Before and After

Fatigue-inducing pilot stress does not occur only in the cockpit.

BY RICK DARBY

BOOKS

'Tired All the Time'

The Pilot Lifestyle: A Sociological Study of the Commercial Pilot's Work and Home Life

Bennett, Simon. Leicester, England: University of Leicester Institute of Lifelong Learning, 2011. 228 pp.

"Didn't get to sleep until 2300. Woke at 0100 and stayed awake until 0400. Then slept until 0800. [At] work by 0900 to pick up taxi to LBA [Leeds-Bradford Airport, England]. Ninety-minute ride. Flight delayed one hour due to late inbound. Operated LBA-PMI-MAN [Leeds-Bradford–Palma de Mallorca, Spain–Manchester, England]. Flight delayed PMI by one hour due to flow-control restrictions. No meal on return flight — oven unserviceable — so starving. Two hours late into MAN. Drove home. Quick chat to wife, then bed at 2230 with sleeping tablet — I need to get some sleep."

Many corporate managers work long hours and travel often. It is hard to imagine a company, however, that would expect a high-level executive to keep a schedule like the one above *regularly*, every working day and/or night.

But it was a manager with a great deal of responsibility, an airline captain, who wrote that description of his workday. It is quoted from the diary he kept during the busy summer charter-flight period, as one of about 130 pilots who recorded in detail their experiences in the cockpit, at airports, at hotels and at home.

Bennett, who conducted the study and analyzed the responses, says, "In 2010, the British Air Line Pilots' Association's members perceived a need to document the pilot lifestyle. Sociology, with its ability to 'get behind the story,' seemed the ideal investigative tool. … In essence, this report is an oral history of the modern pilot experience."

Bennett used three research instruments to understand and analyze the commercial pilot lifestyle. The first was a sleep/activity log, or SLOG, kept for 21 days by pilots in the study. "More textured than a simple sleep log, it recorded pilots' *lived reality* of work and home," he says. Completed SLOGs, which ranged in length from about 2,000 to 9,000 words, were confidential and de-identified. The study began in mid-2010 and ended in 2011.

Interviews and a Web-based questionnaire supplemented the SLOGs. In addition, "useful data emerged via an unexpected route: Many of the diarists provided information in emails and letters," Bennett says.

Each published diary is followed by Bennett's analysis, often including findings from other researchers, which are keyed to end notes. For the sake of brevity, details of the citations are omitted in the following examples.

From the diary of another captain on long-haul flights:

Day 1. "Woke at 0610. [All times in this and other diary excerpts are coordinated universal time to clarify the durations in the

sequences.] Preflight sleep 1130–1245. Felt well rested. Departed by car for base at 1400. Arrived 1630. (Drive to work took 2.5 hours.) Pushed 1930 for LHR-EWR [London Heathrow to Newark, New Jersey, U.S.]. In-seat sleep for 45 minutes."

Day 2. "[I was] pilot flying for arrival. On blocks 0330. Felt absolutely whacked by the time I boarded the crew bus. Crew bus to Manhattan hotel accommodation. Checked in by 0530. Asleep by 0630. Slept until 1025, then restless sleep until 1330."

Day 7. London Heathrow to HGK (Hong Kong). "No Upper Class seat available for in-flight sleep, so resorted to bunk. Three-and-a-half-hour rest break. There was an extra duvet available, so I slept unusually well."

Day 9. "Pushed 1130 for HGK-SYD [Sydney, Australia]. Two-and-a-half-hour rest break taken in Upper Class seat. The flight service manager warned me she would need the seat if we hit turbulence, as one of the passenger seat belts was defective. Aware of this prospect, I never slept at all, really. I kept waking up when we hit turbulence, anticipating a seat-swap. My eyes were stinging as the sun started to come up during our approach into Sydney."

Day 12. "Woke at 0500 after a good sleep (eight hours). Socialized, then retired at 1830. I slept well at first, but an incoming crew decided to hold a party in the room above mine."

Excerpts from Bennett's analysis:

"The diarist seems to have benefited from quiet and relaxing hotel accommodations, with the exception of the room party incident in HKG. Hotel life [has] its irritations. Hotels can be noisy during the day: rooms are cleaned, goods are delivered, guests are dispatched and maintenance is done. Unfortunately, the noise starts just when pilots are getting ready for bed."

"The diarist lived roughly a two-and-a-half-hour drive from LHR, his base. On landing, he would drive home. … Transport Canada says, 'Driving to and from work when fatigued should be considered a hazard. This is increasing in importance as commute times continue to grow significantly longer. You will always be at risk of falling asleep if you are driving while tired or sleep-deprived.'"

"Generally, the diarist seemed able to obtain preflight and in-flight sleep. The Upper Class seat episode on Day 9 illustrates the importance of undisturbed, stress-free sleep opportunities. This was manifestly not a stress-free sleep opportunity. The [U.S.] Federal Aviation Administration comments: 'Sleep should not be fragmented with interruptions. In addition, environmental conditions, such as temperature, noise and turbulence, impact how beneficial sleep is, and how performance is restored.'"

A first officer preparing for duty on a long-haul flight — Munich, Germany (MUC) to Los Angeles (LAX) to MUC — wrote in his diary:

Day 3. "Leave day. Kids woke me up at 0445. Felt all right. Usual morning tasks. Get kids ready, breakfast. Went to town [Düsseldorf; DUS]. Packed suitcase and prepared for the trip until lunchtime. The wife was angry at me leaving — had a little fight about that. Family took me to the airport at 1400. Flight from DUS to MUC. Arrive 1700. Rented a car and drove to the hotel. Arrived 0815. Had dinner at 1900. Did some preparation/reading for the trip. Went to bed at 2045 and fell asleep around 2100."

Day 13. "I slept from 2400 to 0300 [in the aircraft on a flight to São Paulo, Brazil]. I felt tired afterwards — but well enough to fly the last four hours of the flight. I landed the aircraft. We landed well ahead of schedule and were on blocks at 0750. We drove to the hotel and I finally got to bed at 1000. I slept until 1200. I did not feel rested afterwards. … Since [fellow crewmembers] wanted to meet for dinner, I decided to take a nap from 1800 to 2000 and slept from 1830 to 2000. I did not feel well afterwards. I went to the bar where we had arranged to meet and had my first drink of the evening, bought by my captain — so I couldn't say no. I didn't really want to drink alcohol, though. We spent the rest of the evening (2200–0030) in a steak restaurant. I couldn't eat much because of the time of day. It was too late for me."

Excerpts from Bennett's analysis:

'Sleep should not be fragmented with interruptions.'

"There is strong evidence here of how offspring impose routine on parents. The diarist (and his partner, of course) were locked into a routine of going to bed around 2100 and getting up at between 0500 and 0600. There is also strong evidence of this being a tight-knit family unit with lots of time spent together when the diarist was at home. Young families are demanding. Perhaps it was the prospect of having to cope alone that caused the minor spat prior to the MUC-LAX-MUC trip."

"The diarist had a time-consuming and potentially arduous commute to work. For example, his Day 3 commute to the pre-LAX hotel accommodation by family car, aircraft and rented car took over four hours. After returning from São Paulo, the diarist spent five and a half hours commuting by aircraft, train and bus to his home. … The greater the number of transport interfaces — for example, between an air service and a train or bus service — the greater the chance of missing a connection and of being late for report. Short, single-mode commutes enhance operational resilience."

Hassles with preflight and post-flight transportation are a running thread through the diaries.

"In their paper 'The Mental Health of Pilots: An Overview,' Bor, Field and Scragg investigate the link between social or peer pressure and alcohol consumption amongst commercial pilots: 'Pilots experience high levels of stress in their jobs and have to endure considerable disruption to their personal lives. Intermittent absences from family and social support, periods of time relaxing and recuperating, sometimes accompanied by boredom and social pressure to consume alcohol with fellow crewmembers, may be the root cause of alcohol misuse and dependency.'"

Hassles with preflight and post-flight transportation are a running thread through the diaries. Here is a captain for a charter airline after a flight from Cuba to Manchester:

"Into the [hotel] for a sleep of five hours and then back to LGW [London Gatwick] by coach at 1515. The coach is 30 minutes late and is going via Birmingham Airport, which means we don't get back to LGW until 2130, and after a 20-minute walk and transit ride to my car I get home at 2230, tired and with a headache. After completing a night flight, stop-start coach travel is very unpleasant."

The captain sent an email to Bennett along with his SLOG: "Thank you for undertaking what I view to be a critical piece of research. There has been a change in many airlines from a faintly paternalistic ethos to hard-nosed commercialism. This is reflected in their short-term behavior, which is only to the detriment of flight safety. Fatiguing rosters are far more prevalent now than at any time I can remember. It has become a major topic of conversation in our [flight crew] community. This is the first year in my career of 16 years that I have filed a fatigue report.

"I have noticed an increase in the use of sleeping tablets among crew (I don't use them). These are not necessarily prescribed, as they are available in some of our more esoteric destinations."

In Bennett's analysis, he cites his own study of the sleeping habits of "back of the clock" cargo flight crews, in which he found that "although the majority tried to get pre-report, top-up sleep, they were often thwarted by their body clock or other factors, like noise."

The fatigue issue arises in report after report in the pilot lifestyle book. Here is a typical example, from a first officer working for a German carrier: "Right now many pilots in my company are flying overtime and many say that it can't go on. We usually fly five days in a row, have two days off, flying again for five days, etc. Many times we have four or five legs a day, and to top it off, in Frankfurt we have many aircraft changes — meaning we arrive in Frankfurt, have to hurry to finish up the paperwork, shut down the aircraft, lug our baggage out of the aircraft, hop on a crew bus which takes us to another aircraft, lug our baggage to the new aircraft, do all the checks to turn the aircraft on again, etc. All this leads to many of us being tired all the time."

The overall impression obtained from reading many of the 21-day diaries is that the pilots — perhaps encouraged by being asked to report their experience — were aware of their physiological and psychological states. They were not supermen or superwomen. They were affected by the same problems, anxieties and irritants

as people in more "routine" occupations, plus additional ones related to frequent long-haul flying, such as the disorientation caused by being unsynchronized with local times.

But it is equally clear that the pilots made a disciplined effort to do whatever it took to compensate for stress and find their balance. They phoned home, found ways to amuse themselves and relax as much as possible under the circumstances, and above all tried — albeit not always successfully — to get enough sleep.

According to Bennett's Web-based questionnaire, 74.4 percent of the respondents answered "yes" to the question, "Have you ever commenced a duty [period] knowing you were fatigued?" A larger percentage, 86.1 percent, acknowledged flying a sector knowing they were fatigued.

The questionnaire asked, "What is the longest period of continuous wakefulness (in hours, from waking up to setting the brakes at the end of the last sector) you have experienced at work?" Replies were "up to 17" hours from 13.9 percent of the pilots; "18–22" from 32.6 percent; "23–27" from 33.3 percent; and "28 or more" from 20.3 percent.

Although some pilots criticized company scheduling policies, 84.3 percent said they had failed to get adequate rest at home before reporting for duty. The most frequent reasons given were family-related stress, work-related stress, household noise and extraneous noise.

Bennett concludes, "Although subjective, pilots' responses to questions about fatigue and stress should give cause for concern. … One remarked: 'I don't want to [quit] flying particularly. But I wake up some days and I ask, "For how much longer can I do this when I feel this tired?"' Such sentiments do not bode well for the industry. An airline's safety performance is influenced in part by its organizational memory, the sum of employees' wisdom and experience. Inevitably, airlines with a high pilot turnover have a weaker organizational memory in terms of flying operations than those with a low turnover. Airlines allow the experience pool to evaporate at their peril."

SMS as Seen by Practitioners

Implementing Safety Management Systems in Aviation

Stolzer, Alan J.; Halford, Carl D.; Goglia, John J. (editors). Farnham, Surrey, England, and Burlington, Vermont, U.S.: Ashgate, 2011. 464 pp. Figures, tables, index.

The editors' earlier book, *Safety Management Systems in Aviation*, was largely concerned with explaining safety management system (SMS) concepts (*ASW*, 12/08, p. 54). This time, their book differs in emphasis and format. It is concerned above all with practical SMS implementation. And whereas the earlier work was written by the present editors, here they have assembled stand-alone chapters by industry specialists who have put SMS into practice.

"While the editors are involved in industry, consulting and academia, we thought that turning to the day-to-day practitioners of SMS provides yet another perspective for the student of SMS," the editors say. "Our authors are among the most experienced practitioners in the industry today."

SMS is still evolving as it translates from theory to practice. The authors of the 14 chapters write from their own viewpoints, and the editors say they are more concerned with conveying the breadth of the subject than reconciling the individuals' outlooks into a systematic treatment.

The book begins with a prologue about a fictional fatal runway collision between a corporate jet and a "Quest Airlines" aircraft, as both companies' management teams review their SMS and its prior implementation.

Subsequent chapters examine SMS from various angles. Some headings are "Perspectives on Information Sharing"; "Top Management Support"; "Safety Culture in Your Safety Management System"; "Integrating SMS Into Emergency Planning and Incident Command"; and "Safety Promotion."

The chapter titled "Practical Risk Management," by Kent Lewis, offers an example of the book's material. Lewis says, "The goal of SMS is to prevent loss of life and property while conducting daily operations, and this is accomplished by the detection and mitigation of hazards. Risk management forms the foundation for an effective SMS, regardless of size,

mission or resources of the organization, team or individual."

After outlining several operational risk reduction models, Lewis looks at case studies of hazards and actual incidents and accidents.

For example, in a near midair collision between a U.S. Navy T-34C training aircraft and a civilian aircraft, "the identified hazard was the lack of a radio [in the military airplane] that operated on civilian frequencies. … With [the Navy's] risk-management model, when a severe hazard was discovered, a report had to be generated to notify the appropriate-level risk managers within 24 hours. This report also included recommendations for corrective actions that were generated with input from the squadron's instructor pilots."

'With [the Navy's] risk-management model, when a severe hazard was discovered, a report had to be generated to notify the appropriate-level risk managers within 24 hours.'

Within a reasonable time, money was appropriated to equip the entire fleet of T-34Cs with dual-band radios. "The total cost of the retrofit was under $2 million and, because the trainer was not a combat aircraft, a commercial off-the-shelf system was immediately available," Lewis says.

Another case study was a Bombardier Canadair CL-600 that overran the departure end of the runway after landing in deteriorating weather, with substantial damage to the aircraft but no injuries to the occupants.

"There were many situational hazards present during this operation, and the confluence of these factors resulted in a mishap," Lewis says. "Just by reading the terse description of the mishap from the [U.S. National Transportation Safety Board] probable cause statement, we begin to see the precursors — the latent conditions that existed before the crew reported to the airport for duty, and in the case of pilot flight time and duty time regulations, existed even before the captain or first officer were born. … We have a low-time first officer on day two of line flying, with the crew approaching both the 16-hour duty day and eight-hour flight-time limit, planning a flight into an airport that had battled weather conditions throughout the evening and into the early hours of the morning. …

"We need also to consider the fact that the runway is relatively short for air carrier operations, 6,500 ft [1,981 m] … . And just to round out the evening's festivities, the air traffic control tower was closed and braking action reports would have to be relayed to the inbound aircraft by airport operations personnel."

All of those hazards were known before the accident, Lewis notes.

"With all of this information in hand, a time-critical risk assessment could be conducted and most likely it would score in a category that required actions be taken to reduce the level of risk," he says. "There are many examples of risk-assessment matrices and personal minimum checklists available for use." [The *FSF Approach and Landing Accident Reduction Tool Kit Update* <flightsafety.org/current-safety-initiatives/approach-and-landing-accident-reduction-alar/alar-tool-kit-cd> includes an approach and landing risk awareness tool, a controlled flight into terrain risk assessment checklist, and other risk assessment and mitigation contents.]

"Risk control recommendations should address short-term, mid-term and long-term solutions, and investigators should do so without consideration to cost," Lewis says. "This is not because cost is not an issue, but because the cost is an issue that should be decided at the appropriate level. Many times, the recommendations offer long-term cost savings benefits because the hidden costs of a mishap can be three to five times the visible costs of a mishap. There may be damage to the environment; loss of trust and, subsequently, revenue in a customer base; reduction in revenue from loss of assets; civil and criminal legal fees; and awards and potential fines from a regulator.

"Investigative teams can be exercised by participating in the risk management process; there is no need to wait for loss of life or damage to property."

REPORTS

Addressing Capability Issues

Civil Aviation Authority Safety Plan 2011 to 2013

U.K. Civil Aviation Authority (CAA). IN-2011/090. Aug. 26, 2011. 46 pp. Available online at <www.caa.co.uk/docs/978/CAA_Safety_Plan_2011.pdf>.

The CAA Safety Plan is an element of the CAA Strategic Plan, whose objective is "to enhance aviation safety performance by

pursuing targeted and continuous improvements in systems, culture, processes and capability."

The plan's initiatives are of two types.

First, "we are taking action to address the factors behind the most significant worldwide accident types involving large airliners — we call these the 'Significant Seven' — as well as actions for other sectors, such as business aviation, large public transport helicopters and general aviation."

Second, "we are taking action to address 'capability issues.' We believe that enhancing our safety risk management systems and adoption of a performance-based regulatory approach will improve the way the CAA regulates and will result in safety improvements of benefit to aviation and the public at large by focusing on the right risks."

The Significant Seven factors are loss of control, runway excursions, controlled flight into terrain, runway incursions, airborne conflict and ground handling. Some findings of a CAA task force report on the status of the seven was described in *ASW* (4/11, p. 50).

The report says, "One of the target outcomes from the CAA Strategic Plan is that 'the U.K. aviation industry and the CAA will have measurably increased capability and performance in safety management, human factors and just culture, and demonstrated the benefits in terms of risk reduction.'"

Key capability issues' intended outcomes are discussed under the following headings.

Integrated safety risk management process. "Develop a new integrated safety risk management process to allow more effective monitoring and management of aviation safety risk by the CAA and industry."

Safety management systems (SMS). "Improve the safety performance of organizations through the implementation of effective SMS and the CAA's capability to assess the effectiveness and safety performance of an organization's SMS."

Just culture. "To achieve a balance between the interests of safety (e.g., protection of safety information) whilst not tolerating recklessness, and to achieve improvements in the open reporting of safety occurrences in parts of the industry where it is currently lacking."

Continuing airworthiness. "Improve the CAA's capability to extract intelligence from all sources of airworthiness-related safety data, so that the associated risks are better understood and the most effective actions to mitigate them can be identified and implemented."

Strategy for human factors (HF). "A better understanding of human performance, limitations, attitudes and behaviors to drive the practical application of human factors principles in reducing risk within the aviation safety system."

Performance-based oversight. "Deliver effective regulation in a manner and at times which have the greatest impact on preventing significant aviation losses. Facilitation of proportionate, targeted and consistent regulation."

Fatigue risk management systems (FRMS). "Deliver effective regulatory oversight of fatigue management using FRMS techniques and metrics, proportionate to the size and complexity of the operational environment. To ensure that safety-critical workers are able to operate at an effective level of alertness for all normal and abnormal circumstances."

The report also notes "total system threats" such as the volcanic ash crisis of 2010 — an example of an improbable event whose knock-on effects can temporarily cripple the entire aviation system. Reviewing lessons learned from the ash cloud debacle revealed that "one of the CAA's strengths … was its ability to draw upon internal expertise based on a long involvement in relevant issues and previous incidents. The need to retain such capability is reflected in the CAA Strategic Plan, together with the need for continued improvement in the CAA's expertise, plans and processes for crisis management, and the ability to better identify and prevent or prepare for rare but high-impact events."