OBSTRUCTIVE SLEEP APNOEA & AVIATION COMMUNITY

ICAO 2025 CAPSCA-AP /17

26JUN2025

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DISCLAIMER

- I have not received any budget nor subsidy from any pharmaceutical company / medical equipment company
- My point of view does not reflect Thailand Government policy / perspective

WHAT WE WILL DISCUSS

- The Problem
- Impact on individual health
- Impact on public health
- Impact on aviation

SLEEP APNOEA

- Definition
- Risk Factors
- Diagnosis
- Treatment
- Pilots Medical Standard
- What we expect

EVOLUTION

- Human hunted for food daily / pick vegetable direct from nature
- Seasonal food / vegetable / fruit
- Human learned to preserve food
- Invention of refrigerator / freezer
- Human can eat at any time of the day
- Obesity / abundant fat deposit
- Snore / Obliteration of airway from our own tissue

SLEEP APNOEA

- a sleep-related breathing disorder that involves a decrease or complete halt in airflow despite an ongoing effort to breathe
- Breathing Stop during Sleep

IMPACT ON INDIVIDUAL HEALTH

- Daytime Sleepiness
- Fluctuating oxygen levels
- Increased heart rate
- Chronic elevation in daytime blood pressure
- Increased risk of stroke
- Higher rate of death due to heart disease
- Impaired glucose tolerance and insulin resistance : DIABETES

IMPACT ON INDIVIDUAL HEALTH

- Impaired concentration
- Mood changes
- Increased risk of being involved in a deadly motor vehicle accident
- Disturbed sleep of the bed partner

IMPACT ON PUBLIC HEALTH

- Car accidents and Motorcycle accidents
  - 32% sleeps < 6 hr (USA)
  - 23% fall asleep at the wheel once per year (USA)
  - Insomnia 10% of adults worldwide (WHO)
- Sleep Deprivation links to DM
- Sleep Deprivation reduces effectiveness of Vaccine
- Sleep Deprivation links to Coronary Artery Disease
- Increased workload to Health Care System
- Tremendous Cost to Economy

IMPACT ON AVIATION

- Poor quality sleep / Inadequate sleep
- Pilot microsleep during controlling aircraft
- Impaired decision making
- Impaired vigilance and surveillance
- Pilots / ATCO fall asleep on duty
- Destination / Checkpoint overfly : Northwest 188 overfly Minnesota 2009
- ATCO fell asleep : DC 2011 / Brisbane 2022
- ACCIDENTS

DEFINITION

- Obstructive sleep apnea (OSA) is a sleep disorder characterized by repeated episodes of complete (apnea) or partial (hypopnea) collapse of the upper airway, causing oxygen desaturation or sleep arousal. This disruption leads to fragmented, nonrestorative sleep. Symptoms include loud, disruptive snoring, witnessed apneas, and excessive daytime sleepiness

OSA

- This condition has significant implications for cardiovascular health, mental well-being, quality of life, and driving safety. Diagnosis involves polysomnography or home sleep apnea testing
- Treatment options include continuous positive airway pressure therapy, oral appliances, and surgical interventions

RISK FACTORS

- Obesity
- Large neck sizes : >17” male / >16” female
- Middle-aged and older men, and post-menopausal women
- Micrognathia
- Large tonsils and adenoids
- Supine sleeping position
- Alcohol & Smoking

PREVALENCE

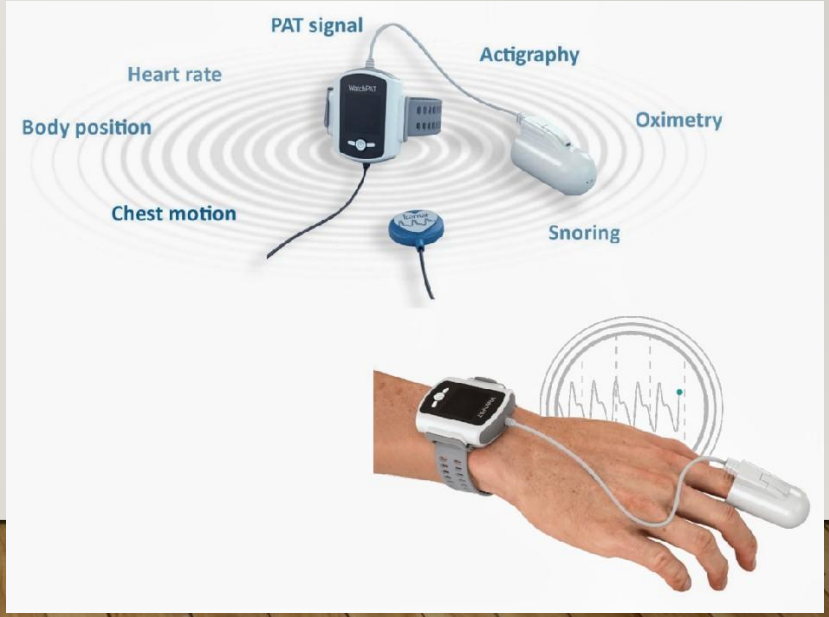
- 24 % of men and 9% of women have the breathing symptoms of OSA with or without daytime sleepiness (USA)
- OSA with resulting daytime sleepiness occurs in at 4% of men and 2% of women (USA)
- In Thailand, 25% of population snore / 5% have sleep apnoea (Royal College of Otolaryngology)

MEASUREMENT OF SLEEPINESS PROBLEM

- Epworth Sleepiness Scale : >10 (from max of 24) fatigue problem
- STOP-BANG Questionnaire : snoring / tired / observed / pressure / BMI / age / neck / gender : >3 →risk for OSA

DIAGNOSIS

- Assessment of daytime sleepiness → positive →
- Polysomnography : Gold Standard ; measure AHI (Apnoea-Hypopnoea Index)
- Home Sleep Apnoea Test ; measure REI (Respiratory Event Index) less accurate
- Wrist / watch technology : under development



SLEEP LAB (POLYSOMNOGRAPHY)

SEVERITY

- **Mild OSA:** *AHI of 5-15*
  - Involuntary sleepiness during activities that require *little* attention, such as watching TV or reading
- **Moderate OSA:** *AHI of 15-30*
  - Involuntary sleepiness during activities that require *some* attention, such as meetings or presentations
- **Severe OSA:** *AHI of more than 30*
  - Involuntary sleepiness during activities that require *more active* attention, such as talking or driving

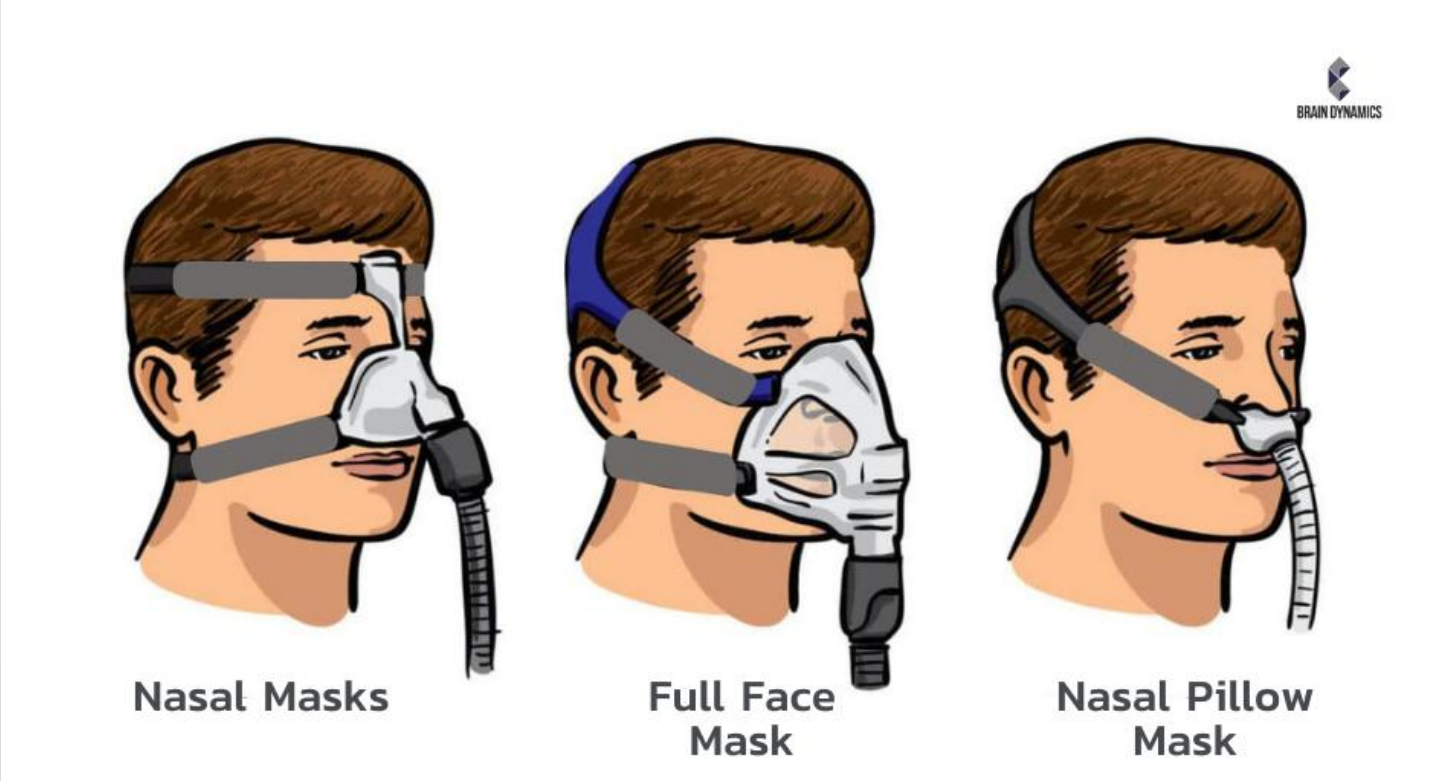
TREATMENT

- continuous positive airway pressure therapy (CPAP) : most effective against manifestation
- oral appliances
- surgical interventions

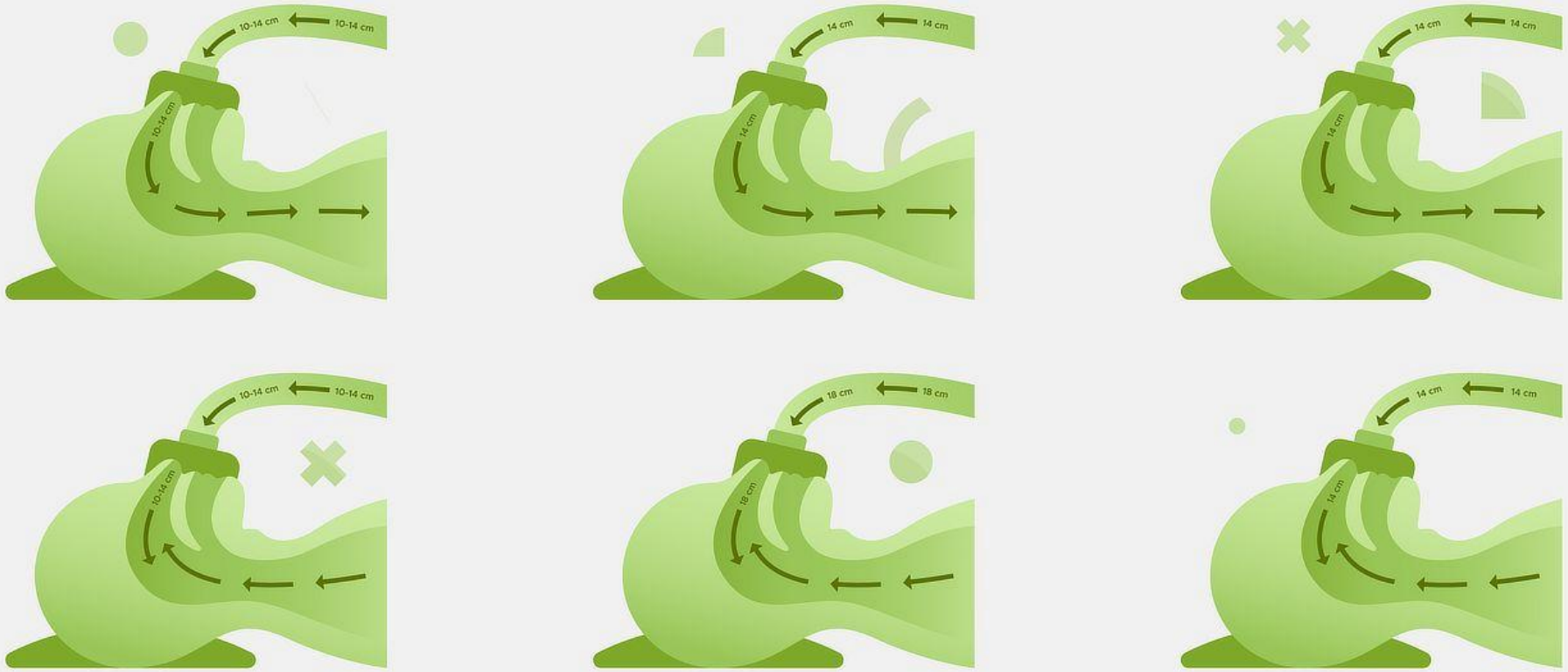
- Treatment of associate diseases : cardiovascular / brain vessels

CPAP

- Nasal CPAP vs Full Face Mask
- CPAP vs APAP vs BiPAP



APAP vs. BiPAP vs. CPAP



APAP

Pressure is set in a range
Pressure remains constant on inhale and exhale
Safe for temporary use without titration/sleep study

BiPAP

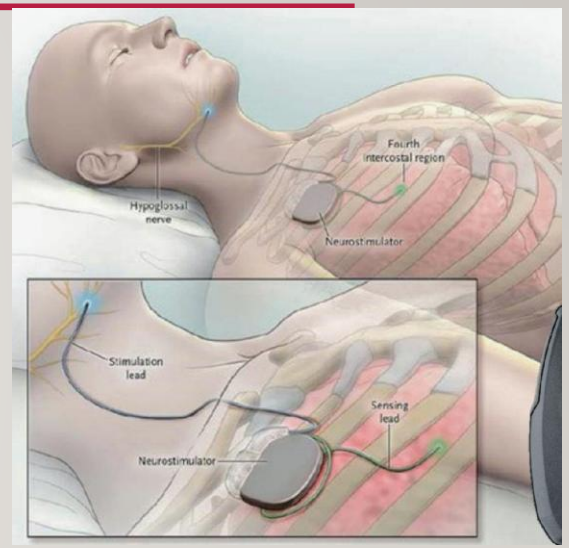
Pressure is set to a precise number
Pressure varies on inhale and exhale
Requires titration/sleep study

CPAP

Pressure is set to a precise number
Pressure remains constant on inhale and exhale
Requires titration/sleep study

TREATMENT

- Oral appliances
  - Lower jaw advancement device
- Surgical interventions
  - Pharynx and palate surgery
  - Weight loss surgery
  - Tongue nerve stimulation
- Medication : less effective , only in selected case
- Positional Therapy



CPAP COMPLIANCE

- Full benefit if used :
- > 5 hr per night
- > 6 nights per week
- Use longer than 6 weeks

HOW DO WE ASSESS COMPLIANCE

- Tracings
- Most CPAP can record usage : SD Card / Cloud Storage
- Manufactured Company can provide tracing / interpretation
- Duration long enough to reliably assessed : >3 mo

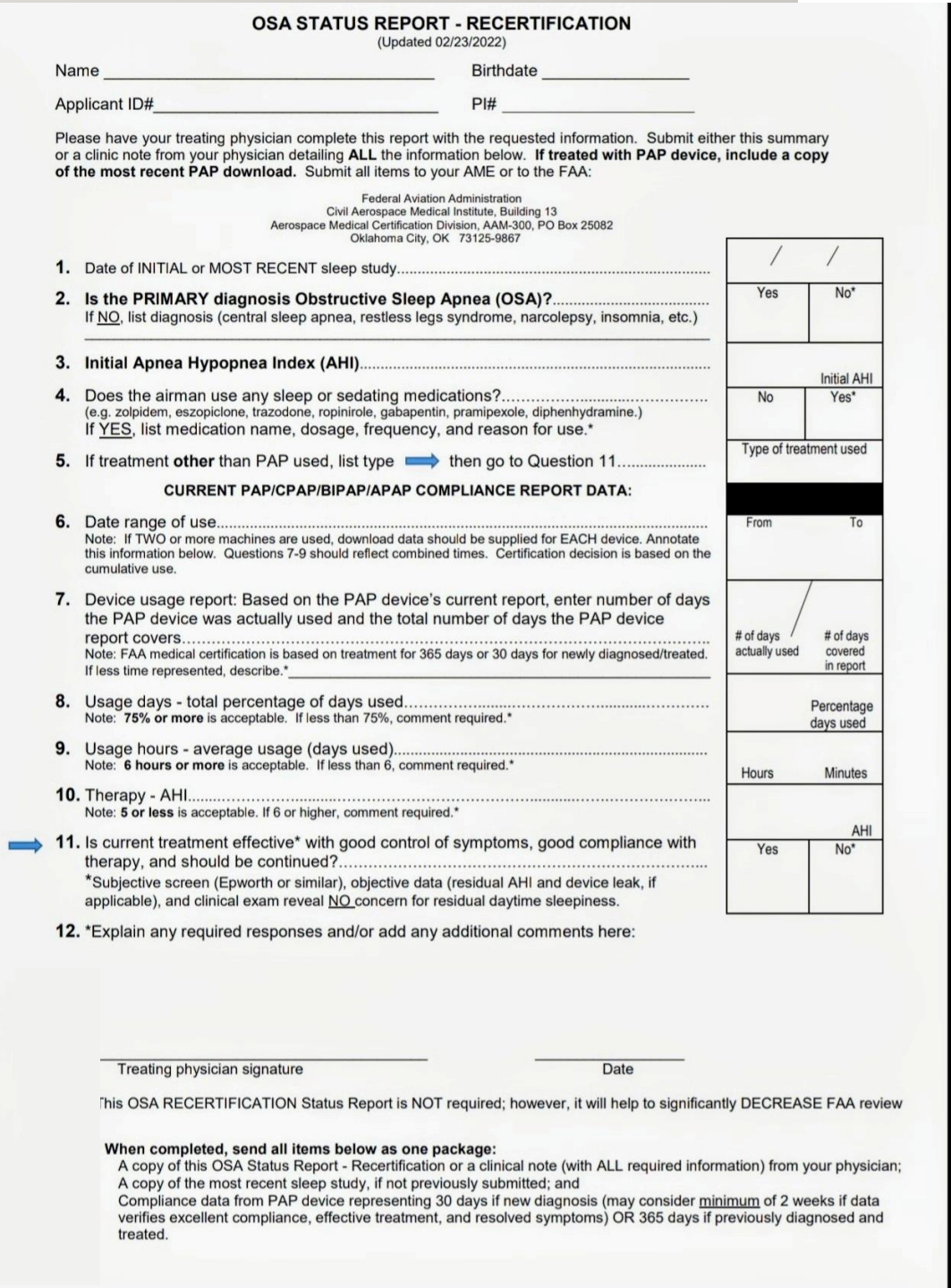
HOW DO WE ASSESS COMPLIANCE

- Direct Approach
  - Pilot / Applicant provides tracing & interpretation from equipment company
- Indirect Approach
  - Written documents from attending physician
  - Good enough compliance ?
  - Pilot recovered from fatigue problem ?
  - Can pilot safely control vehicles / operate machines ?

MEDICAL REPORT

American Example

Minimum percent days with device usage	75%
Average usage (days used)	6 hours
Residual Apnea-Hypopnea Index (AHI)	5 or less



OSA STATUS REPORT - RECERTIFICATION
(Updated 02/23/2022)

Name _____ Birthdate _____

Applicant ID#_____ PI# _____

Please have your treating physician complete this report with the requested information. Submit either this summary or a clinic note from your physician detailing **ALL** the information below. **If treated with PAP device, include a copy of the most recent PAP download.** Submit all items to your AME or to the FAA:

Federal Aviation Administration
Civil Aerospace Medical Institute, Building 13
Aerospace Medical Certification Division, AAM-300, PO Box 25082
Oklahoma City, OK 73125-9867

1. Date of INITIAL or MOST RECENT sleep study..... / /
2. **Is the PRIMARY diagnosis Obstructive Sleep Apnea (OSA)?**..... Yes / No*
   If NO, list diagnosis (central sleep apnea, restless legs syndrome, narcolepsy, insomnia, etc.)
   _____
3. **Initial Apnea Hypopnea Index (AHI)**..... Initial AHI
4. Does the airman use any sleep or sedating medications?..... No / Yes*
   (e.g. zolpidem, eszopiclone, trazodone, ropinirole, gabapentin, pramipexole, diphenhydramine.)
   If YES, list medication name, dosage, frequency, and reason for use.*
5. If treatment **other** than PAP used, list type ➡ then go to Question 11..... Type of treatment used

CURRENT PAP/CPAP/BIPAP/APAP COMPLIANCE REPORT DATA:

6. Date range of use..... From / To
   Note: If TWO or more machines are used, download data should be supplied for EACH device. Annotate this information below. Questions 7-9 should reflect combined times. Certification decision is based on the cumulative use.
7. Device usage report: Based on the PAP device's current report, enter number of days the PAP device was actually used and the total number of days the PAP device report covers..... # of days actually used / # of days covered in report
   Note: FAA medical certification is based on treatment for 365 days or 30 days for newly diagnosed/treated. If less time represented, describe.*_____
8. Usage days - total percentage of days used..... Percentage days used
   Note: **75% or more** is acceptable. If less than 75%, comment required.*
9. Usage hours - average usage (days used)..... Hours / Minutes
   Note: **6 hours or more** is acceptable. If less than 6, comment required.*
10. Therapy - AHI..... AHI
    Note: **5 or less** is acceptable. If 6 or higher, comment required.*
11. ➡ Is current treatment effective* with good control of symptoms, good compliance with therapy, and should be continued?..... Yes / No*
    *Subjective screen (Epworth or similar), objective data (residual AHI and device leak, if applicable), and clinical exam reveal NO concern for residual daytime sleepiness.
12. *Explain any required responses and/or add any additional comments here:

_____ _____
Treating physician signature Date

This OSA RECERTIFICATION Status Report is NOT required; however, it will help to significantly DECREASE FAA review

When completed, send all items below as one package:
A copy of this OSA Status Report - Recertification or a clinical note (with ALL required information) from your physician;
A copy of the most recent sleep study, if not previously submitted; and
Compliance data from PAP device representing 30 days if new diagnosis (may consider minimum of 2 weeks if data verifies excellent compliance, effective treatment, and resolved symptoms) OR 365 days if previously diagnosed and treated.

CPAP ALLOWED ON AEROPLANE PASSENGERS

- Most modern travel CPAP are FAA approved to use in-flight (MPED medical portable electronic devices)
- Do not generate dangerous radio frequency / safe battery
- Example :
  - ResMed AirMini
  - Philips Dreamstation Go
  - Transcend Micro
  - Z2 Travel CPAP
  - Luna TravelPAP

PILOTS MEDICAL STANDARD

- If diagnosed as OSA
- Effective medical treatment established / or
- Surgical intervention performed with satisfactory recovery
- Good compliance :
  - > 5 hr per night
  - > 6 nights per week
  - Long enough period > 6 wk (3 mo preferred)
- Epworth Sleepiness Score decrease to < 10
- AHI decreased to < 5

DIFFICULTY

- Pilot may conceal medical illness
- Getting medical records from attending physician
- Medical Examiner rely on pilot integrity and honour
- Tracings do not have identification technology embedded
- Should pilot with OSA get limitation ?
- Should we screen out OSA Patients to enter flying training school to become commercial pilot?

WHAT WE EXPECT

- Obesity has increased every year (Thailand) so we expect to encounter more OSA pilots and ATCOs
- We will see more accidents related to sleep deprivation / fatigue
- We need effective mitigation strategy
- Early OSA detection and prompt treatments contribute to FRMS
- We will see more new technology in treatments of OSA coming