

Mar 2nd, 9:30 AM - 10:45 AM

Fatigue in Collegiate Aviation

Flavio A. Coimbra Mendonca Ph.D.

Assistant Professor & Senior Aircraft Accident Investigator, Purdue University, coimbraf@erau.edu

Erik Levin

Purdue University, elevin@purdue.edu

Julius Keller Ph.D.

Assistant Professor, School of Aviation and Transportation Technology, Purdue University, keller64@purdue.edu

Aaron Teo

Purdue University, ateo@purdue.edu

Follow this and additional works at: <https://commons.erau.edu/ntas>



Part of the [Education Commons](#), and the [Medicine and Health Sciences Commons](#)

Mendonca, Flavio A. Coimbra Ph.D.; Levin, Erik; Keller, Julius Ph.D.; and Teo, Aaron, "Fatigue in Collegiate Aviation" (2020). *National Training Aircraft Symposium (NTAS)*. 11.

<https://commons.erau.edu/ntas/2020/presentations/11>

This Presentation is brought to you for free and open access by the Conferences at Scholarly Commons. It has been accepted for inclusion in National Training Aircraft Symposium (NTAS) by an authorized administrator of Scholarly Commons. For more information, please contact commons@erau.edu.



Fatigue in Collegiate Aviation

FLAVIO A. C. MENDONCA – MBA; Ph.D.
JULIUS KELLER - Ph.D.



PURDUE AVIATION TECHNOLOGY



OVERVIEW

Introduction

Purpose of the Study

Methodology

Results

Discussion & Conclusions

Future Studies

INTRODUCTION

- ✈ Pilot's fatigue is a significant hazard in flight operations;
 - ✈ Studies have demonstrated a relationship between increasing fatigue and increments of human factors issues!
- ✈ Multidimensional construct – no single mitigation strategy will be effective!
- ✈ Fatigue mitigation strategies include:
 - ✈ Sleep → quantity and quality;
 - ✈ Life and work balance;
 - ✈ Regular exercise;
 - ✈ Balanced diet.



INTRODUCTION

- ✈ Flight training has received little attention in fatigue research;
- ✈ Several factors, alone or in combination, can increase the levels of fatigue by pilots in a collegiate aviation environment, such as:
 - ✈ Intensive workload and/or long workday;
 - ✈ Flight(s) rescheduled due to poor weather (or any unexpected) conditions;
 - ✈ Flights following a demanding night preparing for examinations;
 - ✈ Early flights and/or early flights followed by night flights;
 - ✈ Social activities; and
 - ✈ Night flights after a long day of academic and/or social activities.



PURPOSE OF THE STUDY

- ✈ To investigate possible causes of fatigue afflicting Part 141 Collegiate aviation students;
- ✈ To investigate how pilots in an accredited Part 141 flight school perceive lifestyle factors that could assist in mitigating fatigue.

METHODOLOGY

- ✈ Researchers developed and validated the Collegiate Aviation Fatigue Inventory (CAFI) survey questionnaire;
- ✈ The target population consisted of 350 pilots enrolled in a Midwestern university's accredited Part 141 flight school and a partner FBO.

Fatigue in Collegiate Aviation

Demographics

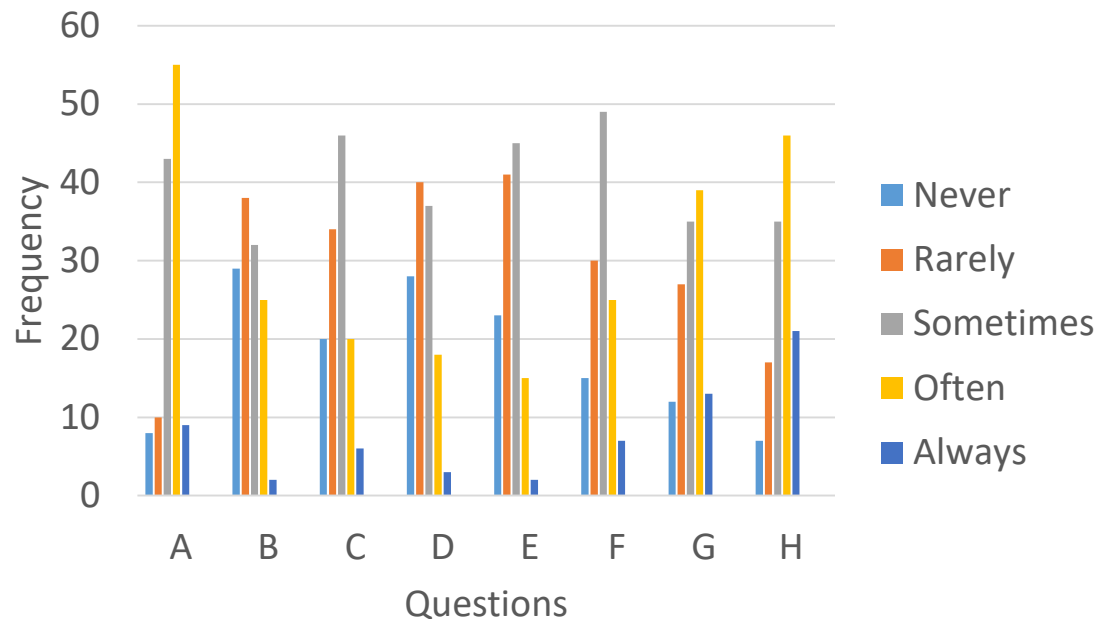
Age		
18-25	113	92.62%
26-35	6	4.92%
36-35	2	1.64%
46-55	1	0.82%
Total	122	
Certifications and Ratings Frequencies		
Student Pilot	57	17.43%
Private	82	25.08%
Commercial	53	16.21%
Instrument	58	17.74%
CFI	29	8.87%
CFI-Instrument	6	1.83%
Multi-Engine	29	8.87%
Multi-Engine Instrument	0	0
Airline Transport Pilot	1	0.31%
Remote Pilot	12	3.67%
Enrollment Status		
Freshman	22	18.03%
Sophomore	28	22.95%
Junior	32	26.23%
Senior	26	21.31%
Graduate Student	8	6.56%
Combined Degree Program	3	2.46%
Other	3	2.46%

RESULTS

Fatigue in Collegiate Aviation

Questions	Causes of Fatigue
A	Working a long day.
B	Stress caused by family or other psychological conditions.
C	Poor scheduling of flight lessons (e.g., too early, too late, or too many).
D	Poor scheduling of academic classes.
E	Personal activities or other commitments (e.g. 2nd job).
F	Academic activities (e.g. midterms, student organizations, etc).
G	Quality of sleep (restlessness or interrupted sleep).
H	Not of enough sleep.

RESULTS

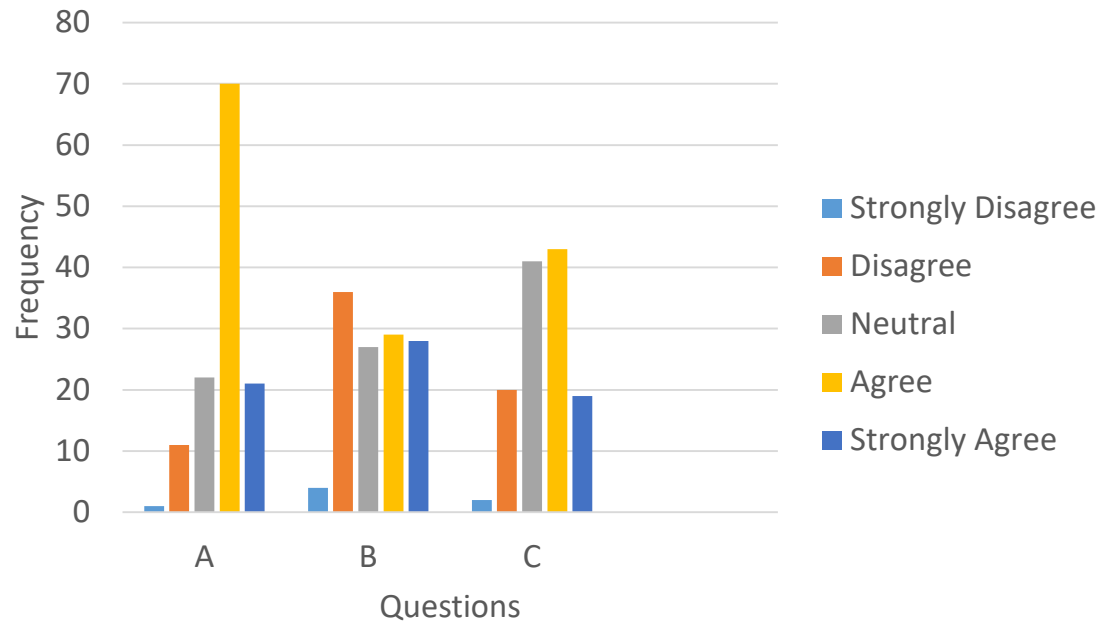


RESULTS

- ✈ Students were encouraged to indicate other factors that contributed to fatigue during flight training;
 - ✈ High workload;
 - ✈ Inadequate sleep;
 - ✈ Improper nutrition; and
 - ✈ Poor academic scheduling.

RESULTS

Questions	Lifestyle
A	I have a healthy work/academic life balance.
B	I exercise regularly.
C	I maintain a proper and healthy diet.



RESULTS

- ✈ Students were given an opportunity to indicate the most significant factors inhibiting their quality and quantity of sleep;
 - ✈ High workload;
 - ✈ Issues with their bed environments that disrupted their bed time;
 - ✈ Use of electronic devices until late;
 - ✈ Caffeine or alcohol prior to bed;
 - ✈ Social commitments, and
 - ✈ Poor time management.

DISCUSSION AND CONCLUSIONS


- ✈ High workload and inadequate sleep were the main causes of fatigue afflicting collegiate aviation students;
- ✈ A leading concern is that approximately half of the sample did not consider themselves to engage in fully adequate physical activities, nutritional habits, and workload and stress management.
- ✈ Three major themes emerged;
 - ✈ Bedtime was delayed through socializing with friends and the use of electronic devices until late at night;
 - ✈ Uncomfortable dorm environments led to sleep disturbances due to factors such as excessive noise and light at bedtime;
 - ✈ Large amount of school and other assignments affect quality and quantity of sleep.

FUTURE STUDIES

- ✈️ Collect similar data but from a larger and more diverse population of collegiate aviation students;
- ✈️ **Collaboration is welcome!**
- ✈️ Utilize inferential statistics procedures to investigate differences between participants and or correlations (e.g., level of enrollment x lifestyle factors);
- ✈️ Measure the fatigue and sleepiness levels during different times of the day.



PURDUE
UNIVERSITY



Flavio A. C. Mendonca – MBA; Ph.D.
fmendonc@purdue.edu

Julius Keller - Ph.D.
keller64@purdue.edu

Thank you!

Select References

- Australia Government Civil Aviation Safety Authority (2012). *Fatigue management strategies for aviation workers: A training and development workbook*. Retrieved from <https://www.casa.gov.au/files/fatigue-management-strategies-aviation-workers-training-and-development-workbook>
- Caldwell, J. A. (2005). Fatigue in aviation. *Travel Medicine and Infectious Disease* 3(2), 85–96.
- Caldwell, J. A., & Brown, C. L. (2003). Running 'on empty'? "Go Pills," fatigue and aviator safety. *Flying Safety*, 59(3), 4.
- Caldwell, J. A., & Caldwell, J. L. (2016). *Fatigue in aviation: A guide to staying awake at the stick*. NY: Routledge.
- Civil Aviation Safety Authority (CASA). (2012). *Fatigue management strategies for aviation workers: A training & development workbook*. Retrieved from <https://www.casa.gov.au/files/fatiguetookitstrategiespdf>
- Dawson, D., & McCulloch, K. (2005). Managing fatigue: It's about sleep. *Sleep Medicine Reviews* 9(5); 365–380.
- Federal Aviation Administration (FAA). (2016). *Pilot's handbook of aeronautical knowledge*. Retrieved from https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/
- International Civil Aviation Organization (ICAO). (2016). *Fatigue risk management systems: Manual for regulators* (Doc. 9966). Montreal, Canada: Author.
- Keller J., Mendonca, F. A. C., & Cutter, J. (2019). Collegiate aviation pilots: Analyses of fatigue related decision-making scenarios. *International Journal of Aviation, Aeronautics, and Aerospace*, 6(4), 1-25.
- Levin, E., Mendonca, F. A. C., Keller, J., Teo, A. (2019). *Fatigue in collegiate aviation*. *International Journal of Aviation, Aeronautics, and Aerospace*, 6(4), 1-25.
- Marcus, J. H., & Rosekind, M. R. (2017). Fatigue in transportation: NTSB investigations and safety recommendations: Injury Prevention. *Journal of the International Society for Child and Adolescent Injury Prevention*, 23(4), 232-238. doi:10.1136/injuryprev-2015-041791
- McDale, S., & Ma, J. (2008). *Effects of fatigue on flight training: A survey of U.S. Part 141 flight schools*. *International Journal of Applied Aviation Studies*, 8(2), 311-336.
- Mendonca, F. A. C., Keller J., Levin, E., & Teo, A. (2019). *Understanding fatigue within a collegiate aviation program*. Manuscript submitted for publication.
- Mendonca, F. A. C., Keller J., & Lu, C-T. (2019). Fatigue identification and management in flight training: An investigation of collegiate aviation pilots. *International Journal of Aviation, Aeronautics, and Aerospace*, 6(5), 1-30.
- National Safety Council (2019). *Fatigue*. Retrieved from <https://www.nsc.org/work-safety/safety-topics/fatigue/physiology-map>
- O'connor, P. J., & Puetz, T. W. (2005). Chronic Physical Activity and Feelings of Energy and Fatigue. *Medicine & Science in Sports & Exercise*, 37(2), 299-305.
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, 18(2), 189-193.
- Roach, D., Roberts, P., Dawson, D., Meuleners, L., Brook, L., & Sargent, C. (2017). Controlling fatigue risk in safety-critical workplaces: A summary of selected papers from the 9th International Conference on Managing Fatigue in Transportation, Resources and Health. *Accident Analysis and Prevention*, 379-382
- Williamson, J., & Pahor, M. (2010). Evidence regarding the benefits of physical exercise. *Archives of Internal Medicine*, 170(2), 124-125.