

## **Sustaining Performance During Cold Weather**

### **Soldier Tasks**

Clothing and equipment malfunctions occur more often during cold weather. Simply wearing bulky cold weather clothing restricts peripheral vision, movement, coordination, and manual dexterity. In combination, these effects can adversely impact on the ability of soldiers to satisfactorily perform various aspects of their tasks.

### **Appreciating the problems:**

1. The properties of materials used to make the clothing and equipment are altered by low temperatures. Rubber, plastic, other manmade fabric and materials and even metal can become brittle and break more easily when cold. Zippers will freeze and break rendering garments unusable.
2. Moisture condensation is a common source of problems during cold-weather operations.
  - a. Moisture from sweat or breathing can become trapped in clothing or sleeping bags, condense and degrade insulation.
  - b. Condensation accumulates inside tents when they are occupied. This adds to the weight and makes it more difficult to pack and move them later.
3. Restricted visibility during cold weather operations hampers many soldier tasks and, particularly, compromises operation of vehicles or weapon systems.
  - a. Cold eyeglasses, goggles, and eyepiece sights fog over easily when warm moist breath passes over them or when the wearer comes in from cold to warmed areas. If this condensation freezes, it is difficult to remove.
  - b. Hoods, balaclavas and other cold weather headgear can restrict vision, particularly peripheral vision.
  - c. Depth perception is reduced when air temperature is below 0F (-18C) and/or wind speed is over 10 mph. Visual acuity is reduced when air temperature is below -20F (-29C) and/or wind speed is over 20 mph. These effects become particularly significant for viewing distances greater than 20 ft (6 meters).
  - d. Fog, rain, and blowing snow further restrict visibility. Ice fog is an unusual condition, which occurs when the air temperature is extremely low (usually -40F), and moisture arises from burning of fuels in engines, stoves, and firing weapon systems. The fog is produced when the moisture is trapped under a layer of cold air and wind is not present to disperse it.
4. Weapon use in extreme cold creates problems that can affect the health and performance of the operators.
  - a. Hang fires are more frequent, especially when the weapon has not recently been fired, due to effect of cold temperatures on ammunition burning. The M72 Light Antitank Weapon (LAW) is particularly susceptible to hang fires in the cold.
  - b. Back blast danger area is doubled for the LAW and tripled for the Dragon.
5. Metal can be dangerous to touch (contact frostbite) in extreme cold. Also, moisture will condense on cold metal exposed to heat. Unless removed, it will freeze upon being returned to the cold, and it can eventually lead to rusting. This is especially a problem with individual weapons.
6. Wearing gloves and mittens causes a significant loss of manual dexterity.
  - a. Conventionally sized toggle switches, push buttons, and control knobs, are difficult to operate when wearing gloves or mittens.
  - b. The decreased dexterity might encourage individuals to remove these protective items while working. However, removing the gloves will allow the fingers to cool and reduce blood flow to the hands, which will, in turn, eventually degrade manual dexterity.
  - c. Blowing warm breath into mittens or gloves can cause the hands to become even colder. Air from the lungs contains moisture, which will condense on the hands and wet the inside of the hand wear, contributing to further hand cooling.

### **Optimizing Ability to Perform Soldier Tasks:**

1. Whenever possible, avoid using clothing and equipment not specifically designed or tested for use in cold weather. Do not force frozen or stuck parts to move when they are cold. Lubricate zippers with wax.
2. Problems resulting from moisture trapped in clothing can be avoided.
  - a. Avoid overdressing, and remove clothing layers upon entering heated areas from the outside.

- b. Dry clothing by hanging in the updraft of the tent to minimize condensation accumulation of moisture.
3. Compensate for decreased visibility by increasing vigilance and slowing down. Avoid placing troops near traffic areas during periods of low visibility. Use antifogging compounds on eyeglasses and goggles.
4. Increase back blast areas and warm weapons by firing at a slow rate at first to minimize the chance of a hang fire or other malfunction.
5. To avoid condensation on small arms and ammunition, they should not be brought inside warm areas, unless outside storage and security is not practical.
  - a. If weapons are brought inside, they should be covered and placed near the floor to minimize condensation.
  - b. Clean and dry the weapon after it warms and before returning to the cold.
6. For tasks requiring manual dexterity, commercially available lightweight polypropylene glove liners can be worn beneath heavier gloves or mittens. The bulky outer glove can be removed to perform a task. Periodically, the outer glove can be replaced to allow the finger to rewarm.
7. Many tasks can be divided into shorter segments to allow rewarming breaks.
  - a. Brief rewarming periods in a heated shelter or even time spent with the gloves replaced may maintain sufficient manual dexterity that the task can be completed.
  - b. It may be necessary to complete the task using a two-team approach, where one team works while the other rewarms.
  - c. Work should be planned to avoid extended periods of inactivity (e.g. in formation or awaiting transportation) while troops are outside in the cold.
8. With practice, soldiers will learn to compensate for the effects of gloves and other cold weather clothing on manual dexterity, movement and performance of various tasks.