SVALEX 2013 Field Safety

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Outline

- Introduction and definitions
- General Safety Guidelines
  - Potential hazards
  - Dressing for the field
- Basic First Aid Principles
  - Scene Assessment
  - Patient Evaluation
  - Communications
- Threats to life
  - Bleeding
  - Shock
  - Hypothermia
- Principles of Evacuation
- Bear safety
- Helicopter safety

- Sources:
  - Tilton, B. (2010) Wilderness First Responder 3rd edition. National Outdoor Leadership School
  - Civil Air Patrol Emergency Services
  - BP Exploration arctic field safety guide for Alaska
  - DOE-NGEE Arctic Field Safety Manual
  - Natural Resources Canada, Polar Continental Shelf Program field operations manual
  - SVALEX 2012 Photos
  - Svalbard Rescue Sub Center, RSC. And Red Cross Organization

Introduction

- Safety considerations are paramount in the Arctic.
  - Ultimately, you are responsible for your safety – do some homework in advance to learn the "rules of the road." DBS!
- Why is this place different?
  - Even though we may be within sight of the ship, we are in the "wilderness" as far as our planning goes…
  - Wilderness is defined as ≥ 1-hour delay to definitive medical care, due to location, conditions, resources
  - Long days in cold conditions makes even standing around hazardous…
- FIRST AID
  - The immediate and temporary care given to injured or suddenly ill person;
  - Its purpose is to preserve life, assist recovery, and prevent aggravation of a condition, until definitive care can be provided.
  - But its all that's needed in many cases.

Svalex Field Work

Svalbard Hazards

- Cold damp windy conditions….all the time
- Permafrost is impermeable, so the active layer is usually wet and soft, making travel challenging.
  - Tussocks and ice wedge troughs are difficult and tiring to traverse
- Wet rocky terrain without soil cover is slippery and unforgiving.
- Overhead rock fall near outcrops
- Small boat operations on very cold water
- Industrial equipment at Pyramida
- **Be aware of your surroundings**

Environmental Factors

- In cold environments you need to worry about cold injuries
  - hypothermia
  - “trench foot”, a potentially debilitating inflammation of the nerve endings in your feet caused by long-term soggy feet (rubberized arctic footwear that is a sauna for your feet).
- Change out of wet clothes, protect your extremities, change your socks, stay hydrated and well nourished, and tell someone if you're getting cold.
- Basic common sense usually works.

Clothing and Gear

- No amount of cutting-edge gear can substitute knowledge and skills. A sober assessment of your own limitations, and carefully considered decisions that keep you out of dangerous situations, are your most important protection.
- Your clothing should be adapted to the season and, as a rule, it should be waterproof and wind-resistant.
- Several layers are generally better than one very thick layer.
- Outerwear and footwear must be large enough to accommodate additional layers.
- There is no such thing as a miracle garment that will meet all requirements, so you will need to bring a variety of clothes that suit your needs.
- Always bring mittens/gloves and a cap, even on short trips.

PPE

- You will have helmets with you out in the field, so wear them. They keep your head warm and intact, and are very stylish.
- Anytime there is an overhead rock fall hazard you must have a helmet on.
- While not required, eye protection should be worn when wielding a rock hammer. Standard sunglasses are fine. DBS
- If you have steel toed boots, not NOT bring them. They are remarkably efficient at freezing your feet in the arctic.

Recommended Field Clothing

- Personal Gear
  - 1 pair of hiking boots (sturdy boots as the terrain is rugged and/or slippery). Do not use steel toed boots
  - Warm woolen sweater or fleece sweater/jacket (Optional: warm down jacket).
  - Sturdy and easily dried field trousers. I do not recommend Levis, but use your own judgement
  - Outdoor-jacket: waterproof and windproof
  - Rain pants: waterproof and windproof
  - Warm cap, not a 'gimme cap'
  - Scarf or fleece-tube
  - Gloves or mittens
  - Long underwear (long johns and top; recommend wool)
  - 3 pair warm socks (recommend wool). Bring extra pair into the field. Recommend use inner and outer pair to better keep feet dry

Basic Personal First Aid Kit

(1) Paper and pencil,
(1) small flashlight
(1) CPR mask
(1) pr. Nitrile gloves
(1) Moleskin (3”x4”)
(3) Alcohol prep pads
(3) Benzalkonium prep pads
(2) XL adhesive bandages (2”x4.5”)
(8) Cloth adhesive bandages (1”x3”) (Bandaids)
(2) Knuckle bandages

(1 roll) 1” waterproof tape
(3) Sterile 3”x3” bandages
(1) Sterile 3” conforming bandage
(1) scissors
(4) Sting-relief pads/vials
(1) Splinter/tick forceps (in vial) + guide card
(1) Mylar blanket
(1) Package Steri-strips
(1) Package Tegaderm (medium size)
(10+) OTC Analgesics (Tylenol or Motrin)

A Few First Aid Items

- This is not a first aid class – hopefully most of you have had a first aid class sometime in the not too distant past
- This is to remind you of some critical things, and to let you know what other people will be doing in case of a medical emergency
- Key Areas:
  - Patient Assessment
  - Bleeding
  - Shock
  - Hypothermia
  - Non Freezing Cold Injuries

Patient Assessment

- PAS: Patient Assessment System
  - Scene Size-Up
  - Initial assessment of the patient
  - Isolate Body Substances
  - Focused exam and history
  - Documenting and reporting the event
  - Monitoring the patient's condition

Scene Size Up

- STOP : look around and assess the dangers to yourself and others
- Try to see what the mechanism of injury was – and prevent it from happening to someone else
  - Rock fall
  - Slip and fall on unstable ground
  - Water immersion
  - Accidental gun shot
- Count the number of patients!
  - Make sure that you have accounted for everyone in your team
- Use the MOI to get a head start on possible injuries…
  - A fall? Head and spine, long bone fractures
  - Water immersion? Hypothermia, water aspiration
- Try to understand WHY the injury happened. A slip and fall may indicate someone with the “stumbles”, and the real issue is hypothermia.

Initial Patient Assessment

- General Impression:
  - Your first impression is often very accurate – someone who is very sick *looks* very sick. Someone who is seriously injured will let you know.
- Establish a relationship
  - Introduce yourself to the patient – this is also a tricky way of learning their level of consciousness.
- Perform an initial assessment
  - **ABCDE**
    - **A**irway
    - **B**reathing
    - **C**irculation
    - **D**isability (Spinal)
    - **E**xpose the injury (consider Environment)
  - Stop and Fix
- Ask about the Chief Complaint (don't get wrapped up into the PAS, talk to your patient.

Focused Patient Exam and History

- Patient Exam
  - Head to toe secondary survey
    - Palpate (touch), rigidity, masses, swelling
    - Ausculatate (listen), breathing quality, pain response
    - Inspect (see): Bruises, angulation, bleeding, swelling
      - Expose the injured area to inspect it!
    - Smell: body or breath odors, clothing odors
    - Ask: pain and tenderness, unusual sensations

Head to Toe Exam

- Head and Neck
- Face
- Chest and shoulders
- Abdomen
- Pelvis
- Lower extremities
- Upper extremities
- Back and Buttocks

Vital Signs

- Level of Responsiveness
  - A&O x 4
- Pulse rate and quality
  - 50-100 and strong
- Breathing rate and quality
  - 12-20, regular, unlabored
- SCTM: Skin color, temperature, moisture
  - Pink, warm, dry
- Pupils
  - PERRL
- Body temperature

Patient History

- **SAMPLE**
  - **S**ymptoms (patient is complaining of ?)
  - **A**llergies (to medications or environmental factors..e.g. latex)
  - **M**edications (Includes herbal remedies)
  - **P**ertinent medical history (do not need to know about e.g. dental cavities, etc.)
  - **L**ast intake/output (food and water/urine)
  - **E**vents (What caused or preceded the injury?)

Cold Water Immersion

- Sudden immersion in very cold water will cause rapid onset of muscle rigidity that often leads to drowning.
- Heat is rapidly drawn out of the body resulting in immersion hypothermia within 30 minutes.
- We will be in survival suits when on the water??, but if you find yourself in the water, do not try to swim for shore – stop moving, assume a survival crouch, and wait for assistance. Swimming greatly accelerates hypothermia
- Rapid removal from even shallow water such as a pond is paramount
- Immediately treat patient for hypothermia whether or not symptoms are displayed.
  - Dry clothes, warm liquids, and shelter
- ALWAYS WEAR A PFD on the water! NO EXCEPTIONS

Severe Bleeding

- The body has powerful responses to bleeding, your job is to help those responses
- Initially use direct pressure,
  - >95% of the time this will be sufficient
  - You can use your gloved hand for immediate control, and then clothing or sterile dressing.
- Maintain pressure for 15 minutes:
  - The patient can help do it themselves
  - If the dressing soaks through remove it, or add another on top.
  - Elevation of the limb may help, but current data is not very supportive
- Use a pressure dressing for persistent bleeding
- Recent data from the military has given strong endorsements of the use of clotting agents and tourniquets!
  - QuickClot bandages are stuffed into wounds and will help the body clot and control bleeding.
  - Tourniquets are being considered a first choice tool for traumatic penetrating injuries of the extremities.
  - Apply tourniquets as far distal as possible on a proximal *upper* extremity (single bone).

Shock

- Generally defined as a “lack of perfusion” and can be caused by low cardiac output, pain, low volume of blood, or other medical causes
- Symptoms (early)
  - Anxiety and/or confusion
  - Rapid strong pulse, but with orthostatic hypotension
  - Shallow rapid respirations
  - Cool clammy skin
  - Normal to pale or chalky complexion
  - Blood pressure WNL with strong radial pulse
  - Pupils PERRL
  - Thirst, nausea, vomiting
  - Dizziness, lightheadedness, and/or weakness

Shock

- The most important early signs of shock are anxiety/confusion, and increased pulse rate.
- Many of the symptoms can mimic other serious medical issues, such as hypothermia, substance abuse, or diabetic emergency. That is why we do a patient assessment with history.
  - Head injuries curiously give opposite symptoms – a slow bounding pulse and increase in BP.

Shock Management

- Prevention is key: Stay hydrated!
- Keep the patient physically and emotionally calm
  - A calm, gentle, and confident rescuer (and bystander) is important and can be instrumental in mitigating shock
- Treat any injuries and splint fractures. Reducing pain reduces shock.
- Maintain body temperature with sleeping pads and bags
- Elevate legs 10-12 inches, but no more.
- Supplemental oxygen is very helpful if available
- Monitor vital signs: Downward changes in key signs may indicate the need for rapid evacuation
- For prolonged evacuations orally rehydrate if injuries allow.

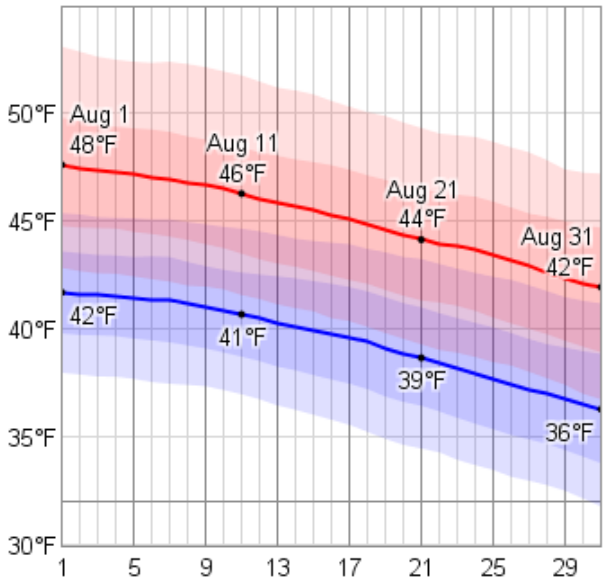
Dehydration

- Proper diet and fluid intake feeds the heat-generating processes in our bodies and maintains critical hydration, preventing cold injuries and shock.
  - A 1.5 liter deficit translates to >20% decrease in endurance and a 10% decrease in maximum oxygen uptake
- When you are bundled up in layers of clothing, you cannot feel your perspiration readily, because it is absorbed by the clothing.
  - you may not be aware of the loss of liquids and salts, which can lead to dehydration.
  - Water deficiency in the cold can lead to hypothermia.
- You should drink more water than normal, even though it will be inconvenient to pee in the field (there are no trees or bushes for, oh, 500 kilometers….)
  - do not count caffeinated tea and coffee as water intake.
  - do not eat snow or ice
- Watch the color of your urine; a light amber indicates that your water level is adequate, while a dark amber indicates that you are getting dehydrated.
- Dehydration will have many of the symptoms of shock, with the addition of a headache, lethargy, and irritability.

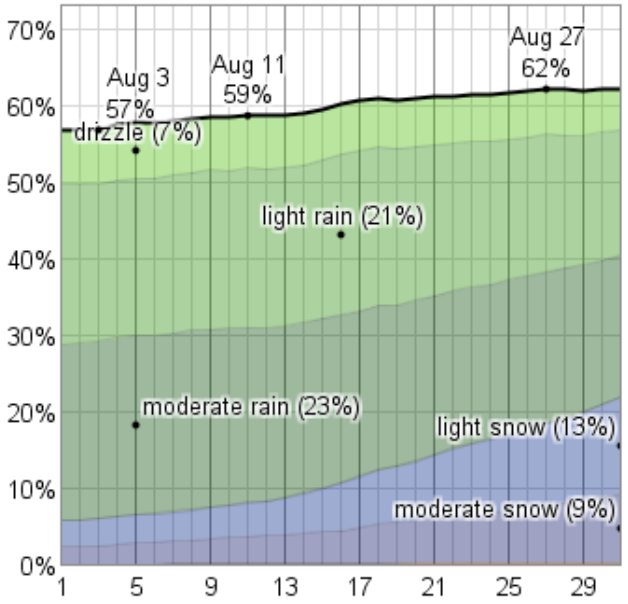
Hypothermia

- Hypothermia is the lowering of body core temperature that places the body in a general state of shock and depresses normal body functions.
- Hypothermia is caused by exposure to cold, and is aggravated by dampness, wind, exhaustion and lack of food and water.
  - Most hypothermia cases develop in relatively warm temperatures between -2°C and +10°C when there may be a false sense of security and comfort.
  - This is right in the temperature range we should expect for this trip:
- Once cooling begins and the bodies compensatory actions fail, the body temperature falls steadily and unconsciousness can occur when the core temperature drops to 32°C (89.6°F).
  - Cardiac arrest is the usual cause of death when the core temperature cools to below 30°C (86°F).

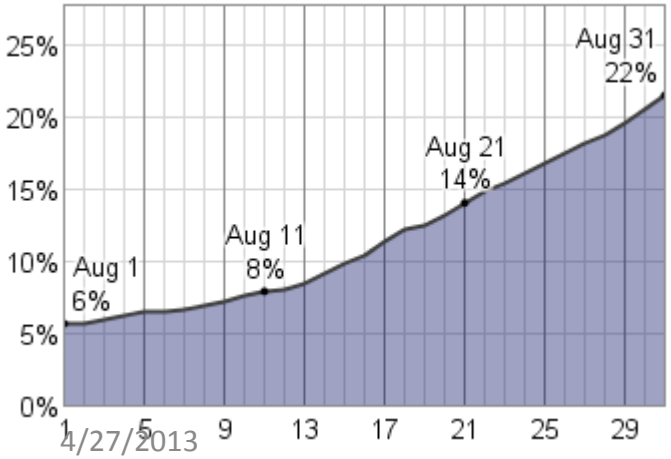
Weather Factors



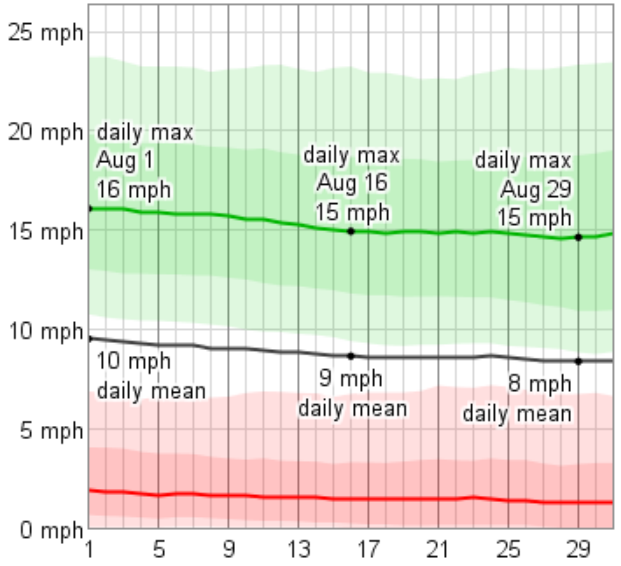
Daily High and Low Temperature in August



Probability of Precipitation at Some Point in the Day in August



Probability of Snow Fall Being Reported in a Given Day in August

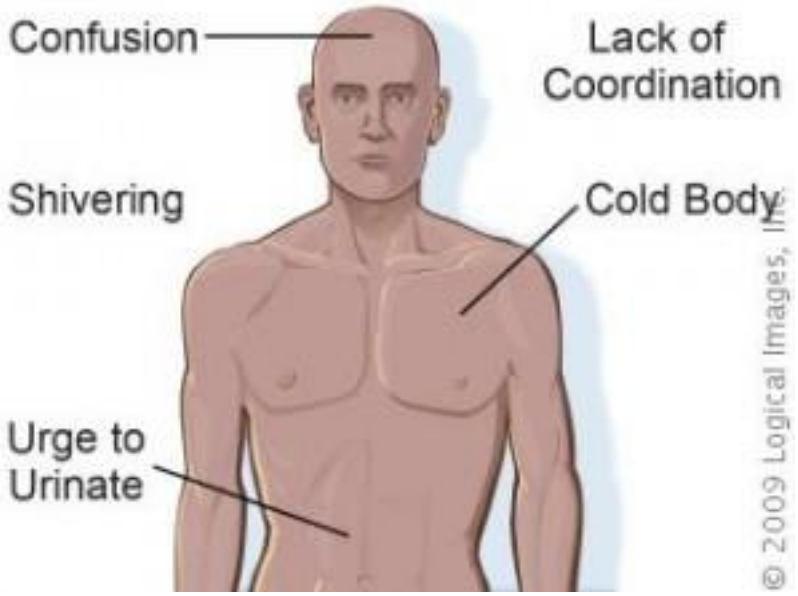


Preventing Hypothermia

- Prevent heat loss
  - Dress appropriately for the weather with wind and water proof clothing that includes a hat and gloves. Stay Dry!!
  - Do not overheat! Clothing that is too heavy will promote perspiration that enhances conductive heat loss and increases the risk of dehydration.
  - The head and neck are the most critical heat loss areas for a normally dressed person.
- Maintain heat generation:
  - The body generates heat to maintain core body temperature in 3 ways: basal metabolism, exercise and shivering.
  - Shivering intensity is determined by the severity and duration of cold exposure and generally occurs in the large muscles of the trunk first.
  - Maintain your activity level, and eat regularly. When working in a cold environment you should be snacking all the time – this is not the time to be on a diet! Fats are good – fuel the fire!
  - Pace yourself and do not overexert – fatigue will lead to hypothermia

Hypothermia Symptoms

- Uncontrollable shivering,
- Apparent exhaustion,
- Cold pale skin, increased pulse and breathing rate
- The '***Umbles***
  - **Grumbling** (personality change);
  - **Mumbling** (having a hard time articulating words);
  - **Stumbling** (reduced coordination in the arms and legs);
  - **Fumbling** (decreased dexterity).
- Lack of mental sharpness, increase in stupidity….
  - Is your field partner being more stupid than normal? It may be hard to tell, but it is an important early sign of hypothermia
  - It may be difficult to convince the victim that there is something wrong because of confusion, and the symptoms resemble fatigue.



Hypothermia Symptoms

- **Pay attention to shivering.** Shivering is a good thing because it produces body heat, but if it reaches severe levels then your activity is not generating enough heat, and your body is expending enormous amounts of energy to stay warm.
- Cessation of shivering while still outdoors is considered a danger sign that the body is no longer able to expend that energy**.**

Treatment

- Fatigue, wet clothing, increasing wind speed, inactivity and lack of energy food lead to or increase the rate of onset of hypothermia.
- First, stop what you are doing, get out of the wind and establish camp or erect shelter if you have been on the move.
- For mild cases dress the sufferer in dry clothing with wind and waterproof layers, and encourage activity
- For moderate cases put patient into a dry sleeping bag.
  - You can further wrap the bag in a tent fly to better conserve heat.
  - Adding a person does not measurably increase rate of warming, but hot water bottles do help.
  - Proximity to a fire does not help.
- Thirdly, give the victim some quick energy food or a hot, sweet drink.

TREATMENT IN THE FIELD

BODY SIGNS/SYMPTOMS TEMP. (rectal)	
37.5°C NORMAL	
36 FEEL COLD	Seek dry shelter, replace wet clothing with dry including socks, gloves, hat, cover neck, insulate whole body including HEAD from cold. Exercise but avoid sweating. External warmth (bath, fire) ONLY if CORE TEMP. above 35°C. Warm sweet drinks and food (high calories).
35 SHIVERING	
BODY CORE TEMPERATURE BELOW 35°C = HYPOTHERMIA = HOSPITAL	
	NO EXERCISE, HANDLE GENTLY, REST. **NO EXTERNAL WARMTH** (except to chest, trunk, eg. Hiebler Jacket).
CLUMSY 34 IRRATIONAL CONFUSED (may appear drunk)	Warm sweet drinks and calories. Internal warming via warm moist air (exhaled air, steam) or warm moist oxygen (40 - 42°C at mask).
33 MUSCLE STIFFNESS	Monitor pulse, breathing. Restrict all activity, lie down with feet slightly raised.
32 SHIVERING STOPS, COLLAPSE. TRANSFER TO HOSPITAL. URGENT.	
31 SEMI CONSCIOUS 30 UNCONSCIOUS No response to painful stimuli	Nothing by mouth. Check airway remains open. May tolerate plastic airway, put in recovery position, check airway, turn every 2 hours to protect skin, monitor pulse and breathing.
29 SLOW PULSE AND BREATHING	Slow mouth-to-mouth breathing, at victim's own rate (may be very slow).
28 CARDIAC ARREST No obvious pulse or breathing Pupils dilated	Check airway. CPR, with mouth-to-mouth breathing. Aim for normal CPR rates of 12-15 breaths/min. and 80-100 compressions/min. but slower rates of 6-12 breaths/min. and 40-60 compressions/min. may be adequate. Continue for as long as you can.
BELOW 28°C. NO VITAL SIGNS, COLD. DO NOT GIVE UP TREATMENT.	

NOTE: NOT DEAD UNTIL WARM AND DEAD!
Avoid rapid rewarming and **HANDLE GENTLY AT ALL TIMES.**
Core temperature may lag behind skin temperature and continue to drop, so keep monitoring.

Non Freezing Cold Injuries

- Immersion Foot (Trench Foot)
  - Cold weather emergency resulting from prolonged contact with cold wet conditions that causes inadequate circulation and tissue damage.
  - Stage one involves decreased blood flow due to tight fitting boots, cold and dampness.
    - The foot is pale, cold to the touch, with swelling and discoloration.
  - Stage 2 occurs when the foot warms and the tissue swells, with tingling pain that never lets up, blisters, ulcers, even gangrene.

Preventing NFCI

- NCFI occurs with poor nutrition, dehydration, wet socks, inadequate clothing, and tight fitting boots.
- Keep a dry pair of socks packed in a ziplock bag in your day pack
  - Don’t add socks when your feet get cold, get bigger boots!
  - If you sweat heavily on your feet, consider using an antiperspirant spray
  - Dry your feet during the day and massage them before putting your boots back on
  - Do not sleep in wet socks.

Polar Bears

Polar bear threat

Polar Bears

- **Polar bears are extremely dangerous animals that do not behave like typical brown or black bears. Should you find yourself in close proximity of a polar bear you should observe the following:**
- When you catch sight of a polar bear, do not under any circumstances approach it. Leave the area swiftly and coolly. Stay together and keep an eye on the bear.
- If the bear follows you and you have no chance of getting away, you should try to frighten it off.
  - Stay together and make as much noise as possible.
  - Behave firmly and make use of whatever means you have to intimidate it.
  - Make sure you do not send flares behind a bear that is on its way towards you.
- If a bear refuses to be intimidated, and lives are at stake, prepare to kill it.
- Define some dividing line in your surroundings, and prepare to shoot if the bear crosses it. You should target vital organs, such as the heart or lungs, if possible. Continue shooting till you are sure the animal has been put down

Other animal hazards

- There is rabies in Svalbard and dead animals must not be touched. There was a rabies alert in 2011 for arctic foxes.
  - Animals that act peculiarly - that seem strangely aggressive or sociable – or appear to be ill, must be shunned.
  - Notify the Governor of Svalbard about such animals.
- The walrus population is growing and you can run into walruses anywhere along the shores of Svalbard.
  - They can be aggressive and dangerous for small vessels.
  - Make sure to keep a safe distance, both at sea and on land.
- The sibling vole parasite is found in Svalbard and can infect humans.
  - ”Echinococcus multilocularis” is a tapeworm for which the sibling vole is the intermediate host.
  - The parasite's primary hosts are dog, cat and fox and the eggs are in the feces of the primary host
  - A human can suffer severe damage to the liver if eggs of this tapeworm enter his system.

Svalbard Rescue Resources

- The Governor of Svalbard supervises the local rescue services for the archipelago and has at his disposal helicopters and tracked personnel vehicles,
- The Longyearbyen Red Cross Emergency Patrol are the primary Search and Rescue resource.
- Svalbard is well-equipped as far as medical facilities, emergency gear and human resources are concerned, but the SAR team is volunteer so there may be time delay to deploy even with a helo.
- The area to be covered is very large; natural conditions and the weather is harsh, so situations can arise when rescue is tricky.

SAR service at Svalbard

Main resourses:

Volunteers;

Longyearbyen Red Cross

”

”J&F”/”To-takteren

- UNIS/NP/Bydrift/ hunters + + +
- SNSG/LNSS/Kings Bay/a.o.
- Trust Arktikugol; heli./mining resc.
- Fueldepots for helicopters
- Service- and emergency huts

Rescue helicopter Svalbard

Principles of Wilderness Evacuation

- Severity of the medical problem
- Distance to the road head/pickup/Helo LZ
- Terrain difficulty
- Strength and stamina of the group
- Weather
- Time of day
- Communications

Helicopter Operations

Developed as part of the National Emergency Services Curriculum Project

Reasons to transport survivors via helicopter

- Would the amount of time needed to transport a patient by ground transportation to an appropriate facility pose a threat to the patient's survival and recovery?
- Would weather, road conditions, or other factors affecting the use of ground transportation seriously delay the patient's access to advanced life support care?
- Does the available rescue have the clinical skills or equipment needed to care for the patient during transport?

Aggravating Factors

- Patients with advanced medical trauma issues may need to be transported via helicopter. The following aggravating factors are indicators
  - Head injuries or comatose
  - A systolic blood pressure <90
  - A respiratory rate <10 or >35
  - A pulse rate <60 or >120
  - A prolonged extrication

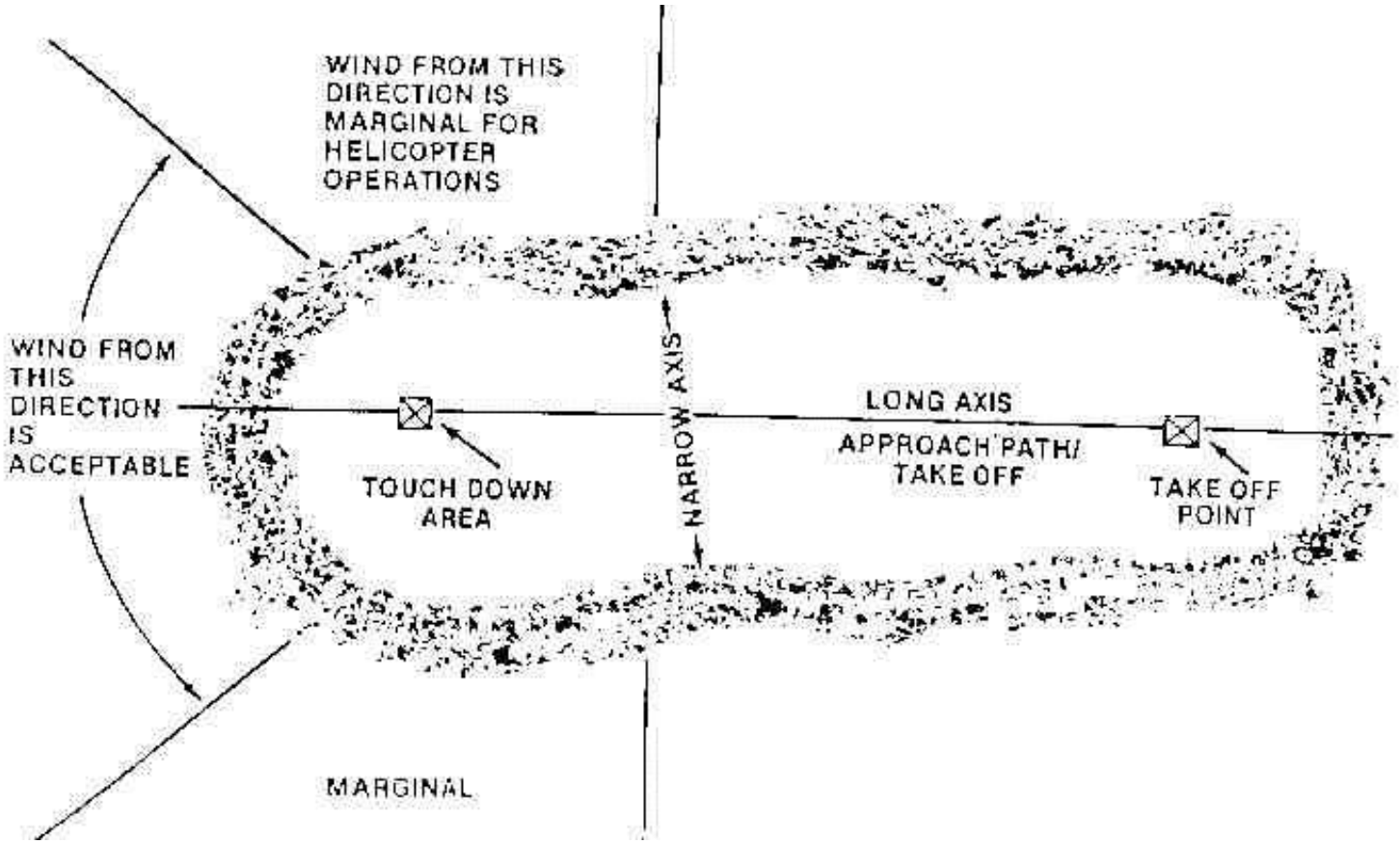
Aggravating Factors Continued

- Paralysis of extremities or spinal cord injuries
- Associated fatalities
- A sprung or crushed pelvis
- Severe oral or facial injuries
- A need for Advanced Life Support
- An inability to maintain a patient airway
- **Qualified personnel make the decision to use a helicopter**

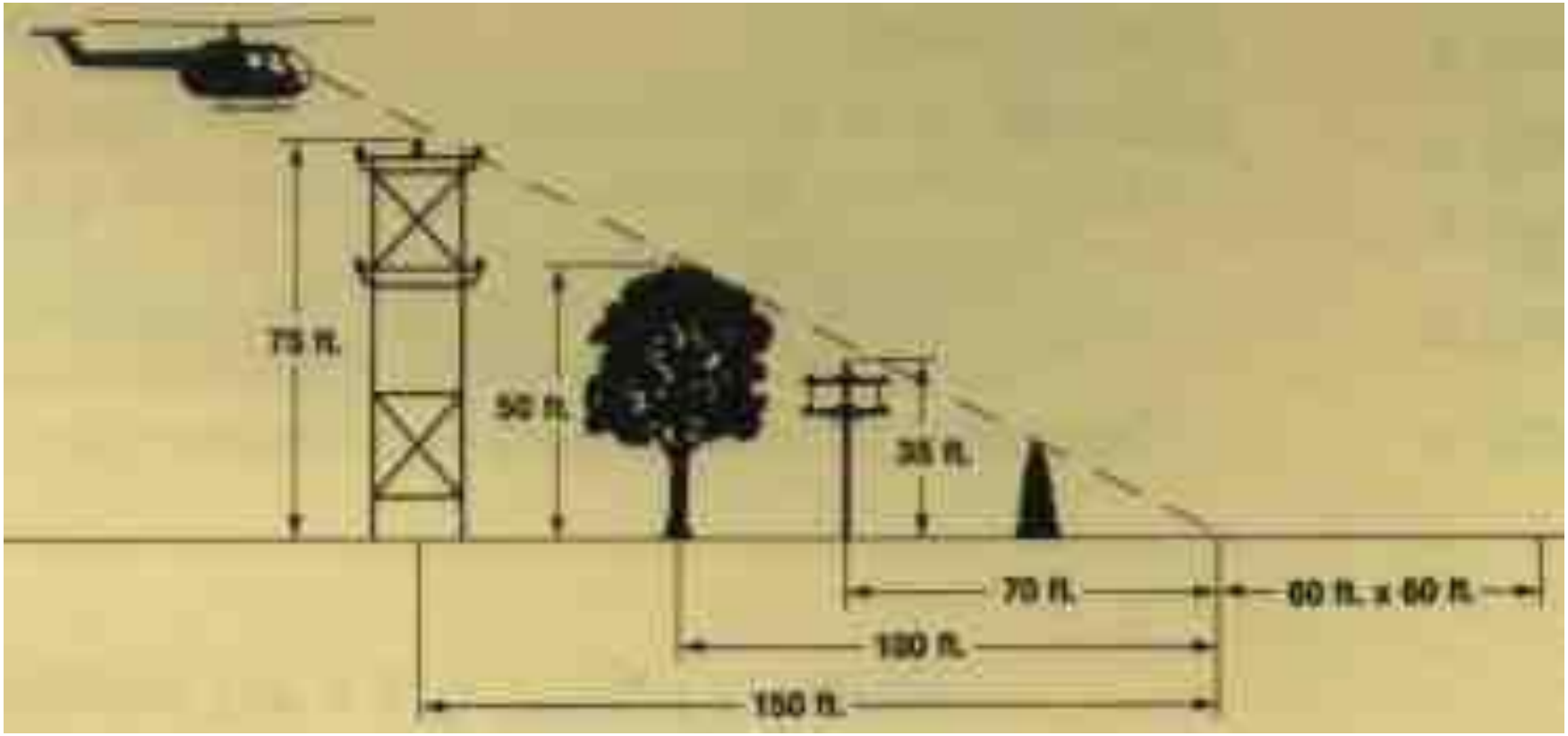
Landing Site Requirements

- Should measure at least 60 feet square, preferably larger around 100 feet square
  - Obstructions surrounding the site may necessitate it to be larger
  - Remember that even though a helicopter may be able to land along a vertical plane in most situations, most helicopter pilots will want to have an approach and takeoff area

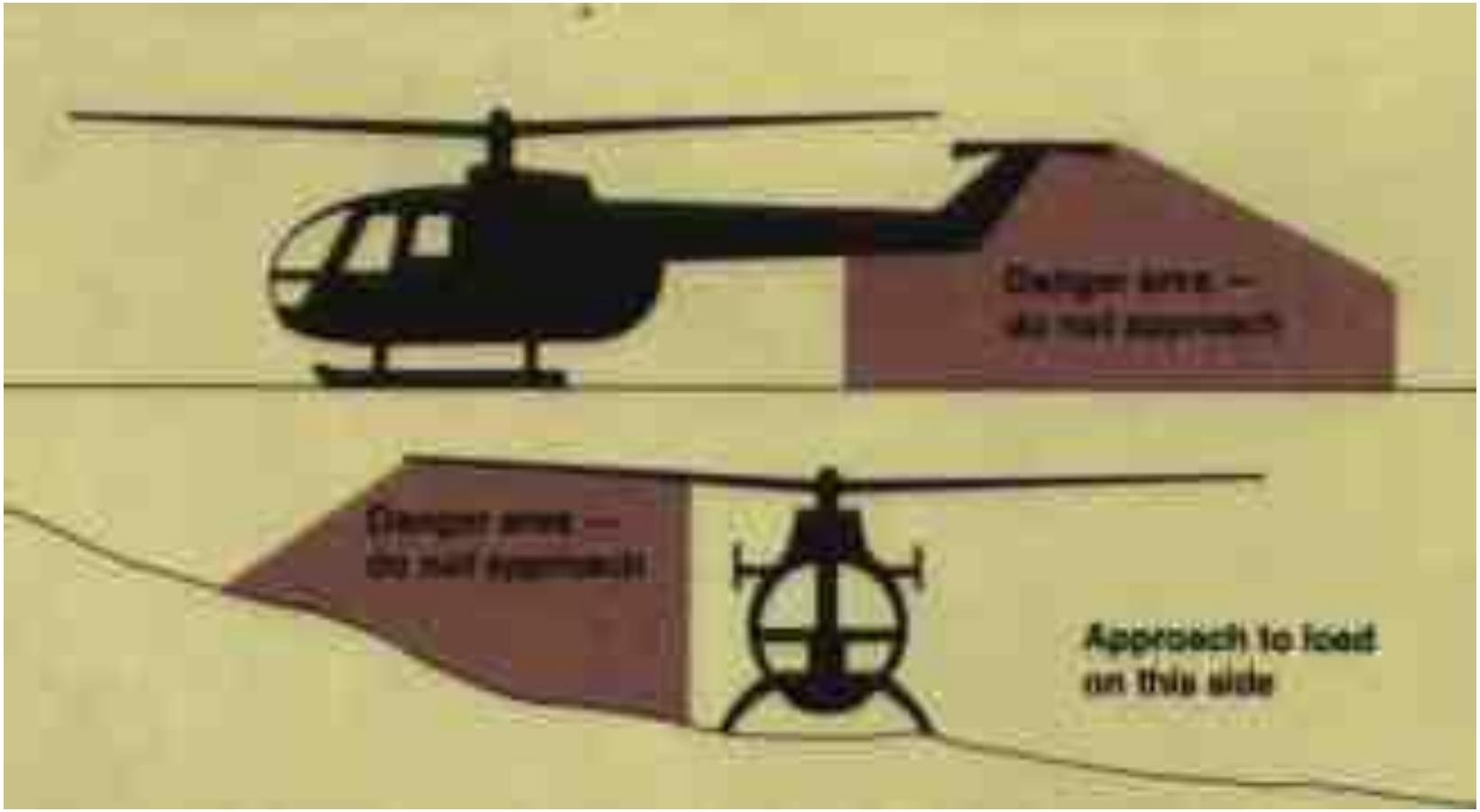
Landing Site Requirements Continued



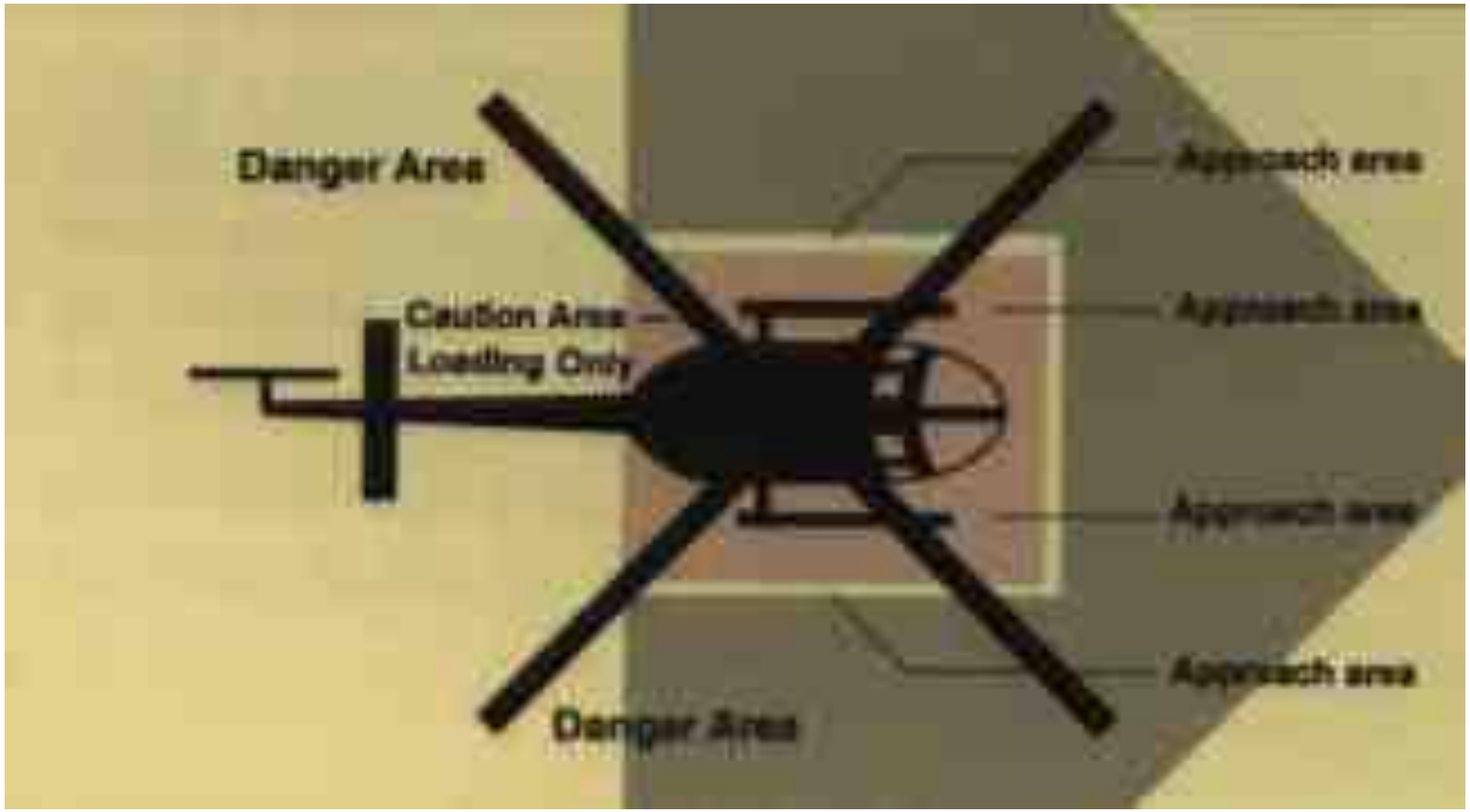
Landing Site Requirements Continued



Helicopter Approach Area Continued



Helicopter Approach Area



Approaching the Helicopter

- Stay out of the landing site unless accompanied by a member of the aircrew or directed by an aircrew member.
- Always approach the helicopter from the front of the aircraft because of helicopter blind spots and danger areas.
- Always approach the helicopter in a crouched position with IVs or long objects carried low or parallel to the ground

Approaching the Helicopter Continued

- When approaching on a slope, approach from downhill, since the rotor will be closer on the uphill side normally, if unsure wait for an escort from the flight crew.
- Never walk around in the tail rotor area.

General Helicopter Guidelines

- DO NOT SMOKE in the landing area.
- No vehicles are allowed within the landing site
- Transferring patient(s) from the team litter to the helicopter litter is done outside of the landing area
- Only the flight crew will open and close the doors or compartments on the helicopter
- All unauthorized personnel should stay out of the landing area.