# Flight crew stress and fatigue in low-cost commercial air operations – an appraisal

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**Abstract:** It has been suggested that the 'low-cost' model of air travel generates excessive levels of stress and fatigue amongst flight crew. Pilots were interviewed at a UK-registered low-cost carrier (LCC). Most said they felt stressed and fatigued. Despite its subjectivity the pilots' testimony suggests that stress and fatigue are issues that merit close attention – not least because events like the September 11th, 2001 terrorist attacks, 2003 Gulf War and coterminous severe acute respiratory syndrome (SARS) outbreak have exacerbated economic pressures within the industry. Flight crews have insights and ideas that may benefit commercial aviation. It is they, and not legislators or civil servants, who deliver the product. It is suggested that a commitment to risk communication (as defined by Irwin and Wynne), which emphasises continuous dialogic risk assessment and the *systematic and routinised* exploitation of 'user knowledge' may enhance flight safety.

**Keywords:** commercial aviation; low-cost carriers; competition; working hours; pilot stress; pilot fatigue; safety.

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## 1    Introduction

The rise of consumerism in the developed world has, certainly with regard to commercial aviation, seen the balance of economic power tilt in favour of the man and woman in the street. Once the preserve of the fortunate few, air travel is now widely affordable [1]. There have been several 'motors of change'. Firstly, the charter or 'inclusive tour' (IT) operators provided affordable air travel (and accommodation). Then came the LCCs with

their 'no-frills' services. By stripping commercial flying of all adornment ('free' in-flight meals, in-flight entertainment, passenger service departments, allocated seats, etc.) and by cutting out the travel agent LCCs were able to provide cheap air travel (albeit to tertiary airports). The low-cost business model is uncompromising: costs must be pared down and resources used to maximum effect. The possibility that the LCC mantra of economic efficiency may have implications for the physical and mental health of pilots has prompted concern amongst both flight crew, trades unions and regulatory agencies like the Civil Aviation Authority (CAA). The data presented here consists of the subjective impressions or perceptions of pilots and first officers employed by a UK-registered LCC. No claims are made for either the objectivity or representativeness of the data. Nevertheless it is hoped a) that the data might inform the debate over such aspects of commercial flying as duty and flight time limitations, pilot recruitment, overnight and permanent accommodation and crew meals and b) that the research process and results described below will serve to illustrate the potential utility of risk communication. Whilst the industry has several well-established 'feedback loops' (like the Confidential Human Factors Incident Reporting Programme (CHIRP)) and some carriers operate consultative committees with flight and cabin crew, the results described below confirm the importance of the kind of continuous dialogue advocated by risk communication theorists. The premise behind risk communication is that 'experts' are not the sole repositories of insight and knowledge. Rather, knowledge is dispersed across functions and grades. Better decisions would be made if such knowledge were utilised. Commenting on the contribution risk communication and the utilisation of 'lay' knowledge might make to decisions on science policy, Wynne [2, p.8] asserts:

> "[T]here are times when controversy would have been avoided if ... questions, asked by non-specialists, had been taken into account from the start .... [P]articipation ... goes beyond ... opinion. This is a process of learning from each other, which will demand time and commitment if it is to become a two-way communication."

Irwin [3, pp.127-128] makes the following case for listening to and acting on the accounts of 'front-line' workers:

> "[L]ay accounts may be more open to changing circumstances and new information than the accounts offered by official science – which seems impervious to ... revision on the basis of locally generated evidence. Any mismatch is seen as a problem of *application* rather than of the knowledge base itself."

In the context of commercial aviation one might substitute 'line pilots' accounts' for 'lay accounts' and 'formal operational risk assessments' for 'official science'.

Following Bennett's [1] argument that we cannot understand the particular (in this case pilot stress and fatigue) unless we first understand the general, the paper commences with a history of the low-cost sector, an analysis of the LCC model and a brief review of UK-based LCCs. The data is then presented and analysed.


## 2   Low-cost carriers – a short history

In the UK the low-cost industry originated in the IT market that developed in the 1960s. Although operating non-scheduled flights carriers like Britannia and Monarch offered

cheap air travel. Dan Air and, in time, Laker Airways reinforced the push for affordable air travel. As Campbell and Kingsley-Jones [4, p.34] explain: "[These carriers] infiltrated and diluted Europe's short-haul market and provided the same thorn in the side of established full-service carriers as today's low-fare scheduled airlines do." In the USA the low-cost model originated with Pacific Southwest Airlines (PSA). Air Southwest (later Southwest Airlines) copied the PSA model. Following Carter's deregulation of US commercial aviation in 1978 the low-cost sector expanded. Between 1978-1989, 88 new carriers were launched. Most failed, undermined by the majors [4, p.34].

Back in the UK innovators like Freddie Laker found themselves battling vested interests. British Airways (BA) (and others) fought Laker to a standstill. As Laker explains in the Foreword to Calder's *No Frills* [5]: "[T]he traditional airlines were conspiring to force my Laker Skytrain out of business." In 1987 the European Union (EU) launched a ten year liberalisation program. In the UK Stelios Haji-Ioannou seized the initiative by founding easyJet, Britain's first low-cost carrier. 'Brand building' rather than day-to-day management was his forté. As Haji-Ioannou put it: "We don't have to start an airline on the operational side. I have found a way of leasing planes, with pilots and everything else. *I'll build a brand* (my emphasis)" [5, pp.95-96]. According to Lawton [6, p.116] the airline's success is built upon "sustainable efficiency improvements and unit cost savings ... [achieved through] *shortening aircraft turnaround times* [and] *extending the flying day ...* (my emphasis)".

Perhaps the most interesting aspect of easyJet's short history is the way it – as the UK's only low-cost/low-fare carrier at the time – rode out the storm over the ValuJet crash of 11 May 1996, in which 110 people died when one of the airline's DC-9s crashed into the Everglades. In the USA many questions were asked about the safety of LCCs. A Federal Aviation Administration (FAA) report published nine days before the crash showed the accident rate for LCCs to be three times that of 'traditional' carriers. The average age of ValuJet's aircraft was 26.4 years. The average age of American Airline's aircraft was 9.2 years. *The Economist* asserted that ValuJet had engaged in 'aggressive cost-cutting' [7, p.58]. Following the crash ValuJet's President countered the adverse publicity by insisting that safety was ValuJet's top priority. Transportation Secretary Federico Pena stated that the airline was 'safe'. The British media reflected US concerns over LCCs. Consider Freedland's [8] report, for example:

> "Over the next few years, we are likely to experience ... more crashes, deaths and sheer terror in the skies .... [T]hat, crudely, is the diagnosis from last week's nosedive of ValuJet Flight 592 into the alligator-ridden Florida Everglades ... and from the fatal crashes, near misses and countless warnings that preceded it".

Writing in *The Times* Elliott [9] commented: "[T]ravellers will inevitably be concerned about the whole concept of very low-cost, no-frills airlines." Having pointed out that easyJet's founder had been inspired by ValuJet "which he visited in Atlanta before setting up easyJet", *The Economist* [10] talked about "the perception that low-cost flying is dangerous". Having failed to rebuild its reputation ValuJet was taken over. Buckingham and Harper [11] noted that after the ValuJet episode "... other low-cost operators in the US [struggled] to fend off the perception that safety [was] being compromised".

By 1997 any EU-registered airline could operate any service between any two countries within the EU (provided, of course, it could get the required 'slots' (landing

permissions) at either end). This meant, for example, that Ryanair, a low-cost airline registered in Eire, could operate out of Stansted in Essex to any airport in Europe. BA's Chief Executive Bob Ayling rose to the challenge of liberalisation by launching GO Fly, an LCC based at Stansted. In November 2000 Ayling's successor Rod Eddington decided to sell GO Fly. GO Fly's CEO Barbara Cassani made the airline as attractive as possible. Cost efficiency and service were emphasised. In June 2001 she secured a management buy out (MBO) with the help of Investors in Industry (3-i). Some, like stockbrokers WestLB, were not convinced that small LCCs like GO Fly had a future [12]. In 2002 GO Fly was purchased by easyJet.

In August 2002 British and Irish low-cost carriers dominated the European low-cost market, the major players being easyJet and Ryanair, supported by Buzz (KLM's low-cost arm based at Stansted), Bmibaby, Fly.be, Virgin Express and My Travel Lite. As of 2002 the LCCs had 'barely 10% of the intra-European market'. Campbell and Kingsley-Jones [4] stated: "[T]he prevalence of state ownership and state aid have slowed the move to a truly free airline market." Some, however, were sanguine. Ed Winter, charged with integrating GO's operations with those of easyJet, remarked: "Within five to ten years, the normal mode of travel will be to go on to the internet and book a no-frills airline" [13]. Lawton [6, p.3] asserted: "Ever increasing industry liberalisation, together with customer demand, will guarantee a place in the market for cost efficient and reliable low fare carriers."

## 3   Low-cost carriers – the contemporary incarnation

In essence low-cost carriers survive by carrying as many people as possible as often as possible over relatively short distances. By doing this they a) maximise the productivity of capital and staff and b) make the most of small 'yields' (the profit on each seat). As Harper and Milner [14] explain:

> "Low-cost airlines tend to focus on short-haul routes of generally less than 1,500 km and *maximise crew flexibility*. Competitive advantage derives from greater aircraft productivity – having an aeroplane in the air for more hours, carrying more passengers is of paramount importance. British Airways configures its Boeing 737s with 126 seats and achieves a utilisation rate of 7.1 hours a day. By comparison, easyJet has 148 seats on its 737s and gets 10.7 hours' usage per day (my emphasis)."

Getting the highest return possible from physical and human capital is a major theme within low-cost operations. As Holloway [15, p.95] puts it:

> "[Low-cost carriers must] build a cost structure which ... can ride-out the fare wars ... and ... can sustain low prices. To achieve this low-cost/low-fare carriers require ... *high asset and workforce productivity*: [Low-cost carriers must] ensure the culture of the airline supports a low-cost/low-fare strategy (*an essential ingredient being flexibility and a willingness to 'pitch-in'*) (my emphasis)."

Michael O'Leary, CEO of Ryanair has stated: "Everything is geared towards efficiency .... We are ... more aggressive than our competitors" [16].

Given that, as Lawton [6, p.3] explains, "The margin of profit for most airline companies is minimal", it follows that for low-cost/low-fare airlines *especially*, 'successful and constant cost control is essential'. Put simply, low-cost/low-fare carriers

have very little margin for error in the way they manage their assets (aircraft, flight and cabin crew, etc.). As evinced by the impact of the first Gulf War and terrorist attacks of 11 September 2001, passenger demand is volatile. The only defence against this volatility, says Lawton [6, pp.3-5] is aggressive and persistent cost-reduction:

> "The obvious way to safeguard a company against ... acute market vulnerability is to decrease operational expenses and *increase employee and aircraft productivity* .... The key factors affecting indirect costs for an airline are fleet structure, route network and *company policies on remuneration and work rules* .... Low price market leaders ... have developed business models that place constant cost reduction and cash accumulation at their core (my emphasis)".

The Anglicised version of the low-cost/low-fare model is summarised by Harper and Milner [14] thus:

> "The ability to offer low fares and still make a profit hinges on a range of savings. The direct sell, often via the internet, cuts out commissions. Using one kind of aircraft ... simplifies maintenance. Airports such as Luton and Stansted (essentially 'tertiary' airports) are cheaper than Heathrow. Selling food and drink rather than giving them away provides additional revenue streams. Turnaround times must be kept to a minimum – 20-25 minutes is ideal .... Ignore two or more of those rules and a company will go under. Debonair (a Luton-based LCC that failed) offered free food and drink and made the mistake of operating the expensive four-engine BAe 146 aircraft with only 100 seats".

It is clear that if a low-cost/low-fare carrier is to survive a) normal competition and b) major perturbations like 11 September, costs must be driven down and the return on investment maximised. A corollary is that resources like flight and cabin crew and aircraft must be utilised in an economically efficient manner. This requires that LCC pilots operate at or near maximum annual flight and duty time limits. It has been ventured that in certain instances flight crew have exceeded flight and duty time limits: "(Fatigue) is made worse by trying to fly up to and in some cases over, the prescribed limits by careful adjustments of rosters (work schedules), days off etc. A number of rosters have been sent to CHIRP (Confidential Human Factors Incident Reporting Programme)" [17]. Perry [17] asserts that the 'pilot shortage' prior to September 11th exacerbated the fatigue situation for in-post flight crew: "[The] present shortage of pilots ... brings another range of problems, including fatigue." Buckley [18] comments: "As a result of this shortage, those pilots who are 'lucky' enough to have airline positions, sometimes find themselves with very fatiguing rosters.". According to McVeigh [19] the pilot shortage was so acute that even low-cost paragons like easyJet and Ryanair were willing to pay 'golden hellos' of up to £30,000 and salaries of up to £100,000. Carriers, she said, were in a 'panic'.

There is agreement that deregulation has spawned popular and successful low-cost/low-fare sectors in both the USA and EU. There is a view that the modus operandi of the entire industry has been affected by the low-cost/low-fare sector. Lopez [20] asserts: "Low-cost operations have become the benchmark that all airlines in every country must match" [21]. Several 'full-service' airlines, like SAS in Europe and Delta in the USA have launched low-cost arms (SnowFlake and Song respectively). Towards the end of the 1990s Cardiff University Business School published *Contesting Globalisation: Airline Restructuring, Labour Flexibility and Trade Union Strategies*, a survey of employment practices and trade unionist opinion within commercial aviation. The report surveyed 52 unions from 29 countries. According to Lopez [20]:

"[T]he report (revealed) that 78% of workers face increased workloads, while 54% said hours of work had lengthened ... 69% said job satisfaction and morale had fallen .... Working hours ... had increased dramatically with more than a third of the unions reporting longer shift durations and 40% citing an increase in total working hours .... Some 75% of airlines had contracted out work (sometimes to companies in low-wage, low/no tax countries) ..."

Lopez concludes: "Jobs and conditions – and safety – are constantly undermined in order to drive up profitability." Reviewing airline strategies and structures, *Airline Business* has commented:

"[T]he traditional ... model looks suspiciously like an old-fashioned piece of vertical integration, owning a vast array of assets and performing everything ... from heavy engineering to internet sales .... The successful global airline may well find itself ... owning fewer hard assets ... *but reaping the rewards of global flexibility* (my emphasis)." [22, p.7]

In its 1999 report on commercial aviation safety the UK Select Committee on Environment, Transport and Regional Affairs [23] came to a somewhat different conclusion. Noting the Department of the Environment, Transport and the Regions' observation that "[European] Commission reports on the air transport market contain no suggestion that liberalisation of the market has impacted on safety", the Select Committee concluded: "Flying in a commercial aircraft and particularly one registered in the UK, remains a very safe way to travel." (LCCs like easyJet and Ryanair, as of April 2003 had never had a fatal passenger event). Nevertheless the Select Committee did warn of the dangers of shortages of pilots and engineers and decried 'the complacent tone of much of the oral evidence': "Many of our witnesses were keen only to emphasise the successful record of the aviation industry in the past and less so to admit that challenges lie ahead."

As for those who run the airlines, whilst there is a reluctance to use safety as a marketing tool [24] some are willing to comment. For example, Tim Jeans, director of sales and marketing at Ryanair, has stated:

"[T]here are no cost compromises on safety .... Safety standards have to be as good, or better than, the full-service competition because clearly the downside to an accident for a low-fares carrier would be considerably greater than if it hit a full-service carrier. We're only too well aware of that" [25, p.116].

Stelios Haji-Ioannou, easyJet's founder, has stated: "In this market the lowest cost producer will win. Nothing else matters. Safety's important and punctuality's important, but once you take those as a given, nothing else matters ..." [26, p.112]

In his 1980 book *International Airport* Cauter [27] stated: "Both pilots and controllers are delightfully courteous (to one another) even when working under pressure." In April, 2002 a report published by CHIRP [28] alleged that a number of LCC pilots were guilty of 'overly aggressive responses' to some air traffic control (ATC) instructions, the report partly attributing the responses to: "... the aggressively commercial ethos that exists within some airline companies." The report stated that this 'aggressive' ethos "[P]robably translates into extreme pressure on the flight deck to achieve programmed sector flight times." Buzz said it was 'very surprised' at the allegation. Ryanair said: "We operate to the highest standards of international safety." easyJet asserted: "Low-cost airlines have to work almost doubly hard on safety .... There's absolute zero tolerance on jeopardising or questioning safety" [29].

On 22 August 2002, *The Times* published an allegation from two Ryanair pilots to the effect "... that dozens of pilots based at Stansted (a Ryanair base) have either broken the 900-hour (annual duty) limit or are scheduled to do so ..." The British Air Line Pilots' Association (BALPA) stated there was 'great cause for concern'. Ryanair's Director of Flight Operations stated that the Irish Aviation Authority's 900-hour limit was "not an absolute, it's simply a framework". He went on: "Our mission here in flight ops is running a safe, efficient operation. We pay our people exceptionally well by UK standards" [30].

## 4    UK-registered low-cost/low-fare carriers

The indigenous low-cost/low-fare industry has its origins in Luton-based easyJet. Since easyJet's inception in 1995 there have been several new entrants, including GO Fly, Bmibaby, Fly.be, My Travel Lite, Jet2 and, with a planned launch date of June 2003, Now. Speaking in April 2002, Ray Webster, easyJet's CEO commented:

> "[A]ll intra-European traffic will be [on] low-cost carriers .... [T]he feeder market is largely a fabrication of the network carrier ... [short sectors are] costly, low yield, low customer satisfaction. Full-service airlines may withdraw from the regional market .... Most of Europe is still wide open." [31]

Before its takeover of GO Fly, easyJet planned to expand annually by 25% (so-called 'organic' growth). As if to confirm Webster's forecast, in August 2002 IT-operator My Travel launched its own low-cost arm. My Travel Lite came to the market in bullish mood, saying that whilst it did not plan a price war, aggressive pricing would be necessary where it went head-to-head with LCCs. The carrier's CEO commented: 'We have given away our value proposition ... and we are determined to get it back' [32]. Clearly the UK LCC market is both dynamic and competitive.

## 5    Research method

Data was produced through ethnographic study. The research method closely followed Gilbert's [33, p.157] definition of ethnography:

> "[T]he techniques are likely to include interviews (usually more like a conversation than a standardised interview ...), the analysis of documents, direct observation of events and some effort to 'think' oneself into the perspective of the members, the introspective, empathetic process Weber called 'verstehen'."

Data was obtained in three ways: firstly via participant observation (the author flew 'jump seat' (the third cockpit seat used by Training Captains) on each operation), secondly, through interviewing (semi-structured interviews were conducted with flight crew) and thirdly from documentation (Operations Manuals and crew rosters). The methodology was designed to give flight crew a 'voice'. In this it replicated the approach used by the Greater Manchester Low Pay Unit (GMLPU) to gather data for their publication *Workers' Voices: Accounts of Working Life in Britain in the Nineties*. The GMLPU publication is described as "... an edited transcript of interviews undertaken with twelve people ..." [34, p.ii].

To satisfy the 'naturalistic' requirements of ethnographic research the author 'signed on' with flight and cabin crew at Operations (the airline department that resources and controls flying activities) at the beginning of the day's flying, attended the crew resource management (CRM) briefing (where the flight and cabin crew discuss the day's flying and apprise themselves of colleagues' experience) and remained with the crew until 'sign-off' at the end of the day and completion of interviews. Elapsed time between sign on and the conclusion of interviewing could be anything up to 13 hours. During the flight the author sat in the jump-seat, which affords an excellent view of the pilots and instrumentation. The author made hand-written notes, listened to radio calls on his personal flight deck head-set, listened to conversations (formal and informal) between flight crew and flight and cabin crew and managed ramp operations at turnaround (that is, supervised the safety and security of the aircraft, passengers and crew while the aircraft was being prepared for its next flight).

Eleven flight crew were interviewed between 8 June 2001 and 22 November 2001. Interviews (of up to one hour in duration) were conducted by the author at the end of the working day (the author having flown with the crew throughout the day). Captains and First Officers were interviewed separately and in private. Each was given an identifier (numbers 1 to 11). Whilst aware of the author's research interests (flight crew stress and fatigue) flight crew were not shown the questions prior to interview. Flight crew were told that the data would be used 'for academic purposes only' and that their identities would be protected. These assurances were given by the author at the pre-flight CRM briefing. The interviews were taped and transcribed. No one refused to be interviewed. The interviews were, to use Gilbert's term, 'conversational'. Much information was volunteered by the interviewees, many of who seemed grateful for the opportunity to 'unburden'. In some cases interviewees would have continued talking unless the author had terminated the interview. The interview questions are given at Appendix 1.

The author's considerable experience as an airline passenger, his part-qualification as a glider pilot and completion of the British Airways' one-week duration Safety Equipment and Procedures (SEP) training course (an admixture of safety theory and practice) helped him to 'think himself into the perspective of the members'. (Graduation from the SEP course by examination was a prerequisite to obtaining CAA permission to work on the flight deck of UK-registered aircraft).

## 6    Definition of terms

### 6.1    Stress

Campbell and Bagshaw [35, pp.129-142] define stress as "... the response to unfavourable environmental conditions, referred to as stressors .... [Stress] describes how a body reacts to demands placed upon it." Stress associated with flying emanates from three sources: "Stress ... related to normal events which may occur during flying operations ..."; 'life' or 'psychological' stress, like emotional upsets, domestic issues and financial problems and stress originating in the body's "physical or mental response to situations which arise in everyday life, as well as those which arise when operating an aircraft". Everyone has a finite capacity for absorbing stress. Stress may be categorised in two ways. There is acute and chronic stress. The former can originate with, for example, an engine fire or wind shear on finals. The latter can originate in relationship problems or

financial difficulties. And there is facilitative or 'eustress' and, for want of a better term, dysfunctional stress. According to Standing [36, p.6]: "... eustress [helps] you rise to the occasion and deal with the demand", whilst dysfunctional stress causes:

> "'[O]mission' (forgetting to do something), 'queuing' (the incorrect prioritisation of actions), 'filtering' (the complete abandonment of tasks due to excessive workload), 'coning of attention' (a narrowing of the cognitive field) or even 'regression' (reverting to learned/internalised routines that are not applicable to the aircraft currently being flown)."

Bennett [37, p.6] notes: "The fact that different people can absorb different amounts of stress further complicates an already Byzantine picture." A person's capacity to absorb stress is a function of both their physiology and psychology. Stress overload "can result in an inability to handle even moderate workload". According to Campbell and Bagshaw [35, p.133] "When [overload] happens to individuals working in a safety related environment ... it can have serious effects in terms of flight safety."

## 6.2 Fatigue

According to Battelle Memorial Institute (BMI) [38, p.2] "'fatigue' has yet to be defined in a concrete fashion." It is, according to Maher and McPhee [39] "a hypothetical construct." As they put it: "'Fatigue' must continue to have the status of a hypothetical construct, an entity whose existence and dimensions are inferred from antecedent and consequent events or variables." The 'antecedent events' can include "time on task, time since awake, any existing sleep debt and the pilot's own circadian cycle" [38, p.1]. The symptoms of fatigue include:

> "[I]ncreased anxiety, decreased short term memory, slowed reaction time, decreased work efficiency, reduced motivational drive, decreased vigilance, increased variability in work performance, increased errors of omission which increase to commission when time pressure is added to the task and increased lapse with increasing fatigue in both number and duration." [38, p.2]

Speaking on the subject of attentiveness, Air Line Pilots Association (ALPA) member Captain Rand Harrell comments:

> "[W]hat pilots often face in the cockpit is a point where your alertness level drops to where you actually may not be asleep but you are essentially sitting there in a daze .... You may see something that ... triggers an alarm ... yet because of the debilitating effects of sleep loss ... you simply do not act ..." [40,41]

According to BMI [38, p.2] "... a common fatigue symptom is a change in the level of acceptable risk." In an effort to avoid additional work the fatigued individual will "engage in greater risk taking activity." Such 'risk taking behaviour' can take the form of "over reliance on automated systems" [38, p.2]. Another symptom is over-concentration on one situation to the exclusion of other – possibly more threatening – situations. A further symptom is an inability to find the appropriate word or phrase to convey a particular meaning.

Perry [42, p.27] asserts: "[T]he problems attributable to fatigue begin to appear after three or more days of continuous flying duties. A common finding was that more risks tended to be taken on the third and subsequent days. The risks taken were for the most part unnecessary." Perry [43, p.29] also asserts: "In some cases the most important

antecedent condition to the onset of fatigue can be found outside of the work situation. Difficult family circumstances, for example, can induce a state of fatigue, which becomes manifested in the work situation." Fatigue may be diagnosed in any of four ways. Firstly, by identifying signs and symptoms. Secondly, through medical examination. Thirdly, via 'objective performance measures' (on-board logs of pilot performance, for example) and lastly through 'biochemical measures' [43, p.29]. As to how fatigue may be eliminated or reduced Perry advocates appropriate flight time limitations. As he explains:

> "It is inappropriate to consider only the 4 or 5 day period of rosters as being the duration of the high workload situation. In order to maintain effectiveness over a longer time-scale the concept of a Duty-Day must be instigated. The most practical duty day in the commercial airline environment is one of 12 hours duration in any period of 24 hours. The 12-hour period of rest and recuperation should be free from any other duty requirement so that all duties should be fitted into the 12-hour duty day. I wrote that 25 years ago, when you analyse it today using any criteria, you come up with the same figure .... The importance of adequate sleep, both in quality and quantity is still considered to be of great importance. I feel very proud to have chaired a group 25 years ago that suggested 12 hours, now NASA AMEs say the same, that must surely say something about 12 hours." [43, p.30]

Chalk [44, p.4] concurs with Perry: "Latest scientific evidence points to a sharp fall in performance after 12 hours on duty. Long multi-sector days, repeated early starts ... and insufficient access to rest and sustenance during the duty, all contribute to a degradation of performance." NASA recommends that of the 12 hours of duty time no more than eight should be spent flying. In mid-2001 FAA regulations provided for an eight-hour rest period in any 24-hour period. But as Rubin [45] explains "[T]he FAA's definition of rest includes the time spent travelling to and from the airport, checking into hotels, eating and the like. That leaves little more than 6 hr. of sleep under ideal circumstances. That's not enough." Harrell [40] is even less sanguine:

> "[W]ith respect to the rest period. That is a period of time from the time that the pilot gets out of the airplane, obtains transportation to the rest facility, in this case a hotel, that could be 10 minutes, 20 minutes and sometimes two hours, time to check-in, a spin down time, obviously you don't check into your room and just immediately fall asleep, approximately an hour or so to get up in the morning, prepare or take a shower and maybe a little breakfast and then transportation back to the airport. So for example if the off-duty period minimum requirement by the FAA is from 9 pm to 5 am a pilot typically only obtains 4 to 5 hours of sleep. We don't think this is adequate."

Dr Mark Roskind comments: "We know on average that humans need 8 hours of sleep and so the sleep opportunities for [pilots'] off duty time really have to build on 8 hours plus ..." [46].

Regarding the optimal relationship between duty time and off duty time the 1 June 1999 fatal aircraft accident at Little Rock National Airport in Arkansas may be seen as a watershed incident. At the time of the accident (in which the Captain and ten passengers were killed and 105 passengers injured) the crew had been on duty for nearly 13½ hours. According to the National Transportation Safety Board (NTSB) "[T]he probable causes of this accident were the flight crew's failure to discontinue the approach when severe thunderstorms and their associated hazards to flight operations had moved into the airport area and the crew's failure to ensure that the spoilers had extended after touchdown." There were three 'contributory factors': Firstly, excessive use of reverse thrust causing a

loss of directional stability. Secondly, attempting to land when American Airlines' maximum crosswind component had been exceeded and thirdly, "impaired [crew] performance resulting from fatigue" [47, p.xii]. The NTSB asserted that the flight crew's inadequate performance was consistent with known effects of fatigue. Speaking on public radio about his own experiences of landing at the end of a long flying day Captain Rand Harrell admitted to a serious loss of concentration:

> "[A]s I recall [the duty] was approaching 13 hours that started very early in the morning and we were on our sixth flight of the day .... [W]e [had] obtained only about 4 or 5 hours of sleep. Early that morning we were quite tired, starting to see some problems with functioning in the cockpit. But 12 hours later we were clearly having difficulty performing our duties .... I can remember ... looking at something thinking I don't remember what just happened the last four or five seconds .... [The First Officer] was in the same condition that I was". [40]

It has been estimated that fatigue plays a part in anywhere between 3.8% and 21% of aviation accidents [48]. In the USA pilots' unions are arguing for reduced flight and duty times. As of June 2002 the Federal Aviation Administration allowed US airlines to operate a 16-hour duty day. Half the day could be spent flying. According to Broderick [49], however, the system has been abused. "[A]irlines have ... been free to overwork flight crews without fear of repercussions" he asserts. (Nevertheless a court did uphold the reinstatement of a pilot who refused to exceed the 16-hour duty-limit). Unions like the Air Line Pilots Association (ALPA) and Allied Pilots Association (APA) have been demanding a 12-hour duty day 'to include eight hours of flight time with a minimum rest period of 10 hours between duty periods'. According to the APA's President: "[T]he current 16-hour duty limit is still much too long and should be reduced to ensure safe flight operations" [50].

In the UK it could be argued that – at least for LCC-type intensive operations – the situation is slightly better. For example, under CAP 371 (the CAA's duty and flight-time regulation) an 'acclimatised' crew (i.e. one that 'has spent three consecutive local nights on the ground' where it has enjoyed 'uninterrupted sleep') reporting between 06:00 and 07:59 to fly a four-sector rotation will work a maximum flying duty period (FDP) of 10.75 hours in 24 hours. (An FDP extends from the time of reporting to Operations to 'on-chocks' at the end of the flying day). An acclimatised crew reporting between 08:00 and 12:59 to fly a four sector rotation will work an FDP of 11.75 hours [51, pp.A7.4-A7.11]. Even so, 2001 saw a number of issues emerge around CAP 371 and more generally the need for a harmonised duty and flight-time limitation scheme within the EU's new European Common Aviation Area (ECAA). Speaking to the debate on harmonisation Chalk [44] asserted: 'We have evidence that at least one EU based carrier (Ryanair) is successfully persuading the authorities that it should be able to 'cherry pick' between the FTLs of different member states'. Speaking to the pilot shortage issue Chalk remarked: "[E]ven if you were to double flight crew costs, then the ticket price would need to rise by less than 4%". In August 2001 the CAA's Safety Regulation Group (SRG) published a *Letter of Consultation* [52] regarding "certain interpretations of CAP 371 which were not envisaged". Interested parties were invited to comment on 'proposed amendments and their costs'. The proposed amendments reflected results obtained from "several Flight Time Limitation (FTL) trials carried out by ... the Defence Evaluation and Research Agency (DERA) ... as part of a program of research into sleep and wakefulness of the active pilot".

# 7    Research data

## 7.1    Introduction

Several themes emerged from the research, most of which had the potential to create stress and/or fatigue amongst flight crew (for example, the quality of accommodation on night stops, rostering, mentoring, etc.). For the sake of perspective, the data should not be considered in isolation. Rather it should be understood in relation to a wider set of circumstances, both within and without the LCC. At the time the research was conducted the LCC and wider industry faced a number of issues. These included a shortage of pilots, intense competition, the usual operational peak during the summer months (when all airlines seek to exploit seasonal opportunities) and, specific to the subject of LCC, boardroom pressure to improve operating results.

The interviews coincided with a period of intense flying, reflected in pilots' rosters. A typical roster is reproduced at Appendix 2. Of note is the five sector day on 20 June 2001 and six consecutive days' flying between 24 June and 29 June 2001, with report times between 05:25 and 09:20.

## 7.2    Findings

### 7.2.1    Fatigue and stress

In the context of issues of fatigue and stress *rostering* was seen as a contributory factor by most interviewees. Interviewee number eleven (I11) [53] reflected on his physical and mental health and the company's motivations:

> "It would have been nice to have met you in the Summer, especially during the months of July and August where the rostering was appalling and we had lots of night flights on the schedule and they nearly broke my spirit in August by rostering night flights into days off into night flights into earlies into lates into night flights ... their only argument being, well it's legal. It might be legal but physiologically and morally it was not correct and it was driven entirely by greed with absolutely no regard whatsoever for my health and well being ... not mine in particular but the cabin crew and every other flight deck member".

Whilst accepting that such rostering was legal, this Captain asserted that the outcomes for him (and others) were negative:

> "I discussed it with just about everyone I flew with and worked with and many, many people suffered the same ill-effects of working nights, days, nights, days, without any due consideration for rest periods, above and beyond legal rest periods. The legal rest period might satisfy a scenario ... it does not satisfy every scenario. And we were finding that because we were working so hard that the minimum legal requirements for going from nights to days could not possibly cover the damaging effects of not knowing what time of day it is coupled with not being able to eat, not knowing when to eat, not knowing when to go to the loo, not knowing when to wake up, not being able to sleep during the day ... I have taken as many measures as I can ... double glazing, black-out blinds .... I think at one point during the summer I was driven to the point of going sick, actually, because I did not know which way was up ..."

This Captain stated that he received little sympathy from Operations and other managers. As to the impact of the summer 2001 schedule on his commitment to the company and morale, he stated:

> "Put simply I just wanted to leave at the earliest opportunity .... I can't see anyone being able to sustain this for thirty years. I have got thirty years left and I do not want to do this for thirty years. I thoroughly enjoy the day-to-day operational [side] ... I enjoy most parts of the job ... but I do not enjoy the greed-driven work regime that we see during the summers ..."

Another Captain (I7) who stated "... we are all working pretty frenetically" had been off sick for two weeks. "I was overworked. Exhausted", he said. A First Officer (I8) spoke about what he perceived to be the self-interest of management with regard to Operations:

> "It is a very stressful place to work this company ... there is a lot of flying ... it is very intensive, but it does not have to be stressful because of that ... the way the pilots are managed, the way people in this company are not managed, is a major factor ... it is impinging on the operation .... The people management here is appalling. When I started here everybody was very enthusiastic. The company management cynically exploited the people in the company for their own ends really. Partly knowingly and partly just by sheer incompetence. Now there is a huge amount of cynicism .... [The CEO] is not interested in the operation of the company ... [The CEO's] main interest is [their] own career and [their] own money ... and [the Chief Operating Officer] is only interested in saving money ..."

Regarding the fatigue and stress-inducing possibilities of five sector days, one Captain (I5), interviewed after completing a five sector day (shuttling between Stansted and Edinburgh) commented:

> "[I feel] very tired. Certainly as the fifth sector was winding down it was harder to concentrate. All those things that you take for granted you were actually concentrating more on because you are thinking 'I may be missing things here'. Certainly my reactions were much slower. I could feel myself being less sharp, shall we say ..."

This Captain had night-stopped in Edinburgh the previous night and had reported for duty at EDI at 12:35. The scheduled 'off-duty' time at STN was 21:15. The actual off-duty time was 22:45. The aircraft had carried two recurring defects throughout the day: an auxiliary power unit (APU) with an intermittent fault and a faulty engine anti-ice unit on the number 1 (port-side) engine. Although manageable, both defects added to the pilots' workload. Regarding the malfunctioning anti-ice unit the Captain commented: "[T]he anti-ice valve not opening used more of my capacity than I would have liked. Unfortunately the weather was such that it was not a nice day and you could just ignore it ... it was a constant nag on every sector .... Is it going to open?" Commenting on the rostering situation generally, this Captain stated:

> "Most people I have spoken to ... certainly when you come in and you ask them what day are you on [you get comments like] 'Oh, I have just had my two days off, it does not feel as if I have been away', or 'I am on day four of my six and I am knackered' or whatever it is ... so everyone is generally feeling very run down and cheesed off, to be honest .... I cannot see me doing this for much more than is absolutely necessary, because this is no lifestyle when you are permanently knackered [sic] .... [W]hen people fly, they need their time off to recharge and recuperate. But this does seem to be quite excessive. In twenty-five years of flying this is the hardest I have ever worked ..."

Reflecting on the fatigue and stress-inducing potential of his five sector day, a First Officer (I6) commented: "[I feel] knackered. Tired. I feel like a basic simple task would take a lot of concentration." Earlier this First Officer had mentioned that when tired he

would mentally review his actions and decisions. When asked to elaborate in the interview he stated: "Well, you would probably forget you had done it. So rather than not do them, you'll think 'Did I do that or didn't I?' So you reiterate and repeat the exercise, rather than miss it". Another First Officer (I10) said, at the end of his five sector day, that he felt

> "Very tired and a little irritable as well. Not even on the last sector, on the last couple of sectors, I felt that my standard was probably a little lower because of it. It took a lot of effort to concentrate. There were certain things I was letting slip. Things that would never normally happen if I was not so tired .... Very tired right now ... especially coming in on the last flight .... We are quite tight on the duty period."

Interviewed after flying six days consecutively (with an overnight stop on the fourth day) one Captain (I3) commented that at the beginning of his last flying day (Friday, the sixth day): "[I felt] tired .... More tired than I normally am on an early start but then it is the end of the week ... A number of earlies ... and long days." Reflecting on his three off-days (Saturday, Sunday and Monday) he stated:

> "I'll be jaded tomorrow ... and I'll be fairly bright on Monday ... I'll be back to work on Tuesday ... this has been a hard week ... six days on ... an extra sector .... It is quite a learning curve for me how to best train a First Officer .... I think I've hit my limit ... I've hit my limit now .... A good night's sleep would get me back into being safe ..."

This Captain's *Personal Crew Schedule* is reproduced as Appendix 2. It can be seen that during his six consecutive days' flying his start times ranged from 05:25 to 09:20. For the third, fourth, fifth and sixth days he was rostered with a First Officer under training – an additional stressor. The extra sector was flown on June 28th when an unplanned stop had to be made to pick up fuel. The First Officer under training (I4) made the following observations on the extra workload encountered on 28 June:

> "By the time I got home yesterday [the evening of June 28th] I did not know where I was ... I think I was still in Niece [the unplanned stop]. It was a hectic day. Hectic day. It turned from a three sector day to a four sector day. The day before [June 27th, report time 05:25] I think I had started at three in the morning ... It has been a long week."

Another First Officer (whose first language was French) trying for his command (Captaincy) made the following observations on fatigue and stress and his personal life:

> "I said I am not tired this morning, but I think this is very unusual. Usually I am very tired. Today was OK because I try hard to go to bed early and I went to sleep a little bit yesterday afternoon. Honestly I keep sleeping to try to catch [up] with this duty time .... [I]f I want to see somebody in the evening ... if I want to go for dinner ... I can't .... If you are six days on duty you spend your six days ... working ... and you try to adapt to this pattern ... and next week I am going maybe late and so I will have to re-adapt to another pattern ..."

This First Officer (I2) talked about the – as he saw it – stresses of changing from a series of 'earlies' to a series of 'lates' (late starts):

> "[Adapting from earlies to lates is] very difficult ... because [of] your biological clock .... If you go to bed at nine o'clock for five days the sixth day at nine o'clock you feel tired and you want to go to bed and if the following day you have to work late in the evening, well you go to work at six o'clock in the evening and at nine o'clock you are tired and so you are finishing your duties,

you know, you are exhausted .... I found this very hard and this is what is happening all the time."

This First Officer also made observations on the *nature* of work on the flight deck, especially with regard to rest periods during the working day: "I am not physically tired ... it is more mental fatigue ... because, basically, we don't do anything physically .... [T]here is no rest ... you know ... it is continuing ... we were on duty for eight hours but there was no [relief] ... basically in a normal day you have no rest on these four sectors." This First Officer was interviewed at the end of his fifth consecutive day flying. He had one day's flying left before time off. Prior to his six day rotation he had been given three days off. His start times ranged from 05:25 to 09:20. At the end of his six days he would have flown sixteen sectors. I2 volunteered that he was seeing a physiotherapist. As he explained: "Yesterday I went to the physiotherapist because I have a problem with my back ... I developed problems with my neck ... very sore neck." A (very experienced) Captain (I7) also commented on the nature of life on the flight deck: "It has been an eleven hour day nearly without a break, maybe five minutes, that is a long, fairly concentrated work pattern." Having night-stopped in Edinburgh this Captain had flown five sectors the following day between STN and EDI. He had signed off at STN at about 22:30. This was his second day of a rostered seven consecutive days flying (although his flying on the sixth day consisted of a night flight to Keflavik, arriving on the seventh day of his rotation). A third Captain (I11) made the following observations on the nature of piloting-as-work: 'We don't have the facility to take a ten minute break and pop to Burger King or go and have a cigarette or a tea break or go and have a chat. We have been locked in that aircraft for the last ten hours and only able to take what is effectively junk food'. This Captain had reported at 10:25 for his day's flying, which consisted of four sectors (Stansted to Alicante and Stansted to Newcastle). The last sector (Newcastle to Stansted) ended at 21:48, when the aircraft touched down at Stansted. The crew disembarked at about 22:15. The crew entered the LCC's building at about 22:30.

In addition to information obtained from the formal interviews, information on rostering was also obtained through informal exchanges on the flight deck. On one sector (13) commented: "Trying to have a life is difficult." (This Captain had a baby son). During a discussion about stress a First Officer who was also a qualified anaesthetist commented: "It's not as stressful as anaesthetics."

### 7.2.2 Commercial pressures

This emerged as a theme to underlying stress and fatigue. Talking about the pressures associated with aircraft changes and 25-minute turnarounds, one experienced Captain (I7) commented: "It is a twenty-five minute turnaround. You know the [change] aircraft was right next to us. But if it is a different terminal and you have got to go from one to the other then that starts to ... on a twenty-five minute turnaround then that really is, you know, a high pressure run about." This Captain compared his previous airline to the LCC:

> "Everything is different. My previous experiences in this type of operation, similar but not quite the same, was with another carrier called Air Europe. We did not work as frenetically as this. We finished up doing as many hours in the month, but we tended to fly longer trips so we built up the hours without the frenetic rush to turnaround here."

This Captain also commented on the attitude of Operations staff towards flight crew: "Very often I find that ground staff do not understand fatigue. They do not understand the problems. They just think that you are in a box and they can pull you out and send you off to do this and that is what you are paid for. You are paid mega-bucks ... and it is not quite like that."

A First Officer (I10) suggested that although the LCC never broke the rules relating to flight time limitations, it certainly worked its flight crew as hard as it could:

> "I really do hope it does improve. I feel there are ... not really loopholes as such ... but there are opportunities to exploit the way the rules are written at the moment .... I am flying a plane sometimes absolutely exhausted .... Even if I was fully familiar with what I was doing ... fully online for about a year or two ... I would still find it very tiring ... and I do hope something good comes of it [the academic research conducted by the author]."

One Captain (I5) correlated operational pressure on flight crew with the LCC's (successful) efforts to maximise yields and profits during the Summer of 2001:

> "I have been with [this LCC] now for seven months and last winter I had a choice of three jobs to go to and two of them were effectively sweat shops. However the ... lifestyle [at this LCC] was sold to me [on the basis] that we only do three or four sector days ... you can plump for night stops or you can stay away from night stops ... when you have got your days off you finish on an early and you start on a late. They really look after the crews. Therefore this is the place to be ...."

> "I have got to say since I have been here that is not actually the case. Now obviously I understand there is a transitional period in [this company] ... it is expanding rapidly and they are trying to make the airline ... look as profitable and forward planning and 'go getting' to make sure that the investment comes in .... But now that they have actually achieved that ... there are people obviously in high places who have looked at it and said 'look we can actually make the crews do this and we are actually profitable by doing this and yes, people are whinging and there are some people leaving, but on the whole it is achievable, therefore we might as well keep this work-rate up."

Another Captain (I1) stated: "[A]t the end of the day there is that commercial pressure to keep the operation going ... yes that is what it is all about. It is all about turnover, basically. I guess there are subtle, sort of, inferences there, isn't there, for fatigue?" Another experienced Captain (I3) stated that due to roster (i.e. commercial) pressures he was finding that he did not have enough time to complete his mandated office duties (he helped maintain the computerised flight data monitoring system used to evaluate flight crew performance):

> "I do work in the office ... computer flight safety system ... three hours after a short flight .... I am actually finding that ... I [am] not getting the office days .... I am meant to have five office days in a month ... you see how many I've got ... I've got one meeting [day] and two office days ... I'm not actually getting enough time ...."

> "I did the Edinburgh flight and worked for the rest of the day in the office, even though it is not rostered ... because it is work that is expected to be done ... you know my beliefs, my ethics are to try my best to get the job done ... and keep battling for enough time to do it."

A very experienced LCC Captain (I9) put a different slant on the pressures at the subject LCC by drawing a comparison with his previous employer, a non-UK registered LCC

flying almost the same equipment as the subject LCC and based at the same airport (Stansted):

> "I was in [my previous airline] for 13 years .... I am probably doing as much flying here as I did at [my previous LCC], however the working atmosphere within the company was totally different. The back-up services available to me as a Captain within the company was totally different. The stability of rostering was totally different. So the stresses of the job were far greater than they are here ... far greater ...."

> "At the time I left we got a four week roster. It came out only a week in advance. It was subject to numerous changes on a weekly basis ... or a daily basis ... it was very difficult to plan either a morning at home or an afternoon doing what you wanted to do .... There was a time when I could not get my car serviced for nearly six weeks ... and the pattern of the roster was totally different as well ... tended to work a whole week of earlies, starting six o'clock in the morning, followed by five days of lates, so it meant that the window for social activities was virtually nil, because on earlies you could not go out the night before and on lates you finished too late to go out. So the only days you had off were two days or maybe three, depending on when you started ... the roster disruptions and the workload [and] the general management style within the company made it quite stressful ..."

### 7.2.3 *Hotel and eating arrangements*

Issues pertaining to *hotel and eating arrangements* were also seen as potential psychological and/or physical stressors. One Captain (I7) made the following observations on the difference between overnight accommodation in Edinburgh and Glasgow:

> "I think the hotel in Edinburgh is very good, you know, for our sort of work .... They provide facilities good enough for our type of operation. I mean food, beverage, being able to get a beer in a bar quite late at night .... I don't mean, you know, having masses ... just one beer, nice to have that to wind down ... and generally they look after us well, it is comfortable, clean, yep, good ... it is one of the better ones ... certainly better than the one in Glasgow which is appalling. It is not a crew hotel, it is a low-cost family, it is for families, sort of cheap and cheerful, very basic, utilitarian, but you cannot get anything when you arrive late at night, absolutely nothing and after a five sector/four sector day it is quite tiring ... because there are kids there ... they run up and down the corridors in the morning ... it is right next to a motorway as well, so on one side you have got the motorway ... the motorway is above the hotel ... we have mentioned it ..."

This Captain also made observations on the necessity (as he saw it) of the airline providing a hot meal for flight crew at some point during the day (this facility was not provided for flight crew working for this LCC, although the crew could purchase sandwiches from the cabin or bring a pre-cooked meal that could be heated in the galley):

> "Take today: we have done nearly eleven hours and ... really you need the option of a hot meal on an eleven hour day .... I could have got a hot meal by going shopping this morning but I felt with a five [sector] day it was not worth getting up and going shopping into Edinburgh and then going, you know, it is just ridiculous. But the company attitude is that you have the opportunity to go shopping. Well our hotel is not near any shops, so you have got to get a bus and go into town. It is just, you know, playing games."

A First Officer (I10) commented on the difficulties sometimes encountered in getting a substantial hot meal late at night at the kind of hotel used by the airline:

> "There was a bit of a cock-up with transport and, um, we actually lost the cabin crew because we arrived so late they had a problem getting through security because people were not around, so we actually got back to the hotel ... I think it was about midnight .... [At the hotel] we all wanted to eat. We were all fairly hungry. There was a very limited bar choice .... [The Captain] had some soup because that was the closest you could get to anything warm."

A Captain (I5) stated that he made every effort to get up for breakfast, as it was the only guaranteed hot meal he would get during the day: "You know that you have limited access to food, so it is in the back of your mind subconsciously that the only hot meal I am going to get is breakfast which finishes at ten o'clock in the hotel, so the last thing you want to do is miss breakfast. So generally most people will make sure they are awake and up and have their breakfast." It is worth noting that, due to either air or ground-borne delays, night-stopping crews might not get to bed much before 02:00.

### 7.2.4  Travel-to-work time and domestic arrangements

Two factors that potentially had a bearing on stress and fatigue were *travel-to-work time* and *domestic arrangements*. It was notable that some flight crew either had fairly significant commutes to Stansted or complex domestic arrangements, including, for example, keeping a permanent residence some distance from Essex and lodging near the airport. All flight crew were asked to give details of their journey to work. None took public transport (there are reasonable bus services to Stansted and there is a rail station at the Terminal. It serves stations south to London and north to Peterborough and beyond). Eight flight crew gave details of their drive to work. One journey took 15 minutes. Another took 17 minutes (to cover 8 miles). Two journeys took 25 minutes. Two journeys took 30 minutes, one took 35 minutes and one took 50 minutes.

In terms of temporary and permanent abodes, one Captain (I9) who lodged near the airport lived in Dublin. Another Captain (I7) who lived a two-and-a-half hour drive away rented an 'apartment' 15 minutes from the airport. A First Officer (I6) had taken digs near the airport, his main residence being in Bolton. When asked what he would do when he returned to his digs, he commented:

> "It is a rented room in a house. So I shall walk in. Brew up. Go and sit on the bed and watch portable TV for half an hour. Which is common to a lot of pilots at the end of a working day, because we live in digs and we work unsociable hours. It would be much nicer to go down to the pub and have a beer with a friend and relax for an hour and then go home and go to bed, but ... I can't do it."

It should be noted that not all flight crew had such a lonely existence. A Captain (I9) who shared a house described his after-work lifestyle:

> "There are several other pilots in it. If there is somebody there I might have a beer, chat, unwind for the day. If not I'll probably go straight to bed .... [I get] comradeship ... fun ... company ... it is a nice place to be ... it is a very nice house .... You tend to talk about aviation and aeroplanes ... a bit like golfers and golf ... that has not been a down side so far."

# 8 Observations and conclusions

Despite the small sample size seven observations can be made. Firstly, several respondents said they had experienced symptoms of fatigue and stress. These included poor short-term memory and omission ("There were certain things I was letting slip. Things that would never normally happen if I was not so tired"; "You were actually concentrating more ... because you are thinking 'I may be missing things here'"), slowed reactions ("I feel like a basic simple task would take a lot of concentration"; "My reactions were much slower. I could feel myself being less sharp"), reduced motivational drive ("I have got thirty years left and I do not want to do this for thirty years"; "I cannot see me doing this for much more than is absolutely necessary, because this is no lifestyle when you are permanently knackered [sic]"), decreased work efficiency ("Rather than not do [something] you'll think "Did I do that or didn't I? So you reiterate and repeat the exercise, rather than miss it"), anxiety ("[I feel] a little irritable"; "Not ... able to sleep during the day") and greater risk-taking ("On the last couple of sectors, I felt that my standard was probably a little lower"; "I've hit my limit now .... A good night's sleep would get me back into being safe"). It is also worth noting that when very fatigued one respondent suffered loss of appetite and what might be described as confusion ("We were finding that because we were working so hard that the minimum legal requirements for going from nights to days could not possibly cover the damaging effects of not knowing what time of day it is coupled with not being able to eat, not knowing when to eat, not knowing when to go to the loo, not knowing when to wake up .... I did not know which way was up"). A First Officer under training described similar feelings ("By the time I got home yesterday ... I did not know where I was ... I think I was still in Niece .... It was a hectic day .... It turned from a three sector day to a four sector day. The day before [June 27th, report time 05:25] I think I had started at three in the morning ... It has been a long week"). It should be noted, however, that the fact that a pilot described symptoms of fatigue and stress should not be taken to indicate that s/he *was* fatigued or stressed.

Secondly, several flight crew said they were fatigued. Categorical statements were made to this effect. For example: "I am flying a plane sometimes absolutely exhausted"; "I was overworked. Exhausted"; "[Management] nearly broke my spirit in August by rostering night flights into days off into night flights into earlies .... It might be legal but physiologically ... it was not correct ... it was driven entirely by greed with absolutely no regard whatsoever for my health and well being"; "This is no lifestyle when you are permanently knackered [sic]". Flight crew attributed their perceived symptoms of fatigue and stress to the requirements of the low-cost business model — specifically to the manner of its implementation within the subject airline. Typical comments were: "The people management here is appalling .... The company management cynically exploited ... people ... for their own ends"; "It is all about turnover, basically. I guess there are subtle ... inferences there ... for fatigue?"; "I am meant to have five office days in a month [to help maintain the computerised flight safety records] ... you see how many I've got ... I've got one meeting [day] and two office days ... I'm not actually getting enough time"; "They are trying to make the airline ... look ... profitable ... and 'go getting' to make sure that the investment comes in"; "I do not enjoy the greed-driven work regime that we see during the summers"; "Everything is different [compared with Air Europe] .... We did not work as frenetically as this ... we tended to fly longer trips so we built up the hours without the frenetic rush to turnaround here". One comment had particular relevance in

the context of the CAA's concurrent review of CAP 371: "There are opportunities to exploit the way the rules are written at the moment. I am flying a plane sometimes absolutely exhausted."

Thirdly, it can be said that there was a strong *perception* amongst the interviewees that a) they were fatigued and stressed and b) that the origins of this fatigue and stress lay in management decisions and, overall, in the LCC model. One interviewee referred to a 'greed-driven' work regime while another talked of 'cynical exploitation'. It could be argued that the fact that these were 'mere' perceptions did not make them any less real to the subjects. As Epictetus [54] remarked: "Perceptions are truth because people believe them." If one accepts the view that 'perception *is* reality' there are clear implications here for LCC managements regarding communication and consultation with employees. Crews who perceive themselves to be exploited or manipulated will react in the same way as crews who are *in fact* exploited or manipulated.

Fourthly, whatever the flight crew were describing and why, it is a fact that concerns about fatigue and stress have been voiced within the wider UK aviation community, as with the CHIRP report of "... extreme pressure on the flight deck to achieve programmed sector flight times" [28] and the report in *The Times* of an airline treating annual duty time limitations as no more than a 'framework'.

Fifthly, despite the fact that the data consists of perceptions rather than verifiable facts, comments on such matters as the (sometimes noisy) utilitarian accommodation used by low-cost airlines, the need to 'wind down' at the end of the flying day, the way in which bureaucratic problems (like not being able to get the crew out of the airport) compromise rest periods and the need for adequate sustenance should not go unheeded. Such stress and fatigue-inducing factors are not difficult to remedy.

Sixthly it could be argued that some stressors are 'self-imposed', like not having a permanent residence within a reasonable commuting distance of the base airport. A number of interviewees lived in temporary accommodation when flying. Some of these pilots commented on the unsatisfactory nature of the arrangement. Isolation and loneliness would seem to be features of this type of existence.

Finally, (I9)'s comments about the *relative* merits of the subject airline should not be forgotten – especially in light of the generally negative comments from other pilots. This very experienced Captain noted the way in which the volatility of rostering and lack of support at his previous airline made it a worse employer than the subject LCC. In the light of this he comments "[T]he stresses of the job were far greater than they are here ... far greater ...." This suggests that, despite their common business model, not all LCCs are perceived in the same way by their pilots. In the light of (I9)'s comments interviewees' opinions about the politics of the airline (like those expressed by (I5)) need to be considered with an appropriate degree of scepticism. It is unlikely that line pilots like (I5) would have any direct experience of boardroom discussions.

To conclude, the business model that underpins LCC operations with its emphasis on securing the maximum return on physical and human capital has the *potential* to compromise safety. The record to date, however, is exemplary. As of April 2003 no UK-registered LCC had lost an aircraft. Furthermore the LCC model is evolving. As Jet Blue's acquisition of LiveTV (a provider of Satellite TV uplinks to aircraft) [55] and the decision by easyJet and MyTravelLite to eschew the 'standard' low-cost vehicle, the Boeing 737, for the Airbus A319/A320 indicate, the 'classic' low-cost model with its emphasis on standardisation and minimalism may be evolving into something more elaborate. Given these developments and an increasingly wealthy and taste-differentiated

public [56] it is possible that the current, economics-driven low-cost model will evolve to the point where cash is made available to provide, for example, sufficient office days to complete administrative duties, more time for turnarounds, better overnight crew accommodation, 'mentoring' and social advice for newly hired pilots, on-board crew meals and, indeed, more crew so that pilots no longer have to work at or near their annual duty-time limit, or be called in so frequently to cover for sick colleagues. Chalk [44] comments: "[E]ven if you were to double flight crew costs, then the ticket price would need to rise by less than 4%. A small price to pay for ensuring that the Flight Crew landing the plane carrying you or your family are awake, alert and ready to respond to any unforeseen event."

As mentioned above it is not just the low-cost sector that has pared down costs. Since the first Gulf War of 1991 the entire industry has had to face hard choices. As *Airline Business* [57] comments:

> "If the extraordinary events of the past couple of years have exposed a major weakness in the airline sector, then it is surely a basic lack of flexibility over costs .... Looking back over the past decade the industry has had to weather a series of global shocks, starting with the first Gulf War and global recession ... foot-and-mouth disease in the UK ... [t]he 'war on terror' [and] now the outbreak of Severe Acute Respiratory Syndrome ..."

Clearly there is a need for the industry to keep a close watch on safety margins. Whilst the relative profitability of LCCs might allow them to add a little more 'fat' to their very lean production systems, carriers like United, American, Air Canada, British Airways and SAS are moving in the opposite direction [58, pp.6-7]. Regardless of the subjective nature of the testimony presented above, it is important that the industry listens to its workers, not only because of their potential utility as 'safety barometers' but also because they will have ideas on how to improve productivity. A workforce whose views are valued is generally a happier and potentially more productive workforce. It is in the industry's interests to listen.

## Acknowledgement

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# Appendix 1

*Research instrument*

Researcher (jump-seat)

1    Date

2    Sectors

3    Elapsed time between Ops Report and Ops Depart (at conclusion of roster)

4    Time in air for each sector (to nearest minute)

5    Delays (various, for each sector)

6    Operational events, for each sector)

Captain (questions put by researcher at end of roster. Time – 10 minutes)

1    Mode of transport to STN?

2    If car, did you drive?

3    If public, did you change?

4    Travel time to STN (front door to Ops)

5    Were there any untoward events during your journey to work?

6    In terms of fatigue, how did you feel before reporting to Ops?

7    Was there ay event on the ground that you found fatiguing? (If yes what and in what way?)

8    Was there any event in the air that you found fatiguing? (If yes what and in what way?)

9    In terms of fatigue, how did you feel at the end of your shift?

10   What is your destination at the end of your shift?

11   How will you get there?

12   What will you do when you get there?

13   Before today's shift, when did you last fly?

14   When will you fly next?

These questions repeated for First Officer (FO)

Captain and FO interviewed separately.

# Appendix 2

**Crew roster (Mon Jun11 – Sun Jul08)**

- **Mon Jun11** (M): T 745 6:15 STN–BFS 7:30; T 746 7:55 BFS–STN 9:05; T 663 9:40 STN–ALC 12:20; T 664 13:00 ALC–STN 15:35 — MEMO
- **Tue Jun12** (M): MEET 8:00 16:00 — MEMO
- **Wed Jun13** (MT): T 401 6:45 STN–CPH 8:30; T 402 9:00 CPH–STN 10:55; T 743 12:20 STN–BFS 13:35 — MEMO
- **Thu Jun14** (M): 750 6:00 BFS–STN 7:10; 445 8:30 STN–FAO 11:30; 446 12:20 FAO–STN 15:10 — MEMO
- **Fri Jun15** (M): OFF — MEMO
- **Sat Jun16** (MT): ROFF — MEMO
- **Sun Jun17** (MT): T 511 18:15 STN–EDI 19:30; T 512 19:55 EDI–STN 21:15; T 895 21:40 STN–GLA 23:00 — MEMO
- **Mon Jun18**: 886 15:35 GLA–STN 16:55; 315 17:35 STN–MUC 19:25; 316 19:55 MUC–STN 21:55 — MEMO
- **Tue Jun19** (MT): F 793 17:00 STN–BCN 19:15; F 794 19:55 BCN–STN 22:15 — MEMO
- **Wed Jun20** (MT): F 331 11:55 STN–BIO 14:00; F 332 14:30 BIO–STN 16:25; T 187 17:00 STN–VCE 19:05; T 188 19:35 VCE–NCE 20:35; T188A 21:15 NCE–STN 23:15 — MEMO
- **Thu Jun21** (MT): MEMO
- **Fri Jun22**: OFF
- **Sat Jun23**: OFF — MEMO
- **Sun Jun24** (MT): T 907 7:20 STN–CIA 9:50; T 908 10:20 CIA–STN 13:00 — MEMO
- **Mon Jun25** (MT): T 524 6:30 STN–EDI 7:45; T 523 8:10 EDI–STN 9:30 — MEMO
- **Tue Jun26** (MT): T 772 9:20 STN–NAP 12:05; T 771 12:35 NAP–STN 15:30 — MEMO
- **Wed Jun27** (MT): T 313 5:25 STN–MUC 7:15; T 314 7:45 MUC–STN 9:45; T 505 10:55 STN–EDI 12:10 — MEMO
- **Thu Jun28** (MT): 518 5:30 EDI–STN 6:50; 908 10:20 STN–CIA 11:40; 908Q 12:10 NCE–STN 13:55 — MEMO
- **Fri Jun29** (MT): T 501 5:25 STN–EDI 6:40; T 502 7:05 EDI–STN 8:25; T 881 8:50 STN–GLA 10:10; T 884 10:35 GLA–STN 11:55 — MEMO
- **Sat Jun30**: ROFF — MEMO
- **Sun Jul01**: ROFF — MEMO
- **Mon Jul02** (MT): OFF — MEMO
- **Tue Jul03** (MT): T 331 11:55 STN–BIO 14:00; T 332 14:30 BIO–STN 16:25; T 187 17:00 STN–VCE 19:05; T 188 19:35 VCE–STN 21:45 — MEMO
- **Wed Jul04** (N): OFCE 11:00 17:00
- **Thu Jul05** (N): OFCE 9:00 16:00
- **Fri Jul06** (MT): T 741 17:20 STN–BFS 18:35; T 742 19:00 BFS–STN 20:10; T 749 20:35 STN–BFS 21:55 — MEMO
- **Sat Jul07** (MT): T 744 10:50 STN–BFS 12:00; T 903 12:55 BFS–STN 15:25; 904 15:55 STN–BFS 18:35 — MEMO
- **Sun Jul08** (MT): T 903 11:30 STN–CIA 14:00; T 904 14:30 CIA–STN 17:10 — MEMO

**OTHER CREW MEMBERS**

| DATE | ROUTE | NAME(S) | DATE | ROUTE | NAME(S) |
|------|-------|---------|------|-------|---------|
| 11.06 | 745 | FO> | 25.06 | 524 | FO> |
| 13.06 | 401 | FO> | 26.06 | 772 | FO> |
| 17.06 | 623 | FO> | 27.06 | 313 | FO> |
| 19.06 | 793 | FO> | 29.06 | 501 | FO> |
| 20.06 | 331 | FO> | 03.07 | 331 | FO> |
| 21.06 | 793 | FO> | 06.07 | 741 | FO> |
| 24.06 | 907 | FO> | 08.07 | 903 | FO> |

**HOTEL INFORMATION**

| PORT | NAME AND ADDRESS | TELEPHONE | DATE |
|------|------------------|-----------|------|
| BFS | POST HOUSE, 22 Ormeau Ave, Belfast BT2 8HS | 0870 400 9005 | Jun13 Jul06 |
| GLA | HOLIDAY INN EXPRESS, St Andrews Drive, Gla A/port, Paisley, PA3 2 | 0141 842 1100 | Jun17 |
| EDI | POST HOUSE, Corstophine Road, Edinburgh | 0131 314 7027 | Jun27 |

**CODE EXPLANATION**

| CODE | DESCRIPTION |
|------|-------------|
| MEET | Meeting |
| OFF | Day off |
| ROFF | Requested day off |
| OFCE | Office duties |