

# Fatigue—A Root Cause

By Capt. Nick Davenport, MC

The mission of naval forces is to train continually in preparation for war, if not already so engaged. Technological advances and the ever-increasing capability of our machines and missions dictate more complex training scenarios and more highly educated and trained professionals in our service. We own the technology of the night, and strike when least expected. The modern Sailor, aviator, and commander must be energetic, intelligent, innovative, highly motivated, highly trained, and resourceful.

We spend unlimited hours and resources training, drilling and molding the minds of warriors. And yet, these minds do not always perform satisfactorily. Training mishaps and loss of assets take a much higher toll on our capabilities and readiness than enemy action ever did. We are our own worst enemy.

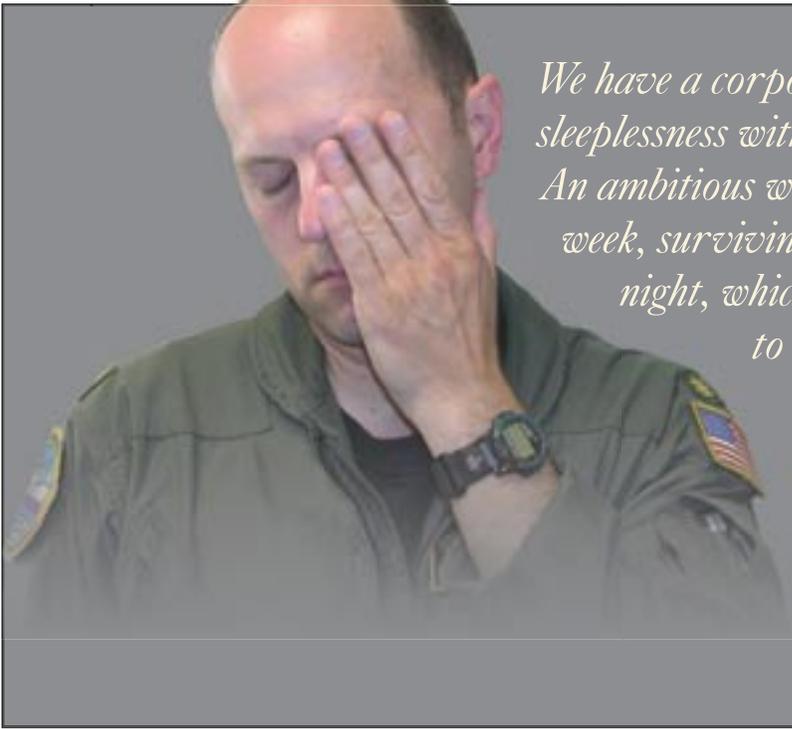
The mind of the successful warrior is simply the product of the human brain. As an organ of incredible complexity and wonder, it is only now beginning to yield its secrets to modern science. The brain is the most complex system in the known universe; yet, in its simplest description, it is nothing more than an electrochemical digital computer. The brain is another weapon system the war fighter must understand in sufficient detail for proficiency; yet, it's so familiar to us that we rarely consider it in such terms.

While awake, the healthy, well-nourished and rested human brain is capable of prodigious feats of sensory perception, symbol manipulation, logic, analytic thought, language, and problem-solving. However, because of its biologic nature, the brain cannot run continuously in the awake conscious mode, but requires scheduled maintenance and recharge cycles for efficient function. The awake functioning brain seems to deplete neurons and biochemical capability, build up toxins and metabolic by-products, and starts to run down. This "running down" is manifest as declines in mental performance, judgment, and complex decision-making, and is associated with a variety of symptoms we commonly experience as "fatigue."

We refer to the regular maintenance and recharge cycles that the brain engages in as "sleep." All animals studied show sleep behavior, cycling around a 24-hour interval. This condition is simply a product of our evolution and the orbital motion of this planet, and is inseparable from the fabric of our existence. Sleep is as necessary for survival as oxygen, water, and nutrition. Animals that cannot enjoy the luxury of unconsciousness during sleep, but must remain continually vigilant, such as porpoises, can switch their brains into sleep mode half-a-brain at a time, while still functioning sufficiently to avoid drowning.

Sleep activity consists of periods of deep, slow electrical activity known as "non-REM" sleep, alternating with periods of fast electrical activity during which the eyes are seen to move beneath the eyelids, hence the term "rapid eye movement," or REM, sleep. Dreams occur during REM sleep, but, in this phase, the brain, in essence, disconnects itself from the rest of the body, and with the exception of respiratory muscle activity, no signals are sent to the muscles of action, so dreams are not translated into body activity. The majority of non-REM sleep is obtained in the first half of the night's sleep, whereas REM predominates in the latter half of the sleep period. Depriving the brain of REM sleep by shortening the nightly sleep period from eight to six hours may significantly affect learning and retention. It is apparent that both are necessary for brain health and function, and if the human brain is deprived of either type of sleep, it actively will seek that type in greater amount. Inefficient or fragmented sleep will result in increased fatigue levels and, again, declining performance.

All this fatigue and sleep physiology would be of mere academic interest to the war fighter were it not for the simple fact the sleep-deprived and fatigued brain suffers increasing performance deterioration as sleep deficits accrue. The signs and symptoms evident in individuals in a fatigued state include deterioration in mood, impairment in complex reasoning and decision-making,



*We have a corporate culture that still confuses sleeplessness with vitality and high performances. An ambitious worker logs 80 hours or more each week, surviving on four to five hours of sleep per night, which induces an impairment equivalent to a blood alcohol content of .1. The analogy of sleep deprivation and drunkenness is a fair comparison because, like a drunk, a person who is sleep deprived has difficulty assessing how functionally impaired they truly are.*

increased tolerance for error and risk, task fixation, reduced communication, reduced vigilance and motivation, and increased reaction times.

As the pressure for sleep increases, the brain will unpredictably try to insert snatches of sleep: lapses or microsleeps. These typically last five to 15 seconds or longer, during which the individual even may appear awake with eyes open but actually is asleep. The brain has switched to sleep mode and is not processing external stimuli. Performance deteriorates because of fatigue, but during these lapses, performance drops to **zero**. These lapses become more frequent as fatigue accumulates. What's most dangerous is that individuals are often unaware of them. External events, such as radio calls, warning lights, sudden threats, or mandatory responses aren't processed during lapses. Fatigue produces predictable declines in performance, interspersed with sudden lapses, an especially dangerous combination of deficits where vigilance is required.

It would be understandable for the war fighter to respond, "So what? We have to train and fight wars in a fatigued state, and we manage to deal with it. We can't eliminate fatigue. Crews must be vigilant and capable 24 hours a day. Wars are fought at 0400. The luxury of eight hours of sleep a night can't be afforded in the military. If the problem is so serious, where's the evidence?"

Our culture, especially in the military, holds that somehow training, habit, motivation or attitude can overcome fatigue. Mishap statistics suggest otherwise.

As part of many mishap investigations, particularly aviation mishaps, we routinely measure for glucose, alcohol, drugs, carbon monoxide, lactic acid, cyanide, and a variety of other biological markers and agents, both in the living and the dead. But, we have no good measure for fatigue, so we've historically missed it as a causal factor.

It's time to change the culture in the Navy regarding sleep deprivation and fatigue. We never would tolerate the profound deterioration in performance that would result if a large number of our personnel routinely were intoxicated on duty; yet, we accept the same levels of impairment in performance from fatigue without recognition. In fact, our military culture often rewards sleeplessness as a badge of honor. Fatigue is so prevalent and such a part of our culture we scarcely see or recognize it. It's the big gray elephant we muscle out of the cockpit when we fly, step around when we enter the bridge, and push aside when we peer into the periscope.

The war fighter is right: We cannot eliminate fatigue. But, we increasingly have sophisticated tools and scientific evidence to recognize the true cost of fatigue on naval operations. We can provide the commander with better risk-assessment strategies and countermeasures. Perhaps, we don't need more training, more discipline, more regulation, more safeguards, or bigger instructions. Perhaps, we just need more sleep. 

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