilizing rotors. Protective goggles shall be worn by personnel under these conditions. Precautions shall also be taken to minimize reduced visibility.

1.2.16.9.5. Adequate precautions shall be taken to provide for the protection of personnel from flying objects in the rotor downwash. All loose gear within 100 feet of the area susceptible to rotor downwash shall be secured or removed.

1.2.16.9.6. Personnel in the area shall wear PPE consisting of eye and ear protection.

1.2.17. Jet Aircraft. Ground handling of jet aircraft involves hazards not common to conventional types. When the engine is in operation, the exhaust blast at the outlet and the suction effect at the inlet present hazards that require particular attention of maintenance support and flight crew personnel. General safety standards relative to conventional powered aircraft also apply to jets. Additional precautions pertaining principally to jet aircraft are given below:

1.2.17.1. Turbine Wheel. Personnel will not stand in line with the red stripe painted on the fuselage or engine nacelles of jet aircraft. This stripe marks the plane of turbine wheel rotation, which is a potentially dangerous area if the turbine fails. **CAUTION:** This area is NOT marked by red stripes on all aircraft.

1.2.17.2. Suction Effect. The suction effect of a jet engine is sufficient to ingest personnel. Additionally, the ingestion of personal articles may cause extensive damage to equipment. Unless required by TO, crewmembers and maintenance personnel will not approach closer than 5 feet to jet duct entrances from the side or rear of the running engine, and all personnel will stay at least 25 feet in front of engine intake ducts when the engine is in operation. Personnel may approach a multi-engine aircraft (e.g., F-15) from the opposite direction of the running engine; however, extreme caution shall be used to prevent possible ingestion. Maintenance and aircrew personnel who work on or near running jet engines will NOT wear loose clothing or hats or carry objects that might be drawn into the ducts. In addition, all objects will be removed from in front of or within the intake ducts prior to engines being started. (See paragraph **1.2.6.** for additional information.) Maintenance personnel will not place their hands or fingers on auxiliary air inlet doors since they

operate automatically and may close. If open, access doors will be secured or removed; they may be forced closed by engine suction.

1.2.17.3. Exhaust Blast. Exhaust blasts of jet engines are particularly hazardous to personnel and will be carefully avoided. Local procedures will be established to prevent personnel, vehicles, and aircraft from passing behind jet aircraft with engines operating above idle speed or passing through hazardous jet blast areas as defined by applicable aircraft TOs. As a minimum, a ground or flight crew member will be stationed to the side of the engine being operated to warn personnel and traffic to remain clear for a minimum distance of 200 feet to the rear of the aircraft, depending on the type of aircraft involved, or as prescribed in the applicable aircraft handbooks. A blast fence will be installed where there is not sufficient clearance to the rear of jets to protect the safety of personnel and equipment. Before any jet engine is started, tools, spare parts, and other objects will be removed from the blast areas.

1.2.17.4. Ejection Seats and Canopies. Accidentally discharged pilot ejection seats, cockpit canopies, and jettisonable hatches (examples: B-1, B-2, B-52, and C-17) present an unusually serious threat to personnel. Extreme heat or unintentional movement of actuating mechanisms can fire the ejection seat catapult canopy remover or rockets. The catapult containing the ejection seat explosive charge is capable of hurling 300 pounds at an initial rate of 60 feet per second. To reduce the possibility of accidental seat or canopy ejection while the aircraft is on the ground, the following precautions will be taken: **NOTE:** Anyone entering a cockpit or flight deck equipped with escape system components must have aircraft cockpit and flight deck familiarization training prior to entering the aircraft.

1.2.17.4.1. Normal Procedure. As a basic safety precaution, ground safety pins are installed by aircrew members or aircraft maintenance persons immediately after the landing aircraft is parked and the engine shut down or by egress personnel after maintenance work requiring the removal of the pins is completed. Care will be exercised to ensure safety pins are removed before the next flight. Only qualified egress maintenance personnel will remove or install canopy or ejection seat discharge mechanisms. Emergency rescue personnel will be trained with the ejection seat completely disarmed and certified by a qualified egress technician. Fire department persons will be trained how to dearm ejection seats and canopy actuators prior to removing crew members from crashed aircraft. Rescue efforts will follow procedures outlined in TO 00-1-105E-9, *Aircraft Emergency Rescue Information (Fire Protection*). When other maintenance personnel work close to ejection seat catapults and ejection seat controls or canopy remover controls, they will exercise particular care to avoid accidental arming and firing. Also, they will not carry items such as combs, screwdrivers, pens, pencils, etc., protruding from pockets or clothing that could cause accidental or inadvertent arming and firing of ejection seat or canopy controls. Only qualified egress and munitions personnel are authorized to handle and maintain the explosive items used for ejection systems.

1.2.17.4.2. Crash Landings. When attempting to remove crewmembers from crashed aircraft, particular care will be exercised to avoid snagging the arming and firing mechanisms. Extreme danger can exist during rescue attempts from possible cookoff, inadvertent actuation, or residual high pressure stored in the lines and tubes of explosive egress components.

1.2.17.4.3. Salvage Operations. Explosive ordnance disposal (EOD) personnel will check to ensure explosive devices have been removed before beginning aircraft salvaging operations. Only qualified and certified egress personnel will remove escape and (or) egress system explo-

sive components. The majority of these items are known as cartridge-actuated devices (CAD) or propellant-actuated devices (PAD). These include, but are not limited to, initiators, catapults, canopy removers, rocket packs, divergence rockets, gas generators, shielded mild detonating cord (SMDC), and flexible linear shape charges (FLSC).

1.2.17.4.4. Transient Checklists. Transient alert organizations will develop local checklists of pertinent questions to ask pilots about explosive egress systems pertaining to aircraft not normally processed through their installations and will follow specific TO procedures for the type of aircraft being serviced.

1.2.17.5. Pressure Testing. When a cockpit is being pressure-tested, the pressure stipulated in the TO will not be exceeded.

1.2.17.6. Sharp Edges. The control surfaces of jet aircraft have unusually sharp edges. Mechanics working on or near these edges will be particularly careful. During prolonged maintenance periods, aircraft parts or equipment with sharp edges or corners will have suitable protective covers (where practicable) or tape placed over them and will have red streamers attached to indicate the danger area.

1.2.17.7. Entering Tail Pipe. When a person enters the tail pipe of a shut down jet engine to inspect the engine turbine wheel assembly, a responsible crewmember will be posted by the aircraft to prevent anyone from entering the cockpit and to observe and communicate with the person inside the tail pipe.

1.2.17.8. Protective Clothing. Mechanics who have to enter jet tail pipes will wear protective clothing. Personnel will remove the protective outer work suit immediately after leaving the tail pipe. Clothing used in this type of operation will be laundered and inspected frequently to check for harmful lead particles that may have filtered through the fabric. Other protective gear will also be inspected periodically for evidence of yellow residue or concentrations of lead oxide. OSHA 29 CFR 1910.1025, *Lead*, will be consulted for additional safety information on lead-contaminated clothing and protective equipment. When aircraft or equipment TOs do not provide specific guidance, criteria established in AFOSH Standards 91-31 and 48-1 will be used. When a mechanic enters an intake they will wear coveralls (bunny suit) with no buttons, zippers, or pockets.

1.2.17.9. Handling Hydrazine. Hydrazine exposure is a hazard in some jobs such as fire fighting and transient maintenance activities. Personnel will be trained in the requirements of AFOSH Standards 48-8, *Controlling Exposures to Hazardous Materials,*and 91-31 and TO 00-25-172.

1.2.18. Safety in Flight Line Contractor Operations. To ensure Air Force personnel or resources are not subjected to hazards, Air Force ground safety, fire, and BE officials will review contracts and be concerned with the activities of contractors who perform a task or service for the Air Force. On occasion, contractor operations within the Air Force have resulted in hazardous working conditions for Air Force personnel. The first step in eliminating hazardous conditions in contractor activities is to ensure the appropriate safety, fire, and health requirements are included in all contract specifications. (This is normally accomplished by including appropriate Defense Acquisition Regulations [DAR] and Federal Acquisition Regulation [FAR] provisions or clauses in the contract.) Ground safety, fire, and BE officials will provide assistance to the contracting officer and representatives from the using organization in establishing appropriate requirements. In addition, appropriate US Air Force and installation traffic provisions will be identified for control of contractor vehicles on base. If a procedure or condition

exists which requires correction by the contractor, action will be initiated through the Air Force Contracting Officer (ACO).

1.2.18.1. Construction Contracts. Before a construction contractor begins operations on an Air Force installation, the contracting officer will call a pre-construction conference at which Air Force ground safety, fire department, and contractor representatives will be present. As appropriate, other agencies such as civil engineering, BE, or the using organization should be represented. At this conference the ACO will make sure the contractor knows all necessary Air Force safety requirements associated with the contract. **NOTE:** This guidance does not apply to contracts which are exclusively under the control of the US Army Corps of Engineers.

1.2.18.2. Non-Construction Contracts. Most of the nonconstruction contracting operations on Air Force installations involve persons or companies providing goods and services to installation personnel and activities. ACO coordination with ground safety, fire department, and BE officials is necessary to determine the appropriate safety, fire prevention, and health requirements are included in the contract. Prior to contract renewal, ground safety, fire department, and BE officials will review the contracts to ensure their continued adequacy.

Chapter 2

TOWING AND TAXIING AIRCRAFT

2.1. Hazards and Human Factors . When properly accomplished, aircraft towing is not a hazardous operation. However, the potential for damage and (or) injury if a mishap occurs is high.

2.2. Towing Operations . Using qualified personnel, following established procedures and properly planning for weather, local conditions like inclined ramps, emergencies, and other limitations should prevent mishaps. AFI 21-101 will be consulted for vehicle operator's aircraft towing responsibilities and qualifications. For maximum safety, tow team personnel will not place themselves in the direct path of aircraft wheels nor ride on any external portion of an aircraft or tow vehicle. When connecting a tow bar to any tow vehicle, personnel will stand clear until the backing tow vehicle is in close proximity to the towbar. When connecting a tow vehicle, personnel will be extremely vigilant to any sudden movement by the two vehicles. MAJCOMs may authorize the movement of aircraft into hardened aircraft shelters (HAS) while the aircraft engines are operating, provided a System Safety Engineering Analysis (SSEA) has been conducted. This will be conducted for each type of generation shelter and for the type of aircraft that will be moved into shelter. **NOTE:** When differences exist in towing procedures prescribed in this standard and applicable technical data for the specific aircraft, the technical data will take precedence.

2.2.1. Qualified Personnel. Aircraft ground handling personnel will be thoroughly familiar with all published towing procedures pertaining to the type of aircraft being towed. Written proficiency tests on local procedures and operating standards review will be conducted at least annually. Newly assigned aircraft maintenance specialists will pass a proficiency test on the types of aircraft towed, after completing supervised on-the-job training (OJT). Wing and tail walkers may not be required to be familiar with all published towing procedures or receive annual proficiency training if their duties are restricted to these positions during tow operations. Supervisors of towing teams will clearly define duties and responsibilities at the time of the pre-tow briefing. (See paragraphs **2.2.3.2.**, **2.2.3.3.**, and **2.2.3.5.**)

2.2.2. Supervisor of Towing Team. The supervisor of the towing team will be in complete command and will take a position that will ensure surveillance of the towing procedures and performance of other team members. Normally this will be the position of nose walker. The supervisor will use a checklist covering all items pertaining to the safe movement of the type aircraft being handled. Applicable steps of this checklist will be completed and towing personnel will be briefed before the aircraft is moved. The supervisor will be the only team member authorized to give the "all clear to move" order and will ensure all team members are qualified per requirements in paragraph **2.2.1.**

2.2.3. Towing Team Assignments. When towing aircraft, team personnel will be stationed to conform to applicable aircraft TO procedures for the type aircraft being towed. Specific number of individuals required on a tow team will conform to those called for in the applicable aircraft TO. In all cases there will be a towing team supervisor. **NOTE:** Tail and wing walkers are not required when towing aircraft on unobstructed, established taxiways and runways or parking ramps where taxi or towing lanes are marked with guide lines.

2.2.3.1. Brake Person in Cockpit. A qualified person, authorized by the supervisor, will be in the pilot's seat to operate the aircraft's brakes and to observe and follow the supervisor's signals. If the

person in the pilot's seat is unable to maintain hydraulic pressure, another qualified person will be stationed to watch and maintain the pressure. The supervisor will be notified if the pressure drops below safe operating limits, and the towing operation will be terminated.

2.2.3.2. Tow Vehicle Operator. The towing vehicle driver will be responsible for operating the vehicle in a safe manner and will follow the instructions issued by the team supervisor. The vehicle operator will also obey emergency stop instructions given by any team member. An authorized and qualified vehicle operator will be at the controls of the towing vehicle at all times during aircraft movement. The tow vehicle will be connected in a manner which will allow the vehicle driver to face the direction of travel while seated. Vehicle operators will not look over their shoulder to face the direction of travel except while making minor changes during final positioning (the towing supervisor must make this determination and brief the towing crew). The vehicle operator will stop the vehicle upon losing sight of or communication with the tow supervisor.

2.2.3.3. Wing Walker. A wing walker will be stationed at each wingtip to ensure adequate clearance of any obstruction in the path of the aircraft. They will be responsible for properly signaling the supervisor as soon as it appears the aircraft is in danger of colliding with an obstruction. In such cases, towing will be stopped until clearance is personally checked by the supervisor. Wing walkers are not required for helicopters being towed with rotor blades in parallel position (H-1 type helicopters parallel their rotor blades in a fore and aft trail position). Wing walkers do not require annual proficiency testing and need not be fully qualified in all towing procedures. Thorough pre-tow briefings by a qualified towing supervisor will satisfy the training requirement.

2.2.3.4. Nose Walker. A nose walker (the supervisor) will maintain a safe position in front of the towing vehicle and a clear view of both wing walkers, the vehicle driver, and the person in the pilot's seat. The nose walker will be in direct contact with the person in the cockpit either by interphone or communications media specified in applicable aircraft TOs. When tail and wing walkers are not required, the nose walker (supervisor) may ride in the cab of the tow vehicle where the supervisor can observe the path to be traversed and direct the actions of the cockpit brake person and the vehicle operator.

2.2.3.5. Tail Walker. A tail walker will be used during towing operations when the aircraft is to be turned sharply or backed into position. Backing of aircraft will be avoided as much as possible. A tail walker will be required when backing an aircraft into a HAS with permanent chocks installed. Tail walkers do not require annual proficiency testing and need not be fully qualified in all towing procedures as long as this is their only task. Thorough pre-tow briefings by a qualified towing supervisor will satisfy the training requirement. **NOTE:** Where movement of small aircraft is accomplished, the tail walker may be eliminated at the discretion of the tow team supervisor. The use of a tail walker in third generation HAS may also be eliminated at the discretion of the supervisor. Earlier generation HAS do not have sufficient clearance to allow the elimination of the tail walker.

2.2.4. Steerable Gear. Steerable landing gear (including outriggers) will be set in tow position before the aircraft is moved and returned to original position after the tow bar has been removed. The supervisor will ensure personnel in the cockpit have been instructed to allow the nose gear steering wheel to turn freely and not to attempt to steer or turn the nose wheel any time the tow bar is connected to the aircraft.

2.2.5. Personnel Riding or Walking. Under no circumstances will personnel walk between the nose wheel of an aircraft and its towing vehicle, nor will they ride on the outside of a moving aircraft, on the tow bar, or on the outside of the vehicle unless an authorized seat is provided. No person will attempt to board or leave a moving aircraft or towing vehicle.

2.2.6. Night Crew Signals. Two luminous wands will be issued to towing team members who require wands. The use of wands by the towing team supervisor will be required even when the aircraft interphone contact is established with the towing team supervisor, the towing tractor operator, and the brake person in the cockpit. Wands or wingtip lights will be used by other tow team members, as required, to warn any aircraft traffic that may approach.

2.2.7. Control Tower Clearance. Before towing an aircraft on or across an established taxiway or runway, the supervisor will obtain clearance from the control tower. At no time will any aircraft be towed on or across runways or taxiways without advance approval of the control tower. The primary means of communication will be the aircraft radio. An alternate method (when conditions restrict aircraft battery operation) is through an escort vehicle in direct radio contact with the control tower. The radio-equipped escort vehicle will accompany the aircraft throughout the towing operation.

2.2.8. Towing Speed. Towing speed will not exceed that of walking team members, with a maximum of 5 miles per hour.

2.2.9. Brakes. To prevent serious mishaps, aircraft brake systems will be charged before each towing operation, and towing will be stopped immediately if brake pressure drops below safe operating limits. Aircraft with faulty brakes will not be towed, except to repair facilities, and then, only with personnel standing by ready with chocks for emergency use.

2.2.10. Tow Bars. Before moving any aircraft, the towing vehicle, tow bars and connections, and other associated equipment will be inspected by the tow team supervisor for defects. Only authorized equipment in good condition will be used in towing operations.

2.2.11. Chocks. Chocks will be immediately available in case of emergency throughout towing operations and will be properly placed before the towing vehicle is unhooked. When towing or parking aircraft with snow, ice, or frost present anywhere on the parking ramp or towing surface, sand bags and chocks will be available and used. Heavier tow vehicles with chains will be used to improve starting and stopping traction during tow operations on ice- or snow-covered towing surfaces. Chocks or other support equipment will not be placed on or hung from any part of the aircraft exterior during towing or repositioning.

2.2.12. Starts and Stops. When moving aircraft, tow vehicle operators will not stop and start suddenly. Aircraft brakes will never be applied when an aircraft is being towed, except in emergencies and upon instructions given by any team member. Before the towing vehicle is unhooked from the aircraft, chocks will be properly placed and the aircraft's brakes set.

2.2.13. Equipment, Stands, and Similar Materials. The supervisor will ensure all equipment, workstands, loose aircraft parts, and other materials are removed from the vicinity of an aircraft and are properly stored. When any equipment or materials are left outside, they will be secured to prevent accidental movement by winds or jet and propeller blasts.

2.2.14. Entrance Doors, Ladders, and Down Locks. To avoid possible worker injury and aircraft damage during towing operations, entrance doors will be closed, ladders will be retracted or removed, and

landing gear down locks installed. The only allowable deviations from these requirements will be according to specific aircraft TOs.

2.2.15. Struts and Tires. Prior to towing any aircraft, towing team members will check nose and main landing gear struts and tires for proper inflation. Unless the applicable TO requires a gauge check, a visual check of tires and struts will be adequate for towing purposes.

2.2.16. Docks. When a multi-engine aircraft with four blade propellers is moved (particularly into and out of docks), the following precautions will be taken to avoid possible damage:

2.2.16.1. Place propellers in an "X" position or in a position determined to be suitable for the aircraft and dock combination.

2.2.16.2. Maintain landing gear main strut and nose gear strut extension suitable for the aircraft and dock involved.

2.2.16.3. Inflate or deflate tires as necessary to provide required clearances, but do not exceed minimum or maximum pressures.

2.2.16.4. Keep hydraulic brake pressure at or above safe minimums.

2.2.16.5. Station two team members in a position to observe the top clearance of propeller blades.

2.2.16.6. Clear ramps of snow and ice for a distance of 100 feet in front of the dock doors and far enough to each side to accommodate all landing gear wheels.

2.2.17. Towing Vehicle Inspections:

2.2.17.1. Tow vehicle operators will ensure all towing equipment is serviceable and functioning properly before starting any towing operation.

2.2.17.2. Before the tow bar is hooked to the aircraft, the tow team supervisor will inspect the tow vehicle for defects or extraneous material that may interfere with safe operation.

2.2.17.3. The unit vehicle control plan will ensure a qualified operator inspects each tow vehicle at least once each shift to see that the cab and bed are clear of all extraneous materials and the vehicle is in safe working condition. Towing connections will be inspected before each use. Pintle assemblies and towing connections will be secured with a pintle hook safety or cotter pin that will positively lock towing connections. When mechanical defects affecting safety are found on tow vehicles, the equipment will be taken out of service and reported to vehicle maintenance for repairs.

2.2.18. Approach of Towing Vehicle. When approaching the aircraft to be moved, the tow vehicle driver will stop at least 50 feet from the aircraft and proceed only on specific instructions from the tow team supervisor.

2.2.19. Towing Clearance. The towing vehicle distance behind another aircraft or another vehicle will not be less than 50 feet. Greater distances (at least 150 feet) will be used when towing aircraft with faulty brakes.

2.2.20. Towing Aircraft Without Access to Cockpit. When cocooned aircraft without seat, brakes, or closed and sealed canopies are moved, chocks will be immediately available throughout towing operations in case of emergency.

2.2.21. Engine Operation. As a general rule, aircraft will not be towed with engines operating. The following two exceptions apply to aircraft towing operations with engines running:

2.2.21.1. Civilian contract air carrier jet engine transport aircraft may be towed or pushed short distances with engines operating according to Federal Aviation Administration-approved procedures contained in operations and maintenance handbooks. Copies of these procedures should be carried aboard the aircraft.

2.2.21.2. Air Force aircraft may be pushed back with engines running to support non-routine or abnormal operational requirements. These push-back procedures will be supported by engineering analysis and published in the aircraft Dash-1 TO.

2.3. Taxiing Operations. Aircraft will not be taxied closer than 100 feet to an active runway where aircraft are operated unless they are taxiing on an established taxiway. Wing walkers will be used when the aircraft is taxied within 25 feet of an obstruction. Wing Commanders may waive this provision for locally based aircraft, if established taxi lines are marked and obstructions are either permanent or other aircraft parked are on established parking spots or lines. Aircraft will not be taxied within 10 feet of an obstruction, unless under one of the following circumstances:

-- During contingency operations when compliance would restrict the mission.

-- From alert, readiness, or protective shelters. A plainly visible centerline must be painted along the exit path and a marshaler will be used.

-- Operating locally based aircraft from parking spots specifically designed for those aircraft. Parking spots will have a minimum 10-foot wingtip clearance between aircraft and clearly marked taxi routes, and support equipment shall be placed in designated locations. A marshaler will be used.

NOTE: On aircraft with swept-back wings, the wingtip path extends beyond the straight line path when the aircraft is in a turn. The amount depends on the degree of turn and the degree of sweep on the wings.

2.3.1. Cleaning of Canopies and Windshield. The aircraft canopy and windshield will be clean before the aircraft is taxied.

2.3.2. Lights. Aircraft position lights will be ON from just before engine start until engine shutdown. The following aircraft are exempt:

2.3.2.1. T-38 and C-21 aircraft during daylight hours.

2.3.2.2. Jet aircraft in approved sound suppressers.

NOTE: Special care will be exercised to not blind the directing ground crew members when taxiing with landing lights on (AFI 11-218).

2.3.3. Doors and Hatches. Personnel will comply with operating instructions and checklists for securing doors and hatches before starting engines, taxiing, or actual flight. Unless a specific requirement exists, no aircraft will be taxied with open doors or hatches. Aircraft commanders will brief all personnel on board that they will not attempt to leave or enter the aircraft while it is in motion. If a door

warning light comes on during taxiing, the aircraft will be brought to a complete stop when operational or airfield constraints allow, and the cause for the warning will be determined.

2.3.4. Communications. Aircraft will not be taxied without clearance. Radio contact will be maintained with the control tower throughout taxi operations. Taxi speeds in uncongested areas will be reasonable, with the safety of the aircraft and personnel the determining factors. Standards outlined in Dash-1 handbooks will govern taxi operations under varying wind conditions.

2.3.5. Crossing Behind Aircraft. Personnel, vehicles, and towed aircraft will remain clear of taxiing traffic and will not pass within 200 feet of the rear of an aircraft with engines running.

2.3.6. Ramp Areas. Aircraft parked in ramp areas will be taxied only after an "ALL CLEAR" signal is given by a responsible ground crew member.

2.3.7. Signaling at Night. At night, ground crewmembers will use two luminated wands for signaling taxiing aircraft (paragraph **2.2.6.**). Refer to AFI 11-218 for additional information and details.

2.3.8. Taxiing Near Other Aircraft. Pilots and taxi-qualified technicians will use minimum power when moving from a row of parked aircraft and will taxi in a way that prevents blast from propellers or jet exhausts from endangering personnel, parked aircraft, or other property. The minimum safe distance to the rear of a jet aircraft operating at 100-percent power setting has been established as the point where blast effects do not exceed 35 miles per hour velocity and 38 degrees Celsius (C) (100 degrees Fahrenheit [F]). See aircraft TOs for recommended safe distance.

2.3.9. Jet Runup Areas. Adequate caution signs will be posted at entrances, gates, and other approaches to jet runup areas to direct attention to the hazards of such operations.

Chapter 3

AIRCRAFT JACKING OPERATIONS

3.1. Hazards and Human Factors . Extensive damage to aircraft and serious injury to personnel have resulted from careless or improper jacking procedures.

3.2. General Requirements:

3.2.1. To ensure the safety of both aircraft and personnel, all persons involved in jacking operations will be thoroughly familiar with the applicable TOs or handbooks for the particular aircraft involved. Jacks will be operated, maintained, inspected, and tested according to applicable TOs. The procedures outlined in these publications will be strictly adhered to when jacking aircraft. As an added safety measure, jacks will be inspected before use to verify lifting capacity, proper functioning of safety locks, conditions of pins, and general serviceability. Documentation of these inspections should be maintained by the supervisor in the work section. When the integrity of a jack is questionable, the supervisor will be notified and the jack immediately removed from service.

3.2.2. Before the aircraft is raised on jacks, all workstands and other equipment not designed to be under the aircraft during jacking will be removed. If the normal weight-and-balance condition of the basic aircraft has been redistributed by removal of heavy items, weight will be added where required to reestablish the center of gravity before jacking the aircraft (specific aircraft TOs contain procedures to safely jack the aircraft). Personnel will not remain in the aircraft while it is being raised or lowered, unless directed by TO procedure to observe leveling instruments. The prescribed jack pads to aircraft jacking pad fittings and the correct adapters to jack screw extensions will be installed. Before the aircraft is raised or lowered, chocks will be removed and the brakes released.

3.2.3. Safety stands of suitable design and capacity will be installed under the wings and tail of the aircraft after it has been raised and leveled when the possibility of equipment failure exists or when an unbalanced condition may occur.

3.2.4. Personnel will not be permitted to pass under or climb or walk on any portion of the aircraft (except as operationally necessary to perform maintenance) when the entire aircraft is supported by jacks. The area around the aircraft will be properly secured and appropriate warning signs posted. For depot maintenance facilities, all entrances to the work area will be posted alerting personnel that the aircraft is on jacks. All personnel not directly involved in the jacking operation or performing maintenance required while the aircraft is on jacks will remain outside the posted area.

3.2.5. Engines and other major components, such as wing panels and stabilizers, will not be changed when the aircraft is resting on jacks with the landing gear clear of the ramp or floor. No deviations from this restriction are authorized unless provided for in the applicable aircraft TO.

3.2.6. The ram locknut will lower under its own weight or be turned down by hand as the ram is extended and remain against the lift tube cylinder during the jacking procedures. Other types of jacks, if equipped with locking pins or nuts, will be set immediately after jacking has been completed. The 35A-series TOs will be consulted for specific instructions.

3.3. Specific Requirements:

3.3.1. Outside Jacking. Aircraft may be supported on jacks outside hangars when wind conditions permit. When specifications for wind velocity for a particular aircraft are not available, maintenance personnel will accept a velocity of 15 miles per hour as the safe maximum for outside jacking operations. Outside jacking should be done on a level surface. High tail surfaces of some aircraft, exposed to even a moderate wind, require special consideration when outside jacking is contemplated. Before attempting outside jacking, maintenance personnel will familiarize themselves with the appropriate TO for the aircraft involved.

3.3.2. Hangar-Dock Jacking. Normally, hydraulic pumping units used to operate aircraft lifting jacks will not be operated in aircraft hangars. However, the operation of such equipment in hangars will be permitted when authorized by the logistics group commander, ground safety representative, and installation fire chief. When authorized for use, all spark-producing components of the equipment and any other possible ignition source shall be at least 18 inches above the floor (NFPA 410 and NFPA 70, *National Electrical Code* [*NEC*]). A minimum of 25 feet will be maintained between the aircraft and the hydraulic pumping unit, and this unit will be positioned in an area entirely free of combustible material. The engine installed on the pumping unit will be properly grounded.

3.3.3. Releasing Jacks. Before releasing jack pressure and lowering the aircraft, maintenance personnel will ensure the area underneath is clear of all equipment, cribbing, and personnel and verify the aircraft is ready for lowering. They will ensure the landing gear is completely down and locked in position and all ground locking devices are installed. Only personnel required to operate the jacks and to free the struts will remain in the vicinity of the aircraft during lowering procedures. The aircraft will be lowered slowly and evenly to the surface. Care will be exercised when removing the jacks from under the wings in order not to damage the aircraft skin or structure. Jacks will be removed safely by first turning down the jack screw extension and then depressing the ram into the cylinder. To avoid possible injury from depressing the ram, personnel will not place any part of their hands on top of the ram.

3.3.4. Landing Gear Retraction Tests. When making retraction tests of landing gear, the operation shall be directed orally by the use of interphone system or orally after obtaining visual assurance from a person outside the aircraft that the wheel well and swing areas are clear.

3.3.5. Fire Fighting Equipment. Maintenance personnel will ensure suitable portable fire fighting equipment is readily available and positioned properly (AFOSH Standard 91-56 and TO 00-25-172).

Chapter 4

AIRCRAFT CLEANING AND DECONTAMINATION

4.1. Hazards and Human Factors. Physical hazards are present in the form of falls from aircraft during cleaning operations, contact with cleaning materials (flammable solvents and vapors of solvents), and spills of solvents. In addition, aircraft contaminated with radioactive materials pose serious health hazards.

4.2. General Requirements. To prevent falls when cleaning aircraft, personnel should not be allowed to climb or walk on wet surfaces while the aircraft is being washed. Separate elevated work platforms and long-handle brushes will used to the maximum possible. If it is absolutely necessary to walk on aircraft wings or other surfaces during washing, extreme care will be exercised and locally designed systems such as sky-lines, to which safety harnesses can be attached, will be used (paragraph **8.2.5.**). Personnel will wear adequate protective clothing and chemical-splash goggles when cleaning aircraft, particularly when cleaning aircraft with chemical brightening agents, caustics, acids, phenolic compounds, or other chemicals. Appropriate footwear will also be worn to aid in preventing falls while working on wet surfaces (AFOSH Standard 91-31). Requirement for respirators will be coordinated with the installation BEE. Only authorized cleaning agents will be used. AFOSH Standard 48-21 should be reviewed for requirements on the Hazard Communication Program.

4.2.1. Flammable Solvents. Nonflammable nontoxic solvents will normally be used for aircraft cleaning as described in TO 1-1-691, *Aircraft Weapons Systems Cleaning and Corrosion Control*. However, when authorized by TOs or other guidance, flammable solvents may be used when cleaning aircraft. This will be a coordinated, approved, and well-planned operation involving the appropriate group commander and installation ground safety, fire department, and BE officials. All potential sources of ignition will be prohibited within 50 feet of the operation, and warning signs will be posted. Suitable auxiliary fire fighting equipment will be kept close at hand at the discretion of the fire chief. The aircraft will be effectively grounded at all times to prevent the collection of static charges. When an aircraft is being washed or cleaned with flammable solvents and electrical storms are occurring within 5 nm or less, the operation will be suspended unless the operation is inside and the facility incorporates approved lightning protection systems. (Also see paragraph **1.2.15.**)

4.2.2. Spills of Cleaning Materials or Solvents:

4.2.2.1. The installation fire department will be immediately advised if there is a spill of flammable solvents.

4.2.2.2. Environmental pollution control procedures for spills of flammable or non-flammable solvents will be according to installation spill prevention control and reporting plans.

4.3. Aircraft Cleaning Operations: (Also see paragraph **1.2.3.3.4.**)

4.3.1. At no time will maintenance personnel clean aircraft parts, hangar floors, equipment, or clothing with gasoline or unauthorized solvents. All cleaning will be done with approved high flashpoint or nonflammable substances or liquids whenever possible. Flammable liquids will be stored as specified in AFOSH Standard 91-43.

4.3.2. Wiping cloths, oily waste, and other flammable materials will be placed in suitable, self-closing metal containers which will be available for use. These containers will be emptied and the contents disposed of at the end of each shift. **CAUTION:** Do not put soiled rags in sealed plastic bags, because of the possibility of spontaneous combustion due to heat buildup.

4.3.3. Smaller amounts of flammable solvents should be stored with adequate ventilation and fire extinguishers always available. Storage areas should be kept cool (55- to 80-degrees F) and free from spark- or heat-producing equipment. Absorbent material should be available to safely clean up spills.

4.3.4. It is important to remember that the flammable and toxic vapors are the most hazardous aspect of solvents. It is the flammable vapors that burn and toxic vapors that cause occupational illnesses.

4.3.5. In any transfer of a gallon or more of flammable solvent, the containers should be bonded. Free flow of the solvent through air should also be avoided, since a static charge can build between the solvent and the air. Remember, to have an effective bonding, there must be metal-to-metal contact.

4.3.6. For safe spill handling, a material should be used which actually controls the hazard. In the case of flammable solvents, this means a material which will adsorb the vapor as well as the liquid spill. A vapor absorbent material will bind the vapors, controlling the hazard. Even if an ignition source is present, the spill will not burn. The binding of the vapors removes the fuel from the area, and there is nothing left to burn.

4.4. Fire Control:

4.4.1. Class B extinguishers will be used for flammable solvents. Anyone working in a solvent area will be trained and proficient in the use of the extinguisher. In no case should water be used.

4.4.2. Extinguishers should be adequate for the size of possible fires. A gallon of burning solvent can cover between 25 and 50 square feet, yet many small extinguishers will only cover 2 square feet. The fire department will be consulted to ensure extinguishers with the proper capacity are obtained.

4.4.3. Workers will be trained to remain vigilant after a fire is extinguished because flammable solvent may still be underneath the extinguishing material. If an ignition source is present, the vapors can ignite again.

4.4.4. Workers will also be trained to be cautious around solvent which is burning in a container. When flames begin to die and the container cools, the change in pressure may suck the flame back into the container, causing the remaining vapors to explode. Safety cans and solvent storage cabinets will have flash arresters to prevent flame from entering the container.

4.5. Decontamination of Aircraft Contaminated With Radioactive and Toxic Materials:

4.5.1. An aircraft suspected of being contaminated will be taxied immediately after landing, by the most direct route, to a pre-approved parking area away from active flight line activities and facilities. **CAUTION:** To limit the spread of contamination, the prevailing winds and the location of drains should be considered as factors in determining selected isolation areas.

4.5.2. A controlled area will be established around the aircraft, and deplaning aircrew members will be monitored and decontaminated, as necessary, under the supervision of the BEE.

4.5.3. Management and decontamination of the aircraft will be done according to TO 00-110A, *Inspection Maintenance Actions Storage, and Disposition of Aircraft*, and related TOs.

4.5.3.1. The BE personnel will provide personal dosimeters and appropriate safety and health briefings to maintenance personnel who work on the aircraft.

4.5.3.2. Maintenance personnel with open wounds or sores will not work in contaminated areas or on contaminated equipment.

4.5.3.3. Personnel, when working in contaminated areas, will not drink, smoke, eat, or chew gum.

4.5.3.4. Personal articles such as watches and rings will not be worn while working in a contaminated area or on contaminated or potentially contaminated aircraft.

4.5.3.5. Maintenance personnel who work in a contaminated area or on contaminated equipment will not (unless absolutely necessary) handle telephones, reports, or other articles which cannot be readily decontaminated.

4.5.3.6. Required PPE, approved by BE and ground safety officials, will be worn by all personnel entering the controlled area (AFOSH Standard 91-31).

Chapter 5

AIRCRAFT TIRE MOUNTING AND SERVICING OPERATIONS

5.1. Hazards and Human Factors. Personnel frequently expose themselves to potential injury when they fail to use proper equipment or to obtain helpers when they remove and handle aircraft tires or wheels. When personnel do not use tire cage guards or use tire inflation equipment properly (over-inflate high pressure tires, use uncalibrated equipment, etc.), they set the scene for injury to personnel and damage to equipment.

5.2. Aircraft Tire Mounting. When mounting or removing heavy aircraft tires, maintenance personnel will use tire dollies or other appropriate mechanical devices. Sufficient work force is also necessary, in addition to mechanical aids, to safely handle heavy tires and wheels.

5.2.1. To prevent possible injuries to maintenance personnel, tire cage guards will be used during the inflation of tires in the shop. Extreme caution will be used to avoid over-inflation of high pressure tires. Air supply lines will be equipped with proper regulators to prevent excessive pressure (over 50 psi) being delivered to the tire. In field operations, TO 4T-1-3, *Tires and Tubes*, and the applicable aircraft TOs will be consulted. When using the remote tire inflator assembly kit, TO 4T-1-3 will be consulted.

5.2.2. Only authorized safety tire inflation equipment will be used for flight line or hangar tire inflation. For tires with a maximum tire pressure (MTP) requirement of less than 50 psi, a relief valve will be set to 100 psi. For tires with a MTP requirement of more than 100 psi, a relief valve will be set to 20 psi over the MTP requirement. The inflator equipment will utilize a 10-foot hose or longer for pressure exceeding 50 psi, allowing the servicer to be positioned forward or aft of the tire, and clear of potential wheel failure fragments.

5.2.2.1. The supply pressure source, especially high pressure gas cylinders, will possess a pressure reducing regulator. The regulator shall be set to provide a controlled inlet pressure not to exceed the required tire pressure by a factor of 50 percent or 600 psi, whichever is less.

5.2.2.2. Only qualified precision measurement equipment laboratory (PMEL) personnel will adjust and (or) calibrate tire inflation equipment. Applicable TOs will be referenced for time requirements.

5.2.3. Tire temperatures are more critical as aircraft become faster and heavier. Nitrogen gas is often preferred for inflating tires because the oxygen in compressed air reacts with the tire rubber at high temperatures and pressures. This results in deterioration, decreased tire life, and a blowout hazard. If compressed air is used, it will be oil- and water-free. Hose material will be compatible with the servicing agent (air or nitrogen) being used. There are two types of gaseous nitrogen available in the Air Force supply system:

5.2.3.1. Oil-free nitrogen commonly called water-pumped nitrogen, will be used for inflating aircraft tires. Guidance for portable, nitrogen (converter) supply system cart (PN AO40111000) will be consulted. **WARNING:** Never inflate a tire using nitrogen directly from the supply cylinder.

5.2.3.2. Oil-tolerant nitrogen, commonly called oil-pumped nitrogen, will not be used for tire inflation because this material may cause an oil film to build up on the inside of the tire and soak

into the rubber. If compressed air (the legal alternative) is later used to inflate the tire, a combustible mixture is produced within the tire by the hydrocarbon film in contact with compressed air.

5.3. Aircraft Wheel Removal. Aircraft tires are not required to be deflated prior to being removed to support other maintenance tasks if immediately replaced when the tasks are complete. In all other removal tasks, tires must be deflated before wheel and tire assemblies are removed because of hazards to maintenance personnel. (See TO 4T-1-3 for procedures for aircraft wheel removal tasks.)

5.4. Employee Training. The supervisor shall ensure workers who service wheels are trained in correct procedures for each type of wheel being serviced. Supervisors will not allow untrained personnel to service wheels. Although targeted to automotive personnel, the film entitled, "Working Safely With Multipiece Rims," Product Identification Number (PIN) 605748, is encouraged for use in the training. The film is available through the Defense Automated Visual Information System (DAVIS) at **http://www.redstone.army.mil/davis**.

5.4.1. Information to be used in the training program shall include, as a minimum, the applicable data contained in the TO and the contents of this chapter.

5.4.2. If any worker has difficulty in reading or comprehending the contents of the TO, the supervisor will take action to ensure the employee is instructed in a manner they can understand. It is important to emphasize the consequences of failure to follow the TO guidance.

5.4.3. The supervisor shall ensure each employee demonstrates and maintains the ability to service aircraft wheels safely, including performance of the following tasks:

5.4.3.1. Demounting of tires (including deflation);

5.4.3.2. Inspection and identification of the wheel components;

5.4.3.3. Mounting of tires (including inflation) with the appropriate safety devices required by this section;

5.4.3.4. Use of tire cages and other equipment required by this section;

5.4.3.5. Handling of aircraft wheels;

5.4.3.6. Inflation of the tire when wheel is mounted on an aircraft or during in-shop maintenance;

5.4.3.7. An understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the wheel following inflation;

5.4.3.8. Installation and removal of wheels; and

5.4.3.9. Wearing appropriate PPE (e.g., goggles and [or] face shield) during the tire inflation process.

5.4.4. The supervisor shall evaluate each employee's ability to perform these tasks safely and shall provide additional training as necessary to ensure each employee maintains proficiency.

5.5. Tire Servicing Equipment. The supervisor shall ensure a restraining device for inflating tires on wheels is available. The restraining device or barrier shall comply with the following requirements:

5.5.1. Each restraining device shall have the capacity to withstand the maximum force that would be transferred to it during a wheel separation occurring at 150 percent of the maximum tire specification pressure for the type of wheel being serviced.

5.5.2. Restraining devices shall be capable of preventing the wheel components from being thrown outside or beyond the device or barrier for any wheel positioned within or behind the device.

5.5.3. Restraining devices shall be visually inspected prior to each day's use and after any separation of the wheel components or sudden release of contained air. Any restraining device exhibiting defects, such as the following, shall be immediately removed from service and an AF Form 979, **Danger Tag**, attached until repaired or reinspected:

5.5.3.1. Cracks at welds;

5.5.3.2. Cracked or broken components;

5.5.3.3. Bent or sprung components caused by mishandling, abuse, tire explosion, or wheel separation;

5.5.3.4. Pitting of components due to corrosion; or

5.5.3.5. Other structural damage which would decrease its effectiveness.

5.5.4. Periodic checks will be made on all welds by NDI methods.

5.5.5. Hoses will be inspected periodically and replaced as required.

5.5.6. Restraining devices requiring structural repair (such as component replacement or rewelding) shall not be returned to service until they are certified by either the manufacturer or a registered professional engineer as meeting the strength requirements of the TO.

5.5.7. The supervisor shall ensure an air line assembly consisting of the following components is used for inflating tires:

5.5.7.1. The specified service chuck;

5.5.7.2. An in-line valve with a pressure gauge or a pre-settable regulator; and,

5.5.7.3. A sufficient length of hose (at least 10 feet) between the clip-on chuck and the in-line valve to allow the employee to stand outside the trajectory.

5.5.8. Current charts, TOs, or manuals containing instructions for the types of wheels being serviced shall be available in the service area.

5.5.9. The supervisor shall ensure only tools recommended in the TO or manual for the type of aircraft wheel being serviced are used.

Chapter 6

FLIGHT LINE VEHICLE OPERATIONS

6.1. Hazards and Human Factors. The safe operation of all government and civilian motor vehicles on the flight line is absolutely essential to normal aircraft operations and maintenance. Motor vehicles present a clear and definite danger to aircraft and ground personnel. Carelessness, haste, and disregard for established safety standards are the primary causes of high accident potential (HAP) incidents, aircraft-vehicle mishaps, and personnel injury on the flight line.

6.2. General Requirements. The standards and directives on the following pages have been established for the control of all motor vehicles on Air Force installation flight lines. Persons assigned to the flight line or to activities related to the flight line will be knowledgeable of and comply with these requirements. Responsible supervisors will evaluate their personnel at frequent intervals to ensure they are in full compliance with established guidelines (Air Force Joint Manual [AFJMAN] 24-306*, Manual for the Wheeled Vehicle Driver,* and AFI 13-213, *Airfield Management and Base Operations*).

6.3. Responsibilities. The following responsibilities will be assigned to ensure only trained personnel are authorized to drive on Air Force installation flight lines.

6.3.1. Security Police. The chief of security police will monitor flight line vehicle operations for compliance with this standard and local directives. Only operators and vehicles designated by the wing commander or airfield manager, as prescribed in AFJMAN 24-306, AFI 13-213, and AFI 31-204, *Air Force Motor Vehicle Traffic Supervision,* will be given access to the flight line.

6.3.2. Acquisition Management Division. The chief of acquisition management (contracting division) will:

6.3.2.1. Ensure contractors understand and comply with these regulations.

6.3.2.2. Inform security police and airfield management of contractors who need to operate vehicles on the flight line or may impact airfield operations.

6.3.3. Safety. The ground safety manager will:

6.3.3.1. In coordination with the airfield manager, administer briefings to temporary duty (TDY) groups (Red Flag, etc.) on base. The briefings will consist of items peculiar to the installation environment and vehicle operations. The airfield manager is responsible for briefing TDY personnel on local flight line procedures, if applicable.

6.3.3.2. Coordinate on lesson plans and tests for local flight line vehicle operations. Ensure vehicle operator briefings include all local flight line traffic rules and hazards.

6.3.3.3. Coordinate on local directives or operating instructions which establish flight line traffic flow patterns and parking plans.

6.3.4. Airfield Management. The chief of airfield management will:

6.3.4.1. Establish a program for issuing an AF Form 483, **Certificate of Competency**, endorsed for flight line driving.

6.3.4.2. Ensure appropriate training is provided to non-Air Force and contractor operators before they are allowed to drive day or night on the flight line.

6.3.4.3. Coordinate on lesson plans and tests for local flight line vehicle operations and train unit Vehicle Control Officers (VCO) and Vehicle Control Non-Commissioned Officers (VCNCO).

6.3.4.4. Develop a program to control and identify privately-owned vehicles authorized access to the flight line (AFI 13-213).

6.3.5. Squadrons and Support Organizations. Squadron and support organization commanders who have personnel authorized to operate motor vehicles on the flight line will, in compliance with local procedures:

6.3.5.1. Ensure immediate supervisors personally ascertain their vehicle operators are qualified for the type vehicle and task. Also consider physical and (or) mental problems or stress before the person is assigned the task.

6.3.5.2. Review individuals' AF Form 110, **Individual Incident Reference Record**, and AF Form 1313, **Driving Record**, (located at security police) to determine their qualifications, before permitting them to operate vehicles and (or) equipment on the flight line.

6.3.5.3. Ensure VCOs and designated flight line driving instructors give both a day and night check ride to all new operators before they are allowed to operate vehicles on the flight line. Include routes, limitations, runway and taxiway crossing, and any other local procedures for driving on the flight line in the orientation check ride.

6.3.5.4. Determine the number of squadron flight line driving instructors to be designated.

6.4. Operating Standards. The following standards will be observed at all times when vehicles are operated on the flight line. Care, attention, and strict adherence to these precautions will prevent accidental damage to aircraft and injury to personnel. Personnel who are authorized to operate motorcycles, mopeds, bicycles, or tricycles on the flight line will conform to flight line vehicle traffic standards.

6.4.1. Speed Limits. No vehicle will be operated at a speed in excess of that deemed reasonable and prudent for existing traffic, road, and weather conditions. Emergency vehicles will not automatically assume the right of way. The following speed limits are for general purpose vehicles: **NOTE:** Vehicles responding to Red Ball exercises and precautionary landings are not authorized to exceed these limits.

6.4.1.1. Vehicle Parking Areas — 5 miles per hour.

6.4.1.2. Aircraft Parking Ramp — 15 miles per hour maximum. **NOTE:** The speed limit is 5 miles per hour within 25 feet of an aircraft.

6.4.1.3. Flight Line Access or Bypass Road — 15 miles per hour as designated by installation commander.

6.4.1.4. Taxiways and Inactive Runway — as designated by installation commander based upon local conditions.

6.4.1.5. Designated Traffic Lanes on the Ramp or Taxiway in Congested Areas or Within 200 Feet of Aircraft Parking Areas — 15 miles per hour.

6.4.2. Aircraft, Equipment, and Trailer Towing:

6.4.2.1. Towing speed is 5 miles per hour for all aircraft and two or more maintenance stands. Towing speed for one maintenance stand is 10 miles per hour.

6.4.2.2. The maximum towing speed for AGE, such as compressors, ground power units, oxygen carts, and similar equipment, is 15 miles per hour. (See paragraph **8.3.4.** for additional information on AGE.)

6.4.2.3. No more than four type B1, B4, B5, and similar small stands may be towed as follows: two sets of two in tandem on a double hitch or two in tandem on a single hitch. Type B3, J7, and similar large stands will be towed singly on a center mounted hitch. Four-wheeled units will not be towed behind two-wheeled units. Large pieces of AGE, when towed in tandem, will not block the driver's vision of the last item being towed.

6.4.2.4. Safety or cotter pins will be used to secure pintle hooks and trailer hitches.

6.4.3. Flight Line Driving: (**NOTE:** Vehicle operators will not approach within 50 feet of an aircraft being towed.)

6.4.3.1. Private Motor Vehicles (PMV). The operator will possess a valid state driver's license and an AF Form 483 endorsed for flight line driving. The airfield manager will provide flight line training to contractor personnel (paragraph **6.3.4.**).

6.4.3.2. Motorcycles. Motorcycles, mopeds, or scooters may be authorized to operate on the flight line. If authorized, the following provisions will apply:

6.4.3.2.1. Appropriate protective equipment as outlined in AFI 91-207 will be worn any time the motorcycle is in motion.

6.4.3.2.2. No passengers will be carried.

6.4.3.2.3. The operator will have successfully completed Course IVA or B outlined in AFI 91-207.

6.4.3.2.4. Motorcycles will be operated with headlights on at all times. If authorized to be operated on the flight line at night, mopeds and scooters will have a headlamp and reflectors front and rear.

6.4.3.3. Bicycles and Tricycles. A bicycle or tricycle operator will be knowledgeable of requirements in this chapter and local directives. The following provisions apply when bicycles or tricycles are authorized on the flight line.

6.4.3.3.1. Tricycles. When parked on the flight line, will have a suitable braking device engaged to prevent inadvertent movement.

6.4.3.3.2. Bicycles and Tricycles. For night operation, will be equipped with an operational headlamp (turned on) and reflectors or reflector tape.

6.4.3.3.3. Bicycles and Tricycles. When parked at night on the flight line, will be positioned so they will not impede the traffic flow of aircraft or motor vehicles.

6.4.3.4. Other Vehicles. If authorized to be operated on the flight line, electrical, gas, or gasoline-powered golf-type carts or similar utility vehicles will follow all rules established for all general and special purpose vehicles and will be equipped with forward and rear lamps if operated at night.

6.4.4. Entering or Leaving the Flight Line Driving Area:

6.4.4.1. All vehicles, except emergency and alert vehicles responding to an alert or emergency, will stop prior to entering the flight line regardless of where they enter.

6.4.4.2. Traffic lanes on the aircraft parking ramp are normally the areas to the right of the aircraft.

6.4.4.3. Unless prevented by local procedures, all traffic flow on the aircraft parking ramp shall be parallel to the noses of the parked aircraft with the driver's side toward the aircraft. Vehicles will not be driven diagonally across the parking ramp, but at 90-degree angles to the driving lanes.

6.4.5. Vehicle Parking:

6.4.5.1. Vehicles will not be backed or parked in the immediate vicinity (25 feet to front 200 feet to rear) of any aircraft, except as authorized for operations such as loading or unloading, servicing, or towing. A spotter will be posted when a vehicle is backed towards an aircraft. Pre-positioned wheel chocks will be used to prevent vehicles from being backed into aircraft.

6.4.5.2. The brakes on all parked vehicles will be set.

6.4.5.3. All unattended vehicles will be parked so they will not interfere with the aircraft being towed or taxied. Ignition will be turned off; keys will be left in the ignition; and the gear lever will be put in reverse gear for vehicles with manual transmissions and in the 'park' position for vehicles with automatic transmissions. All vehicles parked and left unattended will have brakes set or will have chocks placed both in front of and behind one of the rear wheels. One chock will be placed between the tandem wheels of dual (tandem) axle vehicles. The only vehicles exempt from these requirements are alert and emergency vehicles responding to an alert or emergency.

6.4.5.4. All wheeled AGE and maintenance equipment will be braked or, if not equipped with brakes, chocked.

6.4.5.5. When aircraft engines are operating or being started, no vehicle will be parked or driven closer than 25 feet in front of or 200 feet to the rear of any aircraft, except as prescribed in the applicable aircraft handbook. Vehicles parked at the side of the aircraft will be located clear of the wingtips, clearly visible to personnel in the aircraft cockpit.

6.4.6. Passengers in Vehicles:

6.4.6.1. Personnel will not ride on any part of a vehicle not intended for carrying passengers nor will they ride in or upon trailers.

6.4.6.2. Passengers will remain seated while the vehicle is in motion and will keep their arms and legs within the vehicle body.

6.4.6.3. Passengers will use available seat belts at all times while the vehicle is in motion.

6.4.6.4. Passengers will not ride in the doorways or sit on the engine cover of metro vans (also called step vans). Rear door nets will be in place while passengers are transported when the doors are open.

6.4.6.5. Side doors on passenger vans will be closed when the vehicle is in motion.

6.4.7. Restricted Visibility or Night Operations:

6.4.7.1. Flashing lights or parking lights will be used at night when vehicles are temporarily parked on any part of the aircraft parking ramp. This does not apply if vehicles are parked in a designated area.

6.4.7.2. When visibility is less than 300 feet, refueling and explosive loaded (laden) vehicles will not be operated unless directed by the wing or installation commander.

6.4.7.3. When visibility is less than 100 feet, PMVs and flight line vehicles (except emergency and alert vehicles) will not be operated on the flight line. Flashing lights will be used on all vehicles temporarily parked on the aircraft parking ramps during the periods of lowered visibility.

6.4.7.4. When visibility is less than 50 feet, it is recommended that a walking guide equipped with a flashing or luminescent wand be used during emergency movement of alert vehicles.

6.4.7.5. Vehicle operators will exercise caution to ensure headlights do not point toward taxiing aircraft or towing operations, so aircraft or tow vehicle operators are not blinded (paragraphs **6.4.9.2.**).

6.4.8. Control Tower Signs. All authorized PMV operators will have a tower signal decal (available at Base Operations) with them at all times while operating on the flight line. The tower signal decal will be displayed in plain view of the driver in all Air Force motor vehicles (AFMV). All vehicle operators will know and comply with the following signals:

6.4.8.1. Steady Green Light: “Clear to cross.”

6.4.8.2. Steady Red Light: “STOP! Vehicle will not be moved.”

6.4.8.3. Flashing Red Light: “Clear active runway.”

6.4.8.4. Flashing White Light: “Return to starting point.”

6.4.8.5. Red and Green Light: “General warning. Exercise extreme caution.” **NOTE:** During alerts and emergency conditions all non-essential personnel will withdraw to Base Operations or their Work Control Center until the emergency is terminated. The withdrawal of contractors will be at the discretion of airfield management.

6.4.9. Taxiing Aircraft:

6.4.9.1. Except for Follow Me vehicles, vehicles will not be parked in front of or driven into the path of taxiing aircraft. Vehicles will not be driven between a taxiing aircraft and its Follow Me guide.

6.4.9.2. Headlights of a stopped vehicle shining towards a moving aircraft at night will be turned off immediately so the pilot’s night vision will not be affected. The vehicle parking lights or emergency flashers will be turned on so its position will be known. The headlights of the vehicle will remain off until the aircraft is out of range. Headlights will be turned ON prior to putting the vehicle in motion. **NOTE:** Vehicles with daytime running lights will park in a safe location with ignition off, parking brake set, and emergency flashers on.

6.4.9.3. All vehicle drivers, who are operating vehicles on the taxiways and parking ramps, will give way to taxiing aircraft. Vehicles will exit the taxiways by the shortest route. Only as a last resort will the vehicle be driven off prepared surfaces to ensure adequate clearances for the aircraft.

6.4.9.4. When a vehicle has a malfunction which prevents operation under its own power, every means will be used to alert taxiing aircraft. As a minimum, the vehicle operator will:

6.4.9.4.1. Leave the vehicle parking lights or emergency flashers ON if the malfunction occurs during hours of darkness.

6.4.9.4.2. If the vehicle has two-way radio capability, make the following transmission: "All parties BREAK, BREAK- This is (call sign) with an emergency for Base Operations, Tower, and Maintenance Operations Center." State the nature of the problem and your position on the airfield.

6.4.9.4.3. Operators of other radio-equipped vehicles (security police, civil engineering, transportation, etc.) will contact their control center and have the information relayed to the Base Operations Dispatcher for relay to the tower.

6.4.9.4.4. If a vehicle is not equipped with a radio, stay with the vehicle and continue attempts to get the attention of the taxiing aircraft.

6.4.10. Follow Me Vehicles. Follow Me vehicles used for guiding aircraft will be equipped with signs, easily visible at night, reading, "Stop" and "Follow Me." They will be equipped with two-way radios for communication on control tower frequencies. When approaching the parking spot, the Follow Me vehicle operator should illuminate the "Stop" signal, move the vehicle from the intended path of aircraft travel, and position it laterally — clear of the aircraft wingtip. The marshaler, who may be the vehicle operator, will then guide the aircraft to the parking spot by use of approved marshaling signals. When necessary to accommodate the optimum safe taxiing speed of aircraft, Follow Me vehicles will be permitted to exceed the normal 15 miles per hour flight line speed limit. Tugs will not be used as Follow Me vehicles at any time. (AFJMAN 24-306)

6.4.11. FOD Prevention. When motor vehicles are operated on unpaved surfaces, rocks may become lodged between dual wheels and gravel may stick in the tire treads. When entering the ramp area or flight line, operators will stop and remove foreign materials from the tires (AFI 21-101, AFMAN 91-201, and AFJMAN 24-306).

6.4.12. Forklift Operator's Instructions Around Aircraft. The forklift is the basic piece of aircraft cargo handling equipment. It is used primarily for moving cargo to and from aircraft and for raising and lowering loads between the ground and the aircraft. Only licensed drivers will operate forklifts. Operators will never drive forklifts faster than 10 miles per hour on ramps or 5 miles per hour within 10 feet of any aircraft (AFOSH Standard 91-46, Department of Defense [DoD] 4145.19-R-1, *Storage and Materials Handling,* and AFMAN 91-201).

6.4.12.1. Maneuvering Forklifts. When maneuvering forklifts close to aircraft, a spotter will be used to assist the driver in determining safe clearances. Bumper blocks placed on ramps will be used to prevent unintentional backing into aircraft. Before lifting or lowering a load, the forklift will be brought to a complete stop. At no time will forklift drivers raise or lower a load while in motion. Forklifts will never be driven under any part of an aircraft except when the type of aircraft involved requires it. When long distances must be traveled and (or) when bulky loads are carried, the forklift will be driven in reverse to take advantage of the operator's less obstructed field of vision. The forks of parked forklifts will be lowered flat on the ground to prevent injury to personnel working or walking in the area. On parked and unattended forklifts, the operating levers will be in neutral, the ignition switched off, and the handbrake set.

6.4.12.2. Forklift Operating Procedures and Safety Practices. The checklist at **Attachment 2** will be used as a general guide for safe and efficient operation of forklifts in cargo handling.

6.4.12.3. Crating. Large unwieldy crates, which may be blown over when handled outside, will be equipped with rings for attaching tag lines. The use of tag lines makes handling safer and also provides a means of securing crates in open areas. Tag lines will be of sufficient length to permit the person holding the rope to be clear of the load (that is, to avoid standing under the load).

6.4.12.4. Stacking. Forklift drivers will not stack empty pallets higher than eye level. Pallets stacked on forklift tines higher than eye level can cause an unsteady load and become a potential source of injury or property damage. Forklift operators will have a spotter available when stacking cargo on trailers and 463L equipment if vision is obstructed.

6.4.12.5. Using Lift-Truck Forks. Forklifts will not be used to tow trailers or push other equipment unless designed by the manufacturer for that operation and tech data is followed. Forklifts shall be equipped with horns and lights, as required for safe operation, and all will be in operable condition.

6.4.12.6. Training and Licensing. Training will be according to AFI 24-301, *Vehicle Operations.*

6.4.13. Operation of Hi-Lift Trucks Around Aircraft. The operation of hi-lift trucks around aircraft differs little from forklift work in the same area. The same speed limits as prescribed in AFJMAN 24-306 will be used; 10 miles per hour on ramps and 5 miles per hour near aircraft. Like forklifts, hi-lift trucks will be operated only by licensed drivers. Hi-lift truck operators require special training, which is the responsibility of the using organization.

6.4.13.1. Areas of Maneuverability. Drivers will use extreme caution when they operate hi-lift trucks in the immediate vicinity of aircraft. As in many trucks, the driver's vision is restricted; therefore, guides will be used to assist the hi-lift operator when it is necessary to back the vehicle. The driver and guide will be able to communicate at all times. The guide will use luminous wands or flashlights to relay signals to the vehicle operator during the hours of darkness unless supplemental lighting is utilized. Signals will also be used any time the cargo bed is raised or lowered.

6.4.13.2. Cargo Bed Hydraulic System. Before the hydraulic system of the cargo bed is operated, the driver will bring the truck to a complete stop. To ensure adequate clearance, the truck will be moved at least 5 feet from the aircraft before the bed is raised or lowered.

6.4.13.3. Hi-lift Truck Operating Procedures and Safety Precautions. The checklist at **Attachment 3** will be used as a general guide for hi-lift truck operation in aircraft cargo handling.

6.4.14. Operating Hand Pallet Trucks Inside Aircraft:

6.4.14.1. These trucks are hydraulically-operated materials handling devices that can be used for moving heavy objects inside aircraft. Since the hand pallet truck does not have brakes, at least two persons will operate this piece of equipment.

6.4.14.2. When extremely heavy loads are moved inside aircraft, 1- by 12-inch shoring or equivalent protection will be used to prevent damage to floors. Care will also be taken to avoid damaging the sidewalls and ceiling of aircraft.

6.4.15. Cargo Stowing Techniques Aboard Aircraft. To avoid exceeding weight and balance limits, cargo will be loaded aboard aircraft according to pertinent aircraft loading TOs and handbooks.

6.4.16. Using Roller Pry Bars Inside Aircraft. Roller pry bars are particularly helpful in positioning heavy cargo inside aircraft. When using these bars under heavy objects, personnel will be especially careful not to exceed maximum allowable floor strengths. The checklist at **Attachment 4** will be used as a guide when using roller pry bars.

6.4.17. Floor Load. Aircraft TOs will be consulted to determine maximum allowable floor loads. When any load is expected to exceed the published limit, shoring will be used as a safety precaution.

6.4.18. Operation of K-loaders and Roller-Equipped Trailers Around the Aircraft. Operation of flatbed trailer loaders differs little from forklift work in the same area.

6.4.18.1. Areas of Maneuverability. Guides will be used to assist the operator at all times when the aircraft is approached in order to load or off-load cargo. Before operating the hydraulic system of the cargo deck, the operator will bring the loader to a complete stop, set the brakes, and place the cab transmission selector in neutral. To ensure adequate clearance, the loader will be stopped or moved to at least 5 feet from the aircraft for preliminary deck alignment by means of the hydraulic system. The operator will also maintain a 5- to 8-inch clearance between the rubber bumpers and the aircraft for further deck adjustments during on- or off-loading.

6.4.18.2. K-loader and Flatbed Trailer Operation Procedures and Safety Precautions. The checklist at **Attachment 5** will be used as a general guide for K-loader and trailer operation in aircraft cargo handling.

6.4.18.3. Storing and Warehousing of Air Cargo. The techniques of storage and warehousing of air cargo do not differ greatly from normal warehousing procedures. The same safety standards used in general warehousing also apply to air cargo (DoD 4145.19-R-1 and AFOSH Standard 91-46).

6.4.19. Tractor Operations. Tractors are used for a variety of materials handling operations, particularly where extremely heavy loads are to be moved considerable distances. Signs reading “Slow Moving Vehicle” will be displayed on these vehicles.

6.4.19.1. Passengers. Passengers will not be allowed to ride on tractors unless adequate seats are installed.

6.4.19.2. Trailers. No more than four trailers, loaded or empty, will be pulled by any tractor. To avoid jackknifing, trailer trains will be arranged with the most heavily loaded trailer next to the towing vehicle, the next heaviest second in line, and so on. **EXCEPTION:** Six trailers may be moved behind one prime mover if they are A/M-32h-6 palletized cargo trailers.

6.4.19.3. Couplings. Tractor operators will ensure couplings are secure before moving a trailer or train. Pintle assemblies and towing connections will be secured with a pintle hook safety or cotter pin that will positively lock towing connections.

6.4.19.4. Speed Limit. Small flatbed warehousing trailers and airlift palletized cargo will not be towed at speeds in excess of 5 miles per hour. Slow-moving tractor-trailer combinations, when traveling installation roads, will be kept to the extreme right. Lights will be provided on all tractor-trailer combinations when they are operated at night or during periods of low visibility.

Chapter 7

AIRCRAFT HANGAR OPERATIONS

7.1. Hazards and Human Factors. Professional operations in the hangar complement the more visible flight line service operations. Quality housekeeping, personal appearance, work habits, condition of equipment, and job organization directly contribute to safe and efficient operations.

7.1.1. There are many hazards associated with aircraft maintenance activities conducted in hangars, shelters, or nose docks. Personnel must be aware of these mishap potentials to be able to take the necessary precautions.

7.1.2. Sufficient space will be provided between aircraft in maintenance hangars to ensure the safe flow and movement of equipment, materials, and workers.

7.1.3. Aircraft panels, cowlings, or other parts left lying on the hangar floor, under wings, in aisles, or in egress routes increase the probability of mishaps. Materials must be relocated to storage areas when not in use.

7.1.4. Electrical cords and compressed air lines, which are positioned where personnel will have to cross over them during routine work tasks, contribute to trips and falls. These items must be stored when not in use.

7.1.5. Personnel who are not trained in emergency evacuation procedures may not be able to successfully remove critical Air Force resources from the facility and may be injured.

7.2. Requirements:

7.2.1. Hangaring of Aircraft. The responsible group commander will ensure detailed local operating procedures covering safety precautions for hangaring aircraft are prepared and coordinated with installation ground safety and fire department personnel. If weapons-loaded aircraft are to be hangared, coordination will be obtained from the installation weapons safety representative.

7.2.2. Aircraft Hangar, Shelter, and Dock Facility Design Guidance. NFPA 70, Article 513, NFPA 409, *Aircraft Hangars*, NFPA 410, Military Handbook 1008, *Fire Protection for Facilities Engineering Design, and Construction,* and associated engineering technical letters (ETL) will be consulted for detailed guidance.

7.2.2.1. If operational needs require use of a hangar for hazardous operations which exceed the hangar design, installation ground safety, fire prevention, and BE officials will assist the maintenance representatives in developing special procedures to ensure safe operations. Some examples of hazardous operations are fuel system maintenance, fuel servicing operations, or aircraft painting.

7.2.2.1.1. Fixed electrical equipment that has been approved for Class I, Division 1 locations shall be permitted in a Class I, Division 2 location of the same class and compatibility group. Equipment not meeting these guidelines will be de-energized or otherwise disabled and locked out until the special operations are completed and the associated hazardous conditions are permanently eliminated.

7.2.2.1.2. Portable electrical equipment will not be brought into the hangar during the conduct of special hazardous procedures unless it meets the requirements in paragraph **7.2.2.1.1.** and is marked accordingly.

7.2.2.2. All openings from occupied areas into the hangar will be protected by ramps, curbs, or drains to prevent liquids from entering that area. All areas that are normally occupied by personnel should have an exit route to the outside of the hangar that does not require entering any location occupied by an aircraft (NFPA 409). Means of egress from mezzanines shall lead directly to a properly enclosed stairwell, directly to the exterior, or to outside stairs.

7.2.3. Hangar, Nose Dock, and Shelter Door Design Guidance and Operations:

7.2.3.1. To prevent confusion, powered hangar door designs will incorporate alarm sounding devices with a sound that is distinguishable from the facility fire alarm and audible above normal noise levels. The warning device will automatically signal at least 5 seconds before any door section movement and will sound continuously while the door is being operated and will reset immediately after movement stops.

7.2.3.2. Luminescent or reflective directional arrows will be placed adjacent to each switch and on horizontal sliding doors to indicate the direction of door travel for each corresponding switch.

7.2.3.3. For all center door switch operations, open will be placed at the top position and the switches will be wired so the doors open when open is selected. A hinged cover should be installed over the close switch to prevent inadvertent activation. Written operating procedures outlining all safety precautions to be followed will be published and posted next to operating controls. Roll-up, fold-up, counterbalanced, and similar doors will have control switches located to provide a clear view of the door opening. Additional guidance may be found in Air Force design criteria or equivalent Air Force-approved engineering guidance.

7.2.3.4. Only qualified personnel approved by the squadron commander or designated representative will be authorized to operate the hangar doors. Operators will be thoroughly familiar with operating instructions and precautions necessary for safe operation.

7.2.3.5. Overhead hangar doors will be fully opened before aircraft are moved through the door entrance. Horizontal sliding doors will be opened to permit a minimum 10-foot clearance at each wingtip. If the construction of the hangar does not permit such clearance, the doors will be opened to the maximum limit. Under normal conditions, powered hangar or shelter doors will always be opened to a width of at least 10 feet. For special operations, such as during extreme weather conditions, the door may be opened less than 10 feet only if the door control switch is locked off or out and remains locked out until the door can be opened to 10 feet or more or be closed. (See AFOSH Standard 91-66 for lockout requirements.)

7.2.3.6. (Added-302AW) Responsibilities. It is the responsibility of all supervisors to ensure compliance with this instruction.

7.2.3.7. (Added-302AW) Procedures for powered hanger door operation.

7.2.3.7.1. (Added-302AW) Only personnel authorized by their squadron commander may operate powered doors. Operators must be trained by the respective OPRs for the hangar door being operated and be thoroughly familiar with operating instructions and precautions for safe operation. They are as follows:

Building	OPR
208	Aerospace Ground Equipment
210, Bay 1	Fuel Cell
210, Bay 2	Flight line
214, Bay 3	Inspection Dock

7.2.3.7.2. (Added-302AW) Initial operator training will be documented on the Air Force (AF) Information Management Tool (IMT) 55, **Employee Safety and Health Record**, as well as in the G081 Maintenance Information System. Use AF IMT 797, **Job Qualification Standard Continuation/ Job Qualification Standard Continuation/Command JQS**, for non-maintenance personnel if G081 is not used. Each building listed above has doors with different operating characteristics and has a different course code assigned for G081 purposes. Initial training will consist of written materials or computer presentation plus hands-on training. Annual refresher training will consist of awareness training, as a minimum, unless hands-on training is necessary. This training will be documented in G081. Written door operating instructions will also be posted next to all door control switches.

7.2.3.7.3. (Added-302AW) Annual awareness training will be conducted for non-maintenance personnel assigned to a building with powered doors and personnel who have frequent duties inside hangars with powered doors, but do not operate them. Familiarization training will ensure the individual is aware of general safety around powered doors and precautions to be taken. Familiarization training does not qualify an individual to operate the doors. Training will consist of a visual demonstration of the doors in the building where assigned and a computer based presentation. Training will be documented on an AF IMT 797 for non-maintenance personnel and in G081 for personnel assigned to maintenance.

7.2.3.7.4. (Added-302AW) In the event of power failure, personnel will not attempt to open or make any adjustments to powered doors. If power fails to operate main hangar doors, trained personnel will disengage clutch and move doors by hand.

7.2.3.7.5. (Added-302AW) Personnel requiring hangar doors to be operated will request trained personnel to operate them. Under no circumstances will an individual operate a hangar door that he/she has not been trained to operate.

7.2.3.8. (Added-302AW) Procedures for manual hanger door operation.

7.2.3.8.1. (Added-302AW) All non-powered hangar doors will be individually addressed utilizing current Operational Risk Management procedures. Requirements for the safe operation, signage and training of non-powered hangar door operators will be developed and approved by the wing safety office and building user.

7.2.4. Clear Space Requirements Around Hangars. Ready access must be available to all sides of a hangar, shelter, or nose dock. This clear zone will be 50 feet and shall not be used to store or park aircraft or position concentrations of combustible materials. In addition, no buildings of any kind will be erected within the clear zone. (See NFPA 409.)

7.2.5. Vehicle Operations. Two potential hazards are associated with vehicle operations. First, a vehicle may be a source of ignition for uncontrolled fuel vapors emitting from aircraft fuel vents or an inadvertent spill. Secondly, a vehicle may represent a traffic hazard. The appropriate group commander will ensure local procedures are established to control these hazards. Vehicles will not be driven within 25 feet of fuel spills. Air Force general or special purpose vehicles do not require spark arresters; however it is important to be aware that vehicle ignition and power systems are not designed to be operated in hazardous atmospheres. (See paragraph **1.2.3.1.** for discussion on spark arresters). Vehicles will not be parked unattended in front of hangar doors. Vehicles or equipment with metal wheels or studded tires may be prohibited from operations in hangars. When mission requirements or weather conditions create a need to park vehicles inside hangars, a plan for an isolated parking area will be developed and approved by the group commander in coordination with installation ground safety, fire protection, and BE officials. This special parking area will be outside of any potential hazard area and ventilated as required by AFOSH Standard 161-2. Traffic patterns will be separated from parked aircraft.

7.2.6. Heaters. Combustion heaters installed in aircraft will not be operated in a hangar. Portable engine and cabin heaters will be removed and stored immediately after each use or when no longer required. Engine and shelter heaters will be placed as far from the aircraft as the ducting will permit. No portable heater will be left operating while unattended. Only heaters that have been approved for operations inside hangars and do not give off unacceptable levels of carbon monoxide (CO) will be used. The BEE will be contacted for testing of CO levels if a potential for contamination is suspected.

7.2.7. Electric Wiring, Power Cords, and Maintenance:

7.2.7.1. Temporary or makeshift wiring is prohibited in hangars. Only service extensions properly installed and maintained shall be used. Overloading of electric circuits shall be avoided. All primary systems and subsystems within hangars will be protected by circuit breakers or switches with lockout capabilities.

7.2.7.2. Electric power cords used with portable lamps shall be of the three-wire grounded variety and adequately insulated. Personnel shall ensure cords are long enough for the task and shall avoid stretching them. All electric cords will be inspected for deficiencies before each use and replaced as necessary.

7.2.7.3. Wall receptacles of different voltages will be configured as required by the NEC.

7.2.7.4. Metal ladders or stands will not be used when servicing electrical equipment and systems.

7.2.7.5. Only qualified electricians shall be permitted to work on hangar electric systems. Personnel shall not wear jewelry or metal objects which can be conductors of electricity (AFOSH Standard 91-66).

7.2.7.6. Systems will be de-energized and locked out prior to beginning maintenance (AFOSH Standard 91-66).

7.2.8. Ground Power Generators. Generators will not be positioned within a 10-foot radius of an aircraft fuel system vent. The design of the generator will locate all electrical equipment, sparking contacts, hot surfaces, and other possible ignition sources at least 18 inches above the floor level. At no time shall generators be refueled inside hangars.

7.2.9. Aircraft Emergency Removal. The aircraft maintenance officer will establish emergency procedures to remove aircraft from hangars in case of fire or other hazard. Personnel trained in the

responsibilities in emergency plans will eliminate confusion and ensure timely evacuation of the aircraft. If snatch block and (or) harness are laid out on hangar floors, they will be attached to the aircraft when in-progress work permits.

Chapter 8

AIRCRAFT SHOP AND FLIGHT LINE MAINTENANCE OPERATIONS

8.1. Hazards and Human Factors. See **Chapter 1**, paragraph **1.1.**.

8.2. General Requirements:

8.2.1. General Shop Principals:

8.2.1.1. Engineering. Eliminate hazards through redesign or substitution of alternative methods, materials, work procedures, facilities, and equipment.

8.2.1.2. Layout. Logically position operations and facilities in relation to lighting, ventilation, and aisle and work space so safe and efficient production is possible.

8.2.1.3. Mechanical Safeguards. Provide mechanical safeguards to prevent injury in the event of equipment failure or unsafe use.

8.2.1.4. Isolation. Locate hazardous operations in isolated areas where they are less likely to be dangerous to personnel or other operations and activities.

8.2.1.5. Identification. Highlight hazardous areas, shops, or operations through use of colored paint designs, lights, flares, barriers, signs, audible signals, and other means to make the hazards conspicuous.

8.2.2. Machine Safeguarding and Shop Layout:

8.2.2.1. Machine safeguarding is most effectively accomplished through safe design. In the interest of safety and economy, machinery shall be procured with built-in safeguards. These guards should be designed to give maximum protection to the operator without interfering with the normal operation of the equipment. When machinery or power-transmission equipment do not have guards as part of their design, suitable enclosures or barricades shall be installed to prevent possible injury (AFOSH Standard 91-12, *Machinery,* and OSHA 3067, *Concepts and Techniques of Machine Safeguarding).*

8.2.2.2. Machines should be firmly secured to floors, bases, or stands.

8.2.2.3. Machinery and equipment should be located so it will not be necessary for the operator to stand in an aisle. Sufficient space should be provided to allow the operator to handle materials, conduct routine job operations, and perform required maintenance, cleaning, and housekeeping tasks without interference with other workers or equipment operations (AFOSH Standard 91-22).

8.2.3. Tool Safety. The unsafe use of hand and power tools presents a potential for injuries or damage to equipment or resources. Damaged electrical cords of power tools or cracked handles or dull operating heads of handtools shall be repaired or replaced when discovered. Strict tool control procedures shall be established and enforced by supervisors. The use of personally-owned hand and power tools shall be prohibited. When not actually being used, tools will be kept in suitable metal or fabric containers that are provided. Appropriate PPE, such as goggles, face shields, hard hats, gloves, respirators, and safety-toe shoes, will be provided to workers and used when required to safely perform assigned job tasks. See TO 32-1-101, *Use and Care of Handtools and Measuring Tools*, and TO

32-1-2, *Use of Handtools (International Business Mechanical)*. (Refer to paragraph **8.3.9.**for battery-powered tool use.)

8.2.4. Materials Handling. Requirements and guidance on materials handling equipment and manual lifting are contained in AFOSH Standard 91-46 and are not repeated in this standard.

8.2.5. Fall Protection. Falls from aircraft working surfaces are potential sources of injuries. Some operations which expose maintenance personnel to falls are aircraft cleaning and painting, control surfaces and engine maintenance and inspections, and aircraft servicing. The maximum use of maintenance stands and work platforms, whenever possible, will reduce the exposure and risk. The use of long-handle mops during aircraft cleaning tasks may also reduce the need to work from aircraft surfaces. Whenever it becomes necessary to perform required tasks where a worker can fall 10 feet or more, fall protection will be used. The two common systems are fall arrest and fall restraint. The preferred system is the restraint in that the lifeline or lanyard will prevent the worker from falling in case of a slip on an aircraft surface. The fall arrest system will incorporate a lanyard which will prevent the worker from falling more than 6 feet. Anchorages for lanyards that tie off one worker will be capable of supporting at least 5000 pounds (22.2 kilonewton [kN]) per worker attached or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person. Lanyards, D-rings, locking snap-hooks, and all components of a fall arrest system will also be capable of sustaining a minimum tensile load of 5000 pounds (22.2 kN). (Reference: 29 CFR 1910.66, Appendix C, *Personal Fall Arrest System*, Section 1). See AFOSH Standard 91-31 for more information on fall protection equipment.

8.2.5.1. When maintenance procedures require workers to walk or perform tasks where they can fall 10 feet or more the following will apply:

8.2.5.1.1. Designated walkways will be used where possible.

8.2.5.1.2. Personnel working on aircraft surfaces will wear non-slip soled shoes.

8.2.5.1.3. Personnel will be provided and will use appropriate fall protection. **NOTE:** When maintenance or inspections will be performed totally within the TO-specified designated safe walkways on the surface of large frame aircraft, fall protection is not required when tasks are performed according to specified TO procedures and conditions. This method will be used only after appropriate risk management measures have been completed. In all other activities where work will be performed outside these walkways, appropriate protection will be provided to prevent falls from 10 feet.

8.2.5.1.4. Horizontal lifelines (Skylines), if used in aircraft wash racks, corrosion control, or other aircraft maintenance areas, will be designed by a qualified person as defined in 29 CFR 1910.66, Appendix C, Section 1. Local procedures will be developed and used to ensure the number of personnel attached to the lifeline at any one time will not exceed the anchorage point design limits.

8.2.5.2. When aircraft surfaces are wet or covered with snow, frost, or ice, extra caution will be used. If the operational needs do not allow delays for conditions to improve, fall protection shall be used. When fall protection use is not feasible, Commands will evaluate the situation, consider eliminating unnecessary requirements, and require use of elevated platforms or work stands.

8.2.5.3. When using mobile work platforms which have manufacturer-installed structural anchor points and the work level is 10 feet or more above the ground or floor, harnesses shall be worn

with lanyard attached to the structural anchor point. When mobile work platforms have not been manufactured with an approved structural anchor point, protective guardrail and toe boards must be installed on all open sides, except the side facing the aircraft when it is within 14 inches of the working surface. **NOTE:** The side of the platform facing the stairway is not considered an open side when the stairway is equipped with the required handrails.

8.2.6. Compressed Air Systems:

8.2.6.1. All shop and aircraft maintenance personnel should be trained in the proper operation and maintenance of air compressors. If the air compressor is used to provide breathing air, it will comply with the requirements in AFOSH Standard 48-1 and TO 42B-1-22, *Quality Control of Compressed and Liquid Breathing Air Inspection*.

8.2.6.2. Compressed air may be used for general cleaning purposes only when controlled through a device that reduces air pressure to less than 30 psi or when approved for cleaning electronic equipment, to 5 psi or less. Effective chip guarding will be provided, and the device will have a finger-actuated press (on), release (off) control. Compressed air will not be used for cleaning benches, floors, work areas, or aircraft interiors or to clean clothing or exposed body surfaces. The aircraft pitot-static system will not be cleaned with compressed air due to possible damage to instrument diaphragms. (See paragraph **1.2.11.**for more information on cleaning with compressed air.)

8.2.6.3. Personnel will wear appropriate PPE, such as gloves, wrap-around face shields, or goggles, when using compressed air for cleaning.

8.2.7. Compressed Gases. See TO 42B-5-1-2, *Gas Cylinders (Storage Type) Use, Handling, and Maintenance*, for additional information.

8.2.7.1. Compressed gas cylinders, full or empty, shall be handled with care at all times. When not in use, the caps will be placed over the valves and the cylinder will be secured.

8.2.7.2. Flammable gases such as acetylene will be stored separately in upright positions. The storage area should be clean and dry to prevent corrosion and away from heat sources and oxygen.

8.2.7.3. All compressed gas cylinders will be stored in their compatibility groups and shall not be co-mingled.

8.2.7.4. Only approved regulators with anti-flashback devices are permissible when using flammable compressed gases.

8.2.8. Housekeeping. Floor surfaces will be cleaned as often as necessary to provide safe walking and working surfaces. Spills will be cleaned up as soon as they occur. Electrical cords and air hoses will be stored when not in use. All combustibles will be disposed of and removed from the shop.

8.2.9. Personal Safety. Loose fitting clothing or other apparel that may become entangled in moving machinery shall not be worn. Finger rings shall not be worn any time where there is a potential for the ring catching on a part of the equipment or vehicle while performing job tasks. Rings, wristwatches, or other metal conductive jewelry shall not be worn when working on electrical equipment. Metal-framed eyeglasses may be worn, if secured with a head or neck band, to prevent them from falling into an energized circuit.

8.2.10. Occupational Health. There are many chemical and physical hazards associated with the numerous aircraft maintenance operations on the flight line, in shops, and in aircraft shelters, hangars,

and maintenance facilities. All of these hazards will be evaluated, the level of risk established, and controls incorporated where necessary. AFOSH Standard 48-17, *Standardized Occupational Health Program,* establishes the guidance and requirements for these evaluations. Physical hazards, such as high noise levels, will be evaluated for design changes to abate the hazard or PPE to provide protection to workers. Work processes involving the use of chemicals may require additional ventilation, the use of PPE, or a change in the process to ensure the health of exposed workers. If any process is changed, altered, or, new chemicals are introduced after the initial evaluation and abatement actions, a reevaluation will be performed. The functional manager or supervisor shall contact the BEE to arrange for the evaluation.

8.2.11. Environmental Health and Safety. Floor drains will not be connected to the installation sewer system. Floors and drains in shops will be constructed to be self-draining with an oil separator installed. Oil separators will be cleaned at a frequency determined by installation civil engineering representatives and (or) the BEE. The shop supervisor will document the cleaning frequency and comply with local procedures. Hazardous materials will be removed from the shop and disposed of according to local procedures. The installation civil engineering environmental engineering personnel will be contacted for detailed guidance.

8.3. Specific Requirements:

8.3.1. Aircraft Electrical System Maintenance. Potential sources of mishaps involving aircraft electrical maintenance tasks are overloading, poor electrical contacts, and wiring shorts. Specialists will exercise caution and think about each step of the task before taking action.

8.3.1.1. Electrical systems shall be de-energized whenever possible. If the approved procedure requires work on an energized circuit, the sequence of steps shall be followed and other maintenance personnel informed of the actions. If the system has been de-energized, procedures will include a provision to effectively tag out the power source while work is in progress. An AF Form 1492, **Warning Tag,** authorized by AFI 21-101, should be used according to local procedures. The AF Form 979, **Danger Tag**, should only be used when the warning tag is not available or when a non-routine dangerous situation exists (AFOSH Standard 91-66).

8.3.1.2. If a circuit breaker (CB) opens (pops) while maintenance is being performed on the aircraft, the opened CB shall not be reset until the cause is determined. An unexpected popped CB may result from an overload or ground fault. As a rule, a popped fuel system CB should not be reset without following specific guidance in aircraft system TOs.

8.3.1.3. To reduce the probability of internal electrical shorts, aircraft wiring, including wire bundles, will be secured to prevent scraping and chafing.

8.3.1.4. During cleaning operations, electrical components and systems shall be de-energized and isolated from other energized circuits or power sources.

8.3.1.5. Testing of electrical systems or equipment while installed on the aircraft shall be held to a minimum. Electrical components should be bench tested in a properly designed shop.

8.3.2. Battery Equipment and Charging Operations. Refer to AFOSH Standards 91-66 and 161-2 and NFPA 410 for additional information.

8.3.2.1. Batteries shall never be charged while in the aircraft, except on those aircraft where adequate on-the-ground ventilation is provided as part of the aircraft design. Most aircraft battery compartments are designed for in-flight ventilation only.

8.3.2.2. Battery charging areas or shops shall be well ventilated to ensure the maximum gas-air mixture that may be generated during charging is maintained below the lower explosives limits (LEL). The ventilation system shall provide for automatic cutoff of charging equipment in case the ventilation blower or fan fails.

8.3.2.3. Battery chargers and their control equipment and batteries being charged shall not be positioned in Class I locations as classified in NEC 511-3 or defined in NEC 513-2b. Some of these are described as pits or depressions below floor level, areas from floor level up to 18 inches above the floor, and within 5 feet of aircraft fuel vents, tanks, or engines. They shall preferably be located in a separate building or in an area (as described in NEC 513-2d) which is adequately ventilated and effectively separated from the hangar, shelter, or nose dock by walls or partitions. Battery chargers shall carry at least one permanently affixed warning sign which reads: "Warning--Keep 5 Feet Clear of Aircraft Engines and Fuel Tank Areas."

8.3.2.4. Batteries shall be charged at a rate (amperage and length of charge) that will not produce a dangerous concentration of gas or excessive heat.

8.3.2.5. Tools or metal parts shall not be laid on charged batteries. Brushes used to clean batteries shall not have a metal frame or wire bristles. When moving batteries, including removal and replacement, precautions shall be taken to prevent the terminal prongs from contacting metal structure objects. A short across these terminals can burn or weld metal, and resultant arcs may cause an explosion if flammable vapors are present.

8.3.2.6. Whenever possible, aircraft batteries will be disconnected or removed during maintenance operations in order to de-energize all electrical circuits. The battery switch on the aircraft shall be in the OFF position before batteries are removed or installed.

8.3.2.7. When removing and replacing batteries, precautions shall be taken to prevent the electrolyte from spilling. Similar precautions shall be taken when replacing or adding electrolyte solutions in batteries.

8.3.2.8. Flexible cords used for charging shall be suitable for the type of service used and approved for extra-hard usage. Connectors shall have a rating not less than the current-carrying capacity of the cord.

8.3.2.9. Only qualified personnel and others when accompanied by qualified personnel will be allowed access to battery rooms.

8.3.2.10. Smoking, open flames, sparks, arcs, and other sources of ignition shall be prohibited in the immediate vicinity of batteries that are being charged.

8.3.2.11. Finger rings and other metallic jewelry that may contact battery terminals shall not be worn during charging and maintenance tasks. Metal-framed eyeglasses should be secured by a band or cord. (Refer to paragraph **1.2.7.**)

8.3.3. Aircraft Painting and Paint Removal Operations. Spray painting of an entire aircraft is permitted only in hangars designed for the purpose. NFPA 410, NFPA 33, *Spray Application Using Flammable and Combustible Materials*, AFOSH Standard 91-17, *Interior Spray Finishing,* and TO

42A-1-1, *Safety, Fire Precaution, and Health Promotion Aspects of Painting, Doping, and Paint Removal*, provide additional information.

8.3.3.1. Safety and Health Hazards:

8.3.3.1.1. Fire. Painting and paint mixing operations, as well as the storing of paints and thinners, will be conducted in areas or facilities that are free from ignition sources. When incidental storage of small amounts of paints and thinners is required inside a facility, only approved metal cabinets with self-closing doors will be used. Good housekeeping shall be practiced to include the proper disposition of masking materials, paper, and soiled rags in self-closing containers. Containers should be emptied daily as prolonged storage can result in spontaneous combustion and fire. Spills shall be cleaned up as soon as they occur. Quantities of combustible materials stored in hangars and shops will be kept to a minimum.

8.3.3.1.2. Toxicity. Whenever possible, painting will be conducted in well-ventilated rooms or booths that are designed and approved by the BEE for that purpose. Employees who must paint outside their areas shall obtain clearance from BE and ground safety officials according to AFOSH Standard 48-1. Painters should wear protective clothing made of cotton or cotton blend not to exceed 65 percent synthetic fiber. Painting tasks, using polyurethane or other coatings resistant to chemical agents, shall be accomplished only after a thorough evaluation of the facility, equipment, and procedures has been accomplished by the BE and ground safety staffs.

8.3.3.1.3. Mechanical. Spray-painting equipment will be kept clean and well maintained. Pressure hoses shall be inspected for excessive wear and replaced as necessary. To prevent tripping hazards, hoses should be properly stored when not in use. Workstands and (or) scaffolds should be of a height and size to permit reasonable ease and comfort in painting operations. **WARNING:** Never point high-pressure paint nozzles at another person.

8.3.3.1.4. Sanding, Blasting, and Paint Stripping Operations. These operations can produce inhalation hazards. These operations should be evaluated by the host installation BE officials to ensure workers are properly protected and proper respiratory equipment is identified and provided.

8.3.3.2. Operational Requirements. The least amount of flammable or toxic paints or solvents will be used. All materials shall be properly identified and material safety data sheets (MSDS) will be available (AFOSH Standard 48-21).

8.3.3.2.1. Cleaning, preparing, and painting major aircraft assemblies and subassemblies, which are not removable, may be done at any hangar that meets the requirements of NFPA 70, 409, and 410 and TO 42A-1-1. These procedures shall be approved by the responsible group commander in coordination with installation ground safety, fire department, and BE personnel (AFOSH Standard 91-17 and NFPA 33).

8.3.3.2.2. Where major cleaning, painting, or paint removal operations are being conducted, no concurrent, hazardous operations shall be conducted within 50 feet of the work area. Also, the work area shall be inspected prior to the start of paint touchup operations to eliminate sources of ignition. Hazard-free work conditions shall be maintained during the entire work period.

8.3.3.2.3. A hangar's general ventilation may be supplemented by opening the hangar doors (not less than 10 feet) to provide additional air movement. This may aid in preventing flammable vapor concentrations from exceeding 20-percent LEL, especially at floor level and in pits and drains. **NOTE:** If, because of severe weather conditions such as extreme cold, the hangar doors are required to be opened less than 10 feet, the main electrical power switch for the door will be locked out (OFF) and remain locked out until the door is opened more than 10 feet or closed (AFOSH Standard 91-66). If these actions do not achieve the desired results, additional ventilation by forced air will be used.

8.3.3.2.4. Fixed electrical equipment shall conform to the NEC, Article 513. Temporary lighting, used for general illumination during these operations, shall be located so it will not be in direct range of any flammable sprays or liquids or in any overspray areas. This equipment will be approved for Class I, Group D, hazardous locations or removed from the area.

8.3.3.2.5. The use of heat lamps to accelerate the drying of painted surfaces shall be prohibited unless used as part of an approved drying booth or enclosure (NFPA 33). When cleaning or paint removal agents are applied through spray nozzles under pressure, the nozzles shall be the self-closing type so the nozzle will automatically close when the operator's hand is removed.

8.3.3.2.6. Aircraft electrical systems shall be de-energized during cleaning, painting, and paint removal operations. **EXCEPTION:** When aircraft power is required for concurrent operations, all electrical equipment exposed to flammable or combustible liquids or vapors shall be de-energized to avoid any chance of ignition from arcs, faults, or hot surfaces.

8.3.3.2.7. Ramp or flight line areas used for these maintenance procedures shall be designated as servicing areas not open to public access. Sufficient clearance shall be maintained to avoid creating a hazard to adjacent aircraft or structures and to ensure access by fire fighting equipment. The aircraft being worked on shall be isolated from the path of all aircraft taxi and tow routes.

8.3.3.2.8. No food will be brought into or eaten in painting, cleaning, or paint removal work areas. Personnel, performing painting tasks, will wash thoroughly before eating.

8.3.3.2.9. Painting, paint removal, and associated clean-up operations have the potential for generating hazardous wastes. These operations should be evaluated by the installation BE and civil engineering environmental officials to ensure wastes are controlled, handled, and disposed of appropriately.

8.3.3.3. Control of Flammable and Combustible Materials:

8.3.3.3.1. The storage of paints and flammable thinners and solvents in quantities of more than one day's usage shall be located in a separate building or segregated from the aircraft maintenance and servicing areas of hangars by a fire partition with openings which shall be protected by an approved fire door. See NFPA 30, *Flammable and Combustible Liquids Code*, for additional guidance.

8.3.3.3.2. Only an operational supply of paints and flammable solvents, limited to one day's needs, shall be maintained in a hangar. These items shall be in approved, marked containers isolated from other operations. Dispensing drums, when essential to the operation, shall be equipped with positive acting pumps and pressure relief fittings and shall be provided with

drip pans and static bonding clamps and cables. No pneumatic devices which pressurize the drum shall be used for dispensing these products. Flammable solvents will not be dispensed from open containers.

8.3.3.3.3. Epoxy or polyester resins shall not be stored close to ketone-based thinners.

8.3.3.3.4. Petroleum distillate suitable for use as a dry cleaning solvent and other solvent cleaners such as mineral spirits, aliphatic naptha, aromatic naptha, trichloroethylene, xylene, methyl ethyl ketone, and other ketone-based thinners shall not be used in areas of aircraft oxygen systems. These materials are not compatible with oxygen. These restrictions also apply to storage areas.

8.3.3.4. Fire Extinguishing Equipment. Portable dry chemical or equivalent fire extinguishing equipment will be placed within 25 feet of the aircraft or cleaning, painting, or paint removal operation. Size and type of equipment will be as required by the local fire department official.

8.3.4. Aerospace Ground Equipment (AGE):

8.3.4.1. AGE Support Vehicle Operations. Guidance and requirements for vehicle operations on the flight line are found in **Chapter 6** and apply to vehicle operations in support of AGE support activities. (See **Chapter 7** for guidance for vehicle operations in hangars.)

8.3.4.2. Towing AGE. Compressors, ground power units, oxygen carts, and similar equipment will not be towed by general purpose vehicles unless properly equipped with hitches designed for the purpose. Pintle hook safety or cotter pins will be used in all towing operations. Safety chains are not required to tow AGE. The maximum towing speed for AGE is 15 miles per hour. For stability, when towing one unit, the center pintle hook will be used; when towing two units the preferred method is to use both outside pintle hooks. As an alternative, a maximum of two units may be towed in tandem. Units will only be towed in tandem on the center pintle hook. Combination loads will not exceed the rated load for the towing vehicle used. (Refer to the appropriate vehicle technical data to determine load ratings.)

8.3.4.3. Ground Power Units:

8.3.4.3.1. During aircraft refueling operations, ground power generator sets will be positioned according to TO 00-25-172. (See AFOSH Standard 91-38 and NFPA 407*, Aircraft Fuel Servicing*, for additional information.)

8.3.4.3.2. Ground power units shall not be positioned closer than 10 feet to any aircraft fuel vent or under wing surfaces. (See **Chapter 7**guidance for use in hangars.)

8.3.4.3.3. The safety precautions for positioning converter and rectifier units are the same as outlined in paragraphs **8.3.4.3.1.** and **8.3.4.3.2.**

8.3.4.3.4. Engine-driven generators will not be refueled inside maintenance shops.

8.3.4.3.5. When positioning power units, care should be taken to avoid stretching the cables, which causes strains on the cables and connectors.

8.3.4.3.6. Output contacts shall be energized (turned on) only after the connector is installed in the aircraft receptacle and de-energized (turned off) before disconnecting the connector from the aircraft.

8.3.4.4. Compressed Gases. General safety guidance and requirements are contained in paragraph **8.2.7.** Nitrogen and freon are the two gases used most frequently by AGE shop personnel. Both nitrogen and freon displace oxygen in air and will be handled carefully in poorly ventilated or confined spaces because of the potential for asphyxiation. Freon is one of a family of gases known as fluorocarbons and requires stringent environmental controls according to local procedures.

8.3.4.5. Test Equipment:

8.3.4.5.1. The multimeter is one of the most common types of test equipment used in AGE shops. Personnel will be trained prior to using this equipment. Extreme caution will be taken to ensure the meter is set on the proper scale prior to connecting it to a power source. The calibration date shall be checked prior to each use and recalibrated if out of date.

8.3.4.5.2. Generator load banks are used for testing generator sets. Extreme caution will be used when testing, because of high amperage associated with the procedure. Load banks will be maintained in strict compliance with the applicable TOs and manufacturer's manuals. Because of high noise levels associated with the generator operating at heavy loads, hearing protection may be required. Coordination will be obtained from the installation BEE as necessary.

8.3.4.6. Jacking Operations:

8.3.4.6.1. Prior to jacking equipment, the parking brake will be set or chocks will be used or both.

8.3.4.6.2. Jack stands of the proper capacity will used any time equipment is jacked. The equipment will only be jacked to the minimum height required for the task, and the jacks will be removed when the task is completed.

8.3.4.6.3. Personnel will remain under the jacked unit for the least amount of time needed to accomplish the task.

8.3.4.6.4. Jacks and jackstands will be marked with the designed load capacity and inspected and maintained according to the manufacturer's instructions.

8.3.4.7. Tire Maintenance. Tires will not be removed from AGE unless the unit is on jack stands or similarly blocked to prevent falling when the tires are removed. Tires will be deflated prior to wheel disassembly. High pressure air will not be used to inflate tires. Tires will be inflated according to guidance in the applicable TO. Multi-piece rim wheels require special attention during mounting, demounting, and inflation. Tires on multi-piece wheels shall be inflated in a cage or with the use of another approved restraining device (AFOSH Standard 91-20, *Vehicle Maintenance Shops*).

8.3.4.8. Oxygen Carts. See TO 00-25-172 and AFOSH Standard 91-67 for more detailed information on gaseous oxygen and LOX handling.

8.3.4.8.1. Oxygen carts shall be kept clean and free of moisture, oil, and grease.

8.3.4.8.2. Oxygen carts shall not be parked in grassy, sodded, or asphalt-covered areas. LOX carts containing LOX shall not be parked in hangars, nose docks, or shelters unless specifically designed or modified for the purpose.

8.3.4.8.3. Distance requirements for parking and storing of carts containing gaseous oxygen and LOX:

8.3.4.8.3.1. Twenty-five feet from any structures having fire-resistant or non-combustible exterior walls or with automatic fire extinguishing systems.

8.3.4.8.3.2. Fifty feet from any combustible structures or sources of ignition, such as heavy vehicle traffic areas, areas where equipment is operating, or designated smoking areas.

8.3.4.8.3.3. Seventy-five feet from aircraft parking, fueling, or defueling areas.

8.3.4.9. LOX Carts. LOX carts shall be transported with the vent valve closed and parked with the vent valve open.

8.3.4.10. Aircraft Maintenance Stands:

8.3.4.10.1. Requirements for towing small aircraft maintenance stands such as the B1, B4, or B5 or larger stands such as the B3 and J7 are found in **Chapter 6** or in AFOSH Standard 91-2, *Vehicle-Mounted Elevating and Rotating Work Platforms, Manually-Propelled and Self-Propelled Mobile Work Platforms and Scaffolds (Towers)*.

8.3.4.10.2. No maintenance will be performed on any stand platform unless the brakes or locks are set and (or) wheel chocks are in place. A minimum of two brakes, locks, or permanently installed jacks will be operable on all maintenance work stands.

8.3.4.10.3. When mobile maintenance stands are raised, maintenance personnel will install the locking pins; release the hydraulic pressure; ease the platform down onto the locks; and close the hydraulic valve before anyone is allowed to ascend the stairs.

8.3.4.10.4. Where location and aircraft configuration permits, railings will be in place before maintenance tasks are started.

8.3.4.10.5. Personnel will not stand on railings to perform work and will not use the rails as a ladder.

8.3.5. Repairs to Communication and Navigation Equipment:

8.3.5.1. Many types of communication and electronic (C-E) equipment present a potential for serious injury from electrical shock. Repairs to C-E equipment shall be conducted on an approved bench in a shop.

8.3.5.2. Radar and high frequency (HF) radio transmitting equipment shall not be operated, tested, or checked with power-on during aircraft fueling, defueling, fuel cell or integral tank repair activities, or any other situation when hazardous vapors may be present.

8.3.5.3. No radar emissions will be allowed in hangars because of hazards to personnel or the inadvertent activation of facility warning and fire protection systems.

8.3.5.4. Additional information may be found in AFOSH Standard 48-9, *Radio Frequency Radiation (RFR) Safety Program.*

8.3.6. Flight Control Systems. Maintenance personnel will be trained and made aware of the dangers associated with the operation of flight control systems. Serious injuries can be caused from unexpected movement of flight controls. All maintenance activities shall be coordinated and a warning tag

applied to the flight controls to prevent movement when workers are exposed to potential injury. Local procedures will be developed to address work shift changes when the tags must remain in place or be reapplied.

8.3.7. Aircraft Hydraulic Systems. Workers will ensure hydraulic line pressures are relieved prior to disassembling any lines or systems components. Any control that could cause damage to equipment or injury to personnel will be tagged out, according to local procedures, while maintenance activities are in progress. Proper protective equipment, such as goggles, shall be worn. Hydraulic spills will be cleaned up immediately to prevent slipping-type falls.

8.3.8. Aircraft Tire Mounting Operations. See **Chapter 5**.

8.3.9. Battery-Powered Screwdrivers and Drills. Cordless drills and screwdrivers are authorized for use outdoors and indoors during all periods of aircraft maintenance on JP-8 aircraft, with the following restrictions: **NOTE:** If there is conflict with applicable aircraft tech data, the aircraft tech data will take precedence.

8.3.9.1. Tools will not be used within the fuel servicing safety zone as described in TO 00-25-172.

8.3.9.2. Tools will not be used within 5 feet of a fuel vent or open fuel tank.

8.3.9.3. Use on JP-4 aircraft is not permitted. When both JP-4 and JP-8 aircraft occupy the same maintenance hangar, the more stringent requirements for JP-4 aircraft will apply.

8.3.9.4. Tools shall not be used to install or remove fasteners from fuel tanks, fuel cell cavities, or engine enclosures.

8.3.9.5. Tools shall not be used when there is a suspected or known fuel leak.

8.3.9.6. Tool battery exchanges and recharging shall not be conducted in a Class I, Division 1, or Division 2 hazardous area.

8.4. Parachute Shops. Many of the fabrics, paints, and cleaning components used in parachute shops are either highly flammable or toxic. Good housekeeping in parachute shops is essential to a safe and efficient operation. Ventilation, temperature, and humidity will be carefully controlled to prevent deterioration of materials and to minimize mishap potentials. Covered metal safety waste containers will be provided for the disposal of waste and rags saturated with flammable substances. These containers will be emptied daily after work has been completed. The TO 14D1-series contains additional information.

8.4.1. Parachutes and Harness Fabrics. These items, when treated with paints containing waterproof compounds, are subject to spontaneous combustion. These fabrics will not be packed, stored, left in shops, or shipped before the paint is dry. Fabrics will be treated with waterproofing paints immediately before use and will be thoroughly dried in open air.

8.4.2. Cleaning Fluids. Cleaning fluids will be only in well-ventilated rooms, equipped with exhaust systems as described in AFOSH Standard 161-2.

8.4.2.1. Personal Protective Equipment (PPE). Refer to AFOSH Standards 48-1 and 91-31.

8.4.2.2. Cleaning Booths. Booths approved by the fire department and BE officials will be provided, when necessary, for spot cleaning parachutes or components.

8.4.3. Carbon Dioxide (CO2) Cylinders. The handling of CO2 cylinders in parachute shops will be done by, or under the direct supervision of, trained technicians.

8.4.4. Wire, Cords, and Receptacles. Damaged or frayed electric wires, cords, and plugs will be immediately replaced or repaired by qualified electricians.

8.4.5. Smoking. Smoking will be prohibited in all parachute facilities.

8.4.6. Kapok Storage. Kapok and other padding materials will be stored in reasonable amounts in covered and vented metal safety containers.

8.4.7. Hoisting Devices and Hold Downs. All hoisting devices used to hang parachutes in drying towers will be periodically inspected by the supervisor. Recessed hold downs will be installed in drying room floors to eliminate any tripping hazard to operators. Hard hats will be worn by personnel working in drying towers.

8.4.8. Explosives. Storing, handling, and using explosives will be according to specific TOs and AFMAN 91-201.

FRANCIS C. GIDEON, JR., Maj Gen, USAF
Chief of Safety

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

Following is a guide to the references used when writing this standard.

Air Force Handbook 32-1084, *Facility Requirements.*

Air Force Instructions (AFI) 11-218, *Aircraft Operation and Movement on the Ground*.

AFI 13-213, *Airfield Management.*

AFI 21-101, *Maintenance Management of Aircraft.*

AFI 21-105, *Aerospace Equipment Structural Maintenance.*

AFI 21-112, *Aircraft Egress and Escape Systems.*

AFI 23-201, *Fuels Management.*

AFI 24-301, *Vehicle Operations.*

AFI 31-204, *Air Force Motor Vehicle Traffic Supervision*.

AFI 32-1024, *Standard Facility Requirements*.

AFI 36-2903, *Dress and Personal Appearance of Air Force Personnel.*

AFI 91-202, *The US Air Force Mishap Prevention Program.*

AFI 91-207, *The US Air Force Traffic Safety Program.*

AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program.*

AFI 91-302, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Standards.*

Air Force Joint Manual (AFJMAN) 24-306, *Manual for the Wheeled Vehicle Driver.*

Air Force Manual (AFM) 85-16, *Maintenance of Petroleum Systems*.

Air Force Manual (AFMAN) 23-110, *USAF Supply Manual*.

AFMAN 91-201, *Explosive Safety Standards*.

Air Force Occupational Safety and Health (AFOSH) Standard 48-1, *Respiratory Protection Program*.

AFOSH Standard 48-8, *Controlling Exposures to Hazardous Materials.*

AFOSH Standard 48-9, Radio Frequency Radiation (RFR) Safety Program (formerly designated as AFOSH Standard 161-9).

AFOSH Standard 48-17, *Standardized Occupational Health Program* (formerly designated as AFOSH Standard 161-17).

AFOSH Standard 48-19, *Hazardous Noise Program*.

AFOSH Standard 48-20, *Hearing Conservation Program* (formerly designated as AFOSH Standard 161-20).

AFOSH Standard 48-21, *Hazard Communication* (formerly designated as AFOSH Standard 161-21).

AFOSH Standard 91-2, *Vehicle-Mounted Elevating and Rotating Work Platforms, Manually-Propelled and Self-Propelled Mobile Work Platforms, and Scaffolds (Towers)* (formerly designated as AFOSH Standard 127-2).

AFOSH Standard 91-5, *Welding, Cutting, and Brazing*.

AFOSH Standard 91-12, *Machinery* (formerly designated as AFOSH Standard 127-12).

AFOSH Standard 91-17, *Interior Spray Finishing* (formerly designated as AFOSH Standard 127-17).

AFOSH Standard 91-20, *Vehicle Maintenance Shops* (formerly designated as AFOSH Standard 127-20).

AFOSH Standard 91-22*, Walking Surfaces, Guarding Floor and Wall Openings and Holes, Fixed Industrial Stairs, and Portable and Fixed Ladders* (formerly designated as AFOSH Standard 127-22).

AFOSH Standard 91-25, *Confined Spaces*.

AFOSH Standard 91-31, *Personal Protective Equipment* (formerly designated as AFOSH Standard 127-31).

AFOSH Standard 91-38, *Hydrocarbon Fuels General* (formerly designated as AFOSH Standard 127-38).

AFOSH Standard 91-43, *Flammable and Combustible Liquids* (formerly designated as AFOSH Standard 127-43).

AFOSH Standard 91-45, *Hazardous Energy Control and Mishap Prevention Signs and Tags* (formerly designated as AFOSH Standard 127-45).

AFOSH Standard 91-46, *Materials Handling and Storage Equipment* (formerly designated as AFOSH Standard 127-46).

AFOSH Standard 91-56, *Fire Protection and Prevention* (formerly designated as AFOSH Standard 127-56).

AFOSH Standard 91-66, *General Industrial Operations*.

AFOSH Standard 91-67, *Liquid Nitrogen and Oxygen Safety* (formerly designated as AFOSH Standard 127-67).

AFOSH Standard 91-110, *Nondestructive Inspection and Oil Analysis Program* (formerly designated as AFOSH Standard 127-110).

AFOSH Standard 161-2, *Industrial Ventilation*.

American National Standards Institute (ANSI) Standard B30-Series, *Lifting Devices*.

ANSI Standard Z89.1, *Standard for Personnel Protection--Protective Headwear for Industrial Workers --Requirements.*

Department of Defense (DoD) 4145.19-R-1, *Storage and Materials Handling*.

Engineering Technical Letters (ETL). Contact installation civil engineering for subject index.

Military Handbook 1008, *Fire Protection for Facilities Engineering, Design, and Construction.*

National Fire Protection Association (NFPA) Standard 10, *Fire Extinguishers, Portable.*

NFPA Standard 30, *Flammable and Combustible Liquids Code*.

NFPA Standard 33, *Spray Applications Using Flammable and Combustible Materials*.

NFPA Standard 70, *National Electrical Code (NEC)*.

NFPA Standard 101, *Life Safety Code.*

NFPA Standard 231C, *Rack Storage of Materials*.

NFPA Standard 251, *Building Construction and Materials*.

NFPA Standard 407, *Aircraft Fuel Servicing*.

NFPA Standard 409, *Aircraft Hangars.*

NFPA Standard 410, *Aircraft Maintenance*.

Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations (CFR) 1910.21, *Definitions--Walking-Working Surfaces*.

OSHA 29 CFR 1910.22, *General Requirements--Walking-Working Surfaces.*

OSHA 29 CFR 1910.23*, Guarding Floor and Wall Openings and Holes*.

OSHA 29 CFR 1910.24, *Fixed Industrial Stairs*.

OSHA 29 CFR 1910.37, *Means of Egress, General.*

OSHA 29 CFR 1910.66, Appendix C, *Personal Fall Arrest System*, Section 1.

OSHA 29 CFR 1910.95, *Occupational Noise Exposure*.

OSHA 29 CFR 1910.106, *Flammable and Combustible Liquids*.

OSHA 29 CFR 1910.135, *Head Protection.*

OSHA 29 CFR 1910.178, *Powered Industrial Trucks*.

OSHA 29 CFR 1910.179, *Overhead and Gantry Cranes*.

OSHA 29 CFR 1910.180, *Crawler, Locomotive, and Truck Cranes*.

OSHA 29 CFR 1910.181, *Derricks.*

OSHA 29 CFR 1910.184, *Slings.*

OSHA 29 CFR 1910.212, *General Requirements for All Machines*.

OSHA 29 CFR 1910.213, *Woodworking Machinery Requirements*.

OSHA 29 CFR 1910.219, *Mechanical Power - Transmission Apparatus*.

OSHA 29 CFR 1910.301, *Introduction--Electrical*.

OSHA 29 CFR 1910.302, *Electric Utilization Systems.*

OSHA 29 CFR 1910.303, *General Requirements--Electrical*.

OSHA 29 CFR 1910.304, *Wiring Design and Protection*.

OSHA 29 CFR 1910.305, *Wiring Methods, Components, and Equipment for General Use*.

OSHA 29 CFR 1910.306, *Specific Purpose Equipment and Installations.*

OSHA 29 CFR 1910.307, *Hazardous (Classified) Locations*.

OSHA 29 CFR 1910.308, *Special Systems*.

OSHA 29 CFR 1910.399, *Definitions--Electrical*.

OSHA 29 CFR 1910.1025, *Lead.*

OSHA 29 CFR Subpart D, *Walking-Working Surfaces*.

OSHA 3067, *Concepts and Techniques of Machine Safeguarding*.

Technical Orders (TO) 00-110A-Series*, Inspection Maintenance Actions, Storage, and Disposition of Aircraft*.

TO 00-20B-5*, USAF Motor Vehicle and Equipment*.

TO 00-25-172, *Ground Servicing of Aircraft and Static Grounding/Bonding.*

TO 00-25-223, *Integrated Pressure Systems and Components (Portable and Installed).*

TO 00-1-05E-9, *Aircraft Emergency Rescue Information (Fire Protection*).

TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells.*

TO-1A-15, *General Maintenance Instructions for Support Equipment.*

TO 1-1-691, *Aircraft Weapons Systems Cleaning and Corrosion Control*.

TO 11A-1-33*, Handling and Maintenance of Explosive Loaded Aircraft*.

TO 32-1-2, *Use of Hand Tools (International Business Mechanical*).

TO 32-1-101, *Use and Care of Hand Tools and Measuring Tools.*

TO 33B1-1, *Nondestructive Inspection Methods*.

TO 34Y1-1-171, *Installation, Operation, Maintenance, and Inspection of Air Compressors.*

TO 35-1-3, *Corrosion Prevention, Painting, and Marking USAF Equipment*.

TO 36-1-3, *Painting, Marking, and Lighting Requirements for USAF Vehicles*.

TO 36-1-58, *General Requirements for Repair, Maintenance and Testing of Lifting Devices.*

TO 38-1-23, *Inspection and Installation of Spark Arresters and Exhaust Purifiers on Non-Aircraft*.

TO 4T-1-3, *Tires and Tubes*.

TO 42A-1-1, *Safety, Fire Precaution, and Health Promotion Aspects of Painting, Doping, and Paint Removal.*

TO 42B-1-22, *Quality Control of Compressed and Liquid Breathing Air Inspection.*

TO 42B-5-1-2, *Gas Cylinder (Storage Type) Use, Handling, and Maintenance.*

Abbreviations and Acronyms

AC—Alternating Current

ACO—Air Force Contracting Officer

AFI—Air Force Instruction (new designation)

AFM—Air Force Manual (obsolete designation)

AFMAN—Air Force Manual (new designation)

AFMV—Air Force Motor Vehicle

AFOSH—Air Force Occupational Safety and Health

AFSC—Air Force Safety Center

AFR—Air Force Regulation (obsolete designation)

AGE—Aerospace Ground Equipment

ANSI—American National Standards Institute

BE—Bioenvironmental Engineering

BEE—Bioenvironmental Engineer

BWS—Base Weather Station

C—Celsius

CAD—Cartridge-Actuated Devices

CB—Circuit Breaker

C-E—Communication and Electronic

CFR—Code of Federal Regulations

CO—Carbon Monoxide

CO2—Carbon Dioxide

CPR—Cardiopulmonary Resuscitation

DAR—Defense Acquisition Regulation

DAVIS—Defense Automated Visual Information System

DC—Direct Current

DOT—Department of Transportation

DoD—Department of Defense

DRU—Direct Reporting Unit

EOD—Explosive Ordnance Disposal

ETL—Engineering Technical Letter

F—Fahrenheit

FAR—Federal Acquisition Regulation

FLSC—Flexible Linear Shape Charges

FOA—Field Operating Agency

FOD—Foreign Object Damage

HAP—High Accident Potential

HAS—Hardened Aircraft Shelters

HF—High Frequency

HQ—Headquarters

JSA—Job Safety Analysis

kN—Kilonewton

LEL—Lower Explosives Limit

LIN—Liquid Nitrogen

LOX—Liquid Oxygen

MAJCOM—Major Command

MSDS—Material Safety Data Sheets

MOC—Maintenance Operations Center

MTP—Maximum Tire Pressure

NDI—Non-Destructive Inspection

NEC—National Electric Code

NFPA—National Fire Protection Association

nm—Nautical Mile

NSN—National Stock Number

OJT—On-the-Job Training

OSHA—Occupational Safety and Health Administration

PAD—Propellant-Actuated Devices

PDO—Publishing Distribution Office

PIN—Product Identification Number

PMEL—Precision Measurement Equipment Laboratory

PMV—Private Motor Vehicle

POL—Petroleum, Oil, and Lubricants

PPE—Personal Protective Equipment

psi—Pounds Per Square Inch

RFR—Radio Frequency Radiation

SE—Support Equipment

SMDC—Shielded Mild Detonating Cord

SOP—Standard Operating Procedure

SSEA—System Safety Engineering Analysis

TDY—Temporary Duty

TO—Technical Order

US—United States

USAF—United States Air Force

VCO—Vehicle Control Officer

VCNCO—Vehicle Control Non-Commissioned Officer

WWW—World-Wide Web

Terms

Aerospace Ground Equipment (AGE)—All equipment required on the ground to make a weapon system, command and control system, subsystem, or end item of equipment operational in its intended environment. Included is equipment needed to install, launch, guide, control, direct, inspect, test, adjust, calibrate, gauge, measure, assemble, disassemble, handle, transport, safeguard, store, activate, service, repair, overhaul, maintain, or operate the system, subsystem, end item, or component.

Approved—Listed and approved by the Air Force, OSHA, the National Fire Protection Association (NFPA), Department of Transportation (DOT), or other nationally recognized agencies which list, approve, test, or develop specifications for equipment to meet safety, fire prevention, or health protection requirements. Also, certified by the office of primary responsibility as being the correct product or method.

Bonding—The permanent joining of metallic parts to form an electrically conductive path which will ensure electrical continuity and equal potential and provide the capacity to safely conduct any current likely to be imposed.

Cardiopulmonary Resuscitation (CPR)—Emergency first aid treatment involving mouth-to-mouth resuscitation and closed chest heart massage.

Class I, Division 1—

-- Locations in which ignitable concentrations of flammable gases or vapors can exist during normal operations.

-- Locations in which ignitable concentrations of flammable gases or vapors may exist frequently because of repair or maintenance tasks or because of leakage.

-- Locations in which malfunction of equipment or processes might release ignitable concentrations of flammable gases or vapors and might also cause simultaneous failure of electrical equipment.

-- These locations could include hazardous operations such as painting, paint stripping, and aircraft fuel cell and integral tank inspections and repairs.

Class I, Division 2—

-- Locations in which volatile flammable liquids or gases are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which

they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operations of equipment.

-- Locations in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operation of ventilating equipment.

-- A location that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be present unless prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failures are provided.

-- Facilities for storage and general maintenance of fueled aircraft could be considered examples of Class I, Division 2 locations.

Combustible Liquid—A liquid having a flashpoint at or above 100 degrees F (37.8 degrees C).

Compressed Gases—Gases stored under pressure such as compressed air, oxygen, and nitrogen. As used in this standard, they are used to service aircraft systems or support equipment.

Confined Space—An area which by design has limited openings for entry and exit and has unfavorable natural ventilation that could contain or produce an actual or potentially hazardous atmosphere or other recognized safety or health hazard or contains the potential for engulfment by particulate matter or by a liquid. The primary function of the area is not intended for continuous human occupancy, except to perform repair, inspection, or maintenance tasks.

Energized—A circuit electrically connected to a source of potential difference or an electrical charge.

Flammable Liquid—A liquid with a flashpoint below 100 degrees F (37.8 degrees C).

Flashpoint—The minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flight Line—Any area or facility including aprons, hardstands, and ramps on or in which aircraft may be parked, stored, serviced, or maintained.

Grounded—Connected to earth or to some conducting body that serves in place of earth.

Grounding—The process of connecting one or more metallic objects and ground conductors to ground electrodes.

Grounding Stick—A nonconductive handle, usually wood, with conductive (metal) hook and grounding braid attached at a common point. The grounding stick is used to ensure that any voltage potential is neutralized prior to working on energized circuits.

Handtool—Any portable nonpowered tool used for the assembly, disassembly, inspection, servicing, repair, and maintenance of vehicles and equipment.

High Voltage—Any circuit, set of conductors, or exposed point of contact in which the potential to ground or between conductors is 600 volts alternating current (AC) or direct current (DC) or greater.

Integral Brake—A positive system incorporated in or on a piece of equipment to prevent equipment from rolling or being blown into aircraft or other equipment. This braking system may be the handbrake type (AM32A-60 General Set MA3 Air Conditioner, MC1A Air Compressor, etc.) or tow bar to tire and (or) wheel type as incorporated on the MD-3 generator set.

Ionizing Radiation—Electromagnetic or particulate radiation, which may form charged particles within

the cells or tissues of the body. Alpha and beta particles, gamma rays, and X-rays are examples of ionizing radiation.

Machinery and Shop Equipment—Equipment in Federal Supply Group 3400 as outlined in the US Air Force stock list. At times, other similar machinery or shop equipment may also be used.

Maintenance Stand—Moveable work platforms used for working on aircraft. They can be adjusted to various elevations.

May—Indicates an acceptable or satisfactory method of accomplishment.

Oxygen—A colorless, odorless gas. Used in this standard as liquid and gaseous oxygen for aircrew and passenger breathing systems.

Radioactive Electron Tubes—Electron tubes containing radioactive material.

Safety Observer—A person trained in first aid, CPR, and equipment turn-off procedures and who is responsible for administering immediate assistance to a worker and summoning emergency assistance.

Shall—Indicates a mandatory requirement.

Should—Indicates a preferred method of accomplishment.

Test Equipment—Special equipment used to evaluate aircraft systems, subsystems, and components by performing measurement or diagnostic tests.

Will—Is also used to indicate a mandatory requirement and to express a declaration of intent, probability, or determination.

Attachment 2

FORKLIFT OPERATIONS CHECKLIST

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A2.1. Stay within rated capacity.

A2.2. Lift with the mast vertical or tilted slightly back, never forward.

A2.3. Never travel with the load lifted too high.

A2.4. Do not raise or lower the load while traveling.

A2.5. Watch rear-end swing.

A2.6. Proceed slowly and cautiously around corners.

A2.7. Watch blind corners--signal with horn.

A2.8. Use lower gear when going down ramps.

A2.9. Avoid sudden stops.

A2.10. Do not descend ramps with the load in front.

A2.11. Watch overhead clearances.

A2.12. For better vision, drive backwards with bulky loads.

A2.13. Watch floor strength.

A2.14. Use care in high piling--watch for falling stock.

A2.15. Be careful when handling long lengths of bar stock, lumber, etc.; watch swing; and, if necessary, use a walking guide.

A2.16. Keep load against carriage.

A2.17. Keep load balanced laterally.

A2.18. Spread forks according to load width.

A2.19. Lower heavy loads slowly; stop them slowly.

A2.20. Keep clear of loading dock edges.

A2.21. Check bridge plates between loading dock, trucks, and cars for sufficient width, strength, and security.

A2.22. When loading or unloading highway trucks or trailers ensure vehicle brakes are set and (or) wheels chocked.

A2.23. Support vehicle body with jacks or braces if springs are weak.

A2.24. Never tilt an elevated load forward except to place it on a stockpile.

A2.25. Securely chain all objects of irregular shape (including aircraft engines) to the forklift frame before they are raised, lowered, or moved. Place large, irregularly shaped objects on pallets for stability before they are raised and (or) transported.

A2.26. Do not exceed 5 miles per hour around aircraft.

A2.27. Permit only the operator on the forklift.

A2.28. Check foot brakes and hand brakes for effective operation.

A2.29. Do not load or unload cargo while the aircraft is being serviced with oxygen. (**EXCEPTION:** Reference TO 00-25-172.)

A2.30. Have an adequate fire extinguisher available.

A2.31. Have tail stand installed on tricycle landing gear type aircraft (if equipped).

A2.32. Have adequate lighting.

A2.33. Remove ice or snow from area before loading, unloading, or make the area safe through the use of appropriate materials.

A2.34. If equipment technical data does not address the use of forklift tine extensions, obtain the manufacturer's approval before using them. In all cases, do not exceed the maximum rated capacity of the forklift when lifting loads.

Attachment 3

HI-LIFT TRUCK CHECKLIST

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A3.1. Have an adequate fire extinguisher on hand.

A3.2. Check hand and foot brakes for effective operation.

A3.3. Do not back up or raise or lower the cargo bed without a guide or observer.

A3.4. Do not load or unload cargo while the aircraft is being serviced with oxygen or fuel. (**EXCEPTION:** See TO 00-25-172.)

A3.5. Do not allow hi-lifts to touch the aircraft. Ensure all cargo beds have rubber bumpers on edges facing the aircraft.

A3.6. Remove ice or snow from the area before loading or unloading cargo or make surfaces safe through the use of appropriate materials.

A3.7. Have adequate lighting in the operating area.

A3.8. Have tail stand or loading support installed on tricycle-type aircraft.

A3.9. Never leave a vehicle unattended when engine is running.

A3.10. When not in use, lower the bed, turn off the engine, set the hand brake, and leave in gear.

A3.11. Do not transfer loads across the tailgate when it is supported solely by the chains. Support the tailgate by the mating surface across the entire width; otherwise use an appropriate bridge plate.

A3.12. Refer to appropriate published guidance or standard operating procedures (SOP) for complete hi-lift operating instructions.

Attachment 4

ROLLER PRY BAR CHECKLIST

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A4.1. Do not straddle the bar to depress.

A4.2. Watch placement of hands so they will not be scraped against aircraft sides and ceiling or on other objects.

A4.3. When there is room for only one bar, use two workers to control it.

A4.4. Be careful of tie-down holes in the floor; they can cause the bar to swing out of control.

A4.5. Check floors for proper stress, weights, and distribution of cargo.

A4.6. Check pry bars for cracked handles, broken wheels, worn parts, and metal slivers.

A4.7. See that axles are greased and oiled as needed.

A4.8. Use two bars when needed on heavy loads.

A4.9. Guide cargo carefully to prevent damage to internal areas of aircraft.

A4.10. Do not exceed the rated capacity of the pry bar.

A4.11. To determine whether shoring is needed when pry bars or pallet trucks are used to move high density cargo, divide the weight of the load by the area (in square feet) of contact of the wheels or rollers. If the result is 200 pounds per square foot or more, the main cabin floor stress maximum is probably being exceeded; therefore, use shoring to prevent damage to the aircraft. Consult TOs for specific data limitations.

Attachment 5

K-LOADER CHECKLIST

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A5.1. Have an adequate fire extinguisher on hand.

A5.2. Check brakes for effective operation.

A5.3. Do not back up or approach aircraft without a guide or observer.

A5.4. Do not load or unload cargo while the aircraft is being serviced with oxygen or fuel. (**EXCEPTION:** See TO 00-25-172.)

A5.5. Do not allow vehicles to touch aircraft. Ensure all cargo beds have rubber bumpers on edges facing the aircraft.

A5.6. Remove ice or snow from area before loading or unloading cargo or make surfaces safe through the use of appropriate materials.

A5.7. Have adequate lighting.

A5.8. Have ramp support in place.

A5.9. Place wheel blocks where they prevent the vehicle from touching the aircraft.

A5.10. When not in use, lower the bed, turn off the engine, set the hand brake, and leave in gear.

A5.11. See TOs for complete operating instructions.

A5.12. Perform safety inspections on K-loaders at intervals or mileage specified in TO 00-20B-5, *USAF Motor Vehicle and Equipment*.

A5.13. Do not tilt K-loader bed to facilitate cargo movements.

A5.14. Ensure all rollers are locked prior to movement.

Attachment 6

CHECKLIST FOR CHAPTER 1--INTRODUCTION

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A6.1. Are potential physical, fire, and health hazards effectively controlled by training of personnel, use of appropriate work procedures, and supervisory controls? (Reference paragraph **1.2.1.1.**)

A6.2. Except in areas designated by the installation fire chief is smoking prohibited in aircraft maintenance facilities, flight line areas, and weapons maintenance and storage areas? (Reference paragraph **1.2.3.3.2.**)

A6.3. Do workers put wiping clothes, oily waste, and other flammable materials into self-closing metal containers? (Reference paragraph **1.2.3.3.4.**)

A6.4. Is an AF Form 592 issued according to AFOSH Standard 91-5, prior to welding on aircraft? (Reference paragraph **1.2.3.3.5.**)

A6.5. Are there suitable fire extinguishers within easy reach of the operator and close to the ground power equipment which is used to maintain or service aircraft? (Reference paragraph **1.2.3.3.6.**)

A6.6. Are personnel prohibited from wearing hats and caps in an engine intake danger zone while engines are operating? (Reference paragraph **1.2.6.**)

A6.7. Is the wearing of finger rings or other jewelry prohibited and their non-use enforced in situations described in paragraph **1.2.7.**?

A6.8. Are vehicle and equipment markings accomplished according to TOs 35-1-3 and 36-1-3, as applicable? (Reference paragraph **1.2.8.2.**)

A6.9. When authorized are all bicycles (Air Force and privately owned) which are operated on the flight line during hours of darkness equipped with a headlight and reflective markings front and rear? (Reference paragraph **1.2.8.3.**)

A6.10. Where compressed air is used for cleaning, are personnel provided proper eye protection? (Reference paragraph **1.2.11.1.**)

A6.11. When trainee personnel operate or service oxygen and nitrogen equipment or service aircraft are they directly supervised by qualified supervisor or operator? (Reference paragraph **1.2.12.2.**

A6.12. Is there evidence that PPE is adequate and the enforcement of its use is carried out by supervision? (Reference paragraphs **1.2.6.**,**1.2.11.**., and **1.2.12.4.**)

A6.13. Are ramp and hangar guidelines used for the safe movement of aircraft and vehicle traffic? (Reference paragraph **1.2.14.5.**)

A6.14. Have local procedures been established to ensure key agencies are notified of adverse weather conditions? (Reference paragraph **1.2.15.**)

A6.15. Do all aircraft fuel servicing and maintenance activities cease when a lightning warning is in effect? Reference paragraph **1.2.15.1.5.**)

A6.16. Are personnel who start and run up aircraft engines trained and certified according to AFI 11-218? (Reference paragraph **1.2.16.4.**)

A6.17. In noise hazard areas (as determined by the installation BEE) are crew and maintenance personnel required to wear ear defenders or other approved noise suppression devices? (Reference paragraph **1.2.16.8.**)

A6.18. Are maintenance and aircrew personnel restricted from wearing loose clothing and hats or carrying objects that might be drawn into the ducts when working on or near running jet engines? (Reference paragraph **1.2.17.2.**)

A6.19. Are emergency rescue personnel trained on ejection seat removal and certified by a qualified egress technician? (Reference paragraph **1.2.17.4.1.**)

A6.20. Has transient alert developed local checklists of pertinent questions to ask pilots about explosive egress systems pertaining to aircraft not normally processed through installation? (Reference paragraph **1.2.17.4.4.**)

A6.21. When maintenance personnel are required to enter tail pipes of shut down jets, is there a person posted to prevent anyone from entering the cockpit and to communicate with the person inside the tail pipe? (Reference paragraph **1.2.17.7.**)

A6.22. Do mechanics who have to enter jet tail pipes wear appropriate protective clothing? (Reference paragraph **1.2.17.8.**)

A6.23. Do ground safety, fire department, and BE officials review contract proposals to ensure appropriate safety, fire prevention, and health requirements are included? (Reference paragraph **1.2.18.**)

Attachment 7

CHECKLIST FOR CHAPTER 2--TOWING AND TAXIING AIRCRAFT

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A7.1. Are tow team personnel prohibited from placing themselves in the direct path of aircraft wheels or riding on any external part of an aircraft or tow vehicle? (Reference paragraph **2.2.**)

A7.2. Are newly assigned aircraft maintenance specialists required to pass a proficiency test on the types of aircraft towed after they complete OJT? Are towing supervisors, nose walkers, cockpit brake person, and tow vehicle operator fully qualified, trained, and administered annual proficiency tests? (Reference paragraph **2.2.1.**)

A7.3. Is the supervisor the only team member authorized to give the "all clear to move" order? (Reference paragraph **2.2.2.**)

A7.4. Can the supervisor always see both wing walkers, the vehicle driver, and the person in the pilot's seat and maintain direct contact with the person in the cockpit? (Reference paragraph **2.2.3.4.**)

A7.5. Are personnel prohibited from walking between the aircraft nose wheel and a tow vehicle? Do they also know not to ride on the outside of a moving aircraft, on the tow bar, or on the outside of the vehicle unless an authorized seat is provided? (Reference paragraph **2.2.5.**)

A7.6. Do tow team members use luminous wands when aircraft is towed at night? (Reference paragraph **2.2.6.**)

A7.7. Are inspections of towing equipment performed as stated in paragraph **2.2.17.**?

A7.8. Does the supervisor ensure the proper taxiing distances, wing walkers, signal persons, etc., are used? (Reference paragraphs **2.2.**and **2.3.**)

A7.9. Prior to taxi, is radio contact established and maintained with the control tower? (Reference paragraph **2.3.4.**)

A7.10. Is only minimum power used when moving an aircraft from a row of parked aircraft? (Reference paragraph **2.3.8.**)

Attachment 8

CHECKLIST FOR CHAPTER 3--AIRCRAFT JACKING OPERATIONS

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A8.1. Are aircraft jacks operated, maintained, inspected, and tested per applicable TOs? (Reference paragraph **3.2.1.**)

A8.2. Before aircraft are raised on jacks are all workstands and other equipment not designed to be under the aircraft during jacking removed? (Reference paragraph **3.2.2.**)

A8.3. When the possibility of equipment failure exists or when an unbalanced condition may occur, are safety stands of suitable design and capacity installed under wings and tail of aircraft after it has been raised and leveled? (Reference paragraph **3.2.3.**)

A8.4. In depot maintenance facilities, are all entrances to the work area posted alerting personnel to the fact that the aircraft is on jacks? (Reference paragraph **3.2.4.**)

A8.5. Do supervisors ensure engines or other major components, such as wing panels, stabilizers, etc., are not changed when the aircraft is resting on jacks, unless applicable TOs authorize the practice? (Reference paragraph **3.2.5.**)

A8.6. When specifications for wind velocity for a particular aircraft are not available, do maintenance personnel use 15 miles per hour as the safe maximum for outside jacking operations? (Reference paragraph **3.3.1.**)

A8.7. When making retraction tests, is visual assurance from a person outside the aircraft given that the wheel well and swing areas are clear before proceeding? (Reference paragraph **3.3.4.**)

A8.8. Do maintenance personnel ensure suitable portable fire suppression equipment is readily available? (Reference paragraph **3.3.5.**)

Attachment 9

CHECKLIST FOR CHAPTER 4--AIRCRAFT CLEANING AND DECONTAMINATION

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A9.1. When cleaning aircraft, are long-handle brushes and separate elevated work platforms used as much as possible? (Reference paragraph **4.2.**)

A9.2. If it is absolutely necessary to work on aircraft wings during washing are designed systems or anchor points to which safety harnesses can be attached, available and used? (Reference paragraph **4.2.**)

A9.3. Are there procedures in effect to ensure only authorized cleaning agents are used? (Reference paragraph **4.2.**)

A9.4. Where flammable solvents are authorized to be used in aircraft cleaning operations is there a coordinated, approved, and well-planned operation involving the appropriate group commander and installation ground safety, fire department, and BE representatives? (Reference paragraph **4.2.1.**)

A9.5. Are wiping cloths, oily waste, and other flammable materials properly disposed of in self-closing metal containers that are emptied at the end of each shift? (Reference paragraph **4.3.2.**)

A9.6. Are flammable storage areas kept cool (55 to 80 degrees F) and free from spark- or heat-producing equipment? (Reference paragraph **4.3.3.**)

A9.7. Are workers adequately trained in the use of fire extinguishers? (Reference paragraph **4.4.**)

A9.8. Does management coordinate with fire department personnel to ensure extinguishers with the proper capacity are obtained? (Reference paragraph **4.4.2.**)

A9.9. Are personal dosimeters and appropriate safety and health briefing provided to maintenance personnel who work on contaminated aircraft? (Reference paragraph **4.5.3.1.**)

A9.10. Are personnel working in contaminated areas prohibited from drinking, smoking, eating, or chewing gum? (Reference paragraph **4.5.3.3.**)

Attachment 10

CHECKLIST FOR CHAPTER 5--AIRCRAFT TIRE MOUNTING AND SERVICING OPERATIONS

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A10.1. Are tire cages that are configured with guards and properly regulated air supply lines used to mount and remove tires? (Reference paragraph **5.2.1.**)

A10.2. Is the aircraft tire inflation equipment adjusted and (or) calibrated at intervals specified in the TO by PMEL personnel? (Reference paragraph **5.2.2.2.**)

A10.3. Are procedures in effect to ensure only oil-free nitrogen is used for inflating aircraft tires? (Reference paragraph **5.2.3.1.**)

A10.4. Are aircraft wheel tire removal operations performed according to requirements established in TO 4T-1-3? (Reference paragraph **5.3.**)

A10.5. Do supervisors ensure only trained personnel are allowed to service aircraft tires? (Reference paragraph **5.4.**)

A10.6. Does the supervisor evaluate each employee's ability to perform aircraft tire servicing tasks and provide additional training as necessary to ensure each employee maintains proficiency? (Reference paragraph **5.4.4.**)

A10.7. Are tire servicing restraining devices visually inspected prior to each day's use? (Reference paragraph **5.5.3.**)

A10.8. Are current charts, TOs, or manuals, which contain instructions for the types of wheels being serviced, available in the service area? (Reference paragraph **5.5.8.**)

Attachment 11

CHECKLIST FOR CHAPTER 6--FLIGHT LINE VEHICLE OPERATIONS

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A11.1. Do supervisors evaluate their personnel to ensure they are in full compliance with established guidelines? (Reference paragraph **6.2.**)

A11.2. Does the chief of acquisition management (Contracting) ensure contractors on the airfield understand and comply with the governing directives? (Reference paragraph **6.3.2.1.**)

A11.3. Are lesson plans and tests for local flight line vehicle operations coordinated with the installation ground safety manager? (Reference paragraph **6.3.3.2.**)

A11.4. Has the chief of airfield management established a program for issuing a certificate of competency endorsed for flight line driving? (Reference paragraph **6.3.4.1.**)

A11.5. Does the chief of airfield management ensure flight line proficiency training is provided to non-Air Force and contractor operators before allowing them to drive on the flight line? (Reference paragraph **6.3.4.2.**)

A11.6. Do squadrons and support organization commanders ensure personnel using the flight line comply with paragraph **6.3.5.**?

A11.7. Are speed limits established and enforced? (Reference paragraphs **6.4.1.** and**6.4.2.**)

A11.8. Are the procedures for authorizing operation of PMVs on the flight line strictly followed? (Reference paragraph **6.4.3.1.**)

A11.9. Is the requirement to wear seatbelts in both private and military vehicles on the flight line monitored and enforced? (Reference paragraph **6.4.6.3.**)

A11.10. Are local procedures in effect to ensure vehicle operations during restricted visibility or night operations comply with paragraph **6.4.7.**?

A11.11. After driving off the ramp surfaces, do operators stop and remove any foreign materials from tires before returning to the ramp areas? (Reference paragraph **6.4.11.**)

A11.12. Are forklift drivers licensed, and do they observe speed limits of 10 miles per hour on ramps and not more than 5 miles per hour when within 10 feet of any aircraft? (Reference paragraph **6.4.12.**)

A11.13. Are tag lines, which are used when lifting crates, long enough to permit the person holding the tag line (rope) to be clear of the load? (Reference paragraph **6.4.12.3.**)

A11.14. Do forklift operators stack empty pallets no higher than eye level? (Reference paragraph **6.4.12.4.**)

A11.15. Does the activity have a special training program for hi-lift truck operators? (Reference paragraph **6.4.13.3.**)

A11.16. When the hi-lift operator's vision is obstructed or restricted, are guides employed to assist when backing is necessary? (Reference paragraph **6.4.13.1.**)

A11.17. Are guides used to assist the K-loader operator at all times when approaching the aircraft to load or off-load cargo? (Reference paragraph **6.4.18.1.**)

A11.18. Are tractor-type vehicles, which move slower than normal traffic flow, properly placarded "Slow Moving Vehicle"? (Reference paragraph **6.4.19.**)

A11.19. Are passengers prevented from riding on tow tractors without seats that are provided for that purpose? (Reference paragraph **6.4.19.1.**)

A11.20. Are no more than four trailers (except A/M-32h-6 cargo types) permitted to be towed by any one tow tractor? (Reference paragraph **6.4.19.2.**)

A11.21. Are pintle assemblies and towing connections secured with a pintle hook safety or cotter pin? (Reference paragraph **6.4.19.3.**)

A11.22. Are small flatbed warehousing trailers and airlift palletized cargo limited to speeds of 5 miles per hour? (Reference paragraph **6.4.19.4.**)

Attachment 12

CHECKLIST FOR CHAPTER 7--AIRCRAFT HANGAR OPERATIONS

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A12.1. Do local operating procedures establish requirements to ensure portable electrical equipment brought into hangars is approved for the designated hazardous (classified) location for the facility? (Reference paragraphs **7.2.2.1.1.** and **7.2.2.1.2.**)

A12.2. Are powered hangar doors equipped with warning alarms? (Reference paragraph **7.2.3.1.**)

A12.3. Do door operating instructions outline safety precautions and are they posted next to the operating controls? (Reference paragraph **7.2.3.3.**)

A12.4. Do local operating procedures require that horizontal powered hangar doors be opened to at least 10 feet? (Reference paragraph **7.2.3.5.**)

A12.5. When mission requirements or weather conditions create a need to park vehicles inside hangars, is a well-defined plan coordinated and approved by installation ground safety, fire, and BE personnel? (Reference paragraph **7.2.5.**)

A12.6. Is temporary or makeshift electrical wiring prohibited in aircraft hangars? (Reference paragraph **7.2.7.1.**)

A12.7. Are emergency procedures established to remove aircraft in case of fire or other hazard? (Reference paragraph **7.2.9.**)

Attachment 13

CHECKLIST FOR CHAPTER 8--AIRCRAFT SHOP AND FLIGHT LINE MAINTENANCE OPERATIONS

This is not an all-inclusive checklist. It simply highlights some critical items in this chapter. Other requirements exist in the chapter that are not included in the checklist. Where appropriate, MAJCOMs, DRUs, FOAs, local ground safety offices, and supervisors will add to this checklist to include command or individual shop-unique requirements or situations.

A13.1. Are maintenance shop machines guarded, secured when necessary, and located to provide safe work areas? (Reference paragraph **8.2.2.**)

A13.2. Is fall protection provided and used by personnel when they are required to work where they can fall 10 feet or more? (Reference paragraph **8.2.5.**)

A13.3. Are compressed gas cylinders, when not in use, secured with caps in place? (Reference paragraph **8.2.7.1.**)

A13.4. Are good housekeeping practices used throughout the facility? (Reference paragraph **8.2.8.**)

A13.5. Are aircraft electrical systems de-energized and tagged out whenever possible? (Reference paragraph **8.3.1.1.**)

A13.6. Are aircraft batteries normally charged in areas or shops designed for the purpose? (Reference paragraph **8.3.2.3.**)

A13.7. If small amounts of paints or thinners (one day's supply) are kept in an approved aircraft hangar or parts painting facility, are they stored in approved metal cabinets with self-closing doors? (Reference paragraph **8.3.3.1.1.**)

A13.8. If hangar doors are opened to provide extra ventilation to prevent flammable vapor concentrations, are the doors opened at least 10 feet? (Reference paragraph **8.3.3.2.3.**)

A13.9. If opened to less than 10 feet, does the local operating procedure require the main door switch to be locked out? (Reference paragraph **8.3.3.2.3.**)

A13.10. Are multimeters calibrated and documentation of the date checked to ensure currency? (Reference paragraph **8.3.4.5.1.**)

A13.11. Are the tires on multi-piece rim wheels deflated before they are removed from AGE equipment? (Reference paragraph **8.3.4.7.**)

A13.12. Are locking pins installed when mobile maintenance stands are raised? (Reference paragraph **8.3.4.10.3.**)

A13.13. Are local procedures developed to prevent injury because of unexpected movement of flight controls? (Reference paragraph **8.3.6.**)

A13.14. Is the use of battery-powered screwdrivers and drills prohibited on: (Reference paragraph **8.3.9.**)

A13.14.1. JP-4 aircraft?

A13.14.2. JP-8 aircraft when they occupy the same maintenance hangar as JP-4 aircraft?