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
• Naval Research Advisory Committee