

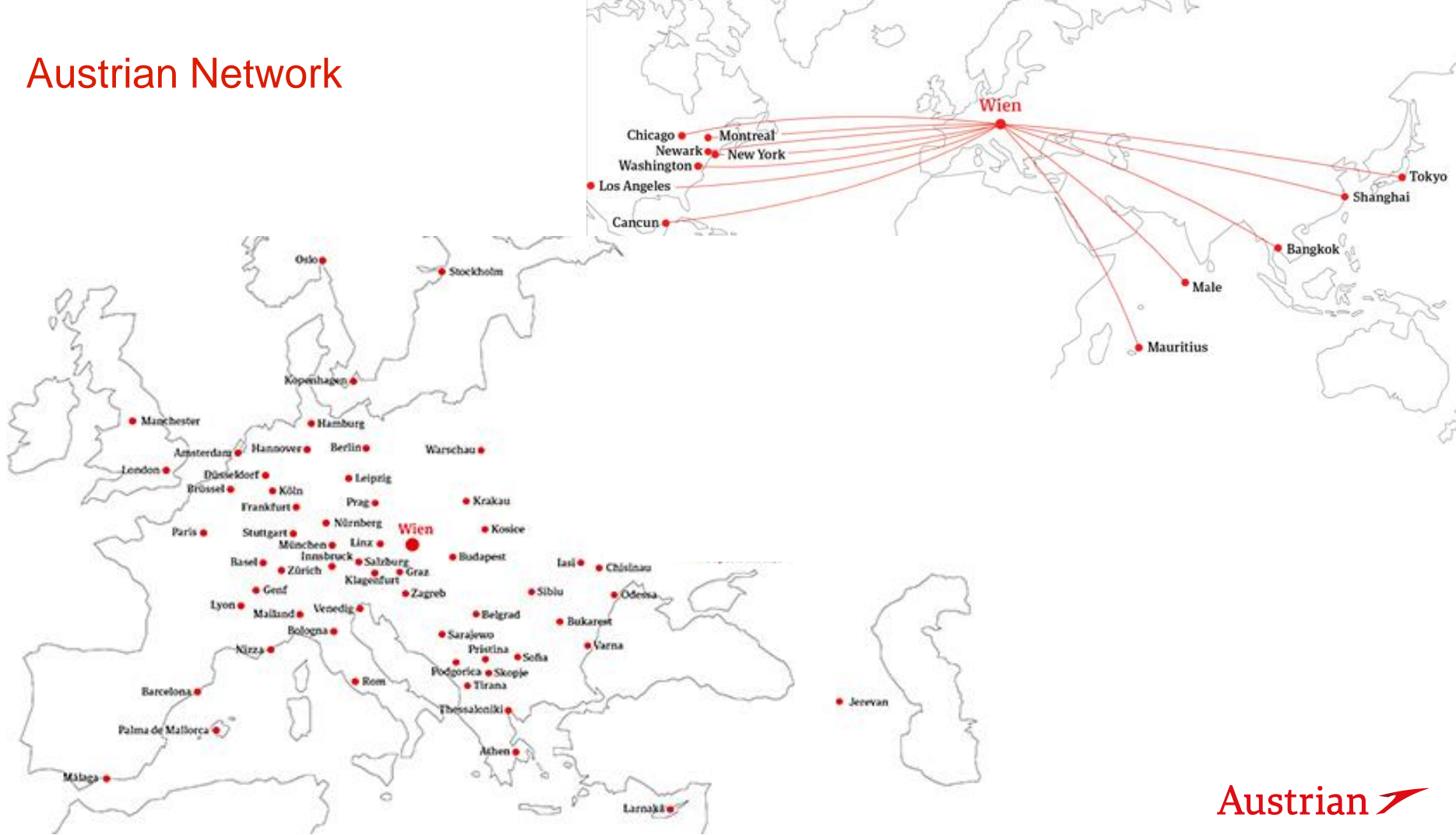


# Fatigue Risk Management Methods and Tools

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Internal

# Austrian Network



# Austrian Fatigue Challenges

- 2-pilot North Atlantic Ops
- Night Flights / Split Duties
  - Eastern Europe/Balkans
  - Middle East
  - „super early“ connections into VIE hub
- Less than 7/7 ops and/or mixed aircraft preventing layovers
- shifts moving back and forth well within EASA disruptive limits
- Hotels

# Risk Assessment

- Risk Factor Analysis performed for night duties
  - manual process
  - depends on new night duties being reported by planning department
  - hard to catch with automated planning
- Analysis of fatigue reports
  - including basic root cause analysis
  - basically counting reports per route
  - matching of reports with complete duties/rosters not supported by reporting software
    - data protection concerns
  - lots of trees

# Roster Metrics – Biomathematical Modelling

- early decision to implement a “live” system within CMS
- First DLR (discontinued)
- now SAFE
- SP prediction shown in roster
- automatic warnings

but

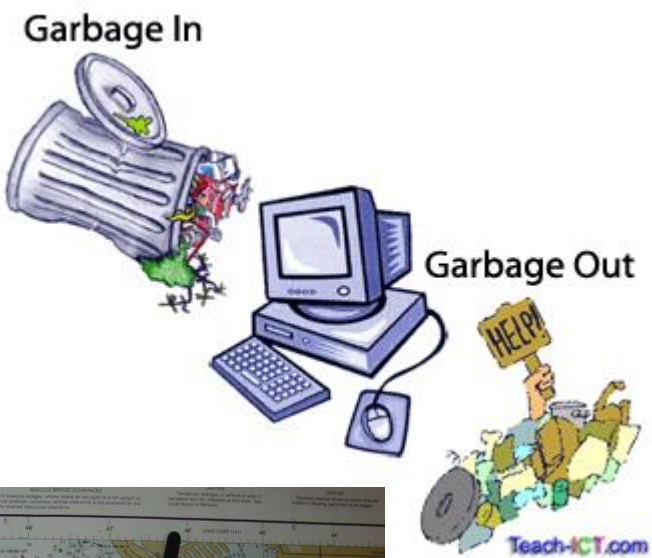
## FRM CHECKS

06Mar: Fatigue (5.19) at arrival 08:15 (OS 128) exceeds the limit of 5.16 for  
29973  
06Mar: Fatigue (5.21) at 07:15 (OS 128) exceeds the limit of 5.16 for  
29973



# Roster Metric Pitfalls

- algorithms can only be as good as the roster data they work on
- know your algorithm's and CMS's strengths and weaknesses
- you need more than one tool
- Beware of metric fixation



# The prescription trap

- Crew planners are used to prescriptive rules
- What's inside is OK
- displaying green fatigue values with a CMS looks like an OK
- Training required to emphasize that „all green“ can still need to fatigue
- Does the CMS / algorithm integration allow for meaningful checks / boundaries?



# „Blind spots“

- Predicted crew alertness levels using roster metrics
  - only show up in CMS once a delay has is entered in ops control software
  - often very late
- Predictions might be interpreted as valid for current crew
  - don't know about crew behaviour / chronotype
- Fatigue Checklist
- Controlled Rest
  - “single pilot ops light” without training

Fatigue Checklist				
How do you feel?	fairly alert or better		0	
	neither alert nor sleepy or some signs of sleepiness		3	
	sleepy, but no effort to keep alert		5	
	sleepy, some effort to keep alert or very sleepy, great effort to keep alert, fighting sleep or falling asleep involuntarily		10	
Rate your last sleep using the descriptions and grid below: • Good – did not wake at all, no difficulty falling asleep • Fair – woke a few times during the sleep period, fell asleep again easily • Poor – woke several times, difficulty falling asleep (again)				
h of sleep	Sleep Quality		→	
<6	Good	Fair		Poor
6-8	2	5		5
>8	0	2		5
At this time, do you feel that you will be able to complete the duty safely from a fatigue point of view?			No 2 Yes 0	
Answer all three questions and add up the points.				



# How risky is fatigue?

- Risk Matrix

vs.

- acceptable levels of fatigue

- Do we know enough to classify fatigue risk?

Event Severity Classification Matrix	Question 2: What was the effectiveness of the remaining barriers between this event and the most credible accident scenario E0 to E12? (answer below)												
	None		Not effective 0% 90%		Minimal 99%		Limited 99.9%		Effective 99.99%		Very effective 99.999%		Normal 99.9999%
	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12
	Alternative Question 2: What is the likelihood that this event leads to the most credible accident scenario?												
	1 out of 1	1 out of 2	1 out of 10	1 out of 30	1 out of 100	1 out of 300	1 out of 1,000	1 out of 3,000	1 out of 10,000	1 out of 30,000	1 out of 100,000	1 out of 300,000	1 out of 1 mil.
Loss of aircraft or multiple fatalities (3 or more) <i>Catastrophic Accident (S5) – A5</i>	a	a	a	a-b	b	b-c	c	c-d	d	d-e	e	e-f	f
Several fatalities, multiple serious injuries, serious damage to the aircraft (almost lost) <i>Serious Accident (S4 – S5) – A4</i>	a	a-b	b	b-c	c	c-d	d	d-e	e	e-f	f	f-g	g
1 or 2 fatalities, multiple serious injuries, major damage to the aircraft <i>Major Accident (S4) – A3</i>	b	b-c	c	c-d	d	d-e	e	e-f	f	f-g	g	g-h	h
Serious incident with injuries and/or substantial damage to aircraft <i>Serious Incident (S3) – A2</i>	c	c-d	d	d-e	e	e-f	f	f-g	g	g-h	h	h-i	i
Incident with injuries and/or damage to aircraft <i>Incident (S2 – S3) A1</i>	d	d-e	e	e-f	f	f-g	g	g-h	h	h-i	i		
Minor injuries, minor damage to aircraft <i>Minor Injuries or damage (S2) – A0</i>	e	e-f	f	f-g	g	g-h	h	h-i	i				
Incident with discomfort and/or less than minor system damage or less <i>Incident or none (S1 or S0) – An</i>	f	f-g	g	g-h	h	h-i	i						

# Lessons learned

- more training for all involved
- de-emphasize biomathematics
  - use but but don't let them take center stage
- clarify responsibility
  - FSAG advisory or in charge
- obtain roster analytics capability
  - IT resources contested



# Servus