



Proactively and objectively applying scientific knowledge to the control of crew fatigue.

Safety Performance Indicators

europa by
easyJet

FRMS Evolution

- August 18th 1993: AIA 808 – first accident in which fatigue was formally cited as a probable causal factor.
- easyJet founded 1995 – non legacy in terms of FTL management.
- 2003: Project Blue established FRMS principles.
- Customised fatigue reporting available since 2006.
- Mature FRMS which has established comprehensive database correlated against operational growth and development over a period in excess of 10 years.



Hazard Identification Processes

As a starting point basic reactive hazard identification processes could include:

- Safety reports
- Confidential reporting
- Direct management contact
- Appropriately designed crew surveys

Can be reviewed at the airline Safety Action Group or using focus groups

The reactive processes can be expanded and proactive and predictive capability introduced:

- Quality Assurance trending
- Exploratory risk investigations
- Predictive fatigue modelling application at roster development stage

Given sufficient data and support processes an FSAG becomes increasingly effective.



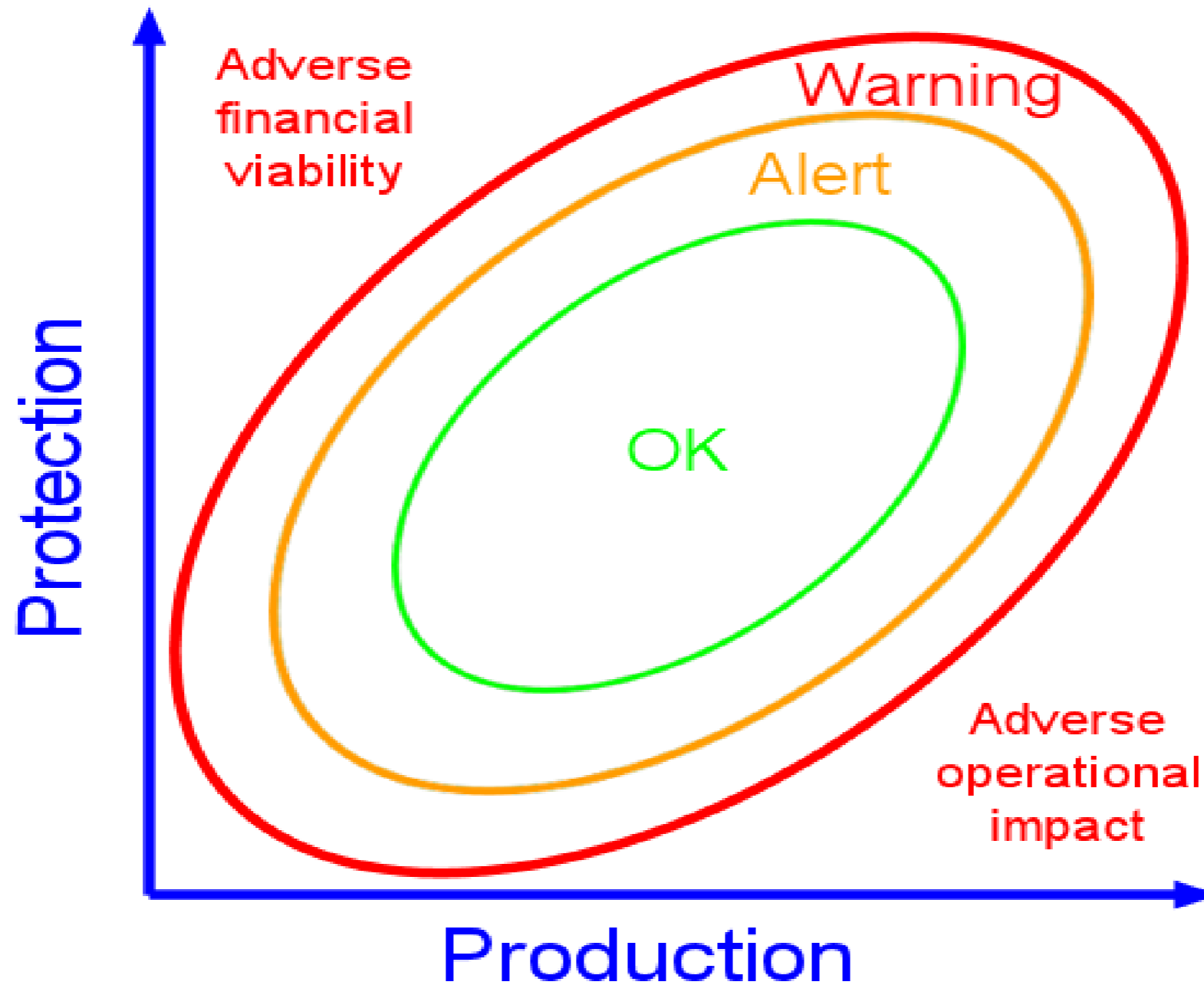
Safety Performance Indicators

- Informed analysis and review of these data sources will derive appropriate Safety Performance Indicators (SPIs).
- SPIs are metrics used to express the level of safety performance achieved in a system.
- These are not static but evolve and can be activated and deactivated in relation to the current risk assessment.
- Dynamic and adaptable – require understanding and interpretation.
- Integrate with current metrics such as compliance and productivity metrics



Protection vs Production

Safety Space - SPI Limits



Defining an SPI

- Analysis of Fatigue Report Forms (FRFs) or fatigue cited in any other safety report.
- All reporting should be managed within a transparent published policy.
- Identify roster fatigue risk indicators within a specific crew population.
- These indicators may be specific to base, fleet, ruleset, contract or any other differentiating factor.

Fatigue Report Form

If confidentiality required tick here

Name Employee No. Pilot/CCM (circle)

WHEN DID IT HAPPEN? Local report date Time of event (local report time)

Duty description (trip pattern)

Sector on which fatigue occurred From To

Hours from report time to when fatigue occurred Disrupt? Yes / No

Aircraft type Number of crew

WHAT HAPPENED?

Describe how you felt (or what you observed)

Please circle how you felt

1 Fully alert, wide awake	5 Moderately let down, tired
2 Very lively, somewhat responsive, but not at peak	6 Extremely tired, very difficult to concentrate
3 OK, somewhat fresh	7 Completely exhausted
4 A little tired, less than fresh	

Please mark the line below with an 'X' at the point that indicates how you felt

alert ----- drowsy

WHY DID IT HAPPEN?

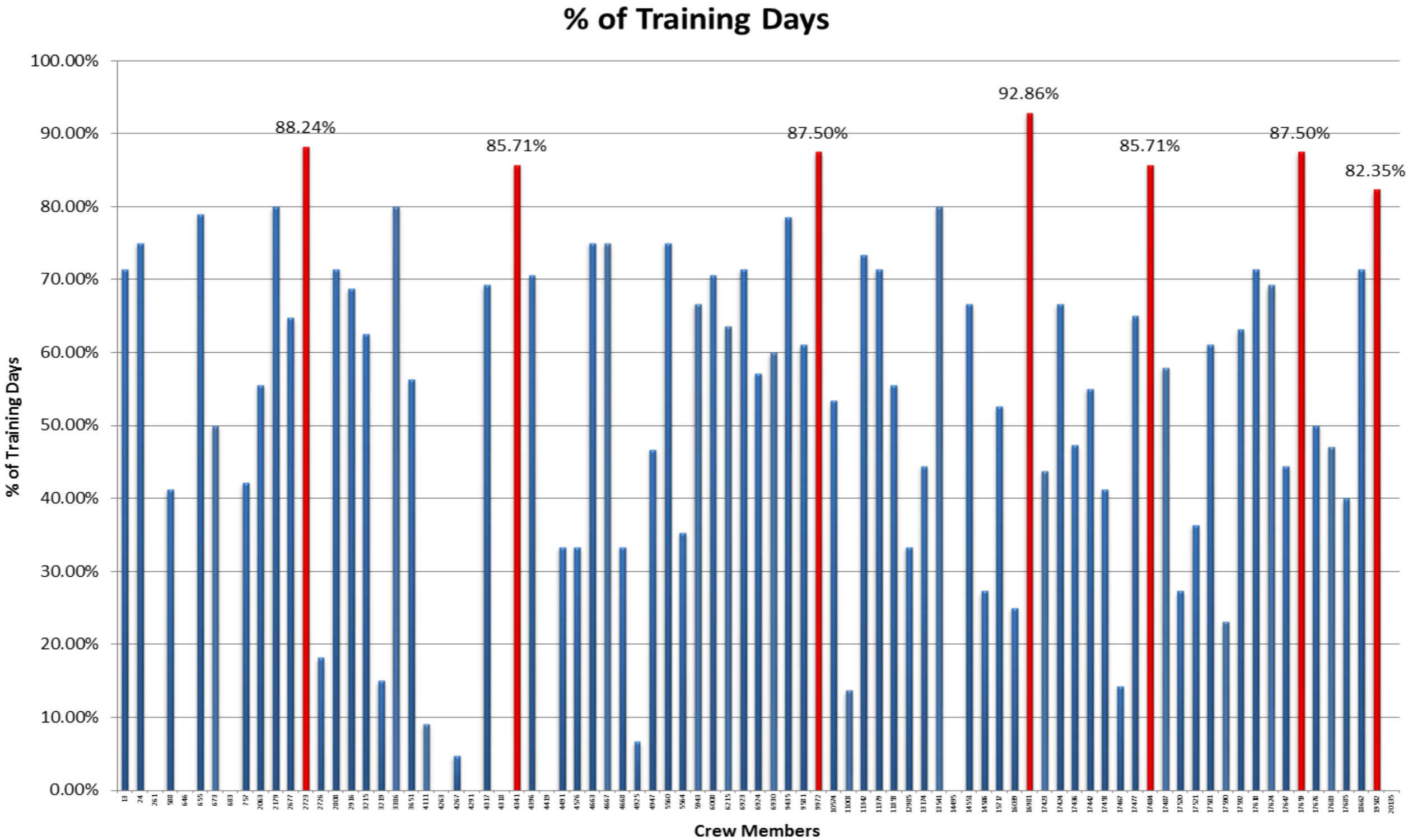
Fatigue prior to duty?	Yes / No	How long had you been awake when the event happened?	hrs	mins
Hotel	Yes / No	How much sleep did you have in the <u>24 hrs</u> before the event?	hrs	mins
Home	Yes / No	How much sleep did you have in the <u>72 hrs</u> before the event?	hrs	mins
Duty itself	Yes / No	flight deck nap? Yes / No	If yes, when	start end
In-flight rest	Yes / No			
Disrupt	Yes / No			
Personal	Yes / No			

Other comments

WHAT DID YOU DO? Actions taken to manage or reduce fatigue (for example, flight deck nap)

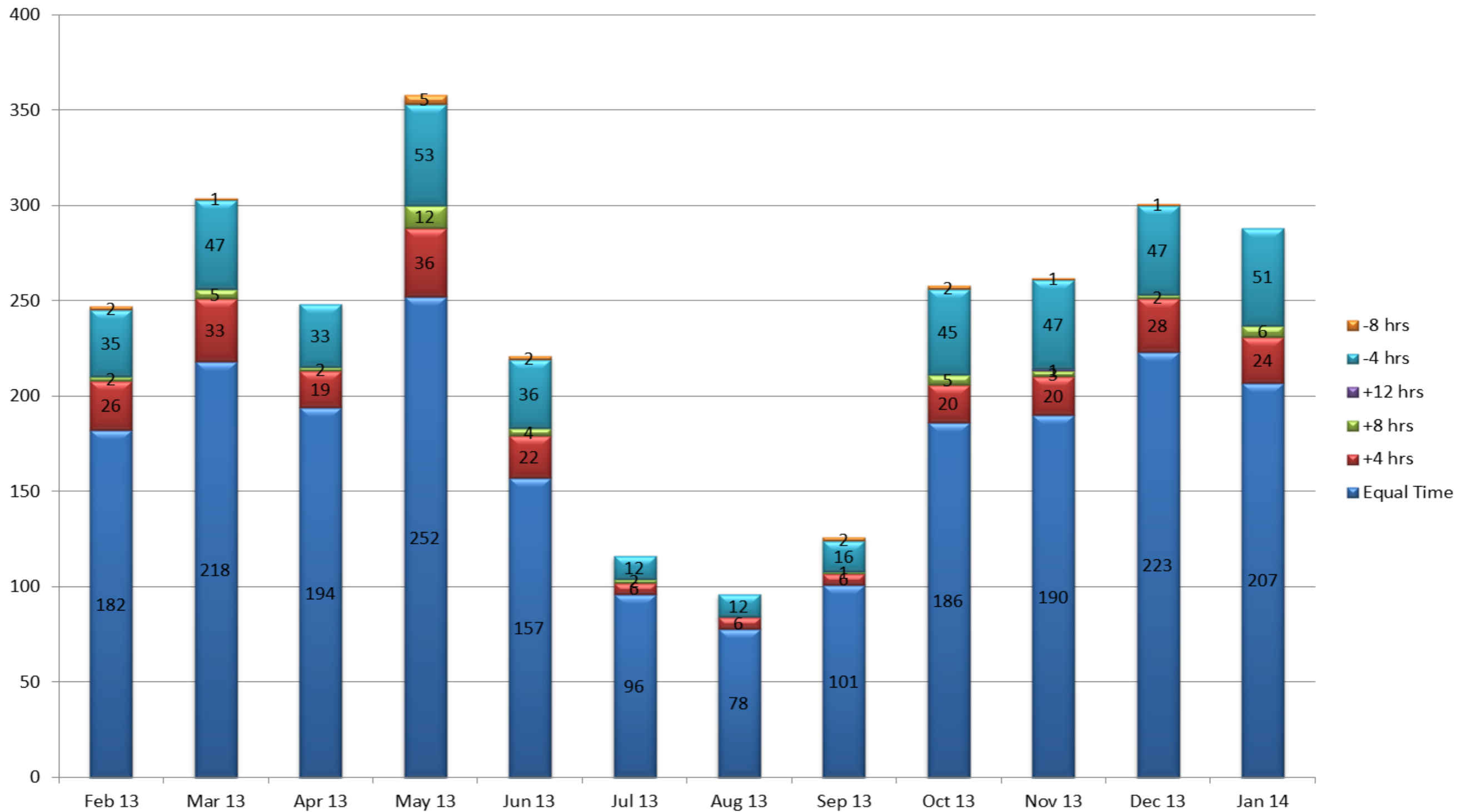
WHAT COULD BE DONE? Suggested corrective actions

Training SPI



Training SPI

SIM Transitions



APEX



- Alertness and Performance Examination
- A biennial analysis of roster related crew performance which utilises a diverse range of objective and subjective methodologies including physiological and psychomotor assessments.
- APEX entails proactively identifying and studying fatigue precursors and trends across all easyJet demographic profiles thereby complementing the reactive FRF process.
- The 2013 study incorporated melatonin testing to assess circadian shift.
- Correlations are performed against FDM data.
- Utilises advanced data mining techniques.

Degree of Fatigue

Fully alert, wide awake

Very lively, responsive at peak

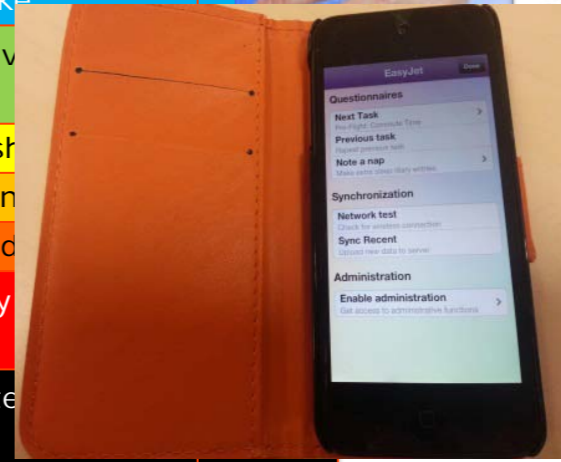
Okay, somewhat fresh

A little tired, less than

Moderately tired, let

Extremely tired, very concentrate

Completely exhausted to function effectively



NASA Task Load Index

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

Name	Task	Date
Mental Demand: How mentally demanding was the task?		
Very Low ----- Very High		
Physical Demand: How physically demanding was the task?		
Very Low ----- Very High		
Temporal Demand: How hurried or rushed was the pace of the task?		
Very Low ----- Very High		
Performance: How successful were you in accomplishing what you were asked to do?		
Perfect ----- Failure		
Effort: How hard did you have to work to accomplish your level of performance?		
Very Low ----- Very High		
Frustration: How insecure, discouraged, irritated, stressed, and annoyed were you?		
Very Low ----- Very High		

				Block A							
D/O D/O D/O			E1	E2	E3	L1	L2	D/O D/O D/O			
Block B							Block C				
E1	E2	E3	L1	L2	D/O	D/O	E1	E2	E3	L1	L2

Roster Characteristic SPI

- Duty length
- Duty placement
- Night duties
- Deep early starts
- Consecutive day sector count
- Forward transitions
- Circadian parity in report
- Rest length
- Rest placement in relation to WOCL
- Recovery days off



Roster Characteristic SPI

SAFETY PERFORMANCE INDICATORS - FRMS (CAUSAL FACTORS TO FATIGUE NORMALISED AGAINST TOTAL FLYING DUTIES FOR MONTH)							
	Fatigue Indicators	Benchmark2013	Trend	Nov-13	Prev month	3 month	12 month
Roster Related	Long Final Day Duty	0.69		1.27	2.03	1.98	1.92
	Insufficient Rest	1.06		1.20	3.17	2.60	2.77
	Long Day One Duty	0.76		0.84	1.53	1.33	1.39
	E - L Transition	0.87		0.75	1.59	1.62	1.87
	Sub Optimal Rest Duration	0.89		0.75	1.83	1.66	1.80
	Elongated Duty >14hr	0.14		0.31	0.55	0.44	0.52
	Consecutive 4 Sector Days	0.80		0.30	0.57	0.53	0.83

Boxes above indicate increase / decrease for current month against benchmark.

Boxes above indicate increase / decrease for current month against previous month.

Boxes above indicate increase / decrease for rolling 12 months against benchmark.

- Can be developed to assess the roster related fatigue risk.
- Workload intensity and roster stability
- Correlated with Event Risk classification to produce a fatigue risk profile

SPI Function

- Awareness of SPI interaction – when trends are significant.
- Mosaic providing a picture of fatigue risk.
- Relevant and robust SPIs are essential to the generation of evidence based mitigations.
- The principle is continuous safety and operational performance improvement in support of business objectives.





Enabling Production and Protection in Harmony

