



INDEPENDENT PILOTS ASSOCIATION

May 13, 1994

Mr. Douglas Ross
Assistant Secretary for Employment & Training
Department of Labor
200 Constitution Ave., N.W., S2307
Washington DC 20210

Dear Mr. Ross:

The Independent Pilots Association (IPA), the union that represents the 1,400 flight deck crew for United Parcel Service (UPS), has long recognized the dangers inherent to fatigued pilots operating aircraft. Because of this concern, the IPA has worked carefully over the last four years with its pilots and outside experts to fully document the effects of excessively tiring schedules on aircrew.

A major part of this effort includes a recent study conducted for the IPA entitled *UPS Bid Pack Analysis of Aircrew Fatigue Risk*. The study analyzed UPS pilot schedules for a recent bid month and was prepared by Harvard Medical School researcher Dr. Martin Moore-Ede of Circadian Technologies, Inc. (CTI). Enclosed you will find an *Executive Summary* of the study. As this summary indicates, the study provides critical analysis of the frequency and effects of fatigue on UPS pilots. This analysis is also applicable to other workers in transportation industries.

The IPA is very concerned with excessively tiring schedules and the unique demands made on pilots in the relatively young overnight express delivery industry. As discussed in the attached *Executive Summary*, these demands are caused by night shift work, adjusting to multiple time zone changes, and flip-flopping from days to nights. The results are a serious percentage of pilots who are fighting sleep and in potentially dangerous situations. To address these problems, the IPA is working with Congress, FAA, NTSB, and UPS to insure that flight and duty time regulations and schedules adequately account for fatigue factors.

The IPA looks forward to discussing this issue with you in the coming weeks. Meanwhile, if we can be of any assistance, please do not hesitate to call.

Sincerely,

Captain Robert M. Miller
President, Independent Pilots Association

RMM/pjo

Enclosure



INDEPENDENT PILOTS ASSOCIATION

UPS BID PACK ANALYSIS OF AIRCREW FATIGUE RISK DC8, B727, B747 AND B757 FLIGHT SCHEDULE ANALYSIS

Introduction

Fatigue, sleepiness, and circadian factors (the body's 24-hour time clock) have extensive effects on transportation system safety. According to the National Transportation Safety Board (NTSB)¹, poor scheduling of work and rest time continues to affect the operating performance of workers in almost all modes of transportation. In addition, many employees and supervisors in transportation industries are not sufficiently aware of the problems related to work and rest schedules and their effect on safety and performance. Furthermore, NTSB has stated that transportation industries do not adequately consider the adverse effects of irregular and unpredictable work and rest cycles on those who operate vehicles, including aircraft. In fact, with regard to the aviation industry, the NTSB has criticized the inadequacies of current Federal Aviation Regulations for flight time, duty time, and crew rest, and recommended that the rules be reviewed and upgraded to assure that they incorporate the latest research and technology on aircrew fatigue and sleep.²

As aircraft more frequently travel at night and fly across time zones, the need has emerged for a more comprehensive understanding of pilot fatigue. In particular, the demands placed on pilots operating throughout the night and across multiple time zones are especially intense. To understand the adverse effects of these demands, a pilot's biological clock must be examined to determine how the pilot's body is adjusting to the fatigue. One's biological clock generates "circadian rhythms" in every aspect of human physiology. These rhythms cycle over a period of 24 hours and can be measured as they fluctuate in body temperature, blood pressure, heart rate, sensory acuity, adrenal gland output, brain neurotransmitter levels, and cell division.³

Historically, workers have lived in accord with their circadian rhythms by working during the day and sleeping at night. In modern times, however, these work patterns have been altered to the point where many employees, especially aircrew, are working in

¹ Testimony of the NTSB Presented to the Committee on Appropriations, United States Senate Regarding Recommendations of the National Commission on Sleep Disorders, November 4, 1992, p. 7.

² *ibid.*

³ R. Curtis Graeber, "Aircrew Fatigue and Circadian Rhythmicity," *Human Factors in Aviation*, 1988, Academic Press, Inc. p. 308.

Background

UPS's overnight express delivery service requires that some or all of the hours of most duty periods (a block of time where an aircrew is flying one or more flight segments) lie within the normal nocturnal sleeping hours. This naturally leads to disruptions in normal sleep patterns for IPA pilots and difficulty in adjusting one's circadian rhythms to remain alert. The result is fatigued pilots.

Air crew fatigue and fatigue-related impairment in performance is one of the most important factors contributing to human error in the aviation industry. Fatigue also contributes to increased risks of medical disability. The major factors contributing to air crew fatigue and ill-health are irregular work schedules which require rapid changes between day and night work, disruptions of the circadian rhythms by irregular schedules and travel between multiple time zones, and the rigors of long hours of work on extended flight routes. These problems are due primarily to the fact that the human body has difficulty adjusting its circadian rhythms by more than 2 hours per day. Technological advances, such as automated flight activities and reductions in the number of aircrew, have also increased the challenge of maintaining peak air crew alertness throughout a flight.

Experienced pilots are fully aware that air crew frequently fight extreme sleepiness and fatigue, particularly on overnight or long flights. They also know that air crew sometimes fall asleep on the flight deck, occasionally at inopportune times, such as on approach to destination or immediately prior to scheduled landing. Generally, danger is avoided, but a sleepy pilot is always a dangerous pilot. In addition, excessively fatiguing round-the-clock duty-rest schedules, in time, cause increased risk of medical disability.

The primary factors contributing to air crew fatigue and ill-health are irregular work schedules requiring quick changes between day and night work, disruptions of the circadian rhythms by irregular schedules and travel between multiple time zones, and the demands of long work hours on extended flight routes.

Methodology

Circadian Technologies, Inc. performed a comprehensive analysis for IPA of the complete UPS DC8, B727, B747 and B757 Pilot Bid Packages for November 1993 to identify individual trips or combinations thereof that have fatigue-impaired duty periods. Aircrew impairment levels were measured using CTI's Circadian Alertness Simulation (CAS) software which utilizes Multiple Sleep Latency Test (MSLT) computer simulations of Sleep-Wake-Duty Schedules.

The CAS simulation provides an objective method for accurately predicting the alertness or sleepiness of an individual hour by hour on any Sleep-Wake-Duty schedule. CAS is based on comprehensive research on the properties of the human sleep-wake

Fatigue Problems

Excessively fatiguing duty-rest schedules present specific short-term risks of human error by tired pilots. These risks can include falling asleep on the flight deck, even on an approach to a destination or immediately prior to scheduled landing. Scheduling practices which exacerbate the already difficult flight duty requirements of operating during normal nocturnal sleeping hours include:

- Next day air flying;
- Time zone changes;
- Fast rotation duty periods; and
- Sequential night duty periods.

Next day air flying is the most common flight duty problem. This occurs when a commercial or deadhead duty period is placed in the early morning as the first leg of a trip to take a pilot to the origin city where he or she will later join an aircraft. Analysis shows that night duty periods that follow an early morning duty period have a higher incidence of aircrew impairment.

The early morning duty period requires curtailed sleep on the night before starting a trip. Therefore, the pilot is prevented from partially adapting his or her sleep-wake pattern for night flying at home, since he or she must make an early morning flight the next morning. Then the pilot is required to fly during nocturnal hours, thus resulting in fatigue-impaired duty time. By the time the UPS aircrew adjusts to the night service system after 2 or 3 days, the trip ends, or there is a long layover where in each case the pilots resume normal night time sleeping patterns. Overall, a significant amount of the impaired duty time for UPS aircrews occurs during a short early morning duty period followed by a night duty period.

Duty periods which require changing time zones require UPS aircrews to continually adjust their sleeping patterns to correspond with the local time zones in which the pilot is flying or laying over. Often a pilot must maintain his or her sleeping pattern to the origin time zone and stay with it until there is an opportunity, during a long layover, to shift to the new local time zone. Once the pilot adjusts to the new local time zone, he or she must maintain a sleeping pattern based on that time zone until there is another opportunity to shift. The time zone change scenario also aggravates aircrew fatigue impairment and occurs mostly on DC8 and B747 aircraft to the Far East and Europe.

risks of serious medical problems. It is possible, however, to reduce pilot fatigue risks and costs by:

- Instituting a process for identifying and modifying overly tiring flight sequences;
- Developing scheduling rules which optimize both UPS productivity and aircrew health;
- Developing sophisticated aircrew training packages tailored to aircrew members with different circadian rhythm types and to particular flight sequences;
- Examining FAA rest-duty time regulations to determine which sections impede development of flight-duty schedules that promote optimal alertness, and whether to revise these sections or seek special exemptions from them;
- Undertaking a comprehensive analysis of aircrew cardiovascular risk at UPS and address these risks before medical consequences develop;
- Developing a human resources policy for UPS aircrew which responds fully to the unique demands of global, 24-hour operations as well as UPS' corporate objectives and business realities.

Current U.S. Federal Flight Time/Duty Time regulations have taken a hands-off approach to monitoring air crew fatigue and provide inadequate protection from excessively tiring schedules. Aviation technology and scientific understanding of pilot fatigue have greatly advanced since present Flight Time/Duty Time regulations were developed and implemented. In addition, the aviation industry today is governed by high speed, long haul jet travel across multiple time zones. Add the business realities of global competition and overnight time-sensitive express package delivery, and there is the potential for fatigued, impaired pilots.

The technology now exists to assist in understanding and addressing the causes of reduced alertness and fatigue in air crew. This technology includes extensive research on circadian rhythms, biological clocks and sleep physiology. Therefore, U.S. Flight Time/Duty Time regulations must take into account modern scientific understanding of fatigue. The IPA's report shows there are dangerously and seriously impaired pilots today flying UPS aircraft and immediate measures need to be taken to address this problem.