dangers of the arctic environment

Working in the harsh arctic environment bears multiple risks which will be described below.

- injuries
- loss of orientation
- travel challenges

Injuries

Cold injuries

Cold temperatures are common in the Polar Regions and pose a serious risk to people. It is however an easy hazard to manage providing the right equipment is available and used properly.

• Frostnip

Frostnip is the first stage of frostbite and can occur very quickly when skin is exposed to severe cold. A light wind is enough to speed up the development of frostnip and should be guarded against. Any exposed skin is at a much higher risk of becoming frostnipped but covered areas can also be affected. The first signs of frostnip are pins-and-needles, throbbing and aching of the affected area. Frostnipped skin will go white with a waxy appearance. Keep an eye out for these signs on others while operating in cold conditions in the field. If you notice that you or someone else in the group has signs of frostnip it is important to cover up the affected area. It can sometimes be enough to put on a balaclava or facemask. To prevent against frostnip make sure you have no skin exposed to the wind. Wear facemasks, neck gaiters and goggles when required. If you or someone else gets frostnip don't panic, if dealt with properly it should clear up in a very short space of time and leave no long-term damage. Be aware of a cold sensation in any of your extremities and do something about it! Cold or damp footwear/gloves speeds up the development of a cold injury like frostnip so always dry your clothing and change items if they become damp.

• Frostbite

If left alone frostnip will develop into frostbite. This is far more serious and can cause lasting damage. The initial stage of frostbite after frostnip causes proper tissue damage. The affected area will feel hard and frozen. Skin may blister and swell and may become itchy. This stage is known as superficial frostbite and only affects the top layers of skin. Effective treatment is required to prevent lasting damage and this treatment begins with getting into some shelter immediately! If left untreated the frostbite will advance into a more severe form. Skin will become white, blue and black in appearance and will feel cold to the touch. This is very serious and damage will extend deeper into the tissue, affecting muscles, tendons, nerves and even the bones. At this stage the tissue is beginning to die and immediate medical attention is required. In extreme cases this tissue may need removing or amputation.

• Non-Freezing Cold Injury (NFCI)

This is one to be particularly aware of as it often appears insignificant at first but can result in life-long problems. NFCI is common in feet when they are exposed to damp conditions just above freezing for a prolonged period of time – also known as 'trenchfoot'. Ensure boots appropriate to the temperatures are used and dried out properly each night. Changing socks on a regular basis is also important. If you think you have an issue with your feet then make the rest of the team aware – do not ignore it! If identified and sorted quickly this issue will completely resolve, if not it can lead to long-term nerve damage and constant pain/discomfort.

• Hypothermia

Normal body temperature is around 37°C, when this drops below 35°C you become hypothermic. This condition can quickly become life threatening and needs to be treated immediately. Main causes of heat loss that can lead to hypothermia:

• Convection – chiefly through wind chill

• Conduction – direct contact with cold from wet clothing or snow

• Radiation – losing heat through moisture evaporation from skin and breathing

• Exhaustion – body becomes unable to produce energy to maintain warmth

• Injury – an additional complication as a result of an incapacitating injury is hypothermia

To prevent hypothermia it is important that you keep yourself warm! Keep moving when possible (on a long skidoo journey make regular stops at agreed intervals and get off the skidoo to get your muscles moving. If you are getting cold don't wait until an agreed stop – signal to the lead driver and stop as soon as it's safe to do so). Keeping yourself well fed and hydrated is also important to maintaining warmth, as is going to the toilet regularly!

Signs of hypothermia:

• Shivering

• Sensation of cold and tiredness

• Clumsiness

• Disorientation

• Slurred speech

When managing a group in a cold environment you must all work as a team. If you notice anyone displaying any signs of hypothermia do something about it and do it quickly! If you yourself start to feel cold do something about it before it gets as far as hypothermia. Hypothermia affects the brain so once it sets in, it is hard for an individual to recognise it in themselves. If someone in the group shows signs of hypothermia the basic actions are to prevent further heat loss. Get the casualty into some form of shelter as quickly as possible, provide warm clothes or blankets and let him or her lie down to avoid movements of the cold body. Do not give hot drinks or alcohol to the casualty.

UV-related injuries

Although operating in a cold environment, heat and UV radiation from the sun also poses a great risk. The ozone layer in our atmosphere is particularly weak at the poles so UV radiation is even stronger. In addition to this a snow-covered surface will reflect UV radiation, increasing its affects.

• Sunburn

Sunburn can be incredibly painful and will occur when working in the field if you are not careful. Each person should carry a bottle of sunscreen on their person and apply it regularly (sunscreen will freeze so keep it in a pocket close to your body). A minimum of factor 30 should be used but factor 50 is strongly advised. In the cold your face and neck are often the only areas of exposed skin but do

not neglect hands and arms if clothing is removed. Lips can be badly damaged in cold, dry and sunny conditions so remember to use lip screen with UV protection. Field medical boxes all contain additional supplies of sunscreen. Make sure you apply sunscreen regularly even on cloudy days as UV radiation will still penetrate.

Caution: Sunscreen goes out of date; ensure the bottle you are using is still in date! Factor 50 is strongly advised for field use in the Polar Regions.

• Snow blindness

In simple terms snow blindness is sunburn to your eyeball! It is extremely uncomfortable and best avoided at all costs! Category three or four sunglasses that fit snuggly around your eyes with no gaps are essential for fieldwork and should be worn virtually all of the time. Get used to your sunglasses being one of the first things you put on in the morning! Snow goggles with UV protective lenses are also suitable and should be carried as a back-up/for use in poor weather. Don’t be fooled into thinking that you won’t get snow blindness on a cloudy day; almost 80% UV can pass through clouds.

Orientation

To loose one's bearings in arctic environment is relatively easy, as weather and visibility can quickly change, landmarks or ice bergs are hardly available and sea ice is generally a low contrast area. General regulations for excursions regarding visibility and weather conditions will be announced by the cruise leader at the beginning of the expedition. Weather can quickly change and therefore it might not be possible to get back to the vessel before conditions worsen significantly and orientation can be lost. Constant weather observation has to be carried out by all group members and will be supported by the duty personnel on the bridge. When the current position of the ship is entered into a handheld GPS device or Iridium Inreach the groups have an alternative to navigate back. If these devices should fail, guidance and direction can also be given from the bridge if the group activates an AIS transponder that will be shown on the ship's navigation devices.

Travel

Traveling on sea ice bears challenges due to the fact that the ice might quickly change. Especially when the wind force and/or direction and tidal strength changes, cracks will open up or pressure ridges will form. This can happen very quickly, therefore you should always take into account that the track may change on the way and can be different on the way back. If cracks are observed the bridge watch has to be informed and observation of the crack should be done if necessary. In some occasions it might be wise to position somebody at a crack to observe the development and to make sure that it is possible to come back. If a crack is opening quickly, everybody needs to be ordered back to the side where the vessel or at least a shelter is situated. Using a Nansen Sledge and turn it unpside down makes an appropriate bridge to cross cracks that opened up to 1,5 meters. Wider cracks have to be crossed, if necessary, by means of bridges with or without the help of flotation elements to increase stability. Cracks that are wider than 2-3 meters can be crossed by boat or kayak only.

Never cross a crack alone, if equipment has to be used to get to the other side! Always observe the crack for changes before crossing.