

The background features a dark blue gradient with faint, light blue technical diagrams, including circular gauges with numerical scales (e.g., 160, 170, 180, 200, 220, 240, 250, 260) and various circular and linear patterns. A solid white horizontal line is positioned across the upper third of the image.

IMPLEMENTING FATIGUE RISK MANAGEMENT SYSTEMS

INTERNATIONAL AEROSPACE MEDICINE CONGRESS
BOGOTA, COLOMBIA

4 APRIL 2019

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BOGOTA COLOMBIA

26 OCTOBER 2015

Flying



Real
Flying



WHAT CAUSES FATIGUE?

Sleep-related factors (acute/chronic)

Circadian factors (time of day)

Task-related factors
(workload/environment)

THE TRADITIONAL APPROACH

Original duty time limits often arbitrary, historical.

Tug-of-war between management and union groups over changes;

Difficult to change

No ideal roster exists!

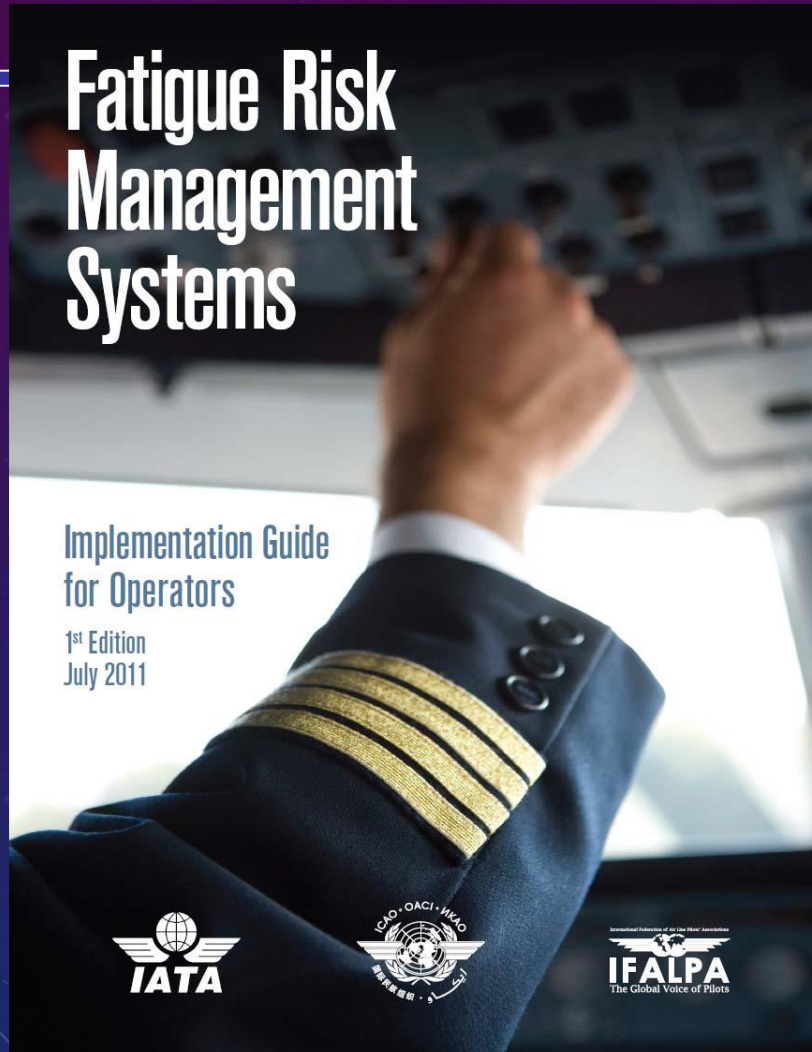


A DIFFERENT APPROACH - FRMS

A data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge, that ensures relevant personnel are performing at adequate levels of alertness.

- Aims to manage fatigue irrespective of cause.
- A data driven, systematic, organizational approach.

Guidance Material ICAO



GUÍA DE IMPLEMENTACIÓN OACI

1- FRMS – Política y **documentación**

2- **Procesos** de evaluación de riesgo en fatiga

Identificar amenazas de fatiga

- Reactivo, proactivo, predictivo

Identificar riesgos de fatiga

Intervenciones para controlar el riesgo de fatiga

3- FRMS – Procesos de **garantía** de seguridad

Incluyendo medidas de efectividad

4- FRMS – procesos de **promoción** – entrenamiento, educación

WHAT IS FRMS NOT?

It isn't just a model

It isn't a negotiating tool

It isn't the job of just one party

It isn't a set of manuals

It isn't a cost-cutting tool

It isn't a way to get rid of limits

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- 3- **FRMS – Procesos de garantía** de seguridad
 - Incluyendo medidas de efectividad
- 4- **FRMS – procesos de promoción** – entrenamiento, educación

THINGS THE FRMS POLICY MUST COVER

Shared responsibility of management, flight and cabin crews, and other involved personnel;

Safety objectives of the FRMS;

Signed by the **accountable executive** and communicated/endorsed to all relevant areas

THINGS THE FRMS POLICY MUST DECLARE

Management commitment to:

effective **safety reporting**;

provision of adequate **resources** for the FRMS;

continuous improvement of the FRMS;

Clear **lines of accountability** for management, flight and cabin crews, and all other involved

Require **periodic review** to ensure it remains relevant and appropriate

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WILLINGNESS TO REPORT

- Know how and when to report
Effective mechanism (available, not too difficult)
- Trust – consequences, jeopardy, confidentiality, purpose of collection
- Motivation – action, communication
= “effective reporting culture”

Fatigue observed

vs Duty not completed due fatigue

vs Incident occurred with fatigue

ONE EXAMPLE

Simple

Roster attached

To Ops integrity first

De-identified if requested

To managers for early
action

FSAG review trends
monthly

If Confidentiality required tick here

Name	<input type="text"/>	Employee No.	<input type="text"/>	Pilot / CCM	<input type="checkbox"/> (Circle)
When did it happen?		Local Report Date	<input type="text"/>	Local Report Time	<input type="text"/>
Duty Description (e.g. "LAX1287" or "AKL - CHC - ZQN - AKL") <input type="text"/>					
Sector on which fatigue occurred: FROM <input type="text"/> TO <input type="text"/>					
Hours from report time to when fatigue occurred <input type="text"/>				Disrupt?	<input type="checkbox"/> Yes / <input type="checkbox"/> No
Aircraft Type	<input type="text"/>	Number of Crew	<input type="text"/>	Pilot / CCM (Circle)	No.: <input type="text"/>
What happened?					
Describe how you felt (or what you observed) <input type="text"/>					
Please circle how you felt					
1.	Fully alert, wide awake	5.	Moderately tired, let down		
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?					
Fatigued prior to Duty		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Hotel		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Home		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Duty itself		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
In-Flight Rest		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Disrupt		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Personal		<input type="checkbox"/> Yes / <input type="checkbox"/> No			
Other / Comments		<input type="text"/>			
What did you do?					
Actions taken to manage or reduce fatigue (e.g. cockpit nap)					
<input type="text"/>					
<input type="text"/>					
<input type="text"/>					
What could be done?					
Suggested Corrective Actions					
<input type="text"/>					
<input type="text"/>					
<input type="text"/>					



A STAR ALLIANCE MEMBER

Fatigue Report Form

If Confidentiality required tick here

Name Employee No. Pilot / CCM (Circle)

When did it happen?

Local Report Date Local Report Time

Duty Description (e.g. "LAX1287" or "AKL - CHC - ZQN - AKL")

Sector on which fatigue occurred: FROM TO

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

Aircraft Type Number of Crew Pilot / CCM (Circle) No.:

What happened?

Describe how you felt (or what you observed)

- Please circle how you felt
- | | |
|--|---|
| 1. Fully alert, wide awake | 5. Moderately tired, let down |
| 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?

Fatigued prior to Duty

Yes / No

Hotel

Yes / No

Home

Yes / No

Duty Itself

Yes / No

In-Flight Rest

Yes / No

Disrupt

Yes / No

Personal

Yes / No

Other / Comments

What did you do?

Actions taken to manage or reduce fatigue (e.g. cockpit nap)

What could be done?

Suggested Corrective Actions

Another example



If Confidentiality required tick here

Name Employee No. Pilot / CCM (Circle)

When did it happen? Local Report Date Local Report Time

Duty Description (e.g. "LAX1287" or "AKL - CHC - ZQN - AKL")

Sector on which fatigue occurred: FROM TO

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

Aircraft Type Number of Crew Pilot / CCM (Circle) No.:

What happened?

Describe how you felt (or what you observed)

Please circle how you felt

1. Fully alert, wide awake	5. Moderately tired, let down
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?

Fatigued prior to Duty	Yes / No
Hotel	Yes / No
Home	Yes / No
Duty itself	Yes / No
In-Flight Rest	Yes / No
Disrupt	Yes / No
Personal	Yes / No
Other / Comments	<input type="text"/>

What did you do? Actions taken to manage or reduce fatigue (e.g. cockpit nap)

What could be done? Suggested Corrective Actions



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Fatigue Report Form

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Name Employee No. Pilot / CCM (Circle)

When did it happen?

Local Report Date Local Report Time

Duty Description (e.g. "LAX1287" or "AKL - CHC - ZQN - AKL")

Sector on which fatigue occurred: FROM TO

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

Aircraft Type Number of Crew Pilot / CCM (Circle) No.:

What happened?

Describe how you felt (or what you observed)

Please circle how you felt

<input type="radio"/> 1. Fully alert, wide awake	<input type="radio"/> 5. Moderately tired, let down
<input type="radio"/> 2. Very lively, somewhat responsive, but not at peak	<input type="radio"/> 6. Extremely tired, very difficult to concentrate
<input type="radio"/> 3. OK, somewhat fresh	<input type="radio"/> 7. Completely exhausted
<input type="radio"/> 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?

Fatigued prior to Duty Yes / No

Hotel Yes / No

Home Yes / No

None	Yes / No
Duty Itself	Yes / No
In-Flight Rest	Yes / No
Disrupt	Yes / No
Personal	Yes / No
Other / Comments	

What did you do?

Actions taken to manage or reduce fatigue (e.g. cockpit nap)

What could be done?

Suggested Corrective Actions



FATIGUE REPORT HANDLING

- Simple form
- Anonymity – important in early stages
- Manager response
- Look collectively more than individually
- Non-punitive
- Not FSAG role to “rule out” fatigue
- “Play the ball and not the player”

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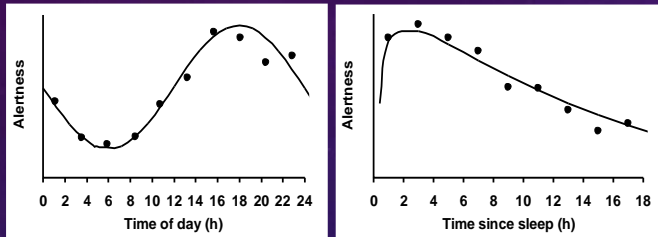
Incluyendo medidas de efectividad

4- FRMS – procesos de **promoción** – entrenamiento, educación

Enabling FRMS

Prediction

Lab Data



In-Flight Data



Math Modeling



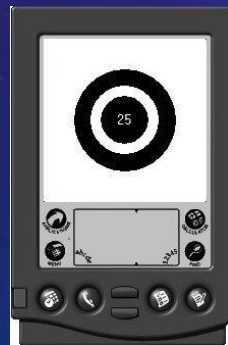
Schedules

Monitoring



Actigraphy

+



PVT/Log

+



Flight Data Monitoring



Validate/
Adjust
Schedules

TRADITIONAL STUDIES

Christchurch-Brisbane-Christchurch

2-pilot overnight



Powell DMC, Spencer MB, Petrie KJ. *Fatigue in airline pilots after an additional day's layover period.* Aviat Space Environ Med 2010; 81:1-5

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ROUTES STUDIED WITH PDA/ACTIWATCH

Pilots	Cabin Crew
AKL-LAX-LHR-LAX-SYD	AKL-NAN-RAR-PPT-RAR-NAN-AKL*
SYD-KIX-BNE-SYD (Ansett)	AKL-KIX-CHC-AKL
SYD-LAX-AKL* 3 vs 4 pilot	AKL-PER-AKL
AKL-LAX-AKL* 1 vs 2 nights	AKL-TBU-HNL-AKL*
AKL-LAX-LHR-LAX-AKL 1 vs 2 night	AKL-LAX-APW-AKL
CHC-BNE-CHC* B737/A320	AKL-LAX-AKL
AKL-HKG-LHR-HKG-AKL x2	CHC-BNE-CHC
AKL-ADL-AKL	AKL-PPT-AKL*

* - Changes made

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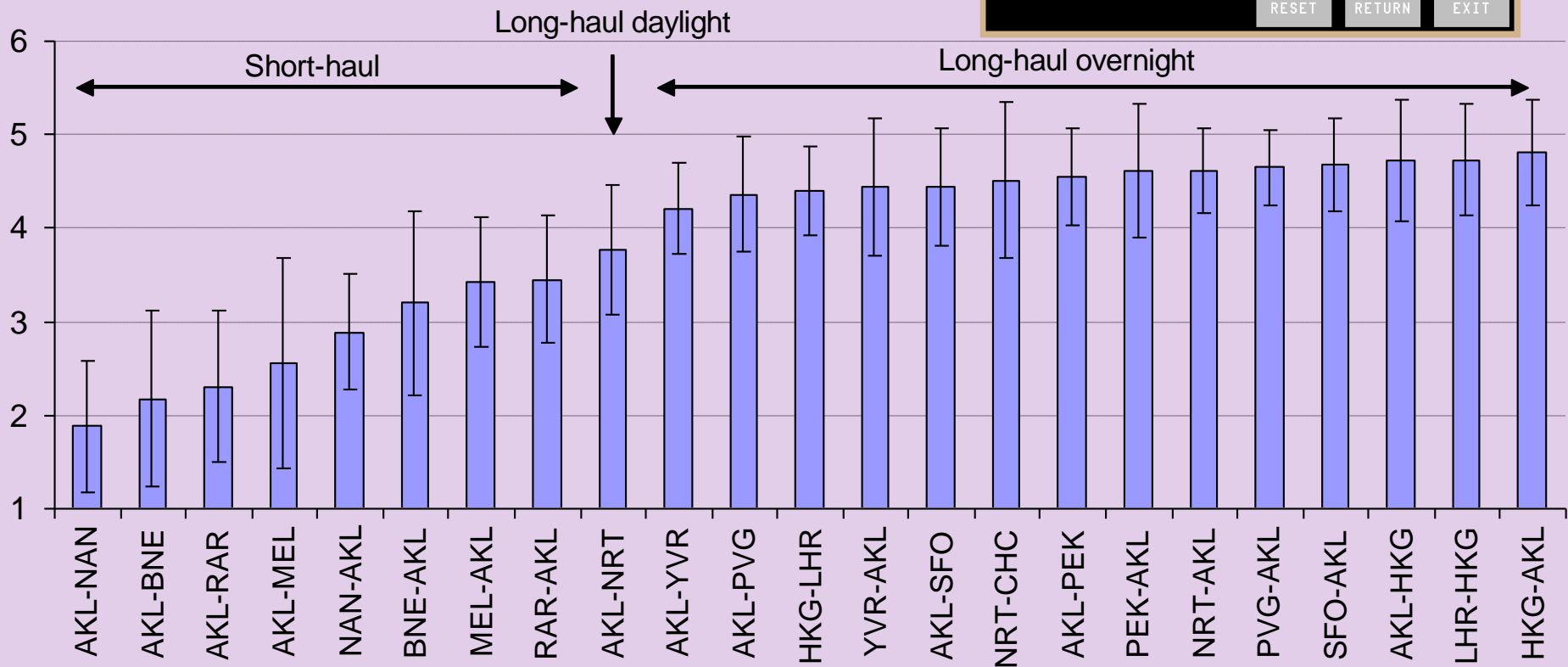
Incluyendo medidas de efectividad

4- FRMS – procesos de **promoción** – entrenamiento, educación

ELECTRONIC TOD

Short < Long (p < 0.001)

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES
hhmmZ	TOP OF DESCENT ALERTNESS EVALUATION	XXXXXXXXXX
1. Fully Alert, wide awake 2. Very lively, responsive, but not at peak 3. OK, somewhat fresh 4. A little tired, less than fresh 5. Moderately tired, let down 6. Extremely tired, very difficult to concentrate 7. Completely exhausted, unable to function effectively 0. Not Applicable		
Pilot A	<input type="checkbox"/>	B <input type="checkbox"/>
		C <input type="checkbox"/>
		D <input type="checkbox"/>
		RESET RETURN EXIT



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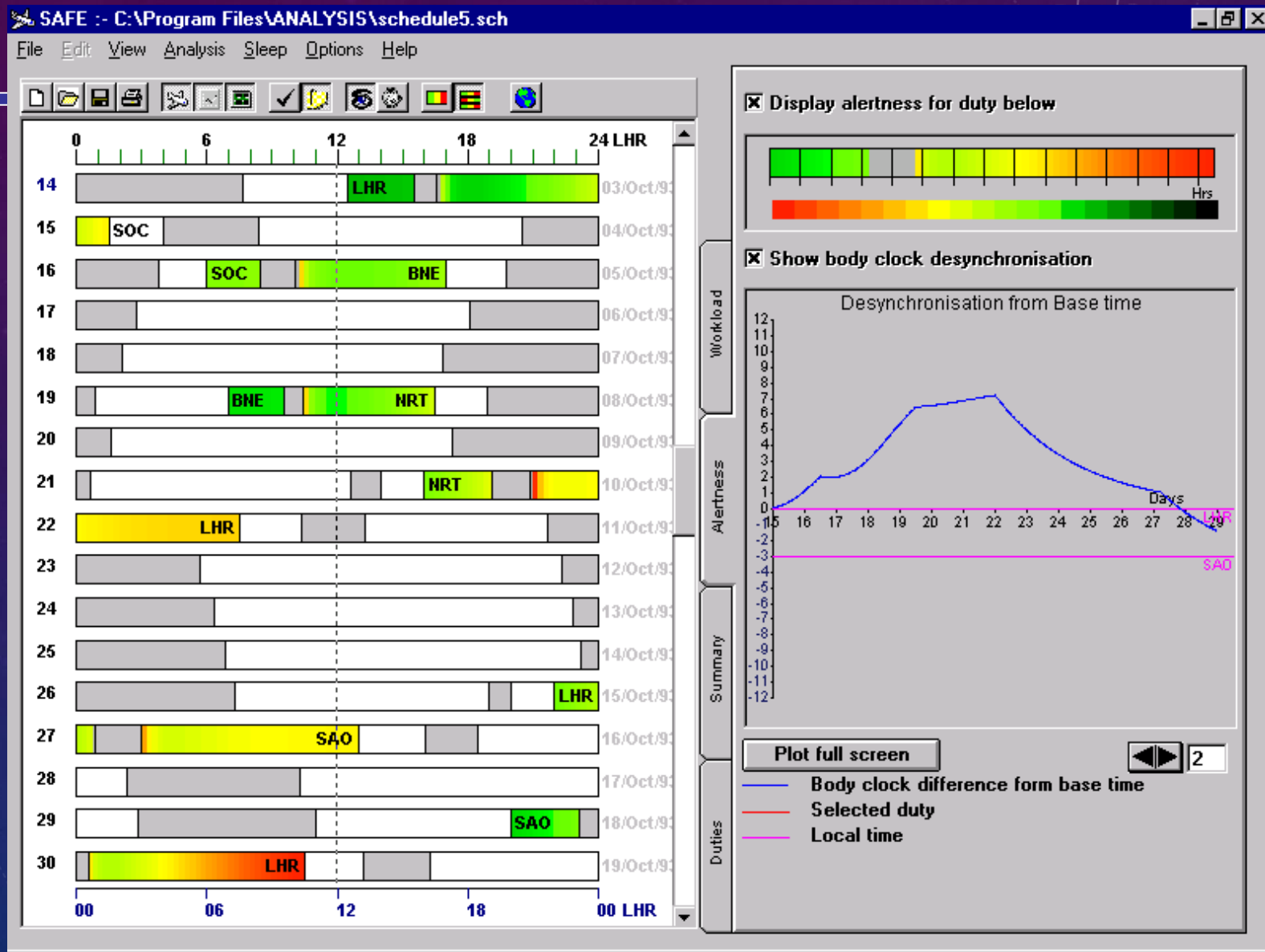
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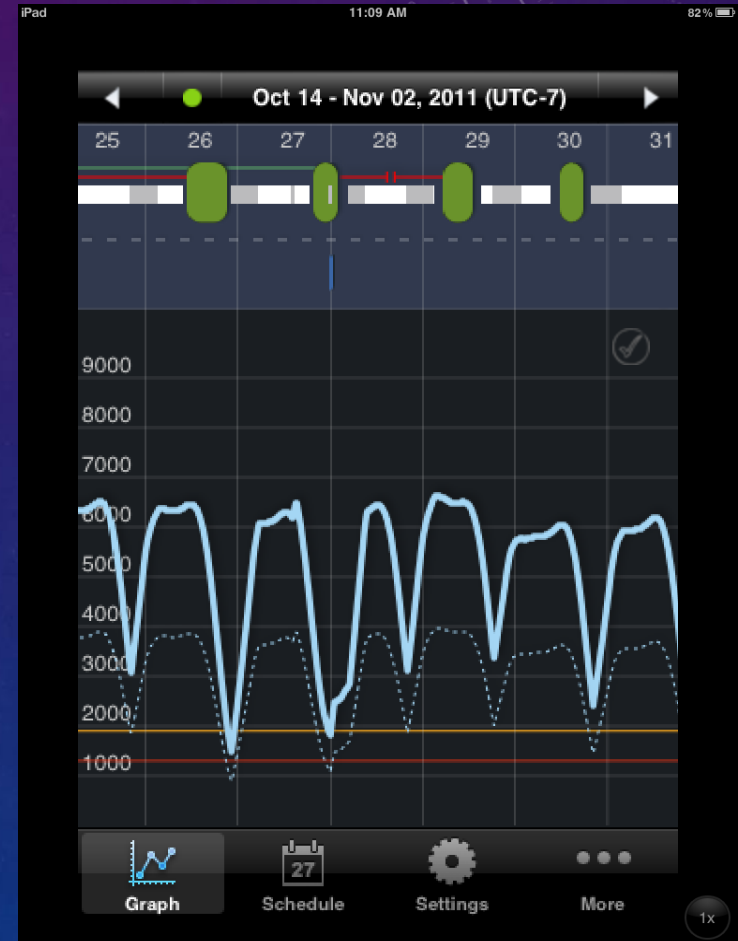
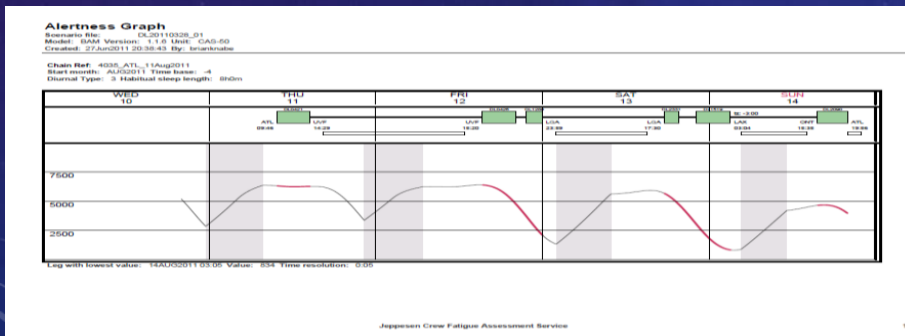
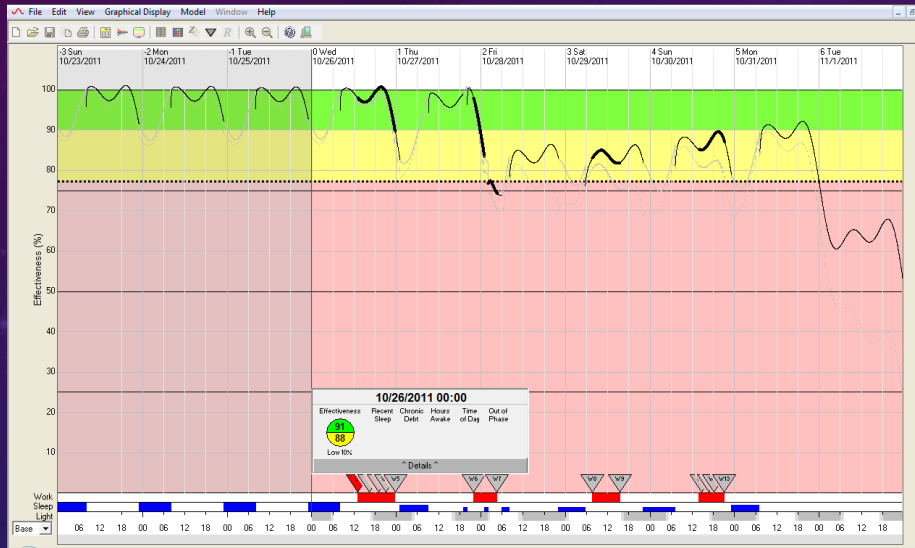
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EXAMPLES



EXAMPLES



BIOMATHEMATICAL MODELS

Used for:

- Pairing/Roster Comparisons
- New Routes
- Evaluation of Mitigations
- Incident Investigation
- Complaint Resolution
- Evaluation of New Regulations

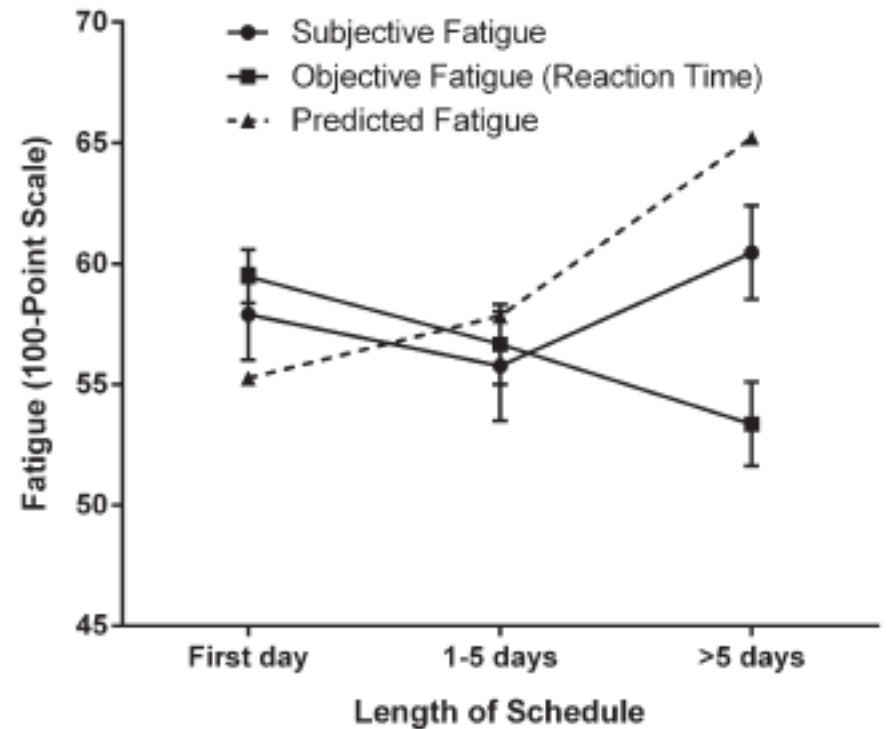
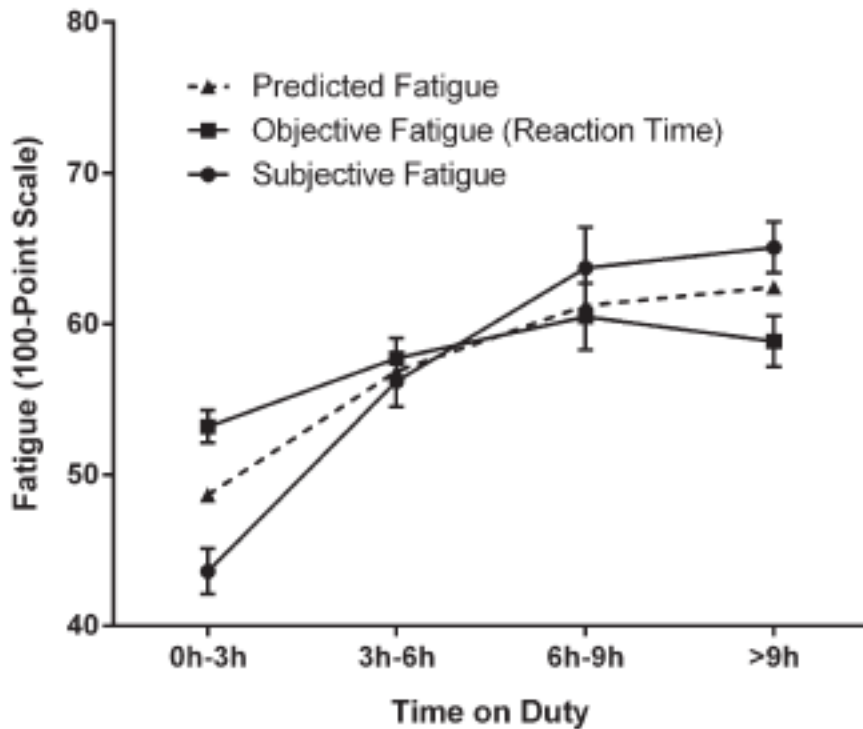
Not Used for:

- Firm Go/No Go Decisions

CHALLENGES

- Straight Science vs. Reality – VALIDATION
- Which Model is the Best? – STANDARDS
- Over Reliance by Stakeholders - User Education
- Accuracy of Predictions – More Data
- Accounting for Crew Mitigations

IN-FLIGHT MEASURES VS MODEL PREDICTIONS



Powell DMC, Spencer MB, Petrie KJ
of a bio-mathematical fatigue model

Comparison of in-flight measures with predictions
Aviat Space Envir Med 2014 85:1177-84

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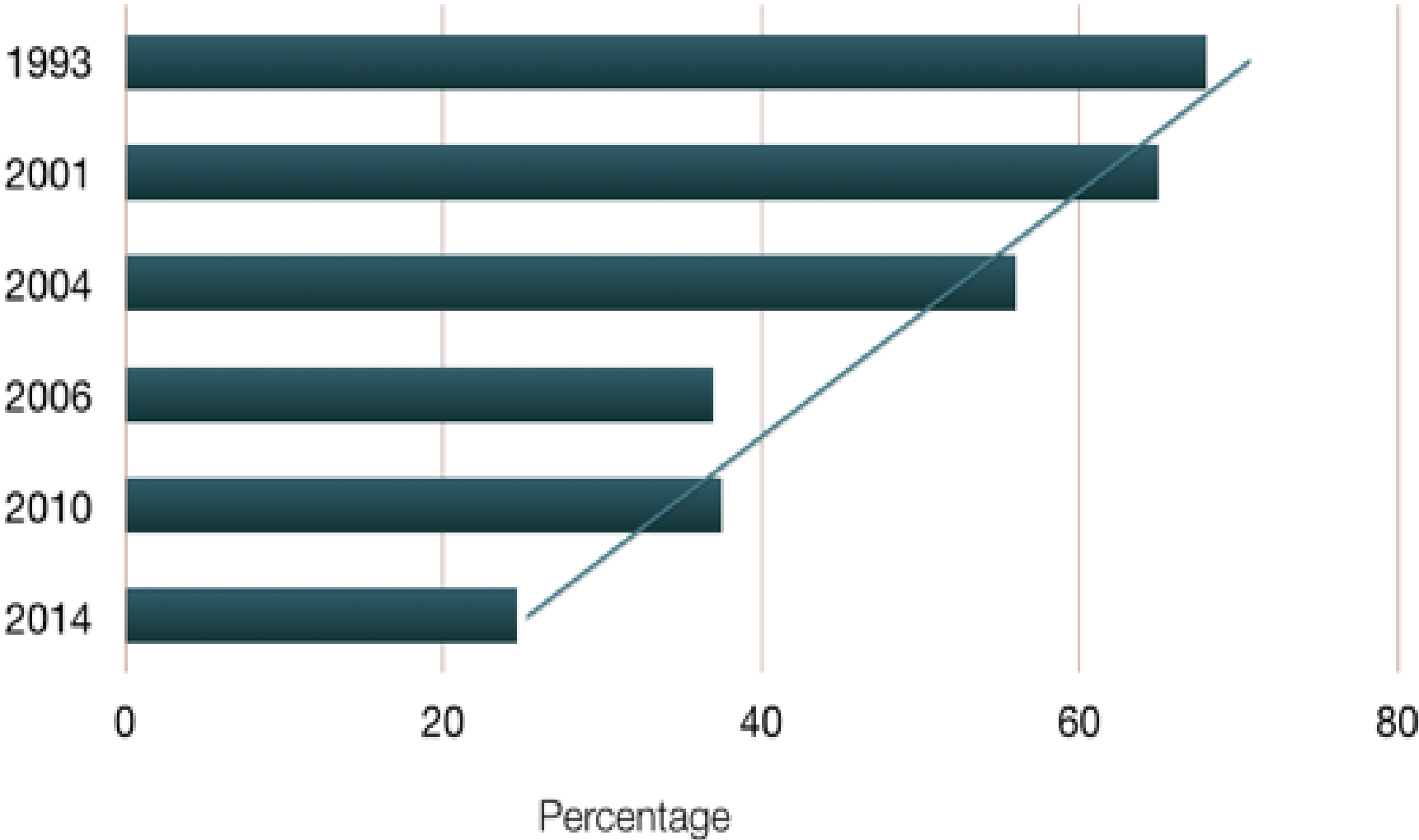
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Pilots reporting significant job fatigue



OTHER MEASURES OF EFFECTIVENESS

Industrial Action

LOSA Interviews

Feedback from External oversight Group

FOQA – To come

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EDUCATION AND TRAINING

More is always needed!

Aimed at:

Crew members

Crew Scheduling

Fatigue Safety Action Group

Senior Management

WHAT HAS WORKED WELL?

Truly collaborative

Management commitment

Developing trust

Listening to critics

Publishing

Education

Advice “before the fact”

A commercial.....



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IMPLEMENTING FRMS

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