

Supporting
European
Aviation



Experiences of integrating FRMS into SMS

EUROCONTROL Guidelines on Fatigue and Roster Best practices

Tony Licu

Head of NMD/Safety

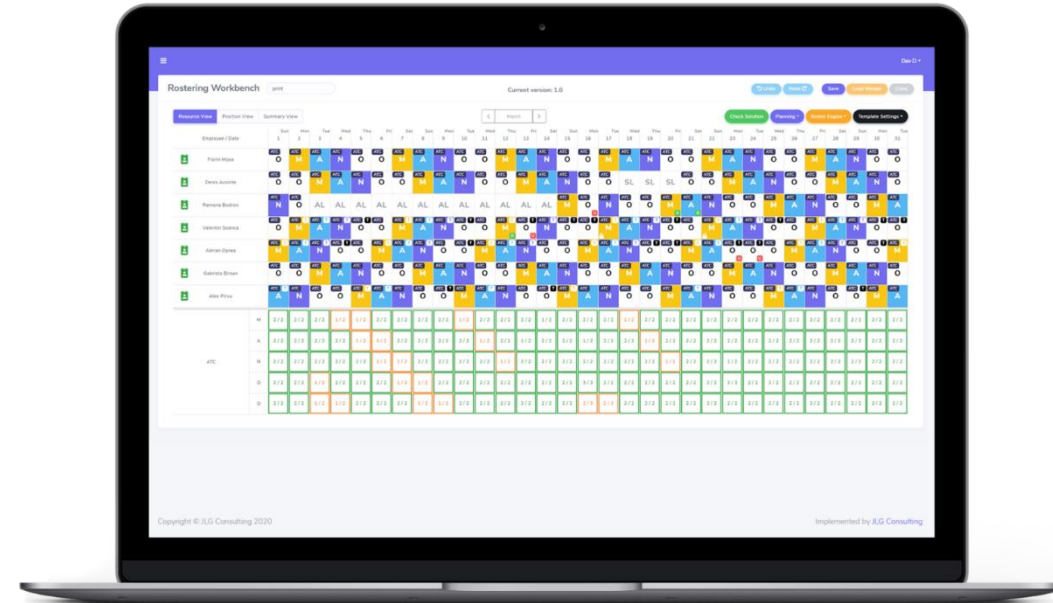
Head of NMD/Digital Transformation Office

antonio.licu@eurocontrol.int



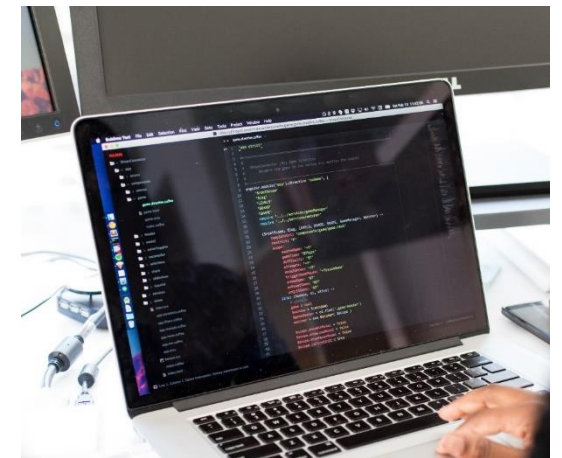
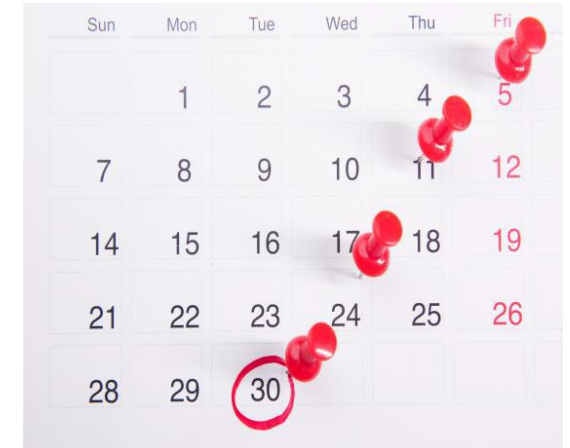
ATCO Rostering – problem statement

- The process of allocating ATCOs to shifts, while ensuring all constraints are met: Performance delivery i.e. best possible (lean) allocation with SoTs without staff leakage, fatigue risk mitigation, labor regulation, human factors, staff availability, working preferences, fair distribution of workload, dealing with exceptional cases (e.g. pandemics crisis) etc.;
- **Too complex to be handled by human mind alone;**
- **Computers manage to solve this problem better and faster.**



ATCO Rostering Tools

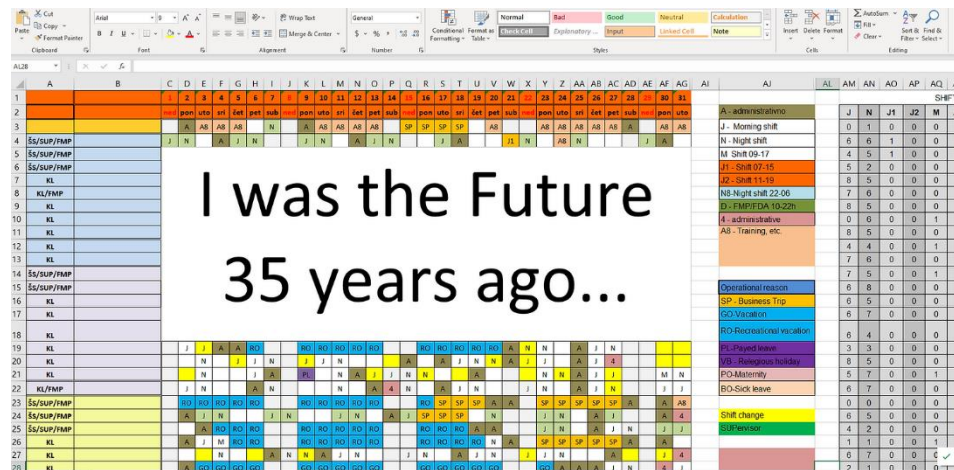
- Also known as **ATCO Planning, ATCO Scheduling, Shift Scheduling, Workforce Management** tools (platforms / systems);
- **Are software systems designed to allocate ATCOs on working positions as safely and efficiently as possible ?**
- Have **few** main performance goals:
 - **increase** flexibility (dealing with staff unavailability, traffic variations/dynamic SoTs) and **preserving** safety (fatigue management) and
 - **decrease** costs associated with workforce management and planning.
- Come in different “shapes” and “sizes”;
- Most of them are not tailored to industry specifics;
- Most of them require some degree of human intervention in the rostering and allocation process, lacking complete automation.



ATCO Rostering Tools adoption

- Most ANSPs lack a proper tool and acknowledge the need to have one;
- Some deployed software tools for rostering, but with limited flexibility (automation);
- **Most ANSPs still use Excel or even pen and paper as their main tool for rostering.**

ATCO Rostering in many ANSPs



Technology world



Team roster /
fixed pattern

Individual roster /
fixed pattern

Individual roster /
dynamic pattern

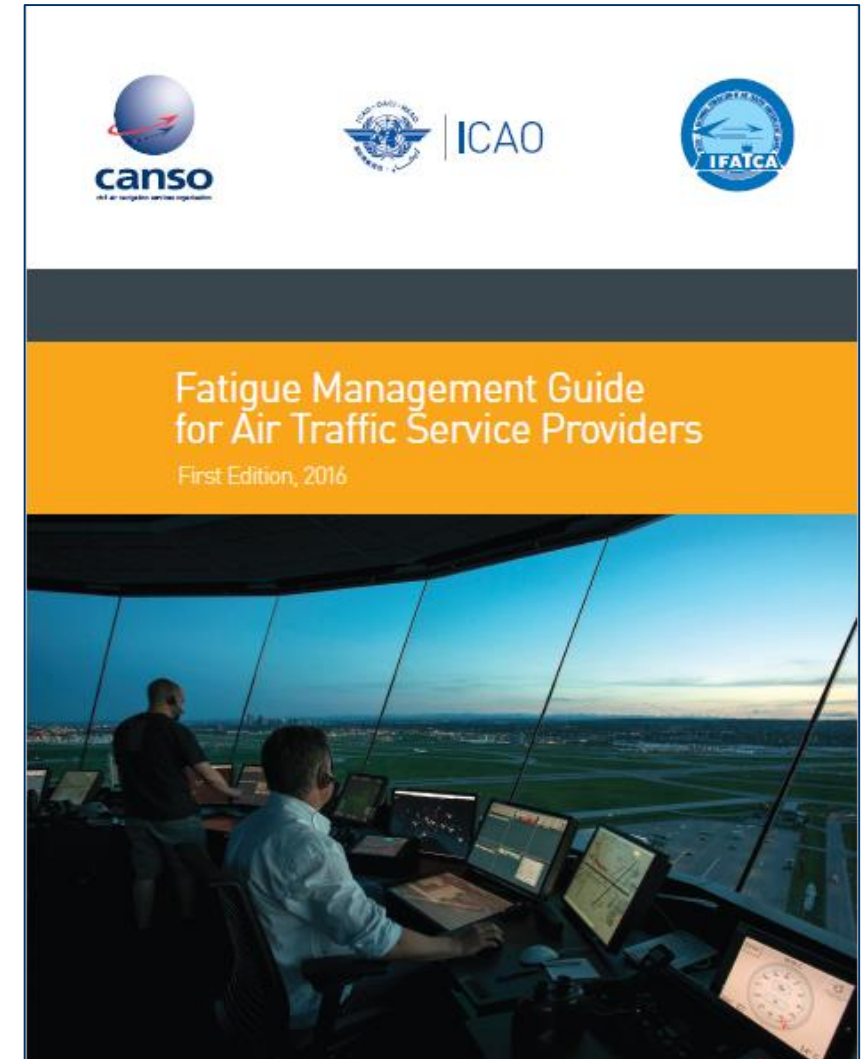


The empty
space in the jar
= staff leakage
in a roster.

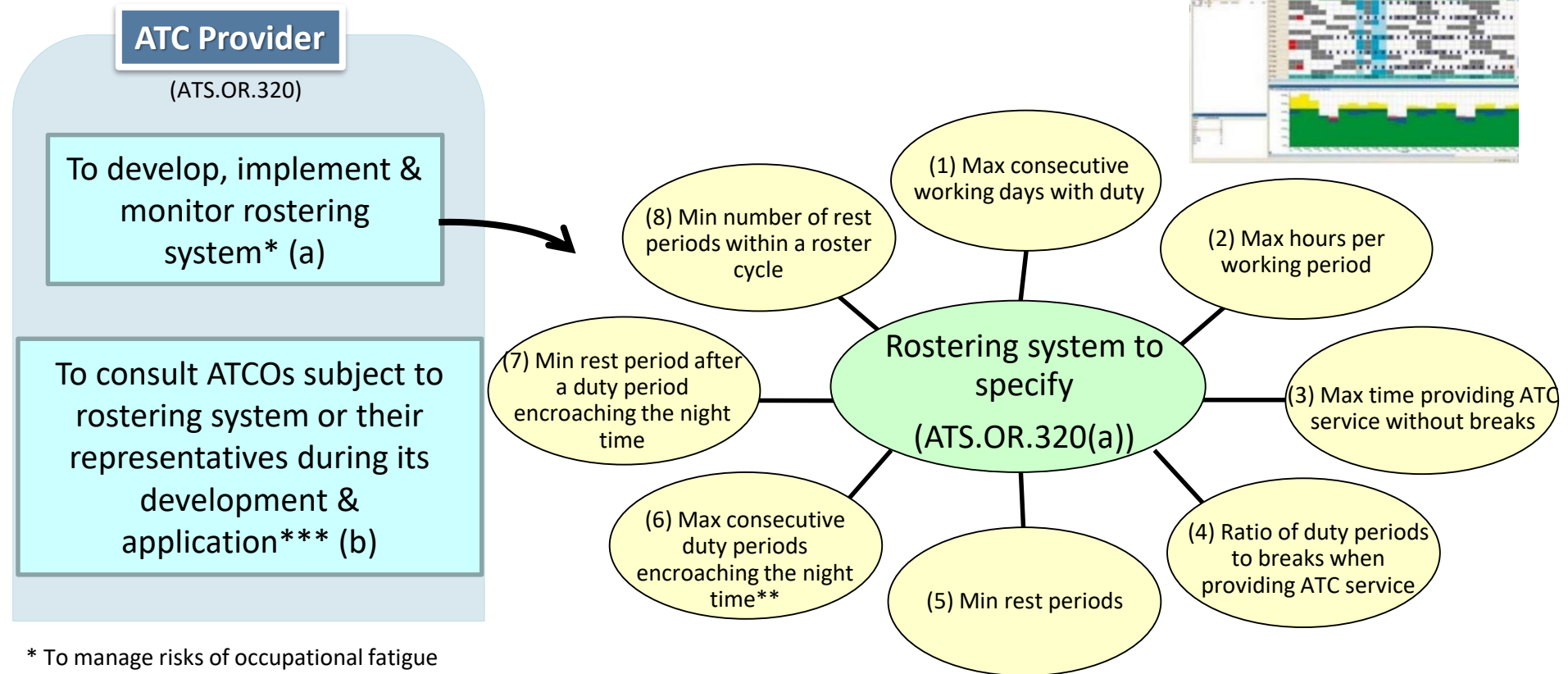
Rostering and fatigue

- Principles from **fatigue science** should be used to construct ATC schedules (rosters) that take into account such factors as the dynamics of sleep loss and recovery, the circadian biological clock, and the impact of workload on fatigue, along with operational requirements and contextual factors.
- When **fatigue science** and **operational knowledge** and **experience** is applied in the building of ATC schedules, fatigue hazards relating to scheduling can be **predicted** and **minimized**.
- Scheduling practices needs to accommodate the effects of different types of shifts that are worked by ATCOs (early starts, day shifts, afternoon shifts, night shifts, etc.).
- Keep roster changes at short notice to a minimum and minimize their impact.
- Provide explicit procedures for shift swapping.

Fatigue Management Guide for Air Traffic Service Providers - ICAO



ATCOs' Rostering System(s) and Fatigue – European regulation



* To manage risks of occupational fatigue

** If applicable, depending upon the operating hours of the ATC unit concerned

*** To identify & mitigate fatigue-related risks due to rostering system itself

Table of contents

- Chapter 1 – Introduction
- Chapter 2 – Scientific Basis
- Chapter 3 – Regulatory Requirements and other sources
- Chapter 4 - Proposed Shift Work Fatigue Prescriptive Limits
- Chapter 5 – ATC Application of the 8 principles
- Chapter 6 – Additional consideration (age, OJTIs etc.)
- Chapter 7 – Conclusions
- Acknowledgements etc.

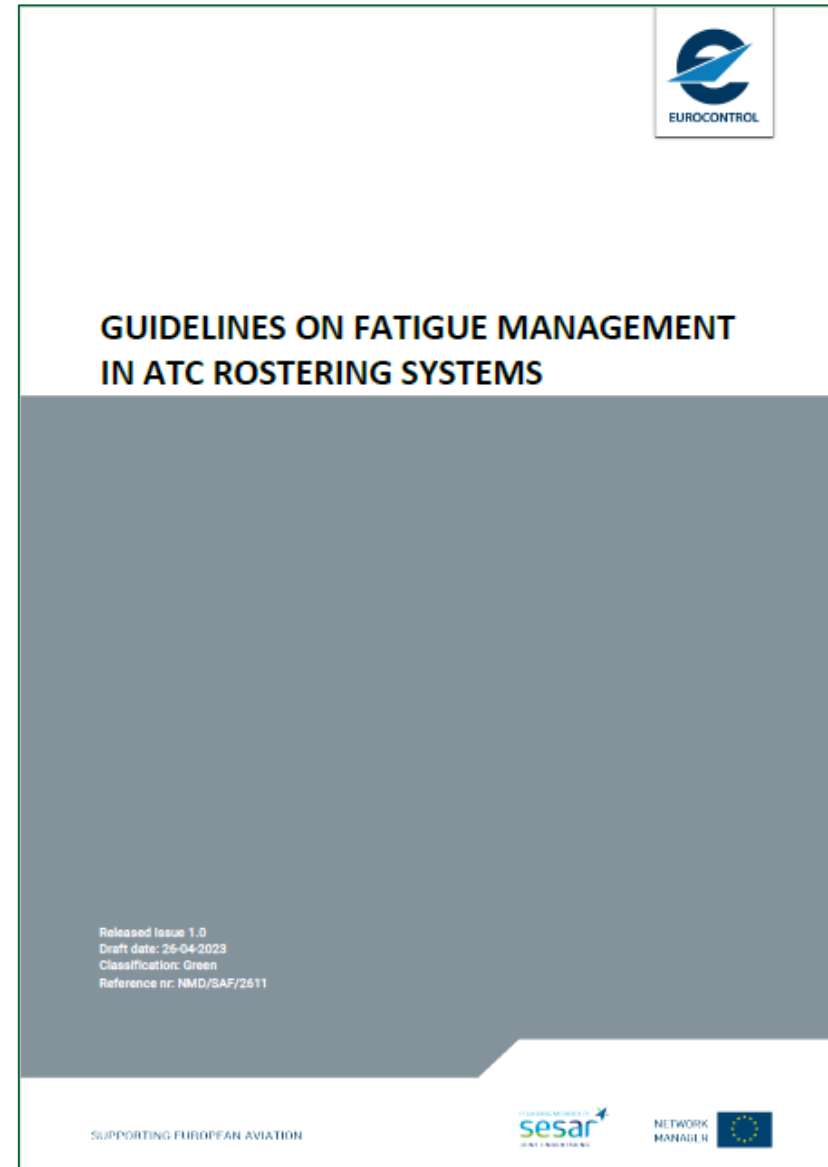
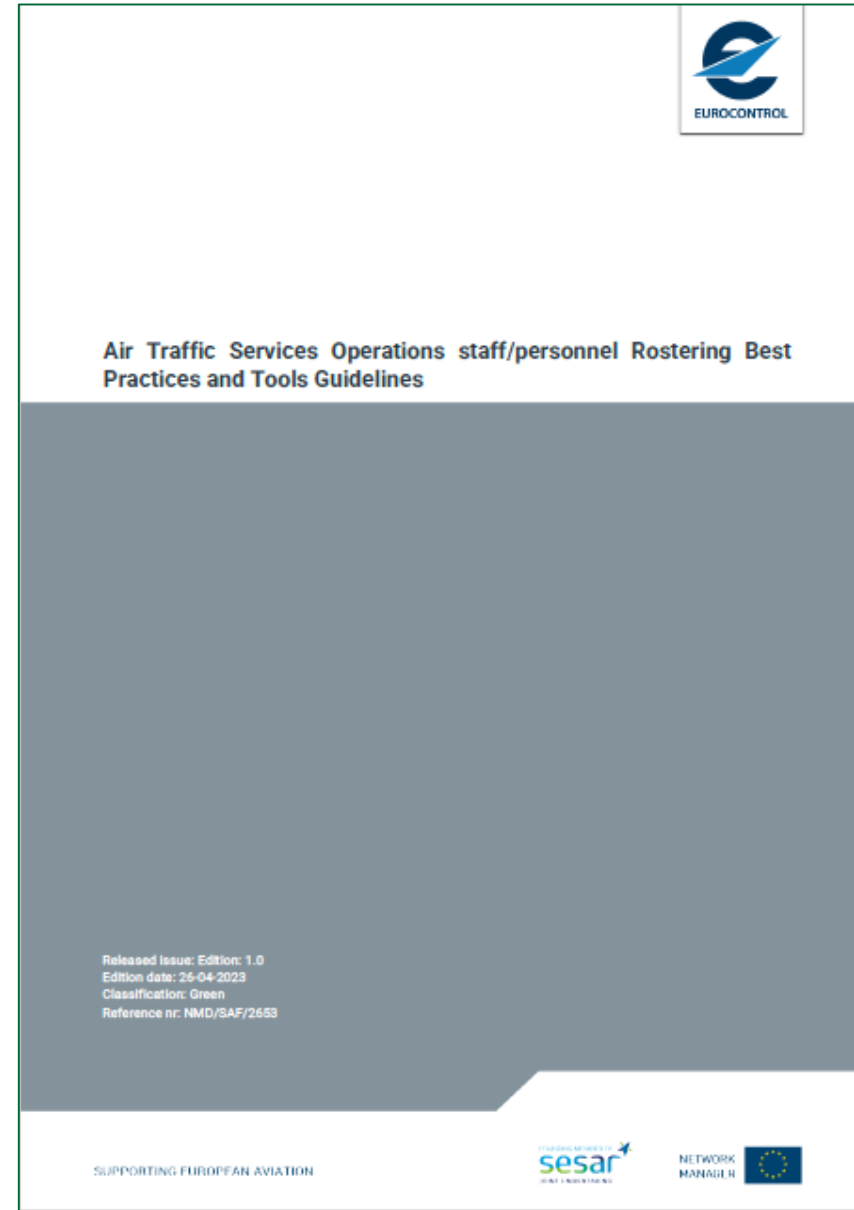


Table of contents

- Chapter 1 – Introduction
- Chapter 2 – Rostering Definition
- Chapter 3 – Rostering Tools
- Chapter 4 – Rostering and Fatigue
- Chapter 5 – Rostering Tools Best Practices
- Chapter 6 – Rostering Tools Flow
- Chapter 7 – Conclusions
- App 1 - Analytics and visualisations for several roosting simulations
- App 2 - Cloud vs. On-premises Licensing Models
- App 3 - Description of Hard and & Constraints
- App 4 - Examples of Hard & Soft Constraints Settings



Using modern tools ML/AI in practice



- Prototyping the ATCO roster for ANSPs (use cases) using the state-of-the-art rostering practices beyond fatigue;
- Close collaboration between EUROCONTROL and JLG Consulting Ltd (SkyRoster Tool).





Case Study

AUTOMATING 60.000 SHIFT SWAPS TO SAVE 360.000 EUR/YEAR

Customer: ANSP in Central Europe.
Size: ~450 operational ATCOs.



PROBLEM

The customer was experiencing a high number of shift swap requests - ~60.000 per year.

For each shift swap request, the planning manager wasted ~15 minutes of his time to fill in paper forms and update the roster in a spreadsheet.

The customer was paying ~5 full-time employees only to manage these shift swaps.



~60.000 shift swaps per year



~900k work minutes wasted per year



Equivalent to ~5 full-time employees

SOLUTION



Case Study

94.3% LESS OVERTIME

Customer: ANSP in Eastern Europe.
Size: ~55 ATCOs.



PROBLEM

The customer is understaffed, scheduling overtime shifts to cover the demand.

Due to overtime shifts, staff is overworked, resulting in alarming fatigue scores.



"According to a study, nearly two in 10 Air Traffic Controllers have made significant errors in the past year, and over half attribute the mistakes to fatigue. A third of the controllers said they perceived fatigue as a "high" or "extreme" safety risk."

SOLUTION

Advance Optimization Algorithms



Soft Constraints

- Desired days to work
- Day shifts distribution
- Consecutive nights
- Maximum consecutive assignments
- Not required shift assignments
- Undesired days to work

constraints

- Minimum rest time
- Maximum hours worked per week
- Maximum hours worked per month
- Maximum hours worked per year
- Locked assignments



Work less for more and
preserve the wellbeing

SUPPORTING EUROPEAN AVIATION

