Network Manager
nominated by
the European Commission

WE'RE ONLY HUMAN (AFTER ALL)

EUROCONTROL

CONTENTS

INTRODUCTION

In the last years the overall Air Traffic Management (ATM) system performance has become a critical factor for all the involved actors. In order to reconcile the demands for economic efficiency on the one hand, and safety and sustainability on the other, the emphasis has been placed on the development and use of new technology and automation. European wide initiatives such as SESAR have brought to fruition new concepts and tools.

However, no matter how technologically advanced a system is, it will only perform as well as the humans that operate it. Therefore, in order to achieve the full potential of the technological advancements, we need the human components of the system performing at their best.

The need for improved human performance support is recognised by the industry and has resulted in new rules and regulations being developed and implemented. The updated ICAO Doc. 9966 addresses the need for fatigue management and new guidance materials (for regulators, crews and air traffic controllers) was released in April 2016. At the European level the EU regulation 373/2017 from May 2017 addresses fatigue, stress, rostering and use of psychoactive substances and places explicit responsibility on organisations to actively manage them.

This paper is a result of a cross ANSP review of the different regulatory and scientific developments and provides consolidated information on what stress, fatigue, psychoactive substances and rosters are. It provides guidance to ATCOs and ANSP managers on the different approaches that can utilised in order to embrace and move forward to achieve compliance with the new regulatory provisions. The paper starts with an illustrative case study based loosely on a real life incident that happened to our fictional colleague, Alice. It shows that we are all only human and that these new regulations should be seen by all of us as an opportunity to improve.

IT HAPPENED TO ALICE
(Case Study)

INCIDENT REPORT EXTRACT (INSPIRED BY TRUE EVENTS)

'While working at the TWR early this morning I noticed that my levels of concentration and vigilance dropped. I felt very tired. During the whole shift, I was making mistakes that I never do under normal circumstances such as issuing wrong clearances, forgetting transfer frequencies etc. I took a coffee thinking this could help battle the feeling of tiredness and improve my performance. Unfortunately, this time it did not help. A vehicle was in the process of completing a FOD inspection on the runway 08L situated in the proximity of the construction area. Without realising that the vehicle was still on the runway, I cleared an aircraft that was on a 5NM final to land. Soon after I realised my mistake and cancelled the landing clearance. By that time the vehicle had vacated the runway and I re-issued the clearance to land'.

THE OUTCOME OF THE FATIGUE-RELATED INCIDENT

In this particular scenario, an accident was avoided, not due to the effective management of fatigue, but because all the factors building up to and present during the incident emerged in a particular pattern. Had the pattern been slightly different – would the accident still have been avoided? Is this scenario something you recognise in your own working experiences? Regardless of the hypothetical outcome of this particular incident scenario, the scientific literature has established a large body of evidence about the association between sleepiness, fatigue and elevated accident risk in many safety-critical industries characterised by irregular working hours.

CONTEXTUAL INFORMATION

Upon a follow-up interview with Alice (not his real name) about the incident, a better understanding was gained of the complex set of factors that were present in the build-up to and during the incident.

In accordance with roster rules, Alice had worked three consecutive 6 day duty cycles with 1 day off between each duty cycle. To enable a longer period of time off to be combined with some leave, Alice had swapped days off with colleagues, thereby minimising the recuperation time between the cycles. On the night before the incident, Alice was feeling unwell. The night was draining and he could not get sufficient rest. At the crack of dawn, Alice, who was on a stand-by duty, got a call from his supervisor asking him to come to work. Pale and dehydrated, he got into his car and drove 100km to the TWR.

Behind the wheel, he felt drowsy and recalls having a micro-sleep before being woken by a bump on the road. Upon arrival to his work position, highly committed to his work, his team and the organisation, Alice enduringly started his duties.

ALICE´S COPING MECHANISM

Alice knew that he felt tired but thought a coffee would be sufficient to restore his alertness. On this particular day, the caffeine would prove to be ineffective, and he was unaware of the impact that fatigue would have on his performance, alertness, and safety. In fact, the scientific literature also supports this claim – fatigued individuals have a relatively poor understanding of the effects of fatigue and the speed with which its effects can emerge - Ref [1]. Due to limited experience in fatigue-induced performance degradation, internal or external pressures, fatigued individuals tend to ignore warning signs, and they do not fully appreciate the possibility of the distressing consequences.

It is important to emphasise the intangible nature and the complexity of the hypothetical construct of mental stress and fatigue. In managing the risks of stress and fatigue, there is no such thing as a silver bullet. Firstly, let us explain what **stress** and **fatigue** are.

Stress is ever more present in our daily lives. We all deal with some stress due to our modern way of living; we are all surrounded by different stressors that we do not even notice anymore. But what is stress exactly? Stress is a state of mental or emotional strain or tension resulting from adverse or demanding circumstances.

Stress originates from the time when our predecessors had to hunt and avoid dangerous animals to survive. It is an ingrained mechanism which triggers the release of hormones (adrenaline among others) to improve our physical performance when we are in danger. So what is wrong with this?

The problem is that this biological phenomenon has drawbacks: it affects some of our mental functions such as memory, reasoning, vigilance… typically the functions that an ATCO will use permanently in his job.

The point is that stress is not only generated when we come face to face with a bear, which is not happening every day, but when the demands are perceived by the person as higher than the capabilities available to achieve the desired goal.

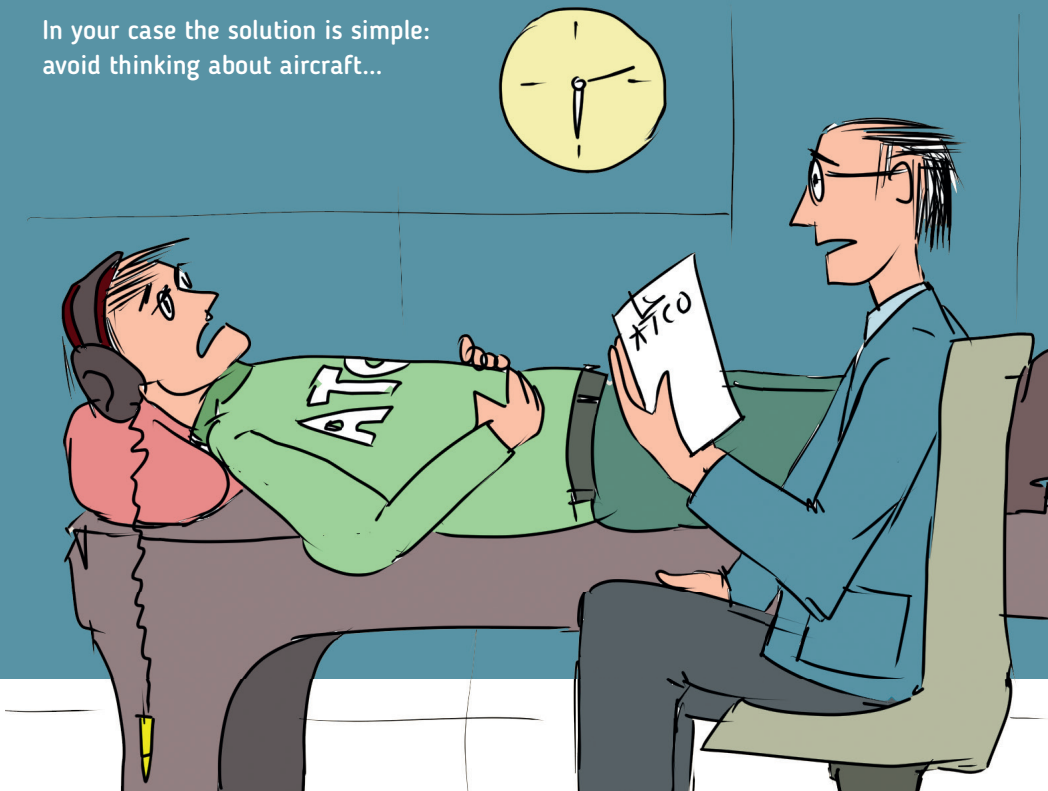
The acute stress is a normal part of everyday life. The problems arise when we are repeatedly exposed to the same stressor or many different stressors for extended periods of time. When this happens, we can fall prey to the effects of chronic stress.

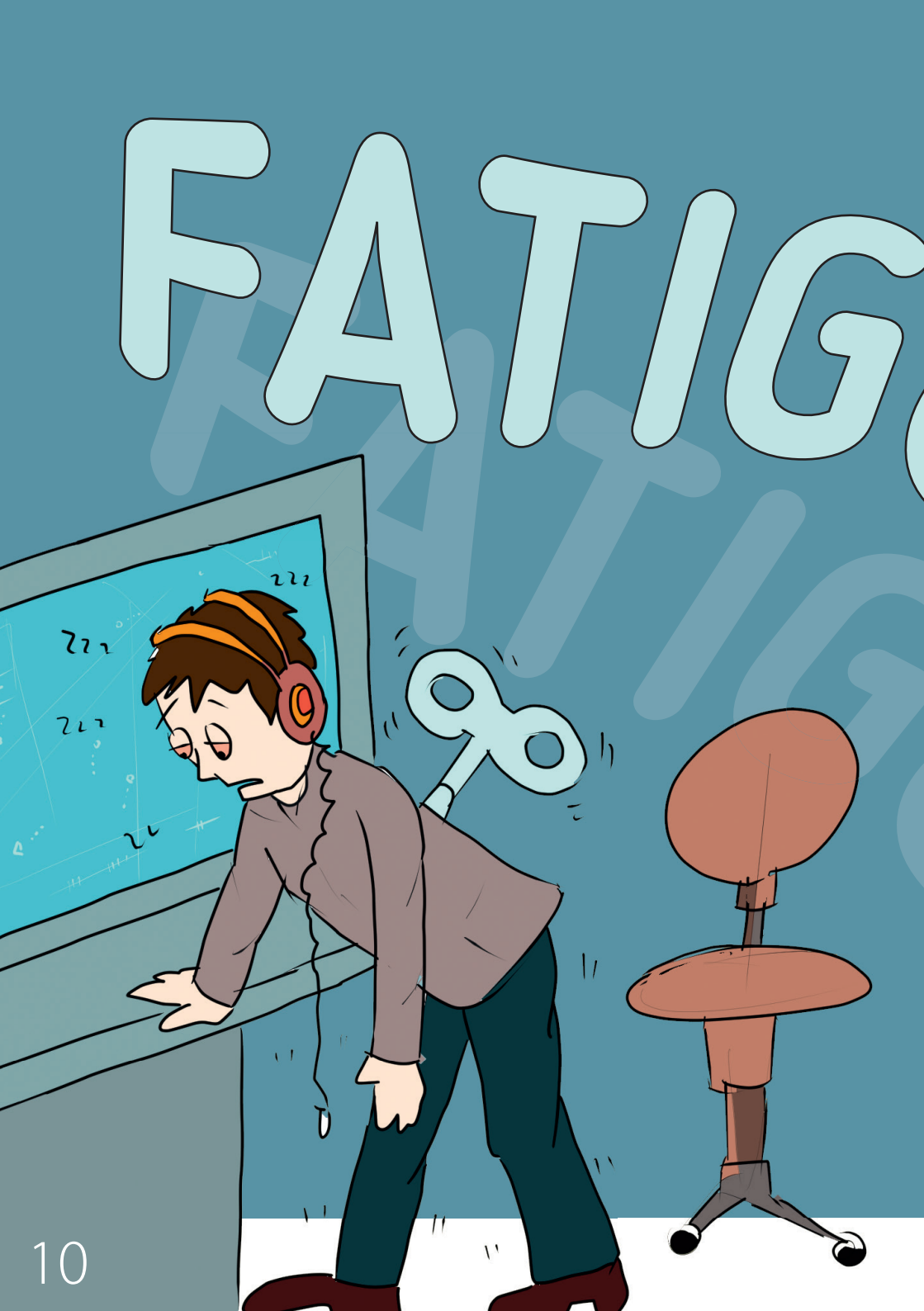
As an ATCO when meeting people in social situations the first thing you are asked after "I hope you are not on duty tomorrow!" would be - "how incredibly stressful is that job?!" And your answer might be something along the lines of "Well no, not really"...

Sounds like bragging but it is not, it is a sincere statement since stress is not seen as a part of a regular, smooth sailing day at the tower. This is because ATC associates stress with unusual situations and emergencies and the vast majority of flights are routine, uneventful, on time, meticulously planned and handled.

At the same time, 1 minute in an "aviation time" measurement system can hold numerous fast movements, manoeuvres and appropriate decisions to be made. Symbolically speaking 1"air" minute can hold quite a few "land" minutes whilst demanding an uninterrupted focus (as a "land" minute does). Unfortunately, this need for continuous alertness means that your alarm system rarely switches off. Without stress management, all too often your body is on high alert and over time, high levels of stress can lead to serious health problems.

In your case the solution is simple: avoid thinking about aircraft...

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Fatigue is a physiological state that can lead to reduced mental and physical performance. Fatigue results from extended wakefulness and an accumulation of sleep deprivation. This is not the same as tiredness after an intensive duty. The ATCOs and other operational staff have strategies to cope with tiredness, such as drinking caffeine, taking breaks, and napping.

For shift workers, fatigue and sleep debt can become a challenge and be difficult to cope with. A booklet that provides knowledge and strategies to help shift workers manage their lifestyles, and hence better manage their sleep, is available in Ref [6].

The issue with fatigue is that it leads to a decrease in our own performance, well before we are able to notice the degradation. We become more error prone, slower to respond, vigilance reduces, and we become more fixated on tasks whilst missing other critical information. It results in the reduced ability to carry out operational duties effectively. A study showed that 17 hours awake is equivalent to a blood alcohol content of 0.05 (which is for most countries the legal blood alcohol driving limit) Ref [2]. All organisations should have alcohol consumption policies - does your organisation have similar policies with respect to fatigue management?

Therefore every organisation should take the issue of fatigue seriously and invest accordingly.

FATIGUE RISK MANAGEMENT

The impact of fatigue on human performance and implicitly on safety of operations is obvious. A well-prepared organization should invest in supporting and protecting employees' physical and mental well-being by managing fatigue risks.

A more resilient organization means: people are much happier and more motivated to report to their duty – as their home-life work-life balances are well maintained, people are more attentive and sharp in cognitive and mental abilities to respond and act appropriately with less errors. There should also be less absenteeism.

Until now, ANSPs and staff have managed stress and fatigue based on experience and 'established practices' with respect to rostering, and delegating the responsibility on to ATCOs to be "fit for duty". In addition, a number of States have specific legislation around privacy and workplace responsibilities for health and safety at work that need to be complied with. With the advent of ICAO doc 9966, Ref [3], and EU 2017/373 there is a clear and explicit responsibility being placed on organisations to explicitly and actively manage stress, fatigue, rostering and psychoactive substances.

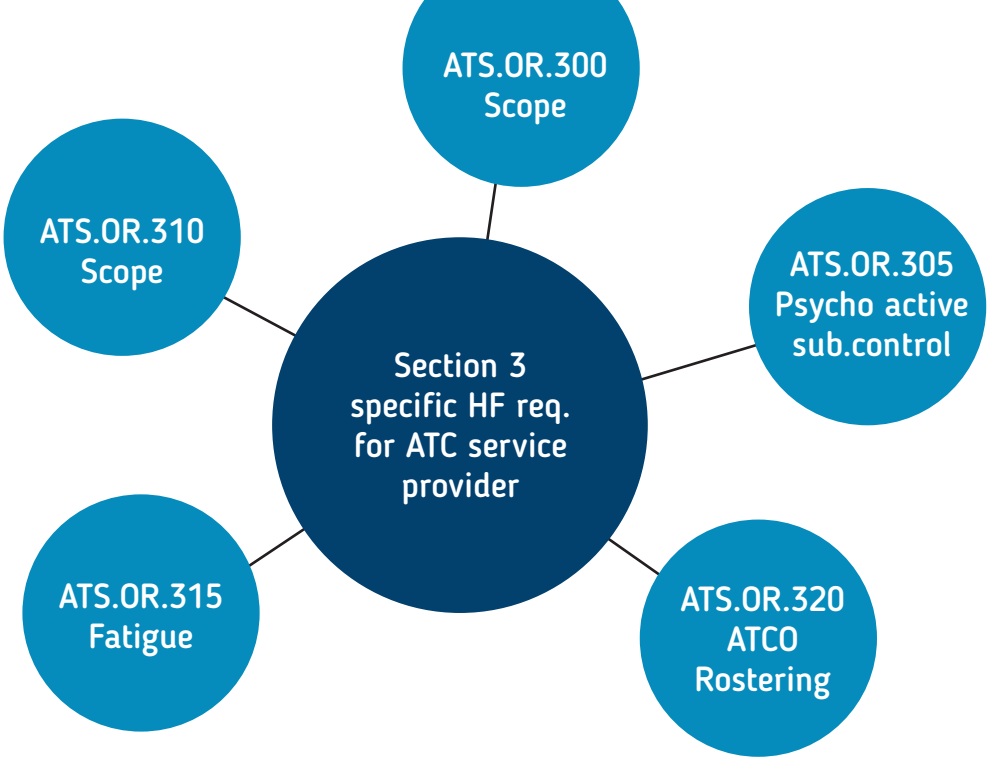
EU 2017/373 establishes the requirements to be met by the air traffic control service provider with regard to human performance in order to:

(a) prevent and mitigate the risk that air traffic control service is provided by air traffic controllers who suffer from a problematic use of psychoactive substances;

(b) prevent and mitigate the negative effects of stress on air traffic controllers to ensure the safety of air traffic;

(c) prevent and mitigate the negative effects of fatigue on air traffic controllers to ensure the safety of air traffic.

The different International, European and National sources of regulations, including health and safety responsibilities, are complimentary and should be taken into account by the ANSP's.



"The ANSP is required to manage/monitor stress, fatigue, psychoactive substance abuse in a way quite different from previous responsibilities in this specific area"

Fatigue management refers to the methods by which Service Providers and operational personnel address the safety implications of fatigue. In general, there are two distinct methods for managing fatigue:

1. The service provider complies with work period limits and non-work period minima defined by the regulator, and manages fatigue hazards using the SMS processes that are in place for managing other types of hazards;

   or

2. The service provider develops and implements a Fatigue Risk Management System (FRMS) and obtains approval by the regulator. The Fatigue Risk Management System (FRMS) is a data-driven means of continuously monitoring and managing fatigue related safety risks, based upon scientific principles, knowledge and operational experience that aim to ensure relevant personnel are performing at adequate levels of alertness. The scientific principles are available in the Fatigue Risk Management Guide for Air Traffic Service Providers – Ref [4].

Some ANSPs may also opt for a combination of the two approaches. Careful consideration should be given in the selection of the FRM approach as a function of the size and nature of the organisation, and on the fact that a prescriptive hours ruleset does not take account of home-life issues, and the fact that ATCOs will and do swap shifts for personal reasons.

We are all our own manager and no amount of regulations will compensate for the lack of looking after yourself. This is complimentary to the regulatory requirements, supportive shift rostering systems, and useful and continuous training and awareness raising efforts.
So the clear fact that we are our own managers, is included in and a key part of the shared effort requirements of the Organisation we work in.

You can find a lot of information about Fatigue Risk Management System on the ICAO web site at:
https://www.icao.int/safety/fatiguemanagement/Documents/FMG for ATSPs FINAL.pdf
Or at the Transport Canada website:
http://www.tc.gc.ca/eng/civilaviation/standards/sms-frms-menu-634.htm

FATIGUE RISK MANAGEMENT-COMMON EFFORT

In order to develop and implement a functional Fatigue Risk Management system we need involvement of a number of interested parties and stakeholders:

- the ATCOs and other shift working staff who experience and manage stress and fatigue at the sharp end;
- ANSPs who must implement, manage and assure Fatigue Risk Management;
- the experts who translate theoretical findings on fatigue into standards and recommended practices;
- the scientific researchers and engineers who provide advancements related to stress, fatigue and rostering;
- the regulators who check compliance of Fatigue Risk Management.

To be effective we need a commitment for a common goal and effort among all stakeholders. Information on the roles and responsibilities of the key players: **ATCO, ANSP and Regulators** are provided below.

ATCOs (& ATSEPs)

To combat stress and fatigue, ATCOs (& ATSEPs) should take a proactive approach towards managing their work and non-work periods at both individual and team levels.

ATCOs (& ATSEPs) have a personal responsibility to manage this, but now they also have a responsibility to inform themselves and take advantage of what the organisation has put in place.

ATCOs (& ATSEPs) should seek from their organisations dedicated training on stress and fatigue to enhance their own understanding about the causes, its evolution, self-monitoring, mitigation strategies as well as the undesired consequences stress and fatigue might induce. The individual performance management process starts with a healthy life style in terms of diet, exercise and adequate sleep quantity and quality. It is recognised that this is easier said than done. To achieve synchronicity between the work and non-work periods, an ATCO (& ATSEP) will require the understanding and support of his/her families and friends. Individual fatigue mitigation strategies such as: self-monitoring; caffeine; task rotation and paced workload should also be developed based on a combination of scientific knowledge and personal experience.

In addition to management at an individual level, an ATCO (& ATSEP) should always be aware of the effects of individual performance variability on the overall performance of the team. Ideally, the Ops Room environment should support and promote open communication on the stress and fatigue and this may require some changes to current Ops Room cultures.

Lastly, ATCOs (& ATSEPs) possess valuable experience at front-line fatigue management and should therefore seek opportunities to share this positive and negative experience with all stakeholders through surveys, education programmes and reporting their own experiences of stress and fatigue in line with the Just Culture policy and principles.

ANSPs

The role of an ANSP in the FRMS is to create a fertile working environment, to prevent and protect its ATCOs and other staff from the effects of fatigue on the basis of a combination of scientific knowledge and operational experience.

An effective FRMS starts with a clear policy on fatigue that sets out the framework for the environment, commitment, tools, processes and procedures that support the identification, assessment and mitigation of risks associated with fatigue. The policy also highlights the responsibilities for all staff whose role can influence FRM in the organisation. The CEO and the senior management must recognise the importance of FRM and allocate sufficient resources to ensure its effective management. The activities should include:

- creating an ergonomically designed working environment to combat fatigue (e.g. natural lighting);
- a rostering system that enables tiredness to be managed at an acceptable level while at work, without leading to fatigue;
- setting up, recording, monitoring, investigating, following up and evaluating the results from an FRM reporting system;
- education and training at all levels ;
- surveys on stress and fatigue as part of local health and wellbeing surveys.
- counselling and coaching for individuals that have difficulties in managing stress and fatigue;

REGULATORY AUTHORITIES

With the objective to protect the wider society from the risk of fatigue, the Regulatory Authorities, be they at a national level (e.g. NSA) and/or at an international level (e.g. the European Aviation Safety Agency (EASA)) are responsible for the development of an FRM regulatory framework and ensuring ANSPs` compliance with the requirements depicted in the framework. In addition, a number of states have specific legislation around privacy and workplace responsibilities for health & safety that will need to be complied with and should complement each other.

Regardless of the selected approach, the regulatory framework should ensure ANSPs have adequate FRM resources, work environment, fatigue reporting processes, limits on operational duty and breaks, duty and rest periods, roster construction and training for all organisational stakeholders.

INVESTMENT OR COST?

The demands on ATCOs and ATSEPs to perform at optimal levels are increasing due to higher system complexity and evolving traffic levels. This is affecting competence and associated initial and recurrent training. Also, staff have increasing demands in their home lives due to changes in social circumstances. These demands place more emphasis on the safety critical organisation to pay more attention and act in the interests of the well-being of its staff. Some organisations are already facing an ATCO shortage that can compound the issue of stress and fatigue. As a shortage of workforce leads to additional work for the remaining staff, it becomes even more important to implement and manage fatigue in order to avoid compounding the level of accumulated fatigue.

The pressures on organisations to do more with less means that staff well-being becomes increasingly important as an investment opportunity. Performance first, safety always.

Seeing as FRM is new to ANSPs, the cost of doing it is currently unknown. Clearly, items such as creating an FRMS, monitoring fatigue and stress, and providing training on stress and fatigue are new and will add cost, but can these be absorbed as part of the current investment programmes? The real question is whether not doing this will have a negative impact on the organisation in the longer term.

You can find some information on a return of investment tool with a real example of a company implementing some fatigue training material for their maintenance technicians in Ref [5].

IMPLEMENTING HUMAN PERFORMANCE IN THE MANAGEMENT SYSTEM

HOW SHOULD AN ORGANISATION GO ABOUT IMPLEMENTING THE SYSTEM(S)?

To manage psychoactive substances, stress and fatigue effectively, the processes need to be integrated into the Management System of the organisation. There are a high number of stakeholders that will have roles and responsibilities in the support system: the target audience of ATCOs and other shift working staff; supervisors; managers; Human Resources; welfare officers; in-house doctors; training section staff etc.

It is therefore suggested that a project is established, with top management support. This is about systems that support staff, and hence, by their very nature, will be complicated to establish, and will require a project management plan that has been consulted with, and is supported by the social partners.

The project management plan needs to:

1. Identify the different activities and stakeholders that are required to implement, maintain and use the psychoactive substances, stress and fatigue management systems. These activities should include a study to determine what the organisation already has in place, both formally and informally.

2. Obtain management commitment to release the staff to develop and integrate the psychoactive substances, stress and fatigue management systems within the organisations management system, and put in place the required facilities and support arrangements;

3. Coordinate the identified activities to implement the systems in a cohesive and systematic way;

4. Promote the systems to encourage staff to understand what has been established and make use of the systems and the facilities;

5. Transfer the implemented system(s) to a member of staff who will ensure the established system(s) are tuned to iron out any issues that may occur in its use, and continues to monitor and improve the performance of the established system(s) to ensure it is effective in achieving the required objectives.

When developing the Project Management Plan, consideration needs to be given to the implementation strategy that will be used, for example, the organisation may decide the system will be initially implemented with a target audience of only ATCOs, or ATCOs and ATSEPs. Once implemented for this target population, it may be possible to extend further to include all staff. Another approach may be to implement a system in just one operational unit, then extend to other units once the established system is shown to be effective.

The psychoactive substances, stress and fatigue systems will need to cover, as a minimum, mechanisms that enable prevention, detection, mitigation and education of staff. It will need to be systematic, i.e. is supported by clear and published policies and procedures. It will need to follow a joined up approach with all players and competences involved. Coordination with the NSA/regulator to approve the systems, including the psychoactive substance testing scheme, should be triggered at an early stage in the development.

TRAINING & COACHING FOR STRESS, FATIGUE AND PSYCHOACTIVE SUBSTANCES

Different types of training can be provided to address **fatigue** factors. Staff should gain knowledge about the effects of fatigue and be able to manage them by applying the appropriate sleeping strategies, nutrition tips and fitness practices.

As defined previously, **stress** is generated when the person perceives that the demands are higher than their own ability to cope. So there is a question of perception. The more people will feel able to cope with a situation, the less they will be subject to stress. Improving the coping capacities of ATCOs can be achieved through appropriate training and coaching, such as combining high workload simulations with training on stress detection and coping techniques to improve their confidence in these types of situations. Coping techniques cover methods to prepare for stress situations (e.g. positive routines), deal with stressful factors (e.g. emotional intelligence) and recovery afterwards.

Staff should be briefed about the psychoactive substances policy, and on the effects of medication.

Training should be targeted at different levels to improve the organisations understanding and ability to manage stress, fatigue and psychoactive substances. Managers should be aware of the impact of fatigue, stress and psychoactive substances and what tools the organisation provides to mitigate it. Supervisors and line managers should be aware of the initial signs of fatigue and stress, and decode the potential stressors in order to manage them according to the organisation policy.

Information and training should be provided to both line management and staff who are reintegrating after a long absence caused by a heavy stress, fatigue, depression, burn out or disease.

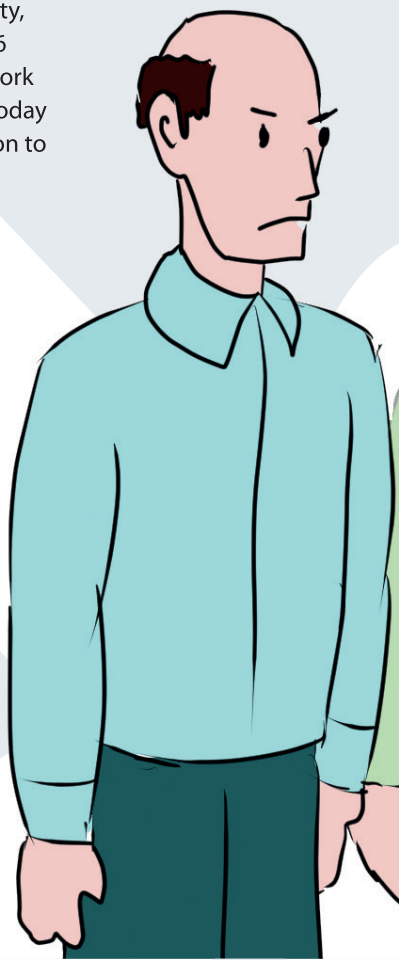
For training support on stress, fatigue and human factors in general, see EUROCONTROL IANS catalogue under the HUM Domain of courses.

ROSTER

Ms Dolly Parton's 'working 9 to 5' expressed concerns about the hard life of routine. In our working environment however the clock does not stop at 5 pm. It is scientifically reported that shift work can increase the risk of certain disorders and have a negative impact on the overall well-being of employees.

How to combine the needs of our business with the concerns raised on shift work?

There is obviously no one-fits-all solution as every unit has its own specificities. However, all of them should address a balance between individual health & social life, productivity, safety, individual performance and efficiency. Back in 2006 EUROCONTROL EATMP published a paper "EATMP Shiftwork Practices Study – ATM and Related Industries" which still today remains a solid reference guide for best practices in relation to rostering and the scientific principles behind it.



The regulation hints at a number of elements that need careful consideration in designing a working schedule, a 'roster', which mitigates best for the negative effects of shift work, and should be based on scientific principles. Defining a maximum number of consecutive working days/shifts, a maximum duty length, maximum time on position, minimum rest periods etc are core elements of the roster.

In most organisations these decisions are subject to consultation with the Social Partners, hence the importance of raising the awareness with Senior Management, employees and their representatives on the importance of rostering in managing fatigue risks or health and sustainability of the (shift working) population in our businesses.

One of the remaining challenges is to ensure a good balance between the rigidity of hard rules and the flexibility allowing for a more efficient application of those rules. Flexibility (within the set of rules) should however never allow the individual to deviate from the principles of health and safety. A concrete example. The rules defined that the standard roster skeleton is a 4-2 and the planning office cannot deviate from it. The user however is allowed to work 6-1 on his own initiative/demand. The risk exists that some individual users arrange their planning to work a series of 6-1 cycles to have an extended off period thereafter, as in the case study featuring Alex.

PSYCHOACTIVE SUBSTANCES

Problematic use of psychoactive substances is the use of one or more psychoactive substance by aviation personnel in a way that constitutes a direct hazard to the user or endangers the lives, health or welfare of others and/or causes or worsens an occupational, social, mental or physical problem or disorder.

The risk that the air traffic control service is provided by employees who perform safety sensitive functions and are struggling with the problematic use of psychoactive substances, needs to be prevented and mitigated. In order to do that an air traffic control service provider must develop and implement a policy, with related procedures, to ensure that the problematic use of psychoactive substances does not affect the provision of service. This includes providing training about the effects of psychoactive substances on individuals, and subsequently on air traffic control service provision.

For those who are dependent on psychoactive substances the air traffic control service provider should make appropriate support available. It's possible to employ third-party assistance if necessary but even then such assistance should be freely available. When it comes to the occurrence investigation and analysis the problematic use of psychoactive substances should be considered as a contributing factor.

To make it really work, procedures for the detection of cases of problematic use of psychoactive substances need to be objective, transparent and non-discriminatory. They should specify the applicability, responsibilities and thresholds for psychoactive substances. It's very important to encourage those (ATCOs, ATSEPSs) who think that they may have a problem to seek and accept help made available to them, and ensure that they are treated in a consistent, just and equitable manner.

"Warnings: don't drive or operate heavy machineries"...
So staying at the console should be OK...

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This document was assembled by the Human in The Operation (HITO2) group, plus guests. This core of the group was established by voluntary members from the FABEC ANSPs. Guests from EUROCONTROL and the Estonian ANSP, plus other experts also joined the group. The group was established with the objective to share information and coordinate with each other, as each participant develops its own practical and pragmatic human factors and human performance methods in the areas of Stress, FRMS, Rostering and Psychoactive substances.

Left to Right: Keiko Moebus (Human Factors Specialist – skyguide); Marinella Leone (Safety & Human Factors Team Leader – MUAC); Luc Staudit (Hd ATCO Training – MUAC); Kaie Peerna (Safety Manager – EANS); Alain Du Bois (Safety Manager – Belgocontrol); Arnoud Bourbey (Operational safety expert – ANA); Daniel Avram (EUROCONTROL Network Management); Maike Ihler (ATCO & HF specialist – skyguide); Keith Cartmale, Chairman of the HITO2 group (Safety Manager – MUAC).

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