

# SLEEP

## ▷ 2019 ◁

# *Controlled Rest on the Flight Deck: Profile of Use, Challenges, and Best Practices*

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# Pilot Fatigue & Countermeasures

- Airline pilots often suffer from fatigue
- Fatigue Risk Management System (FRMS) and countermeasures are used to manage fatigue
- Controlled Rest (CR) is a “mitigation strategy to be used as needed in response to unanticipated fatigue experienced during flight operations” (ICAO, 2015)
  - Nap taken in-seat on the flight deck (c.f. bunk rest)
  - Defined policy and procedures to follow
  - Pilots must still be fit for duty
  - Approved by USAF, USCG and in most countries; not approved by FAA

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# “Uncontrolled” Rest

## Unintentional

- Up to 20% of night shift workers unintentionally fall asleep on shift  
(Coleman & Dement, 1986; Torsvall & Åkerstedt, 1987; Torsvall et al., 1989; Kecklund & Åkerstedt, 1993; Åkerstedt et al., 2002)
- 58% (N=713) Brazilian pilots reported unintentionally falling asleep while flying  
(Marqueze et al., 2017)
- 78% (N=7) pilots were observed having microsleeps during critical phases of flight; 44% (N=4) fell asleep during cruise (Rosekind et al., 1994)

## Intentional

- Planned naps reported by US flight crew
  - 11% (N=3) long-haul pilots observed (Gander et al., 1991)
  - 56% (N=797) regional pilots surveyed (Co et al., 1999)
  - 39% (N=580) corporate/exec pilots surveyed (Rosekind et al., 2000)
  - “[CR] definitely needs to be legal. It’s being done anyway.” (Rice et al., 2018)

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Aug 3, 2009

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# NTSB: Both Pilots Asleep on Hawaii Flight

“The National Transportation Safety Board determines the probable cause(s) of this incident as follows:

- The captain and first officer inadvertently falling asleep during the cruise phase of flight.
- Contributing to the incident were the captain's undiagnosed obstructive sleep apnea and the flight crew's recent work schedules, which included several consecutive days of early-morning start times.”

(NSTB Report SEA08IA080, 2009)



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# Benefits of CR: Survey Data

- Managers and flight crew using CR (non-US)

(N=35; Holmes & Okuboyejo, in press)

- 90% - “CR has provided significant benefits for flight safety”
- 87% - “CR has reduced fatigue-related performance decrements during safety-critical phases of flight”
- 83% - “CR has reduced the incidence of uncontrolled napping”

- US pilots

(N=30; Rice et al., 2018)

- 70% approved or strongly approved of using CR in the US

# Benefits of CR: In-flight data



- N=21 pilots
- 40min nap opportunity
- 20min recovery period
- Polysomnography (PSG)
- Psychomotor Vigilance Test (PVT)
- Karolinska Sleepiness Scale (KSS)

Rosekind et al., 1994

[www.nasa.gov](http://www.nasa.gov)

# Benefits of CR: In-flight data



[www.nasa.gov](http://www.nasa.gov)

- Sleep achieved in 93% of attempted naps
- Sleep Onset Latency (SOL) ~5min
- Total Sleep Time (TST) ~26min
- Increased speed; reduced lapses
- Reduced risk of unintentional sleep in cruise
- Eliminated microsleeps in critical phases of flight

**Rosekind et al., 1994;**

Valk & Simons, 1997; Spencer & Robertson, 2000

# Profile of Use: Survey Data

## Non-US carriers

- 53% (N=134) pilots surveyed used CR in past 12 months (Petrie et al., 2004)
- Carriers with a fatigue reporting system and CR policy (N=2)
  - 30% of fatigue reports cite CR (Holmes & Okuboyejo, in press)

# Profile of Use: In-flight Data

## EASA Effectiveness of Flight Time Limitations Study (EASA, 2019)

- 24 airlines; 261 pilots; 2-week data collection
- 27% of night flights >10h contained CR

# Profile of Use: In-flight Data

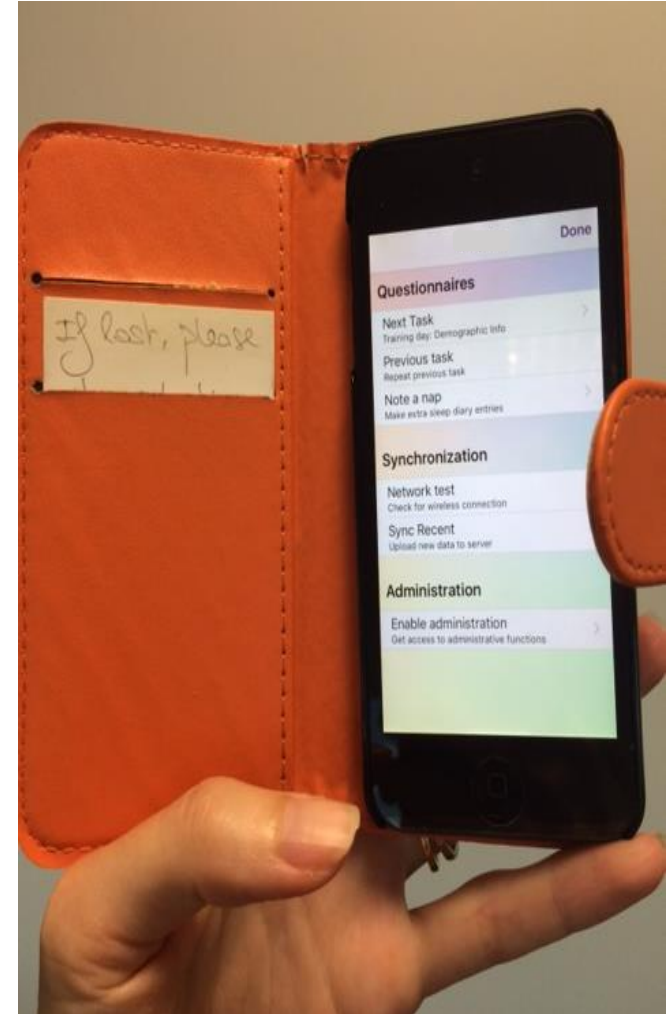
## Controlled Rest during Long-Haul Operations

### Methods

- N=43 pilots, 2-week data collection = 240 flights
- Sleep diaries, in-flight rest log, actigraphy, PVT

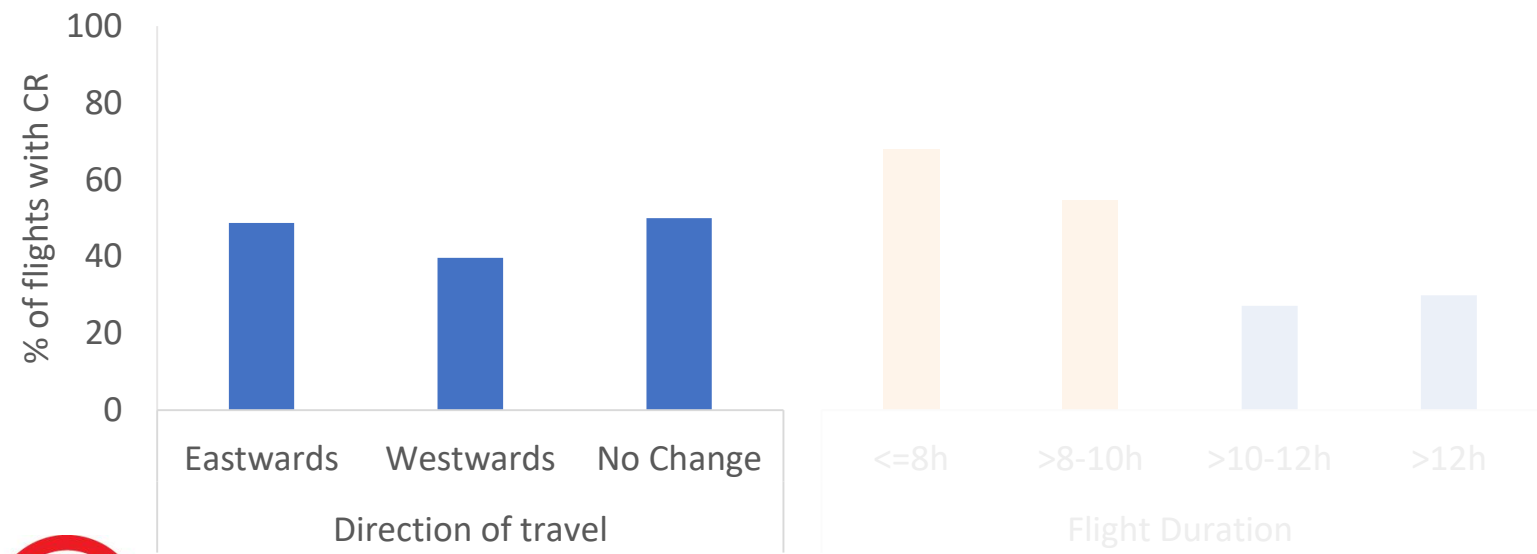
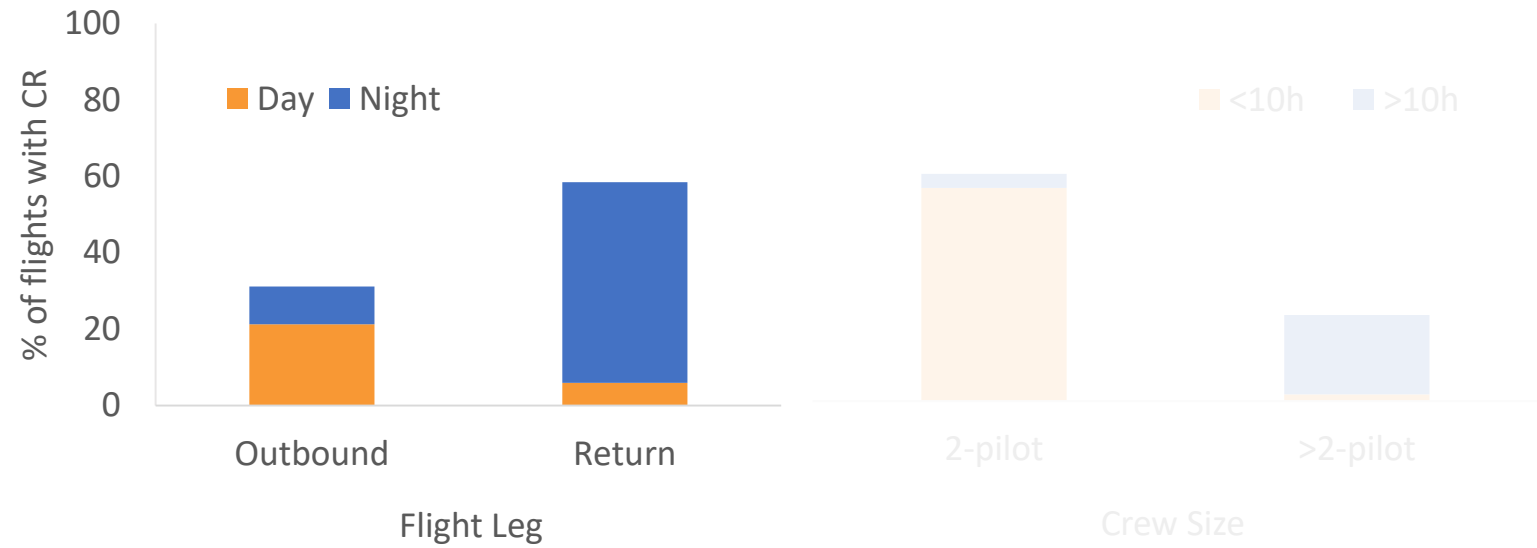
### Results

- 45% (n=107) flights contained CR
- $24.8 \pm 16.1$  min average sleep duration (actigraphy)



Personal photo







# Challenges

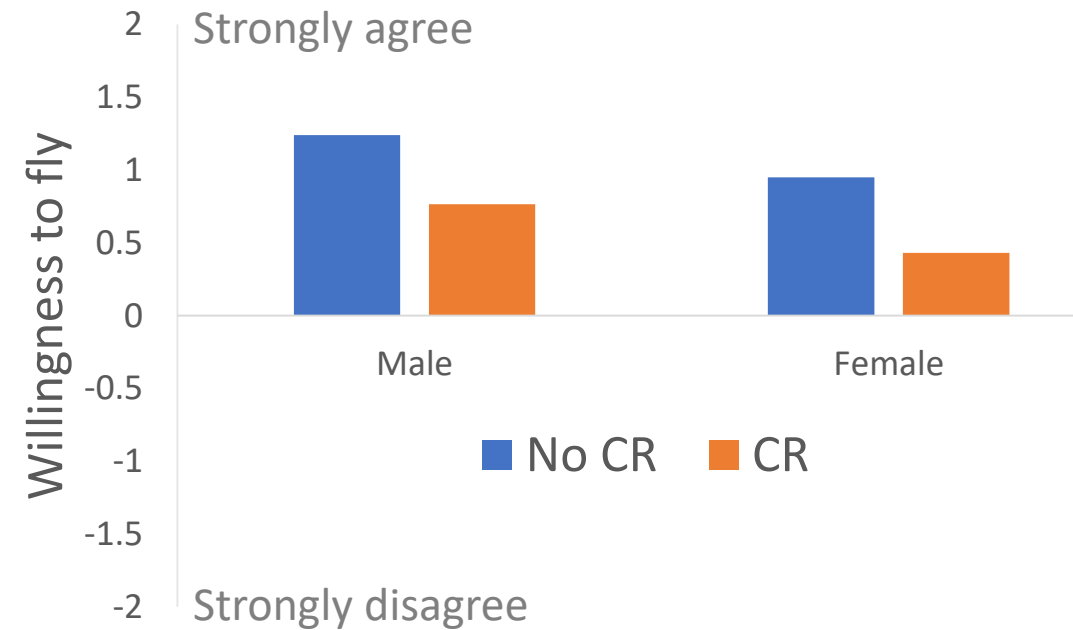
- Sleep inertia
  - Education, policy for recovery after nap
- Risk of other pilot falling asleep
  - Communication, planning, flight attendant check
- Public perception
  - Less willing to fly relative to No CR (N=530; Winter et al., 2015)
  - 86% (N=869) agreed that pilots should be able to nap (NSF Sleep in America Poll, 2002)
  - Education, public awareness campaigns to manage perceptions

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(Adapted from Winter et al., 2015)

# Challenges

- Non-compliance; not following procedures
  - Education, WHY not just HOW, develop policy with flight crew, safety culture

## Air India pilot's 'sleep inertia' caused crash

Updated 11/18/2010 1:12 PM | Comments [57](#) | Recommend [5](#)



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AFP/Getty Images

Crews work amid the smoldering wreckage of an Air India Boeing 737-800 that crashed on landing in Mangalore, India.

By Alan Levin, USA TODAY

The senior pilot of an Air India jet that crashed in May was asleep for most of the flight and then made critical errors because he was disoriented after waking up, according to Indian news reports.

The crash on May 22 in [Mangalore](#), India, killed 158 people after the jet overran the runway and plunged off a cliff.

Capt. Zlatko Glusica was captured loudly snoring on a cockpit recorder, the accident investigation found, according to the *Hindustan Times*. The Associated Press confirmed the account from a government official who spoke on condition of anonymity because the report

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## Air Canada pilot suffering from 'sleep inertia' put the whole flight in trouble: TSB

Toronto : Canada | Apr 17, 2012 at 6:17 PM PDT

BY [madn3wz](#)

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# Best Practice

## Fatigue Countermeasures Working Group

- Sleep inertia and napping science
  - Nap benefits vary
  - Recovery period 20 min
- When to use
  - Low workload phase (cruise)
  - No abnormal situations
  - End at least 30min before top-of-descent (TOD)
- Minimum Safeguards
  - Handover briefing
  - Cabin crew check

## Controlled Rest on the Flight Deck: A resource for operators

FATIGUE COUNTERMEASURES WORKING GROUP



<https://flightsafety.org/wp-content/uploads/2018/11/Controlled-Rest.pdf>

# Best Practice

## Fatigue Countermeasures Working Group

- Education
- Integrate into Fatigue Risk Management
  - Report CR use
  - Identify trends
  - Develop management solutions
- CR is not a replacement for:
  - Requirement to be fit-for-duty
  - Best scheduling practices

## Controlled Rest on the Flight Deck: A resource for operators

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<https://flightsafety.org/wp-content/uploads/2018/11/Controlled-Rest.pdf>

# Summary

- Current studies suggest CR can improve alertness and performance
- We need more data on CR in practice – how it's used; effectiveness
- Not advocating for CR (until we have more data to support it!)

# Future Research

- Global Fatigue Countermeasures Survey of Commercial Airline Pilots (NASA and Fatigue Countermeasures Working Group)
- Investigate field-deployable countermeasures to sleep inertia (NASA, Central Queensland University, University of South Australia)
- Encourage airlines to collect data on CR to increase knowledge of use, attitudes, and effectiveness



# Thank you

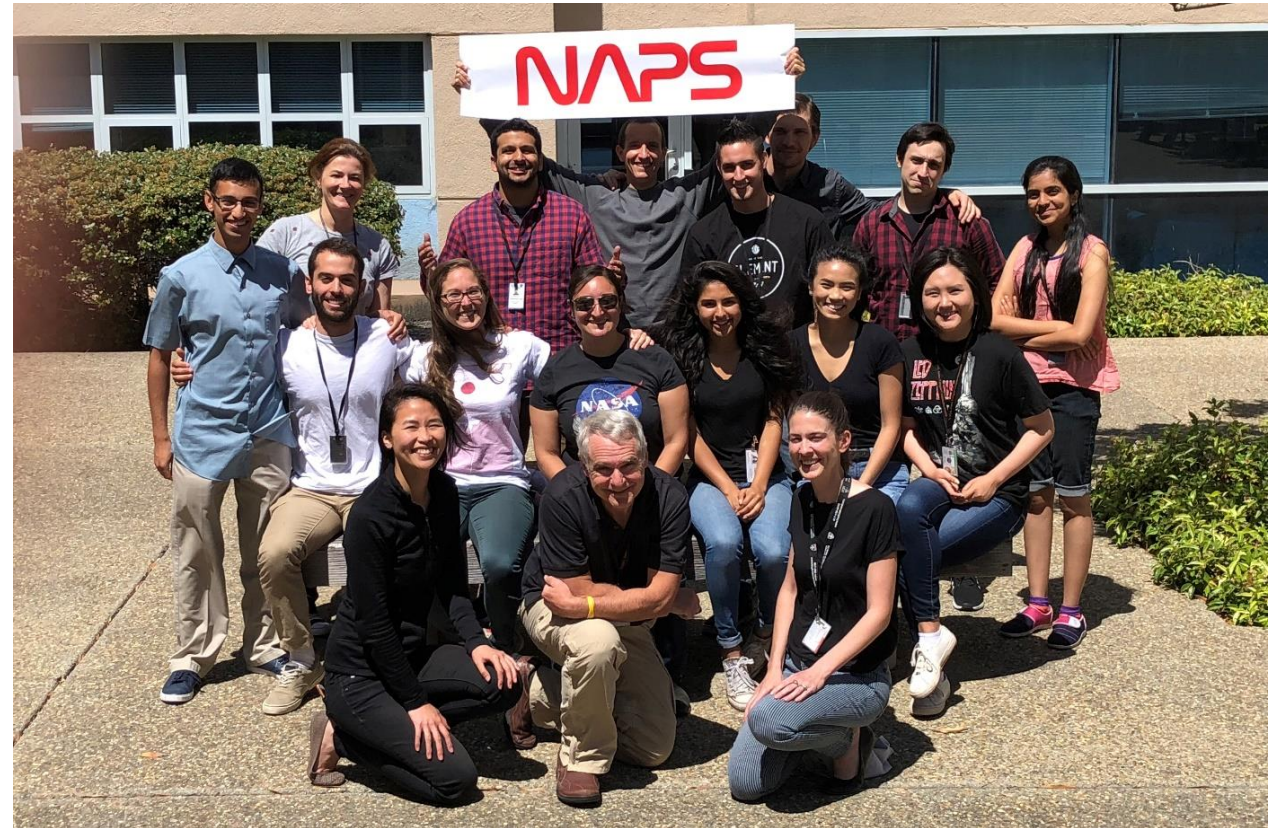
- Fatigue Countermeasures Lab (NAPS)
- Fatigue Countermeasures Working Group
- Erin Flynn-Evans
- Lucia Arsintescu
- Kevin Gregory

## Support

- NASA Airspace Operations and Safety Program, System-Wide Safety Project

## Questions? Poster 112!

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Personal photo