24 May 2018, Cologne

Safe and Efficient Crew Rosters

Tomas Klemets
Head of Scheduling Safety, Jeppesen
Tomas Klemets is since the late nineties specialized in airline crew management and has worked with a large number of airline operators world-wide helping them find the optimal blend of crew productivity, real costs, quality of life aspects, roster stability and flight safety.

Tomas is heading the crew scheduling safety work at Jeppesen and has presented results and findings at a large number of safety conferences and in safety journals over the last ten years. Tomas is the leading Jeppesen expert, and a key innovator behind a wide range of solutions, services, concepts and industry standards, in the field of Fatigue Risk Management aimed at supporting the airlines crew management processes.
Human Error…

Figure 1: execution and planning failures adapted from Rasmussen

- Fatigue
- Situation awareness
- Workload
- Training / experience
- Familiarity
- Memory

Fatigue Risk ≈ the risk of a lapse, slip, mistake and/or violation by crew as a consequence of reduced alertness, negatively impacting flight safety.
The core of the problem...

Rule sets are ‘flawed’ x 2:
- Allow for new, unexpected fatiguing patterns to “slip through” (allowing higher risk)
- Block also fairly good patterns from being produced (lowering crew efficiency)

The space of possibilities, as described by Jens Rasmussen. Figure adapted from Rasmussen’s 1997 article.
The Crew Management Process

- Flexibility in agreements
- In tight cnx
- Standbys and reserves
- Buffers to FTL
- A/C changes
- # duty days
- Per base
- Per qualification
- Amount of crew
- Pre-conditions
- FTLs
- Tools/People
- Flight schedule
- Labor agreement
- Business model
- Real costs
- Hotels
- Per diem
- Over time pay
- Positioning
- # crew
- Robustness
- Fatigue
- Positioning
- Meal stops
- Fatigue risk
- Crew composition
- Recency
- Quality of life aspects
- Bid fulfillment
- Contract variations
- Overall workload / TAFB
- Flight safety aspects
- Fair share
The best use of fatigue models (science)

Gradient towards increased efficiency

Gradient towards better working conditions

Plus: using them for improving the rules.
A BMM in action reducing risk

- “Normal” planning rules/focus w/o any true guidance on human physiology

- Vs. having a BMM providing an incentive for avoiding poorly planned flights.

- Same data. Same rules. Almost identical crew efficiency. **But much lower risk.**

- 45% risk
- +2 duty days
Concluding...

Company:
- Provide for diversity
- Allow crew influence
- Build in buffers to rule limits (for the sake of roster stability)
- Suppress overall risk using a BMM during planning
- Distribute risk using a BMM in planning
- Collect and use operational experience
- Improve (if allowed) also the rules

Crew:
- Don’t expect perfection: the business model will dictate a certain fatigue risk level
- Assist in gathering quality data; report, collect data, answer surveys.
- Make sleep a priority: to recover and prepare
- ...
1. Difficult capturing risk on this type of curve with any precision

2. By setting max duty time and minimum rest