STATE OF ARIZONA ● EMERGENCY MEDICAL SERVICES AND TRAUMA SYSTEM

Curriculum for Helicopter Scene Safety - Arizona

Course Description

This course is designed to provide instruction in helicopter scene safety for EMS providers.

Prerequisites

None.

Methodology

The student should receive at least 1.0 hour of lecture or self-review.

Instructor

It's recommended the instructor have experience in aviation processes and procedures.

Equipment

No equipment needed**.**

Course Competencies:

Upon completion of the course, the student should be able to clearly understand scene safety elements when working with helicopters.

Course Outline

1. Terminology and Definitions
2. Situational Awareness
3. Dispatching Considerations for Helicopter Ambulance
4. Establishing Landing Zones
5. Guidelines for Visual Markers
6. Ground Security
7. Tail Guard
8. In-Flight Communications
9. Patient Packaging
10. Approaching the Helicopter
11. Loading the Patient
12. Lift Off Communications

13. Hospital Hot Load/Off Load Situations
14. Quality Improvement
15. Final Safety Tips
16. Appendix (pictures & drawings of commonly used aircraft)

1. Terminology and Definitions

Brown Out / White Out - A condition of reduced visibility due to blowing dust, blowing snow, or other debris, usually from the helicopter's rotor wash, which impairs the pilot's ability to land safely.

Cold Off Load/Loading - Unloading or loading of patients into or out of the helicopter while rotors are stopped and engine is shut down.

Hot Off Load/Loading - Unloading or loading of patients into or out of the helicopter while rotors are turning and engine is running.

Flight Crew Member / Air Medical Crew - Any of the medical crew personnel on board, including the Pilot, Paramedic, or Nurse.

LZ (Landing Zone) - The area where the helicopter will land.

Landing Zone Commander – The person who is in Command of the Landing Zone.

"Go-Around"- The universal phrase for an aircraft to abort an approach or landing and climb to a safe altitude.

HazMat – Hazardous materials.

Main Rotor - The main spinning blade on top of the aircraft.

Skids - The gear the helicopter sets down on. These could be fixed rails (skids) or retractable wheels.

"Stop! – Stop! – Stop!" – A command used by some Air Ambulance providers to cease and hold the helicopter where it is and to wait for further instructions. This command is used when there is immediate danger to the aircraft and/or crew and it may be too dangerous for the pilot to proceed in a "***Go-Around***" maneuver.

Rotor Down Wash (Rotor Wash) - The wind generated by a helicopter's main rotor blades while the helicopter engine is running. Rotor wash winds can approach hurricane force of 120 mph or more and are the most extreme during take-off and landing maneuvers.

Tail Guard - A person positioned toward the aft of the aircraft to prevent personnel, including other responders and bystanders, from approaching the helicopter from the rear.

Tail Rotor - The small spinning blade at the tail of the helicopter. (The RPM is generally 4 times faster than main rotor blade). The spinning tail rotors are generally invisible and pose an imminent hazard to personnel in close proximity.

Visual Markers – Indicators that may be seen by the Pilot of the aircraft to aid in the identification of the Landing Zone and/or hazards.

2. Situational Awareness

Situational Awareness is defined as the ability to manage multiple tasks while maintaining awareness of all risks in and around the aircraft. To safely utilize a medical helicopter requires coordination, communication, and comprehension between the ground and air crews to ensure that all parties have an appropriate level of situational awareness.

- **Coordination**: The Landing Zone Commander must ensure that preparations for landing the helicopter are completed in a safe, effective, and timely manner. The Pilot must ensure that the aircraft and flight crew are prepared to land and lift off in a safe manner.

- **Communication**: The Pilot must have sufficient visual and verbal communication from the Landing Zone Commander so that he/she can safely land/liftoff the aircraft. The Landing Zone Commander must be aware of any limitations, concerns, or needs of the Pilot to ensure that the Landing Zone is adequately prepared. Communication must be sufficient to accomplish these tasks but should be limited in nature so as not to unnecessarily distract the Pilot's attention.

- **Comprehension**: The ground crews must understand the flight crew's need to limit distractions during the critical phase of flight – the five minutes before landing. Radio communication must be limited to instructions from the Landing Zone Commander about scene hazards. Patient information should never be communicated during the landing phase.

3. Dispatching Considerations for Helicopter Ambulance

The list below includes information that should be provided to the Pilot:

- Local area weather conditions;
- Wind direction and speed, if possible;
- Number of aircraft responding to the emergency;
- GPS coordinates of the Landing Zone;
- Main crossroads or other identifiable landmarks;
- The radio frequency assigned for the LZ;
- Identification of the Landing Zone Commander;
- Disclosure of other aircraft that refused the response.

4. Establishing Landing Zones

The selection of an appropriate Landing Zone is of critical importance in all field situations. The Landing Zone must be located and identified for the Pilot in all situations. The Pilot has final authority in accepting the identified LZ.

The recommended surface selection hierarchy is as follows:

1. Pre-identified LZ (established and pre-approved "official" Landing Zones)
2. Concrete – (preferred)
3. Asphalt – (helicopter skids can sink into asphalt during hot summer months)
4. Grass – (great surface as long as it is fairly level and not too wet)
5. Compacted dirt / compacted snow (dirt lightly moistened to control dust)
6. Dry, loose dirt/sand (heavily moistened to control dust – least favored due to potential brown-out conditions)

The Landing Zone must be relatively flat and free of obstructions for an area of at least 100' x 100' for each helicopter. All bystanders, vehicle traffic (including emergency vehicles), and animals must be kept a minimum of 200 feet away from the Landing Zone. The area should be considerably larger for multiple helicopters or a larger sized aircraft, such as military helicopters. The military usually requests 200' x 200' for each helicopter. In the center of the Landing Zone, a 60' x 60' "touch down" area should be identified with appropriate visual markers. The person communicating with the Pilot should stand at the front right corner (as seen by the Pilot) of the touch-down area. A visual check should be made for overhead wires, poles, towers, and similar obstructions. Any obstructions noted must be communicated to the Pilot before he/she commences the approach. The Pilot can then assess the obstruction.

The approach and departure paths must be free of obstructions. Because helicopters generally approach and depart into the wind, wind direction and speed will determine the approach and departure path of the aircraft. Plan the Landing Zone location down-wind from the emergency scene except during Hazardous Materials incidents or smoky conditions; in which case an upwind location would be preferred. In addition, approach and departure paths should not pass over a treatment area, Command Post, or other activity areas where noise and rotor wash would cause problems. The Landing Zone should be located at least 100 yards from these and other activity areas. The Landing Zone and surrounding area must be free of small objects that can be blown around by rotor wash. Check for metal objects and secure loose clothing or blankets.

Once a helicopter has landed, the Pilot may elect to shut down the engine for added safety in the Landing Zone. While the helicopter is on the ground, whether running or not, a "Tail Guard" should be stationed 50 to 100 feet from the tail rotor to keep the area secured. **At no time should personnel pass between the "Tail Guard" position and the tail rotor of the aircraft.**

Daytime guidelines:

- Minimal area: 100 X 100 feet;
- The bigger the better;
- Use appropriate visual markers;
- Pilot has final authority.

Nighttime guidelines:

- Minimal: 150 x 150 feet;
- The bigger the better;

- Use appropriate visual markers – coordinated with the flight crew;
- Additional lights should be used to illuminate LZ obstructions, as needed. (Do not point lights at aircraft);
- The use of white lights can affect Night Vision Goggles;
- Pilot has final authority.

Nighttime guidelines with Night Vision Goggles (NVGs):

- Minimal LZ illumination is needed;
- Red lights are visible from great distances;
- The use of appropriate visual markers will help reduce glare as seen by the Pilot.

5. Guidelines for Visual Markers

Guidelines for visual markers are described below:

- **Day Time Operations:**
  - ***LED Strobe Lights*** – White - Put directly in the center of the LZ;
  - ***Emergency Flashers*** – Fire, EMS, or Police vehicles. These vehicles need to be located outside of the LZ and used to identify corners and sides of the LZ;
  - ***Cones*** – Should be weighted down and mark corners of LZ.
  - Note: Lit flares **ARE NOT** recommended due to the potential fire hazard.

- **Night Time Operations:**
  - ***LED Strobe lights*** – Red, Blue, Green, or White. If multiple strobes are used, mark corners of LZ and notify Pilot of which color strobes marks the center or front of LZ.
    - If only one strobe light is used, place in center of LZ.
  - ***Emergency Flashers*** – Fire, EMS, or Police vehicles. These vehicles need to be located outside of the LZ and used to identify corners and sides of the LZ;
    - Note: Emergency vehicles can also be used to park under power lines and communicate that information to the Pilot.
  - ***Vehicle Head Lights***: Vehicles placed outside LZ with head lights on LOW beam can be directed into the LZ. Pilot may request the lights be turned off once the LZ is identified.
  - ***Spot Lights***: Can be used to point out obstacles or LZ site and should never be pointed directly at the aircraft, Pilot or crew. The lights should be turned off once the Pilot confirms obstacles or LZ.

6. Ground Security

The entire Landing Zone must be secured prior to the aircrafts arrival. Four corners of security is highly recommended to ensure maximum safety. Spectators and traffic should be kept at least 200 feet from the aircraft. Once the helicopter has landed at the Landing Zone, there should be no vehicle movement within that area, including EMS vehicles.

The Tail Guard should be positioned 50-100 feet to rear of the tail rotor. The Tail Guard's main responsibility is to secure the sides of the aircraft from any hazards; either stationary or approaching. (See the Tail Guard section for more information)

7. Tail Guard

As mentioned previously, the Tail Guard is the person assigned to guard the aft of the aircraft in an effort to prevent any personnel, including other responders and bystanders, from approaching the helicopter from the rear. Additional specific requirements for this important duty include the following:

- The Tail Guard's responsibility is to ensure that no individual or hazard can approach the aircraft from the rear and shall maintain visual control without facing towards the aircraft when possible;
- The Tail Guard should be selected by the Landing Zone Commander and should have specific training;
- The Landing Zone Commander should notify the Pilot that a Tail Guard has been assigned;
- The Tail Guard must have and maintain radio communication with the Landing Zone Commander;
- The Tail Guard should wear head, eye, and hearing protection, at a minimum;
- The Tail Guard should remain on-post until released by the Landing Zone Commander.

8. In-Flight Communications

Air-to-ground communications should be used whenever possible to provide landing instructions to approaching helicopters. During descent and landing activities, communication should be limited to essential information in order for the flight crew to execute a safe landing. Additional communication should include whether the Landing Zone has been wetted and the identification and deployment of a Tail Guard.

If a hazard is or becomes present as the aircraft approaches, the Landing Zone Commander can use the phrase **"Stop!-Stop!-Stop!"** or "**Go-Around**". As indicated earlier, the "Stop" command means to immediately cease inbound movement and hold the helicopter where it is and wait for further instructions. This is used when there is immediate danger to the aircraft and/or crew. The "Go-Around" phrase means to power up, gain altitude, and go around the Landing Zone.

Sterile Cockpit is a term that describes a period of time when Pilot should only transmit and receive vital flight safety information to minimize distractions during a critical phase of flight. It is recommended that a Sterile Cockpit is maintained 5 minutes out, below 300 feet AGL, or based on Pilot discretion. During this period, no external communications are permitted by the medical team and no patient information is transmitted. The Pilot will announce to the medical crew members when Sterile Cockpit will begin and when it will end. It is also recommended that during the Sterile Cockpit period, at least one crew member should maintain outside vigilance during the critical phases of flight, regardless of the patient's clinical situation. This crew member should view outside the aircraft on the side opposite the Pilot and communicate any pertinent information to the Pilot.

9. Patient Packaging

Proper patient packaging increases safety of the patient, crews, and the aircraft. The patient should be packaged according to his/her injuries with a typical trauma patient having a c-collar applied and then being secured to a long-board. It is important that no straps are left dangling as the straps may catch on the aircraft loading mechanism. An oxygen bottle may be secured between the patient's legs so it can be easily removed when the helicopter crew switches the oxygen supply.

Care should be taken with any IV tubing and catheters for scene calls as well as interfacility transports. All tubing should be easily seen and not be underneath the patient. All tubing should be easily traceable from the patient to the origin.

The patient should be loaded into the aircraft (rotor-wing) feet-first, so the legs and feet must be properly secured to limit movement during flight. Many air medical crews will affix netting over the patient's feet to accomplish this as the patient's feet will be within striking distance of the Pilot. The restriction of the patient's legs may be uncomfortable but is needed for safety. The application of a traction splint may prevent the patient from being transported via rotor-wing aircraft as the splint may be too long to fit in the aircraft. The patient cannot be loaded head first as the patient's airway must be visible at all times in order to be properly monitored.

10. Approaching the Helicopter

Personnel involved in loading activities should never approach the helicopter without being escorted by a member of the flight crew. They must remain approximately 50 feet from the aircraft and wait for the flight crew to approach them. Because different types of helicopters have specific safety and loading protocols, specific safety and loading information will be communicated to the affected landing zone personnel at this time.

11. Loading the Patient

Only personnel trained in EMS helicopter operations should assist the flight crew with loading a patient into the helicopter. After the patient is loaded, the flight crew should escort ground personnel to a safe area away from the aircraft, usually the same way or direction that the personnel were escorted to the aircraft. The flight crew member will then return to the aircraft, secure the bay doors, and allow the Pilot to begin departure activities.

The following list contains additional safety guidelines for loading a patient:

- Loading and unloading of the helicopter will be at the direction of the flight crew;
- Enter only when escorted by the flight crew;
- No loose items: hats, sheets, etc.; check under the gurney as well;
- No IV poles or other items held high;
- The rotors are very loud, thereby making communication difficult;
- Maintain control of the stretcher to avoid aircraft damage;
- Exit to a safe area when escorted by a flight crew member.

12. Lift-Off Communication

The Landing Zone area should be maintained for the first few minutes after departure. Radio contact between the Landing Zone Commander and the Pilot should also be maintained for two to three minutes after departure of the helicopter in case an in-flight emergency develops and the Pilot requests to return to the Landing Zone.

13. Hospital Hot Load / Off Load Situations

All loads and off-loads should be conducted as "Cold" unless extenuating circumstances, such as patient/pilot condition or ground conditions, etc., require otherwise.

For rare situations where hot off-loads are required, particularly at a hospital, hospital staff shall not approach the helicopter unless:

- Deemed necessary by the flight medical crew;
- Requested by the flight medical crew;
- A flight crew member escorts hospital staff to the helicopter.

14. Quality Improvement

It is not uncommon that a medical crew participating in the transfer of patient care to another medical crew will have questions or even disagreements on some aspect of the interface. This is not limited to the utilization of a helicopter for scene transport. Typically, these situations arise from a simple misunderstanding that can be easily rectified with a follow-up call between the participating crews.

Occasionally there may be questions associated with time frames or operations that may be better resolved by involving the agency managers or the regional EMS Council. It is important to remember that a call that results in a helicopter transport is likely to involve a patient with potentially severe illness or injury. It is never appropriate to enter into discussions or activities that will detract from patient care, packaging, or transport while on scene.

Any "opportunities for improvement" for any of the helicopter transportation processes (from preparing the Landing Zone to lift-off) should be communicated through regular communication channels with all persons involved. This will allow for effective and sustainable continuous improvement activities. It is important to share "lessons learned" and take actions to improve the safety and efficiency of this critical operation.

15. Final Safety Tips

- Approach and depart the helicopter only when escorted by flight crew members;
- At no time should personnel approach the tail area of any helicopter, unless assigned the Tail Guard duties;
- Maintain a safe distance from the spinning tail rotors of the aircraft, which are generally invisible and pose an imminent hazard to personnel;
- It is recommended that Landing Zone personnel utilize eye protection or helmet face shields and hearing protection.

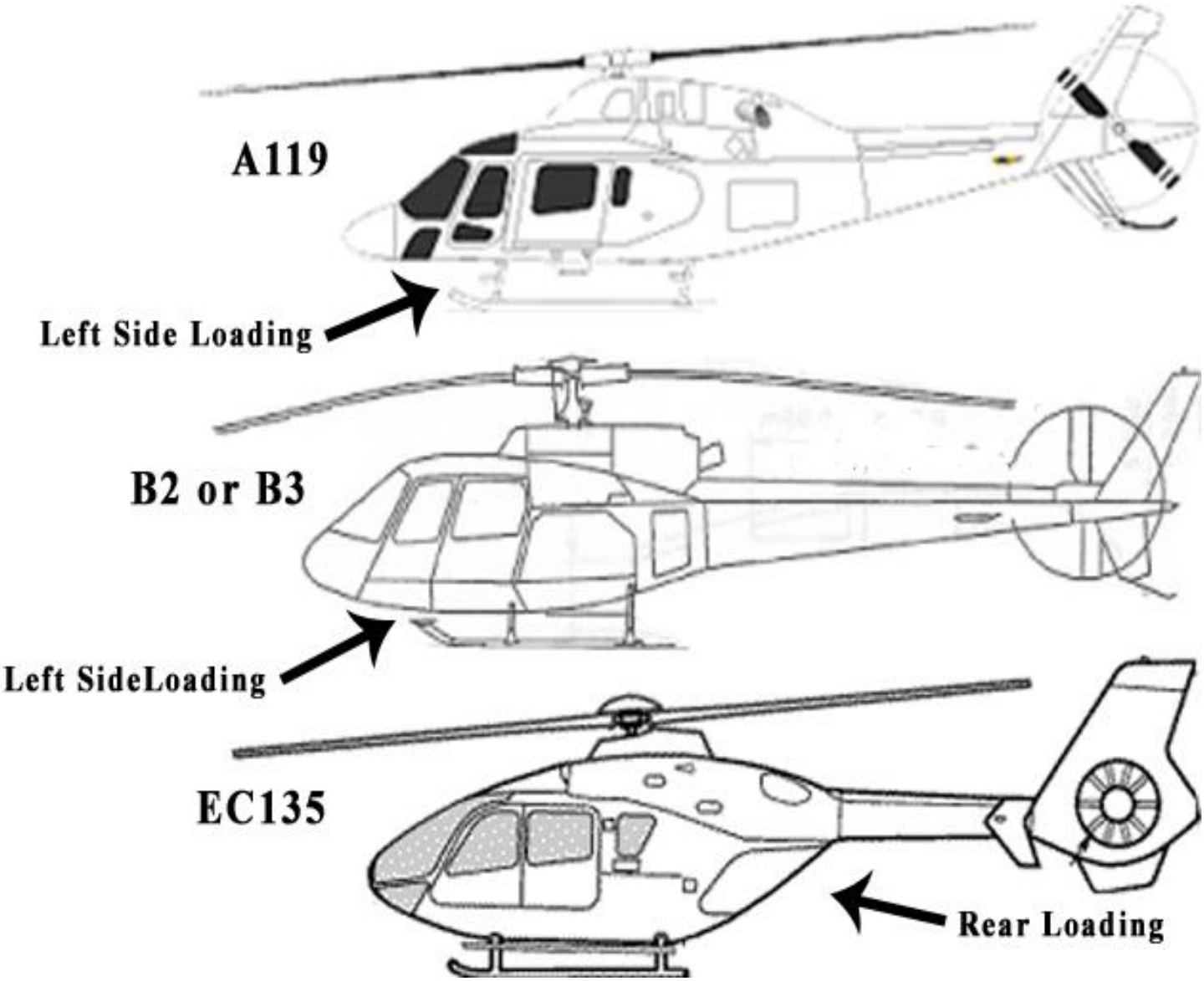
- Keep landing areas clear of loose articles that may "fly" in the rotor down wash - small objects and clothing (caps, jackets, etc.) can be blown around easily. Do not grab or chase articles blown away by the rotor wash;
- Do not throw items anywhere in the landing zone area;
- Multi-helicopter scenes require close coordination and additional training and resources to operate safely and effectively.

16. Appendix

The following pictures and diagrams are various types of aircraft that you may encounter:

A119

B3


A119
Left Side Loading
B2 or B3
Left SideLoading
EC135
Rear Loading