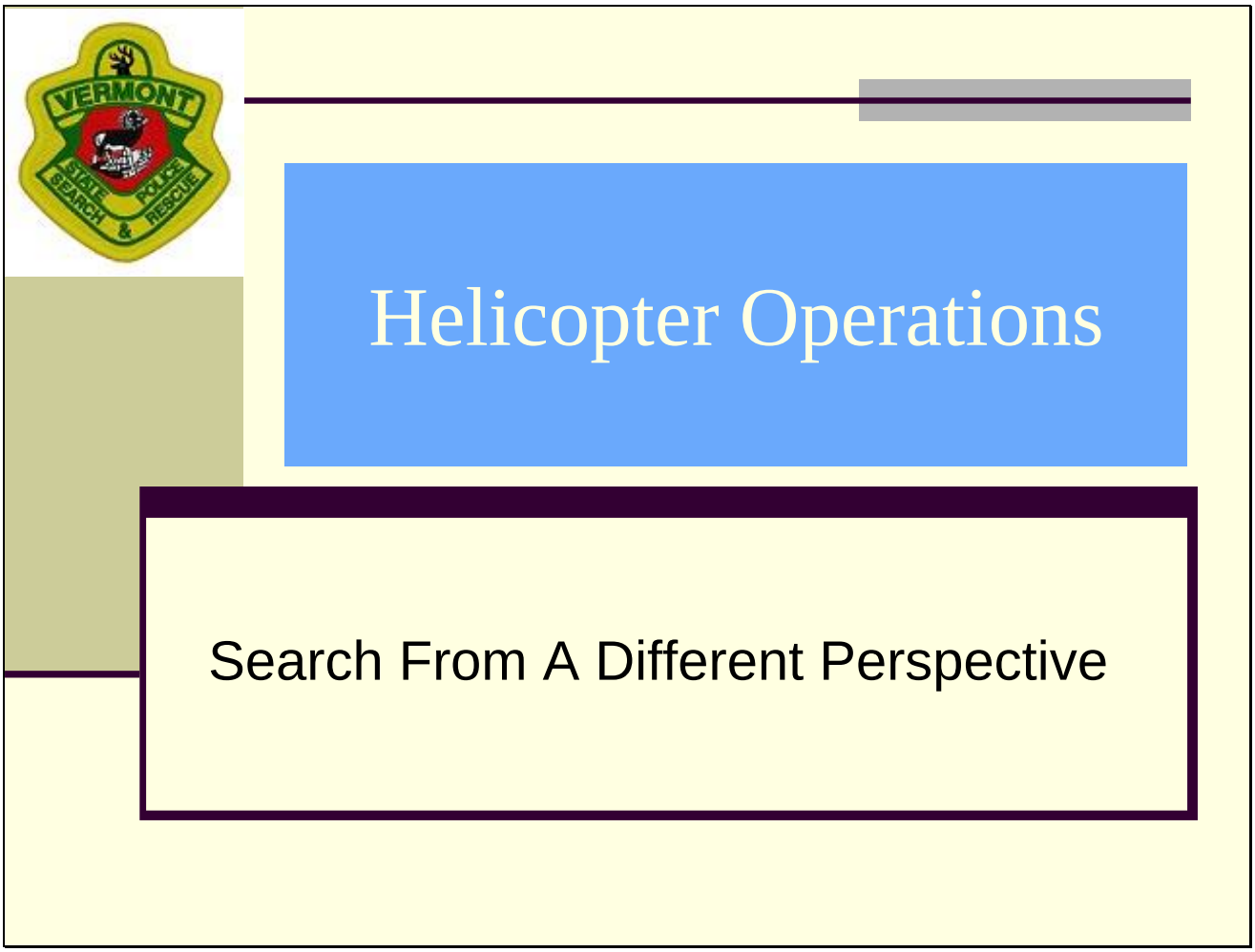


Helicopters have long been recognized as valuable assets in SAR Operations. They require much less space to land than other aircraft but still have very strict safety guidelines for landing or even hovering to pick up an injured individual.

As with other assets, there are risks associated with their use. This lesson will help you in understanding more about rotary wing aircraft and will help you understand their effective and safe deployment in a rescue scenario.

Effective but Higher Risk

- Overhead view
- Control of forward speed
- Reach and transport victim faster

Rotary wing aircraft provide several valuable contributions, not the least of which is an overhead view of the search area. Some helicopters are equipped to provide lighting at night that further enhances their effectiveness. Some helicopters are equipped with FLIR (Forward Looking Infrared) sensors. These units are highly sensitive and able to portray shaped temperature differences compared to the ambient temperature. Oftentimes FLIR is used at night because there is a larger difference between environmental temperature and the body temperature of persons on the ground. There will also typically be fewer searchers in the field to confuse the findings.

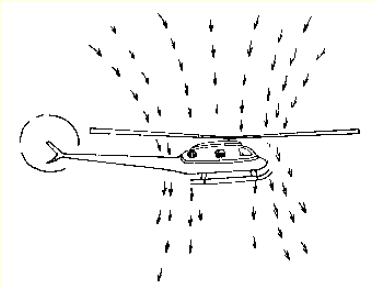
The helicopter's ability to control its forward speed and land in very limited areas is a huge benefit to SAR.

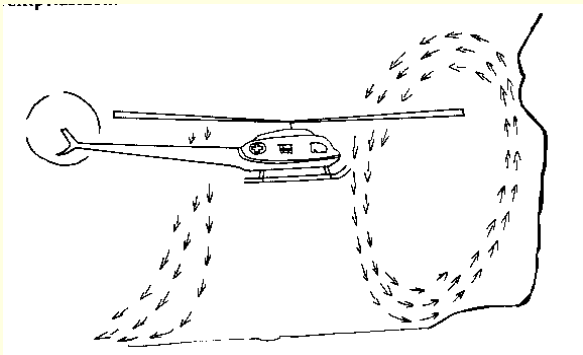
You may see several different configurations of helos searching as several agencies may participate in searches in Vermont.

Most commonly the Vermont National Guard, Customs and Border Protection or private medical helicopters from UVM Medical Center or Dartmouth Hitchcock (DHART) are utilized.

Effective but Higher Risk

- Limited to good weather flying for the most part
- Complicated machinery with limited ability to survive mechanical difficulty or pilot error



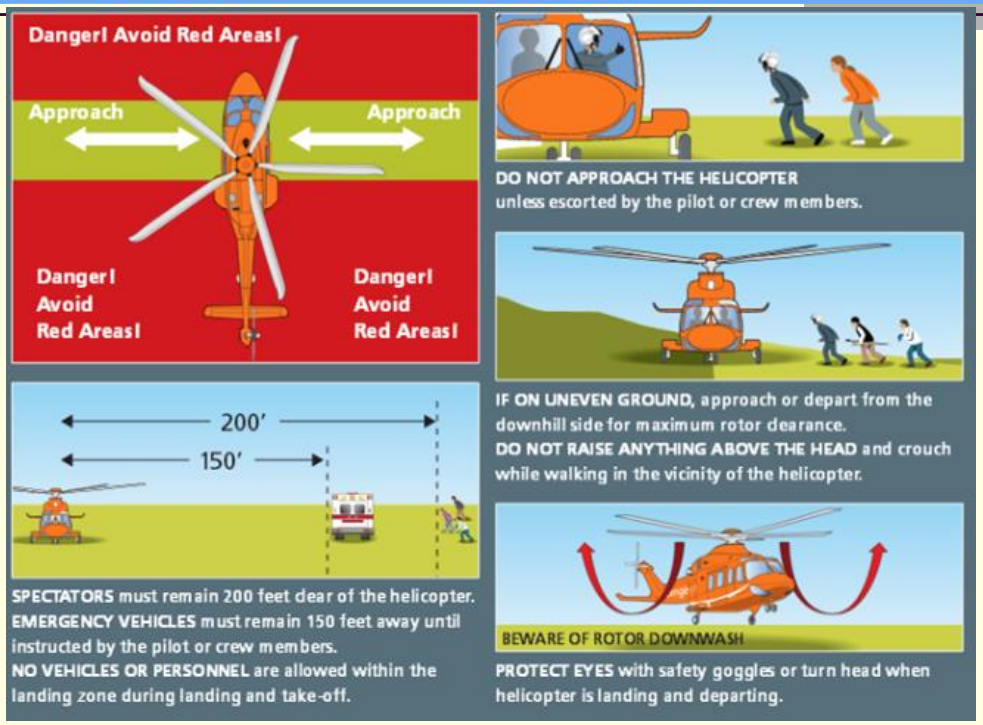


The aerodynamics that make the helicopter excellent for SAR work adds some limitations as well.

They are highly precise mechanisms and often are limited to good weather operations. Because of this mechanical complexity and the otherwise non-aerodynamic configuration of the aircraft, there isn't much room for failure or error.

The illustration on the slide gives some idea of the types of issues pilots may face, comparing normal airflow (on left) to the type of disruption that occurs working near cliffs (on right). Hovering to connect to a litter and lift it to the aircraft can become much more complicated with gusty or otherwise unpredictable winds. Likewise when landing or hovering a great deal of material from the ground is blown around and can be ingested into an engine or strike searchers or the aircraft causing damage.

General Safety Information



This diagram illustrates some of the general safety information that is important when working around helicopters.

Subsequent slides will go in to more detail.

Risk to SAR Personnel

When they are on the ground

- Main rotor
- Tail rotor

When they are airborne

- Objects on ground & particles blown by downwash
- Static Charge from winch cables

It is helpful to break down the potential dangers to ground and airborne resources.

While the aircraft is on the ground, the obvious danger is from both rotors. They travel extremely fast and will act like a fast-moving knife slicing through anything they hit, including ground personnel. It is often very difficult to tell where rotors end and how much they are dipping toward the ground.

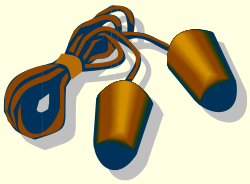
DO NOT APPROACH THE AIRCRAFT UNTIL TOLD TO BY A CREW MEMBER AND THEN STAY LOW (HUNCHED OVER)!

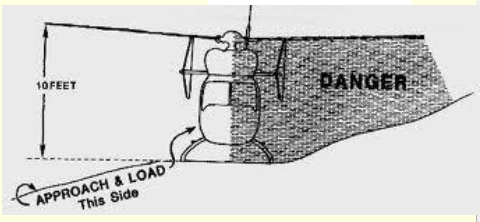
The closer to the ground the aircraft is, the more likely that noise and debris being kicked up will become a hazard. Be very careful to clear areas used for low-hover or landing of items such as packs, hats, jackets, gear, etc. because these can easily be a hazard to both you and the helicopter.

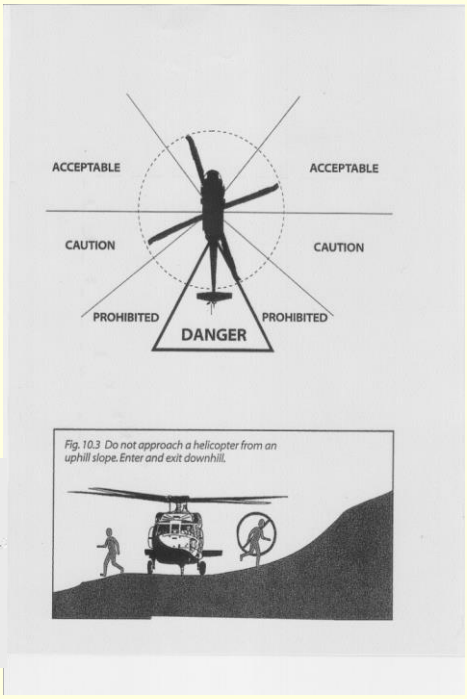
Winching cables represent a hazard to ground forces – **ALWAYS** allow them to hit the ground before touching them. They can and often do build up immense static electricity charges and also may swing around dangerously. If you contact the cable before the cable touches the ground you become part of the circuit to the ground and get a shock, likewise if it swings into you and hits you… well it could hurt.

Safety Procedures

- Eye and Ear Protection
- Approaching the Aircraft
  - Only when signaled!
- Leaving the Aircraft
  - When told







This slide shows the basic safe and dangerous areas when approaching the helicopter. This is so critical as to require repeating:

DO NOT APPROACH THE AIRCRAFT UNTIL TOLD TO BY A CREW MEMBER AND THEN STAY LOW (HUNCHED OVER)!

When approaching come in from the forward quarters as shown in the diagram to ensure the flight crew sees you.

When a helo lands on an uneven slope or near a slight rise extra care must be taken to approach from the downhill side to give yourself as much clearance as possible from the rotors.

Every ready pack should include ear and eye protection as you never know when starting out on a search if you will be working under a helo that day.

Both hearing and eye protection are critical when working under or near a helo.

Safety Procedures

- Loading the Helicopter
- Assisting with Patient Loading
- Hoisting Operations

Do not touch the cable before it touches the ground!

If asked to assist with patient loading much will depend on the conditions. If it is a one-skid load (semi-hovering) you must be particularly careful to follow the directions of the flight crew as to appropriate procedure. In a both skid with engine running load it is also very important to remember that the rotors are moving – this is a hazard from a safety perspective because of the rotors and debris. Remember, the hazard is to you and to the patient. The third, and much more common type of load is an engine-off ground load, where the helicopter is shut down before you approach.

Remember during hoisting operations that cables swing and hoisting devices can be quite heavy – doing considerable damage when hitting you. Also remember that the cable can be heavily charged with static electricity – always let it touch the ground before touching it.

During hoisting operations for a stretcher there will normally be a tag line between the stretcher and the ground to help prevent it from spinning or moving into obstructions such as trees. Once the stretcher has reached the aircraft the tag line will be let go and dropped to the ground to be picked up by the ground crew.

Videos of Helicopter Rescues

Take a moment to go back to the lesson page and watch the videos of helicopter rescues.

- Maine Army Air Guard lifting an injured individual during a rescue in Baxter State Park.
- An attempted rescue on Mt. Hood in Oregon which shows how dangerous these operations can be.
- Two hoisting operations; with and without a tagline

After watching the 4 videos think about what factors need to be considered in evaluating the risk/benefit of utilizing helicopters in different SAR scenarios.

Landing Zone (LZ)

- Allows aircraft to fly in and fly out, not hover.
- Routes at least 3.5 rotor widths wide (about 250 feet for Blackhawk)
- LZ should be smooth and clear of obstacles.
- LZ should have no more than 8 degree slope.
- LZ should be at least 1.5 rotor widths square (at least 100 feet).
- LZ should not be frozen water body, loose sand or loose snow.

It is important to understand that it is much easier to have a helicopter land with a fly in approach and take off with a fly out departure than it is to have it hover and drop in to a small spot. That isn't to say that it can't be done.

The approach and take off routes should be a least 3.5 rotor widths across to allow for horizontal error and wind issues.

The landing zone itself needs to be checked carefully before bringing in the aircraft. There should be no obstacles and it needs to be relatively smooth and clear with a slope less than 8 degrees.

It is important that the landing zone itself be at least 1.5 times as wide as the rotors on the helicopter because of wind gusts and margin of error.

Landing zones have other limitations – frozen water bodies are not good candidates due to weight-bearing concerns. Loose sand and snow pose debris problems and easily become airborne as the helicopter attempts to land or take off.

Landing Zone

- LZ is marked with **T** or **H** pattern for identification if time permits.
- Identify wind direction with streamers or hand signals.

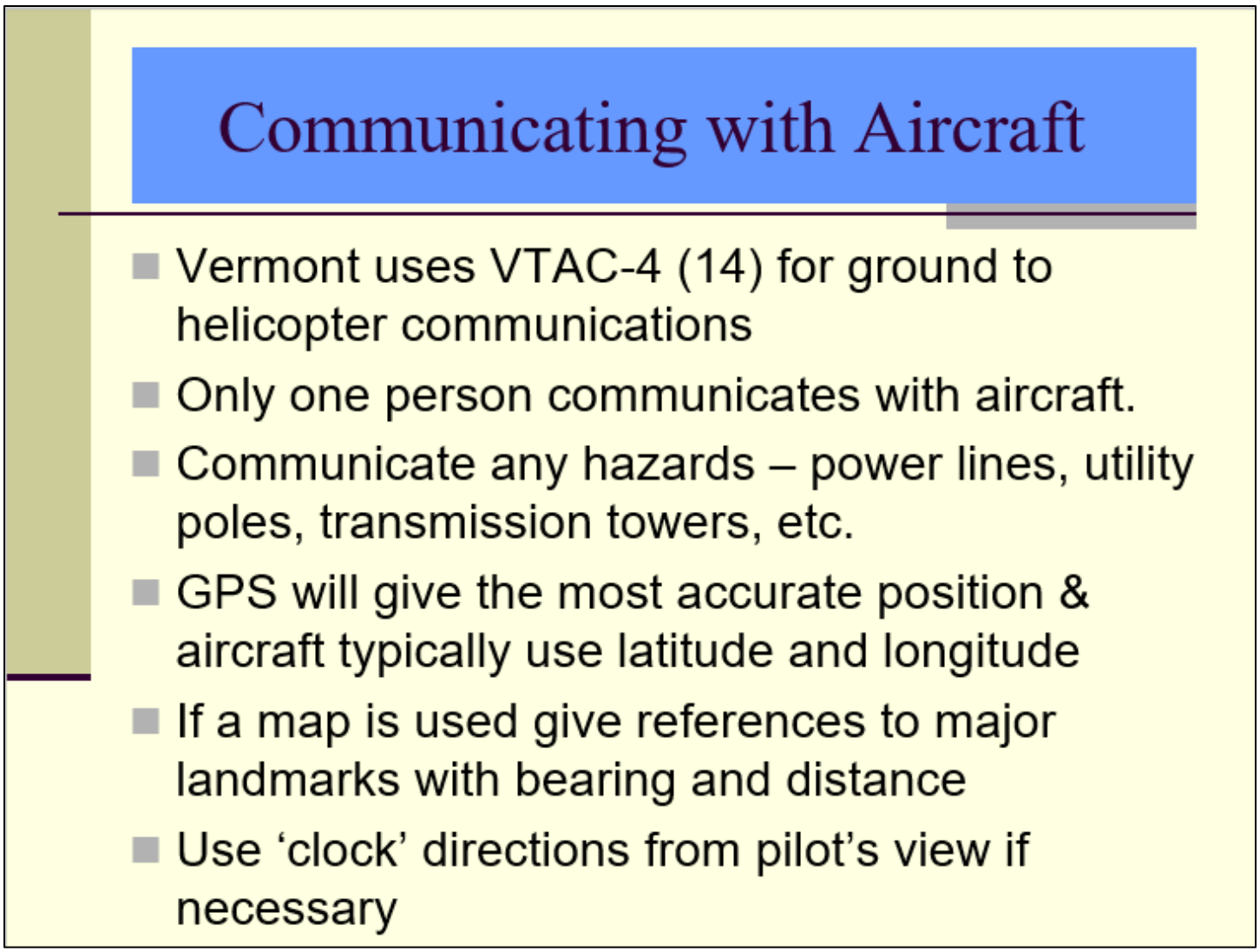
When marking a landing zone with the T or H pattern it is important to make the letters at least 6' long and proportionately wide. They should contrast with the surrounding terrain. Be VERY careful about using anything that can blow away and create potential debris.

It is also very helpful for you to communicate the wind direction at ground level.

The pictures show ways of telling the pilot what the wind is on the ground. An orange smoke flare not only helps the aircraft find you but will indicate the wind direction, the orange surveyor's tape you should always carry can be tied to something or held in your hand over your head to demonstrate wind direction and you always **stand WITH THE WIND AT YOUR BACK pointing with both arms in the direction the wind is going.**

Be aware that the established hand communication for ground-to-pilot communication for 'ABORT LANDING!' is to wave and cross both hands overhead.

The use of emergency vehicle lights to help identify the landing zone may also be helpful, but the pilots may want them turned off as they approach for landing. Similarly at night headlights may be used to identify the LZ, but as the helicopter gets closer to landing they will likely want them turned off.



Communicating with SAR air assets applies to both rotary and fixed wing.

A GPS position is the best locator when attempting to communicate your position. Lacking a GPS unit, relate your position south, north, east, etc. in relation to a highly visible feature such as a peak, radio tower, highway intersection, etc. Be careful when using features that could be confused, such as among multiple hills or mountains. Giving your approximate distance from the feature is also important.

As the aircraft becomes visible use the clock method relating the aircraft's nose at 12 o'clock. For example if you are 90 degrees to the right of the helicopter you would say "I'm at your 3 o'clock right now."

Other Aviation Resources

Fixed Wing Aircraft

The Civil Air Patrol provides fixed wing aircraft capabilities for SAR missions.

The Civil Air Patrol is a non profit auxiliary of the United States Air Force.

Vermont has a very active Civil Air Patrol (CAP) presence with aircraft in various locations around the state, including Burlington and Rutland.

On occasion private aircraft have also volunteered and been utilized in searches.

Fixed wing aircraft are most commonly used to assist in the search for missing aircraft, as locating an individual person can be difficult given the speed and altitude at which they operate.

Congratulations, you have finished this module

You may close this window to return to the main course and select another module to complete.

Be sure you keep track on your course checklist so you know which modules you have completed.

If you are interested in learning more about the use of helicopters in SAR, the *Mountain Rescue Association* has an excellent online class.

There is no cost for the class and the link is available on the lesson page.