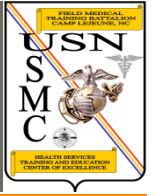




# RADIOLOGICAL CASUALTIES





# OVERVIEW

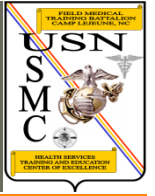


- Nuclear Blasts
- Nuclear Injuries
- Levels of Exposure
- Signs and Symptoms
- Treatment
- Personal Protective Measures
- Decontamination



# LEARNING OBJECTIVES

Please Read Your  
Terminal Learning Objectives  
And  
Enabling Learning Objectives





# FOUR TYPES OF NUCLEAR BURSTS



- High Altitude Burst
- Air Burst
- Surface Burst
- Subsurface Burst



# HIGH ALTITUDE BURST



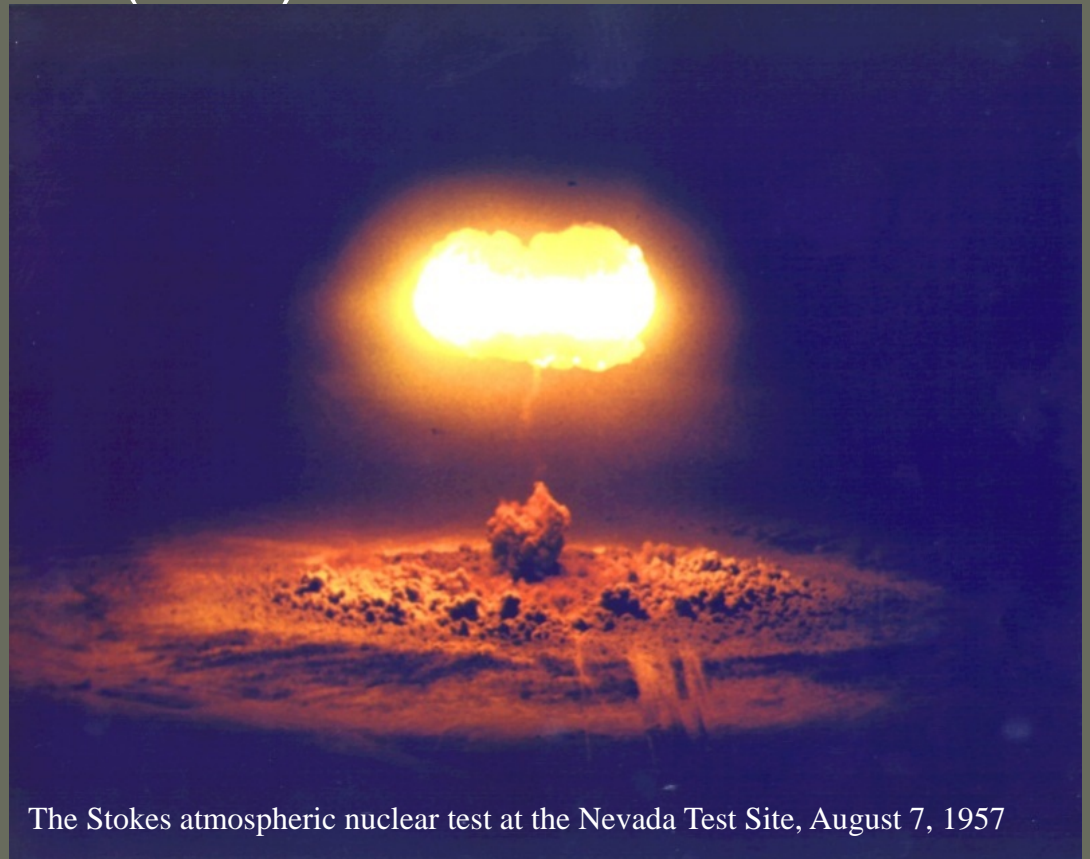
- Detonation at an altitude **above** 100,000 feet (30 Kilometers)
- Much larger fireball, expands more rapidly than other bursts
- Ionizing radiation can travel hundreds of miles before being absorbed



# HIGH ALTITUDE BURST



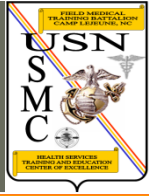
- Severe disruption of communication
  - Electromagnetic Pulse (EMP)
- Degrades/destroys communication, electronic & critical medical equipment



The Stokes atmospheric nuclear test at the Nevada Test Site, August 7, 1957



# AIR BURST



- Detonation of a weapon at an altitude **below** 100,000 feet
- Fireball does NOT contact the surface of the earth



# AIR BURST



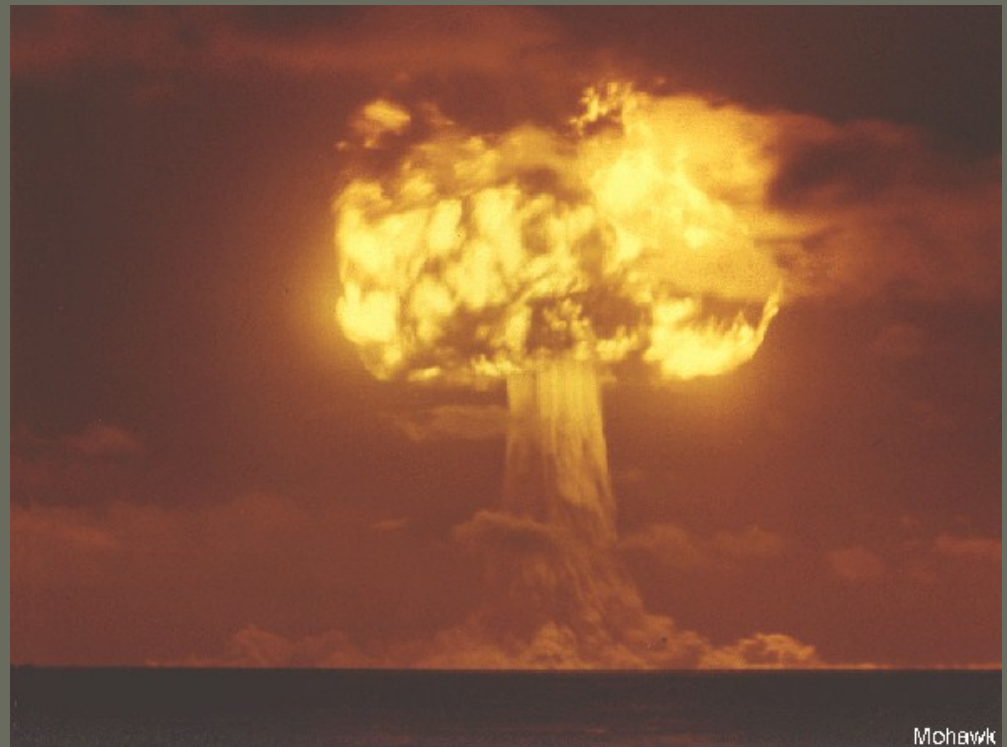
- Cause burns to exposed skin over many square kilometers
- Eye injuries at even greater distances
- Tactically, most likely to be used against ground forces



# SURFACE BURST



- Detonation, **on or slightly above** the surface of the earth
- Fireball touches the ground or water surface



Mohawk

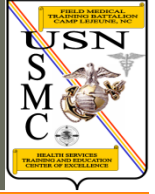


# SUBSURFACE BURST



- Detonation **beneath the surface** of land or water
- Causes cratering of the ground





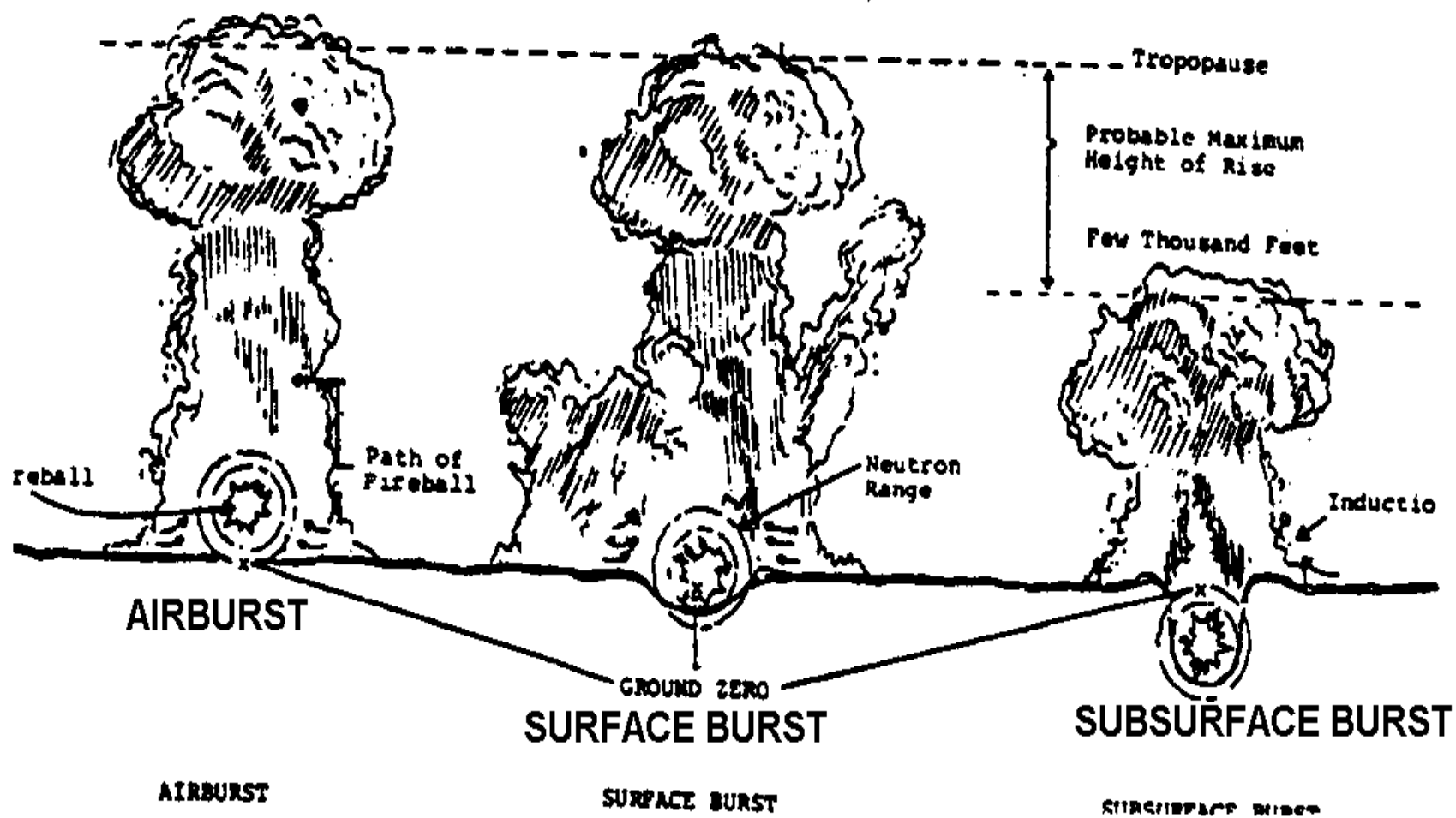
# SUBSURFACE BURST

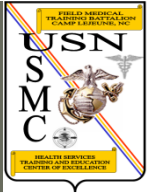


May not penetrate the surface.

If it does the blast, thermal and initial nuclear radiation effects will be present, but less than a surface burst of comparable yield.

Fallout is heavy if burst penetrates.

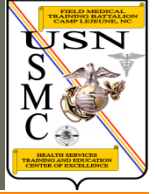




# BLAST INJURIES

- Two Types:
  - PRIMARY (Direct)
  - SECONDARY (Indirect)



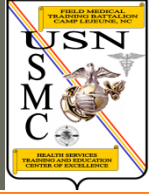


# PRIMARY BLAST INJURIES

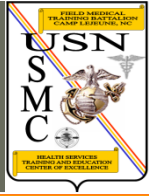
- Caused by the direct action of the shock wave upon the body.
- Injuries occur due to over pressure of rapid air expansion.
- If in close proximity, the initial blast wave is usually lethal.
- Sub lethal exposure causes damage to bones, muscle, lungs, GI system and ear drums.



# SECONDARY BLAST INJURIES



- Caused by indirect wind forces after the initial blast.
- Injuries occur as a result of debris and bodies thrown against solid objects.
- More injuries are created by indirect blast wind forces, than by the shock wave.



# TREATMENT OF BLAST INJURIES

- Blunt Trauma
  - Same as in a non-contaminated environment
- Pressure Trauma
  - Injury is to the lungs
  - 100% O<sub>2</sub>, positive pressure if needed
  - If pulmonary embolus is suspected, place the patient on their left side

# THERMAL INJURIES

- Two Types:
  - Flash Burns (Direct)
  - Flame Burns (Indirect)





# FLASH BURNS



- Results from intense thermal heat released from the fireball
- Exposed skin and extremities facing the explosion will be burned



# FLAME BURNS



- Caused by exposure to fires from the environment
- Could be the predominant cause of burns depending on the flammable materials present



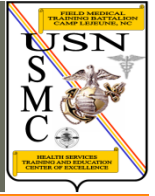
# EYE INJURIES



- Two Types:
  - Flash Blindness
  - Retinal Scarring



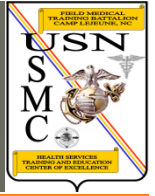
# FLASH BLINDNESS



- Results from looking in the **general direction**, but not directly at fireball
- Light swamps the eyes and depletes the pigmentation of the retinal receptors causing blindness



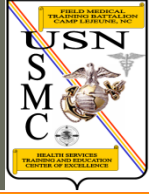
# FLASH BLINDNESS



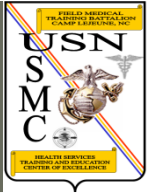
- Temporary –
  - Lasts seconds to minutes during daylight hours
  - Followed by a darkened after image for several minutes
  - Can last 15 to 30 minutes at night



# RETINAL SCARRING

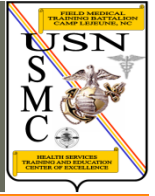


- Results from looking **directly at** the fireball
- Relatively uncommon injury
- Can cause blind spots and permanent blindness





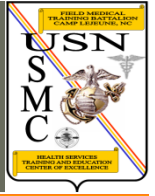
# DIAGNOSIS



- Radiation Absorbed Dosage (RAD)
  - The method for measuring radiation
  - Diagnosis is based primarily upon the clinical picture presented by the patient



# LEVELS OF EXPOSURE



## Mild

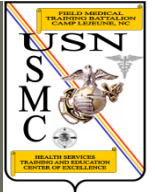
- Vomiting does not occur by the end of the fourth hour after exposure

## Severe

- Vomiting within two hours

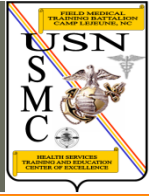
## Deadly

- Vomiting within the first hour accompanied by explosive diarrhea





# SIGNS AND SYMPTOMS



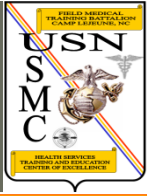
90% of patients exposed to ionizing radiation will exhibit symptoms within 2 - 6 hours of exposure



# SIGNS AND SYMPTOMS



- Nausea
- Vomiting
- Diarrhea
- Fatigue
- Anorexia
- Malaise
- Hyperthermia
- Erythema
- Hypotension
- Neurological Dysfunction





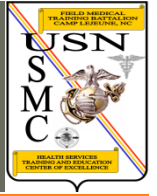
# TREATMENT



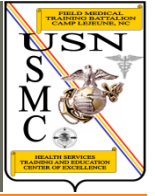
- If NO physical injuries:
  - Supportive in nature
- Treat physical symptoms based on:
  - Life-threatening injuries
  - Burns
  - Blunt Trauma
  - Hemorrhage Control
  - Pressure Trauma
  - S/S as displayed



# TREATMENT

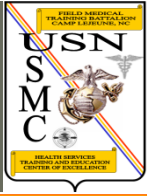


- Pain Management
  - Morphine given as 10mg, every 4-6 hours
- Antibiotics
  - 3 times the normal dosage of antibiotics
- Oral antifungal agents
- Recovery time is 8 – 15 weeks





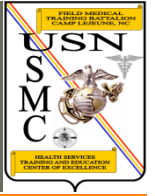
# PERSONAL PROTECTION MEASURES



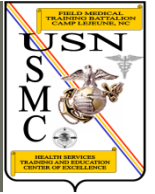
- Drop flat on the ground or to the bottom of your fighting hole, with head toward blast
- Close your eyes; don't look at explosion
- Protect or cover exposed skin by putting hands and arms under or near the body and keeping your helmet on



# PERSONAL PROTECTIVE MEASURES

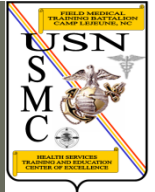


- Keep your head down
- If in a fighting hole  
cover head with arms, place face against legs,  
and place fingers in ears
- Stay down until shock wave has passed,  
and debris has stopped falling
- Don protective mask





# DECONTAMINATION PROCEDURES





# DECONTAMINATION PROCEDURES



- Decon away from the scene at a decontamination station.
- Early removal of radioactive material will reduce radiation burns, radiation dosage and the chances of inhaling or ingesting radioactive particles.



# DECONTAMINATION STEPS



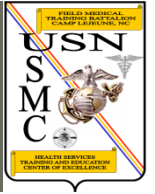
- Spot clean first
- Carefully remove contaminated clothing and garments
- Deposit contaminated clothing and garments in a garbage bag or disposable container
- Bathe or flush contaminated wounds with sterile water



# DECONTAMINATION STEPS



- Apply impermeable dressing over any uncontaminated cut, scratch, or wound
- Shower thoroughly with soap and water
- Scrub the entire body with a soft bristle brush
- Repeat procedures again if any contamination remains





# RADIOLOGICAL CASUALTIES

