18 MINUTE READ

PILOT FATIGUE

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HOW TO MANAGE FATIGUE AND SURVIVE NIGHTSHIFTS

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Emergency Medical Service) Pilot and the founder of Pilotswhoaskwhy.com He has a Degree in Aerospace Engineering and has been flying helicopters for about 10 years. His passion is to tackle hard aviation topics and share high quality explanations that are easy to digest and understand. In this fascinating article we look at the knowledge transfer that can be used by talking with other industries.

Sleep is something none of us can escape from. For some it is amazing, for others it is annoying. Pilots, like many other people in other professions, often have to deal with staying awake while everyone else is dreaming away. Lots of recent research is revealing more and more about the effects of sleep (and the lack of) on our bodies and brains. So today, we will be looking at how to manage fatigue, and how we can stay safe and healthy while (sometimes literally) flying through the night. Human error still accounts for roughly 75% of all global aviation accidents, and pilot fatigue still accounts for roughly 20% of that! Recent studies have even shown that landing an aircraft at 5AM after a full night of flying can have a mental impairment that is equivalent to a blood alcohol level of 0.08%. Pretty crazy stuff right? Let us unpack all of this step by step, and start from the beginning.

By Jop Dingemans

What happens when we sleep?

Sleep is essential for us! It recharges our brains and bodies, and keeps our immune system up to speed to fight off diseases. The average amount of sleep you and I need is 7-9 hours. However, it changes based on our age, amount of physical and mental energy we have used, and our individual differences in our brains. Sleep is now finally starting to get the attention it needs in a world where so many of us are chronically sleep deprived. It turns out that the sleep – nutrition – exercise triangle actually gravitates more towards sleep than the other 2, if you want to live a healthy life. But let us zoom in on what is going inside the brain when we feel sleepy, and while we are sleeping. Why do we feel tired, and why do we (usually) no longer feel tired when we wake up?

1. When we are awake, our brain is having to deal with a constant increase in a chemical called

Adenosine.

2. Adenosine in the brain is what makes us feel more tired when it interacts with receptors in the brain that Adenosine can bind itself to Receptors.

3. When this binding happens it stimulates our desire and ability to sleep.

The act of sleeping causes the high Adenosine levels (that we built up during the day) to lower substantially throughout the night. This eventually results in waking up and not feeling sleepy once all the Adenosine is ‘used up’. In addition to Adenosine, the other important chemical for sleep is Melatonin. Melatonin helps us fall asleep and gets created in the Pineal gland inside the brain.

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ADENOSINE

BRAIN RECEPTORS

This gland’s production is extremely sensitive to light. Meaning that if we expose ourselves to even a little bit of blue / bright light, Melatonin production is severely affected and sleep will become more difficult. Keep this process in mind as we will come back to it in the caffeine section.

What are Circadian Rhythms?

The amount of sleep you personally need is determined by our internal body clocks. This body clock is called the Circadian Rhythm. Think of it as a daily regular fluctuations of variables inside your brain and body. What variables? Good question! All of these change a lot throughout one standard cycle:

• Body Temperature • Blood Pressure • Heart Rate • Sensory sensitivity • Neurotransmitter activity

What is interesting is that a standard cycle for us actually lasts 25 hours, not 24. The reason we are able to make 24 hours work anyway, is because we have external cues telling us what time of day it is roughly: sunrise, sunset, regular mealtimes, work schedules, etc. These points in time are called Zeitgebers (which is German for 'time givers'). If we were to lock you up in a dark room with none of these Zeitgebers anywhere, your brain would eventually return to a 25 hour circadian rhythm, with roughly 17 hours of wake time and 8 hours of sleep!

What types of sleep are there?

There are 4 main types of sleep:

1) Transitional light sleepis the phase between putting your head

on a pillow and actually falling asleep. Muscles relax, blood pressure drops, and the brain is becoming less active (or more for some people). 2) Light NREM(Non Rapid Eye Movement) sleep is the next phase. This is usually the biggest chunk of our nights (50-60%). This is the phase where an annoying neighbour, cars, or anything else nearby has a higher chance of waking us up. 3) Deep NREMsleep is sometimes called slow-wave sleep. This is because our brainwaves slow down a lot. Heartrate and breathing slow even more, and it becomes more difficult to wake up. Deep NREM sleep is important for restoring our physical bodies. The body repairs its cells, restores functions to organs, the immune system, and bodily tissues. 4) REM(Rapid Eye Movement) sleep got its name from the fact that during this sleep phase, our eyes move rapidly in different directions. Our heart rate and blood pressure is higher, our breathing rate increases, and we start dreaming. REM sleep is critical for our brains. The brain consolidates all the information and processes we have kept ourselves busy with before falling asleep. It also helps transfer our acquired knowledge that was in our short term memory, into our long term memory. Without REM sleep we would all still be trying to figure out how to make fire, not a good time!

What is Fatigue?

Fatigue happens when we as humans do not get enough

opportunities to get rest and let our bodies and brains recharge.

What are the different types of fatigue?

There are 4 main types of fatigue:

1) Circadian Fatigueis the reduced performance caused by trying to function properly outside your normal circadian rhythm. The riskiest window for this type of fatigue is between 2 AM and 6 AM. 2) Cumulative Fatigueis caused by constant mild interruptions to our sleep over time (throughout a week for instance). Let us say you have a baby that needs constant attention, a constantly changing roster, or simply noisy neighbours that keep waking you up. 3) Transient Fatigueis what happens when you stay up for a long period within 1 day, or sometimes 2. This can happen after a full night of flying, or if you are suffering from insomnia. 4) Workload fatigueis the type of fatigue you get after a long stretch of intense work, whether mentally or physically.

What is fatigue caused by?

For pilots, the main causes for fatigue are:

• Long duty periods • Poor general health • High workload for long times • Emotional stress, whether at work or at home • Poor lifestyle (bad nutrition, sleep, exercise, alcohol etc) • Reduced amount of sleep or nap opportunities • Working outside our circadian rhythm • A bad night sleep

What are the hazards caused by Fatigue?

There are quite a few hazards that are caused by pilots being fatigued:

• Decreased mental performance • Reduced alertness • Long term health effects • Increased reaction time • Less effective memory • Impulsive mood

All of these reduce our ability to deal with the day to day operation, not to mention unforeseen circumstances or emergencies.

How can you recognise you are Fatigued?

Recognising fatigue is extremely important when you're working in a rapidly changing, dynamic environment. What are the main giveaways from a pilot's perspective?

Here are the main ones:

• Forgetting earlier discussed items • Increased reaction time • Being mentally behind the aircraft • Micro-sleeps (falling asleep very briefly / not being in control of staying awake) • Alerts going unnoticed unless your FO or captain detects them • Sluggishness on the radio, or even completely missing calls • Less accuracy during manual flight

1.

CAFFINE ADENOSINE

How to manage Fatigue?

So what can we do to manage the risks and hazards that come with being fatigued as a pilot?

1) Ask yourself, am I getting enough sleep in general? If the answer is no, it might be time to look into how you can increase the amount of time you give yourself to bel able to get 7-9 hours

of sleep. Sleep deficit can build up and get worse over time, to the point where even getting 1 good night is still not good enough and you'll still feel tired. 2) Take care of yourself in regards to nutrition and exercise. Fatigue is often caused by poor physical health. Dealing with this has solved various long term fatigue issues for a lot of pilots (and others who work irregular work patterns like doctors, nurses, etc). 3) Make sure you create enough potential nap opportunities, if allowed during a nightshift or flight. Most OPS manuals allow for naps as long as you make sure you do not enter deep sleep, as this can cause sleep inertia in moments where your attention level should be the highest it can be. A nap that lasts 10-20 minutes is the safest way to make sure this does not happen. Short naps, also called "Power Naps" or "NASA Naps" can massively increase performance if you feel fatigued. NASA discovered that pilots who decided to nap in the cockpit for 26 minutes, showed alertness improvements by 54%, in addition to a 34% increase in overall performance, pretty convincing results! If you take a nap to manage your fatigue while on an off day and you're trying to not screw up your schedule too much, avoid taking naps later in the day as this can 'consume' Adenosine too close to the point where you do want to fall asleep, making it trickier to fall asleep at a normal bedtime.

RECEPTORS DIAGRAMS

2. Have a look at the list below. By the way,

the same applies to engineers, air traffic controllers, or anyone else with a role that impacts safety in any industry.

• Adhere to your Flight Time Limitation scheme, or in the case of non-pilots, manage your working times with anything you have control over • CRM Training should raise awareness about the effects and causes of fatigue • Try to make working conditions the most pleasant you can while on duty • Alert and brief colleagues if you feel tired, or if you think you are behind the curve • Take your sleep seriously, figure out how much sleep you need (count the amount of hours you tend to sleep without an alarm), and strive to hit this amount as much as possible. • Limit your caffeine intake • Stay hydrated as much as possible • Only eat small portions, if you have to, if you’re working through the night

How does Caffeine affect fatigue?

Caffeine is in a lot of stuff these days. It is loved by many for its alertness-increasing effects. But how does it work? Remember the receptors we talked about earlier that, when interacting with Adenosine, makes us sleepy? Well, caffeine attaches itself to these Adenosine receptors as well!

(See receptors diagrams below)

So now what?

Now, the receptors are now too busy playing around with all the caffeine that binds itself to them. You can have all the built up adenosine you want, but unless they can actually interact with the receptors, you're not going to feel sleepy! The problem is though, that the creation of adenosine isn't influenced by caffeine intake. This means that there is a buildup of adenosine, but you don't feel the effect until all the caffeine left your system, and the receptors are freed up again:

3.

CAFFINE ADENOSINE ADENOSINE

Once the caffeine has left your system, all the built up Adenosine chemicals are like 'Yay let's go guys', and they all try to attach to the now freed-up receptors at the same time, making you very sleepy after the caffeine wears off. This is why after a lot of caffeine, even after waking up, you might feel very drowsy! Let's have a look how much caffeine your average beverages contain.

• Your average cup of coffee: 95 mg • Your average cup of tea: 57 mg

The recommended maximum for the average person is about 400 mg. More than this can have negative effects on cognitive and physical functioning such as:

• Digestive issues • Anxiety • High blood pressure • Heart palpitations / rapid heart rate

How to Sleep Better before a nightshift?

For nightshifts specifically, there are two options of sleep management:

1) Set the alarm early the night before so that when it is early afternoon you will have a sufficient Adenosine level go attempt to daytime sleep. 2) Go to bed late the night before, wake up late on the day of the upcoming nightshift, relax as much as possible during the afternoon so you will still have enough energy to complete the night shift without additional sleep.

Good question! Here are the most proven principles for increasing your sleep quality that can also be applied to irregular working times:

• Use a sleeping mask or black-out blinds if you need to sleep while there is daylight around to preserve Melatonin levels • Use good sleep hygiene (meaning low light levels, no electronic devices before sleep, a quiet room) • Develop routines that help you with good habits such as exercise and taking time to unwind • Stick to a sleep schedule as much as you can, waking up at the same time every day on off days will still benefit your circadian rhythm consistency • Do not go to bed hungry or completely full, avoid large meals right before bed • Create a relaxing environment with optimum lights, sounds / silence, and temperature • Try not to nap after 4 PM if you are trying to sleep soon after, as the nap will use up some of the Adenosine we spoke about earlier • If you feel mentally busy / worried / anxious, use mindfulness techniques such as yoga or meditation to clam down before sleep • Get more exercise to use up energy throughout the day if you feel too energetic when it's bedtime • Try and stay away from sleeping tablets, as they can drastically reduce the sleep quality, and time spent in REM or NREM sleep. Currently the only sleeping tablet that is approved by the UK CAA is Temazepam, but needs to be ground tested by individuals to make sure you do not have side effects, and always crosscheck this with your company's policies, procedures, and OPS Manuals. • For long haul flights, keep in mind that it takes your system a full day in a new time zone to shift your circadian rhythm by about 90 minutes

Accidents and incidents caused by fatigue

There have been plenty of fatigue related accidents in the past:

1) A US based Night Air Ambulance Helicopter LOC-I crashed due to pilot fatigue in 2018 2) An Alaska Air Ambulance crashed with pilot fatigue as a main contributing factor in 2017 3) TriMG Boeing 737-300 from Singapore to Jakarta Halim accidentally taxied onto the active runway without a clearance in 2020. The final report included: “The captain’s statement noted that he had not attained any appreciable sleep in the 24 hours preceding the flight. “ 4) A superjet 100 crash in 2013 was crashed during a test flight that was linked to pilot fatigue

Lessons learnt from “Why We Sleep” by Neuroscientist Mathew Walker

I heavily recommend “Why We Sleep” by Mathew Walker. He’s an experienced Neuroscientist with a PhD in Neurophysiology from the Medical Research Council in London, UK. After lots of recommendations from the doctors I work with as a HEMS pilot, I decided to read it. In HEMS, we fly a lot at night, and deal with a Day-Day / Night-Night, 4 off roster, which can be fatiguing at times.

Here are my main take-aways from his research and experiments:

• Natural sleep is always better than medically aided sleep (pills, drinks, etc). • The World Health Organisation has classed any form of night-time shift work as a probable carcinogen • After just one night of only four or five hours of sleep, your natural

killer cells –the ones that attack the cancer cells that appear in your body every day –drop by 70%. • It is proven that some people perform better in evenings or mornings. Find out who you are, and utilise this knowledge to your advantage • Cut down on blue light before sleep. If you must use a screen moments before bedtime, try to turn on night shift or any other screen mode that eliminates as much blue light as possible • Caffeine can affect our brains much longer than most of us realise. If you have some coffee at 12 PM, a quarter of that caffeine will be still be active in your brain around midnight. It takes roughly 5-7 hours for the amount of caffeine in your body to halve. • Adults above 45 years old who sleep less than 6 hours per night are 200% more likely to suffer a stroke or heart attack throughout their life compared to people who hit 8 hours a night • The shorter you sleep every night, the shorter your lifespan. • Sleep is a crucial factor in increasing skill level for anything in life. Most of the programming in your brain happens not during practice, but while sleeping. • Being awake for 16 hours will result in the brain starting to depreciate in cognitive functioning. Try and be aware of your own limitations and brief others accordingly!

LISW23

THE GLOBAL EVENT

HAPPENING IN LONDON

By Sean Moloney

London International Shipping Week 2023 (LISW23) will live up to its claim to be the 'must attend event of the global maritime calendar' when an expected 30,000 visitors and countless thousand more online, descend on London during the week of Sept 11-15 to attend an anticipated 400 events that will be held during the week.

Shipping industry leaders, regulators, insurers, arbitrations, lawyers, ship brokers, ship owners and ship managers, not to mention experts in commodities, satellite communications, classification, ship registration, crew travel, ports and port agency, training and the world's media will rub shoulders to make LISW23 the blue sky thinking and thought leadership event of the industry.

And the United Kingdom Maritime Pilots Association (UKMPA) is proud to announce that it will be there representing the interests of its members at this global event.

Sean Moloney, co-owner and cofounder of London International Shipping Week, welcomed the involvement of the UKMPA and said that holding an event during LISW23, will ensure that the elements of the global shipping industry that the Maritime Pilots want to influence, are fully aware of the important work that the

sector does.

“London International Shipping Week is different to any other global maritime week because it revolves around a multitude of events that attract in the key players that everyone wants to meet and network with. Supporting Organisations like the UKMPA, as well as corporate and company sponsors are the only entities able to hold events during LISW. The week is all about collaboration and shipping industry leaders attending shipowner meetings” he said.

Moloney said, “The management of the event is highly organised and totally transparent with a Board of Advisors (or industry grandees) sitting above a Steering Group and an Executive Team. These three entities are dedicated to delivering a world class international maritime event in London during September 2023, with the aim of utilising the week to promote London and the UK as a world-leading International Maritime Centre, helping UK maritime businesses increase exports, win business and attract inward investment”. John Hulmes, Chair of the LISW23 Steering Group, added: “The world is going through a period of unprecedented challenge and change and LISW23 will be the key focal point for the shipping leaders from around the world to meet and review the current and future state of our industry.”

Details have now been revealed about the spectacular Gala Evening celebrations which are planned as the fitting culmination of London International Shipping Week 2023

(LISW23). The evening is supported by our three major sponsors and will be held on Thursday 14th September 2023.

A Champagne Gala Reception, a fabulous black-tie Gala Dinner and –for the first time – an exciting After Party event, all taking place on one extraordinary evening to celebrate the tenth anniversary of LISW and all that is good about London, the UK and the international shipping and maritime industry. The glittering evening will be held at Evolution London, a truly special venue in London's Battersea Park which will welcome up to 2,000 of the world's foremost shipping industry leaders in a magnificent setting with excellent communication links, including specially chartered boats for guests on the River Thames.

The LISW23 Champagne Gala Reception will be sponsored by HFW; the Gala Dinner by ABS; and the After Party by newly announced sponsor, the French International Register RIF.

Tickets are already on sale via the LISW website. Those eager to pre-register their interest in reserving a place at this not to be missed celebratory evening, should contact Karen Martin by emailing kmartin@shippinginnovation.com.

Organised with the full backing of the UK Government, as well as the international and domestic UK maritime industries, LISW23 will attract the world's shipping industry leaders and thought leaders to London in September 2023 to network and debate key issues facing the industry. We particularly look forward to

welcoming delegates from the UKMPA.

Further information about all aspects of the recently held LISW21 as well as information relating to the LISW2023 week can be found on the dedicated event website: www.londoninternationalshippingweek.com Also follow us on social media: @LISWOfficial / #LISW23