

Capt Ph. Pilloud, easyJet Switzerland

easyJet



**Head of Operations
Risks Management**

FOUNDED IN 1995 BY STELIOS HAJI-
IOANNOU



1995

One base: LTN

3 Destinations

2 leased aircraft

Virtual Airline

EASYJET IN 2015

2 airlines: Swiss & UK

+65 millions passengers per year

+20 bases
in Europe

+250 acft
+ 9000
employees



easyJet G-EZAE aircraft at Edinburgh photo

Growth: + 15% par annum since 15 years

A Profitable airline

EASYJET

1 Takeoff / Landing
every 40 seconds

Selby 28/02/01

Fatalities – 13

Injuries - 82



At just after 6am the driver fell asleep at the wheel of his car, which then swerved off the M62 onto the track where the driver tried reversing the car off the track and while trying to contact the emergency services the train heading from Newcastle to London hit the car and although remained upright then hit a freight train half a mile down the track.

The story behind the easyJet

Fatigue Risk Management System FRMS

europe by
easyJet

FATIGUE RISK MANAGEMENT SYSTEM

Started in **2004**
with a fatigue study



A Human Engineering study into fatigue levels of flight crew

Aim: To investigate whether a relationship exists between current rostering practices at easyJet, pilot fatigue and human error.

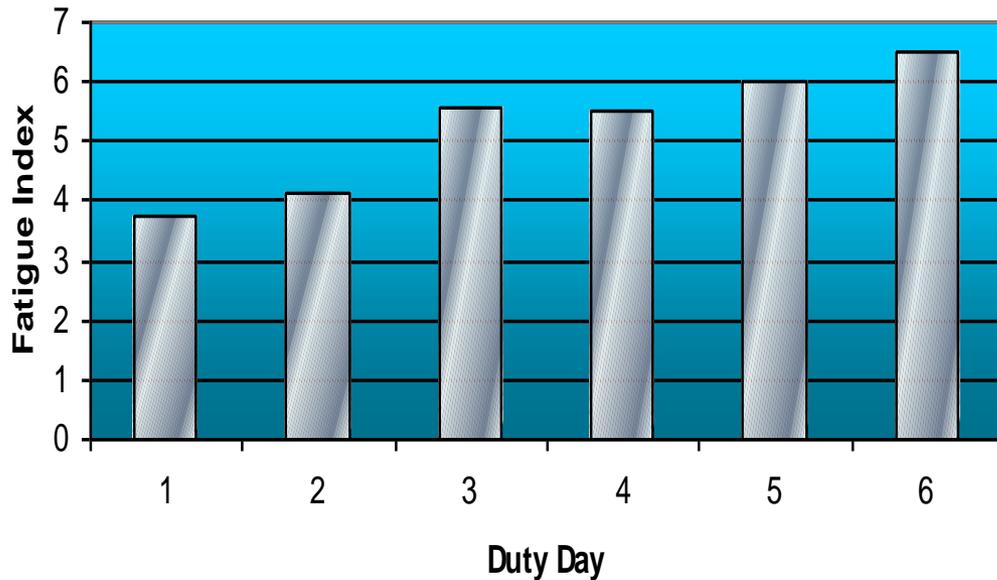
HOW TO MEASURE FATIGUE

utilising data mining from the following sources:

- Surveys
- Flight Data Monitoring (FDM)
- Safety Reports (ASRs)
- LOSA (Line Operations Safety Assessment)
- Cognitive Performance tests
- Subjective fatigue / alertness questionnaires

SURVEY DATA

Reported Fatigue vs. Duty Day



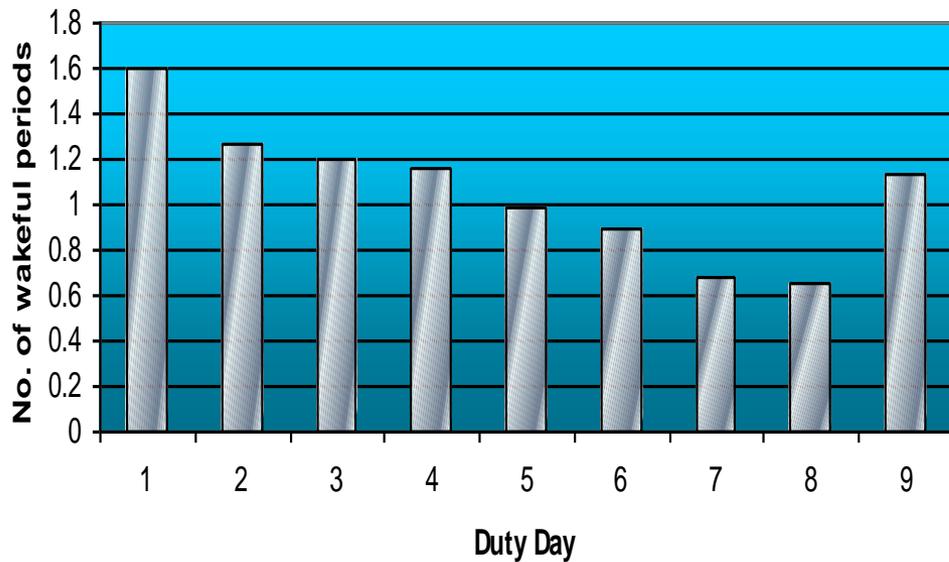
Demographic Surveys

- Cumulative trend across the working week.
- Lowest fatigue report duty day one, highest day six.

– Anova $F(5)=8.113$, $p<0.01$

SLEEP DISRUPTION

Sleep disruption vs. duty day



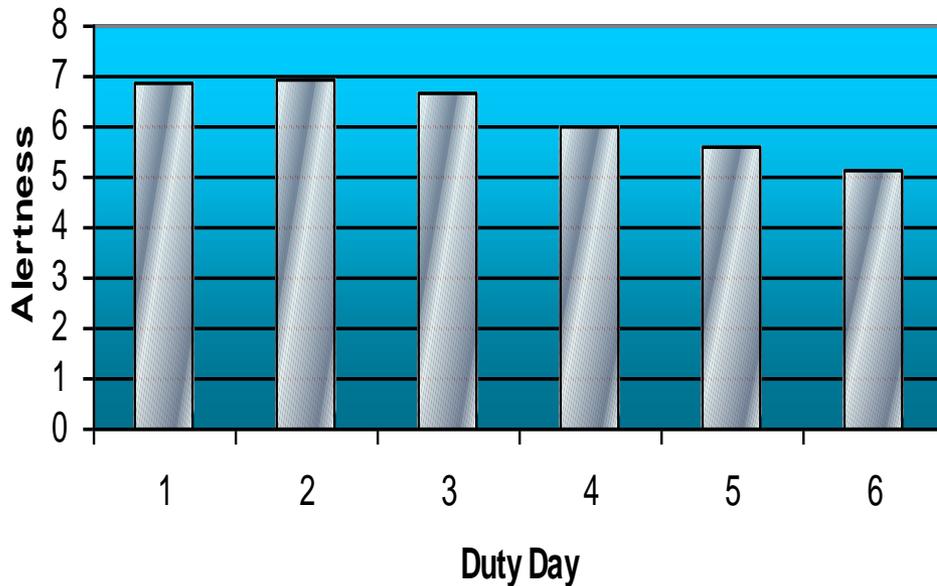
Survey Demographics

- Sleep disruption: 1-2 wakeful periods per night.
- Most apparent before early duty day one.

Anova: $F(8)=6.787, p<0.05$

CREW ALERTNESS

Reported Alertness vs. Duty Day



Demographic Surveys

- Reported Alertness decreasing across working week.
- Lowest alertness day six.
- Highest alertness day one and two.

– Anova: $F(5)=13.962$, $p<0.01$

Critical skills affected by fatigue:

- Understanding a complex situation
- Ignoring irrelevant information
- Assessing risks
- Anticipating consequences
- Effective communication
- Dealing with the unexpected
- Developing and updating strategies



INITIAL ACTIONS

- New rostering practices
- 5 days early or 5 days late
- Preferential Bidding System
- Trip Trade
- FRMS: Policy, reporting, analysis, etc..



FATIGUE RISK MANAGEMENT SYSTEM

2005 FRMS

Policy

Reporting

Analysis

Communication/Training

Use of predictive software



FATIGUE RISK MANAGEMENT SYSTEM

Online fatigue reporting

TO AVOID OBSTACLES, WE NEED TO
SEE THEM FIRST

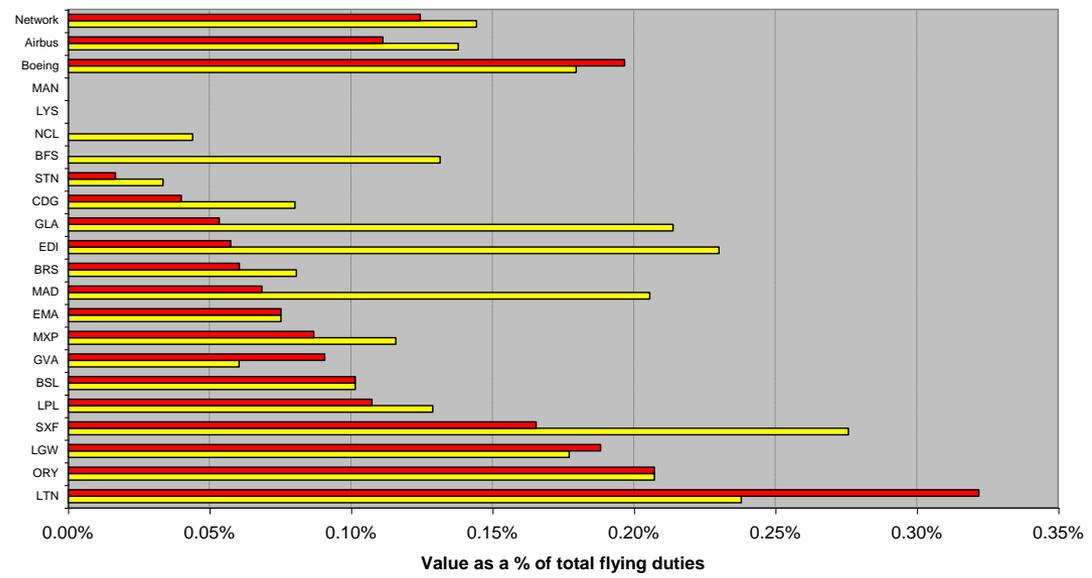
To control the risks,
we need to know
the risks we live with



SAFETY PERFORMANCE INDICATORS - FRMS (CAUSAL FACTORS TO FAITGUE AS % OF TOTAL REPORTS INVESTIGATED FOR XXX)						
	Fatigue Indicators	Trend	XXX	Prev month	3 month	12 month
Roster Related	Consecutive Long Duties		18%	9%	14%	14%
	Dual Transition		14%	7%	7%	9%
	E - L Transition		14%	21%	15%	10%
	Early Report		23%	4%	10%	2%
	Long Final Day Duty		14%	14%	14%	6%
	Sub Optimal Rest Timing		14%	7%	8%	5%

SAFETY PERFORMANCE INDICATORS - FRMS (CAUSAL FACTORS TO FAITGUE AS % OF TOTAL REPORTS INVESTIGATED FOR XXX)						
	Fatigue Indicators	Trend	XXX	Prev month	3 month	12 month
Personal Factors	Hotel Factors		5%	1%	3%	2%
	Disrupted Home Rest		5%	4%	5%	6%
	Health Issues		5%	0%	2%	3%
	Stress		0%	1%	1%	2%
	Young Child at Home		0%	0%	1%	1%

Reported fatigue normalised against total Flying Duties FRF Fatigued



Example of Factors

Factor Name	%Of Reports Containing Factor
Ineffective Contextual Rest	51.6%
Meaning – Ineffective Rest In The Context Of The Duties Or Block (more coming later!)	
Sub-Optimal Rest Timing	24.1%
Meaning – Rest Period Desynchronised From Circadian Rhythm. (Rest During Daylight)	
Sub-Optimal Early-Late Transition	23.6%
Meaning – Transition From An Early Duty To A Late Duty Finishing After 23:00L (Usually also contains Sub-Optimal Rest Duration Rest Between 18h-30h)	
Long Final Day Duty	21.4%
Meaning – Duty In Excess Of 10 Hours After 4 Duty Days.	
Long Day One Early Duty	18.9%
Meaning – Early Duty In Excess Of 10 Hours On D1.	

What is Ineffective Contextual Rest?

Is the rest effective in the context of the surrounding duties?

Including but not limited to:

- Duty Length
- Sectors
- Duty Start Times
- Duty Finish Times

What can rostering do?

Take a look when changing duties

Think about rest before a duty (11 hours rest before a 13 hour duty may not be great)

Look at the time of finish (Finishing at 8pm is very different to finishing at 4am)

Look at rest periods throughout the block. (Consecutive days rest of 12:00-13:00)

Why Is Rest so important?

Increased rest can improve memory function.

Increased rest can restore the body.

Most Importantly

Increased rest is the most simple and positive way to mitigate fatigue.



FATIGUE RISK MANAGEMENT SYSTEM

A continuous
Development for all
stakeholders



Fatigue Countermeasure Training (FACT)

FATIGUE PRECURSORS AND EFFECTS

- Precursors
- Variable working time and conditions
 - Long periods of work



- Fatigue effects
- Physiological
 - Cognitive
 - Behavioural



THE EFFECT OF FATIGUE ON PERFORMANCE

- Become poor in assessing risk or appreciate consequences of action
- Reduced ability to notice and appropriately react to unusual events
- Unable to track multiple sources of information and avoid distractions
- Moody—impatience when dealing with others
- Difficult communicating clearly



CAUSES OF FATIGUE

Lack of sleep



Working



Overstimulation



Jet lag



Mental stress

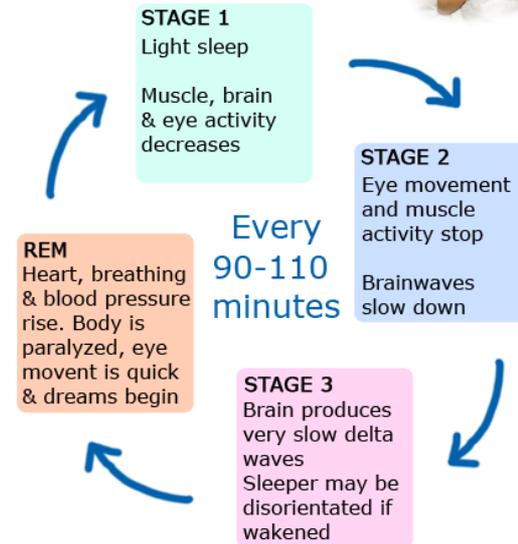


Disease

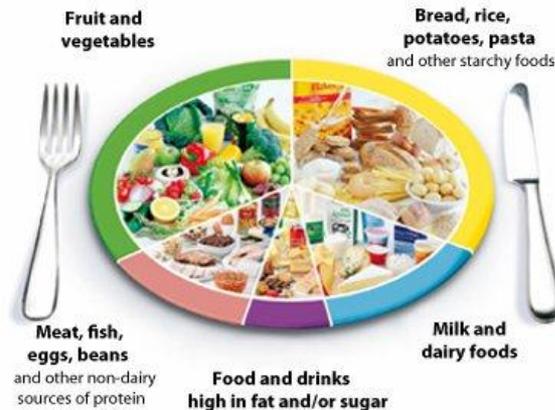


WHAT IS SLEEP

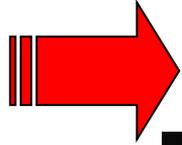
The Sleep Cycle 4 Stages Of Sleep



FATIGUE INFLUENCING FACTORS



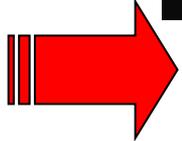
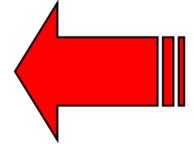
Fatigue Countermeasures



Tell your colleague

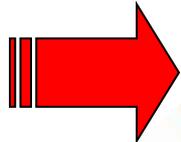
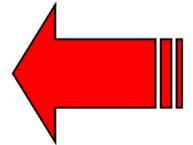


Workload sharing/offloading

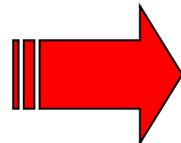
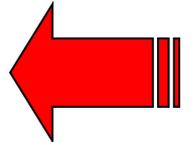


Increased communication & cross-checking

Stay hydrated



Have a 'slow release' snack



Controlled rest in the cockpit

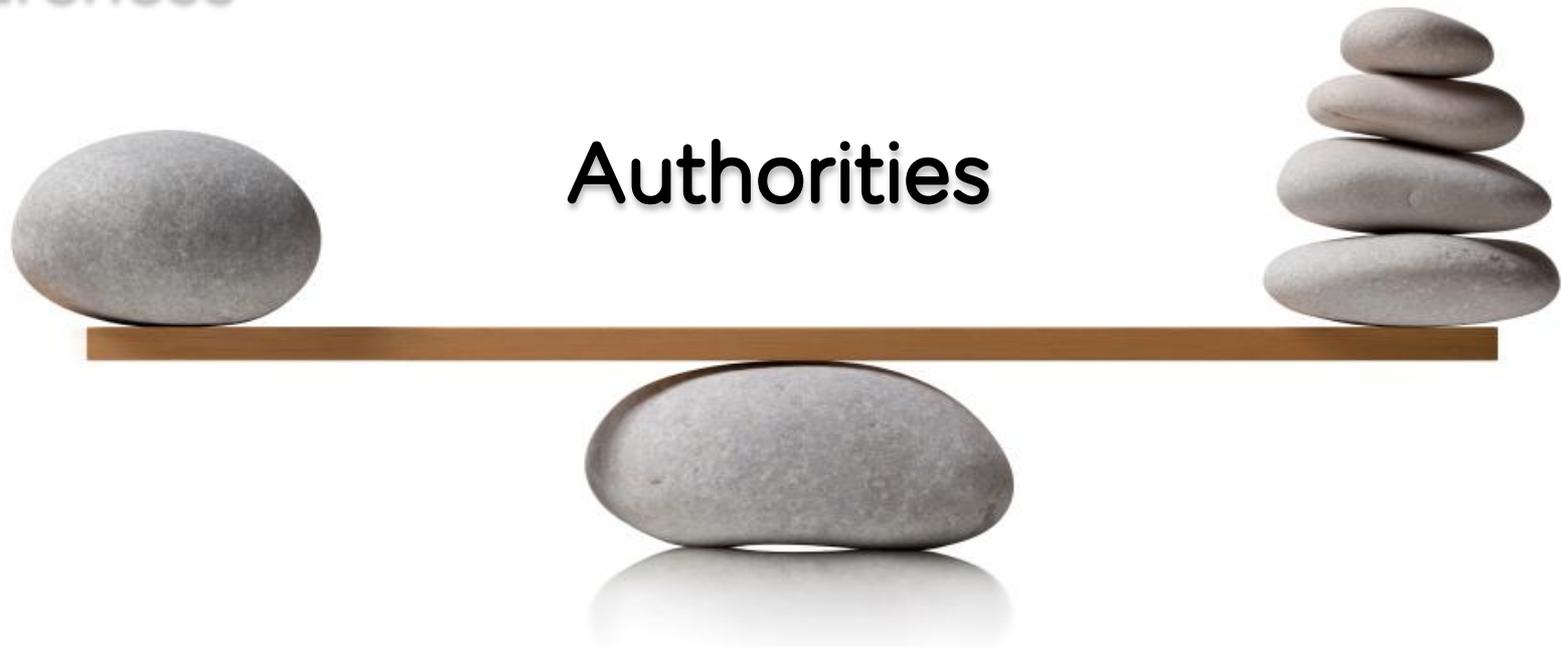
FATIGUE RISK MANAGEMENT IS A SHARED RESPONSIBILITY

Life style

Personal awareness

Crew rostering

Company policy



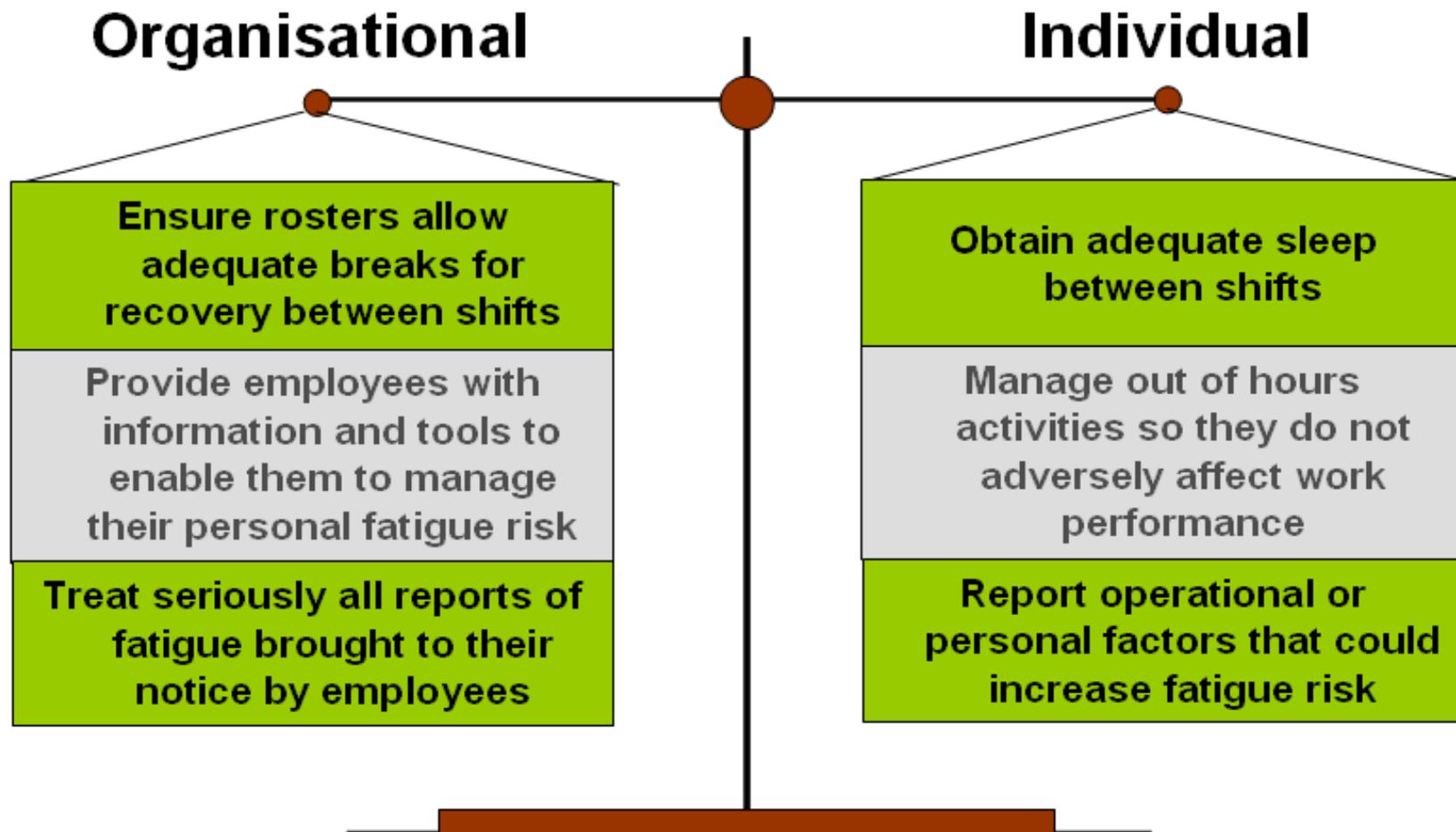


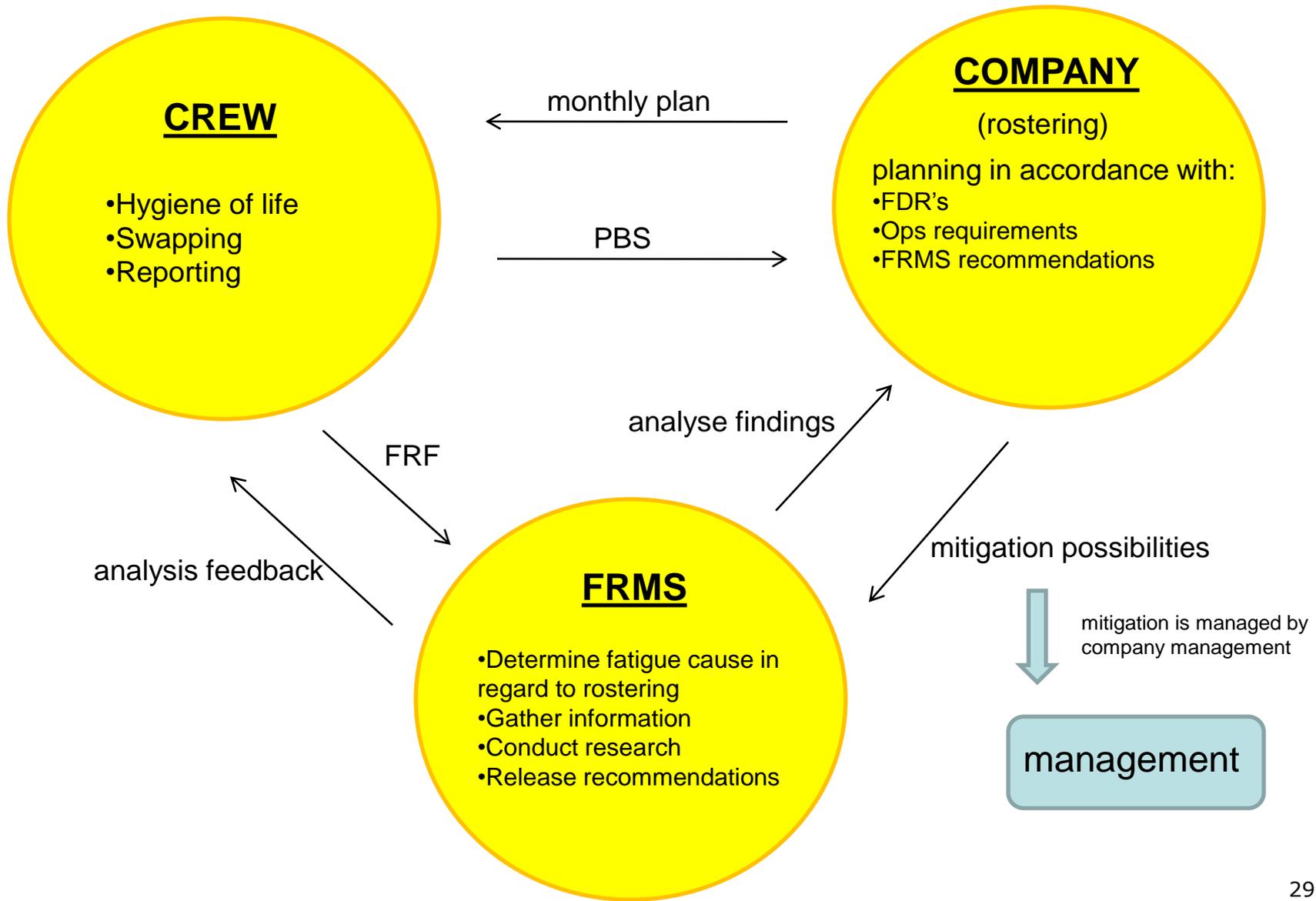
Exxon Valdez Spill

Deceased (Approximately)
100,000-250,000 sea birds
2,800 sea otters
12 River Otters
300 Harbour Seals
247 Bald Eagles
22 Orcas



On 24/03/1989 the Exxon Valdez oil tanker bound for California while in Alaska struck a reef and spilled 38 million gallons of crude oil. The **crew had been reduced due to cost cutting**, requiring further hours per crew member on board, the third mates plotting and navigation was unchecked, the crew member was due to be relieved however didn't wake the other crew member due to his long working hours.





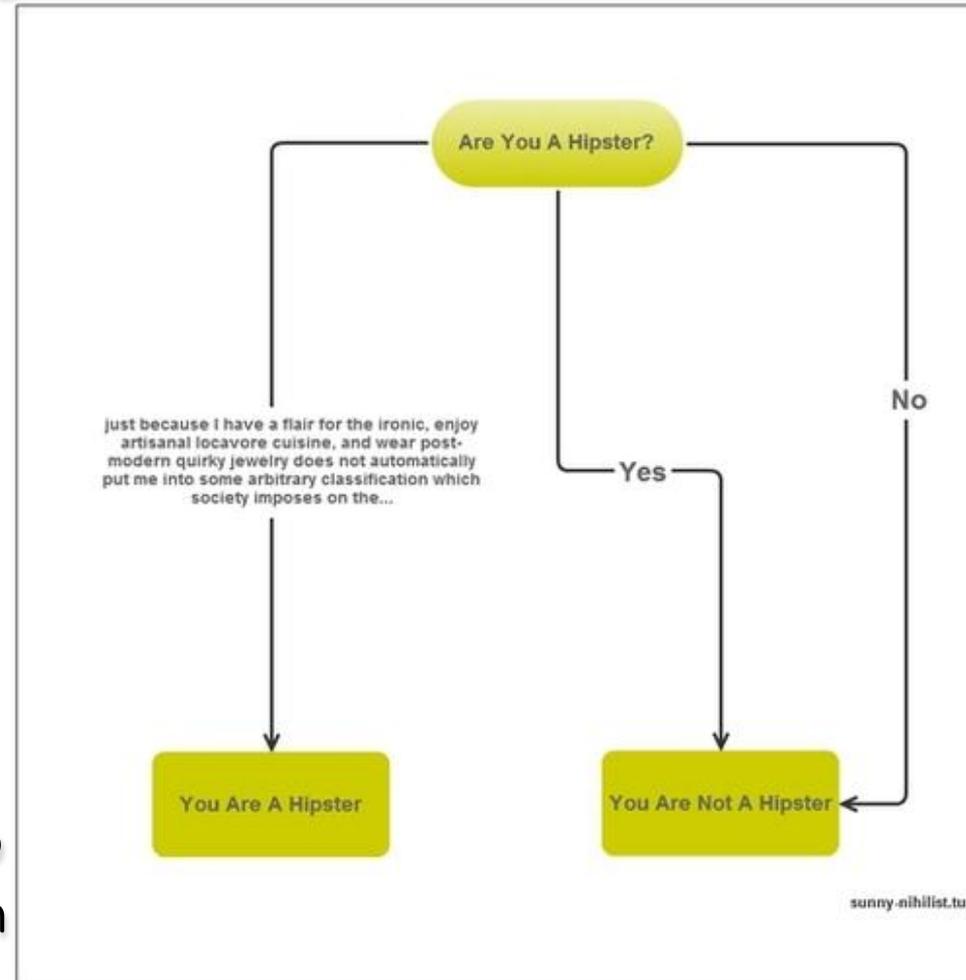
Predictive modelling

Rosters are analysed by a fatigue risk assessment software

algorithms and formulae based on the results of research from a Centre for Sleep Research at south australia university

Analysing planned/actual Hours of Work from which indicative fatigue levels for individuals,/groups, can be determined.

The results can then be used to help manage the risks associated with fatigue.



Fatigue Mitigation Request (FMR)

crew may request an FRMS assessment for a **forthcoming roster sequence**, or request a retrospective investigation of a flown duty sequence, should they have a concern regarding fatigue.



Korean Air - 801

August 6th 1997

Fatalities - 228

Survivors - 26



On the morning of August 6th 1997 Korean Air 801 flew from Seoul to Guam, on approach into Guam at around 01:40am. The Captain flew the approach after being on duty for only 5 hours, the crew member had previously been expecting to fly to Dubai however due to a rest period had been changed to Guam. On approach the Captain seemed disorientated and flew the aircraft into Nimitz Hill.



UPS 1354 – 14/08/2013

Findings released 9th September 2014

12. For the captain, **fatigue due to circadian factors may have been present** at the time of the accident.

14. The first officer **poorly managed her off-duty time by not acquiring sufficient sleep**, and she did not call in fatigued; she was fatigued due to acute sleep loss and circadian factors, which, when combined with the time compression and the change in approach modes, likely resulted in the multiple errors she made during the flight.



15. Given the increased likelihood of fatigue during overnight operations, briefing the threat of fatigue before every flight would give pilots the opportunity to identify the risks associated with fatigue and mitigate those risks before taking off and throughout the flight.

18. By providing fatigue counseling, UPS and the Independent Pilots Association would help to increase pilot awareness and understanding about fatigue and may provide a valuable resource in understanding fatigue calls.

<http://www.nts.gov/doclib/reports/2014/AAR1402.pdf>

“An FRMS scientifically–based, data-driven addition/alternative to prescriptive flight and duty time limitations which manages crew fatigue in a flexible manner appropriate to the level of risk exposure and the nature of the operation.”

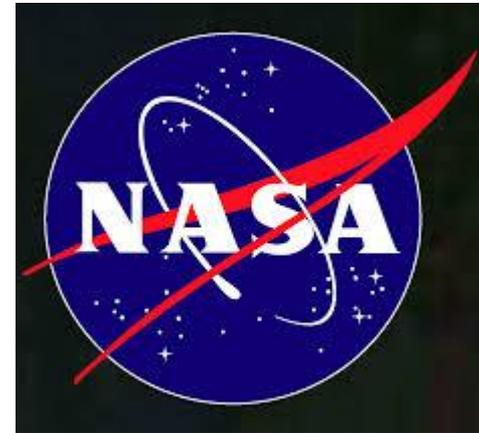
ICAO, 2006

Essential Components of an FRMS

1. fatigue risk management **policy**
2. education and awareness **training programmes**
3. processes for the **detection, reporting, investigation and managing** of fatigue risk
4. processes for **monitoring** crew member fatigue
5. processes for **reporting, investigating and recording** incidents that may be **attributable** wholly or partially to fatigue; and
6. **FRMS feedback** mechanism

FATIGUE RISK MANAGEMENT SYSTEM

Continuous Development of human factors monitoring program in partnership



Safety **IS** the Number 1 Priority
We **ALL** have a responsibility to mitigate fatigue
(This includes all stakeholders)

MINIMAL THOUGHT



We **MUST** do things better

We **NEED** to work together

YOU CAN make a difference

FRMS aims

The prime purpose of the Fatigue Risk Management System (FRMS) is to determine the probable cause of fatigue occurrences in relation with any aspect of roster planning and execution, so that lessons can be learnt which may help to reduce the risk of fatigue from these factors.

ICAO definition of fatigue

Fatigue

A physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase, or workload (mental and/or physical activity) that can impair a crew member's **alertness and ability to safely operate** an aircraft or perform safety-related duties.

ICAO definition of fatigue

ICAO Annex 6
Standards And Recommended Practices

- Definition of two types of fatigue
 - Transient fatigue
 - is experienced following a period of work, exertion or excitement and is normally dispelled by a single **sufficient** period of sleep.
 - Cumulative fatigue
 - might occur after delayed or incomplete recovery from transient fatigue or as the after-effect of too much work or over-exertion without sufficient opportunity for recuperation.