



Air Force Research Laboratory

SLEEP AND OTHER ACTIVITIES OF OFF DUTY PILOTS

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THIS TECHNICAL REPORT HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION.

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SUMMARY

Research was conducted to uncover existing archives, reports, databases or publications that describe the activities of off-duty pilots as they prepare for night or long duration missions. An extensive search of relevant literature databases for reports generated by flight surgeons and by safety officers within the AF did not uncover information appropriate for generating an algorithm for predicting pilot sleep from the time of their mission. This report describes the futile search for those studies and their data. It includes methods, samples of some relevant information, and a CD-ROM containing many relevant references that were found during the search, but are not particularly useful for developing the required algorithm.

Since this research was unable to find the required information in the literature, it was decided that a survey should be constructed to collect the necessary data. A questionnaire is included that builds on the work that was done on an existing survey tool, developed by the AF Flight Standards Agency, that was never been disseminated.

It is highly recommended that off-duty pilots be surveyed with regard to when they sleep to prepare for their missions. These data are important for providing a general concept for how pilots prepare for a mission. This concept can be reverse engineered for a given mission to determine when pilots typically take their sleep. An existing model, Sleep, Activity, Fatigue, and Task Effectiveness (SAFTE), can then be used to estimate when a pilot will begin to experience fatigue that can degrade human cognitive performance.

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PREFACE

This report covers the project period of 13 April 2000 to 15 February 2003. The work was performed under Job Order Number 71845901. Most of the work was performed by the following contractor:

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The project manager was Capt William Hurtle, USAF (AFRL/HEPM), Biodynamics and Protection Division, Air Force Research Laboratory.

Sleep and Other Activities of Off Duty Pilots

INTRODUCTION

The Fatigue Avoidance Scheduling Tool (FAST™) is a Windows® program that allows planners and schedulers to estimate the average cognitive performance effects of various sleep and work schedules. It was developed by NTI, Inc. as an Air Force (AF) Small Business Innovation Research (SBIR) product. As a part of FAST™ development, the inventors wanted to make data entry as easy as possible and believed the time of sleep could be automatically entered for various military and training missions using an algorithm. However, the development of an automated sleep entry facility required that data on the sleep habits of pilots be available for modeling. That is, sleep times for missions at various times were required. Once these data were available, an algorithm could be created to insert sleep into FAST™ so that cognitive performance effectiveness could be estimated for the work interval.

Hursh (2001) created such an algorithm for railroad engineers. Data were available for railroad engineers to compute such an algorithm from a study conducted by Pollard (1996). Dr. Hursh's approach is briefly described in Appendix A. It was the authors' belief that a study of pilot sleep habits must have been conducted so that the same approach could be taken in developing a sleep algorithm for pilots.

Our hypothesis was that one or more studies had been performed concerning the sleep habits of pilots as they prepare (rest) during their mandatory crew rest for their upcoming mission. The completion of this work was then to lead to a set of basic findings on sleep and napping habits among one or more pilot population samples. This was to be the data for developing a sleep timing algorithm. Mr. Mark Crabtree, NTI, led this effort with the assistance of NTI staff. Research was conducted to discover existing archives, reports, databases or publications that describe the off-duty activities of pilot as they prepare for night or long duration missions. An extensive search of the literature, including reports generated by flight surgeons and by safety officers within the AF, did not uncover information appropriate for use in FAST to predict pilot sleep times for various missions. This report describes the futile search for those studies and their data. It includes methods, samples of data that are available, and a CD-ROM containing many references relevant to air crew fatigue.

Since this research was unable to find the required information in the literature, it was decided that a survey should be constructed to collect the necessary data. Through the authors' contacts with AF representatives, it was discovered that LtCol O'Toole, a flight surgeon within the AF Flight Standards Agency, was designing a survey instrument for collecting similar types of data. Pilots of the Air Mobility Command had expressed a concern for the fatigue they were experiencing during their multi-day missions. It was his plan to collect data sufficient to document the concern and define the specific problem such that countermeasures could be implemented. The authors, Dr. Steven Hursh, and members of the Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Fatigue Countermeasures Group, with Lt Col O'Toole's permission and encouragement, added questions to the survey instrument requesting information necessary for constructing a sleep

timing algorithm. LtCol O'Toole gave permission for NTI to have access to the data for the purposes of this project. LtCol O'Toole's cover letter and the final questionnaire are included with this report as Appendices B and C. Unfortunately, to date NTI has received no data. No budget was included in the SBIR for NTI to collect data. Therefore, the survey instrument is included in the report so that should opportunities arise in the future, NTI, AFRL or LtCol O'Toole will be ready to collect the important data.

METHODS

For this report, many databases were searched for information on pilot sleep patterns. The procedures were as follows:

1. Conduct online and library searches using key words and terms to acquire references to articles, books, magazines, databases, presentations, or products that might contain useful information or reference to other sources that could lead to the information.
2. These references were then secured through online databases, retrieval from libraries, phone calls or written requests for copies.
3. Thereafter the references were reviewed for the requisite information.

Table 1 lists the databases searched and the key words that were used. The key words that were used in the searches were varied across databases as needed in order to obtain relevant results. The keyword or phrase that was useful in obtaining relevant references in one database did not always yield useful information in another.

Table 1. Databases and Keywords Used for Search

<i>Source</i>	<i>Keywords</i>
PsychInfo-database	pilot preparation for duty pilot preparation to go on duty military person preparation for duty military person fitness for duty off duty activities-military studies on the military-psychology psychological studies on military pilots pilot off-duty activities
PAIS International-database	Pilot preparation for military duty Pilot readiness for duty
NASA Website	Pilot off-duty activities Pilot preparation for flight Pilot preparation for duty Pilot time-off Pilot leisure time Pilot rest Pilot sleep

<i>Source</i>	<i>Keywords</i>
	Pilot work schedule Pilot flight schedule Pilot personal time Pilot personal life
Sociological Abstracts-database	men in the military studies from the military military off-duty lifestyle
GPO Monthly Catalog-database	military pilot preparedness for duty military pilot studies aviation pilot studies
FAA	office of aviation medicine pilot fatigue pilot rest pilot preparation for duty
Rand.org-website	off duty activities of military pilots research studies on military pilots pilot preparation for duty pilot rest cycles pilot off-duty behavior
ArticleFirst-database	military pilots off duty activities military pilot preparation for active duty military pilots
Human Factors	Fatigue Drowsiness Sleepiness Pilot duty Flight
Yahoo and Excite search engines	office of aviation medicine office of human factors in aviation medicine military pilot preparedness for duty political and military sociology military pilot preparation for duty pilot off-duty activity pilot lifestyles before flight duty preparation for flight duty preflight activities military pilot sleep sleep patterns of pilots military pilot rest fatigue management fatigue countermeasure pilot professionalism pilot home life pilot personal life

<i>Source</i>	<i>Keywords</i>
	pilot off-duty pilot pre-deployment
Rand.Org	Pilot quality of life Activities affecting readiness Fatigue-related crashes Pilot sleepiness Pilot sleep patterns Pilot fatigue and crashes

Note: Most of the above terms were also used in a general search at the Wright State University Library. The search included all books and periodicals. A general internet search was also conducted using all of the above terms.

RESULTS

Over 80 documents pertaining to fatigue in military and commercial aircrews were acquired for the purpose of determining how crewmembers use their off-duty time to prepare for duty. These documents discuss at length such topics as cognitive impairment resulting from fatigue, techniques to combat fatigue, scheduling algorithms to minimize fatigue effects, the importance of sleep in reducing the likelihood of human error, techniques for improving and increasing the amount of rest that aircrew members receive, and real-world events that are attributable to fatigue. Although much is known about the importance of the proper amount of sleep prior to periods of significant cognitive demand and long-duration cognitive performance, there is scarcely a document that describes crew off-duty behaviors, and how they prepare for duty. In some articles, there are vague references to what pilots and crew may have done the night before a major mission or long-duration flight; in other documents, there are general discussions of job-related activities that prevent a good night's sleep, such as ground support activities that are often required for military missions; still other papers mention noisy motels, uncomfortably high temperatures, poor beds, and social activities associated with an exciting layover, that contribute to the crewmembers' lack of sleep (this is more relevant to commercial than military pilots, but literature concerning commercial pilots was also reviewed to determine if relevant data exists for this population).

A possible source of bits and pieces of information concerning what crewmembers may have done in their off-duty time prior to flight duty is contained in the "sleep and activity history" section of aircraft accident reports. Here are some examples from commercial and general aviation incidents:

- (1) A Cessna 177B carrying seven-year-old Jessica Dubroff, who was to be the youngest female pilot (trainee) to attempt a record transcontinental crossing, crashed in Cheyenne, Wyoming, moments after take-off on the rainy morning of April 11, 1996, at about 0824 mountain daylight time, killing Jessica, her father, and the command pilot, Joe Reid. This crash occurred **following a very tiring previous day that included two flights lasting nearly nine hours, plus extensive media coverage**

before and after each one. On the evening prior to the crash, the program director of a local radio station noticed that all three looked tired and discussed being very tired. The pilot telephoned his wife from the airport, and she later stated that he sounded tired and that he stated he was very tired from flying and all the media coverage. Even an airport manager stated that the pilot was "noticeably exhausted" prior to the second flight earlier in the day. On the following morning, i.e., the morning of the crash, the pilot made a number of errors that contributed to the crash, and are consistent with fatigue. (The errors, such as incorrect mixture setting, failure to turn on carburetor heat, problems setting the radio frequency, difficulty communicating with the controller, as well as other errors, are interesting from a human performance perspective, but are not germane to the objectives of the current project.) He was an experienced and qualified pilot with a "clean" record who would not normally have been expected to make such errors. **The pilot had ample opportunity to sleep--over eight hours--the night before the crash.** But whether he did, and the quality of sleep, are unknown. The only clue is that the desk clerk stated that the pilot seemed rested and happy when he checked out of the motel just prior to the fatal flight.

- (2) On June 18, 1994, a Learjet 25D crashed at Washington's Dulles Airport. Both pilots and 10 passengers, most of them children, were killed. Although both pilots were young and relatively inexperienced, and it is questionable if the pilot-in-command should have been upgraded to captain shortly before the incident, there were elements of fatigue apparent in the captain's behaviors that resulted in the crash. (He apparently lost control of the aircraft while looking for the runway during his second approach, after sloppily missing the first one, in poor weather conditions.) The captain had been awake for 11.5 hours following **a three hour nap that he took in preparation for the flight.** The pilots had been flying all night--a disruption of their normal habits.
- (3) In Quincy, Illinois, on November 19, 1996 CST, a United Express Beechcraft 1900c collided with a Beechcraft King Air A90 at the Quincy Municipal Airport. Fourteen people were killed. The actual events that lead up to the crash are complex and will not be discussed here. Although fatigue was ruled not to be a contributing factor, it has been noted that **the United Express pilot had been "socializing" and did not go to bed before 11:00 pm** on November 18, even though he knew he would report to work at 4:15 am on the 19th. At the time of the accident, the pilot was completing over 13 hours on-duty time, with five hours or less of sleep.
- (4) On January 2, 1989, the captain of a 707 dragged his left outboard engine for over 60 feet on the runway at Salt Lake City. Within the previous 30 hours, he had been on duty for 19 hours, and had flown for 13 hours. He had been off duty for almost 12 hours, but **managed to get only one hour of sleep** during this time. The reason for this was not discussed.

- (5) In August 1993, a DC-8 piloted by Capt. Jim Chapo, crashed into level terrain short of the runway at Guantanamo Bay. He was so intent on finding the runway strobe lights that he lost airspeed and the airplane stalled. **He had slept only 15 hours out of the previous 96 hours.** The specific reason for the minimal rest was not given, although it was presumed to be due to the work duty schedule.
- (6) Perhaps the best description of pre-duty activities and the state of the pilot prior to flight is given in Human Factors Investigation section of an NTSB Report (NTSB/AAR-90/05) describing the crash of Aloha Islandair Flight 1712 on October 28, 1989, in which all 20 people onboard were killed. The de Havilland DHC-6-300 Twin Otter collided with terrain on Molokai while en route on a scheduled passenger flight from the Kahului Airport on Maui to the Kaunakakai Airport on Molokai. For a two-week period prior to the accident, the pilot had **spent his evenings studying** for ground school provided by his employer. The study sessions lasted until 0200. He slept from approximately 0200 to 0700. During Thursday, prior to the crash which occurred on the following Saturday, the captain "studied" at the beach all day. On Thursday evening, he **studied late into the night** for a final exam which he passed the next day. On Friday night, he went to bed at midnight, and slept until 0830. He ate breakfast with his family, then took a short nap before leaving for work. He reported to work at 1300. He had been on duty for 5 hours at the time of the accident. During various training classes, instructors observed that the **pilot was often tired**, and had a tendency to nod off in class. He was counseled about his professional responsibilities. Another instructor said that the captain admitted **he received little rest** and that his diet had been poor. One instructor believed that **the captain's off-duty activities interfered with his flying skills**. A first officer had previously noted that the captain had nodded off and fallen asleep while flying a scheduled operation. Another captain that had flown with this pilot believed that **the captain's personal life distracted him from his professional duties** and that he was somewhat immature. The captain had two recent significant events in his life: He had just become engaged to be married, and he had advanced to a flight officer position within Aloha Airlines.

A NASA tech report prepared by Rosekind, Co, Gregory, and Miller (2000) presents the results of an interesting fatigue factors survey that was responded to by nearly 1500 commercial pilots. The data suggest that commercial pilots get an average of about 7 hrs 17 min of off-duty sleep per 24 hours. Data were also obtained regarding factors that affect the hours of sleep and the quality of sleep. Although the survey was not specifically designed to obtain data about how pilots prepare for long duration flights, and did not address the military pilot population, it did attempt to obtain useful data about many other factors affecting pilot fatigue.

Even in military documents specifically examining crew rest and fatigue, it still seems to be the case that only anecdotal data are available. For example, Palmer, Gentner, Schopper, and Sottile (1996) mention a study reported by Bisson, et. al. (1993) of C-5 crews during

Operation Desert Shield that suggested there was "opportunity" for 8 hours of continuous sleep, but ground operations, delays, and taxi time frequently reduced the actual sleep time to four hours or less. Sleep logs often indicated that aircrews reporting for duty had difficulty sleeping, lying awake for two or more hours. In the same report, Palmer, et. al. (1996) state that both military and commercial crewmembers have reported that preparing for duty by inflight sleeping does not work well because of restlessness due to heat, noise, vibration, and not knowing when sleep time was likely to occur.

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

An obvious problem with examining accident reports to obtaining information is that they do not tell us much about the crewmembers' family life, social life, attitudes towards professionalism, activities prior to duty, etc. This approach does not provide the much-needed survey data that documents normal or average activity prior to a mission. Also, the data are biased in the sense that the only crewmembers represented are those involved in actual incidents. With this approach, we cannot know what the vast majority of crewmembers do who are not involved in incidents.

Because of the sparsity of data discovered to date, it would be wise to continue this investigation. In addition, AVWEB (and AVFlash), a popular aviation website, would like to conduct a survey of pilots off-duty activities. NTI will be working with them, and may have some input for the specific questions that will go into the survey. Any more information resulting from this effort will be described in the final report for this contract.

It is highly recommended that off-duty pilots be surveyed with regard to when they sleep to prepare for their missions. These data are important for providing a general concept for how pilots prepare for their missions. This data can be captured in an algorithm, which can then be used to predict the likely time of sleep for the Fatigue Avoidance Scheduling Tool that can then predict their performance on the mission. A mission scheduler can then use FAST to estimate when a pilot will begin to experience fatigue that can degrade human cognitive performance and threaten mission success.

A CD-ROM accompanied this report. It contains many of the articles retrieved and reviewed for the purposes of this report. Several of these reports provide an excellent background in the area of sustained operations and fatigue management.

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Appendix A

A Method for Determining Sleep Times from Work Times

The follow information was extracted from a presentation entitled, "A Method for Determining Likely Sleep Patterns in Railroad Engineers Based on a Given Work Schedule," given by Steven R. Hursh, Ph.D., Biomedical Modeling and Analysis Program, SAIC, on 31 August 2001. It provides the model for how a sleep algorithm could be created from data of pilot off-duty activities including sleep for missions.

His goal was to design an algorithm that would create sleep periods for a work schedule that would mimic what might be expected of an actual train operator. He was attempting to find default parameters that would allow the algorithm to closely match sleep as recorded by actual engineers using sleep logs. A limitation of the algorithm was that it would not be designed to create an "optimal" sleep schedule that would maximize performance. Further, the algorithm would only be able to predict regular patterns of sleep, not idiosyncratic patterns unrelated to work pattern. Also, the algorithm was not designed to insert extra naps that would anticipate evening work starts following a normal night of sleep.

From the research of Pollard (1996) and others, the following observations were made:

- Engineers average a little over 7 hrs of sleep per day.
- Engineers work about 8 hrs per day on average.
- Engineers who end work between 0500 and noon get a little over 5 hrs of sleep per day, except for work end times between 0800 and 0900 (optimal split sleep work end time) when they get 6 hrs sleep.
- Engineers who end work between 1500 and 0100 get about 8 hrs of sleep.
- No consistent relationship between the geographic location of sleep and sleep duration or quality were observed.
- Engineers seldom sleep between noon and 2000 hrs (8 pm) – This is sometimes referred to as the "forbidden sleep zone."

Pollard, J. K. (1996) "Locomotive Engineer's Activity Diary." *U.S. Department of Transportation, Federal Railroad Administration, Office of Policy and Program Development and Office of Research and Development, Washington, D.C. 20590.*

Reid, Roach and Dawson (1997) "The proportion of time spent sleeping and working across the day in train drivers working irregular hours." *Sleep Research*, vol. 26, p 747.

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Foret, J. and Lantin, G. (1972) "The sleep of train drivers: an example of the effects of irregular work schedules on sleep." In W.P. Coquhoun (ed.), *Aspects of Human Efficiency*, The English Universities Press, London, pp. 273-282.

A major non intuitive observation was that train engineers seldom sleep during the afternoon, independent of when called for work. Although sleep may occasionally occur during this

period, a regular pattern emerged that suggested that the usual preference was to remain awake during this period.

From these observations Dr. Hursh developed the following two rules for assigning sleep to a schedule of work for railroad engineers:

Rule 1, Start Sleep Early

When work ends in the first half of the day between midnight and 1200 then the first sleep period starts early (work end plus commute time) and continues until 8 hrs is accumulated. Sleep is split if necessary to avoid the "forbidden zone" from 1200 to 2000 (also, see minimum sleep period rule, below). For work times ending in the morning, 8 hrs of sleep can not be accumulated because it would conflict with the "forbidden zone."

Rule 2, Delay Sleep to Evening

When work ends after noon during the "forbidden zone" (1200 to 2000) or in the evening between 2000 and midnight then sleep is delayed at least until after the forbidden zone or until normal bedtime, nominally set at 2300. Sleep continues until 8 hrs are accumulated. For work times ending in the first half of this period, 8 hrs may not be achieved because of the likely early morning call (0400 to 0700).

The following General Rules and definitions were created to handle the details of transitioning from one state to another:

Commute Time: Always allow commute time between work end and any possible sleep start (nominally 1 hr) and commute time between sleep end and any possible work start (again, nominally 1 hr).

Minimum Sleep Period: Minimum sleep period is nominally set at 1 hr.

Default or "Rest Day" Sleep: any day that has no work after 12 noon qualifies for default sleep starting at normal bedtime. This rule "fills in sleep" on rest days and sleep is according to "rest day" rules. For example, if work ends at 0600 on Friday and resumes again on Monday morning at 0700, then rest day sleep would be scheduled for Friday, Saturday, and Sunday night. If work ends after noon on Friday, then sleep on Friday would be according to Rule 2 (above) and sleep on Saturday and Sunday would be rest day sleep. Nominal sleep on rest days is 8 hrs but can be set longer (or shorter) than for work days.

Maximum Sleep per Day: the rules are coordinated such that no more than the maximum amount of work day sleep (nominally 8 hrs) will occur on a calendar day in which work occurs.

An algorithm of this type can be validated with appropriate data independent of the data used to develop it. For example, sleep/work logs can be used from a study of pilot's sleep times for various missions. Their work schedule can be input to the algorithm and predictions made. The predictions can then be compared to the pilot reported sleep times.

Dr. Hursh did just that for five railroad engineers. He found the sleep function made reasonable predictions of sleep when the pattern of sleep had a regular relationship to the work (R^2 of .91 for three of the logs). Idiosyncratic gaps in sleep that were not required by

the work schedule were not predicted and unusually long sleep periods significantly longer than 8 hrs of sleep per day were also not predicted.

The algorithm tended to underestimate effectiveness on days when an extra evening nap was taken in anticipation of a late evening work call. An optional "napping rule" could be implemented in the future to solve this problem. Clearly the predictions should be compared to a larger independent sample of data to fully validate the algorithm.

Appendix B

CREW REST SURVEY

The scientific study of fatigue and sleep has progressed enormously in the past 40 years. In particular we have learned much about sleep requirements, human performance during sustained operations and fatigue countermeasures. This body of work has a direct impact on policy governing Flight Duty Period (FDP), crew rest requirements and the like.

This survey is intended to supply much needed information about actual aircrew practices related to FDP and crew rest. This information will help quantify the effects of current fatigue management practices on aircrew performance and flying safety. It will also inform recommendations for future fatigue management policy.

Completion of the survey is entirely voluntary and anonymous. If you agree to participate, please attempt to answer the questions as accurately as possible. Also please review the survey in advance of your mission, and if you have questions about how to complete the form, discuss them with your designated unit representative or myself.

Thank you in advance for your help with collecting this much-needed information.

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Appendix C

Explanation of Survey Questions

Hours Slept in Crew Rest

Enter total number of hours slept during the previous crew rest period.

Time Sleep Attempted

Enter time sleep attempted during crew rest. If more than one sleep episode, record for longest sleep episode. Indicate UTC (Zulu) and current local time.

Show Time/Takeoff Time/Landing Time

Self-explanatory. Record as UTC.

Duration FDP

Flight Duty Period starts when reporting for a mission, briefing, or other official duty and ends when engines are shut down at the end of a mission, mission leg, or a series of missions.

Duration crew duty time

Crew duty time is FDP plus the time required completing post-flight related duties.

Additional crew rest requested?

Answer yes or no.

Number of time zones crossed

Enter difference between UTC at first departing location and last destination prior to re-entering crew rest.

East/West travel?

Enter East, West or None.

FDP/CDD waiver

Check if FDP or CDD waiver requested.

Inflight naps and total duration

Self explanatory

Caffeine drinks

Enter number of servings of coffee, caffeinated tea, or caffeinated soft drinks.

Alcohol drinks

Enter number of servings of alcoholic beverages.

Stanford Sleepiness Scale

Enter appropriate number that describes your level of sleepiness. Enter one value for the beginning of FDP and another for the end of FDP.

1. Feeling active and vital; alert; wide awake
2. Functioning at a high level, but not at peak; able to concentrate
3. Relaxed; awake; not at full alertness; responsive
4. A little foggy; not at peak; let down
5. Fogginess; beginning to lose interest in remaining awake; slowed down
6. Sleepiness; prefer to be lying down; fighting sleep; woozy
7. Almost in reverie; sleep onset soon; lost struggle to remain awake

Sleep Quality Scale

Enter appropriate number to rate the **average** quality of your last crew rest sleep

1. Awoke feeling as tired as before sleep.
2. Awoke feeling tired but improved from before sleep.
3. Awoke feeling rested but could have slept more if time allowed.
4. Awoke feeling completely restored, full of energy; unable to sleep longer.

Mental Workload

Rate your **average** mental workload for the (1-7), fill in the number that is your best estimate of your average mental workload across the whole work period. Use this scale:

1. Nothing to do; no system demands.
2. Light activity; minimum demands.
3. Moderate activity; easily managed; considerable spare time.
4. Busy; challenging but manageable; adequate time available.
5. Very busy; demanding to manage; barely time enough.
6. Extremely busy; very difficult; non-essential tasks postponed.
7. Overloaded; system unmanageable; essential tasks undone; unsafe.

Crew Rest Questionnaire

Aircraft Type _____

Crew position _____

Age _____ ☐ Male ☐ Female

Normal Sleep Duration When Not Traveling _____ hrs

Your participation in this survey is optional. You are not required to answer any questions you feel uncomfortable answering. Information is requested from day prior through one day post-trip. A "day" is considered to be from the start of crew rest to beginning the next crew rest period. Please round duration to the quarter hour.

	Preflight	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Hours Slept in Crew Rest									
Time Sleep Attempted									
Show Time									
Takeoff Time									
Landing Time									
Duration FDP									
Duration crew duty time									
Additional crew rest requested?									
Number of time zones crossed									
East/West Travel?									
FDP/CDD waiver?									
# Inflight Naps & Total Duration									
# Caffeine Drinks									
# Alcohol Drinks									

Stanford

1. Alert; wide awake
2. High level, but not at peak
3. Relaxed; not at full alertness
4. A little foggy; not at peak
5. Fogginess; slowed down
6. Sleepiness; fighting sleep
7. Sleep onset soon

Sleep Quality

1. As tired as before sleep.
2. Tired but improved from before sleep.
3. Rested but could have slept more if time allowed
4. Completely restored, full of energy

Mental Workload

1. Nothing to do; no system demands
2. Light activity; minimum demands
3. Moderate activity; easily managed
4. Busy; challenging but manageable
5. Very busy; demanding to manage
6. Extremely busy
7. Overloaded; essential tasks undone

Rating Scales (see instructions)

	Preflight	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Stanford Sleepiness Scale									
Sleep Quality									
Mental Workload									

	Preflight	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Hours Slept in Crew Rest									
Time Sleep Attempted									
Show Time									
Takeoff Time									
Landing Time									
Duration FDP									
Duration crew duty time									
Additional crew rest requested?									
Number of time zones crossed									
East/West Travel?									
FDP/CDD waiver?									
# Inflight Naps & Total Duration									
# Caffeine Drinks									
# Alcohol Drinks									

Rating Scales (see instructions)

	Preflight	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Stanford Sleepiness Scale									
Sleep Quality									
Mental Workload									

Comments: _____
