Evaluation of pulmonary diseases with abnormal pulmonary lung function test

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FlyDubai crash pilot 'was due to leave job over fatigue'

By Stephen Ffotrell
BBC News

24 March 2015 | Europe

The captain of the FlyDubai jet which crashed in Russia last Saturday was due to leave the airline, citing fatigue, colleagues say.

The Boeing 737-800 crash in Rostov-on-Don killed all 62 people on board, including seven crew.

The Telegraph

Thai airline 'covered up failings behind crash which killed 90'

Eight British holidaymakers died when a Thai aeroplane crashed in a tropical storm because the pilots were poorly trained and exhausted after working illegal overtime, an inquest will hear today.

By Heidi Blake
10:09AM GMT 22 MAY 2011

U.S. News

Germanwings crash: New rules needed for pilot health issues, French investigators say

March 13, 2016, at 3:08 p.m.

abc News

NTSB: Heart Problem Likely Led to Plane Crash That Killed 4

By THE ASSOCIATED PRESS - LAKE CLEAR, N.Y. — Aug 17, 2016, 3:07 PM ET

The National Transportation Safety Board says a fiery plane crash that killed four people last year in the Adirondack Mountains likely happened because the pilot was affected or incapacitated by a heart problem.
Former Concorde pilot died from deep vein thrombosis after flying BA plane from Shanghai

17:56, 22 APR 2016  BY LUCY THORNTON, PAUL WHITEHOUSE

A coroner was told James Bedforth could have been saved if hospital staff, knowing his record of flying, had diagnosed and treated him more quickly.
Aviation medical examinations are conducted to ensure that pilots are fit to perform flight duties and are unlikely to become incapacitated during flights.
Tests to evaluate pulmonary health and diseases:

1. Chest x-ray

A chest x-ray provide an outline of the heart, major blood vessels and the lungs.

This can show tuberculosis, pneumonia, lung tumors, collapsed lungs, emphysema, abnormalities in the size or shape of the heart, and calcium deposits within the heart tissue, which may warrant additional tests.

A chest x-ray is recommended during the initial class 1 medical assessment and periodically during future medical examinations.
Case report no. 1

• A case of a 25-year-old male, diagnosed of Pneumonia. He came for medical check-up as a requirement for student pilots.

• Signs and symptoms: cough with whitish sputum for one week, fever for two days.

• Chest x ray: Localized prominent interstitial density at both basilar lungs noted in this exam.(more on the left lung ).

• Treatment: Avelox 400 mg tab 1 tab once daily and Fluimucil-A 600 mg tab 1 tab 2 times daily

• 2 weeks after treatment: clearing of Penumonia, no more cough with sputum
Chest X Ray

First consultation

Latest result
Case report no. 2

• A case of an 18-year-old male, diagnosed of Pneumonia. He came for a medical check-up to acquire student pilot license.

• Signs and symptoms: cough for two to three days with greenish sputum.

• Chest x ray: Ill-define patchy opacity at left upper lung is detected, suspecting infective process; TB is possible.

• Treatment: Avelox 400 mg tab 1 tab once daily and Fluimucil-A 600 mg tab 1 tab 2 times daily

• 1 week after treatment: clearing of Pneumonia, no more cough with sputum

• Chest x ray: As compared with previous film, the follow up film shows complete resolved infiltration at left upper lung.
Chest X Ray

First consultation

Latest result
Tests to evaluate pulmonary health and diseases:

2. Pulmonary function test (PFT)

Pulmonary function tests (PFTs) are non-invasive tests that show how well you move air in and out of your lungs and how well oxygen enters your body.

The tests measure lung volume, capacity, rates of flow, and gas exchange.

This information can help your healthcare provider diagnose and decide the treatment of certain lung disorders.
Normal result of PFT

Gender: Female  
Age: 28  Race: Asian  
Height(cm): 153  Weight(kg): 52.8

**PULMONARY FUNCTION ANALYSIS**

### Spirometry

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ref</th>
<th>Pre Meas</th>
<th>% Ref</th>
<th>Pre %</th>
<th>Post Meas</th>
<th>% Ref</th>
<th>% Chg</th>
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### Pulmonary Pressures

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<tr>
<th>Parameter</th>
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Restrictive lung

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<th>Height(cm): 170</th>
<th>Weight(kg): 67.7</th>
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### Pulmonary Function Analysis

#### Spirometry

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#### Pulmonary Pressures

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<tr>
<td>PE Volume (Liters)</td>
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# Obstructive Lung

**Gender:** Male  
**Age:** 70  
**Race:** Asian  
**Height (cm):** 179  
**Weight (kg):** 68.9  
**Temp:** 25  
**PBar:** 755

## Pulmonary Function Analysis

### Spirometry

<table>
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<tr>
<th>Measure</th>
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<th>Post</th>
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### Pulmonary Pressures

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<tr>
<td>PE Volume</td>
<td>Liters</td>
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Pulmonary diseases
Oxyhemoglobin Dissociation

The primary difference between the aircraft environment and the ground environment relates to the atmosphere.

The cabin altitude will be between 5000 and 8000 ft (1524 m and 2438 m). This results in reduced barometric pressure with a concomitant decrease in partial pressure of oxygen (PO2).

While the barometric pressure is 760 mm Hg at sea level with a corresponding PaO2 (arterial O2 pressure) of 98 mm Hg, the barometric pressure at 8000 ft will be 565 mm Hg with PaO2 of about 55 mm Hg. If these last data are plotted on the oxyhemoglobin dissociation curve, we obtain a blood oxygen saturation of 90%.

Although most healthy travelers can normally compensate for this amount of hypoxemia, this may not be true for **coronary, pulmonary, cerebrovascular, and anemic patients**. Because these patients may already have a reduced PaO2 on the ground, further reduction in aircraft cabin pressure will bring them to the steep part of the oxyhemoglobin dissociation curve with a resultant very low saturation, which could cause distress and/or exacerbation of their illness.
Oxyhemoglobin Dissociation curve
Deep Vein Thrombosis (DVT)

• DVT is a condition in which a clot, or thrombus, typically forms in a deep vein in a leg. People with a DVT may notice pain and swelling in the leg where the clot has formed, though smaller clots may not cause any symptoms. The major problem occurs when a part of the clot breaks off and flows to the lungs.

• This condition, called a Pulmonary Embolus (PE), can cause severe injury or death.
Traveler’s Thrombosis

The condition has been erroneously dubbed *Economy Class Syndrome* by some people because of the perception that passengers in the more restrictive coach or economy class of the aircraft are more likely to develop DVTs.

Recent research, however, has found that passengers in any seating class of the aircraft may develop a DVT. Research indicates that any situation where one’s activity is limited for long periods – a long automobile drive or train ride, for instance – may contribute to a DVT.
Economy class syndrome
Prevention

• Increasing leg muscle activity during long periods of sitting improves blood flow in the legs. This may include walking around the cabin or exercising your lower legs and ankles while seated.

• Drinking adequate fluids, and avoiding alcohol and caffeine, may also help by preventing dehydration.

• Loose-fitting clothing may be beneficial in avoiding constriction of veins.

• Some recommend taking short naps, instead of long ones, to avoid prolonged inactivity.
The incidence rate did not increase with number of flight hours per year and did not clearly vary by rank. We conclude that the risk of VTE is not increased amongst airline pilots.

Asthma

• Disorder characterized by increased responsiveness of the small airways to various allergens and non-specific stimuli resulting in widespread airways inflammation and reflex narrowing of the airways.

• It has a wide clinical spectrum varying from a single short-lived episode requiring no medication to that of constant disabling condition.
Asthma: Aeromedical Significance

- Acute asthma attacks may cause partial (or complete) incapacitation in the cockpit (or air traffic control workplace).

- Acute asthmatic attacks may be precipitated in flight by the inhalation of fumes such as might occur in engine or electrical fires and from other agents which could act as bronchial irritants.

- In severe asthmatics, particularly after recent attacks, actual pulmonary function may be worse than that determined from simple clinical examination. Consequently, hypoxia, as measured by oximetry, may be more obvious at higher altitudes than normal.

- A humid environment and high pollen counts that may be encountered during low altitude flight can exaggerate airway responsiveness and predispose to more severe asthma attacks. Air trapping in chronic asthma can present an increased risk of barotraumas in high altitude flight, particularly if sudden decompression should occur.
Asthma- Certification protocol:

i. All initial applicants for all the medical classes of medical certificates should be evaluated by specialist chest physical or general physician if there is:
   a. PEF < 80%
   b. abnormal PFT
   c. History of Asthma

ii. If the applicant is diagnosed to have mild asthma, which is well controlled, and normal chest examination and no history of acute attack within the preceding 5 years, he may be assessed as fit class I and the license may be restricted should be reviewed & examined as indicated by chest physician.

iii. Class II and cabin crew class applicant, may be assessed fit if the asthma is mild, well controlled and no acute attack requiring emergency room visits within the preceding 2 years. Class 3 will be assessed individually.

iv. For renewal of class I, if symptoms are, mild, infrequent, symptoms well controlled on medication, no symptoms in flight, no wheeze on examination, the company can issue the medical certificate based on his clinical examination.

v. Renewal for cabin crew and class II, the company can issue the medical certificate unless otherwise indicated.
All the classes of medical examinations, the company should not renew the medical certificate, if he noticed:

- The symptoms worsen/or wheeze on chest examination
- Increase in frequency of emergency room, hospital, or outpatient visits.
- The FEVI is < 70% predicted value.
- The applicant requires 3 or more medications for stabilization.
- The applicant is using steroid in dosage equivalent to more than 20mg of prednisone per day.
Chronic obstructions airways disease is defined by a chronic pulmonary disease with a progressive airway obstruction, which is not totally reversible after applying bronchodilators or glucocorticoids.
COPD- Recertification:

i. All applicants for initial Class I, II, III and Cabin crew class certificates with an established history of COPD requiring continuous medication shall be assessed as unfit.

ii. Class I, II, III and Cabin crew class certificate holders whose disease is mild, who have only very minor impairment of lung function, are symptomless, require no medication, and have no radiological evidence of bullae, may usually be assessed as fit.
Pulmonary Tuberculosis

- Pulmonary tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis* (*M. tuberculosis*). TB is contagious. This means the bacteria is easily spread from an infected person to someone else. You can get TB by breathing in air droplets from a cough or sneeze of an infected person. The resulting lung infection is called primary TB.
Tuberculosis and air travel

Assessing whether contact-tracing is needed

Physician diagnoses a TB case with history of recent long-distance air travel

Airline informed by patient/physician of a TB case with history of recent long-distance air travel

Public health authority notified of a TB case with history of recent long-distance air travel

Airline contacts public health authority

Flight(s) occurred within the past 3 months?

YES

Was the patient likely to have been infectious at the time of travel?

YES

Public health authority contacts the airline to verify TB patient was on aircraft

NO

Was the patient likely to have been infectious at the time of travel?

NO

No further action needed

Was the patient on the aircraft?

YES

Was the total flight duration ≥8 hours?

YES

Public health authority, in cooperation with the airline company, gathers contact details of passengers sitting in the same row and in the two rows in front of and behind the TB case

NO

No further action needed

NO

No further action needed
For travellers

Pretravel

1. People with infectious or potentially infectious TB should postpone all travel by commercial air transportation of any flight duration until they become non-infectious.

For physicians

Pretravel

2. Physicians should inform all infectious and potentially infectious TB patients that they must not travel by air on any commercial flight of any duration until they are sputum smear-negative on at least two occasions (additional steps are required for MDR-TB and XDR-TB, see recommendation 3).

3. Physicians should inform all MDR-TB and XDR-TB patients that they must not travel by any commercial flight – under any circumstances or on a flight of any duration – until they are proven to be non-infectious (i.e. two consecutive negative sputum-culture results).

Excluding specially-designated aircraft – air ambulance.
4. Physicians should immediately inform the relevant public health authority when they are aware that an infectious or potentially infectious TB patient intends to travel against medical advice.

5. Physicians should immediately inform the relevant public health authority when they are aware that an infectious or potentially infectious TB patient may have exceptional circumstances requiring commercial air travel. Post-travel

6. Physicians should immediately inform the public health authority when an infectious or potentially infectious TB patient has a history of commercial air travel within the previous three months.
Sarcoidosis

- A disease of unknown etiology characterized by granulomatous lesions which can affect multiple organ systems. It can cause pulmonary manifestation; skin lesions; uveitis; hepatic cirrhosis; renal calculi; hypersplenism; cardiac arrhythmias and valvular defects.
Aeromedical Disposition

If all the mentioned tests are satisfactory including no cardiac sarcoidosis; no evidence of other organ involvement and no medication is prescribed a class I OML restriction. Class II and Cabin crew class may be given unrestricted licenses. Class 3 will be assessed individually.

Cardiac sarcoidosis is disqualifying:

- Applicants with a diagnosis of active sarcoidosis shall be assessed as unfit.
- Initial applicants with a history of multi-system sarcoidosis shall be assessed as unfit.
- Previous history of systemic involvement (skin, bone, eye, central nervous system and lung parenchyma), the applicant will be given permanent restricted license.
Spontaneous or idiopathic pneumothorax

• Pneumothorax is defined as the presence of air or gas in the pleural cavity (ie, the potential space between the visceral and parietal pleura of the lung), which can impair oxygenation and/or ventilation.

• Patients should not travel by air or travel to remote sites until radiography shows complete resolution.
3 อาชีพที่ห้ามเป็น กรณี Pneumothorax

1. นักบินอวกาศ
2. นักบิน
3. นักประดาน้ำ
Spontaneous or idiopathic pneumothorax

Assessment guidelines for initial applicants:

Applicants for initial certification with a history of a single spontaneous pneumothorax may be assessed as fit provided that:

i. One year has elapsed since full recovery after adequate treatment.

ii. Full respiratory evaluation is normal.

iii. No bullae are discovered on chest radiography, CT scans, or other medical imaging technique.

iv. The bullae have been treated by surgery and no smoking status has been confirmed.
Chest drain
One way valve
Certificate holders who develop a spontaneous pneumothorax must be assessed as temporarily unfit until full resolution has occurred. They maybe assessed as fit for certification provided that:

i. Full re-expansion of the lung has taken place.

ii. A minimum of six weeks has elapsed since the occurrence.

iii. Full respiratory evaluation is normal.

iv. No bullae are discovered on chest radiography, CT scan, or other medical imaging technique.

v. Restricted license for all the classes ofd medical certificate holders for one year from the Original occurrence.
Case report no. 3

• A case of a 32-year-old female, diagnosed of Catamenial pneumothorax.

• Signs and symptoms: right chest pain, mild difficulty of breathing, dry cough

• Chest x ray: Right hydropneumothorax noted in this exam.

• Conservative treatment: Oxygen support via nasal cannula at 2 liter per minute, rest and monitoring of chest x ray

• 2 weeks after treatment: chest x ray: decreased right pneumothorax
Catamenial pneumothorax
Samsung Galaxy Note 7 banned from flights as officials fear it might cause planes to catch fire

The phones shouldn't be put into bags because of 'recent incidents and concerns', the Federal Aviation Authority said in an extremely rare warning.

Andrew Griffin | @andrew_griffin | Friday 9 September 2016 |
Clinton, nudges Sanders

The meeting was the set piece of a day of choreographed political theater in which Democrats nudged Sanders to a visit only slightly less elaborate than that of a head of state. The Obama administration made sure cameras were positioned to capture the president and the vanquished Verminator scrolling along the colonnade to the Oval Office for the see > DEMOCRATS, 47

Exploding e-cigs burning more victims

HARBORVIEW SEES RISE

Experts hope FDA’s new authority over vaping products will help

By JONEL ALECCIA
Seattle Times health reporter

Reports of devastating burns caused by exploding e-cigarettes
The Engine Is The Heart Of An Airplane, But The Pilot Is Its Soul.

~ The Fresh Quotes ~
Thank You!