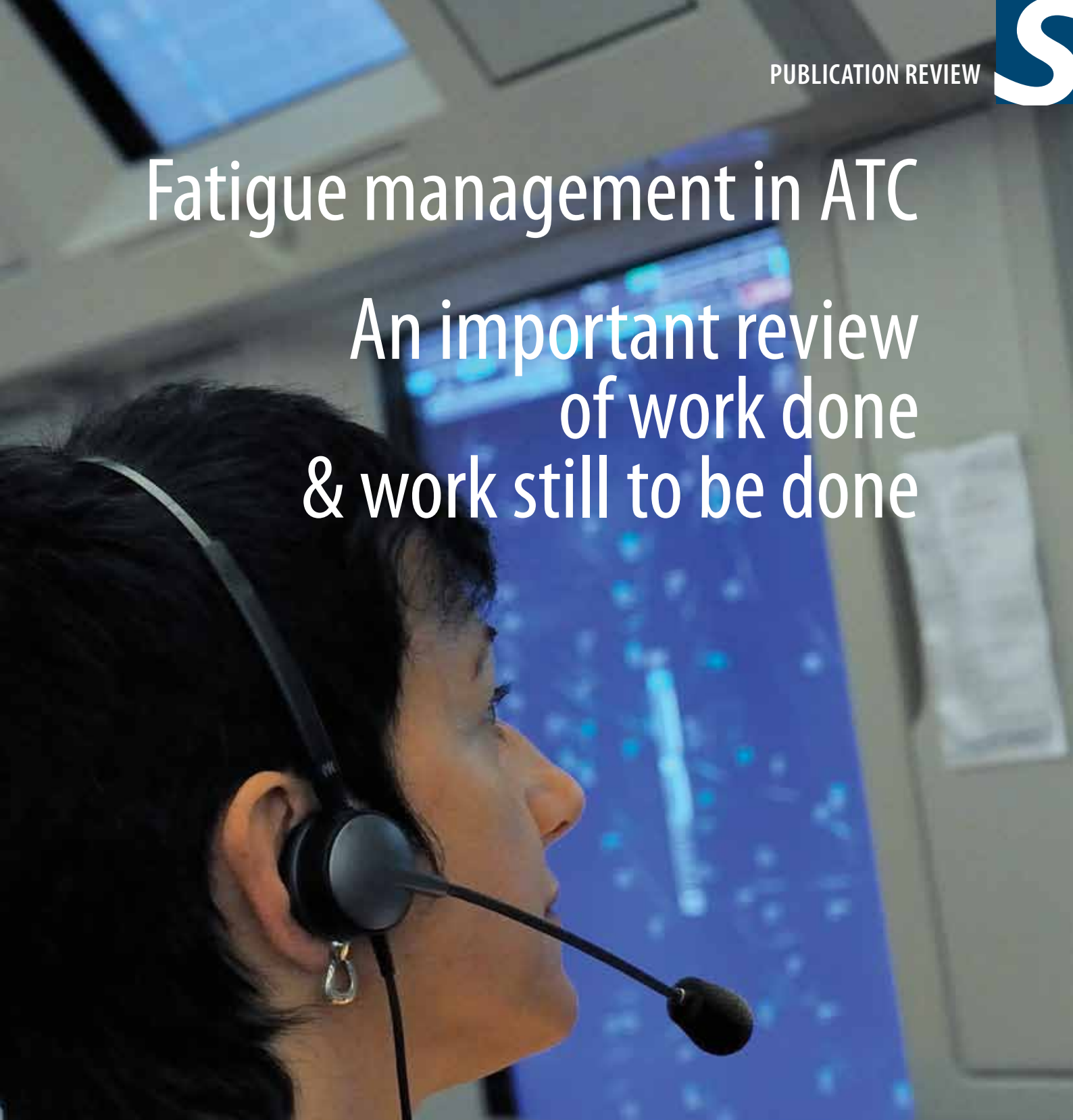
Fatigue management in ATC

An important review of work done & work still to be done



We felt that it would be impossible to focus on fatigue and its management in this issue without acknowledging the contribution made by the publication last year of a very thorough literature review and 'next steps' plan by the well-known Mitre Corporation under a US Government contract. This aims to provide a (new) starting point for applied research in respect of controllers. We recommend you take a look at it, but in the meantime, we have asked one of our 'resident experts', **Captain Ed Pooley**, to take a quick look and pick out a few highlights to get you interested"!

Fatigue management in ATC
An important review of work done & work still to be done (cont'd)

In concluding that "the majority of research (into fatigue) fails to adequately address many current areas of concern within the aviation community", it provides a salutary reminder that, despite the arrival of the FRMS approach, we are still a very long way from the bank of scientifically-validated off-the-shelf solutions which need to be integral to any effective FRMS - for controllers or others.

Now, did you know that the FAA already has an 'Office of Fatigue Risk Management'? I didn't. Their definition of fatigue is quoted:

> "Fatigue is a condition characterised by increased discomfort with lessened capacity for work, reduced efficiency of accomplishment, loss of power or capacity to respond to stimulation, and is usually accompanied by a feeling of weariness and tiredness."

Perhaps the rather simpler statement "fatigue can arise from two sources: sleep loss and time on duty" states the obvious rather well.

Anyway, the work reported took a logical three-stage approach:

- A review of what is already known about the effect of fatigue on performance
- The identification of current gaps in relevant understanding
- The development of a prioritised plan to fill those gaps

The Report comes complete with an extensive list of references and a long inventory of appendices which summarise different aspects of the fatigue 'issue' in detail and can be strongly recommended for those who are interested in particular aspects. The ones that caught my eye were the review of subjective and objective measurement of fatigue (Appendix A) and the review of 'sleep disorders' in Appendix B.

The work acknowledges the priority order for a solution-oriented study as US Civil, US Military, other country ATC. It has attempted to take account of non-US work but I suspect that it has probably not managed to capture all relevant work published other than in the English language. As far as Europe is concerned however, it does note 'outreach' to both the Austrian and German Societies for Sleep Research and Sleep Medicine as well as the (UK) Royal Air Force School of Aviation Medicine. Unfortunately, as with similar reliance on peer-reviewed publication, the review seems to have missed some of the ground-breaking work on FRMS in the airline industry when it says, in respect of non-ATC FRMS applications, "FRMSs were either in place or in development in the following locations and industries: Australia in the mining and medical industries; France in the airline industry; New Zealand in the airline industry; the United Kingdom in the energy industry and in military aviation, and the United States in emergency services (police), nuclear power plants, and the rail industry." Few would fail to acknowledge the real (and successful) efforts to deal with the flight crew fatigue risk at operators such as Singapore and Cathay Pacific.

But to return to what is, despite any shortcomings, still a really useful reference work, I'll talk a little more about the approach taken.

Factors influencing Fatigue in ATC shift work are identified as age, gender and health. So far work on the effects of age is described as having yielded "contradictory conclusions". In respect of health, one quoted study confirmed the intuitively logical observation that those who practice good health habits achieve more sleep and better quality sleep. However, the Report concludes overall that "despite all the research that has been performed on shift work, few conclusions have transferred to operational settings."

Studies of the **Effects of Fatigue** in ATC were found to have been heavily biased towards the effect of shift work on fatigue. By comparison, it was found that comparatively little atten-

'Fatigue Countermeasures' are divided into short-term and structural (FRMS). A good composite summary of simple short-term countermeasures is given:

- Napping
- Avoiding alcohol, caffeine and nicotine 3 to 6 hours before bed
- Limiting alcohol and caffeine consumption
- Obtaining 8.5 hours of continuous sleep each day
- Sleeping in a conducive environment (e.g. appropriate bedding, comfortable temperature)
- Utilising blackout curtains and/or eye masks when sleeping during daytime hours
- Avoiding carbohydrates until the end of a shift
- Consuming healthy meals while working (proteins, fruits and vegetables will increase alertness)
- Avoiding a large meal after work if one is going to sleep soon after
- Stretching regularly (at least every hour) to improve circulation
- Exercising 2-3 before bedtime
- Developing a pre-sleep routine
- Getting to sleep the same time each night
- Utilising mental relaxation techniques to help sleep
- Avoiding sleeping pills
- Awareness of side-effects of medication that may cause fatigue or affect alertness

tion has been given to the effects of fatigue in respect of performance, task complexity and workload. The self-evident fact that night shifts are characteristically worked with less prior sleep than day shifts and at lower levels of 'mental sharpness' is confirmed but when this detail is put into the context of shift patterns, no statistically significant finding that the level of observed operational error favours any one sequence of duties over others has yet emerged. One study is quoted as defining two 'facets' of controller workload the "intrinsic complexity related to the traffic structure" and "the human factor related to the controller's ability and alertness."

As the solution to structural countermeasures, the Report describes an FRMS as a device which relies on "continuous measurements of fatigue risk factors to gauge the likelihood of fatigue and an active culture to derive strategies to decrease either the likelihood of fatigue or reduce the impact of its occurrence".

The gap analysis undertaken by the Review is aimed at "help(ing to) highlight the areas of research that are currently lacking and to encourage a collaborative effort to achieve a broader understanding of the causal factors for fatigue in aviation as well as investigate how these factors interact". The five priorities identified in the Report (in their priority order) are:

(1) Rectifying the coverage of field measurements of fatigue so that they are classified by reference to the type of ATC role being performed (controllers for en route, terminal radar, approach sequencing, VCR or military traffic together with supervisors and a range of support staff).

(2) Validation of measures of controller performance which are sensitive to fatigue.

(3) Research the short and long-term effects of shift work on controllers - the potential effects of personality and age and the effects on cognitive performance, communicative vigilance and situation awareness.

(4) Collection of data to support sleep disorder policy (given that sleep disorders are seen as a major factor in fatigue).

(5) Validation of human performance models to predict controller fatigue.

Do you think these priorities are in the correct order? Personally, having worked quite extensively in mathematical modelling and learnt its limitations as well as its benefits, I think they got No 5 right….