

## APPENDIX K

WEATHER EFFECTS ON  
NUCLEAR, BIOLOGICAL, AND CHEMICAL OPERATIONS

NBC operations are extremely sensitive to environmental conditions that affect the transport and diffusion of CB agents. Humidity, air temperature, ground temperature, wind direction and speed, low-level temperature gradient, precipitation, cloud cover, and sunlight are a few of the critical elements to consider when planning NBC operations. The degree of impact depends upon the synoptic situation and the local influence of topography, vegetation, and state-of-the-ground.

The low-level stability of the atmosphere is an important factor in determining whether there will be a good horizontal transport of radioactive or CB clouds. However, stability is not measured directly but is calculated by considering the above weather elements. The WETM or SWO will assist you in making a stability determination. Listed below are weather effects for NBC operations that are not contained in the WTDA tables.

**CLOUDS AND SKY COVER.** persistent overcast low clouds usually indicate a neutral (favorable) condition, while broken low clouds indicate an unstable (unfavorable) condition during the day and a moderately stable (favorable) condition at night.

**HUMIDITY.** Humidity has little effect on most chemical agents; however, high humidity destroys some chemical agents such as lewisite and phosgene because of rapid hydrolysis. High humidity increases the effectiveness of HC and phosphorous smokes, some chemical agents, and both wet and dry forms of biological agents. High humidity improves the effectiveness of wet aerosols by reducing evaporation while low humidity assists agent aerosols. High humidity, combined with high temperatures, reduces time in which troops in MOPP gear are effective.

**PRECIPITATION.** Rain and snow will effect the persistence of chemical agents and may produce radioactive rainout and hot spots. Snow may cover and neutralize certain liquid agents. Rain may even work as a decontaminate. On the other hand, some agents may be very persistent on snow.

**STATE-OF-THE-GROUND.** Soil conditions impact the effectiveness of chemical agents. Bare, hard ground favors short-term effectiveness and high-vapor concentrations. If the surface is porous, such as sand, the liquid agent quickly soaks in. Vegetative cover

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reduces exposure to ultraviolet light and favors the survival of wet aerosols. Wet soil degrades the effectiveness of smoke munitions.

**SUNLIGHT.** A bright sun will shorten the lifespan of biological agents. Sunlight also plays a role in temperature gradients, winds, and temperature (stability).

**TEMPERATURE.** Some agents are more persistent at low temperatures. Vaporization may be a problem with higher temperatures. Normal atmospheric temperatures have little direct effect on a biological agent aerosol. Sub-freezing temperatures make water-based decontamination methods ineffective.

**THUNDERSTORMS AND LIGHTNING.** Severe electrical storms will restrict munitions handling because of safety.

**WINDS.** Winds play a significant role in CB agent dispersion, chemical agent persistence, and aerial delivery methods. Very light and strong winds degrade effectiveness of smoke and NBC operations. Wind direction is considered for fallout pattern determination.





Table K-3. Weather effects from surface wind.

WEATHER VALUE (KNOTS)	SEVERE DEGRADATION		MODERATE DEGRADATION	
	SYSTEM/EVENT	REMARKS	SYSTEM/EVENT	REMARKS
Calm	Chemical agents Smoke employment			
LT 2			Chemical agents	
LT 5			Smoke employment	
LT 10			Smoke employment, chemical agents	Wind direction more critical
GT 19	Smoke employment	Wind direction more critical		
GT 25			Personnel	See app L
GT 30	Chemical agents	Wind direction more critical		
GT 40	Personnel	See app L		

Table K-4. Weather effects from temperature.

WEATHER VALUE (°F/°C)	SEVERE DEGRADATION		MODERATE DEGRADATION	
	SYSTEM/EVENT	REMARKS	SYSTEM/EVENT	REMARKS
LT -25/-32	Chemical detection	Becomes ineffective		
LT -20/-28			Protective mask	wo winter kit
LT -15/-25	Chemical decontamination (DS-2) Detector (battery operated)	Solution becomes ineffective		
LT +32/0			Chemical detection Chemical decontamination	
LT 40/3	Nerve agent antidote	Protect against low temp		
GT 80/26	Personnel	See app L for MOPP4		
GT 95/35			Chemical evaporation	
GT 110/39			Chemical decontamination	
GT 120/48	Smoke generator			

Table K-5. Weather effects from precipitation.

WEATHER CONDITION	SEVERE DEGRADATION		MODERATE DEGRADATION	
	SYSTEM/EVENT	REMARKS	SYSTEM/EVENT	REMARKS
Light rain or snow			Chemical agents Nuclear burst	Wash into low areas Absorb/ scatter up to 90% thermal energy
Moderate rain or snow			Engine-generated smoke	
Heavy rain or snow	Chemical agents Nuclear burst  Engine-generated smoke	Wash into low areas Absorb or scatter up to 90% thermal energy		
Thunder- storm/ lightning	Chemical Smoke			
<b>SNOW DEPTH (INCHES)</b>				
GT 3	WP smoke rounds			