



Air Ambulance Helicopter Landing Zone Procedures

2024

Introduction

- The purpose of this briefing material is to provide first responders and local communities with the information necessary to select, prepare and safely operate a temporary Landing Zone (LZ) for BC Emergency Health Services (BCEHS) air ambulance helicopters.
- This course is intended for people who may be running an LZ or people who will be training others on running an LZ.
- Please note that the final decision to operate from a landing zone (LZ) rests with the pilot-in-command.

New since Apr 2024

- Slide 41 – carry equipment below waist by helicopter
- Slide 48 – No stakes for dust/snow
- Slide 53 – only pilots signal people towards helicopter
- Slide 57 – dangerous materials on helicopters

LZ Course content

- [Slide Deck](#)
- [LZ Check list/Quick Reference Card](#)
- Or Google “BCEHS Critical Care” and look under “Related Documents” on the right hand side.

On Line course

- Available on Learning Hub for CE credits.
 - Search for LZ or Landing Zone on Learning Hub
 - <https://learninghub.phsa.ca/Learner/Home>
- Consists of:
 - Video of past course
 - Exam
- Can challenge exam and not watch video but must pass exam for any credit (80% mark to pass)
- 2 CME credits for passing exam.

Outline

- General Info
- Requesting an aeromedical helicopter
- Role of the Landing Zone (LZ) Manager
- Selecting the Landing Zone (LZ)
- Hazard Identification
- Communicating with the aircraft
- Protecting the Landing Zone (LZ)
- Continuity of care – preparing the patient for transport

- A helicopter air ambulance will:
 - decrease transport time to definitive care
 - provide critical care capabilities on-scene and during transport
 - provide support in multiple casualty incidents

- BCEHS has helicopter contracts with three dedicated air ambulance providers and numerous ad hoc carriers in BC and Alberta

- The information in this brief is most applicable to our dedicated carriers



Sikorsky S76C+

- Vancouver & Prince Rupert
- Seats up to four medics and two patients
- Three aircraft in the fleet plus an S76A model as YVR back-up
- 24/7 availability
- Night Vision Goggle equipped
- Cot must be returned to aircraft



Bell 412EPi

- Kamloops & Prince George
- Seats up to 2 medics and 2 patients
- 12/7 availability
- Night Vision Goggle equipped
- Stryker cot can be swapped with ambulance cot
- Loudhailer



MD902

- Parksville base
- Two paramedics
- One patient
- 12/7 availability
- Night Vision Goggle equipped
- Cot specific to MD902. Patient must be transferred to/from Stryker.
- No tail rotor



Night Vision Goggles

Does NOT turn night into day

Does let pilots see their surroundings at night (given enough light to amplify)

- Increased safety
- Restricted field of view
- More fatiguing
- Visual acuity 20/30 to 20/40

Other limitations:

- Limited by available light to amplify (e.g. moonless overcast night away from towns may be an issue)
- Obscurants (dust, snow, rain, smoke, etc) affect it
- Some LED lights do not appear in NVGs (e.g. on tower)
- Twilight can cause issues (too bright for NVGs and too dark for naked eye)
- Wires and narrow/thin obstacles very hard to see



Ad Hoc Chartered Helicopters

- BCEHS uses the services of other providers where there is not dedicated helicopter coverage.
- These carriers have signed agreements to provide services at an agreed rate but do not have to keep aircraft or pilots on standby
- Helicopter types vary and will not be equipped with medical interiors like dedicated helicopters.
- Not all Ad Hoc helicopters are suitable for all patients.



Requesting an Air Ambulance

- Most likely through your dispatch
- For scene response (pre-hospital care)
 - Call “9-1-1”
 - Areas where “9-1-1” not available: Toll Free 1.800.461.9911
 - Cellphone / Satellite Phone / Outside BC 250.374.5937
- Calls to “9-1-1” will be triaged by paramedics and emergency physicians working for BCEHS. The BCEHS dispatch centre will deploy the most appropriate resource. A road ambulance may be assigned instead of an air ambulance

Info Required by BCEHS Dispatch from scene First Responders

- Scene / LZ location
 - Latitude and Longitude in degrees and decimal minutes (GPS coordinates) e.g. 47° 26.767' N 123° 58.933' W
 - Format – degrees/minutes and decimal (as above) or degree/minutes/seconds
 - Cross streets (intersection)
 - Closest city / town
 - Street address of the location
 - Well-known landmarks (distance & bearing/direction from)
- Warning of obstacles in the area that may present hazards to an arriving helicopter (e.g. wires, towers, etc.)
- Weather if low cloud or visibility

Role of Landing Zone (LZ) Manager

- A Landing Zone Manager should be appointed from the on-scene responders to take responsibility for landing zone selection and safety duties.
- The Landing Zone Manager should **NOT** be involved in scene operations or patient care.

LZ Manager – duties (pre-helo arrival)

- Coordinate activities with incident/scene command personnel
- Select an appropriate LZ (more later)
- Identify helicopter briefing points (more later):
 - wind direction
 - obstacles (wires, antennas)
 - Other hazards (*“if in doubt, point it out”*)
- Liaise with fire department (if available) to anticipate fire suppression activities in the event of an aircraft accident
- Conduct a LZ team briefing to ensure hazards have been identified, roles (especially who will be controlling LZ access/keeping bystanders away) and responsibilities clarified, and that landing/departure procedures are understood
- Ensure that all vehicles and non-essential personnel remain clear of the LZ safety area during helicopter operations

LZ Selection

- Must balance LZ site requirements:
 - Need to be as close to patient as possible
 - Safety of helicopter and first responders at scene
- Talk to paramedics - sometimes it's better to get patient quickly to helicopter, other times it's better to get paramedics to patient side quickly
- A nearby LZ that is normally used may not be the most appropriate depending on patient condition (i.e. the patient's condition may need a closer LZ).
- LZ Manager should consult with first responder agencies on LZ selection
- IC (Incident Commander) ultimately responsible for LZ selection if first responders can't agree.

LZ Selection (cont)

- The pilot-in-command has final authority over LZ suitability. During the initial LZ reconnaissance, the flight crew may select a different landing area
- LZ should be 40 paces x 40 paces (40 metres/yards or ~120 ft)
 - Always plan on getting biggest size helo
- The LZ should be at least 50 paces (150 feet) away from the accident or patient care location
- If practical, the LZ should be downwind of the scene unless a HAZMAT incident is present. If the LZ must be located upwind of the scene, the distance from the LZ to the accident site should be increased as much as possible to avoid helicopter downwash creating a hazard to first responders and compromising patient care
- If the LZ is dusty, ask the fire department to wet down the area to prevent a zero visibility situation when the helicopter lands
- Fresh snow should be packed down to prevent whiteout conditions. If this is not possible, warn the flight crew of loose or powder snow conditions
- LZ access – how easily can patient be transferred to helicopter (fences, ditches, etc.)
- LZ surface – firm, well drained and preferably not covered in manure

LZ Manager – Duties (helo 5 minutes back)

- Put safety vest on in order to be easily identified by Helo (ideally different colour vest than other first responders).
- Stand back to wind, arms raised and when helo confirms visual with LZ Manager, point in landing direction.
- Establish radio communications with the arriving helicopter (see next slide for details)
- Brief helicopter on LZ (more later)
- Advise the flight crew when the LZ is secured
- Maintain “secure LZ” until helicopter departs
- Ensure that ground personnel do not approach the helicopter until after the rotors have stopped turning, the engines are secured, and only when specifically requested to approach by the pilots

Aircraft communications

- Direct radio contact is best. Turn on radio as soon as you arrive at LZ and are setting up
- Normally PEPCORD1 (148.655) or AIR2GRND channel in EComm coverage area. Alternately give dispatch a frequency to contact the helicopter (note: the helicopter may not get the frequency from dispatch).
- **Only the LZ manager and the helicopter should be on the frequency/channel**
- Helicopter briefing:
 - ID yourself as LZ Manager (“BCAS air ambulance this is LZ manager”)
 - LZ status (e.g. secure & ready for landing/LZ prep in progress/LZ not secure, estimate time ready X minutes)
 - LZ location using cardinal references (N,S,E,W) to accident scene or landmarks)
 - LZ markings
 - Wind direction/speed (estimated)
 - LZ hazards (more later)

Aircraft communications (cont)

- If you do not have access to PEPCORD1 contact embcradio@gov.bc.ca to obtain a letter of permission.
 - BCEHS can help facilitate/support the application

LZ Readiness Check

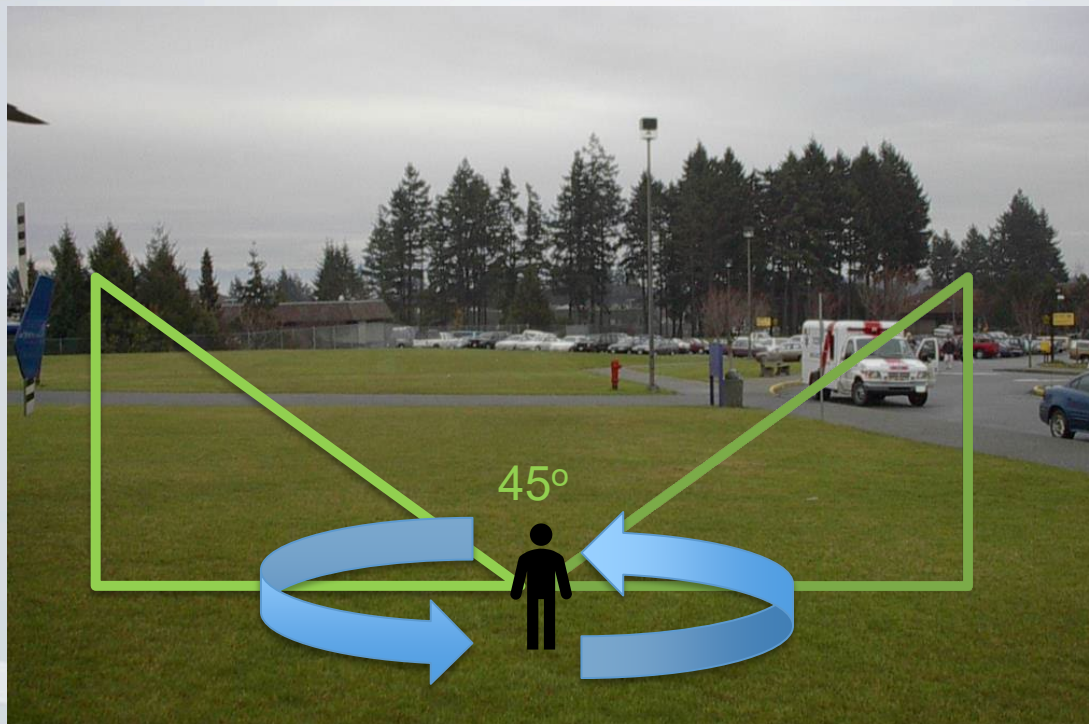
- While time can be of the essence, ensure the LZ is ready for landing before clearing the helicopter in to land
 - If you aren't ready the helicopter can orbit until you are
 - We don't want a landing that leads to an accident and more injuries
- Is the LZ secure (e.g. from pedestrians or vehicles)?
This implies your team has been briefed on the LZ and is ready for helo arrival
- Has the LZ been swept for debris?

Approach/Departure Path

- The selected LZ must have an approach & departure path:
 - Preferably into wind rather than down wind
 - Free of obstacles to the greatest extent possible (e.g. wires, telephone/power lines, flag poles, etc.)

Obstacles & Hazards

- To identify obstructions on the approach/departure path to the LZ, stand in the centre of the landing area and raise one arm up at a 45-degree angle
- Turn slowly through a complete circle and note any obstruction that appears above the level of your raised arm
- Reference obstructions to the compass cardinal points (e.g. “Trees to the North and East; lamp posts to the Northeast”)



Obstacles – poles & wires



From the ground

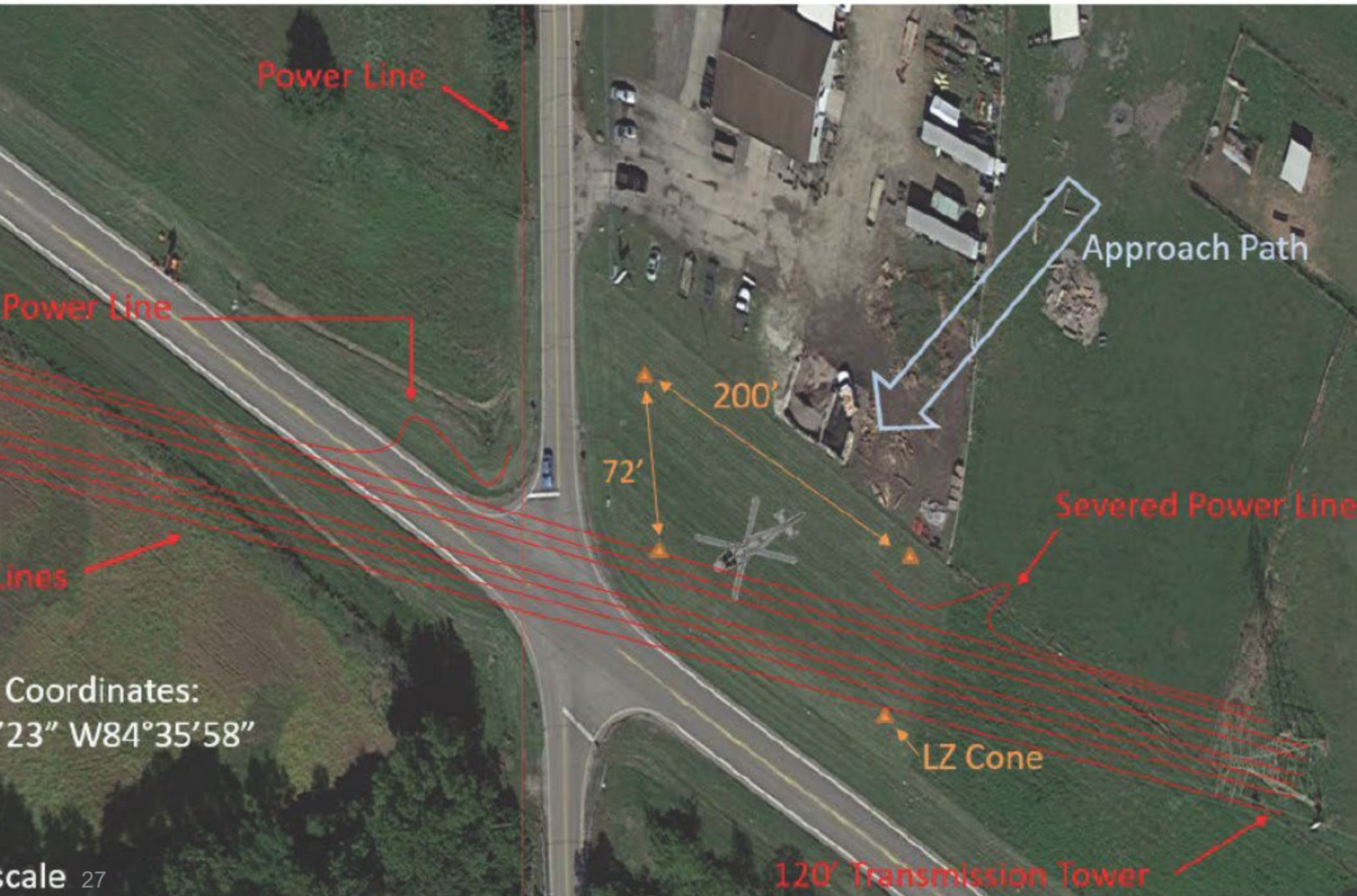
From the air



- Parking a vehicle under wires crossing a road close to LZ is a good way to mark them

Case Study - Wires

- Night
- Helo contacted LZ manager and was told high voltage wires on south side of LZ
- Site marked with four illuminated orange cones



Power Line

Power Line

Approach Path

200'

72'

Severed Power Line

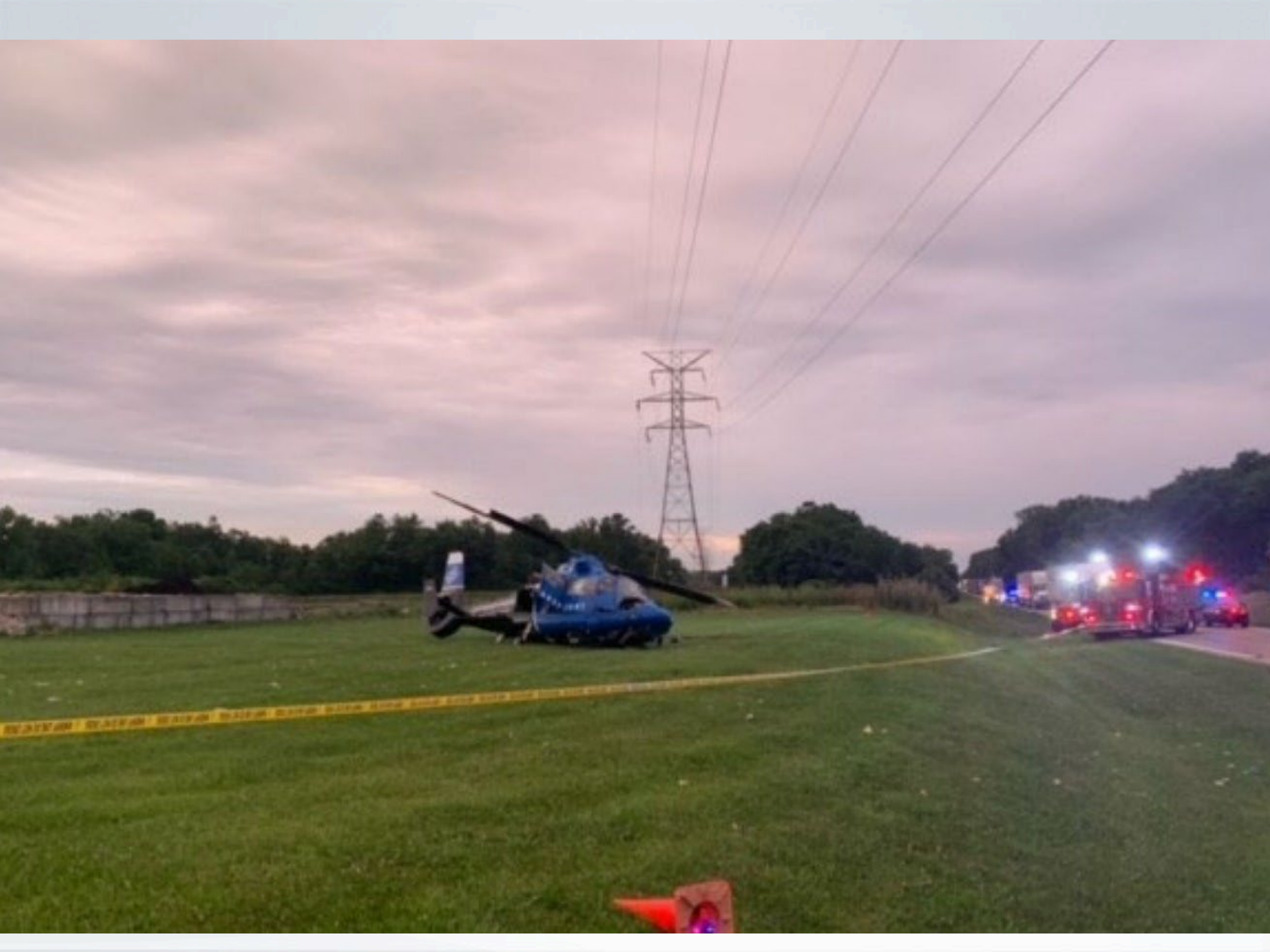
lines

Coordinates:
23" W84°35'58"

LZ Cone

120' Transmission Tower

scale 27



Discussion

- Pilot could see towers but not wires on NVGs.
- Attempted to use landing light to illuminate wires to no effect.
- Patient unfortunately passed at the scene.

Lessons

- Do not put an LZ beside power lines day or night – put LZ edge at least 50m away.
- If less than 50m away, pilot must be briefed by LZ manager on hazard.
- Park vehicles under power lines and/or illuminate towers with lights

Landing point selection

- LZ = landing zone safety area + landing point
- Landing point is area within LZ where helo will touch down
- It must be:
 - clear of obstacles (e.g. tree stumps, fire hydrants, etc) as much as possible
 - Support helo weight
 - ~12,000 lbs for S76 & 412
 - ~ 6,700 lbs for MD902
 - ~5,000 lbs for AS350 AStar (common ad hoc charter aircraft – see below)

Notes:

- Helo weight may cause damage to infill supporting artificial turf
- Helo may be heavy enough to damage septic field



Landing Zone Safety Area

- The LZ safety area is an area surrounding the landing point (touchdown area) that will permit the safe landing, takeoff, and manoeuvring of the helicopter
- The LZ safety area should be:
 - At least 40 x 40 paces (approximately 120 x 120 feet)
 - Free of debris that may be propelled by the rotor downwash
 - Firm and flat (less than 10 degree slope)
 - Free of stumps, brush, posts, large rocks or ditches which may damage the helicopter
 - Located downwind of the scene unless the accident site involves HAZMAT, in which case the LZ should be located upwind of scene



Walk the LZ to look for hidden debris that may fly up in rotor wash. Also check roadside ditches.

LZ Identification -Day

- LZ Manager in **high vis vest (ideally different colour), back to wind facing LZ, arms raised**
- Corral formed by emergency vehicles and/or obvious natural boundaries
- Weighted traffic cones placed at the 12, 3, 6 and 9 O'clock positions of LZ (if possible)
- Fluorescent paint may be used to mark the perimeter or a large 'H' placed in the centre of the LZ. This is especially effective on snow covered surfaces
- Smoke at the 10 or 2 O'clock position. Start smoke when helo visual. Do NOT use smoke if no wind.

LZ Identification - Night

- LZ Manager in **high vis vest, back to wind facing LZ, arms raised**
- Flashlights placed inside traffic cones / LED beacons / battery-powered “turbo flares” at the corners and midpoints (if possible)
 - Some red LED beacons are invisible to NVGs
 - If you have a different colour turbo flare – place it at the 12 O’clock position with the LZ manager. It is NOT required to have a different colour turbo flare.
- Flight crew will generally request that strobes be turned off during landing as they can overwhelm NVGs
- Vehicles with headlights 30-50 ft away from LZ perimeter with lights on low beam pointed into wind and to the side of the LZ
- Do not shine vehicle lights towards helicopter landing, taking off or on the ground running.
- Use spotlights to mark obstacles and poles with wires

LZ Manager hand signals



LAND HERE
(DAY)



LZ UNSAFE
(DAY)



LAND HERE
(NIGHT)



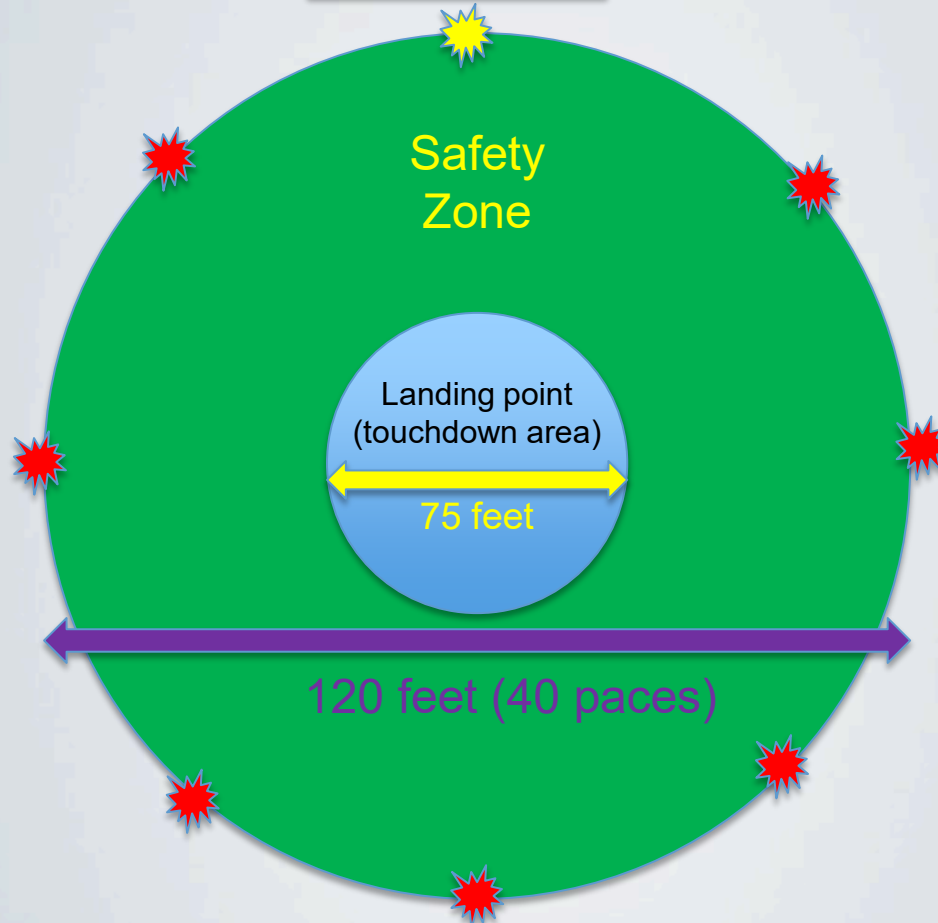
LZ UNSAFE
(NIGHT)

LZ Diagram

wind

wind

LZ Manager



Marking/lighting

- IR/visible lights
- Vehicle 30-50ft back from LZ perimeter
- If a different colour turbo-flare available – at 12 O'clock position
- If only 4 markers or lights – use diamond configuration at 12, 3, 6 and 9 O'clock

LZ manager:

- Back to wind
- Safety vest to ID for helo
- On PEPCORD1 or EComm AIR2GRND
- Arms raised then point to LZ centre when helo on short final

* Helo approach path may be curved or from the side due to obstacles

12 Jan -24C w/15km/h wind



LZ Don'ts

- Do not use people to mark the perimeter of the LZ
 - Do use people to control access to the LZ.
- Do not shine lights directly at the helicopter

LZ – Safety

- Use personal protective equipment
 - Helmet/hard hat with chinstrap (guard against unsecured flying debris)
 - Reflective vest
 - Eye protection (safety glasses, face shield – for flying debris/dust)
 - Hearing protection
 - Jacket and pants to cover bare skin



Hazards – Main Rotor

- Never approach helicopter when rotors turning!
- Carry equipment below waist



Hazards – Tail Rotor/Aircraft Rear

- Never approach helicopter with rotors turning
- Tail rotors are almost invisible when spinning
- Never go behind **rear of landing gear/skids** unless asked to by pilots or paramedics



Hazard - Pitot Tube(s)

- Used to measure airspeed
- Can be very hot (burn skin) and sharp
- Easy to catch on clothing



Hazard – Loose debris

- Rotor wash can be up to 150km/hr
- Remove or secure all loose debris from LZ and surrounding area
- Rotor wash can lift easily lift loose debris and objects
 - Injure people
 - Damage property
 - Ingested through helicopter intake and cause engine failure



plywood



Tarps/blankets



canopies



Empty barrels



Signs



Plastic bags

FOD impact on helo



Hazard - Noise

- Helicopter noise can startle people & livestock located near an LZ. Ensure animals are secure from the LZ.
- Engine & rotor noise will make communications difficult



Hazard – vehicles & traffic

- When possible, emergency vehicles should be used as a physical barrier to block LZ access
- Traffic should be blocked in both directions during approach/departure – even on divided highways – as flight operations will distract drivers.



Hazard – dust/snow

- Rotor wash may blow dust/snow and create white/brown out conditions
- If available in dusty conditions, consider using fire truck to wet ground prior to helicopter landing
- Do not put stake in snow for reference



[Helicopter downdraft and brownout YouTube](#)



Hazard - Drones

- At some scene responses, people may use drones to get a better view or to find out what's going on.



Final approach

- Once helicopter on final – LZ Manager should clear outside safety zone
- Watch for hazards
- Minimize communications with aircraft to safety critical items
- If you see a hazard transmit “**ABORT, ABORT, ABORT**” over the radio or extend both arms over head and wave in a crossing motion
- Pilot in command makes ultimate decision for LZ selection and landing decision



If helo over shoots/aborts

- Remain on PEPCORD1/AIR2GRND
- Expect the following on the radio:
 - The reason for the overshoot/abort
 - If the LZ manager called the abort explain why to the helo
 - The follow on plan:
 - Resolve reason for abort (e.g. loose debris that can be secured)
 - Move to another LZ
- Note may be delay in radio comms after overshoot/abort if LZ is close to airport control zone or busy air traffic

After landing

- Protect the LZ
 - be aware of vehicles or pedestrians approaching when rotor turning. Pilots cannot see anything approaching from behind
- Stay well clear of rotor and never approach aircraft when rotors turning
- Prevent people approaching helicopter until rotors have stopped turning and definitive “all clear” signal from pilots
- After shutdown, continue to control/guide vehicles near aircraft
- Pilots will signal to approach the helicopter
- Time permitting – come talk to the pilots about helicopter operations

Continuity of care

- Flight paramedics will seek out primary ground caregiver of the patient
- Provide brief, concise report of patient condition and a short history of what happened to the best of your knowledge
- Provide copy of patients ID and vital signs and any pertinent medical history (e.g. medication allergies if known)
- Assistance may be required loading the patient – follow flight paramedic and pilot instruction



Unless asked by pilots or flight paramedics do NOT

- Load anything into helicopter
- Open or close any aircraft doors
 - Never force open/closed any aircraft doors

Take off

- Once helicopter close up and starting engines
 - Look for open doors, panels or straps hanging out – let helicopter know by radio
 - Keep radio in hand to advise pilots of any hazards
 - Keep radio channel open until aircraft is out of sight
 - Keep LZ clear of personnel and equipment until aircraft out of sight in case it needs to return at short notice
 - Keep LZ secure for 5 minutes after helo departure in case it has to return unexpectedly

Hard landing/crash

- Do not approach helicopter until all moving parts have come to a complete stop
- Helicopters have dangerous material:
 - Compressed gas bottles
 - O₂
 - N₂
 - Magnesium in gearbox

Seasonal Considerations



Ice

- Non-level ice covered surfaces can cause helicopter to slide





https://youtu.be/ie2JmWy26_c



Conclusion

- LZ operations are a team effort
 - Establishing a safe LZ is critical to success of scene air medical evacuations
- For more info contact BCEHS Aviation
 - aviationservicesmanagement@bcehs.ca



Questions?