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AIRCRAFT OPERATIONS AND MOVEMENT ON THE GROUND

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This instruction implements AFPD 11-2, *Flight Rules and Procedures*. It prescribes rules for the operation, movement, and control of aircraft on the ground. This instruction applies to ground operations of all USAF aircraft operating in an aircraft apron/ramp and movement area at any airfield, whether military, civilian, or foreign. This instruction does not apply to specialized maintenance procedures normally conducted away from aircraft apron/ramp and movement areas, such as engine runs conducted in approved sound suppressors. This instruction applies to all personnel operating USAF aircraft on the ground, whether military, civilian, or contractor. Major commands (MAJCOM) must send supplements to the Air Force Flight Standards Agency (HQ AFFSA/XOF), 1535 Command Drive, Suite D305, Andrews AFB MD 20762, for approval.

(AMC) AFI 11-218, 19 May 2004, is supplemented as follows: (This supplement governs operation of all aircraft assigned to AMC flying organizations; it also applies to all AMC-gained Air National Guard (ANG) and United States Air Force Reserve (AFRC) units.)

SUMMARY OF REVISIONS

This document is substantially revised and must be completely reviewed.

This change incorporates IC 2004-1 and reflects the addition of AFVA 11-240, *Airport Signs and Markings* (paragraph **3.2.2.**, **3.2.3.**). Changed or revised material is indicated by a star. The entire text of the IC is at the last attachment.

(AMC) Grants OG/CCs operating C-20 & C-37 aircraft authority to qualify Flight Engineers in engine run and taxi operations (paragraphs **1.14.3.** and **1.17.3.**). All AMC maintenance personnel are prohibited

from being certified in taxi operations (paragraph **1.11.2.**). Aircraft marshallers are authorized use of high visibility marshalling sticks/wands during daylight operations (paragraph **2.3.1.3.**). **A bar (|) indicates a revision from the previous edition.**

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Chapter 1

RULES FOR AIRCRAFT OPERATION AND MOVEMENT ON THE GROUND

Section 1A—General Rules

1.1. Procedures and Checklists. Personnel authorized to start, test, taxi, or operate US Air Force (USAF) fixed or rotary wing aircraft will adhere to procedures as described in aircraft flight and maintenance manuals. Appropriate technical order (TO) checklists will be used.

1.2. Use of Protective Equipment.

1.2.1. Personnel must wear protective goggles or an appropriate helmet with visor, when in rotor wash areas or in front of an aircraft that is being backed using the aircraft's engines.

1.2.2. Personnel must wear earplugs, muff-type ear defenders, or headsets in the immediate area of aircraft that have engines, Auxiliary Power Unit (APU), or Gas Turbine Compressor (GTC) running. "Immediate area" is the area where hearing loss may occur if ear protectors are not worn.

1.3. Crew Rest and Duty Time Limitations.

1.3.1. Crew rest is required for all personnel prior to operating an aircraft on the ground. This includes engine start and taxi of aircraft.

1.3.1.1. Aircrew personnel shall comply with AFI 11-202 Volume 3, *General Flight Rules*, for crew rest and maximum duty periods when operating aircraft on the ground.

1.3.1.2. Maintenance personnel shall comply with AFI 21-201, *Aerospace Equipment Maintenance Management*, for crew rest and maximum duty periods when operating aircraft on the ground.

1.4. Use of Aircraft Lights.

1.4.1. For aircraft equipped with anti-collision lights, the lights must be on from just prior to engine start until engine shutdown.

1.4.1.1. Aircraft that do not have power available before engine start shall turn anti-collision lights on as soon as power is available.

1.4.2. From sunset to sunrise all moving aircraft shall display position lights and lights to clearly illuminate the extremities of the aircraft.

1.4.2.1. From sunset to sunrise, moving aircraft with no power available to operate lighting systems, such as aircraft being towed, shall use wing-walkers with lighted wands, or another means to illuminate the extremities of the aircraft in motion.

1.4.3. Flashing lights may be switched off or reduced in intensity if they will adversely affect the performance of duties, or subject an outside observer to harmful glare.

1.5. Use of Radios. Operators shall obtain approval from ground control, ramp control, or tower, in accordance with local procedures, prior to engine start. Emergency situations or authorized flights are

exempted. If approval is required and the aircraft radios are inoperative, obtain the approval through alternate means.

1.5.1. Monitor ground control, ramp control, or tower frequency, if available, during ground operations with engines running to insure prompt emergency response if needed. If the aircraft radios are inoperative, a person who does have contact with the controlling agency, or crash, fire, rescue personnel, must monitor ground operations with engines running.

1.5.2. At airfields where ground control, ramp control, or tower does not operate continuously, establish radio contact with base operations, base command post, maintenance job control, or other responsible agency, in accordance with local procedures, prior to engine start. The contacted agency must have immediate access to the base fire department and, when possible, the secondary crash net.

Section 1B—Records Disposal.

1.6. Records Disposal. Dispose of records IAW AFMAN 37-139.

Section 1C—Training Procedures and Documentation

1.7. General Training Requirements. Personnel involved in engine runs or moving aircraft on the ground will receive instruction in their required duties.

1.7.1. Conduct training in accordance with AFI 21-101, *Aerospace Equipment Maintenance Manangement*, and MAJCOM directives or supplements (as applicable). MAJCOMs will specify in directives or supplements the minimum areas required in training lesson plans.

1.7.1.1. Non-pilot aircrew members authorized to start engines and taxi aircraft are not required to meet the minimum skill level, rank, and experience prerequisites specified in AFI 21-101, *Aerospace Equipment Maintenance Management*, prior to entry into training. MAJCOM's will establish minimum skill level, rank, and experience requirements for training entry for non-pilot aircrew members.

1.7.1.2. Maintenance personnel authorized to start, run-up and test engines and taxi aircraft shall comply with this instruction, AFI 21-101, *Aerospace Equipment Maintenance Management,* and MAJCOM supplements or directives for training requirements.

1.8. Evaluation Requirements. Where periodic evaluation or certification is required, comply with the following evaluation/certification intervals:

1.8.1. For pilot and non-pilot aircrew members, such evaluations/certifications will expire on the last day of the 17th month following the month in which the previous evaluation/certification was successfully completed. Evaluation/re-certification eligibility period begins 6 months prior to the expiration date. The evaluation/re-certification may be administered any time in the eligibility period. For example, an evaluation/certification completed on 9 Oct 96 expires on 31 Mar 98. The eligibility period begins on 1 Oct 97. MAJCOM's may prescribe a more frequent evaluation/re-certification schedule.

1.8.1. (AMC) Document flight engineer engine run and taxi qualifications on AF IMT 8 **Certificate of Aircrew Qualification** as a ground phase item.

1.8.2. IAW AFI 21-101, *Aerospace Equipment Maintenance Management*, for maintenance personnel such evaluations/certifications will expire on the last day of the 12th month following the month in

which the previous evaluation/certification was successfully completed. Evaluation/re-certification eligibility period begins 6 months prior to the expiration date. For example, an evaluation/certification completed 9 Oct 96 expires on 31 Oct 97. The eligibility period begins on 1 Apr 97. MAJCOM's may prescribe a more frequent evaluation/re-certification schedule.

1.9. Use of Simulators. Units with flight simulators (aircrew training devices), will schedule maintenance personnel and non-pilot aircrew personnel certified to run engines or taxi aircraft to use the simulator during periods that will not interfere with pilot aircrew training. Each maintenance person and non-pilot aircrew certified to run engines or taxi aircraft will receive emergency procedures evaluation/ certification simulator in accordance with (IAW) paragraph **1.8.** MAJCOM's will establish alternate evaluation/certification procedures for units without flight simulators (aircrew training devices).

1.10. Start, Run-up and Test of Engines.

1.10.1. Conduct training for maintenance personnel and non-pilot aircrew personnel authorized to start, run-up and test engines in accordance with AFI 21-101, *Aerospace Equipment Maintenance Management*, and MAJCOM directives or supplements. MAJCOM's shall specify in directives or supplements the minimum areas required in training lesson plans. As a minimum, training lesson plans will include proper use of normal and emergency braking systems, throttles, aircraft controls, checklists, radios, egress systems, and fire extinguishing systems.

1.10.2. The proficiency of maintenance personnel authorized to conduct engine start, run-up and test of engines will be documented on AF Form 623, **On-The-Job Training Record**, or IAW AFI 21-101, *Aerospace Equipment Maintenance Management*, or another suitable product. This record must stipulate the maximum power at which the individual is qualified to operate the engines. MAJCOM directives or a supplement to this instruction must specify qualification requirements and procedures for certification. Re-certification intervals are IAW paragraph **1.8.**

1.10.3. The proficiency of non-pilot aircrew personnel authorized to conduct engine start, run-up and test of engines will be documented on AF Form 8, **Certificate of Aircrew Qualification**. This record must stipulate the maximum power at which the individual is qualified to operate the engines. MAJCOM directives or a supplement to this instruction must specify qualification requirements and procedures for evaluation. Evaluation intervals are IAW paragraph **1.8.**

1.10.3. (AMC) Flight engineers will receive instructions from qualified flight examiner and instructor pilots, flight engineers or approved contracter training. Aircrew will document training on the appropriate aircrew qualification training record. Demonstrate qualification to a flight examiner (pilot or engineer). Engine run qualification expiration dates may be aligned with periodic evaluations.

1.11. Taxi.

1.11.1. Conduct training for maintenance personnel and non-pilot aircrew personnel authorized to taxi aircraft in accordance with AFI 21-101, *Aerospace Equipment Maintenance Management*, and MAJCOM supplements or directives. MAJCOM's shall specify in directives or supplements the minimum areas required in training lesson plans. As a minimum, training lesson plans will include proper use of normal and emergency braking systems, throttles, aircraft controls, checklists, radios, egress systems, fire extinguishing systems, control tower light signals, marshalling signals, airport markings, lights, and signs.

1.11.2. The proficiency of maintenance personnel authorized to taxi aircraft will be documented on AF Form 623, **On-The-Job Training Record**, or IAW AFI 21-101, *Aerospace Equipment Maintenance Management*, or another suitable product. MAJCOM directives or a supplement to this instruction must specify qualification requirements and procedures for certification. Re-certification intervals are IAW paragraph **1.8.** A pilot Flight Examiner must administer taxi certification.

1.11.2. (AMC) AMC maintenance personnel will not be trained/certified in taxi operations.

1.11.3. The proficiency of non-pilot aircrew personnel authorized to taxi aircraft will be documented on AF Form 8, **Certificate of Aircrew Qualification**. MAJCOM directives or a supplement to this instruction must specify qualification requirements and procedures for evaluation. Evaluation intervals are IAW paragraph **1.8.** A pilot Flight Examiner must administer taxi evaluation.

1.11.3. (AMC) Taxi qualification expiration dates may be aligned with periodic evaluations.

1.12. Towing.

1.12.1. Conduct training for maintenance personnel authorized to tow aircraft in accordance with AFI 21-101, *Aerospace Equipment Maintenance Management*, and MAJCOM supplements or directives. MAJCOM's shall specify in directives or supplements the minimum areas required in training lesson plans. As a minimum, training lesson plans will include proper use of normal and emergency braking systems, aircraft controls, checklists, radios, egress systems, fire extinguishing systems, control tower light signals, marshalling signals, airport markings, lights, and signs.

1.12.2. The proficiency of maintenance personnel authorized to tow aircraft will be documented on AF Form 623, **On-The-Job Training Record**, or IAW AFI 21-101, *Aerospace Equipment Maintenance Management*, or another suitable product. A qualified maintenance tow team supervisor will administer tow certification. AFI 21-101, *Aerospace Equipment Maintenance Management,* MAJCOM directives or a supplement to this instruction must specify qualification requirements and procedures for certification. Re-certification intervals are IAW paragraph **1.8.**

1.13. Aircraft Marshalling, Airport Markings, Lights, and Signs.

1.13.1. MAJCOM's will ensure that all ground and all aircrew personnel who are or could be directly involved with aircraft movement are tested on their knowledge of marshalling signals, airport markings, lights, and signs. Test personnel within 30 days after:

1.13.1. (AMC) Pilots, navigators, flight engineers, loadmasters, boom operators, and crewmembers delegated ground control (marshaller) duties will test. Tests for these personnel will cover only signals applicable to their respective aircraft. Marshalling examinations and tests for aircrew will consist of a minimum of 20 open book questions, with a passing score of 85 percent corrected to 100 percent. If the score is below 85 percent, failed examinations or tests will be retaken only after retraining.

1.13.1.1. Reporting for duty following permanent change of station (N/A if tested at a formal school within the previous 6 months), or

1.13.1.2. After their first assignment to duties requiring knowledge of marshalling signals and/or airport markings, lights, and signs.

1.13.2. For ground personnel, document successful test completion on AF Form 623, **On-The-Job Training Record** or another suitable product. For aircrew personnel, document successful test com-

pletion in Aviation Resource Management System (ARMS), MAJCOM specified training folder, or other suitable product.

1.13.3. Test personnel only in those areas applicable to their qualifications. For example, do not test personnel on airport markings, lights, and signs if the individuals' qualifications do not permit towing and taxi operations.

Section 1D—Start, Run-up and Test of Engines.

1.14. Authorized Personnel. Personnel authorized to start, operate, warm-up, or test engines installed in aircraft are:

1.14.1. Rated pilots.

1.14.2. Student pilots approved for solo operations IAW MAJCOM directives, supplements, or training syllabus, or being supervised by a qualified instructor.

1.14.3. Non-pilot aircrew members qualified IAW this instruction, and MAJCOM directives or supplements, or being supervised by a qualified instructor.

1.14.3. (AMC) Operations group commanders may authorize mission qualified flight engineers to conduct engine run operations. Flight Engineers will be trained and qualified as specified in paragraphs **1.10.1.** and **1.10.3.**

1.14.4. Maintenance personnel certified IAW this instruction, and MAJCOM directives or supplements, or being supervised by a qualified instructor.

1.14.5. Flight engineers may carry out the functions stated at paragraph **1.14.** from the engineer's position provided a person listed in that paragraph is seated in the pilot's seat.

1.15. Engine Run-up

1.15.1. Run engines at approved sites.

1.15.2. Use technical order procedures for seat belt and shoulder harness use. Exceptions to this paragraph are:

1.15.2.1. Emergencies.

1.15.2.2. Helicopters being operated in unimproved areas.

1.15.3. Do not leave controls unattended when engines are running.

1.15.4. Run-up aircraft engines so the propeller wash or jet blast does not pose a safety hazard to personnel, buildings, pavement, stands, vehicles, and other aircraft, particularly those taxiing, taking off, or landing.

1.15.5. (Added-AMC) When required, the pilot and flight engineer positions in the engine run checklist will be filled by qualified and certified engine run personnel for each maintenance run requirement. As a minimum, personnel occupying the copilot's position will be qualified brake and communications operators. Personnel filling other required positions (i.e. scanners) need only be qualified in the specific responsibilities of the position being filled. ***EXCEPTION***: Not applicable to C-12 and C-21 aircraft maintained by civilian contractor technicians. For all H-1 engine runs, the minimum

crew requirement will be that specified as "minimum crew required to operate the helicopter" in accordance with the flight manual.

1.16. Engine Run-up of Rotary Wing Aircraft.

1.16.1. A qualified rotary wing pilot must be in the seat with a functioning set of flight controls for engine start and/or run-up on helicopters that require rotor rotation.

1.16.2. Certified personnel may operate helicopter engines on a helicopter with a rotor brake, or other system that does not allow the rotors to turn, without a qualified pilot in the seat.

1.16.2. (AMC) Rotor brake system must be operational and used during ground idle engine runs. Pre-flight check will be accomplished using the pilot's abbreviated flight crew checklist prior to accomplishing the ground crew APU/APP and engine start checklist.

Section 1E—Taxi

1.17. Authorized Personnel. Personnel authorized to taxi aircraft are:

1.17. (AMC) Authorized Personnel. Maintain radio contact with ground control or tower prior to and while taxing. Notify them when taxiing operations are completed.

1.17.1. Rated pilots.

1.17.2. Student pilots approved for solo operations IAW MAJCOM directives, supplements, or training syllabus, or being supervised by a qualified instructor.

1.17.3. Non-pilot aircrew personnel qualified IAW this instruction, and MAJCOM directives or supplements for both day and night operations, and have received a taxi evaluation from a pilot Flight Examiner.

1.17.3. (AMC) Operations group commanders may authorize mission qualified C-37 and C-20 flight engineers to perform taxi operations. Flight engineers will be trained and qualified as specified in paragraphs **1.11.1.** and **1.11.3.**

1.17.4. Maintenance personnel certified IAW this instruction, and MAJCOM directives or supplements for both day and night operations, and have received a taxi evaluation from a pilot Flight Examiner.

1.17.4. (AMC) AMC maintenance personnel are prohibited from taxiing aircraft.

1.18. Taxiing of Rotary-Winged Aircraft. Only a qualified helicopter pilot, or student helicopter pilot under supervision of a qualified helicopter instructor pilot, may taxi a rotary-wing aircraft.

1.18. (AMC) Taxiing of Rotary-Winged Aircraft. Minimum crew requirement will be that specified as "minimum crew required to operate the helicopter" according to the applicable flight manual.

1.19. Manning Requirements. Aircraft requiring two pilots for flight must have both seats occupied by authorized personnel during taxi.

1.19. (AMC) Manning Requirements. The flight engineer (FE) position will be occupied by a qualified FE for all taxi operations. ***EXCEPTION:*** The FE/Observer position on C-37 and C-20 aircraft may be unoccupied.

1.19.1. MAJCOM's may establish incentive, indoctrination, and orientation programs to allow unqualified personnel to occupy a pilot seat during taxi. Comply with AFI 11-401, *Flight Management*, regarding orientation programs.

1.19.1.1. MAJCOM's will establish specific supervision and training requirements in supplements or directives.

1.19.1.1.1. MAJCOM supplements or directives will specify briefing requirements for taxi, emergency, and egress procedures.

1.19.1.1.2. When an unqualified individual occupies a pilot seat during taxi, an instructor pilot must be seated at the other set of controls.

1.19.1.1.3. Passengers may not be carried when an unqualified person is occupying a pilot seat during taxi.

1.20. Right-of-Way Rules.

1.20.1. Usually, right-of-way is given to the aircraft least able to maneuver, which normally permits that aircraft to maintain course and speed. However, each person operating an aircraft on the ground must take whatever action is necessary to avoid collision, regardless of who has the right-of-way.

1.20.1.1. When two aircraft are approaching head on, or approximately so, each shall stop or where practicable alter its course to the right so as to keep well clear.

1.20.1.2. When two aircraft are on a converging course, the one that has the other on its right shall give way.

1.20.1.3. An aircraft that is being overtaken by another aircraft shall have the right-of-way and the overtaking aircraft shall keep well clear of the other aircraft.

1.21. Traffic Control Light Signals.

1.21.1. The following procedures are used by air traffic control towers in the control of aircraft, ground vehicles, equipment, and personnel not equipped with a radio. These same procedures will be used to control aircraft, ground vehicles, equipment, and personnel equipped with radio if radio contact cannot be established.

1.21.1.1. Air Traffic Control (ATC) personnel use a directive traffic control signal that emits an intense narrow light beam of a selected color (red, white, or green) when controlling traffic by light signals.

1.21.1.2. Between sunset and sunrise, a person operating an aircraft on the ground wishing to attract the attention of the control tower should turn on a landing light and taxi the aircraft into a position, clear of the active runway, so that light is visible to the tower. The landing light should remain on until appropriate signals are received from the tower.

1.21.1.3. During daylight hours, acknowledge tower transmissions or lights signals by moving the flight controls. At night, acknowledge by blinking the landing or navigation lights. If radio malfunction occurs after departing the parking area, watch the tower for light signals or monitor tower frequency.

Table 1.1. Air Traffic Control Tower Light Gun Signals (Ground Only).

Meaning		
Color and Type of Signal	**Movement of Vehicles, Equipment, and Personnel**	**Aircraft on the Ground**
Steady green	Cleared to cross, proceed or go	Cleared for takeoff
Flashing green	Not applicable	Cleared for taxi
Steady red	STOP	STOP
Flashing red	Clear the taxiway/runway	Taxi clear of the runway in use
Flashing white	Return to starting point on the airport	Return to starting point on the airport
Alternating red and green	Exercise extreme caution	Exercise extreme caution

1.22. Taxi and Towing Distances.

1.22.1. Do not taxi or tow beyond taxiway hold lines, or within 100 feet of an active runway if there are no hold lines, unless previously cleared by air traffic control.

1.22.2. Do not taxi or tow an aircraft within 25 feet of obstructions without wing walkers monitoring the clearance between aircraft and obstruction. Locally based aircraft are exempt when fixed taxi routes are marked and the obstruction is permanent. Taxi routes must be used by the same model aircraft for which they were designed and in specifically designed parking spots. Support equipment shall be located in appropriately designated areas.

1.22.3. Do not taxi aircraft closer than 10 feet to any obstacles. This restriction is waived under the following circumstances:

1.22.3. (AMC) AMC aircraft will not be taxied within 10 feet of an obstruction. Scanners (if required by the applicable flight publications), taxi signal personnel, and wing walkers will render a stop signal in lieu of a turn signal when in their judgment an immediate turn is required to provide the necessary 10-foot clearance. Any time the pilot doubts that adequate clearance exists, aircrew members, if applicable, will deplane to verify obstruction clearance. C-12 and C-21 aircraft do not require a signal person at the wingtip if the marshaller is in a position at the nose of the aircraft which allows clear visibility of the wingtip and obstruction. When Air Force signal personnel are not otherwise available, the pilot will use crewmembers not required for taxi operations, including qualified maintenance personnel, as signal personnel. All crewmembers and maintenance personnel used as signal personnel will be thoroughly briefed on deplaning and signaling procedures. This paragraph applies only when aircraft have the capability to safely deplane crewmembers with engines running.

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

1.22.3.2. Operating from alert, readiness, or protective shelters. A plainly visible centerline must be painted along the exit path. A marshaller must be used.

1.22.3.3. Operating locally based aircraft from parking spots specifically designed for those aircraft. Parking spots shall be spaced to allow a minimum 10' clearance between any portion of adjacent aircraft and will have clearly marked taxi routes. Support equipment required for each spot shall be placed in appropriately designated and marked areas. A marshaller must be used.

1.22.3.3. (AMC) Support equipment will be placed no closer than 10 feet from wing tips.

1.22.3.4. These clearance criteria can only be assured at US Air Force installations.

1.23. (Added-AMC) Rules for Personnel Engaged in Towing Operations. When primary crewmembers are required to occupy cockpit positions during towing operations by non-AMC personnel at non-AMC Air Force installations, the aircraft commander will coordinate with the senior maintenance officer or superintendent to ensure the towing supervisor and crew are fully qualified in accordance with AFOSHSTD 91-100, *Aircraft Flight Line-Ground Operations And Activities*. At non-Air Force installations, the aircraft commander must have approval from the airfield operations officer or manager prior to towing. The aircraft commander will personally ensure that the tow team supervisor briefs all personnel on their duties, responsibilities, and hazards involved during the towing operation, i.e. "wing tip growth" phenomenon, backing, etc., and that proper checklists are used. If any doubt exists as to the qualification of tow team personnel or the safety of the operation, make no attempt to tow aircraft until qualified Air Force personnel can be located. **(Not applicable to contractor-maintained aircraft.)**

1.24. (Added-AMC) Aircraft Recovery. Aircrews will not attempt to recover an AMC fixed-wing aircraft from unprepared surface areas that have been entered inadvertently. Normally, aircraft recovery will be accomplished by ground crews using appropriate equipment. Recovery may be accomplished by aircrews when it can be determined that the unprepared surface will support the aircraft; however, this procedure may be used only after obtaining prior approval from HQ AMC Stan/Eval.

Chapter 2

AIRCRAFT MARSHALLING

Section 2A—Standard Marshalling Signals For The Air Force

2.1. Standard Marshalling Signals. For standard marshalling signals for the Air Force, see **Figure 2.1.** and **Figure 2.2.** All ground and aircrew personnel must use these signals to direct and control movement and operation of aircraft on the ground. Refer to **Chapter 1** for testing requirements.

2.2. AF Visual Aid (AFVA) 11-224, Aircraft Marshalling Signals. AFVA 11-224 shows marshalling signals identical to those in **Figure 2.1.** and **Figure 2.2.** Display this visual aid where maintenance and flight related operations take place. Suitable locations are aircraft maintenance work areas and flight line buildings frequented by ground and aircrew personnel.

Section 2B—Aircraft Marshallers.

2.3. Aircraft Marshallers. Aircraft marshallers provide hand signals to personnel taxiing or operating aircraft on the ground.

2.3.1. Transient alert aircraft marshallers will wear the uniform described in paragraph **2.3.1.1.** Uniform consistency is necessary to ensure flying personnel of one nation can readily identify aircraft marshallers of other nations. Individuals directly involved in fueling, defueling, and servicing liquid oxygen systems shall not wear the marshaller's uniform. Concurrent Servicing Supervisors are exempted.

2.3.1.1. The uniform is a sleeveless garment of fluorescent international orange. It covers the shoulders and extends to the waist in the front and back. Wear this garment over the basic uniform prescribed for transient alert personnel.

2.3.1.2. The orange garment may be marked with numbers on the front and back, at the discretion of the installation commander,

2.3.1.3. During daylight hours, marshallers may use high visibility paddles. Self-illuminating wands are required at night or during restricted visibility.

2.3.1.3. (AMC) AMC marshallers may use either high visibility paddles or high visibility marshalling sticks/wands during daylight hours.

Section 2C—Visual Marshalling Signals

2.4. USAF Visual Marshalling Signals (Pilot Initiated):

2.4.1. Pilots will initiate all signals regarding the operation of aircraft systems, for example, speed brakes, flaps, etc. The marshaller (crew chief) will repeat the given signal when it is safe to operate the aircraft system.

2.4.2. When marshallers must stay with a moving aircraft, pilots must make sure taxi speeds allow the ground marshaller or signal person to keep their proper position.

2.4.3. When giving visual signals, the pilot's hands must be in clear view of the marshaller. Specific signals are:

2.4.3.1. "OK." Thumbs up.

2.4.3.2. Trim Set for Take Off. Pilot forms "T" with hands.

2.4.3.3. Safety Pin check. Comply with technical order procedures. If the technical order does not specify safety pin check procedures, then the pilot must display seat pin before requesting removal of chocks. Marshallers must display ground safety pins before stowage.

2.4.3.4. Armament Switches Off, Safe, or Normal Position. This signal is used during arming and de-arming aircraft. The pilot must verify that all armament switches are turned off and then place hands in clear view of the ground crew.

2.4.3.5. Pitot Heat Check. The pilot grasps extended forefinger of left hand with right hand. The marshaller will give "OK" signal if the system is operating properly.

2.4.3.6. Nose Gear Steering Check. The pilot, with hands at head level, palms toward marshaller, moves hands back and forth simulating movement of rudder pedals. After positive acknowledgment from marshaller, the pilot performs the steering check. The marshaller will give the "OK" signal if nose gear moves properly.

2.4.3.7. Probe Check. The pilot raises arm upward and in a position resembling a probe. The marshaller will give the "OK" signal if no malfunction is observed.

2.4.3.8. Clearance to Release Drag Chute. The pilot extends arm outward and down; alternately clenches and opens hand. The marshaller will:

2.4.3.8.1. Respond with an affirmative nod if all is clear to release chute, and

2.4.3.8.2. Give the "OK" signal when drag chute separates from aircraft.

2.4.3.9. Clear to Lower Canopy. The pilot pats top of helmet; the marshaller pats top of head.

2.4.3.10. Flight Refueling Door Check. The pilot places hand on top of helmet with palm down and fingers forward, then raises and lowers forward portion of hand to simulate door opening and closing. The marshaller repeats the signal to indicate clear for safe opening or closing; then gives an "OK" signal if operation is proper.

2.4.3.11. Pilots may use other signals, similar to marshaller's signals in **Figure 2.1.** and **Figure 2.2.**, as necessary.

2.4.3.11.1. CAUTION: Do not extend arms or hands outside the cockpit on aircraft configured with clamshell-type canopies unless an uplock device has been inserted.

2.5. International Aircraft Marshalling Signals.

2.5.1. Where possible, signals in this instruction comply with North Atlantic Treaty Organization (NATO) Standardization Agreement 3117, *Air Standardization Coordinating Committee Air Standard 44/42A*, the International Civil Aviation Organization (ICAO), and Federal Aviation Administration (FAA) signals. Where there is a conflict in guidance between USAF, FAA, ICAO, and NATO documents, the USAF generally follows ICAO guidance wherever feasible. Significant differences in signals are annotated wherever possible.

2.5.2. The marshaller will signal facing the aircraft while standing in one of the following positions:

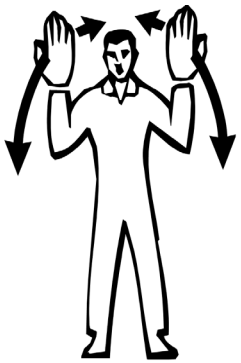
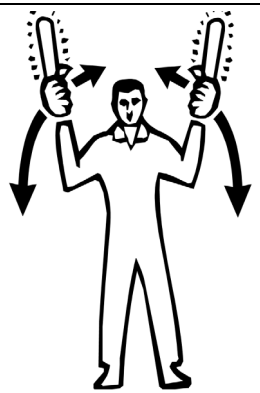
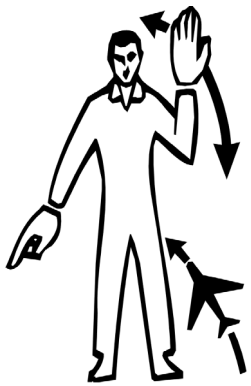
2.5.2.1. Fixed Wing Aircraft. The marshaller will stand forward of the left wingtip of the aircraft and remain in full view of the pilot.

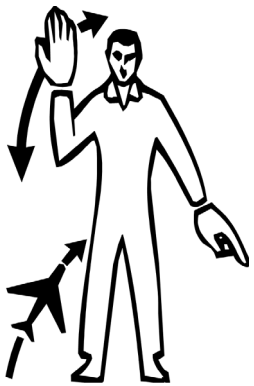
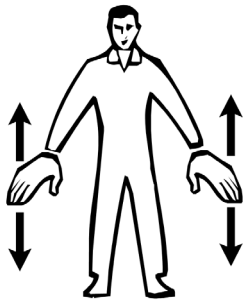
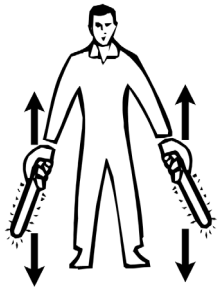
2.5.2.2. Helicopters. The marshaller will stand in full view of the pilot (the pilot is usually on the right side of the helicopter).

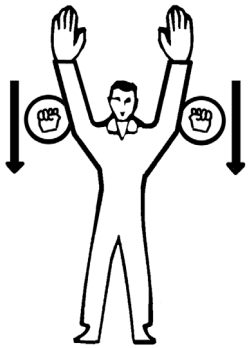
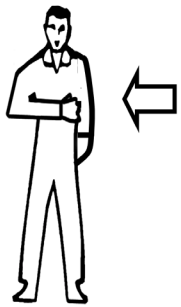
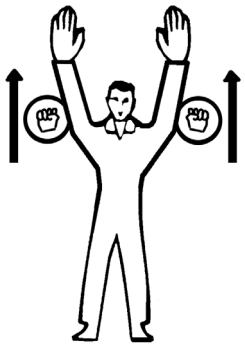
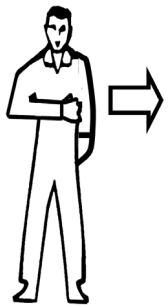
2.5.3. During night operations or restricted visibility, the marshaller will use a pair of same color light wands. During surface taxiing or parking, the pilot must stop immediately if one or both of the marshaller's wands fail.

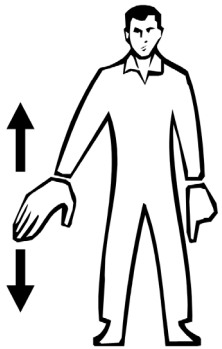
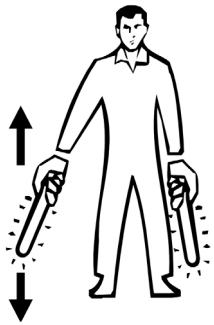
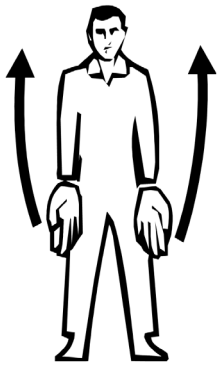
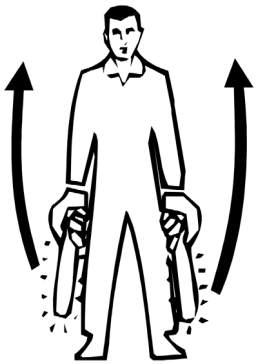
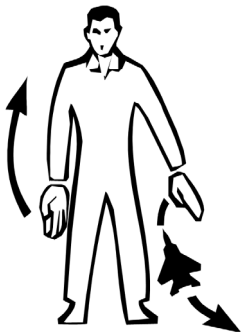
Figure 2.1. Ground Movement Signals For All Aircraft (Signals 1 Through 54) .
Note: Day and night signals are the same except where noted.

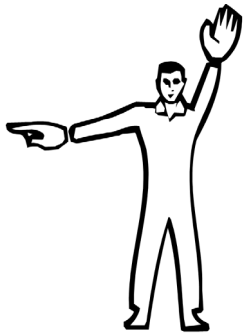
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
1. PROCEED TO NEXT MARSHALLER Right or left arm down, other arm moved across the body and extended to indicate direction of next marshaller.			NONE	SAME	SAME
2. THIS MARSHALLER Arms above head in vertical position with palms facing inward			SAME	SAME	SAME

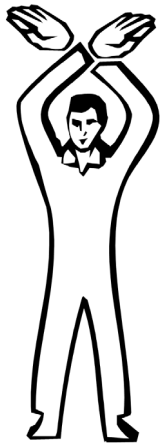
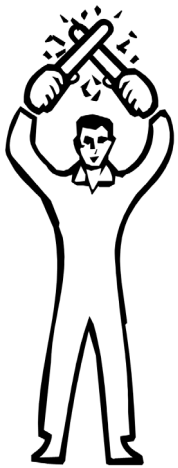
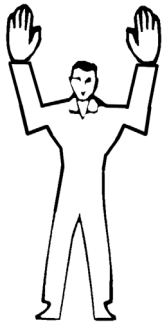
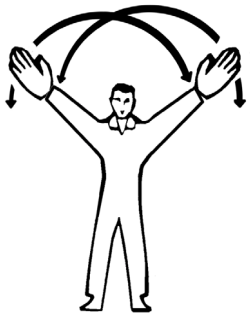
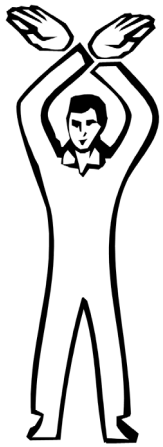
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
3. PROCEED UNDER FURTHER GUIDANCE BY SIGNALPERSON Right hand raised vertically overhead and moved left and right. Left hand at side.	NONE	NONE	NONE	NONE	
4. MOVE AHEAD Arms a little aside, palms facing backwards and repeatedly moved upward backward from shoulder height.			SAME	SAME	SAME
5. TURN TO THE LEFT Point right arm downward, left arm repeatedly moved upward backward. Speed of arm movement indicating rate of turn.			SAME	Signals 5 and 6 are the same as a spot turn for hovering aircraft.	SAME

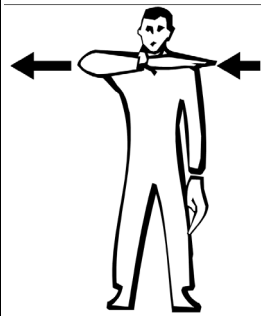
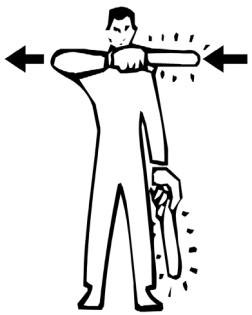
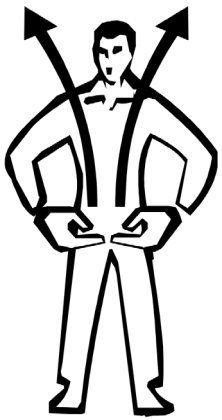
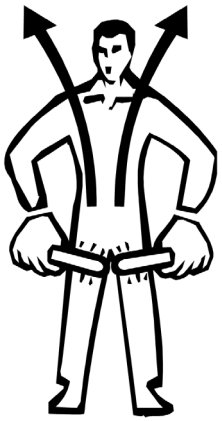
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
6. TURN TO THE RIGHT Point left arm downward, right arm repeatedly moved upward backward. Speed of arm movement indicating rate of turn.			SAME	Signals 5 and 6 are the same as a spot turn for hovering aircraft.	SAME
7. SLOW DOWN Arms down with palms toward ground then moved up and down several times.			SAME	SAME	SAME

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
8. <u>BRAKES ON</u> Day: Arms above head, open palms and fingers raised with palms towards aircraft, then fist closed. Night: Arms above head then wands crossed. ICAO: Raise arm and hand with fingers extended, horizontally in front of body then clench fist.	NONE	NONE	NONE		
9. <u>BRAKES OFF</u> Day: Arms above head, fist close facing aircraft. Then fist open. Night: Arms above head with wands crossed then uncrossed. ICAO: Raise arm, with fist clenched, horizontally in front of body, then extend fingers.	NONE	NONE	NONE		

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
10. SLOW DOWN ENGINES (S) ON INDICATED SIDE Arms down with palms toward ground, then either right or left arm waved up and down indicating that left or right side engines respectively should be slowed down.			NONE	SAME	SAME
11. MOVE BACK Arms by sides, palms facing forward, arms swept forward and upward repeatedly to shoulder height. Do not bend arms at the elbow.			For rotary wing aircraft only.	SAME	SAME
12. TURN WHILE BACKING - TAIL TO THE RIGHT Point left arm down. The right arm is by the side, palm facing forward. The right arm is swept forward and upward repeatedly to shoulder height. Do not bend arm at the elbow.			NONE		SAME AS FAA

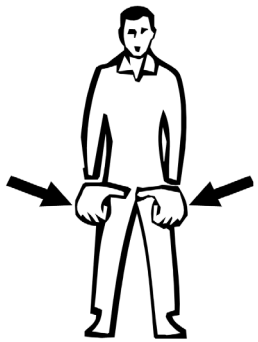
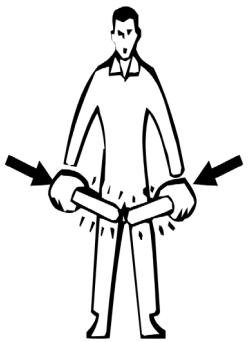
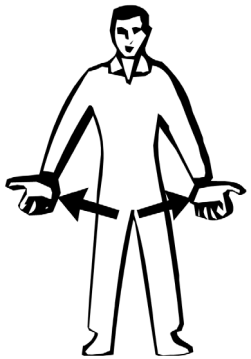
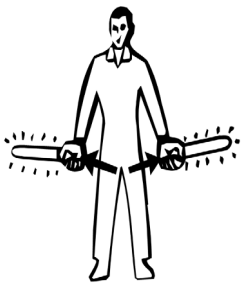
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
13. TURN WHILE BACKING - TAIL TO THE LEFT Point right arm down. The left arm is by the side, palm facing forward. The left arm is swept forward and upward repeatedly to shoulder height. Do not bend arm at the elbow.			NONE		SAME AS FAA
14. REQUEST/ CLEARANCE FOR PERSONNEL TO APPROACH AIRCRAFT A beckoning motion with right hand at eye level.		SAME	NONE	SAME	NONE
15. PERSONNEL APPROACH THE AIRCRAFT Left hand raised vertically overhead, palm towards aircraft. The other hand indicates to personnel concerned and gestures towards aircraft.			NONE	SAME	NONE

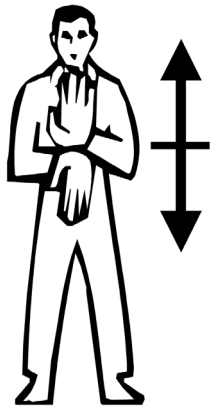
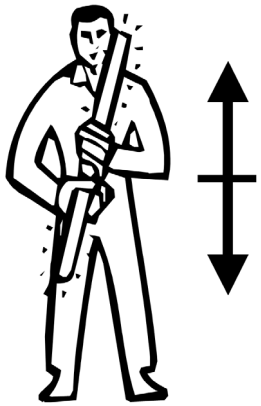
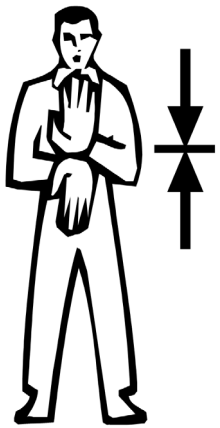
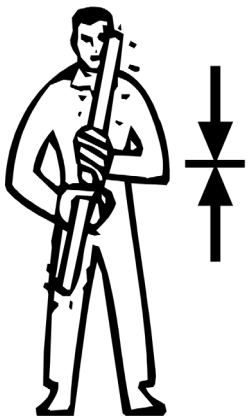
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
16. STOP USAF. Arms crossed above the head, palms facing forward. ICAO Note: The rapidity of the arm movement should be related to the urgency of the stop, i.e. the faster the movement the quicker the stop.				SAME AS USAF	
17. EMERGENCY STOP Arms crossed above the head, palms facing forward. Arms repeatedly crossed above head (the rapidity of the arm movement should be related to the urgency of the stop, i.e. the faster the movement the quicker the stop).	NONE	NONE		NONE	NONE

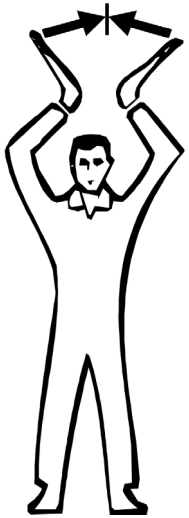
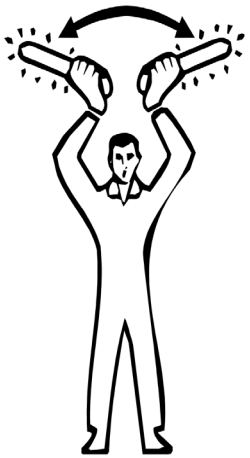
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
18. START ENGINE (S) Circular motion of right hand at head level with left arm pointing to engine.			SAME EXCEPT Circular motion is in front of body perpendicular to the ground.	SAME EXCEPT Number of fingers extended on left hand indicates engine to be started.	SAME EXCEPT Number of fingers extended on left hand indicates engine to be started.
19. CUT ENGINE (S)/ ROTOR Either arm and hand level with shoulder, hand moving across throat, palm downward.			SAME	SAME	SAME
20. ABANDON AIRCRAFT Marshaller first gives signal to cut engines, followed be signal simulating unfastening seat belt and shoulder straps and throwing them up and off.			NONE	SAME	NONE

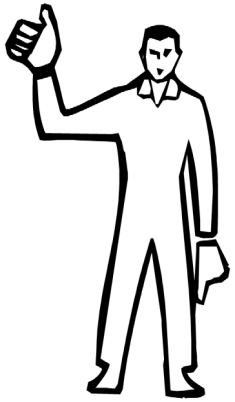
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
21. AUXILIARY POWER UNIT - CONNECTED Hands above head, left fist partially clenched, right hand moved in direction of left hand with first two fingers extended and inserted into circle made by fingers of the left hand.		SAME	NONE	SAME	NONE
22. AUXILIARY POWER UNIT - DISCONNECTED Hands above head, left fist partially clenched, right hand moved away from left hand, withdrawing first two fingers from circle made by fingers of the left hand.		SAME	NONE	SAME	NONE

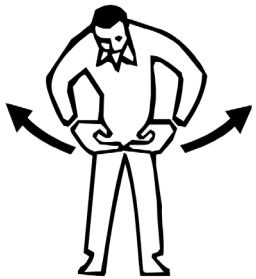
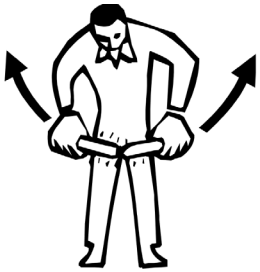
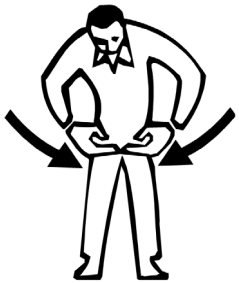
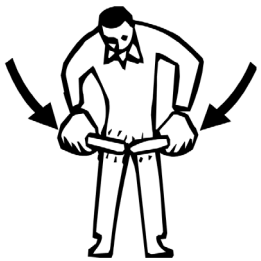
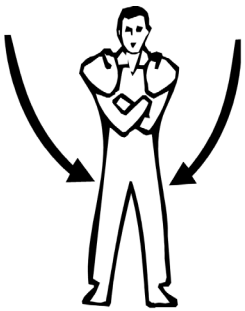
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
23. EXTERNAL STARTING AIR-CONNECTED Hands above head, left hand cupped, right first fully clenched, right fist moved in direction of left hand and inserted into cup made by left hand.		SAME	NONE	SAME	NONE
24. EXTERNAL STARTING AIR-DISCONNECTED Hands above head, left hand cupped, right first moved away from left hand withdrawing fist from cup made by left hand.		SAME	NONE	SAME	NONE

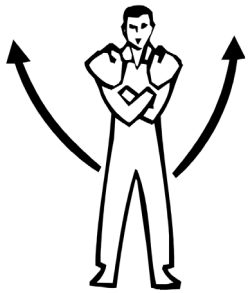
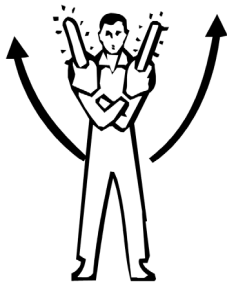
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
25. CHOCKS-INSERTED Arms down, fists closed, thumbs extended inwards, swing arms from extended position inwards.			SAME	SAME	SAME
26. CHOCKS-REMOVED Arms down, fists closed, thumbs extended outwards, swing arms outwards.			SAME	SAME	SAME

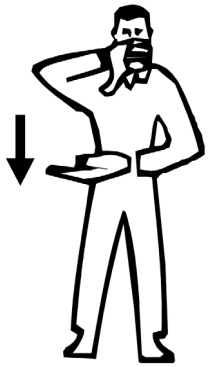
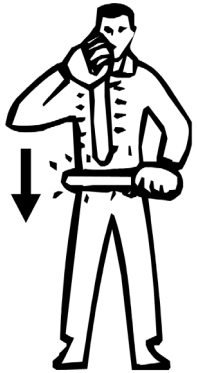
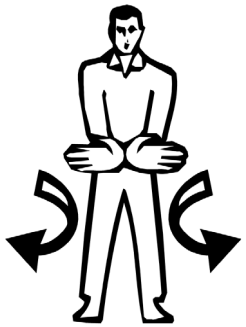
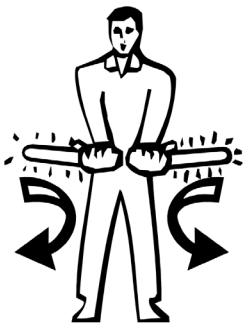
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
27. LOWER WING FLAPS OR FLAPS ARE EXTENDED Hands in front, palms together horizontally then opened from the wrist.			NONE	SAME	NONE
28. RAISE WING FLAPS OR FLAPS ARE UP Hands in front, horizontally, with palms open from the wrists, then suddenly closed.			NONE	SAME	NONE

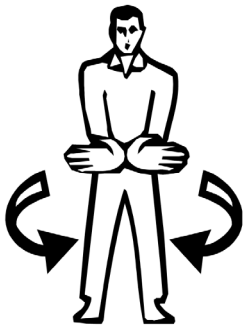
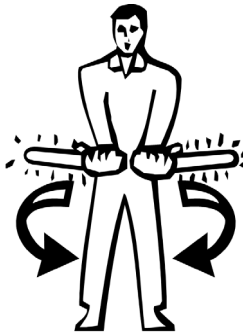
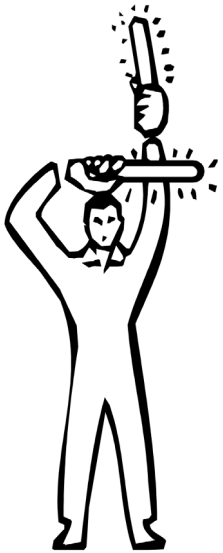
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
29. TAIL WHEEL/NOSE WHEEL-LOCK Hands together overhead, palms open from the wrists in a vertical V, then suddenly closed.			NONE	SAME	NONE
30. TAIL WHEEL/NOSE WHEEL-UNLOCK Hands overhead, palms together then opened from the wrists to form a vertical V.			NONE	SAME	NONE

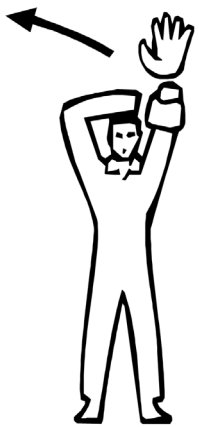
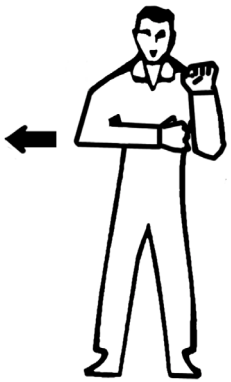
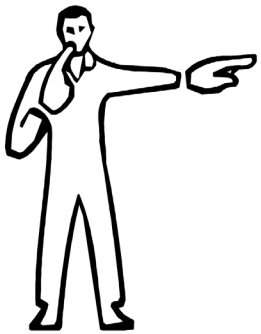
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
31. AFFIRMATIVE (ALL CLEAR OR "OK") Hand raised, thumb up.			SAME	SAME	SAME
32. NEGATIVE (NOT CLEAR) Hand raised, thumb down.			NONE	SAME	NONE

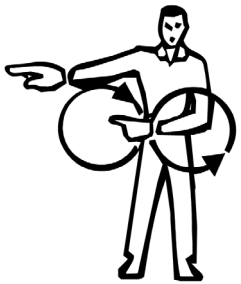
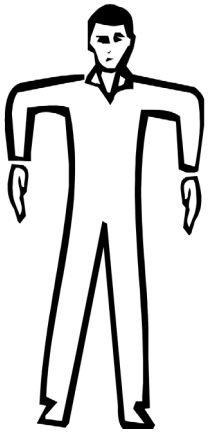
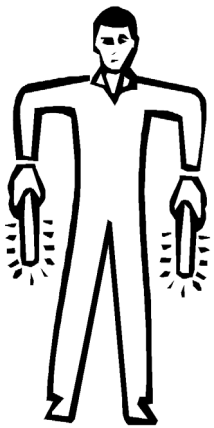
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
33. WEAPON BAY - OPEN Body bent forward at the waist, hands held with fingertips touching in front of body and elbow bent at approximately 45 degrees, then arms swing downwards and outwards.			NONE	SAME	NONE
34. WEAPON BAY-CLOSE Body bent forward at the waist and arms extended horizontally, then arms swing downward and in until finger tips touch in front of the body with elbows bent at approximately 45 degrees.			NONE	SAME	NONE
35. FOLD WINGS/ HELICOPTER BLADES/ SWEEP WINGS AFT Arms straight out at sides, then swept forward and hugged around shoulders.		SAME	NONE	SAME	NONE

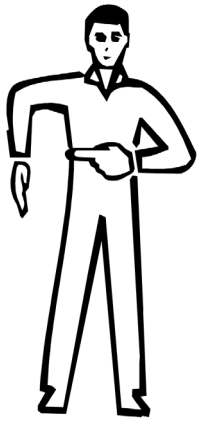
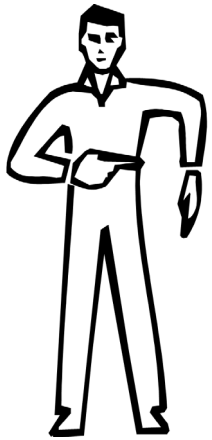
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
36. SPREAD WINGS/ HELICOPTER BLADES/ SWEEP WINGS FORWARD Arms hugged around shoulders, then swept straight out to the sides.			NONE	SAME	NONE
37. LOCK WINGS/ HELICOPTER BLADES Hit right elbow with palm of left hand.			NONE	NONE	NONE
38. UP TAIL HOOK Right fist, thumb extended upward, raised suddenly to meet horizontal palm of left hand.			NONE	SAME	NONE

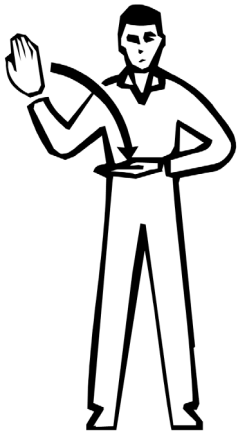
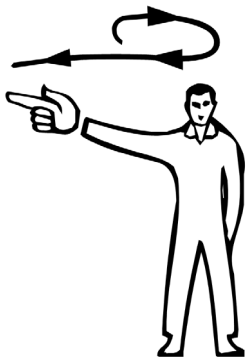
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
39. DOWN TAIL HOOK Right fist, thumb extended downward, forward suddenly to meet horizontal palm of left hand			NONE	SAME	NONE
40. OPEN AIR/SPEED BRAKES OR AIR/SPEED BRAKES ARE OPEN Hands in front, palms together vertically, then opened from the wrists.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
41. CLOSE AIR/SPEED BRAKES OR AIR/SPEED BRAKES ARE CLOSE Hands in front, vertically with palms open from the wrists, then suddenly closed.			NONE	SAME	NONE
42. DOWN LOCKS/ LANDING GEAR PINS INSTALLED With arms above head, the right-hand clasps left forearm. NATO: Left arm bent vertically in front with fist clenched, right arm bent horizontally in front with fist clenched and held motionless at left elbow.			NONE		NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
43. DOWN LOCKS/ LANDING GEAR PINS REMOVED With arms and hands clasped as in “INSTALLED" position, the right hand unclasps the left forearm. NATO: Left arm bent vertically in front with fist clenched, right arm bent horizontally in front with fist clenched and held motionless at left elbow. Right fist moves horizontally away from left elbow.			NONE		NONE
44. ENGAGE NOSE GEAR STEERING Point to nose with index finger while indicating direction of turn with other index finger.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
45. DISENGAGE NOSEGEAR STEERING Point to nose with index finger, lateral wave with open palm of other hand at shoulder height.			NONE	SAME	NONE
46. FIRE IN THE ENGINE OR APU Make rapid horizontal figure-of-eight motion at waist level with either arm, pointing at source of fire with the other.			NONE	SAME	NONE
47. HOT BRAKES Arms extended with forearm perpendicular to ground. Palms facing body.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
48. HOT BRAKES - LEFT SIDE Arms extended with forearm perpendicular to ground. Gesture indicates left side.			NONE	NONE	NONE
49. HOT BRAKES-RIGHT SIDE Arms extended with forearm perpendicular to ground. Gesture indicates right side.			NONE	NONE	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
50. FEATHER/FUEL SHUT OFF (PROPELLER AIRCRAFT ONLY) Make a chopping motion with one hand slicing into the flat and open palm of the other hand. Number of fingers extended on right hand indicates affected engine.			NONE	NONE	NONE
51. TAKE OFF THIS WAY (at pilot's discretion) Marshaller conceals left hand and makes circular motion of right hand over head in horizontal plane ending in a throwing motion of arm towards direction of takeoff.	NONE ***NOTE:*** For USAF, this is a rotary wing signal only.	NONE ***NOTE:*** For USAF, this is a rotary wing signal only.	NONE	 ***NOTE:*** For NATO this is a fixed wing signal only.	NONE

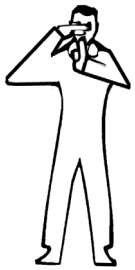
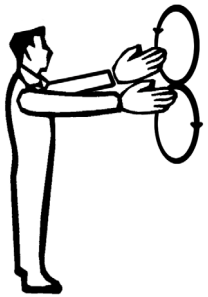
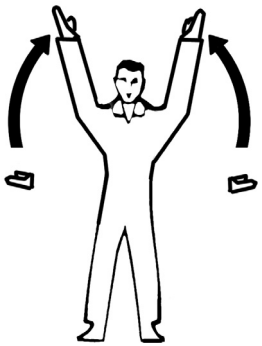
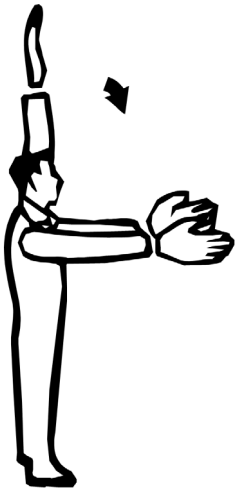
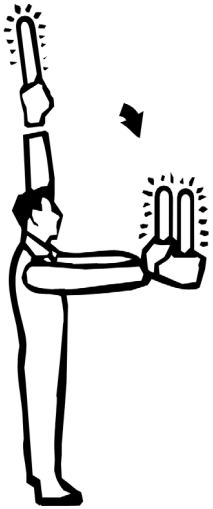
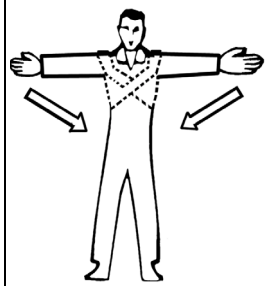
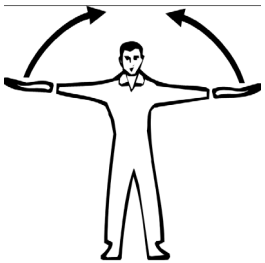
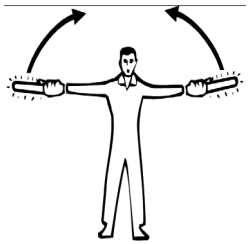
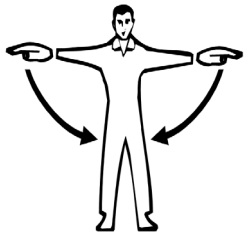
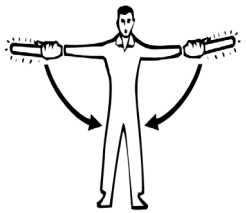
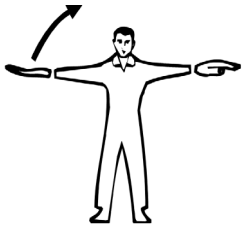
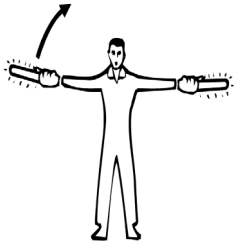
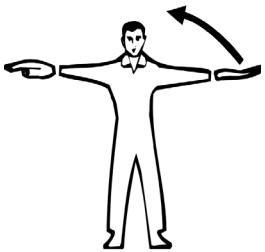
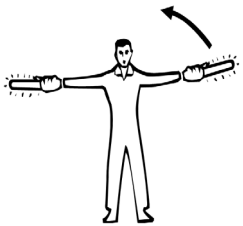
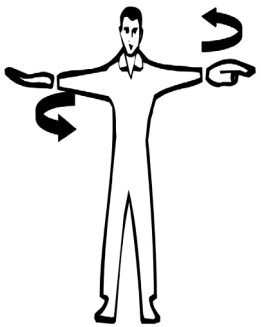
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
52. VENTILATION Circular motions or right hand in horizontal plane, fist clenched, index finger stretched down, right arm extended, with forearm perpendicular to the ground.	NONE	NONE	NONE		NONE
53. TELEBRIEF Make a “T” signal with hands at head level.	NONE	NONE	NONE		NONE
54. LASHINGS ON/OFF With arms horizontal, hands make a circular motion in front of body.	NONE	NONE	NONE		NONE

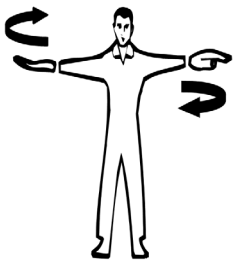
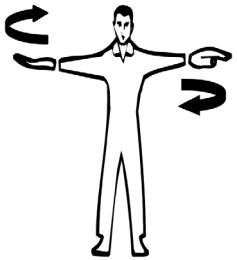
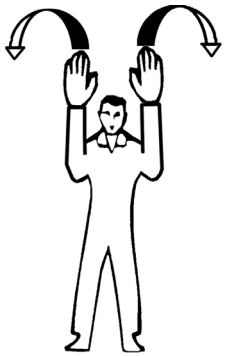
Figure 2.2. Additional Signals For Hovering Aircraft (Signals 55 Through 90)
Note: Day and night signals are the same except where noted.

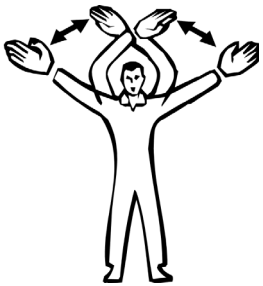
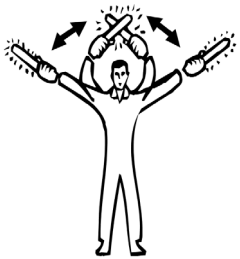
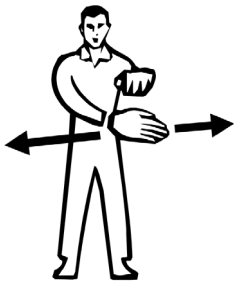
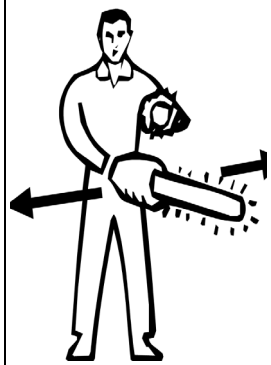
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
55. TAKEOFF Arms extended horizontally sideways beckoning upwards.	NONE	NONE	NONE		NONE
56. CLEAR TAKEOFF DIRECTION Both arms extended on same side above shoulder level in direction clear to fly off.	NONE	NONE	NONE		NONE

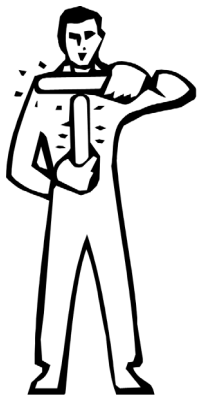
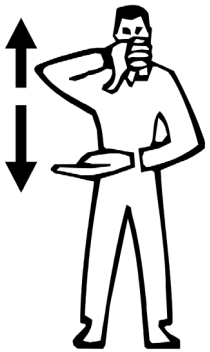
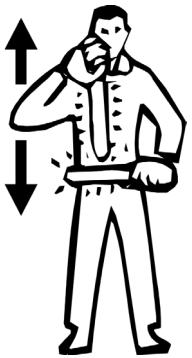
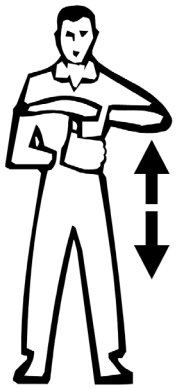
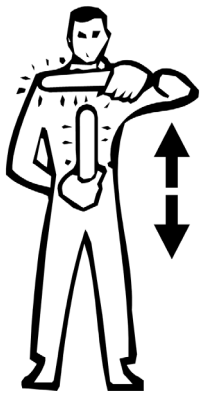
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
57. LANDING DIRECTION Marshaller turns and faces toward point where aircraft is to land; the arms are lowered repeatedly from a vertical position to a horizontal position, stopping finally in the horizontal position.			SAME	SAME	NONE
58. STOP ROTOR Arms extended horizontally sideways, palms facing forward, and then crossed across the chest so hands touch shoulders.	NONE	NONE		NONE	NONE

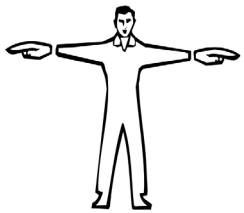
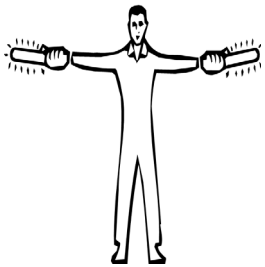
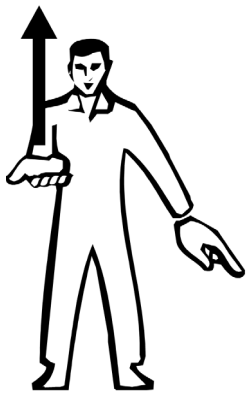
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
59. STOP Arms extended vertically overhead, palms facing outwards.	NONE	NONE		NONE	NONE
60. VERTICAL MOVEMENT-MOVE UPWARD Arms extended horizontally sideways beckoning upwards, with palms turned up. Speed of movement indicates rate of ascent.			SAME	SAME	SAME
61. VERTICAL MOVEMENT-MOVE DOWNWARD Arms extended horizontally sideways beckoning downwards with palms turned down. Speed of movement indicates rate of descent.			SAME	SAME	SAME

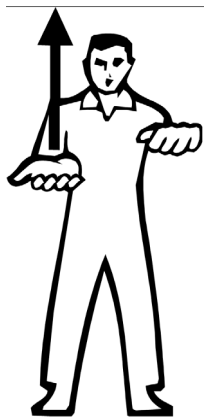
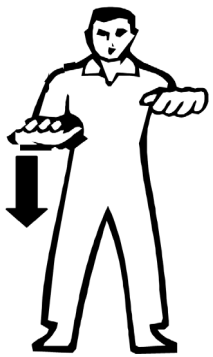
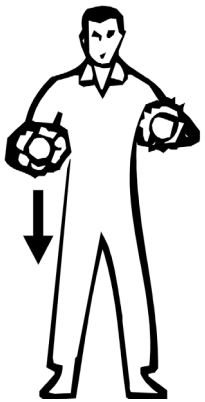
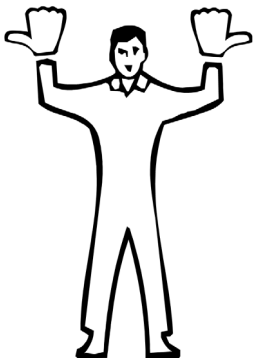
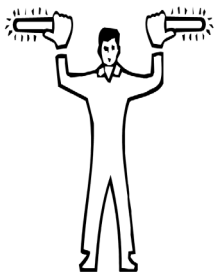
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
62. <u>HORIZONTAL MOVEMENT-MOVE TO THE RIGHT</u> Left arm extended horizontally sideways in direction of movement and other arm swung over the head in same direction, in a repeating movement.			SAME EXCEPT Signal shows arm movement in front of chest parallel to ground.	SAME	SAME EXCEPT Signal shows arm movement in front of chest parallel to ground.
63. <u>HORIZONTAL MOVEMENT-MOVE TO THE LEFT</u> Right arm extended horizontally sideways in direction of movement and other arm swung over the head in the same direction, in repeating movement.			SAME EXCEPT Signal shows arm movement in front of chest parallel to ground.	SAME	SAME EXCEPT Signal shows arm movement in front of chest parallel to ground.
64. <u>SWING TAIL TO RIGHT</u> Right arm swings over chest perpendicular to ground. At the same time the left arm swings behind the back perpendicular to the ground. Elbows remain locked.	NONE	NONE		NONE	NONE

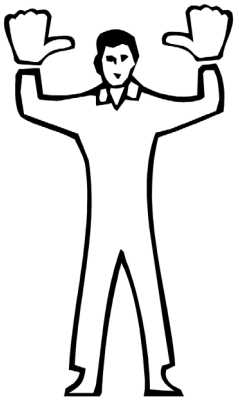
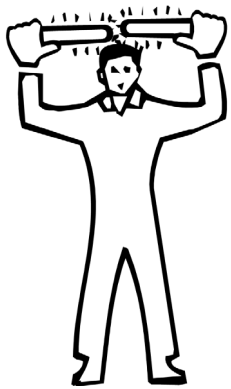
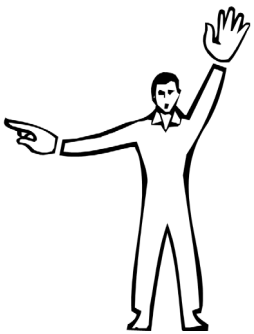
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
65. <u>SWING TAIL TO LEFT</u> Left arm swings over chest perpendicular to ground. At the same time the right arm swings behind the back perpendicular to the ground. Elbows remain locked.	NONE	NONE		NONE	NONE
66. <u>MOVE BACK</u> Arms by sides, palms facing forward, arms swept downward repeatedly from shoulder height.	NONE	NONE		NONE	NONE
67. <u>MOVE FORWARD</u> Arms a little aside, palms facing backwards and repeatedly moved upward backward to shoulder height.	NONE	NONE		NONE	NONE

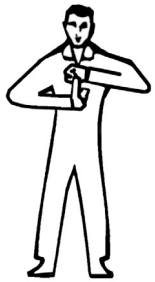
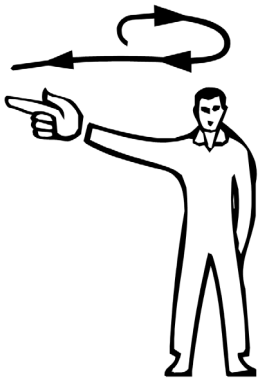
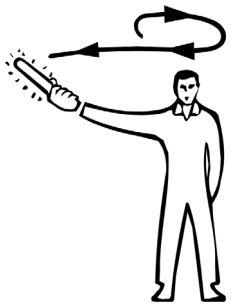
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
68. LOWER WHEELS When aircraft approaches with landing gear retracted, Marshaller gives signal by side view of a cranking circular motion of the hands.			NONE	SAME	NONE
69. WAVE OFF Waving of arms over the head.			NONE	SAME	NONE
70. RELEASE LOAD Left arm extended forward horizontally, fist clenched, right hand making horizontal slicing movement below the left fist, palm facing body.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
71. <u>LOAD HAS NOT BEEN RELEASED</u> Bend left arm horizontally across chest, with fist clenched, palm downward; open right hand pointing up vertically to center of left fist.			NONE	NONE	NONE
72. <u>DOWN CARGO HOOK</u> Right fist, thumb extended downward, repeatedly raised and lowered to meet palm of left hand.			NONE	NONE	NONE
73. <u>UP CARGO HOOK</u> Right fist, thumb extended upward, repeatedly raised and lowered to meet palm of left hand.			NONE	NONE	NONE

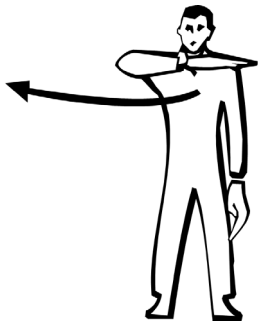
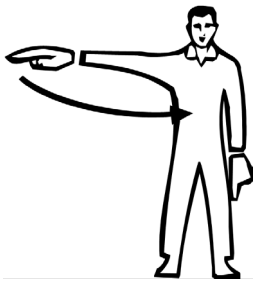
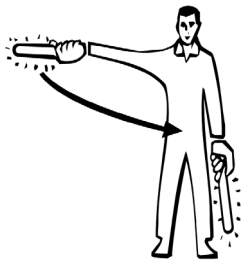
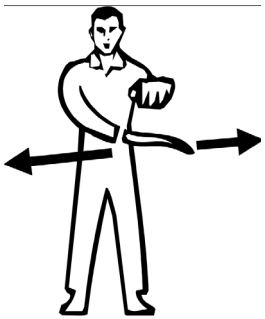
	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
74. <u>HOVER</u> Arms extended horizontally, palms downward.			NONE	SAME	SAME
75. <u>SPOT TURN</u> Left or right hand moving upward and backward, from a horizontal position, to indicate direction of tail movement. Other hand pointing to center of spot turns. Marshaller must remain in full eye-view with pilot.			NONE	SAME ***NOTE:*** These are the same as signals 5 and 6 for fixed wing aircraft.	NONE
76. <u>LAND</u> Arms crossed and extended downwards in front of the body.			NONE	SAME	SAME

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
77. WINCH-UP Left arm horizontal in front of body, fist clenched, right-hand with palm turned upwards making upward motion.			NONE	SAME	NONE
78. WINCH-DOWN Left arm horizontal in front of body, fist clenched, right hand with palm turned downwards making downward motion.			NONE	SAME	NONE
79. DROOP STOPS OUT Hand above head level, thumbs pointing out.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
80. DROOP STOPS IN Hand above head level, thumbs pointing in.			NONE	SAME	NONE
81. REMOVE BLADE TIE-DOWNS Left hand above head, right hand pointing to individual boots for removal.			NONE	SAME	NONE
82. WHEELS OR SLING LOAD THIS HIGH Hands extended before body and palms facing each other. The bottom hand indicates the ground and the top hand the wheels or bottom of sling load. The distance between the hands will indicate the height of the wheel or bottom of sling load above the ground.			NONE	NONE	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
83. <u>CARGO LOAD SECURE</u> Arms extended forward, elbows flexed, right hand grasping left fist.			NONE	NONE	NONE
84. TROUBLE WITH LOAD Bend left arm horizontally across chest with fist clenched, palm downwards; open right hand pointed up vertically to center of left fist.	NONE	NONE	NONE		NONE
85. <u>TAKE OFF THIS WAY (at pilot's discretion)</u> Marshaller conceals left hand and makes circular motion of right hand over head in horizontal plane ending in a throwing motion of arm towards direction of takeoff. NATO: For fixed wing aircraft only.			SAME	***NOTE:*** Used for fixed wing aircraft only.	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
86. ENGAGE ROTOR (S) Circular motion in horizontal plane with right hand above head.			SAME	SAME	NONE
87. HOOK UP LOAD Hands make a rope climbing motion.			NONE	SAME	NONE

	USAF DAY	USAF NIGHT	FAA	NATO	ICAO
88. SPREAD PYLON Bend elbow across chest, palm downward. Extend arm outward to horizontal position, keeping palm open and facing down.			NONE	SAME	NONE
89. FOLD PYLON Extend right arm horizontally, palm downward. Bend arm across chest, keeping palm down.			NONE	SAME	NONE
90. CUT CABLE A signal similar to "Release Load" except that the right hand has the palm facing downwards. Rapid repetition of right hand movement indicates urgency.			NONE	SAME	NONE

Chapter 3

AIRPORT MARKINGS, LIGHTS AND SIGNS

Section 3A—Standard Airport Markings, Lights, and Signs.

3.1. Standard Airport Markings, Lights, and Signs. All ground and aircrew personnel involved with moving aircraft on the ground must be familiar with airport markings, lights and signs. This is to direct and control movement and operation of aircraft on the ground and reduce runway incursions. Refer to **Chapter 1** for testing requirements.

3.2. Visual Aid for Airport Markings, Lights, and Signs.

3.2.1. FAA Form 5280-7 shows selected FAA airport markings and signs identical to those in **Section 3C**, **Section 3D**, and **Section 3E**. For units based at civilian or joint use airports, display this visual aid where maintenance and flight related operations take place. Suitable locations are aircraft maintenance work areas and flight line buildings frequented by ground and aircrew personnel. This visual aid is available free from the FAA via **http://www.faa.gov/runwaysafety/**. Select the button "Runway Safety Awareness Materials". Select "Ground Vehicle Guide Placard".

3.2.2. AFVA 11-240 shows selected USAF airport markings and signs identical to those in **Section 3C**, **Section 3D**, and **Section 3E**. For units based at USAF installations, display this visual aid where maintenance and flight related operations take place. Suitable locations are aircraft maintenance work areas and flight line buildings frequented by ground and aircrew personnel. This includes vehicles operated on USAF airfields. Reference AFI 13-213, Airfield Management, for further flight line driving information.

3.2.3. Units located at contingency or foreign airfields use the visual aid (FAA or USAF) that most clearly depicts the actual markings at the airfield.

3.3. Compliance With Airport Markings, Lights, and Signs. Where possible, airport markings, lights, and signs shown in this instruction are taken from applicable ICAO NATO, and FAA airport markings, lights, and signs documents. Not all airfields will have all forms of markings, lights, and signs described in this chapter. Certain older airfields may be "grand fathered" under obsolete standards. Additional variations may be required due to unique terrain, or obstacles. Foreign airfields may not comply with ICAO Standards and Recommended Practices (SARPS). Installation of a particular system is dependent on airfield design, airfield jurisdiction, age of the airfield, predominant use, geographic location, and other operational factors. Flight Information Publications (FLIP) and local directives detail configurations for each particular airfield. Personnel must be familiar with the specific airport markings, lights, and signs at a particular airfield prior to operating an aircraft on that airfield. In case of conflict between ICAO, NATO, FAA, and USAF documents, USAF requirements take precedence at USAF airfields. Significant differences are annotated to the maximum extent feasible.

Section 3B—Airport Markings

3.4. General.

3.4.1. For the purpose of this regulation the Airport Pavement Markings have been grouped into four areas:

3.4.1.1. Runway Markings.

3.4.1.2. Taxiway Markings.

3.4.1.3. Holding Position Markings.

3.4.1.4. Other Markings.

3.4.2. Marking Colors. Most runway markings are white. Arresting System Warning Markings are yellow. USAF and some ICAO arrowheads and chevrons in displaced threshold areas are yellow. Markings defining the landing area on a heliport are also white, except for hospital heliports that use a red "H" on a white cross. Markings for taxiways, areas not intended for use by aircraft (closed and hazardous areas), and holding positions (even if they are on a runway) are usually yellow.

3.5. Runway Markings.

3.5.1. Runway Designators. Runway numbers and letters are determined from the approach direction. The runway number is the whole number nearest one-tenth the magnetic azimuth of the centerline of the runway, measured clockwise from the magnetic north. The letters, differentiate between left (L), right (R), or center (C), parallel runways, as applicable:

3.5.1.1. For two parallel runways "L" "R."

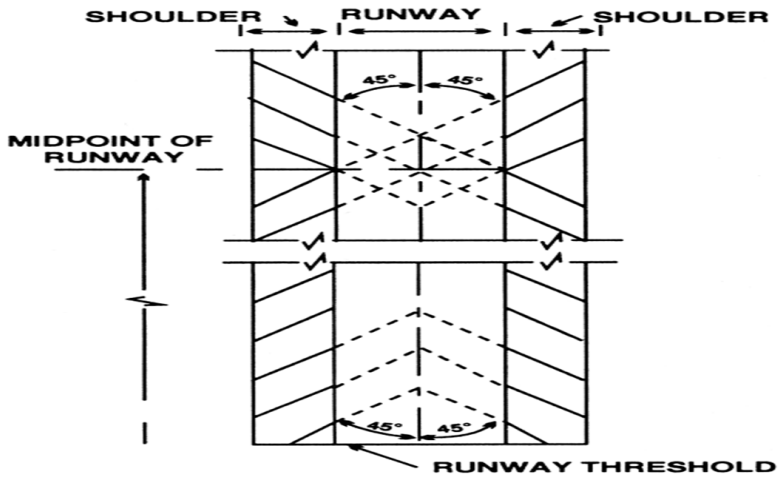
3.5.1.2. For three parallel runways "L" "C" "R."

3.5.2. Runway Centerline Marking. The runway centerline identifies the center of the runway and consists of a line of uniformly spaced stripes and gaps.

3.5.3. Runway Side Stripe Marking. Runway side stripes delineate the edges of the runway to enhance visual acquisition of the runway environment during transition from instrument to visual flight. Side stripes consist of continuous white stripes located on each side of the runway.

3.5.4. Runway Shoulder Markings. Runway shoulder stripes may be used to supplement runway side stripes to identify pavement areas contiguous to the runway sides that are not intended for use by aircraft. Runway Shoulder stripes are yellow.

Figure 3.1. Runway Shoulder Markings.



3.5.5. Threshold Bar. FAA Only. A threshold bar delineates the beginning of the runway that is available for landing when there is pavement aligned with the runway on the approach side of the threshold. The threshold bar is 10 feet wide and is white since it is part of the useable runway surface.

3.5.6. Demarcation Bar. A demarcation bar delineates a runway with a displaced threshold from a blast pad, under run, stopway (overrun) or taxiway that precedes the runway.

3.5.6.1. FAA Only. The demarcation bar is three feet wide and is located on the blast pad, stopway or taxiway at the point of intersection with the runway. It is yellow to indicate it is not part of the useable runway, except when the area preceding the threshold can be used for takeoff, then the demarcation bar will be white.

3.5.6.2. USAF/ICAO Only. Neither USAF nor ICAO require a demarcation bar for contiguous blast pads or overruns. The demarcation bar is only required where operational pavement is located on the approach side of the threshold marking, such as with a displaced threshold or contiguous taxiway. In those cases, the bar is four feet wide and is white because it is located on the runway surface.

3.5.7. Threshold Markings. These markings are used to show pavement areas aligned with the runway that are unusable for landing, takeoff, and/or taxiing.

3.5.7.1. General Information.

3.5.7.1.1. Arrowheads highlight the beginning of the useable landing surface.

3.5.7.1.2. Taxiway markings in a displaced threshold area indicate an area suitable for taxi only.

3.5.7.1.3. Arrows in a displaced threshold area indicate an area suitable for taxi and takeoff only.

3.5.7.1.4. Chevrons in a displaced threshold area indicate an area unsuitable for taxi, takeoff, or landing.

3.5.7.2. Arrows and Arrowheads.

3.5.7.2.1. FAA Only. Arrows and arrowheads used in a displaced threshold area are white since the area is useable for takeoff. Arrowheads used on a taxiway prior to a runway threshold are yellow since the area is not useable for takeoff or landing.

3.5.7.2.2. USAF Only. In permanently displaced thresholds all arrows and arrowheads are yellow. The shaft of the arrow will be white. In temporarily displaced thresholds the arrowheads could be white or yellow.

3.5.7.2.3. ICAO Only. Arrows and arrowheads used in a displaced threshold area may be white or yellow regardless of whether the displaced threshold area is suitable for takeoff.

3.5.7.3. Chevrons

3.5.7.3.1. Chevrons are yellow since the area is unusable for taxi, takeoff, or landing.

Figure 3.2. FAA Demarcation Bars and Threshold Markings.

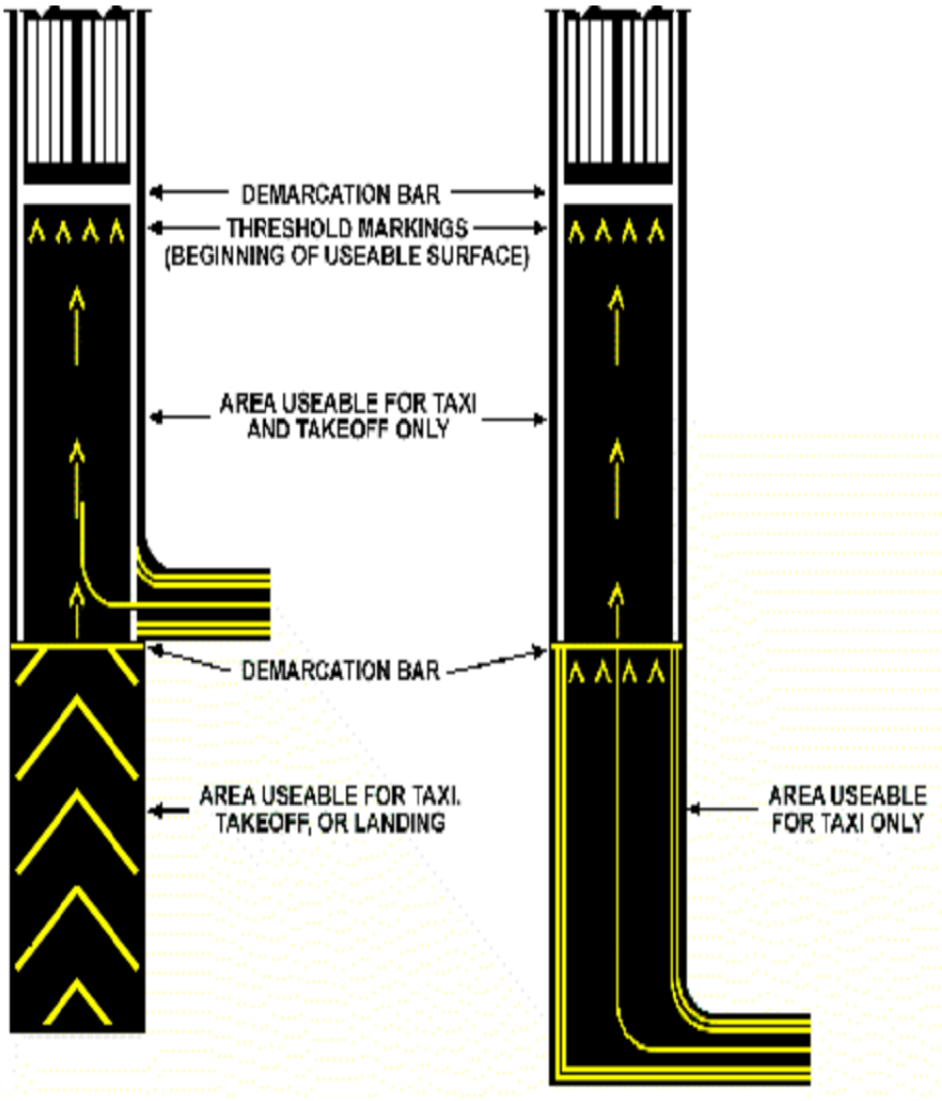
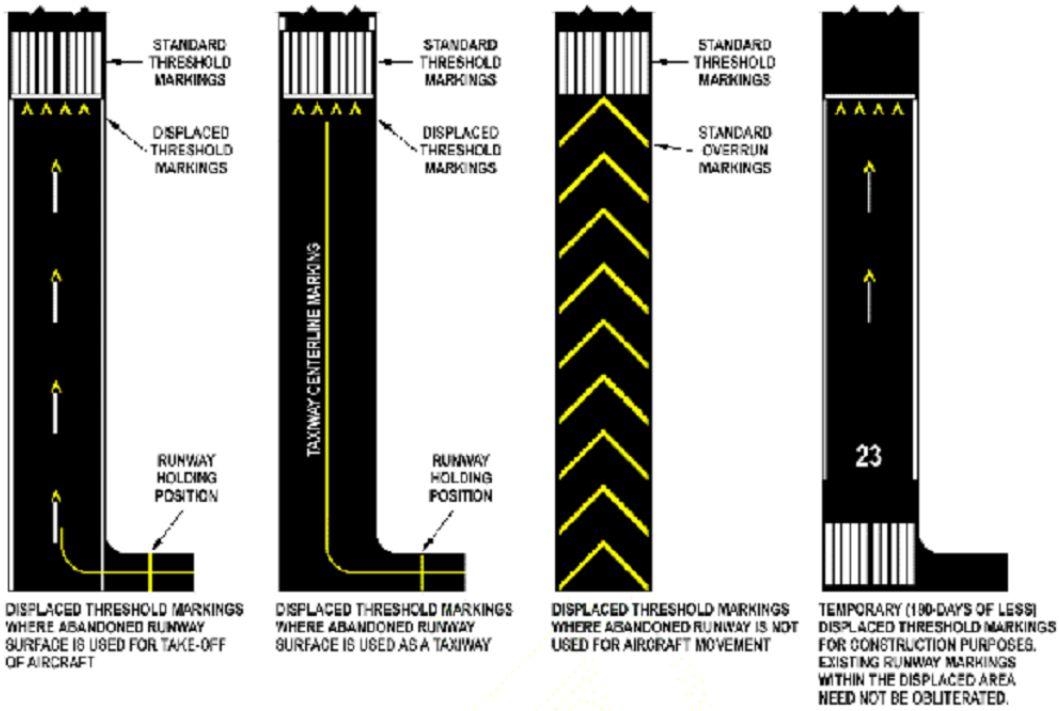


Figure 3.3. USAF Threshold Markings.

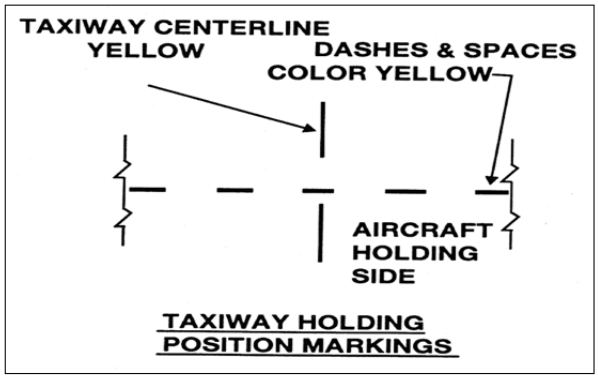


3.6. Taxiway Markings.

3.6.1. All taxiways should have centerline markings and runway holding position markings whenever they intersect a runway. Taxiway edge markings are present whenever there is a need to separate the taxiway from a pavement that is not intended for aircraft use or to delineate the edge of the taxiway. Taxiways may also have shoulder markings and holding position markings for Instrument Landing System/Microwave Landing System (ILS/MLS) critical areas, and taxiway/taxiway intersection markings.

NOTE: The USAF has no requirement to mark taxiway/taxiway intersections at USAF installations.

Figure 3.4. Taxiway Holding Position Markings.



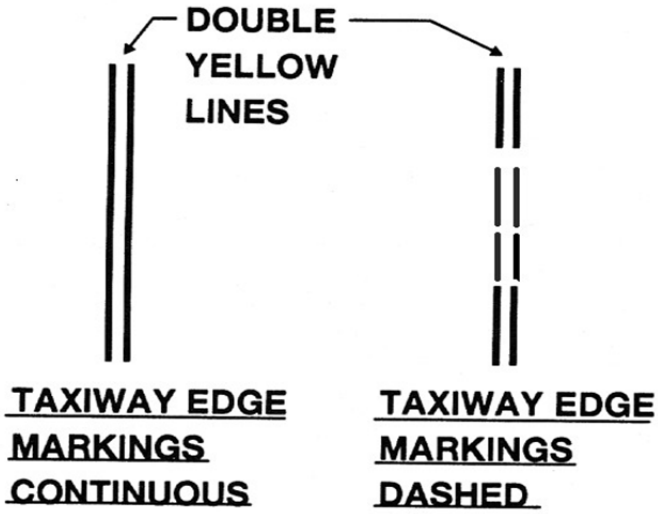
3.6.2. Taxiway Centerline. The taxiway centerline is a single continuous yellow line. This provides a visual cue to permit taxiing along a designated path. Ideally the aircraft should be kept centered over this line during taxi to ensure adequate clearance.

3.6.3. Taxiway Edge Markings. Taxiway edge markings are used to define the edge of the taxiway. They are primarily used when the taxiway edge does not correspond with the edge of the pavement. There are two types of markings depending upon whether the aircraft is supposed to cross the taxiway edge:

3.6.3.1. Continuous Markings. These consist of a continuous double yellow line. They are used to define the taxiway edge from the shoulder or some other abutting paved surface not intended for use by aircraft.

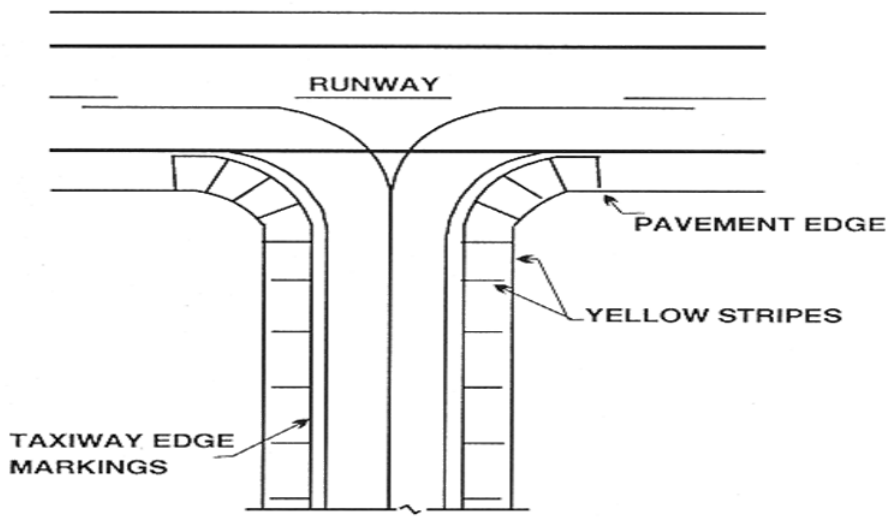
3.6.3.2. Dashed Markings. These markings are used when there is an operational need to define the edge of a taxiway or taxi lane on a paved surface where the adjoining pavement to the taxiway edge is intended for use by aircraft. e.g., an apron. Dashed taxiway edge markings consist of a broken double yellow line.

Figure 3.5. Taxiway Edge Markings.



3.6.3.3. Taxiway Shoulder Markings. Taxiways, holding bays, and aprons are sometimes provided with paved shoulders to prevent blast and water erosion. Although shoulders may have the appearance of full strength pavement they are not intended for use by aircraft, and may be unable to support an aircraft. Usually the taxiway edge marking will define this area. Where conditions exist such as islands or taxiway curves that may cause confusion as to which side of the edge stripe is for use by aircraft, taxiway shoulder markings may be used to indicate the pavement is unusable. Taxiway shoulder markings are yellow.

Figure 3.6. Taxiway Shoulder Markings.



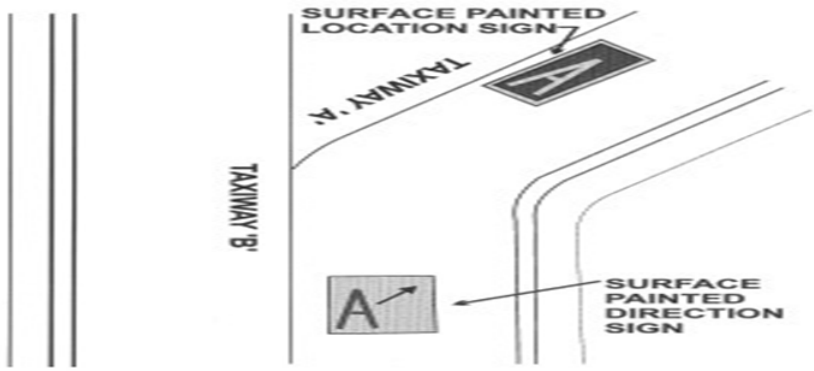
3.6.4. Surface Painted Taxiway Direction Signs. Surface painted taxiway direction signs have a yellow background with a black inscription, and are provided when it is not possible to provide taxiway direction signs at intersections, or when necessary to supplement such signs. These markings are located adjacent to the centerline with signs indicating turns to the left being on the left side of the taxiway centerline and signs indicating turns to the right being on the right side of the centerline.

NOTE: At USAF installations, surface painted taxiway direction signs are yellow block letters with no background.

3.6.5. Surface Painted Location Signs. Surface painted location signs have a black background with a yellow inscription. When necessary, these markings are used to supplement location signs located along side the taxiway and assist the pilot in confirming the designation of the taxiway on which the aircraft is located. These markings are located on the right side of the centerline.

NOTE: At USAF installations, surface painted location signs are yellow block letters with no background.

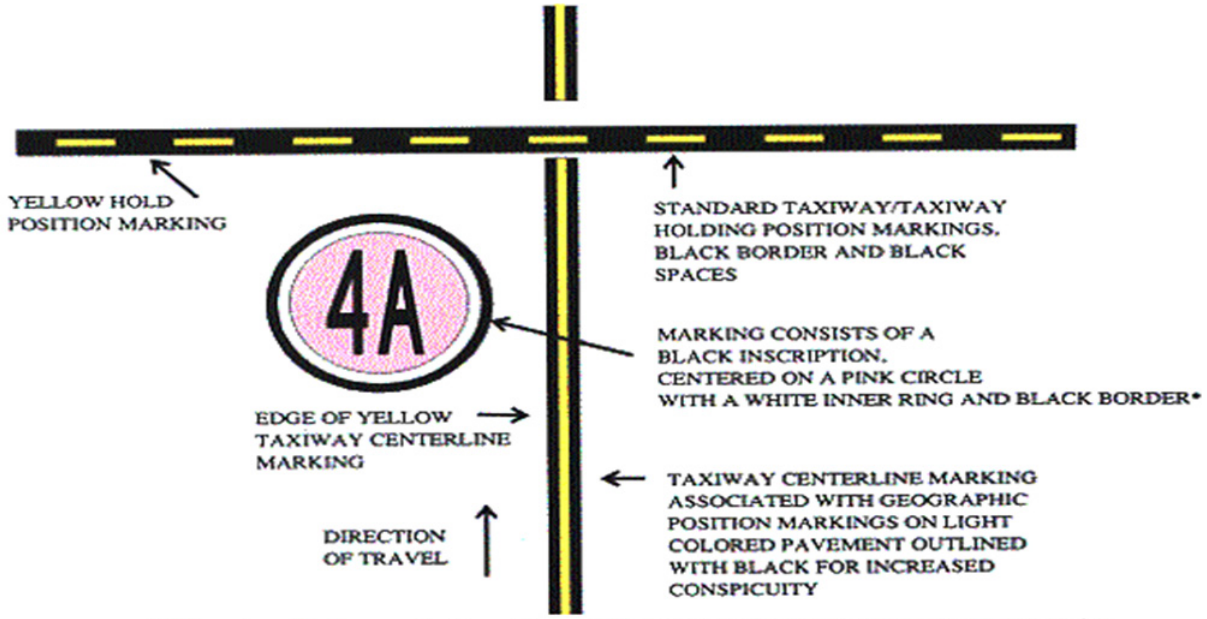
Figure 3.7. Surface Painted Location and Direction Signs.



NOTE: At USAF installations, surface painted taxiway direction and location signs are yellow block letters with no background.

3.6.6. Geographic Position Markings. These markings are located at points along low visibility taxi routes designated in the airport's Surface Movement Guidance Control System (SMGCS) plan. They are used to identify the location of taxiing aircraft during low visibility operations. Low visibility operations are those that occur when the runway visual range (RVR) is below 1200 feet. They are positioned to the left of the taxiway centerline in the direction of taxiing. The geographic position marking is a circle comprised of an outer black ring contiguous to a white ring with a pink circle in the middle. When installed on asphalt or other dark-colored pavements, the white ring and the black ring are reversed, i.e., the white ring becomes the outer ring and the black ring becomes the inner ring. It is designated with either a number or a number and letter. The number corresponds to the consecutive position of the marking on the route.

Figure 3.8. Geographic Position Markings.



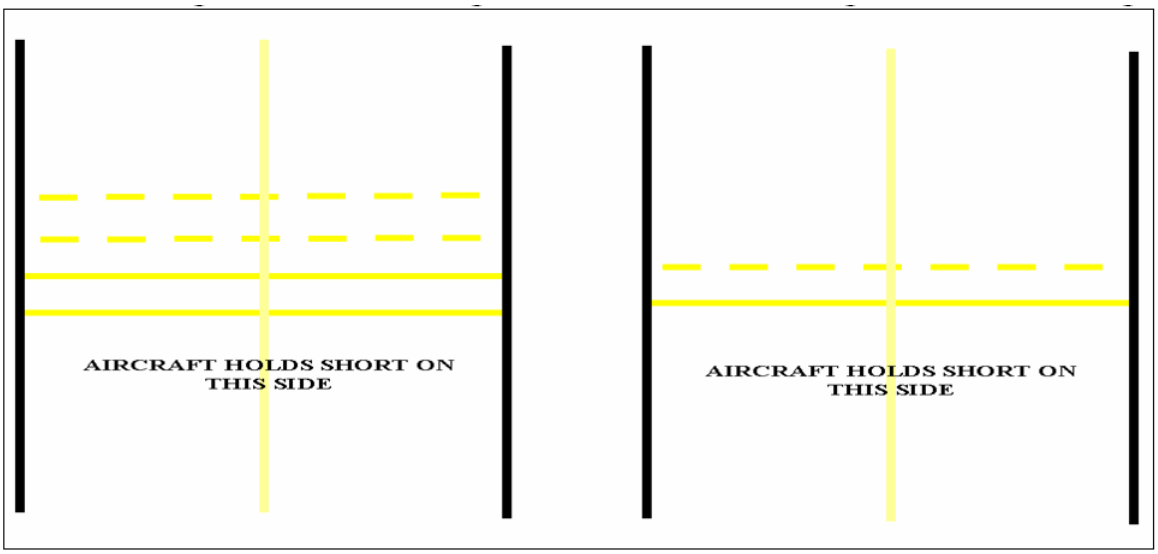
3.7. Holding Position Markings.

3.7.1. Runway Holding Position Markings. For runways these markings indicate where an aircraft is supposed to stop. For the FAA, they consist of four yellow lines, two solid and two dashed, extending across the width of the taxiway or runway. For the USAF, they may only consist of two yellow lines, one solid and one dashed, extending across the width of the runway or taxiway. The solid lines are always on the side where the aircraft is to hold. There are three locations where runway holding position markings are encountered.

Caution: The USAF Runway Holding Position Marking shown below is the same as the FAA marking for a Non-movement Area Boundary. Personnel must be cognizant of this difference to avoid a runway incursion.

Figure 3.9. Runway Holding Position Markings.

FAA Holding Position Markings **USAF Holding Position Markings**



3.7.1.1. Taxiways. These markings identify the locations on a taxiway where an aircraft is supposed to stop when it does not have clearance to proceed onto the runway. The runway holding position markings are shown. When instructed by ATC "Hold short of (runway "xx")" the aircrew or ground crew should stop so no part of the aircraft extends beyond the holding position marking. When approaching the holding position marking, an aircrew or ground crew person should not cross the marking without ATC clearance at a controlled airport or without making sure of adequate separation from other aircraft at uncontrolled airports. An aircraft exiting a runway is not clear of the runway until all parts of the aircraft have crossed the applicable holding position marking.

3.7.1.2. Runways. These markings are installed on runways only if the runway is normally used by air traffic control for "land, hold short" operations or taxiing operations and have operational significance only for those two types of operations. A sign with a white inscription on a red background is installed adjacent to these holding position markings. The holding position markings are placed on runways prior to the intersection with another runway, or some designated point.

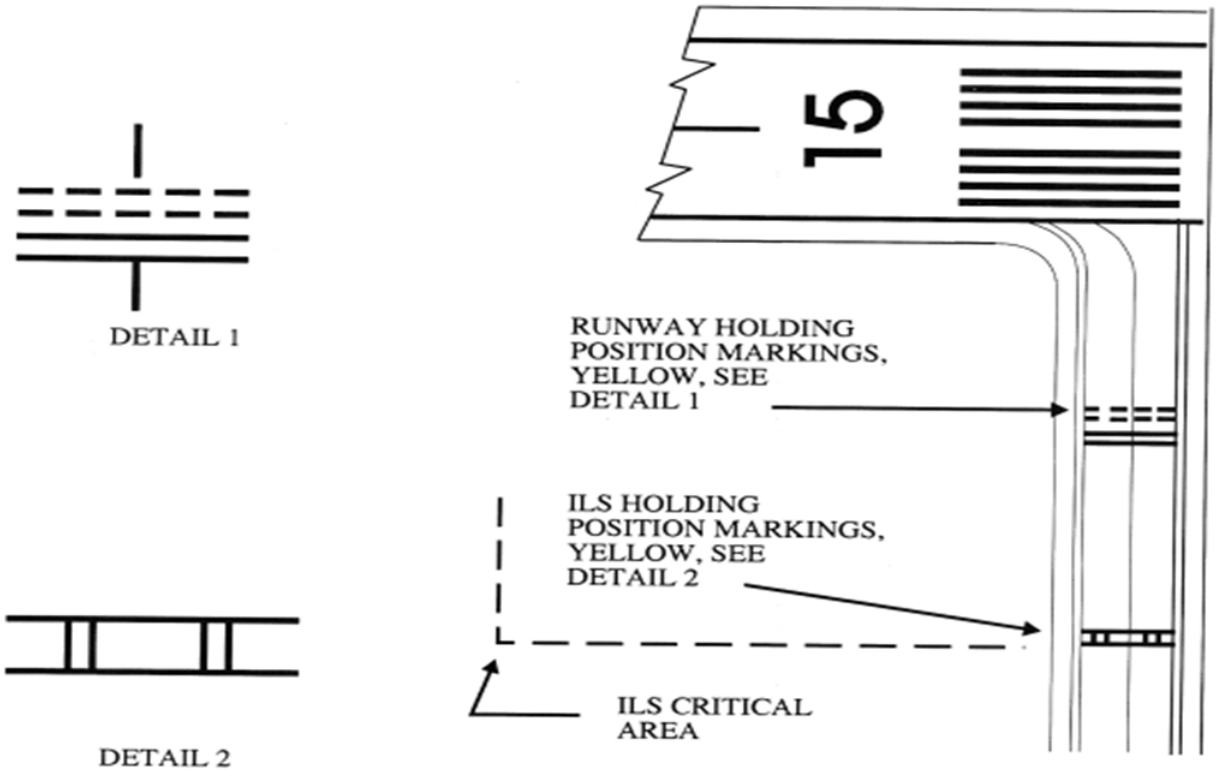
3.7.1.3. Runway Approach Areas. These markings are used at some airports where it is necessary to hold an aircraft on a taxiway located in the approach or departure area of a runway so that the aircraft does not interfere with the operations on that runway. This marking is collocated with the runway approach area holding position sign.

3.7.2. Holding Position Markings for ILS. Holding position markings for ILS/MLS critical areas consist of two yellow solid lines spaced two feet apart connected by pairs of solid lines extending across the width of the taxiway as shown. A sign with an inscription in white on a red background is installed adjacent to these hold position markings. When the ILS critical area is being protected, the aircrew or ground crew should stop so no part of the aircraft extends beyond the holding position marking. When approaching the holding position marking, an aircrew or ground crew person should not cross the

marking without ATC clearance. ILS critical area is not clear until all parts of the aircraft have crossed the applicable holding position marking.

NOTE: At USAF bases, additional markings will be present at the holding position. The letters "INST" are painted symmetrically about the centerline of the taxiway just beyond the instrument hold line so they can be read by an aircraft operator facing the runway.

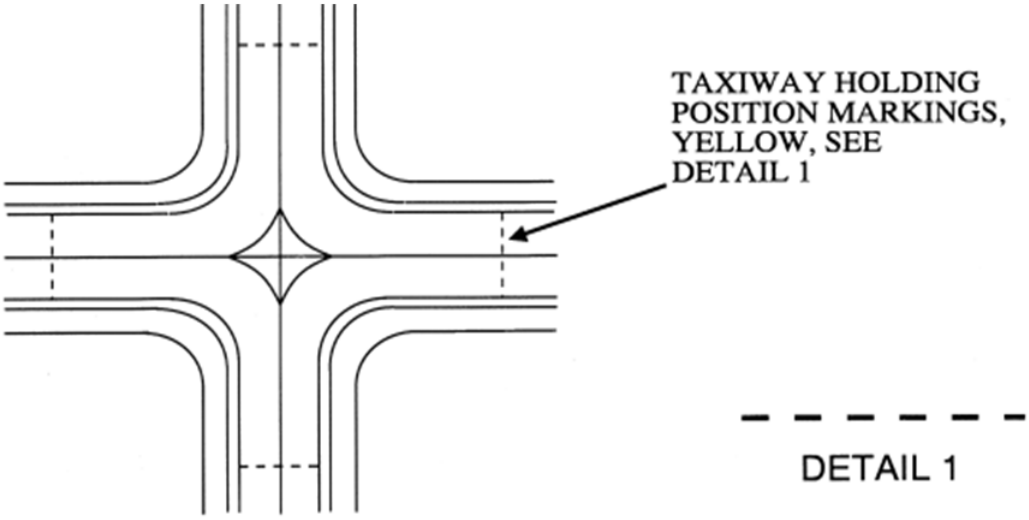
Figure 3.10. Holding Position Markings for ILS Critical Area.



3.7.3. Holding Position Markings for Taxiway/Taxiway Intersections. Holding position markings for taxiway/taxiway intersections consist of a single dashed line extending across the width of the taxiway. They are installed on taxiways where air traffic control normally holds aircraft short of a taxiway intersection. When instructed by ATC "hold short of (taxiway)" the aircrew or ground crew should stop so no part of the aircraft extends beyond the holding position marking. When the marking is not present the aircrew or ground crew should stop the aircraft at a point that provides adequate clearance from an aircraft on the intersecting taxiway.

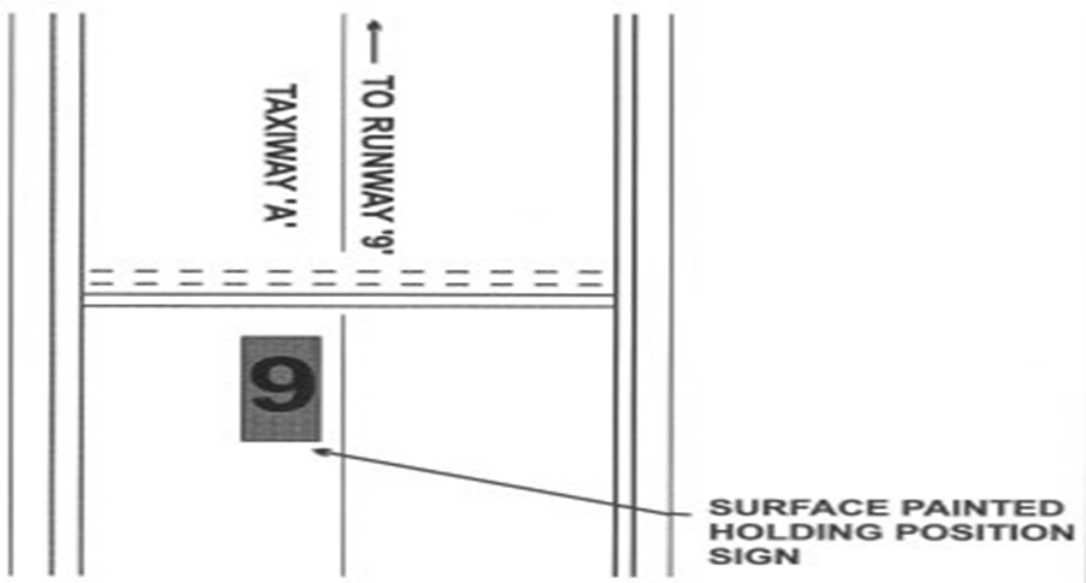
NOTE: The USAF has no requirement to mark taxiway/taxiway intersections at USAF installations.

Figure 3.11. Holding Position Markings for Taxiway/Taxiway Intersections.



3.7.4. Surface Painted Holding Position Signs. Surface painted holding position signs have a red background with a white inscription and supplement the signs located at the holding position. This type of marking is normally used where the width of the holding position on the taxiway is greater than 200 feet. It is located to the left side of the taxiway centerline on the holding side and prior to the holding position marking.

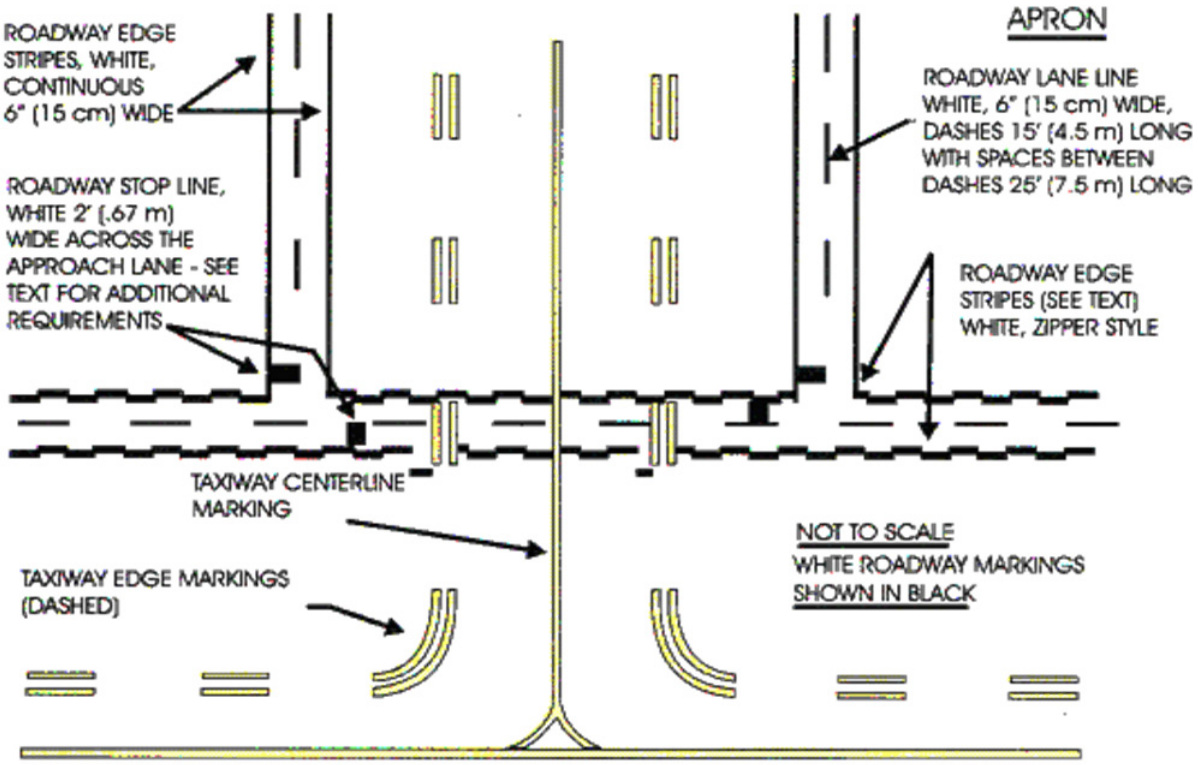
Figure 3.12. Surface Painted Holding Position Sign.



3.8. Other Markings.

3.8.1. Vehicle Roadway Markings. The vehicle roadway markings are used when necessary to define a pathway for vehicle operations on or crossing areas that are also intended for aircraft. These markings consist of a single or double white solid line to delineate each edge of the roadway and dashed or solid yellow or white lines to separate lanes within the edges of the roadway. In lieu of the solid lines, zipper markings may be used to delineate the edges of the vehicle roadway.

Figure 3.13. Vehicle Roadway Markings.



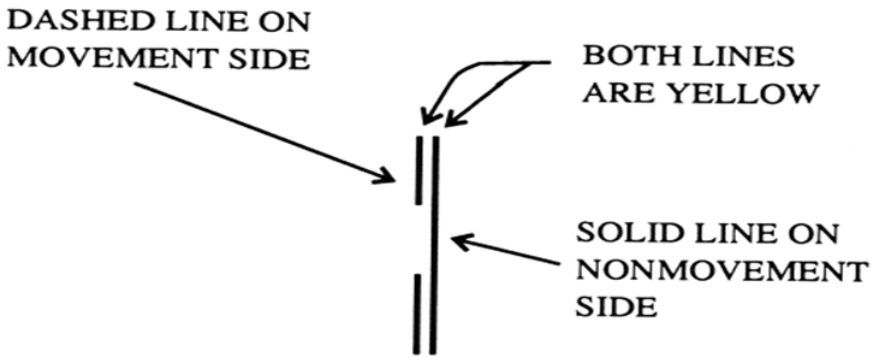
3.8.2. Non-movement Area Boundary Markings. These markings delineate the movement area, i.e., area under air traffic control. These markings are yellow and located on the boundary between the movement and non-movement area. The non-movement area boundary markings consist of two yellow lines, one solid and one dashed. The solid line is located on the non-movement area side while the dashed yellow line is located on the movement area side.

NOTES:

There is no requirement for non-movement area boundary markings at USAF installations.

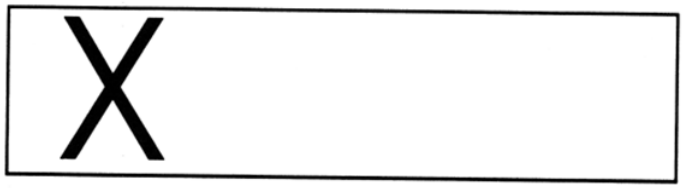
Caution: The USAF Runway Holding Position Marking is the same as the FAA marking for a Non-movement Area Boundary shown below. Personnel must be cognizant of this difference to avoid a runway incursion.

Figure 3.14. Non-movement Area Boundary Markings.



3.8.3. Marking and Lighting of Permanently Closed Runways and Taxiways. For runways and taxiways that are permanently closed, the lighting circuits will be disconnected. The runway threshold, runway designation, and touchdown markings are obliterated and yellow X's are placed at each end of the runway and at 1,000-foot intervals.

Figure 3.15. Closed Runway or Taxiway Markings.



3.8.4. Temporarily Closed Runways and Taxiways. To provide a visual indication to pilots that a runway is temporarily closed; X's are placed on the runway only at each end of the runway. The X's are yellow in color.

3.8.4.1. A raised lighted yellow X may be placed on each runway end in lieu of the markings described to indicate the runway is closed.

3.8.4.2. A visual indication may not be present depending on the reason for the closure, duration of the closure, airfield configuration and the existence and the hours of operation of an airport traffic control tower. Pilots should check NOTAM's and the Automated Terminal Information System (ATIS) for local runway and taxiway closure information.

3.8.4.3. Temporarily closed taxiways are usually treated as hazardous areas, in which no part of an aircraft may enter, and are blocked with barricades. However, as an alternative a yellow X may be installed at each entrance to the taxiway.

3.8.5. Helicopter Landing Areas. Helicopter landing areas can be depicted in one of three ways, as shown below. The letter "H" in the markings is oriented to align with the intended direction of approach.

Figure 3.16. Helicopter Landing Areas.

Section 3C—Airport Lighting Systems

3.9. Runway Lights

3.9.1. Runway Edge Lights. Runway edge lights are used to outline the edges of runways during periods of darkness or restricted visibility. The runway edge lights are white, except on instrument runways yellow (or amber) replaces white on the last 2,000 feet or half the runway length, whichever is less, to form a caution zone for landings.

3.9.2. Runway End Lights. Runway end lights define the end of the operational runway surface for aircraft for landing, roll out, or takeoff. They consist of red lights located symmetrically about, and perpendicular to, the runway centerline. They are located within 10 feet of the end of the usable landing surface.

3.9.3. Runway Threshold Lights. Runway threshold lights define the beginning of the operational runway surface for aircraft for landing. The lights emit red light toward the runway to indicate the runway end to a departing aircraft and may emit green outward from the runway end to indicate the threshold to landing aircraft.

3.9.4. Runway Centerline Lighting System. Runway centerline lights are installed on some precision instrument runways. They are located along the runway centerline and are spaced at 50-foot intervals. When viewed from the landing threshold, the runway centerline lights are white until the last 3,000 feet of the runway. The white lights begin to alternate with red for the next 2,000 feet, and for the last 1,000 feet of the runway, all centerline lights are red.

3.9.5. Touchdown Zone Lights. Touchdown zone lights are installed on some precision approach runways. They consist of two rows of transverse light bars disposed symmetrically about the runway centerline. The system consists of steady-burning white lights that start 100 feet beyond the landing threshold and extend to 3,000 feet beyond the landing threshold or to the midpoint of the runway, whichever is less.

3.9.6. Stopway Lights (ICAO ONLY). Stopway lights are installed in stopways intended for use at night. They are placed in rows as an extension of the line of runway edge lights, with an additional line perpendicular to the runway centerline at the end of the stopway. Stopway lights are red.

3.9.7. Taxiway Lead-Off Lights. (FAA and ICAO ONLY). Taxiway lead-off lights extend from the runway centerline to a point on an exit taxiway to expedite movement of aircraft from the runway. These lights alternate green and yellow (or amber) from the runway centerline to the runway holding position or the ILS/MLS critical area, as appropriate.

3.9.8. Runway Exit Lights. (USAF ONLY). Runway exit lights serve the same function as taxiway lead-off lights. At USAF airfields these lights are green.

3.9.9. Land and Hold Short Lights. Land and hold short lights are used to indicate the hold short point on certain runways that are approved for Land and Hold Short Operations (LAHSO). Land and hold short lights consist of a row of pulsing white lights installed across the runway at the hold short point. Where installed, the lights will be on anytime LAHSO is in effect. These lights will be off when LAHSO is not in effect.

3.10. Control of Lighting Systems.

3.10.1. Operation of approach light systems and runway lighting is controlled by the control tower (ATCT). At some locations the Flight Service Station (FSS) may control the lights where there is no control tower in operation.

3.10.2. Pilot's radio control of lighting is available at selected airports to provide control of lights by keying the aircraft's microphone. Control of lighting systems is often available at locations without specified hours for lighting and where there is no control tower or FSS or when the tower or FSS is closed (locations with a part-time tower or FSS) or specified hours. All lighting systems that are radio controlled at an airport, whether on a single runway or multiple runways, operate on the same radio frequency. USAF personnel should not adjust the intensity of lights, unless preparing to take off or land, to preclude producing a setting undesirable for a pilot attempting to take off or land.

3.11. Taxiway Lights

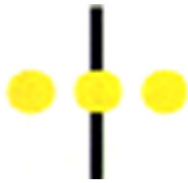
3.11.1. FAA

3.11.1.1. Taxiway Edge Lights. Taxiway edge lights are used to outline the edges of taxiways during periods of darkness or restricted visibility. These fixtures emit blue light.

3.11.1.2. Taxiway Centerline Lights. Taxiway centerline lights are located along the taxiway centerline in a straight line on straight portions, on the centerline of curved portions, and along designated taxiing paths in portions of runways, ramp, and apron areas. Taxiway centerline lights are steady burning and emit green light.

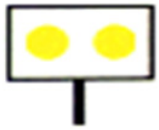
3.11.1.3. Clearance Bar Lights. Clearance bar lights are installed at holding positions on taxiways in order to increase the conspicuity of the holding position in low visibility conditions. They may also be installed to indicate the location of an intersecting taxiway during periods of darkness. Clearance bars consist of three in-pavement steady-burning yellow (or amber) lights.

Figure 3.17. Clearance Bar Lights.



3.11.1.4. Runway Guard Lights. Runway guard lights are installed at taxiway/runway intersections. They are primarily used to enhance the conspicuity of taxiway/runway intersections during low visibility conditions, but may be used in all weather conditions. Runway guard lights consist of either a pair of elevated flashing yellow (or amber) lights installed on either side of the taxiway, or a row of in-pavement yellow (or amber) lights installed across the entire taxiway, at the runway holding position marking.

Figure 3.18. Runway Guard Lights.



3.11.1.4.1. Some airports may have a row of three or five in-pavement yellow (or amber) lights installed at taxiway/runway intersections. They should not be confused with clearance bar lights described in paragraph **3.11.1.3.** Clearance Bar Lights.

3.11.1.5. Stop Bar Lights. Stop bar lights, when installed, are used to confirm the ATC clearance to enter or cross the active runway in low visibility conditions (below 1,200 ft RVR). A stop bar consists of a row of red, unidirectional, steady-burning in-pavement lights installed across the entire taxiway at the runway holding position, and elevated steady-burning red lights on each side. A controlled stop bar is operated in conjunction with the taxiway centerline lead-on lights that extend from the stop bar toward the runway. Following the ATC clearance to proceed, the stop bar is turned off and the lead-on lights are turned on. The stop bar and lead-on lights are automatically reset by a sensor or backup timer.

3.11.1.5.1. Aircrews and ground crews should never cross a red illuminated stop bar, even if an ATC clearance has been given to proceed onto or across the runway.

3.11.1.5.2. If after crossing a stop bar, the taxiway centerline lead-on lights inadvertently extinguish, aircrews and ground crews should hold their position and contact ATC for further instructions.

Figure 3.19. Stop Bar Lights.

3.11.2. USAF

3.11.2.1. Taxiway Edge Lights. Taxiway edge lights are used to outline the edges of taxiways during periods of darkness or restricted visibility. These fixtures emit blue light.

3.11.2.2. Taxiway Centerline Lights. Taxiway centerline lights are located along the taxiway centerline in a straight line on straight portions, on the centerline of curved portions, and along designated taxiing paths in portions of runways, ramp, and apron areas. Taxiway centerline lights are steady burning and emit green light. Where there are intersecting taxiways, the lights will be yellow (or amber). When installed in conjunction with a holding position, they will be yellow (or amber) facing the holding aircraft. Taxiway centerline lights may be installed in lieu of taxiway edge lights.

3.11.2.3. Taxiway Hold Lights/Stop Bar. Taxiway hold lights are installed at hold positions where there is a need to enhance identification. They consist of 3 yellow (or amber) lights perpendicular to taxiway centerline (5 lights will be installed if the taxiway is unusually wide).

3.11.2.4. Hold Position Edge Lights (Wig-Wag or Runway Guard Lights). Hold position edge lights are installed at taxiway/runway intersections and other areas where hold markings, signs, and clearance markings have not been fully effective, or in areas where other lights might cause distraction. They consist of a pair of elevated flashing yellow (or amber) lights installed on either side of the taxiway.

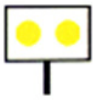
3.11.3. ICAO

3.11.3.1. Taxiway Edge Lights. Taxiway edge lights are used to outline the edges of taxiways during periods of darkness or restricted visibility conditions. These fixtures emit blue light.

3.11.3.2. Taxiway Centerline Lights. Taxiway centerline lights are located along the taxiway centerline in a straight line on straight portions, on the centerline of curved portions, and along designated taxiing paths in portions of runways, ramp, and apron areas. Taxiway centerline lights are steady burning and emit green light.

3.11.3.3. Runway Guard Lights. Runway guard lights are installed at taxiway/runway intersections. They are primarily used to enhance the conspicuity of taxiway/runway intersections during low visibility conditions, but may be used in all weather conditions. Runway guard lights consist of either a pair of elevated flashing yellow (or amber) lights installed on either side of the taxiway, or a row of in-pavement yellow (or amber) lights installed across the entire taxiway, at the runway holding position marking.

Figure 3.20. Runway Guard Lights.



3.11.3.4. Stop Bar Lights. Stop bar lights, when installed, are used to confirm the ATC clearance to enter or cross the active runway in low visibility conditions (below 1,200 ft RVR). A stop bar consists of a row of red, unidirectional, steady-burning in-pavement lights installed across the entire taxiway at the runway holding position, and elevated steady-burning red lights on each side. A controlled stop bar is operated in conjunction with the taxiway centerline lead-on lights that extend from the stop bar toward the runway. Following the ATC clearance to proceed, the stop bar is turned off and the lead-on lights are turned on. The stop bar and lead-on lights are automatically reset by a sensor or backup timer.

3.11.3.4.1. Aircrews and ground crews should never cross a red illuminated stop bar, even if an ATC clearance has been given to proceed onto or across the runway.

3.11.3.4.2. If after crossing a stop bar, the taxiway centerline lead-on lights inadvertently extinguish, aircrews and ground crews should hold their position and contact ATC for further instructions.

Figure 3.21. Stop Bar Lights.

Section 3D—Airport Signs

3.12. General. There are six types of signs installed on airfields: mandatory instruction signs, location signs, direction signs, destination signs, information signs, and runway distance remaining signs.

3.13. Mandatory Instruction Signs.

3.13.1. These signs have a red background with a white inscription and are used to denote:

3.13.1.1. An entrance to a runway or critical area and;

3.13.1.2. Areas where an aircraft is prohibited from entering.

3.13.2. Typical mandatory signs and applications are:

3.13.2.1. Runway Holding Position Sign. This sign is located at the holding position on taxiways that intersect a runway or on runways that intersect other runways. The inscription on the sign contains the designation of the intersecting runway. The runway numbers on the sign are arranged to correspond to the respective runway threshold. For example, "15-33" indicates that the threshold for Runway 15 is to the left and the threshold for Runway 33 is to the right.

Figure 3.22. Runway Holding Position Sign.

3.13.2.2. Runway Holding Position Sign at Beginning of Takeoff Runway. On taxiways that intersect the beginning of the takeoff runway, only the designation of the takeoff runway may appear on the sign, while all other signs will have the designation of both runway directions.

Figure 3.23. Runway Holding Position Sign at Beginning of Takeoff Runway.

3.13.2.3. Runway Holding Position Sign at Intersection of Two Runways. If the sign is located on a taxiway that intersects the intersection of two runways, the designations for both runways will be shown on the sign along with arrows showing the approximate alignment of each runway. In addition to showing the approximate runway alignment, the arrow indicates the direction to the threshold of the runway whose designation is immediately next to the arrow.

Figure 3.24. Runway Holding Position Sign at Intersection of Two Runways.

3.13.2.4. Position of Runway Holding Position Signs. A runway holding position sign on a taxiway will be installed adjacent to holding position markings on the taxiway pavement. On runways, holding position markings will be located only on the runway pavement adjacent to the sign, if the runway is normally used by air traffic control for LAHSO operations or as a taxiway.

3.13.2.5. Runway Approach Area Holding Position Sign. At some airports, it is necessary to hold an aircraft on a taxiway located in the approach or departure area for a runway so that the aircraft does not interfere with operations on that runway. In these situations, a sign with the designation of the approach end of the runway followed by a "dash" (-) and letters "APCH" will be located at the holding position on the taxiway. Holding position markings will be located on the taxiway pavement. An example of this sign is shown in below. In this example, the sign may protect the approach to Runway 15 and/or the departure for Runway 33.

Figure 3.25. Runway Approach Area Holding Position Sign.

3.13.2.6. ILS Critical Area Holding Position Sign. At some airports, when the instrument landing system is being used, it is necessary to hold an aircraft on a taxiway at a location other than the holding position described above in Holding Position Markings. This prevents vehicles and aircraft on the ground from interfering with the ILS signal transmitted to an aircraft on final approach. In these situations the holding position sign for these operations will have the inscription "ILS" and be located adjacent to the holding position marking on the taxiway. At USAF airfields this sign will say “INST”.

Figure 3.26. ILS Critical Area Holding Position Sign.

3.13.2.7. No Entry Sign. This sign prohibits an aircraft from entering an area. Typically, this sign would be located on a taxiway intended to be used in only one direction or at the intersection of vehicle roadways with runways, taxiways or aprons where the roadway may be mistaken as a taxiway or other aircraft movement surface.

Figure 3.27. No Entry Sign.

3.14. Location Signs.

3.14.1. Location signs are used to identify either a taxiway or runway on which the aircraft is located. Other location signs provide a visual cue to aircrews and ground crews to assist them in determining when they have exited an area.

3.14.1.1. Taxiway Location Sign. This sign has a black background with a yellow inscription and yellow border. The inscription is the designation of the taxiway on which the aircraft is located. These signs are installed along taxiways either by themselves or in conjunction with direction

signs or runway holding position signs. Taxiways are designated using all letters of the alphabet, normally starting with “A”.

Figure 3.28. Taxiway Location Sign.

Figure 3.29. Taxiway Location Sign Collocated With Runway Holding Position Sign.

3.14.1.2. Runway Location Sign. This sign has a black background with a yellow inscription and yellow border. The inscription is the designation of the runway on which the aircraft is located. These signs are intended to complement the information available to aircrews and ground crews through their magnetic compass and typically are installed where the proximity of two or more runways to one another could cause pilots to be confused as to which runway they are on.

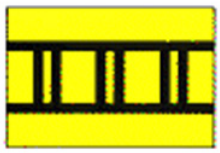
Figure 3.30. Runway Location Sign.

3.14.1.3. Runway Boundary Sign. This sign has a yellow background with a black inscription with a graphic depicting the pavement holding position marking. This sign, which faces the runway and is visible to the aircrew or ground crew exiting the runway, is located adjacent to the holding position marking on the pavement. The sign is intended to provide aircrews and ground crews with another visual cue which they can use as a guide in deciding when they are "clear of the runway."

Figure 3.31. Runway Boundary Sign.

3.14.1.4. ILS Critical Area Boundary Sign. This sign has a yellow background with a black inscription with a graphic depicting the ILS pavement holding position marking. This sign is located adjacent to the ILS holding position marking on the pavement and can be seen by aircrews and ground crews leaving the critical area. The sign is intended to provide aircrews and ground crews with another visual cue they can use as a guide in deciding when they are "clear of the ILS critical area." Note at USAF airfields this is referred to as the “Instrument Critical Area”.

Figure 3.32. ILS Critical Area Boundary Sign.



3.15. Direction Signs.

3.15.1. Direction signs have a yellow background with a black inscription. The inscription identifies the designation(s) of the intersecting taxiway(s) leading out of the intersection that an aircrew or ground crew would normally be expected to turn onto or hold short of. An arrow indicating the direction of the turn accompanies each designation.

3.15.1.1. Except as noted in **3.14.1.1.**, each taxiway designation shown on the sign is accompanied by only one arrow. When more than one taxiway designation is shown on the sign each designation and its associated arrow is separated from the other taxiway designations by either a vertical message divider or a taxiway location sign.

3.15.1.1.1. Direction signs are normally located on the left prior to the intersection. When used on a runway to indicate an exit, the sign is located on the same side of the runway as the exit.

Figure 3.33. Direction Sign to Indicate Runway Exit.

3.15.1.2. The taxiway designations and their associated arrows on the sign are arranged clockwise starting from the first taxiway on the pilot's left.

3.15.1.3. If a location sign is located with the direction signs, it is placed so that the designations for all turns to the left will be to the left of the location sign; the designations for continuing straight ahead or for all turns to the right would be located to the right of the location sign.

3.15.1.4. When the intersection is comprised of only one crossing taxiway, it is permissible to have two arrows associated with the crossing taxiway. In this case, the location sign is located to the left of the direction sign.

3.16. Destination Signs

3.16.1. Destination signs also have a yellow background with a black inscription indicating a destination on the airport. These signs always have an arrow showing the direction of the taxiing route to that destination. When the arrow on the destination sign indicates a turn, the sign is located prior to the intersection.

3.16.2. Destinations commonly shown on these types of signs include runways, aprons, terminals, military areas, civil aviation areas, cargo areas, international areas, and fixed base operators. An abbreviation may be used as the inscription on the sign for some of these destinations.

3.16.2.1. When the inscription for two or more destinations having a common taxiing route are placed on a sign, the destinations are separated by a "dot" (•) and one arrow. When the inscription on a sign contains two or more destinations having different taxiing routes, each destination will be accompanied by an arrow and will be separated from the other destinations on the sign with a vertical black message divider.

Figure 3.34. Destination Sign for Military Area.

Figure 3.35. Destination Sign for Common Taxi Route to Two Runways.

Figure 3.36. Destination Sign for Different Taxi Route to Two Runways.

3.17. Information Signs.

3.17.1. Information signs have a yellow background with a black inscription. They are used to provide the pilot with information on such things as areas that cannot be seen from the control tower, applicable radio frequencies, and noise abatement procedures. The airport operator determines the need, size, and location for these signs.

3.18. Runway Distance Remaining Signs.

3.18.1. Runway distance remaining signs have a black background with a white numeral inscription and may be installed along one or both side(s) of the runway. The number on the signs indicates the distance (in thousands of feet) of landing runway remaining. The last sign, i.e., the sign with the numeral "1," will be located at least 950 feet from the runway end.

Figure 3.37. Runway Distance Remaining Sign Indicating 3,000 feet of Runway Remaining

Section 3E—Surface Movement Guidance and Control System (SMGCS)

3.19. General Information

3.19.1. FAA Only. SMGCS is implemented at selected US airports where scheduled air carriers are authorized to conduct operations when the visibility is less than 1,200 RVR. A SMGCS plan facilitates the safe movement of aircraft and vehicles on the airport by establishing more rigorous control procedures and requiring enhanced visual aids. This plan helps insure aircraft and vehicles remain in the areas intended for their use.

3.19.2. ICAO Only. SMGCS is defined as a system that provides guidance to, and control or regulation of aircraft in the movement area. The system also provides guidance to, and control or regulation of all ground vehicles in the movement area. The term SMGCS is applied to the system of aids, facilities, procedures, and regulations and applies during all weather conditions.

NOTE: Several aerospace companies market surface movement radar and surveillance systems (hardware) also called SMGCS that may be part of an overall SMGCS plan but should not be confused with the plan itself.

3.19.2.1. For ICAO airports, SMGCS is implemented in three stages:

3.19.2.1.1. Visibility Condition 1. Visibility is sufficient for the pilot to taxi and avoid collision with other traffic by visual reference, and for ATC to exercise control over all traffic by visual reference.

3.19.2.1.2. Visibility Condition 2. Visibility is sufficient for the pilot to taxi and avoid collision with other traffic by visual reference, but insufficient for ATC to exercise control of all traffic by visual reference.

3.19.2.1.3. Visibility Condition 3. Visibility is less than 400 meters RVR (1200 feet). Visibility is insufficient for the pilot to taxi and avoid collision with other traffic by visual reference, and also insufficient for ATC to exercise control over traffic by visual reference. This is called "low visibility conditions".

3.19.3. SMGCS procedures do not supersede established policies, procedures, rules or guidelines for airports, aircraft or vehicle operators, or air traffic control. Compliance with SMGCS procedures and restrictions is not mandatory for USAF personnel. However, to enhance the safety of low visibility ground operations, USAF personnel shall follow the guidance in the SMGCS plan to the maximum extent possible when conducting low visibility operations at an airport with such a plan.

3.20. SMGCS Training.

3.20.1. When complying with **3.19.3.** above, personnel involved in moving aircraft on the ground at airports with a SMGCS plan shall receive training prior to conducting low visibility operations at that airport. SMGCS training is airport specific.

3.20.1.1. Training lesson plans will include as a minimum ramp operations, ILS critical areas, runway safety areas, obstacle free zones, stop bar lights, runway guard lights, taxiway centerline lights, clearance bar lights, runway lead-on and lead-off lights, geographic position markings, taxiway and runway hold position markings, movement/non-movement area boundary marking, other pavement markings, use of low visibility taxi route(s) chart(s), review of local taxi routes and procedures, and taxi procedures at turns requiring judgmental over steering.

3.20.1.1.1. For aircrew personnel, document training completion in ARMS, MAJCOM specified training folder or other suitable product. Annotate the airport for which training applies.

3.20.1.1.2. For maintenance personnel, document training completion in AF Form 623, **On The Job Training Record**, or other suitable product. Annotate the airport for which training applies.

3.21. SMGCS Procedures (FAA).

3.21.1. SMGCS procedures will be implemented when the RVR is below 1,200 feet. Additional procedures will be implemented for RVR below 600 feet.

3.21.1.1. ATC is responsible to initiate and terminate each phase of SMGCS procedures IAW the SMGCS plan for that airport. Implementation and termination will be based on meteorological trends of increasing/decreasing RVR values and weather phenomena such as patchy fog and pilot reports.

3.21.1.2. SMGCS procedures initiation/termination will be broadcast on the ATIS.

3.21.1.3. Specific aircrew SMGCS procedures are in the SMGCS plan for that particular airport.

3.21.2. When complying with the SMGCS plan, USAF personnel shall use the low visibility taxi route(s) chart(s) for that airport.

3.21.3. The following visual aids are required for operations when the RVR is below 1,200 feet down to and including 600 feet RVR, except where others are specified in the SMGCS plan for that airport.

3.21.3.1. Movement Area.

3.21.3.1.1. Runway guard lights

3.21.3.1.2. Taxiway edge or centerline lights

3.21.3.1.3. Taxiway signs

3.21.3.1.4. Taxiway hold markings

3.21.3.1.5. Surface painted direction or location signs

3.21.3.2. Non-movement Area.

3.21.3.2.1. No additional visual aids required

3.21.4. The following visual aids are required for operations when the RVR is below 600 feet, except where others are specified in the SMGCS plan for that airport.

3.21.4.1. Movement Area.

3.21.4.1.1. Stop bar lights

3.21.4.1.2. Runway guard lights

3.21.4.1.3. Taxiway centerline lights

3.21.4.1.4. Clearance bar lights

3.21.4.1.5. Taxiway hold markings

3.21.4.1.6. Surface painted direction or location signs

3.21.4.1.7. Geographic position markings

3.21.4.2. Non-movement Area.

3.21.4.2.1. Taxiway centerline lights or taxiing assistance (ex. Follow-me vehicle)

3.22. SMGCS Procedures (ICAO). ICAO SMGCS procedures are not as standardized as FAA. In general, ICAO SMGCS procedures for Visibility Condition 3 will be implemented when the RVR is approaching or less than 400 meters (1200 feet). For many airports, this may also be coincident with, and announced as, category II or III ILS usage.

3.22.1. Compliance with ICAO SMGCS procedures and restrictions during Visibility Condition 3, or any time category II or III ILS are in use, are not mandatory for USAF personnel. However, to enhance the safety of low visibility ground operations, USAF personnel shall follow the guidance in the appropriate FLIP AP volume during Visibility Condition 3, or any time category II or III ILS are in use, to the maximum extent possible when conducting low visibility operations at these airports.

3.22.1.1. Implementation and termination will be based on meteorological trends of increasing/decreasing RVR values and weather phenomena.

3.22.1.2. Specific aircrew SMGCS procedures for Visibility Condition 3 (if any) are in the appropriate FLIP AP volume.

3.22.1.3. When complying with the SMGCS plan during Visibility Condition 3, USAF personnel shall use the low visibility taxi route(s) chart(s) for that airport (if available).

Section 3F—Aircraft Arresting Devices

3.23. Emergency Arresting Gear. Certain airports are equipped with a means of rapidly stopping military aircraft on a runway. This equipment, normally referred to as “Emergency Arresting Gear”, generally consists of pendant cables supported over the runway surface by rubber "donuts." Although most devices are located in the overrun areas, a few of these arresting systems have cables stretched over the operational areas near the ends of a runway.

3.23.1. Arresting cables that cross over a runway require special markings on the runway to identify the cable location. These markings consist of 10 feet diameter solid circles painted "identification yellow", perpendicular to the runway centerline across the entire runway width. Additional details are contained in USAF Engineering Technical Letter (ETL) 94-01, *Standard Airfield Pavement Marking Schemes* and AC 150/5220-9, *Aircraft Arresting Systems for Joint Civil/Military Airports,*.

3.23.2. Aircraft operations on the runway are not restricted by the installation of aircraft arresting devices. However, aircraft T.O.’s may restrict operations of a particular mission design series (MDS) for taxi, takeoff, and/or landing over a particular type(s) of arresting cables.

3.24. (Added-AMC) IMTs Adopted. AF IMT 8 Certificate of Aircrew Qualification.

RONALD E. KEYS, Lt General, USAF
DCS/Air & Space Operations

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

Aeronautical Information Manual

AFI 11-202, Volume 2, *Aircrew Standardization/Evaluation Program*

AFI 11-202, Volume 3, *General Flying Rules*

AFI 11-217, Volume 1, *Instrument Flight Procedures*

AFI 11-401, *Flight Management*

AFI 13-203, *Air Traffic Control*

AFI 13-213, *Airfield Management*

AFI 21-101, *Aerospace Equipment Maintenance Management*

AFI 32-1042, *Standards for Marking Airfields*

AFI 32-1043, *Managing Aircraft Arresting Systems*

AFI 32-1044, *Visual Air Navigation Systems*

AFI 33-360, Volume 1, *Publications Management Program*

AFMAN 11-230, *Instrument Procedures*

AFMAN 32-1076, *Design Standards for Visual Air Navigation Facilities* (To be published as AFMAN 32-1187)

AFPD 11-2, *Flight Rules and Procedures*

DoD Flight Information Publication, *General Planning*

ETL 94-01, *Standards for Airfield Marking Painting Schemes*

FAA 7110.65L, *Air Traffic Control*

FAA Advisory Circular 00-34A, *Aircraft Ground Handling and Servicing*

FAA Advisory Circular 120-57, *Surface Movement Guidance and Control Systems (SMGCS)*

FAA Advisory Circular 150/5220-9, *Aircraft Arresting Systems for Joint Civil/Military Airports*

FAA Advisory Circular 150/5340-18C, *Standards for Airport Sign Systems*

FAA Advisory Circular 150/5340-1H, *Standards for Airport Markings*

FAA Advisory Circular 150/5340-24, *Runway and Taxiway Edge Lighting System*

FAA Advisory Circular 150/5340-28, *Low Visibility Taxiway*

FAA Advisory Circular 150/5340-29, *Installation Details for Land and Hold Short Lighting Systems*

FAA Advisory Circular 90-42F *Traffic Advisory Practices at Airports Without Operating Control Towers*

Federal Aviation Administration Regulations *Part 91*

International Civil Aviation Organization Document 9476-AN/927, *Surface Movement Guidance Control System Manual*

International Civil Aviation Organization, *Annex 14 – Aerodromes*

International Civil Aviation Organization, *Annex 2 – Rules of the Air*

North Atlantic Treaty Organization (NATO) Standardization Agreement 3117 – *Air Standardization Coordinating Committee Air Standard 44/42A*

Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*

Abbreviations and Acronyms

AFFSA—Air Force Flight Standards Agency

ARMS—Aviation Resource Management System

AIM—Aeronautical Information Manual

AP—Area Planning

APU—Auxiliary Power Unit

ATC ——Air Traffic Control

ATCT—Air Traffic Control Tower

ATIS—Automated Terminal Information System

DoD—Department of Defense

ETL ——Engineering Technical Letter

FAA—Federal Aviation Administration

FCF ——Functional Check Flight

FLIP—Flight Information Publications

FSS—Flight Service Station

GTC—Gas Turbine Compressor

IAW—In Accordance With

ICAO—International Civil Aviation Organization

ILS—Instrument Landing System

LAHSO ——Land and Hold Short Operations

MAJCOM—Major Command

MDS—Mission Design Series

MLS—Microwave Landing System

NATO—North Atlantic Treaty Organization

NOTAM—Notices to Airmen

RVR—Runway Visual Range

SARP—Standards and Recommended Practices (ICAO Term)

SMGCS—Surface Movement Guidance Control System

STANAG—Standardization Agreement (NATO Term)

TO—Technical Orders

USAF—United States Air Force

Terms

Apron (ICAO)—A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance.

Apron/Ramp (USAF/FAA)—A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance.

Blast Pad (FAA/ICAO)—An area prior to the beginning of the landing runway designated by the airport authorities as being unable to support an airplane during a landing. This area may be able to support an aircraft during taxi and/or take-off.

ILS Critical Area—A designated area on the airfield in the vicinity of the ILS antennas where the presence of vehicles and/or aircraft on the ground will interfere with airborne reception of ILS signals. Aircraft and vehicle access to the Critical Area will be strictly controlled by Air Traffic Control to ensure integrity of ILS signals whenever the conditions are less than report ceiling 800 feet and /or visibility less than 2 miles.

Land and Hold Short Operations (LAHSO)—Operations which include simultaneous takeoffs and landings and/or simultaneous landings when a landing aircraft is able and is instructed by the controller to hold-short of the intersecting runway/taxiway or designated hold-short point. Pilots are expected to promptly inform the controller if the hold short clearance cannot be accepted.

Low Visibility Operations—Operations conducted at airports when the visibility (RVR) is below 1200 feet (400 meters). Refers to SMGCS operations.

May—Indicates an acceptable or suggested means of accomplishment.

Movement Area (USAF/FAA)—The runways, taxiways, and other areas of an airport/heliport which are utilized for taxiing/hover taxiing, air taxiing, take-off, and landing of aircraft, exclusive of loading ramps and parking areas. At those airport/heliports with a tower, specific approval for entry onto the movement area must be obtained from Air Traffic Control.

Movement Area (ICAO)—That part of an airport to be used for the take-off, landing and taxiing of aircraft, consisting of the maneuvering area and the apron(s).

Night Operations—Operations conducted at airports during periods of darkness as defined by FAR Part 1 and AFI 11-202 Volume 3, *General Flight Rules*. The time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time.

Overrun (USAF)—An area beyond the take-off runway designated by the airport authorities as able to support an airplane during an aborted take-off. The FAA/ICAO term for this is “stopway”.

Runway Visual Range (RVR) (ICAO)—The maximum distance in the direction of take-off or landing

at which the runway or the specified lights or markers delineating it can be seen from a position above a specified point on its centering at a height corresponding to the average eye-level of pilots at touchdown.

Runway Visual Range (RVR) (USAF/ FAA)—An instrumentally derived value, based on standard calibrations, that represents the horizontal distance a pilot will see down the runway from the approach end; it is based on the sighting of either high intensity runway lights or on the visual contrast of other targets whichever yields the greater visual range. RVR is based on what a pilot in a moving aircraft should see looking down the runway. RVR is horizontal visual range not slant visual range. It is based on the measurement of a transmissometer made near the touchdown point of the instrument runway and is reported in hundreds of feet.

Shall or Will—Instructions or procedures prefaced by “shall” or “will” are mandatory.

Should—Indicates a preferred but non-mandatory method of accomplishment.

Stopway (FAA/ICAO)—An area beyond the take-off runway designated by the airport authorities as able to support an airplane during an aborted take-off. The USAF term for this is “overrun”.

Surface Movement Guidance Control System (SMGCS)—Operations implemented at selected US and foreign airports where scheduled air carriers are authorized to conduct operations when the visibility is less than 1,200 RVR. A SMGCS plan facilitates the safe movement of aircraft and vehicles on the airport by establishing more rigorous control procedures and requiring enhanced visual aids. This plan helps insure aircraft and vehicles remain in the areas intended for their use.

Attachment 2

IC 2004-1 TO AFI 11-218, AIRCRAFT OPERATIONS AND MOVEMENT ON THE GROUND

19 MAY 2004

SUMMARY OF REVISIONS

This change reflects the addition of AFVA 11-240, *Airport Signs and Markings* (paragraph **3.2.2.**, **3.2.3.**). Changed or revised material is indicated by a star.

3.2.2. AFVA 11-240 shows selected USAF airport markings and signs identical to those in **Section 3C**, **Section 3D**, and **Section 3E**. For units based at USAF installations, display this visual aid where maintenance and flight related operations take place. Suitable locations are aircraft maintenance work areas and flight line buildings frequented by ground and aircrew personnel. This includes vehicles operated on USAF airfields. Reference AFI 13-213, Airfield Management, for further flight line driving information.

3.2.3. Units located at contingency or foreign airfields use the visual aid (FAA or USAF) that most clearly depicts the actual markings at the airfield.