Joint Session

Fatigue Risk Management Systems: Measurement and Evaluation of Effectiveness

Fatigue Management, Assessment and Evaluation: An Operational Perspective

Captain Greg Fallow

Air New Zealand,
IFALPA

11:05 - 11:30

June 18, 2008

Presented at the FAA Fatigue Management Symposium: Partnerships for Solutions; Vienna, VA: June 17-19, 2008

Captain Greg Fallow
Biography

Greg Fallow is currently an Air New Zealand B777 check and training captain having previously flown B767, B747-200, B747-400, B737 and F27 aircraft for the airline. His aviation career spans just over 40 years encompassing both military and commercial operations. He has flown long-haul operations with Air New Zealand for over 20 years and has had active involvement in fatigue management as a pilot representative for the past 13 years. He represents the New Zealand Air Line Pilots' Association as a member of Air New Zealand's Crew Alertness Study Group.

He is a member of the IFALPA Human Performance Committee, and represented IFALPA as a member of the Flight Safety Foundation ULR Steering Committee which conducted workshops to obtain industry consensus on the best way forward for emerging ultra long range (ULR) operations. He currently represents IFALPA as member of the ICAO Operations Panel Fatigue Risk Management subgroup which is tasked with drafting Standards, Recommendations and Guidance Material for the Operations Panel to consider as part of a task of the Air Navigation Commission for amending ICAO Annex 6 provisions on flight and duty time limitations.

In addition to his involvement in fatigue management Greg is also a FOQA analyst for Air New Zealand's B777 operations which, similar to fatigue management, forms part of the airline's safety management system.

Fatigue Management, Assessment, and Evaluation: An Operational Perspective

Captain Greg Fallow

Air New Zealand Crew Alertness Study Group

AIR NEW ZEALAND

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Overview

- The genesis of the company's fatigue monitoring and management
- Measures used to assess crew alertness in the workplace
- Crew reporting
- Some examples of studies and data collection
- Evaluation of effectiveness
- Current initiatives

FIRST STEPS

Gaining regulatory approval
Identifying methodology
Achieving union support / Importance of a “Just Culture”
External supervision

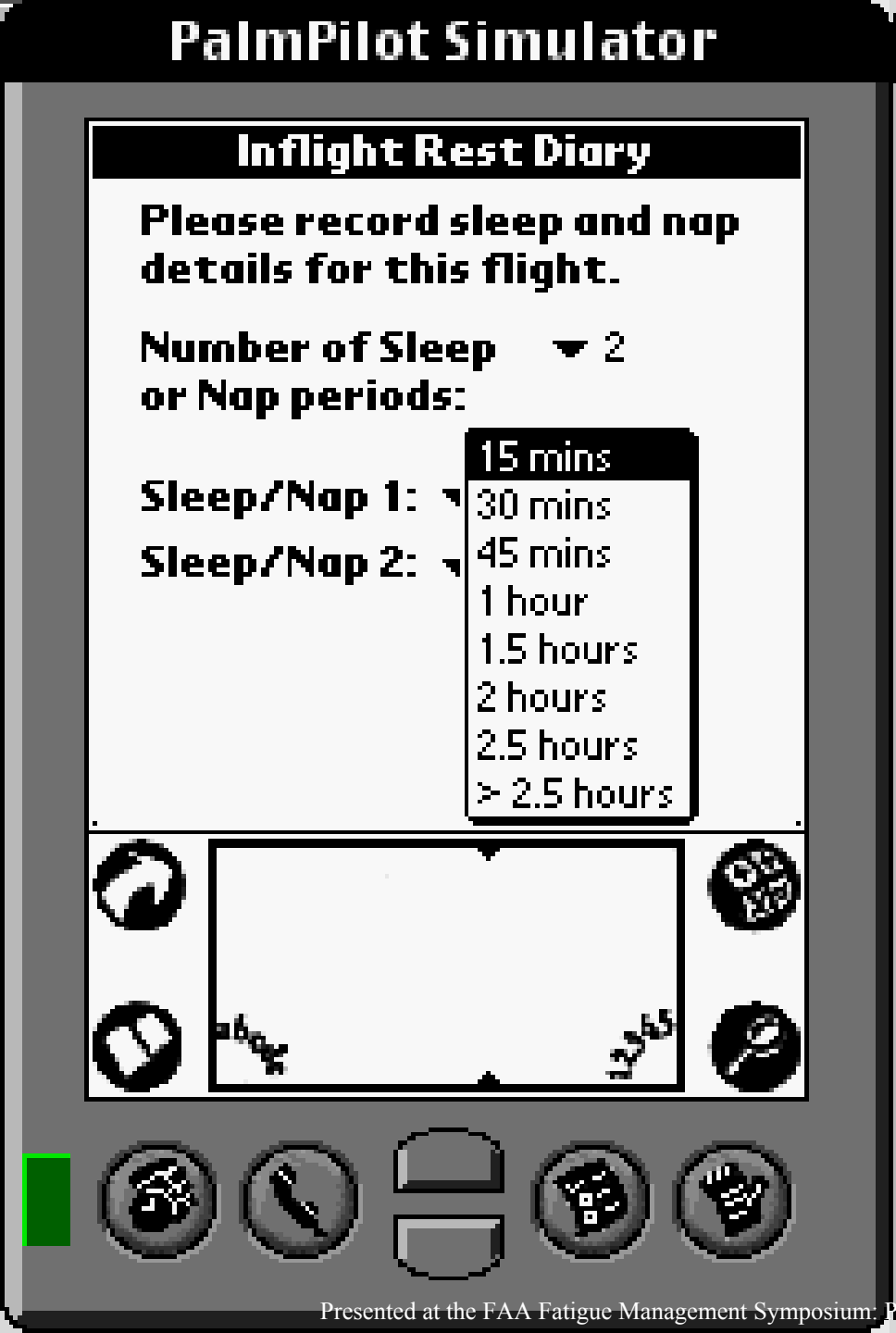
Early Studies

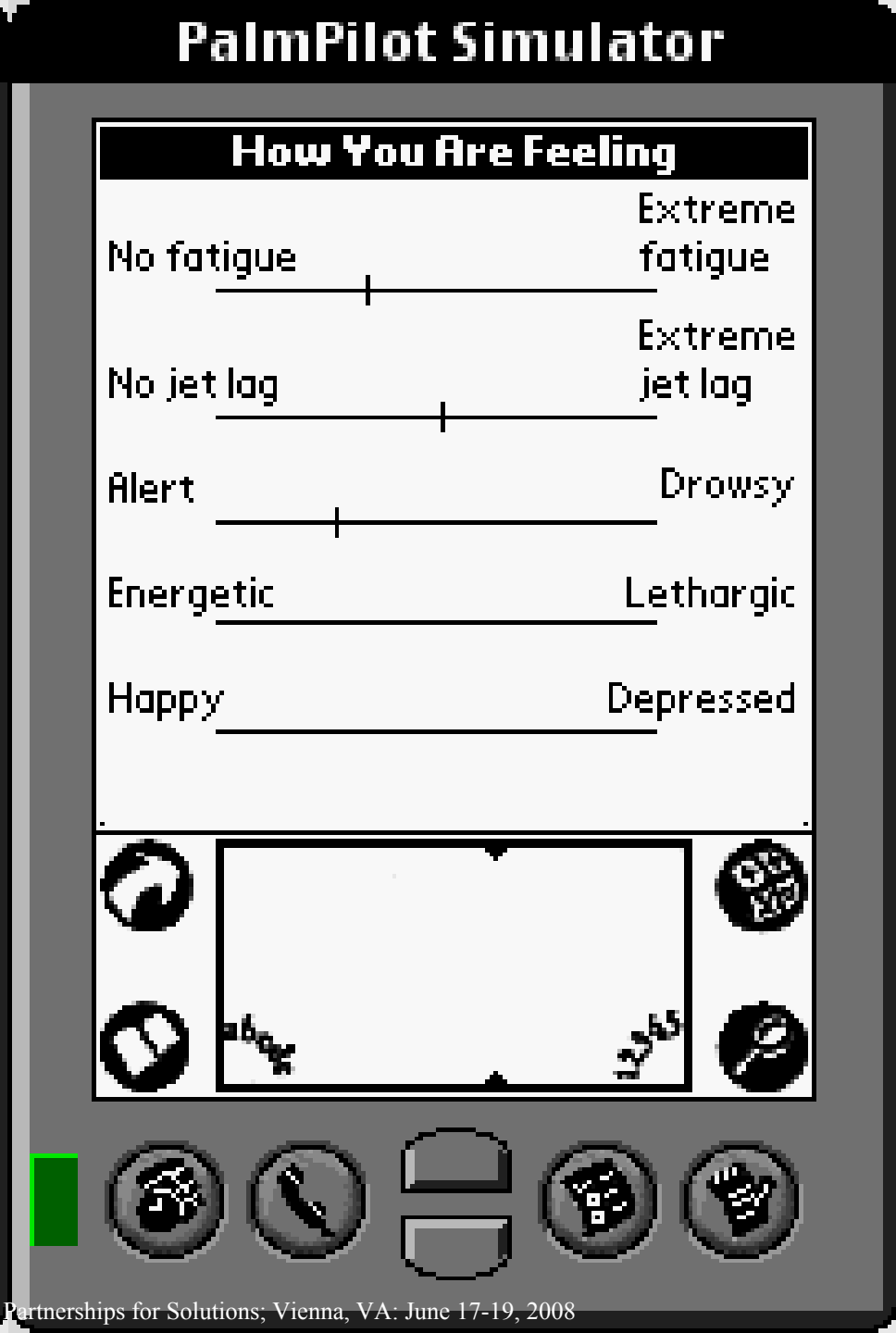
PVT and Paper
Actilumes
No experimenter
Double FRA (melatonin study)

TPE-BNE-AKL
NRT-NAN-AKL
AKL-SIN-CHC
Freedom Air

Later Studies

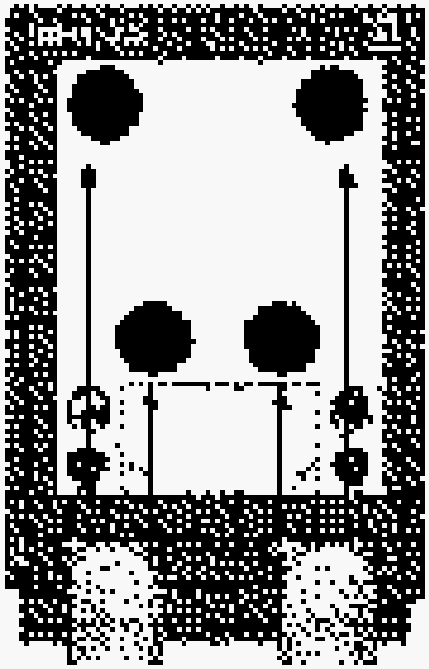
- Palm Pilot – Establishment + 3-stage Validation


PalmPilot Simulator
Inflight Rest Diary
Please record sleep and nap details for this flight.
Number of Sleep or Nap periods:
2
Sleep/Nap 1:
Sleep/Nap 2:
15 mins
30 mins
45 mins
1 hour
1.5 hours
2 hours
2.5 hours
> 2.5 hours


PalmPilot Simulator
How You Are Feeling
No fatigue
Extreme fatigue
No jet lag
Extreme jet lag
Alert
Drowsy
Energetic
Lethargic
Happy
Depressed

PalmPilot Simulator

Alertness Test



Hold the device with each thumb poised between two buttons as shown.

OK

abc

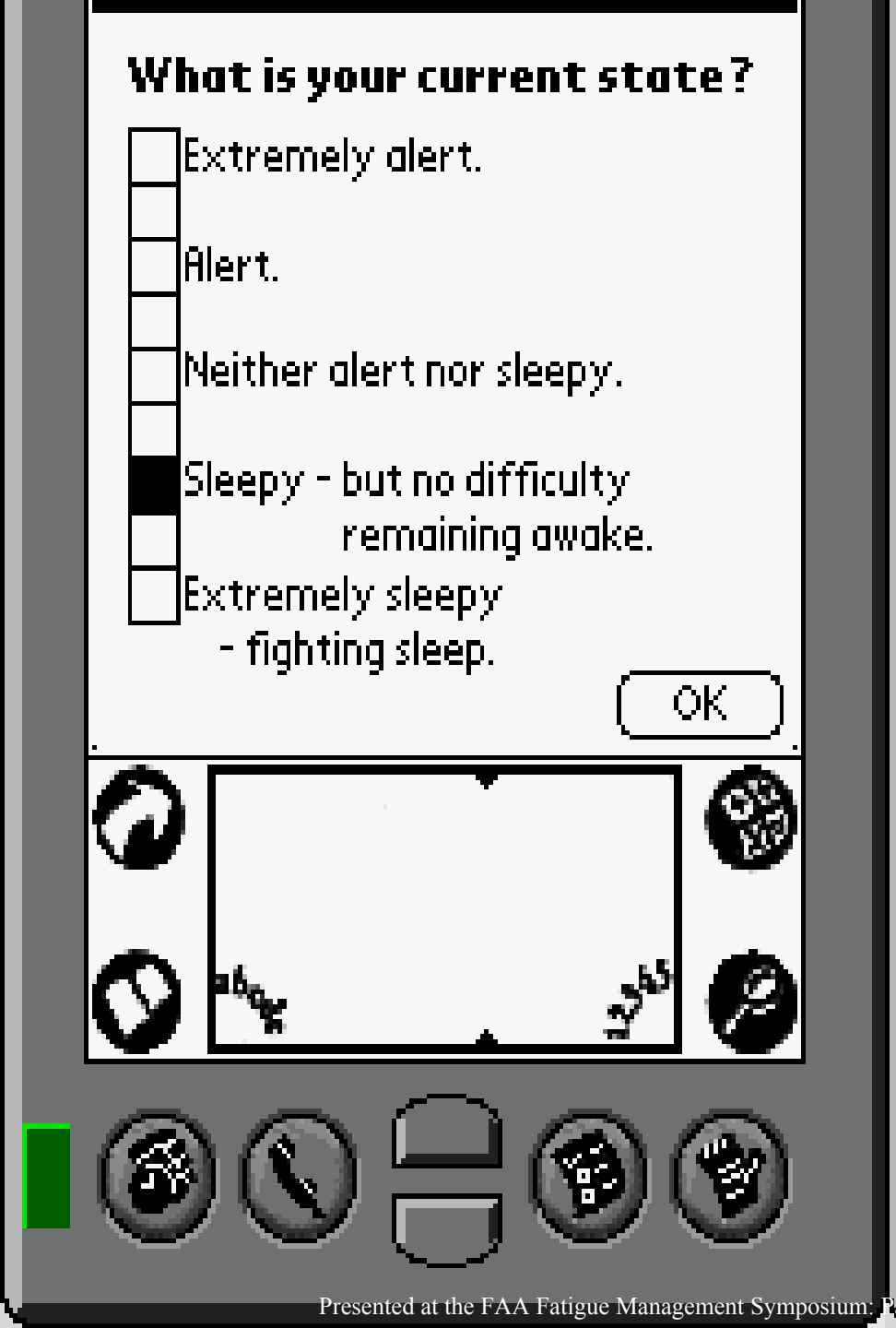
123

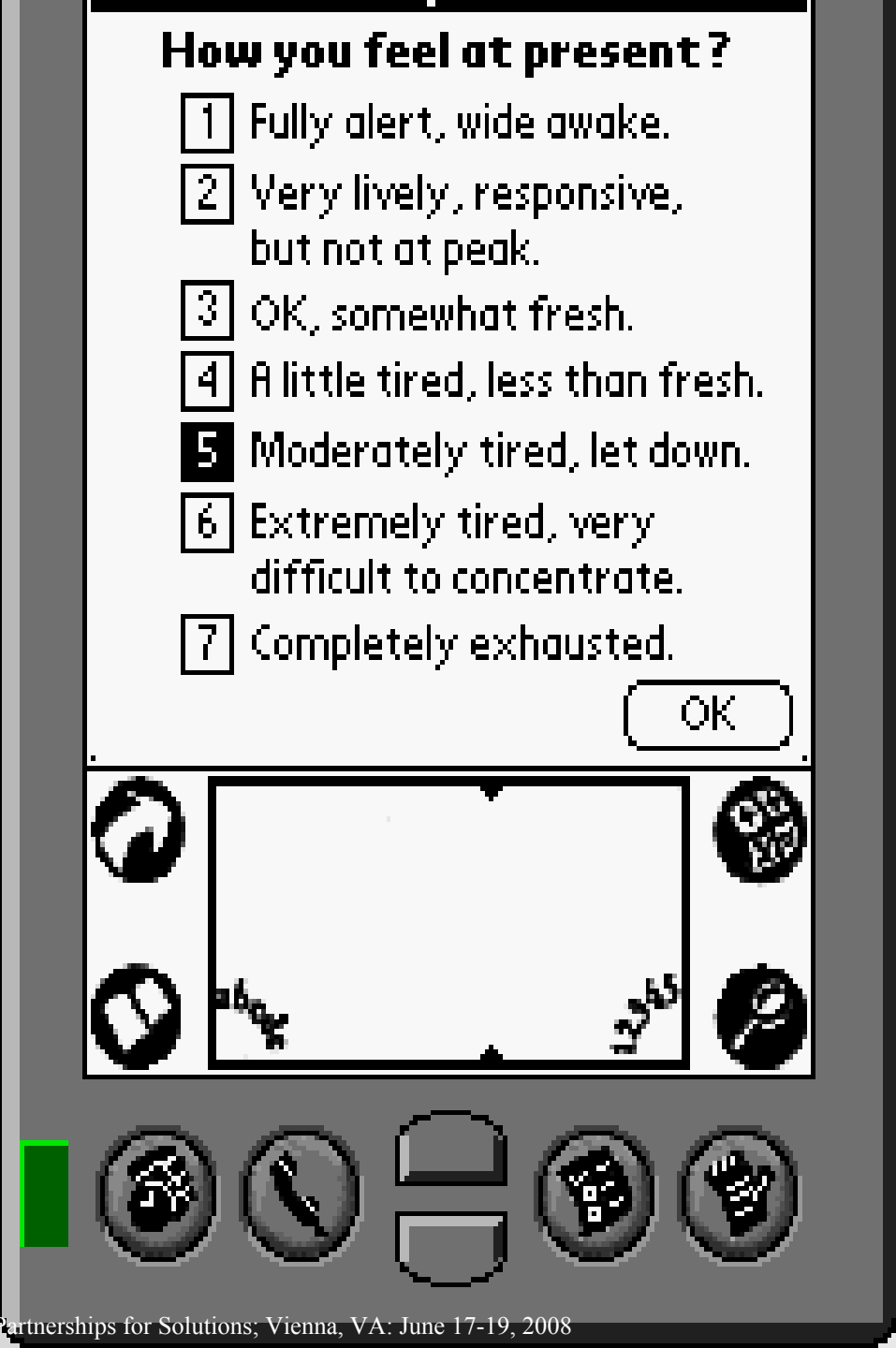
PalmPilot Simulator

Alertness Test

abc

123


What is your current state?
Extremely alert.
Alert.
Neither alert nor sleepy.
Sleepy - but no difficulty remaining awake.
Extremely sleepy - fighting sleep.
OK


How you feel at present?
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.
OK

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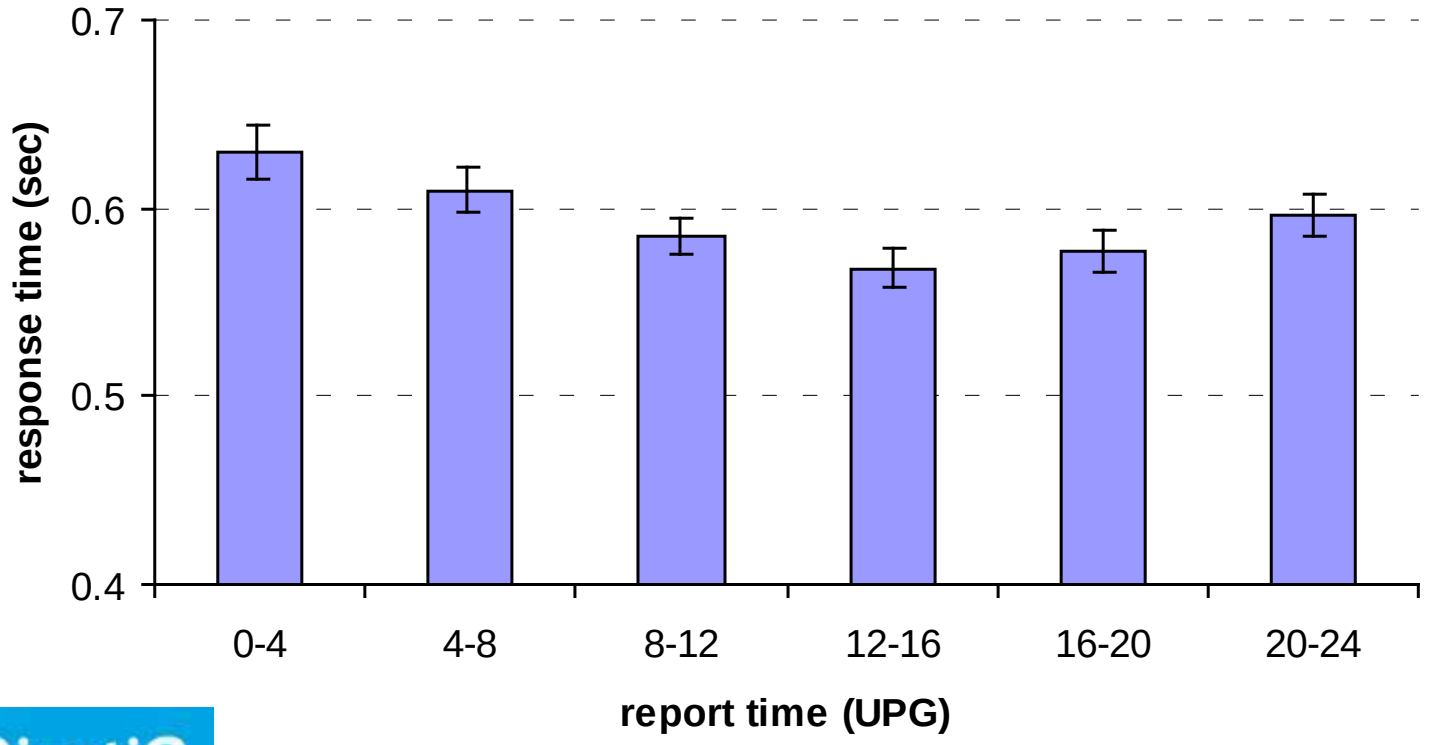
Haj (Palm Validation) - 216 Flights
Same route 2-hourly around the clock



QinetiQ

Sleep Deprivation Study

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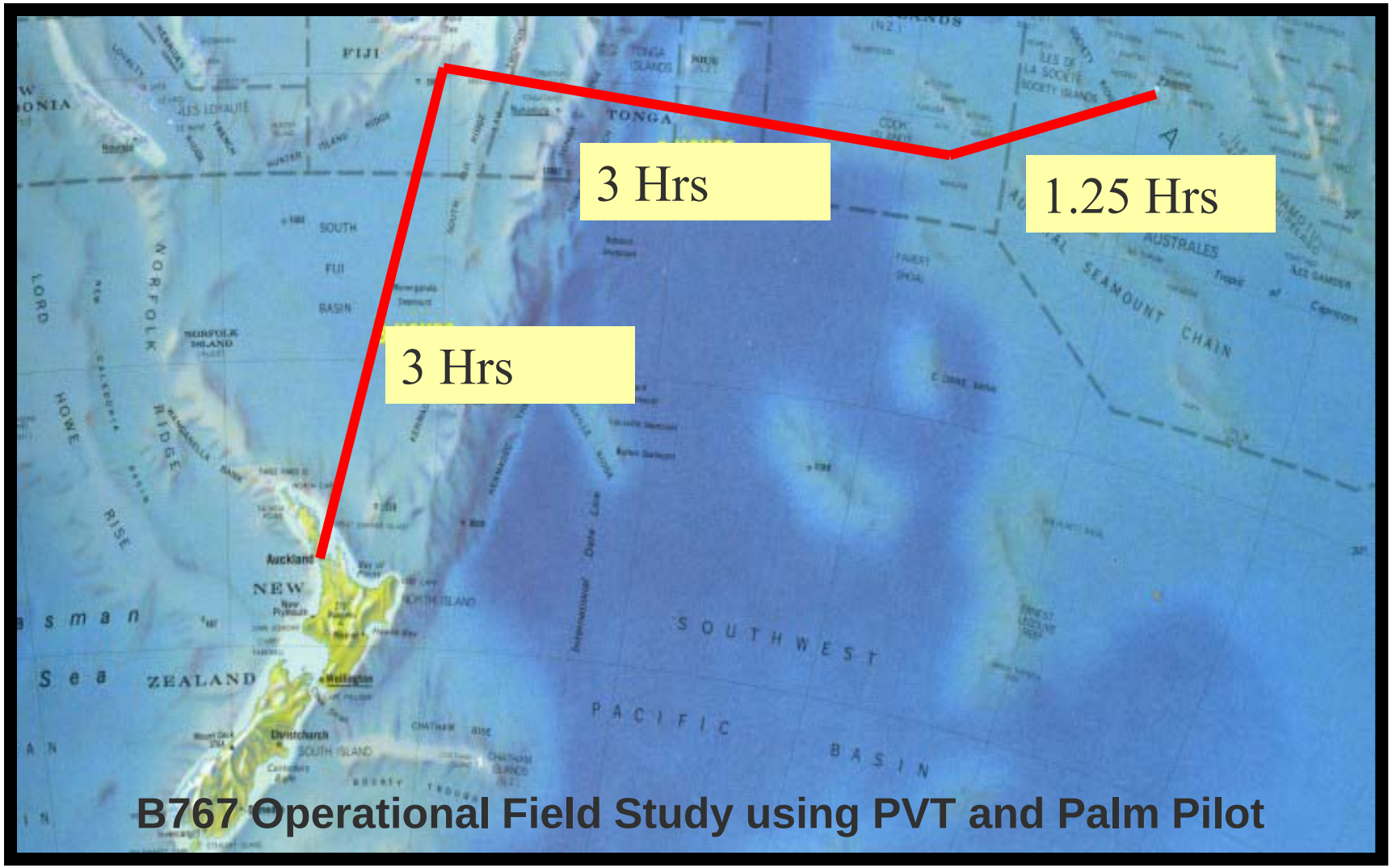
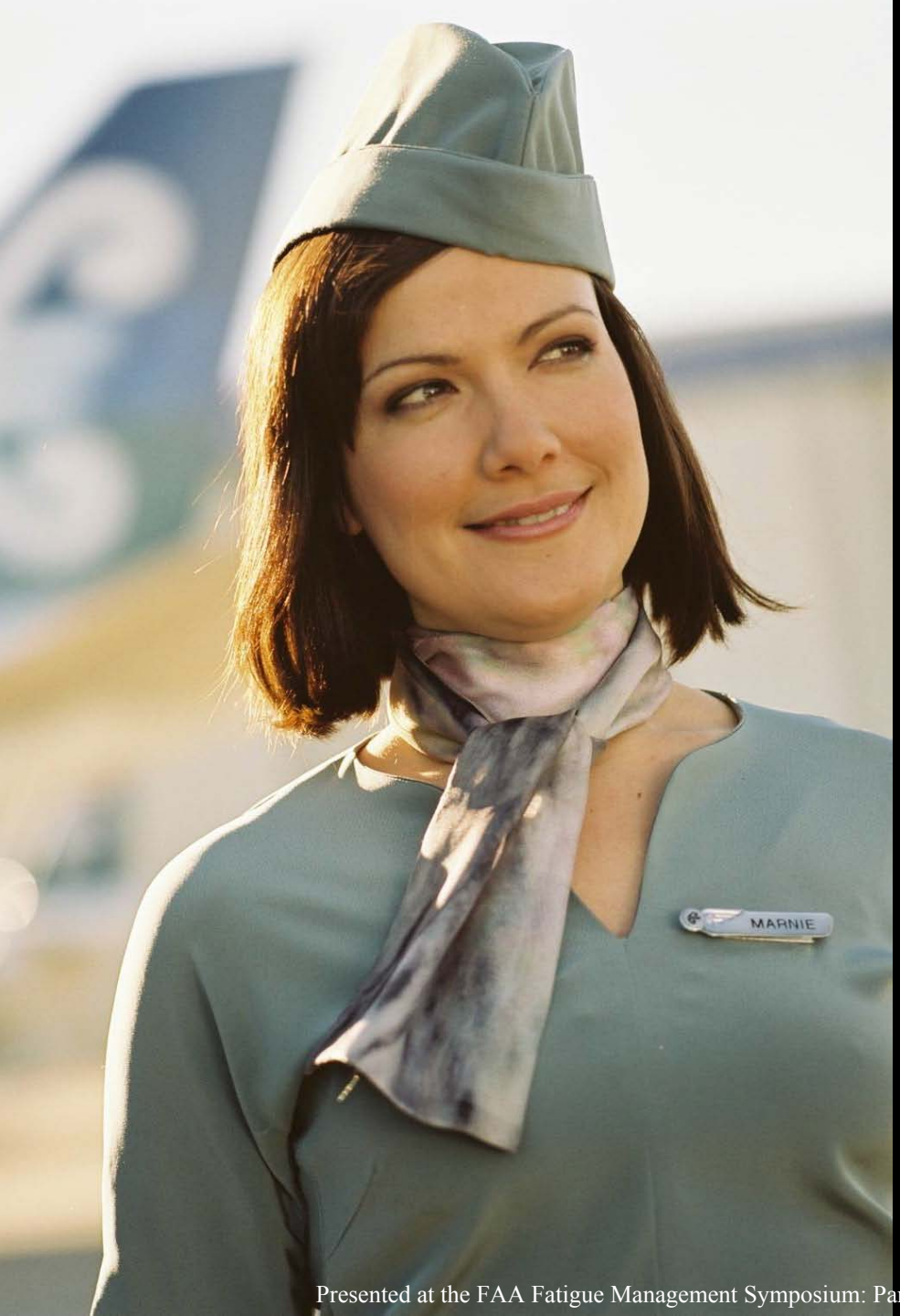


B767 Operational Field Study using PVT and Palm Pilot



Cabin Crew

Creation of In-Flight Services Fatigue Study Group

Subsequent incorporation into Crew Alertness Study Group

Challenges of commitment, trust and culture

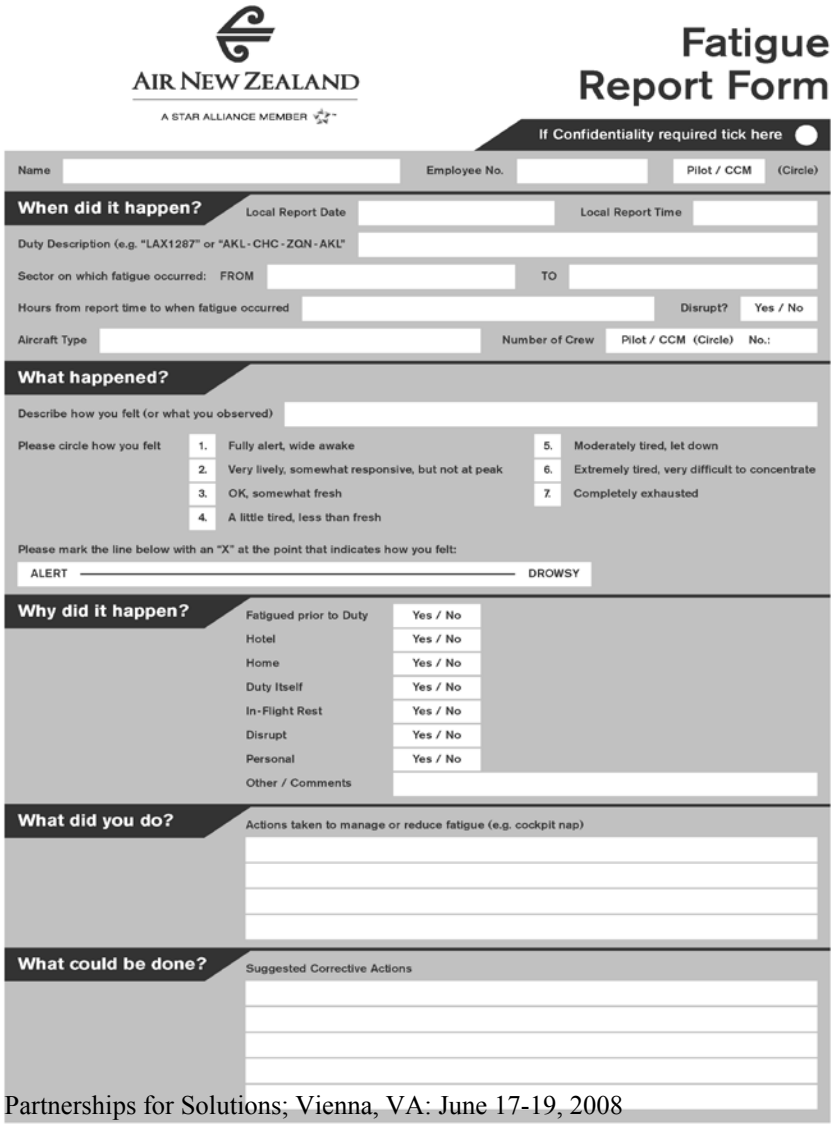
Palm Pilot Studies

(* = Changes Made)

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*	AKL-PER-AKL
AKL-LAX-AKL*	AKL-TBU-HNL-AKL*
AKL-LAX-LHR-LAX-AKL	AKL-LAX-APW-AKL
CHC-BNE-CHC*	AKL-LAX-AKL
AKL-HKG-LHR-HKG-AKL	CHC-BNE-CHC

Crew Reporting System

- Kept on aircraft
- Completed by crew member
- De-identified if requested
- To management
- Then to CASG



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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
2. Very lively, somewhat 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

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

“You’re doing it wrong”

“Powell’s Folly” Top of Descent Survey

- **Last descent of the duty day**
- **Self rated fatigue (SP, VAS)**
- **Three months**
- **9000 responses**

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PILOT ALERTNESS REPORT FORM

Forms to be completed immediately prior to Top of Descent on last leg of duty period.

[ ] Report Time (UTC)

[ ] Time (UTC) at Top of Descent

Name the Sectors operated this duty period.

[ ] [ ] [ ] [ ] [ ]

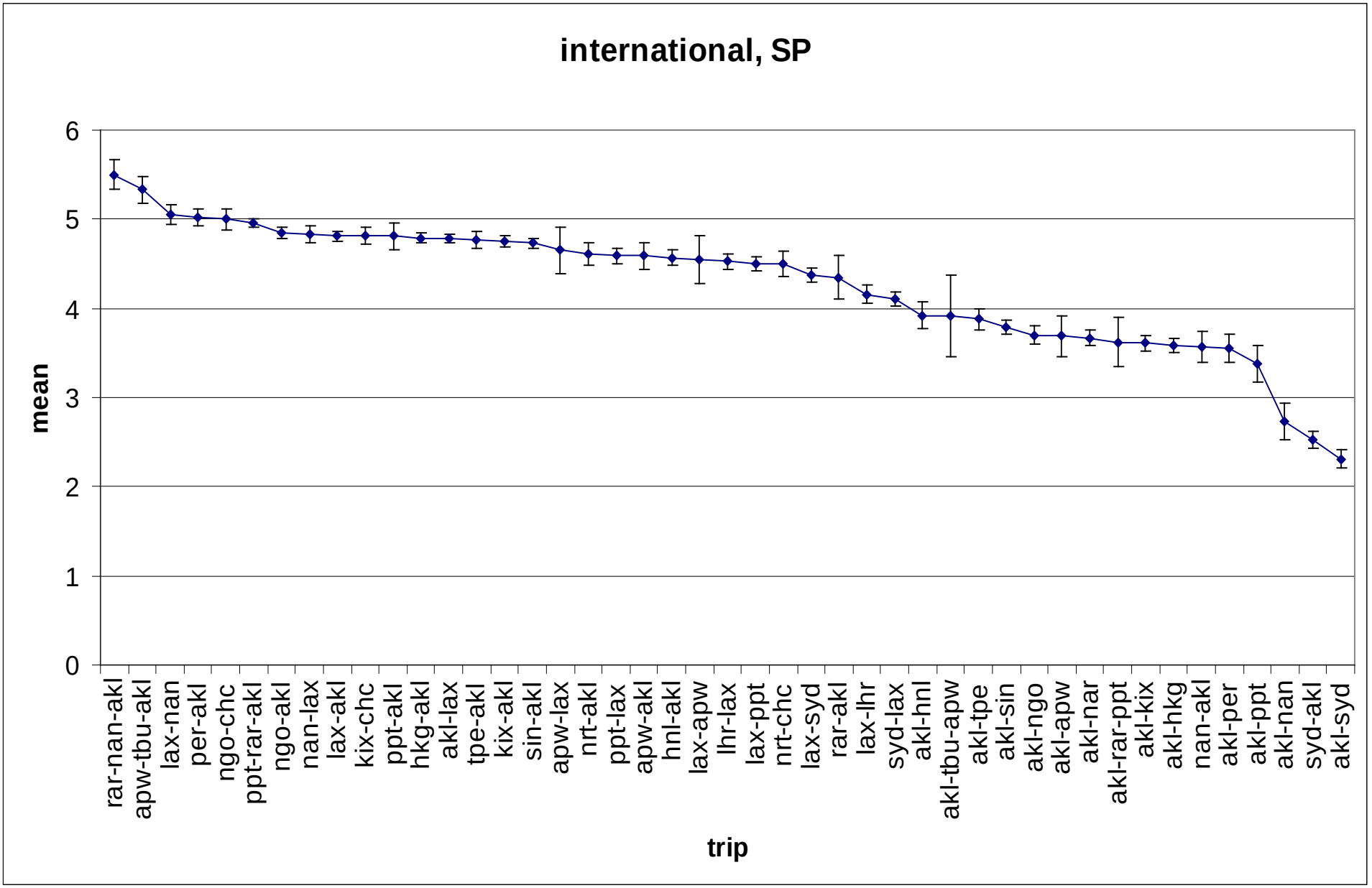
Please circle “How you feel” at Top of Descent

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. Completed exhausted

Please mark on the line below

Alert ——— Drowsy

Please place in brown envelope



Top of Descent Survey Results - Representative

RESEARCH ARTICLE

Pilot Fatigue in Short-Haul Operations: Effects of Number of Sectors, Duty Length, and Time of Day

David M. C. Powell, Mick B. Spencer, David Holland, Elizabeth Broadbent, and Keith J. Petrie

Powell DMC, Spencer MB, Holland D, Broadbent E, Petrie KJ. ***Pilot fatigue in short-haul operations: effects of number of sectors, duty length, and time of day.*** **Aviat Space Environ Med 2007; 78: 698–701.**

Introduction: There is little research on what factors are associated with fatigue in short-haul pilots. The aim was to investigate how length of duty, number of sectors, time of day, and departure airport affect fatigue levels in short-haul operations. ***Methods:*** Pilots completed Samn-Perelli fatigue ratings prior to descent at the end of each rostered short-haul duty over a 12-wk period. Overall, 1370 usable responses were collected (67% of rostered duties) and fatigue scores were examined in relation to the departure airport, the number of sectors flown, time, and the length of duty period. ***Results:*** The most important influences on fatigue were the number of sectors and duty length. These were associated with fatigue in a linear fashion. Time of day had a weaker influence, with lower levels at midday and increased fatigue later in the

starts as the most important causes (2). Short-haul rosters cause pilots to sleep less, wake earlier, and have less restful sleep over the work period (5). Studies with UK pilots have identified time of day and the number of flights per day as important influences on the development of fatigue during the course of a short-haul duty period (3). It is clear from the small amount of research conducted with short-haul crew that early starts, late finishes, and the high workload caused by multiple sectors are important influencing factors on fatigue levels. However, it is not clear which factors contribute most, particularly at the most critical period for flight safety—the final approach and landing phase. This in-

“Holland’s Mistake”
- Cabin Crew Sector Survey

- Same methodology as pilot survey
- Conducted over entire network – International, Regional and Domestic
- 10,000 responses collected over one month

“Holland’s Mistake”
- Cabin Crew Sector Survey

….analysis still proceeding

Presented at the FAA Fatigue Management Symposium: Partnerships for Solutions; Vienna, VA: June 17-19, 2008

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Pilot Fatigue Surveys

ERGONOMICS, 15 APRIL, 2004, VOL. 47, NO. 5, 461–468

Taylor&Francis
healthsciences

Fatigue self-management strategies and reported fatigue in international pilots

KEITH J. PETRIE,†*, DAVID POWELL‡ and ELIZABETH BROADBENT†

†Department of Health Psychology, University of Auckland

‡Medical Unit, Air New Zealand

Keywords: Fatigue; Aircrew; Pilots; Napping; Mediation.

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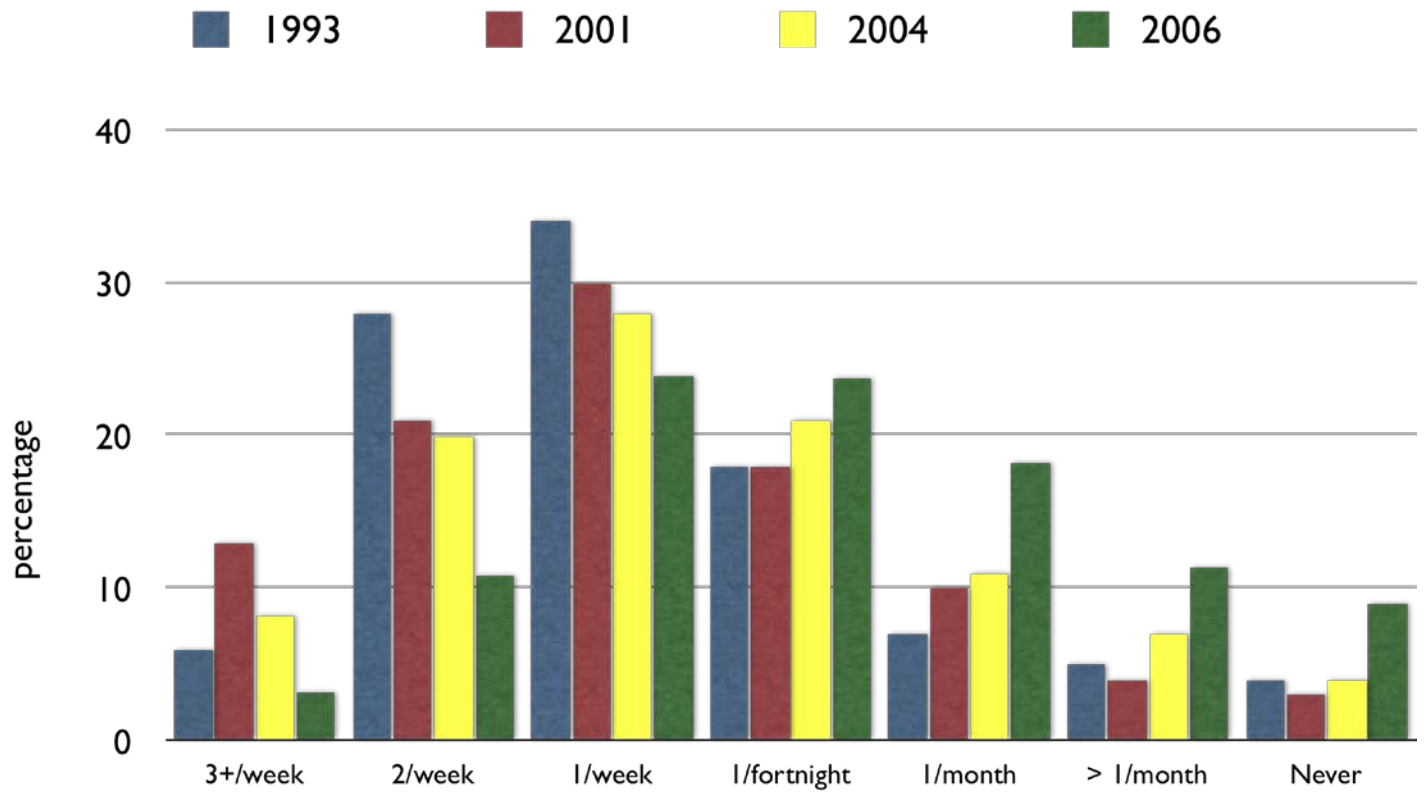
Significant Fatigue from Job 1993, 2001, 2004 and 2006



Other Components of Company FRMS

- Education
  - Induction Training
  - Periodic Annual Fleet Refreshers / Recurrent Training
  - Reference Manuals, CASG Intranet Website

- Provision of Controlled Rest Procedures in SOPs
  - Along similar lines to JAA provisions
  - Specified protocols for use (cruise, low workload, no planned deviation from track or flight plan etc)
  - Used when other fatigue countermeasures have been ineffective
  - Not preplanned

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External Work / Outreach

- Ansett……
- FSF sponsored ULR Workshops
- ULR Delivery Flights
- External Airline Study
- QinetiQ / UKCAA

Safety Regulation Group

Civil Aviation Authority

CAA PAPER 2003/14

Wakefulness on the Civil Flight Deck: Evaluation of a Wrist-worn Alertness Device

Flight Safety Foundation
An International Organization for Everyone Concerned With the Safety of Flight

From Reactive to Proactive

Domestic – Maximum 5 Sectors out of overnight
Back of the clock AKL - PPT - AKL
B737 augmentation for Niue flights
Shanghai flight crew augmentation
Establishment of Home Rest matrix for International Operations

Summary of Key Points

- A **"Just Culture"** environment allowing free and open feedback
- Management and Unions working together from the outset establishing agreed processes and procedures
- Focus on a data driven approach and known science
- 3 large data sets - fatigue reports, operational studies, top of descent survey
- Decisions made by management **BUT** there must be a commitment to act where required
- The importance of external review, audit and oversight
- Over time a comprehensive data base can be established – extremely valuable for interpreting and understanding each new study's results
- Ability to make decisions proactively based on previous knowledge & experience
- An important component of the company's Safety Management System, and fulfils company's "duty of care" responsibility required by NZ HSE law

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QinetiQ

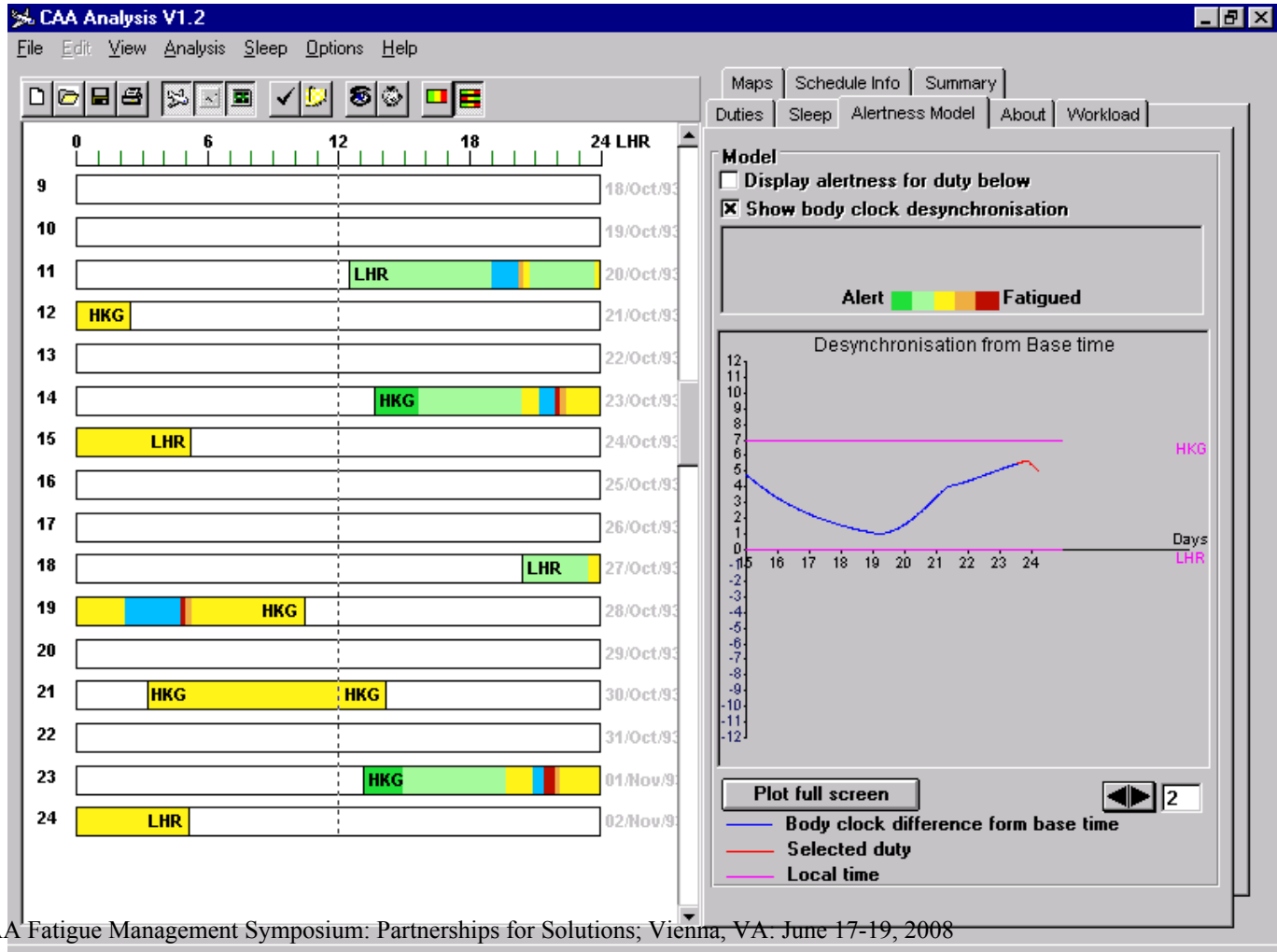
Model Integration

SAFE currently used to evaluate individual "tours of duty"

Aim: To incorporate fatigue model into roster generation process

Proof of concept / initial trialling completed

Working on way forward to reduce rostering optimiser run times



Universal Data Collection

- Use of ACARS to collect pilot alertness status prior to top of descent
- EFB e-documents for on board reporting of fatigue events
- Examine potential use of EFB interface for field study data collection

Questions?

During Q and A Session

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greg.fallow@orcon.net.nz NZALPA Representative Crew Alertness Study Group

Palm pilot programme available on application to Dr Powell