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Crew Endurance Resources Now On-Line

www.uscg.mil/hq/g-m/cems/crewendurance/index.htm

Welcome to the second issue of the Crew Endurance Management Newsletter! This newsletter is provided for basic information and applications of the Crew Endurance Management (CEMS). We continue to send out issues via email, so remember, if you are interested in subscribing, please [register](#) with us!

Check out the [CEM web site](#) where we continue to update you with CEM information and resources. Your thoughts and suggestions on what you would like to see on either the newsletter or the website are always welcome. Please forward them to fldr-G-MSE@comdt.uscg.mil or call us at 202-267-2997.

Crew Endurance Risk Factors

In our [last issue](#), we listed the 15 Crew Endurance Risk Factors and talked about the first one, "Insufficient Daily Sleep." In this issue we discuss "Sleep Quality."

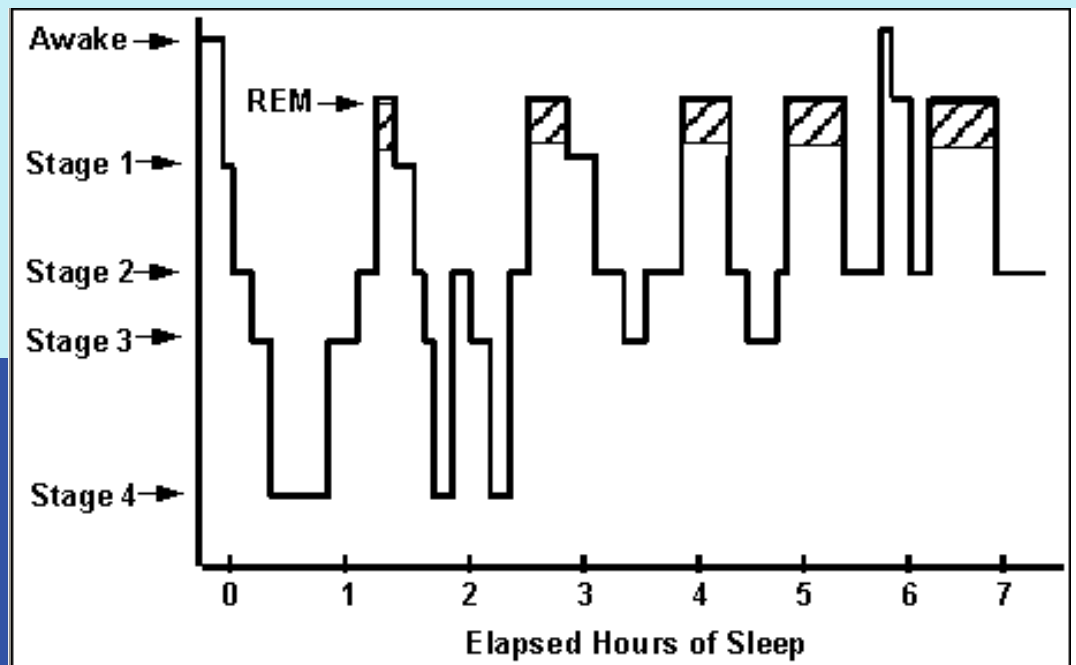
Sleep Quality

Sleep quality has to do with how well you are actually sleeping when you lie down to rest. It's important to review the basic pattern of sleep to understand the importance of sleep quality.



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Sleep cycle

Sleep consists of certain brain activities that progress predictably through five distinct stages :

Stage 1 is the transition from awake to asleep. This stage is characterized by a slowing of brain activity. When aroused from this stage, many people believe they were never asleep. After about five to ten minutes of stage 1 sleep, a person progresses to a deeper sleep, stage 2.

Stage 2 is characterized by brain activity slower than that typical of stage 1, and is considered by many to be the true beginning of sleep. Within 10 to 15 minutes, brain activity slows even further and progresses into the deepest sleep, stages 3 and 4.

Stages 3 and 4 are termed slow-wave sleep (SWS). It can be very difficult to arouse a person from SWS, and once awake, the person may feel sluggish for several minutes. After 20 to 30 minutes of slow-wave sleep, brain activity reverts briefly back to stage 2 sleep, and is then followed by rapid eye movement (REM) sleep (stage 5).

REM, stage 5 or dream sleep, is characterized by quick eye movements, little to no muscle tone, and by very active brain patterns. The first REM period of the night is relatively short, lasting five to ten minutes. After REM sleep, the sleep cycle repeats itself, returning to stages 2, 3, 4, and 5.

Each cycle through the four stages lasts approximately 90 minutes, with approximately five to six cycles occurring per night. Most SWS occurs during the first half of the sleep period, while most REM sleep occurs during the second half of the period. Overall, stage 2 sleep occupies the majority of the sleep period, followed by REM sleep, and then SWS.

For a good night's rest, wear comfortable sleep clothes, darken the room as much as possible, keep noise to a minimum, and if possible, use a white noise generator such as a fan.

For more information about sleep, check out the [National Sleep Foundation](#) where you can find an abundance of information!

This cycle of sleep can be disrupted by such factors as schedule changes, frequent awakenings, and medications. **Any disruption bringing on full wakefulness will cause the brain to start the sleep cycle from the beginning, with the result that the full cycle may not then be completed, because of time constraints. When chronic disruption occurs, endurance degradation ensues.**

If you've ever woken up after having a full 8 hours with which to rest, and didn't feel well rested, it's very likely you didn't sleep well, resulting in your lagging performance the next day!

Stay tuned next issue when we discuss sleep fragmentation.

Fluorescent light? Sunlight? Green light?

To understand Crew Endurance Management, you also must understand light management. In discussing light management, or the use of light to appropriately shift your body clock, the topic of green light always comes up. What is it? How can it be used? Why Green light and not red, yellow, or blue? This article is provided to shed a little more light...on **GREEN** light!

To understand how light is used to manage endurance , it's important to also understand the Red Zone of Human Performance. [Click here](#), to review this important element of Light Management as written in the [Crew Endurance Guide for Maritime Operations](#).

So, now that we understand the timing of our light exposure can have a profound influence on when our Red Zone occurs, we can talk more about green light. Remember, when we talk about light exposure, it must be bright enough - sunlight is the best, but when indoors, fluorescent or incandescent light needs to be more than 1000 lux in intensity (Crew Endurance Coaches are trained how to use light meter to measure this).

Coast Guard Implementation and Green Light Studies

U.S. Coast Guard implementation of Crew Endurance Management has resulted in new studies showing how **Green Light** affects our biological clocks. Night watch personnel dined under dim green lights for two weeks and they found that sleepiness was delayed. The R&D collaborated with Coast Guard Cutter ACUSHNET to demonstrate the potential use of dim green lights to improve crewmember endurance on the night watch during patrols in the Bering Sea. Previously, several controlled laboratory studies had shown that dim green lights can inhibit the production of hormones that promote sleep during the night. Afloat or ashore, night watch personnel routinely experience sleep deprivation, fatigue, and compromised performance. Aboard CGC ACUSHNET, crewmembers installed dim green lights in the mess deck above dining tables. During the night, personnel stopped to eat prior to reporting for watch. Hormone samples demonstrated that this simple use of green lights was sufficient to delay

Light Management is a critical part of the process of adapting to new watch schedules.

Light Management involves being exposed to measured amount of ambient light of a specific intensity and wavelength (color). Light Management does NOT involve staring into naked light bulbs.

Got Comments?

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the body's hormonal regulation of sleep until after the end of the watch period. In the near future other CG units are preparing to test the feasibility of using dim green lights to reduce fatigue during the night watch as well.

But remember, not any old green light will do!

For our eyes to effectively transmit green light as a message to our body clocks, it must be a particular color, or wavelength. Research continues on what frequency and intensity is most effective, however, a general rule of thumb is to consider 300 lux of green light equivalent to 1000 lux of white light in terms of it's sleep delaying effects. As we are able to shed more light on this subject, we will update this website.

Why not just use bright white light?

There are many instances in the marine environment where bright white light just won't cut it. Mariners need their night vision if standing watch in the pilothouse, and bright lights can be disturbing below decks after hours.

This is where green may be a viable alternative. As the studies have shown, green lights affect the body clock in similar ways that bright white light (or sunlight) does, but at potentially lower intensities, or brightness. Since the lights are of a lower intensity, night vision can be recovered more quickly than if exposed to white light !

How do I use green light?

Understanding light management is critical to your success with Crew Endurance Management and requires you to understand when to time your light exposure, given your particular watch schedule. While it takes training and experience to fully understand the science of light management, [this excerpt](#) from the Crew Endurance Guide is a good start.