GROUND SCHOOL

TODAY

Welcome

Aeronautical Decision Making

Aviation Physiology

Aircraft Systems, Instrumentation, and Aerodynamics

Congratulations

- Less than ½ of 1 percent of people do what you are about to do.
- The challenges as the rewards are formidable but well worth the effort.
- One half drop out because of the challenge but YOU CAN DO IT – I will help you accomplish your goal – just stick with it !

Getting your pilots license is ACHIEVABLE

1. Develop a **plan of clear steps in getting what you wish to achieve**.
2. Be **SMART**

   Specific Goal: Be specific as to what you want to accomplish.

   Measureable Goals: **Milestones** are good measureable goals in achieving your license.

   - First Flight
   - Getting your "Student Pilot License" needed to solo
   - First Solo Flight
   - First Cross Country
   - First LONG Cross Country (Private Pilots)
   - First Night Cross Country (Private Pilots)
   - Passing the Aeronautical Written Exam
   - Passing Your Checkride – Getting the license
   - Flying your 1st Passenger

   Achievable: Don't beat yourself up – baby steps before big steps!

   Realistic: ***Flying is expensive*** – even in a "club."

   Pace yourself to find a working budget.

   Time Based: Set a time table and try to hold to it.

   If your schedule slips as might happen – then readjust it realistically.

3 Develop a ritual or pattern of study and flight training. Set specific times and hold to it to do your studies and flights

4. Expect occasional setbacks. It is human to have occasional problems along the way.
5. Don't let it discourage you or cause you to give up your dream. YOU CAN DO IT☺

Certificates, Categories, Classes and Type Ratings

CERTIFICATES	**Restrictions**
Sport Pilot (2005)	Numerous
Recreational Pilot	Numerous
Student Pilot	Released by CFI Endorsement
Private Pilot (non-instrument or instrument)	VFR only without Instrument Rating
Commercial Pilot (Non instrument or instrument)	VFR only without Instrument Rating
Airline Transport Pilot	

"***RATING***" specifies the Category and Class you may fly

CATEGORY	**CLASS**	**Restrictions**
Lighter-than-air	Airship (blimp)	
	Free air	
Rotorcraft	Helicopter	
	Gyroplane	
Glider	(none)	Aerotow Only
Powerlift	(none)	
Airplane	Single-Engine-Land SEL	
	Single-Engine-Sea SES	
	Multi-Engine-Land MEL	
	Multi-Engine-Sea MES	

Certificates, Categories, Classes and Type Ratings

Additional Ratings in the Certification-Rating Matrix

Type	**Category/Class**
CFI	Airplane - SE
	Airplane - ME
	Rotocraft - Helicopter
	Rotocraft - Gyroplane
CFII	Instrument - Airplane
	Instrument - Helicopter
	Instrument – Glider

Type	**Application**
Ground Instructor	Basic - Private, sport pilot, recreational pilot, and private pilot flight review
	Advanced - Private, commercial, and all flight reviews
	Instrument -Private, commercial, instrument all flight reviews.
Specific Type Ratings	
Specific aircraft/weight	Jet and aircraft weighing greater than 12,500 lbs (approximate 125+ specific type ratings)

Aeronautical Decision Making

Created by Steve Reisser

What is ADM

Aeronautical Decision Making (ADM) is a "**systematic approach** to the mental process used by aircraft pilots to consistently determine the best course of action in response to a given set of circumstances."

FAA Advisory Circular AC 60-22 in jewel box

There is also more to consider …..

ATTITUDE AND ETHICAL BEHAVIOR

In aviation, dense regulations, technical skill and knowledge are insufficient to ensure safe flying. **Ethical behavior**, **constructive attitudes**, **and a *positive culture*** add to safety for individual pilots and foster a healthy aviation community.

Flying is not about ME, it is about **WE**. Your actions as a pilot have **significant effects and implications on OTHERS** on the ground, in the sky, and at your side in the cockpit. You mess up and EVERYBODY in the community pays. You should not consider being a pilot if you are only thinking of yourself.

Part of ADM is risk management. You must manage risks associated with:

- Yourself as The Pilot in Command
- Your Aircraft
- The Environment (surface and airborne)
- The Operations of Flight (safety first)

ADM means managing risk elements for all situations.

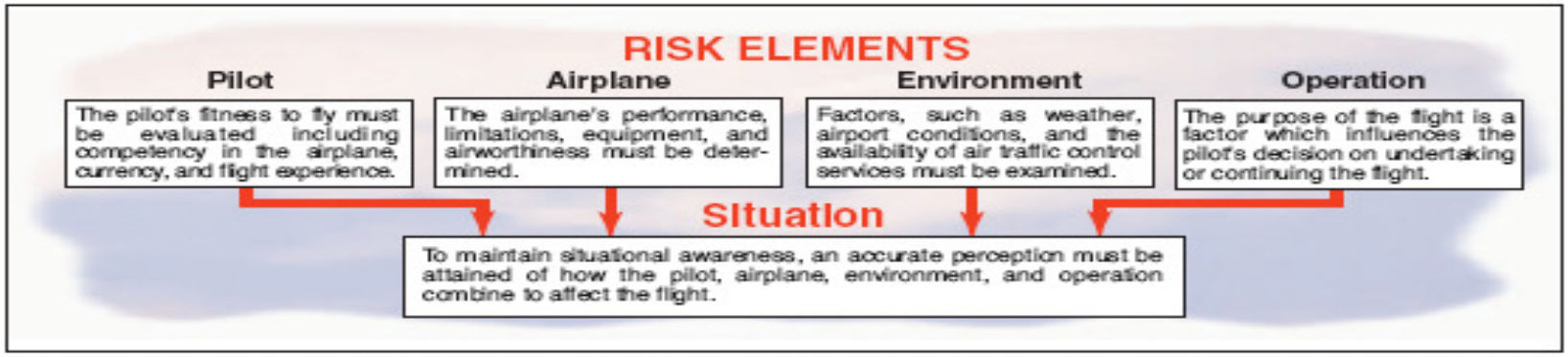


Figure 16-3. When situationally aware, the pilot has an overview of the total operation and is not fixated on one perceived significant factor.

***Pilot**: A pilot had only 4 hours of sleep the night before. The boss then asked the pilot to fly to a meeting in a city 750 miles away. The reported weather was marginal and not expected to improve. After assessing fitness as a pilot, it was decided that it would not be wise to make the flight. The boss was initially unhappy, but later convinced by the pilot that the risks involved were unacceptable.*	***Airplane**: During a preflight, a pilot noticed a small amount of oil dripping from the bottom of the cowling. Although the quantity of oil seemed insignificant at the time, the pilot decided to delay the takeoff and have a mechanic check the source of the oil. The pilot's good judgment was confirmed when the mechanic found that one of the oil cooler hose fittings was loose.*	***Environment**: A pilot was landing a small airplane just after a heavy jet had departed a parallel runway. The pilot assumed that wake turbulence would not be a problem since landings had been performed under similar circumstances. Due to a combination of prevailing winds and wake turbulence from the heavy jet drifting across the landing runway, the airplane made a hard landing. The pilot made an error when assessing the flight environment.*	***Operation**: On a ferry flight to deliver an airplane from the factory, in marginal weather conditions, the pilot calculated the groundspeed and determined that the airplane would arrive at the destination with only 10 minutes of fuel remaining. The pilot was determined to keep on schedule by trying to "stretch" the fuel supply instead of landing to refuel. After landing with low fuel state, the pilot realized that this could have easily resulted in an emergency landing in deteriorating weather conditions. This was a chance that was not worth taking to keep the planned schedule.*

Human Factors-AERONAUTICAL DECISION MAKING

PILOT IN COMMAND RESPONSIBILITY

RESPONSIBILITY = **E V E R Y T H I N G**

PRE-FLIGHT YOURSELF – **IF YOUR NOT READY THEN DON'T FLY TODAY** !

Created by Steve Reisser

Human Factors-AERONAUTICAL DECISION MAKING

- Communications
  - Actively Listen and communicate as needed
- Resources: Utilize all available resources provided to and for you including other pilots, instructors, and www resources (Join AOPA for free as a student pilot)
- Workload Management also called Plan, Prioritize, Prepare to prevent overload. In a multiperson crew configuration, effectively use all personnel and material assets available.
- Situational Awareness: be aware of all factors (self, airplane, environment, and operations of aircraft. Also keep your eye on the sky - Scan, Observe and Fly the airplane first above all things

Please see “AC 60-22” ADM on CD for full details.

Human Factors-AERONAUTICAL DECISION MAKING

Poor Judgment (PJ) Chain is a series of mistakes that may lead to an accident or incident. Two basic principles generally associated with the creation of a PJ chain are:

(1) One bad decision often leads to another; and

(2) as a string of bad decision grows, it reduces the number of subsequent alternatives for continued safe flight. ADM is intended to break the PJ chain before it can cause an accident or incident.

RECOGNIZE AND DEAL with problems while they are small before they get BIG.

Use the 'DECIDE' Model for Making Systematic Decisions

Detect the change that is occurring or has occurred.

Estimate the effect of the change (what happens if I ignore it) – You "**define** the problem"

Choose a **desirable outcome** +Communicate + Climb

Identify suitable **courses of action/s** to achieve outcome

Do the action/s. **Take action now** – don't let situation deteriorate.

Evaluate the effect of your actions. If the outcome is not what you expect or does not accomplish the desired objective, then go back to "I"dentify a different course of action/s.

The acronym DECIDE is used by the FAA to describe the basic steps in the decision-making process.

Detect the fact that a change has occurred.
Estimate the need to counter or react to the change.
Choose a desirable outcome for the success of the flight.
Identify actions which could successfully control the change.
Do the necessary action to adapt to the change.
Evaluate the effect of the action.

1 Recognize a change.

While on a cross-country flight, you discover that your time enroute between two checkpoints is significantly longer than the time you had originally calculated.

ETE	ETA	Fuel
ATE	ATA	Rem.
4+5		9:19
11		
13		9:02
16		9:0
15		9:4
18		9:5
20		10:0
		31.9

2 Define the problem.

Based on your insight, your cross-country flying experience, and your knowledge of weather systems, you consider the possibility that you have an increased headwind.

You verify that your original calculations are correct and consider factors which may have lengthened the time between checkpoints, such as a climb or diversion off course. To determine if there is a change in the winds aloft forecast and to check recent pilot reports, you contact flight watch.

After weighing each information source, you conclude that your headwind has increased. To determine the severity of the problem, you calculate your new groundspeed, and reassess fuel requirements.

3 Choose a course of action.

After considering the expected outcome of each possible action and assessing the risks involved, you decide to refuel at an airport prior to your original destination.

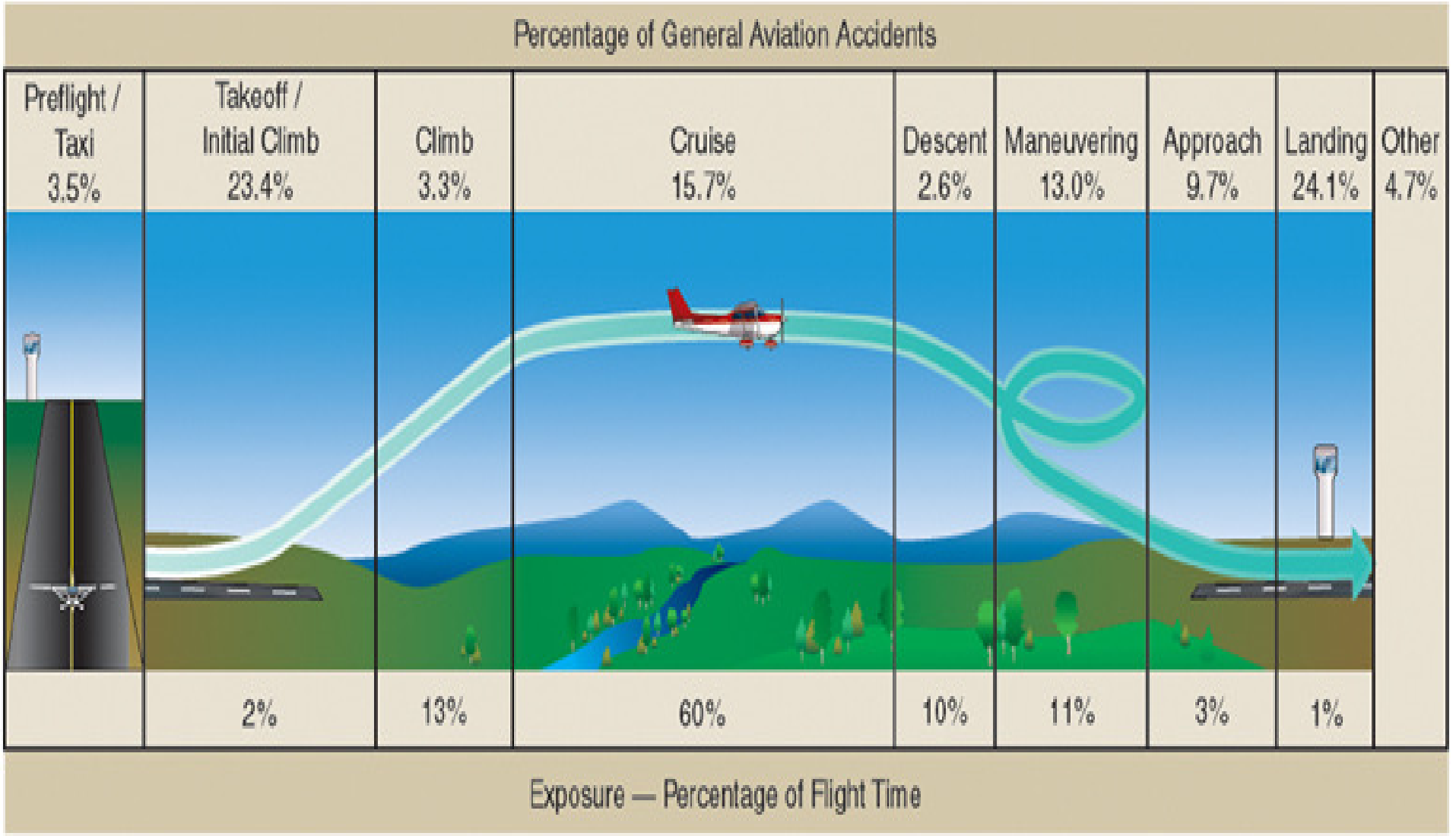
4 Implement your decision.

You plot the course change and calculate a new estimated time of arrival, as well as contact the nearest FSS to amend your flight plan and check the weather conditions at your new destination.

5 Ensure that your decision is producing the desired result.

To evaluate your decision and determine if additional steps need to be taken, you monitor your groundspeed, aircraft performance, and the weather conditions as the flight continues.

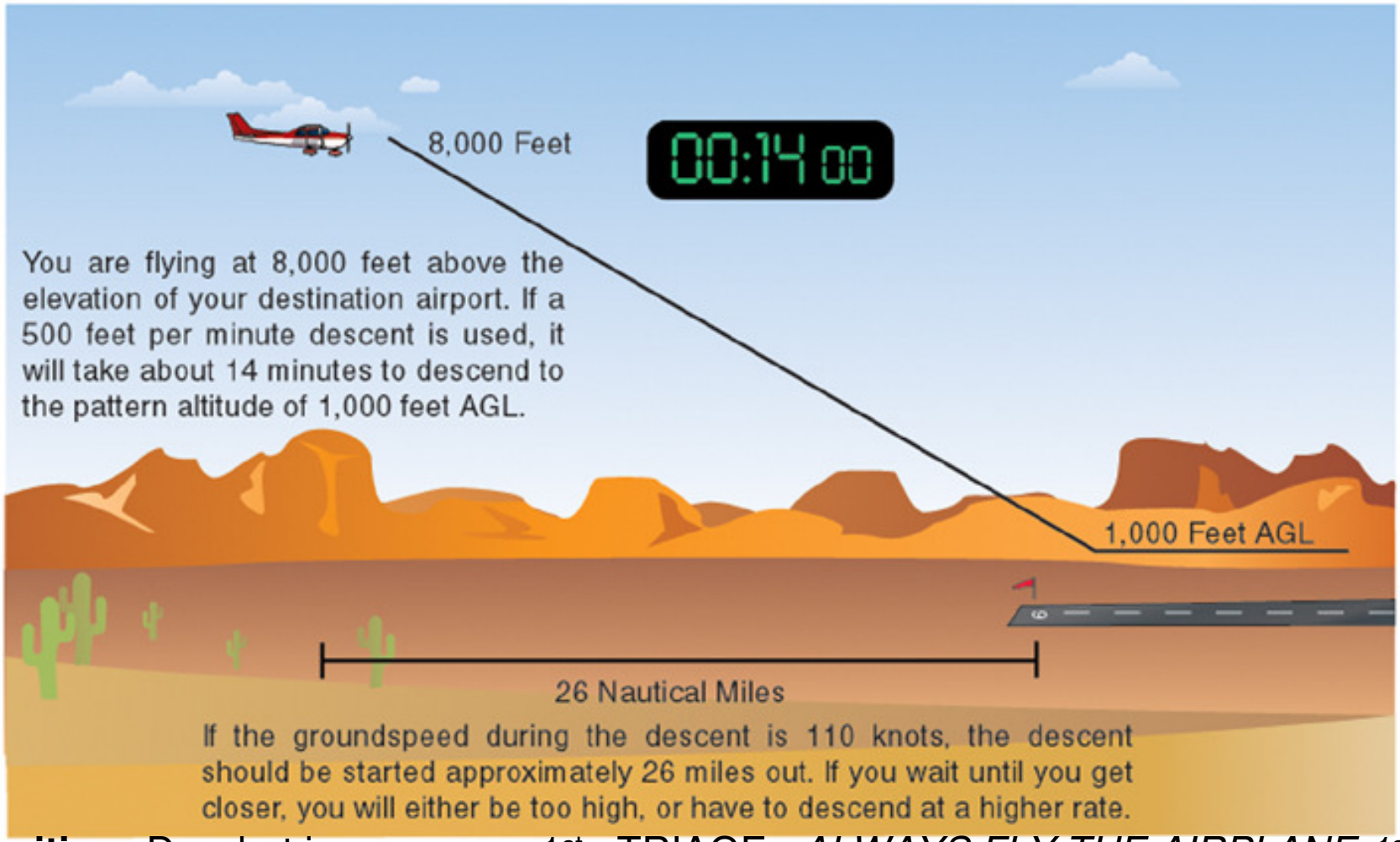
Exposure to Risk for your flight



FLYING IS STILL SAFER THAN DRIVING WHEN USING GOOD ADM

ADM – Workload Management

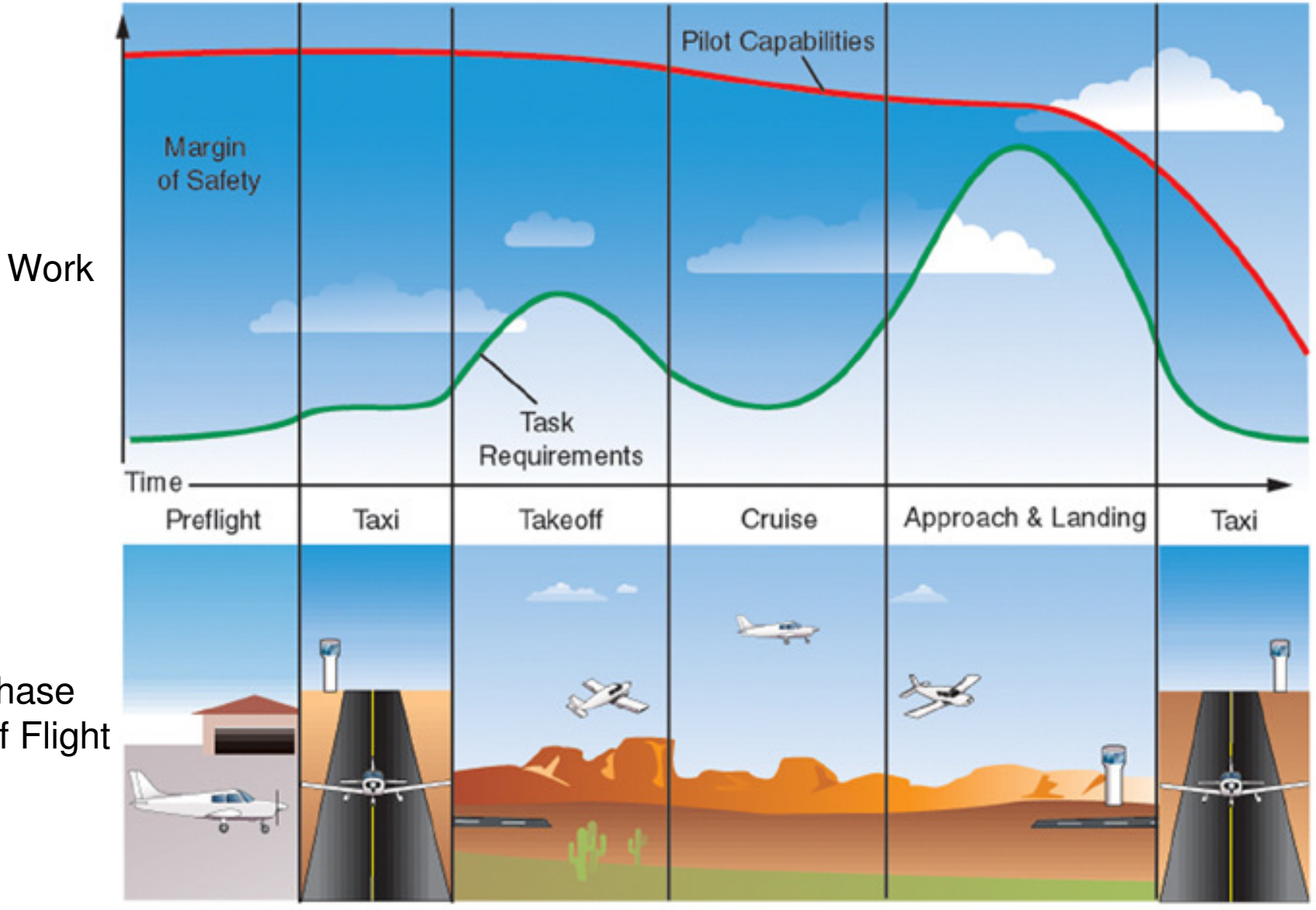
Planning and Preparation: Always be "ahead," on the ground and in the air. Never get "behind the power curve."



Prioritize: Do what is necessary 1st. TRIAGE. *ALWAYS FLY THE AIRPLANE 1st*.

ADM – Workload Management

MANAGE THE LOAD NOT TO EXCEED YOUR CAPABILITY



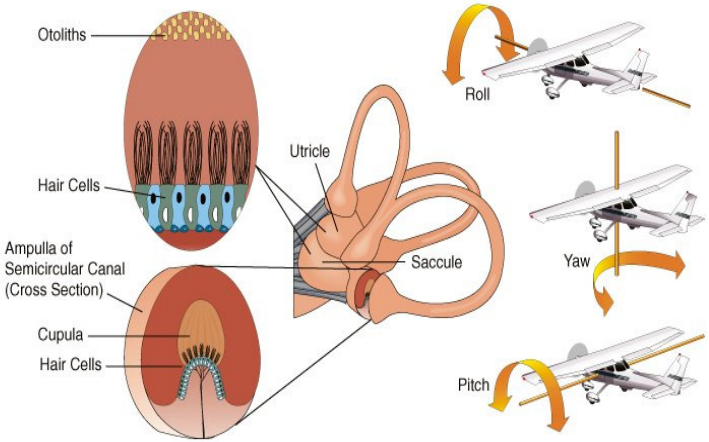
Aviation Physiology

Created by Steve Reisser

Aviation Physiology

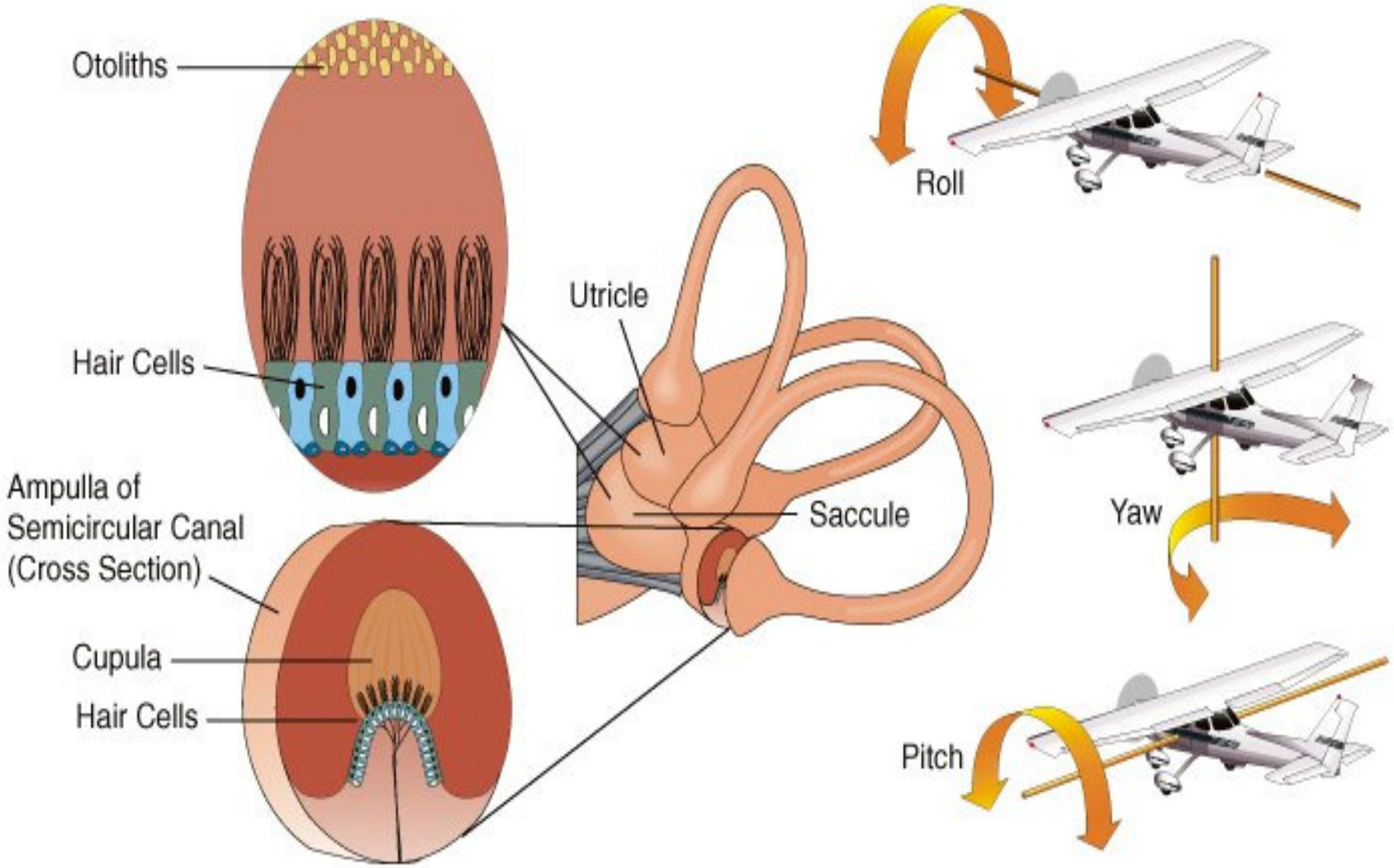
- Disorientation
  - Brain receives conflicting messages from our senses
  - Spatial disorientation
    - Central vision differs from peripheral vision
    - Example: Car in spot adjacent to you begins to move
    - **To overcome spatial disorientation, you must rely on, and properly interpret, your flight instruments**
    - **Using your body to interpret flight attitude makes you more susceptible to disorientation**

Aviation Physiology

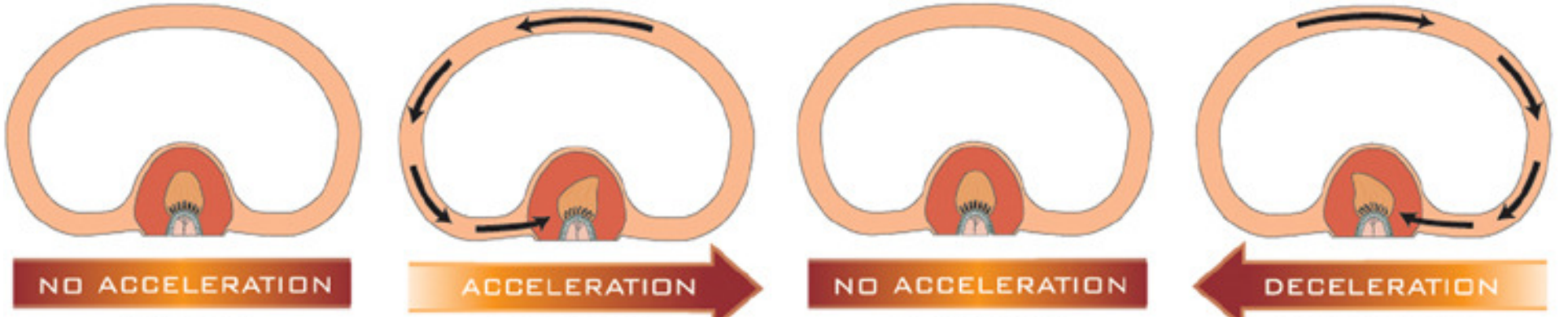


- Disorientation (cont'd)
  - Vestibular disorientation
    - Fluid in bony canals of inner ear is set in motion (acceleration)
    - Interpreted as movement by the brain
    - Since bony canals are oriented in three axes, fluid movement in any canal is interpreted as movement in that direction
    - Constant movement (no *acceleration*) is interpreted as no movement, i.e., no acceleration -> no movement

Aviation Physiology - Equilibrium



Aviation Physiology - Equilibrium



NO TURN

If no acceleration is taking place, the cupula is stationary and the hair cells are not deflected. No sensation of a turn is felt.

INITIATING A CLOCKWISE TURN

A clockwise turn deflects the hair cells in the direction opposite of the acceleration. You experience an accurate sensation of the turn direction.

PROLONGED CONSTANT-RATE TURN

During a prolonged constant rate turn, you may not sense any motion since the fluid in the canals eventually reaches equilibrium and the hair cells are no longer deflected.

DECREASE IN RATE OF TURN

If you decrease the rate of turn, the deflection of the hair cells may produce a false sensation of a turn in the opposite direction. In this example, you experience the sensation of a counterclockwise turn.

Aviation Physiology

*Rapid acceleration during takeoff will be interpreted as ?

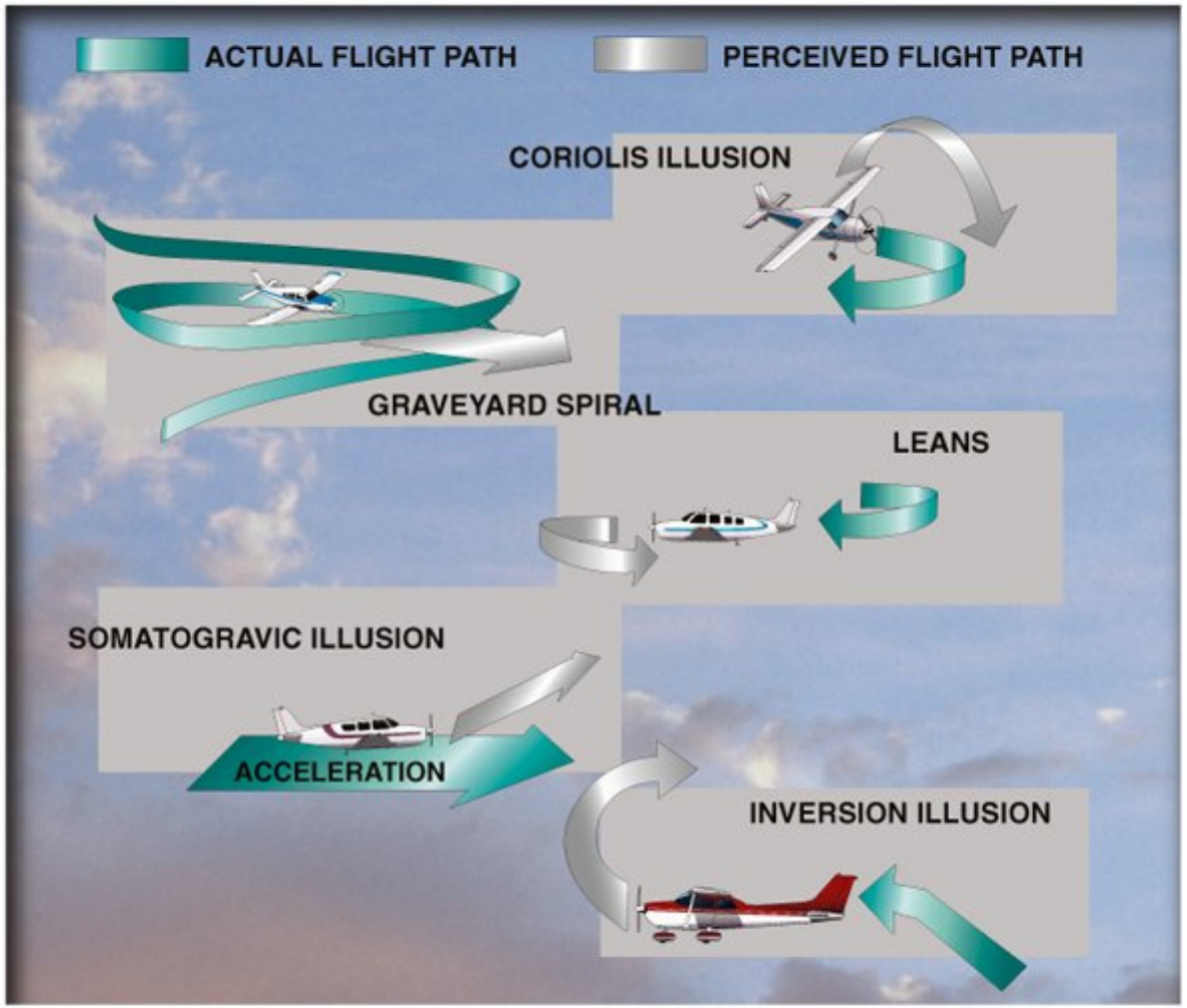
Being in a nose-up attitude

*Abrupt change from a climb to straight and level will be interpreted as ?

Tumbling backwards

*Abrupt movement of your head during a constant rate turn will produce ?

Coriolis illusion



Vertigo frequently leads to “Air Sickness”

- Physical symptoms include loss of appetite, saliva collecting in the mouth, nausea, nausea, vomiting.
- Actions a pilot might take if the passenger is suffering air sickness might include open air vents, loosen clothing, use supplemental oxygen and keep the eyes on a point outside the airplane. Avoid unnecessary head movement. Get the passenger down on the ground as soon as possible.

Ear Blockage

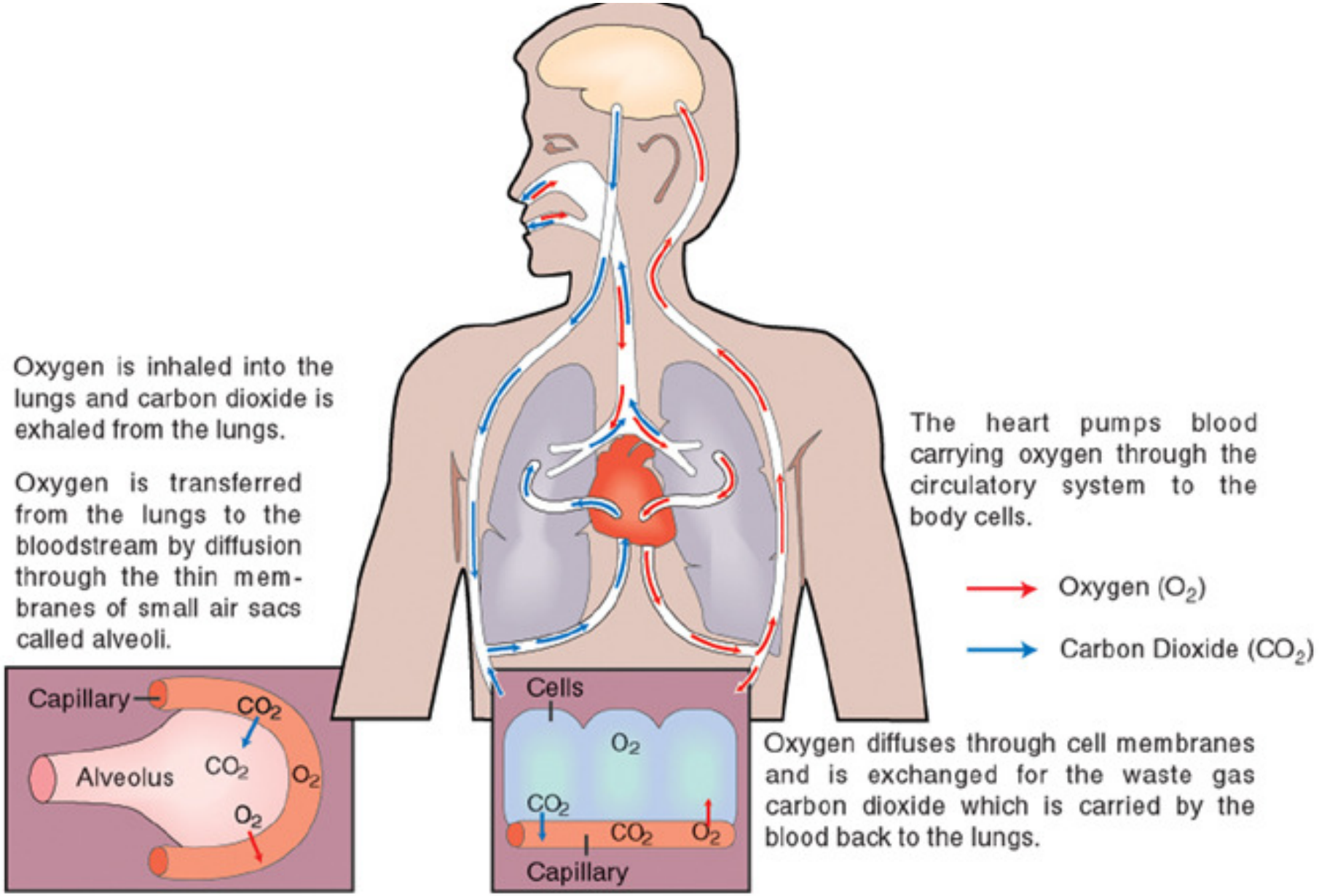
- Infections, colds, allergic reactions prevent equalization of external pressure to internal pressure in the Eustachian tube between throat and inner ear causing sever pain and loss of hearing. Duration hours to days.
- Possible relief by yawning, swallowing, tensing muscles in throat, pinching nostrils and exerting pressure (“Valsalva Maneuver”)

Vertigo

What do you think you should do if you get vertigo ….

- On the ground before a flight?
- In the air as pilot-in-command?

Aviation Physiology



Aviation Physiology

Altitude	Time of Useful Consciousness
45,000 feet MSL	9 to 15 seconds
40,000 feet MSL	15 to 20 seconds
35,000 feet MSL	30 to 60 seconds
30,000 feet MSL	1 to 2 minutes
28,000 feet MSL	2 1/2 to 3 minutes
25,000 feet MSL	3 to 5 minutes
22,000 feet MSL	5 to 10 minutes
20,000 feet MSL	30 minutes or more

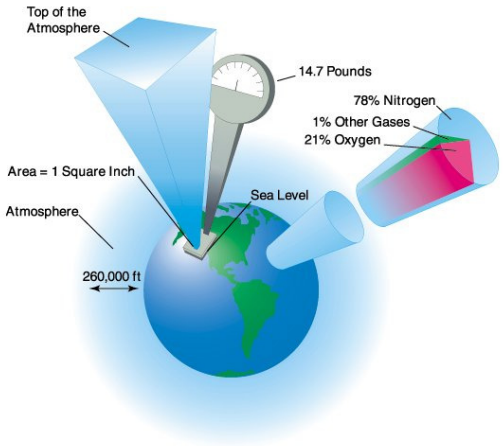
Aviation Physiology

- Hypoxia
  - Tissues, e.g., the brain, the eyes, in the body do not receive enough oxygen (hypo -> below, ox -> oxygen, -ia -> condition of)
  - * Insidious because the symptoms are difficult to recognize before your reactions are affected!
  - Hypoxic hypoxia is due

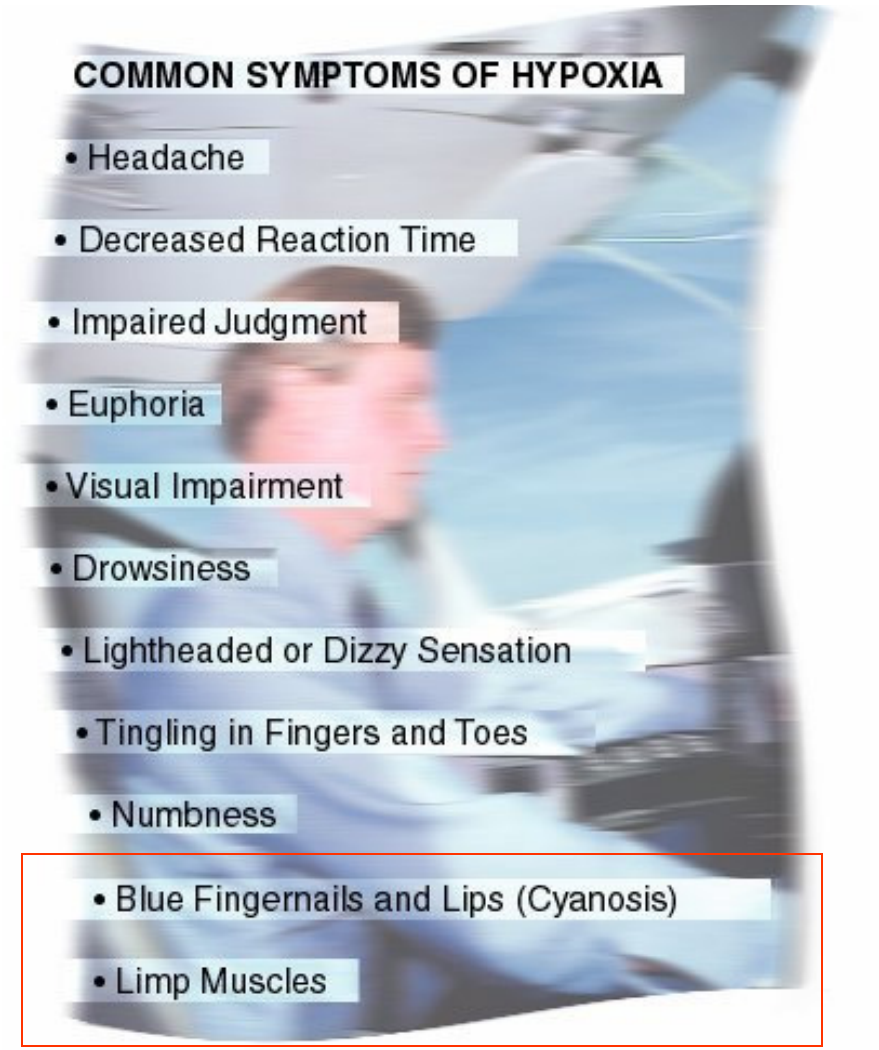
to insufficient partial pressure

of oxygen in the atmosphere

  - **What are the symptoms**?



Aviation Physiology - Hypoxia



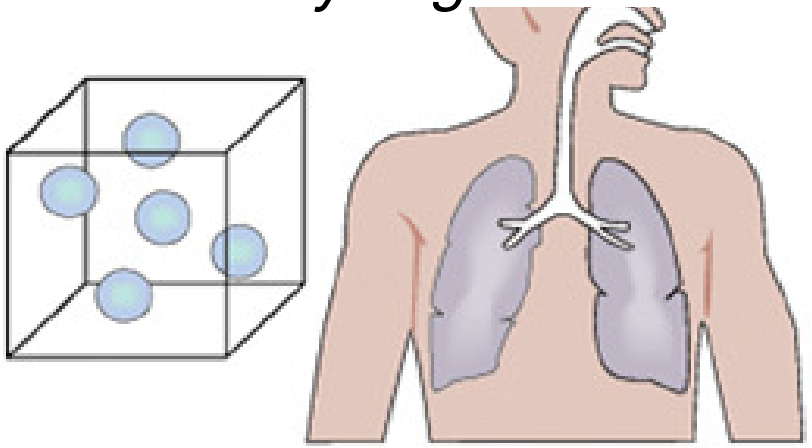
What's the remedy for hypoxia?

Oxygen (O_2)

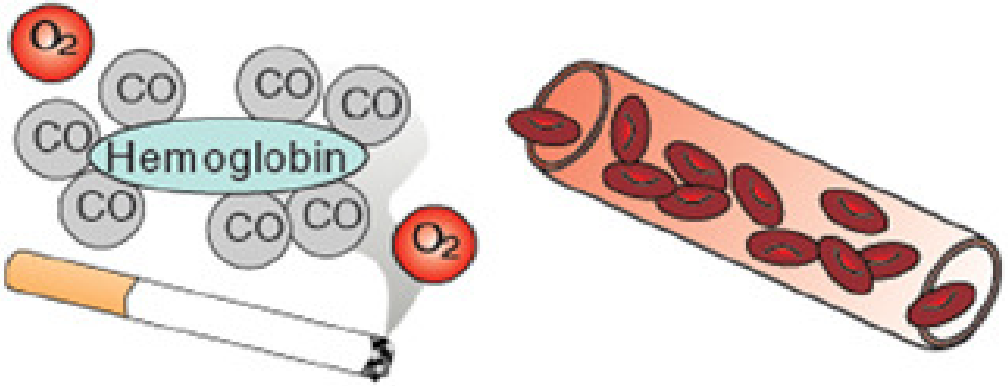
Either use O_2 or descend to lower altitude.

Aviation Physiology

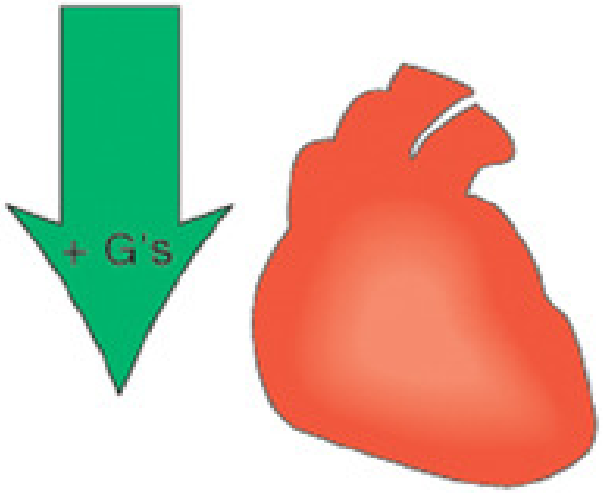
Why might sufficient oxygen not get into your body?



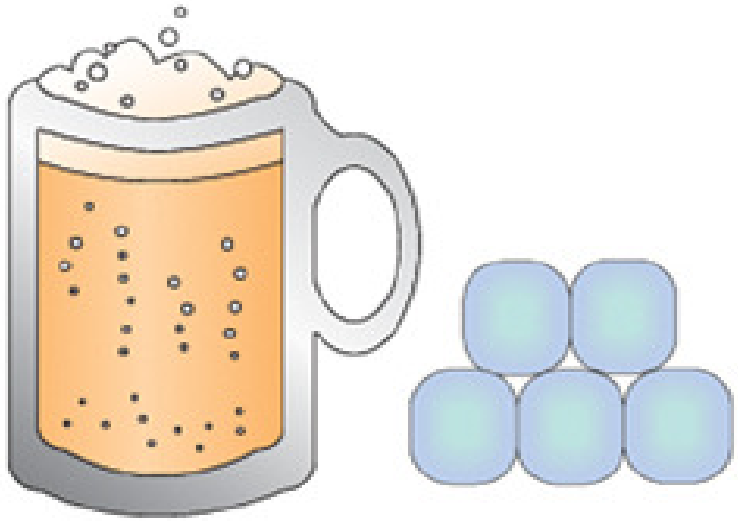
Hypoxic Hypoxia – Inadequate Supply of Oxygen



Hypemic Hypoxia – Inability of the Blood to Carry Oxygen

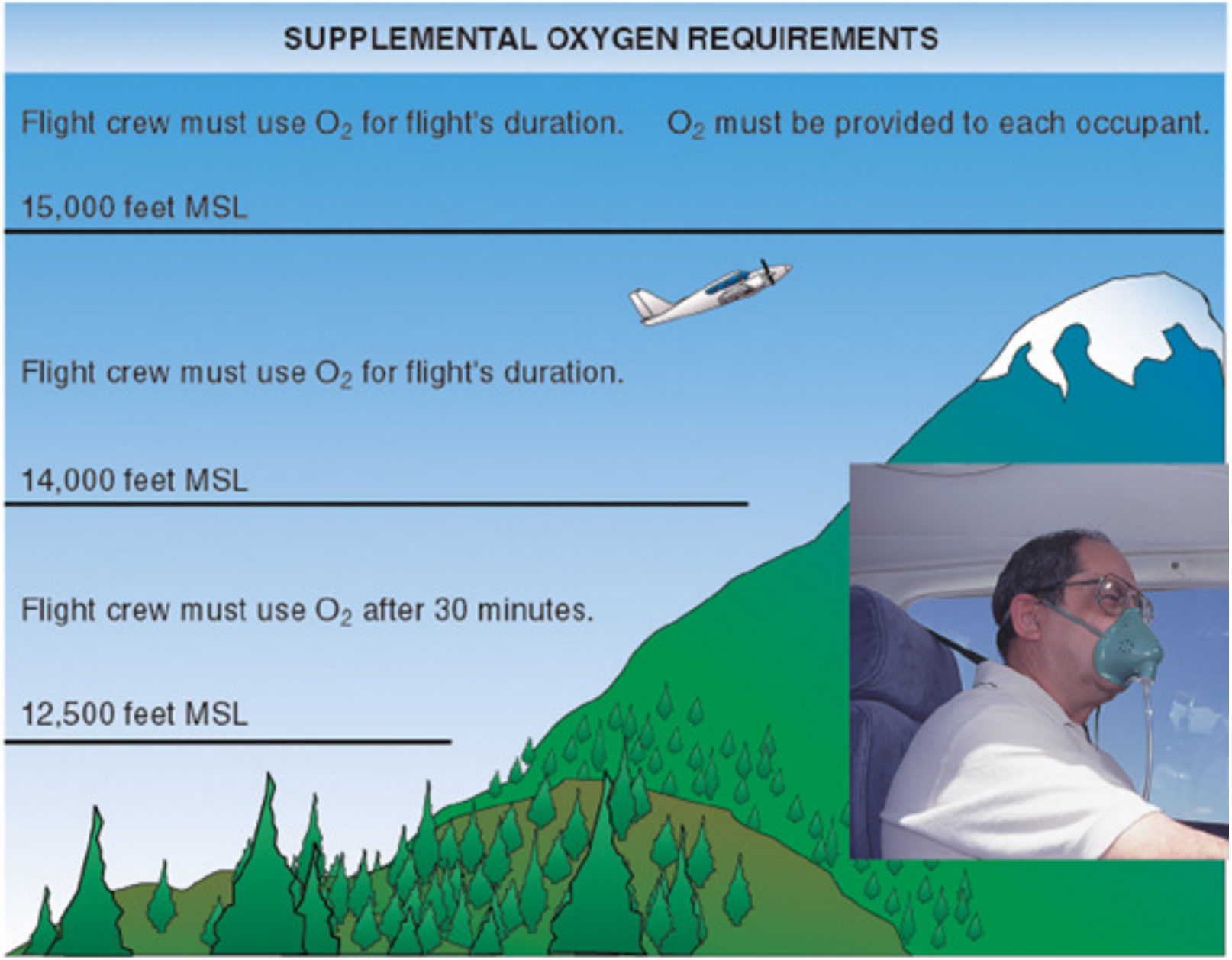


Stagnant Hypoxia – Inadequate Circulation of Oxygen



Histotoxic Hypoxia – Inability of the Cells to Effectively Use Oxygen

Aviation Physiology



Aviation Physiology

- Carbon monoxide, CO, can cause hypemic hypoxia
  - CO is found in cigarette smoke
    - 3 cigarettes ⟶ equivalent of 8,000 feet!
    - *If you are around smokers, you are being exposed to CO*!
  - CO is found in internal combustion engine exhaust
    - Cabin heat is provided by a shroud around exhaust pipe
    - Hole in exhaust pipe will cause CO to enter cabin
    - *If you smell exhaust, you are being exposed to CO*!

How can hypoxia be avoided?

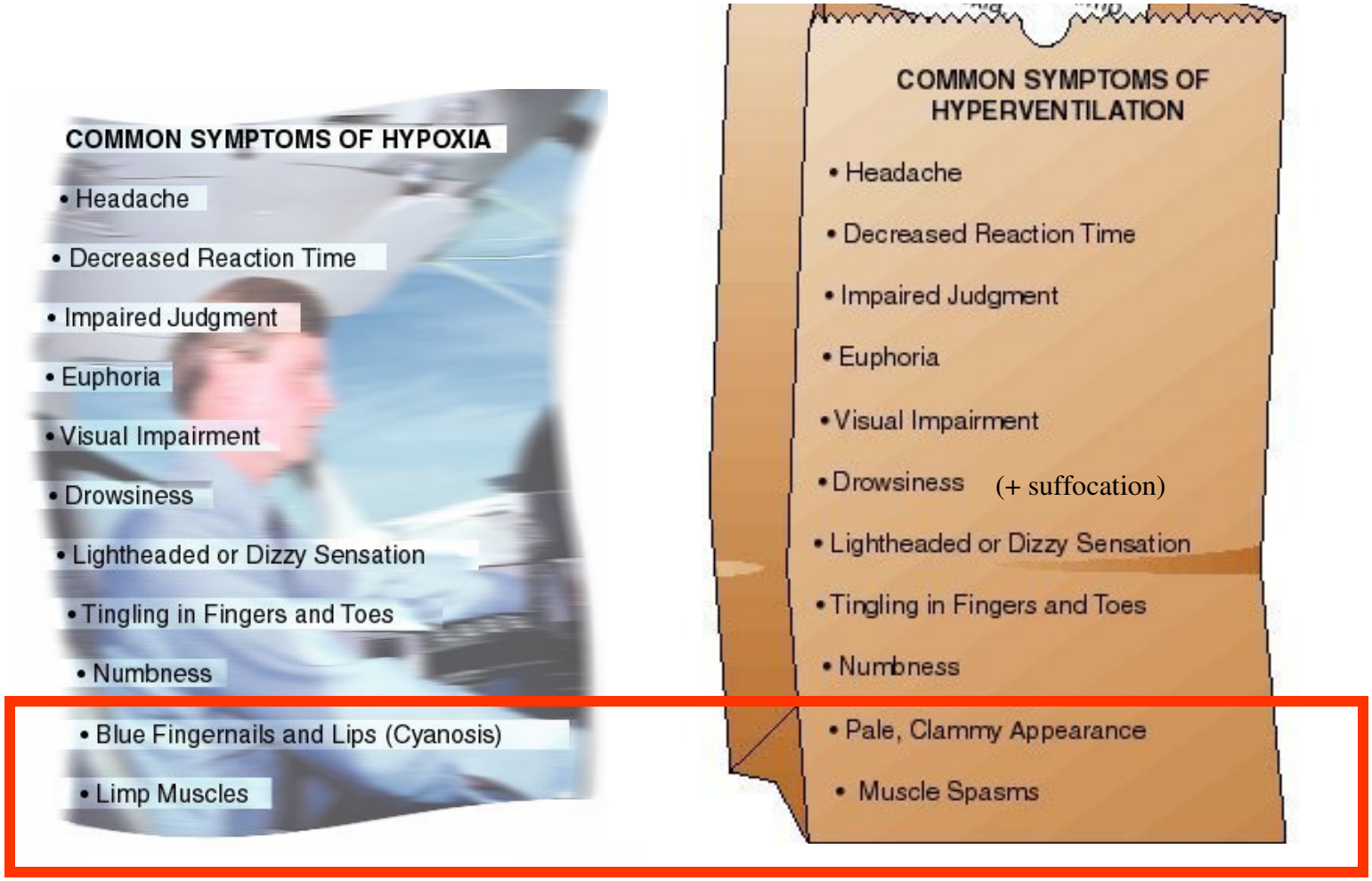
- Maintain a safe, comfortable, oxygen rich pressure cabin level
- Although not required by FAA regulation, it is wise to use supplemental oxygen above 10,000 MSL during the **day**.
- Although not required by FAA regulation, it is wise to use supplemental oxygen above 5,000 MSL during the **night**.

Aviation Physiology

- Hyperventilation
  - Breathing too rapidly (hyper -> above, ventilation -> breathing) - **Why**?
  - Causes too much carbon dioxide, CO_2, to be lost
  - The remedy is simple - *slow your breathing down*!
    - Conscious effort to slow breathing
    - Breathing into a paper bag
  - **What are the symptoms**?
  - **How can these symptoms be distinguished from hypoxia**?

Aviation Physiology - Hyperventilation

Hypoxia or Hyperventilation?



Aviation Physiology – IMPAIRMENT

- FATIGUE – You must be SHARP, ALERT, and IN CONTROL. Fatigue jeopardizes.
- NOISE – Causes fatigue and problems with communications – use headphones.
- MEDICATION, DRUGS, ALCOHOL – Impair response and judgment.
- ATTITUDES (Anti-authority, “Beat the Clock”, Ego Trips, etc.)

Alcohol Impairs Judgment

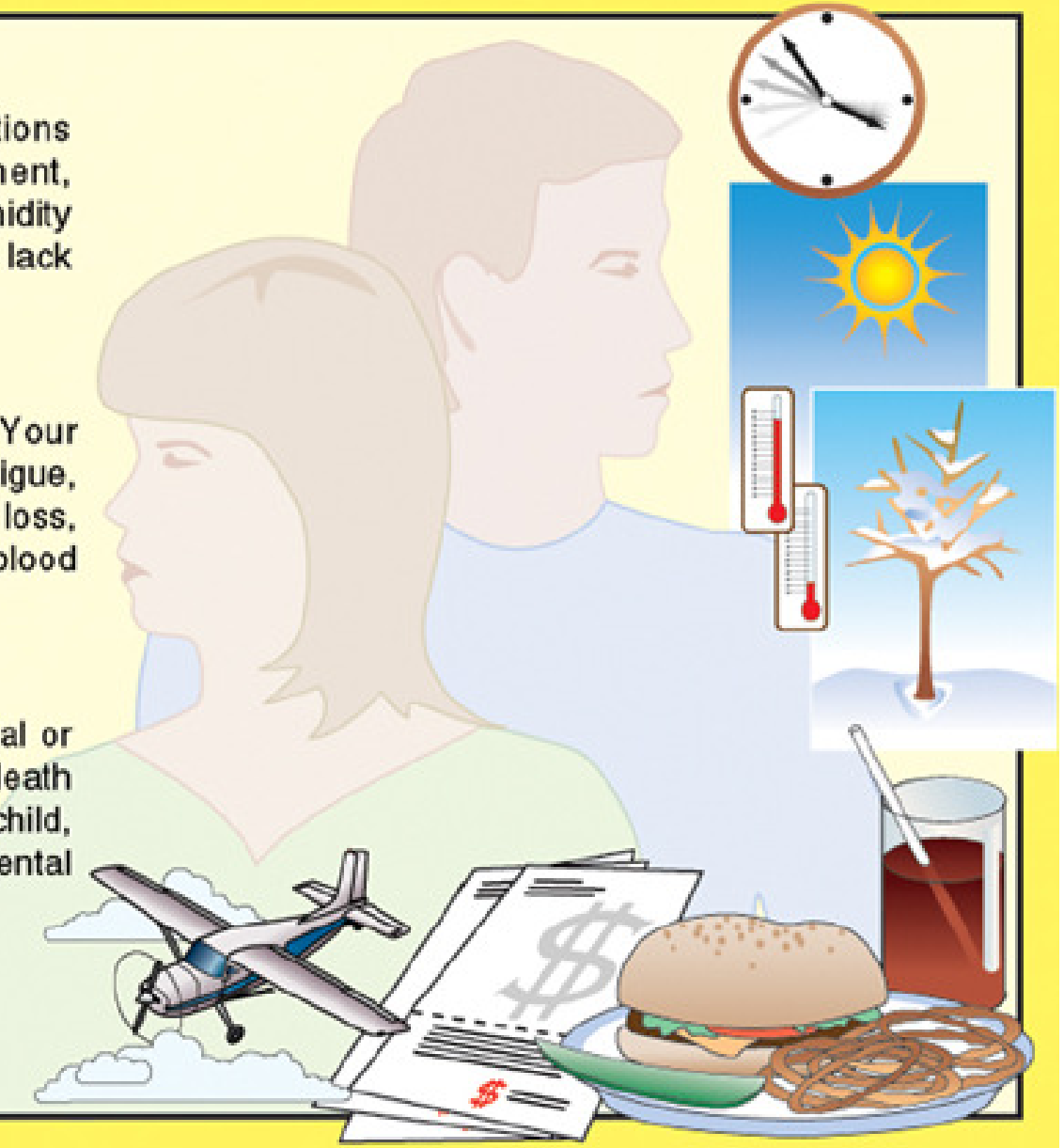
- **NEVER DRINK AND FLY - P E R I O D**
- FAA says 8 hours, less than .04% percent
- Wiser judgment says no less than 12 hours, better 24 hours bottle to throttle!!

Aviation Physiology – IMPAIRMENT

Physical Stress — Conditions associated with the environment, such as temperature and humidity extremes, noise, vibration, and lack of oxygen

Physiological Stress — Your physical condition, such as fatigue, lack of physical fitness, sleep loss, missed meals (leading to low blood sugar levels), and illness

Psychological Stress — Social or emotional factors, such as a death in the family, a divorce, a sick child, a demotion at work, or the mental workload of in-flight situations



DANGEROUS ATTITUDE – There are old pilots and bold pilots
There are no “Old Bold Pilots” because of bad attitudes and risks.

Macho — Steve often brags to his friends about his skills as a pilot and how close to the ground he flies. During a local pleasure flight in his single-engine airplane, he decides to buzz some friends barbecuing at a nearby park.

Taking chances is foolish.

Anti-Authority — Although he knows that flying so low to the ground is prohibited by the regulations, Steve feels that the FARs are too restrictive in some circumstances.

Follow the rules. They are usually right.

Invulnerability — Steve is not worried about an accident since he has flown this low many times before and he has not had any problems.

It could happen to me.

Impulsivity — As he is buzzing the park, the airplane does not climb as well as Steve had anticipated and without thinking, Steve pulls back hard on the yoke. The airspeed drops and the airplane is close to a stalling attitude as the wing brushes a power line.

Not so fast. Think first.

Resignation — Although Steve manages to recover, the wing sustains minor damage. Steve thinks to himself, *“It’s dangerous for the power company to put those lines so close to a park. If somebody finds out about this I’m going to be in trouble, but it seems like no matter what I do, somebody’s always going to criticize.”*

I’m not helpless. I can make a difference.

DANGEROUS ATTITUDES

Peer Pressure. Poor decision making based upon emotional response to peers rather than evaluating a situation objectively.

Mind Set. The inability to recognize and cope with changes in the situation different from those anticipated or planned.

Get-There-Itis. This tendency, common among pilots, clouds the vision and impairs judgment by causing a fixation on the original goal or destination combined with a total disregard for any alternative course of action.

Duck-Under Syndrome. The tendency to sneak a peek by descending below minimums during an approach. Based on a belief that there is always a built-in "fudge" factor that can be used or on an unwillingness to admit defeat and shoot a missed approach.

Scud Running. Pushing the capabilities of the pilot and the aircraft to the limits by trying to maintain visual contact with the terrain while trying to avoid physical contact with it. This attitude is characterized by the old pilot's joke: "If it's too bad to go IFR, we'll go VFR." Continuing visual flight rules (VFR) into instrument conditions often leads to spatial disorientation or collision with ground/obstacles. It is even more dangerous if the pilot is not instrument qualified or current.

Getting Behind the Aircraft. Allowing events or the situation to control your actions rather than the other way around. Characterized by a constant state of surprise at what happens next. (STAY AHEAD: You not the airplane is in control)

Loss of Positional or Situation Awareness. Another case of getting behind the aircraft which results in not knowing where you are, an inability to recognize deteriorating circumstances, and/or the misjudgment of the rate of deterioration.

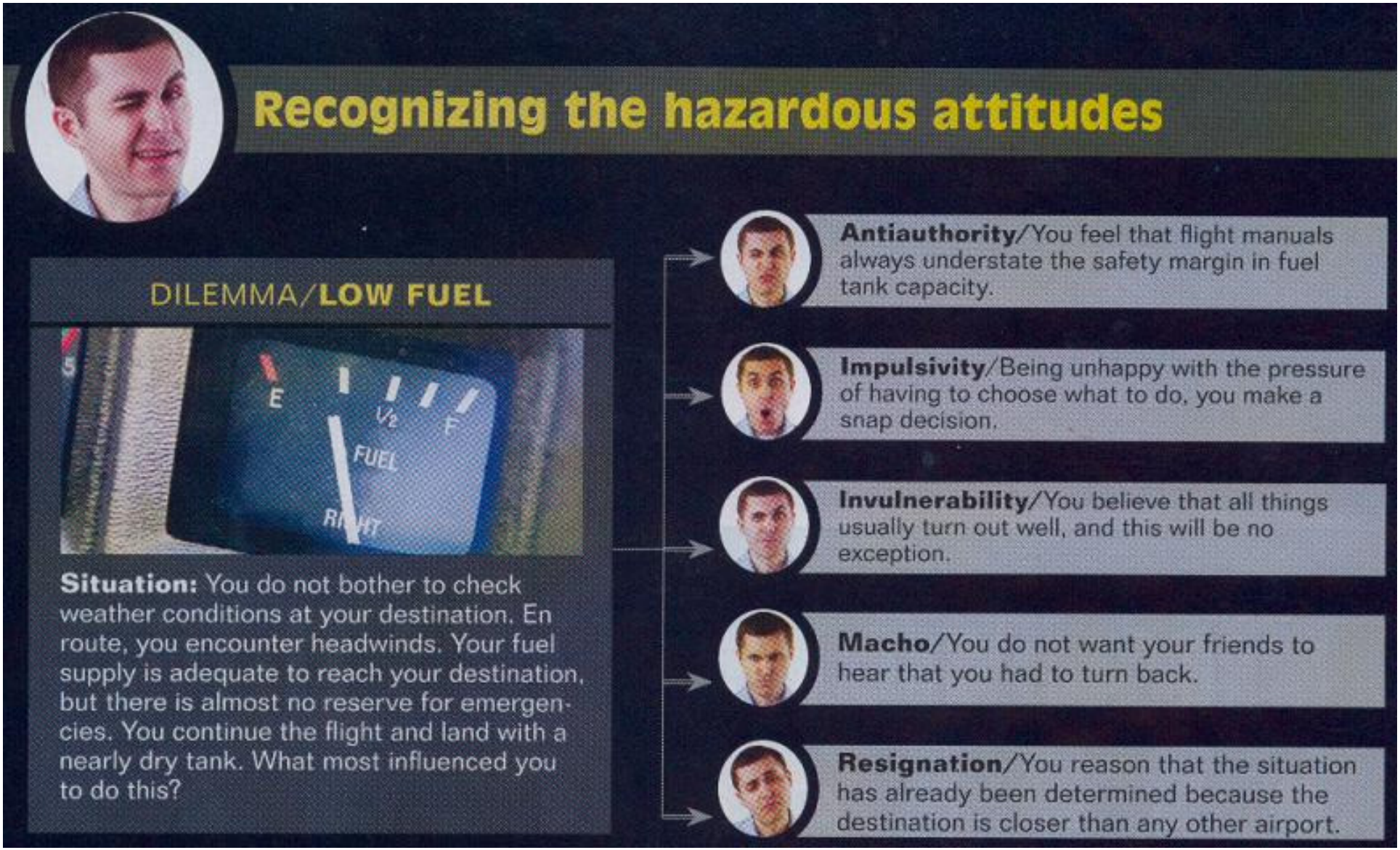
Operating Without Adequate Fuel Reserves. Ignoring minimum fuel reserve requirements, either VFR or Instrument Flight Rules (IFR), is generally the result of overconfidence, lack of flight planning, or ignoring the regulations.

Descent Below the Minimum Enroute Altitude. The duck-under syndrome (mentioned above) manifesting itself during the en route portion of an IFR flight.

Flying Outside the Envelope. Unjustified reliance on the (usually mistaken) belief that the aircraft's high performance capability meets the demands imposed by the pilot's (usually overestimated) flying skills.

Neglect of Flight Planning, Preflight Inspections, Checklists, Etc. Unjustified reliance on the pilot's short and long term memory, regular flying skills, repetitive and familiar routes, etc.

HAZARDOUS ANTIDOTE ATTITUDE



HAZARDOUS ANTIDOTE ATTITUDE

DILEMMA/**CHANGING WEATHER**

Situation: You are on a flight to an unfamiliar, rural airport. Flight service states that VFR flight is not recommended since heavy coastal fog is forecast to move into the destination airport area about the time you expect to land. You consider returning to your home base where visibility is still good, but decide to continue as planned and land safely after some problems. Why did you reach this decision?

Antiauthority/You resent the suggestion by flight service that you should change your mind.

Impulsivity/You feel the need to decide quickly, so you take the simplest alternative.

Invulnerability/You feel sure that things will turn out safely, and that there is no danger.

Macho/You hate to admit that you cannot complete your original flight plan.

Resignation/You reason that since your actions would make no real difference, you might as well continue.

HAZARDOUS ANTIDOTE ATTITUDE

DILEMMA/**QUESTIONABLE BRAKES**

Situation: While taxiing, you notice that your right brake pedal is softer than the left. Once airborne, you radio for information. Strong winds are reported at your destination. An experienced pilot who is a passenger recommends that you return to your departure airport. You continue the flight. Why?

Antiauthority/You feel that suggestions made in this type of situation are usually overly cautious.

Impulsivity/You immediately decide that you want to continue.

Invulnerability/Your brakes have never failed before, so you doubt that they will this time.

Macho/You are sure that if anyone could handle the landing, you can.

Resignation/You feel that you can leave the decision to the tower at your destination.

HAZARDOUS ANTIDOTE ATTITUDE

- Antiauthority: Don't tell me. Follow the rules. They are usually right.
- Impulsivity: Do something quick. Not so fast. Think first
- Invulnerability: It won't happen to me. It could happen to me.
- Macho: I can do it. Taking chances is foolish.
- Resignation: What's the use? I'm not helpless. I can make a difference.