The Safety Sigma

Mission Readiness through Operational Safety

Spring 2011 **Volume II, Number 2**

From the Director: Maximum potential – Necessity for combating the *Blue Threat*

CAPT Bob "Cosmo" Conway, USN – Director

"May you live in interesting times" – so goes the ancient Chinese curse and we are certainly living in interesting times. The fiscal constraints and scarce resources we are experiencing today are unprecedented and are generating an increasing number of tangible and intangible *Blue Threats*. However, we have the ability to avoid the curse and these opportunities lie squarely in the CO and his or her command excellence team's court. Setting the right tone and creating a command climate that fosters excellence is the key to mission success, risk reduction and mishap avoidance at any time but is needed now more than ever.

As flight time becomes more of a premium, personnel are cut and supplies become more limited, we must be on the guard for the risks that accompany these measures. Leadership relying on previous experience alone, whether it is suited to today's challenges or not, is not be enough to handle today's increased *Blue Threat* risks. Defending against today's *Blue Threats* revolve around enforcing and maintaining the utmost standards of professionalism and excellence and performing to your unit's maximized potential. By doing so, safety, or minimized mishap risk, is achieved by default.

> "I will admit that I wasn't quite sure what to expect when I arrived, but [ASO] turned out to be one of the best experiences of my military or civilian career."
>
> *– Recent ASO Graduate –*

It is important to understand that safety is not tangible and is not something that is effective when applied to a process as a separate entity. Rather it has to be integral into the process and is achieved as a byproduct of the professionalism and excellence in carrying out the process. For instance, is it better to perform a flight or maintenance procedure by the book, not cutting any corners and avoiding less-than-standard techniques by all involved? Or is it better to conduct the procedure as it always has been and superficially get the safety representatives check in the block? I will submit that the former example is the better of the two because the reduced risk of mishap is the byproduct of the high standards, expertise and quality possessed and employed by everyone in the process.

Take a deep and concentrated look at the behavioral norms (a.k.a. culture) in your unit and if they are producing unwanted effects. If left unchecked, I guarantee you that *Blue Threats* (aligned with Mr. Murphy) which are increasing in strength with every budget cutback made, will eventually manifest themselves in a mishap. Reread "Charting the Course to Command Excellence" and break out those SAS pubs and take-home disks to review the ASO and ASC classroom material on successful squadrons. Take a look at your ASAP, CSA and MCAS results too. Then compare those examples of success to what you are seeing in your own units. Regardless of the results, make maximum use of the tools and programs available as well as your ASO so that the performance of your unit can achieve its maximum potential. It takes dedication from every corner of the squadron to soundly defeat this ever increasing Blue Threat day after day. And always remember that ***you*** and your leadership hold the keys to success in keeping the mishap curse at bay.

Where is your Blue Threat

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Man: Fatigue – How are we doing?

CDR Walter "Lunar" Dalitsch, MC, USN – Aeromedical

We have been beating the fatigue topic to death lately because, frankly, fatigue has been beating us to death. Studies by the NTSB have shown that 30-40% of long-haul trucking mishaps have fatigue as an underlying causal factor. Major mishaps such as explosion of Space Shuttle *Challenger*, the *Exxon Valdez* oil tanker spill, the Chernobyl nuclear power plant meltdown, and the aircraft carrier *USS Theodore Roosevelt* (CVN 71) versus cruiser *Leyte Gulf* (CG 55) collision at sea all occurred during circadian troughs where fatigue was an underlying causal factor that affected judgment and decision-making. And, we see approximately one Class A Naval Aviation mishap every two months with fatigue identified as an underlying causal factor – sadly with an increasing trend in the past two decades.

Recent science has proven that 95% or more of us really do need that eight to eight-and-a-quarter hours of sleep to maintain 100% functioning. Anything less first changes our mood and personality, closely followed by degrading other frontal lobe functions such as reasoning, judgment and decision-making. Our brain is simply a selfish organ that when threatened by fatigue, hypoxia, alcohol or drugs is more interested in keeping itself alive by concentrating on breathing and heart beats while ignoring the higher-level cognitive functions that keep us safe on the road and in the cockpit. Ever wonder why you got colds more often right after that first kid was born? That newborn was definitely not introducing you to new viruses – but that newborn brought on your fatigue and your brain didn't care as much about your immune system any more as it did about breathing and heart rate.

Did you know?

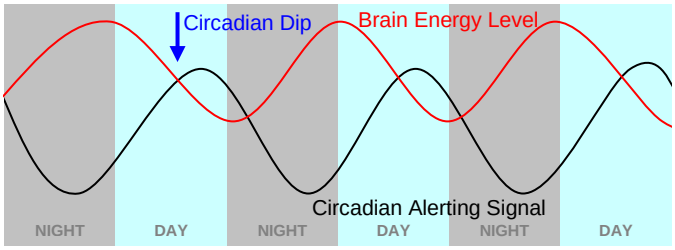
As a society, we sleep a full hour-and-a-half less than we did 100 years ago.

A recent study showed that only one out of one hundred people who think they are short sleepers (needing less than eight hours a night) are actually short sleepers. Which means if you think you are a short sleeper, there's about a 99% chance you're not! Sleep lab and cognitive research has proven that the majority of people sleeping only six or seven hours a night are functioning at only 60-70% effectiveness and don't even know it – because they've never functioned at 100% effectiveness.

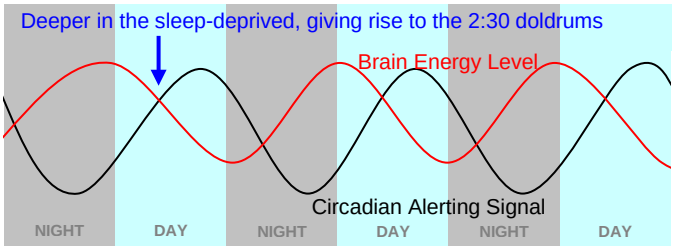
If you have a tendency to nod off after lunch, if you sleep more on weekends than during the week, if you sleep more on vacation than when at work, or if you fall asleep in less than ten minutes after the lights are turned off – then you have strong signs of chronic sleep deprivation. Scientific research has conclusively proven that our performance plummets after being awake about 12 to 13 hours – and yet we continue trying to perform, and we ask our folks to stay late to get the job done. Meanwhile, whenever we awaken to an alarm clock, we are taking our brain out of the middle of its maintenance period and putting it to work early. You wouldn't do that with an aircraft. You wouldn't do that with your car. So why are we the only animals that willingly deprive ourselves of sleep? Why are we abusing our brains – the most important organ in our bodies – so badly? We have a lot to learn from the family dog, because Fido, Rover and Killer certainly do not deprive themselves of sleep!

In a recent preliminary survey I conducted to determine the extent of the problem in Naval Aviation, I found some interesting – and frightening – statistics. The survey was distributed through former ASO students, and I had an amazing response rate of 642 Navy and Marine Corps members. Here are some of the things I learned:

- 46% of our members are getting six or less hours of sleep during the work week – while only 12% are doing this on the weekends or on vacation. This means nearly half our force is operating at only about 60% or so effectiveness – giving the enemy a distinct advantage!
- 45% of respondents fall asleep in less than ten minutes, and 19% in less than five minutes! This is a clear sign of sleep deprivation, as researcher feel normal is 15 minutes or more.
- 60% have a tendency to doze off after lunch at least a couple times a week. Contrary to popular belief, this is not due to the big, fat, greasy cheeseburger you had for lunch – it's due to sleep deprivation. People getting eight hours of sleep a night usually don't even yawn in the afternoons.



Brain energy is reduced in the sleep-deprived (below).



My challenge to you: Try sleeping at least eight hours a night and see how it affects your performance. It's more likely that the first to notice will be others – your spouse, your supervisor, your co-workers. Feedback I've received from students who have taken this challenge includes reduction of work days from 11 hours to eight hours while accomplishing more in those eight hours than they ever had before! There is an improved quality of life, faster run times on the PRT, higher test scores and better grades. So get some sleep!

Machine: Extending the life of my aircraft?

Mr. Rick "Zeus" Wartman – Structures Instructor

The life of an aircraft is primarily based on the fatigue life of the airframe. In essence how many times can you bend the airframe back and forth before it begins to crack? When your aircraft is first being designed, one of the parameters that must be met is the fatigue life. This is typically what determines how many hours the aircraft can be flown before it must be retired. Aircraft manufacturers are typically required to test the airframe to two life cycles to account for the variability in fatigue data. Therefore if your aircraft has an operational life of 10,000 hours, the manufacturer must fatigue test it to 20,000 hours. Keep in mind that this testing is done prior to the military receiving the first aircraft. The AH-1Z shown in the photograph is in a typical fatigue testing fixture. This aircraft was designed for a life of 10,000 hours and they have just successfully achieved the 20,000 hour fatigue test.

This fixture has several hydraulic actuators that are capable of applying loads to the airframe that mimic what the airframe will experience when it is operational. The magnitudes of the loads that are input into the airframe during this testing represent how the manufacturer believes the aircraft will be operated.

Once an aircraft is put into service it begins to accrue flight hours. Eventually it will begin to approach its life in hours. As it does, the question will arise "Is there any safe usable fatigue life still left in the airframe". The military will get in touch with the manufacturer and explain to them they would like to have one of their "high time" aircraft tested to see if there is any useful life still left. This is the Service Life Assessment Process (SLAP). The military will let the manufacturer know how many hours they would like to extend the airframe. The manufacturer is then required to test the airframe once again to two life cycles. As an example we have a 10,000 hour airframe that is bumping up on high time. The military would like to extend the life of the airframe an additional 3,000 hours to give it a new high time of 13,000 hours. This requires the manufacturer to test the airframe an additional 6,000 hours (two life cycles). At this point the manufacturer will take a high time airframe (assume 9,999 hours) and install it into the original fatigue testing fixture that was used for the original fatigue verification. They will also typically instrument a current flying aircraft. This is done to get a load spectrum that represents how the aircraft is currently being operated. This new load spectrum is what will be utilized during the 6,000 hour fatigue test.

There are several possible outcomes from the fatigue test. Below are four of the more common:

1. One possible outcome is that the airframe goes through the entire 6,000 hour fatigue test without any fatigue cracks occurring. This obviously means there was at least 6,000 hours of fatigue life left in all of the components that create the airframe and it is safe to extend the life an additional 3,000 hours. This would also mean that either a very conservative approach was used by the manufacturer for the original fatigue life assessment or the aircraft was not being operated at the high stress levels that were originally expected.

2. Another possible outcome is that part of the way through the fatigue test; the airframe begins to develop serious cracks in several critical parts. Even though any part can be replaced on an airframe, at some point it will eventually costs more to replace the cracked components than it will to purchase a new airframe. This information would imply there isn't any appreciable fatigue life left in the airframe and it should be scraped.

AH-1Z Cobra undergoing fatigue testing. This aircraft has successfully achieved twice the design life, being subjected to hydraulic actuators that induce loads on the airframe similar to those experienced in flight.

3. The next possible outcome is the most common the author has experienced. The airframe begins the fatigue test and part of the way through the testing a fatigue crack starts in a component. The testing will continue but the manufacturer will monitor this crack. Typically the crack will arrest itself by either migrating to the end of the component or when it reaches a rivet. The rivet hole will often act similar to stop drilling a crack. The testing will continue and a new crack may appear in another component. This crack will grow during testing and will also eventually stop for similar reasons. Finally the fatigue testing will stop since they have reached their target number of hours. What we have just learned from the testing is which components on the airframe have been working the hardest. The two components that cracked in the above explanation no longer have any fatigue life left. All the remaining components have shown they have the additional fatigue life needed to extend

the aircraft. When this particular model aircraft goes through the Service Life Extension Program (SLEP) the two above components that cracked will be 100% replaced with new components.

4. The fourth possible outcome is actually a variation of the 2nd and 3rd outcome. In this case the airframe develops significant cracks but usually in the later portion of the fatigue test. The manufacturer informs the military that this particular model aircraft does not have sufficient fatigue like left in it to allow them to increase the total number of flight hours to the desired level. However, the manufacturer will often test a second airframe at a slightly reduced level of stress. By reducing the level of stress this will directly increase the fatigue life of the airframe. If they now achieve the desired increase in flight hours, this aircraft will also be a good candidate for SLEP. However, the operating limits will need to be reduced to reflect the reduced level of stress that was applied during the fatigue testing.

Medium: Knowing what you don't know

CDR Dave "Ivan" Ivezic – Programs Instructor

During the Aviation Safety Programs class we encourage the ASO students to frequently walk the hangar deck and flightline. We provide some anecdotes and experiences to illustrate the importance of walking around, but until recently I have not seen a published piece of work that I could reference.

I just finished reading the book *Know What You Don't Know* by Michael Roberto and I found the reference I was looking for. Roberto opens Chapter 1, "From Problem-Solving to Problem-Finding," by quoting G. K. Chesterton (no, I don't know who that is either): "It isn't that they can't see the solution. It's that they can't see the problem." The premise for this chapter sets the tone for the book; institutions spend too much effort looking for solutions, but in actuality failures usually stem from not being able to correctly identify the problems. If you convert Roberto's words into the language of Naval Aviation, you see we already use this theory. It's Step 1 of ORM – identify the hazards. Easier said than done.

> *"You can observe a lot by watching."*
>
> – Yogi Berra

How does one identify the hazards hidden in plain sight? In Chapter 2, "Circumvent the Gatekeepers," Roberto gets to the basis of my connection with walking the flightline. He first discusses the reasons why information does not get to the leadership. In a word – filters. He then does a brilliant job at analyzing successful leaders and describing how they circumvented the filters. He suggests that leaders should listen with their ears, seek different voices, connect with young people, and go to the periphery. What do these suggestions sound like? Right – walking the flightline and hangar decks. Pay attention to the flow of work. Engage the young guys and gals turning the wrenches. Talk to the plane captains and flight crews as they preflight their aircraft. Lose the assumptions and preconceptions and really listen to them. You will learn about a whole new world that you will never find in the ready room gossip sessions.

Now we're ready to go on to Step 2.

Mishaps: Proactive identification of hazards

CDR Dirk "Dutch" Hart, USN – Reporting Instructor
LCDR T.J. "Donuts" Staffieri, USN – Reporting Instructor

The motto at the School of Aviation Safety (SAS) is: *Mission Readiness through Operational Safety*. As stated in the Naval Aviation Safety Program (OPNAVINST 3750.6 (series), the program succeeds by preventing damage and injury. The potential causes of damage and injury under human control are termed hazards. The goal is to eliminate or control those hazards. Every Aviation Safety Officer (ASO) understands that an effective tool for controlling and eliminating these hazards is Operational Risk Management (ORM). It is critical part of meeting the Secretary of Defense 2012 goal of achieving a 75% accident reduction. This decision-making aid can help identify and reduce risk to the lowest level consistent with mission accomplishment. One ORM application is to study qualitative and quantitative data with the goal of mishap prevention. That being said, the first step in the ORM process is to: Identify the Hazard by asking yourself, "What is in the operating environment that has the potential to adversely affect the cost of achieving my objective?"

The SAS consistently improves its curriculum with current events, lessons learned, and informal data extraction to keep the course relevant and consistent with the dynamic changes associated with Naval Aviation. In doing so, the SAS Reporting Instructors informal research realized hazard concerns in Naval Aviation to include:

Fatigue, Near Mid-Air Collisions (NMAC), Bird and Animal Strikes (BASH), Runway Incursions, Things Falling-Off Aircraft (TFOA), and Kids Falling-Off Aircraft (KFOA). Obviously, the number #1 priority for an ASO is a proactive safety program. It is imperative that any command realize deficiencies, shortfalls, and hazards prior to a mishap. The hazards mentioned above were collated from Fleet emails, correspondence, Hazard Reports (HAZREPS), mishap Initial Notifications (IN), and Safety Investigation Reports (SIR). The intent of the article is to stimulate ASO thinking, emphasize the importance of Fleet inputs, but most importantly to *provide awareness to these hazards*. ***These are hazards in your operating environments with the potential to adversely affect the cost of achieving your objective.***

Did you know?

The leading aeromedical causal factor of all Navy and Marine Corps mishaps and HAZREPs combined is…

Fatigue!

Crew Resource Management: Is CRM lost in translation?

LT Bruce "Cabbage Patch" Lindsay, USN –Rotary/Prop/ Heavy CRM IMM

"What is CRM?" A typical response is "Training to make us work together better as a crew." While this is certainly true, it only represents part of the story. It seems that in the process of teaching people how to work together we may have lost sight of "why" working together "well" is so important. The overarching rationale for CRM is to increase mission success and thus ultimately reducing the frequency and severity of errors that are crew-based. So to this I ask; "Has the intent of CRM been lost in translation?" Human Factor and CRM failures seem to be at an all time high in the recent SIR and HAZREPS that I have read lately. It seems we spend more time teaching the seven skills, rather than using them; and arguing over the verbiage in the OPNAV 1542.7 series rather than the intent of the message. We can't afford to let the original concepts of CRM near a point of stagnation. Sometimes it seems that CRM has become a second thought rather than second nature. CRM is not just another "DAMCLAS" that we have to teach annually. It is a culture and a lifestyle in the aviation community.

We define CRM at the schoolhouse here as the use and integration of all available resources to collectively achieve and maintain flight efficiency and mission success. Resources include, but are not limited to, personnel (within and external to the flight), hardware (the human-machine interface), procedures (NATOPS, 3710, SOPs, FAR/AIM, etc.), and each individual crew members aviation experience and ability to effectively use the seven critical skills.

Returning to the original concept of CRM as a way to avoid pilot and crew based errors there are a few things we should do to "re-cage" our CRM gyros. The first, naturally, is to continue teaching the facets of CRM and encourage the usage of the seven skills to the point that it becomes second nature. At the risk of sounding cliché' we need to "learn it, live it and love it." The strength of these skill sets are often based in experience and should be utilized in conjunction with superior NATOPS and tactics knowledge. This ultimately results in the avoidance of errors by our aircrews. We need to continue to learn and fly the basics before we can push ourselves further into the tactical envelope. Often times our tactical knowledge comes at the expense of complacency in basic flight techniques and proficiency (NATOPS, System Knowledge, Instruments). The majority of our mishaps are happening in training and usually during the "ADMIN" portions of our flights rather than while pushing ourselves and aircrafts tactically. We need to continue to train our crews to recognize and mitigate the consequences of errors which occur and are not trapped. Performed properly, the 7 skills of CRM become behavioral traits of good aviators and allow aviators to utilize their resources to the best of their ability.

Doc Bank Memorial Distinction: ASO student recipients

The *Milt "Doc" Bank Memorial Distinction*, recognizes the student or students in each graduating ASO class that best exemplify the characteristics of the late, great Doc Bank: motivation, intelligence, imagination and aptitude as a potential future ASO Instructor. There were three recipients in ASO Class 11-2: Lt. Cmdr. Greg Keeney, USN of Electronic Attack Squadron 142 (VAQ-142 *The Gray Wolves*) at NAS Whidbey Island, Washington; Lieut. Andy Tabellion, USN of Carrier Airborne Early Warning Squadron 126 (VAW-126 *Seahawks*) at NAS Norfolk, Virginia; and Capt. Courtney Slafter, USMC of Marine Medium Helicopter Squadron (HMM-262 *Flying Tigers*) at MCAS Futenma, Okinawa, Japan. There was one recipient in ASO Class 11-3: Lt. Cmdr. Matthew Ventimiglia, USN of Carrier Airborne Early Warning Squadron 116 (VAW-116 *Sun Kings*) at Naval Base Ventura County, Point Mugu, California.

The Safety Sigma is published quarterly by the Naval School of Aviation Safety located at NAS Pensacola, Florida. If you have a question for the staff, or are interested in attending Aviation Safety Officer, Aviation Safety Command, or Crew Resource Management Instructor training, please visit our website at https://www.netc.navy. mil/nascweb/sas/index.htm or call (850) 452-3181. **If you would like to submit** a short article for publication, please contact CDR Walt "Lunar" Dalitsch at (850) 452-5140 or walter. dalitsch@navy.mil.