Fatigue Guidelines and Countermeasures

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We all recognize that fatigue can have a negative effect on personal performance. In the 24-hour-a-day aviation industry, how do you protect against the effects of fatigue when normal activities include shift work, night work, irregular and unpredictable work schedules and time zone changes?

Working outside the typical Monday-to-Friday, 9-to-5 routine limits the opportunity for sleep and recovery in each 24-hour period, and can reduce the amount of sleep achieved between one and three hours per day. The simple reality is aviation operations’ work schedules:

- limit the amount of time available for sleep.
- disrupt the human body clock, which is programmed for activity during the day and sleep at night.

In addition to sleeping less, people who work non-traditional hours often obtain sleep of a lower quality. Many factors affect the quantity and quality of sleep an individual obtains. Some of these factors can be work related, such as:
hours of work (especially night work, early morning starts, and high total number of hours).

⇒ task demands or time pressures that do not allow for adequate breaks during shifts.

⇒ working conditions that may compound fatigue (for example, heat stress and time pressures).

Other non-work related factors may also come into play. For example:

◊ undiagnosed or untreated sleep disorders.

◊ individual family or social factors that take priority over sleep.

Managing fatigue and associated risks is the dual responsibility of employers and employees. Recommended guidelines and countermeasures can be applied on a personal level and also through company policies and procedures.

Employees can take the following steps to reduce their fatigue:

• Attempt to get 7-9 hours of sleep a day

• Remember to eat properly – low blood sugar can cause fatigue. Periodically eating healthy snacks can keep your blood sugar levels from dropping.

• Stay hydrated - When your body is low on water, it tries to conserve what you have left. It does this by reducing your activity and making you relax and slow down.

• Use caffeine strategically:
  * Avoid drinking caffeinated drinks when you are not tired. The caffeine will have little effect and will contribute to increasing your caffeine tolerance. Your body will get used to having it and, over time, you will need to drink more to get the same effect.
  
  * Avoid drinking caffeinated drinks in the morning. The early part of the day is a time when your body is waking up naturally and, generally speaking, you will feel more awake as the morning progresses. Using caffeine to speed up the process simply increases your tolerance to it. One exception may be if you have to get up really early in the morning.
  
  * Avoid caffeinated products for a few hours before bedtime. Because caffeine acts as a stimulant, it can make falling asleep and staying asleep more difficult.
  
  * Be aware that caffeine usually gets into your system within 20 to 30 minutes and the noticeable effects last approximately 4 to 6 hours.
  
  * Be aware of how much caffeine is in different foods and drinks.
  
  * If you do drink caffeinated drinks, increase your water intake to counter caffeine’s diuretic effect. You may have noticed that you need to urinate more frequently when you drink caffeinated drinks.
• Consume less alcohol prior to bed – alcohol can reduce the quality of sleep and lead to a more restless and light slumber.
• If you smoke, avoiding nicotine in the evening and at bedtime may help improve your sleep.
• Exercise can also improve sleep. Research shows that exercise taken approximately 30 to 180 minutes prior to bed can increase the amount of deep (restorative) sleep that you obtain.
• A healthy social and domestic life is an important foundation for good physical and mental well-being.

The best-known countermeasure to fatigue is sleep. Sleep opportunity is determined to a great extent by the hours you are not at work. Therefore, fatigue reduction strategies must include work schedule design. It is important to remember that there is no perfect working time arrangement that suits everyone all the time. When designing working time arrangements, the following should be considered:

- Length of shifts - Studies show that the level of risk associated with errors and accidents increases after eight hours and dramatically increases when a person works twelve or more hours in a shift.
- Number of consecutive shifts - Weekly work limits should be established.
- Direction of rotation in alternating shifts (forward or backward).
- Working conditions - Environmental factors such as vibration, noise and temperature may further contribute to operator fatigue.
- Type of shifts to be worked (nights, afternoons and mornings, days)
  - Limit successive night shifts, reduce night shift durations, and require rest periods at the end of a series of night shifts. Two successive recovery nights in a seven day period should be considered.
  - If early morning starts disrupt the typical rest periods, then shift duration should be reduced and the number of successive early morning starts should be limited.
- Staffing levels, experience, expertise, and opportunities for job rotation
  - Hire enough people to balance the workload and avoid forcing employees to work overtime due to low staffing levels.
  - Have maintenance personnel who just recently came on shift to assist those who are at the end of their shift to provide quality control.
- Breaks between and within work periods.
- Types of tasks being undertaken, (repetitive, boring, exciting, stimulating)
  - Try to complete tasks that require an increase in attention to detail or are more complex earlier in the shift.
  - Take breaks often when completing boring and/or repetitive tasks.
  - Stimulating tasks over a period of time can be very taxing mentally and physically.
• Allow at least eight hours of rest between shifts and account for travel time and personal time.
  ◦ It is important that sleep opportunities be protected, for example, from calls by scheduling managers, responsibilities for flight planning and noise caused by hotel staff.
• Consulting with all stakeholders about developing new work schedules – participation by all is likely to foster feelings of ownership of the outcome
• Testing changes to the work schedule to determine impacts on the health, safety, and productivity of employees and the company.

Flight crew members often cross multiple time zones during a trip which result in jet lag. One of the most common symptoms of jet lag is sleep disruption. This is likely to include:
⇒ difficulty getting to sleep at regular “local” bedtime
⇒ waking up during the night and not being able to get back to sleep
⇒ fighting sleep during the day

This level of sleep disruption can lead to insufficient sleep quality and quantity, and subsequent fatigue.

Resetting the body clock is more easily accomplished gradually than all at once. Depending on the direction you have travelled, and how long you plan on staying at the destination, one option is to start adjusting sleep and eating times before you leave. Even shifting your bed and meal times by an hour or two can jumpstart the change in your body clock in the right direction.

Upon return home after crossing multiple time zones, it is recommended that flight crew members be given 48 continuous hours off. Time off allows the crew to adjust back to their home time zone and provides the opportunity for at least two consecutive nights of normal sleep to recover from any sleep loss and ensure they are sufficiently rested upon return to duty.

Some of the recommended fatigue countermeasures and guidelines in the aviation industry are:
• Using an augmented crew so that individuals can sleep during duty periods.
• Establishing maximum duty times and required rest periods.
• Pre-positioning a crew.
• Opportunities for rest breaks during duty day.

Positive intentions drive these countermeasures and they do help reduce fatigue, but sometimes real-world logistics hinder their application. Also, even the best laid operational plans go astray. Below are a couple examples of where fatigue countermeasures were in place but the countermeasures could not be properly executed.
Example 1 - This trip was planned for an 18 hour duty day, but with drive time from hotel to airport, extra time required for circuitous routing for position leg, extra time required for clearing customs at SBGR and KMIA, and the passenger showing 2 hours after planned time, the duty day was an actual 20 hours and 30 minutes. Duty day exceeded 18 hours due to unplanned or unidentified delays. Additionally, this trip was crewed with 3 pilots, 1 flight attendant, and a flight mechanic. The crew area of a Gulfstream V does not accommodate five crewmembers with any degree of comfort or expectations for quality rest.

Example 2 - On a 10+ hour long overnight international flight, with a relief pilot (P3), the pilot (P1) who flew the landing was not given the opportunity for 3 hours of rest per the new MAPP directive. The P1 planned to take the second rest period, but had to wait for P3 to finish his rest period. Once relieved, P1 finally had the opportunity to retrieve, began preparing, and then served his dinner and that of the other crew members. After eating P1 finally had the opportunity to enter the crew rest compartment, but was awakened less than two hours later by P2, who was now feeling tired and needed rest. P1’s total time out of the seat was approximately 2.5 hours, with around 1 hour and 45 minutes of actual rest time. P1 (Pilot Flying) and P3 (Pilot Monitoring) were in the seat for the landing. Lack of a clearly defined rest plan as to who would be sleeping when, and for how long. The plan was not determined until arrival at the aircraft, and could be paraphrased as: if you feel tired, sleep. This resulted in the pilot who took the first rest period (P3) taking a longer than normal rest period. P1 was not feeling tired and therefore was reluctant to wake up P3, but was then also planning to be afforded an appropriately long rest period. Less than three hours in, however, P2 was feeling excessively tired and felt the need to be relieved. In addition, P1 was reluctant to leave just one pilot alone in the seat for an extended period while preparing his meal. Therefore, he waited until P3 was awake so there would be two pilots in the cockpit for the 30+ minutes it would take back in the galley preparing the meals. This food prep time greatly cut into the time he then had available to actually rest.

The personal fatigue management strategies and the recommended countermeasures described above can help greatly reduce fatigue but in an environment like aviation there is no way to completely eliminate it. Improving fatigue countermeasures and operating practices necessitates feedback. Any fatigue related event should be reported and tracked as part of the fatigue risk management system (FRMS).

Effective fatigue management is best addressed through a multi-faceted approach and with the understanding that one size doesn’t fit all operations. An FRMS requires participation from everyone in an organization. By providing all personnel with the knowledge, strategies and tools, operators generate a culture that keeps a constant awareness of fatigue risks and allows each person to become a strategic facilitator who will make better informed decisions, enhancing safety for the operation and improving the health and performance of each employee.
Checklist Concerns
BY: Jenna Albrecht, PRISM   Source: FAA SAFO 17006

Manufacturers provide normal, abnormal, and emergency checklists for each aircraft. These checklists provide sequential steps that ensure all necessary items are checked and completed in the correct order. By using commercial off-the-shelf or personally developed checklists pilots run the risk of completing tasks out of order or omitting necessary steps.

Recently, a pilot was unable to lower the aircraft’s landing gear and referred to a COTS checklist for the specific type of aircraft. The aircraft landed with the landing gear partially extended. On contact with the runway, the landing gear collapsed, and the aircraft sustained substantial damage.

The post-accident investigation compared the POH/AFM and the COTS checklist used. The investigation found that the COTS checklist did not match the manufacturer’s checklist relating to the landing gear failure and manual gear extension. The omission of steps within the COTS checklist significantly contributed to the pilot’s inability to fully extend the aircraft’s landing gear. Further, the CAUTION statement in the POH/AFM was not present on the COTS checklist. The CAUTION states: “Do not re-engage landing gear operating motor in flight. To reduce landing gear side loads to a minimum, avoid crosswind landing and high speed turns while taxiing.”

If personally developed or commercial off-the-shelf checklists are used, pilots should meticulously compare their checklists against the manufacturer checklists to make sure their checklists include everything that the manufacturer has listed and that the order is the same.
PRISM ARMOR Adds Scheduled Reporting to Safety Intelligence.

In 2016, PRISM introduced the newest SMS tool in ARMOR called Safety Intelligence (SI). SI takes the available data from the HazRep, FRAT, GRAT, and IEP Manager and provides the safety manager with the opportunity to utilize their data in a meaningful way. Through visual depictions called “panels” SI can display trends, performance, and other indicators giving the safety manager insight into the operation’s safety risk and performance.

The newest feature to be added to Safety Intelligence is the ability to schedule reports. You can create reports within SI that can be exported and downloaded as a PDF. These reports can include your company logo or any other images that you can upload, any of the panels available in the Visual Gallery, and text to provide additional commentary about each panel or your overall performance. You can also include links to other webpages in the report. Once you have created your report, you can share that report with other users within SI or you can schedule that report to be sent via email.

Scheduled reports will automatically be sent based on the interval (once, daily, weekly, or monthly) that you select. These reports can be sent to multiple people or to just one person and are not limited to users who have a login to your ARMOR account; you can add any and all email addresses. For scheduled reports, the data in the panels are on a sliding scale that looks at the last 90days from the date the report is generated.

For detailed instructions on how to create reports and schedule reports, please see the attached Safety Intelligence Quick Start Guide. You can also find this guide on the ARMOR website under PRISM Website Training. Keep an eye out as new features will continue to be added to Safety Intelligence.
It might be considered wise to heed advice from a man who has an army tank named after him. Not that you would want to literally eat an elephant, but the lesson is a good one. Resist the temptation to ignore the details and just get it done. All complex objectives demand patience and persistence, as well as dedication to the intricacies. Additionally, allow opportunity for adjustments along the way as inevitable bumps and obstacles arise. Don’t begin with the assumption it will be quick and easy, or set unrealistic and unachievable expectations. Accomplishing a worthwhile goal is never an easy endeavor. Yes, every thousand mile journey begins with a single step.