Shaping Asia Pacific ATM - Global Vision, Regional Action

4 - 6 MAY 2016
QUEENSTOWN, NEW ZEALAND

CANSO ASIA PACIFIC CONFERENCE
People Make ATM Work

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The Importance of Humans in Our Systems

- **Shaping ATM in our region**
  - Dependent on people
  - Plan-design-operate

- **Regional agenda and growth**
  - Pressure on all parts of the ATM system
  - Need to optimise human performance from both a safety and efficiency perspective
    - *Putting wheels on car whilst car is moving*
    - *Doing a heart transplant whilst running a marathon*
  - CANSO Safety Strategy priority theme is People Create Safety

- **Short introduction which CANSO is supporting on human performance**
Risk and Strength

• People are a risk
  – Human errors are said to lead to the vast majority of aircraft accidents
  – Our safety record shows that people identify and recover situations

• People are our strength
  – The ATM system functions because people are flexible and adapt……not because the system is perfectly thought out and designed.
Role of ATC in delivering efficiency and safety

• Moving forward:
  – The ATM system will play a larger role in monitoring conformance and conflict detection
  – Humans will maintain key decision maker role
  – Human performance will remain key but changed driver of ATM performance

• ANSPs need to understand how they can optimise performance
  – Organisational systems drive human performance
  – Understand how work environment can influence human performance
Human Performance in 2 minutes!

- Workload/Arousal/Stress: Performance increases with low workload, decreases with high workload.
- Experience: Performance increases with high experience, decreases with low experience.
- Time on task: Vigilance: Performance decreases with long time on task, increases with short time on task.
- Fatigue: Performance decreases with high fatigue, increases with low fatigue.
- Alcohol consumption: Performance decreases with 7 units of alcohol consumption, increases with no alcohol consumption.

Organised by canso, Hosted by AIRWAYS, Lead Sponsor Aireon™
What do we currently do?

Asset

Risk
The Human Performance Pyramid

- People make ATM work (Business Performance)
- People need support (Human Performance)
- Support needs expertise (Human Factors)
- The key Human Performance areas that deliver the business
- The discipline that deals with the underlying Human Factors in work situations and their optimisation
- Safe, effective system performance [cost, service, delivery, etc.]
  - Selection, Training, Procedures, Tools & Equipment, Teamwork, Roles & Responsibilities, Wellbeing, Leadership, Change Management, HP Assurance
Organisational influences on Human Performance
What the ANSPs want...

- Identify which elements of human performance ANSPs should focus on.
- Identify where ANSPs are already doing well and where improvements could help business performance.
- Identify what other ANSPs are doing in this area.
- Identify the level of maturity an ANSP needs to get to, considering the size and scale of its operations.
- Identify first steps to take in managing human performance.
ANSP Contributors to the Standard

- AP15 oversight
  - Eurocontrol and FAA – co-chairs of AP-15
- Contributors
  - NATS
  - Airservices Australia
  - AustroControl
  - NAV CANADA
  - Avinor
  - LFV
12 Supports for Human Performance
Role of ATC in delivering efficiency and safety

Organisational Vision: People make ATM work
“An appreciation of the role of Human Performance in the delivery of service”
Scope: All operational staff (including managers, ATCOs, ATSEPs/TecOps etc)

Human Performance
“Focuses on all job-related factors at the individual, group and organisational level”

1. Policy, Strategy, Resources
   - 2. Occupational Health & Wellbeing
   - 3. ATM Equipment & Support Tools
   - 4. Operational Procedures
   - 5. Teamwork & Communication
   - 6. Operational Training
   - 7. ATCO Selection
   - 8. Impact of Change
   - 9. Leadership
   - 10. Roles & Responsibilities
   - 11. Investigation & Learning

12. Human Performance Assurance

Human Factors
“Discipline applying scientific knowledge to optimise well-being and system performance”

HF supporting methods and tools:
e.g. HF case, HCA, HSI, User Confidence, Design Guidance, TMA, Training Effectiveness, Workload, SA, Teamwork, Comms, ROSS, D2O, Safety in the Wild
## Maturity Levels

### Element 5: Teamwork and Communication

<table>
<thead>
<tr>
<th>Objective</th>
<th>Initiating</th>
<th>Planning / Initial Implementation</th>
<th>Implementing</th>
<th>Managing &amp; Measuring</th>
<th>Continuous Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>To optimise communication, performance, and shared situational awareness when working together and across system interfaces.</td>
<td>Teamwork and team performance is not considered as being part of the service delivery.</td>
<td>There is some recognition of team attitudes, behaviours and teamwork relations and how they influence performance.</td>
<td>Teamwork is considered a skill supporting human and system performance.</td>
<td>There is a systematic TRM Program in place including regular training &amp; licensing of all operational staff (including engineers/technicians) and recording and evaluation of team working skills.</td>
<td>Effective team working practices and team performance are considered as major resources to mitigate safety events and to improve performance.</td>
</tr>
<tr>
<td>Operational groups are working independently from each other to achieve different goals.</td>
<td>Groups from different units / departments work independently from those teams.</td>
<td>There is a policy in place to develop and reinforce Team Resource Management (TRM) principles (e.g. teambuilding activities, watch briefings, facility safety councils).</td>
<td>Controllers are trained on positive attitudes and behaviours towards teamwork.</td>
<td>Teamwork is recognised as a mitigating factor to safety events.</td>
<td>Team performance is compared across operational teams to ensure teams learn from each other and continuously improve their performance.</td>
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<tr>
<td></td>
<td>There are some “team building” activities in place.</td>
<td>Groups from different units / departments who collaborate over time to achieve a common goal are considered as being a “team” with dedicated team responsibilities.</td>
<td>There is a policy in place to develop and reinforce Team Resource Management (TRM) principles (e.g. teambuilding activities, watch briefings, facility safety councils).</td>
<td>TRM skills are part of the competency scheme and are practiced and reinforced in live and simulator operations.</td>
<td>Research is done looking at team factors in the ATM system.</td>
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## Pilot Assessment of SoE

<table>
<thead>
<tr>
<th>Country</th>
<th>Agency/Control Authority</th>
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</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Airservices Australia</td>
</tr>
<tr>
<td>Austria</td>
<td>Austro Control</td>
</tr>
<tr>
<td>Belgium</td>
<td>Belgo Control</td>
</tr>
<tr>
<td>Canada</td>
<td>NAV CANADA</td>
</tr>
<tr>
<td>Finland</td>
<td>Finavia</td>
</tr>
<tr>
<td>France</td>
<td>DSNA</td>
</tr>
<tr>
<td>Hungary</td>
<td>Hungarocontrol</td>
</tr>
<tr>
<td>Ireland</td>
<td>IAA</td>
</tr>
<tr>
<td>Maastricht</td>
<td>EUROCONTROL</td>
</tr>
<tr>
<td>Norway</td>
<td>Avinor</td>
</tr>
<tr>
<td>Singapore</td>
<td>CAAS</td>
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<tr>
<td>Sweden</td>
<td>LFV</td>
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<tr>
<td>UK</td>
<td>NATS</td>
</tr>
<tr>
<td>USA</td>
<td>FAA</td>
</tr>
</tbody>
</table>
Example 1
Comparison across all ANSPs
White Paper

- The White Paper was published in December 2015.
How to use the SoE

1. Authorising the Assessment
2. Performing the Assessment (as-is)
3. Determining the Optimum Level (to-be)
4. Determining Actions Required
5. Action Plan
6. Regular Review (Effectiveness)
Next Steps

The work of AP-15 on the HP SoE is now complete.

A new CANSO Human Performance work stream is being proposed to:
• Produce guidance material to aid understanding of what should be in place to achieve each level of each element of the HP SoE
• Propose an assessment methodology which aligns with that for the SMS SoE
Fatigue Management

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Workshop objectives

- Background to why fatigue management is now gaining importance for ANSPs
- Briefly discuss what drives fatigue levels
- Provide examples of how four ANSPs currently manage fatigue and how they intend to evolve their approach
- Discuss how CANSO can support your ANSP in its efforts to manage this risk
Increasing importance of fatigue management

- Fatigue is something that can occur in all professions
  - 24 hour operations
- Contributes to 15-20% of fatal aviation accidents caused by human error
- ICAO and industry recognised need for similar regulations to those for pilots and cabin crew
- National Health & Safety regulations increasingly focused on well-being
Endorsed late 2015
• Effective implementation 2020
• Places obligations on regulator and service provider
• Addresses
  – Work scheduling
  – Education
  – Promotion of fatigue as a risk
ICAO SARPS

FM regulations to be established by States

FM options for a service provider

Additional requirements related to prescriptive regs.

Additional requirements related to FRMS

Prescriptive:
- Mandatory

FRMS:
- Optional

- Evidence that limits are not exceeded
- FM training

- Protection of information
- Integrate with SMS
- Subject to approval

Evidence that limits are not exceeded
- FM training

- Protection of information
- Integrate with SMS
- Subject to approval
CANSO Message to ICAO FRMS Symposium

- Regulators should start considering their approach today.
- ANSPs will need in excess of two years to implement any fatigue management intervention which requires additional resources.

- 18 months therefore available to research, negotiate and legislate new regulations
  - CANSO views this as a challenging timeline for any regulator.
Prescriptive Limitations

**Maximum**
- Hours in any duty time
- Number of consecutive work days
- Hours worked in a defined period
- Time-in-position

**Minimum**
- Duration of non-duty period
- Number of non-duty days in a defined period
- Duration of breaks between periods in-position
Prescriptive Limitations Assurance

Limits have not been exceeded

Cases of Deviation:
- Reason
- Extent
- Date and time
- Safety case: mitigation to support deviation
Fatigue Risk Management

- Policy
- Documentation
- Hazard Identification
- Risk Assessment
- Risk Mitigation
- Assurance
- Promotion and Training
Understanding the differing approaches

Complexity to develop and apply

Prescriptive Approach

Prescriptive Approach amended based on SMS practice

Fatigue Risk Management System

Ability to modify to meet business requirements
ICAO Guidance

- Co-branding with CANSO
- Great introduction to fatigue management
  - Science/scientific principles
  - Implementation of effective fatigue approaches
    - Prescriptive
    - FRMS
Fatigue Definition

A physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase and/or workload (mental and/or physical activity) that can impair a person’s alertness and ability to adequately perform safety-related operational activities.

Key words:
- Sleep loss
- Extended wakefulness
- Circadian Phase
- Workload
- Alertness
- Perform safety-related operational activities
- Mental or physical performance
Fatigue – Causes and Effects

**CAUSAL FACTORS:**

1. SLEEP LOSS or EXTENDED WAKEFULNESS
2. CIRCADIAN PHASE
3. WORKLOAD

**PHYSIOLOGICAL STATE** (Not measured directly)

**FATIGUE**
- (reduced mental performance capability)
- (reduced physical performance capability)

**EFFECTS:**

- DEGRADED OPERATIONAL PERFORMANCE
- DEGRADED ALERTNESS
Why Sleep?

- **Why sleep?**
- Brain needs to go ‘off-line’ for essential recovery and maintenance
  - reduced processing of inputs from the senses (light, sound, smell)
    - complex series of processes dreaming (REM) and non-dreaming (non-REM)
    - memory consolidation, learning
    - emotional regulation
    - repair of tissue wear-and-tear
    - growth
    - recharge immune system
    - regulate appetite, metabolism ...
  - wake up as an updated version of yourself
CAUSAL FACTOR 1: SLEEP LOSS / EXTENDED WAKEFULNESS (INSUFFICIENT SLEEP)

Sleep Loss Effects on Performance:
Less Sleep per Night = Worse Performance

<table>
<thead>
<tr>
<th>Sleep Schedule</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Hrs sleep/night</td>
<td>WORSE</td>
</tr>
<tr>
<td>5 Hrs sleep/night</td>
<td>WORSE</td>
</tr>
<tr>
<td>6.5 Hrs sleep/night</td>
<td>WORSE</td>
</tr>
<tr>
<td>8 Hrs sleep/night</td>
<td>BETTER</td>
</tr>
</tbody>
</table>

7 Days on Sleep Schedule
Sleep Loss and Recovery

• Recovery is not hour-for-hour:
  • deeper, more consolidated sleep on 1st recovery night
  • recovery usually takes at least 2 nights of unrestricted sleep
    • 1st night – recover deep non-REM (slow-wave sleep)
    • 2nd night – recover REM
  • not 48 hours off
  • waking function can take more than 2 full nights of sleep to recover

• Pressure for sleep builds up across time awake
CAUSAL FACTOR 2: CIRCADIAN PHASE
(TIME of DAY)

Circadian Phase Effects on Performance:
NIGHTTIME = WORSE PERFORMANCE
Circadian Phase Effects on Performance: HIGH POINTS and LOW POINTS

Approximate Window of Daily High Point (hours preceding usual bed time)

Approximate Window of Daily Low Point ("Window of Circadian Low" or WOCL) (hours preceding usual wake-up time)
Ideal: Day Work and Night Sleep

In an ideal world, we WORK DURING the DAY, across the period of increasing circadian alertness...

...and we SLEEP DURING the NIGHT, across the period of decreasing circadian alertness...
In reality, we must sometimes work during the night, across the period of decreasing circadian alertness.

...and we must sometimes try to sleep during the day, across the period of increasing circadian alertness.

...increased risk of errors at night...

...compounded by insufficient sleep (reduced ability to obtain sufficient sleep during the day).
Causal Factor 3: Workload

• What do we mean by workload?

• In ATC, generally refers to mental workload: demand placed on operator’s mental resources used for attention, perception, reasonable decision-making and action
FATIGUE in other OPERATIONS:

Extreme Operational Consequences

- Three Mile Island Near-Meltdown – 28 MAR 1979 “The machines worked quite well. If there had been no human fault, the whole thing would have been a minor failure” – John Kemeny, who led the panel investigating the disaster (early morning hours)

- Challenger Explosion – 28 JAN 1986 The Presidential Commission report indicated that there was a serious flaw in decision-making (during early morning hours) prior to launch

- Chernobyl Meltdown – 26 APR 1986 “The standard point of view is that operator error was the root cause of the disaster. This was also the view of the Soviet Accident Commission.” E. Stang, 1996. (early morning hours)

- Sinking of the Herald of Free Enterprise – 06 MAR 1987 “… combination of human errors (management, design and individual) that resulted in the loss of 193 lives. (Bosun responsible for closing bow doors was on break and asleep during launch)

- Exxon Valdez Grounding - 24 MAR 1989 NTSB “determines that the probable cause of the grounding of the EXXON VALDEZ was the failure of the third mate to properly maneuver the vessel because of fatigue and excessive workload; and the failure of Exxon Shipping Company to provide a fit master and a rested and sufficient crew”
Key Points

• Fatigue-related impairment results from physiological disruption
  • fatigued people are unable to perform at their optimum level, not unwilling
• Sleep is required to recover from the physical and mental exertion of all waking activities (not just work demands)
  • managing fatigue is primarily about managing sleep opportunities, not the length of rest breaks
• The circadian body clock drives rhythms in many aspects of waking function (physical and mental work capacity, mood ...)
  • ability to fall sleep and stay asleep
  • the perfect roster is day work with unrestricted sleep at night
• In 24/7 operations fatigue is inevitable
  • the associated safety risk must be managed
Morning Tea