Institution: University of Leicester

Unit of Assessment: 19 Business and Management Studies

Title of case study: Improving Airline Safety through the Analysis of Pilot Fatigue

1. Summary of the impact

Flight safety has been a major focus in the past sixteen years at the Civil Safety and Security Unit (CSSU), affiliated with the University of Leicester's School of Management. The knowledge created has had three impacts. First, the development of a tailored fatigue-risk management system (FRMS) now in operation in a night-freight airline. FRMS provides for the development and validation of rosters that optimise crews' economic and safety performance, saving lives and money. Until this research no UK-registered night-freight airline had operated a FRMS. Second, the research underpins the evidence-base for the British Air Line Pilots' Association (BALPA) in its lobbying of the European Aviation Safety Agency (EASA). Third, the research is supporting the Society for the Welfare of Indian Pilots (SWIP) in its campaign for safe flight-time limitations (FTLs).

2. Underpinning research

CSSU has an international reputation for risk management expertise. The research underpinning the impacts was carried out at the University of Leicester, in part funded by BALPA who awarded £53k to Dr Simon **Bennett** (Leicester since 1992) to research the pilot lifestyle. It was conducted in three overlapping phases. Between 1998 and 2013 Bennett conducted much research into the safety impacts of stress and fatigue. Between January 2008 and June 2011, this knowledge was used to develop a bespoke FRMS for a night-freight airline. Prior to this FRMSs had been used mainly in passenger airlines. The unique aspect of night-freight is that *all* services are operated through the circadian low. The chosen airline was known for its roster volatility. Finally, between November 2010 and April 2011 a study of pilot lifestyle was initiated by the British Air Line Pilots' Association (BALPA).

The initiative for each phase was the previous phase and the knowledge creation itself an impact of the original research. The project began as a normal social scientific study, Mode 1 science in Gibbons *et al's* terms, but developed through a participant observation/action research study into Mode 2, in which knowledge emerged in the context of application. The research was unique because it correlated stress and fatigue with pilot lifestyle.

In phase one, the major findings (1, 2, 3) of the research were that:

a) flight-crew represent a peripatetic workforce – a 'pilot diaspora' – for which commute-to-work distances are increasing
b) the peripatetic lifestyle causes physical and psychological stress
c) such stresses can impact a pilot's working and home life
d) context-sensitive rostering can help mitigate stresses and reduce turnover (and costs)
e) pilots need to 'unburden'
f) pilots constitute a committed, cohesive and mutually-supportive work-group
g) managers should work with, rather than against this strong flight-deck culture

Phase two involved a three-and-a-half year research partnership with a night-freight airline (4, 5). First, ethnographic research recorded the 'lived experience' of flight-deck labour and other methods included: a sleep-diary study; analysis of Mandatory Occurrence Reports; the post-incident debriefing of pilots; participant observation of flight-deck operations and the down-route lifestyle; interviews. Bennett delivered initial FRMS training to pilots and managers, analysed Crew Fatigue Reports and made recommendations. His on-going research — particularly into the effects of changes to rosters and positioning practices on fatigue and efficiency — was used to optimise the system. The research found that:

a) Commute-to-work times impacted pilots' physical and psychological health and fatigue levels
b) Pressure on bottom-end salaries left some pilots unable to afford convenient accommodation

c) Consequences included arduous commutes and inappropriate use of facilities equipped for napping. Acute/chronic fatigue as well as health, psychological and relationship problems resulted
d) FRMS helped the airline identify and correct fatigue-inducing rosters
e) Pilots form cohesive, self-reliant, norm-driven and mutually-supporting groups, even when there is no union representation
f) Safety cannot be considered in isolation from other factors, like financial reward and the property market

Phase 3 involved a social-psychological study of the commercial pilot lifestyle based on 433 questionnaire responses, 130 sleep diaries and interviews (6). The findings included that pilots:
a) Perceived unsympathetic rostering to cause stress and fatigue
b) Perceived the peripatetic lifestyle to cause stress, fatigue, low-morale, relationship problems and financial pain
c) Believed a healthy reporting climate to be a prerequisite for the comprehensive and timely reporting of fatigue-risk
d) Believed that under-reporting weakened FRMSs
e) Attempted to keep fit despite being fatigued
f) Tended not to trust airline authority figures and Aviation Medical Examiners
g) Sometimes reported for work when they should have reported sick and sometimes reported sick when they were suffering acute or chronic fatigue
h) Formed a cohesive work-group and believed that UK aviation is underappreciated

3. References to the research

1. Bennett, S.A. (2003) Flight crew stress and fatigue in low-cost commercial air operations — an appraisal. *International Journal of Risk Assessment and Management*. 4/2: 207-231.
2. Bennett, S.A. (2006) A longitudinal ethnographic study of aircrews' lived experience of flying operations at a low-cost airline. *Risk Management: An International Journal*. 8/2: 92-117.
3. Bennett, S.A. (2006) *A Sociology of Commercial Flight Crew*. Aldershot: Ashgate.
4. Bennett, S.A. (2010) A longitudinal ethnographic study of night freight pilots. *Journal of Risk Research*. 13/6: 701-730.
5. Bennett, S.A. (2011) A Study of the Sleeping Patterns of Night-Freight Pilots Operating in Europe. *Journal of Aviation and Aerospace Perspectives*. 1/2: 36-57.
6. Bennett, S.A. (2012) Self-assessment – a useful contribution to our understanding of pilot fatigue? *Aviation in Focus*. 3/1: 53-99.

4. Details of the impact

The research has had global impact in three areas – the development and testing of a FRMS; campaigns against the liberalisation of EU FTLs; and (on-going) campaigns by the Society for the Welfare of Indian Pilots against similar liberalisation proposals.

The night-freight airline, aware of Bennett's research, asked him to tailor the FRMS model to accommodate the fatigue-risk management needs of a night-freight operator. To refine the FRMS Bennett conducted surveys throughout his 3.5 years at the airline. The design of the FRMS involved modification of the standard International Civil Aviation Organization model to accommodate intense night operations through the circadian low. The adaptive work drew on Bennett's research into flight-deck labour. Testing and refinement of the system was based on his involvement as an action-researcher. Bennett's participant observation/action research approach helped maintain pilot engagement which assisted in the identification of feedback problems in the standard FRMS system. Without feedback FRMS becomes a source of risk.

The development of a FRMS allowed the airline to verify and fine-tune rosters. It enabled the development and validation of a variation that satisfied both the CAA's safety criteria and the airline's operational requirements. Data generated by the FRMS was used to optimise the trans-Atlantic rosters such that an acceptable safety margin was maintained. Bennett's work (validated

by the CAA) laid the foundations for a 'virtuous circle' of research. Because they required the introduction of the new, larger Boeing 767F, the trans-Atlantic services revolutionised the airline's operations. For example, instead of a crew heading to Italy on the same day they were due to operate from that country, they were flown out the day before, allowing them to sleep prior to their duty. After this roster change, the FRMS confirmed the beneficial impact on fatigue levels (fewer fatigue reports were filed for this duty). Bennett confirmed the safety benefits of new facilities (like a new sleeping facility at the airline's Italian hub and expanded accommodation at its German hub).

The night-freight FRMS research attracted BALPA's attention, who commissioned Bennett to further investigate the pilot lifestyle. BALPA has 10,000 members. Bennett had contributed to BALPA's journals for over a decade and his report *The Pilot Lifestyle* was distributed to the European Commission, European Aviation Safety Agency (EASA), ICAO, International Air Transport Association (IATA), CAA, Members of the European Parliament, Members of the UK Parliament, airline managements, pilots, civil servants, journalists and trade unions. Bennett engaged with opinion-formers and decision-makers, in 2011 attending a Parliamentary Reception to bring this research to the attention of Ministers. Since publication of *The Pilot Lifestyle* Bennett has contributed to the media debate (via, for example, the newspaper *Politiken* and a lead news item for the Danish Broadcasting Corporation in June 2013, a Channel 4 documentary in July 2013). He has corresponded with the British Prime Minister, the Minister of State for Transport, the Chair of the Transport Select Committee, the CAA's Head of Safety Strategy, the Chief Executive of the United Kingdom Flight Safety Committee, the Chairman of the All Party Parliamentary Group for Freight Transport and the Executive Director of the Parliamentary Advisory Council for Transport Safety. The EU campaigns included the writing of papers that were strongly informed by Bennett's research. An example is a lobby paper written by Bennett for the Parliamentary Advisory Council for Transport Safety (*Contemporary issues: Fatigue impacts of employee commutes*). An example of a position paper is that written for a Parliamentary Reception hosted by BALPA (*Executive summary of The Pilot Lifestyle: a sociological study of the commercial pilot's work and home life*). The Indian campaigns included the publication of a report by Moebus Aviation on behalf of SWIP. Bennett contributed a chapter to the report.

Documents and presentations made by BALPA and Bennett were part of a campaign to show that the harmonisation of standards in the EU would relax rather than improve them. Bennett's main contributions were *The Pilot Lifestyle* and his contribution to the position paper *The Next Chapter*. He published summaries of his BALPA-funded research throughout 2011 and 2012 (in the Flight Safety Foundation's *AeroSafety World*, the Royal Aeronautical Society's *The Aerospace Professional* and the UK Flight Safety Committee's *Focus on Commercial Aviation Safety*). Bennett's action-research made him an actor in BALPA's campaign against the harmonisation of EU FTLs. In a letter, BALPA's Head of Flight Safety said: "I am pleased to say your work has importantly informed the current BALPA Safety Plan and also the current House of Commons Select Committee enquiry into pilot fatigue." Further union work, specifically participation in the UK Independent Pilots' Association campaign video Pilot Fatigue: Is Your Captain Awake? The documentary drew on his research findings and featured Bennett talking about the factors that induce pilot fatigue. The BBC approached Bennett for an interview. A former Training Captain wrote to Bennett: "I would like to congratulate you on your crystal-clear analysis of the fatigue issue in the IPA pilot fatigue film; very well done."

Bennett's publications and his work for BALPA and the night-freight airline attracted the attention of Moebus Aviation, a consultancy engaged by the Society for the Welfare of Indian Pilots to help it campaign for safe FTLs. Bennett contributed a 950-word critique of the FRMS methodology ('Fatigue-risk management systems – requirements for successful operation') to Moebus Aviation's 2012 report.

In the Summer of 2012 Bennett secured a 12-month research placement with British Airways World Cargo (BAWC). The airline's ultra long-haul (ULH) operation will add a new dimension to Bennett's research and produce further impact in the future.

5. Sources to corroborate the impact

1. Programme Director, MSc Air Transport Management, City University

2. General Secretary, British Air Line Pilots' Association

3. Member, Flight Operations Group, Royal Aeronautical Society

4. Safety Manager, DHL Air, Cargo West, East Midlands Airport, "I would like to thank you for your academic input, hard work and support which has allowed us to develop a pro-active and industry-leading fatigue-risk management system" (letter dated 17 February, 2011).

5. Member, BALPA National Executive Committee: "I really appreciate what you are doing to help us with regard to flight safety, and explaining from an informed point of view. So glad we got you to do the pilot lifestyle study." (e-mail dated 10 January, 2013)

6. *Flight International*, "BALPA has commissioned a human factors expert from Leicester University, Dr Simon Bennett, to carry out a wide-ranging study of modern airline crew lifestyle, and its potential effects on pilot competency. This will examine the effects of numerous factors, like the increasing need for pilots to commute long distances to work, and the stresses caused by high levels of personal debt resulting from the fact that pilots increasingly pay for all their training. This mirrors many of the Australian Senate concerns" (article dated 18 February, 2011).