Controlled Rest: Profile of Use, Challenges, and Best Practices

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SJSU Research Foundation, NASA Ames Research Center
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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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)

www.nasa.gov

Rosekind et al., 1994
Benefits of CR: In-flight data

- 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

www.nasa.gov

Rosekind et al., 1994; Valk & Simons, 1997; Spencer & Robertson, 2000
Profile of Use (Non-US Carriers)

Survey Data
• 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)

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 CR Use in Long-Haul Operations

- N=44 pilots
- ~2-week data collection
- 239 long-haul flights
- App-based sleep diary
- Actiwatch
- Schedule info from operator
Actigraphy

- Rest Periods based on sleep diary entry
- Sleep estimated using Actiware (Medium Wake Threshold)
Flight Summary

Flight Leg

- Outbound
- Return

No. of Flights

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Crew Size

- 2-pilots
- >2-pilots

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Flight Timing

- Day
- Night

Flight Departure Time (Home Base Time)

- 00:00-03:59
- 04:00-07:59
- 08:00-11:59
- 12:00-15:59
- 16:00-19:59
- 20:00-23:59

Direction of Travel

- Eastwards
- Westwards
- No Change

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Flight Duration

- <=8h
- >8-10h
- >10-12h
- >12h

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In-Flight Rest Summary

- 1 Controlled Rest
- 2 Controlled Rests
- Controlled & Bunk Rest
- Bunk Rest Only
- No Rest
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)
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
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


FRMS Forum, 1-2 October 2019, San Francisco, California, USA
Summary

• In-lab and in-flight suggest CR can improve alertness and performance
• Naturalistic in-flight study of CR use show that is being used by pilots
• We need more data on CR in practice – how it’s used; effectiveness
• Interested in learning more about CR; not advocating for 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

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- Fatigue Countermeasures Working Group
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