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Aircraft Fuel Systems Journeyman

Volume 1. Maintenance Fundamentals and Administrative Responsibilities

Air Force Career Development Academy

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Author: MSgt Kristopher J. Chapman
361st Training Squadron
82nd Training Group (AETC)
361 TRS/TRR
501 Missile Road
Sheppard Air Force Base, Texas 76311-2264
DSN: 736-3254
E-mail address: kristopher.chapman@us.af.mil

Instructional Systems Specialist: Evangeline K. Walmsley

Editor: Sandra F. Glenn

Air Force Career Development Academy (AFCDA)
Air University (AETC)
Maxwell AFB-Gunter Annex, Alabama

WELCOME TO THE Aircraft Fuel Systems Journeyman Career Development Course (CDC). This two-volume course is designed to provide you with the career knowledge necessary for upgrade to the 5-skill level.

Volume 1 covers various maintenance fundamentals and administrative responsibilities maintenance personnel are required to know.

Volume 2 focuses on integral fuel tank and fuel cell maintenance. The volume includes topics such as aircraft familiarization, special tools and equipment, confined space entry, and fuel leak isolation.

In this volume, Unit 1 covers career field progression, organizational structure, responsibilities of the personnel in the maintenance group, and maintenance documentation.

Unit 2 covers the different inspection concepts and the importance of maintenance documentation.

Unit 3 deals with principles of ground safety. The unit describes the requirements for handling fuels, chemicals, and compressed gases, as well as various types of personal protective clothing and equipment.

Unit 4 deals with the types of Air Force publications and technical orders. The technical order numbering system and the Maintenance Integrated Data Access System (MIDAS) are also covered.

Unit 5 outlines the structure and function of the supply system. The unit introduces the characteristics of the Standard Base Supply System (SBSS), and describes the processing and controlling of materiel, the use of supply products, and materiel deficiency reporting.

A glossary is included for your use.

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For Guard and Reserve personnel, this volume is valued at 12 hours and 3 points.

NOTE:

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

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Unit 1. Career Ladder Progression and the Maintenance Organization

TO PROGRESS IN YOUR CAREER FIELD, you must acquire certain knowledge that will give you the versatility you need to move quickly from one duty position to another. Career knowledge and job proficiency are the cornerstones of skill-level advancement. In addition to becoming proficient in your specialty, you must also be familiar with the requirements for skill-level advancement. You must know how you fit into the "maintenance complex;" that is what this unit is about. First, you will learn what it takes to progress in the aircraft fuel systems career field. Additionally, you will gain an understanding of how the typical maintenance organization is structured and, along the way, you will earn the responsibilities of the various personnel assigned to the maintenance group. We will then turn our attention to quality assurance, their responsibilities, types of inspections, and a few of their programs.

1–1. Career Ladder Progression

Adequate training and timely progression from the apprentice to the superintendent skill level play an important role in the Air Force's ability to accomplish its mission. Everyone involved in training must do his or her part to plan, develop, manage, and conduct an effective training program. As a trainee, you should strive to fulfill the requirements of skill-level upgrade continually. In this section, we will cover these requirements. To do this, we will present three major subject areas:

1. Terms related to career field and job identification.
2. Skill-level advancement requirements.
3. Duties and responsibilities of 3- and 5-skill level personnel.

001. Personnel classification terms

The main purpose of the classification system is to assist in assigning each Airman to the job he or she can do best, provided it is in harmony with total Air Force requirements. To understand the classification system, you must first become familiar with five basic terms related to your career field and your job identification:

1. Air Force specialty code (AFSC).
2. Primary Air Force specialty code (PAFSC).
3. Secondary Air Force specialty code (2AFSC).
4. Duty Air Force specialty code (DAFSC).
5. Control Air Force specialty code (CAFSC).

Air Force specialty code

The AFSC is the code that identifies your specific profession (job) in the Air Force. AFSCs are five-position, alphanumeric codes. They are broken down by characters—each with a specific meaning.

First character

The first character identifies the *career grouping* (e.g., 1 = operations, 2 = logistics, and 3 = support).

Second character

The second character identifies the *career field*. Officer AFSCs use numbers while enlisted AFSCs use letters (e.g., 2A = Aircraft Maintenance and 2S = Supply).

Third character

The third character identifies the *functional area* (e.g., 2A6 = Engines/Systems and 2A1 = Avionics).

Fourth character

This character identifies the *skill level* (1, 3, 5, 7, or 9).

Fifth character

The fifth character identifies the *specific expertise*, or specialty, within a functional area. This character "pinpoints" the exact duty of an individual.

The table shown in figure 1–1 contains a breakdown of the AFSC for an aircraft fuel systems journeyman.

2	Career Grouping	Maintenance Group
A	Career Field	Aircraft Maintenance
6	Functional Area	Engine/Systems
5	Skill Level	Journeyman
4	Specific Expertise	Aircraft Fuel Systems

Figure 1–1. AFSC 2A654.

Primary Air Force specialty code

Your PAFSC is the awarded Air Force specialty (AFS) in which you are most highly qualified to perform duty.

Secondary Air Force specialty code

This is an awarded AFSC that is other than the primary AFSC. Airmen who retrain from one career field to another are assigned the AFSC for their new career field, but also retain their old AFSC as a 2AFSC.

Duty Air Force specialty code

This code identifies the authorized manning document position to which you are officially assigned. A manning document tells your supervisor and other interested people how many individuals are authorized at your unit in each rank and skill level. Occasionally, because of personnel shortages or overages, an Airman may actually be assigned to a manning document position that is at a higher or lower skill level than the one he or she possesses.

Control Air Force specialty code

This code governs assignments and assists in the identification and control of training requirements. Your CAFSC identifies your highest usable skill in terms of total Air Force requirements. It's a management tool the Air Force uses to assign Airmen to positions where they are needed most or to train them to fill these positions at a later date.

002. Skill-level advancement requirements

When you graduated from basic training, you were assigned to the Sheppard Air Force Base (AFB) training wing to complete the Aircraft Fuel Systems Apprentice Course. Upon completion of the initial skills training at Sheppard AFB, you were awarded the 3-level (apprentice); at this time, you should have approximately six months of on-the-job training (OJT).

Qualification and knowledge

In addition to the 3-level qualifications, a 5-level (known as a journeyman) must possess the knowledge and skills necessary to maintain aircraft fuel systems and associated subsystems. A 5-level must possess additional knowledge of hardware and components, such as the following:

- Valves, interconnects, lines, gauges, controls, pumps, and other attachments.
- Sealing materials.
- Sheet metal parts.
- Rubber properties and organic sealing compound applications.
- Layout drawing use.
- Technical publications.
- Concepts and applications of maintenance directives to include confined spaces work policies and procedures.
- Proper handling, use, and disposal of hazardous waste and material.

Training sources

The 5-level career development course (CDC) you are completing is designed to provide the career knowledge training required for upgrade. It is designed to build on your current knowledge base by providing more in-depth knowledge than you received during initial skills training.

NOTE: Completion of this CDC is but one step in the skill-level advancement process. The other step is completing all the OJT requirements identified by your supervisor.

Upgrade requirements

The requirements for award of the 5-skill level are that the individual must be qualified in and have AFSC 2A634 qualifications, have a minimum of twelve months in upgrade training, and complete the 2A654 CDC and all 5-level core tasks.

Career development course

As previously stated, completion of this CDC will satisfy the career knowledge requirements for upgrade. This CDC consists of two volumes. You must complete both volumes before taking the end-of-course examination. You must receive a passing score on the examination to receive credit for completing the course. The exam’s minimum passing score is 65 percent.

Job proficiency

Just as you would not expect to become proficient at driving a car by completing a written course, completing this course will not make you ready for upgrade. Instead, you must also be able to perform all the core tasks for your career field as well as those tasks your supervisor has determined necessary to be eligible for upgrade. Your supervisor assigns all the required tasks in the specialty training standard (STS) in your training records.

Look at figure 1–2. Notice, there are 14 items on this page. Four of these items have asterisks beside them meaning they are core tasks. Core tasks are those tasks in which every 5-level in the aircraft fuel systems career field are expected to be proficient. Other items on the page will be identified if they are required for upgrade training.

Now, look at certification for the OJT column. The first four columns are used to document task qualification. The Tng Start column contains the date that training was started on the particular task. When the trainee completes the training and both the trainer and trainee feel the trainee is proficient at performing the task, the Tng Comp column will have the date the trainee completes training. The trainee and trainer then will initial their respective Trainee Initials and Trainer Initials columns, acknowledging task proficiency. For core tasks, a certifying official must also initial the last column, Certifier Initials.

Remember, skill-level upgrade is your responsibility. Learn as much as you can about the weapon systems assigned to your unit. Budget your time to allow completion of this CDC within a reasonable time frame and keep yourself eligible for promotion to senior Airman (SrA). The table shown in figure 1–3 shows the projected enlisted career path from Airman to chief master sergeant. The table also shows the estimated timeline for 3-level and 5-level progressions. See where you fit into this timeline.

In addition to the table showing the enlisted career path, we included a table showing (in checklist form) the requirements for upgrade to the journeyman and craftsman (7-level) skill levels. Look at figure 1–4. As you can see, base/unit education and training managers use this checklist to ensure you (and other trainees) have met the requirements for skill-level upgrade.

1. Tasks, Knowledge And Technical References		2. Core Tasks		3. Certification For OJT					4. Proficiency Codes Used To Indicate Training/Information Provided (See Note)				
		A	B	A	B	C	D	E	A 3 Skill Level	B 5 Skill Level		C 7 Skill Level	
		5 Level	7 Level	Tng Start	Tng Comp	Trainee Initials	Trainer Initials	Certifier Initials	(1) Course	(1) Course	(1) CDC	(1) Course	(2) CDC
NOTE 1: This STS is mandatory for all 2A6X4 personnel. NOTE 2: Users are responsible for annotating training references to identify current references pending STS revision. NOTE 3: All tasks and knowledge identified as training requirements in column 4A will be taught during wartime. NOTE 4: Items in column 2 marked with an asterisk (*) identify core tasks.													
2.1.	AIRCRAFT FUEL SYSTEMS CAREER LADDER PROGRESSION TR: AF Enlisted Classification Guide								-	-	A	-	-
2.2.	AF OCCUPATIONAL SAFETY AND HEALTH (AFOSH) PROGRAM TR: AFI 90-821, AFOSH Std 91-501												
2.2.1.	Principles of ground safety TR: AFMAN 91-201; AFI 91-202; AFOSH Stds 91-66, 91-100, and 91-501								B	-	B	-	-
2.2.2.	Practice safety precautions while working in a functioning radar/NDI/fuel/noise/ toxic/ hydrazine maintenance area TR: AFIs 91-101 and 32-2001; AFOSH Stds 91-66 and 91-100								-	-	-	-	-
2.2.3.	Ground and bond aircraft and equipment TR: TOs 00-25-172 and 1-1-3	*							2b	-	b	-	-
2.2.4.	Practice housekeeping consistent with safety of personnel and equipment TR: AFI 21-101; 91-501, AFOSH Stds 91-66 and 91-100								2b	-	b	-	-
2.2.5.	Apply safety precautions when using tools and test equipment TR: TOs 1-1-3 and 32-1-101								2b	-	b	-	-
2.2.6.	Apply precautions for handling chemicals TR: TOs 1-1-3, 42B-1-1; AFOSH Std 91-501	*							2b	-	b	-	-
2.2.7.	Apply precautions for handling fuels TR: AFOSH Std 91-38								b	-	b	-	-
2.2.8.	Selection and use of personnel restraint harnesses TR: AFOSH Std 91-501								B	-	-	-	-
2.2.9.	Contain fuel spills TR: TOs 1-1-3, 42B-1-1; AFOSH Std 91-501	*							b	-	b	-	-
2.2.10.	Use and maintain personal protective equipment TR: AFOSH Stds 48-137 and 91-501	*							2b	-	b	-	-
2.2.11.	Use and Maintain Respirators TR: AFOSH Std 48-137								b	-	-	-	-
2.2.12.	Apply precautions for handling compressed gases TR: TO 42B5-1-2								b	-	b	-	-
2.2.13.	Foreign object damage (FOD) prevention program TR: AFI 21-101								B	-	B	-	-

Figure 1–2. 2A6X4 specialty training standard.

Education and Training Requirements	Grade Requirements			
	Rank	Average Sew-On	Earliest Sew-On	High Year Of Tenure (HYT)
BMTS	AB			
Apprentice Technical School (3-Skill Level)	Amn A1C	6 months 16 months		
Upgrade To Journeyman (5-Skill Level) - Minimum 12 months on-the-job training (OJT). - Minimum 9 months OJT for retrainees. - Complete all 5-level core tasks where applicable. - Complete appropriate CDC if/when available.	Amn A1C SrA	6 months 16 months 3 years	28 months	10 years
Airman Leadership School - Must be a SrA with 48 months' time in service or be a SSgt Selectee. - Resident graduation is a prerequisite for SSgt sew-on (Active Duty Only).	**Trainer** - Qualified and certified to perform the task to be trained. - Must attend the Air Force Training Course.			
	Certifier - Be at least a SSgt with a 5-skill level, or civilian equivalent, trained and qualified to perform the task being trained. - Attend Air Force Training course. - Be a person other than the trainer except for AFSCs, duty positions, units, and/or work centers with specialized training standardization and certification requirements.			
Upgrade To Craftsman (7-Skill Level) - Minimum rank of SSgt. - 12 months OJT. - 6 months OJT for retrainees. - Complete all 5- and 7-level core tasks. - Complete appropriate CDC if/when available.	SSgt	7.5 years	3 years	20 years
Noncommissioned Officer Academy (NCOA) - Must be a TSgt or TSgt Selectee. - Resident graduation is a prerequisite for MSgt sew-on (Active Duty Only).	TSgt MSgt	12.5 years 16 years	5 years 8 years	22 years 24 years
USAF Senior NCO Academy (SNCOA) - Must be a MSgt or SMSgt Selectee. - A percentage of top non-select (for promotion to E-8) **Upgrade To Superintendent (9-Skill Level)** - Minimum rank of SMSgt	SMSgt	19.2 years	11 years	26 years
Chief Enlisted Manager (CEM)	CMSgt	21.5 years	14 years	30 years

Figure 1–3. Enlisted career path.

Table 8.2. Base/Unit Education and Training Manager Checklist		
Requirements for Upgrade to:	**Y**	**N**
Journeyman - Has the apprentice completed mandatory CDCs, if available? - Has the apprentice completed all appropriate 5-level core tasks identified in the CFETP? - Has the apprentice completed all other duty position tasks identified by the supervisor? - Has the apprentice completed 12 months training (9 months for re-trainees) for award of the 5-skill level? - Has the apprentice met mandatory requirements listed in specialty description, Air Force Enlisted Classification Directory (AFECD), and the CFETP? - Has the apprentice been recommended by their supervisor?		
Craftsman - Has the journeyman achieved the rank of SSgt? - Has the journeyman completed mandatory CDCs? - Has the journeyman completed all 5- and 7-level core tasks identified in the CFETP? - Has the journeyman completed all other duty position tasks identified by the supervisor? - Has the journeyman completed a minimum 12 months UGT (6 months for re-trainees) for award of the 7-skill level?		

Figure 1–4. Base/unit education and training manager's checklist.

003. Duties and responsibilities of an aircraft fuel systems journeyman

Your duties and responsibilities will vary from time to time and increase as you move up the career ladder. As an aircraft fuel systems journeyman, the tasks you will perform are numerous and varied. They include the following:

- Perform confined space entry procedures.
- Perform in-tank maintenance.
- Perform both scheduled and unscheduled maintenance.
- Inspect, troubleshoot, remove, repair, install, and modify aircraft fuel systems and associated components.
- Identify, isolate, and diagnose malfunctions.
- Recommend corrective actions.
- Resolve problems using technical publications and analytical techniques.
- Perform operational checks of fuel systems, subsystems, and components using test and support equipment.
- Identify corrosion within fuel systems.
- Operate and maintain related support and test equipment using technical orders and schematic diagrams.
- Record pertinent data on maintenance data collection forms and/or enter data into automated maintenance systems.
- Maintain inspection and maintenance records.
- Recommend methods to improve equipment performance and maintenance procedures.
- Inspect, verify, and determine shelf and service life of sealants.
- Handle, label, and dispose of hazardous materials and waste according to environmental standards.

Self-Test Questions

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

001. Personnel classification terms

1. What does the third character in an AFSC identify?

2. Which AFSC indicates the specialty in which you are most highly qualified to perform duty?

3. If you retrained into another specialty, what would your old AFSC be considered?

4. What is the purpose of the CAFSC?

002. Skill-level advancement requirements

1. What source provides the career knowledge training required for upgrade to the 5-skill level?

2. How are tasks in the STS identified as requirements for upgrade?

3. Who has the responsibility for skill-level upgrade?

003. Duties and responsibilities of an aircraft fuel systems journeyman

1. As an aircraft fuel systems apprentice/journeyman, what resources should you use to resolve problems?

2. In addition to its application, what are your responsibilities concerning sealant?

3. What are your duties concerning hazardous materials?

1–2. Organizational Structure

Not only does it feel good to know your purpose in the Air Force, it is important for you to know where you fit into the organization. The fuel shop is part of the maintenance group (MXG). As the lowest echelon of organization, the fuel shop is usually part of the accessories flight. The accessories

flight is part of the component maintenance squadron (CMS) or the maintenance squadron (MXS). If an MXS is larger than 700 people, it is split into a CMS and an equipment maintenance squadron (EMS). The MXS or CMS and EMS are part of the MXG. Of course, the next higher level above the group is the wing.

004. The wing

The Air Force holds wing commanders responsible and accountable for mission results (fig. 1–5). Wing commanders cannot do this alone. The wing is broken into groups, squadrons, flights, and even to sections. We will discuss each of those areas, starting with the wing. There are three types of wings—operational, air base, and specialized mission wings.

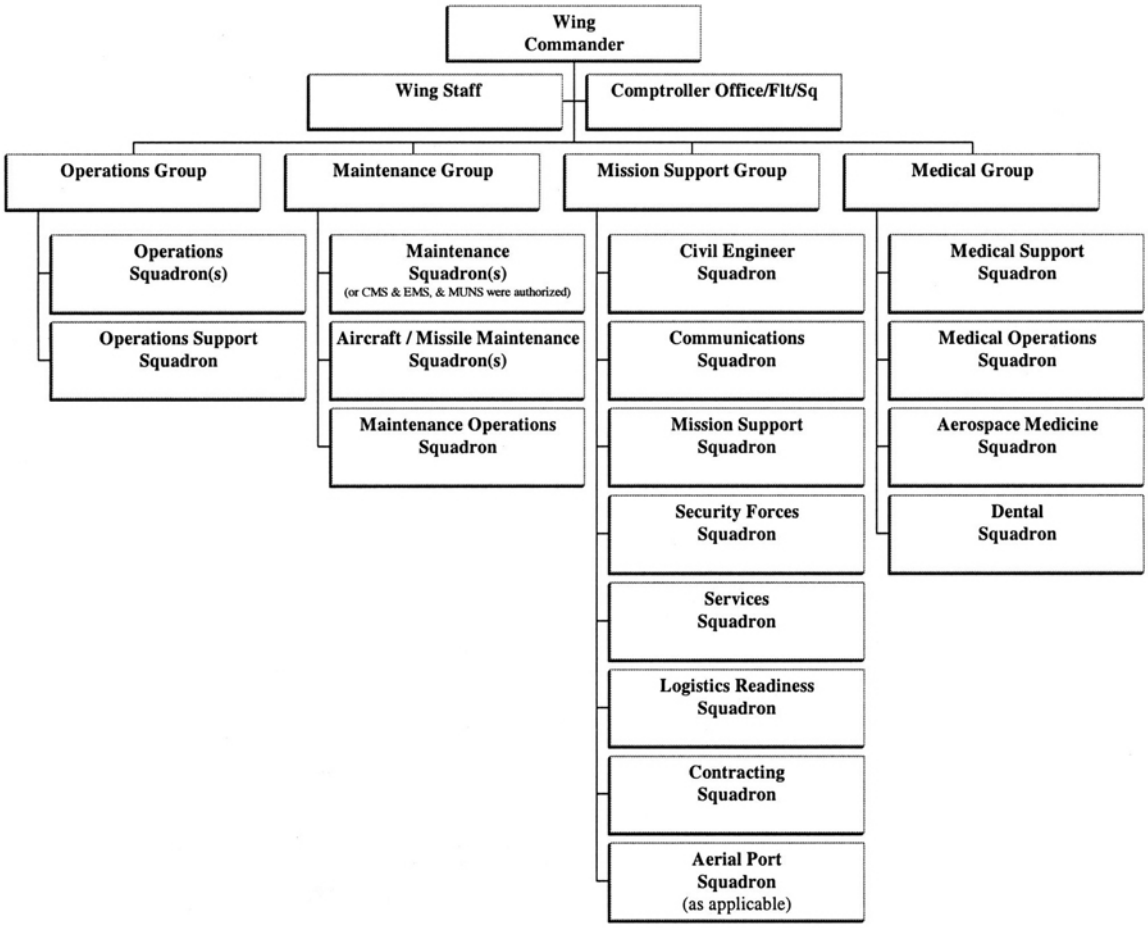


Figure 1–5. Operational wing structure.

Operational wing

An operational wing is composed of an operations group (OG) and an operational mission. An operational wing usually has aircraft or missiles assigned, and the units necessary to support its mission. When the base is owned by another major command (MAJCOM) and the wing is a tenant on the base, then the host command provides varying degrees of base and logistics support.

Air base wing

An air base wing performs support functions such as logistics, finance, civil engineering, and other functions for tenant units, such as an operational wing, or a numbered Air Force (NAF) or MAJCOM headquarters.

Specialized mission wing

A wing that performs a unique mission, like a training wing (TRW), an intelligence wing, and so forth is called a specialized mission wing. Usually, a specialized mission wing does not have aircraft or missiles assigned to it. The 82 TRW at Sheppard AFB is a good example.

Operations group

The objective of the OG is to focus on the planning and execution of the wing mission air and space power. The OG operates the primary mission equipment. In our case, that is all aircraft in the Air Force inventory. The OG performs the basic mission of the Air Force and requires the support of the maintenance units (fig. 1–5).

Maintenance group

The MXG is concerned with the maintenance of air and space weapon systems (fig. 1–5). To maintain a proper balance and get the most out of our resources, we must employ maintenance professionals with the greatest skills and proficiency possible. The MXG includes maintenance operations (MXO), the aircraft maintenance squadron (AMXS), the MXS or CMS/EMS, and the munitions squadron (MUNS) when applicable.

005. Maintenance squadrons

Perhaps you are wondering where you fit into the scheme of the organizational structure of your wing. To answer, we will back up a bit within the wing structure to the block designated as the MXG (fig. 1–5). Under this block, you see the MXS(s). The personnel assigned to the MXS have many different responsibilities. For example, some personnel may maintain aerospace ground equipment (AGE); others maintain munitions, off-equipment aircraft, and support equipment components. In addition, MXS personnel perform on-equipment maintenance of aircraft. Other personnel fabricate parts. Still others are responsible for repair and calibration of test, measurement, and diagnostic equipment (TMDE). Two squadrons may be formed when size and circumstances dictate. Figure 1–6 illustrates the organizational structure of the CMS.

A CMS consists of the following:

1. Squadron commander.
2. Maintenance supervision.
3. Fabrication flight.
4. Propulsion flight.
5. Accessories flight.
6. Avionics flight.
7. AGE flight.
8. TMDE flight.
9. Maintenance flight.
10. Inspection flight.
11. Munitions flight.

Check under the accessories flight, and you will see where the fuel systems section falls within the organizational structure of the CMS.

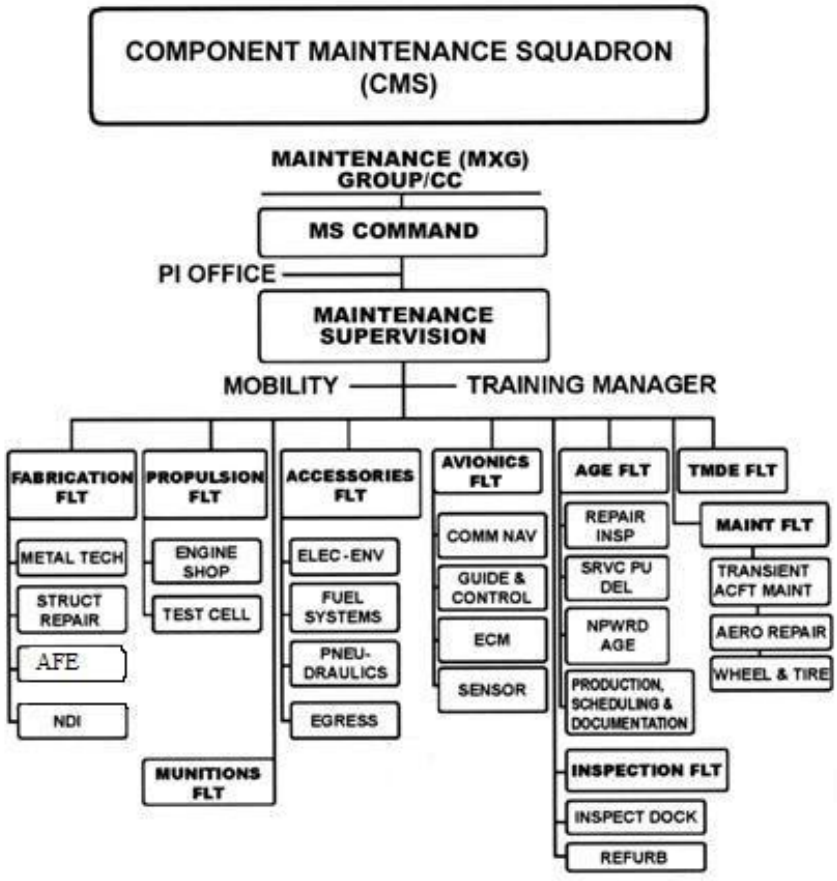


Figure 1–6. Component maintenance squadron.

Responsibilities

Now that you have an idea of the organizational structure of the CMS, we will look at the responsibilities of the personnel assigned to the command and supervisory levels of this squadron. Then, we will look at responsibilities of the personnel assigned to the earlier listed flights. The responsibilities discussed are basic; for more detailed descriptions refer to Air Force Instruction (AFI) 21–101, *Aircraft and Equipment Maintenance Management.*

Squadron commander

As the name implies, the squadron commander performs command functions. These functions are outlined by public law and applicable directives and are common to all squadron commanders. A squadron commander is responsible to the MXG commander for overall squadron management.

Maintenance superintendent

The maintenance superintendent advises the squadron commander on technical matters, leads a mission-focused maintenance effort, and manages resources necessary to accomplish the mission. They provide necessary administration to manage assigned responsibilities, control maintenance through production superintendents, flight chiefs, and section/shop chiefs.

Flight chiefs

The flight chiefs are responsible to the maintenance superintendent for the management, supervision, and training of assigned personnel within the flight. The leadership, technical skill, and supervisory ability of the flight chiefs are key in the development and application of combat capability.

Section chiefs

Each section chief is responsible to the flight chief for the management, supervision, and training of assigned personnel within his or her shop. In essence, the section chief is a first-line supervisor of maintenance production and, as such, is the technical authority and advisor in that area.

Flights

Now that you know the command and supervisory level responsibilities, let's look at some of the flights and the responsibilities of the personnel assigned to them.

Propulsion flight

Personnel assigned to the propulsion flight maintains propulsion units, propulsion components, and propellers. These personnel perform engine tear down, build-up, test, and repair of components.

The propulsion flight can be organized into these five sections:

1. Jet engine intermediate maintenance (JEIM).
2. Test cell and noise suppression systems (NSS).
3. Accessory/modular repair.
4. Small gas turbine and engine support equipment.
5. Turboprop/turbo shaft engines and support.

Test, measurement, and diagnostic equipment flight

Personnel assigned to the TMDE flight maintains, calibrates, and certifies TMDE, as well as provides base-level support of aircraft, precision-guided munitions, ground systems, and other equipment assigned to the base.

The TMDE flight consists of these four sections:

1. Precision measurement equipment laboratory (PMEL).
2. Production control.
3. Quality program.
4. Technical order distribution office (TODO).

In some cases, a rapid assistance support team for calibration (RASCAL) may also be assigned.

NOTE: Personnel assigned to the PMEL maintains, calibrates, and certifies TMDE using standards traceable to the National Institute of Standards and Technology.

Avionics flight

Primarily, the personnel in the avionics flight performs the following duties:

- Off-equipment maintenance of avionics components.
- Off-equipment maintenance of electronic warfare systems and sensor pods.
- Off-equipment maintenance of airborne videotape recording systems.
- Off-equipment maintenance of airborne photographic systems.
- On-equipment maintenance of assigned support equipment.

The sections assigned to this flight are dependent on the weapons systems support and the scope of maintenance responsibilities.

Aerospace ground equipment flight

Personnel assigned to the AGE flight provides powered and nonpowered AGE to support the wing. Powered and nonpowered AGE are items that are portable and required to directly support a weapon system or subsystem or to give a service to aid in the repair of such systems.

The personnel in the AGE flight picks up, delivers, repairs, modifies, inspects, and services all AGE. Exceptions to this requirement are nonpowered munitions trailers, propulsion support equipment, avionics support equipment, gaseous and cryogenic servicing units (AGE personnel only accomplish basic trailer and chassis maintenance), locally designed/procured AGE, unless directed by the squadron commander.

Fabrication flight

Fabrication flight personnel repairs, maintains, modifies, locally manufactures, and inspects aircraft and equipment components.

The fabrication flight consists of these three sections:

1. Aircraft structural maintenance.
2. Metals technology.
3. Nondestructive inspection (NDI).

Munitions flight

Munitions flight personnel manages and maintains conventional munitions, nuclear weapons and training shapes, reentry vehicles and systems, chemical training munitions, air launched missiles, and associated support equipment.

The munitions flight consists of these three sections:

1. A combat munitions unit (CMU) for each assigned flying squadron.
2. Combat support unit (CSU).
3. Munitions operations unit (MOU).

Accessories flight

The personnel in the accessories flight are responsible for repairing, maintaining, modifying, locally manufacturing, and inspecting aircraft and associated equipment.

The flight is organized into the following four sections:

1. Electro-environmental (E/E).
2. Aircraft fuel systems.
3. Pneudraulics.
4. Egress (most bases).

Electro-environmental section

Personnel assigned to the E/E section maintains aircraft electrical system components and locally manufactures, repairs, overhauls, tests, modifies, and inspects electrical components and batteries.

The personnel in the E/E section also maintains aircraft oxygen, environmental, pneumatic, installed fire extinguishing, vacuum, and bleed air systems and components.

Except for basic trailer or chassis and user maintenance, E/E section personnel maintains and repairs gaseous and cryogenic servicing units and storage tanks, including scheduling inspections, ordering parts, and reporting status to the personnel in the maintenance operations center (MOC).

Aircraft fuel systems section

Personnel assigned to the aircraft fuel systems section are responsible for repairing, functionally checking, and inspecting aircraft fuel, water, hydrazine, and in-flight refueling systems and components. Exceptions to this requirement are engine-installed components.

Pneudraulics section

The personnel in the pneudraulics section maintain pneumatic, hydraulic, and pneudraulic systems (except environmental and egress). In addition, they provide maintenance support for assigned support equipment.

Pneudraulics section personnel also maintain the components of hydraulic test stands and pumping units. In addition, they also provide for the local manufacture and testing of hose assemblies and testing of rigid hoses.

Egress section

Personnel assigned to the egress section maintain aircrew egress systems, components, and trainers. Not all bases have an egress shop.

Self-Test Questions

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

004. The wing

1. What are the three types of wings?

2. What is the objective of the OG?

3. What must we do to maintain a proper balance between sortie production and maintenance downtime and get the most out of our resources?

4. What units are usually included in the MXG?

005. Maintenance squadrons

1. What flights are assigned to the maintenance squadron?

2. Who is responsible for managing the resources to accomplish the workload?

3. Who is viewed as the technical authority and advisor in each duty section?

4. To which flight is the PMEL assigned?

5. Which flight accomplishes the basic trailer and chassis maintenance on nonpowered munitions trailers?

6. Which section locally manufactures hose assemblies?

1–3. Maintenance Group Responsibilities

To balance sortie production and maintenance support, two separate commanders (OG and MXG) are given authority to accomplish each mission. The wing commander must balance the needs and demands of each of these two groups. We tend to be concerned more with accomplishing the maintenance of aircraft, since that is our job, but comprehending the big picture can really help you understand why you have to do things that do not seem to make sense. Commanders and supervisors at squadron and group level make decisions using that big picture. In this section, we will look at some of the responsibilities of the MXG.

006. General responsibilities

In this lesson, we will outline some of the specific responsibilities for group commanders and common responsibilities for key managers.

Maintenance group commander's responsibilities

MXG commanders are responsible for equipment maintenance required to ensure balance between sortie production and fleet management. The total production effort and management of group maintenance functions are part of the group commander's responsibilities. The following is a partial list of the MXG 'commander's responsibilities:

1. Ensure maintenance is performed only by personnel who are trained, qualified, and certified, unless under the direct supervision of a trainer or certifier.
2. Ensure strict adherence to technical data and management procedures.
3. Institutionalize risk management within the workplace. Identify, eliminate or control, and document hazards to minimize risks in accordance with applicable instructions.
4. Coordinate with fire emergency services, wing safety, and the airfield operations flight in developing adverse weather procedures for protecting aircraft and equipment in accordance with applicable instructions.
5. Ensure organizational compliance with all federal, state, and local laws pertaining to environmental regulations and pollution prevention.
6. Ensure the individual completes the task documents maintenance information systems (MIS) and aircraft forms. (**EXCEPTION*:*** For Red Ball maintenance, follow locally developed documentation procedures.)
7. Utilize the quality assurance (QA) program to ensure standardized inspection and maintenance procedures.
8. Establish written procedures to review and clear repeat, recurring, and cannot duplicate (CND) discrepancies.
9. Ensure the technical order (TO) and publication library is established.
10. In coordination with the OG commander, review and approve the weekly, monthly, quarterly, and annual flying schedules.
11. Ensure the maintenance capability is considered in the development of the flying program.
12. Develop an impoundment program and ensure compliance with applicable publications.

Squadron commander's responsibilities

Squadron commanders are the most influential people in the wing. They are not only responsible for ensuring the unit's mission is accomplished, but they also handle all the money, equipment, personnel, and deployment issues. They work closely with wing and group staffs, and keep abreast of the concerns of each work center.

The following is a list of a few of the squadron commander's duties. A more in-depth list is found in AFI 21–101 and AFI 38–101, *Air Force Organization.*

1. Ensure manpower and all levels of supervision are equitably distributed for all duty periods based on manning workload.
2. Ensure strict adherence to technical data and all other written management procedures.
3. Enforce sound maintenance, supply discipline, and financial management practices.
4. Designate a unit deployment manager (UDM).
5. Review status of training programs monthly. Ensure upgrade training and maintenance qualification programs emphasize quality and are not focused primarily on meeting minimum upgrade timeframes.
6. Implement and manage self-inspection, retention and career motivation, security, mobility, and personnel reliability programs, as applicable.
7. Administer the squadron safety program.

Flight chief's responsibilities

Flight chiefs are an integral level of supervision. Commanders rely on them to supervise and assist section noncommissioned officers in charge (NCOIC) in the accomplishment of their sections' missions. The flight chief has many more responsibilities than those in the following list.

1. Manage shift manpower distribution and make necessary adjustments. Equitably distribute all levels of supervision, based on manning and workload, to supervise all duty periods.
2. Execute the squadron's mishap prevention program for the flight.
3. Monitor and ensure environmental health physicals and respirator training, initial and recurring requirements are accomplished when required for assigned personnel in accordance with applicable AFIs.
4. Enforce lockout/tag-out procedures.
5. Enforce strict adherence to technical data and management procedures.
6. Ensure aircraft forms and MIS documentation are complete and accurate for each shift.
7. Monitor cannibalization actions.
8. Review/update flight in-process inspection requirements listing annually.
9. Select personnel to perform special certification tasks and forward names for approval by the maintenance superintendent.
10. Assign section supervisors.
11. Ensure reparable parts are processed promptly through repair channels within the required timeframe.

Section chief's responsibilities

Finally, just so you do not think that your boss has nothing better to do than give you a hard time, here is a listing of just a few of the section chief's responsibilities:

1. Ensure safe fuel tank/cell entries.
2. Enforce strict adherence to technical data and management procedures, and conduct face-to-face counseling with personnel who violate directives.

3. Ensure availability and serviceability of personal protective clothing, equipment, tools, and support equipment.
4. Ensure personnel are identified and are prepared to deploy for taskings.
5. Review and evaluate QA and other inspection reports and take corrective action, if necessary.
6. Set up adequate bench stocks.
7. Develop workcenter training requirements.
8. Author and maintain the master entry plan.
9. Maintain housekeeping, safety, security, and environmental control standards.
10. Evaluate maintenance quality, personnel qualifications, and training of assigned personnel. Nominate quality performers for flight recognition.
11. Establish a safety program designed specifically for the hazards associated with the work center.
12. Assist with the development of the emergency response and rescue plan.

These are just a few of the general responsibilities associated with command and supervisory positions. In addition to the general responsibilities, each position has some specific responsibilities, which we will cover in the next lesson.

007. Specific functions and responsibilities

In this lesson, you will study some of the specific functions and responsibilities of the MXG. Remember, these responsibilities are in addition to the ones discussed in the previous lesson.

Maintenance group specific responsibilities

The MXG (through staff agencies) support squadrons in fulfilling the wing's mission. The staff agencies act in the name of the MXG commander on those matters for which they have been given responsibility. The MXG and staff must provide the direction and guidance essential for all subordinate units to implement, apply, and comply with local and higher headquarters' directives.

Though not limited to the duties on this list, the MXG commander does the following:

1. Establishes a dedicated crew chief program.
2. Establishes written procedures for the unit's flight control maintenance program.
3. Establishes an aircraft battle damage repair (ABDR) program.
4. Ensures maintenance standardization and evaluation program (MSEP) requirements are implemented.
5. Ensures effective management of the wing's total maintenance training program. Provides aircraft, personnel, and equipment to support training.
6. Establishes unit procedures to reconcile training munitions issued for flightline requirements.
7. Manages the maintenance/munitions-training program to include course development content, ancillary, qualification, and maintenance training activities.
8. Ensures an orientation program is developed and conducted for all newly assigned personnel to all wing maintenance activities.
9. Approves local manufacture requests.
10. Ensures fire extinguisher, hazard communication (HAZCOM), and appropriate ancillary training programs are established for personnel performing on-/off-equipment maintenance duties.

Maintenance operations

MXO is responsible to the MXG commander for aircraft maintenance staff-related functions required for the efficient operation of the MXG. MXO is divided into these six sections:

1. Engine management.
2. Plans, scheduling, and documentation.
3. Maintenance management analysis.
4. MOC.
5. Maintenance training.
6. Programs and resources.

The personnel assigned to MXO are responsible to the MXO officer in charge (OIC) for the overall management of specific functional areas. MXO is the central agency for monitoring and developing long-range strategies of fleet management to sustain the health of the fleet. Fleet management is defined as the effective utilization of available resources to accomplish the aircraft support cycle from planned maintenance events to operations schedule execution.

Maintenance operations center

The MOC has three main functions: (1) monitor and coordinate sortie production and maintenance production, (2) monitor the execution of the flying schedule, and (3) maintain visibility of "health of the fleet" indicators. During periods of contingency tasking (simulated or actual), the MOC assumes increased responsibility for the coordinating effort.

Coordinating with the AMXS and maintenance units, MOC sets priorities for maintenance actions, dispatches specialists (such as egress), and schedules areas of limited space for specialized maintenance, like the aircraft fuel systems hangar, or wash racks. The information you give to the MOC, either by radio, Integrated Maintenance Data System (IMDS), or over the phone, must be detailed sufficiently to enable them to make an informed decision on priorities and identify potential conflicts between maintenance actions with enough lead-time to avoid them. Since some types of maintenance cannot be performed when the aircraft is in the aircraft fuel systems hangar with open fuel tanks, your jobs must be scheduled so as not to coincide and cause conflicts. Since plans and scheduling is responsible for scheduling maintenance, the MOC deals more with fitting unscheduled actions into the maintenance schedule, and the hour-by-hour execution of maintenance.

Plans, scheduling and documentation

Many aircraft maintenance organizations are large, have complex weapons, and hundreds of maintenance personnel assigned. Any attempt to manage such an organization without an efficient means of planning and scheduling would be unthinkable. Maintenance planning is mandatory to ensure the effective use of maintenance resources. Good planning supports future needs, such as flying-hour allocations, aircraft and activity inspections, maintenance training, and scheduled exercises. Coordination must be done with base agencies, such as transportation, fuels management, supply, and security police. Only through proper planning and scheduling can we effectively accomplish the maintenance workload.

The personnel assigned to plans, scheduling, and documentation (PS&D) forecast and monitor the long-range requirements with maintenance schedules. From these schedules, PS&D personnel complete and publish a *monthly maintenance plan*. The monthly maintenance plan is used by your supervisor and includes the dates when scheduled events—such as flight schedules, aircraft and activity inspections, time change and time compliance technical orders (TCTO)—will be done. A weekly maintenance plan redefines the monthly plan. The PS&D personnel also conduct daily maintenance planning meetings to confirm that plans are implemented and workload requirements are being met.

Documentation is an integral part of all PS&D functions. Because of this, the PS&D personnel maintain historical maintenance data within the IMDS/mobility unit maintenance information system (G081) computer systems. The accuracy of maintenance documentation is the basic responsibility of you and your supervisor.

Maintenance training flight

The maintenance training flight provides initial and recurring qualification, certification skills, and ancillary training required by technicians to perform duties in the maintenance complex. Comprised of two sections for (1) training management and (2) curriculum development and instructors, maintenance training flight is the single point of contact for all training matters that affect maintenance. Unit training managers, whether they work in the units or are centralized in one office, are part of the maintenance training flight.

Programs and resources

The personnel assigned to the programs and resources section are concerned with issues of budget, manpower, support agreements, facilities, and deployment. Programs and resources personnel develop, maintain, and coordinate all applicable AFI-directed programs and plans affecting maintenance.

008. Quality assurance

By now, you should have a good idea of what goes on in the maintenance complex. But, do the decision makers know how we're doing our job? Are we putting forth our best efforts every day? The personnel assigned to QA are tasked with determining the answers to these questions. In recent years, successful businesses have learned that they must set up external controls to ensure quality products. They have learned that consumers want nothing less. The automotive industry is a prime example.

The Air Force uses this same reasoning and applies it to all maintenance organizations. In essence, quality maintenance is the responsibility of all individual maintenance technicians, supervisors, and commanders. To ensure everyone meets their responsibilities, maintenance organizations use personnel assigned to the QA section.

Responsibilities of QA personnel

High-quality maintenance is the responsibility of all maintenance personnel. As was stated earlier, QA personnel are responsible for determining aircraft and equipment condition, personnel proficiency, and increase reliability and maintainability. These personnel must be highly qualified. They must have the experience and background to inspect any maintenance performed to ascertain that it is consistent with established standards.

QA programs include the following:

- MSEP.
- Product improvement program.
- TODO.
- Air Force repair and enhancement program.
- Aircraft and equipment impoundment program.
- Functional check flight program.
- Weight and balance program.
- Hot refuel/aircraft-to-aircraft refuel.

There are too many to discuss in detail so we will briefly discuss the first three.

Maintenance standardization and evaluation program

Quality maintenance is the responsibility of individual maintenance technicians, supervisors, and commanders. Aircraft and equipment condition and personnel proficiency are determined through the MSEP. The MSEP is a dynamic inspection system designed to improve aircraft combat capability through high-quality maintenance and effective training.

QA identifies, through evaluation or inspection, negative trends and problem areas. Types of inspections performed by QA are personnel evaluations, quality verification inspections, management inspections, and special inspections.

Personnel evaluation

A personnel evaluation is an over-the-shoulder evaluation of a technician or supervisor who is completing a maintenance action or inspection on an aircraft, missile systems, components, or equipment. Personnel evaluations evaluate the technician or supervisor's job proficiency, degree of training, and compliance with technical data. All individuals performing, supervising, or evaluating maintenance tasks are subject to a personnel evaluation at least annually.

Quality verification inspection

A quality verification inspection is an inspection of a component, equipment item, or an aircraft after maintenance has been performed. It is intended to assess the quality of maintenance and reliability of equipment. Again, inspectors will target specific problem areas if problems exist.

Management inspection

A management inspection is an inspection intended to follow up on past trends, conduct investigations, or conduct research to identify root causes of problems. Commanders or workcenter supervisors may request a management inspection.

Special inspection

A special inspection is an inspection not covered by personnel evaluations, quality verification inspections, or management inspections. Some examples are aircraft forms, bench stock programs, composite tool kits (CTK), TO files, and housekeeping. These inspections can be rated or unrated at the MXG commander's discretion.

QA recommends possible corrective actions to supervisors and may provide on-the-spot assistance. The MSEP provides an objective sampling of equipment condition and maintenance personnel qualifications. Contrary to popular belief, QA personnel are your friends. They are there to improve your product and your abilities, if possible. Their oversight helps us maintain our integrity.

Deficiency analysis

QA personnel also perform deficiency analysis. This is the technical investigation and troubleshooting phase of the problem analysis process. Whenever problem trends develop such as excessive equipment breakage or jobs taking too long to complete, the personnel in deficiency analysis research the cause. Because of this, QA personnel must maintain a close working relationship with the personnel assigned to maintenance systems analysis.

Product improvement program

The product improvement manager is tasked to emphasize and promote deficiency-reporting programs and ensure all maintenance personnel in the MXG and OG are familiar with them. These programs, together with day-to-day maintenance data reporting, provide an effective method of improving the reliability and maintainability of parts. The product improvement manager is the wing focal point for all aircraft maintenance deficiency reporting, technical data, and product improvement programs and is assigned to the MXG QA.

Technical order distribution office

QA is responsible for maintaining an up-to-date master TO file. This includes inspection work cards, work unit code manuals, and checklists. QA also inspects in-use TOs during technical inspections to ensure that your TOs are serviceable and up-to-date. Through the monthly maintenance plan, QA also informs you of any TO and regulation changes.

Self-Test Questions

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

006. General responsibilities

1. Who is responsible for utilizing the QA program to ensure standardized inspection and maintenance procedures?

2. Who administers the squadron safety program?

3. Who manages shift manpower distribution and makes necessary adjustments to equitably distribute all levels of supervision based on manning and workload to supervise all duty periods?

4. Who is responsible for reviewing, evaluating, and taking corrective action on QA inspection reports?

007. Specific functions and responsibilities

1. Who establishes a dedicated crew chief program?

2. What section develops long-range strategies of fleet management to sustain the health of the fleet?

3. What product includes scheduled events such as flight schedules, aircraft inspections, time changes, and TCTOs?

008. Quality assurance

1. Who is responsible for increasing reliability and maintainability?

2. What was the MSEP designed to do?

3. How does QA identify negative trends and problem areas?

4. What is a management inspection?

5. What system enhances reliability and maintainability of parts, components, and equipment?

6. Who is responsible for maintaining an up-to-date master TO file?

Answers to Self-Test Questions

001

1. The functional area.
2. PAFSC.
3. 2AFSC.
4. To govern assignments and assist in the identification and control of training requirements.

002

1. The 5-level CDC.
2. The tasks are assigned.
3. Trainee.

003

1. Technical publications and analytical techniques.
2. Inspect, verify, and determine shelf and service life.
3. To handle, label, and dispose of hazardous materials and waste according to environmental standards.

004

1. (1) The operational.
   (2) Air base.
   (3) Specialized mission wings.
2. To focus on the planning and execution of the wing mission air and space power.
3. Employ maintenance professionals with the greatest skills and proficiency possible.
4. The MXO, the AMXS, the MXS or CMS/EMS, and the MUNS when applicable.

005

1. Propulsion, TMDE, avionics, AGE, fabrication, munitions, accessories, maintenance, and inspection.
2. The maintenance superintendent.
3. The section chief.
4. TMDE.
5. AGE.
6. Pneudraulics.

006

1. MXG commander.
2. The squadron commander.
3. The flight chief.
4. The section chief.

007

1. The MXG commander.
2. MXO.
3. The monthly maintenance plan.

008

1. QA.
2. Improve aircraft combat capability through high-quality maintenance and effective training.
3. Through evaluation or inspection.
4. An inspection intended to follow up on past trends, conduct investigations, or conduct research to identify root causes of problems.
5. The product improvement program.
6. QA.

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

Unit Review Exercises

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

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

1. (001) Which character of an Air Force specialty code (AFSC) identifies the skill level?
   a. Second.
   b. Third.
   c. Fourth.
   d. Fifth.

2. (001) A Control Air Force specialty code (CAFSC) identifies an
   a. awarded Air Force specialty code (AFSC) other than a primary AFSC.
   b. authorized manning position to which an Airman is assigned.
   c. Airman's highest usable skill in terms of total Air Force requirements.
   d. awarded specialty in which an Airman is qualified to perform all duties.

3. (002) Which source provides the career knowledge training required for upgrade to the 5-skill level?
   a. Job proficiency.
   b. Technical orders (TO).
   c. Specialty training standard (STS).
   d. Career development course (CDC).

4. (002) Who is responsible for a trainee's skill-level upgrade?
   a. Trainer.
   b. Trainee.
   c. Commander.
   d. Unit training manager.

5. (003) As an aircraft fuel system journeyman, you are expected to
   a. troubleshoot components.
   b. treat aircraft corrosion.
   c. refuel an aircraft.
   d. clear red Xs.

6. (003) As an aircraft fuel system journeyman, what are your duties regarding hazardous materials?
   a. None. You are not authorized to get involved with hazardous materials.
   b. Handle, label, and dispose of them according to environmental standards.
   c. Handle and label them only according to environmental standards.
   d. Dispose of them according to applicable Air Force Occupational Safety and Health standards.

7. (004) Responsibility and accountability for mission results rests with
   a. base commanders.
   b. wing commanders.
   c. group commanders.
   d. squadron commanders.

8. (004) What are the three types of wings?
   a. Operational, air base, and specialized mission wings.
   b. Operational wing, objective wing, and home based wing.
   c. Composite wing, operational wing, and objective wing.
   d. Specialized mission wing, air base, and home based wing.

9. (004) Training wings and intelligence wings are examples of
   a. air base wings.
   b. operational wing.
   c. specialized mission wings.
   d. composite wing.

10. (004) Which group is concerned with the maintenance of air and space weapon systems?
   a. Operations group (OG).
   b. Maintenance squadron (MXS).
   c. Logistics group.
   d. Maintenance group (MXG).

11. (005) To whom is the component maintenance squadron commander responsible for overall squadron management?
   a. Maintenance group commander.
   b. Combat wing commander.
   c. Major command (MAJCOM).
   d. Headquarters United States Air Force.

12. (005) The technical authority and advisor of maintenance production in a maintenance shop is the
   a. maintenance supervisor.
   b. squadron commander.
   c. section chief.
   d. flight chief.

13. (005) Propellers are maintained by personnel assigned to the
   a. aerospace ground equipment (AGE) flight.
   b. propulsion flight.
   c. fabrication flight.
   d. accessories flight.

14. (005) Off-equipment maintenance of electronic warfare systems is performed by the personnel assigned to the
   a. test measurement and diagnostic equipment (TMDE) flight.
   b. avionics flight.
   c. munitions flight.
   d. accessories flight.

15. (005) Maintenance and repair of gaseous and cryogenic servicing units are performed by the personnel assigned to the
   a. pneudraulics flight.
   b. fuels flight.
   c. aerospace ground equipment (AGE) flight.
   d. electro-environmental (E/E) flight.

16. (006) Responsibility for establishing procedures to clear repeat and recurring discrepancies rests with the
   a. flight chief.
   b. section chief.
   c. group commander.
   d. squadron commander.

17. (006) Responsibility for enforcing sound maintenance practices rests with the
    a. flight chief.
    b. section chief.
    c. group commander.
    d. squadron commander.

18. (006) Responsibility for reviewing, evaluating, and taking corrective action based on quality assurance (QA) and other inspection reports rests with the
    a. flight chief.
    b. section chief.
    c. group commander.
    d. squadron commander.

19. (007) Who approves local manufacture requests?
    a. Operations group commander.
    b. Maintenance group commander.
    c. Flying squadron commander.
    d. Operations support squadron commander.

20. (007) Who ensures there is an orientation program developed for all newly assigned personnel?
    a. Operations group commander.
    b. Maintenance group commander.
    c. Supply technician.
    d. Fuel journeyman.

21. (007) Personnel assigned to maintenance operations are responsible to the maintenance group commander for
    a. monitoring the product improvement program.
    b. monitoring the quality assurance program.
    c. the overall management of all functional areas.
    d. aircraft maintenance staff related functions.

22. (007) Who is responsible for the hour-by-hour execution of maintenance?
    a. Squadron commander.
    b. Maintenance group commander.
    c. Maintenance operations center (MOC).
    d. Plans, scheduling, and documentation (PS&D).

23. (008) Responsibility for ensuring high-quality maintenance rests with
    a. quality assurance personnel.
    b. the squadron commanders.
    c. all maintenance personnel.
    d. the logistics group commander.

24. (008) Which of the following is a dynamic inspection system designed to improve aircraft combat capability?
    a. Maintenance standardization and evaluation program (MSEP).
    b. Management inspection/evaluation concept.
    c. Phase inspection concept.
    d. No notice evaluation.

25. (008) After you have performed maintenance or repair on an aircraft or equipment, quality assurance (QA) personnel conducts a
    a. technical inspection.
    b. personnel inspection.
    c. supplemental inspection.
    d. quality verification inspection.

26. (008) An over-the-shoulder evaluation of a technician or supervisor accomplishing a maintenance action by quality assurance (QA) personnel, is a
    a. technical inspection.
    b. personnel evaluation.
    c. supplemental inspection.
    d. quality inspection.

Please read the unit menu for unit 2 and continue ➔

Student Notes

Unit 2. Inspections and Maintenance Documentation

THE BASIC FUNCTION OF YOUR ORGANIZATION is to ensure assigned aircraft and equipment are safe, serviceable, and properly configured to meet all mission needs. The maintenance actions you are required to perform include, but are not limited to, inspection, repair, overhaul, modification, preservation, refurbishment, testing, and analyzing the condition and performance of aircraft fuels systems. As you can see, you have a big and an important job. Did you notice that your responsibilities started with inspection of systems? There is a reason for this. In this unit, we cover the different inspection concepts the Air Force has adopted to "keep 'em flying."

In addition, we cover the importance of the maintenance documentation. You will gain a working knowledge of the symbols and Air Force technical order (AFTO) forms used in the aircraft maintenance complex.

2–1. Inspections

Throughout its existence, the Air Force has searched for proven methods to make its weapon systems safer, more reliable, and cost effective. Early on, it was determined that inspection systems could identify and help prevent equipment failures before they could cause costly or deadly failures. Today, the Air Force uses an inspection and maintenance concept that provides a method of performing required planned inspections and repairs on a scheduled and controlled basis. In order to use manpower effectively, planning and scheduling are required for the inspection concepts we cover in this section.

009. Inspection concepts

Since the middle of the 1960s, the Air Force has used the basic inspection concepts in use today. Currently, there are six authorized inspection concepts used for aerospace vehicles:

1. Periodic.
2. Phased.
3. Isochronal.
4. Aerospace vehicle manufacturer.
5. Programmed depot maintenance (PDM).
6. Contingency decks.

All these inspections are listed in detail in TO 00–20–1, *Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures*. The aircraft's –6 TOs or –6 TOs work cards authorize the use of each concept.

Before we cover the inspection concept, we need to present some overall information that applies to the inspection concepts:

- The Air Combat Command (ACC) inspects most of its assigned aircraft under the *periodic and phased* concepts.
- To better accommodate aircraft scheduling, the Air Mobility Command (AMC) predominantly uses the *isochronal* concept.
- The phased concept is designed to keep an aircraft out of commission for the shortest period. However, most of the older aircraft still used by the Air Force are on the periodic concept. Regardless of the inspection concept used at your base, all aircraft fall under the PDM concept.
- At wing level, the group commander is responsible for establishing the necessary controls to assure the periodic, phased, or isochronal inspections are accomplished at or near the scheduled due time.
- The single manager, in coordination with the using agency, schedules the PDM inspection at, or prior to, the scheduled due time.

NOTE: The weapon system manager is the program manager vested with full authority, responsibility, and resources to execute and support an approved Air Force program.

The earlier mentioned –6 inspection work cards may include varying calendar inspection periods (for example, 7-day, 14-day, etc.) as determined by the weapon system manager and MAJCOM personnel.

Inspections for support and training equipment include service, operator, special, periodic, acceptance, transfer, and war reserve material or mobility inspections.

We will now turn our attention to the six concepts that we mentioned earlier.

Periodic

There are seven basic sub-elements for the periodic inspection:

1. Pre-flight.
2. End-of-runway (EOR).
3. Thru-flight.
4. Basic post flight (BPO).
5. Hourly post flight (HPO).
6. Combined pre-flight/BPO or pre-flight/thru-flight.
7. Periodic.

Phased

There are seven basic sub-elements for the phased inspection:

1. Pre-flight.
2. EOR.
3. Thru-flight.
4. BPO.
5. HPO.
6. Combined pre-flight/BPO or pre-flight/thru-flight.
7. Phase

Isochronal

There are eight basic sub-elements for the isochronal inspection:

1. Pre-flight.
2. EOR.
3. Thru-flight.
4. BPO.
5. Combined pre-flight/BPO or pre-flight/thru-flight.
6. Home station checks (HSC).
7. Minor.
8. Major.

Aerospace vehicle manufacturer

The four basic sub-elements for the aerospace vehicle manufacturer inspection are as follows:

1. A check.
2. B check.
3. C check.
4. D check.

A/B checks are considered minor inspections and usually performed at home station. C/D checks are considered major inspections and are usually performed at a heavy maintenance/depot facility. The letter checks concept is specified in either flying hours or calendar days.

Programmed depot maintenance

The PDM is an inspection requiring skills, equipment, and facilities beyond your normal duties. Individual areas, components, and systems are inspected to a degree beyond the –6 requirements. PDM applies to all aircraft regardless of whether they are under the periodic, phased, or isochronal concept.

Contingency decks

The MAJCOM may authorize the use of a modified inspection work card deck for certain aircraft during contingencies, sortie surge exercises, and increased readiness conditions. These inspection work cards must be designated and published by the system manager, in conjunction with the lead command, for use only during periods of increased flying-in support of such activity. The lead command is the command that serves as operator's interface with the security program manager for a weapon system as defined by Air Force Policy Directive (AFPD) 10–9, *Lead Command Designation and Responsibilities for Weapon Systems*. The period of use must be authorized by the MAJCOM. The contingency decks are constructed to make certain that all items that would impact aircraft safety and reduce aircraft reliability are inspected. They are designed for use for only a limited period. The normal inspection work card deck is then accomplished upon termination of the contingency, increased readiness, or at the expiration of the authorized usage period as directed by the MAJCOM.

010. Basic scheduled inspections

Earlier, we listed some basic scheduled inspections that are common to the periodic, phased, isochronal concepts:

1. Pre-flight.
2. EOR.
3. Thru-flight.
4. BPO.

The main purpose for these inspections are flight stability, suitability, and preparedness. Each inspection examines certain systems, subsystems, and components to ensure that defects or hazards that would interfere with further flight of the aircraft do not exist.

Pre-flight inspection

As the name implies, the pre-flight inspection is a flight preparedness check. The pre-flight inspection is required before the first flight of a specified flying period (which is determined by the MAJCOM). The pre-flight inspection consists of a visual inspection and an operational check of certain systems and components to ensure that no defects exist that could cause accidents or abort missions. A pre-flight inspection is *mandatory at the following times*:

- Prior to the first flight of a specified flying period.
- When the pre-flight validity period has expired.
- When the pre-flight validity period is 72 hours and the aircraft has not flown within 48 consecutive hours.

Personnel at the MAJCOMs, in conjunction with the aircraft system manager, have the option of selecting a 24-, 48-, or 72-hour pre-flight validity period. If the pre-flight validity period selected is 72 hours, but the aircraft has not flown within 48 consecutive hours during the period, then another pre-flight must be performed prior to flight. This new pre-flight would then be valid for up to 72 hours.

End-of-runway inspection

The EOR inspection is a final visual inspection and/or operational check on some aircraft systems and components just before takeoff. The purpose of the inspection is to detect critical defects, which might have developed or become apparent during ground operation of the aircraft. The inspection normally includes such items as the following:

- Cuts in tires.
- Leakage in fluid systems.
- Landing gear down locks.
- Foreign object damage (FOD) covers.
- Removal of safety pins.
- Last minute security checks of aircraft panels and closed doors.

Thru-flight inspection

The thru-flight inspection is designed for use on cargo aircraft used for regular airline-type operations. It is, however, applicable to any aircraft for which an immediate turnaround or a continuation flight is scheduled. This inspection is performed prior to takeoff at intermediate stops for refueling or other normal requirements. The aircraft is checked visually to determine if there are any defects, which could impair flight safety. The scope of the thru-flight is governed by the inspection concept under which the aircraft is maintained.

Basic post flight inspection

The BPO inspection is performed after the last flight of a specified flying period. This inspection consists of checking the aircraft to determine whether it is suitable for another flight. A visual examination of certain systems and components is made to ensure that no defects exist which would be detrimental to flight safety.

Maintenance is not obligated to perform the BPO inspection until the aircraft is released by operations. If an aircraft lands to change pilots or other crewmembers, or if an aircraft makes a brief stop with the crew staying in the immediate area of the aircraft, the BPO inspection need not be

performed since the aircraft has not been released by operations. The BPO inspection is a more thorough check than the pre-flight or the thru-flight inspections.

011. Scheduled inspection characteristics

Of the five inspection concepts, only two have inspections based on the accrual of a number of flying or operating hours specified in the –6 TOs. These inspections are the HPO inspection and periodic inspection, which are from the periodic concept. The phase inspection is also based on the accrual of flying hours; it falls under the phase concept. As an aircraft fuel systems journeyman, most of your scheduled maintenance will be performed during the periodic and phased inspection.

Hourly post flight inspection

The HPO inspection is performed after a specified number of flying hours have been accumulated. It consists of checking certain component areas and systems of the aircraft to make sure that no conditions exist that could result in failure of the part before the next scheduled inspection. This inspection augments the BPO. In fact, a BPO is often done at the same time. The due time for all HPO is determined at the completion of each periodic inspection. Aircraft fuel systems journeymen are sometimes required to perform certain parts of these inspections.

Periodic inspection

The periodic inspection is a more extensive inspection than the HPO or BPO inspections. In addition to the recurring inspection items required at the HPO and BPO inspections, the periodic inspection includes certain parts, areas, and systems of the aircraft not inspected by a HPO or BPO. Each item and component is inspected and checked carefully against applicable technical data. Items failing to meet TO criteria are replaced, and the new items installed are again checked against TO procedures. Nothing is left to chance. As you can see, this is a very thorough inspection and the whole aircraft is checked.

The periodic inspection is due when the specified number of flying hours or calendar time has expired. As in the case of the HPO inspection, the aircraft should not be scheduled for flight if the mission over extends the inspection by too great a margin. MAJCOMs and single managers can approve deviations to schedules when inspections cannot be met.

Phase inspection

The phase inspection is a combination of parts of the BPO, HPO, and periodic inspection requirements. Lumping these three inspections into one would make an inspection that requires an extremely long time to complete. Therefore, this inspection is broken into parts or phases. The amount of flying time accrued between phases depends on the aircraft and its use. For example, in a phased inspection cycle having a 50-hour inspection interval, 12 inspections will be done during a 600-hour cycle. Phase 1 is due at 50 hours, phase 2 at 100 hours, phase 3 at 150 hours, and so on until the cycle is complete at 600 hours with phase 12, then the cycle starts all over at 650 hours with phase 1.

When aircraft are required for extended missions and are under the phased inspection concept, the required number of phase packages may be performed in advance to cover the period of the extended mission. One of the main objectives of the phase inspection is to reduce the time the aircraft is out of commission for any given inspection. The phases are arranged in such a manner that each requires approximately the same number of man-hours. This arrangement permits all inspection requirements to be met with a short out-of-commission time for any one phase.

012. Isochronal inspection concept

You have seen that the phased and periodic inspection concepts use flying time as the basis for scheduling inspections. In contrast, the isochronal system uses specified calendar intervals on which to build a schedule for inspections based on days.

Three inspections are included in the isochronal inspection system:

1. Major inspection.
2. Minor inspection.
3. HSC.

Major inspection

The major inspection is due on the accrual of the number of calendar days as specified in the applicable –6 TOs. This date is computed from the programmed start date of the last major inspection. It is a thorough and searching "look, see, and fix" of the weapon system and each of the requirements may be more extensive in scope than for past inspection items. A major inspection is a more thorough inspection than a minor inspection. In addition to the items covered by a minor inspection, a major inspection also covers parts, areas, and systems that require less frequent inspection due to their roles and high reliability. It is performed to determine if a condition exists that, if not corrected, could result in failure of a part or cause a system malfunction before the next scheduled inspection. The major inspection is performed at the end of the mission during which the specified number of days have accrued.

Minor inspection

The minor inspection is due upon the accrual of the number of calendar days specified in the applicable –6 inspection manual and –6 work cards. It consists of checking certain components, areas, or systems of the aircraft to ensure that no conditions exist that could result in failure or malfunction before the next scheduled inspection. Like the major inspection, the minor inspection is performed at the completion of the mission during which the specified calendar days are accrued.

Home station check

The HSC is a combination inspection of former BPO and HPO items. These items are arranged and designed to be performed at the home station when the aircraft returns from a long-range mission or on expiration of a specified short-term calendar interval. This inspection is due and is performed at the calendar interval specified in the –6 inspection work cards. When the HSC becomes due during a mission, the inspection is performed upon completion of that mission. It is completed in conjunction with minor and major inspections.

013. Other inspections

There are four supplemental inspections:

1. Calendar.
2. Transfer.
3. Acceptance.
4. Special.

Calendar inspections

Calendar inspections consist of 30-day and 90-day inspections. If an aircraft does not fly or is out of commission for more than 30 or 90 calendar days, maintenance personnel must perform the specified inspections required. Aircraft in PDM do not require the 90-day inspection to be accomplished if all the 90-day requirements have been accomplished as part of the PDM contract, and 90 days has not elapsed since they were done. More details concerning calendar inspections are listed in TO 00–20–1.

Transfer inspections

The losing unit prior to transfer of an aircraft from one Air Force unit to another performs transfer inspections. They do not apply to aircraft being loaned. The transfer inspection may be performed by PDM if the aircraft is to be transferred while in depot.

Acceptance inspections

Maintenance personnel perform these inspections on all newly assigned aircraft. During these inspections, they examine the aircraft with sufficient thoroughness to determine its mechanical fitness for flight and the completeness of its equipment and supporting documents. During this type of inspection, aircraft fuel systems journeymen ensure that all parts of the aircraft fuel system are accounted for and serviceable.

Special inspections

The –6 TO contains a section that is concerned with special inspections. These inspections differ from other types of inspections in that only one part of the aircraft or item requires inspection. Maintenance personnel perform special inspections on these three occasions:

1. On the accrual of a specific number of flying hours of operation.
2. Following the lapse of a specific calendar time.
3. After the occurrence of a specific or unusual condition. For example, an aircrew lands the aircraft too hard on the runway are requirements for a special inspection. The landing gear, wing attachment points, and internal aircraft fuel systems components could all be affected by the hard landing.

Normally, maintenance personnel perform hourly or calendar requirements of the special inspections along with the next BPO or phased inspection, such as HPO or periodic (if the periodic system is used), whichever is appropriate.

014. Inspection management

In this lesson, we first cover the procedures that provide a common approach to inspection management. Personnel, facilities, and equipment supporting the inspection unit must be reviewed before the inspection to ensure that they are adequate to carry out and complete the programmed workload. These three elements are explained in the following paragraphs to emphasize their importance. In addition, we look at the phases required to perform inspections.

Personnel

The skill and teamwork of the personnel performing the inspection determine the quality of the inspection and maintenance. To aid in developing efficient teams, the following two factors should be considered:

1. Inspection team integrity and stability should be maintained to ensure the team’s proficiency on a particular type of aircraft. Initially, individuals should be trained to inspect a specific area. After the individuals have developed proficiency in a particular area, they should be trained in other areas until they are qualified in all areas of the aircraft.
2. Personnel must be skilled in inspection procedures and techniques. In this regard, OJT of 3-skill level Airmen as additional team members provide a valuable means for upgrading inspection skills and techniques.

Facilities

The facilities available to the inspection unit depend on the location of the unit and the type of aircraft assigned. Facilities should be selected which have adequate heat, illumination, ventilation, and communications. The location should be favorable with respect to supporting shops. Regardless of facility differences, facilities that provide the basis for greatest efficiency for the inspection function should be used.

Equipment

Inspections cannot be performed efficiently without the required tools and equipment. To minimize delays, each inspection section should have access to the following items:

- Applicable –6 inspection work cards, TOs, and work unit code manuals.
- Adequate hand tools and special tools.
- Bench stock and petroleum products required for servicing.
- A card bin for controlling inspection work cards.

Inspection phases

An inspection should be carried out according to a basic plan. This plan is broken down into these four phases:

1. Pre-inspection phase.
2. Look phase.
3. Fix phase.
4. Post-inspection phase.

Most aircraft maintenance, and especially inspections, is performed using these phases.

Pre-inspection phase

The pre-inspection phase consists of the following:

1. Pre-inspection meeting.
2. Aircraft preparation.
3. Inspection area preparation.

Pre-inspection meeting

Personnel attend the pre-inspection meeting from PS&D, maintenance supply liaison (MSL), and representatives from the maintenance flight. The discussions will center on what can be accomplished reasonably within the time allotted. The requirements for performing maintenance relative to delayed discrepancies, TCTOs, time change items, and supply support are discussed also.

Aircraft preparation

The aircraft should be washed in preparation for inspection. In some cases, the aircraft may need to be defueled or refueled depending on the phase requirements. Also, ensure the aircraft has been disarmed.

Inspection area preparation

The inspection area must be clean, and the necessary equipment and tools must be available.

Look phase

The look phase trails the pre-inspection phase and consists of an inspection of the aircraft according to the applicable –6 inspection manual and work cards. All write-ups found are documented and given to the supervisor or coordinator for pre-planning the work to be done.

Fix phase

The fix phase may be started before the look phase is completed, but it should not interfere with the look phase. The fix phase consists of maintenance actions to correct write-ups found on the look phase and to close out the preplanned maintenance determined during the pre-inspection phase.

Post-inspection phase

The post-inspection phase starts when the fix phase is completed; however, it may be started earlier if directed by maintenance control. This phase consists of these three actions:

1. Performing operational checks according to the applicable –6 inspection work cards and TOs.
2. Preparing the aircraft for functional check flight, when applicable.
3. Correcting write-ups found on post-inspection checks and those found after the functional check flight.

The inspection phases we have covered apply to the aircraft inspection section. These procedures should be incorporated into how you accomplish your major inspections.

Self-Test Questions

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

009. Inspection concepts

1. Air Force aircrafts are inspected under what six inspection concepts?

2. Match the inspection concepts in column B with the type of scheduled inspection in column A. Items in column B may be used more than once.

Column A	*Column B*
____ (1) Pre-flight.	a. Phased.
____ (2) Periodic.	b. Periodic.
____ (3) HSC.	c. Isochronal.
____ (4) EOR.	
____ (5) Basic post flight.	
____ (6) Hourly post flight.	
____ (7) Thru-flight.	
____ (8) Minor.	
____ (9) Phase.	

010. Basic scheduled inspections

1. Summarize the purpose and scope of pre-flight, EOR, thru-flight, and BPO inspections.

2. How long is a pre-flight inspection valid?

3. Which inspection is accomplished just prior to takeoff?

4. What type of inspection would you perform on an aircraft that lands for refueling and plans to continue its flight immediately?

5. When is a BPO inspection completed?

6. What type of inspection determines if the aircraft is suitable for another flight?

011. Scheduled inspection characteristics

1. When is the HPO performed?

2. Which inspection does the HPO inspection augment?

3. A periodic inspection includes the recurring inspection items from what two inspections?

4. What is the main objective of the phase inspection?

012. Isochronal inspection concept

1. How many inspections are included in the isochronal inspection concept? What are they called?

2. When are major, minor, and HSC inspections due?

3. How does a major inspection compare with a minor inspection?

4. What does the minor inspection consist of?

5. Describe the HSC.

013. Other inspections

1. If an aircraft is idle for more than 30 days, what type of inspection must be performed?

2. When is an acceptance inspection performed?

3. Give three occasions when a special inspection may be required.

014. Inspection management

1. Why are the types of people used so important to proper inspections?

2. List the four basic requirements for adequate inspection facilities.

3. What equipment should each inspection team have to perform efficiently?

4. Match the inspection phase in column B with the appropriate inspection element in column A. Items in column B may be used more than once.

Column A	*Column B*
____ (1) Washing.	a. Pre-inspection phase.
____ (2) Equipment and tools available.	b. Look phase.
____ (3) Perform pre-planning maintenance.	c. Fix phase.
____ (4) Fulfill –6 work card requirements.	d. Post-inspection phase.
____ (5) Pre-inspection meeting.	
____ (6) Perform operational checks.	
____ (7) Correct discrepancies.	
____ (8) Clean inspection area.	
____ (9) Write-ups given to supervisor for pre-planning.	

2–2. Maintenance Documentation

Although the performance of aircraft maintenance and inspections is an extremely important part of the Air Force mission, the proper documentation of these maintenance and inspection actions is equally as important. If you were buying a used car from someone, wouldn't you appreciate a written record of all maintenance performed on the car since it was new? The information would help you determine when to inspect certain components, which components were replaced previously, and provide a foundation for any future malfunction which may need troubleshooting.

The same reasoning holds true for aircraft. The Air Force must keep accurate records of all maintenance performed on its weapon systems, and this is where you, as the maintenance personnel, get involved. All maintenance must be entered in the appropriate maintenance data collection system, such as IMDS or G081.

In addition to understanding the methods of maintenance documentation, it is equally important that you have a thorough knowledge of the various forms the Air Force uses to keep track of the maintenance being performed on aircraft and equipment. These forms are critical to the success of mission performance for any Air Force organization. After all, what a chaotic place the flight line would be if we did not have a means of informing each specialist the status of the aircraft they are assigned to work. Without a means of recording the status of each aircraft, we would never know how the aircraft was configured, and we would never know what inspections, service, or maintenance were due or had been done. In fact, we probably would not have a job, because the aircraft would have ceased to fly or crashed long ago.

To prevent this chaos from happening, the Air Force developed the AFTO Form 781 series. The AFTO 781 series forms are used to report the status of a particular weapon system or support system. In this regard, they provide records of the status of the following aircraft actions:

1. Maintenance.
2. Inspection.
3. Service.
4. Configuration.
5. Flight.

Although you will not use all of the 781 series forms in your day-to-day job, you will need a working knowledge of their basic purpose. In this section, we will provide you with that information by briefly describing the purpose of some of the AFTO 781 forms you will encounter and their entries. In addition, we will cover the uses of the AFTO Form 244, Industrial/Support Equipment Record, AFTO Form 245, Industrial Support Equipment Record (Continuation), and AFTO Form 427, Aircraft Integral Fuel Tank Repair Historical Record, all which are governed by TO 00–20–1.

015. Using symbols on forms

Symbols are established for use on maintenance documents. These symbols make important notations instantly apparent. The symbols readily reflect the mechanical condition; fitness for flight or operation; and service, inspection, and maintenance status of a particular weapon system or support system.

There are three symbols used on Air Force forms:

1. Red X.
2. Red dash (–).
3. Red diagonal (/).

You must have a full understanding of the three symbols in order to make the proper entries on maintenance documents. All symbols are entered in red. The symbols go from corner to corner; the dash goes all the way across the block. When the discrepancy is cleared, your last-name initial is entered in pencil over the red symbol. Make all other entries with a pencil.

The red X represents the most serious condition, the red dash represents the next most serious condition, and the red diagonal the least serious condition. We will now cover the use of each symbol.

Red X

Use a red X immediately upon discovery of an unsatisfactory condition serious enough to warrant its use. Entering a red X means that you believe the equipment, aircraft, or system is unsafe and may *not* be used until the red X has been cleared. The red X may be used also for in-process inspections when conditions (e.g., work stoppage, crew change, etc.) necessitate an entry in the maintenance document, as determined locally.

NOTE: Normally, each red X condition requires a separate entry on the maintenance document.

Red dash

The red dash indicates that a required special inspection, accessory replacement, operational check, or functional check flight is due. It also indicates that a scheduled inspection (preflight, postflight, BPO, HSC, etc.) is overdue. The presence of the symbol indicates the condition of the aerospace vehicle or equipment item is unknown and that a more serious condition may exist.

Red diagonal

The red diagonal indicates that an unsatisfactory condition exists on the aircraft or equipment but is not sufficiently urgent or dangerous to warrant grounding of the aircraft or discontinuing use of the

equipment. A red diagonal must be entered in the appropriate maintenance documents immediately upon receipt of an urgent action or category I routine action safety modification TCTO.

Entries not requiring symbols

Informational notes that do not affect safety of flight or the flying efficiency of the aircraft will not be assigned a symbol. These entries will have the words INFO-NOTE entered into the discrepancy block of the AFTO Form 781A, Maintenance Discrepancy and Work Document.

EXAMPLE: *INFO-NOTE. Weathered paint on number two main tank access cover.*

016. Using Air Force technical order 781 series forms

Earlier, in our introduction to this section, we described the chaos that would occur if we did not have ways to document the status of our aircraft or equipment. Recall that we said the Air Force uses the AFTO 781 series forms to prevent this chaos from happening. In this lesson, we describe the most common 781 series forms you will encounter on the job:

1. AFTO Form 781A, Maintenance Discrepancy and Work Document.
2. AFTO Form 781K, Aerospace Vehicle Inspection, Engine Data, Calendar Inspection and Delayed Discrepancy Document.
3. AFTO Form 781H, Aerospace Vehicle Flight Status and Maintenance.

AFTO Forms 781A and K

As a fuel journeyman, it is your responsibility to review the AFTO 781 series forms prior to performing any maintenance on an aircraft. Reviewing these forms ensures you are aware of the status of the aircraft and all the potential safety hazards. During your work, you will primarily deal with two of the AFTO 781 series forms:

1. AFTO Form 781A.
2. AFTO Form 781K.

The AFTO Form 781A is shown in figure 2–1; you are probably the most familiar with this form. Use the AFTO Form 781A to document each discrepancy discovered by aircrew or maintenance personnel—except for discrepancies resulting from battle damage. It is virtually impossible for any type of maintenance to be performed on the aircraft without annotating information on this form.

For weapon systems equipped with aircraft integrated data systems, such as the C–5 Maintenance Analysis Detection and Recorder Subsystem (MADARS), it is not necessary to enter malfunctions detected by the airborne automated checkout equipment on the AFTO Form 781A unless directed by the MAJCOM or local commander. At the end of each flight, the flight engineer will call up a printout with all malfunctions that were detected during flight. This summary printout will be attached to the AFTO Form 781A (upon termination at the home station only) even though the defects may be also recorded on the 781A.

Maintenance personnel are responsible for assuring sufficient copies of the AFTO Form 781A are available for the entire mission.

Form Completion Instructions Defined in TO 00-20-1 Para 5.7

FROM	TO	MDS	SERIAL NUMBER	PAGE / PAGES
20181007		B-1B	86-0123	1 OF

SYM	JCN	DATE DISC	DOC NO.	CF	XF	DATE CORRECTED
C	182800197001	20181007		781A ☐	781K ☐	20181007

WUC/REF	FAULT CODE	STA CODE	CORRECTIVE ACTION
			Removed and Replaced #1 Engine boost pump IAW 1B-1B-2-28JG-20-3 (28-23-10)

DISCREPANCY: #1 Engine boost pump inoperative

CORRECTED BY	EMPLOYEE NO.
K. Glynn	00599

DISCOVERED BY (Print)	EMPLOYEE NO.	INSPECTED BY	EMPLOYEE NO.
N. Chapman	00461	J. Callaway	01056

SYM	JCN	DATE DISC	DOC NO.	CF	XF	DATE CORRECTED
C	182800197002	20181007		781A ☐	781K ☐	20181007

WUC/REF	FAULT CODE	STA CODE	CORRECTIVE ACTION
			Ops Ck good IAW 1B-1B-2-28JG-20-3 (28-23-12)

DISCREPANCY: Operational Check due on #1 Engine boost pump

Refer to page 1 item 1

CORRECTED BY	EMPLOYEE NO.

DISCOVERED BY (Print)	EMPLOYEE NO.	INSPECTED BY	EMPLOYEE NO.
C. Morgan	02169	N. Chapman	00461

SYM	JCN	DATE DISC	DOC NO.	CF	XF	DATE CORRECTED
C	182800197003	20181007		781A ☐	781K ☐	20181007

WUC/REF	FAULT CODE	STA CODE	CORRECTIVE ACTION
			Leak Ck good IAW 1B-1B-2-28JG-20-3 (28-23-14)

DISCREPANCY: Leak Check due on #1 Engine boost pump

Refer to page 1 item 1

CORRECTED BY	EMPLOYEE NO.

DISCOVERED BY (Print)	EMPLOYEE NO.	INSPECTED BY	EMPLOYEE NO.
M. Hryniszak	02197	N. Chapman	00461

AFTO FORM 781A, 20170628 MAINTENANCE DISCREPANCY AND WORK DOCUMENT

Figure 2–1. Sample AFTO Form 781A entries.

Refer to figure 2–1 as we look at five of the entries required on the AFTO Form 781A:

1. Heading entries.
2. Other entries.
3. Warning notes.
4. Repeat discrepancies.
5. Operational checks.

Heading entries

Minimum heading requirements for double-sided AFTO Form 781A forms (odd numbered pages only) will be as follows:

- FROM—Enter the date the form was initiated.
  Example: 20100430 (year month date).
- TO—Enter the date the form was closed out and removed from the binder.
  Example: 20100502.
- MDS—Enter the aerospace vehicle mission, design, and series (MDS) designator.
  Example: F–16CJ, F–15E, F–22A, F–35, C–130H, C–5.
- SERIAL NUMBER—Enter the aerospace vehicle serial number.
  Example: 83–0228.
- Of_____PAGES—when closing a set of forms, enter the total number of pages on page one only.
  Example: Page 1 of 15 pages.

Other entries

Other block entries are as follows:

1. SYM BLOCK—Enter the proper symbol of each discrepancy documented. Never erase entries in this block, even if entered in error.
2. JCN—Maintenance personnel or aircrew technicians ensure the job control number (JCN) when assigned is entered.
3. DATE DISC—Aircrew or maintenance personnel will print the date discovered.
4. DOC NO—Maintenance personnel or aircrew trainer technicians ensure the supply document number, if part(s) is back ordered, is entered.
5. DATE CORRECTED—Enter the date discrepancy is corrected.
6. FAULT CODE—MAJCOM option.
7. STA CODE—Use this block for any corrective action accomplished away from home station and maintenance is performed by other than home station personnel.
8. DISCREPANCY—Review the forms to prevent duplication prior to entering any new discrepancies.
9. DISCOVERED BY—Person who discovered the discrepancy enters his or her name (first initial and last name).
10. EMPLOYEE NO—Enter your employee number.
11. CORRECTIVE ACTION—Enter the corrective action with the TO reference.
12. CORRECTED BY—Person who did the maintenance.
13. INSPECTED BY—Person who inspected the job. Most of the time, this is a 7-level.

When a new AFTO FORM 781A is initiated, uncorrected discrepancies are carried forward to a new AFTO FORM 781A. Discrepancies that we do not intend to fix in the immediate future can be

transferred to a 781K. Red X discrepancies *cannot* be transferred to the 781K, only diagonal and dash discrepancies can.

The AFTO Forms 781K are maintained in the forms binder and are used to document delayed discrepancies. Use of this form is governed by TO 00–20–1. You use the reverse side (section D). The crew chief, flight crew, and all specialists are authorized to make entries on this form.

If the discrepancy is to be transferred to the AFTO FORM 781K, mark the XF 781K box on the 781A with a red X. Transcribe the symbol, JCN, original discrepancy and, if applicable, the supply document number.

Do not place an initial over the symbol for the discrepancies that are carried forward or transferred to another form since this only represents a transcribing action and does not correct the reported condition.

Warning notes

Whenever a red X discrepancy is of a nature that operation of the affected system(s) under any circumstances would be hazardous or result in further damage, a warning note shall be included following the discrepancy statement.

EXAMPLE: *NOTE—OPEN FUEL TANKS—DO NOT APPLY EXTERNAL POWER.*

The word “NOTE” must be entered in red followed by the remarks, which may also be written in red. If the remarks are not written in red, they must be underlined with a red pencil, twice. Never write the word “NOTE” in the symbol block. When required, only the applicable red symbol will be entered in the symbol block to denote the seriousness of the entry. Line through the note when the condition that created the note no longer applies.

Repeat discrepancies

Repeat discrepancies are identified by entering “REPEAT” in red in the discrepancy block.

Operational checks

When an operational check is required because of maintenance performed, and it is accomplished immediately after maintenance, it is documented in the CORRECTIVE ACTION block by including a statement such as “OPS CK GOOD.”

If a malfunction is detected during the operational check, document the finding (sign off the original write-up as “OPS CK BAD”) and refer to a new write-up documenting the malfunction under the appropriate symbol.

AFTO Form 781H

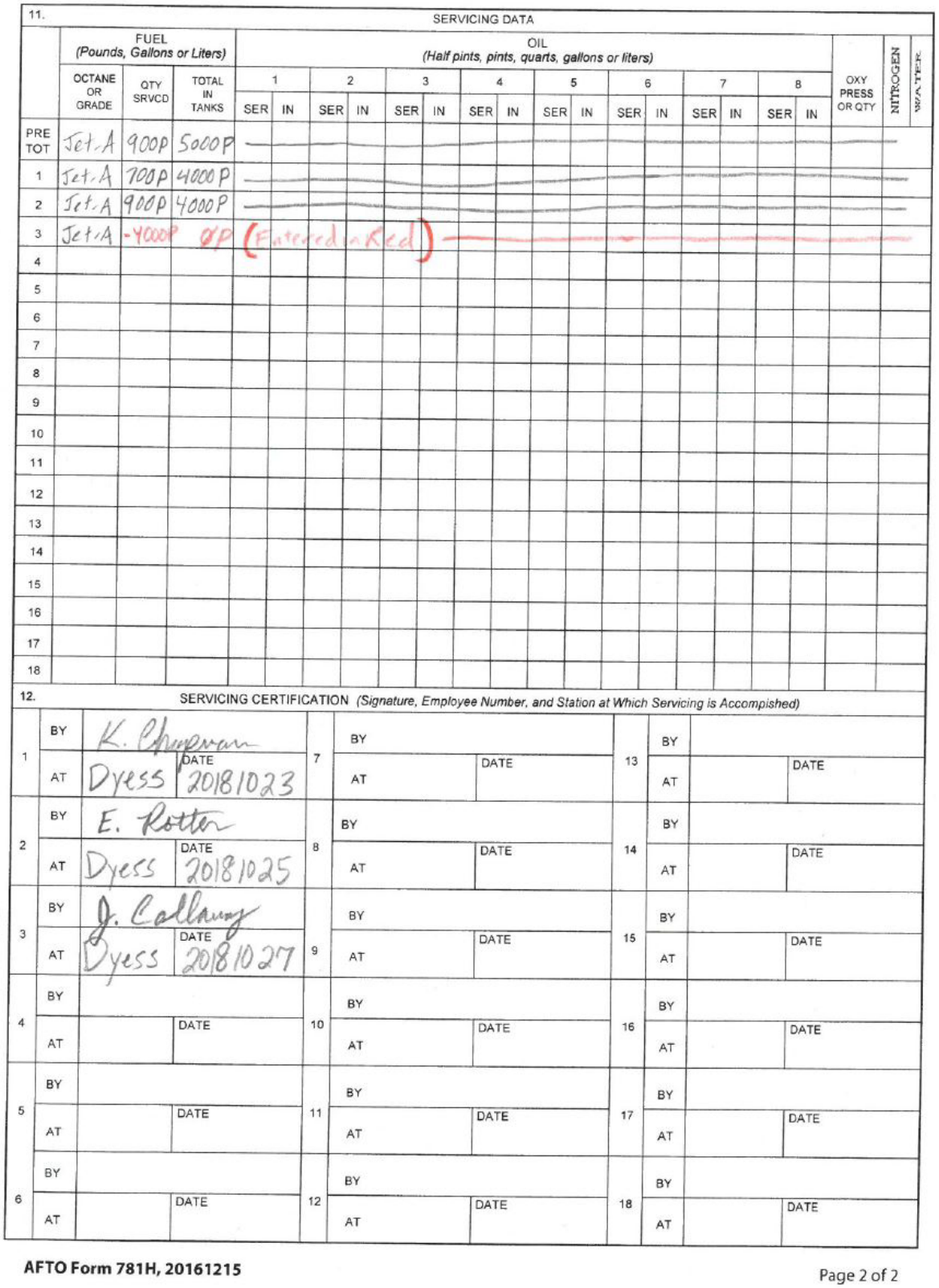
You can use the AFTO Form 781H to document maintenance status and service information and to provide the reference status of aerospace vehicles. You will primarily be concerned with the back of the form, block 13. Refer to figure 2–2 as we discuss the entries that are required.

There is a row that is labeled PRE TOT; this stands for previous total. Use this row to transcribe the last entry from the previous 781H. The next rows numbered 1–18 are where you record the fuel that is added or removed from the aircraft:

- OCTANE OR GRADE—Enter the fuel grade/octane that the aircraft was serviced with.
- QTY SRVCD—Enter the total quantity of fuel (liters, gallons, or pounds) that was refueled or defueled at one operation. Always put an “L ,” “G,” or “P” after the amount of fuel to indicate the type of measurement system used. If you remove fuel, put the entry in red with a minus sign in front of the number.
- TOTAL IN TANKS—Total number of fuel onboard in all tanks, followed by the appropriate letter as described above.

Line through all unused blocks on a servicing row. For example, if only fuel is added, line through oil, oxygen, and nitrogen blocks not used in the servicing number row. This will ensure that no additional entries are made on a service line that has been certified in block 14.

Block 14 is for servicing certification. The individual who performs or supervises the operation enters their *minimum signature* of first initial and last name in the BY block corresponding with the row in block 13. Enter the station name and date at which the action was performed in the corresponding AT and DATE blocks.



11. SERVICING DATA

	FUEL (Pounds, Gallons or Liters)			OIL (Half pints, pints, quarts, gallons or liters)																OXY PRESS OR QTY	NITROGEN	WATER
	OCTANE OR GRADE	QTY SRVCD	TOTAL IN TANKS	1 SER	1 IN	2 SER	2 IN	3 SER	3 IN	4 SER	4 IN	5 SER	5 IN	6 SER	6 IN	7 SER	7 IN	8 SER	8 IN			
PRE TOT	Jet-A	900P	5000P																			
1	Jet-A	700P	4000P																			
2	Jet-A	900P	4000P																			
3	Jet-A	-4000P	0P	(Entered in Red)																		
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						

12. SERVICING CERTIFICATION (Signature, Employee Number, and Station at Which Servicing is Accomplished)

1	BY	K. Chapman	7	BY		13	BY	
	AT	Dyess	DATE 20181023		AT	DATE		AT	DATE
2	BY	E. Rotter	8	BY		14	BY	
	AT	Dyess	DATE 20181025		AT	DATE		AT	DATE
3	BY	J. Callaway	9	BY		15	BY	
	AT	Dyess	DATE 20181027		AT	DATE		AT	DATE
4	BY		10	BY		16	BY	
	AT		DATE		AT	DATE		AT	DATE
5	BY		11	BY		17	BY	
	AT		DATE		AT	DATE		AT	DATE
6	BY		12	BY		18	BY	
	AT		DATE		AT	DATE		AT	DATE

AFTO Form 781H, 20161215

Page 2 of 2

Figure 2–2. Sample AFTO Form 781H entries.

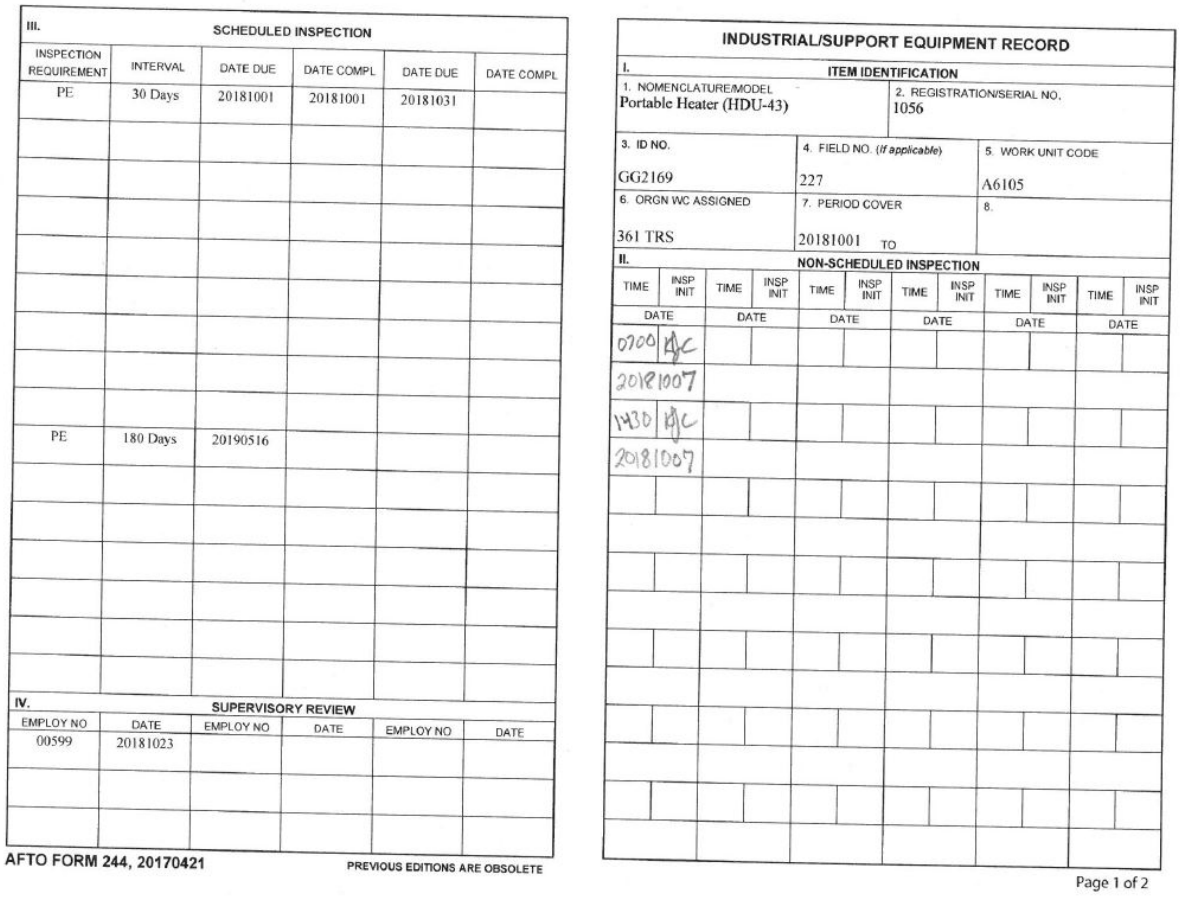
017. Using other Air Force technical order forms

In this section, we cover other AFTO forms you frequently use in your job. We will discuss them briefly; if in doubt, ask your supervisor or refer to the TO. The following forms will be discussed:

1. AFTO Forms 244, Industrial/Support Equipment Record and 245, Industrial Support Equipment Record (Continuation).
2. AFTO Form 427, Aircraft Integral Fuel Tank Repair Historical Record.

AFTO Form 244/245

The AFTO Forms 244 and 245 provide a means to document equipment delayed discrepancies and corrective actions, record service, periodic and special inspections, record inspection status, and historical data. The AFTO Form 244 *must be attached* to all items of support equipment, such as special tools and test equipment, and AGE. Entries on this form are similar to the entries made on AFTO Form 781A. An example of the AFTO Form 244, Page 1, is shown in figure 2–3.



III. SCHEDULED INSPECTION

INSPECTION REQUIREMENT	INTERVAL	DATE DUE	DATE COMPL	DATE DUE	DATE COMPL
PE	30 Days	20181001	20181001	20181031	
PE	180 Days	20190516			

IV. SUPERVISORY REVIEW

EMPLOY NO	DATE	EMPLOY NO	DATE	EMPLOY NO	DATE
00599	20181023				

AFTO FORM 244, 20170421 PREVIOUS EDITIONS ARE OBSOLETE

INDUSTRIAL/SUPPORT EQUIPMENT RECORD

I. ITEM IDENTIFICATION

1. NOMENCLATURE/MODEL	2. REGISTRATION/SERIAL NO.
Portable Heater (HDU-43)	1056

3. ID NO.	4. FIELD NO. (*If applicable*)	5. WORK UNIT CODE
GG2169	227	A6105
6. ORGN WC ASSIGNED	7. PERIOD COVER	8.
361 TRS	20181001 TO	

II. NON-SCHEDULED INSPECTION

TIME	INSP INIT	TIME	INSP INIT	TIME	INSP INIT	TIME	INSP INIT	TIME	INSP INIT	TIME	INSP INIT
DATE		DATE		DATE		DATE		DATE		DATE	
0700	MJC										
20181007											
1430	MJC										
20181007											

Page 1 of 2

Figure 2–3. Sample AFTO Form 244, Page 1.

The AFTO Form 244, Page 1 is divided into these five parts: Part I, Item Identification; Part II, Non-Scheduled Inspection; Part III, Scheduled Inspection; Part IV, Supervisory Review; and Part V, Maintenance/Delayed Discrepancy. The AFTO Form 245 is a continuation of Part V.

Part I, Item Identification

This first part of the form provides a means to record the identity of the system or equipment for which the form is maintained. The entries on this part are self-explanatory and usually are preprinted if using a computer-generated version of the form.

Part II, Non-Scheduled Inspection

This part provides a means to document required support equipment servicing inspections and prior-to-use inspections.

TIME/DATE

Enter the time and date the service/prior-to-use inspection was accomplished. If the unit is equipped with a running time meter, the meter time may be used in place of the time of day.

INSP INIT

Enter the initials of the person completing the inspection.

Part III, Scheduled Inspection

This section provides a means to document inspection due (for example, periodic inspection [PE], special wheel bearing, etc., and number, if applicable).

INSPECTION REQUIREMENT

Enter the type inspection due (e.g., P.E. special wheel bearing, etc., and number, if applicable).

INTERVAL

Enter the scheduled inspection interval (e.g., hourly/monthly/annual).

DATE DUE/DATE COMPLETED

Enter the next inspection hour/date in the next open DATE DUE block and enter the hour/date the inspection was completed in the DATE COMPL block.

Part IV, Supervisory Review

This section provides a means to document a quality control or supervisory review of the equipment forms. The specific time intervals between supervisor reviews may be determined by the MAJCOM or delegated to the logistics commander.

NOTE: This section is not to be used for documenting inspection of completed maintenance.

EMPLOYEE NUMBER

Enter the employee number (or first name initial, last name, and grade).

DATE

Enter the date the supervisory review was accomplished.

Part V, Maintenance/Delayed Discrepancy

Part V of the AFTO Form 244 is where you document inspections or any problems with the affected piece of equipment. The AFTO Form 245 shown in figure 2–4 is a continuation of Part V of AFTO Form 244. It provides users a means to document discrepancies and corrective actions as a separate document or as an extension of the AFTO Form 244.

Examples of conditions to be reported in Part V include the following:

- Delayed discrepancies (malfunctions identified that cannot be corrected as part of the maintenance actions in progress and must be scheduled for follow-on maintenance actions).
- Overdue scheduled inspections.
- Overdue time change, major configuration lists, and TCTOs.
- Discrepancies discovered by the operator during operation of the system/equipment.

INDUSTRIAL SUPPORT EQUIPMENT RECORD
(Continuation)

V. MAINTENANCE/DELAYED DISCREPANCY

9. T.O.	10. NSN	11.	12.			
35E11-2-3	4810-00-383-1056					

DATE DISCOVERED	DISCOVERED BY / SUP DOC NO.	SYMBOL	DISCREPANCY	JOB CON/	CORRECTIVE ACTION	DATE CORRECTED	CORRECTED BY / INSPECTED BY
20181001	K. Clyn 00599 X361FS18274000	C	#1 Shut-off Valve Inoperative	18274 0019	Replaced #1 Valve	2018 1007	A. Howat K. Chapman

AFTO FORM 245, 20170420 PREVIOUS EDITION IS OBSOLETE

Figure 2–4. Sample AFTO Form 245.

TO

Enter technical order number or manufacturer's manual that covers the item identified in block 1.

NATIONAL STOCK NUMBER

Enter the assigned national stock number (NSN) for the item identified in block 1.

Blocks 11 and 12

These blocks are optional for MAJCOM use.

DATE

This is the date-discovered column. Self-explanatory.

DISCOVERED BY

The personnel discovering the discrepancy signs his or her first name initial, last name, grade, or employee number. If this block is not used, enter N/A or leave blank.

SUPPLY DOCUMENT NUMBER

Enter the base supply document number (SUP DOC NO). As the requester receives parts, draw a single line through the document number to show its receipt.

SYMBOL

This is the symbol column. Enter the applicable status symbol for the discrepancy. Discrepancies that are discovered on equipment that do not require a red symbol should be annotated “Info” only if an individual finds that it is important to pass on relevant information.

DISCREPANCY

Enter the discrepancy or maintenance action required. This entry should reflect the same description that appears on the associated AFTO Form 349, Maintenance Data Collection Record, or automated product.

JOB CONTROL OR WORK ORDER NUMBER CON/W.O. NO

Enter the job control or work order number (CON/W.O. NO) assigned to the discrepancy.

CORRECTIVE ACTION

Enter the description of the corrective action taken or leave blank if necessary. If more space is needed to make this entry, use the next open block.

DATE CORRECTED

Self-explanatory.

CORRECTED BY

The person that corrects the discrepancy will sign his or her first name initial, last name, grade, or employee number in this block.

INSPECTED BY

The person authorized to clear red X symbols will enter their first name initial, last name, and grade in this block and initial over the red X in the symbol column.

NOTE: The AFTO Forms 244 and 245 will be closed out and a new form initiated when additional recording space is required.

AFTO Form 427

All fuel leaks are documented on AFTO Form 427 (fig. 2–5); this includes temporary repairs. Since it has required that temporary repairs be permanently repaired any time the fuel tank is entered, you must be aware of any temporary repairs that have not been permanently repaired. All integral fuel tank leaks are annotated on the AFTO Form 781A or 781K and on the AFTO Form 427 unless the specific aircraft TO states otherwise. After a permanent repair is accomplished, the AFTO Form 427 is maintained as historical data, and the entry on AFTO 781A or 781K is cleared. These documents accompany the aircraft to depot, or contractor repair, or when it is transferred.

Always consult aircraft historical data when fuel systems maintenance is to be performed. The completed historical records are retained on file and will be forwarded with the weapon system documents if the aircraft is transferred or the component is removed and shipped to an overhaul facility. By looking at the example, you can see all the information that may be required.

AIRCRAFT INTEGRAL FUEL TANK REPAIR HISTORICAL RECORD — PAGE 1 OF PAGES

1. MISSION DESIGN SERIES/TYPE, MODEL AND SERIES	2. MANUFACTURER	3. ACCEPTANCE DATE	4. AIRCRAFT T.O.
KC-135 61-0624	Boeing	20181207	1C-135(K)R 2-5GA-2

ENTRY	DATE	FUEL LEAK LOCATON: WING R	WING L	TANK	WING STATION	STRING NUMBER	LEAK CLASS: A	B	C	D	TYPE REPAIR: TMP	PRM	CAUSE OF LEAK	REMARKS	ORGANIZATION
1	20181210	☒	☐	4	427	7	☒	☐	☐	☐	☐	☐	Fastener	No Repair Required	552 CMS
2	20190205	☒	☐	4	415	5	☐	☒	☐	☐	☒	☐	Fastener	Applied Pig Putty	552 CMS
3	20190216	☐	☒	2	253	2	☐	☐	☒	☐	☐	☒	Defective Sealant	Removed Faulty Sealant; Perm Repair A-1/2, B-1/2	552 CMS
4	20190216	☐	☒	1	368	16	☐	☐	☐	☒	☐	☒	Rivet Failure	R2 Fastener, Re-applied Sealant A-1/2, B-1/2	552 CMS
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			
		☐	☐				☐	☐	☐	☐	☐	☐			

AFTO FORM 427, 20120928 — PREVIOUS EDITION IS OBSOLETE

Figure 2–5. Sample AFTO Form 427.

Self-Test Questions

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

015. Using symbols on forms

1. What is the primary purpose for using maintenance symbols on aircraft forms?

2. How should a symbol be entered in the symbol block of maintenance documents?

3. Under what circumstance would you enter a red X in the symbol block of a maintenance document?

4. Which red maintenance symbol indicates the condition of the equipment is unknown?

5. What type of maintenance document entries do not require the entry of a symbol in the symbol block?

016. Using Air Force technical order 781 series forms

1. What type of discrepancies do not require documentation on AFTO Form 781A?

2. What is the procedure for documenting a warning note in the discrepancy block of AFTO Form 781A?

3. What symbols can be transferred to the 781K?

4. When the condition requiring a warning note in the DISCREPANCY block no longer applies, what action closes it out?

5. In block 13 of the AFTO Form 781H, how do you document fuel that is removed from the aircraft?

6. On the AFTO Form 781H, who enters their name in block 14 and in what format?

017. Using other Air Force technical order forms

1. What purpose does the AFTO Form 244 serve?

2. To what type of equipment must the AFTO Form 244 be attached?

3. Prior to using an equipment item, on what part of the AFTO Form 244 do you document an inspection of the item?

4. What part of AFTO Form 244 is used to document overdue scheduled inspections?

5. Integral fuel tank leaks are documented on what forms?

6. Which documents accompany the aircraft to depot, or contractor repair, or when it is transferred?

Answers to Self-Test Questions

009

1. (1) Periodic.
   (2) Phased.
   (3) Isochronal.
   (4) Aerospace vehicle manufacturer.
   (5) PDM.
   (6) Contingency decks.
2. (1) a, b, c.
   (2) b.
   (3) c.
   (4) a, b, c.
   (5) a, b, c.
   (6) a, b.
   (7) a, b, c.
   (8) c.
   (9) b.

010

1. The basic purposes are flight stability, suitability, and preparedness. Each inspection examines certain systems, subsystems, and components to ensure that defects or hazards that would interfere with further flight of the aircraft do not exist.
2. 24, 48, or 72 hours.
3. EOR.
4. Thru-flight.
5. After the last flight of the flying period.
6. BPO.

011

1. After a specified number of flying hours have accumulated.
2. BPO.
3. BPO and HPO.
4. To reduce the out-of-commission time for an aircraft.

012

1. Three: major, minor, and HSC.
2. At the end of the calendar period specified in the applicable – 6 TO.
3. A major inspection is far more thorough than a minor inspection. In addition to the items covered by a minor inspection, a major inspection also covers parts, areas, and systems that require less frequent inspection due to their roles and high reliability.
4. Checking certain components, areas, or systems to ensure they will not fail or malfunction before the next scheduled inspection.
5. It is a combination of former BPO and HPO inspections.

013

1. A calendar inspection.
2. On all newly assigned aircraft.
3. (1) On the accrual of a specific number of flying hours of operation.
   (2) Following the lapse of a specific calendar time.
   (3) After the occurrence of a specific or unusual condition.

014

1. The skill and teamwork of personnel performing the inspection determine the quality of inspection and maintenance.
2. (1) Adequate heat.
   (2) Illumination.
   (3) Ventilation.
   (4) Communications.
3. (1) Applicable – 6 inspection work cards, TOs, and work unit code manuals.
   (2) Adequate hand tools and special tools.
   (3) Bench stock and petroleum products.
   (4) A card bin.
4. (1) a.
   (2) a.
   (3) c.
   (4) b.
   (5) a.
   (6) d.
   (7) d.
   (8) a.
   (9) b.

015

1. To make important notations instantly apparent.
2. All symbols must be entered in red. All other entries must be made with a pencil.
3. Immediately after discovering that an unsatisfactory condition exists that is serious enough to warrant its use.
4. The red dash.
5. Informational notes not affecting safety of flight or the flying efficiency of the aircraft.

016

1. Discrepancies resulting from battle damage.
2. The note should follow the discrepancy statement and should be entered in red followed by the remarks, which may also be written in red. If the remarks are not written in red, they must be underlined twice in red pencil.
3. Only diagonals and dashes.
4. Line through the note.
5. Write the entry in red with a minus sign in front of the number.
6. The person who performs or supervises the operation, they enter their minimum signature of first initial and last name.

017

1. It provides a means to document equipment delayed discrepancies and corrective actions, record servicing and inspections, record inspection status and historical data.

2. To all items of support equipment such as special tools, test equipment, and AGE.
3. Part II, Non-Scheduled Inspections.
4. Part V, Industrial/Support Equipment Record.
5. AFTO Form 781A or 781K and an AFTO Form 427 unless the specific aircraft technical order states otherwise.
6. AFTO Form 781A or 781K and the AFTO Form 427. After a permanent repair is accomplished, the AFTO Form 427 is maintained as historical data, and the AFTO Form 781A or 781K is cleared. These documents accompany the aircraft to depot or contractor repair when it is transferred.

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

Unit Review Exercises

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

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

27. (009) Which inspection requires skills, equipment, and facilities beyond your normal duties?
    a. Phased.
    b. Periodic.
    c. Isochronal.
    d. Programmed depot maintenance (PDM).

28. (009) Which type of workcards may be authorized for use during contingencies?
    a. Deployed workcards.
    b. Periodic workcards.
    c. Inspection decks.
    d. Contingency decks.

29. (010) Which inspection concept is applicable to aircraft doing an immediate turnaround?
    a. Hourly post flight.
    b. Thru-flight.
    c. End-of-runway.
    d. Preflight.

30. (011) Which inspection augments the basic post flight (BPO)?
    a. Preflight.
    b. Thru-flight.
    c. End-of-runway.
    d. Hourly post flight.

31. (012) Which inspection concept is performed when the aircraft returns from a long-range mission?
    a. Phase.
    b. Minor.
    c. Major.
    d. Home station check.

32. (013) An aircraft is examined with sufficient thoroughness to determine its mechanical fitness for flight and the completeness of its equipment and supporting documents during
    a. a time replacement inspection.
    b. an acceptance inspection.
    c. a calendar inspection.
    d. a special inspection.

33. (013) Which inspection is outlined in the –6 technical order (TO) and differs from other types of inspections in that only one part of the aircraft or item requires the inspection.
    a. Special.
    b. Calendar.
    c. Acceptance.
    d. Time replacement.

34. (014) During an inspection, when are all write ups found and documented?
    a. Fix phase.
    b. Look phase.
    c. Post-inspection phase.
    d. Pre-inspection meeting.

35. (015) When you *clear* a discrepancy in Air Force technical order (AFTO) 781s, what is placed over the symbol?
    a. First name initial.
    b. First and last name initials.
    c. Last name initial.
    d. Minimum signature.

36. (015) Which symbol indicates an unsatisfactory condition exists but is not sufficienty urgent or dangerous to warrant discountinuing use of the equipment?
    a. Red X.
    b. Red dash.
    c. Red diagonal.
    d. Warning note.

37. (016) Prior to performing maintenance, you review the Air Force technical order (AFTO) 781s to ensure
    a. air pressure in the tires is good prior to refueling.
    b. there are no open discrepancies.
    c. there are no open fuel tanks.
    d. there are no potential safety hazards.

38. (016) To enter a warning note in the Air Force technical order (AFTO) Form 781A, Maintenance Discrepancy and Work Document, the word “NOTE” is entered in
    a. red in the symbol block.
    b. black in the discrepancy block, followed by the remarks written in red.
    c. red in the discrepancy block, followed by the remarks, which may be written red.
    d. black in the discrepancy block, followed by the remarks written in black and underlined in red.

39. (016) On the Air Force Technical Order (AFTO) Form 781H, after refueling the aircraft, the person who performs or supervises the operation puts their name in block 14 using what format?
    a. Minimum signature (first initial and last name).
    b. Printed first and last name.
    c. Last name only.
    d. First name only.

40. (017) What part of the Air Force Technical Order (AFTO) Form 244 provides a means to document a quality control review of the form?
    a. Part II, NON-SCHEDULED INSPECTIONS.
    b. Part III, SCHEDULED INSPECTIONS.
    c. Part IV, SUPERVISORY REVIEW.
    d. Part V, INDUSTRIAL/SUPPORT EQUIPMENT RECORD.

41. (017) After a permanent repair on a fuel tank is accomplished, the Air Force Technical Order (AFTO) Form 427, Aircraft Integral Fuel Tank Repair Historical Data Document, is
    a. cleared.
    b. destroyed.
    c. maintained as historical data.
    d. re-accomplished.

Student Notes

Please read the unit menu for unit 3 and continue ➔

Unit 3. Maintenance Related Safety Fundamentals

COMMANDERS AND SAFETY MANAGERS at all echelons are always faced with convincing their people that safety is the responsibility and concern of everyone. Much has been written and said about the matter but perhaps an Air Force captain said it best a few years ago:

"Safety isn't something one can take or leave alone. It is not an activity that's participated in only when one is being watched or supervised, or when there is a safety person around. Safety isn't posters, slogans, or rules; nor is it movies, meetings, investigations, or inspections. Safety is an attitude—a frame of mind. It is the conscious awareness of one's environment and action all day, every day. Safety is knowing what is going on, what can injure anyone or anything, how to prevent that injury, and then acting to prevent the injury or damage. To do this does not require a genius, a degree, or a title of rank. All it requires is a reasonable amount of intelligence and an ability to see, hear, smell, and think. To ignore safe practices doesn't indicate a brave person, only a foolish one; and to do things safely and correctly is the mark of a wise man, not a timid one."

In your job as an aircraft fuels systems journeyman, you will be working in a very dangerous place. Thus, you need to take the captain's advice to heart—you must live and breathe safety all day, every day. Stop for a moment and think of your job environment: running jet engines, taxiing aircraft, moving vehicles, high-noise, hazardous materials, corrosive fluids, flammable fluids, radiation, lethal levels of electricity, fire, ammunition, bombs, missiles, other people, and the list goes on and on.

With all these hazards facing you, you need as much help as you can get to do your job in a safe manner. Although the Air Force does its best to limit the dangers of your workplace, there is really only one person who can prevent you from becoming a statistic—YOU. All the instructions and literature on safety cannot and will not prevent you from having an accident. Only thinking about and making a conscious effort to follow their message can prevent accidents. This thinking must come from you. Think and practice safety to the point that it becomes an automatic reaction. When you reach this point, you become safety conscious and always take the positive actions necessary to ensure you work safely.

In this unit, we look at the principles of ground safety. You will see that your organization has a ground safety program whose principal objective is to eliminate accidents. Then, we cover three flightline hazards of which you must be aware: static electricity, aircraft dangers and FOD. Also, we cover the precautions and procedures necessary for safely working with and handling fuels, chemicals, and compressed gases. There is no doubt that the repair of aircraft fuel systems presents

hazards that are difficult to eliminate. These dangers require the use of special equipment and clothing designed to protect you. We conclude the unit with information about the personal protective equipment used in this career field.

3–1. Principles of Ground Safety

Like many Air Force professions, your duties as an aircraft fuels systems journeyman are as safe as YOU make them! As we stated earlier, there are many hazards involved with aircraft maintenance. Fuel systems maintenance is no exception and has its own specific hazards. Your best protection against these hazards is to know your job, know the hazards, and follow all safety practices and procedures. In this section, we will cover three major subject areas as they apply to ground safety:

1. Causes and effects of accidents.
2. Techniques for accident prevention.
3. Ground mishap reporting.

018. Causes and effects of accidents

According to the National Safety Council, accidents are the fourth leading cause of death in the United States. Only heart disease, cancer, and chronic lower respiratory disease kill more people. This ranking is based on all types of accidents including motor vehicle accidents, drowning, fires, falls, natural disasters, and work-related accidents. It is interesting to note that only two percent of all accidents are due to natural causes such as lightning, storms, or floods.

While you are reading this short lesson, three people will be killed and about 390 will suffer a disabling injury. On the average, there are 15 unintentional-injury deaths and about 2,360 disabling injuries every hour. The cost of workplace accidents is estimated to be $58 billion a year. Air Force people are not immune to these statistics. Although the Air Force goes to great expense to develop safety programs and supervisors at all levels are tasked to ensure their people work safely, ACCIDENTS HAPPEN. It is surprising to note that many people believe that accidents are unavoidable. These people are of the mistaken belief that accidents are the inevitable result of unchangeable circumstances or fate.

In this lesson, we will cover three areas as they apply to the cause and effect of accidents:

1. Cause and effect relationship.
2. Preventable accidents.
3. Indirect costs of accidents.

Cause and effect relationship

The basic ingredient of all accidents is based upon the law of cause and effect. This cause and effect relationship can be used to give reasons and explanations for events, conditions, or behaviors that can cause accidents, injuries, or deaths in the workplace (and other environments) and the consequences (effects) of the events, conditions, or behaviors. For example, if you continually work around running jet engines without using the proper ear protection, you will eventually suffer hearing loss or deafness.

Preventable accidents

Theoretically, preventable accidents can be traced to your earlier training or causes originating in your work environment. These beginnings can further be said to manifest themselves in unsafe personal characteristics that allow you to perform an unsafe act or to overlook or tolerate unsafe conditions that may result in an accident. When the accident happens, the injuries, property damage, and loss of combat capability that follow complete a costly cause and effect sequence. Of course, the

way to prevent or stop the cause and effect sequence or relationship is to start at the cause—usually unsafe acts or personal characteristics.

Often, the last and most obvious element of the cause sequence preceding an accident are unsafe acts and conditions. Thus, these unsafe acts and conditions can be considered the immediate or direct cause of the accident. When this direct cause is removed, the sequence is interrupted or stopped, and the accident is preventable. Usually, unsafe acts and conditions can be anticipated, readily identified, and eliminated almost immediately upon discovery. Because of this, practical accident prevention measures are designed to prevent or eliminate direct causes, and suitable controls have been developed for this purpose.

From this, you can see that correcting unsafe acts and conditions is a relatively simple and effective means of accident prevention; however, the detection and elimination of unsafe personal characteristics, such as inattentiveness, excitability, impatience, and stubbornness, are normally extremely difficult to detect and correct.

Indirect costs of accidents

Earlier, we covered some of the human costs in injuries and deaths that result from accidents. We also stated that the monetary costs are almost $50 billion a year. In addition to direct costs, every accident involves indirect costs that are estimated to be several times those that can be readily counted.

Indirect cost means all costs associated with an accident other than property damage and medical expenses for injured or killed people. Indirect costs include all of the following:

- Loss of time and production of the injured and those who aid them.
- Time lost by curious or sympathetic people at the scene of the accident.
- Time lost through investigation.
- Cost of training replacements.
- Interference with operations.

Though less tangible than direct costs, indirect losses can be computed and totaled in the overall cost of any accident. Personnel at any installation can establish a valid, indirect cost ratio by calculating these indirect losses over a representative time period and comparing them with equivalent direct costs.

NOTE: Studies indicate that the ratio of indirect to direct costs is at least four to one. In other words, for every dollar of direct accident cost, there will be at least four dollars of indirect costs. Again, these losses can be prevented!

019. Techniques for accident prevention

There is an old safety saying that states, “An ounce of prevention is worth a pound of cure.” Most of us know that accidents do not happen without cause, yet they continue to happen. In fact, each year there seems to be hundreds of deaths and thousands of injuries. In almost all cases, investigations of these accidents show they could have been prevented if the proper techniques had been applied.

Earlier, we talked about the cause and effect relationship. Invariably, it seems that all catastrophes happen because of some known (but ignored) cause. Identification, isolation, and control of these causes are the underlying principles of all accident-prevention techniques.

In this lesson, we will cover important techniques for accident prevention: good housekeeping and minimizing distractions.

Good housekeeping

Good housekeeping is the neatness and cleanliness necessary for the successful performance of a job. The first rule of good housekeeping is personal cleanliness. If you are an orderly person and present a good appearance, it probably reflects in your work. This is true, because a person who is neat and

clean has developed a habit that carries over into his or her work life. Thus, you have made a great stride in the right direction and are already far ahead of the game in the safety program.

What about your work area? Many so-called accidents can be prevented, and much loss of time and pain may be avoided if you keep your work area clean and orderly. As an example, oil spilled on the floor may cause you or another person to slip and injure yourself seriously. If oil or fuel is spilled, cover it with an approved compound; or better still, clean it up immediately. Keep the floor or ramp free of obstructions. An extension cord or dropped tool may cause you to trip and injure yourself.

Some units that you disassemble will have small parts that can be easily lost, broken, or mixed with other parts. To avoid the loss of time while you hunt or acquire another part, keep your bench top in a neat orderly condition. A cluttered bench makes effective work almost impossible and is the starting place for an accident. Worn-out or reparable parts should be disposed of promptly in their correct places—not on the floor.

Soft drink bottles are also other items that always seem to find its way into work areas. To be safe, keep these bottles in the break area and in the proper container.

Candy and gum wrappers belong around candy and gum or in a wastebasket. Never allow gum on the floor. It soils the floor when you step on it, and it can cause a fall. Food and food wrappers should never be in an open fuel tank repair area.

Every shop has a designated place to keep toolboxes when they are not in use. You should always keep your toolbox in place and keep the lid closed. It does not require much time or effort to open the box when you need a tool, and you may prevent someone from acquiring a badly bruised shin.

If your shop maintains a stockroom, cases and other goods should be stacked neatly in the prescribed location and to the designated height. This prevents possible damage to the stored items and makes them readily available when they are needed.

Minimizing distractions

In any job requiring the use of tools or equipment, you must keep alert. Many accidents are caused by a mechanic's inattention or preoccupation. Pay attention to what you are doing. Be constantly alert. Take it upon yourself to stress the habit of alertness or attentiveness in your coworkers. This habit prevents many "would be" accidents.

Essentially, there are two types of distractions: external and internal.

External distraction

External distractions are things that occur because of outside forces. They can be either mental or physical. An example of external distraction occurs with automobiles. Perhaps it has happened to you. You are driving and become distracted by watching the other traffic lane, scenery, or pedestrians. Then, the next thing you become aware of is a BOOM—an accident, or at least an emergency stop.

Your shop or flightline work environment is full of potential external distractions. The flight line is famous for noise. In this regard, a loud sudden noise, or an explosion can be one of the worst distracters. They can cause you to turn away or look up at a critical point during a task. In the wrong circumstances, this can cost you a finger, a hand, or even your life. In addition to sudden noises, many other external distracters can cause you to pay little or no attention to what you are doing. Other external distracters can include telephone calls, visitors, conversations, poor lighting, and uncomfortable temperatures in the work area.

Internal distractions

The other type of distracter is internal distractions. These can be either mental or physical. If you are thinking about a personal problem rather than the job at hand, you are engaging in a mental internal distracter. There is little doubt that it is very difficult to think of two things at once and perform a task at the same time.

Daydreaming is a good example of an internal distracter. This is a particularly dangerous type since your mind can become completely absorbed in the pleasant thoughts of a daydream. When this happens, your awareness of your surroundings is almost completely lost.

Boredom is another mental internal distracter. Usually, boredom is caused by a highly repetitive task that fails to stimulate your continual interest. Boredom leads to indifference, inattention, and lack of alertness.

The only way to overcome the hazards of these mental distracters is simply to use your willpower. You have to make yourself pay attention to what you are doing.

As we said, the other type of internal distraction is physical. This includes such things as being overly tired, in pain, or ill. If you experience any of these physical symptoms, you must inform your supervisor so appropriate actions can be taken.

020. Ground mishap reporting

One dictionary defines the word mishap as “bad luck.” Another defined it as “an unfortunate accident.” Even with the Air Force’s constant emphasis on the importance of safety, accidents still happen. When accidents do happen, they must be investigated and reported.

Air Force mishaps are investigated to find their causes. Investigations provide commanders at all levels with information on pertinent facts and circumstances related to the occurrence. This is so remedial action can be taken by the appropriate agencies to prevent similar mishaps. Some mishaps, which cause injury or damage to Air Force resources, are investigated by non-Air Force agencies.

As early as possible after an accident happens, the Air Force needs to know if property was damaged, what the contributing factors were, and how many people, if any, were injured or killed. Air Force safety personnel must do what is necessary to prevent further damage or injury and take corrective action to prevent recurrence.

Although investigating and reporting a mishap is primarily the responsibility of the fuel element shop chief, you may be asked to assist in the collection of information or preparation of the report. It would be in your best interest to become familiar with mishap reporting. AFI 91–204, *Safety Investigations and Reports*, is the governing source for mishap investigation and reporting.

Air Force mishaps are categorized by the environment where they occur. This allows processing by safety and medical staff personnel who specialize in these mishap environments. In addition, statistics on mishap experience may be broken down into environmental categories for better understanding. Since your career field deals primarily with aircraft, we will use this lesson to cover aircraft mishaps.

Classification of mishaps

All mishaps, with the exception of those involving nuclear weapons, are classified by the total dollar cost of damage or the degree of injury or occupational illness involved. The property damage includes the official estimate of damage to non-Air Force property. Mishaps are classified as class A, B, C, or D.

Class A mishap

Class A mishaps are the most severe and result in a total cost of $2 million or greater for property damage, a fatality (death) or permanent total disability, or destruction of an aircraft.

Class B mishap

Class B mishaps would result in property damage totaling more than $500,000.00, but less than $2 million, a permanent partial disability, or the hospitalization of three or more personnel.

Class C mishap

Class C mishaps result in damage totaling $50,000.00 or more, but less than $500,000.00, or an injury or occupational illness resulting in the loss of one or more days away from work.

Class D mishap

Class D mishaps are any nonfatal injury or occupational illness. Cases may include employees who work partial days, restricted duties, required medical treatment greater than first aid or experienced loss of consciousness.

Mishap reports

To ensure fast and accurate dissemination of mishap information, two types of mishap reports are submitted: safety message and formal.

Safety message reports

There are three types of safety message reports:

1. Preliminary.
2. Status.
3. Final.

Of these three, the preliminary message is the only document you will most likely be involved with as a 5-skill level. The preliminary message is the first electronically transmitted message advising of a non-nuclear mishap. It should contain only the facts. Preliminary messages are submitted using the Air Force Safety Automated System. The message should include a narrative description of what happened. The narrative should include enough detail so that the reader understands the most important events of the mishap.

Status messages explain report delays/extensions and relay any new information discovered. A final message provides a narrative of the mishap/event sequence, states the mishap cause, and recommends preventive actions.

Formal reports

For formal report generation, upload electronic documents to the Air Force Safety Automated System tabs section to construct the formal report. Based on investigative information entered, the Air Force Safety Automated System indicates whether each individual tab is required or optional. Tabs that are not relevant are not displayed. Tab templates are located in the Air Force Safety Automated System Pubs and Reference section. Refer to discipline-specific safety manuals for content and formatting requirements. Safety investigations where a formal report is not required may upload files to appropriate tabs but must comply with discipline-specific safety manual tab formatting requirements.

Regardless of the type of report submitted, the accuracy of information provided is crucial in determining the extent of preventive actions to be taken to ensure the accident does not happen again. Should it become necessary, you can contact your unit safety manager for additional information regarding mishap reporting.

Self-Test Questions

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

018. Causes and effects of accidents

1. Why do many people believe that accidents are unavoidable?

2. What is the basic ingredient on which all accidents are based?

3. What factors are often considered the direct cause of any accident?

4. What is meant by “indirect costs” in relation to accidents?

019. Techniques for accident prevention

1. What is the first rule of good housekeeping? How can it affect your work?

2. Give three examples of possible dangerous situations in a work area.

3. What are two types of distractions that can keep a worker from paying close attention to his or her job?

4. Give examples of each type of distraction.

020. Ground mishap reporting

1. Why are ground accidents reported?

2. Which mishap class is the most severe?

3. Which mishap class involves the hospitalization of three or more people?

4. What is the purpose of the preliminary message?

3–2. Flightline Safety Hazards

During your work with aircraft fuels systems, you will encounter various hazards that arise from the nature of the work, the materials used, and the equipment and tools involved. Other factors involve weather conditions, day and night operations, mission priorities, and associated aircraft systems. In this section, we will cover three flightline safety hazards and the safety precautions associated with them:

1. Static electricity—a source of ignition.
2. Aircraft danger areas.
3. FOD prevention program.

021. Grounding and bonding aircraft and equipment

As an aircraft fuels systems journeyman, you should keep this formula foremost in your mind:

Oxygen + Fuel + Ignition = BOOM!

Since oxygen and fuel vapors are always present during fuel systems maintenance, you must ensure that all possible sources of ignition are kept away from this fuel-air mixture. In this regard, you must be aware that static electricity is a source of ignition and a constant danger.

Many different movements or motions create static electricity. Some of these are the movement of fuel through manifolds, air flowing through ducting equipment, movement across the flight line, air over the surfaces of the aircraft, and your movement as you walk from area to area. In addition, the sloshing of fuel in a container can produce static electricity. If the fuel in the container is contaminated by water or rust, the hazard of static electricity buildup is increased. When the buildup of static electricity is not prevented, the BOOM of the formula is completed. So, how do you prevent the buildup of static electricity and the completion of the BOOM formula?

In this lesson, we will cover three methods:

1. Effective grounding.
2. Bonding.
3. Inspecting.

Effective grounding

Effective grounding is providing a path for static electricity to flow to a grounding point in the earth. A continuous length of steel cable, with attaching connections on both ends provides the path for the static electricity to flow to earth. You should first attach the cable to the ground and then to the unit, equipment, or aircraft. By following this sequence, you ground yourself before you attach the cable to the aircraft. If an arc does occur, it should be minimal, and no harm should occur. Specific grounding procedures are usually specified in aircraft technical manuals; if not refer to TO 00–25–172, *Ground Servicing of Aircraft and Static Grounding/Bonding*.

Static electricity can also build up in your body. To discharge this buildup, personnel-static-discharge plates are provided. These plates are made of copper, zinc, or zinc-coated material. They are required at the entrance of the work stand being used during fuel systems maintenance. The plate must be grounded to an approved ground. Making physical contact with the personnel-static-discharge plate releases the static electricity from your body.

NOTE: Physical contact is not made with the personnel-static-discharge plate when you are wearing gloves. The reason is the gloves are insulators and, therefore, prevent the release of static electricity from your body. You must remove a glove and touch the static-discharge plate with your bare hand.

Bonding

Bonding is also essential to the prevention of the buildup of static electricity. The purpose of bonding is to eliminate the differentials in electrical charges that exist or generate between a component and the aircraft or between two components. To do this, a bonding cable attaches the two components together. First, attach/connect the bonding cable to the equipment, then to the aircraft. The surface must be clean and unpainted at the location where the bonding wire is attached. In addition, no bonding and grounding procedures will be effective if the bonding cables are not in good condition.

Inspecting

As a minimum, you must inspect all static ground wires for proper attachment before each work shift. This is important because just one unattached or improperly attached grounding connection is all that is required to ruin your day. One faulty connection can cause fuel vapors to ignite.

Attachment of the ground wires to any portion of the aircraft that is insulated electrically is useless. For example, aircraft wheels and landing gear assemblies are a handy location to attach ground cables, but there is no continuity between these assemblies and the aircraft structure because of the lubrication on these components.

Check all new ground wires with a multimeter for continuity prior to placing them in service. The test points should be from the inside of the clamp jaws to the end of the plug. A nominal 100-foot length of cable will have a maximum allowable resistance of 10 ohms.

Be sure you use the applicable aircraft TO or an approved checklist during your inspection. In all inspections, accomplish the following:

- Replace the *clamp* if jaws are deformed, spring is weak, or if it will not make a good connection.
- Inspect the *plug* for corrosion, weakness, or loose nut. Replace if heavily dented or deformed.
- Replace the *cable* if more than one-third of the cable wires are broken.
- Ensure that ground wires are attached to an unpainted and clean surface of the aircraft or equipment.
- Inspect all equipment that is positioned within the fuel system repair area to ensure that it is grounded and then bonded to the aircraft.
- Ensure all personnel-static-discharge plates are mounted at the entrance of all work stands and that continuity exists between the plate and a grounding point.

022. Aircraft danger areas

There is no doubt that working around aircraft is dangerous. In this lesson, we will cover various aircraft areas that pose a specific hazard. Keep in mind that these areas may vary with the model and design of the different types of aircraft. In any case, it is imperative that you become aware of these potential hazard areas.

1. Propeller plane of rotation.
2. Jet air intake.
3. Jet engine exhaust.
4. Turbine wheel plane of rotation.
5. Noise hazards.
6. Power-actuated surfaces and equipment.
7. Radar and radio hazards during fueling and defueling.
8. Ground locks.
9. Precautions for entering and exiting the cockpit area.

Propeller plane of rotation

The area in front of and inside the plane of rotation of the propeller on a reciprocating engine must be clear. Standing close to a rotating propeller can possibly cause vertigo. Personnel must not stand in line with the stripe that designates the plane of propeller operation. Personnel must not be near or go through the static propeller arc of reciprocating and turboprop aircraft or helicopters, even without the engine running.

Jet air intake

A powerful jet engine uses a large amount of air. All of this air must flow into the intake. The suction developed in front of the engine is enough to pull caps, coats, equipment, and ingest personnel. You must not approach closer than 5 feet from the side/rear of the intake if the engine is running. You must stay at least 25 feet from the front of engine intake ducts when the engine is operating. Do not wear loose clothing or carry objects that might be drawn into the ducts when working on or near operating jet aircraft. Most bases use anti-personnel screens in front of intakes. Be sure these screens are in place. In addition, never place any object on or in the intake ducts.

Jet engine exhaust

The high-velocity, high-temperature exhaust blast of a jet engine is particularly hazardous to personnel and is to be carefully avoided. Do not pass close behind a jet aircraft when the engine is operating. Remove all tools, spare parts, and other objects from the blast areas before starting any jet engine. Warn all personnel and traffic to remain clear for a minimum distance of 200 feet from the rear/exhaust of the aircraft. This distance may depend on the type of aircraft on which you are working. Be safe, not sorry.

Turbine wheel plane of rotation

Although it is rare, there have been instances when the turbine wheel of a jet engine has disintegrated during operation. When this happens, pieces of the turbine are launched like shrapnel through the skin of the aircraft. The area where this occurs is called the “plane of rotation.” It is identified by a red stripe that is painted on the fuselage or engine nacelles of jet aircraft. Do not stand near the red stripe during engine run-up. If a turbine wheel disintegrates while you are in the plane of rotation, there is a good chance you will have serious or fatal injuries.

Noise hazards

Personnel working on or near operating jet aircraft potentially are exposed to the most intense and sustained noise exposures experienced in the Air Force. Possible adverse effects of noise exposure include the following:

1. Hearing loss.
2. Interference with speech communications.
3. Disruption of job performance.

In addition to hearing loss, there are suggestions that noise can cause other physical and psychological disturbances. In many cases, exposure to noise can lead to fatigue. Fatigue, in turn, can lead to faulty maintenance, which causes an increase in the number of accidents attributed to maintenance errors. There will be times when you are required to wear double hearing protection. If you are not sure, always ask your supervisor.

Noise hazards can be reduced by wearing either earplugs or ear protectors, provided they have been properly fitted to the individual. A poorly fitted pair of earplugs can do as much damage as none at all. You only have hearing ability one time, so be careful. Once you lose it, you will not get it back.

Power-actuated surfaces and equipment

Aircraft have power-operated devices such as flight control surfaces, landing gear, bomb doors, speed brakes, and canopies. If you carelessly operate any of these devices, you can damage equipment or injure someone. Since these devices are designed to operate quickly and against heavy air loads, they can be quite dangerous unless all precautions are observed. It is a terrifying experience and can easily be fatal to suddenly be caught by the accidental closing of a bomb bay door, flap, or even a landing gear door. When you are working on fuel systems, do not touch, bump, or in any other manner, accidentally operate the controls of these movable surfaces.

As a fuel systems journeyman, there may be times when you must work in wheel wells or flaps. When in these areas, it is a good idea to place AF Form 1492, Warning Tag, on the fuel management panel, battery, and external power receptacle to prevent you from being injured or killed. This also prevents other maintainers from performing maintenance on the aircraft.

Many surfaces on jet aircraft have unusually sharp edges. Every mechanic should be particularly cautious when working on or near these edges. During prolonged maintenance periods, aircraft parts or equipment with sharp edges or corners should have these hazardous areas protected by covers or tape placed over them with red streamers attached to indicate the danger area.

Radar and radio hazards during fueling and defueling

As you go about your job, you should be aware of dangers that are beyond your ability to see or hear. These include electromagnetic radiation created by operating radar, radio equipment, and electronic countermeasure devices. Do not ever underestimate the power of the energy radiated by the antennas for these devices. Tests have shown that when high-powered radar is beamed on dry-steel wool 100 feet away, the wool will ignite and burn. In addition, tests have shown that photoflash bulbs will fire at a much greater distance. If the radar energy can cause these effects at these distances, think of what it can do to fuel vapors!

Because of the danger, fueling or defueling of aircraft must comply with Air Force directives and with these two specific warnings:

1. Airborne radar equipment *must not be operated* near fueling or defueling operations.
2. Aircraft *must not be serviced* with fuel, oil, or water-alcohol while aircraft radio or radar equipment is in operation.

NOTE: The aircraft intercommunication system may be used for communicating with maintenance personnel during fueling when required and circumstances indicate safe use is possible.

Ground safety locks

As the name implies, ground safety locks prevent inadvertent activation of certain systems. Ground safety locks are used in numerous places (e.g., landing gear, flight controls, bomb bay doors, etc.). As a fuel system mechanic, you are not normally required to install ground locks on aircraft; however, you are required to make sure aircraft ground crews install them. This is one precaution that calls for close attention. In fact, no repair personnel are authorized to work on an aircraft without the ground locks being installed. Part of your OJT will involve training on these areas.

Precautions for entering and exiting the cockpit area

At times, your duties will require you to enter aircraft cockpits. Keep in mind that this can be a very dangerous environment. This is especially true for fighter and bomber type aircraft because of the explosive charges that eject the seats and canopies. Because of these explosive charges, the cockpits of aircraft have always presented hazards to maintenance personnel. History and accident investigations have shown that these systems can cause serious personal injury, death, and damage to the aircraft if they are fired accidentally. Because of the dangers involved, ejection seat and canopy systems must command the same respect from you as a machine gun or aircraft cannon because, in a way, the catapult and removers are types of firearms.

NOTE: The catapult charge of a typical ejection seat can hurl a weight of 300 pounds at an initial rate of 60 feet per second.

As a basic safety precaution, the seat canopy and hatch must have ground safety pins with red or yellow streamers installed immediately after flight. In addition, they must remain installed while the aircraft is on the ground. These ground safety pins are attached to red or yellow streamers that have the words REMOVE BEFORE FLIGHT stenciled in large letters. An example is illustrated in the top view in figure 3–1. Before you enter any aircraft cockpit, you must first ensure the ground safety pins are installed. If you find they are not installed, DO NOT ENTER the cockpit, and immediately inform the crew chief.

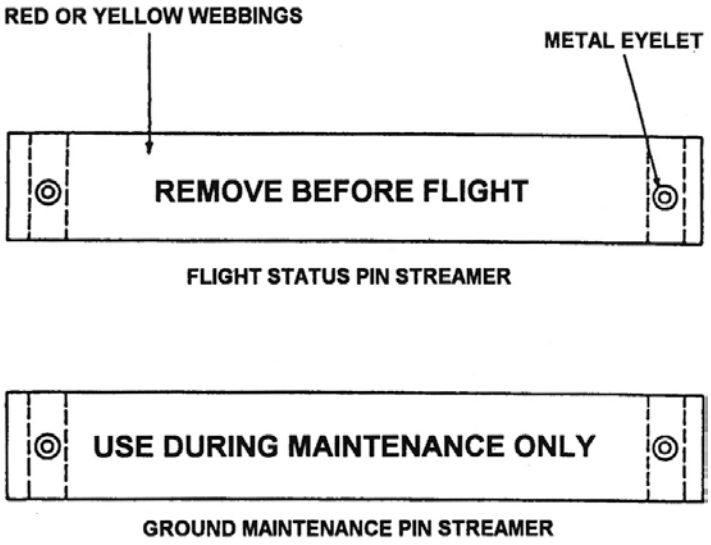


Figure 3–1. Safety streamers.

When you are working close to ejection seat catapults or canopy remover controls, you must perform only the work you are authorized to do. At all times, exercise particular care to avoid accidental arming and firing. Even though the safety pins are installed, unintentional movement of the actuating mechanisms can fire the ejection seat.

During most maintenance periods and ground operation of the aircraft, the ground safety pins mentioned earlier are your protection from accidental firing of the seat and canopy initiators. If an ejection seat, canopy, or hatch is to be removed from an aircraft, the mechanically actuated initiators are made safe by installing safety pins in them. Several of these initiator pins are usually required, and they are attached to one or more, red or yellow streamers, which have the words “USE DURING MAINTENANCE ONLY” stenciled in large letters. Figure 3–1 shows an example.

023. Foreign object damage prevention program

A plastic cap is being propelled haphazardly across an Air Force flight line by the exhaust of a running jet engine. To most people, this plastic cap would appear to be an irksome, but harmless, traveler on today’s landscape. However, to maintenance professionals, such litter is anything but harmless; instead, it is called a foreign object. In essence, a foreign object is an object that is alien to an area or system. Foreign objects cause FOD. FOD is any damage to an aircraft, engine, aircraft system, component, tire, or munitions caused by a foreign object. Now, back to our cap. The least this foreign object can do is cause serious damage to an aircraft engine. At worst, the harmless cap can be the cause of serious injury or death.

As you would expect, the Air Force is very concerned about FOD. This subject is covered in AFI 21–101. This instruction specifies that all organizations will develop a FOD prevention program. The success of each program depends upon command support, personnel knowledge and awareness, and

its integration into the total maintenance effort. All personnel working in, on, around or traveling through areas near aircraft, munitions, AGE, engines, or components thereof will comply with FOD prevention. FOD can include engine damage caused by ingestion of loose hardware, flight controls jammed by hardware or tools.

In this lesson, we will explore three subject areas as they apply to FOD and its control:

1. Causes of FOD.
2. Classes of FOD.
3. Prevention and control.

Causes of FOD

There are many causes of FOD; however, two major contributors are poor housekeeping and poor work habits. They include not accounting for hardware, safety wire, tools, and so forth, during operations and maintenance. All loose objects, regardless of their origin, can cause catastrophic and costly damage. Have you ever seen someone toss a piece of safety wire on the hangar floor? This piece of safety wire may end up in an aircraft engine and cause thousands of dollars' worth of damage.

Other causes of FOD include natural phenomena, such as high winds or heavy rainfall. FOD occurs all too often when loose objects (stone, paper, trash, etc.) are blown or washed onto taxiways or runways. Gravel and stone easily make their way into jet engines, cut aircraft tires, or cause other serious damage.

Classes of FOD

There are three general classes of FOD:

1. Metal.
2. Stone.
3. Miscellaneous.

Metal

Hardware can cause metal FOD. All too often, journeymen fail to account for and properly dispose of nuts, bolts, clamps, bits of safety wire, and clippings during removal, repair, or installation of aircraft parts. These items must never be left in or around the cockpit or near the engine.

Another metal that causes FOD is the tools maintenance personnel use. Wrenches, screwdrivers, pliers, or even test equipment can (and have) find their way into the flight controls or the inlet ducts of operating jet engines. Failure to account for tools and hardware properly can result in destroyed engines or aircraft crashes.

Other objects that are classified as a metal FOD include items that we are all familiar with—pens, pencils, coins, and even security badges.

Stone

There are two classes of stone: natural and man-made.

Natural stone

The most plentiful type of stone is natural stone. It is found in all countries and on all bases throughout the world. At your base, the immediate edge of runways and taxiways is probably the greatest source of natural stone. Normally, wind or rain will not blow or wash gravel, pebbles, and stone onto the surface of the operating area; however, if the edges of the flight line are disturbed, the loosened material could be blown or washed onto parking areas or runways. At other times, the

borders may be disturbed by overlapping sweeping machines, engine exhaust blasts, aircraft landing gears, or even flightline vehicle traffic.

Manmade stone

Manmade stone is the concrete and asphalt material that covers most aircraft runways and taxiways. At times, these surfaces release small stones and particles. Adverse weather conditions aggravate this predicament by causing cracks or breaks in concrete and asphalt surfaces.

It is worth noting that stone, in either its natural or manmade state is probably the most difficult of all foreign material to control. Therefore, everyone must continually police the areas where jet engines operate.

Miscellaneous

As you have probably already guessed, this class of foreign objects covers anything that does not fit the metal or stone classes. Miscellaneous items include wood, rubber, cloth, plastic, and organic matter (birds).

Prevention and control

The Air Force has been the pioneer in the development of an operational FOD program. This program is directly responsible for reducing the incidences of FOD on the ramp and in the back-shops. The key phrase in the Air Force program is “FOD prevention is everyone’s responsibility.”

The following practices have been developed to help eliminate FOD:

1. Tool inventories.
2. Foreign object removal.
3. FOD control.
4. FOD walks.

Tool inventories

You must inventory your tools before and after each job. Most CTKs are silhouetted identifying each tool. This aids tremendously in eliminating many “forgotten tools.” However, there is still the possibility of human error. This is why it is so important you inventory your tools when you arrive at the job site and before you leave.

NOTE: The importance of the tool inventory cannot be overemphasized as a FOD prevention procedure.

In addition to checking the CTK, make sure to account for the items you brought with you. This includes special tools, tech data, bench stock, and so forth.

Foreign object removal

Personal items can and do contribute their share to the FOD problem. Jet engines are like large vacuum cleaners. Hats, restricted area badges, glasses, ear protectors, and so forth, have been sucked into the intakes of operating jet engines with disastrous results.

Loose items in your pockets such as pencils, pens, wallets, cigarette lighters, and coins, can fall out of your pockets when you lean over or crawl into work areas. These items could result in FOD if not removed from your pockets or secured before you begin working around aircraft.

If you drop an item while you are working inside a fuel tank or engine area, search the area until you find the item. If you are unable to locate the lost item, you must take action to prevent the aircraft from flying. A detailed entry in the aircraft forms is often necessary. The more details, the better, because this helps the search crew identify the object if found. Each base develops guidelines for

finding lost objects and impounding aircraft. At times, X-rays, bore scope, and other equipment can be used to help locate foreign objects in inaccessible areas.

Remember, you have a responsibility to the aircrew to *never* conceal or overlook an object that has been lost in an aircraft. You must be willing to admit a human error that caused something to be lost for the sake of the aircrew you support.

Foreign object damage control

Items lying loose on the flight line, where aircraft are parked or required to taxi, are potential causes of FOD. A key aid in FOD control are FOD walks. These FOD walks are very common on most flight lines. In essence, the walks are organized police-up details to clean up flightline areas.

NOTE: In addition, mechanical sweepers sweep the flightline areas on a regular schedule.

Another method to control foreign objects is the use of FOD bags. These bags are a type of pouch worn by an individual or attached to CTKs to collect bits of safety wire, cut cotter pins, and other foreign objects that may be found lying around. Remember to empty FOD bags after each job and never place the bag in a position where the contents may spill. It is almost impossible to determine if every piece of FOD lost from the bag was recovered.

Self-Test Questions

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

021. Grounding and bonding aircraft and equipment

1. What are four ways that static electricity may be created around an aircraft fuel system?

2. What is “effective grounding?”

3. What is the proper sequence for grounding a unit, piece of equipment, or an aircraft?

4. Where should a personnel-static-discharge plate be mounted?

5. What procedure concerning the discharging of static electricity from the body is violated in the following situation: While supervising the repair of an integral tank during cold weather, you notice that a mechanic removes her gloves to touch the personnel-static-discharge plate and, then, remembers that there is a tool she needs. She goes and gets the tool, returns, and starts the work.

6. What is the purpose of bonding?

7. What are the two surface requirements that must be met where a bonding wire is attached?

022. Aircraft danger areas

1. What is the danger of standing close to a rotating propeller?

2. What is the minimum safe distance to approach the intake of an operating jet engine?

3. What must you do to prevent injury when you are working near exhaust areas?

4. What are some power-actuated surfaces of an aircraft requiring special precautions?

5. What items do you use to warn personnel against using certain controls for power-actuated surfaces, when working in wheel wells or flaps?

6. Why isn’t airborne radar operated near a refueling or defueling operation?

7. What type of communication may be used during refueling or defueling operation?

8. Where are ground locks installed on an aircraft?

9. What precautions should you take when working near ejection seat catapults?

023. Foreign object damage prevention program

1. What are some examples of aircraft FOD?

2. What are the two primary contributors of FOD?

3. What are the three general classes of FOD?

4. What type of FOD is the most difficult to control?

5. What is perhaps the best method of eliminating FOD caused by lost or misplaced tools?

6. What are three methods used to control FOD on a typical flight line?

3–3. Handling Fuels, Chemicals, and Compressed Gases

Two of the principal hazards connected with your job are the presence of aircraft fuel and toxic chemicals. To perform your job safely, you need to know the dangers involved and the need for strict observance of all safety rules and regulations. In far too many instances, violations of the prescribed rules and regulations have caused bodily injuries and, in some cases, fatalities.

In this section, we will discuss three subject areas as they apply to handling fuels, chemicals, and compressed gases:

1. How to handle fuels and chemicals.
2. Procedures for containing fuel spills.
3. How to handle compressed gasses.

024. How to handle fuels and chemicals

Until the 1990s, the most common fuels used by the Air Force were Jet Propellant (JP)–4 and aviation gasoline. During the 1990s, the Air Force switched from JP–4 to JP–8 because it had a higher flashpoint and was less carcinogenic. By the mid-1990s, the Air Force further modified JP–8 to include a chemical that reduced the buildup of contaminants in the engines that affected performance. The Air Force has since begun the transition to a commercial fuel type known as Jet A.

No matter the type, all fuels are in liquid form and have heat energy that can be converted into mechanical energy.

In this lesson, we cover two subject areas that apply to handling fuels and chemicals:

1. Volatility and vaporizing.
2. Effects of fuels and chemicals on your body.

Volatility and vaporizing

In order for fuel to release its heat energy, it must contain a quantity of hydrocarbons and should vaporize rapidly in order to have complete combustion in the engines. The engines found on our most common aircraft do not burn raw (liquid form) fuel; instead, they burn fuel vapors. How rapidly a fuel vaporizes is due primarily to its chemical composition, and the vaporizing rate is determined by the refining process. The term *vaporizing* means the changing of the fuel from a liquid to a gas. When this is accomplished, the vapor is mixed to proper proportions with air by a carburetor or fuel control. The rate at which a particular fuel vaporizes is *volatility*.

Effects of fuels and chemicals

Fuels or chemicals coming in contact with skin, accidentally swallowed, or inhaled can have painful and sometimes chronic affects. In some cases, death can result. These statements are not made to scare you; instead, they are made to make you aware of the dangers involved and to teach you proper respect for fuel and chemical safety. With this thought in mind, let’s discuss some of these dangers and precautions further.

Physical contact

The most common hazard you will face is that of your coveralls becoming soaked with fuel or chemicals. If you do not take immediate action, these liquids will act as solvents removing skin oils, and your skin will become irritated. This irritation can progress to a severe rash known as dermatitis. Should your coveralls get splashed or sprayed, leave the area immediately and remove them. When you depart the area to remove your clothing, keep one thing in mind; *you are a walking, gigantic firecracker.* Any source of ignition will set fire to your clothes and turn you into a human torch.

Be sure to seek an area that is as safe as your repair area to remove your clothes and shower immediately with plenty of soap and water. Never reuse the coveralls without allowing them to air dry and launder them with soap and water.

Swallowing fuel

Fuel taken internally is another hazard you must guard against. It produces abdominal pain, prolonged constipation, discomfort, fatigue, and paralysis. If treatment is not prompt, accidental swallowing of fuels or chemicals can cause internal injury or death.

WARNING: *Never* force yourself or another person to vomit following ingestion of petroleum products. Instead, go or take the person showing any of these signs to a medical facility immediately. Keep in mind that death can be the result of ingested fuel or chemicals.

Vapor inhalation

Inhalation of vapors may result in an irritation to the eyes, nose, and throat. The most common signs of excessive inhalation are headaches, dizziness, muscular incoordination, and unconsciousness. In extreme cases, inhalation of vapors from fuel or chemicals can cause vertigo, nausea, and sometimes death.

If a coworker stops breathing, immediately move him or her to an area with fresh air. Start artificial respiration and continue it until medical help arrives. If fuels, chemicals, or their vapors come in contact with your eyes, flush them thoroughly with water and seek medical aid immediately.

WARNING*:* Under no circumstances should you rub your eyes. If you do, you may irritate your eyes and may cause the loss of sight.

025. Procedures for containing fuel spills

A fuel spill can occur during fueling, defueling, transfer, draining, depuddling, or any other time that fuel is being moved whether on or off the aircraft. Fuel spills are particularly hazardous because they present a fire hazard and because they can potentially cause harm to the environment. If you are involved with cleaning up a fuel spill or just working with fuel, always wear the proper personal protective equipment. Fuel spills are categorized as class I, class II, and class III.

When any fuel spill occurs, you must react quickly to minimize the hazards. If the spill results from a refuel or transfer operation, cease the operation immediately, turn off all potential ignition sources in the area, and notify the fire protection agency.

Always follow local environmental guidelines for the disposal of fuel-soaked materials. These guidelines vary by state or location, so become familiar with the procedures for handling and disposing hazardous materials at your installation.

Class I spill

A class I fuel spill involves an area less than two feet in any direction. You must determine if these spills create a fire hazard to the aircraft or equipment, and make sure you have a fireguard standing by. Generally, class I spills need only be monitored until the aircraft is moved. If the spill is a class I type and was caused by the sloshing of fuel from a small container, by the removal of a bottom wing access door, or by some similar event, you may simply be able to absorb the fuel with a cotton cloth or sponge.

Class II spill

Class II spills involve an area ten feet or less in any direction or less than 50 square feet, and not of a continuing nature. Post people as fireguards and notify the fire protection organization and the base agency responsible for cleanup of hazardous spills immediately. You may even be assigned as part of this agency.

Class III spills

Class III spills involve an area over ten feet in any direction, over 50 square feet, or a spill of a continuing nature. Reacting to a class III spill means posting people in the area to act as fireguards and notifying the fire protection agency and appropriate environmental cleanup personnel immediately. A class III fuel spill is considered a ground mishap, which we covered earlier in this unit. The senior fire official will respond with personnel, vehicles, and equipment necessary to control and contain the spill condition until the local or base agency responsible for cleanup can properly dispose of the hazardous material.

026. How to handle compressed gases

In this lesson, we discuss the two types of pressure systems you will use most frequently to accomplish fuel system maintenance. They are compressed gases and compressed air.

The degree of hazard in these systems is proportional to the amount of energy stored. This is why all pressurized systems must be properly color-coded or properly marked as specified in applicable directives.

General compressed gas safety

Throughout your career, you will work with different types of compressed gases. Some compressed gas bottles can hold pressures of up to 3,500 pounds per square inch (psi). Always use proper personal protective equipment when working with compressed gases, to include safety glasses, leather gloves, safety shoes, aprons, and anything required by AFI standards or applicable TOs.

You may use several different types of compressed gases in your duties, the most commonly used being nitrogen. Liquid nitrogen is a colorless, odorless, and extremely cold liquid and gas under pressure. It can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels below 19.5 percent; therefore, it does not support life. Contact with liquid or cold vapors can cause severe frostbite. Cold vapors in the air appear as a white fog due to condensation of moisture. While this may indicate the presence of the gas, it should not be used to determine its concentration in the atmosphere.

Many gases, especially in enclosed spaces can displace oxygen. If in a high enough concentration, this can create an asphyxiation hazard. Monitor oxygen concentrations in a gas release area. Exposure to an oxygen deficient atmosphere (less than 19.5 percent) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing eight to ten percent or less oxygen will quickly bring about unconsciousness without warning, leaving individuals unable to help or protect themselves. Lack of sufficient oxygen can cause serious injury or death.

Skin contact with a liquid compressed gas can cause tissue freezing, resulting in severe burns. The extremely low temperature of the cryogenic liquid (and not the result of chemical action) causes the burns. Skin may appear red with the formation of blisters. In cases that involve prolonged or severe exposure, tissue may freeze and have a waxy or yellow appearance.

Compressed air

The use of compressed air during fuel system maintenance is common. That is why it is extremely important that you are aware of the dangers associated with its handling and use. Utilizing compressed air to clean clothing or a repair area by blowing the dirt, dust, or metal shavings away is particularly hazardous. The particles can cause serious damage to your skin, eyes, or ears. It does not take high pressure to cause serious injuries. There are three hazards associated with compressed air: air pressure, flying particles, and noise.

- Air under pressure can penetrate the skin, causing hemorrhaging and pain. If compressed air gets into the body through cuts in the skin, an air bubble (embolism) could form in the bloodstream, and that could kill you if a bubble gets to the heart or lungs. Furthermore, compressed air entering the body through the mouth or nose can cause injury to internal tissues and organs. Compressed air that hits an eye can blow the eyeball from its socket, and if blown into an ear can rupture the eardrum.
- Air pressure of 40 psi can drive chips and other particles into the eyes and face with the force of shrapnel. Flying particles can also cause cuts and bruises to other parts of the body.
- Noise levels of compressed air can sometimes reach or exceed 120 decibels.

Make sure you always wear the proper personal protective equipment. Recommended personal protective equipment includes safety glasses, face shield, hearing protection, dust mask, or respirator. Use eye protection while performing the air hose and bubble test, drying a leak area, or doing anything that involves the use of compressed air. Should you observe any acts of horseplay, put a stop to it immediately. If you do not, it will probably result in injury.

Always focus on safety when you are working with compressed air. Your compressed air safety checklist should include, as a minimum, the following:

- Inspect the hose to make sure it is in good condition and properly connected.
- Keep air hoses off the floor where they can be tripping hazards or become damaged.
- Prevent sharp objects from rubbing against air hoses.
- Always coil the hose, without kinks; when it is not in use, hang it over a broad support, not on a hook or nail.
- Use the lowest pressure that will do the job when you have a choice of pressure.
- Do not point an air nozzle or air gun at anyone—including you.
- Choose a safer, better way to clean dust from your clothes, such as a brush or vacuum.
- Do not fool around when using compressed air. It is a tool that should be used with caution, not a toy for engaging in horseplay.

Self-Test Questions

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

024. How to handle fuels and chemicals

1. What is “vaporizing?”

2. What’s “volatility?”

3. If fuels or chemicals come in contact with your skin, what skin condition can result?

4. What three extreme conditions can result from inhaling concentrated vapors?

5. Suppose you are working on an aircraft with a coworker, and during the final stages of removing a fuel system component, you notice that he or she suddenly grabs the rail of a maintenance stand and tries to brace, but then collapses. What course of action must you take?

025. Procedures for containing fuel spills

1. What two factors make fuel spills particularly hazardous?

2. What actions should you take if a large amount of fuel spills while you are operationally checking components of the ground fueling system on an aircraft?

3. What guidance should you follow when you are disposing fuel-soaked materials such as absorbent cloth?

4. What action should you take concerning a class I fuel spill?

5. What are the characteristics of a class II spill?

6. Normally, which fuel spill class does *not* require notifying base fire protection personnel?

026. How to handle compressed gases

1. What three factors “mask” the presence of nitrogen?

2. What is considered an oxygen deficient atmosphere?

3. What happens when skin comes in contact with liquid nitrogen?

4. Using compressed air to clean clothing or a repair area by blowing the dirt, dust, or metal shavings away is particularly hazardous to which parts of the body?

5. How much air pressure does it take to propel a piece of debris with the force of shrapnel?

6. When working with air pressure, is the highest pressure possible always the best choice?

3–4. Personal Protective Equipment

At times, a hazard will exist although all practical control measures have been taken to eliminate it. When this happens, you must be given further protection by means of protective equipment and clothing. The repair of aircraft fuel systems presents hazards that are difficult to eliminate. Because of these dangers, you are required to use equipment and wear clothing designed to meet your specific needs. The hazards are known and the equipment and clothing are available—it is up to you to use them and use them properly!

027. Use and care of respirators

Make the selection of a respirator based on AFI 48–137, *Respiratory Protection Program*, and 29 Code of Federal Regulations (CFR) 1910.134, *Respiratory Protection*. These standards dictate that respirators used in confined spaces be full-face, supplied-air type equipment. A respirator fit-test must be conducted initially and at least annually for every wearer of a respirator. If a respirator does not fit properly, it will not afford the required protection. The personnel in the bioenvironmental engineering flight provide this initial and annual training to respirator wearers. The training must be documented on your AF Form 55, Employee Safety and Health Record.

Respirator care

Your section chief is responsible for implementing a written respiratory protection program. It is developed for your particular workplace and is updated as necessary. This program must include respirator care, inspection, and maintenance. Each person issued a respirator is responsible for its primary care and maintenance, to include cleaning.

Cleaning and sanitizing

As a rule, respirators issued to an individual should be cleaned and sanitized at the end of each day in which they were used. If you are sharing respirators, they must be cleaned and sanitized before being

worn by a different individual. Emergency-use respirators shall be thoroughly cleaned and disinfected after being used. Disassemble the respirator and then wash it in warm water with a mild detergent. Rinse in clean warm water. If any defective parts are found, replace them.

Storage

Store respirators in a manner that protects them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals. Respirators must be stored to prevent distortion of rubber parts, such as the face piece and exhalation valve. Do not store them in places such as lockers or toolboxes unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators in work areas must be easily accessible at all times, and the storage cabinet or container in which they are stored must be clearly marked.

Inspection

As the user, inspect the respirator immediately before each use and during cleaning; this will ensure it is serviceable. Inspect each respirator stored for emergency or rescue use at least monthly and check for proper operation before and after each use. When you are inspecting the respirator, always check the condition of all the parts, to include the face piece, head straps, valves rubber parts, canisters or filters are a good starting point. Remember, your respirator is there to keep you breathing; keep it serviceable.

Maintenance

Respirators found to be defective are removed from service and repaired. Only personnel trained in proper respirator maintenance and assembly should do repair or replacement of parts. Refer to the manufacturer’s instructions for guidance.

028. Use of personal protective clothing

Personnel performing maintenance in fuel system repair areas or facilities are required to wear certain types of protective clothing. Several items are approved for wear.

Coveralls

Personnel performing open fuel tank/cell repair shall wear approved coveralls. If you are in a fuel tank and your coveralls get wet, you must immediately exit the tank, remove the coveralls, and shower or rinse the fuel from your body. Do not wear the coveralls again until they have been laundered. If you are issued a pair of coveralls that fail to adequately protect you due to cuts, tears or excessively worn material, do not wear them. Throw them away. We will cover only two types of coveralls: the tri-layer and white cotton coveralls.

Tri-layer coveralls

Tri-layer coveralls are worn during wet fuel operations, fuel foam removal/installation, and during fuel tank/cell entry operations until the fuel tank has been completely depuddled, dried, and ventilated with no chance of fuel leakage from any manifolds or associated components.

White cotton coveralls

White cotton utility coveralls with enclosed cuffs and anklets may be worn after the completion of wet fuel operations. Coveralls with buttons or zippers present a foreign object hazard and are not used for open tank maintenance. You may wear utility coveralls when you are performing fuel system maintenance that does not require tank entry.

Undergarments

Any undergarments can be worn as long as the approved coveralls are worn over them.

Footwear

Personnel entering the fuel system repair areas/facilities must remove all footwear with exposed spark-producing nails or metal plates on the walking surfaces. Clean shoes or boots with or without footwear covers may be worn in integral fuel tanks. If footwear covers are not worn, shoes or boots are inspected prior to every fuel tank entry to ensure foreign objects are not introduced into the fuel tank. Clean, serviceable, and static-resistant or neoprene booties are worn during fuel cell entries. Shoes or boots are not worn in the fuel cells.

Gloves

Approved gloves (in accordance with TO 1–1–3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells*) are used during depuddling operations, applying cleaners and solvents, removal of fuel foam, and as otherwise directed. They are worn for the application of sealants and adhesives.

NOTE: Hand creams and barrier creams are not considered suitable hand protection but may be used under approved gloves.

Head coverings

Head coverings must be worn whenever a potential exposure to liquid fuel (e.g., pulling fuel foam from overhead) exists. The head covering must be clean, serviceable, and static-resistant. Wear caps or head coverings when accomplishing sealant repair on curing-type sealant inside an integral tank. The head covering prevents scalp or hair oils from contaminating aircraft surfaces and minimizes the possibility of getting sealant in your hair.

029. Use of protective equipment items

Several items of safety equipment are available for performing fuel system maintenance. They are designed to protect you from exposure to toxic vapors, hearing loss, and other potential hazards you may encounter.

Personal protective equipment shall be selected in accordance with Air Force Manual (AFMAN) 91–203, *Air Force Occupational Safety, Fire, and Health Standards*, and any other applicable AFI, and guidance provided by the personnel in ground safety and the bioenvironmental engineering flight. We will cover some of the most popular and important items.

Eye protection

If they are not already wearing a full-faced respirator, anyone performing work that generates dust or could cause fluids to enter their eyes must wear the appropriate eye protection. Remember there are two basic types of eye protection: goggles and safety glasses. Examples of work that require goggles include repairing a fuel leak, draining a fuel tank or cell, and applying leak detection powder. Wear safety glasses when you are safety wiring. Wear eye protection anytime you feel there is a possibility of getting something in your eyes.

Hearing protection

The personnel in the local bioenvironmental engineering flight determine hearing protection requirements based on a survey of the noise hazards involved in all aspects of the job at your present duty station. These hazards are included in the initial safety briefing and listed on everyone’s AF Form 55. However, a common sense approach should always be taken; if you think it is too loud, wear ear protection!

Padding

Neoprene rubber knee and elbow pads may be used for protection during maintenance. Neoprene mats may be laid in the tank or cell for cushioning and protection.

Aprons

Aprons may be worn to provide protection from chemical splashes.

Emergency eyewash and shower

All fuel system repair facilities and areas must be equipped with emergency eyewash fountains and emergency personnel showers that are equipped with a privacy enclosure to permit complete disrobing. The emergency eyewash and showers shall provide water through a thermostatic mixing valve. These units allow you to flush your eyes with water if they become contaminated with fuel, chemicals, or foreign matter. The showers permit you to rinse chemicals or fuel from your body if necessary.

Any existing/modified facility shall be equipped with a minimum of a self-contained emergency eyewash station (fig. 3–2). Always ensure these stations are filled with fresh water before beginning any maintenance.

The operational check and flush of consolidated eyewash and shower stations in repair facilities and areas should be done as part of any maintenance preparation checklist. Since these units are not used frequently, contaminants such as rust or bacteria may build up inside the plumbing after a period of time and require flushing out prior to use.

Figure 3–2. Self-contained eyewash station.

Self-Test Questions

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

027. Use and care of respirators

1. What type of respirator is required for use in confined spaces?

2. When must a respirator fit-test be done?

3. On what document is respirator training annotated?

4. When should respirators issued to an individual be sanitized?

5. As a minimum, how often should a respirator kept for emergency use be inspected?

028. Use of personal protective clothing

1. When are the tri-layer coveralls worn?

2. When are the white cotton coveralls worn?

3. What is the only footwear authorized for use inside a cell?

4. What type of hand protection should you wear when applying sealant?

5. When should a cap be worn inside an integral tank?

029. Use of protective equipment items

1. What are the two types of eye protection?

2. What is a good example of when you would use safety glasses?

3. Who determines hearing protection requirements for the tasks associated with your present job?

4. When should your supervisor identify noise hazards in your work area to you?

5. Why should you flush emergency eyewash fountains and emergency personnel shower prior to beginning aircraft fuel systems maintenance?

Answers to Self-Test Questions

018

1. They believe that accidents are the inevitable results of unchangeable circumstances or fate.
2. The law of cause and effect.
3. Unsafe acts and conditions.
4. All costs associated with an accident other than property damage and medical expenses for injured or killed people. Indirect costs may include the following:
   - Loss of time and production of the injured and those who aid them.
   - Time lost by curious or sympathetic people at the scene of the accident.
   - Time lost through investigation.
   - Cost of training replacements.
   - Interference with operations, and similar losses.

019

1. Personal cleanliness. If you are an orderly person and present a good appearance, it probably reflects in your work.
2. Any three of the following:
   (1) Oil spilled on the floor.
   (2) Extension cord or dropped tool on the floor.
   (3) Soft drink bottles lying around.
   (4) Chewing gum on the floor.
3. External and internal.
4. Loud noises or explosions can be external distractions; thinking about a personal problem or daydreaming can be an internal distraction.

020

1. Accidents are reported so that their cause can be found and corrective action can be taken as soon as possible to prevent similar mishaps.
2. Class A mishap.
3. Class B mishap.
4. It is the first electronically transmitted message advising of a mishap. It should contain a narrative description of what happened.

021

1. (1) Movement of fuel through manifolds and air through ducting.
   (2) Movement across the flight line.
   (3) Air over the surfaces of the aircraft.
   (4) Sloshing of fuel in a container.
2. It is providing a path for static electricity to flow to a grounding point in the earth.
3. Attach the cable to the ground then to the unit, equipment, or aircraft.
4. At the entrance of work stands used during fuel system repair.
5. The mechanic forgot to remove her gloves and touch the personnel static discharge plate again prior to resuming work.
6. It eliminates the differentials in electrical charges that exist or are generated between a component and the aircraft or between two components.
7. They must be clean and unpainted.

022

1. It could cause vertigo.
2. From the side and rear, no closer than 5 feet to the intake and 25 feet in front of the engine intake.
3. Stay a minimum distance of 200 feet from the rear of the aircraft.
4. Flight control surfaces, landing gear, bomb doors, speed brakes, and canopies.
5. Warning tags (AF Form 1492).
6. Because radar can cause ignition from distances of 100 feet or better.
7. The aircraft intercommunication system may be used for communicating with maintenance personnel during fueling when required and circumstances indicate safe use is possible.
8. Landing gear, flight controls, bomb bay doors, and so forth.
9. Exercise particular care to avoid accidental arming and firing, because unintentional movement of the actuating mechanisms can fire the ejection seat.

023

1. Engine damage caused by ingestion of loose hardware, flight controls jammed by hardware or tools, and cut tires caused by foreign objects on the ramp or taxiways.
2. Poor housekeeping and poor work habits.
3. Metal, stone, and miscellaneous.
4. Stone FOD.
5. Conduct an inventory of your tools before and after each job.
6. By the use of FOD walks, mechanical sweepers, and FOD bags.

024

1. The changing of a liquid to a gas.
2. The rate at which fuel vaporizes.
3. Dermatitis.
4. Vertigo, nausea, and possibly death.
5. Remove your coworker immediately to an area of fresh air and start artificial respiration; continue until medical personnel arrive.

025

1. Fire hazard presented and potential for harm to the environment.
2. Cease the operation immediately, turn off all potential ignition sources in the area, and notify the fire protection agency.
3. Local environmental guidelines.
4. Monitor the spill until the aircraft is moved.
5. They involve an area 10 feet or less in any direction or less than 50 square feet, and not of a continuing nature.
6. A class I spill.

026

1. It is odorless, tasteless, and colorless.
2. Oxygen level that is less than 19.5 percent.
3. Tissue can freeze, resulting in severe burns.
4. Skin, eyes, and ears.
5. 40 psi.
6. No. Use the lowest air pressure possible for the job. The lower the pressure the safer you are.

027

1. Full-faced, supplied-air type.
2. When you are initially receiving the respirator and annually thereafter.
3. Each employee's AF Form 55, Employee Safety and Health Record.
4. At the end of each day in which they were used.
5. At least monthly.

028

1. They are worn during wet fuel operations, fuel foam removal/installation and during fuel tank/cell entry operations.
2. They are worn after the completion of wet fuel operations.
3. Clean, serviceable and static-resistant or neoprene booties.
4. Approved gloves.
5. When performing sealant repair.

029

1. Goggles and safety glasses.
2. When safety wiring.
3. Personnel in the local bioenvironmental engineering flight office.
4. During the initial workplace safety briefing.
5. To allow contaminants such as rust or bacteria to be flushed out prior to use.

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

Unit Review Exercises

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

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

42. (018) What percentage of accidents is due to natural causes, such as lightning, storms, or floods?
    a. Two.
    b. Four.
    c. Six.
    d. Eight.

43. (018) All these factors contribute to the *indirect* cost of an accident *except*
    a. interference with operations.
    b. time lost through investigation.
    c. medical costs for injured person.
    d. loss of production time due to injury.

44. (019) Many accidents can be prevented by simply
    a. keeping bench stock in its place.
    b. keeping your work area clean and orderly.
    c. practicing good personnel hygiene.
    d. cleaning fuel spills at the end of the day.

45. (019) Which are the two types of distracters found in the workcenter?
    a. Depression and displacement.
    b. External and despondent.
    c. Despondent and internal.
    d. External and internal.

46. (020) An accident has resulted in the hospitalization of three or more personnel. This mishap would be classified as
    a. class A.
    b. class B.
    c. class C.
    d. class D.

47. (021) What is the *key* factor in the creation of static electricity?
    a. Motion.
    b. Air density.
    c. Temperature.
    d. Conductivity of object.

48. (021) Which materials are used to make personnel static discharge plates?
    a. Copper, zinc, or zinc-coated metal.
    b. Copper, brass, or brass-coated metal.
    c. Aluminum, zinc, or zinc-coated metal.
    d. Aluminum, brass, or brass-coated metal.

49. (021) Static-discharge plates should be mounted on the
    a. left handrail of a workstand.
    b. entrance of the workstand.
    c. top left side of a workstand platform.
    d. bottom right side of a workstand platform.

50. (021) The purpose of bonding is to eliminate
    a. static electricity.
    b. differential in electrical charges between a component and the aircraft.
    c. electrical charge by splitting it between two components.
    d. static differential in an aircraft by providing a path to ground.

51. (022) What is the *minimum* safe distance from the jet engine exhaust?
    a. 75 feet.
    b. 100 feet.
    c. 150 feet.
    d. 200 feet.

52. (022) What should you use to prevent other maintainers from inadvertent operation of devices such as landing gear and flight control surfaces?
    a. Danger tags, Air Force Technical Order (AFTO) Form 979.
    b. Warning tags, AFTO Form 1492.
    c. Red streamers, AFTO Form 1495.
    d. Red tags, AFTO Form 1775.

53. (022) What type of communication may be used during ground refueling operations?
    a. The aircraft radio systems.
    b. The aircraft intercommunication system.
    c. Battery-powered radios only.
    d. Hand-held walkie-talkies.

54. (022) As a fuel system journeyman, what are your responsibilities concerning ground locks?
    a. Install them if the ground crew is not available.
    b. Install them only if you are working on the aircraft.
    c. Notify someone if they are missing and continue working.
    d. Ensure the ground crew has installed them before you begin work.

55. (022) Which precaution should you take when you are working near ejection seat catapults?
    a. Wear heavy gloves to prevent injury to fingers.
    b. Wear static-free clothing to prevent accidental firing.
    c. Always have the seat removed to prevent accidental firing.
    d. Avoid unintentional movement of the actuating mechanisms.

56. (023) Two major contributors of foreign object damage (FOD) are poor
    a. planning and work habits.
    b. organization and planning.
    c. work habits and housekeeping.
    d. housekeeping and organization.

57. (023) Which is the *most* difficult class of foreign object damage (FOD) to control?
    a. Metal.
    b. Stone.
    c. Organic.
    d. Miscellaneous.

58. (023) Which are two proven methods to control foreign object damage (FOD)?
    a. Trash detail and FOD walks.
    b. FOD walks and FOD bags.
    c. Tool control and operation clean sweep.
    d. Tire checks and trash removal.

59. (024) What is the *first* thing you should do if your clothes become soaked with fuel or chemicals?
    a. Notify your supervisor.
    b. Launder your clothes with soap and water.
    c. Leave the area and remove your clothes.
    d. Shower with soap and water.

60. (025) Which fuel spill is considered a ground mishap, and requires response by the senior fire official on the installation?
    a. Class I.
    b. Class II.
    c. Class III.
    d. Class IV.

61. (025) During a refuel operation, you notice a small fuel leak. What is the *first step* you should take?
    a. Post fireguards and contact your supervisor.
    b. Notify the installation fire protection agency.
    c. Turn off all potential ignition sources.
    d. Stop the refuel operation.

62. (026) Which are the three hazards associated with compressed air?
    a. Air pressure, fluids, and internal distracters.
    b. Air pressure, flying, particles, and noise.
    c. Compressed gasses, noise, and distractions.
    d. Nitrogen, noise, and foreign object damage (FOD).

63. (026) Which of the following would not be on a compressed air safety checklist?
    a. Use air in well ventilated area.
    b. Always coil the hose.
    c. Never point the air nozzle at anyone.
    d. Inspect hose prior to use.

64. (027) As a *minimum*, a respirator fit-test must be accomplished for every respirator wearer initially and
    a. then monthly.
    b. then every six months.
    c. before each use.
    d. then at least annually.

65. (027) Respirator training *must* be documented on an
    a. Air Force Form 55.
    b. Air Force Form 623.
    c. Air Force Form 1071.
    d. Air Force Technical Order (AFTO) Form 244.

66. (027) Individually issued respirators should be cleaned and sanitized
    a. after every use.
    b. before every use.
    c. at the end of the each day in which they were used.
    d. at the beginning of the day in which they will be used.

67. (027) Respirators stored for emergency or rescue use *must* be inspected at least
    a. daily.
    b. monthly.
    c. semiannually.
    d. annually.

68. (028) Which footwear items are authorized for wear inside a fuel cell?
    a. Gym shoes.
    b. Static resistant or neoprene booties.
    c. Steel-toe boots with footwear covers.
    d. Clean boots with or without footwear covers.

69. (028) When you're applying solvents to an aircraft structure, you may wear
    a. cotton gloves.
    b. leather gloves.
    c. surgical gloves.
    d. approved gloves.

70. (029) You *must* wear safety goggles when you're
    a. draining a fuel tank.
    b. installing an access door.
    c. performing blowback from inside an integral tank.
    d. performing injection sealing from inside an integral tank.

71. (029) What should you do to a self-contained emergency eyewash station before you begin any fuel systems maintenance?
    a. Flush the unit.
    b. Check date on expiration tag.
    c. Place the unit outside.
    d. Ensure the unit is filled with fresh water.

Please read the unit menu for unit 4 and continue ➔

Student Notes

Unit 4. Air Force Technical Publications

PERHAPS AT SOME TIME in your life, you have started a job or task without any idea of how to do it, where to start, or what you needed to complete it. While that may be all right in some jobs or tasks, do not try that with Air Force equipment. It is not allowed (not now and never will be). The reason for this is that TOs have been developed to guide you in the proper procedures for accomplishing all the jobs of your specialty in a proper and timely manner. The choice of if or when you are required to use TOs has been made for you—you will use the proper TO each and every time you do a task. Every TO is a military order, directly from the secretary of the Air Force.

There are many types of AFTOs and publications. You need to learn which publications you need, where to locate them, and how to use them. As a fuel system journeyman, you will use TOs more often than other publications. Your duties will expand to include other publications as you progress in rank and move into a supervisory position. Nevertheless, now is the time to become well acquainted with all types of AFIs, TOs, and other basic publications.

In the last 10 years, the Air Force and the Department of Defense (DOD) have been rapidly moving toward digital forms of publications. In fact, it is now a rare occasion when an AFI is not available online. Additionally, most TOs are in digital format, available as needed.

Enhanced Technical Information Management System (ETIMS) is the Air Force system of record, a secure Web application accessible via the Air Force portal with the TO catalog. This application establishes and manages information about AFTOs, disseminates current information on available TOs, manages TODO accounts for the ordering and maintaining of TOs and records, and enables the viewing of electronic technical orders (eTO) online in the ETIMS connected mode and on electronic tools (eTool) in the ETIMS disconnected mode. The ETIMS functions to acquire, improve, publish, catalog, manage, store, distribute, and display the official TOs needed for the safe and effective operation of Air Force weapon systems and equipment. For the purpose of this unit, we will stick to the basics of Air Force publications. However, it will be to your advantage to become familiar with the aforementioned system.

NOTE: AFTO system training is available through the Air Force network (AFNET) site. ETIMS computer-based training is located on the ETIMS AFNET site.

In this CDC, we cover the subject areas that lay the foundation to build your knowledge base of the TO and publication systems used in the Air Force. We will first cover the AFTO system. Then, we will cover methods for issuing, selecting, and correcting TOs.

4–1. Technical Order System

What a disaster it would be if everyone working on aircraft systems was allowed to go his or her own way. Of course, this is not allowed to happen. Instead, a common core of directives is available called

the AFTO system. The purpose of the AFTO system is to provide clear, concise instructions for the safe and effective operations and maintenance (O&M) of Air Force-owned systems and equipment. The secretary of the Air Force has the authority to publish TOs. Each TO provides the necessary information and instructions to operate, install, maintain, inspect, and modify the equipment or system it covers. As a fuel system journeyman, you will use various TOs and support data, and each type fills a certain need. The five basic types of TOs you will use are listed:

1. Index TOs.
2. O&M TOs.
3. TCTOs.
4. Methods and procedures technical orders (MPTO).
5. Abbreviated TOs.

030. Index technical orders

TOs that list other TOs are called TO indexes. These indexes provide a means of selecting needed TOs, showing the status of all TOs, and in certain instances, grouping the TOs to specific items of equipment. In addition, the indexes provide a basis for determining initial distribution and requisition requirements and for updating TO files and records. Several kinds of index TOs are used. In recent history, indexes were published in microfiche form and were updated by revisions but are now available as a compact disc (CD) in one large electronic file called 0–1–CD–1 *USAF Technical Order Catalog* (also available online). The CD is subdivided into indexes. Most indexes cover a TO category or a section of a category when the category is subdivided. The three primary indexes you will deal with as a fuel system journeyman are the TO catalog, special TO index, and the list of applicable publications (LOAP).

TO catalog

The TO catalog provides information about all active AFTOs. You can access the TO catalog using ETIMS. You can use the Tech Order List, New Technical Orders, and New Increments screens to generate lists of TOs according to search criteria that you enter. The TO Detail search screen displays all of the information for a specified TO. The ETIMS catalog is updated daily with information for newly assigned TOs, TO increments (revisions, changes, or supplements), TCTO headers, and TCTOs. Information regarding renumbered and reinstated TOs (previously rescinded) is updated daily in ETIMS, too. You can access this information by conducting an ETIMS Tech Order List and New Increments wildcard (*) search. Complete information for all TOs is refreshed weekly in ETIMS and displayed on the TO Detail screen. Information associated with all TO publication status changes is refreshed monthly. This includes information for TOs rescinded or reinstated, superseded/distributed, and/or renumbered.

Special TO indexes cover special classes of TOs such as nuclear weapons support. Nuclear weapons TOs are indexed in TO 0–1–11N, *Numerical Index to Joint Nuclear Weapons Publications,* and TO 0–1–11N–1–CD–1, *Numerical Index to Joint Nuclear Weapons Publications AF Supplement.* Another example of special TO indexes is TO 0–1–71, *Consolidated Security Assistance Technical Order Index*, which covers TOs used by security assistance countries. The TO catalog in ETIMS replaced every other index.

List of applicable publications

A LOAP is a complete listing of TOs for a specific weapons system, such as the F–16 aircraft, or for a piece of equipment. The main purpose of this TO is to help you become familiar with the TOs you may need for the system. If you need a TO number, look at the LOAP. If you establish a TO file, the LOAP provides you with the minimum TO requirements.

A LOAP TO is one where –01 appears at the end of a TO number (an exception is TO 0–1–01). Do not use the LOAP to determine the currency of TOs or for ordering TOs.

031. Operations and maintenance technical orders

Figure 4–1 illustrates several types of O&M manuals. These TOs contain specific instructions for working on weapons systems or equipment. They cover operation, maintenance, and handling of systems and equipment. Since methods and materials are improved, steps and procedures are revised. This potential for change and the critical nature of the work you do means you must perform *every job by the book.* When a TO is sufficiently large and has several natural divisions in tasks or equipment breakout, it may be divided into several smaller TOs. These TOs are identified with a separate dash number. Examples of O&M TOs include the following:

1. General vehicle (GV).
2. General system (GS).
3. Job guide (JG).
4. Troubleshooting (TS).
5. Fault isolation (FI).
6. Illustrated parts breakdown (IPB).

This is only a partial list of types of O&M TOs. You should take the time and effort to research the TOs in your shop and learn what information is available. Besides promoting your own career, you can gain the satisfaction of knowing your job better than your peers know.

Here is a brief description of the information contained in each manual with examples of TO numbers. Do not get worried, we will break down the TO numbering system in a later objective.

General vehicle

The GV TO provides general vehicle information. You would use a GV TO if you wanted to know the safety hazards of being around an aircraft or how to tie down an aircraft. It also contains many other general procedures about the aircraft. For example, TO 1F–15C–2–00GV–00–1, *General Vehicle—Aircraft Description and Maintenance Orientation,* gives general knowledge and maintenance tasks about the F–15C.

General system

The GS TO provides detailed descriptions of system and subsystem theories of operation. For example, TO 1F–16C–2–28GS–00–1, *Technical Manual-General System-Organizational Maintenance Fuel Systems,* is a detailed description of the aircraft fuel system of the F–16C. The GS also lists special tools, test equipment, and information to help your fabrication shop manufacture necessary tools.

Job guide

JGs provide detailed procedures for equipment maintenance in a portable size intended to be used on the aircraft. They may be printed in parts, with each part assigned its own TO number. The table of contents shows how many parts make up the TO. Each JG contains complete start-to-finish maintenance instructions for each task in a logical step-by-step sequence. For example, TO 1F–16C–2–28JG–20–1, *Organizational Maintenance Fuel System Distribution,* covers on-aircraft maintenance for the fuel distribution system.

Troubleshooting

The TS TO provides detailed troubleshooting instructions. The information enables you to isolate a problem or troubleshoot a malfunctioning component, system, or operation. For example, troubleshooting instructions for the A–10 fuel system can be found in TO 1A–10A–2–28TS–1, *Organizational Maintenance Troubleshooting, Fuel System.*

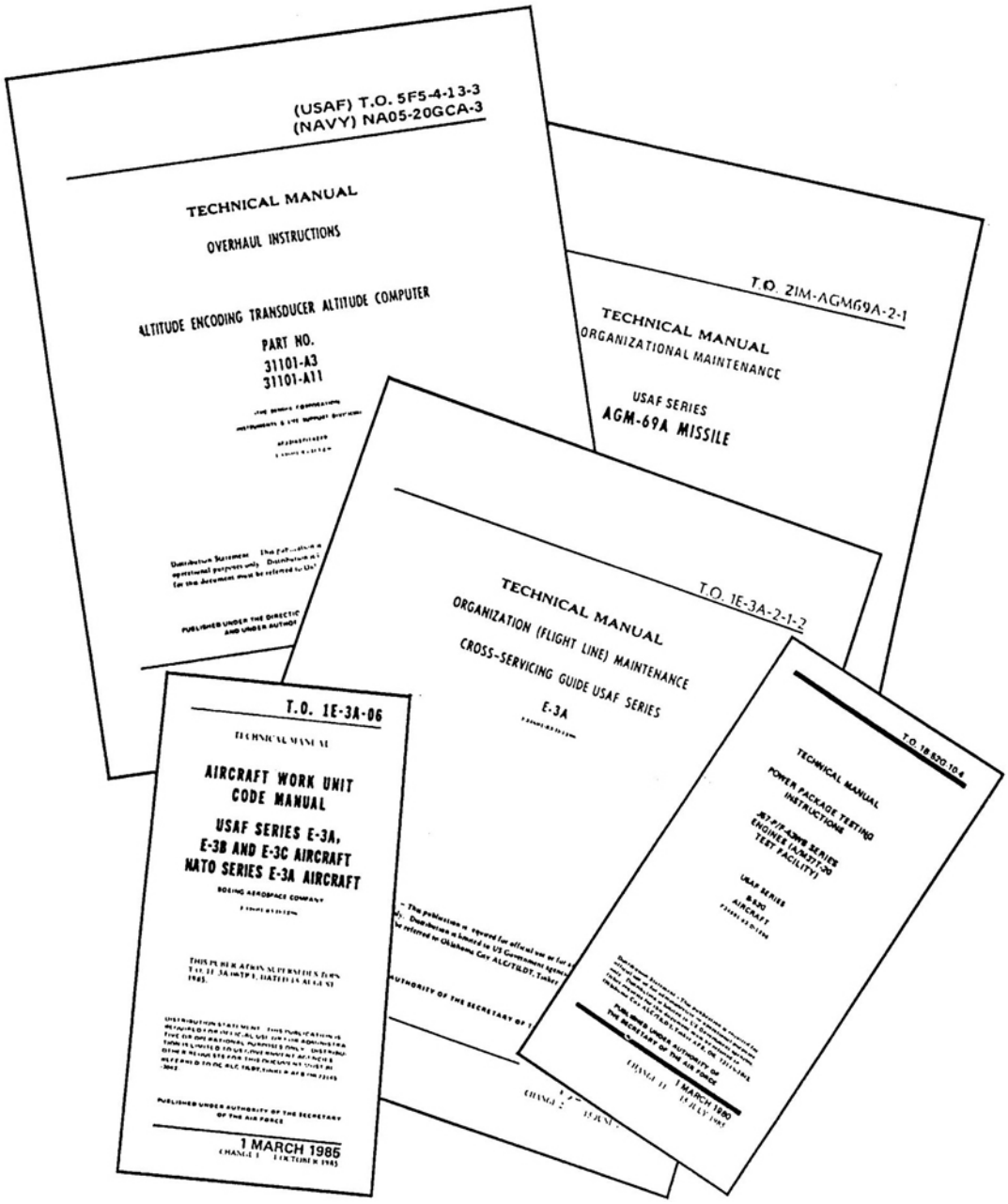


Figure 4–1. O&M manuals.

Fault isolation

FI TOs provide information on fault isolation for a system or subsystem. These TOs help you work your way from a fault condition to the probable cause and then the remedy. For FI procedures for the engine feed system for the F–15C, you would need TO 1F–15C–2–28FI–00–1, *Fault Isolation Organizational Maintenance Fuel System.*

Illustrated parts breakdown

In addition to instructions on installation, operation, maintenance, and handling, some TOs also list part numbers, names, pictures, and other information needed to order parts or assemble a piece of equipment. These TOs are called an IPB. When IPBs are too large to be printed as one book, they may be sectionalized.

032. Time compliance technical orders

TCTOs provide instructions for modifying military systems and commodities within specified time limits. They also initiate special "one-time" inspections or impose temporary restrictions on systems and commodities. Each TCTO is assigned a category by a Configuration Control Board. There are three categories authorized—immediate, urgent, and routine action.

Immediate action TCTOs

Immediate action TCTOs are issued when unsafe conditions, if not corrected, could result in any of the following:

- Serious or fatal personal injury.
- Extensive equipment damage.
- Destruction of valuable property.

Interim time compliance technical order (ITCTO) messages Issue immediate action TCTOs. Because of their urgency, immediate action TCTO distribution is given a high priority, and commanders ensure distribution to all affected personnel within four hours of receipt (fig. 4–2).

If a formal publication of this TCTO is issued, the words "IMMEDIATE ACTION" are printed in red at the top center of the first page and a series of red Xs (**XXXX**) are printed around the border of the first page. As the name implies, immediate action TCTOs require immediate action to remove the concerned aircraft or equipment from service. Immediate compliance is required when directed.

Usually, the methods for correcting the unsafe condition are specified in the TCTO. Upon receipt of an immediate action TCTO, a red X is placed in the aircraft or equipment maintenance forms.

Urgent action TCTOs

Urgent action TCTOs are issued under the governing factors of combat necessity or potentially hazardous conditions, which could result in the following:

1. Injury to personnel.
2. Damage to property.
3. Unacceptable reductions in combat efficiency.

They are issued by message or as formal TCTOs. The urgency of these TCTOs requires compliance within the specified time limit of one to ten days. If compliance is not accomplished by expiration of the time limit, these TCTOs require action to remove aircraft from service. On urgent action TCTOs, the words "URGENT ACTION" are printed in red at the top center of the first page and a series of red diagonals alternately spaced with red Xs (**/X/X/X**) are printed around the border of the first page, as shown in figure 4–3.

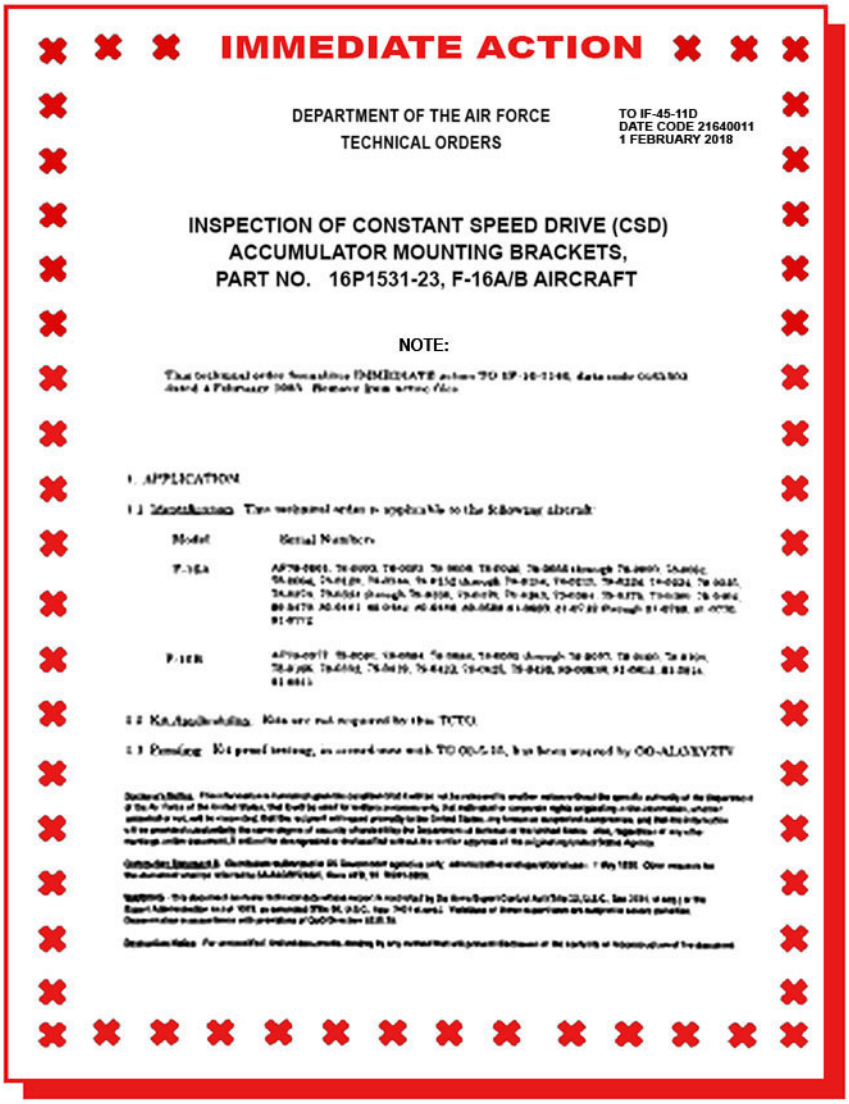
Routine action TCTOs

Routine action TCTOs are issued for any conditions not covered under immediate or urgent action TCTOs. Governing factors are equipment or procedural deficiencies of a material, mechanical, operational, or tactical nature. If not corrected, these conditions could result in the following:

1. Create a hazard through prolonged usage.
2. Have a negative effect on operational efficiency.
3. Reduce tactical or support utility.
4. Reduce operational life or general service utilization of systems or commodities.

Routine action TCTOs are issued to authorize, accomplish, and record one-time Air Force requirements (e.g., inspections, restrictions, etc.) and permanent modifications. This type of TCTO is given a time limit in which the action must be accomplished. This compliance period varies based on

the maintenance level (organizational, depot) to which the aircraft are assigned but is normally from 30 to 270 days.



IMMEDIATE ACTION

DEPARTMENT OF THE AIR FORCE
TECHNICAL ORDERS

TO IF-45-11D
DATE CODE 21640011
1 FEBRUARY 2018

INSPECTION OF CONSTANT SPEED DRIVE (CSD) ACCUMULATOR MOUNTING BRACKETS, PART NO. 16P1531-23, F-16A/B AIRCRAFT

NOTE:

1. APPLICATION

Model Serial Numbers

F-16A

F-16B

Figure 4–2. Sample immediate action TCTO.

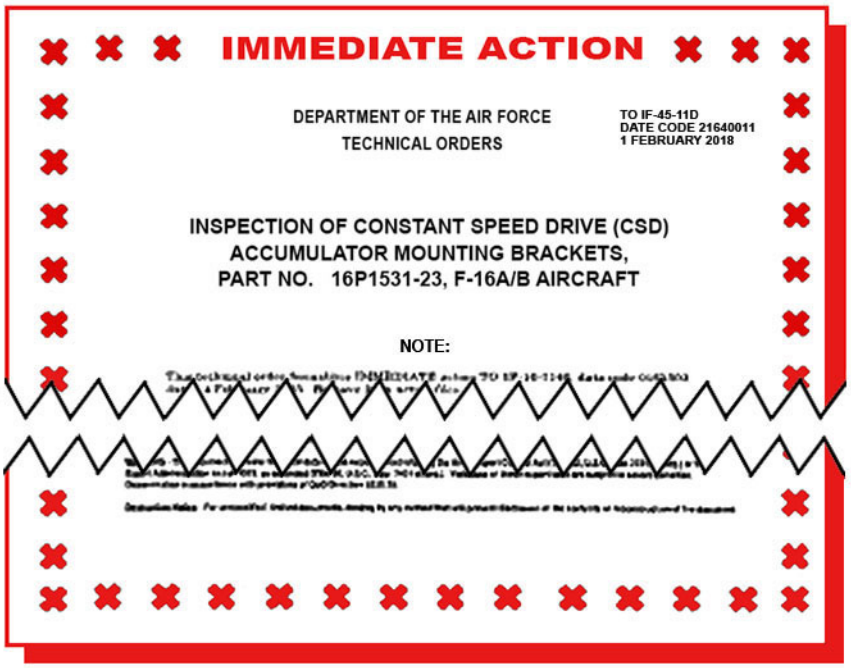


Figure 4–3. Urgent action Sample TCTO.

033. Methods and procedures technical orders

Some TOs are written on general subjects rather than on specific equipment; these are called MPTOs. Figure 4–4 illustrates several types of MPTOs. MPTOs establish policies and prescribe procedures relating to such subjects as the following:

- TO system.
- Preventive maintenance.
- Scheduled equipment inspections.
- Maintenance management systems.

MPTOs are general in nature, differing from TOs dealing with specific aircraft, missiles, or other equipment. MPTOs tell the what, when, and how of the subjects listed in the table of contents of TO 0–1–02, *General Technical Orders*. Various series of TOs are important to your job as a fuel system journeyman. The 00–5 series and the 00–20 series are two prime examples of the MPTOs that we use on a regular basis.

00–5 series

The 00–5 series TOs provide information on the TO system, TCTO system, and TO numbering schemes. The important 00–5 series are as follows:

- TO 00–5–1, *Air Force Technical Order System*.
- TO 00–5–18, *United States Air Force Technical Order Numbering System*.

TO 00–5–1, Air Force Technical Order System

The 00–5–1 TO system covers the concept and management of the United States Air Force (USAF) TO system. It provides policy and assigns responsibilities on such subjects as TO compliance and waivers, TO improvement reporting, and the process of review, validation, and verification of TOs.

TO 00–5–18, USAF Technical Order Numbering System

This TO describes the procedures and techniques employed to assign TO numbers to technical data used to operate, install, maintain, inspect, perform procedural functions on, and modify Air Force

weapons systems and equipment. This TO will take you through every category used in the TO system. We will discuss the TO numbering system in detail later.

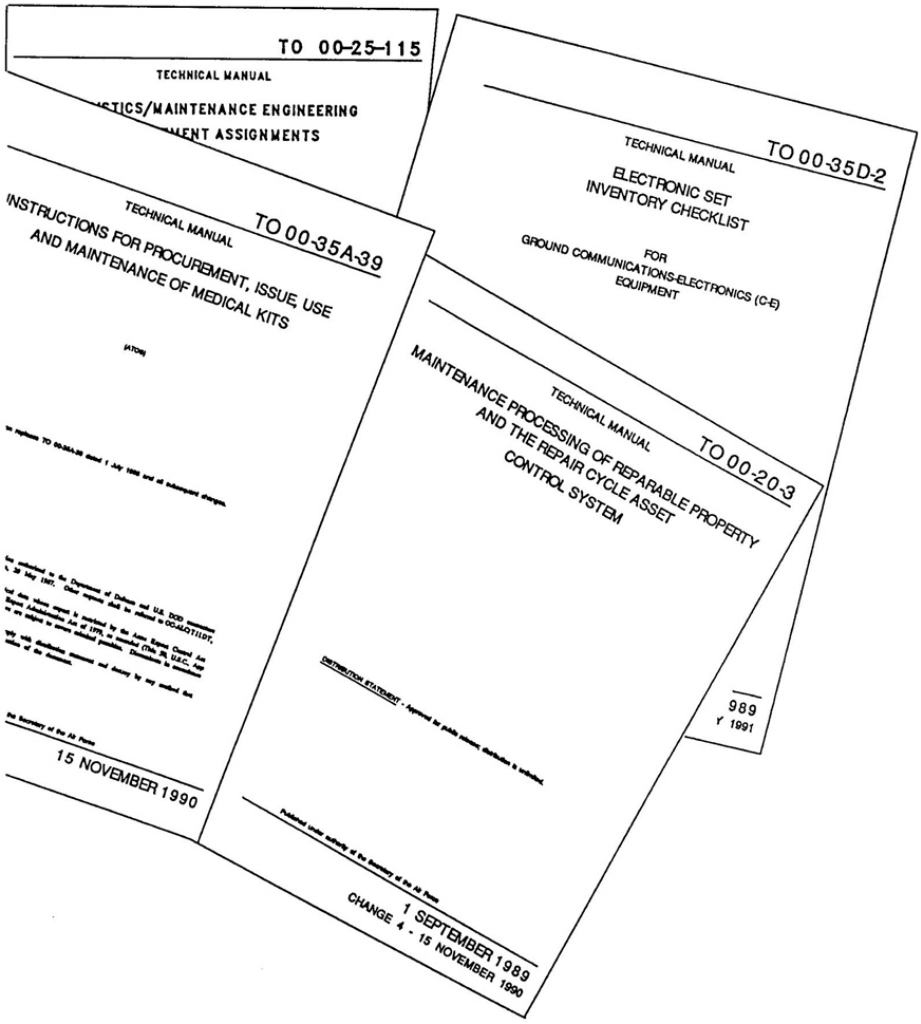


Figure 4–4. Examples of methods and procedures TOs.

00–20 series technical orders

The 00–20 series of TOs provide maintenance management information. The following 00–20 series TOs apply to your job almost daily:

- TO 00–20–1, *Aerospace Equipment Maintenance Inspection, Documentation, Policy and Procedures*.
- TO 00–20–2, *Maintenance Data Documentation*.
- TO 00–20–3, *Maintenance Processing of Reparable Property and the Repair Cycle Asset Control System.*

These TOs contain more information than we have room or time to mention. You are highly encouraged to get these TOs and look through them in your spare time.

TO 00–20–1, Aerospace Equipment Maintenance Inspection, Documentation, Policies, and Procedures

TO 00–20–1 covers inspection concepts, forms documentation, and general requirements and procedures for preventative maintenance. It also describes the symbols established for use on

maintenance documents. You must understand these symbols and their uses in order to make the proper entries on the forms. Some of the AFTO forms commonly used by our career field are the AFTO 781 series, AFTO 244, and AFTO 95. TO 00–20–1 gives the steps necessary to complete these forms correctly.

TO 00–20–2, Maintenance Data Documentation

TO 00–20–2 provides policy to the user for the use and operation of the maintenance data documentation (MDD) process. This is the TO for IMDS and G081. It also describes the codes and entries used in the MDD process. Another AFTO form we frequently use is the AFTO Form 350 tag. This TO tells you how to fill one out.

TO 00–20–3, Maintenance Processing of Reparable Property and the Repair Cycle Asset Control System

TO 00–20–3 gives general policies and procedures for managing repair cycle assets. Repair cycle assets are items that must be repaired, when possible, because of their cost. When not reparable (condemned), these assets are turned into the repair cycle to be used for parts. Because of the high cost or high use of these assets, the maintenance processing system often tracks their purchase, repair, and use.

034. Abbreviated technical orders

These TOs are primarily work simplification devices. The three types of abbreviated TOs are inspection work cards, inspection sequence charts, and checklists.

Inspection work cards

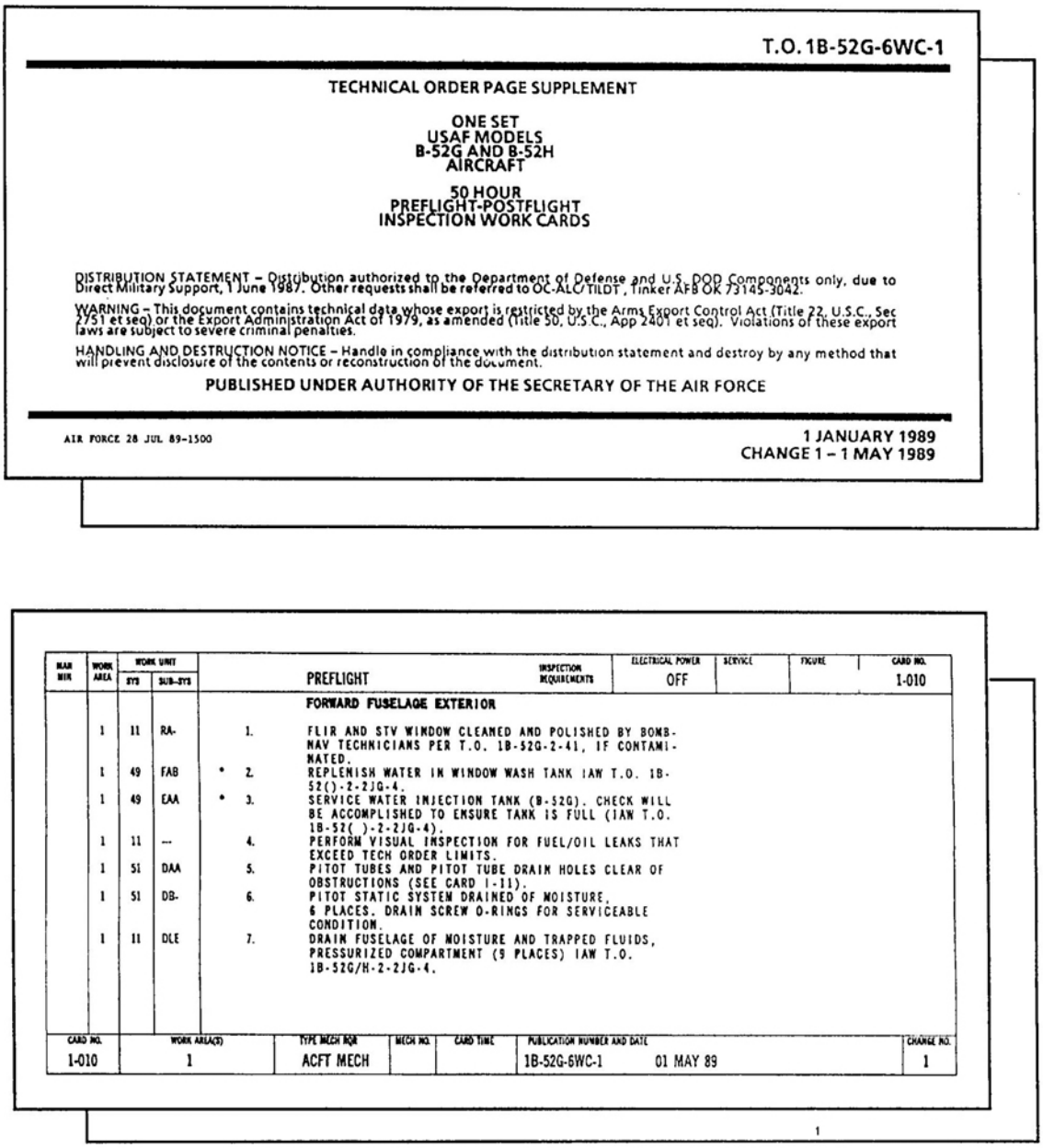
Figure 4–5 shows examples of inspection work cards. These card sets list, in checklist form, the inspection requirements given in the –6 aircraft inspection TO. They provide guidance, including applicable safety warnings, cautions and notes, and specific accept or reject criteria for performing an inspection. Like sectionalized TOs, inspection work cards are subdivided, as needed, to fit each inspection. You can take these TOs to the job when you perform an inspection. Work card sets cover a specific type of inspection and normally the system on which the inspection is to be performed. The inspection requirements on each card are arranged in a logical sequence. Pictures on the reverse of selected cards show the locations of components to be inspected. These work cards are used in conjunction with the inspection sequence charts.

Inspection sequence charts

Inspection sequence charts come in sets similar to the work cards. However, sequence charts are used primarily for *scheduled* inspections and depict a basic planned work schedule or sequence in which the work cards may be used. The charts are guides to preparing the actual work schedule for each inspection and normally are used by personnel such as the phase dock chief to control the assignment of work during an inspection.

Checklists

Checklists are lists of TO items in abbreviated form. They guide minimum serviceable condition. This means a checklist is to be followed in the order the steps are given. A checklist may be published to prescribe sequential steps to be followed to preclude potential damage or degrade operational readiness of equipment. The checklist number consists of the basic TO number from which its information was taken, the letters CL that identifies it as a checklist, and the number of the checklist. A typical checklist number for organizational maintenance on an A–10 attack aircraft is TO 1A–10A–2–12JG–1CL–1. The sequence of tasks or operations in the checklist is deemed the most practical to determine the operational readiness of the equipment.



T.O. 1B-52G-6WC-1

TECHNICAL ORDER PAGE SUPPLEMENT

ONE SET
USAF MODELS
B-52G AND B-52H
AIRCRAFT

50 HOUR
PREFLIGHT-POSTFLIGHT
INSPECTION WORK CARDS

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AIR FORCE 28 JUL 89-1500

1 JANUARY 1989
CHANGE 1 – 1 MAY 1989

MAR MIR	WORK AREA	WORK UNIT SYS	WORK UNIT SUB-SYS		PREFLIGHT INSPECTION REQUIREMENTS	ELECTRICAL POWER OFF	SERVICE	FIGURE	CARD NO. 1-010
					FORWARD FUSELAGE EXTERIOR				
	1	11	RA-		1. FLIR AND STV WINDOW CLEANED AND POLISHED BY BOMB-NAV TECHNICIANS PER T.O. 1B-52G-2-41, IF CONTAMINATED.				
	1	49	FAB	*	2. REPLENISH WATER IN WINDOW WASH TANK IAW T.O. 1B-52()-2-2JG-4.				
	1	49	EAA	*	3. SERVICE WATER INJECTION TANK (B-52G). CHECK WILL BE ACCOMPLISHED TO ENSURE TANK IS FULL (IAW T.O. 1B-52( )-2-2JG-4).				
	1	11	---		4. PERFORM VISUAL INSPECTION FOR FUEL/OIL LEAKS THAT EXCEED TECH ORDER LIMITS.				
	1	51	DAA		5. PITOT TUBES AND PITOT TUBE DRAIN HOLES CLEAR OF OBSTRUCTIONS (SEE CARD 1-11).				
	1	51	DB-		6. PITOT STATIC SYSTEM DRAINED OF MOISTURE, 6 PLACES. DRAIN SCREW O-RINGS FOR SERVICEABLE CONDITION.				
	1	11	DLE		7. DRAIN FUSELAGE OF MOISTURE AND TRAPPED FLUIDS, PRESSURIZED COMPARTMENT (5 PLACES) IAW T.O. 1B-52G/H-2-2JG-4.				

CARD NO.	WORK AREA(S)	TYPE MECH REQR	MECH NO.	CARD TIME	PUBLICATION NUMBER AND DATE	CHANGE NO.
1-010	1	ACFT MECH			1B-52G-6WC-1 01 MAY 89	1

1

Figure 4–5. Abbreviated TOs (inspection work cards).

Self-Test Questions

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

030. Index technical orders

1. What do you call TOs that are lists of other TOs?

2. What types of information do TO indexes provide?

3. What is the purpose of LOAP TOs?

4. What does a –01 at the end of a TO number identify?

031. Operations and maintenance technical orders

1. What type of information is contained in O&M TOs?

2. Which type of TO contains detailed information on the theory of operation of systems and subsystems?

3. Which type of TO provides detailed procedures for on-aircraft maintenance?

4. What information is found in a FI TO?

5. What type of information is found in IPBs?

032. Time compliance technical orders

1. What is the purpose of TCTOs?

2. What three TCTO categories are authorized?

3. Under what conditions are immediate action TCTOs issued?

4. How is an immediate action TCTO issued?

5. Why are urgent action TCTOs issued?

6. What is the time limit for accomplishment of an urgent action TCTO?

7. What happens to the affected aircraft or equipment if an urgent action TCTO is not accomplished by expiration of the time limit?

8. Which type of TCTO is issued for conditions, which may create a hazard through prolonged use of the affected system?

9. Normally, what is the compliance period for routine action TCTOs?

033. Methods and procedures technical orders

1. Match the subjects in column A with the technical order series in column B. Choices in column B may be used once, more than once, or not at all.

Column A	*Column B*
____ (1) Preventive maintenance program.	a. TO 00–5–1.
____ (2) Maintenance data documentation.	b. TO 00–5–18.
____ (3) TO improvement reports.	c. TO 00–20–1.
____ (4) Describes symbols and their uses.	d. TO 00–20–2.
____ (5) Repair cycle management.	e. TO 00–20–3.
____ (6) How TOs are numbered.	

034. Abbreviated technical orders

1. Abbreviated TOs are primarily what?

2. Inspection work cards are in what form and from where do the requirements come?

3. For what are inspection sequence charts primarily used?

4. What type of abbreviated TO may be published to prescribe sequential steps to be followed to preclude potential damage?

4–2. Technical Order Numbering and Improvement System

In the last lesson, we discussed the different types of TOs and how they are issued. Previously, we used examples of how TOs are numbered. In this lesson, we will present in-depth information of the meanings of the specific parts in an AFTO number. We cover the TO numbering system and the use of TOs. For more information, see TO 00–5–18.

035. Technical order numbering system

The TO numbering system provides a systematic grouping of technical publications. Each TO number has three or more parts separated by dashes. Each part has a definite meaning. The first number of a TO designates the *category*. TO categories are not numbered in a consecutive sequence. Currently, 42 categories are identified between category 0 and category 71.

Technical order categories

The following is a partial listing of TO categories:

–0	Numerical indexes, alphabetical indexes, and cross-reference tables.
–00	General TOs (MPTOs).
–1	Aircraft publications (including helicopter and associated equipment).
–2	Aircraft and missile engines and associated equipment.
–3	Aircraft propellers and associated equipment.
–4	Aircraft landing gear components and associated equipment.
–5	Airborne TO.
–6	Aircraft and missile fuel systems and equipment.
–37	Fuel-, oil- and propellant-handling equipment.
–42	Coating, cleaning and sealing compounds and fuels, gases, lubricants, chemicals and materials.
TO 00–5–1 lists the titles of each of the remaining TO categories.	

Because you are assigned to the aircraft fuel systems career field, you should be thoroughly familiar with the numbering system for category 1 (aircraft) TOs. The following partial category 1 breakdown identifies types of aircraft TOs:

Partial Breakdown of Category 1 Aircraft Technical Orders			
1	Aircraft general	1E	Electronic aircraft
1A	Attack aircraft	1F	Fighter aircraft
1B	Bomber aircraft	1H	Helicopters
1C	Cargo aircraft	1T	Trainer aircraft

Breaking down an aircraft technical order number

The first number of the TO indicates the *category*. This is followed by a letter identifying the *basic mission* of the equipment, such as bomber (B), fighter (F), or cargo (C) aircraft.

The second part gives a further breakdown of the first part. An example of this is the model of aircraft, such as 52 (1B–52), 5 (1C–5), or 16 (1F–16). The second part may also be broken down further by general series of aircraft A, B, or C, and so forth. The *series letter* indicates a major modification of the aircraft. For example, when the C–5 aircraft was built, it was given the designation “C–5A” indicating that it had not yet been modified. Later, the fleet of C–5As were sent to depot and modified to incorporate technology updates.

The result was a new series of aircraft, designated the C–5B. Other examples are shown in the following table:

1B–1B	Bomber aircraft, Model 1, Series B (first modification)
1B–52D	Bomber aircraft, Model 52, Series D
1C–17A	Cargo aircraft, Model 17, Series A
IF–16D	Fighter aircraft, Model 16, Series D
1C–10(K)A	Tanker aircraft (with a modified mission as a cargo aircraft), Model 10, Series A

The third part identifies the type of TO. There are many types of TOs within an aircraft category. The following table shows a partial list of aircraft TO types:

–01	LOAP
–06	Work unit code manuals
–1	Flight manual
–2	Maintenance instructions
–3	Structural repair instructions
–4	IPB
–5	Basic weight checklist and loading data
–6	Inspection requirements

Part three may also contain one or more alpha characters indicating a series of checklists, work cards, supplements, and other functions. These alpha characters may be used in part four also. Some authorized alpha characters for category 1 TOs are as follows:

-CF	Acceptance or functional check flight procedures
-CL	Checklist
-JG	Job guide
-LC	Lubrication charts
-S	Operational supplements
-SS	Safety supplements
-WC	Work cards
-WS	Worksheets

When an aircraft TO number has *four* parts, the *fourth* part identifies a supplemental manual or sections of a sectionalized TO, commonly called the "volume," for example, in TO 1C–5B–2–5:

1C	Cargo aircraft
–5B	Model 5, Series B
–2	Type of technical order (maintenance instructions)
–5	Section of maintenance instructions (fuel systems)

When a TO number has *five* parts, the *third* part identifies the kind of TO, the *fourth* part identifies an individual TO, and the *fifth* part identifies a section of the sectionalized TO. Looking at the previous example, TO 1C–5B–2–5JG–1 is interpreted as shown below:

1C	Cargo aircraft
–5B	Model 5, Series B
–2	Maintenance instructions
–5JG	Section (fuel systems) and suffix letters (job guide)
–1	Sectionalized portion of job guide (book 1 of ?)

Let's take a moment to review.

- A TO number is made up of several parts with each part being separated by a dash.
- The first part of *any* TO number is called the *category*. There are 42 categories of TOs in the technical order system at the present time. The category you will use most often is Category 1-Aircraft.
- The *first* part of an aircraft TO number also includes a letter indicating the basic mission of the aircraft. A second letter may also be used to indicate a modified mission of the aircraft.
- The *second* part of an aircraft TO number identifies the aircraft model and series.
- The *third* part identifies the type of TO.
- The *fourth* part identifies a section (volume) of the manual identified in the third part.
- The *fifth* part identifies a sectionalized portion of the fourth part. This numbering system is used for the majority of aircraft TOs, with the exception being maintenance manuals assigned to the Maintenance Integrated Data Access System (MIDAS).

036. Maintenance Integrated Data Access System

The MIDAS is a numbering system for organizational maintenance manuals, too. The system is used for performing maintenance on modern aircraft such as the F–16, B–1, and KC–10.

In essence, MIDAS is a way of dividing and identifying data by system, subsystem, and subject. The TO number of a maintenance manual conforming to MIDAS may contain up to seven separate parts.

Parts one, two, and three

The first three parts of a TO number using MIDAS are formed in the same manner described in the previous lesson on TO numbering:

- The *first* part identifies the category (1 for aircraft) and basic mission of the aircraft.
- The *second* part identifies the model and series.
- The *third* part identifies the type of manual (–2 indicates a maintenance manual; [e.g., *1B–1B–2* indicates a maintenance manual for a bomber aircraft, model 1, second series]).

Part four

The fourth, fifth, sixth, and seventh parts of a MIDAS manual are formed in a different manner than other manuals in the TO system. In the *fourth* part, two numeric characters identify the chapter number in the TO and the equipment system or subject matter that the TO covers. Some system designators used in part four are as follows:

–05	Aircraft general
–24	Electrical power
–27	Flight controls
–28	Fuel systems
–29	Hydraulic systems

Notice that fuel systems is given the designation “28.” This means that within MIDAS, any fuel system TO will be assigned “28” as the fourth part. The fourth part also consists of two alpha characters that identify the function of maintenance manuals; they are used in conjunction with the applicable chapter number. The following list contains authorized alpha designators:

-FI	Fault isolation manual
-FR	Fault reporting manual
-GS	General system manual
-GV	General vehicle manual
-JG	Job guide manual
-SD	Schematic diagram manual
-WD	Wiring data manual

Other previously authorized alpha designators remaining in use on some current TOs include those in the following table:

-GA	General aircraft manual
-MS	Maintenance support manual
-TS	Troubleshooting manual

Part five

The fifth part consists of two numbers. The first number denotes the MIDAS subsystem, and the second number denotes the sub-subsystem if further breakdown is required. A zero in either one or both positions indicates there is no equipment breakdown at that level. For example, TO *1B–1B–2–28GS–00* represents a general system maintenance manual for fuel systems on a B1–B aircraft. The “*00*” indicates that this manual covers all fuel systems on the B–1B aircraft, and that no separate manuals are required for subsystems.

Part six

Part six consists of one or more numbers that identify the TO series number of the subsystem indicated in part five (e.g., 1B–1B–2–28GS–00–1).

Part seven

This part, although rarely used, consists of one or more numbers identifying a section of a sectionalized TO or identifying a supplemental manual. You can find additional information on MIDAS by referring to the general vehicle TO for your unit's assigned aircraft.

Understanding the TO numbering system will enable you to locate information without referring to an index. However, you must use the current numerical index each time to ensure you are using a current TO. If you have a problem with a TO, you need to use the TO improvement reporting system.

037. Recommending changes to technical orders

Let's start this lesson with a brief scenario. You are doing a task and come to a point where an important step has been left out of the JG manual. At this point, you have a couple of options—ignore the omission and continue the task, or notify someone of the mistake. Of course, option two is the correct action. If you discover a mistake in a TO, you have an obligation to report the discrepancy. To remedy this situation, use the AFTO Form 22, Technical Manual (TM) Change Recommendation and Reply, to process recommended changes (RC), which was developed to correct errors or omissions in TOs. This form may be used to identify/suggest specific TO improvements, correction of an error, or correction of an omission of a technical nature, which may impair mission accomplishment. An example of an AFTO Form 22 is illustrated in figure 4–6. Several blocks are required to be filled in by you, as in the example. The remaining blocks are filled out by an outside agency, such as QA.

NOTE: Do not use AFTO Form 22 to correct minor inaccuracies of a non-technical nature unless the error affects the meaning of instructive information or procedures.

In this lesson, we will cover two subjects as they apply to the submission of an AFTO Form 22:

1. Routing and approval procedures.
2. Types of reports.

Routing and approval procedures

The person who discovers the discrepancy is responsible for completing the AFTO Form 22. The supervisor of the person submitting the RC ensures the RC is valid and should be submitted. The supervisor then signs the form electronically and makes sure the initiator has also electronically signed it. Then, the RC is forwarded to the responsible organization for review and approval.

Types of reports

Depending on the seriousness of the deficiency, one of three types of RCs may be submitted:

1. Emergency.
2. Urgent.
3. Routine.

Emergency recommendations

Emergency recommendations are submitted on TO deficiencies, which if not corrected *would* result in a fatality (death) or serious injury to personnel, extensive damage, or destruction of equipment or property, or inability to achieve or maintain operational posture (which is mission-essential). A work stoppage caused by TO deficiencies affects operational posture and can be considered a basis for an emergency report. Emergency recommendations are transmitted as e-mail message and the subject of the message will read, "EMERGENCY AFTO Form 22." A read receipt on the e-mail message is required. Initiators must notify the TO manager of the emergency submittal by telephone or e-mail. An emergency recommendation requires the technical content manager, in coordination with the TO management office, to either issue an ITCTO, rapid action change or interim supplement within 48 hours (72 hours for work stoppage) after receipt, or requires the technical content manager to disapprove or downgrade the recommendation within the same timeframe. Emergency recommendations can be downgraded only with the concurrence of the lead command control point.

ATTACH

Freeze Data (use only after form is completed)

TECHNICAL MANUAL (TM) CHANGE RECOMMENDATION AND REPLY
(Use IAW Completion Instructions and TO 00-5-1)

LCN

OMB NO. 0704-0188

1. PIM *(or equivalent)*
ORGANIZATION
NAME
PHONE INITIAL SUBMIT DATE
☐ APPROVED ☐ DISAPPROVED
E-MAIL
sign

2. MAJCOM CCP *(After Review, Return to PIM)*
ORGANIZATION
NAME
PHONE REVIEW DATE
☐ APPROVED ☐ DISAPPROVED
E-MAIL
sign

3. LEAD COMMAND CCP *(After Review, Return to PIM)*
ORGANIZATION
NAME
PHONE REVIEW DATE
☐ APPROVED ☐ DISAPPROVED
E-MAIL
sign

4. TO MANAGEMENT ACTIVITY *(After Receipt, Forward to Evaluator)*
ORGANIZATION
NAME
PHONE RECEIPT DATE
E-MAIL
sign

5. LOCAL CONTROL NUMBER (LCN)

6. PRIORITY *(Check One)*
☐ EMERGENCY ☐ URGENT ☒ ROUTINE

7. CHANGE TYPE *(Check One)*
☐ CORRECTION ☒ IMPROVEMENT

8. INITIATOR
NAME Jeremy Sherwood
RANK SSgt PHONE 461-2169 DATE 20190603
E-MAIL jeremy.sherwood@us.af.mil
sign

9. INITIATOR SUPERVISOR
NAME Kristopher Chapman
RANK TSgt PHONE 461-2769 DATE 20190604
E-MAIL kristopher.chapman@us.af.mil
sign

10. PUBLICATION NUMBER	11. BASIC DATE	12. CHANGE NUMBER	13. CHANGE DATE
1-1-3	23 October 2018	1	16 February 2019

14. WORK PACKAGE/WORK CARD ID	15. PAGE NUMBER	16. PARAGRAPH NUMBER	17. FIGURE/TABLE NUMBER
N/A	27	c	N/A

18. SHORT DESCRIPTION OF DEFICIENCY
Safety statement missing

19. DEFICIENCY
N/A

AFTO FORM 22, 20170309 PREVIOUS EDITION IS OBSOLETE

Figure 4–6. Sample AFTO Form 22.

Urgent recommendations

Urgent recommendations are generated by TO deficiencies, which if not corrected *could* cause one or more of the following:

1. Injury to personnel.
2. Damage to equipment or property.
3. Reduction of operational efficiency.

Also, an urgent recommendation might be submitted if the deficiency could jeopardize the safety or successful accomplishment of a mission. All TCTO deficiencies are submitted as urgent recommendations. The TO management office must publish and distribute a TO update within 40 calendar days or disapprove or downgrade the recommendation within 15 calendar days. Urgent recommendations can be downgraded only with the concurrence of the lead command's command control point (CCP). Use AFTO Form 22 for submission of urgent recommendations.

Routine recommendations

Conditions that do not meet the critical nature of emergency or urgent RCs are routed as routine recommendations. They are submitted as a "Normal" precedence e-mail. A routine RC requires a response within 45 calendar days after receipt. The change should be published and distributed in a TO update within 365 days. The AFTO Form 22 is used to submit this type of recommendation also.

TO 00–5–1 details the TO improvement reporting system; refer to this TO when preparing, reviewing, and submitting TO RCs.

Self-Test Questions

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

035. Technical order numbering system

1. What does the TO numbering system provide?

2. What does the first part of a technical order number identify?

3. What information is contained in the second part of an aircraft technical order number?

4. What does the third part of a technical order number represent?

5. Match the technical order number in column B with its corresponding type of technical order in column A. Items in column B may be used once, more than once, or not at all.

Column A	*Column B*
____ (1) Illustrated parts breakdown.	a. 0–2–1.
____ (2) Inspection work card.	b. 1F–16C–06.
____ (3) Methods and procedures TO.	c. 1F–15E–4–2.
____ (4) Flight manual.	d. 1K(C)–135R–2–28JG–1.
____ (5) Operational supplement.	e. 1C–5A–2–5.
____ (6) Work unit code manual.	f. 1B–2A–6WC–13.
____ (7) Structural repair manual.	g. 1F–16D–1.
____ (8) Inspection requirements technical order.	h. 00–25–172.
____ (9) JG.	i. 1C–5B–3–7.
____ (10) Index TO.	j. 1T–37A–5CL–2.
	k. 1C–141B–2–28S–17.
	l. 1K(C)–10A–6–3.

036. Maintenance Integrated Data Access System

1. For what purpose is MIDAS used?

2. What information is identified by the fourth part of a TO number assigned to MIDAS?

3. In part four of a MIDAS TO number, what do the numeric characters “28” identify?

4. In the TO number 1B–1B–28GS–00–1, what does the “GS” indicate?

5. What is identified in the fifth and sixth parts of a MIDAS maintenance manual?

6. Which part of a MIDAS TO number, if used, identifies a supplemental manual or a section of a sectionalized TO?

037. Recommending changes to technical orders

1. What form is used to recommend a change in a technical order?

2. What should an AFTO Form 22 *not* be used to do?

3. Who is responsible for completing an AFTO Form 22?

4. After supervisor approval and signature, where is the AFTO Form 22 routed?

5. What kind of deficiencies would require an emergency technical order improvement report to be submitted?

6. What guidance should you refer to when preparing, reviewing, or submitting technical order improvement reports?

Answers to Self-Test Questions

030

1. TO indexes.
2. A means of selecting needed TOs, show the status of all TOs, and in certain instances, group the TOs to specific items of equipment. They also provide a basis for determining initial distribution and requisition requirements and for updating TO files and records.
3. To help you to become familiar with the TOs needed for a specific weapons system.
4. With the exception of TO 0–1–01, it identifies that TO as a LOAP TO.

031

1. These TOs provide specific instructions or explain how to work on weapons systems or equipment.

2. GS TO.
3. JG TO.
4. Information on FI for a system or subsystem. They help you work your way from a fault condition to the probable cause and remedy.
5. A list of part numbers, names, pictures, and other information needed to order parts or assemble a piece of equipment.

032

1. They provide instructions for modifying military systems and commodities, and for performing or initially establishing one-time inspections. They may also impose temporary restrictions on systems or commodities.
2. (1) Immediate.
   (2) Urgent.
   (3) Routine action.
3. They are issued for conditions, which, if not corrected, could result in fatality or serious injury to personnel or extensive damage to or destruction of valuable property.
4. As ITCTO messages.
5. Under the governing factors of combat necessity or potentially hazardous conditions.
6. 1 to 10 days.
7. The aircraft or equipment must be removed from service.
8. Routine action.
9. 30 to 270 days.

033

1. (1) c.
   (2) d.
   (3) a.
   (4) c.
   (5) e.
   (6) b.

034

1. Primarily work simplification devices.
2. In checklist form, from the –6 aircraft inspection TO.
3. Scheduled inspections and depict a basic planned work schedule or sequence in which the work cards may be used.
4. Checklists.

035

1. A systematic grouping of technical publications.
2. The category.
3. Aircraft model and series.
4. Type of technical order.
5. (1) c.
   (2) f.
   (3) h.
   (4) g.
   (5) k.
   (6) b.
   (7) i.

(8) l.

(9) d.

(10) a.

036

1. It is a numbering system for organizational maintenance manuals used to perform maintenance on modern aircraft. MIDAS divides and identifies data by system, subsystem, and subject.
2. The chapter number in the TO and the equipment system or subject matter covered by the TO.
3. Fuel systems.
4. A GS manual.
5. The fifth part identifies the MIDAS subsystem and sub-subsystem, if required. The sixth part identifies the technical order series number of the subsystem named in part five.
6. Part seven.

037

1. AFTO Form 22.
2. It shouldn’t be used to correct minor inaccuracies of a non-technical nature unless the error affects the meaning of instructive information or procedures.
3. The person who discovers the discrepancy.
4. To the responsible organization.
5. Deficiencies which, if not corrected, would result in a fatality or serious injury to personnel, extensive damage to or destruction of equipment or property, or inability to maintain operational posture (mission-readiness).
6. TO 00–5–1.

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

Unit Review Exercises

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

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

72. (030) Which is a complete listing of technical orders (TO) for a specific weapons system?
    a. Cross reference table.
    b. List of applicable pages.
    c. Alphabetical index TO.
    d. List of applicable publications (LOAP).

73. (031) A job guide is an example of
    a. a methods and procedures technical order (MPTO).
    b. a checklist (CL).
    c. an operations and maintenance (O&M) technical order (TO).
    d. an abbreviated TO.

74. (031) What type of operations and maintenance (O&M) technical order (TO) enables you to isolate a malfunctioning component?
    a. Job guide (JG).
    b. Checklists (CL).
    c. Troubleshooting (TS).
    d. General vehicle (GV).

75. (032) What type of time compliance technical order (TCTO) is issued for conditions that *could* result in a fatality if not corrected?
    a. Urgent action.
    b. Routine action.
    c. Immediate action.
    d. Emergency action.

76. (032) Which time compliance technical order (TCTO) requires compliance within a specified time limit of one to ten days?
    a. Urgent action.
    b. Routine action.
    c. Immediate action.
    d. Emergency action.

77. (033) Which technical order (TO) gives detailed information on how to correctly complete Air Force technical order (AFTO) forms?
    a. 00–5–1.
    b. 00–5–2.
    c. 00–20–1.
    d. 00–20–3.

78. (034) What type of technical order (TO) is mainly a work simplification device?
    a. Abbreviated.
    b. Directory.
    c. Index.
    d. Time compliance technical order (TCTO).

79. (034) What type of card set lists the inspection requirements from the –6 aircraft inspection technical order (TO)?
    a. Checklists (CL).
    b. Job guides (JG).
    c. Inspection sequence charts.
    d. Inspection work cards.

80. (034) Which abbreviated technical order (TO) is meant to be followed step by step?
    a. Inspection work cards.
    b. Checklists (CL).
    c. Job guide (JG).
    d. Fault isolation (FI).

81. (035) What does the *first* number of a technical order (TO) designate?
    a. Mission design.
    b. Category.
    c. Basic mission.
    d. Type of manual.

82. (035) If the aircraft technical order (TO) number only has three parts, what does the *third* part identify?
    a. Type.
    b. Category.
    c. Series.
    d. Volume.

83. (036) What does the fourth part of a Maintenance Integrated Data Access System (MIDAS) manual number identify?
    a. Type of aircraft.
    b. Type of manual.
    c. Aircraft model and series.
    d. Chapter number and subject matter.

84. (036) What does the fifth part of a Maintenance Integrated Data Access System (MIDAS) manual number identify?
    a. Subsystem.
    b. Type of manual.
    c. Chapter number in the manual.
    d. Supplemental manual.

85. (037) What are the three authorized types of technical order (TO) improvement reports?
    a. Immediate, urgent, and routine.
    b. Urgent, emergency, and routine.
    c. Emergency, interim, and urgent.
    d. Interim, immediate, and priority.

86. (037) How are *emergency* technical order improvement reports submitted?
    a. Air Force Technical Order (AFTO) Form 22.
    b. Priority mail.
    c. Facsimile.
    d. E-mail.

87. (037) Which type of technical order (TO) improvement report would be submitted for a deficiency that *could cause* injury to personnel or damage to equipment?
    a. Urgent.
    b. Priority.
    c. Routine.
    d. Emergency.

88. (037) Which of the following Air Force Technical Order (AFTO) Form 22 recommended changes (RC) require a response within 45 calendar days after receipt?
    a. Urgent.
    b. Priority.
    c. Routine.
    d. Record.

Please read the unit menu for unit 5 and continue ➔

Student Notes

Unit 5. Supply

EACH YEAR, the Air Force buys literally millions and millions of items. These include such things as aircraft, vehicles, spare parts, maintenance tools, job control consoles, desks, computers, and the list goes on and on. The cost each year is billions and billions of dollars. To manage and control all of these assets, Air Force personnel use a well-planned, implemented supply system. Even though you do not work in base supply, your job requires that you have a good working knowledge of how you interact with the personnel that operate and manage this system.

As a fuel system journeyman, you will find that one of your most important responsibilities is the care and management of Air Force materiel. Your shop cannot achieve its mission without supplies. Webster defines the word “materiel” as, “The equipment and supplies, as guns and ammunition, of a military force” or “An organization’s equipment and supplies.” The term *materiel* can be applied to a complete weapon system or a simple O-ring seal. At this stage in your career, how you requisition, utilize, safeguard, transfer, or dispose of materiel items can make or break your shop. As a consumer of supplies, you are a key player in the supply system.

We first look at characteristics of the supply system. Then, we will cover the Standard Base Supply System (SBSS). Next, we turn our attention to the methods used to process and control materiel and how to use supply products, and report the status of materiel deficiencies.

5–1. The Supply System

To monitor and control all the millions of items the Air Force buys, the Air Force uses the SBSS. The SBSS is a computerized system used by supply personnel to account for all the supplies and equipment used by activities throughout the Air Force. By using the SBSS, supply personnel can process issues, receipts, turn-ins, and shipments of supplies.

To obtain the most service for the billions of dollars spent on supplies and equipment, the Air Force uses a repair cycle program for many of the items needed to “Keep ‘em flying.” Under this program, some items that are removed from weapon systems are sent to depots for maintenance. The items are often repaired and reissued back to the user. This cycle may be repeated several times before an item is no longer reparable and is sold for scrap.

As you go about your aircraft maintenance duties, you will find yourself working with the personnel in base supply in some way. There is no getting away from the fact that supplies of all sorts are necessary to keep your aircraft and equipment in serviceable condition.

In this section, we will cover two supply areas you need to be familiar with to perform your duties as an aircraft maintainer successfully:

1. Characteristics of the supply system.
2. Using the SBSS.

038. Characteristics of the supply system

The management of the Air Force Supply System is more complicated than any civilian system. This is true because the system is tailored to support different management requirements of various

commodities and command missions effectively. To support the total mission, Air Force supply managers must procure, stock, and issue millions of different items for thousands of customers worldwide. Furthermore, the need for rapid delivery and economy of operation—along with the need for immediate response to the diversified and changing needs of its customers—requires more insight and flexibility than any civilian system.

Thus, you can see that the Air Force Supply System cannot be compared logically in either size or complexity with any distribution system anywhere in the civilian industrial world. Two important factors make this so:

1. First, management of the Air Force Supply System is infinitely more complicated than civilian systems since it must procure, stock, and issue several million different items to thousands of customers located throughout the world.
2. Second, the need for speed of delivery and economy of operation is paramount. The system must immediately respond to the constantly changing needs of its customers and requires more flexibility than that of any civilian supply system.

As a review you should remember the Air Force supply structure is rather complex because the system must be segmented in order for it to be effectively managed. Three characteristics of the supply system are of prime importance in determining the segments.

1. First, the supply system is worldwide. This suggests manageable segments on a geographical basis.
2. Second, accomplishment of the supply system mission depends on the performance of specialized functions, such as storage, distribution, and disposal. This suggests *manageable segments on a functional basis*.
3. Third, the system contains millions of items, which vary in size, use, complexity, and value. This suggests manageable segments based on a classification system.

Because of these characteristics, the supply system is based on a classification concept in which all three characteristics are considered.

039. Using the supply system

In this lesson, we give overview of the parts of the supply system you will see a lot of on the job. Our discussions will be general in nature. For specific guidance on supply procedures, refer to AFI 23–101, *Air Force Materiel Management,* and AFI 21–101. The SBSS is the oldest and most mature of the Air Force's automation systems. It is also one of the largest. The SBSS is used at bases all over the world with 100s of main accounts and satellite accounts. The SBSS was first automated in 1965. The system has evolved into a high tech global computer system that can be accessed worldwide.

In essence, the SBSS is an accounting system consisting of standardized computer equipment, programs, procedures, and supply policy. This system provides base activities with their supply needs and employs a standard base-level computer to account for supplies; equipment; petroleum, oil, and lubricants; munitions; and clothing. With the SBSS, logistics personnel, customers, and commanders can track every item in the supply system through standardized programs and procedures. All Air Force activities use the SBSS for accounting on both line item and dollar basis.

To use the supply system, it helps to know the organizational structure. Familiarity with the structure will smooth out your experience by getting your requests to the right people, so your needs will be met quicker and with more efficiency.

To serve customers quickly and efficiently, the SBSS and base supply personnel are organized according to the standardized organizational chart shown in figure 5–1. This means that no matter what Air Force base you are assigned to, the supply organization should be the same.

As a supply customer, you have three primary points of contact within base supply:

1. Customer service element.
2. Demand processing element.
3. Equipment management element (EME).

Customer service element

Normally, the customer service element is the primary point of contact for supply-related questions and queries. This office provides customer assistance. The personnel assigned have the responsibility of receiving and resolving customer problems and complaints. If you have any type of supply problem, it is easier to contact the personnel in customer service and let them deal with any other supply elements involved. In all cases, customer service personnel document your request for assistance and notify you of actions taken.

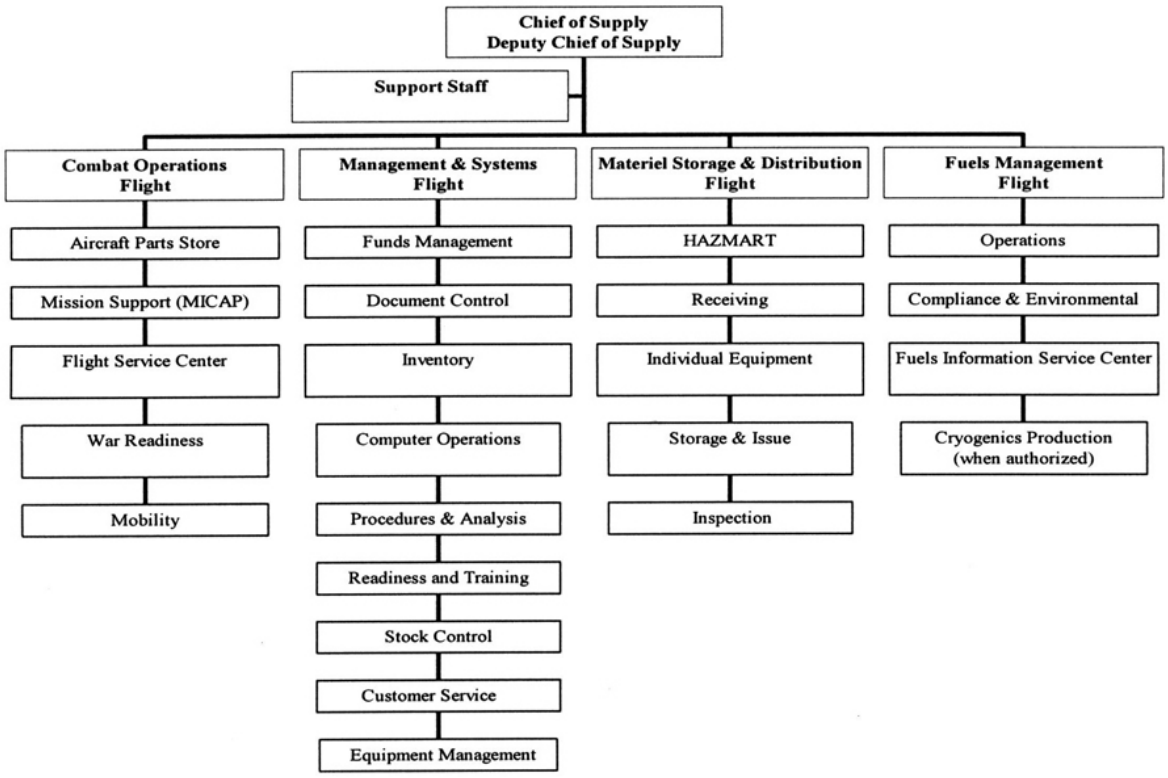

Figure 5–1. Chief of supply organizational chart.

Demand processing element

Needed supplies other than bench stock and office supplies are ordered from this element. Most MAJCOMs and installations have decentralized demand and issue processing and parts-into-aircraft maintenance such as Air Combat Command's and Pacific Air Force's Combat Oriented Supply Organization, and United States Air Force Europe's dedicated aircraft supply support. The demand-processing element is the *first point in the process* of obtaining materiel from supply.

Equipment management element

Normally, equipment management-related matters reside at a regional level and base level; EME is the point of contact for all matters related to equipment management. For your unit, the EME is the source of supply and the addressee for all equipment requests for nonexpendable items that your organization is authorized by allowance standards. Examples of these items are ground support equipment, test equipment, and some special tools, such as go/no-go gages. If you are an equipment

custodian for your shop, you have probably dealt with personnel from the EME. Although these are the primary points of contact, you may have to deal with other elements of the logistics readiness squadron or other personnel within the supply system, such as war readiness, mobility, and retail sales.

Self-Test Questions

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

038. Characteristics of the supply system

1. In what two ways is the Air Force Supply System different from civilian distribution systems?

2. What three characteristics depict the concept of the supply system?

039. Using the supply system

1. Describe the SBSS.

2. Which office is your primary point of contact for supply-related questions and queries?

3. Who is the first point in the process for obtaining materiel from supply?

4. Which element would you call for equipment issues?

5–2. Processing and Controlling Materiel

We made the point that the term materiel applies to just about anything used by the Air Force to accomplish its mission. We also stated that the Air Force buys thousands of items (materiel) each year. This includes such things as aircraft, vehicles, spare parts, maintenance tools, job control consoles, desks, and calculators. All this material costs billions of dollars each year. This property is stored, issued, and used. At times, some items are returned for maintenance, repaired, and reissued back to the user. This process is called the repair cycle. This cycle may be repeated several times before an item is no longer usable and is sold for scrap.

As a fuels system journeyman, you have several responsibilities concerning this program. The first is to process reparable parts through the repair channels promptly.

NOTE: A reparable item is as important as a serviceable item, because the reparable item may represent the only source of supply.

Your second responsibility requires the exercise of proper handling and packing. This is so, because repair cycle items are often critical and in short supply on your base or Air Force wide.

Your third responsibility is to use the proper priority when ordering parts. It is human nature to be primarily concerned about your particular aircraft; therefore, you may be tempted to use a higher priority than circumstances warrant when you order parts. Do not do this; think and make the right decision.

Perhaps you are wondering how each shop within a maintenance complex can know the status of all their assets at any one time. Base supply personnel provide their customers with several computer-generated products or listings that show the status of funds, back orders, and other transactions that apply to a work center.

040. Supply discipline

The supply system is important, because if you do not understand and use it properly, you may be wasting money that could be used to support another part of the mission. To avoid that, we must learn and use the principles of supply discipline.

Conservation

One type of supply discipline is conservation. Conservation of supplies and equipment can take several forms. Ordinarily, you would think of conservation as simply not ordering or using more than you need to do a job, but there is more to it than that. Supplies and equipment must be protected from hazards such as abuse, fire, corrosion, or anything else that might render them unusable.

Many items that become unserviceable can be repaired. Sometimes, this can be done at base or unit level. At other times, they must be sent to a depot. In the interests of conservation, any item that is economically reparable should be sent to the proper facility as soon as practicable. In this way, time and money are conserved.

Economical use

A major concept of economical use is to use available supplies and equipment only for their intended purposes. For instance, you would not, use a wood chisel as a screwdriver; it would be easy to dull or chip the edge. Another concept of economical use is not to use a large, expensive piece of equipment when a smaller unit will do. For example, a motor vehicle dispatcher should not send a 2-ton truck to move a few hundred pounds of material from one place to another; rather, the dispatcher should send a small pickup, since it is more economical to operate.

Excess property

It is very important for all personnel involved in issuing or consuming Air Force property to screen items on hand and determine if they are excessive. Let us distinguish between “excess” and “surplus.” An item may be excess to the immediate needs of a unit, but it does not become excess to the Air Force until it is clear that there is no present or future requirement for it. After it has been declared excess to the Air Force, further efforts may be made to determine whether it may be wanted by another military service or federal agency. If it is not needed by any of these, it is then declared to be surplus, and the DOD activity that holds it may dispose of it in accordance with established procedures, such as sale, salvage, or destruction.

Property may become excess to an activity for a number of reasons, but technological development is one of the main reasons. Air Force weapons systems and equipment are constantly being modified and improved, making items on hand obsolete. Certain aircraft types are phased out and new ones introduced. Military requirements vary with the world situation; a time of peace after war renders many items excess. Accordingly, both supply personnel and those using particular items must frequently screen the stocks on hand to determine if they are excessive to the needs of the base or unit. Perhaps some other Air Force activity or federal agency can use the items; if so, arrangements are made to transfer them. They are declared surplus only if no agency can use them.

Responsibility for property and pecuniary liability

Congress allocates the money used to buy Air Force property. This money comes from taxes. Therefore, any one individual does not hold the title to this property. All of us own it jointly. We have no problem in determining who is responsible for our personal possessions, and we know if our personal property is abused, we will have to pay for its repair or replacement. Now then, who is responsible for the millions of Air Force items costing billions of dollars? In March 1894, Congress passed a law to hold individuals responsible for public property. This law is the authority for directives concerning responsibility for public property.

Certain officers, Airmen, and civilian employees are designated as supervisors. Perhaps you are a supervisor or will be soon. Supervisors are responsible for carrying out the orders and directives of their commander. As a representative of their commander, supervisors have certain responsibilities for subordinates and property. However, supervisors are usually responsible for several workers and cannot always be looking over the shoulder of each one. Therefore, like their commander, supervisors cannot be solely responsible for the property in your possession or activity.

Caring for the property you use to do your job, whether it is a desk, tool kit, truck, or tester, is your responsibility. Good management dictates that the person who is assigned the property is responsible for its care. Everyone in the Air Force is responsible for some type of property. For one person, it may be a shop full of equipment; for another, it may be a bed blanket. In any case, property responsibility is part of every position description in the Air Force.

The property responsibility imposed by law on all officers, Airmen, and civilian employees cannot be delegated—only shared. This obligation includes *pecuniary liability*. Pecuniary liability means we must make good the loss, destruction, or damage to property caused by our misadministration or negligence. This responsibility of an individual is true regardless of duty assignment, level of command, or level of supervision. When you buy an article from a store, the moment the sales clerk completes the transaction, the store drops its accountability. The article then becomes your property, and you must assume responsibility and accountability for whatever uses you make of the article.

041. Routing assets through the repair cycle

The primary objective of the repair cycle asset control system is to bring about the economy of spares procurement through the effective management of assets. The system is set up to give firm control over repair cycle assets and to make sure these items are repaired at base level as soon as possible. The repair cycle time of an item starts when the unserviceable item is removed from the aircraft or piece of equipment, and a demand is made on supply for replacement. It stops when the item, either serviceable or unserviceable, is sent back to base supply.

We will cover nine subject areas as they apply to the process of routing assets through the repair cycle.

Characteristics of the repair cycle support system

The repair cycle support system (RCSS) establishes control of all unserviceable repair cycle assets from the time they are generated until they are returned to base supply as serviceable or unserviceable. Personnel assigned to the repair cycle support element (RCSE) in base supply function are responsible for managing the repair cycle system.

NOTE: Repair cycle assets are items with expendability, recoverability, reparability cost designator (ERRCD) of XD or XF. They are also known as due-in from maintenance (DIFM) items.

The objective of the RCSS is to obtain the greatest benefits from the base maintenance elements (shops). The system establishes firm control over repair cycle assets to make sure they are repaired at base level or sent to a repair facility as quickly as possible.

Starting and ending the repair cycle

The repair cycle time of an item starts when the unserviceable item is removed from the aircraft or equipment, and a demand is made on supply for a replacement. The repair cycle time stops when the item is sent back to base supply as serviceable or unserviceable.

It's important to know that base supply personnel will not order a replacement item until it is determined that the unserviceable item cannot be repaired on base, or the item has been condemned. To make the system work properly, unserviceable repair cycle items must be processed through the repair shops as quickly as possible. In addition, the status of these items must be continually maintained and updated.

Due-in from maintenance issue procedures

Four activity codes are important in the DIFM process:

1. X (Expedite).
2. R (Routine).
3. S (Supply point).
4. C (Contract maintenance).

In addition, two demand codes are important:

1. R (Recurring).
2. N (Nonrecurring).

Ordering an item from supply that has an ERRCD of XD or XF, with an activity code of X, R, S and with a demand code of R or N, places that transaction and the item under DIFM control.

NOTE: All items issued to the personnel in contract maintenance (activity code C) are put under DIFM control regardless of the ERRCD or demand code.

Multiple due-in from maintenance indicator

Usually, DIFM issues are for a quantity of one each. Therefore, the computer system in base supply is programmed to reject a DIFM issue for more than one each of an item. The major reason for this is the possibility of having different action taken codes assigned when multiples are issued on the same document number. Although the norm is one each per document number, there may be cases where this is not reasonable. When you must order more than one each under the same document number, call the personnel in the RCSS and explain your situation. They may assign a multiple DIFM indicator to allow DIFM issue requests for multiple quantities.

Maintenance turnarounds

Repair cycle items may be removed from the end item, repaired, and reinstalled without a demand being placed on base supply or after base supply personnel confirm that the serviceable asset is not available from their stocks. The repaired item is not processed through base supply physically; however, the maintenance activity must give the RCSS the information needed to update supply records. The term frequently used to record these types of transactions is "maintenance turnaround" or TRN. It is very important to document each repair made on repair cycle items. Inform the RCSS every time you take repair action and prepare the necessary documentation, an AFTO Form 350, Reparable Item Processing Tag. Send the bottom portion of the AFTO Form 350 to the RCSE and ensure it is filled out completely to include the maintenance action taken code. The action taken code for TRNs must be A, F, G, K, L, or Z. If you do not inform base supply about TRNs, the result will be a reduction of serviceable items base supply can keep on hand.

Due-in from maintenance turn-in

DIFM assets are returned to base supply through the RCSS. The RCSS processes and controls all DIFM assets. A completed AFTO Form 350, a condition tag (Department of Defense [DD] Forms

1574, Serviceable Tag-Materiel; 1575, Suspended Tag-Materiel; or 1577–2, Unserviceable (Reparable) Tag-Material), and copy number 3 of the original issue or due-out release document (DD Form 1348–1A, Issue Release/Receipt Document) must be provided when items are turned in to the RCSS.

Due-in from maintenance update

To control DIFM assets accurately, the status and location of the item must be known. When items are received in a shop or when the status changes, the shop scheduler or fuel element shop chief must inform the RCSS. RCSS personnel update the location and status of the item in SBSS records. An example of a status change would be when a boost pump in an in-shop environment changes from "awaiting maintenance" to "in-work." A location change occurs when an item is moved from one shop to another.

Status codes

DIFM items must be returned to supply as quickly as possible. The DIFM managers in supply and maintenance must make every effort to process repair cycle items quickly. MAJCOMs may assign other status codes to cover special situations in their commands. Each day, the standard base-level computer generates a repair cycle asset management list. This listing is forwarded to each shop and the personnel in the RCSE as an aid in managing and controlling DIFM assets. When differences exist between the DIFM status or location, as shown on the DIFM list and the actual status or location, the personnel in the RCSE must be informed to ensure updates are made.

Self-Test Questions

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

040. Supply discipline

1. Give some examples of supply conservation.

2. Who holds the title to Air Force property?

3. What responsibility is a part of every position description in the Air Force?

4. What is pecuniary liability?

041. Routing assets through the repair cycle

1. Which base supply element is responsible for managing the repair cycle system?

2. What is the objective of the RCSS?

3. What action begins the repair cycle of an item?

4. What action ends the repair cycle?

5. How does a TRN occur?

6. When you return DIFM assets to the RCSS, what documents must you also provide with the items?

Answers to Self-Test Questions

038

1. (1) It must procure, stock, and issue several million different items to thousands of customers worldwide.
   (2) In addition, the system must immediately respond to the need of its customers.
2. (1) The system is worldwide.
   (2) Accomplishment of the supply system mission depends on the performance of specialized functions such as storage, distribution, and disposal.
   (3) The system contains a few million items, which vary in size, use, complexity, and value.

039

1. It is an accounting system consisting of standardized computer equipment, programs, procedures, and policy. It provides base activities with their supply needs, using a standard base-level computer to account for supplies, equipment, and so forth.
2. Customer service element.
3. Demand processing element.
4. The EME.

040

1. Not ordering or using more than you need to do a job, protecting supplies and equipment from hazards such as abuse, fire, corrosion, or anything else that might render them unusable, repairing reparable items quickly.
2. No one person holds the title to Air Force property; it is owned jointly by all of us.
3. Property responsibility.
4. It applies to property which was lost, destroyed, or damaged because of misadministration or negligence; the individual who had responsibility for the property is accountable for the loss, destruction, or damage.

041

1. The RCSE.
2. To obtain the greatest benefits from the base maintenance elements.
3. It starts when an unserviceable item is removed from the aircraft or equipment and a demand is made on supply for a replacement.
4. It ends when the item is sent back to base supply as serviceable or unserviceable.
5. A TRN occurs when an unserviceable item is removed from an end-item, repaired, and reinstalled without a demand being placed on supply.
6. A completed AFTO Form 350, a condition tag (DD Forms 1574, 1575, or 1577–2), and copy number 3 of the DD Form 1348–1A.

Unit Review Exercises

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

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

89. (038) The Air Force Supply System is different from civilian supply systems because it
    a. deals with many customers.
    b. is not as concerned with economy of operation.
    c. receives its supplies from many different vendors.
    d. requires more flexibility.

90. (039) Which system allows logistics personnel, customers, and commanders to track every item in the supply system through standardized procedures?
    a. Standard Base Supply System (SBSS).
    b. Bench Stock Management System (BSMS).
    c. Maintenance Supply Interface System (MSIS).
    d. Core Automated Maintenance System (CAMS).

91. (039) Which supply element is the first point in the process of obtaining materiel from supply?
    a. Retail sales.
    b. Customer service.
    c. Demand processing.
    d. Equipment management.

92. (040) Who allocates the money to buy Air Force property?
    a. Headquarters United States Air Force.
    b. Department of Defense (DOD).
    c. Major commands (MAJCOM).
    d. Congress.

93. (040) The responsibility of a person to make good any loss, destruction, or damage of government property caused by misuse or negligence is known as what kind of liability?
    a. Personal.
    b. Property.
    c. Command.
    d. Pecuniary.

94. (041) The repair cycle of a supply asset ends when the item is
    a. removed from the aircraft.
    b. installed on the aircraft or equipment.
    c. sent back to supply as serviceable or unserviceable.
    d. sent back to the base maintenance shop as serviceable.

95. (041) Which form documents a repair action has been accomplished on a repair cycle item as a result of a maintenance turnaround (TRN)?
    a. Department of Defense (DD) Form 1575.
    b. DD Form 1348–1.
    c. Air Force Technical Order (AFTO) Form 350.
    d. AFTO Form 349.

Glossary of Abbreviations and Acronyms

2AFSC	secondary Air Force specialty code
ABDR	aircraft battle damage repair
ACC	Air Combat Command
AFB	Air Force base
AFI	Air Force instruction
AFMAN	Air Force manual
AFNET	Air Force network
AFPD	Air Force policy directive
AFS	Air Force specialty
AFSC	Air Force specialty code
AFTO	Air Force technical order
AGE	aerospace ground equipment
AMC	Air Mobility Command
AMXS	aircraft maintenance squadron
BPO	basic post flight
CAFSC	control Air Force specialty code
CCP	command control point
CD	compact disc
CDC	career development course
CFR	Code of Federal Regulations
CL	checklist
CMS	component maintenance squadron
CMU	combat munitions unit
CND	cannot duplicate
CON/W.O. NO	control or work order number
CSU	combat support unit
CTK	composite tool kit
DAFSC	duty Air Force specialty code
DIFM	due-in from maintenance
DOD/DD	Department of Defense
E/E	electro-environmental

EME	equipment management element
EMS	equipment maintenance squadron
EOR	end-of-runway
ERRCD	expendability, recoverability, reparability cost designator
ETIMS	Enhanced Technical Information Management System
eTO	electronic technical order
eTool	electronic tool
FI	fault isolation
FOD	foreign object damage
GS	general system
GV	general vehicle
HAZCOM	hazard communication
HPO	hourly post flight
HSC	home station check
IMDS	Integrated Maintenance Data System
IPB	illustrated parts breakdown
ITCTO	interim time compliance technical order
JCN	job control number
JEIM	jet engine intermediate maintenance
JG	job guide
JP	jet propellant
LOAP	list of applicable publications
MADARS	Maintenance Analysis Detection and Recorder Subsystem
MAJCOM	major command
MDD	maintenance data documentation
MDS	mission, design, and series
MIDAS	Maintenance Integrated Data Access System
MIS	maintenance information system
MOC	maintenance operations center
MOU	munitions operations unit
MPTO	methods and procedures technical order
MSEP	maintenance standardization and evaluation program
MSL	maintenance supply liaison
MUNS	munitions squadron

MXG	maintenance group
MXO	maintenance operations
MXS	maintenance squadron
NAF	numbered Air Force
NCOIC	noncommissioned officer in charge
NDI	nondestructive inspection
NSN	national stock number
NSS	noise suppression system
O&M	operations and maintenance
OG	operations group
OIC	officer in charge
OJT	on-the-job training
PAFSC	primary Air Force specialty code
PDM	programmed depot maintenance
PE	periodic inspection
PMEL	precision measurement equipment laboratory
PS&D	plans, scheduling and documentation
psi	pounds per square inch
QA	quality assurance
RASCAL	rapid assistance support team for calibration
RC	recommended change
RCSE	repair cycle support element
RCSS	repair cycle support system
SBSS	Standard Base Supply System
SrA	senior Airman
STS	specialty training standard
SUP DOC NO	supply document number
TCTO	time compliance technical order
TM	technical manual
TMDE	test, measurement, and diagnostic equipment
TO	technical order
TODO	technical order distribution office
TRN	turnaround
TRW	training wing

TS	troubleshooting
UDM	unit deployment manager
USAF	United States Air Force

Student Notes

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