How are Humans Affected by the Dark?

How do we Train for Night Operations?

How does Darkness Affected us?
Six Factors:

- **Vision**
- **Hearing and Smelling**
- **Skills**
- **Sleep Deprivation**
- **Fatigue**
- **Psychology**

Vision

- **Visual Acuity**: 20/20
- **Depth Perception**: For range estimation

- Photopic: Full-Light Vision
  - Daylight vision
- Mesopic: Mid-Light Vision
  - Reduction in color and acuity at dawn and dusk
- **Scotopic**: Low-Light Vision
  - Total color loss, one seventh acuity, 20/200

Vision Problems

- Presbyopia:
  - After 40, retina receives less light
  - Instruments and maps are difficult to read, especially in red light
- Night myopia:
  - Nearsighted people with blurred vision at night
  - “Night Blindness”
- Astigmatism
  - Vision out-of-focus

AVOID

- Diet that *decreases* night vision
  - Alcohol within 48 hours
  - Tobacco, smoked or chewed
  - Narcotics, drugs, caffeine

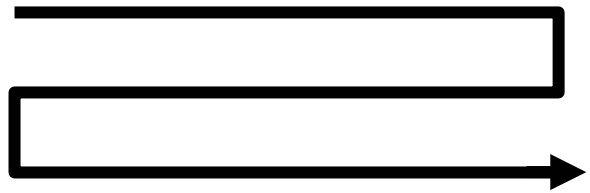
- Conditions that *decrease* night vision
  - Age, fatigue, depression, stress
  - Nearsightedness, diabetes, dehydration
  - Lack of oxygen, colds, exposure to bright light

ENCOURAGE

- Diet that *increases* night vision
  - Vitamin A: Milk, Cheese, Eggs
  - Vitamin A: Dark Vegetables
    - Broccoli, carrots, spinach, others
- Conditions that *increase* night vision
  - Physical fitness, diet, sleep
- *No race or people have night vision advantage*

Unaided Night Vision Techniques

- Scanning
  - Reduces illusions



- Off-Center Viewing
  - Move around periphery, look for silhouette
- Dark Adaptation

Dark Adaptation

- Dark Adaptation and *scotopic sensitivity* (low-light vision):
  - Varies between individuals
  - Varies over time for single individual

  - 30 minutes to acquire: 10K times more sensitive
  - 2 seconds to lose: flashes, flares, lights
  - 45 minutes to *reacquire*
  - Prevented by NVGs. Adapt *before* using NVGs.

Lights Visible at Night

- Headlights 8k
- Bonfire 8k
- Rifle Muzzle Flash 2k
- Flashlight 2k
- Lit Match 1500m
- Cigarette 800m

IR sources are *brighter* than visible lights

Hearing is Increased at Night

- Rifle Shot 3k
- Oars on Water 2k
- Vehicle on Road 1k
- Unit on Road 600m
- Magazine Change 500m
- Conversation 300m
- Single steps 40m

Smell is Increased at Night

Skills

- Estimate Distance: Usually *overestimated*
- Identify Objects: Usually *underestimate* size
- Move on Foot:
  - Good night vision avoids hazards
- Navigate:
  - "Conceptualize" terrain, do not try to see it
  - Good day navigators develop good night skills
  - Some individuals are distinctly better
  - Individual who moves well is NOT best navigator

Sleep Deprivation - Reactions

- Body reaction similar to alcohol use
  - IQ drops each hour / Short term memory loss
  - Stress increases so night vision decreases
  - 20 hours without sleep is *equivalent* to 0.08 Blood Alcohol Level
  - 22 hours without sleep is *equivalent* to 0.10 Blood Alcohol Level
- Like alcohol use, the more tired people are, the more confident they are of their abilities

Sleep Deprivation - Performance

- Performance degrades 25% per day
  - Mental tasks degrade before physical tasks
  - New skills degrade before well-learned skills
  - Initial effects after 18 hours
  - Zero performance after 96 hours
- Performance depends on:
  - *Knowledge*, Motivation, Skills, Health, Fitness
- Poor Performance
  - Exxon Valdez, Challenger Shuttle, Chernobyl, Three Mile Island, 50% of auto accidents

Sleep Deprivation - Fatigue

- Fatigue causes (4) changes:
  - Perception, Slowing, Irregularity, Disorganization
- Fatigue is greatest between 0000-0600
- Fatigue causes hostility, irritability, depression, fear and panic
- Caffeine *masks* effects, does NOT *repair*
  - Caffeine reduces night vision
  - Stimulant drugs have serious drawbacks

Fight Fatigue

- Physical fitness and diet reduces effects
- Techniques to minimize problems
  - SOPs, formats, repetitive training
  - Clear, simple instructions: repeat, double-check
- Commanders should not ‘gut it out’
  - Contrary to popular practice, decisionmakers need *more* sleep
- Rest breaks with food *or* nap *or* prone rest
- Unit Sleep Plan

Unit Sleep Plan

- Schedule and enforce Unit Sleep Plan
- “Uninterrupted” - Quality is more important than quantity
- 4 to 5 hours uninterrupted sleep per night
  - 50% performance drop by fourth day
  - 75% performance drop by twelfth day
  - ‘Sleep debt’ of 8-12 hours owed after 36-48 hours
  - More than 1 night’s sleep owed after 48 hours

Unit Sleep Plan

- 7 to 8 hours of uninterrupted sleep
  - Maintains performance above 80% indefinitely
- Best Sleep Times
  - 2400-0600, 1200-1800, 1800-2400, 0600-1200
- Naps help
  - Napoleon, Churchill, Edison
  - A nap 30 minutes *before* an event improves performance for hours afterwards

The Night Shift: “Mid-Watch”

- 3-5 Days for adequate adaptation
- 3-4 Weeks for complete adaptation
  - Night performance = Day performance
- Do NOT rotate schedule
- Individual preference is important

Psychology

- “Normal” fear of the dark is ancient
- *Nyctophobia* is an abnormal fear of the night or darkness
- Under stress of combat, fear is magnified
- Fear of the dark is overcome by confidence. Confidence is developed by night training
- Leaders must understand human psychology and take actions to address

How are Humans Affected by the Dark?

- FM 7-8 *Infantry Platoon and Squad*
- FM 7-70 *Light Infantry Platoon and Squad*
- *Human Factor Problems in Night Operations* Weitzman. ARI, 1977.
- Naval Research Advisory Committee