Duty periods with early start times restrict the amount of sleep obtained by short-haul airline pilots

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ABSTRACT

Most of the research related to human fatigue in the aviation industry has focussed on long-haul pilots, but short-haul pilots also experience elevated levels of fatigue. The aim of this study was to examine the impact of early start times on the amount of sleep obtained prior to duty and on fatigue levels at the start of duty. Seventy short-haul pilots collected data regarding their duty schedule and sleep/wake behaviour for at least two weeks. Data were collected using self-report duty/sleep diaries and wrist activity monitors. Mixed-effects regression analyses were used to examine the effects of duty start time (04:00–10:00) on (i) the total amount of sleep obtained in the 12 h prior to the start of duty and (ii) self-rated fatigue level at the start of duty. Both analyses indicated significant main effects of duty start time. In particular, the amount of sleep obtained in the 12 h prior to duty was lowest for duty periods that commenced between 04:00 and 05:00 h (i.e. 5.4 h), and greatest for duty periods that commenced between 09:00 and 10:00 h (i.e. 6.6 h). These data indicate that approximately 15 min of sleep is lost for every hour that the start of duty is advanced prior to 09:00 h. In addition, self-rated fatigue at the start of duty was highest for duty periods that commenced between 04:00 and 05:00 h, and lowest for duty periods that commenced between 08:00 and 10:00 h. Airlines should implement a fatigue risk management system (FRMS) for short-haul pilots required to work early-morning shifts. One component of the FRMS should be focussed on the production of ‘fatigue-friendly’ rosters. A second component of the FRMS should be focussed on training pilots to optimise sleep opportunities, to identify circumstances where the likelihood of fatigue is elevated, and to manage the risks associated with fatigue-related impairment.

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1. Introduction

Operating a large passenger aircraft, i.e. an airliner, is an inherently risky task: the likelihood of an accident occurring is very low, but the potential consequences of an accident are catastrophic. The safe operation of an airliner depends on the effective functioning of an integrated system that is served by people in numerous occupations, including maintenance engineers, refuelers, air traffic controllers and cabin crew. At the sharp end of this system, the ultimate responsibility for the safety of an airliner, and its passengers and crew, is borne by its pilots. Over the last 40 years, the role of the airliner pilot has changed quite dramatically. In older airliners, pilots manually operated flight controls in the cockpit (i.e. yoke, rudder pedals, throttle) that were directly connected to the control surfaces (i.e. ailerons, elevators, rudder) and engine. In newer airliners, pilots operate similar flight controls as before, but rather than being directly connected, these controls provide inputs to a computer system that sends messages to the control surfaces and engine. This shift from mechanical to computerised systems has substantially changed the art of flying, because pilots now receive very little tactile feedback through the flight controls. More importantly the inclusion of a computer in the flight control system means that airliners can be controlled by an autopilot, without continuous input from the pilot. Consequently, pilots now spend relatively little time during a flight manually controlling the airliner. Instead, they spend the majority of the flight monitoring the airliner’s computerised flight control system and managing any external and internal threats that may arise (e.g. weather, terrain, traffic, errors).

Commercial aviation is an ultra-safe industry, so there are relatively few data regarding the causal factors associated with airliner accidents. However, as in the road and rail transport industries, some of the consequences of human fatigue, e.g. inattention, irritability and errors, have the potential to compromise the safe operation of a commercial passenger flight. Indeed, human fatigue has been identified as a causal factor in a number of airliner accidents over the last 20 years (Caldwell, 2001). This is probably to be expected, given that the manual flying skills and, most