Medical Issues in Aviation

Passenger Fitness to Fly

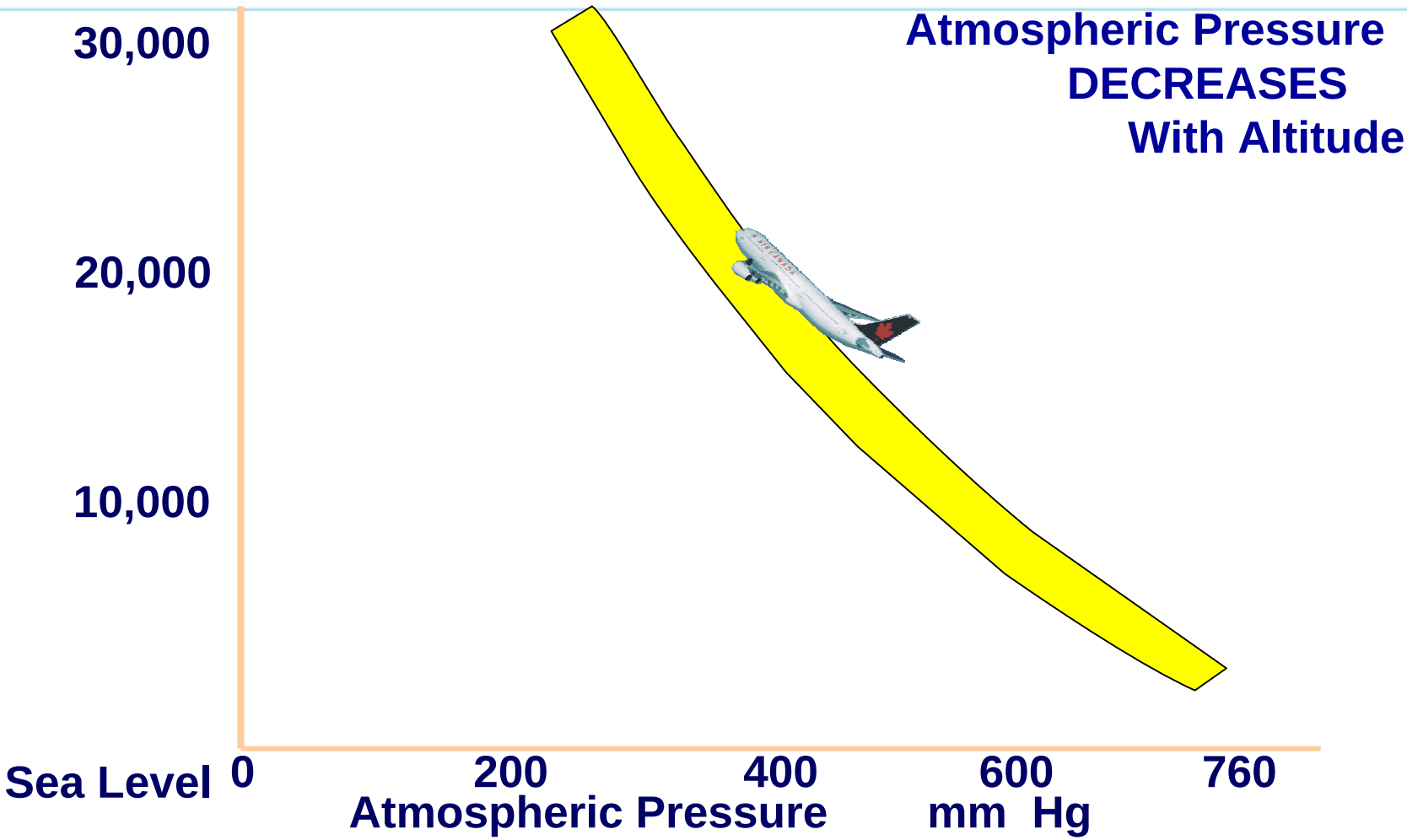
Lima, Peru, April 2009

Claude Thibeault MD
Medical Advisor

Passenger Fitness to Fly

Plan

- Review real cases based on altitude physiology
- Review real cases based on other considerations
- Review contraindications to fly (as passenger)
- Discuss rationale for medical clearance

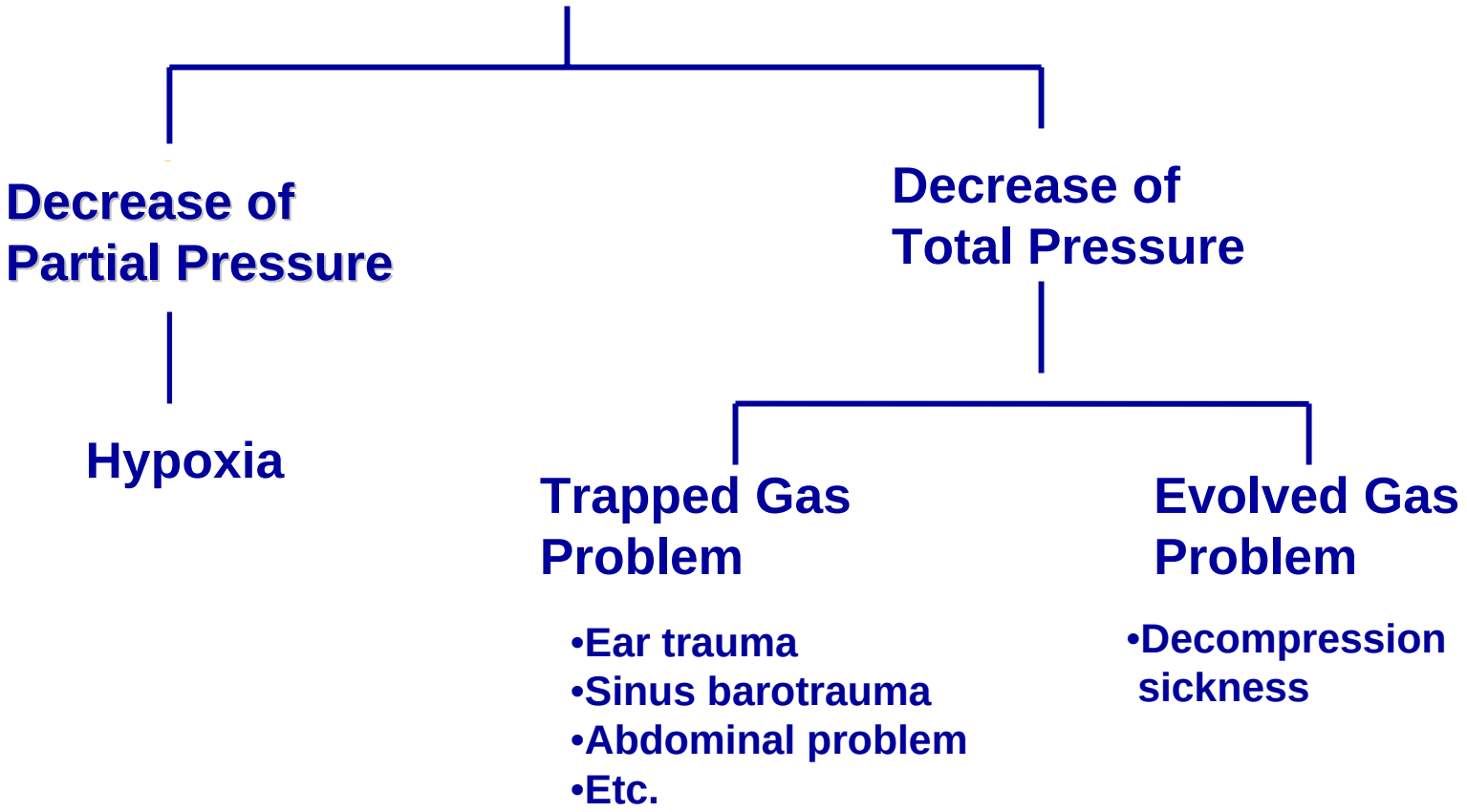

Atmospheric Pressure
DECREASES
With Altitude
30,000
20,000
10,000
Sea Level
0
200
400
600
760
Atmospheric Pressure
mm Hg

Passenger Fitness to Fly

At cruising altitude (ex:39000 feet), the cabin of a commercial aircraft (ex:A320):

1. is pressurized to ground pressure equivalent
2. is pressurized to 6000-8000 feet
3. is pressurized to 2000-3000 feet
4. is not pressurized

Decrease of Atmospheric Pressure



DALTON'S LAW

The total pressure of a given mixture of gases is equal to the sum of the partial pressures of the gases

ATMOSPHERE SEA LEVEL - DRY

Partial Pressures - mm Hg **Volume of Gas - per cent**	**NITROGEN** **600** **79**	**OXYGEN** **160** **21***	**AIR** **760** **100**

***constant to 70,000 feet**

Gas Pressure Variation and O_2 Saturation At Altitude

ALTITUDE	PRESSURE						
	Atmospheric	Ambient air 0_2	Alveolar CO_2	Alveolar O_2	Arterial CO_2	Arterial O_2	Saturation O_2
Sea Level	760	159	37	107	40	98	97
6000 (1800 m)	610	125	37	71	40	64	92
8000 (2400 m)	565	116	37	59	39	55	90
10000 (3000 m)	525	100	36	55	36	50	82
15 000 (4500 m)	430	80	33	42	30	37	70

Hypoxia

- J.K. 64 y/o male
- MI (heart attack)10 days ago with cardiac failure and poorly controlled arrhythmia
    - Wants to travel alone from Toronto to Los Angeles to visit his daughter
- Can he travel on a commercial airline?

Hypoxia

J.K. (cont.)

- Travel not approved
- Travel could be approved as medical evacuation with:
  - Stretcher
  - Physician
  - Monitoring equipment and medication
  - O_2, 4 LPM

Hypoxia

- M.V. 57 y/o female
- Quebec – New York (2.0 hours)
- C.O.P.D. with exertion dyspnea
- Patient uses O_2 at home 2 LPM for 18 hours. Not a CO_2 retainer. Stable.
- 15% O_2 test = PO_2 drop to 40
- Flight in one month with husband
- Treating physician requests O_2 4 LPM

Hypoxia

- M.V. 57 y/o female (Cont'd)

- Flight approved if no change until the flight,with:
  - O_2 4 LPM
  - Wheelchair
  - Non medical escort

PRE FLIGHT ASSESSMENT (Adults)

- Predicting hypoxemia from equations
- Hypoxic challenge test
    - 15% o_2
- The 50 meter walk

Hypoxia

COPD

- IF PaO_2 < 70 mmHg on room air = supplemental oxygen 2L/min.
- Inhaler in hand luggage
- Spacer as effective as nebuliser
- Consider requesting wheelchair at airport
- Check for bullae

Hypoxia

- C.C. 82 y/o female
- Paris – Toronto - Vancouver (13.0 hrs 10 min.)
- Stroke 5 days ago
- Residual left hemiparesia. Stable. Controlled HBP. Non insulin dependent diabetes.
- Flight 7 days post stroke
- Traveling alone with wheelchair

Hypoxia

- C.C. 82 y/o female (cont'd)
- Flight could be approved with:
  - Stretcher
  - O_2 2 LPM
  - Medical escort
- Otherwise wait for at least 14 days and travel with non medical escort

Conditions affected by hypoxia

- Coronary disease
- Heart failure
- Pulmonary disease
- Stroke
- Anemia
- Shock
- Poisoning
- Eye trauma

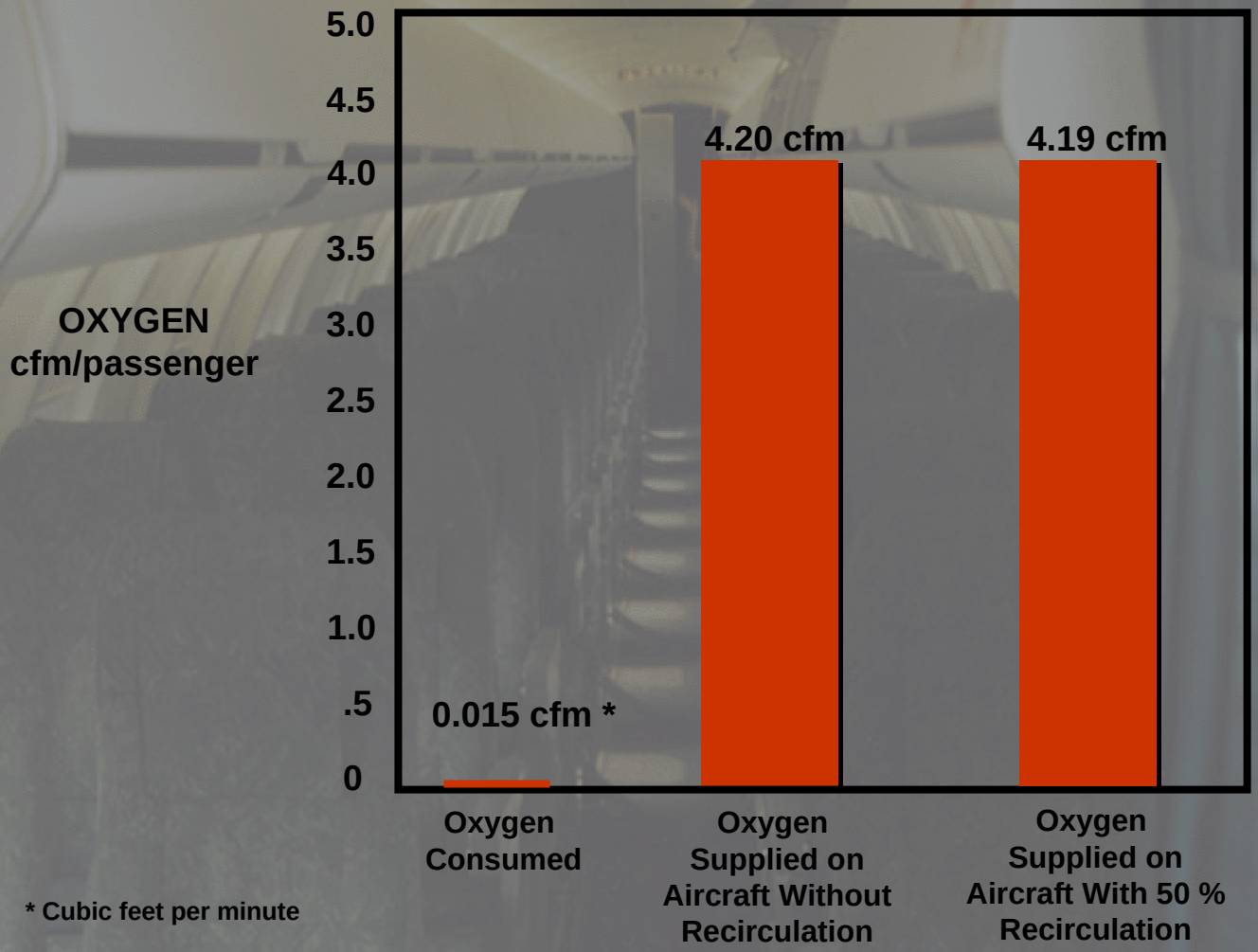
Ventilation and available oxygen

In an airplane that recirculates air, there is a significant decrease in available oxygen?

A) True

B) False

Oxygen Consumption vs. Oxygen Supplied



* Cubic feet per minute

Decrease of Atmospheric Pressure

Decrease of Partial Pressure

- Hypoxia

Decrease of Total Pressure

Trapped Gas Problem

- Ear trauma
- Sinus barotrauma
- Abdominal problem
- Etc.

Evolved Gas Problem

- Decompression sickness

Gas Expansion

E.W. 50 y/o female

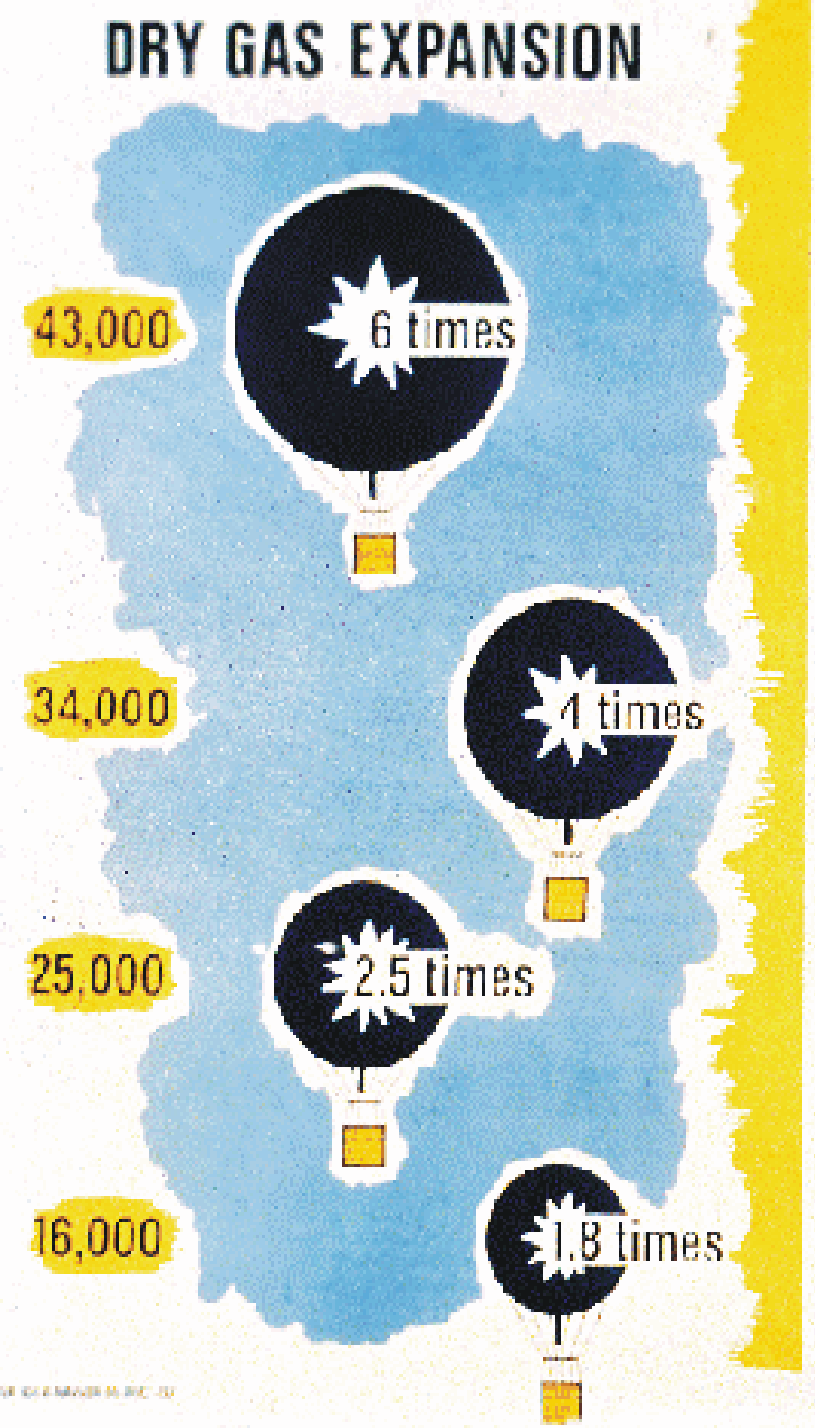
- Car accident two days ago with thoracic injury
- Small pneumothorax still visible on x-rays
- Fine otherwise
- Wants to travel Montréal to Paris

Gas Expansion

You are the airline physician, do you accept to transport E. W.?

A) Yes

B) No



BOYLE'S LAW

THE VOLUME OF A GAS IS INVERSELY PROPORTIONAL TO IT'S PRESSURE: TEMPERATURE REMAINING CONSTANT

PNEUMOTHORAX

- Closed pneumothorax is contraindication to air travel
- Pneumothorax under drainage (Heimlich valve) = Medical escort
- Resolved pneumothorax: needs at least 5 days before travelling and chest x-ray before the flight

BULLAE

- Pneumothorax
- Pneumo mediastinum
- Air embolism

Gas expansion

- G.G. 38 y/o male
- Going home from Montreal via Toronto to Port of Spain (5 hrs 30 min.)
- Widely spread intestinal cancer
- Had a known Crohn's disease, but required an emergency laparotomy for sub-occlusion.

  Generalized carcinomatosis. Stable. No anemia.

  Gastric tube in place drain 600 cc/8 hrs
- Flight 5 days post-op. Stretcher with a nurse escort.

Gas expansion

- G.G. 38 y/o male (cont'd)
- X-Ray shows no air level at this time
- Approved if X-Ray normal the morning of the flight
- Stretcher
- Nurse with appropriate medication

Structures affected by gas expansion

- Gastrointestinal tract
- Middle ear
- Sinus
- Lung
- Any other structures where gas has been introduced by accident, by surgery or for investigation

Structures affected by gas expansion

Do not forget equipment with air:

- Air splint
- Catheters
- Anti-shock trousers

Henry's law

The amount of gas dissolved in solution is directly proportional to the pressure of the gas over the solution

Evolved Gas

- M.G. 32 y/o male
- Miami to Montreal (3 hrs 20 min.)
- Professional underwater photographer presently in transit in Miami after a trip to Honduras where he made several dives in the last 10 days
- Pain in left elbow during flight to Miami with paresthesia of left 5th finger
- No previous medical problem

Evolved Gas

- M.G. 32 y/o male (cont'd)
- Rule out type II Decompression Sickness
- Contraindication to commercial flight
- Consultation in hyperbaric medicine
- Reference given: "Divers Alert Network"
- If Decompression Sickness proven, should probably be treated on the spot. Otherwise need 0 – 500 feet cabin altitude

Other Considerations

Specific conditions

- Contagious disease
- Active psychiatric condition
- Pregnancy
- Newborn
- Epilepsy
- Diabetes

Contagious Disease

- R.C. 2.5 y/o male
- Val d'Or to Montreal with mother (1 hrs 10 min.)
- Anemia for 1 month, Hb at 7.3 gr
- Transfer for complete investigation
- Chickenpox in the last 72 hours
- Flight the same day

Contagious Disease

- R.C. 2.5 y/o male (cont'd)
- Flight refused
- Could be considered again with oxygen when not contagious

Psychiatry

- R.A. 23 y/o male
- London UK to Toronto (8 hrs 35 min.)
- Schizophrenia:
  - First episode in Prague
  - Transferred to London 2.5 weeks ago
  - Partial insight, relatively stable
  - Taking Haldol 15 mg die and Kemadrin 5 mg die
- Flight in 3 days
- No escort recommended by treating physician

Psychiatry

- R.A. 23 y/o male (cont'd)
- Flight approved with:
  - Medical escort (psychiatric nurse)
  - Sedation
  - Supply of appropriate medication for the trip
- Treating physician not happy with the decision

Other Considerations

Specific conditions

- Contagious disease
- Active psychiatric condition
- Pregnancy
- Newborn
- Epilepsy
- Diabetes

Other Considerations

Turbulence

- Air sickness
- Anxiety
- Traction
- Unstable fracture
- Intravenous line

Air Sickness

- A.H. 17 y/o female
- Ottawa to Halifax (1 hr. 30 min.)
- Jaw fracture reduced with wiring
- Liquid diet
- Flight 4 days post-op
- Mother will accompany the patient

Air Sickness

- A.H. 17 y/o female (cont'd)
- Flight approved
- Patient should preferably have anti-emetic
- Mother must be taught how to release the wiring

Other Considerations

Turbulence

- Air sickness
- Anxiety
- Traction
- Unstable fracture
- Intravenous line

Unstable Fracture

- D.B. 32 y/o male
- Port au Prince to Montreal (4 hrs. 10 min.)
- L 1 fracture 2 days ago; paraplegic
- Acute schizophrenia. Fell from the roof while watching the stars.
- X-Ray shows cuneiform fracture with vertical posterior displacement. Needs surgery asap.
- Dexamethasone, Haldol, Foley catheter
- Stretcher with escort nurse (family member) the same day

Unstable Fracture

- D.B. 32 y/o male (cont'd)
- Our orthopedic consultant does not recommend commercial air transport because of unstable fracture. Risk also increased if patient is agitated.
- Many aspects to discussion:
    - Medical
    - Social
    - Public Relations

Other Considerations

Turbulence

- Air sickness
- Anxiety
- Traction
- Unstable fracture
- Intravenous line

Other considerations

Specific factors

- Acceleration/deceleration
- Low humidity
- Noise and vibration
- Delayed or cancelled flights

Contraindications to Commercial air transport

- Untreated pneumothorax
- Bowel occlusion or subocclusion
- Recent bowel surgery (< 10 days)
- Decompression sickness
- Uncontrolled psychotic patient
- Acute diverticulitis or ulcerative colitis
- Recent stapedectomy
- Recent eye surgery

Need for medical clearance

- Rule out contraindications for air transport
- Protect health of the passenger
- Avoid extra safety risk of unscheduled landing
- Minimize inconvenience for other passengers
- Cost

RESOLUTION 700 ATTACHMENT B PART ONE

Information Sheet for Passengers Requiring Medical Clearance (to be completed or obtained from the attending physician)

1. Patient's name .....

   Date of Birth ..... Sex ..... Height ..... Weight .....

2. Attending physician .....

   E-mail .....

   Telephone (mobile preferred), indicate country and area code ..... Fax .....

3. Diagnosis (including date of onset of current illness, episode or accident and treatment, specify if contagious) .....

   .....

   .....

   Nature and date of any recent and/or relevant surgery .....

4. Current symptoms and severity .....

   .....

5. Will a 25% to 30% reduction in the ambient partial pressure of oxygen (relative hypoxia) affect the passenger's medical condition?
   (Cabin pressure to be the equivalent of a fast trip to a mountain elevation of 2400 metres (8000 feet) above sea level) ___ Yes ___ No ___ Not sure

6. Additional clinical information

   a. Anemia ___ Yes ___ No If yes, give recent result in grams of hemoglobin .....
   b. Psychiatric and seizure disorder ___ Yes ___ No If yes, see Part 2
   c. Cardiac condition ___ Yes ___ No If yes, see Part 2
   d. Normal bladder control ___ Yes ___ No If no, give mode of control .....
   e. Normal bowel control ___ Yes ___ No
   f. Respiratory condition ___ Yes ___ No If yes, see Part 2
   g. Does the patient use oxygen at home? ___ Yes ___ No If yes, specify how much .....
   h. Oxygen needed in flight? ___ Yes ___ No If yes, specify 2 LPM 4 LPM ___ Other

7. Escort

   a. Is the patient fit to travel unaccompanied? Yes ___ No
   b. If no, would a meet-and-assist (provided by the airline to embark and disembark) be sufficient? Yes ___ No
   c. If no, will the patient have a private escort to take care of his/her needs onboard? ___ Yes ___ No
   d. If yes, who should escort the passenger? ___ Doctor ___ Nurse ___ Other
   e. If other, is the escort fully capable to attend to all the above needs? Yes ___ No

8. Mobility

   a. Able to walk without assistance ___ Yes ___ No b. Wheelchair required for boarding ___ to aircraft ___ to seat

9. Medication list .....

10. Other medical information .....

RESOLUTION 700 ATTACHMENT B PART TWO

Information Sheet for Passengers Requiring Medical Clearance (to be completed or obtained from the attending physician)

1. Cardiac condition

a. Angina ___ Yes ___ No When was last episode? .....
- Is the condition stable? ___ Yes ___ No
- Functional class of the patient?

___ No symptoms ___ Angina with important efforts ___ Angina with light efforts _ Angina at rest
- Can the patient walk 100 metres at a normal pace or climb 10-12 stairs without symptoms? Yes ___ No

b. Myocardial infarction ___ Yes ___ No Date .....
- Complications? ___ Yes No If yes, give details .....
- Stress EKG done? ___ Yes ___ No If yes, what was the result? ..... Metz
- If angioplasty or coronary by pass, can the patient walk 100 metres at normal pace or climb 10-12 stairs without symptoms? ___ Yes ___ No

c. Cardiac failure ___ Yes ___ No When was last episode? .....
- Is the patient controlled with medication? ___ Yes . No
- Functional class of the patient?

___ No symptoms ___ Shortness of breath with important efforts ___ Shortness of breath with light efforts ___ Shortness of breath at rest

d. Syncope ___ Yes ___ No Last episode .....
Investigations? ___ Yes ___ No If yes, state results .....

2. Chronic pulmonary condition ___ Yes ___ No

a. Has the patient had recent arterial gases? ___ Yes ___ No

b. Blood gases were taken on: ___ Room air ___ Oxygen ..... LPM
If yes, what were the results ..... pCO_2 ..... pO_2
Saturation ..... Date of exam .....

c. Does the patient retain CO_2? ___ Yes ___ No

d. Has his/her condition deteriorated recently? ___ Yes No

e. Can the patient walk 100 metres at a normal pace or climb 10-12 stairs without symptoms? ___ Yes ___ No

f. Has the patient ever taken a commercial aircraft in these same conditions? ___ Yes ___ No
- If yes when? .....
- Did the patient have any problems? .....

3. Psychiatric Conditions ___ Yes ___ No

a. Is there a possibility that the patient will become agitated during flight ___ Yes ___ No

b. Has he/she taken a commercial aircraft before . Yes ___ No
- If yes, date of travel? ..... Did the patient travel ___ alone ___ escorted?

4. Seizure ___ Yes ___ No

a. What type of seizures? .....

b. Frequency of the seizures .....

c. When was the last seizure? .....

d. Are the seizures controlled by medication? ___ Yes ___ No

5. Prognosis for the trip ___ Good ___ Poor

Physician Signature ..... Date .....

Note: Cabin attendants are not authorised to give special assistance (e.g. lifting) to particular passengers, to the detriment of their service to other passengers. Additionally, they are trained only in first aid and are not permitted to administer any injection, or to give medication.

Important: Fees, if any, relevant to the provision of the above information and for carrier-provided special equipment are to be paid by the passenger concerned.

Air Taxi
vs
Air Ambulance

Thank you for your attention

to represent, lead and serve the airline industry