

Joint Session

Top-Down Safety Focus: Fatigue Risk Management Systems (FRMS)

Operational Benefits of an FRMS

Captain Don Gunther
Continental Airlines

13:30 - 13:50

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Captain Don Gunther
Biography

Don Gunther is the Senior Director of Safety & Regulatory Compliance for Continental Airlines. He is currently the Industry Co-Chair for the Commercial Aviation Safety Team (CAST) and Chairman of the ATA Safety Council. He also teaches a Threat & Error Management (TEM) Development Program at the University of Southern California's Aviation Safety & Security Program. Don has completed terms as Chairman of the Air Transport Association (ATA) Human Factors Committee and Chairman of the International Air Transport Association (IATA) Human Factors Working Group.

Hired by Continental Airlines in 1977, he has been a Captain & Instructor Pilot for Continental since 1986 and has qualified on the B-727, B-737, DC-10, B-757, B-767 and B-777. He flew the Navy's P-3 Orion for 20 years and is now a retired Naval Reservist. Don is a graduate of the U.S. Naval Academy.

Fatigue Risk Management & Flight Operations



Captain Don Gunther
Senior Director of Safety
Continental Airlines

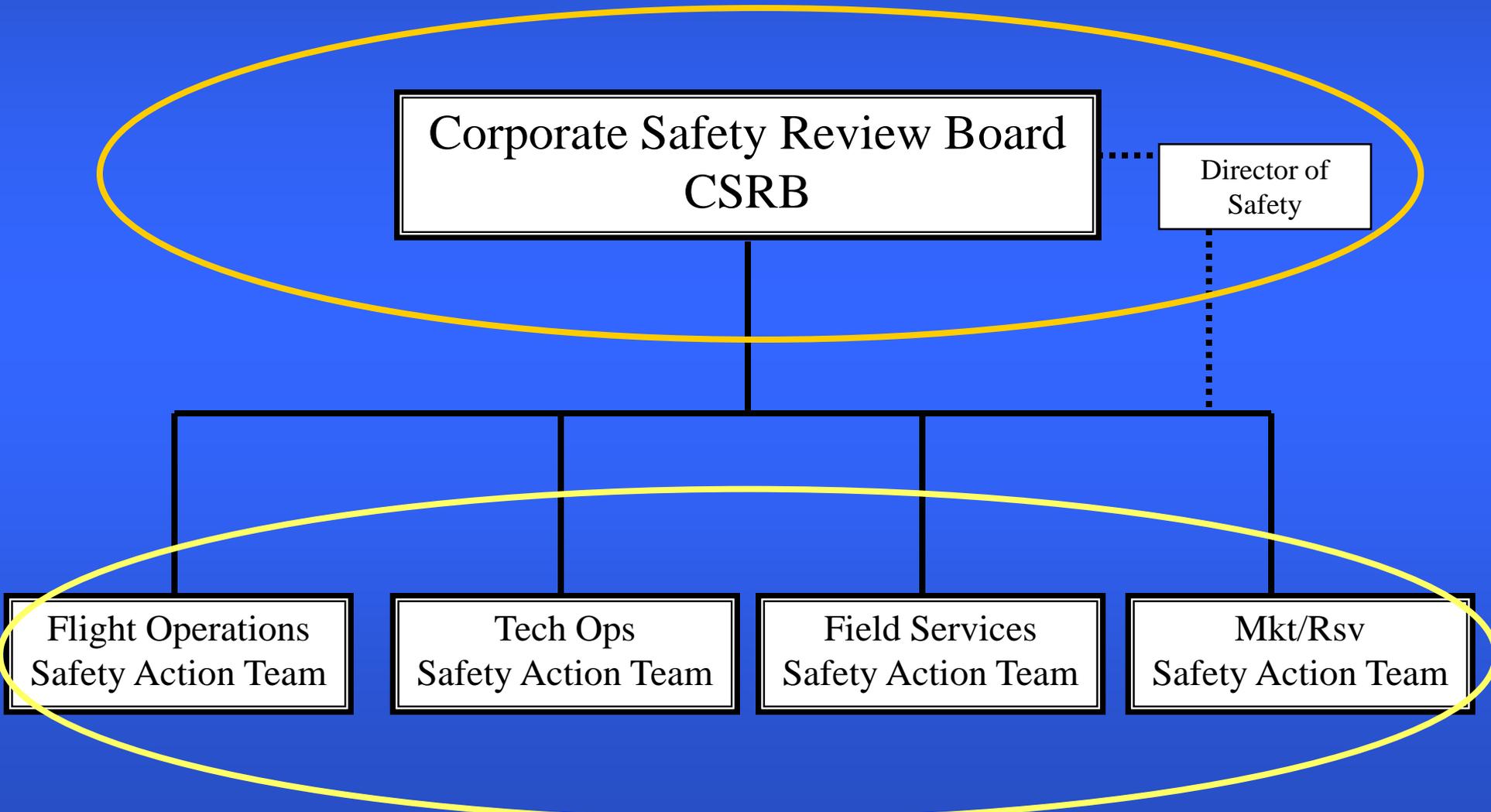
Presented at the FAA Fatigue Management Symposium: Partnerships for Solutions;
Vienna, VA: June 17-19, 2008

Fatigue Risk Management System as part of a Safety Management System

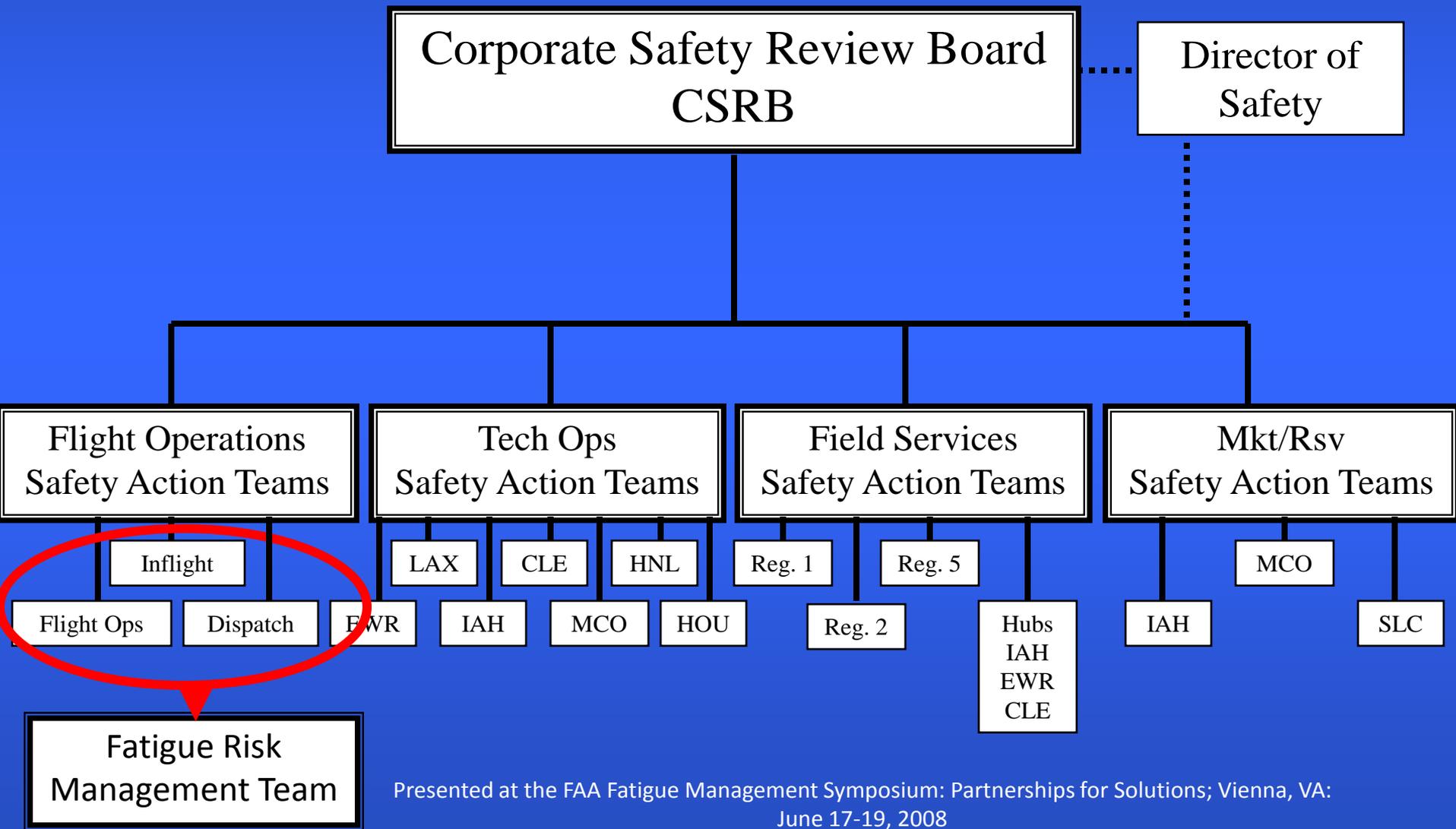
Safety Management System (SMS)

- SMS is an organized approach to managing safety including the necessary organizational structures, accountabilities, policies and procedures. *(ICAO)*
 - *SMS is quality management approach to controlling risk (threats)*
 - *SMS provides management with a detailed roadmap for monitoring safety related processes*

Continental SMS



Continental SMS



Safety Action Team (SAT)

Accountability

SATs are responsible to the Corporate Safety Review Board and the chair is determined by the appropriate (Sr/Exec) VP.

Membership

SAT membership will normally be drawn from directors, managers, supervisors and staff, from within the appropriate functional area and when appropriate the FAA and labor.

Terms of Reference

As a minimum each SAT is responsible for the following:

- To oversee operational safety within the functional area.
- To ensure that any necessary corrective action is taken in a timely manner.
- To report to and accept strategic direction from the Corporate Safety Review Board via the appropriate Exec/Sr VP.

Flight Operations Safety Action Team (SAT)

Develop the process by which safety data and crew performance and behavior data from FOQA, LOSA, ASAP, AQP, CASIS, Line Checks,... are analyzed by ...

- Safety, Flight Operations, Inflight, Flight Standards & Training, FAA and ALPA Safety in order to facilitate change.*

Fatigue Risk Management Team (FRMT)

Accountability

The Fatigue Risk Management Team (FRMT) is responsible to the Flight Operations Safety Action Team (SAT) and the Corporate Safety Review Board (CSRB). The FRMT chair is determined by the VP of Operations

Membership

FRMT membership will be drawn from directors, managers, supervisors and staff, from within the appropriate operational divisions, the Global Medical division, the FAA, labor and a non-company individual to provide expertise in the area of fatigue risk management.

Fatigue Risk Management Team (FRMT)

Terms of Reference

At a minimum, the FRMT will meet quarterly and is responsible for the following:

- Assist in the development and review of all fatigue mitigation strategies on an individual basis for all Ultra-long-range (ULR) flights. The development and review of fatigue issues for each ULR flight to include:
 - Planned duty time limits, roster modeling, flight rest schemes, layover fatigue mitigation schemes, use of reserves, etc.
 - ***Determination of appropriate methods for fatigue data acquisition (e.g., questionnaires, diaries, actigraphy, performance testing, etc.).***
- Review of data from all fatigue-information monitoring sources to include, but not limited to, ASAP, LOSA, CASIS, Inflight audits, etc.
- Monitoring performance issues that may relate to fatigue by reviewing objective flight data from the previous sources as well as delays, diversions, absenteeism, etc.
- Investigate all fatigue-related issues, determine appropriate mitigating strategies and provide timely feedback to the workforce.
- Oversee the quality assurance of initial and recurrent fatigue risk management training in all divisions.
- Assist in the development of policies for identifying and managing employees who are fatigued to the extent that represents a safety risk, including provisions for employees to opt out of an assignment.
- To report to and accept strategic direction from the Flight Operations (SAT) on all fatigue-related issues and the appropriate mitigating strategies.
- The Safety Department will report on the fatigue related activities of the FRMT and the Flight Operations (SAT) to the CSRB.



Continental Airlines

Managing Long Range Operations

Dr. Greg Belenky
Research Professor & Director
Sleep & Performance Research Center
Washington State University

Fatigue Risk Management System (FRMS)

Five-tiered defense-in-depth to prevent fatigue related errors, incidents, and accidents (Dawson & McCulloch 2005)

- **Tier 1 – Does system of shift timing and duration allow for adequate opportunity for sleep?**
 - Computer-based rostering
 - Predictive Modeling
- **Tier 2 – Do employees take advantage of the sleep opportunity?**
 - Self-report
 - Wrist-worn actigraph (sleep watch)
- **Tier 3 – In the workplace, do they maintain adequate alertness and performance?**
 - Self-report & co-worker report
 - Palm Pilot Psychomotor Vigilance Task (PVT)
 - Embedded performance metrics
 - When needed refer for assessment for sleep disorders
- **Tier 4 – Are there errors, near-misses?**
- **Tier 5 – Are there incidents and accidents?**

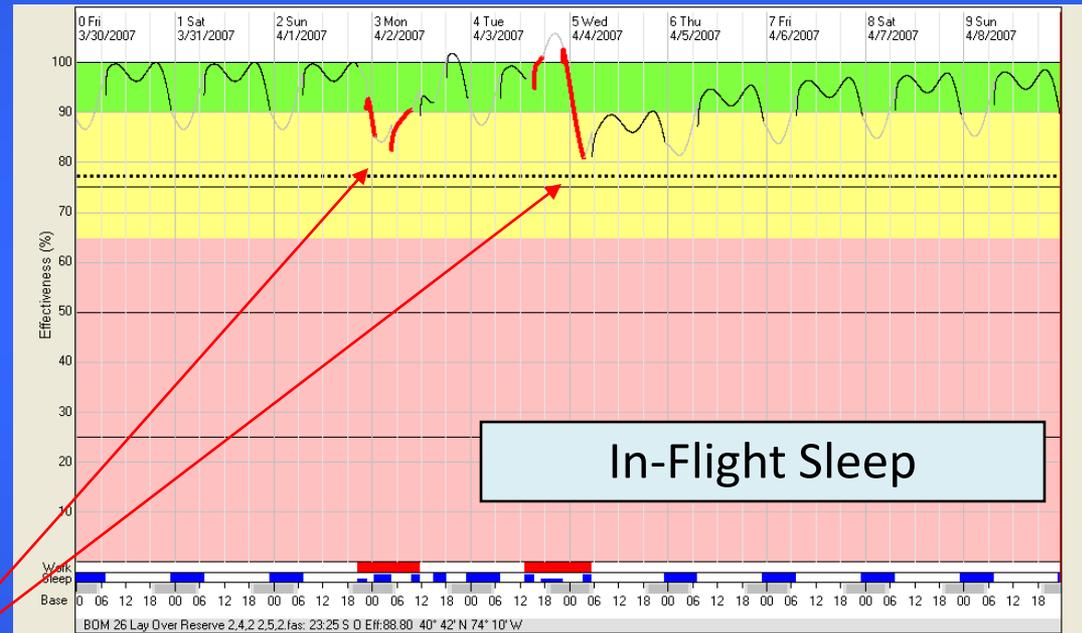
Mathematical Models to Predict Performance for FRMS Tier 1

Mathematical Models to Predict Performance from Prior Sleep

- There are a number of mathematical models that predict performance from prior sleep (sleep/wake history) and time of day (circadian rhythm) – using a two-process model
- The Sleep, Activity, Fatigue, and Task Effectiveness Model / Fatigue Avoidance Scheduling Tool (SAFTE™/ FAST™) appears to be one of the better validated models (Van Dongen, 2004; Hursh et al., 2004a; 2004b; 2006).
- The beauty of a mathematical model is that it incorporates extant scientific knowledge, and
- Given a validated model, you can assess the performance consequences of any possible schedule

Performance Predicted by SAFTE/FAST

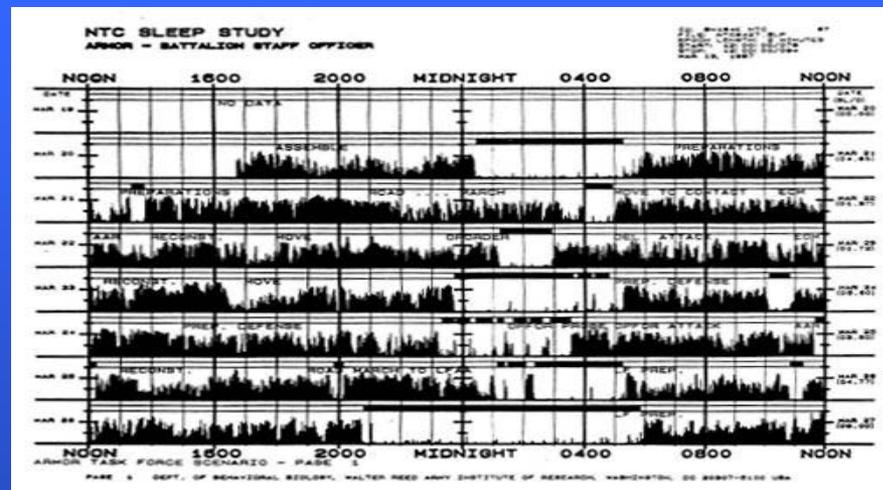
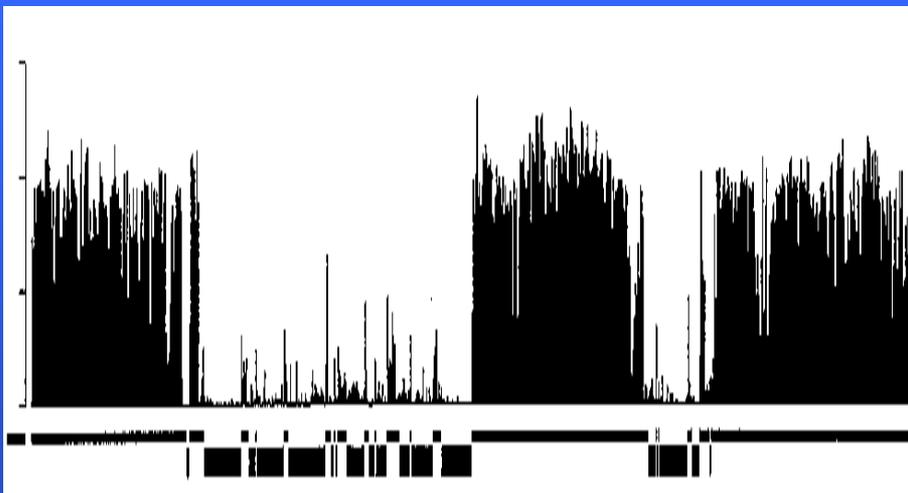
- On-duty periods indicated by red bars
- Sleep periods indicated by blue bars
 - Sleep at home or in hotel coded as excellent
 - Sleep on aircraft coded as good unless at adverse circadian phase in which case it is coded as poor
- Night in Newark, NJ indicated by gray bars
- Performance plotted in trace at top of graph
 - Green / Unimpaired
 - Yellow / Mild to Moderate Impairment
 - Red / Severely Impaired
- Performance is degraded by
 - Time awake / sleep loss
 - Time of day / circadian rhythm



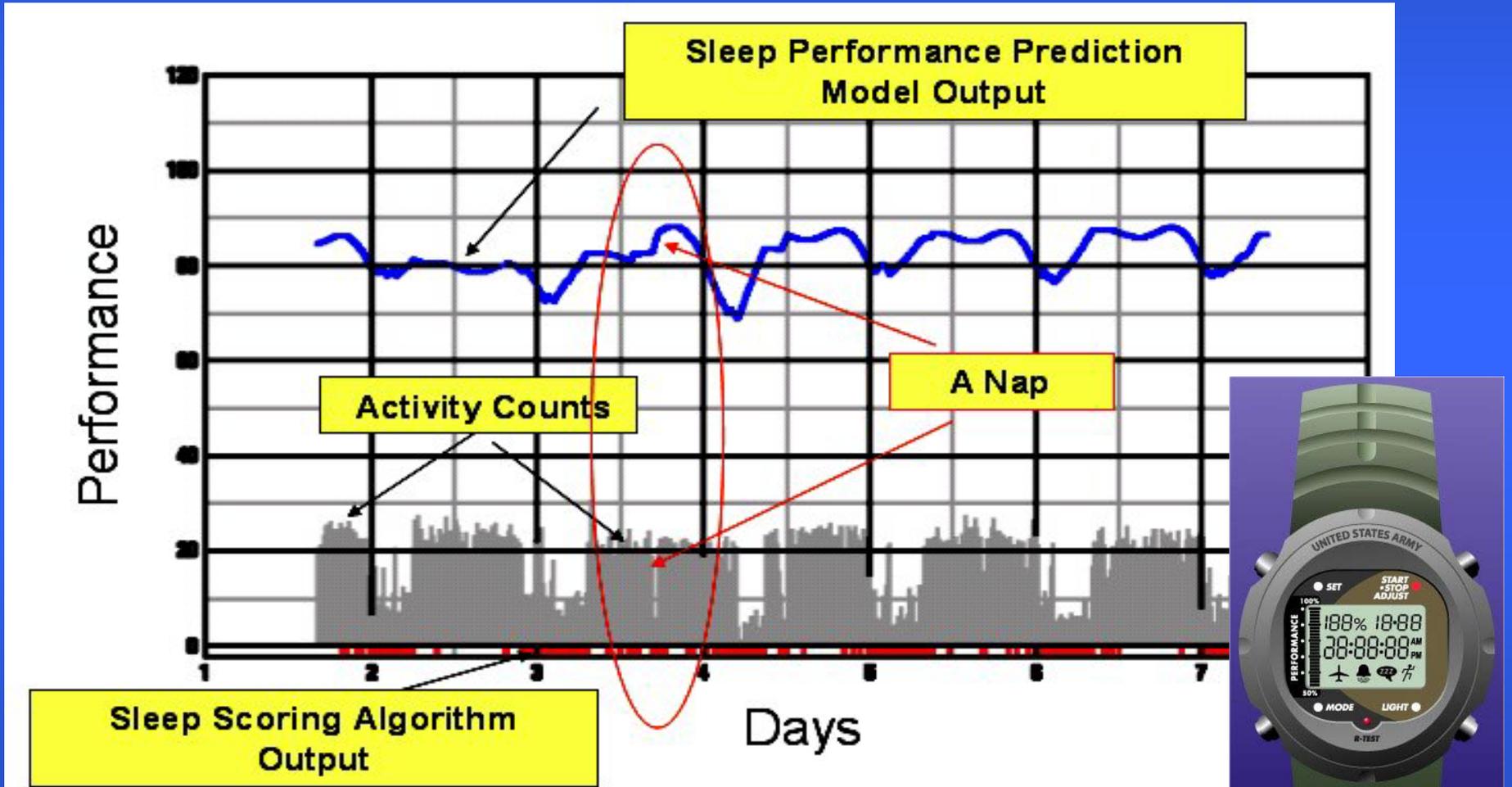
Actigraphy (Sleep Watch) for FRMS Tier 2

Fatigue Risk Management System (FRMS)

- Tier 2 – Do employees take advantage of the sleep opportunity?
 - Self-report
 - Wrist-worn actigraph (sleep watch)



The Sleep Watch in Real-World Application



Performance Measures for FRMS Tier 3

Fatigue Risk Management System (FRMS)

- **Tier 3 – In the workplace, do they maintain adequate alertness and performance?**
 - **Self-report & co-worker report**
 - **Palm Pilot Psychomotor Vigilance Task (PVT)**
 - **Embedded performance metrics**
 - **When needed refer for assessment for sleep disorders**



PVT

FOQA

Fatigue Risk Management System (FRMS)

- Tier 4 – Are there errors, near-misses?

ASAP

- Tier 5 – Are there incidents and accidents?

Safety Reports and Investigations

Fatigue Mitigation Strategies

Fatigue Risk Management System (FRMS)

FOQA

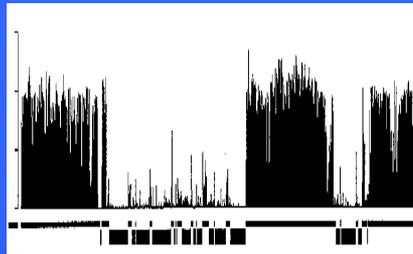


ASAP

Safety Reports and Investigations



SAFTE/FAST



ACTIGRAPH



PVT

Mitigation Strategies

Conclusion and Recommendations

- In-flight sleep is an effective countermeasure for in-flight degradation in performance caused by the effects of extended time awake and adverse phase of circadian rhythm
- Sleep performance prediction modeling based on the two-process model of sleep regulation and validated against data is a useful tool for comparing the performance effects of different schedules and for recommending countermeasures