

AAM-510 Fatigue

SAS REDAC Projects Review

Fatigue Mitigation in Flight Operations

FAA Fatigue Management Working Group

February 23, 2021

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Fatigue Mitigation in Flight Operations (2021)

1. Continue collection and entry of data into the FAA Fatigue Risk Management System (FRMS) database; evaluate data and formulate HF research questions to improve understanding of flight crewmember fatigue during operations that exceed the limitations of 14 CFR Part 117 regulations.
 - Results of this research provides information on specific safety performance indicators and helps identify objective improvements in flight ops the new regulations have achieved, such as reduced internal flight operations fatigue reports, reduced fatigue-related ASAP reports, improved measures of sleep, performance, and flightcrew mood.
 - Knowledge gleaned from these improvements will inform development of operational requirements, standards, conditions, limitations, mitigations, and FRMS authorizations relevant to these flight operations issues.



Fatigue Mitigation in Flight Operations (2021)

Examples of approved FRMS operations & the need for data

<u>Carrier A</u>	<u>FT Max</u>	<u>FDP Max</u>	<u>FDP +Ext</u>
LAX-HKG	17:00	18:00	20:00
DFW-HKG	19:00	21:00	23:00
LAX-SYD	17:00	19:00	20:00
<u>Carrier B</u>			
LAX-MEL	17:00	18:40	20:40
CA-SYD	18:30	20:30	22:00
CA-SIN	18:30	20:30	22:00
IAH-SYD	18:30	20:30	22:00
EWR-CPT	18:30	19:30	21:30
SFO-DEL	18:00	19:30	21:00
(LACP)	19:30	21:00	22:00

NOTE: LACP = Loss of Airspace Contingency Plan.



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Fatigue Mitigation in Flight Operations (2021)

2. Conduct operational study to understand pilot performance and HF issues caused by high frequency, multiple segment, short haul flights that do not exceed the limitations of 14 CFR Part 117. This study will provide the FAA with operational SH fatigue data, that does not currently exist.
- Short-Haul Study designed to improve understanding of human factors/pilot performance issues during multiple segment, short haul flight operations
 - To characterize the effects of workload and cumulative sleep loss across trip pairings:
 - ✦ evidence shows that early start times, nighttime arrivals, and the number of segments flown during a duty day contribute the most to short haul pilot workload-related fatigue
 - ✦ majority of research examining workload and sleep restrictions in these operations rely primarily on subjective reporting and offer few recommendations
 - ✦ few studies have experimentally examined how the implementation of recommendations decreases risk or to compare the efficacy of imposed countermeasures



Fatigue Mitigation in Flight Operations (2021)

Short-Haul, Multi-segment Flight Operations are conducted within table limits for Flight Time and Flight Duty Period.

- Very little data available regarding the impact on sleep, workload, and performance, even though SH comprises significant share of U.S. airlines' daily operations
- Public Law 111-216, § 212(B) Fatigue Risk Management Plan (FRMP), provides carrier's with a mandate to manage fatigue, but **not** reported to FAA

Fatigue Mitigation in Flight Operations (2021)

- Mitigation strategies limited due to flight operations and un-augmented crew complement
- A significant amount of night flying is found in these operations
- Regulations provide 10 hr between FDPs, but circadian rhythm issues often affect quantity & quality sleep pilots receive
- Rest/napping/sleep opportunities are restricted; U.S. regulations do not allow in-cockpit napping

Fatigue Mitigation in Flight Operations (2023)

3. Longitudinal Study of Long Haul / Ultra-Long-Range Operations
 - Evaluate behavioral adaptation of pilots to multiple time zone shifts associated with long-haul and ultra-long-range flight operations and capture pilot performance data
 - Apply results to refine operational requirements, standards, conditions, limitations, and mitigations relative to fatigue, thereby using a “data-driven systemic safety approach to identify risks, enhance standards and programs, and evaluate continued effectiveness.”

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Long Haul / Ultra-Long-Range Flight Operations

- For domestic travel across continental US, science shows circadian rhythms re-adjusts to new time zones by ~1.15 hr per day
 - ✦ re-entrainment occurs on average 92 min later each day after westward flights and 57 min earlier each day after eastward flights
- But science is unclear when >4 times zones have been crossed
- New FRMS data suggests pilots are not fully acclimating on routes per the § 117.3 definition, whereby acclimation occurs after either 36 consecutive hrs free from duty or 72 hrs in theater

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Long Haul / Ultra-Long-Range Flight Operations

- Since there is not clear scientific consensus on acclimation rates for flights crossing 4 or more time zones...
 - ✦ recovery of one day per time zone crossed is a common suggested guideline amongst the scientific community
- Anecdotal evidence suggests behavioral adaptation and maintenance of performance may occur, but the range of influence is unknown

Fatigue Mitigation in Flight Operations (2023)

Study Objectives:

- 1) To systematically evaluate the behavioral adaptation of pilots to multiple time zone changes associated with long-haul (LH) and ultra long range (ULR) flight operations
 - a. To investigate the rate of behavioral adaptation to new time zones from base and/or differences between east vs. westbound adaptations
 - b. To utilize a study population with exposure to repeated time zone changes typical of commercial LH/ULR aviation crews
- 2) To develop a pilot profile of behavioral adaptation across typical LH/ULR transmeridian flight operations
- 3) To investigate the degree to which behavioral tactics modulate crew performance across time zones under operational conditions typical of the aviation industry



FAA Fatigue Management Working Group

Workgroup Purpose:

- Formalize communication across types of operations with consideration for stakeholder concerns and priorities for aviation fatigue research
- Prioritize fatigue research recommendations and capitalize on overlapping opportunities, in-house assets, pooling of resources, and industry collaboration
- Meet annually with all stakeholders to re-assess priorities and research gaps relating to fatigue

(NOTE: The workgroup data/findings do not necessarily result in funded research, but provides critical information to policy offices to prioritize decisions for research, synergy across operations, resource pooling, and collaboration)



FAA Fatigue Management Working Group

- Internal FAA meeting held with government representatives from each type of operation
- Expanded operations subgroups to include policy-holders, industry-stakeholders, and labor and conducted introductory teleconferences
- Post Subgroup Meeting(s): compiled and documented research prioritizations and identified respective fatigue research priorities, justification of research needs, and opportunities for synergy with other sub-groups
- Currently, Subgroup meeting minutes drafted and reviewed. A combined report is under development



UAS Operator Fatigue (2021)

- Survey to gather information on current practices for pilots of unmanned aircraft systems (UAS).
 - ✦ Target information gathered is the common fatigue-related practices, and the minimum knowledge, skills, abilities (KSAs), testing, and staffing procedures required for operating UAS
 - ✦ Information to be collected will be used to inform future rulemaking and the development of supporting guidance
 - ✦ Necessary because existing regulatory framework, to include the certification of airmen, was not designed with remote pilots in mind.
 - ✦ To broadly integrate UAS and remote pilots into the NAS, further rulemaking will be required to address remote pilot certification for air carrier operations and flight and duty time limits applicable to remote pilot air carrier operations



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