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OBSTRUCTIVE SLEEP APNEA SYNDROME IN AIRCREW MEMBERS: THE AEROMEDICAL ASSESSMENT



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I have no financial relationships to disclose.

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Systematic Review of Motor Vehicle Crash Risk in Persons With Sleep Apnea

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Study Objectives: To determine whether drivers with sleep apnea are at increased risk of motor vehicle crash; whether disease severity, daytime sleepiness, or both disease severity and daytime sleepiness affect this risk, and whether treatment of sleep apnea reduces crash risk.

Design: Systematic review of published literature.

Setting: N/A.

Patients/participants: Patients with sleep apnea.

Interventions: N/A.

Measurements and Results: Forty pertinent studies were identified. For studies investigating whether noncommercial drivers with sleep apnea have increased crash rates, the majority (23 of 27 studies and 18 of 19 studies with control groups) found a statistically significant increased risk, with many of the studies finding a 2 to 3 times increased risk. Methodologic quality of the studies did not influence this relationship ($p = .22$). For commercial drivers, only 1 of 3 studies found an increased crash rate, with this association being weak (odds ratio of 1.3). The evidence was mixed regarding whether the risk of crash involvement is proportional to

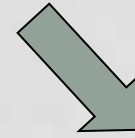


ence for driving safety.

Keywords: Sleep apnea, driving, motor vehicle crashes, systematic review

Citation: Ellen RLB; Marshall SC; Palayew M et al. Systematic review of motor vehicle crash risk in persons with sleep apnea. *J Clin Sleep Med* 2006;2(2):193-200.

RISKS FOR FLIGHT SAFETY



Cognitive and psychological disorder

Memory loss, impaired concentration
Slowed reaction time
Depression/irritability

Excessive daytime sleepiness

Sleepiness
Road traffic accidents

Cardiovascular risk factor

Hypertension
Diabetes mellitus } link
Cardiovascular events

DEFINITIONS

Repetitive apneas and hypopneas during sleep

Definition 1:

- PSG or HSAT demonstrates **≥ 5 obstructive respiratory events per hour** of sleep
- The presence of **one or more** of the following:
 - The patient complains of **sleepiness**, non-restorative sleep, fatigue, or insomnia symptoms
 - The patient **wakes with breath holding**, gasping or choking
 - The bed partner or other observer reports habitual **snoring, breathing interruptions** or both during the patient's sleep.
 - The patient has been diagnosed with **hypertension**, a **mood disorder**, **cognitive dysfunction**, **coronary artery disease**, **stroke**, congestive heart failure, atrial fibrillation, or **type 2 diabetes mellitus**

Definition 2:

- PSG or HSAT demonstrates **≥ 15 obstructive respiratory events per hour** of sleep

AASM. ICSD-3, 3rd edition, 2014

COMMISSION REGULATION (EU) No 1178/2011

of 3 November 2011

laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

(d) Applicants with a history or established diagnosis of: (5) **sleep apnoea syndrome;**

shall undergo respiratory evaluation with a satisfactory result before a fit assessment can be considered. Applicants with an established diagnosis of the conditions specified in (3) and (5) shall undergo satisfactory cardiological evaluation before a fit assessment can be considered.

(e) Aero-medical assessment:

- (1) applicants for a Class 1 medical certificate with any of the conditions detailed in (d) above shall be referred to the licensing authority;
- (2) applicants for a Class 2 medical certificate with any of the conditions detailed in (d) above shall be assessed in consultation with the licensing authority.

(h) Sleep apnoea syndrome/sleep disorder

Applicants with unsatisfactorily treated sleep apnoea syndrome should be assessed as unfit.

What arguments could lead to a fit decision in an AM with OSAS ?

METHODS

- **Aims of the study:**
 - To describe the population of AM with an OSAS
 - To study the arguments leading to the fitness decision

METHODS

Included population:

- Aircrew members examined in the AeMC Percy (Paris) between 2011 and 2017
- History of OSAS considered as severe and/or treated

Exclusion criterion:

- Cabin crew



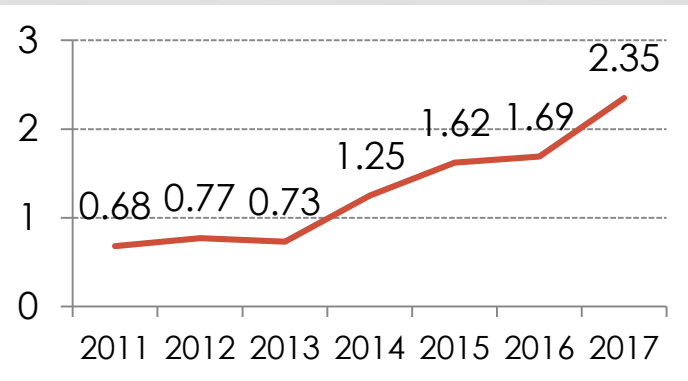
Analyzed Data:

- Age, sex, flight duty
- Predisposition and symptoms
- Diagnosis, treatment
- Fitness assessment

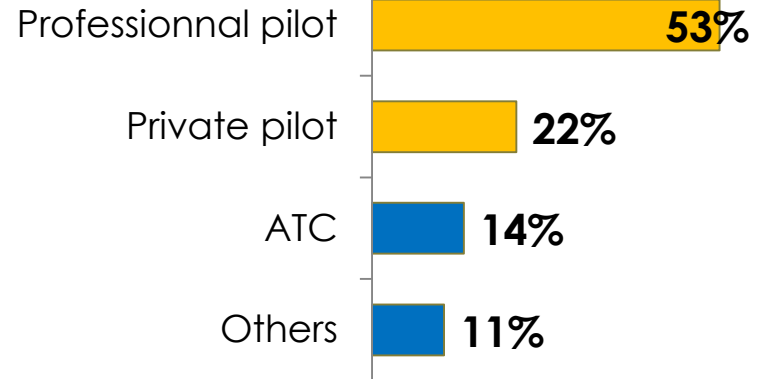
RESULTS

91 AM with OSAS:

- Mean age: 49.9+/-10yo
- 98.9% males
- 73.6% civilians
- 74.7% pilots



DUTY



Incidence rate evolution 2011-2017 in AM (rate /1000AM/year)

PREDISPOSITION AND SYMPTOMS

Symptoms:

- **Snoring 66%**
- **Sleepiness 48%**
- Witnessed apneas 10%
- Nycturia (≥ 2 /night) 4%
- Morning headaches 2%

Predisposition:

- **Obesity 59%**
- **Hypertension 39%**
- Cardiovascular disease 5%

77% of cases

Led to diagnosis:

23% of cases

DIAGNOSIS AND TREATMENT

- Ambulatory sleep monitoring or polysomnography
- **Frequency of apnea/hypopnea:**
 - Moderate: 15-30 events/hour of sleep **29%**
 - Severe: more than 30 events/hour of sleep **71%**
- **Treatment:**
 - Continuous positive airway pressure (CPAP) **92%**
 - Mandibular advancement devices **8%**

OSAS ASSESSMENT

- **Treatment efficiency:**
 - Respiratory events with treatment: **<10/h => 100%**
 - Excessive daytime sleepiness evaluation:
 - Epworth sleepiness scale: **4.3 +/-3**
 - Maintenance of wakefulness test:
 - **Performed n=60 (66%)**
 - **No sleep (40 min * 4 tests) : n=51 (85% of cases)**

MAINTENANCE OK WAKEFULNESS TEST

- Validated objective measure of the ability to stay awake
 - EEG, EOG, chin EMG
 - Sitting on a comfortable chair
 - Semidark room
 - Four 40-minutes trials

=> Mean sleep latency to the first epoch of sleep



OSAS ASSESSMENT

Maintenance of wakefulness test <40min = 9 AM (15%)

- Age, AHI before CPAP, obesity, comorbidity, sleepiness before CPAP: **no difference with the 40min MWT group**
- All treated with CPAP
- Epworth sleepiness scale ≥ 11 for 2 AM
- MWT:

0-19min	4 AM (2AM with bad compliance)
20-33 min	2 AM
34-39 min	3 AM

OSAS ASSESSMENT

- **Treatment compliance:**
 - Hours per night, nights per month
 - Acceptable for **98%** of AM treated with CPAP
- **Metabolic and cardiovascular assessment:**
 - Blood analysis: cardiovascular risk factors: **100%**
 - Exercise ECG or stress cardiac imaging: **85%**

FITNESS ASSESSMENT

All AM were declared **unfit** by AeMC:

- Military AM: referred to the military aeromedical commission
- Civilian AM: referred to/ consultation with the licensing authority

FITNESS ASSESSMENT

Unfit

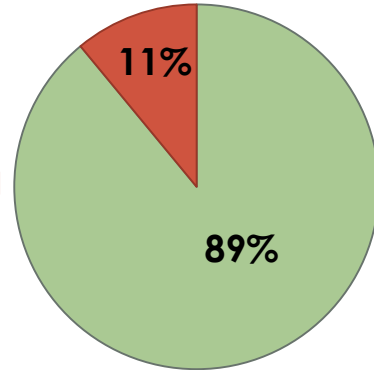
Excessive daytime sleepiness (n=6):

- Residual sleepiness (3)
- Associated chronic insomnia (1)
- Bad compliance (2)

Psychiatric disorder (n=4)

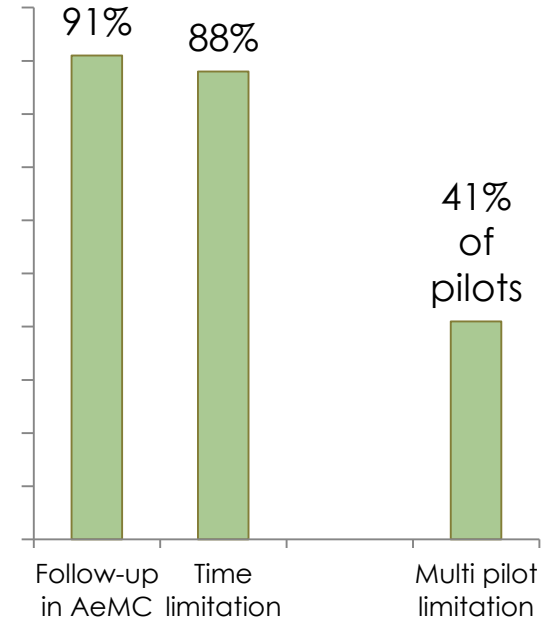
In all cases, required by the AM

Fitness



■ Fit ■ Unfit

Limitations



71% military AM were unfit for overseas deployments

AEROMEDICAL ASSESSMENT

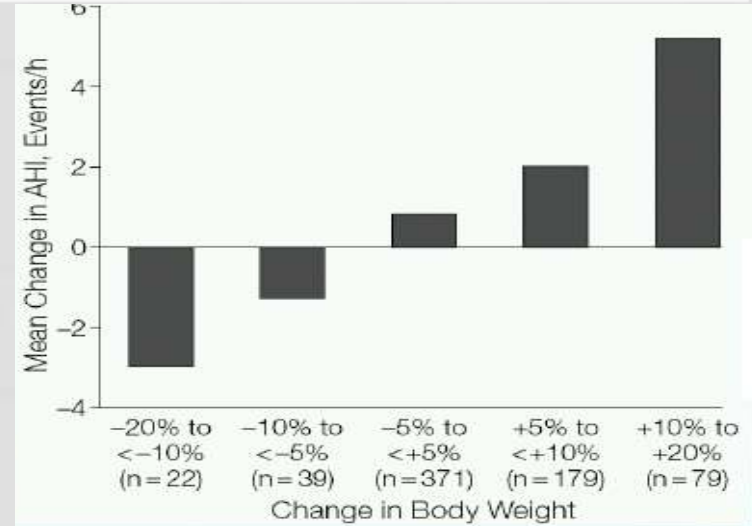
Lifestyle advice:

Weight loss and exercise:

Sleep position:



Alcohol and medication avoidance

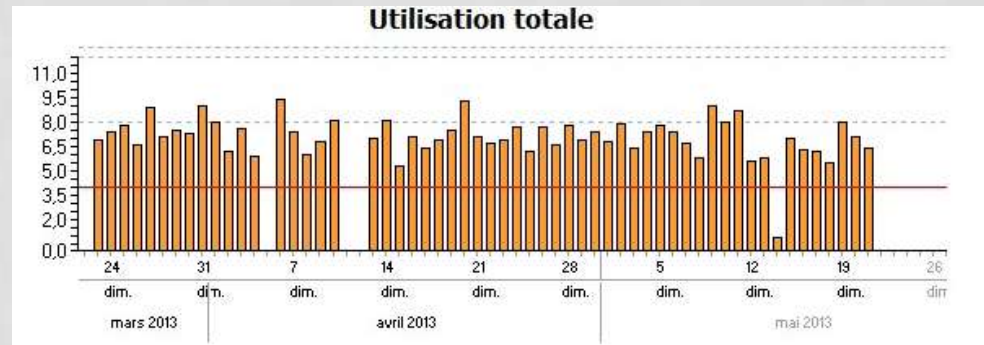


Peppard et al, JAMA 2000

AEROMEDICAL ASSESSMENT

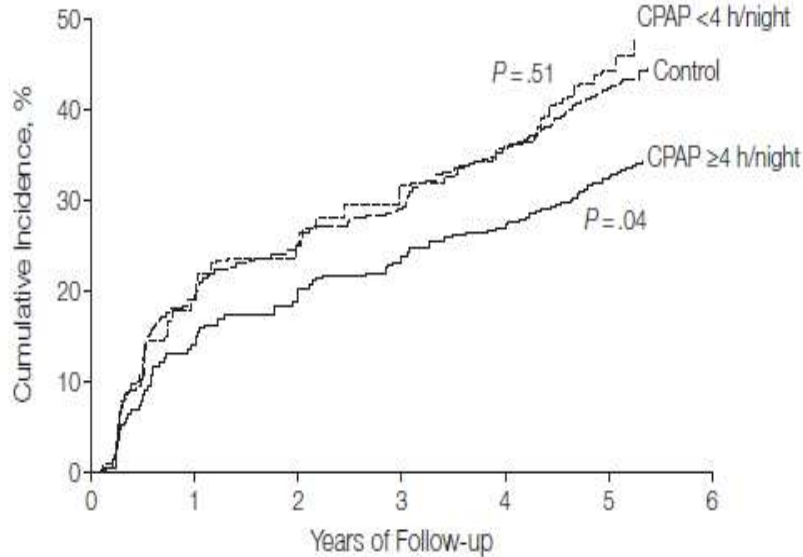
Compliance:

- Mandibular advancement devices:
 - Need of sleep monitoring
- With the CPAP data:
 - At least 80% of nights
 - 4 hours per night



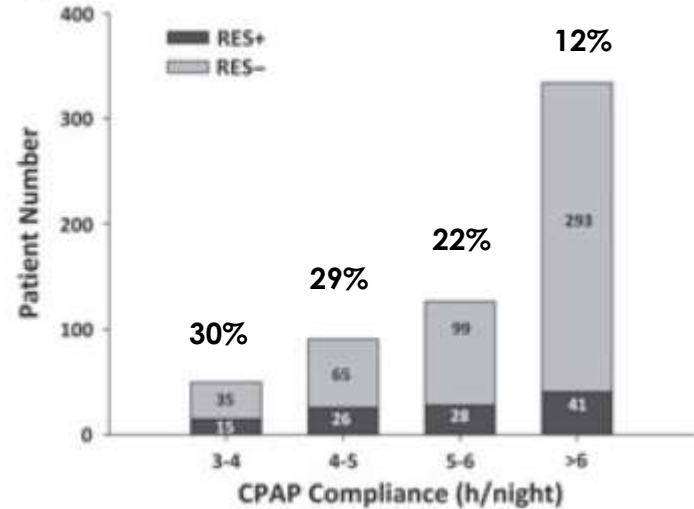
AEROMEDICAL ASSESSMENT

incidence of hypertension and cardiovascular events



Barbé et al, JAMA 2012

Prevalence of RES (residual excessive sleepiness)



Gasa et al, J Sleep Res 2013

AEROMEDICAL ASSESSMENT

- Duty:

- **Pilot: solo flying** and sleepiness => importance of maintenance of wakefulness test

- Which limit is the best ?

- *34 min and more*: « do not differ from control subjects for driving performance »
Philip et al, MWT, OSAS and driving risk, Ann neurol 2008
- *40 min*: « the strongest objective data available supporting an individual's ability to stay awake » , « an appropriate expectation for individuals requiring the highest level of safety »
Littner et al, the clinical use of MSLT and MWT-AASM practice parameters, Sleep 2005

- **Military aircrew member**: Overseas deployments



CONCLUSION

- OSAS: frequent disease in AM
- More and more diagnosed
- But probably still under-estimated

- A fit decision is generally possible
 - Efficient treatment (AHI, no sleepiness on MWT)
 - Good compliance
 - No argument for cardiovascular disease

CONCLUSION

- Importance of sleepiness evaluation
- MWT= not a perfect test but a good tool
 - MWT: which limit is the best?
 - 34 minutes ?
 - 40 minutes ?
 - MWT: recommended even in multi pilot?

děkuji za pozornost

