

**CIVIL AIR PATROL
U.S. Air Force Auxiliary**



Flight Line
Reference Text
Revision 10/04/03 (Draft)

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1.0 Introduction

1.1 General

Civil Air Patrol (CAP) designed this text to assist members in planning and working on a flight line. This text should help provide standardization in the flight line training program and should provide a meaningful flight line experience for both students and staff.

1.2 Purpose

This Flight Line Reference Text should be used as a reference in flight line training and as a guide in the preparation and execution of flight line operations. The text helps develop knowledge and skills to safely perform the duties of a functional flight line. The flight line text is designed to: (1) Qualify CAP members as Flight Line Marshaller and Flight Line Supervisor, and (2) Aid CAP members in obtaining the basic knowledge and skills needed to carry out safe and efficient flight line operations that suit the needs of the mission.

1.3 Safety

The importance of safety is emphasized throughout the text and course. Lessons learned in this text will enable flight line members to operate in a safe and efficient manner, thus reducing accidents and incidents.

2.0 Acknowledgements

2.1 History

Many dedicated persons have contributed to the development of the text, slides, and attachments that make up the CAP Flight Line Text. Material was taken from CAP sources all over the country. There are too many to thank, but we will mention several important contributors. The core of this text was developed from Squadron 89 (no longer exist) and the California Wing, maintained and taught by members of both organizations, the text has been in existence for several years.

2.2 Text

The text was modified and expanded to serve as the classroom material for the National Emergency Services Curriculum Project Flight Line Course. Lt. Col Mike DuBois developed this text and the associated slides; he now maintains and updates the materials. Lt. Col Rich Simerson provided invaluable input and was indispensable in shaping the text and course. Several Volunteers helped with the project including the following:

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This text will also serve as the reference for the Flight Line Marshaller and Flight Line Supervisors specialty tracks that are being developed under the auspices of the Emergency Services Curriculum

Project. Valuable input was provided by one of the Great Lakes Region representatives, Lt. Col. Larry Sidle.

2.3 Document

This is a “living” document. It is being tested and improved through its use in NESAs Mission Aircrew School and it is being field-tested by units throughout the country as part of the National Emergency Services Curriculum Project.

2.4 Who to contact

Please direct comments (via e-mail) to the text administrator, Lt. Col Mike DuBois, at mhdubois@cox.net. Please be specific and provide justification for your comments. If you refer to specific text or figures, please identify them clearly. If you have better pictures or slides than the ones appearing in the text or slides, or have others that you feel will improve the text and/or slides, please send them electronically and include explanatory notes or annotation.

3.0 Flight Line Operations

This section establishes policies governing the organizations and operation of a mission flight line. It applies to all Civil Air Patrol personnel who are authorized to be on the flight line. A successful flight line operation depends on the leadership of the Flight Line Supervisor and a team effort on everyone’s part.

3.1 Glossary of Words and Abbreviations

- ◆ A/A - Air-to-Air.
- ◆ A/G - Air-to-Ground.
- ◆ ANSI - American National Standards Institute
- ◆ Combustible Liquid – A liquid having a flashpoint at or above 100 degrees F (37.8 degrees C).
- ◆ EOR - End of Runway.
- ◆ ECP - Entry Control Points.
- ◆ Flammable Liquid - A liquid with a flash point less than 100 degrees F (37.8 degrees C)
- ◆ Flight Line - A flight line is any area or facility including aprons, hardstands, and ramps on or in which aircraft may be parked, stored, serviced or maintained.
- ◆ Flight Line Supervisor – Officer responsible for all operations on the flight line area.
- ◆ FOD - Foreign Object Damage.
- ◆ Statically Grounded - Connected to earth or to some conducting body that serves in place of earth.
- ◆ Grounding - The process of connecting one or more metallic objects and ground conductors to grounded electrodes.
- ◆ HAP - High Accident Potential.
- ◆ LZ - Landing Zone.
- ◆ Marshaller – The person who is responsible for marshalling and parking of aircraft.
- ◆ IC (Incident Commander) - One who is in charge of the mission and mission base.
- ◆ NFPA - National Fire Protection Association.
- ◆ OSHA - Occupational Safety and Health Association.
- ◆ PMV - Private Motor Vehicle.

3.2 Flight Line Operation Center

3.2.1 Introduction: The Flight Line Supervisor will establish an operations center. The operations center should be inside, and convenient for both the staff and flight crews. The Flight Line Supervisor should appoint a member of his team as Flight Line Administration Officer to expedite the flow of information and flight crews to and from the flight line. This will help keep non-essential personnel off the flight line.

3.2.2 Flight Line Parking Board: The flight line operations center should have a aircraft parking board that shows the parking area layout with a space to show “N” numbers and call signs of the aircraft parked in each space. This will give flight line operations a place to display what is on the flight line and where.

3.2.3 Aircraft Key Peg Board: The flight line operations center should have a aircraft key peg board that is a smaller copy of the aircraft parking board that can be used to keep and display aircraft keys. This will give the flight line operations a place to display the keys it has to which aircraft.

- ◆ All keys received from aircrews without “N” number tags shall be immediately tagged with the “N” number.

3.2.4 Aircraft Keys: The flight line operation center is the best place to keep aircraft keys because they are in charge of all mission aircraft.

- ◆ If you have only one crew per aircraft there is no advantage to have each aircrew turn in their keys after each flight. From a safety stand point it is better to have each crew flying their assigned aircraft.
- ◆ If you have more than one aircrew per aircraft then it will become necessary for each aircrew to turn in their keys after each flight.

3.2.5 Reporting: All aircrews should report to the Flight Line Operations Center after every sortie, and before leaving on a new sortie. The following outlines the procedures.

- ◆ Under no circumstances should a set of aircraft keys be given to an aircrew without a completed CAPF 104 signed by the pilot, briefing officer and Air Operations Branch Director.
- ◆ After receiving the CAPF 104, The Flight Line Administration Officer will give the keys to the aircrew for their assigned aircraft, and notify the flight line marshaller (optional) that the designated aircraft has been released to the appropriate aircrew.
- ◆ Upon returning from sorties, each aircrew should return their keys to the Flight Line Administration Officer.

3.3 Communications

The flight line operations center and flight line personnel should be equipped with three radios. The Flight Line Supervisor will brief all personnel on the use and operation of the radios.

- ◆ Two-way radio (typically a 26.620 MHz, 49 MHz, or FRS channels) to be used for communications between the operations center and the flight line personnel.
- ◆ CAP FM radio used for communications between the operations center and other staff members. If available, phones may also be used.
- ◆ VHF air radio used for communications between the operations center and the FBO. If available, phones may also be used.

3.4 Clothing and Personal Equipment

3.4.1 Introduction: The standard Air Force or CAP BDU uniform and reflective vest should be worn. During cold weather all personnel should have adequate clothing (jackets, gloves, etc.); during warmer temperatures, personnel may remove their BDU tops.

3.4.2 Jewelry: Many severe lacerations and finger amputations have resulted from personnel wearing rings while working around aircraft and ground handling equipment. Personnel will not wear rings, dog tags, necklaces, bracelets, watches, or any other loose items, which could be snagged or caught, while performing on the flight line.

3.5 Hats

Hats should be worn to provide protection from the sun, but the following rules should be followed:

- ◆ The hat must have a retaining device to help secure the hat. If your hat does not have one, it can be fabricated (e.g., two small alligator clips on a short piece of cord; one clip is attached to the hat in the back and the other is attached to the collar).
- ◆ Boonie hats offer the most solar protection and have a sewn in retention strap. If boonie hats are used the strap must be kept tight under the chin to be effective.
- ◆ Should a hat be blown from your head, let it go. Under NO circumstance should a Marshaller chase a hat or run on the flight line.

3.6 Hearing Protection

Hearing protection must be worn when working around turbine powered aircraft (turbo or fan-jet or turboprop) and Helicopters.. This can be accomplished with suitable earplugs or earmuffs. The use of foam type earplugs is recommended due to their low cost.

3.7 Eye Protection

Eye protection may be worn when operating on the flight line, if there is a danger from flying debris (use safety glasses instead of goggles, as goggles tend to fog up). This protection should be suitable safety glasses with safety side shields. You can get safety glasses that are also sunglasses for sunny days. Goggles are preferred during helicopter operations.

3.8 Sun Protection

All flight line personnel should use sunscreen with an SPF at least 15. Sunscreen should be applied to all exposed skin surfaces at beginning of the day and periodically after that (remember the ears!). The Flight Line Supervisor or Mission Safety Officer will ensure that cadet personnel have and use sun protection as needed. Chap Stick (lip balm) containing sun protection should also be available.

3.9 Wands

Aircraft marshallers shall use high-visibility wands available during the day and lighted wands at night. High-visibility wands may be locally fabricated (see 9.1).

3.10 SAFETY

3.10.1 Introduction: The primary concern during any flight line operation is SAFETY. No activity is important enough that the safety of any personnel should be compromised, for any reason. All personnel are authorized to stop any activity on a flight line if any actual or perceived unsafe activity is occurring. Aircraft marshallers should contact the Flight Line Supervisor, Mission Safety Officer or IC if there is any concern over safety.

3.10.2 Hazards: During flight line operations various hazards are encountered. They include:

- ◆ Explosive hazards such as gasoline, oil and cleaning solvents.
- ◆ The Flight Line Supervisor will ensure all personnel are aware of potentially flammable fuel vapor areas. Fuel vapors are heavier than air and will settle to ground level and enter below ground areas. Some examples of hazardous fuel vapor areas are fuel pits below ground level, and areas within 10 feet of aircraft fuel vent systems and fuel spills.
- ◆ Tripping hazards such as cables, tie-down ropes or chains, fuel hoses and ladders.
- ◆ Slipping hazards such as oil, hydraulic fluid, grease spills, and weather conditions.
- ◆ Lightning and high static electricity conditions.
- ◆ Cell phones and pagers are a distraction and can be an ignition source. Do not wear either while working on the flight line or refueling.
- ◆ Antennas, static wicks, Pitot tubes, and other projections.
- ◆ Medical conditions as dehydration and fatigue should be treated as hazards too. Both can result in unsafe operations and poor performance.

3.10.3 Safety Procedures: While on the flight line there are a number of other safety procedures you must observe. After entering the designated flight line area:

- ◆ No saluting.
- ◆ NO SMOKING.
- ◆ No running.
- ◆ No horse play.
- ◆ No walking backwards.
- ◆ Personnel should remain at least 15 feet from propellers. It is very difficult to see a propeller when it is rotating at high speed, so personnel must be especially careful when approaching a rotating propeller from the front. The aircraft could suddenly move forward without warning.

3.10.4 Dehydration: It is very easy to become dehydrated while working on the flight line. All personnel should consume sufficient liquids to maintain their health. Flight Line Supervisors shall insure sufficient water is available so all personnel can drink at least every 15 minutes. Limit the consumption of drinks containing carbonation or caffeine (e.g., sports drinks, coffee or soda); they can cause you to become dehydrated.

3.10.5 Fatigue: Fatigue is a major contributor to many safety incidents and accidents. Incident Commanders will ensure that personnel performing operational mission activities, particularly flight operations, have had sufficient rest to enable them to safely complete the proposed assignment. The Flight Line Supervisor will brief you on how to request time for a rest room break and how meals will be handled. The Flight Line Supervisor and /or marshaller's are authorized to remove any personnel from the flight line area if they seem fatigued. CAP flight line personnel will make a conscientious effort to avoid or reduce fatigue by:

- ◆ Periodic rest breaks.
- ◆ Periodic light refreshments (e.g., moderate amounts of hot foods, soup, fruit juice).
- ◆ Avoid excessive smoking.
- ◆ Sufficient sleep between operations periods (i.e., at least eight hours).
- ◆ Refraining from alcohol within 24 hours of reporting for the mission.
- ◆ Rest when they have the opportunity. Typically search missions (especially training) launch aircraft in surges. Between surges, take advantage of opportunities to rest in comfortable surroundings.

3.10.6 Foreign Object Damage (FOD): Foreign Object Damage (FOD) is a threat to engines and, as such, is a big concern for flight line and aircrew personnel. It can also be a threat to other portions of an aircraft as well as do serious injury to people. Aircraft propellers and tires are extremely vulnerable to FOD.

Foreign objects can be rocks, dirt, hats, paper, trash, bolts, screws, safety wire, tools, rags and pens. If any FOD material is seen, it should be picked up and placed in a suitable trash receptacle. To prevent any object from doing damage to an aircraft or person, the flight line should set aside a few minutes each day for an inspection and physical pickup of foreign objects. This is known as “FOD WALK”. You stand side by side in a line formation and walk slowly down the flight line looking for any foreign objects. Flight line personnel should perform a "FOD WALK" just prior to opening any CAP flight line for operations.

3.10.7 Housekeeping: An important practice in any safety program is good housekeeping. Housekeeping in hangers, vehicles and other aircraft is essential to personnel and aircraft safety.

- ◆ Keep work areas clean and orderly.
- ◆ Clean up any spills or messes immediately.
- ◆ Pick up and account for any tools and equipment.
- ◆ Properly dispose of any waste material.

3.11 Fire

3.11.1 Warning: Under no circumstances should a cadet or senior member approach an aircraft on fire when the propeller is turning. Remain at least 15 feet from it.

Never fight a fire in a burning aircraft unless you have been specifically trained in this fire-fighting technique!

3.11.2 Aircraft Engine Fire During Starting: If an aircraft engine fire occurs during start up, the following procedure should be followed:

- ◆ Immediately call the fire department.
- ◆ Allow the aircrew to follow their “fire during engine start” procedures (they will increase engine rpm).
- ◆ Once the fire department arrives, get out of their way and let them do their job.
- ◆ *Never* approach an aircraft while its propeller is turning (even if it is on fire).
- ◆ Remain at least 15 feet from the propeller.
- ◆ If not assisting, remain 50 feet from the aircraft or as directed by the Flight Line Supervisor.
- ◆ If the aircrew can not put out the fire, they will follow their aircraft evacuation procedure.
- ◆ Be available to help the aircrew once they clear the aircraft.
- ◆ Normally, the only way to get the fire extinguishing agent onto an engine (with the cowling in place) is through the engine intake (do not attempt while prop is turning).

3.11.3 Aircraft Cockpit Fire: If an aircraft fire occurs in the cockpit before or after starting, the following procedure should be followed:

- ◆ Immediately call the fire department.
- ◆ Allow the aircrew to follow their cockpit fire procedures.
- ◆ Once the fire department arrives, get out of their way and let them do their job.
- ◆ Never approach an aircraft while its propeller is turning.

- ◆ Remain at least 15 feet from the propeller.
- ◆ If not assisting, remain 50 ft from the aircraft or as directed by the Flight Line Supervisor.
- ◆ If the aircrew can not put out the fire, they will follow their aircraft evacuation procedure.
- ◆ Be available to help the aircrew once they clear the aircraft.

3.11.4 Fire Extinguishers: All CAP aircraft carry a small fire extinguisher in the aircraft. Due to its small size, it is only useful in putting out small (primarily electrical) fires.

- ◆ A large, portable fire extinguisher should be positioned near the flight line; preferably out of the way behind the line, but easy to get to in an emergency.
- ◆ The type and quantity of extinguishing agent must be suitable for the kinds of fires likely to occur.
- ◆ Only personnel *who have been trained* in the use of fire extinguishers should use them to fight a fire. Portable fire extinguisher training should be arranged with your local fire department with emphasis on the type of extinguisher to be used on different classes of fires. Training should also include the use of portable fire extinguishers.

3.11.5 Fire Training: All CAP flight line personnel must attend a aircraft fire training program, and have our fire training requirement form completed for their files (see Attachment 1). Training should include, but not be limited to the following with hands on experience in the use of fire extinguisher and putting out a fire.

- ◆ The Fire Triangle.
- ◆ Properties of Fire.
- ◆ The Fire Tetrahedron.
- ◆ Extinguishing Principles.
- ◆ Classification of Fires.
- ◆ Extinguishing Agents.
- ◆ Fire Fighting Procedures.
- ◆ General Safety.
- ◆ Personal use of a Fire Extinguisher.

Attachment 1, Fire Training Requirements, can be completed on a mission or in a class. A copy of this form should remain in the members personnel file as proof of training.

3.12 Fire Department

If you don't have a fire department on the airport try to arrange with the local fire department to make a fire truck available during your flying hours or make sure you know the local procedures for getting them out to the airport.

3.13 Ambulance

If you don't have a ambulance or EMT services on the airport try to arrange with the local jurisdiction to make one available during your flying hours or make sure you know the local procedures for getting them out to the airport.

3.14 Staff

3.14.1 Introduction: The flight line staff is the most important tool we have to ensure the efficient, effective and safe operations of our flight line. We have only two (ICS) qualifications:

- ◆ Flight Line Marshaller.
- ◆ Flight Line Supervisor.

The following will define their duties and qualifications, and provide useful checklists.

3.14.2 Flight Line Marshaller: The Flight Line Marshaller is responsible for the safe moving and parking of all mission aircraft. Each Flight Line Marshaller must be well trained, confident of their knowledge and skills of the flight line and aircraft operations. The Flight Line Marshaller reports directly to the Flight Line Supervisor (or assistant if assigned).

Duties:

- ◆ Marshall aircraft.
- ◆ Wing walker.
- ◆ Aircraft startup.
- ◆ Aircraft taxi.
- ◆ Aircraft shutdown.
- ◆ Tie-down aircraft .
- ◆ Ground safety observer.

Qualifications:

- ◆ Qualified Flight Line Marshaller (CAPF 101).
- ◆ RST training (senior) required if cadets attend.

Daily:

- Inspect and check all required marshalling equipment.
- Monitor safety on the flight line.
- Monitor yourself and others for fatigue and dehydration.

3.14.3 Flight Line Supervisor: The Flight Line Supervisor is responsible for flight line personnel and the efficient, effective and safe operation of the flight line. All members of the flight line team are the responsibility of, and reports to the Flight Line Supervisor. The Flight Line Supervisor reports directly to the Air Operations Branch Director (or equivalent).

Duties:

- ◆ Coordinate activities with local FBO.
- ◆ Coordinate activities with airport administration and security.
- ◆ Coordinate activities with local fire department.
- ◆ Coordinate activities with local hospital and/or EMT operators.
- ◆ Survey airport for the best parking areas and taxi routes.
- ◆ Survey airport for hazards and emergency equipment.
- ◆ Supervise Flight Line Marshalls.
- ◆ Brief Flight Line Marshalls and trainees.
- ◆ Tow and park an aircraft.
- ◆ Refuel an aircraft.
- ◆ Keep track of aircraft refueling.
- ◆ Responsible for helicopter operations.

Qualifications:

- ◆ Qualified Flight Line Marshaller (CAPF 101).
- ◆ At least 18 years of age.
- ◆ Knowledge of Community First Aid and Adult CPR (certification preferred).
- ◆ Possession of a CAP driver's license and ROA.

- ◆ Completion of SET (Skills Examiner Training).
- ◆ RST training required if cadets attend.

Checklist:

- ◆ Upon arrival:
 - Prepare for mission with safety as the number one priority.
 - Familiarize yourself with mission polices, guidelines, and procedures.
 - Coordinate with the Mission Safety Officer for aircraft safety inspections (CAPF 71).
 - Coordinate, organize, and manage assigned staff (check 101 and 101T-FLM cards).
 - Check flight line areas for equipment, function and safety. Perform a FOD check.
 - Coordinate aircraft staging, fueling, and security.
 - Inspect tie-downs to ensure compliance with CAPR 66-1.
 - Check all safety equipment including wands, vests and fire extinguishers.
- ◆ At start of mission activity:
 - Assure all arriving aircraft are checked in and required paperwork completed.
 - Provide a safety briefing for all trainees to include emphasis on safety, safety procedures, local hazards, and other areas of concern.
- ◆ Daily:
 - Provide a daily safety briefing for staff.
 - Monitor mission progress and arrange for extra assistance as needed.
 - Assure adherence to mission schedules.
 - Develop and distribute any schedules/changes/updates to staff.
 - Walk down flight line areas to check for cleanliness, neatness, and safety hazards.
 - Check for outstanding fuel bills, and inform the Air Operations Branch Director or the Finance Section Chief (or equivalents).
 - At the end of each day, check tie-downs and chocks, aircraft Control/Gust locks installed, aircraft doors and windows locked, aircraft baggage compartments locked, aircraft and flight line vehicles windshields clean and equipment stowed.

Note: Flight Line Marshaller and Flight Line Supervisor are the only two CAPF 101 qualifications needed to work on the flight line. The following positions do not require a 101 qualification, but would be helpful to the Flight Line Supervisor in running a large flight line operation.

3.14.4 Assistant Flight Line Supervisor: The Assistant Flight Line Supervisor is responsible for assisting the Flight Line Supervisor in the efficient, effective and safe operation of the flight line. The Assistant Flight Line Supervisor reports directly to the Flight Line Supervisor.

Duties:

- ◆ Assist the Flight Line Supervisor in managing the flight line and personnel.
- ◆ Monitor flight line personnel for fatigue and dehydration.
- ◆ Arrange breaks as need.

Qualifications:

- ◆ Qualified Flight Line Supervisor (CAPF 101) or Trainee.
- ◆ Basic computer skills and familiar with MS Office software.
- ◆ Knowledge of COMMUNITY first Aid and Adult CPR (certification preferred).
- ◆ Possession of a CAP driver's license and ROA.
- ◆ Completion of SET (Skills Examiner Training).
- ◆ RST training required if cadets attend.

Checklist:

- ◆ Daily:
 - ❑ Perform FOD walk on a periodic basis.
 - ❑ Monitor tie down equipment for safety and reliability.
 - ❑ Assure adherence to mission schedules.
 - ❑ Distribute daily schedules/changes/updates to flight line personnel.
 - ❑ Walk down flight line areas to check for cleanliness, neatness and safety hazards.
 - ❑ Monitor for fatigue and dehydration.
 - ❑ Check fire extinguishers and equipment (e.g., wands and vest).

3.14.5 Flight Line Administration Officer: The Flight Line Administration Officer is a key person for making sure the flight line runs smoothly. The Flight Line Administration Officer reports directly to the Flight Line Supervisor.

Duties:

- ◆ Maintain a log of all aircraft arrivals, parked on and departures from the flight line.
- ◆ Maintain the flight line parking and aircraft key boards.
- ◆ Issue aircraft keys to the assigned flight crew.
- ◆ Maintain communications with flight line personnel.
- ◆ Maintain communications with air branch operation director.
- ◆ Maintain communications with the FBO personnel.
- ◆ Assist the Flight Line Supervisor to assure completion of mission goals and objectives.
- ◆ Assist the Flight Line Supervisor to ensure compliance with CAP and mission regulations and directives.

Qualifications:

- ◆ General ES (CAPF 101).
- ◆ Basic computer skills and familiar with MS Office software.
- ◆ Possession of a CAP driver's license and ROA.
- ◆ RST training required if cadets attend.

Daily:

- ❑ Inventory all aircraft and keys.
- ❑ Check to make sure all aircraft keys are available for aircrews.
- ❑ Assure adherence to mission schedules.

4.0 Flight Line Procedures for Vehicles

4.1 Introduction

This section establishes procedures governing the operation of vehicles on the flight line. It applies to all Civil Air Patrol personnel who are authorized to be on the flight line. Motor vehicles operating on the flight line are necessary for some operations. However, they can present a potential danger to aircraft and ground personnel.

4.2 Purpose

To control access to flight line and adjacent areas; to restrict vehicular parking to necessary vehicles; to control and limit crossing of runways by foot and vehicular traffic.

4.3 Flight Line Movement

No vehicle will be operated at speed in excess of that deemed reasonable and prudent for existing conditions of traffic, road and weather.

- ◆ Vehicle Parking Areas: 5 mph.
- ◆ Aircraft Parking Ramp: 15 mph maximum. 5 mph within 25 feet of an aircraft.
- ◆ Taxiways and Runways: 35 mph.
- ◆ On a controlled airport no vehicle will operate on an active taxiway or runway unless communication has been established with that airport's ATC facility.

4.4 Flight Line Driving

Only CAP Corporate vehicles and authorized Private Motor Vehicles (PMV) will be driven in designated flight line areas. Only the Flight Line Supervisor or the IC can give authorization for PMV's. Authorization will be in written form with copies to the airport administration and airport security.

4.5 Entering or Leaving the Flight Line, Taxiway or Runways

When entering and leaving the flight line and runways, the following procedures should be followed:

- ◆ Vehicles and personnel will enter or leave the designated flight line area through Entry Control Points (ECP).
- ◆ All personnel entering the area must show written authorization to the Flight Line Supervisor prior to entry. A checkpoint and authorization procedure must be established for this process.
- ◆ Vehicles must always yield right-of-way to aircraft. Before crossing a taxiway, always bring the vehicle to a complete stop and determine visually that the taxiway is clear.
- ◆ Before crossing a runway, come to a complete stop at least 100 feet from the runway. Do not proceed across a runway until you have received radio or visual clearance from the control tower.
- ◆ If the airport does not have a tower, come to a complete stop at least 100 feet from the runway, and do not proceed crossing the runway until you have visually confirmed there is no aircraft on the runway or approaching to land.
- ◆ Headlights and flashers must be on during this operation. You may also use a flashing amber strobe on top of the vehicle.

4.6 Vehicle Parking

Parking vehicles in the vicinity of an aircraft may not seem like an important issue, but it is. The number of accidents that have resulted from the improper parking of vehicles on the flight line is unbelievable, so we do not want to cause any additional accident for this reason.

- ◆ All vehicles will park more than 25 feet from any part of an aircraft or 200 feet to the rear of any aircraft with operating engines; the only exceptions are service vehicles.
- ◆ Vehicles should never be parked directly in front of an aircraft.
- ◆ Vehicles (including service vehicles) parked facing towards or away from an aircraft will be chocked to prevent them from unintentional movement.
- ◆ There are times when a vehicle must be parked to the side of an aircraft. If so, the vehicle must be located more than 10 feet from the aircraft and clear of the wingtips and clearly visible from the aircraft's cockpit.
- ◆ Vehicles will not be backed up in the immediate direction of any aircraft, except as authorized in certain loading/unloading and servicing. A ground guide will be posted when backing towards an aircraft. Wheel chocks will be pre-positioned to prevent vehicles from backing into aircraft.
- ◆ All parked vehicles with automatic transmissions will be placed in "Park" and all vehicles will have the parking brakes set.
- ◆ All unattended vehicles will be parked so that they will not interfere with the aircraft being towed or taxied.

- ◆ Do not under any circumstances attempt to drive under the wing of any aircraft.

4.7 Restricted Visibility

When operating in restricted visibility the following procedures should be followed:

- ◆ Flashing lights or hazard lights must be used when stopped on any part of the aircraft parking ramp.
- ◆ All flight line personnel will carry a light source and wear reflective safety vests.
- ◆ At night, headlights of a vehicle shining towards a moving aircraft at night will be turned off immediately, so the pilot's night vision will not be affected. The parking or hazard lights on the vehicle will be left on so that its position will be known. The headlights of the vehicle will stay off until the aircraft is out of range. Vehicle headlights will be left off when the vehicle is unattended.

4.8 Follow Me Vehicles

"Follow Me" Vehicles used for guiding aircraft will be equipped with signs, easily visible at night, reading "Stop" and "Follow Me." They will be equipped with two-way radios for communications on control tower and/or mission base frequencies. When approaching the parking spot, the "Follow Me" vehicle operator should illuminate the "Stop" signal, move the vehicle from the intended path of the aircraft travel and position it laterally – clear of the aircraft wingtip. The Marshaller, who may be the vehicle operator, will then guide the aircraft to the parking spot by use of approved marshalling techniques.

4.9 Flight Line Vehicle Training

Personnel operating flight line vehicles must be trained I.A.W. FAA Advisory Circular 150/5210-20 *Ground Vehicle Operations on Airports*. This circular is available at <http://www1.faa.gov/arp/ACs/5210-20.pdf>

4.10 Equipment Requirements

Vehicles operating on the flight line under the control of CAP personnel must have the following equipment:

- ◆ Markings indicating that the vehicle is approved for flight line use.
- ◆ Fire extinguisher.
- ◆ Chocks (ground vehicle chocks must be at least 4 inches high and 18 inches long).
- ◆ Flight line signaling placard.
- ◆ The following visual aids which can be ordered, without cost, via the internet from: <http://www.faarsp.org/xrsam1.htm>:
 - Ground Vehicle Guide Placard.
 - Pilot's Guide Quick Reference.

5.0 Flight Line Procedures for Aircraft

5.1 Introduction

Safe, efficient and effective flight line procedures are imperative for a successful flight line operation. Using standardized startup, taxing, parking and shut down procedures will make it easy on the aircrew and marshallsers. The following will outline procedures to be followed by the pilot and marshaller.

5.2 Arrival at Mission Base:

The following will outline what the flight line can expect from new arriving aircrews.

- ◆ Park and Secure Aircraft (responsibility of the aircrew).
 - Look for marshaller's signals and follow taxi plan.
 - After the aircraft parks, the pilot will shut down the engine.
 - Install Avionics/Gust Lock and Pitot tube covers/engine plugs installed.
 - Parking Brake OFF after chocks and tie-downs installed.
 - Lock the windows, doors and baggage compartment.
 - Check oil and arrange for refueling.
 - Clean leading edges, windshield, and windows.
- ◆ Check in with Flight Line Supervisor and Safety Officer (may complete CAPF 71).
- ◆ Close FAA Flight Plan, call Flight Release Officer.

5.3 Fuel Samples

Per CAPR 60-pilots (or Flight Line Supervisors) obtaining fuel samples from the aircraft fuel system shall return the uncontaminated fuel to the fuel tank or place the fuel sample in an approved container.

5.4 Engine Starting Procedures

The following outlines procedures used during engine start up. The marshaller will be positioned within view of the pilot at all times.

- ◆ Engine starting procedures should be included in aircrew briefing.
- ◆ The pilot should not start the engine without a marshaller in position.
- ◆ Check that chocks are removed before engine start.
- ◆ Before starting the engine, the pilot will let the marshaller know they are ready by holding their hand out the window, moving their hand up and down, and stating "Clear Prop". The marshaller will check the area around the prop and give a 'thumbs up' sign: this signal lets the pilot know that the area is clear and the marshaller is ready for engine start.
- ◆ During night operations flashing of the landing lights may be substituted for the hand signals.

Note: Every aircrew will need time to go through their checklist before moving from one point in this procedure to the next. Marshalls will need to be patient and give the aircrew time to complete their check lists.

5.5 Taxi Procedures

The following outlines procedures used to taxi the aircraft. The marshaller will be positioned within view of the pilot at all times.

- ◆ Taxi procedures should be included in aircrew briefing.
- ◆ The pilot should not begin to taxi without the marshaller's permission.
- ◆ When the pilot is ready to taxi, they will turn their pulse light on or flashing their landing/taxi light.
- ◆ The marshaller will give the pilot permission to taxi using standard taxi signals.
- ◆ The pilot may then taxi to designated run-up area.
- ◆ If you see an aircraft taxiing too fast, signal them to slow down by using the appropriate marshalling signal.

5.6 Marshaller Positioning

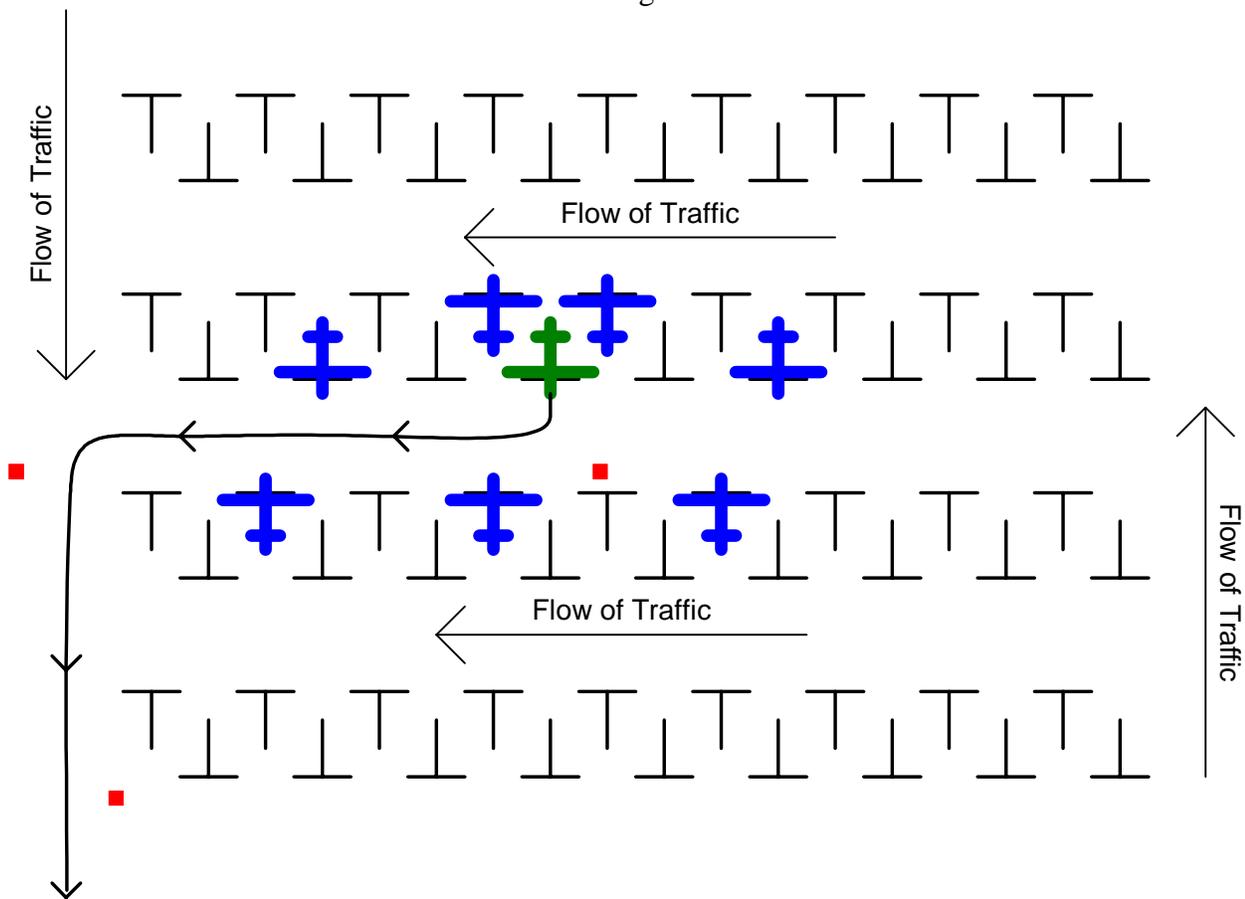
CAP personnel marshalling aircraft must position themselves to meet the following requirements.

- ◆ Never position yourself in the path of an oncoming aircraft
- ◆ Never position yourself in a location where any part of an aircraft will pass over you.

- ◆ Never walk backwards on the ramp.
- ◆ Never run on the ramp.
- ◆ Always marshal aircraft entering a congested ramp under CAP control.
- ◆ Always get enough personnel to control aircraft movement without compromising safety.
- ◆ Always position yourself where you can maintain direct eye contact with the pilot-in-command (ten feet to the pilot's left of the left wing tip and far enough in front of the aircraft to allow for a turn in front of you is ideal).
- ◆ Always hand the aircraft off to the next marshaller before the pilot loses sight of you.

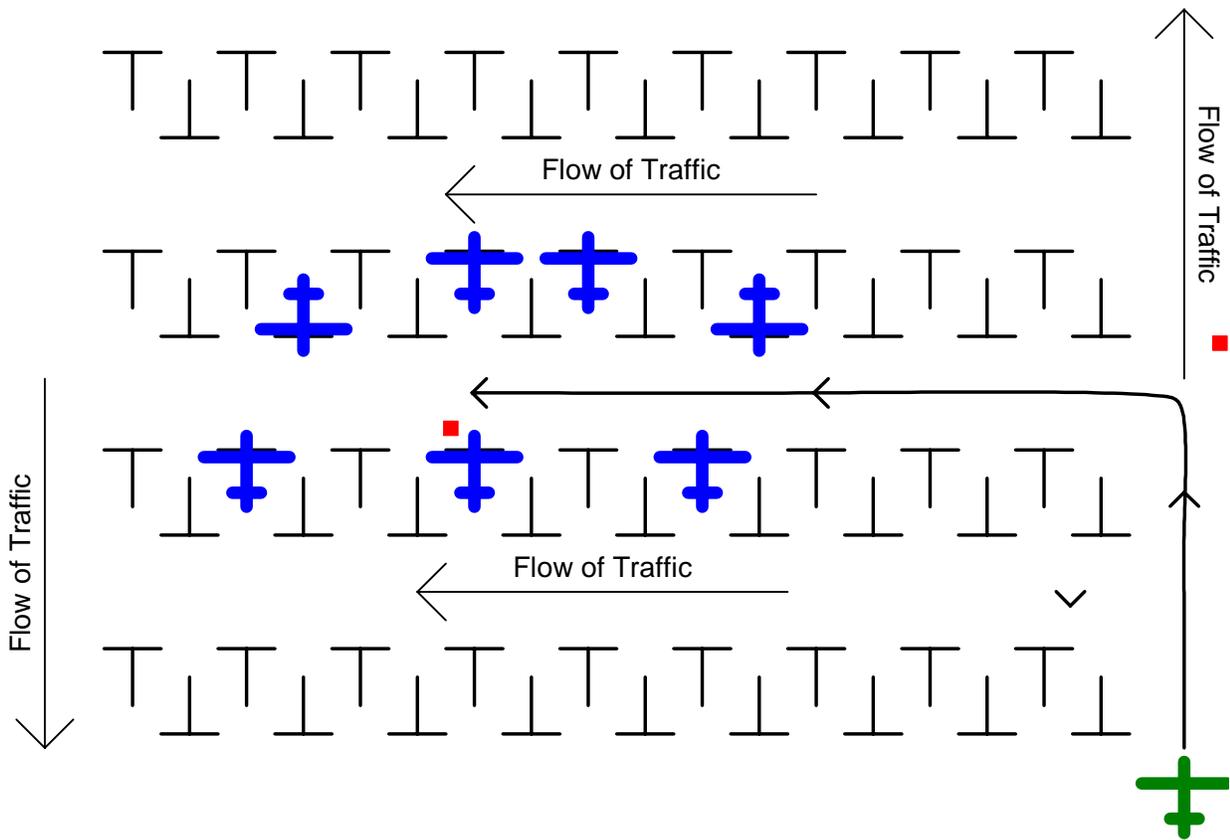
Careful planning of the number of resources and their position can accomplish this with ease. Suggested marshaller positioning is shown on the following diagrams for departing (Fig. 1) and arriving (Fig. 2) aircraft.

Figure 1



Departing aircraft are marshaled out of their spot and released once clear of the congested area.

Figure 2



Arriving aircraft are marshaled into place just passed their assigned parking spot and pushed back into place.

5.7 Wing Walker

Since you will be moving aircraft in and out of congested spaces, you should always have another person act as your wing walker.

- ◆ A wing walker is essential, because it is impossible for the marshaller to see all the extremities of the aircraft from the marshalling position. Using a wing walker is most important when marshalling an aircraft into a close parking spot.
- ◆ As the marshaller, you have the ultimate responsibility for the aircraft. If you lose contact with your wing walker, or you do not understand the directions being given by the wing walker, stop immediately. Verify that you have adequate clearance.
- ◆ If you are working as a wing walker, always maintain eye contact with the marshaller. The same hand signals that you used to direct a pilot should be used to direct the person marshalling. Use crisp and distinct hand signals and vocalize the situation if necessary. Do not hesitate to call out “STOP” if you see a problem or are unsure of the clearances.

5.8 Run-up Areas

A safe and out of the way run-up should be established to help the flow of traffic for the local airport. All CAP aircraft will use the run-up area to perform all pre-takeoff checks.

5.9 Parking and Shut Down Procedures

The following outlines procedures used to park and shut down the aircraft.. The marshaller will be positioned within view of the pilot at all times.

- ◆ The pilot should follow the taxi plan and marshalls directions (with help from wing walkers and aircrew as needed).
- ◆ The pilot should indicate engine shutdown by showing the marshaller the aircraft keys.
- ◆ The marshaller will indicate when chocks have been installed, and at that time the pilot should release the parking brake.
- ◆ A post-flight inspection will be preformed by the aircrew on all aircraft after each sortie.

Note: After the engine is shut down and chocks are installed, marshalls are free to move to their next assignment.

5.10 Aircraft Refueling

5.10.1 Introduction: If the airport has a full service FBO, you may not have a choice on how your aircraft gets refueled. If the FBO has a Unicom, the PIC can help by contacting them with his ETA to their refueling location. This will minimize delays in refueling. If you do not have a FBO with a fuel truck or fuel pumps, refueling will be one of the primary job duties of the Flight Line Supervisor. This section is designed to prepare and familiarize the Flight Line Supervisor with the correct procedures for refueling piston aircraft that utilizes aviation gasoline (Avgas).

5.10.2 Piston Engine Fuel and Oil Products: Piston aircraft engines are similar to those used in automobiles. However, the fuel that is used by piston aircraft is a more sophisticated and specially formulated product called Avgas.

5.10.3 Avgas (Aviation Gasoline): Avgas is manufactured in three grades; 80/87 octane (red), 100/130 (green), and 100LL (low lead) which is blue. The 80/87 octane fuel is designed for use in low- powered engines commonly used in the smallest single engine piston aircraft. The 100/130 octane fuel, identified by its green color, is used in high performance engines found on many piston engine aircraft. 100LL is designed to be compatible with all reciprocating engines, and is typically used in all piston engine aircraft. The majority of aviation service organizations offer 100LL for their piston aircraft customers.

5.10.4 Piston Engine Oils: You may be required to check the oil level on our aircraft. Depending on the type and size of the engine, different types and grades of oils will be appropriate for use. There are two distinct types of oils which are used in piston aircraft.

- ◆ Ashless Dispersant or “A-D” oil is used most commonly.
- ◆ Non- Ashless Dispersant, or “Non-AD”, which is a mineral-based oil. This type of oil is used in new aircraft or recently overhauled engines during the “break-in” period.

The pilot will be very specific about the brand, type and viscosity of oil which is required. When adding oil to an aircraft, oil types and weights must never be mixed. Putting in the wrong oil can cause serious damage and major difficulty when the aircraft is in the air. Be absolutely sure that the oil that you are delivering is exactly what the pilot orders. If you are uncertain about the type or weight of oil that should be placed into the aircraft, ask the pilot.

When checking the oil level of an aircraft engine, always wipe down the dipstick and re-insert it for a more accurate reading. Stick the level a second time to verify the first reading. Never fill above the full mark on the dipstick. Typically, the pilot will advise you to fill the oil to a specific level on the stick. For example “fill to 7 (quarts) with Texaco 100 AD”. This would indicate that you should fill the oil to a maximum of 7 quarts with Texaco, 100 weight/viscosity, Ashless dispersant oil.

Always wipe up any spilled oil and verify that all dipsticks are in place and oil filler openings are closed and secure before leaving the aircraft. Note: do not over-torque the oil dipstick – Finger tight is sufficient.

5.10.5 Refuelers and Refueling Systems: Most aviation service providers deliver fuel to aircraft using a self-contained mobile refueling unit, commonly referred to as a refueler. At some locations, other systems are also used, including fuel delivery islands or refueling cabinets. Although refueling systems may vary slightly, the safety procedures for all fuel servicing operations remain constant.

5.10.6 Avgas Refuelers: Avgas refuelers should have standard equipment and placarding including the following.

- ◆ The type of fuel (Avgas) must be clearly marked on each side of the refueler per American Petroleum Institute standard 1542. Avgas refuelers are identified with white letters on a red background.
- ◆ Two (BC) type fire extinguishers must be available on each refueler, one on either side. (All extinguishers must be clearly marked as to type and last inspection date).
- ◆ Bonding or ground cables, which are designed to equalize the static electrical potential between the refueler and the aircraft being refueled, are also required.
- ◆ All nozzles should have dust covers in place when the refueler is not in use.
- ◆ Vehicles should have a brake lockout mechanism to lock the brakes “on” when the nozzles and hoses are in use.
- ◆ Refueling vehicles should also be identified, on each side and the rear, with “Flammable” and “No Smoking” Placards.
- ◆ The Department of Transportation Placard 1203 should also be on each side and the rear of the vehicle.

Prior to beginning any refueling operation, you must verify that the refueler has the proper fuel grade (for the aircraft that you are servicing).

You must also verify that both fire extinguishers and bonding cables are operating properly. If it is missing or inoperable, the refueler cannot be used.

Other equipment which should be included on the refueler include protective refueling mats, windshield cleaning products, soft paper towels, and a variety of aviation oils. These items will improve efficiency and prevent the distraction of leaving the refueling area to obtain equipment or products which may be required to properly refuel the aircraft.

You will also need a step ladder for refueling. Check to see that the refueler has one. Visually inspect it to make sure it is in good condition and ready for use. If the step ladder is not safe, remove it from service and select another.

5.10.7 Refuel Delivery Meters: Each refueler is equipped with refuel delivery meters which correspond to each delivery hose on the refueler. The meter is the sole method by which you will be able to identify the amount of fuel which is dispensed into the aircraft, and is the means by which you will be able to document the transaction.

Refueling delivery meters have two sets of numbers which are described as follows:

- ◆ The large set of numbers which are located on the center face of the meter indicates the gallons which are delivered for each refueling. Prior to each refueling, the larger numbers must be reset to zero which can be accomplished by turning the large knob on the meter.
- ◆ There is a smaller row of numbers which are located either at the top or bottom of the meter's face. These numbers are the meter's master figures, and are the units which register the gallons dispensed from the tank on a cumulative or continuous basis. Since these numbers cannot be reset, they provide a master record of the fuel which flows through the meter.

5.10.8 Refueling Paperwork: A key part of your job and the culmination of each refueling operation is the completion of the documentation or paperwork of the delivery. Legible and accurate records of the amount of fuel and oil delivered and other services which were performed, are a necessity. You must verify that the services ordered by the pilot were the services which were indeed performed.

5.10.9 Aircraft Fuel Filler Caps: There are three (3) types of avgas fuel caps found on avgas aircraft:

- ◆ The first is a external cap and is found on smaller aircraft. Similar to the caps used on automobiles, it is a very simple twist-off surface mounted cap. When replaced the grip must be parallel to the air flow.
- ◆ The second type of cap is an inner cap located under a secured access door. This cap has a pop-up lever, which releases the cap for removal. When pushed downward, the lever expands the diameter of the cap against the filler port to secure the cap. When replacing the inner cap, be sure that the tab is pointed to the rear of the aircraft and that the outer access door is secured.
- ◆ Recognized as the most commonly used, the flush mounted fuller cap consists of a pop-up tab which must be rotated counter-clockwise for removal. To replace, reverse the procedure. When replaced, make sure that the tab is pointed aft, or to the rear of the aircraft.

5.10.10 Step Ladders: The correct procedures associated with the use of ladders must be consistently practiced to minimize damage to aircraft and equipment and injury to yourself.

If a step ladder is required, position it next to the airplane. If the wind is gusty, or if there is a lot of aircraft activity nearby, don't leave the step ladder stranding unattended where it can be blown into the aircraft. Lay it on the ground.

Never position a ladder underneath a wing's surface. As fuel is delivered into the aircraft, the extra weight will cause the airplane to settle, and either the wing or the entire aircraft will drop several inches onto the ladder. The result may be significant damage to the aircraft's wing and/or fuel spillage from a punctured aircraft's fuel tank.

Remember to use caution and common sense when using or positioning a ladder.

5.10.11 Single-Engine Piston Aircraft Refueling Procedures: The following is the step by step procedure which must be followed when refueling a typical single-engine piston aircraft.

Setting up to refuel:

- ◆ Begin by bonding the refueler to the aircraft. Attach the clip on the end of the cable to a non-painted, machined metal surface on the landing gear. Never attach the bonding cable to a propeller, brake line, or antenna.
- ◆ Determine which tank on the aircraft should be filled first, by referring to the information provided on the service order, or as directed by the pilot verbally.

- ◆ If a step ladder is required, position it next to the airplane. Remember, if the wind is gusty or if there is aircraft activity nearby, don't leave the step ladder standing unattended where it can be blown into the aircraft. Lay it on the ground if necessary.
- ◆ Return to the refueler and zero the delivery meter by rotating the knob on the side of the meter. Inspect the nozzle to be certain that it is clean and dry. Obtain a wing mat and pull enough hose to reach the tank farthest from the refueler. If you have any questions about which tank to refuel first, refer to the information provided on the service order or check with the pilot.

Refueling the aircraft:

- ◆ Touch the nozzle to the filler cap, prior to opening, to dissipate any static charge potential between the filler and the nozzle.
- ◆ Open the filler cap on the aircraft and place it on the mat adjacent to the opening. Use caution when inserting the refuel nozzle into the filler port; the nozzle should never be inserted more than three inches (3") into any tank. Damage can occur to delicate equipment and rubberized bladders which seal the tank. Maintain contact between the filler neck and the nozzle to avoid static discharge during refueling.
- ◆ If the nozzle you are using will not fit into the filler port, STOP IMMEDIATELY! You must verify that the refueler you are using has the correct fuel for the aircraft being serviced. Many avgas aircraft have a special adapter plate installed to prevent the acceptance of the "j-Spout", nozzle found on jet refuelers.
- ◆ While refueling, do not allow any contaminants into the tank such as dust or water, and do not refuel during heavy rain. You should hold the nozzle and hose with both hands to avoid damage to the leading edge or deicing boots. Caution should be used to prevent pens, glasses, flashlights, service orders or other objects from dropping into the tank.
- ◆ As you lean over the wing, be sure to guard against damaging the leading edge, which often holds delicate de-icing equipment. On some aircraft, this is a rubber boot which inflates during flight to remove ice. Puncturing a hole in this mechanism would destroy its de-icing capability.
- ◆ Fill the tanks according to the directions indicated by the pilot on the service order. Spilled fuel should be wiped up immediately (appropriate gloves should always be used during refueling and clean-up). When each tank is completed, the refuel cap should be replaced immediately before going to the next tank. Never leave an open fuel tank unattended.
- ◆ When topping off an aircraft fuel tank during summer months, the pilot may request that you leave the fuel level just below the maximum full level. This will allow the fuel to expand, as it warms up in the tank, avoiding overflow onto the ramp.
- ◆ When refueling is completed, rewind the hose, and stow the refuel mat. Stow the nozzle properly to prevent the accumulation of water and dirt. Never lay the nozzle on the ground and always replace the dust caps on the nozzles.

Checking the oil:

- ◆ Locate the oil access door in the cowling. Open the door and locate the dipstick. On some aircraft, the location of the dipstick is different from the filler location.
- ◆ Pull out the dipstick, wipe it clean, re-insert it, and pull it out again to determine the oil level. Repeat the process a second time to verify accuracy. If the oil filler location is different than the dipstick, replace the dipstick. Do not force the dipstick into place.
- ◆ Add the correct type and amount needed to bring the oil to the level ordered by the pilot. Be careful to avoid spillage. Thoroughly wipe up any spilled oil immediately.
- ◆ Check the dipstick a final time to verify that you have added the correct amount. Check the oil filler and the dipstick, and verify that they are properly secured. Be absolutely certain that you

have not left anything inside the cowling. Close the cowling access and check to be certain that it is secured.

Stow and Check:

- ◆ Stow the ladder.
- ◆ Remove the bonding cable from the aircraft.
- ◆ Carefully rewind the bonding cable onto its reel.

Complete the paperwork:

- ◆ Check the delivery meter for the ending reading.
- ◆ Complete the paperwork carefully and neatly.

Perform a final visual check:

- ◆ Perform a visual check of the entire refueling area to verify that all equipment has been removed, and that all refuel caps, oil caps, and access doors have been closed and properly secured.
- ◆ Be certain that the bonding cable has been removed, wing mats and step ladders stowed.
- ◆ Ask yourself, if the aircraft were mine, would I be satisfied with the way the services were performed, and would I feel safe flying it?

5.10.12 Refueling Operations During Thunderstorms: Thunderstorms precipitate lightning strikes over a wide area, and create an abundance of static electricity in the air. Knowing when to stop refueling because of a thunderstorm is a matter of experience and good judgment.

A general accepted safety rule is to stop all refueling operations when a thunderstorm is within Five (5) miles of your airport. Essentially, the storm's distance from the airport, its direction of travel, storm intensity, and level of lightning activity are all factors to be considered in your decision to temporarily suspend refueling operations. The following procedure should be used to estimate the distance to the active thunderstorm:

- ◆ Since sound travels about 1/5 of a mile per second, count the number of seconds between the flash of lightning and the sound (which reaches you) of thunder.
- ◆ Divide the number of seconds by 5 to arrive at the approximate distance to the thunderstorm in miles.

5.11 Aircraft Cleaning

After every flight, each aircrew is responsible for making sure their aircraft is clean and ready for the next flight. If they are pressed for time, you may assist in the cleaning.

- ◆ The windshield and side windows will be cleaned after each sortie. Use a cleaner that is certified for aviation (Plexiglas) windows. Do not use "Windex" or other similar glass cleaning product.
- ◆ The leading edges of the wings, struts horizontal stabilizers and vertical stabilizers, and the nose section of the cowling should be cleaned after each sortie.

5.12 Aircraft Towing

5.12.1 Introduction: If you have a full service FBO, you may not have a choice on how aircraft are moved around on the flight line or in hangars. If you do not have a full service FBO, towing will be one of the primary job duties of the Flight Line Supervisor. To familiarize you with towing safety

rules and towing procedures, this section will illustrate a typical towing operation (step-by-step) in which an aircraft is moved.

5.12.2 Getting Started: The following will get things started in a efficient and safe manner.

- ◆ Determine the best (shortest and safest) route for your towing operation.
- ◆ Be sure there's adequate space at your destination, before moving the aircraft.
- ◆ Be sure that the propeller will not be in the way of the tow bar during aircraft movement. If, necessary, carefully move the propeller (opposite normal powered rotation). Always keep your body out of the propeller arc and never wrap your fingers over the blade. The blade can kick back and cause serious injuries.

5.12.3 Preparing the Aircraft for Towing: One must prepare the aircraft for towing. The following will outline the steps for an efficient and safe preparation for the aircraft for towing.

- ◆ Select the proper tow bar and attach it to the appropriate location on the nose gear.
- ◆ Visually check the nose gear for any turning limit markers and manually check the turn limits for the nose gear by moving the nose gear from side to side. Each aircraft has its own nose wheel turn limit. The "turn limit" is the maximum turning angle of the nose gear. *Typically, the "turn limit" is less than 45 degrees to each side.*
- ◆ Perform a thorough walk-around of the aircraft. Start at the left side of the nose (pilots left) and work your way around the entire aircraft. If possible, look inside to confirm that the parking brake is off. Do not board an aircraft without the permission from the flight crew.
- ◆ Finish the walk-around with a check of the right side of the aircraft. Remove the tie downs and chocks. As you approach the nose of the aircraft, double check the tow bar one last time to ensure that it is securely attached to the aircraft.

5.12.4 Starting the Towing Operation: The following procedures will help you make a efficient and safe transition to the towing process.

- ◆ Smoothly begin to move the aircraft. If it does not move easily, the parking brake may be on. If the brakes are "on", do not proceed any further, Stop and check with the pilot.
- ◆ Once in motion you should keep your eyes moving at all times. Watch the direction in which you are heading, continually checking the wing clearances, and occasionally checking the nose gear.
- ◆ Keep your mind on what you are doing at all times. If someone or something should distract you, stop movement of the aircraft.
- ◆ During wet or icy conditions, adjust your speed to maintain a margin of safety. Always slow your speed down as ramp and visibility conditions deteriorate. Stay within the nose wheel turn limit, and avoid sharp turns or sudden movements.
- ◆ When pulling the aircraft into position, slowly and smoothly bring the aircraft to a stop so that you do not put any unnecessary stress on the nose gear mechanism. A sudden stop can cause damage to the nose gear.
- ◆ Once in place, position the chocks to secure the aircraft. Never remove the tow bar if the aircraft has not been chocked. After chocking always disconnect the tow bar from the aircraft. Return the tow bar to its proper place.
- ◆ Make a final walk around of the aircraft to be certain the aircraft is the way you found it prior to towing.

5.12.5 During the Towing Operations: The following are important considerations during the towing operation.

- ◆ CAP aircraft are to be moved manually, CAP personnel are not authorized to use aircraft towing vehicles.
- ◆ Personnel will never cross tow bar while towing is in progress.
- ◆ Personnel will never ride on the exterior of the aircraft at anytime during towing.
- ◆ Chocks will be immediately available during towing in case of emergency.
- ◆ Personnel should never place themselves in the direct path of aircraft wheels while aircraft is moving.
- ◆ Personnel will always walk in the direction of the towing (never walk backwards).
- ◆ Towing of aircraft is to be only conducted by use of a tow bar.
- ◆ NEVER push or pull an aircraft using the propeller.

5.12.6 Fragile Aircraft Components: Aircraft structures and components are designed to be very lightweight, yet strong and durable during flight operations. During towing, these same components can be very fragile. For example, wing surfaces are engineered to withstand server forces of wind when flying, however, certain portions of the wing could actually be damaged by hand if pushed or lifted in the wrong location. The following areas of the aircraft are very delicate. Use caution when in close proximity to these items.

- ◆ Wing Tips and Tip Tanks.
- ◆ Winglets and Tip Sails.
- ◆ Static Wicks.
- ◆ Rudder and Tail Cones.
- ◆ Trim Tabs.
- ◆ Landing Gear Doors.
- ◆ Pitot Tubes and Angle –of-Attack Indicators, Nose Cones and Radomes.
- ◆ De-Ice Boots.
- ◆ Canards.
- ◆ Wheel Pants.
- ◆ Nose Wheel Brake & Electrical Lines.
- ◆ Communication and Navigation Antennas.
- ◆ All Control Surfaces.

5.12.7 Securing the Aircraft:

- ◆ When positioning an aircraft for parking, it is recommended that all aircraft, regardless of size, be secured with wheel chocks. If no tie down chains or ropes are available, all three landing gear should be chocked.
- ◆ If you accidentally damage an aircraft, no matter how slight, you **must** report it to your supervisor immediately. Unreported aircraft damage is not acceptable and is **extremely dangerous**.
- ◆ The general safety rules previously discussed also apply to hangar operations with the following additional procedures and precautions.
- ◆ Hangars can be very confined areas because most FBOs have limited aircraft space available. Hangar towing requires special care because of the need to park aircraft close together.
- ◆ During hangar operations, use wing walkers as there may be hazards from all sides of the aircraft. These hazards include; wing clearances, tail height and ceiling limits, hangar door openings, and other obstructions such as equipment and vehicles positioned in the area. You must constantly scan the entire aircraft for potential hazards.

- ◆ When moving aircraft over hangar door tracks, avoid stopping the aircraft with one of the main wheels in the tracks. With one wheel in the tracks, it is possible that the aircraft will rotate suddenly. To avoid this problem, maintain a slow and constant speed as you push the aircraft over tracks. Approach the hangar tracks straight on so that each main wheel goes over the tracks at the same time. This is also true when moving an aircraft over icy ruts or heavy snow.
- ◆ Avoid overlapping aircraft wing surfaces. A landing gear strut can collapse or settle causing the wing to drop several inches.
- ◆ Also, avoid putting aircraft surfaces within the propeller arc of another. This reduces the risk of damaging the propeller and it keeps the area clear if the propeller inadvertently rotates.
- ◆ Before moving an aircraft in or out of a hangar, perform a walk-around to check for aircraft damage, and to check that the towing area is clear of other support equipment.

5.12.8 Wing Walker: Since you will be moving aircraft in and out of congested spaces, you should always have another person act as your wing walker.

- ◆ A wing walker is essential, because it is impossible for you to see all the extremities of the aircraft from the tow position. Using a wing walker is most important when pushing an aircraft back into a hangar or another parking spot.
- ◆ As the tow operator, you have the ultimate responsibility for the aircraft. If you lose contact with your wing walker, or you do not understand the directions being given by the wing walker, stop immediately. Verify that you have adequate clearance.
- ◆ If you are working as a wing walker, always maintain eye contact with the tower. The same hand signals that you used to direct a pilot should be used to direct the person towing. Use crisp and distinct hand signals and vocalize the situation if necessary. Do not hesitate to call out “STOP” if you see a problem or are unsure of the clearances.

5.12.9 Tow Teams: Since we do not have tugs, a tow team is necessary to help both the tower and wing walkers to get our aircraft from one point to another. In some cases the tower can move an aircraft by themselves, but help makes the move easier and safer.

- ◆ The tow team will be properly positioned at aircraft push-points.
- ◆ Their only job is to push. This frees the tower and wing walker to doing only their assigned jobs.
- ◆ The tow team will carry chocks during the towing operation in case of an emergency.
- ◆ After stopping, hold the aircraft in position until it is properly chocked.

5.12.10 Towing Safety Rules: Always follow these general towing safety rules.

- ◆ Tow aircraft SLOWLY, CAREFULLY, and STAY ALERT!
- ◆ DO NOT become distracted while towing, STOP moving if someone is talking to you.
- ◆ NEVER assume anything, visually check clearances whenever in doubt.
- ◆ Always CHECK nose gear turning limits before towing.
- ◆ Always choose the SAFEST and SHORTEST towing route.
- ◆ Utilize a “WING WALKER” to assist in the prevention of accidents.
- ◆ DO NOT tow an aircraft that has a RED MAINTENANCE tag attached to the nose gear.
- ◆ DO NOT tow an aircraft with its parking brake “on”.
- ◆ DO NOT tow any aircraft if there is any question in your mind concerning connecting the tow bar, disconnecting the nose gear, turning limits, or any other aspect of the towing operation. CALL YOUR SUPERVISOR.
- ◆ TOW DEFENSIVELY, don’t assume other vehicles will stop for you.
- ◆ DO NOT TOW behind an aircraft with beacon lights on or engines running.

- ◆ When changing directions, i.e., forward to reverse, reverse to forward, always bring the unit to a COMPLETE STOP.
- ◆ DO NOT walk or climb on aircraft.
- ◆ NEVER place any part of any aircraft within the propeller arc of another aircraft.
- ◆ DOUBLE CHECK each aircraft before moving it. Are the power cords unplugged, are tool boxes clear, cowling secure, aircraft not on jacks, tires properly inflated, and is the nose gear disconnected (if required).
- ◆ Use EXTREME caution, tow SLOWLY and keep your head up!
- ◆ At no time shall a tow bar be left attached to an aircraft unless manned by qualified personnel. In other words "IF A TOW BAR IS ATTACHED TO THE AIRCRAFT, A PERSON IS ATTACHED TO THE TOW BAR!". The number one cause of propeller strikes is a tow bar still attached to the aircraft at engine start.

5.13 Aircraft Wheel Chocking

Wheel chocks will be placed fore and aft of the main landing gear or as specified in applicable aircraft manual.

5.14 Aircraft Tie-Down

This will be accomplished according on type of aircraft. When ropes are used, they will be tied to designated mooring fittings on aircraft. Normally a bowline knot will be used to prevent slippage and to provide secure fastening. Just enough slack should be allowed to prevent excessive stress on the wings, fittings and rope due to tires and strut expansion or deflation and to prevent contraction of the tie-down ropes due to moisture or wetness. The mooring points on the ground should be as close as possible directly under the respective mooring points on the aircraft. This diagram shows a vertical anchor using straight link coil chain for connection between the wire rope and aircraft wing. One link on the free end is then passed through a link of the taut portion and a safety snap is used to keep the link from passing back through. Any load on the chain is borne by the chain itself instead of the snap.

The following will review procedures as outlined in CAPR 66-1 (1 February 2000).

a. Storage and Tie-Down. Region and wing commanders are responsible for assuring that all possible preventive measures are taken to safeguard corporate 6 CAPR 66-1 (E) aircraft from wind and weather damage. Aircraft should be kept in a hangar whenever possible. Aircraft parked in the open shall be tied down at the three approved tie-down points (wings and tail) and securely chocked to prevent wind damage. The control lock shall be installed. Aircraft in extended outside storage shall be tied at four points (nose, wings, and tail).

b. Tie-Down Anchors. There are many methods of anchoring tie-downs. Satisfactory tie-down anchors may be constructed as shown in Attachment 3. Variations may be necessary when local conditions dictate.

c. Tie-Down Ropes. Tie-down ropes with tensile strength of 3,000 pounds or greater shall be used. Nylon or dacron tie-down ropes are recommended. Refer to Attachment 3 for rope specifications.

d. Tie-Down Chains. Chains shall not be used directly from aircraft mooring points to an anchor point because of excessive impact loads on wing spars. When chain tie-downs are used, they shall be attached to wire rope anchors as depicted in Attachment 3. Wire rope anchors are constructed of two continuous lengths of parallel wire rope passed through the anchor points. The tie-down chains shall be attached to the wire rope with round pin galvanized anchor shackles. This allows the chains to float along the wire rope to reduce impact loads. Chain links used for tie-down must be at least 5/16-inch

steel and a proof load of 2,720 pounds and breaking load of 5,440 pounds. All fittings must be equally as strong and chains should be secured without slack.

e. Spoilers. In high wind areas, the use of sandbags, or spoiler boards as described in FAA Advisory Circular 20-35C are recommended.

5.15 Aircraft Keys

After each flight aircraft keys should be turned into the flight line operations center. The Flight Line Administration Officer will keep aircraft keys in a safe place, and keep track of their usage per paragraph 3.2.4.

5.16 Last Flight of the Day

After the last sortie of each day aircraft keys and a verbal aircraft condition report will be turned in to the Flight Line Supervisor. The Flight Line Supervisor will then walk the flight line and check for the following:

- ◆ Tie-downs and chocks.
- ◆ Aircraft Control/Gust locks installed.
- ◆ Doors, windows and baggage compartments are locked.
- ◆ All windshields and windows are clean.

6.0 Standard Marshalling Signals

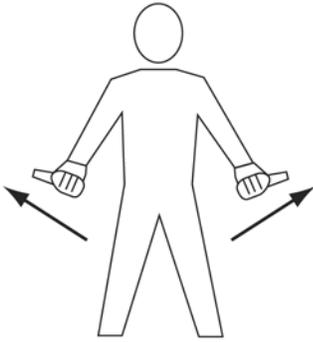
6.1 Introduction

The hand signals taught in this course are universal and are used by all aviation services. REMEMBER some pilots may not be familiar with these signals.

- ◆ These signals are designed for use by the marshaller, using flashing lights when necessary, to facilitate observation by the pilot, and facing the aircraft in a position to the pilots left.
 - For fixed wing aircraft – within view of the pilot at all times.
 - For helicopters – where the marshaller can best be seen by the pilot.
- ◆ The meaning of the relevant signals remains the same if batons, illuminated wands or flashlight's are used.
- ◆ The aircraft engines are numbered, for the marshaller facing the aircraft, from right to left (i.e., # 1 engine being the port or left outer engine).

6.2 Aircraft Marshalling Signals

Marshalling signals are a very important part of any flight line operation, and the knowledge of their meaning by both aircrews and marshaller's are imperative. The following signals will be used on all CAP flight lines to provide a safe environment for both aircraft and personnel.



Outward motion with Thumbs - **PULL CHOCKS**



Circular motion of right hand at head level with left arm pointing to engine. **START ENGINE**



Raise arm, with fist clenched, horizontally in front of body, and then extend fingers. **RELEASE BRAKE**



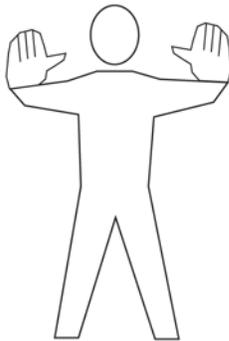
Thumb up **OK or YES**



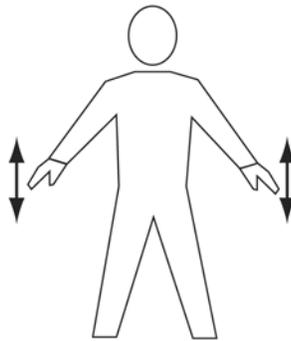
Thumb down **NOT OK or NO**



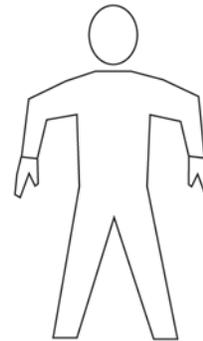
Arms above head in vertical position with palms facing inward. **THIS MARSHALLER**



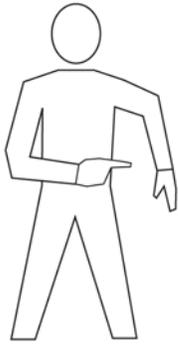
Arms a little aside, palms facing backwards and repeatedly moved upward and backward from shoulder height. **MOVE AHEAD**



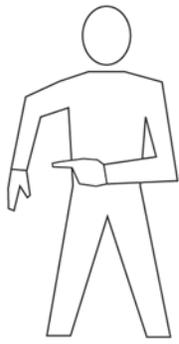
Arms down with palms toward ground, then moved up and down several times. **SLOW DOWN**



Arms extended with forearm perpendicular to ground. Palms facing body. **HOT BRAKES**



Arms extended with forearm perpendicular to ground. Palms facing body. Gesture indicates right side of aircraft. **HOT BRAKES-RIGHT SIDE**



Arms extended with forearm perpendicular to ground. Palms facing body. Gesture indicates left side of aircraft. **HOT BRAKES-LEFT SIDE**



Waiving arms over head. **EMERGENCY STOP**



Right or left arm down, other arm moved across the body and extended to indicate direction of next marshaller. **PROCEED TO NEXT MARSHALLER**



Point right arm downward, left arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn. **TURN TO THE LEFT**



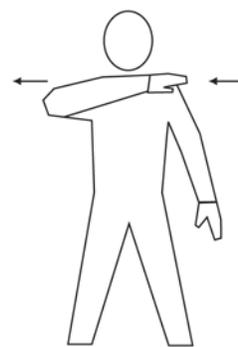
Point left arm downward, right arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn. **TURN TO THE RIGHT**



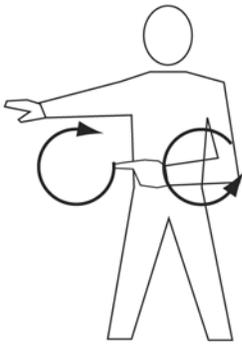
Arms crossed above the head, palms facing forward. **STOP**



Make a chopping motion with one hand slicing into the flat and open palm of the other hand. Number of fingers extended on left hand indicates affected engine. **FEATHER/FUEL SHUT OFF**



Either arm and hand level with shoulder, hand moving across throat, palm downward. **CUT ENGINES**



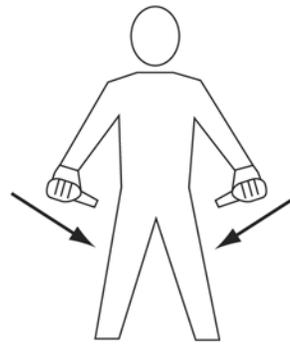
Make rapid horizontal figure-of-eight motion at waist level with either arm, pointing at source of fire with the other.

FIRE ONBOARD

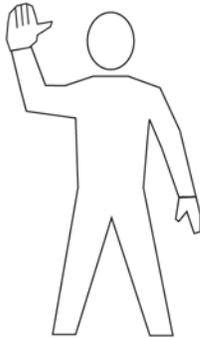


Raise arm and hand, with fingers extended horizontally in front of the body, then clench fist.

ENGAGE BRAKE



Inward motion with Thumbs - **INSERT CHOCKS**



Right arm raised with elbow at shoulder height with palm facing forward.

MARSHALLER FINISHED

7.0 Helicopters

7.1 Introduction

CAP does not own helicopters, but some of our partners do. The Flight Line Supervisor should use Attachment 2 as a reference when needed. This attachment is designed to provide our supervisors with procedures to use around helicopters.

8.0 Risk Management

8.1 How much experience does the flight line personnel have?

- ◆ How many missions have the flight line personnel worked?
- ◆ Of those missions, is this mission a common type or are flight line personnel unfamiliar with the current operations?
- ◆ When was the last time the flight line personnel worked this type of mission?
- ◆ What is your current operations tempo? Are most of the flight line personnel on the flight line at the same time?

8.2 Do you have adequate communications with flight line personnel?

- ◆ Are regular check-ins planned/accomplished for flight line personnel? What is the plan should a flight line member not check-in?
- ◆ Are backup plans in place to communicate with flight line personnel should problems develop (pagers, packet radio, cellular phones, etc.)?

8.3 What is the overall condition of your flight line personnel?

- ◆ Have flight line personnel had adequate rest (breaks)?
- ◆ Are the flight line personnel showing signs of fatigue or sickness?
- ◆ When was the last time flight line personnel were relieved?
- ◆ Have you planned for possible replacement flight line personnel to be brought in for the next operational period?
- ◆ If flight line personnel have been exposed to dangerous working conditions, victims, or other trauma, have personnel been offered counseling or other forms of critical incident stress management?

8.4 What is the overall condition of the vehicles being used on the flight line?

- ◆ Are all vehicles fully functional?
- ◆ Is a mechanism in place to report and correct discrepancies?
- ◆ What condition is the equipment being operated in?
- ◆ Is equipment being operated in ideal/optimal conditions or in a poor environment?

8.5 What kind of weather are flight line personnel operating in?

Are flight line personnel working in extreme cold or heat, or is the temperature comfortable for work?

What kind of travel conditions are flight line personnel working in?

What level of precipitation are flight line personnel being exposed to?

8.6 Have all flight line personnel been adequately briefed so that they can effectively and safely complete their assigned tasks?

- ◆ Are briefing personnel adequately trained to do so?
- ◆ Do briefing personnel have all the necessary information available to brief?
- ◆ Are flight line personnel being adequately debriefed so that future operations can avoid encountering similar problems?

9.0 Appendix

9.1 Marshalling Batons

Marshalling Batons are easy to make, and the following items will give the materials needed, tools needed and directions for making your own batons.

9.1.1 Materials List: The following list of materials is everything you need to make your batons.

- ◆ 1" diameter PVC Schedule 40 plastic pip, 16" long (2 per person).
- ◆ 1" PVC pipe end cap (2 per baton).
- ◆ 3/16" diameter nylon cord (parachute cord), (15" per baton).
- ◆ International Orange or Yellow or Lime Yellow spray paint (A/R).
- ◆ 600 Grit Sand paper.
- ◆ Clear spray paint (A/R).
- ◆ (Optional) Reflective Tape (A/R).
- ◆ PVC pipe glue and primer (A/R).

9.1.2 Tools Needed: Only two tools are needed, and they are listed below.

- ◆ Hack saw with blade or PVC pipe cutter.
- ◆ Drill with 11/32" drill bit.

9.2.3 Directions: Follow these simple directions to complete your batons.

- ◆ Cut pipe to length.
- ◆ Sand each pipe with 600 grit paper.
- ◆ Prime and glue 1 end cap to pipe.
- ◆ Drill 3/16" hole in center of end cap.
- ◆ Double nylon cord through hole and secure with overhand knot, making loop
- ◆ Prime and glue end cap.
- ◆ Paint batons international Orange or Yellow or Lime Yellow.
- ◆ (Optional) Apply reflective tape to ends of baton.
- ◆ Paint with clear spray paint.
- ◆ NOTE: Can buy the Yellow batons from Sporty's Pilot Shop (1-800-LIFTOFF), also a nylon holster for batons.

9.2 Needed items

- ◆ Ear Muffs from the following.
 - Rutland Tool & Supply.
 - Home Depot.
 - Global Industrial Equipment.
- ◆ Orange Safety Vest.
 - Home Depot.
- ◆ Lab Safety Reflective Tape.
 - Global Industrial Equipment.
 - Rutland Tool & Supply.
- ◆ Safety Glasses.
 - Global Industrial Equipment.
 - Rutland Tool & Supply.
 - Home Depot.
- ◆ Night Lights.
 - Radio Shack.

9.3 References

- ◆ Civil Aviation Orders Part 20, Section 20.3, Issue 3, Appendix 1 Marshalling and Parking of Aircraft.

- ◆ Air Force Occupational Safety And Health (AFOSH) 127-series.
- ◆ Air Force Instruction (AFI) 11-218, 26 May 1994, Aircraft Operation and Movement on the Ground.
- ◆ Helicopter Safety – Air Rescue 85, Broward County Fire Rescue Dispatch.
- ◆ Aircraft Armanent System Journeyman, Third Volume CDC2W151B, aircraft fundamentals.
- ◆ Air Force Occupational Safety And Health Standard (AFOSHSTD) 91-100, 1 May 1998.
- ◆ California Wing Aircraft Marshaller's Guide.
- ◆ March Field Composite Squadron 45 Guide.
- ◆ Western Operations, Inc. Helicopter Division, Mr. Robert W. Spencer, Vice-President.
- ◆ CAPR 60-1.
- ◆ CAPR 60-2.
- ◆ CAPR 60-3.
- ◆ CAPR 66-1.
- ◆ Aircraft Rescue and Fire Fighting (Fourth Edition).
- ◆ FAR/AIM 2003.

Attachment 1

National Head Quarters, Civil Air Patrol Fire Training Requirements

The following training requirements must be accomplished before you can be signed off as a marshaller.

Member Name (Print)

CAPID

Date
Completed

The Fire Triangle

Properties of Fire

The Fire Tetrahedron

Extinguishing Principles

Classification of Fires

Extinguishing Agents

Personal use of a Fire Extinguisher (???)

Fire Fighting Procedures

General Safety

Print Name

Print Name

Fire Safety Professional Signature

Commanders Signature

NOTE: These training requirements can be completed on a mission or in a class. Just enter the date and turn into your commander after being signed off by a qualified fire safety professional. A copy of this form should remain in the members personnel file as proof of training.

Attachment 2

Helicopters

Introduction

CAP does not have helicopters, but some of our customers do. This attachment is designed to briefly update our supervisors on helicopter operations, and what to do if needed.

Helicopter Hazards

Helicopters generate lift through the rotation of the main rotor system, so this can pose a completely different hazard. When the rotor is turning at flight rpm, the rotor disc can be a lethal hazard for the unwary. Additionally, some types of helicopter design incorporate a tail rotor that is mounted at the rear of the aircraft and operates at a speed that makes the tail rotor very difficult to see. The accompanying figure shows the possible hazard areas typical to helicopters when the engines are operating.

- ◆ When the helicopter is landing or taking off, the air circulated through the main rotor moves downward and outward and will cause any dirt, debris, ball caps, or loose items to be blown around. In addition to the missile hazards this creates, eye injuries can result. Personnel directing aircraft movement should be well outside the rotor arc and wear appropriate protective clothing and equipment.
- ◆ All rotor blades have a small amount of flexibility in their design and may flex down low enough to be dangerous to anyone standing or walking within the rotor arc. Normally, the centrifugal force created by the rotor turning at normal rotational rpm is sufficient to keep the blade disc up, but when the helicopter is starting up or shutting down, additional hazards are encountered. If the helicopter is using a surface that is not level, the rotor disc on the uphill side of the aircraft can be closer to the ground, creating an additional hazard.
- ◆ Helicopters normally land and takeoff into the wind. If the helicopter has to use another direction, the possibility exists for a reduction in directional stability. If the helicopter yaws to face the wind line on takeoff or landing, personnel on the ground should be well aware of their vulnerability to rotor wash, debris and the actual tail rotor itself. It is best to be positioned well outside the landing zone area, at least a full helicopter length away from these areas.
- ◆ Any loose objects in the vicinity of a helicopter-landing zone can cause FOD (Foreign Object Damage). This FOD can cause injuries to people near the landing zone and to the helicopter itself. Light objects such as paper, plastic bags and ball caps can be ingested into a turbine engine intake. Sand and gravel can cause premature erosion of the landing edge abrasion strips of the main and tail rotor of the helicopter. This erosion can also occur in the compressor section of the turbine engine. Sand and dust can clog the air filter of piston-powered aircraft. If the landing zone is very dusty, wetting down the area is recommended.

Landing Zone

In the event that no landing zone (LZ) is located and a helicopter needs to land, keep in mind several things:

- ◆ The LZ should be set up as to facilitate takeoffs and landings into the wind.
- ◆ If the Flight Line Officer is not sure of the wind direction or of which direction the helicopter should approach from, then he/she should wait until the helicopter is in the area and confer with the air crew on this decision.
- ◆ The approach and departure ends of the LZ should be clear of obstacles (any object >40 feet tall that is within 100 feet of the LZ).

- ◆ Debris such as wood, cans, plastic, should be removed from the LZ. Flying debris can do damage to both the helicopter and personnel on the ground.
- ◆ To minimize the hazard of blowing sand and dust, the LZ (may be hosed down as necessary).
- ◆ Once the helicopter has landed and after the rotor system has been shut down a Marshaller should be posted as a tail rotor guard. Unless the flight crew has been briefed ahead of time, they may get nervous about someone moving out of their field of vision while the blades are turning. They will remain at this post until the helicopter is ready to depart.
- ◆ No unauthorized personnel shall be permitted to approach the helicopter.
- ◆ Once the helicopter has landed, the Flight Line Officer should confer with the aircrew as to the helicopter's departure.

Positioning

- ◆ The marshaller will stand at the outer edge of the LZ perimeter on the windward side, with his/her back to the wind.
- ◆ Remain in eye contact with the pilot at all times.
- ◆ DO NOT approach the helicopter; remain vigilant at your post.
- ◆ ONLY after "ALL CLEAR" signal has been given by a helicopter crewmember should anyone leave or approach the aircraft.
- ◆ Whenever approaching or leaving the helicopter with the blades rotating, all personnel shall remain near the front so the pilots or helicopter operator can see you at all times.
- ◆ While approaching or leaving keep your head down at all times. The slower the rotor blades are turning, the lower they will dip towards the ground, so keep in a low crouched position.
- ◆ NO unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.
- ◆ Keep long-handled tools, litters, radio antenna, and similar items away from rotor blades.

Equipment

- ◆ Goggles and earplugs should be worn.
- ◆ Wand flashlights, if getting dark or at night.
- ◆ DO NOT use road flares. DO NOT shine spotlights or headlights at the helicopter or into the LZ. The pilot will utilize the "night sun" to light up the LZ as needed. Shinning lights or strobes at the LZ may cause vertigo, night blindness or seizures of the pilot.

Night Helicopter Landings at Unlighted Facility

- ◆ Beware of any hazards such as power lines, fences, trees, etc., that the pilot may not be able to see.
- ◆ Park vehicles with low beams on approximately 40 to 50 feet from helicopter landing area offset from helicopter approach route.
- ◆ Never shine lights at helicopter because it may blind the pilot.