

# Occupational Alertness & Fatigue Management



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**Integrated  
Safety  
Support**

ENHANCING FUTURE WORKFORCES TODAY

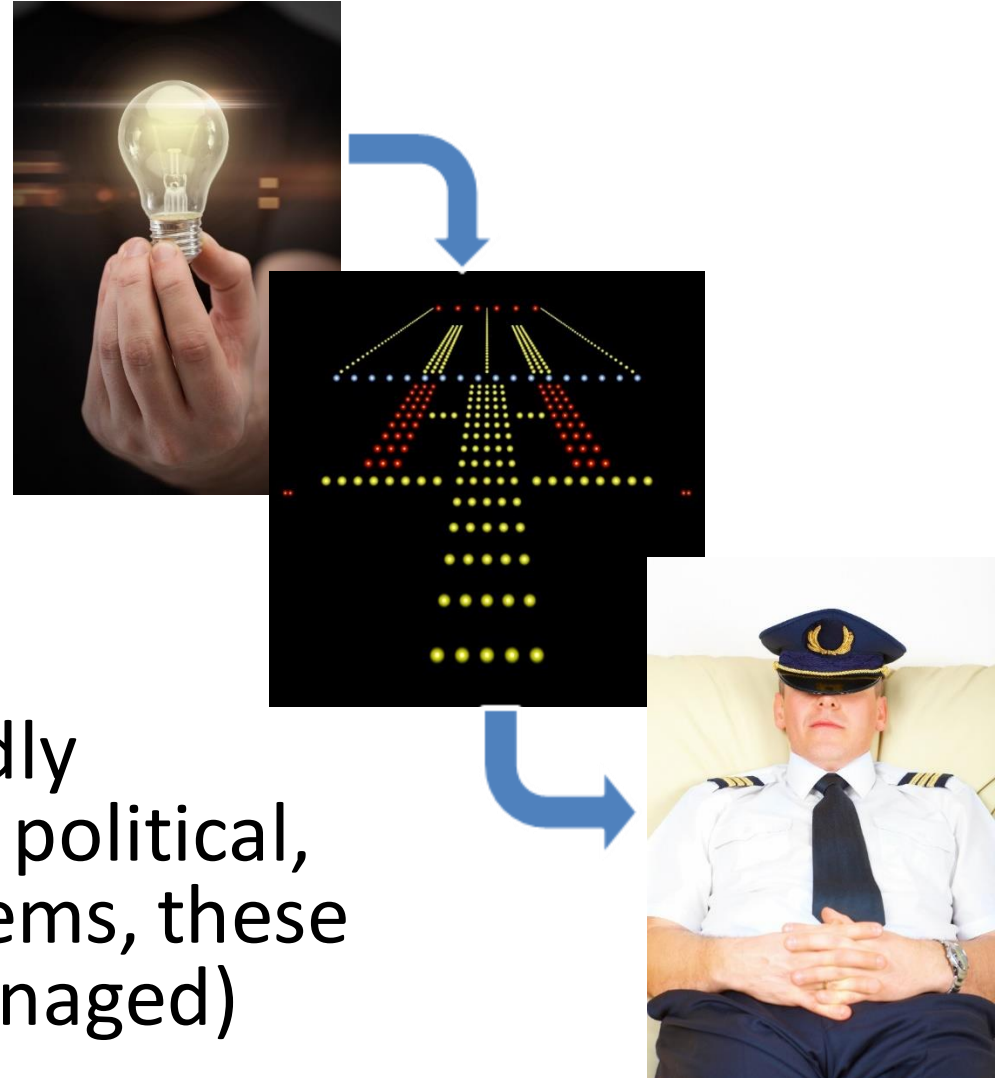
# Human alertness: Design basics

- Humans evolved to have ~24-hour (i.e. circadian) rhythms in alertness/sleepiness, metabolism, etc.
- Circadian rhythms allow us anticipate and prepare for precise and regular environmental changes
- Historically, this allowed us to capitalize on resources (e.g. light and food), which allowed us distinct selective advantage



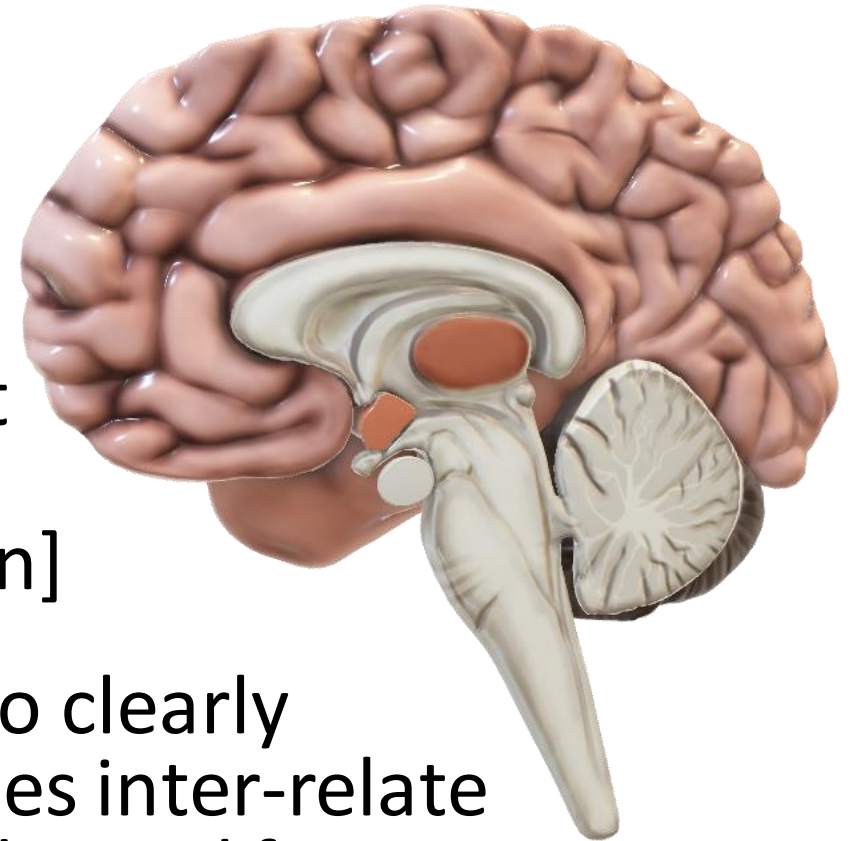
# Human alertness: Design basics

- And then we started manipulating our external environmental signals
- Not surprisingly, since we have not adapted our biology/physiology, we have created new risks
- Placed in the context of rapidly changing social, commercial, political, technological and other systems, these risks can be amplified (or managed)



# Human alertness: Design basics

- Occupational sleepiness & fatigue has become an undisputed contributor to aviation safety outcomes [evidenced by an almost constant place in the US NTSB's Most Wanted list since its inception]
- Medical and scientific evidence also clearly indicate that sleep and fatigue issues inter-relate with many other individual and industrial factors: E.g. Risk taking, mental health, immune function, productivity, safety reporting, Type 2 diabetes, etc.



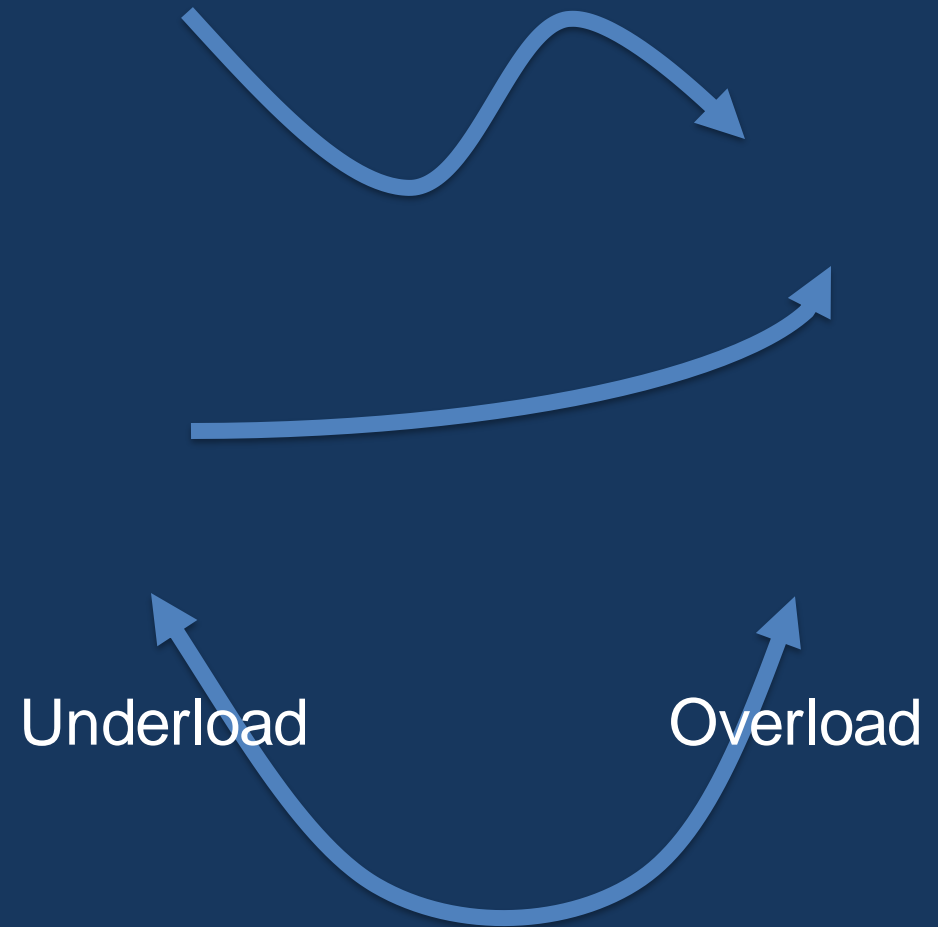


# So, when are humans most alert?

(1) Time of the day

(2) Time awake  
since last sleep,  
duty length duration

(3) Workload

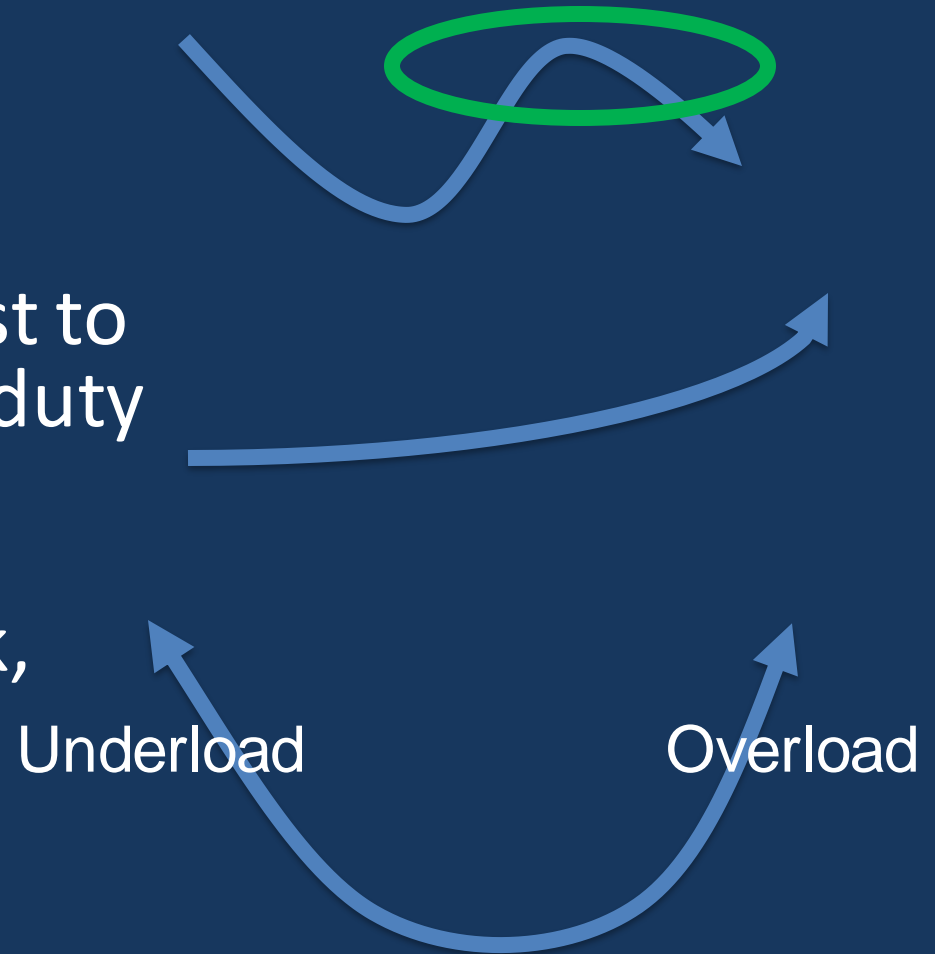


# So, when are humans most alert?

(1) Daylight hours

(2) In the hours closest to waking up, starting duty

(3) When workload is balanced (using task, crew/team, tech, and other factors)

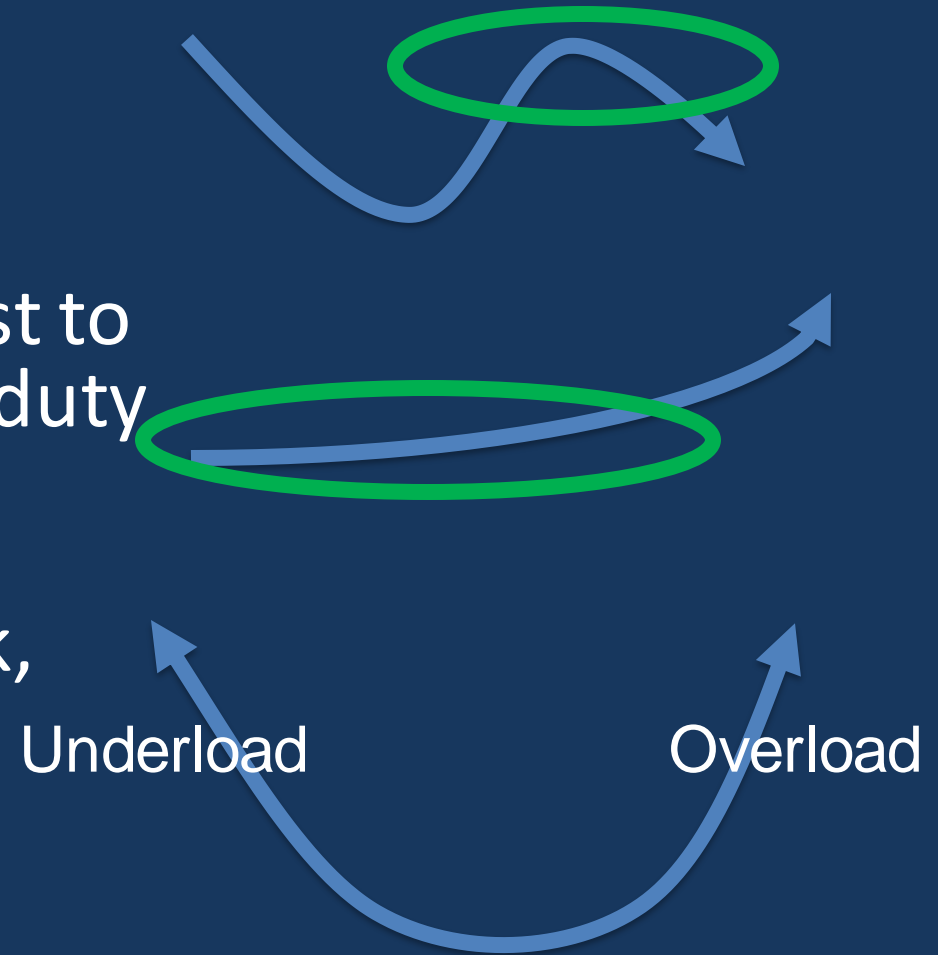


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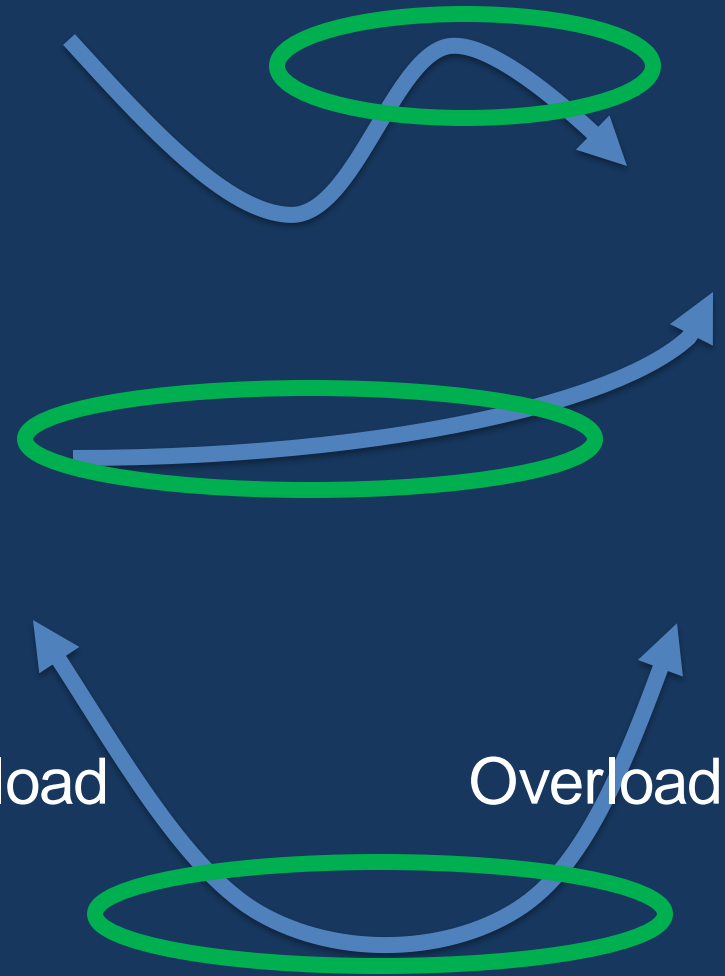
(1) Daylight hours

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Underload

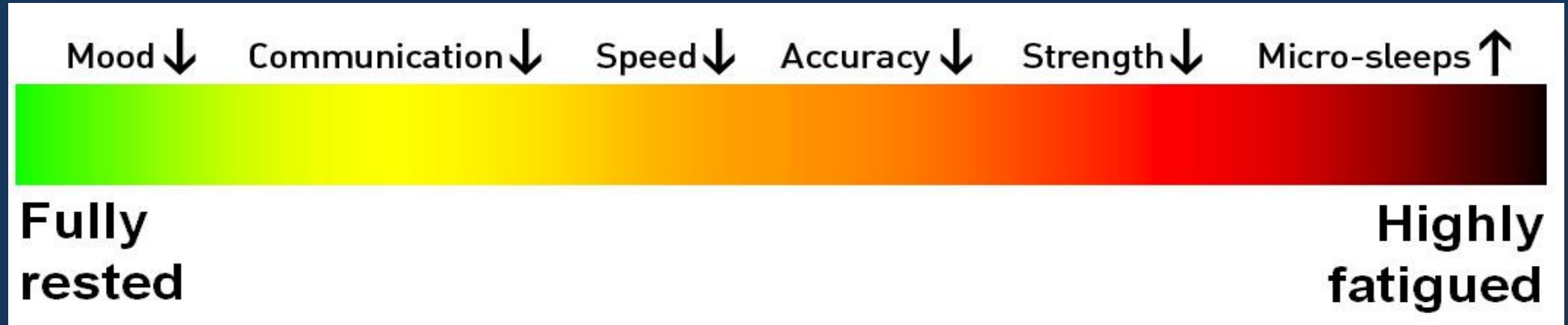
Overload





# And what does Fatigue Management focus on?

- Most business aims to manage the risk of falling asleep but the full benefits come from optimising alertness
- Alert people think better, react faster, communicate clearly, come to work more often and perform efficiently



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# And what does Fatigue Management focus on?

- Designing tasks, teams, environments and systems in a way that respects our human design strengths and limitations
- This relates to scheduling/rostering, crew configuration / augmentation, CRM, checklists / cross-checks, adaptive workload metering, breaks (including handover risks), naps (including sleep inertia), statistical model / analytics links to performance (e.g. FDM, LOSA), crew reporting, and overall resourcing



# Does technology help or hinder?



- Of course, it can easily do both
- Automation can reduce excessive workload and create risk alerts, but also can reduce cognitive engagement and alertness
- What is an invaluable information augmentation layer at 10am on duty day 2 can become invisible and/or overwhelming flows of information at other times
- **Where humans are safety-critical how can we do better?**

# Concluding comments

- Despite major differences in mission profiles, cultures, seasonal impacts, role types, etc. successful management of occupational alertness and fatigue is possible in any work system globally
- Objective evidence/validation has helped us demonstrate that Fatigue Management can support the simultaneous maintenance and improvement of: **compliance, safety, operational flexibility, communication, risk management, worker morale and more**





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