Private Pilot (ASEL) Ground School Course

Lesson 16 | Weather Theory

Lesson Overview

Lesson Objectives:

- Develop knowledge of aviation weather theory.
- Develop an understanding of how to handle weather hazards and make appropriate decisions.

Lesson Completion Standards:

- Student demonstrates satisfactory knowledge of weather theory by answering questions and actively participating in classroom discussions.

Weather in a Nutshell …

- ***All weather is the result of the uneven heating of the earth's surface***
- The movement of air is how nature attempts to redistribute heat
- Air that circulates brings with it some of the general properties of the surface over which it formed, such as hot/cold/wet/dry
- That means water can be transported by moving air

Weather in a Nutshell …

- Water in the air means clouds can form when the air is sufficiently cooled
- Cloud formation means that the heat energy originally used to evaporate the water is released back into the air
- Sufficient released heat means rising air, where thunderstorms can form

Atmospheric Structure

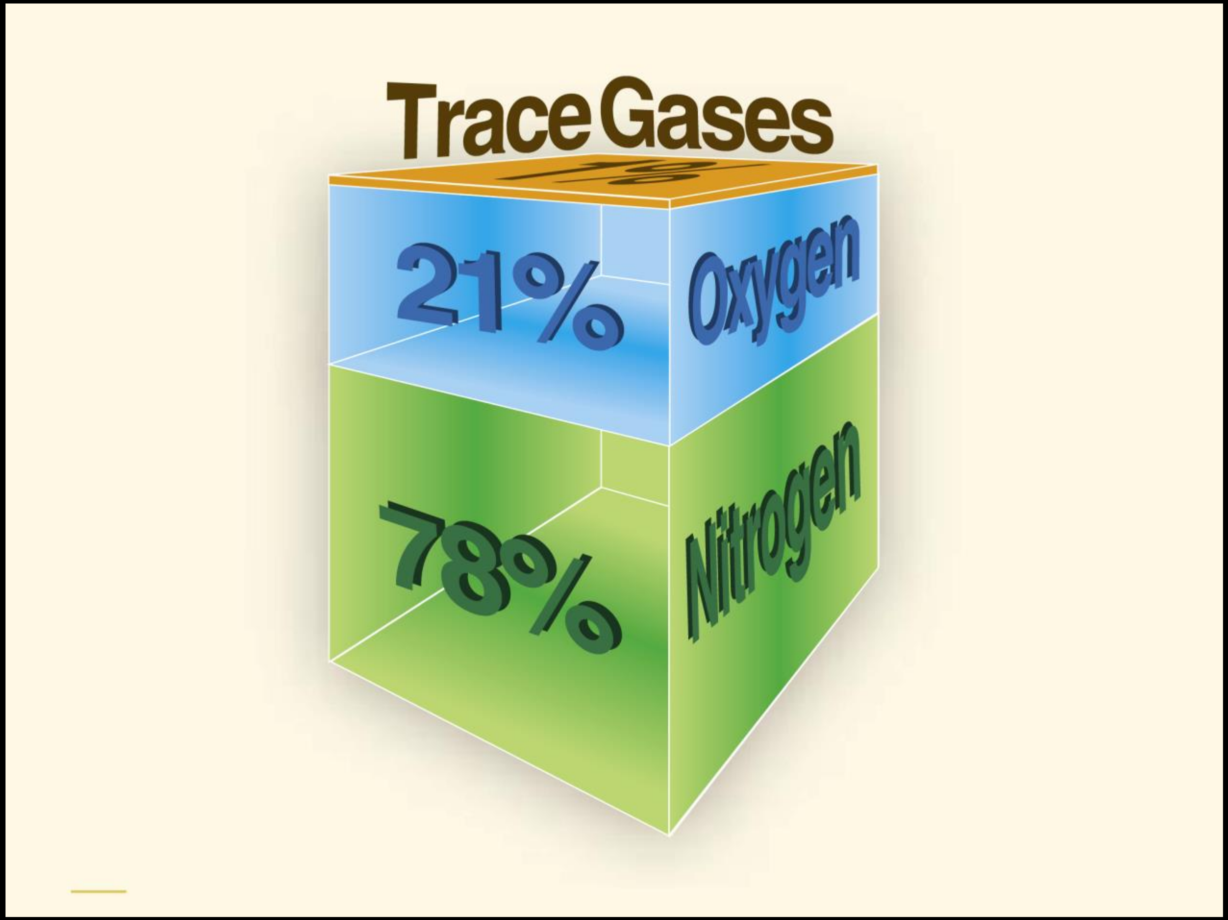
Weather Theory

The Earth's Atmosphere

- Atmosphere is a cloud of gas and suspended solids
- Extends from the surface out to many thousands of miles
- Becomes increasingly thinner with distance
- Always held by the Earth's gravitational pull

Composition

- 78% Nitrogen
- 21% Oxygen
- 1% many other gases
- Trace to 4% water vapor

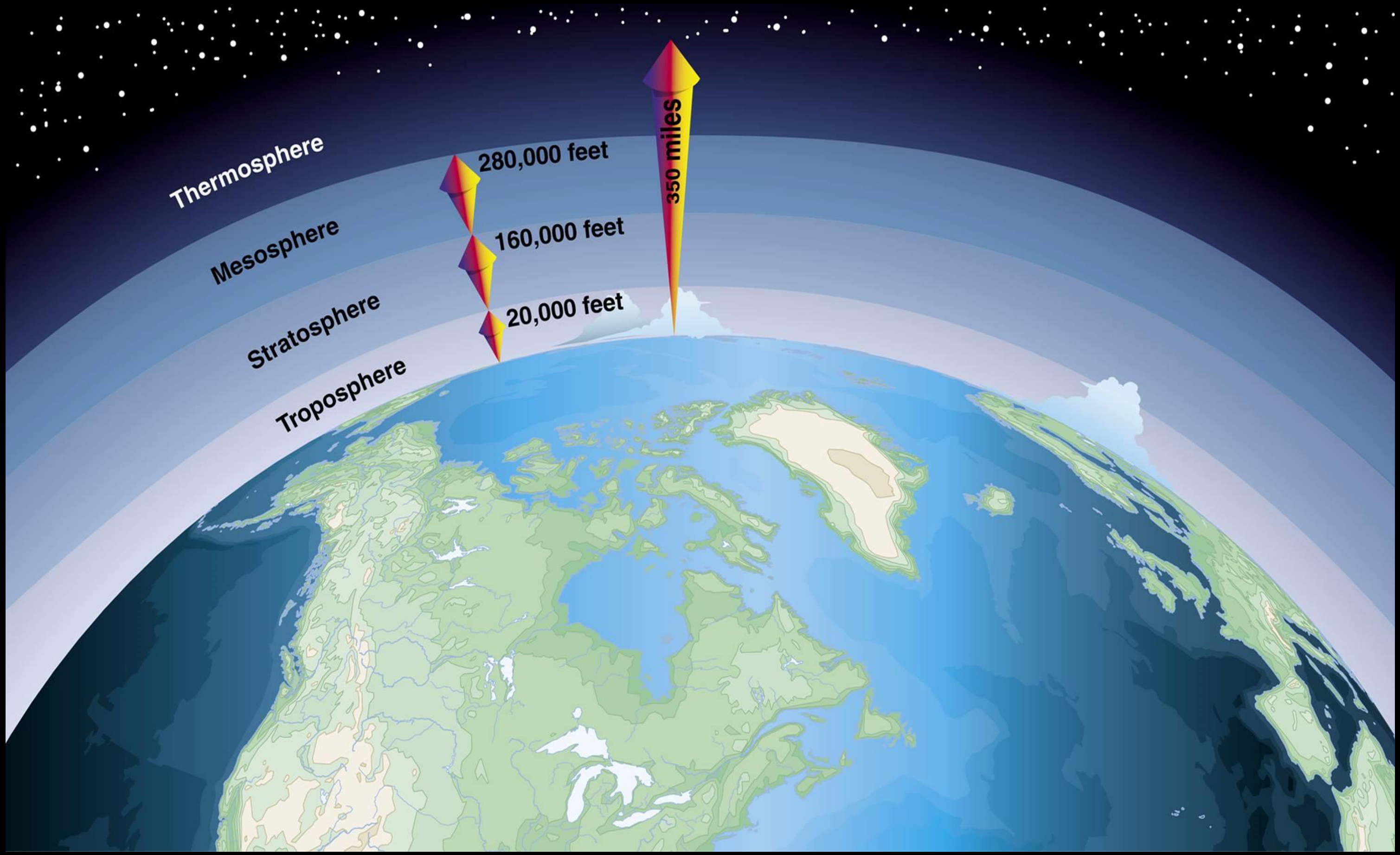


Air Parcel

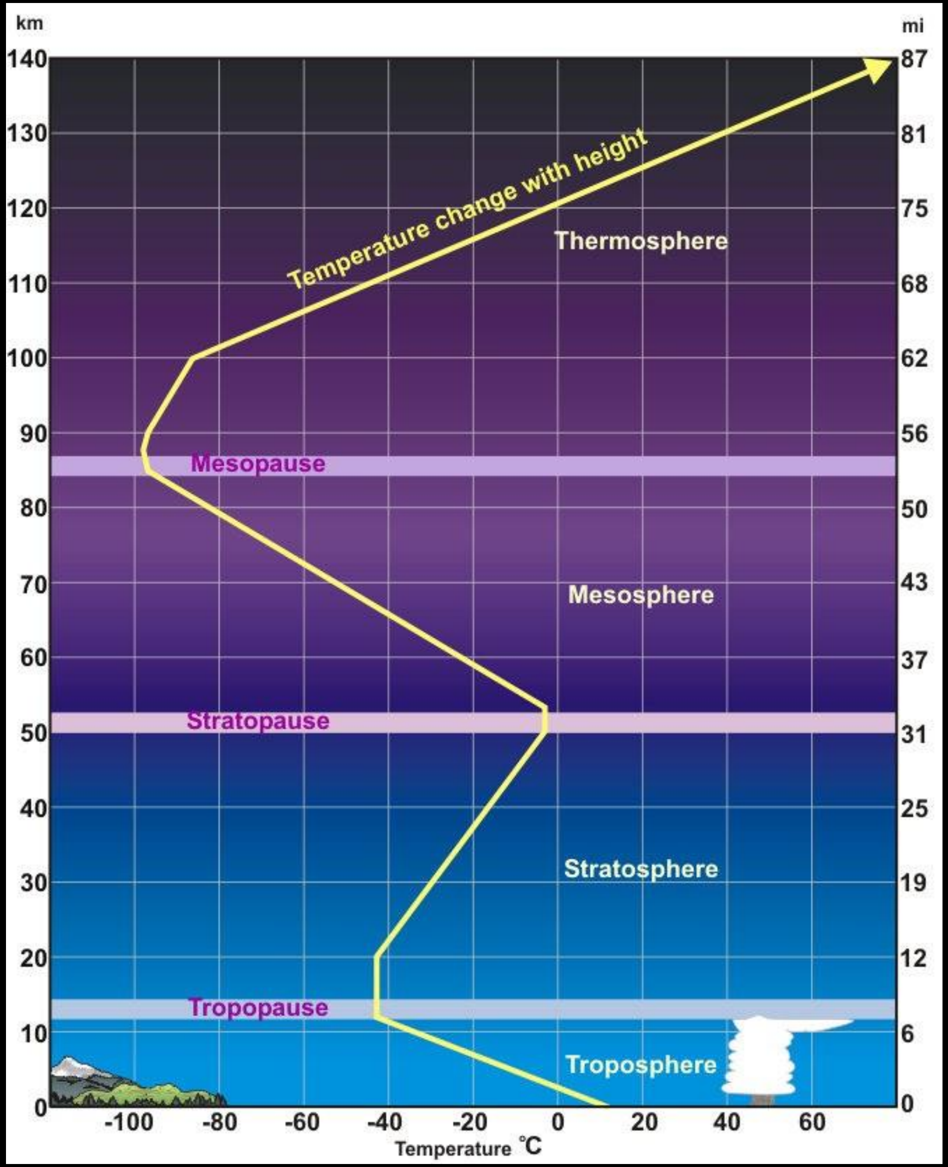
- An imaginary volume of air to which any or all of the basic properties of atmospheric air may be assigned
- Is large enough to contain a very large number of molecules, but small enough so that the properties assigned to it are approximately uniform
- It is not given precise numerical definition, but is used where air parcels are discussed
- In meteorology, an air parcel is used as a tool to describe certain atmospheric processes

Vertical Structure

- Subdivided into five concentric layers
- Based on the vertical profile of average air temperature changes, chemical composition, movement, and density
- Each layer is topped by a pause, where the maximum changes in thermal characteristics, chemical composition, movement, and density occur

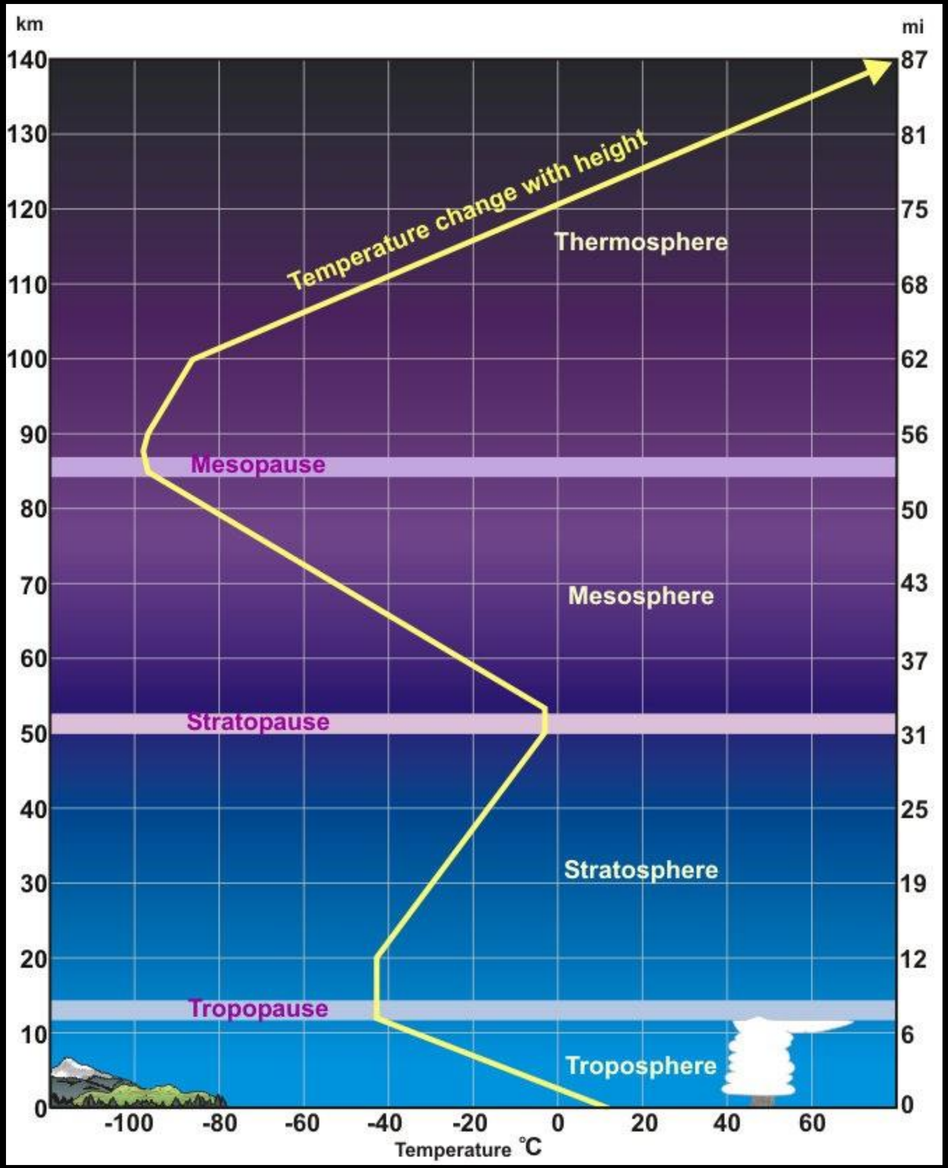


Vertical Structure



Troposphere

- Begins at the Earth's surface and extends up to about 36,000 feet
- Since the gases in this layer decrease with height, the air becomes thinner
- **Temperature in the troposphere decreases with height.**
- Temperature drops from about 15 °C (59 °F) to -56.5 °C (-70 °F)
- *Almost* all weather occurs in this region

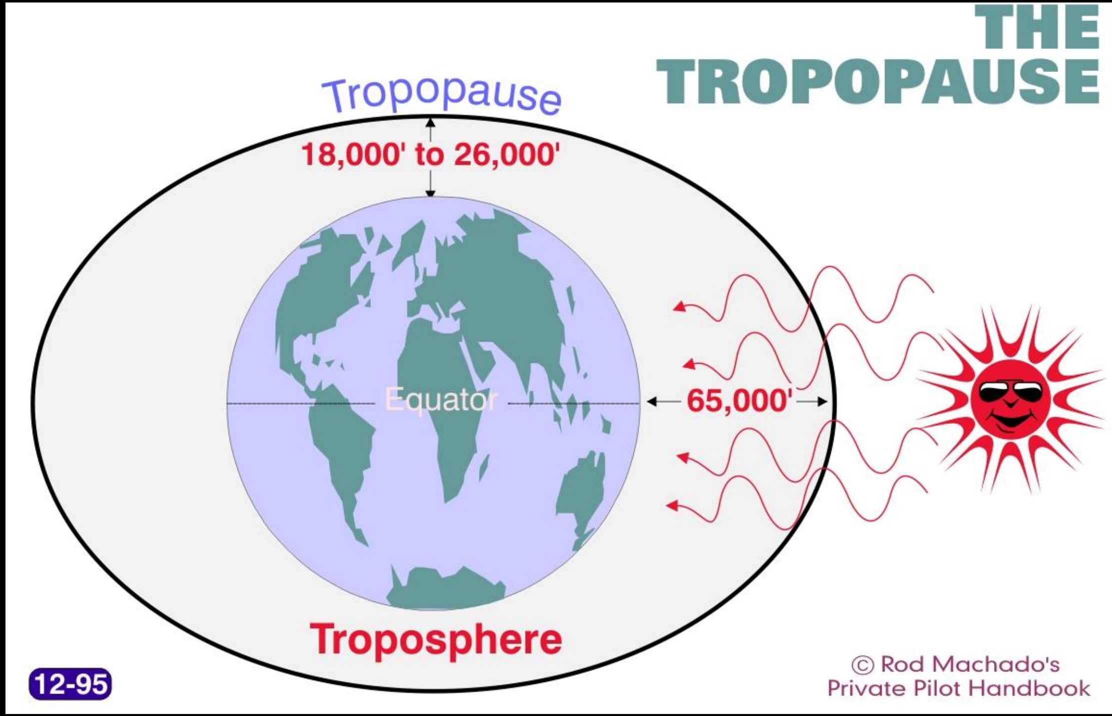


Troposphere

- Vertical depth varies due to temperature variations caused by latitude and season
- Height decreases from the Equator to the poles and is higher during summer than in winter
- The transition boundary between the troposphere and the layer above is called the tropopause

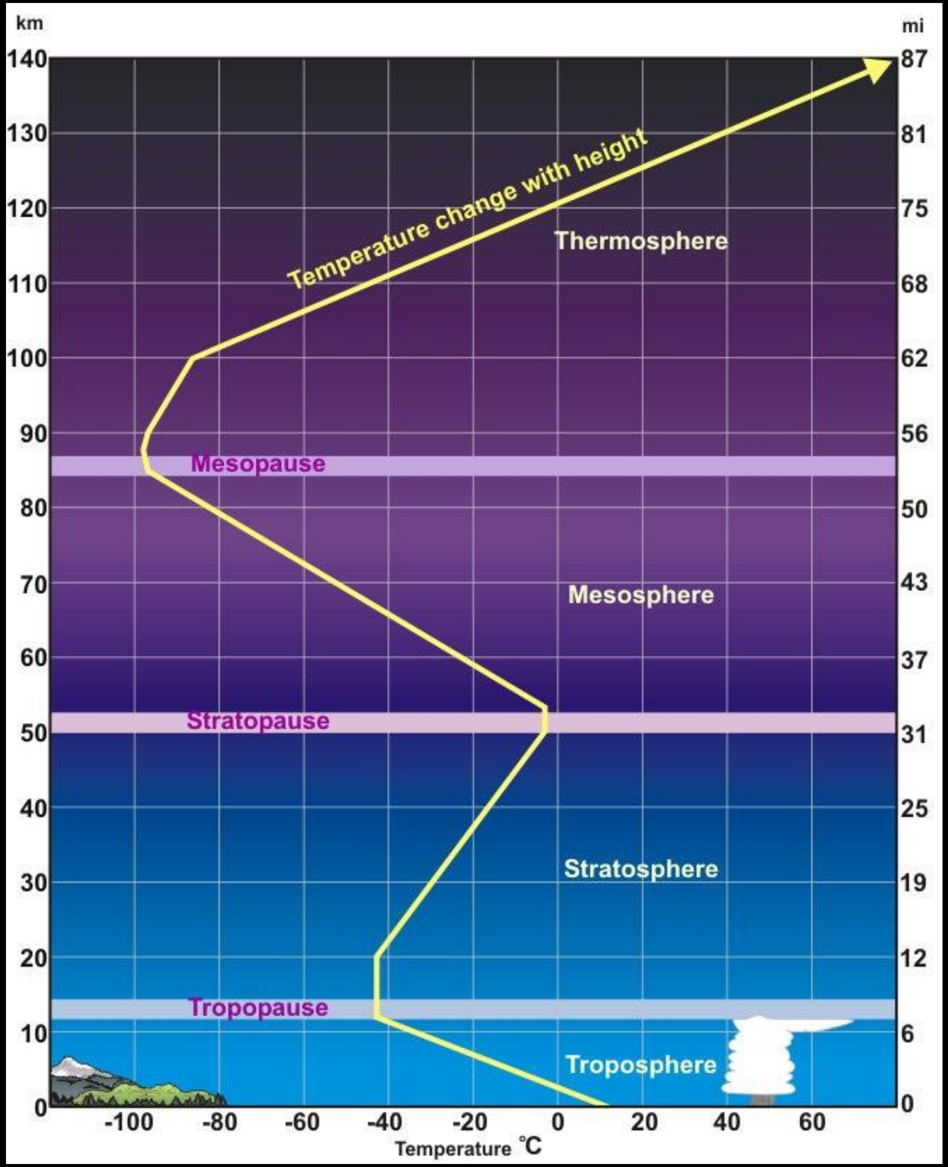
Troposphere

- The height of the troposphere varies with latitude and seasons
- It slopes from about 20,000 feet over the poles, to an average of 37,000 feet over the mid-latitudes, to about 65,000 feet over the Equator
- Is higher in summer than in winter
- An abrupt change in temperature lapse rate characterizes the Tropopause



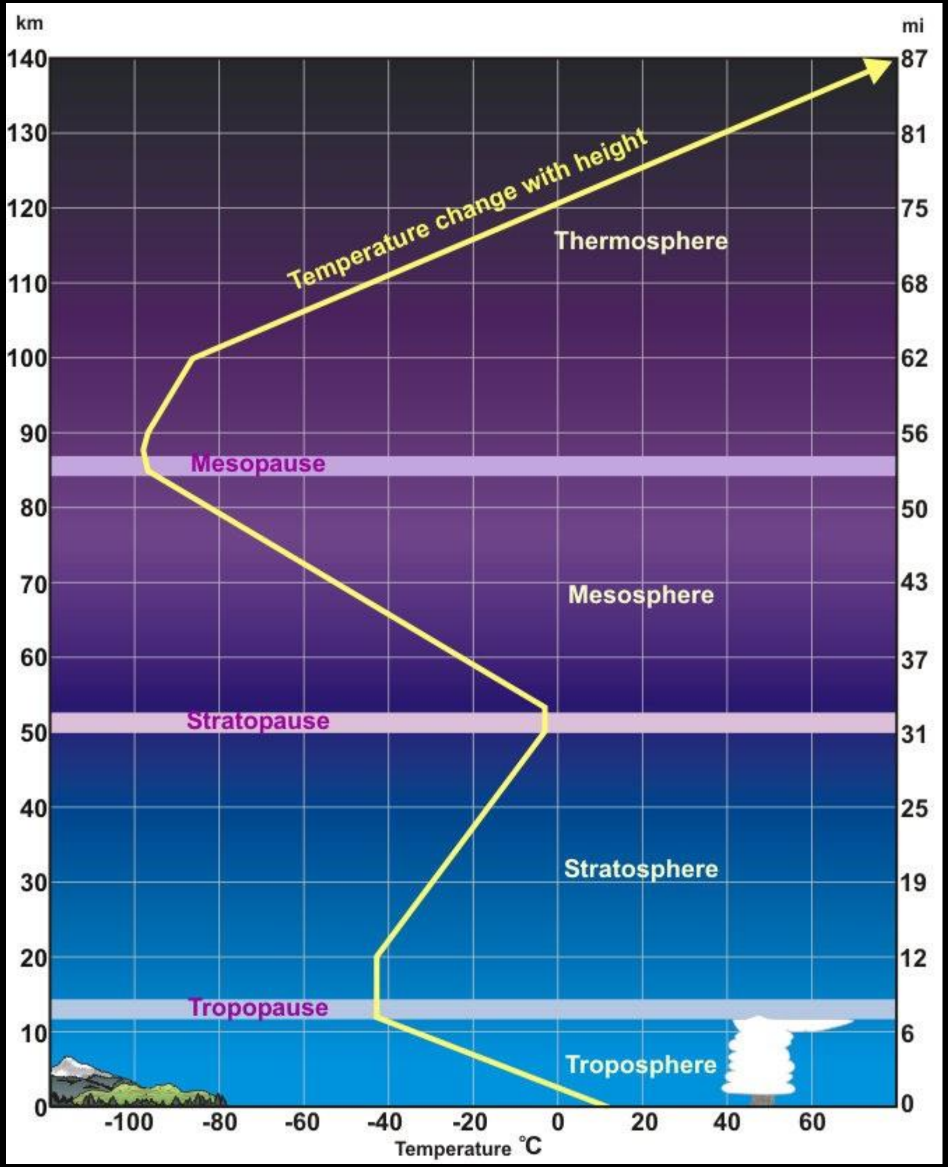
Stratosphere

- Extends from the tropopause up to 31 miles above the Earth's surface
- This layer holds very little water vapor
- ***Relatively small changes in temperature with height except for a warming trend near the top***
- Minimal weather (convective overshoot of TRW may occur)
- Increased levels of radiation and concentration of ozone



Last Three Layers

- Mesosphere – Decrease of temperature with height (Aurora)
- Thermosphere – Increase of temperature with height
- Exosphere – Edge of space

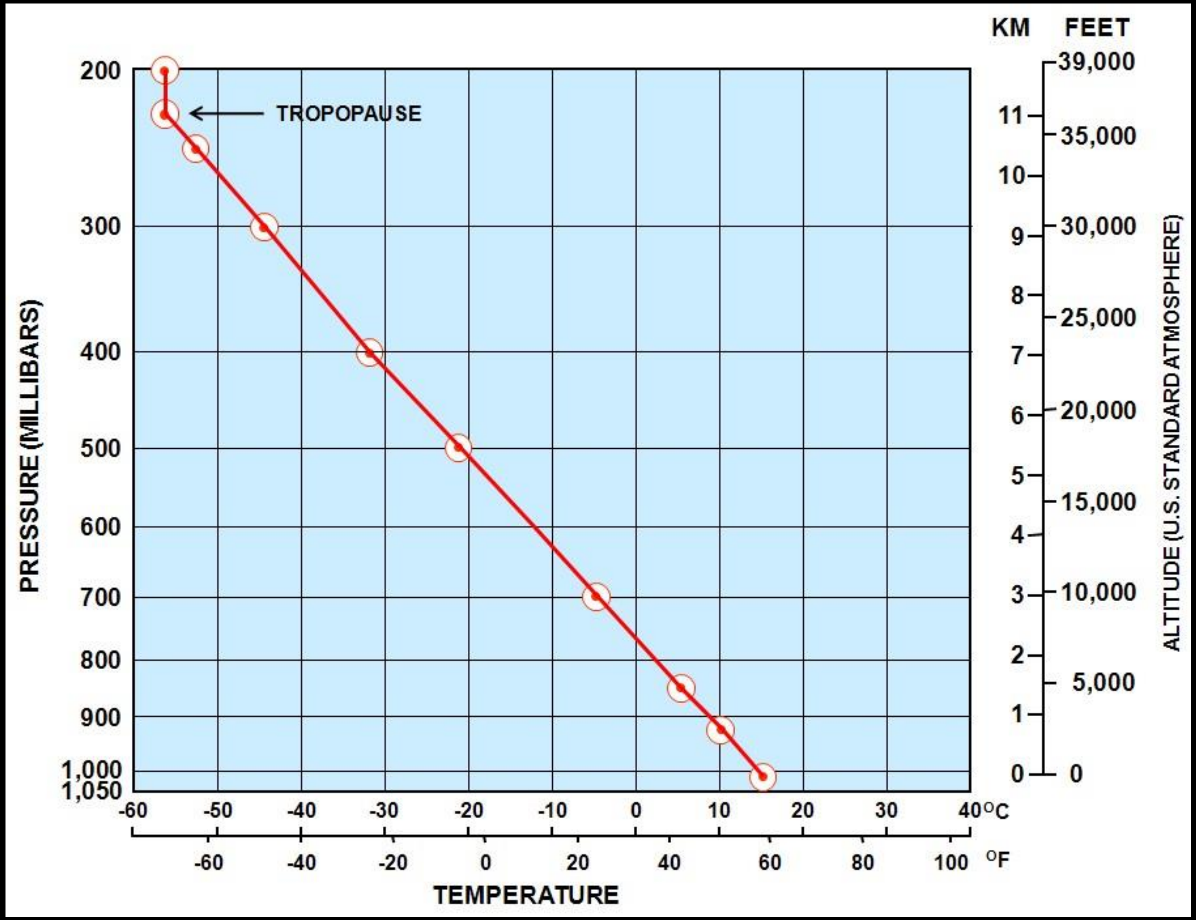


Standard Atmosphere

- Represents an *average* of conditions throughout the atmosphere for all latitudes, seasons, and altitudes
- Basis for altimeter and aircraft performance calculations
- Sea level pressure: 29.92 Hg (1013.2 Mb)
- Sea level temperature: 15°C / 59°F
- Temperature lapse rate: 2°C (3.57°F)/1000 feet
- Pressure Altitude of tropopause: 36,089 feet

Standard Atmosphere

- Within Troposphere
- Temperature lapse rate *2°C/1000* feet
- Tropopause located where lapse rate becomes zero



Wind Patterns

Weather Theory

Atmospheric Circulation

- Uneven heating of the Earth is the ultimate weather engine
- Air moves around the earth in a never-ending attempt to evenly distribute heat
- As the air moves it creates everything that makes up the weather

Wind

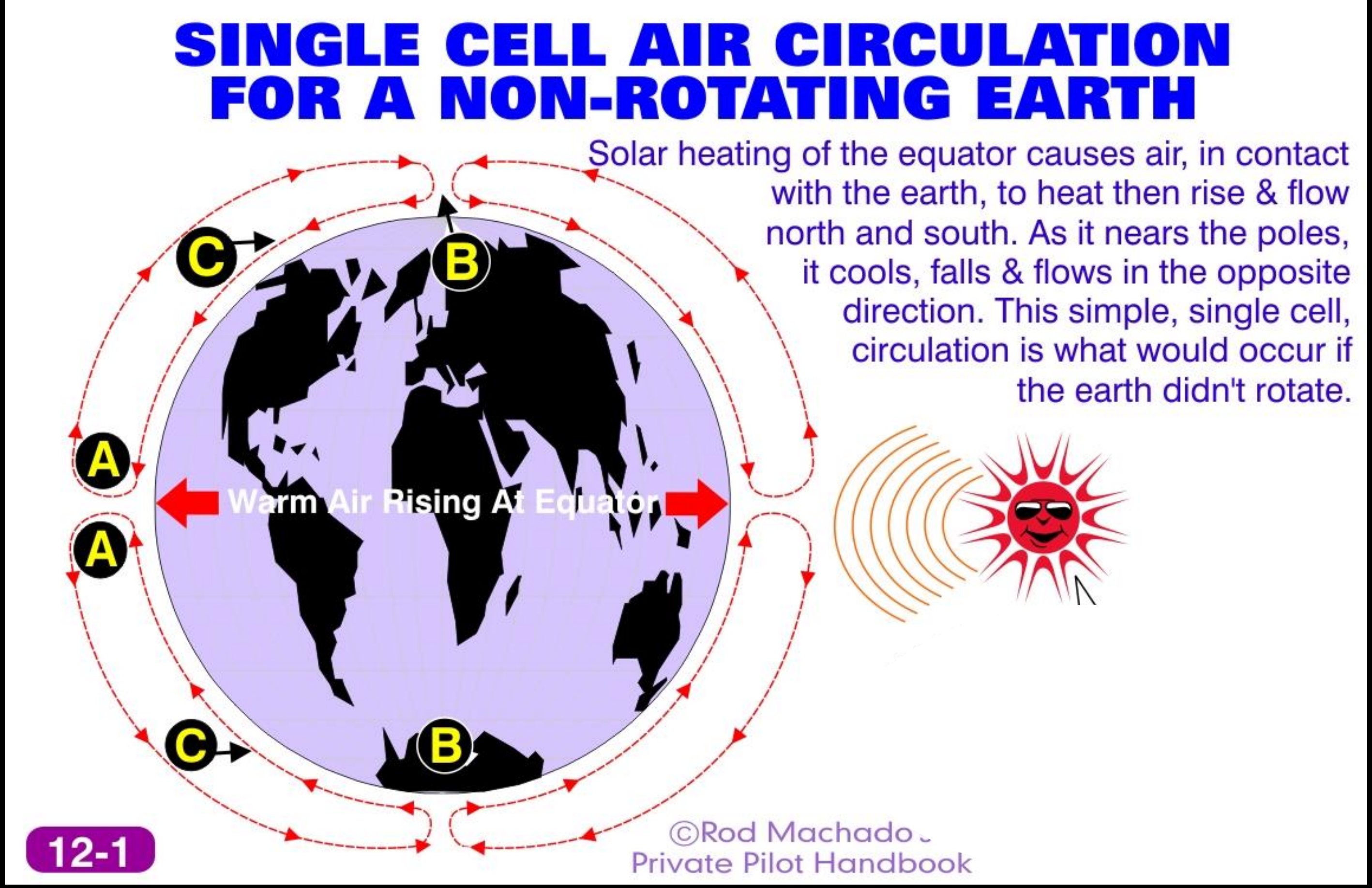
- Wind is the air in motion relative to the surface of the Earth
- We can measure its motion by the force that it applies on objects
- Winds cause the formation, dissipation, and redistribution of weather
- Winds also affect aircraft during all phases of flight

Wind Direction

- Wind is named according to the direction <u>from</u> which it is blowing
- For example, a west wind indicates the wind is blowing from the west to the east
- In aviation, 36 points of the compass are normally used to represent the direction from which the wind is blowing
- For example, north winds come from 360°, east from 90°, south from 180°, and west from 270°

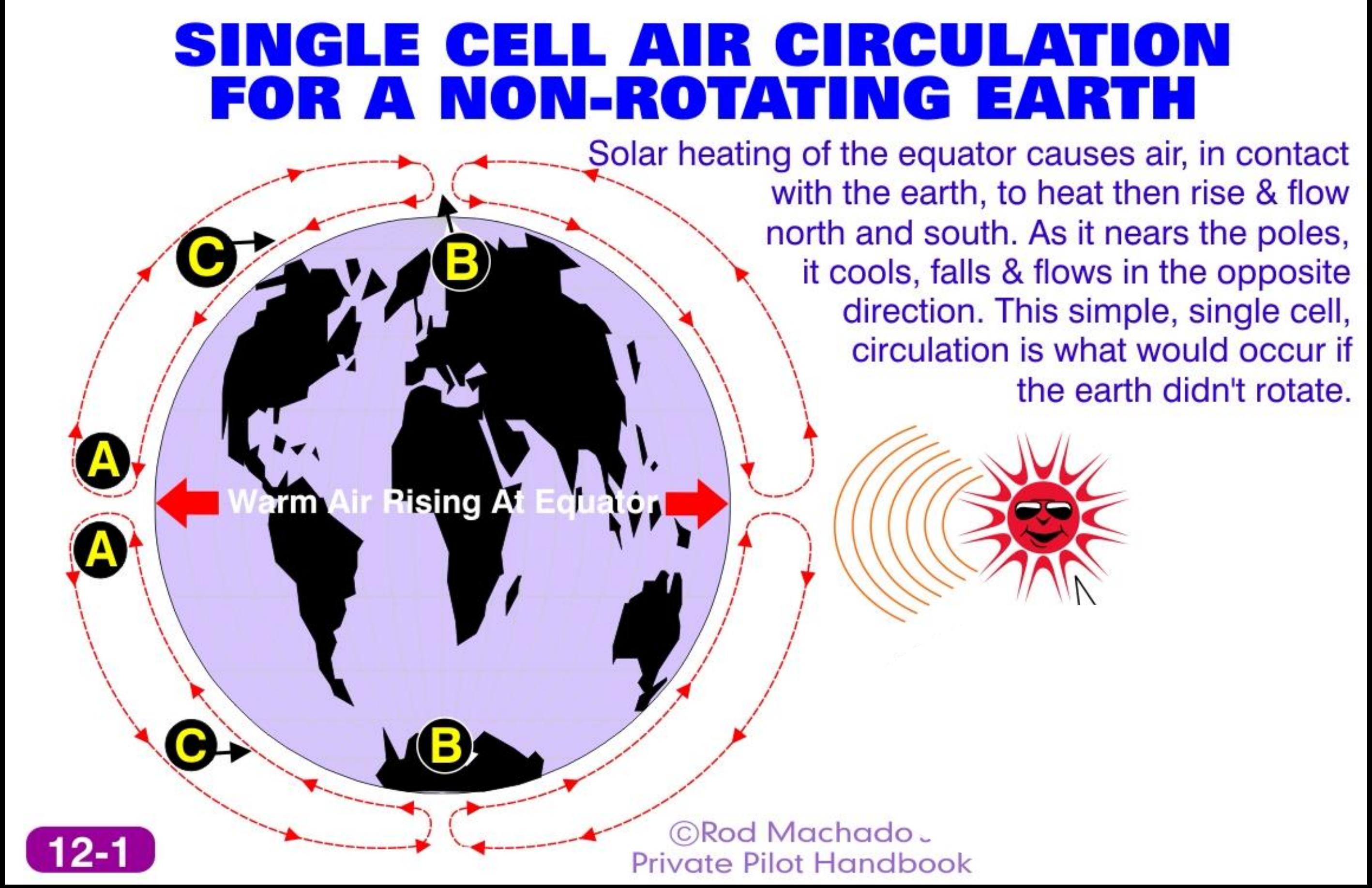
Single Cell Model

- Assume the earth doesn't rotate
- Equator receives much more solar heat than the area near the poles
- Equatorial air, resting over a warmer surface, is heated from below
- The air becomes less dense and rises



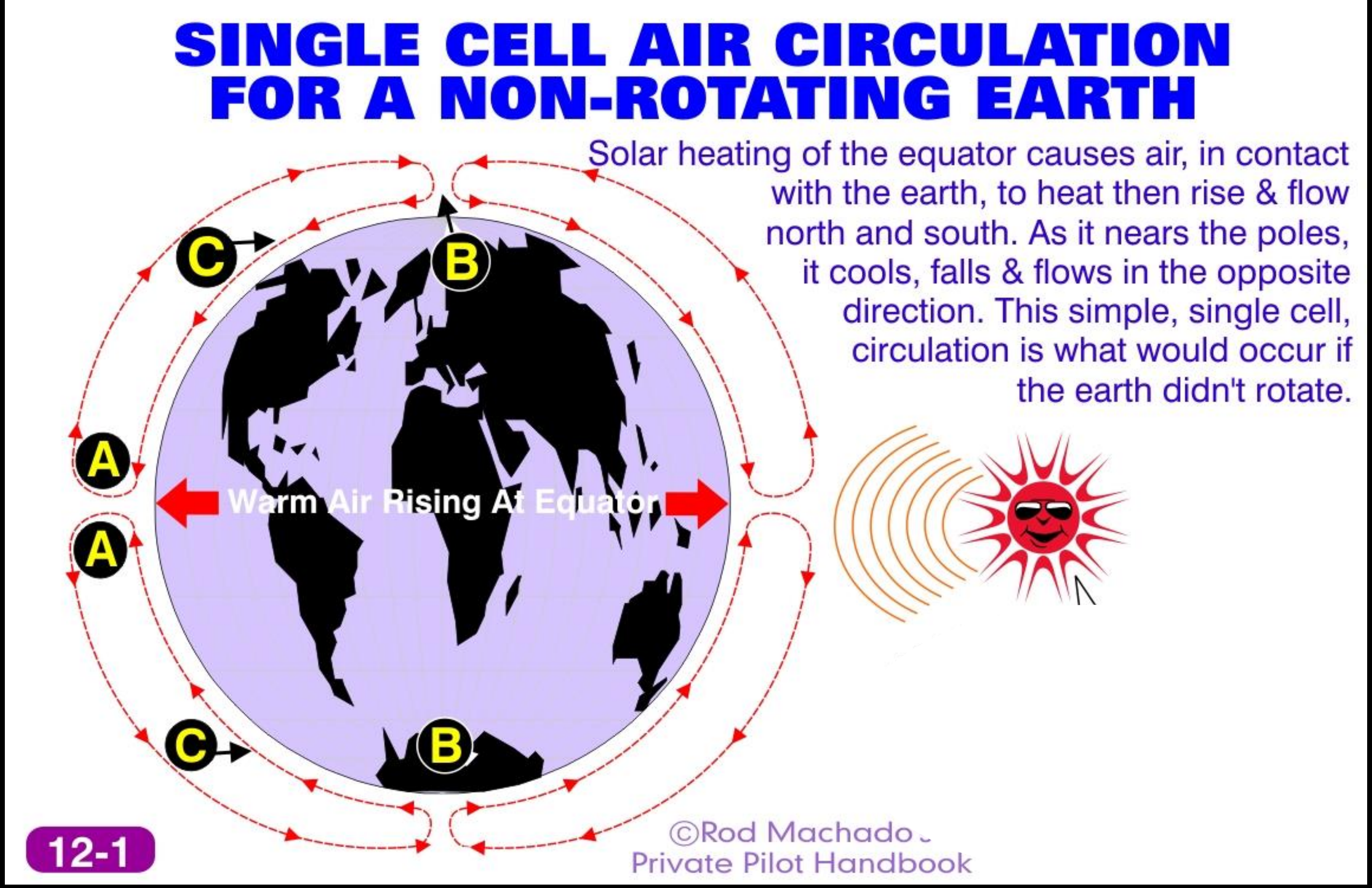
Single Cell Model

- Temperature decreases with altitude up to the tropopause
- The equatorial (heated) air rises until it finds air of a similar temperature near the tropopause
- Once it’s at equilibrium with the air around it, the air stops rising, but it won’t stop moving



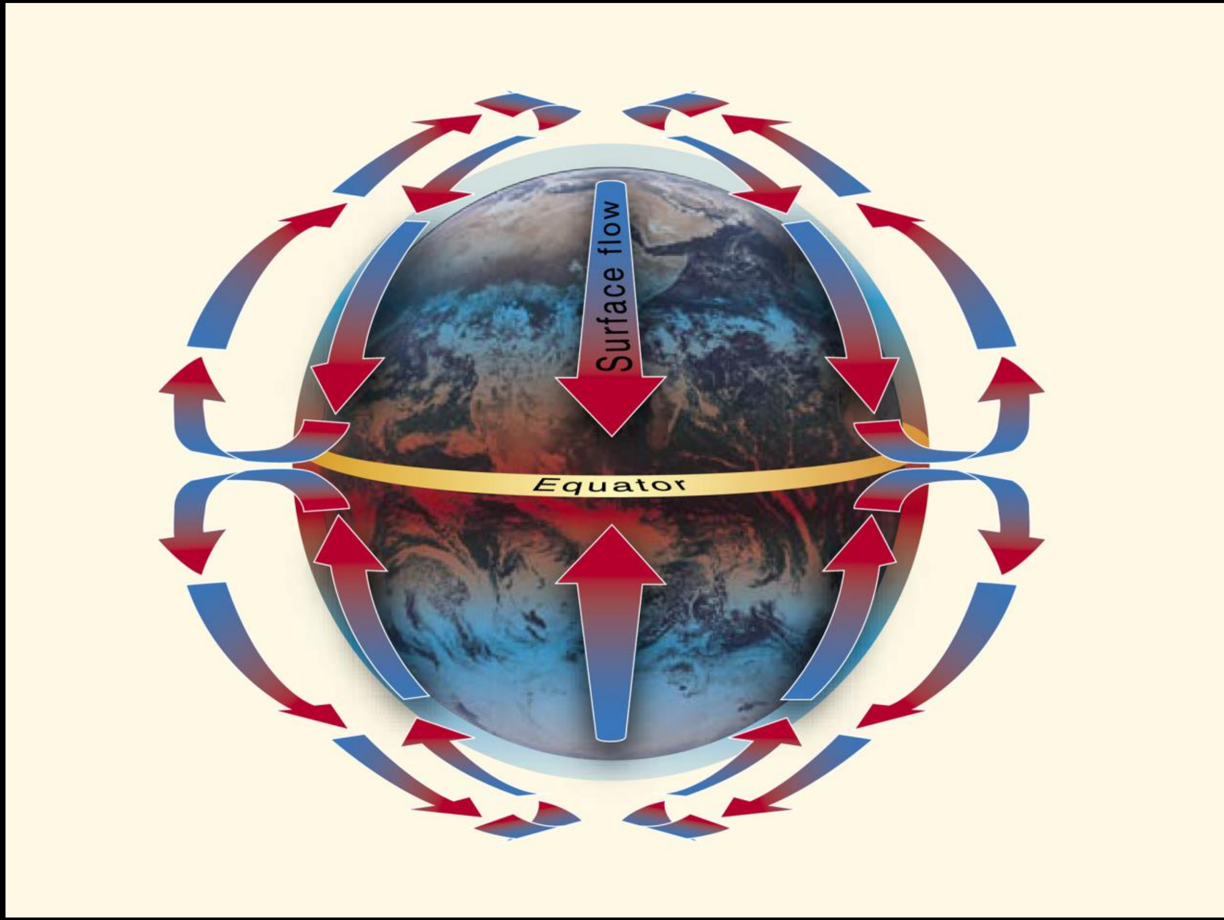
Single Cell Model

- Unable to ascend further, the air flows north and south toward the poles, where it eventually cools and descends
- Cycle is complete when cold, descending polar air moves toward the equator replacing the rising equatorial air
- This single-cell circulation would be the way things were if the earth didn't rotate



Single Cell Model

- Another perspective …

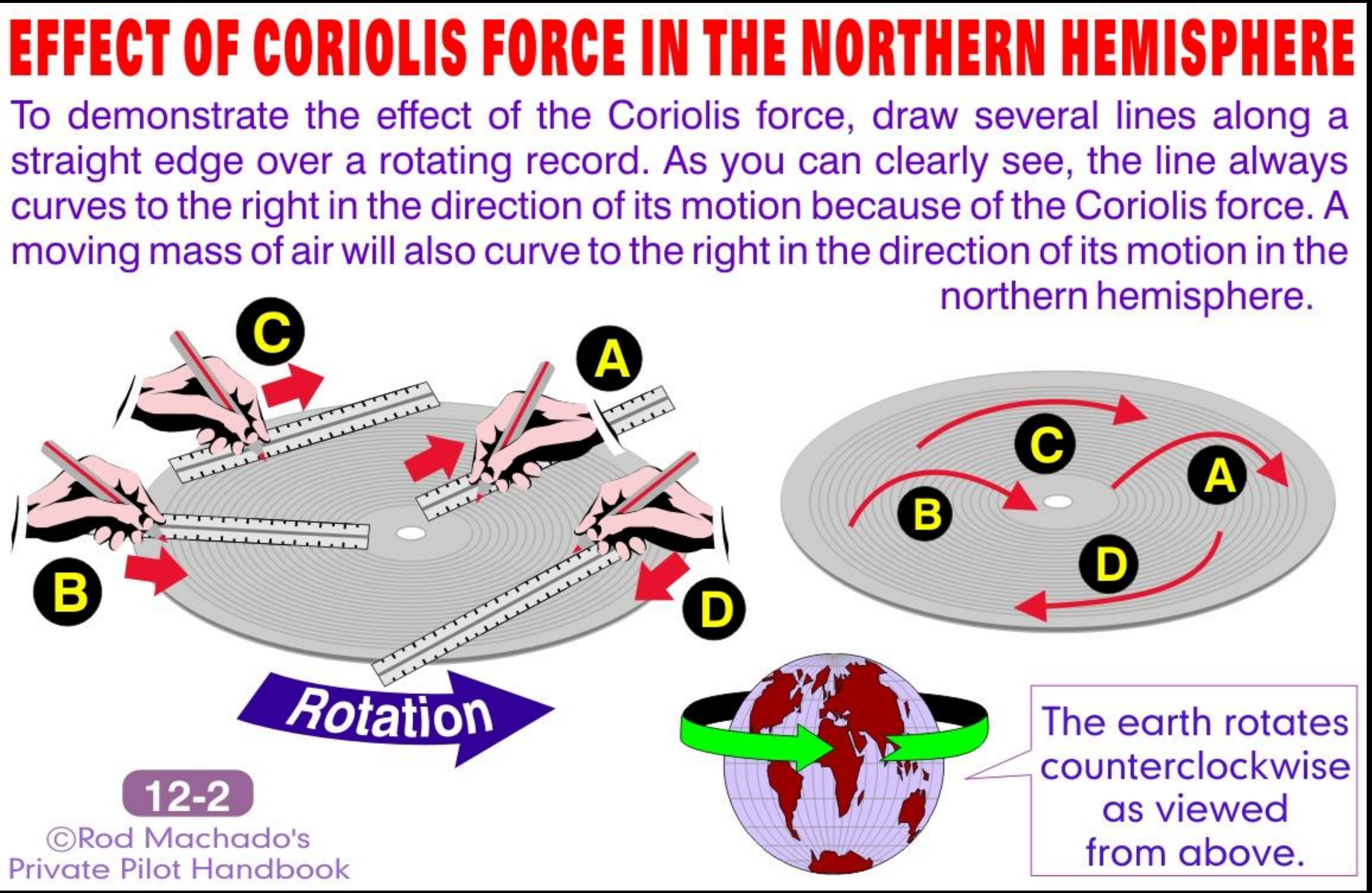


The Coriolis Force

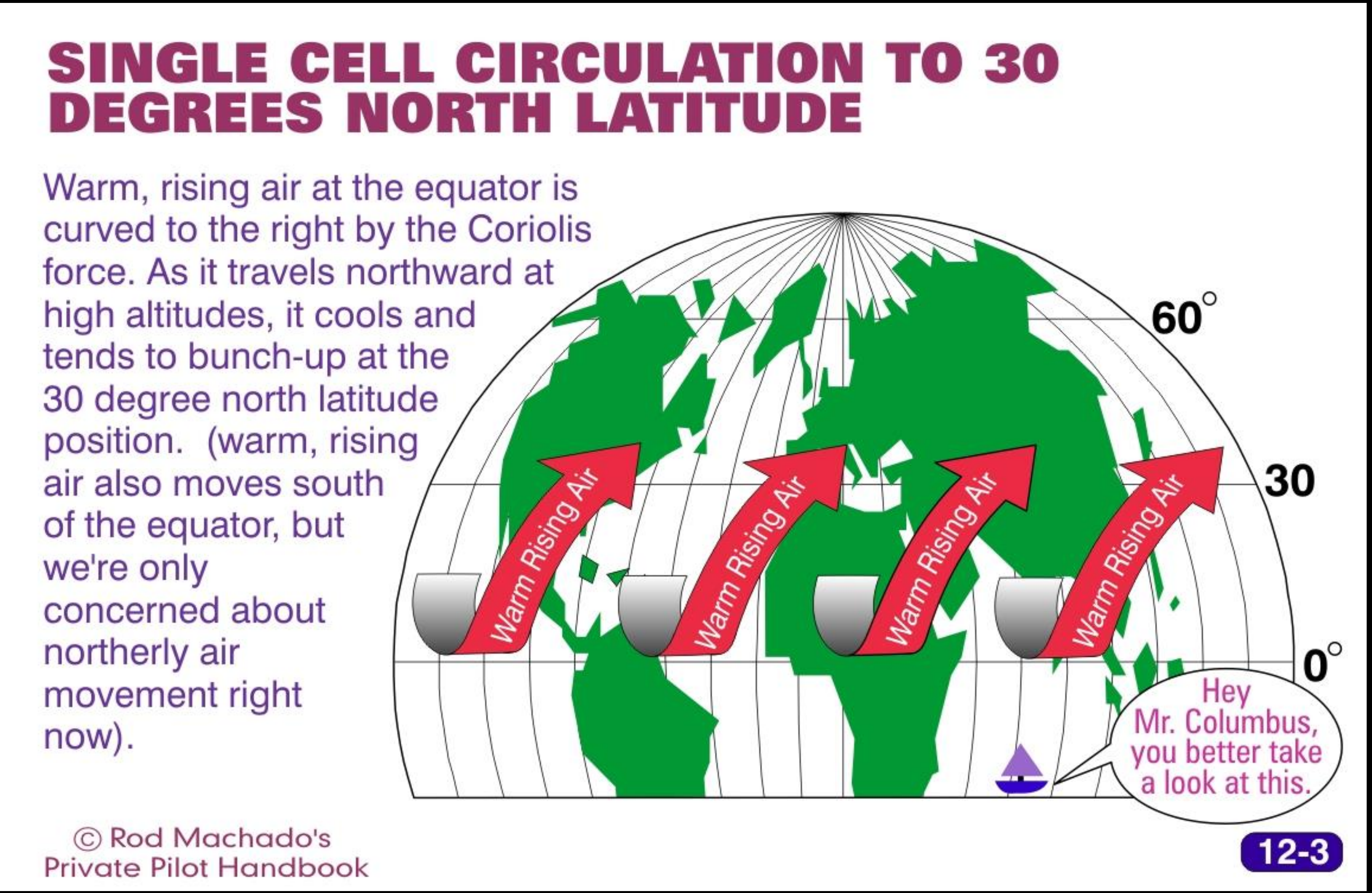
- When viewed from above the north pole, the counterclockwise rotation of the earth causes air to curve to its right in the northern hemisphere (left in the southern hemisphere)
- No matter which way the air moves, it will have a right curve added to its direction of motion
- Air is forced to curve by an apparent force called the Coriolis force
- The earth rotates under a moving parcel of air which gives the air the appearance of being deflected to the right in the direction it was moving

Coriolis Force

- Viewed from above, the earth has a CCW rotation
- Air curves to the right in Northern Hemisphere



Coriolis Force Single Cell



- Earth moves under a moving parcel of air, giving the air the appearance of the air deflecting to the right in the direction it was moving
- As the air rises, some of its heat is lost during the ascent

Multi-Cell Circulation

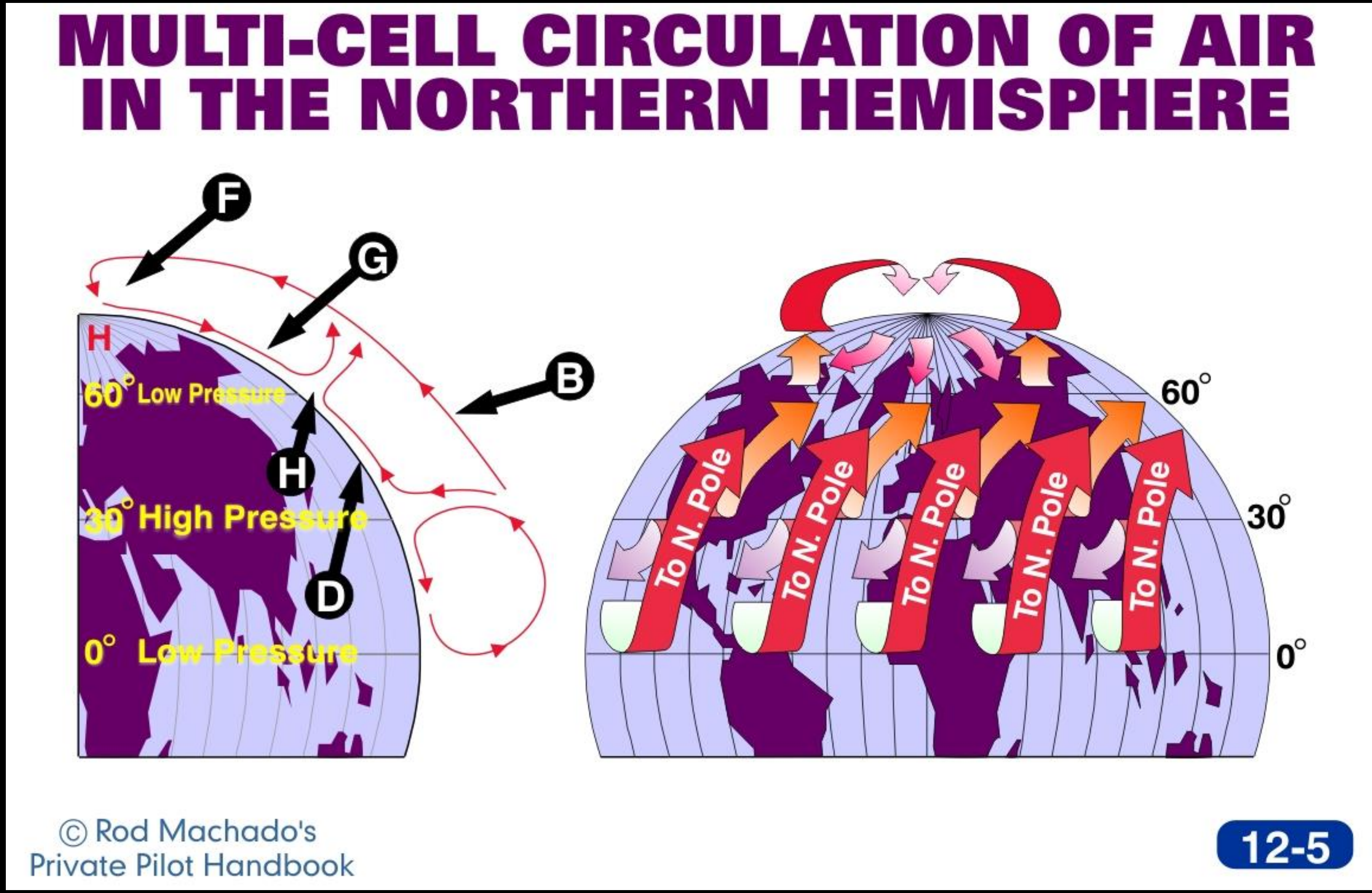
- Rising warmer air is curved to the right in an easterly direction

  The air starts to bunch up at about 30° north latitude

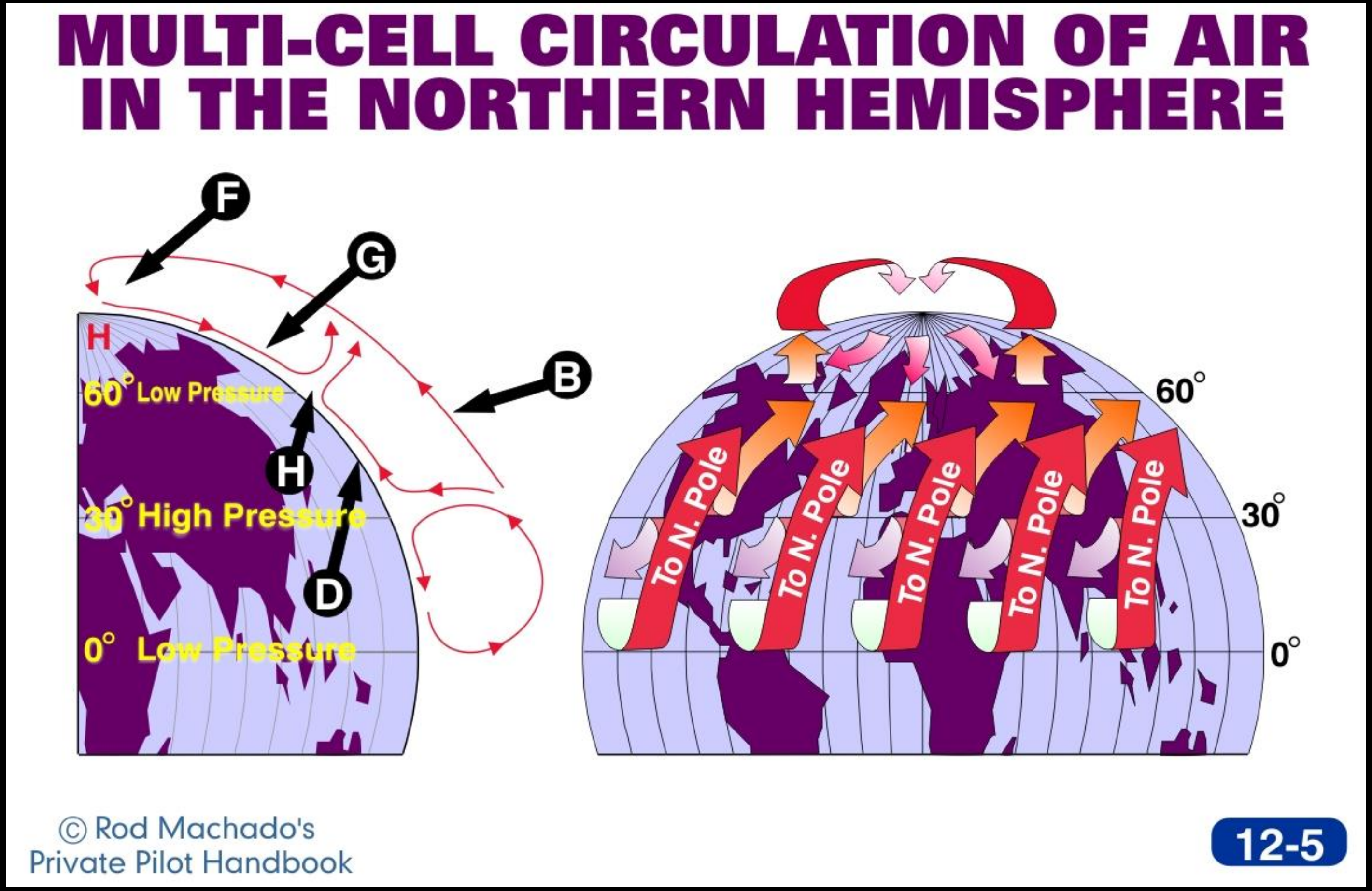
  As the air rises, some of its heat is lost through radiation during the ascent

  Both bunching up and cooling cause some (not all) of this air to descend slowly at the 30° north latitude location

  Bunching up increases the air mass above and causes a higher surface pressure at the 30° latitude position



Multi-Cell Circulation

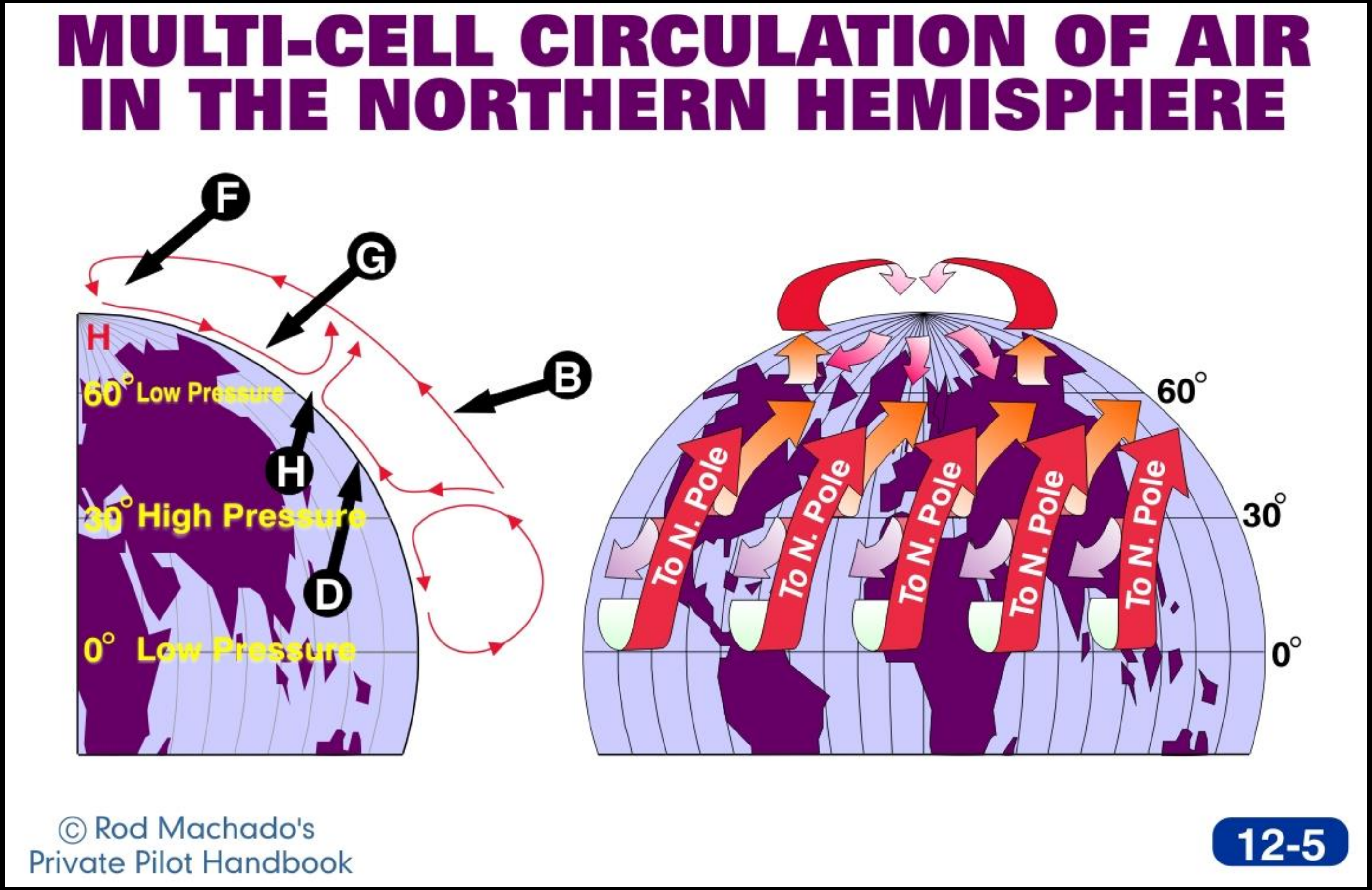


- As the air descends toward the surface, it warms, causing clear skies and warm surface temperatures

  Some of this high-pressure air flows southward toward lower pressure at the equator

  The rest of this warm low altitude air moves northward

Multi-Cell Circulation

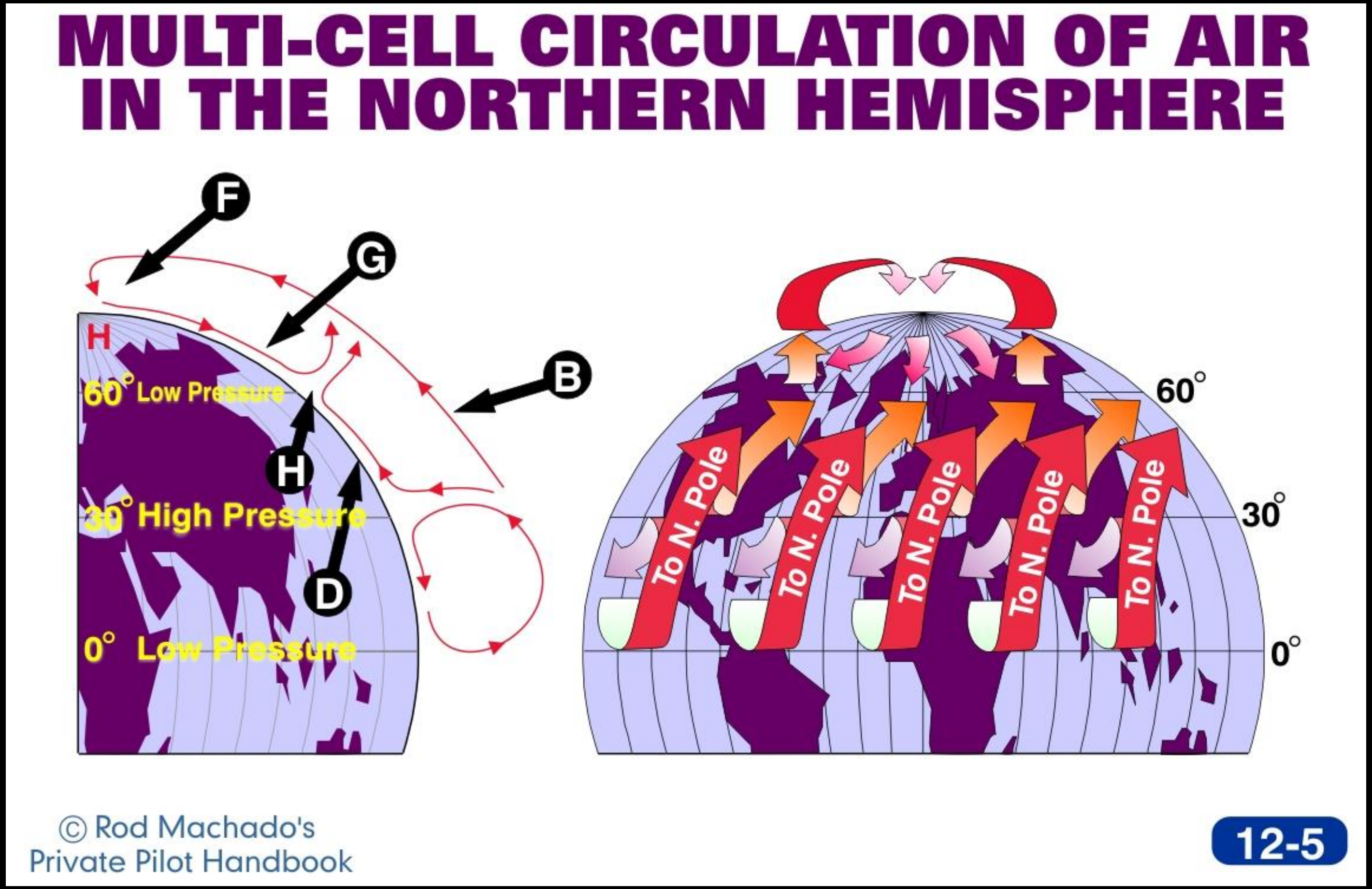


- Some of the high-altitude air that didn't descend at 30° latitude continues to move northward toward the pole

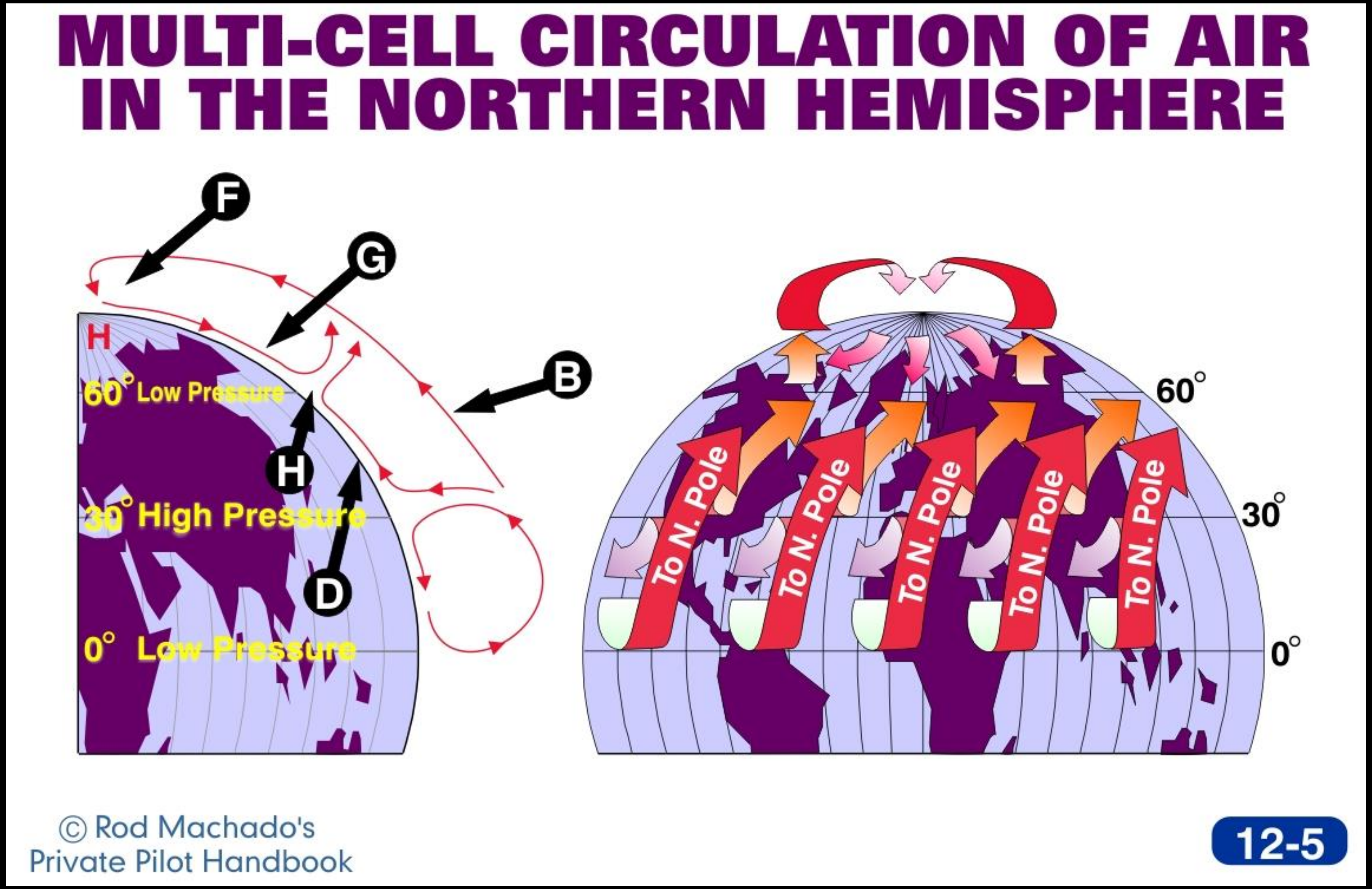
  As it continues to cool, it falls and travels southward from the North Pole

Multi-Cell Circulation

- At 60° north latitude (G), southward moving colder air meets the northward moving warmer air (D)
- These two air masses have different temperatures, and thus different densities
- Things with different densities tend not to mix



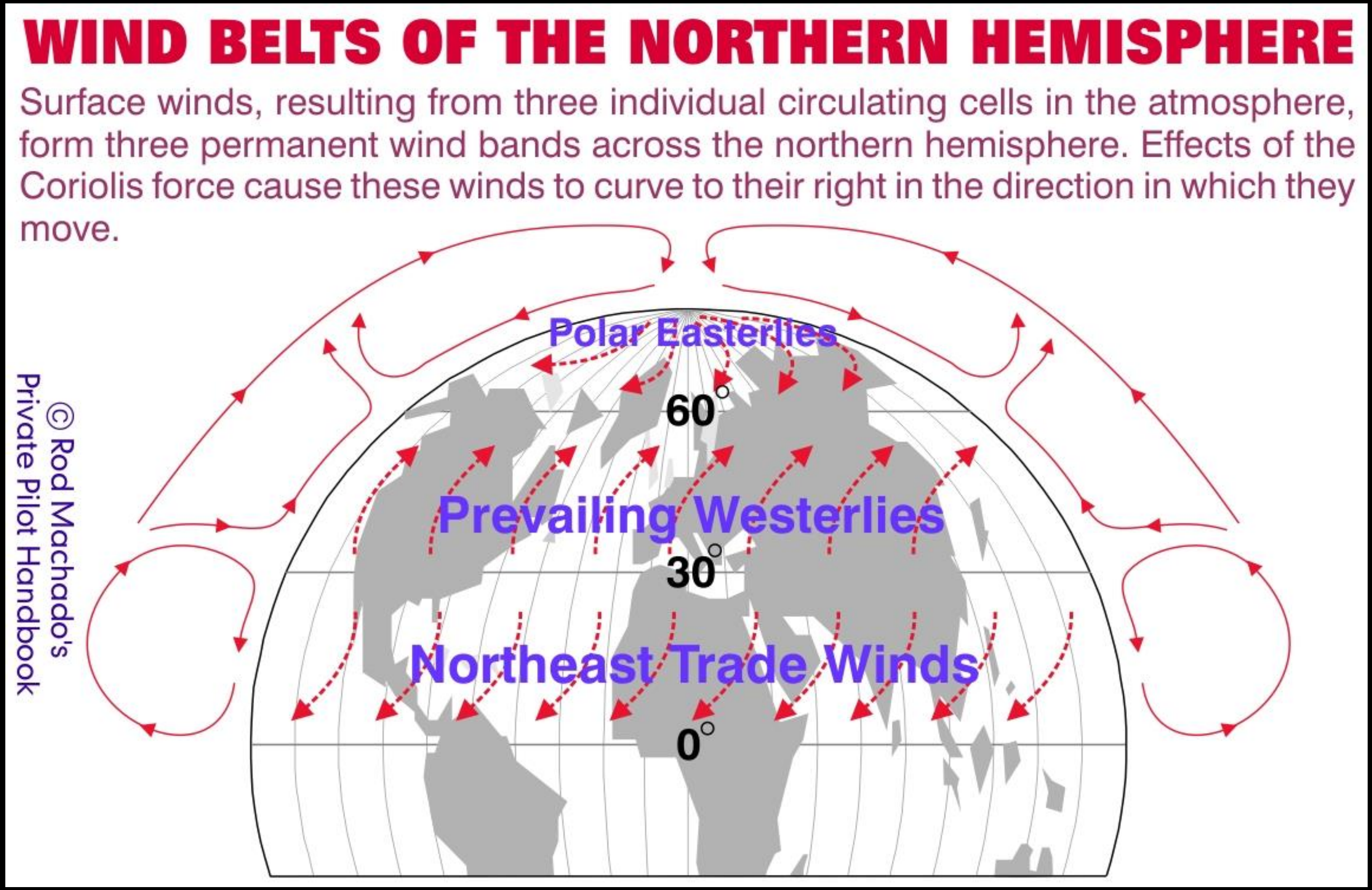
Multi-Cell Circulation



- When very cold polar air bumps into cool tropical air, the result is a transition zone (H)
- This zone is the polar front (a zone where air masses with different densities meet)
- Some of the northward-moving, cool air flows upward over the colder (denser) polar air (H)
- This ascending air is carried northward, toward the pole, with the rest of the high altitude winds

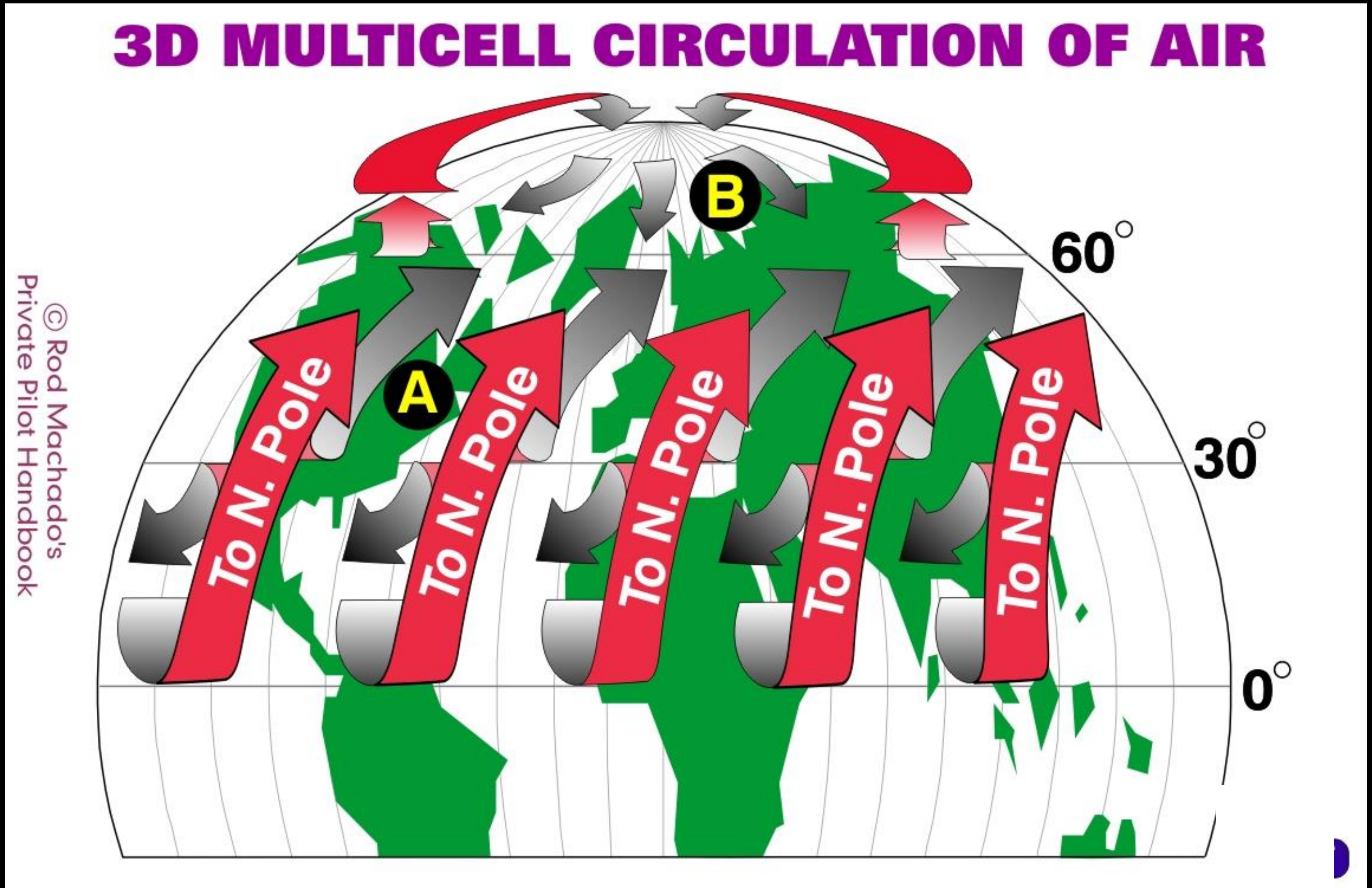
Wind Belts

- Three permanent wind bands across northern hemisphere
- 0° to 30° LAT: Northeast Tradewinds
- 30° to 60° LAT: Prevailing Westerlies
- 60° to 90° LAT: Polar Easterlies



Three Wind Belts

- Warmer, northward moving air from 30° latitude (A) confronts colder, southward moving air from the north polar region (B)
- This confrontation is the source of much of the nasty weather we experience in the US

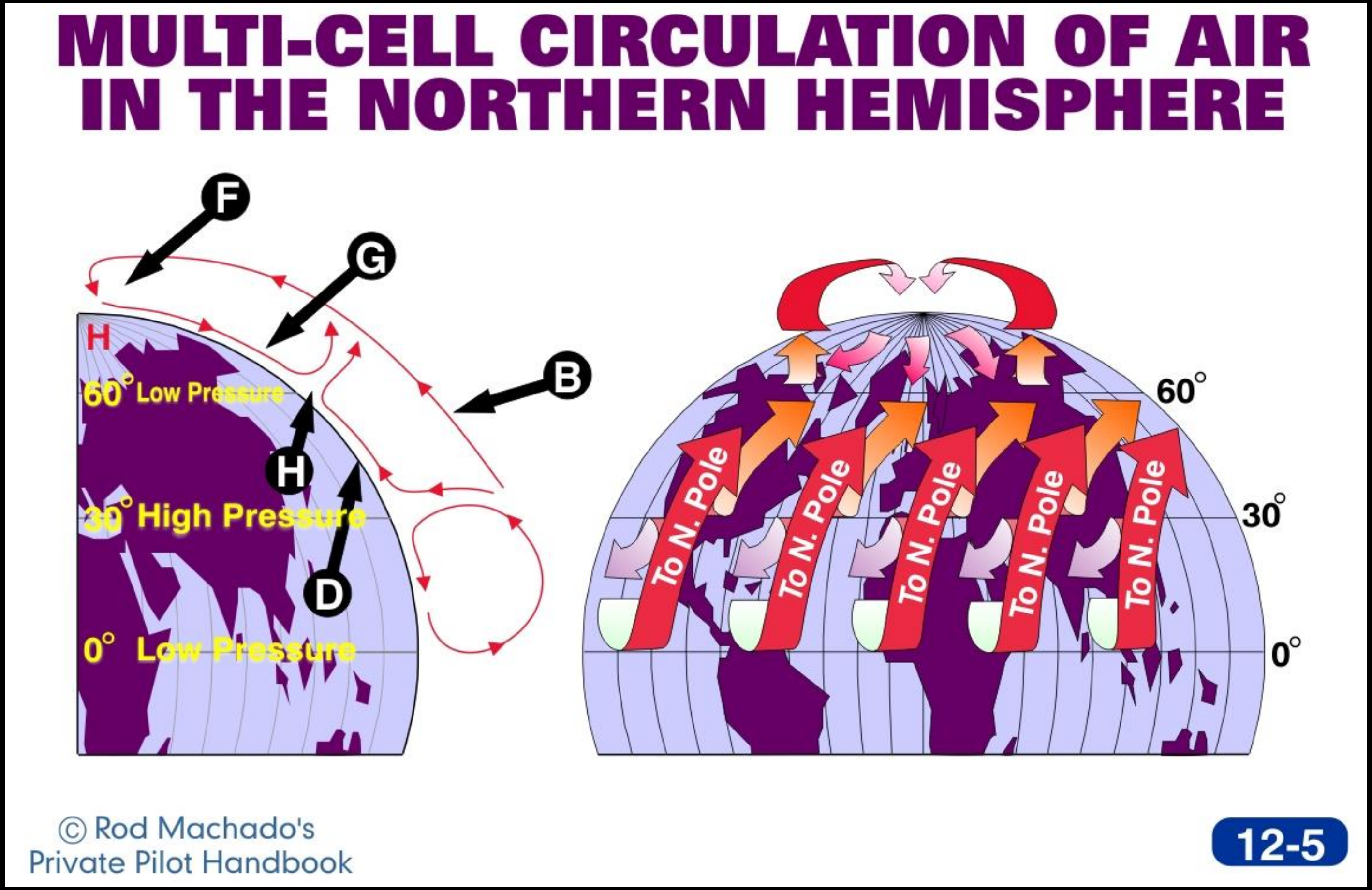


Air Pressure and Vertical Air Movement

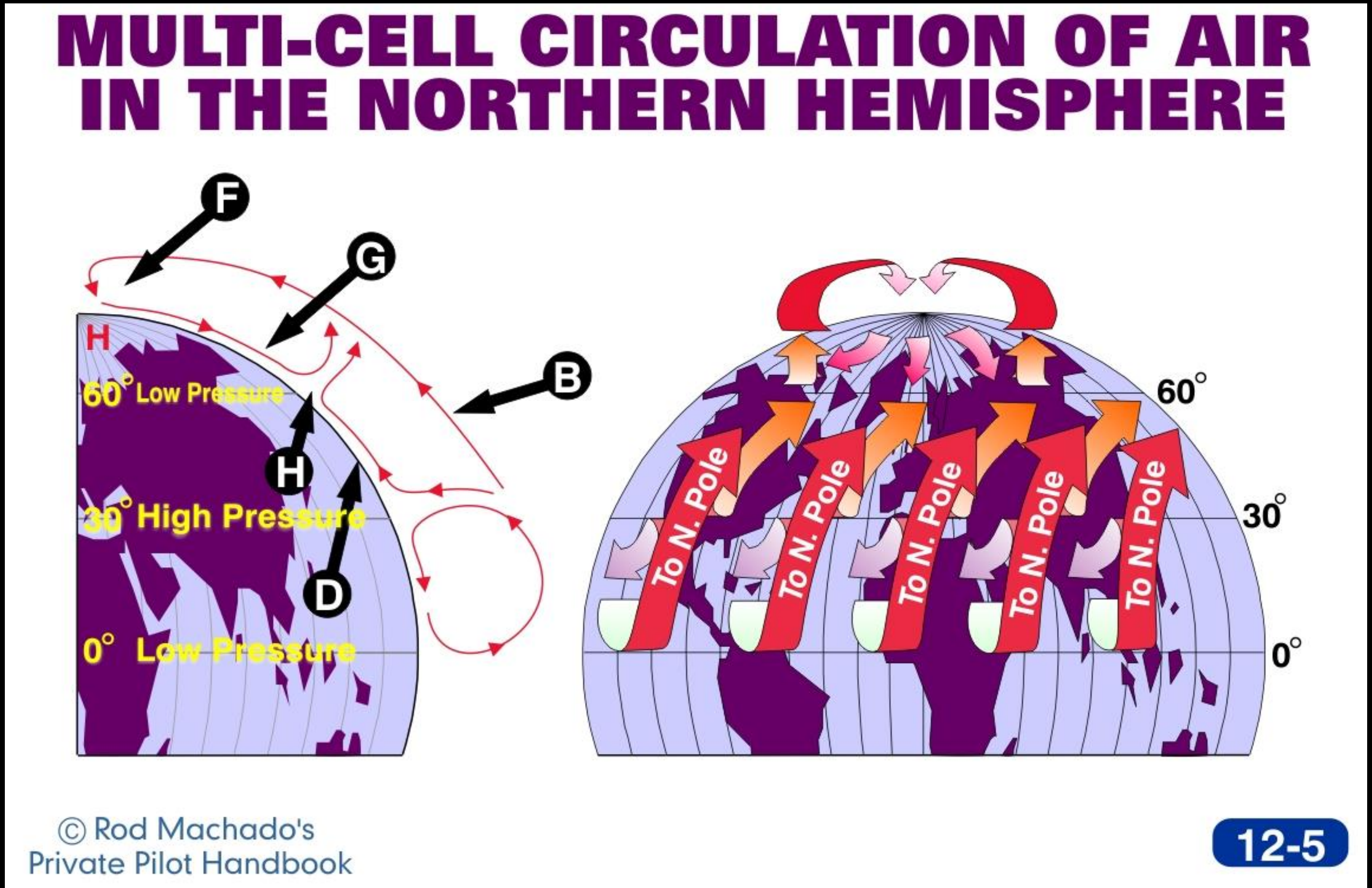
- Air has weight which exerts a pressure on the earth’s surface
- Changing the air’s temperature changes its density and the pressure it exerts on the earth’s surface

Low Pressure Bands

- Warmer (less dense) rising air provides less push or pressure on the surface
- Large areas of warm rising air are low pressure centers
- Near the equator are permanent belts of low pressure air wrapped around the earth



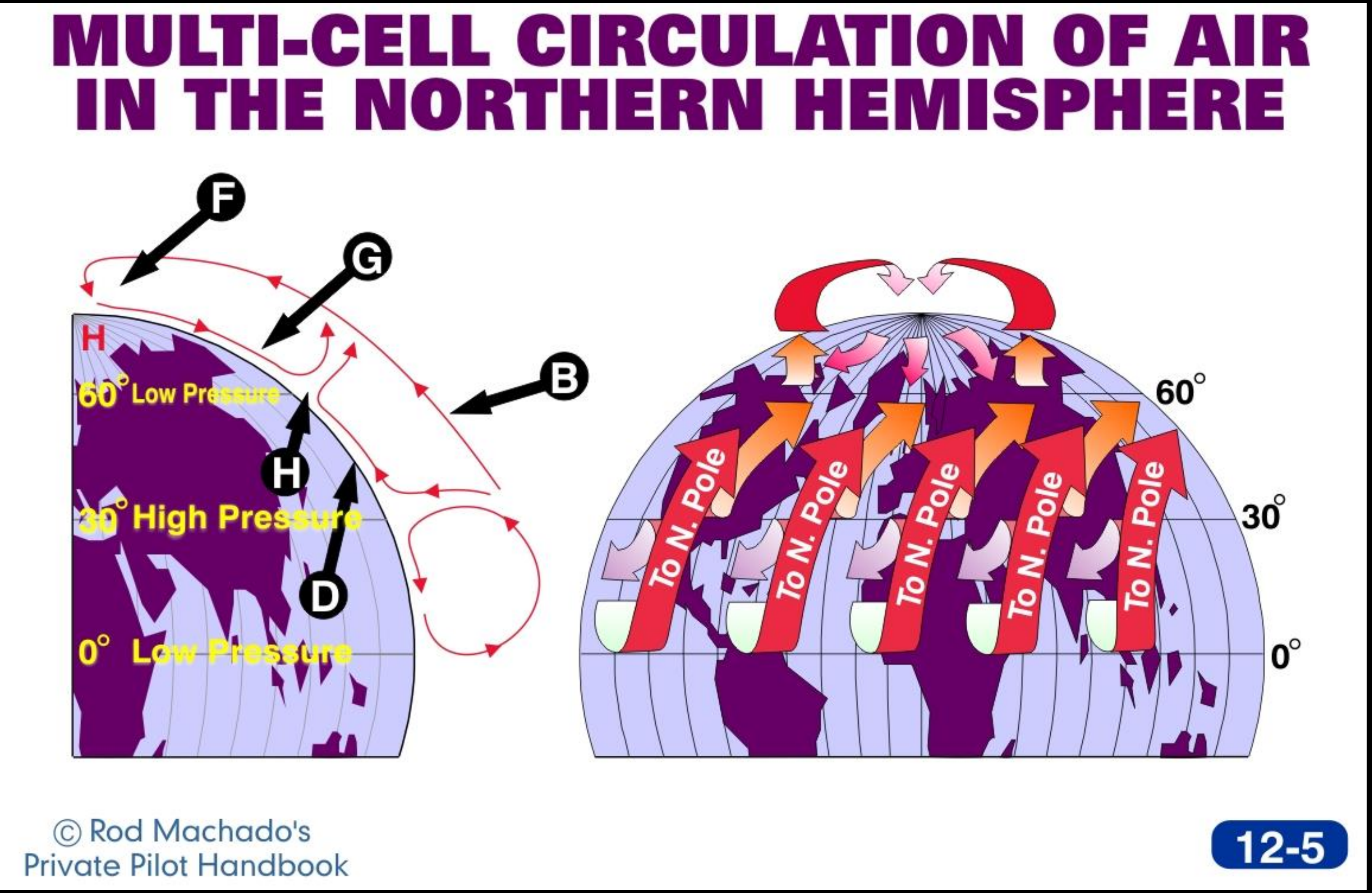
Low Pressure Bands



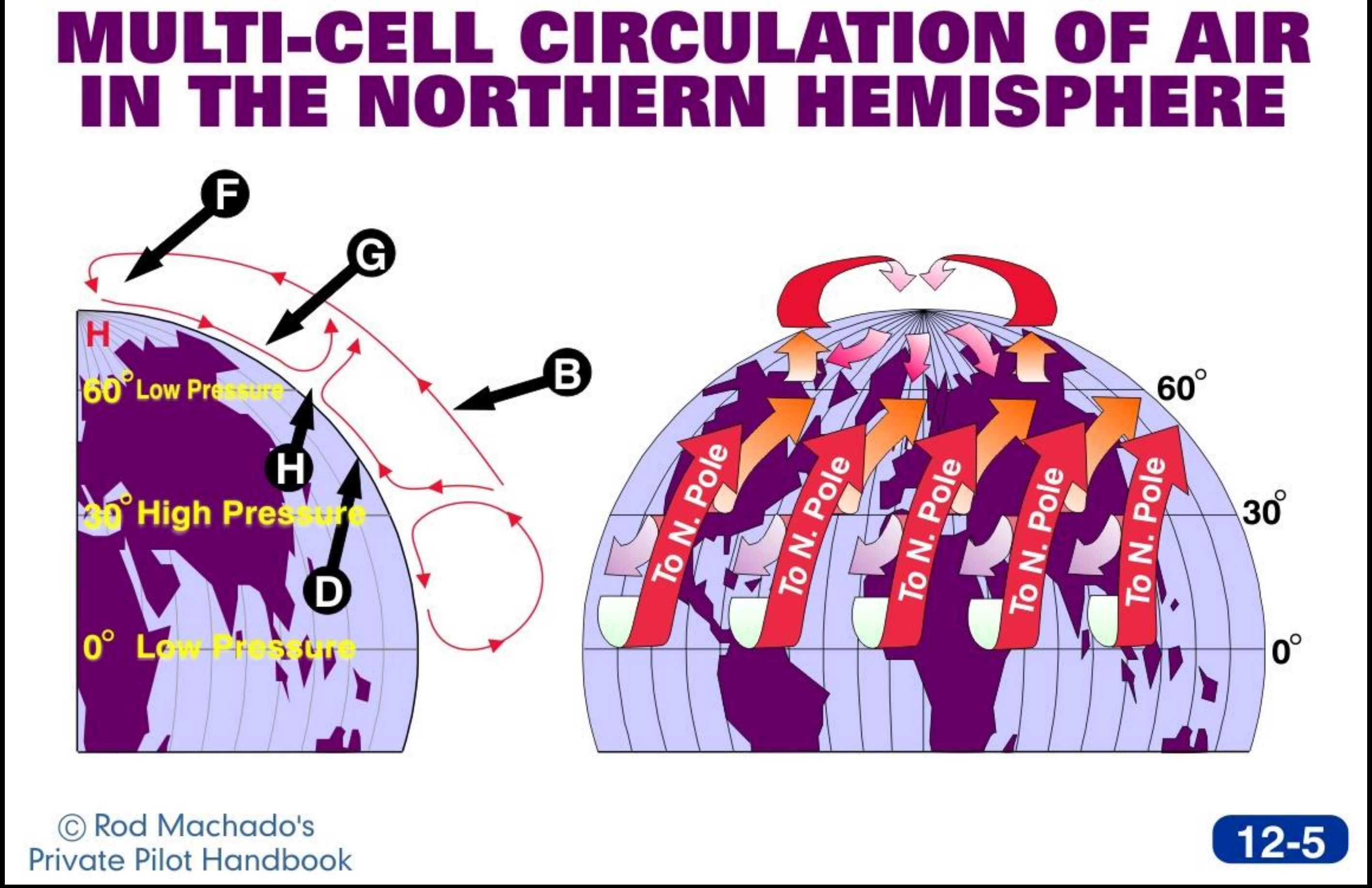
- Low pressure bands are found at the Equator and 60° N/S latitude
- Rainy and stormy weather is associated with low pressure
- The higher latitudes, especially near the west coast of continents, tend to have more precipitation due to more storms moving around the Earth at these latitudes

High Pressure Bands

- Permanent high pressure areas exists at the poles
- Colder (more dense) air descends, creating more pressure on the earth's surface



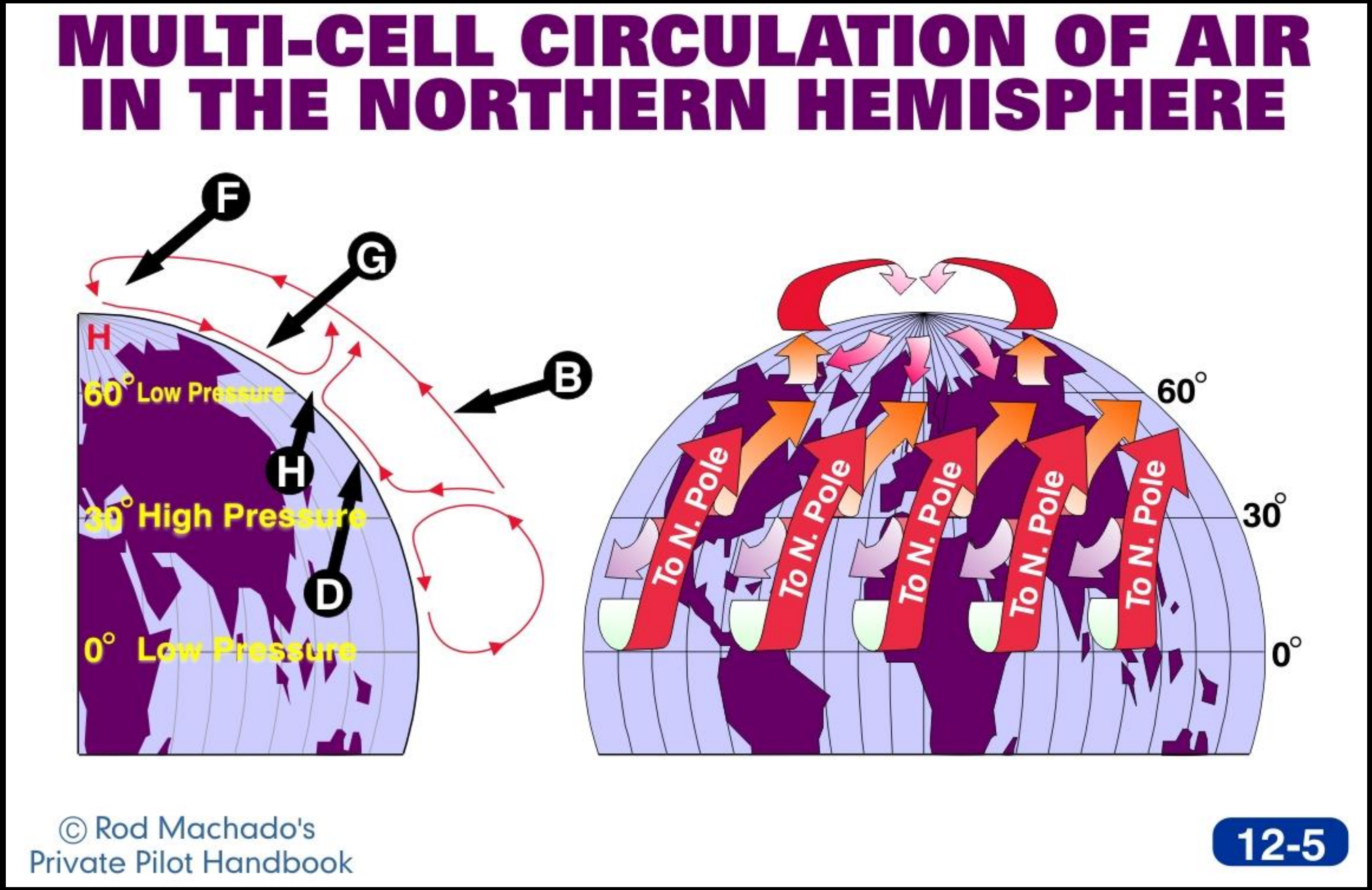
High Pressure Bands



- Between each of these circulation cells are bands of high and low pressure at the surface
- The high-pressure band is located about 30° N/S latitude and at each pole
- Fair and dry/hot weather is associated with high pressure
- Consider deserts located along the 30° N/S latitude around the world compared to the region between 50°-60° N/S latitude

Air Circulation

- Pressure at the surface decreases as warm air rises
- As warm air rises, cold air moves in underneath to replace it
- Atmospheric circulation consists of high pressure air moving toward lower pressure air (wind)



Water Vapor

- Water vapor is the gaseous form of water and one of the most important of all constituents of the atmosphere
- It constitutes only a small percentage of the Earth’s atmosphere, varying from only trace amounts to 4 percent by volume, and its amount varies widely in space and time
- Approximately half of the atmospheric water vapor is found below 6,500 feet altitude
- Only a minute fraction of the total occurs *above* the tropopause.

Atmospheric Stability

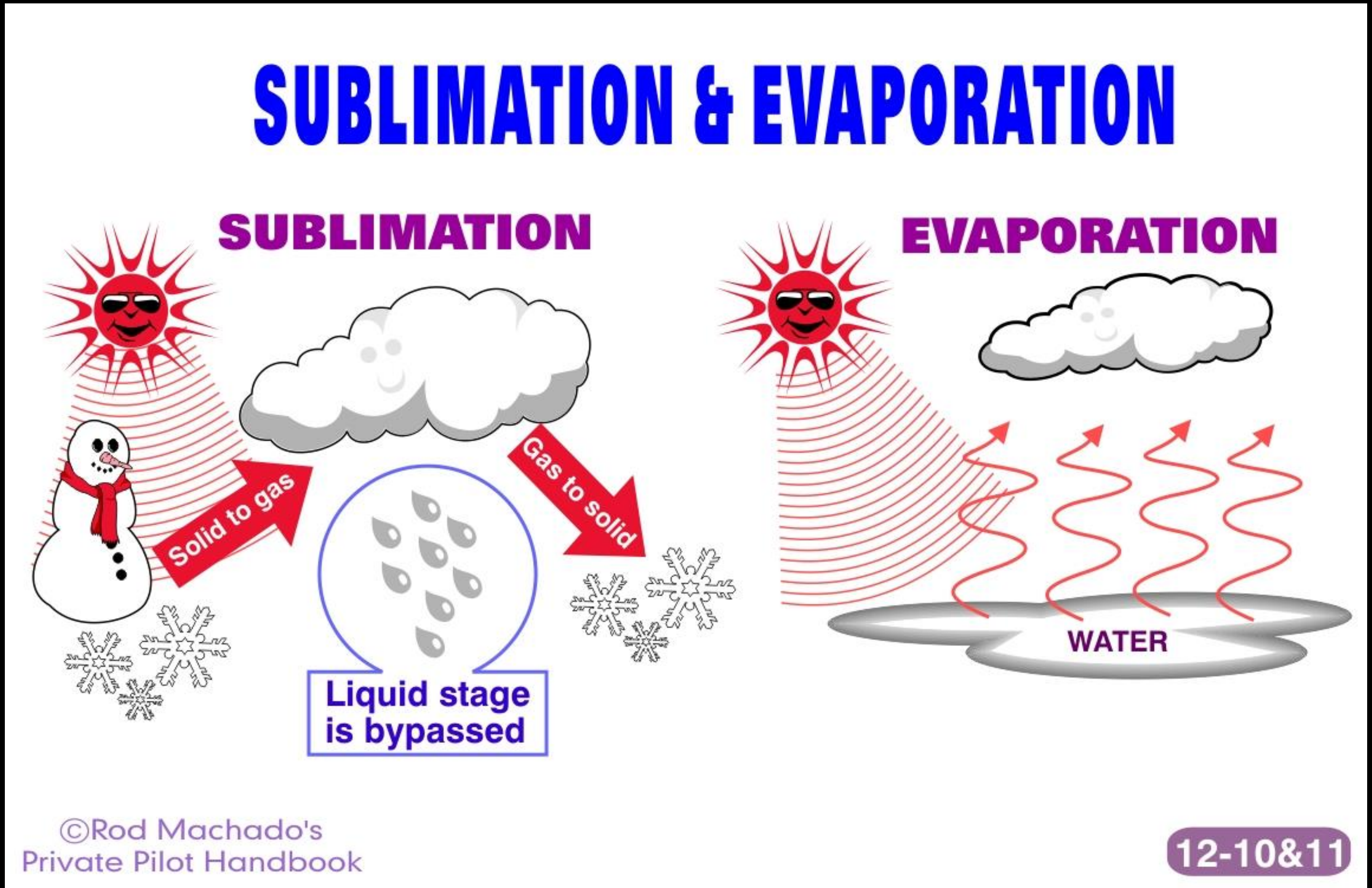
Weather Theory

Water Vapor

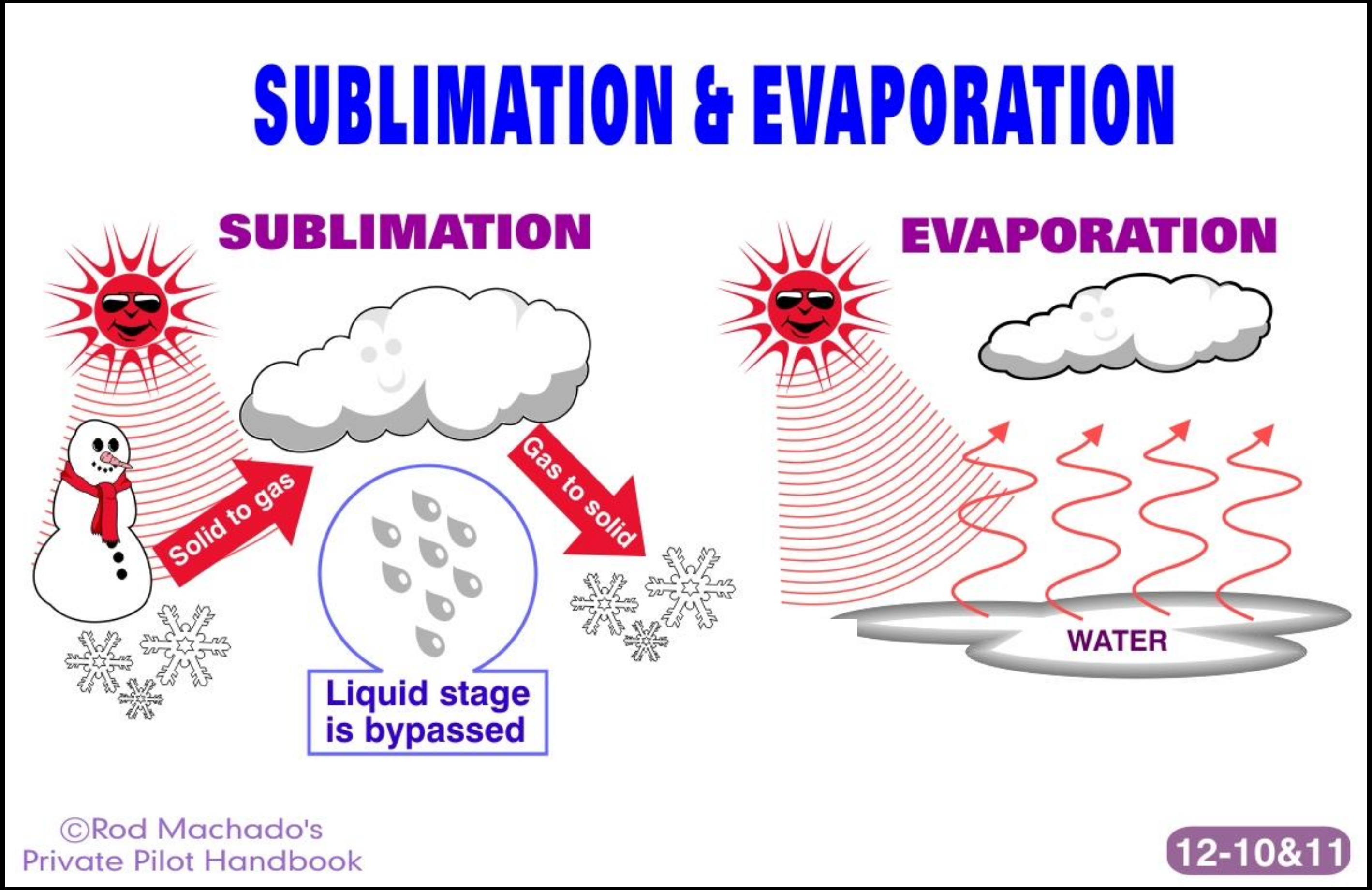
- Weather (clouds, rain, thunderstorms, etc.) wouldn't exist if there wasn't water vapor in the air
- Water is added to the air through one of two different processes: evaporation or sublimation
- Either of these processes cause water molecules to absorb heat energy and enter the atmosphere as vapor
- Water exists in three states: solid (ice), liquid, and gas (water vapor)

Sublimation

- Changes from ice to water vapor while bypassing the liquid state
- Snow or ice can sublimate directly from a solid to the gaseous state
- This increases the water vapor content of the atmosphere



Evaporation



- More common means of adding water to the atmosphere
- As water molecules absorb heat energy, they eventually enter the air
- More heat means more evaporation
- Given enough heat and a large enough water supply, the atmosphere can fill with water vapor

Saturation

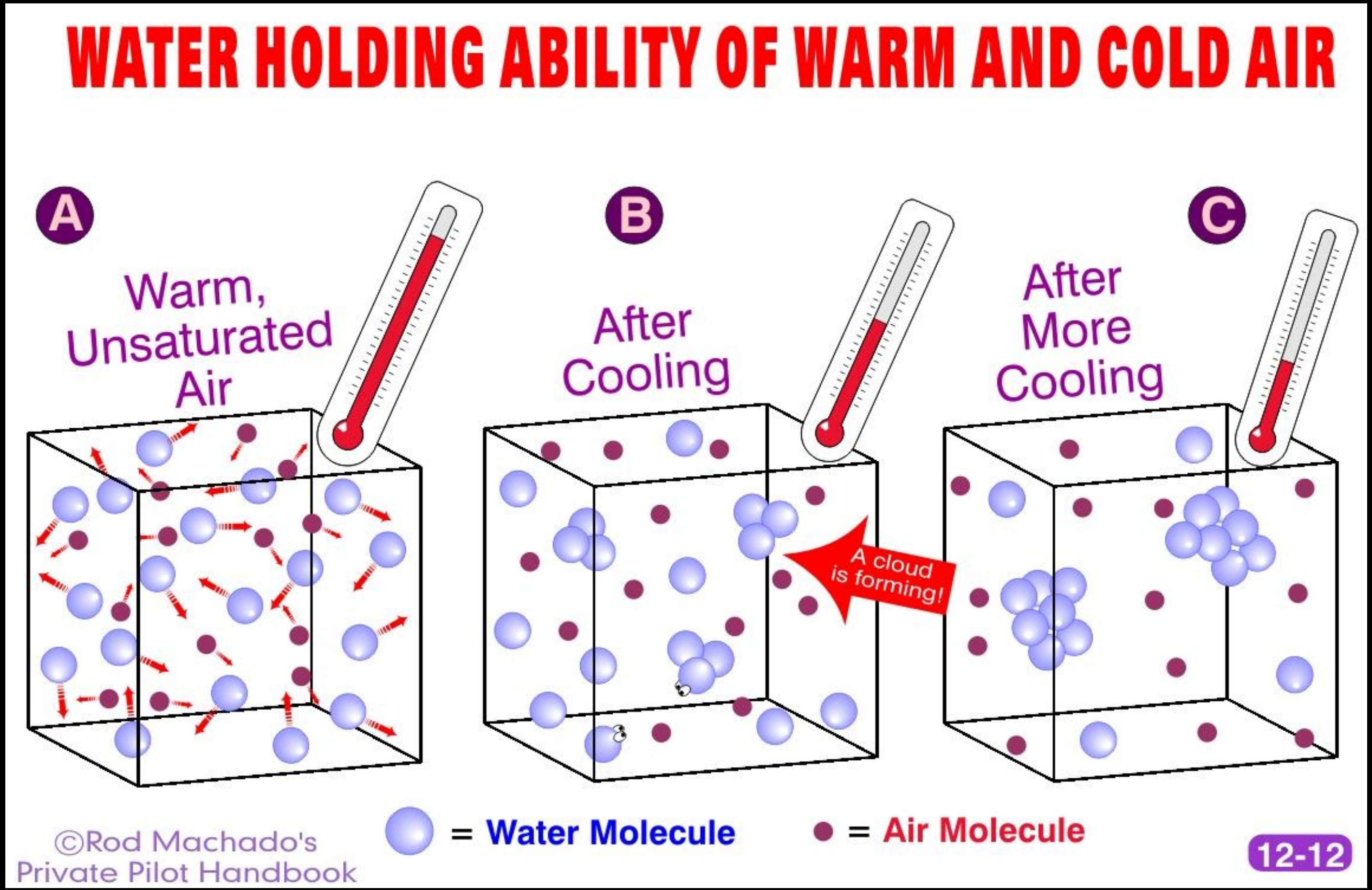
- Saturation is the maximum possible quantity of water vapor that an air parcel can hold at any given temperature and pressure
- The term saturated air means an air parcel has all the water vapor it can hold, while unsaturated air means an air parcel can hold more water vapor

Water Vapor

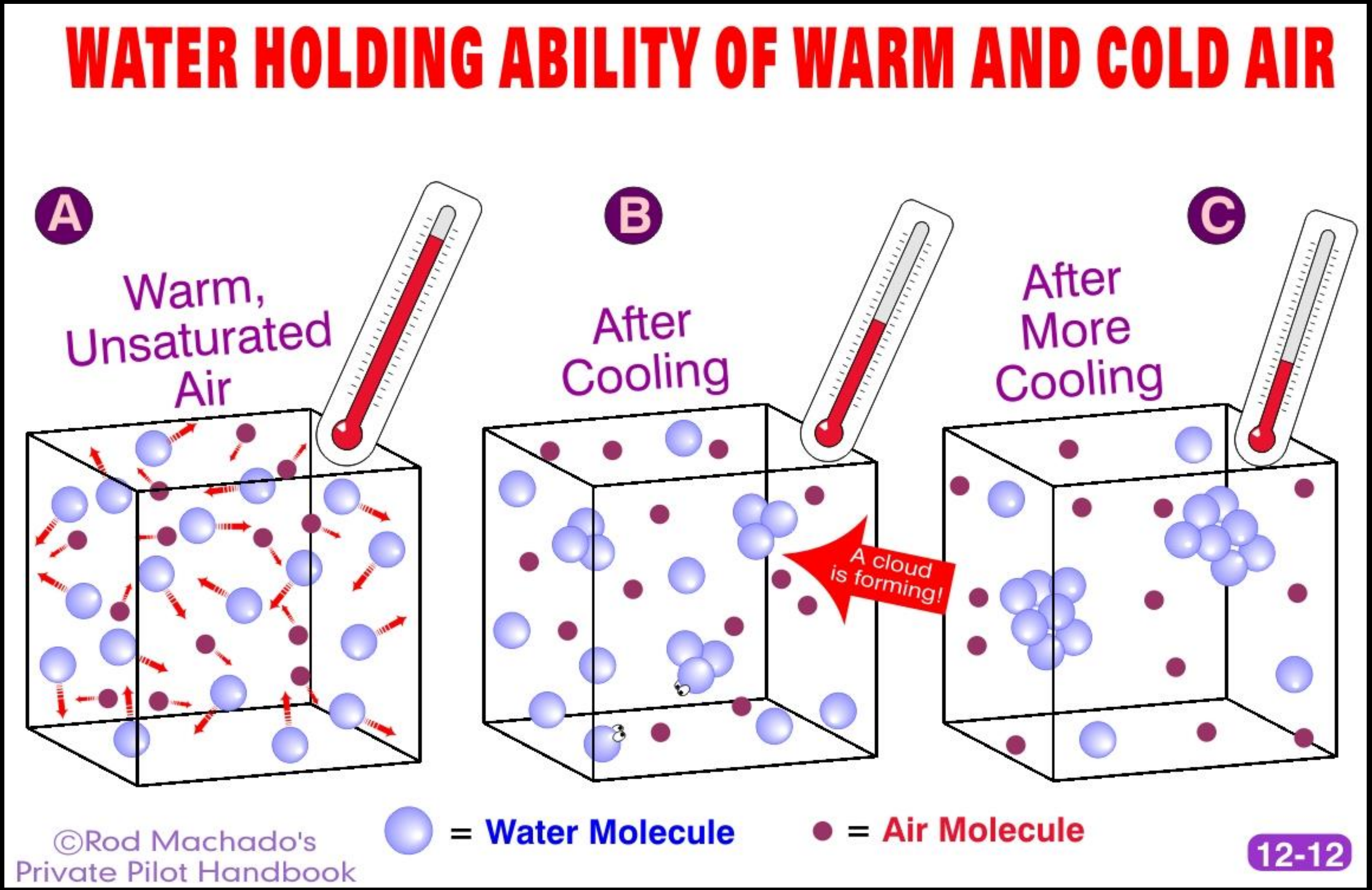
- As water molecules absorb heat energy, they eventually become vapor
- More heat results in more evaporation
- For a given temperature the air can only hold a certain amount of water
- Warmer air can hold a lot of water vapor; Cold air holds less water vapor for a given volume of air
- The air is saturated when additional water vapor is unable to enter the air at a given temperature

Water Content of Air

- Warm air has the capacity to hold more water than colder air
- Heating the air causes both air and water molecules to vibrate faster
- Water molecules that bounce off each other with sufficient impact are less likely to stick together
- More water molecules can be added into warmer air without them clinging to each other and forming clouds



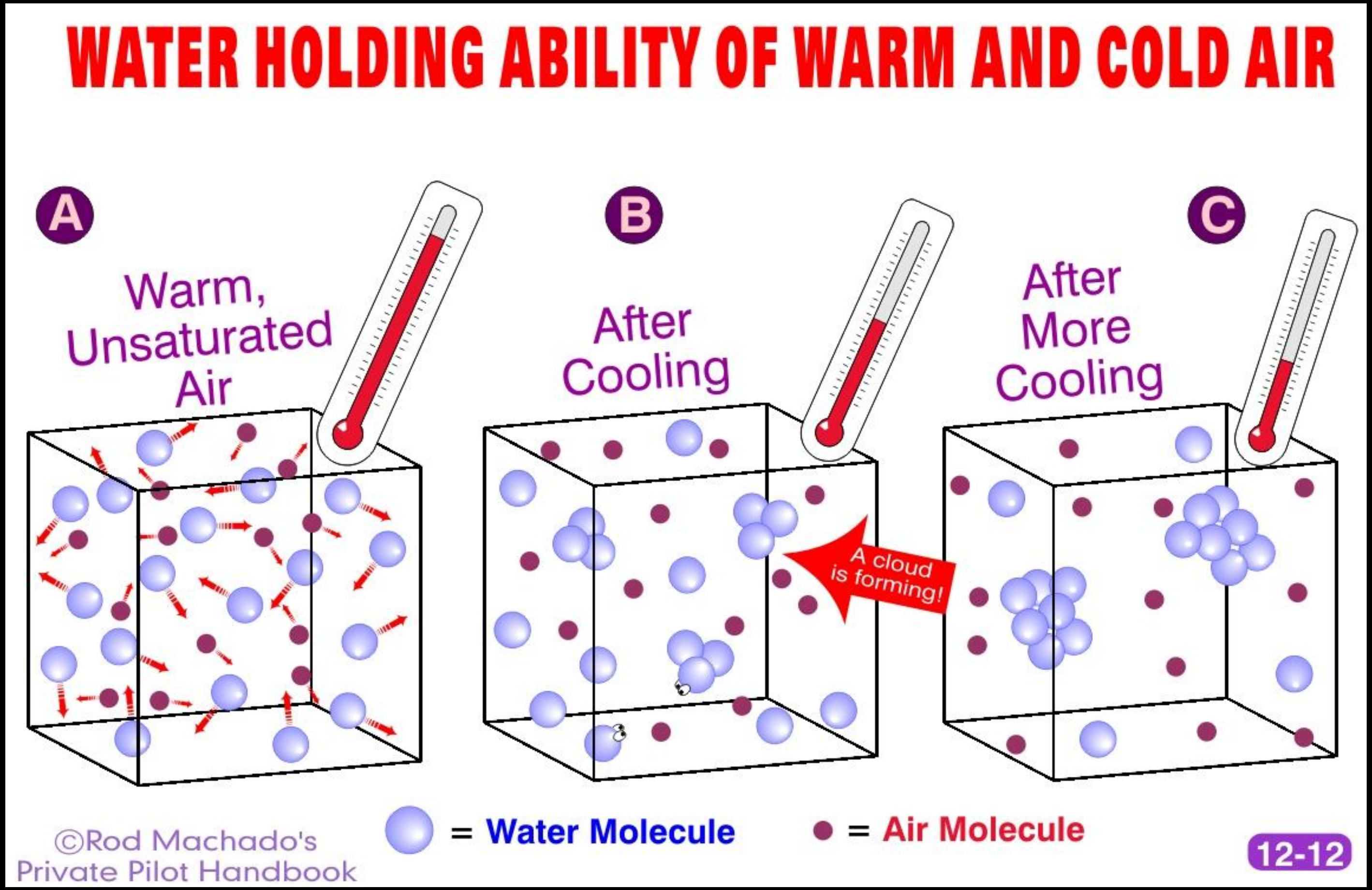
Water Content of Air



- As the air cools, water molecules move slower and vibrate less
- Collisions between water molecules are now gentle enough to let them stick together
- These clinging water molecules become visible in the form of a cloud
- The water molecules can't remain as vapor (gas), so they return to the liquid state in the form of a cloud

Water Content of Air

- Additional cooling allows the water droplets to grow in size



Condensation

- The process of water vapor becoming visible
- Results in the formation of fog or clouds
- When water vapor condenses it means that the air is saturated and can’t hold any more water in vapor form
- Reason why cold air can hold less water vapor than warm air
- It reaches its point of saturation sooner
- The process of condensation is the opposite of evaporation

Two Ways to Cool Air

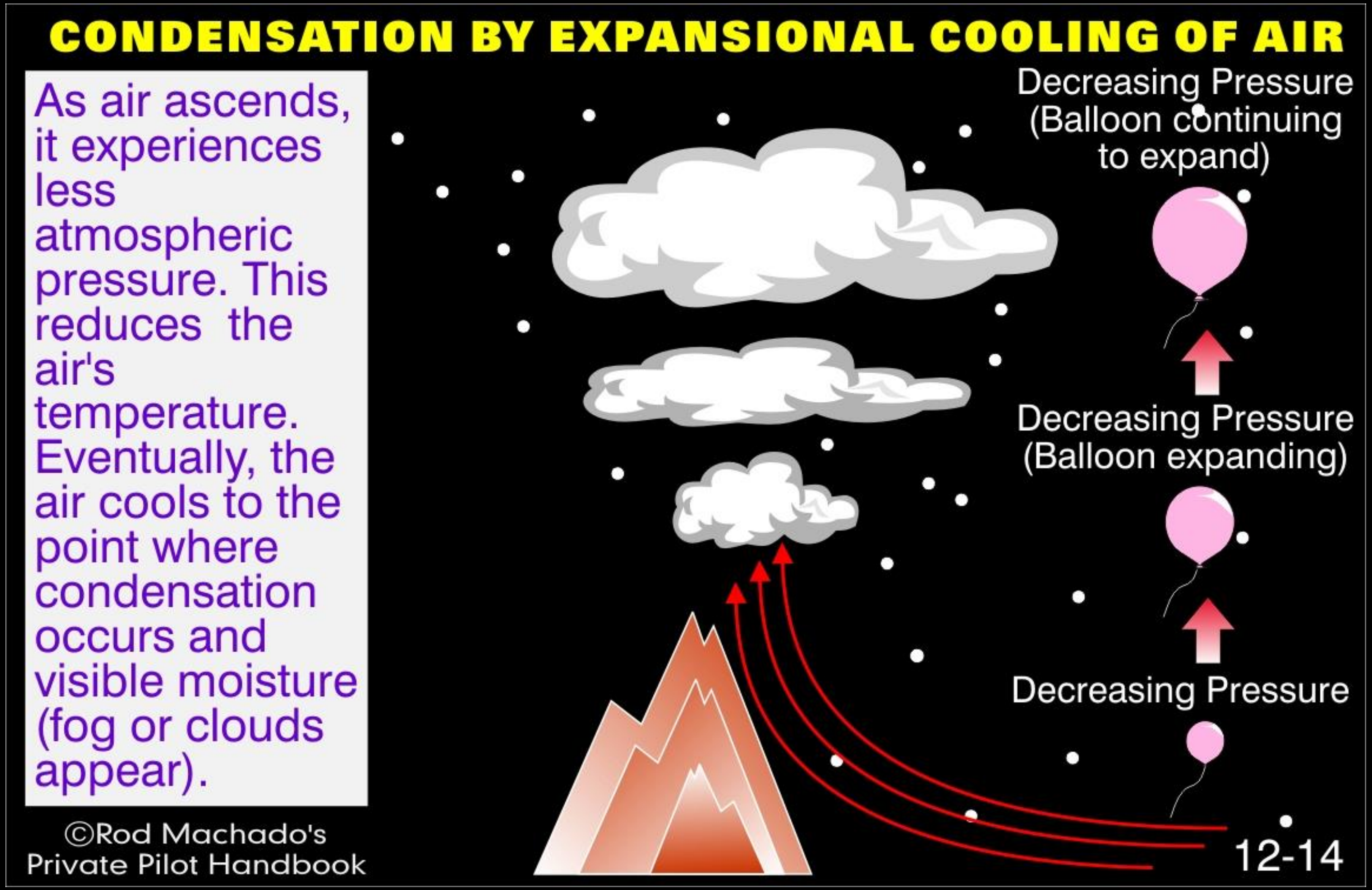
- There are two ways to cool air and condense water vapor
- First, you can put the air in contact with a cooler surface or environment
- Second, you can lift the air and let it cool by expansion

Cooling Air by Contact

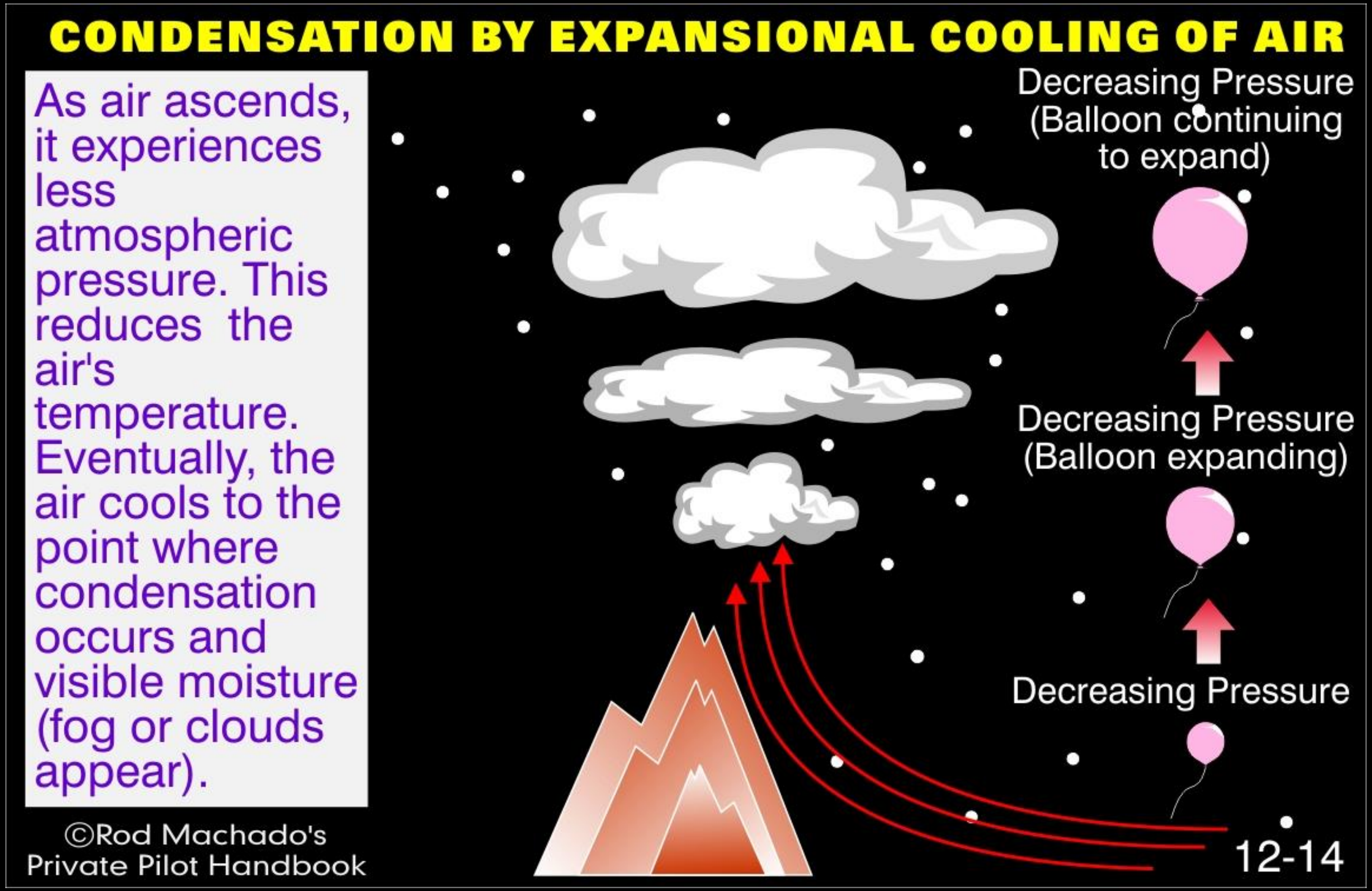
- As warm air comes into contact with the colder surroundings, it becomes saturated with water vapor, condensation occurs, and a cloud forms
- Fog formation is caused by air coming into contact with a cooler surface
- Water vapor condenses, forming visible moisture in the form of clouds that touch the ground

Cooling Air by Lifting

- Rising air undergoes a decrease in pressure because of the decrease in weight (thus pressure) of the atmosphere above it
- Air molecules expand when they are subject to less pressure
- With no other source of energy available, the air molecules must use their own energy to expand
- This slows them down, which results in a lower temperature



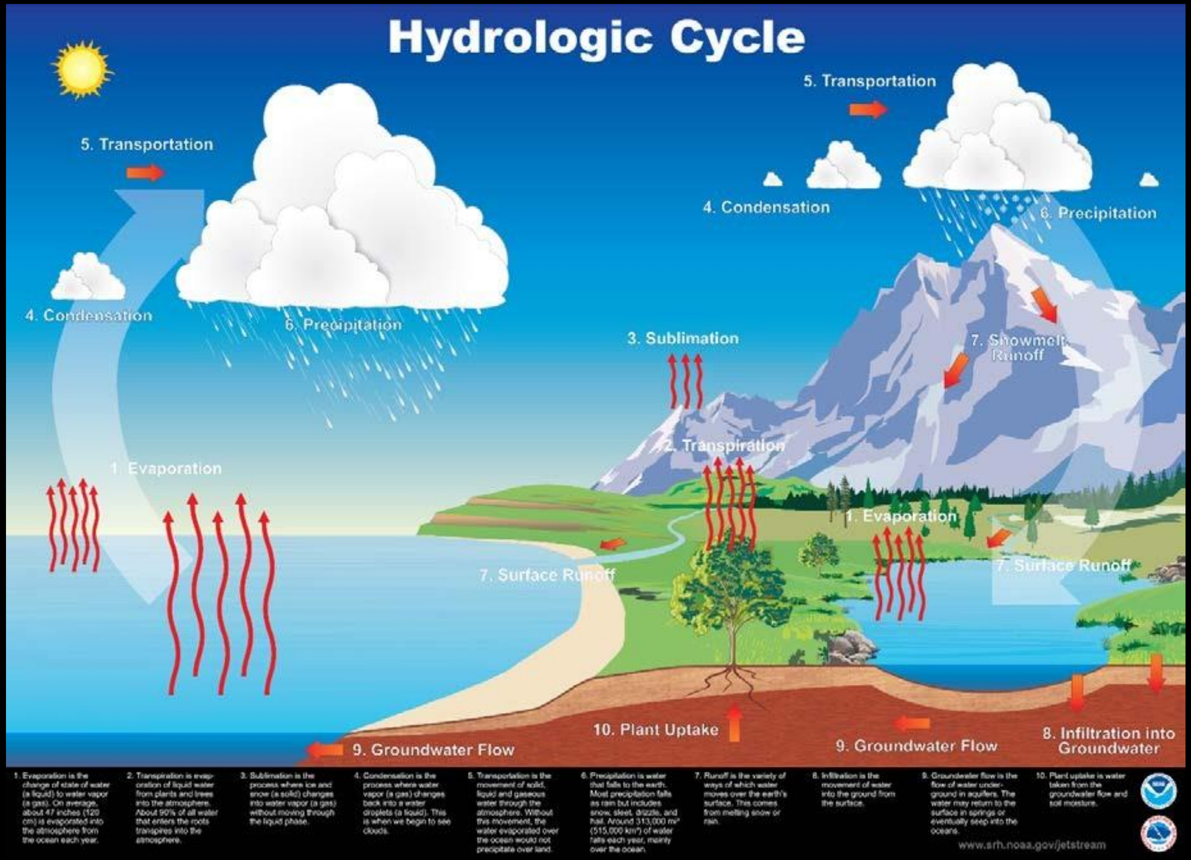
Cooling Air by Lifting



- Cooler air can't hold as much water as warmer air and becomes saturated
- This creates visible moisture in the form of clouds

Hydrologic Cycle

- Continuous circulation of water in the Earth atmosphere system
- Water vapor plays a critical role in this cycle



Relative Humidity

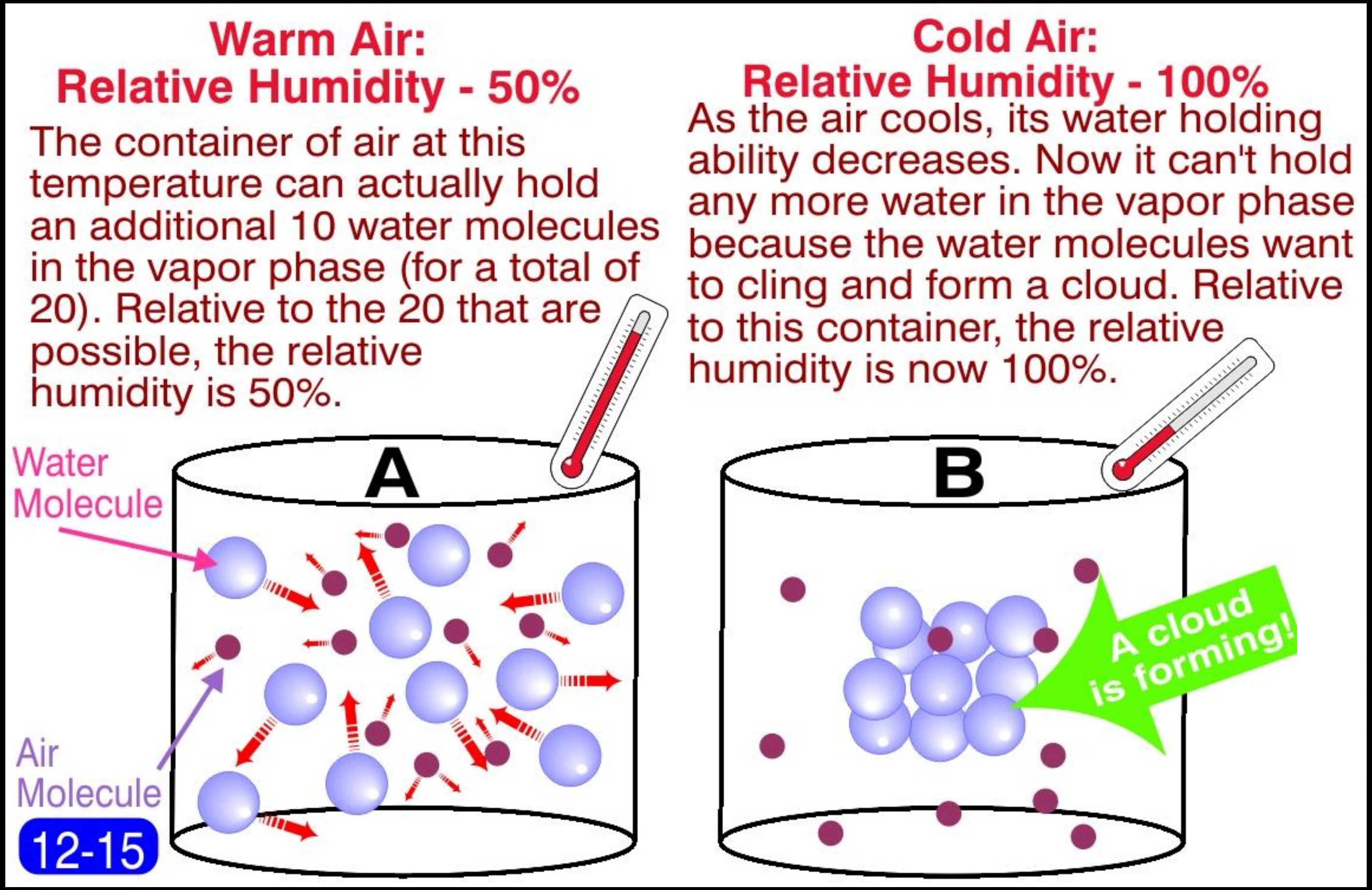
- The ratio expressed as a percentage, of water vapor actually in the air parcel compared to the amount of water vapor the air parcel could hold *at a particular temperature and pressure*
- RH = water vapor content / water vapor capacity
- Relative humidity does *not* indicate the actual water vapor content of the air, but rather how close the air is to saturation

Relative Humidity

- An air parcel with 100 percent relative humidity is saturated, while an air parcel with relative humidity *less than* 100 percent is unsaturated
- An air parcel's capacity to hold water vapor (at a constant pressure) is directly related to its temperature
- It is possible to change an air parcel's relative humidity without changing its water vapor content

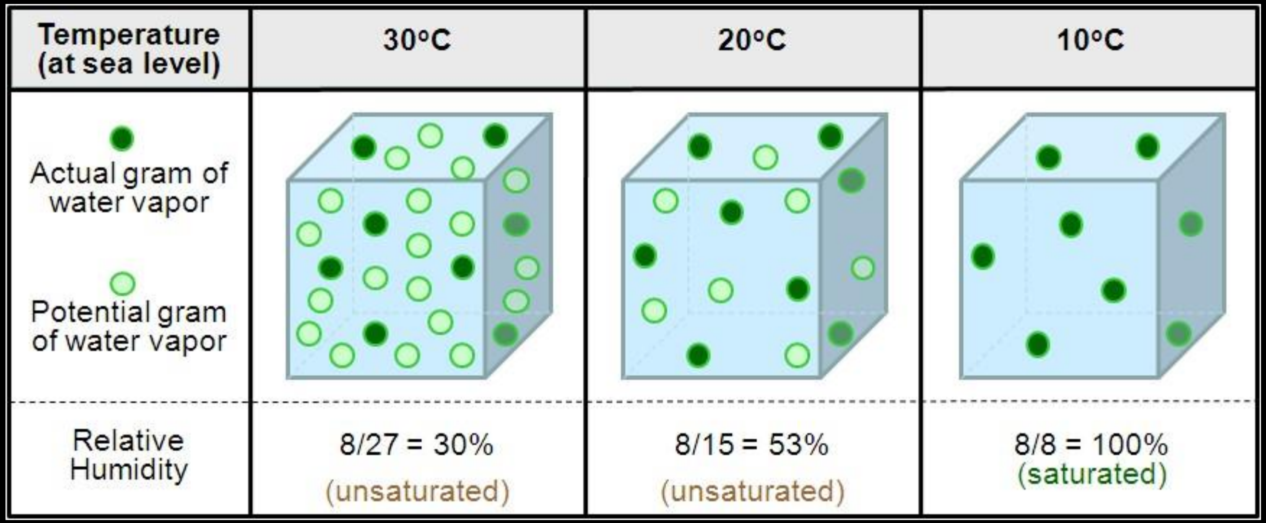
Relative Humidity

- Cooling the air is the most common way for it to become saturated
- When the air temperature decreases the relative humidity increases
- The air loses its capacity to hold water
- The actual amount of water (vapor and liquid) in the air didn't change - Only the ability of the air to hold additional water vapor was changed



Relative Humidity

- During the cooling process, the air parcel's actual water vapor content remained constant
- Relative humidity increased with decreasing temperature



Dewpoint

- Dewpoint is the temperature an air parcel must be cooled to allow the water vapor in the parcel to condense into water (dew)
- When this temperature is below 0°C (32°F), it is sometimes called the frost point
- Lowering an air parcel’s temperature reduces its capacity to hold water vapor

Dewpoint

- It’s a predictor of when condensation will begin for a particular parcel of air
- Cooling the air down to its dewpoint causes the relative humidity to increase to 100%
- Condensation occurs and fog or clouds form

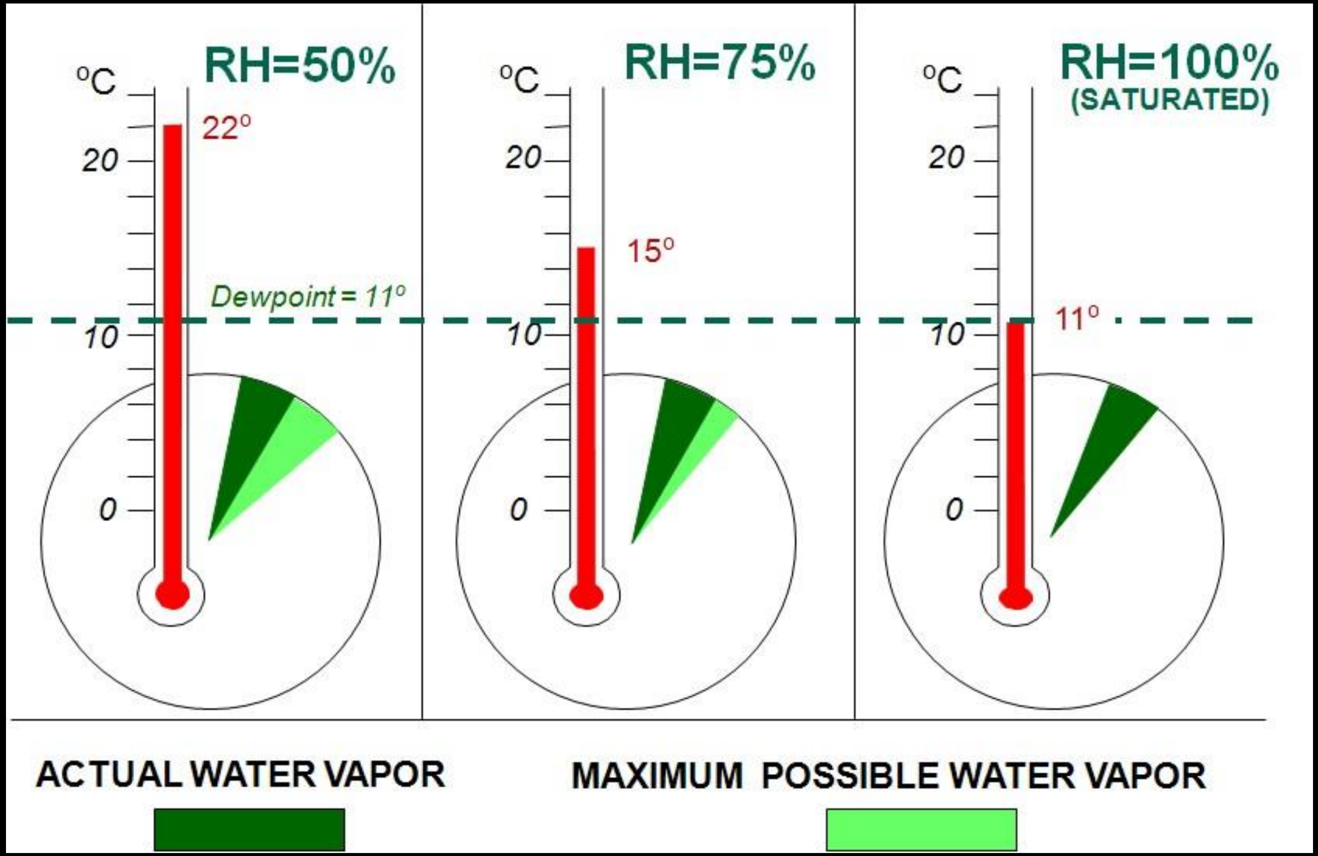
Temperature-Dewpoint Spread (Dewpoint Depression)

- The actual temperature difference between the temperature and the dewpoint is the temperature/dewpoint spread
- METARs provide observations of both temperature and dewpoint
- The process of condensation can actually begin about 5°F (2.8°C) before the air temperature cools to its dewpoint (spread of 5°)
- The temperature greatly affects the air parcel's ability to hold water vapor, while the dewpoint indicates the actual quantity of water vapor in the parcel

Temperature-Dewpoint Spread (Dewpoint Depression)

- As the spread decreases, relative humidity increases
- When the spread decreases to zero, relative humidity is 100 percent, and the air parcel is saturated.
- Surface temperature-dewpoint spread is important in anticipating fog but has little bearing on precipitation
- To support precipitation, air must be saturated through thick layers aloft

Relationship Between Dewpoint Spread and RH



Dewpoint

- The dewpoint is a great indicator of the atmosphere's water content
- High dewpoint temperatures indicate a lot of water in the air
- Low dewpoint temperatures indicate little water in the air
- The temperature/dewpoint spread indicates whether the humidity is high or low

Condensation Nuclei

- Water vapor condenses more easily when the air contains an abundance of airborne particles
- Particles makes it easier for very small particles of water vapor to collect, helping to form larger water drops
- Airports downwind from an area of industry (smog = particulate matter) are more likely to have fog or low clouds form at larger temperature-dew point spread

Precipitation

- Not all clouds form precipitation
- For significant precipitation to occur, clouds must generally be around 4,000 feet thick
- Can take the form of rain, hail, snow, ice pellets or grains, or freezing rain
- Is any or all forms of water particles, whether liquid or solid, that fall from the sky and reach the ground
- It is distinguished from clouds, fog or dew in that it falls and makes contact with the earth’s surface

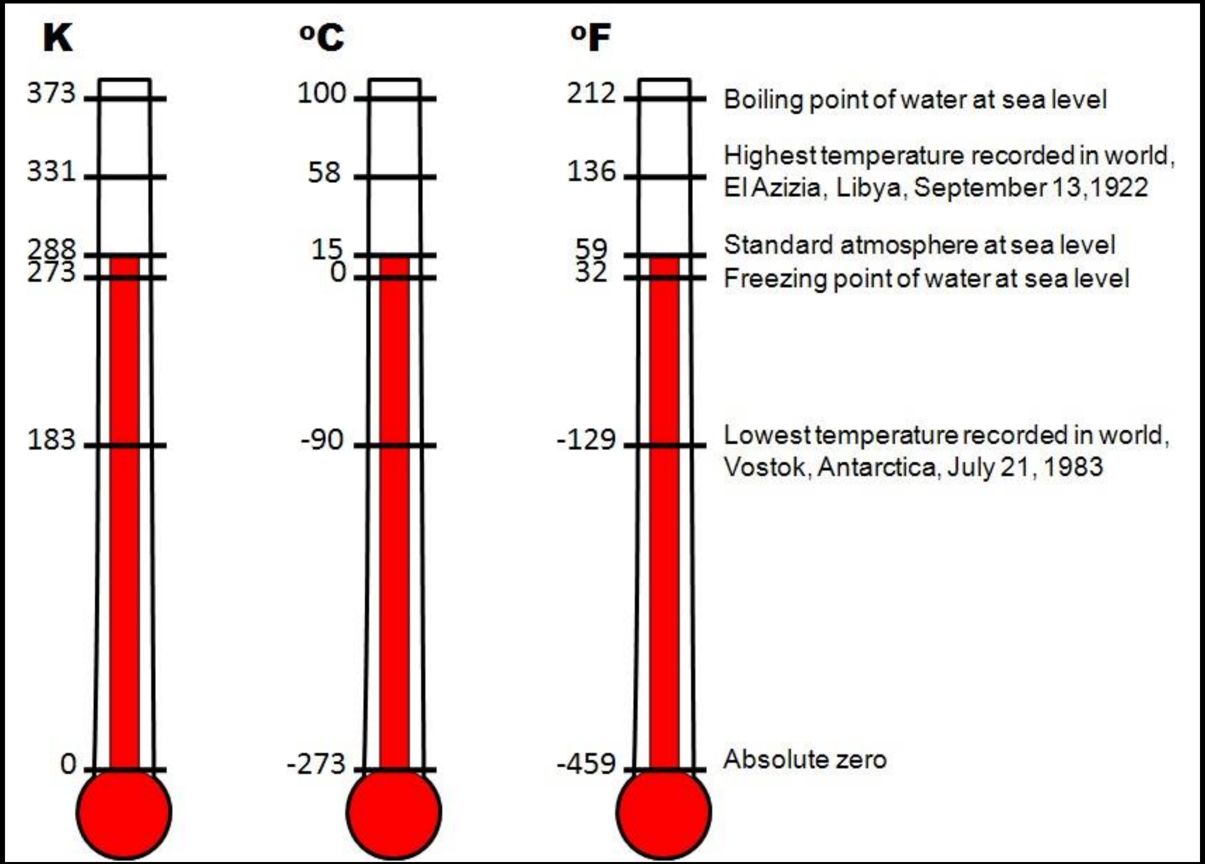
Temperature

- One of the most basic variables used to describe the state of the atmosphere
- Is an indicator of the internal energy of air
- Varies with time from one season to the next, between day and night, and even from one hour to the next
- Also varies from one location to another, from high altitudes and latitudes to low altitudes and latitudes
- Temperature can be critical to some flight operations

Temperature Measurement

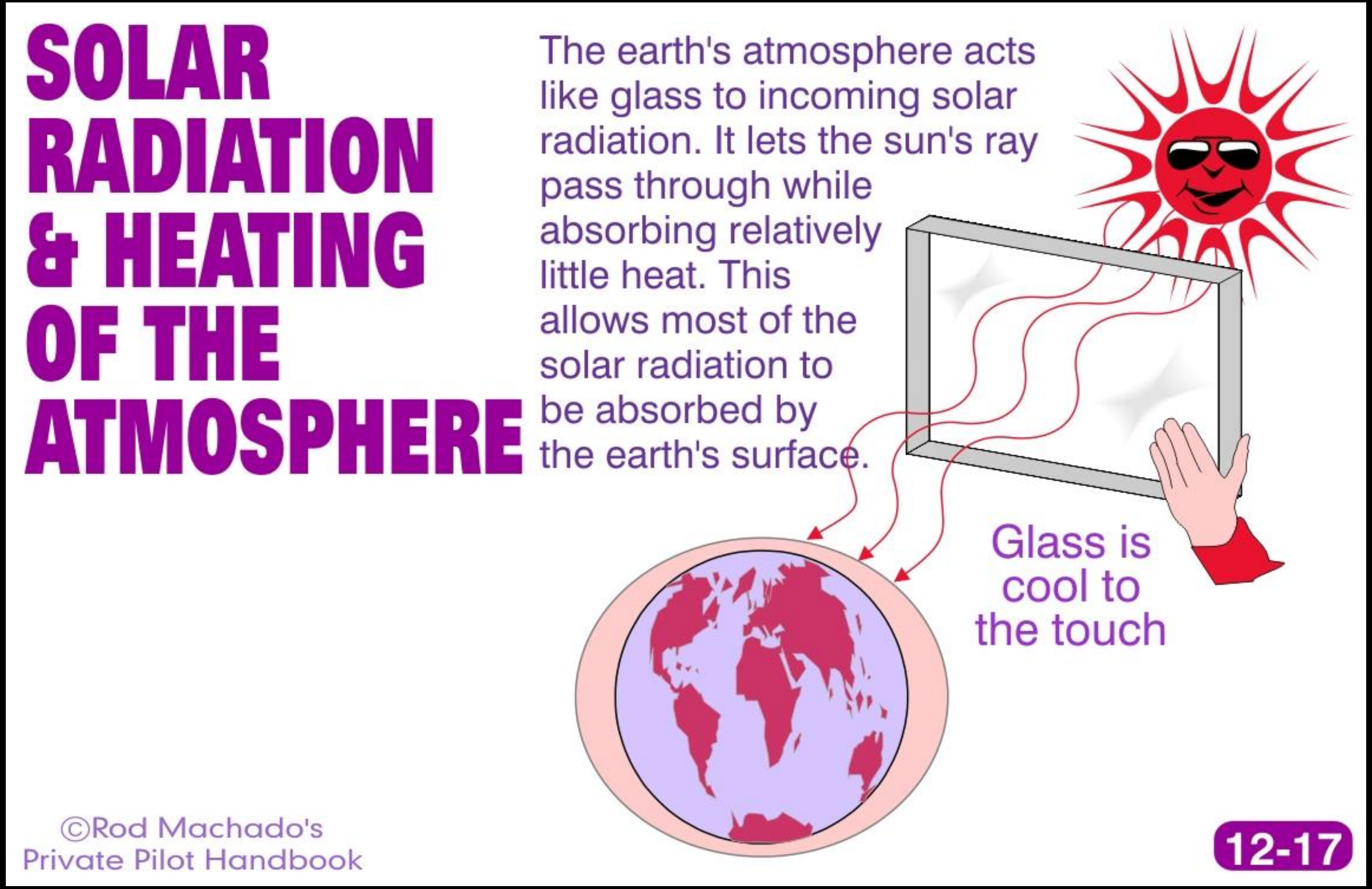
- A thermometer is an instrument used to measure temperature
- The Celsius (°C) scale is the most commonly used temperature scale worldwide and in meteorology
- The scale is based on the freezing point (0°C) and boiling point of water (100°C)
- The U.S. uses Fahrenheit (°F) scale for everyday temperature measurements
- In this scale, the freezing point of water is 32°F and the boiling point is 212°F

Thermometers



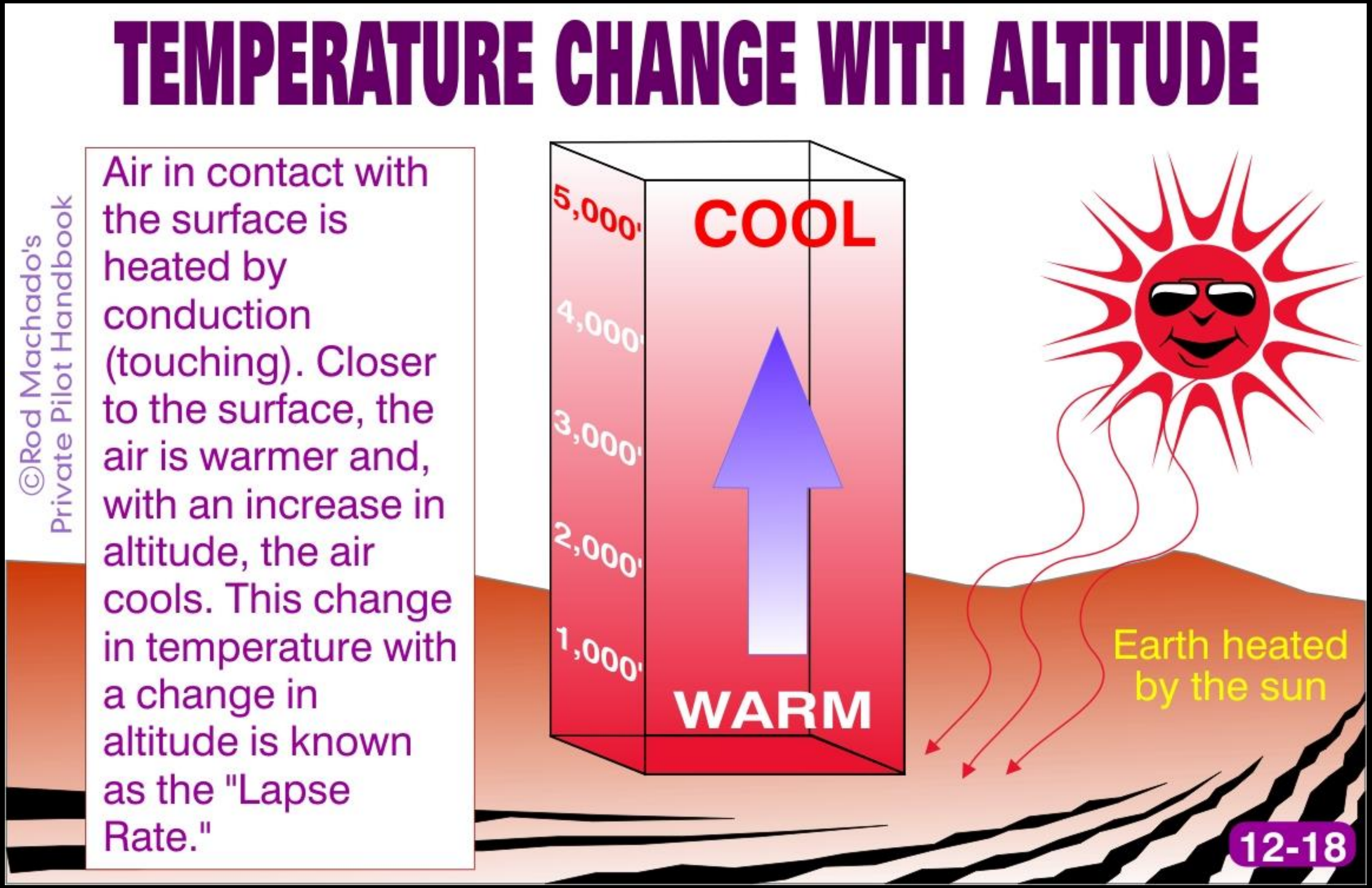
Earth's Heat Source

- The heat source for the surface of our planet is the sun
- Energy from the sun is transferred through space and through the Earth's atmosphere to the Earth's surface
- Since this energy warms the surface and atmosphere, some of it becomes heat energy

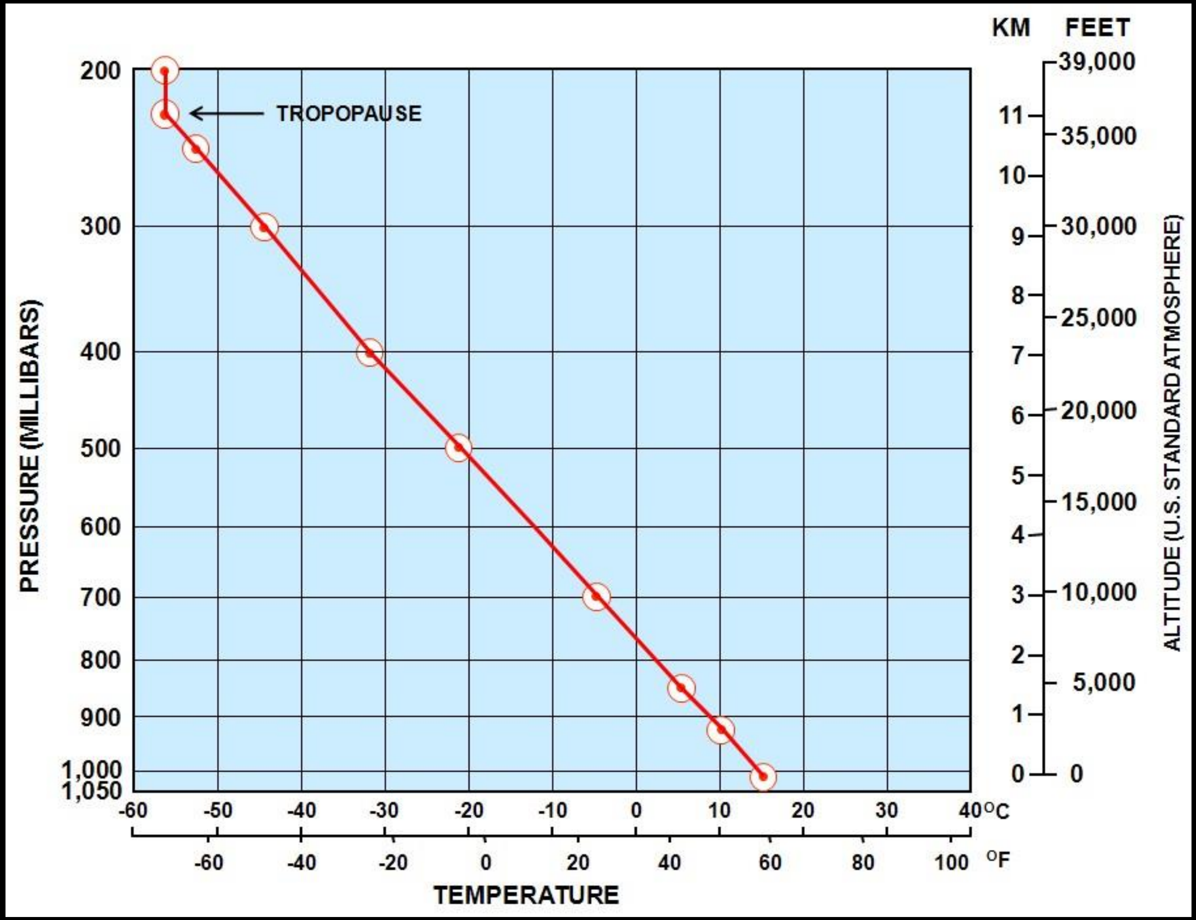


Temperature Lapse Rate

- Heat is absorbed by the earth's surface
- The surface of the earth heats or cools the air directly
- The air cools as we move away from this heated surface



Temperature Lapse Rate



- A lapse rate of temperature is defined as a decrease in temperature with height
- Temperature decreases approximately 2°C (3.5°F) per 1,000 feet in the *standard* atmosphere
- Since this is an average, the exact value seldom exists
- Temperature in the troposphere sometimes remains constant or even increases with height

Rawinsonde Observations

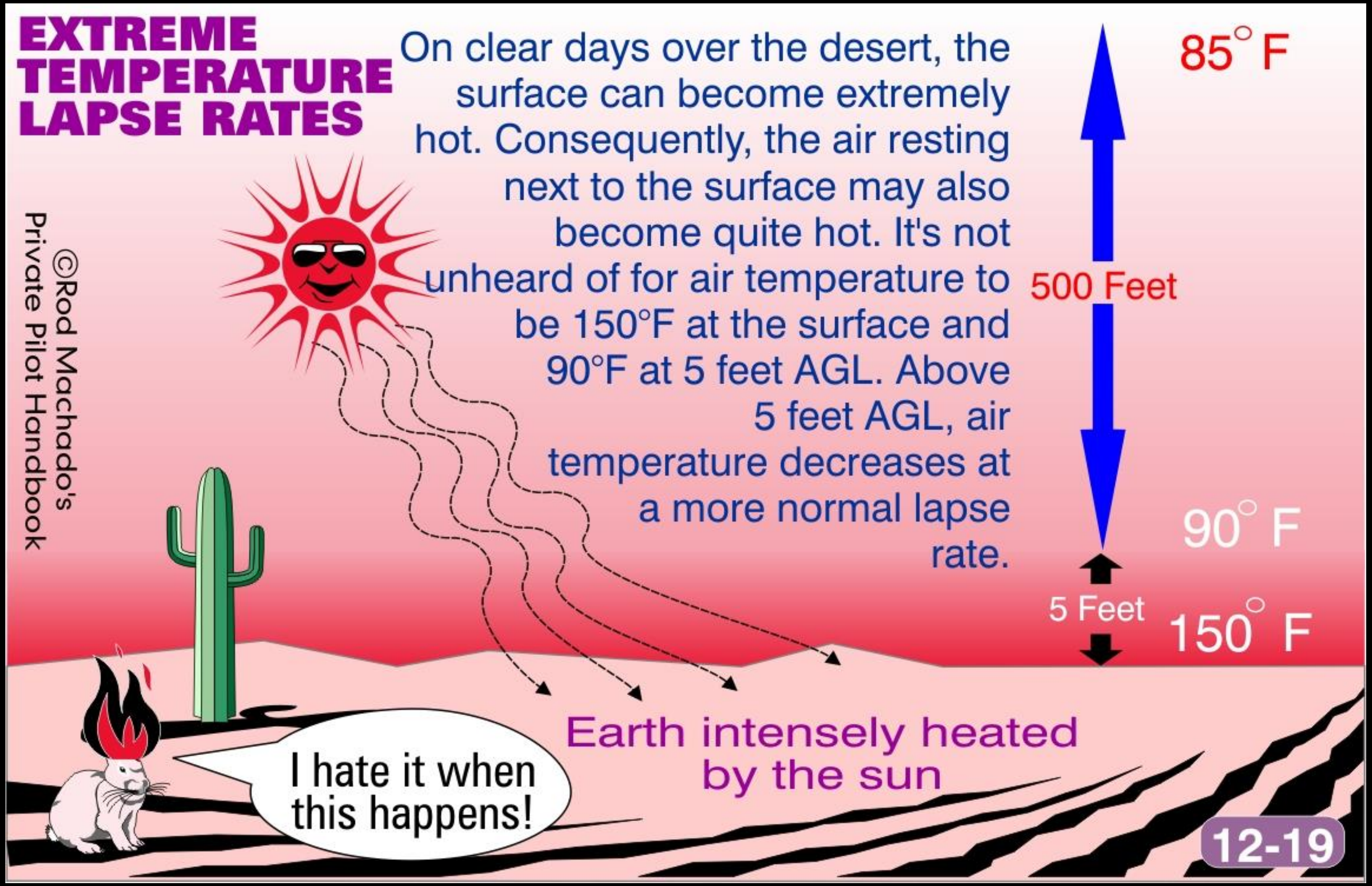
- The NWS takes routine scheduled upper air observations referred to as soundings
- A balloon carries a rawinsonde instrument which consists of radio gear and sensing elements
- While in flight, the rawinsonde transmits pressure, temperature, and relative humidity data
- Wind speed and direction aloft are obtained by tracking the position of the radiosonde in flight using GPS
- Most stations around the world take rawinsonde observations

Environmental Lapse Rate

- Meteorologists send radiosondes up twice daily to measure the rate of temperature change
- Radiosondes provide information on wind, pressure, humidity and temperature
- Using this information, the ambient (environmental) temperature lapse rate is determined
- This lapse rate is a vertical temperature profile of the atmosphere

Extreme Lapse Rates

- Airplanes entering this shallow, heated layer of air during landing might experience turbulence and a decrease in air density
- The turbulence is caused by thermals or updrafts, which are small, rising parcels of warmer air that you fly through



Temperature Inversions

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- Air temperature normally decreases with height
- If the temperature *increases* with height, it is called a temperature inversion
- The normal decreasing temperature lapse rate is turned upside down or inverted
- There are two types of temperature inversions:
  - Surface inversion
  - Inversion aloft

Surface Temperature Inversions

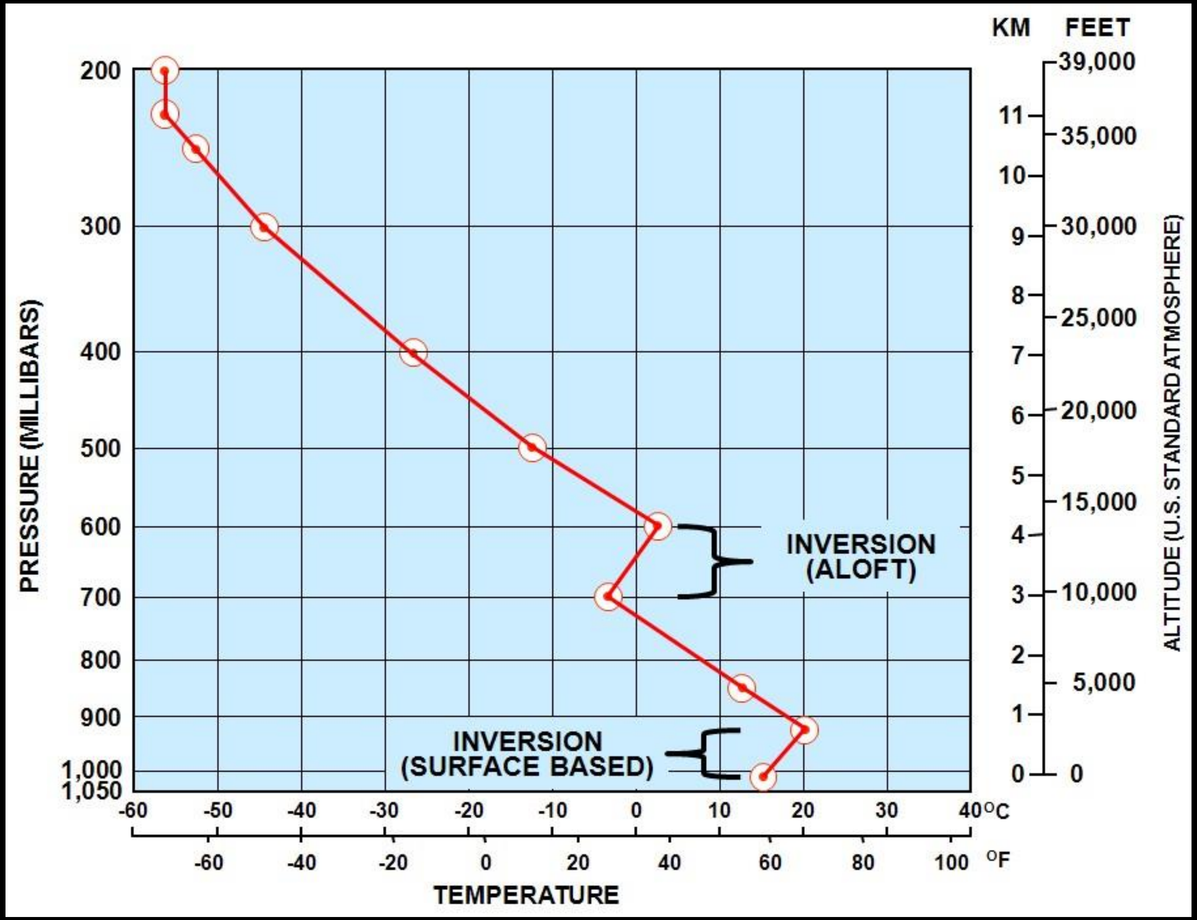
- A surface-based inversion typically develops over land on clear nights when wind is light
- The ground radiates and cools much faster than the overlying air
- Air in contact with the ground becomes cool, while the temperature a few hundred feet above changes very little
- Thus, temperature increases with height

Temperature Inversions Aloft

- An inversion may also occur at any altitude when conditions are favorable
- A current of warm air aloft overrunning cold air near the surface produces an inversion aloft
- Inversions are common in the stratosphere
- The principal characteristic of an inversion layer is its marked <u>stability</u>, so that very little turbulence can occur within it

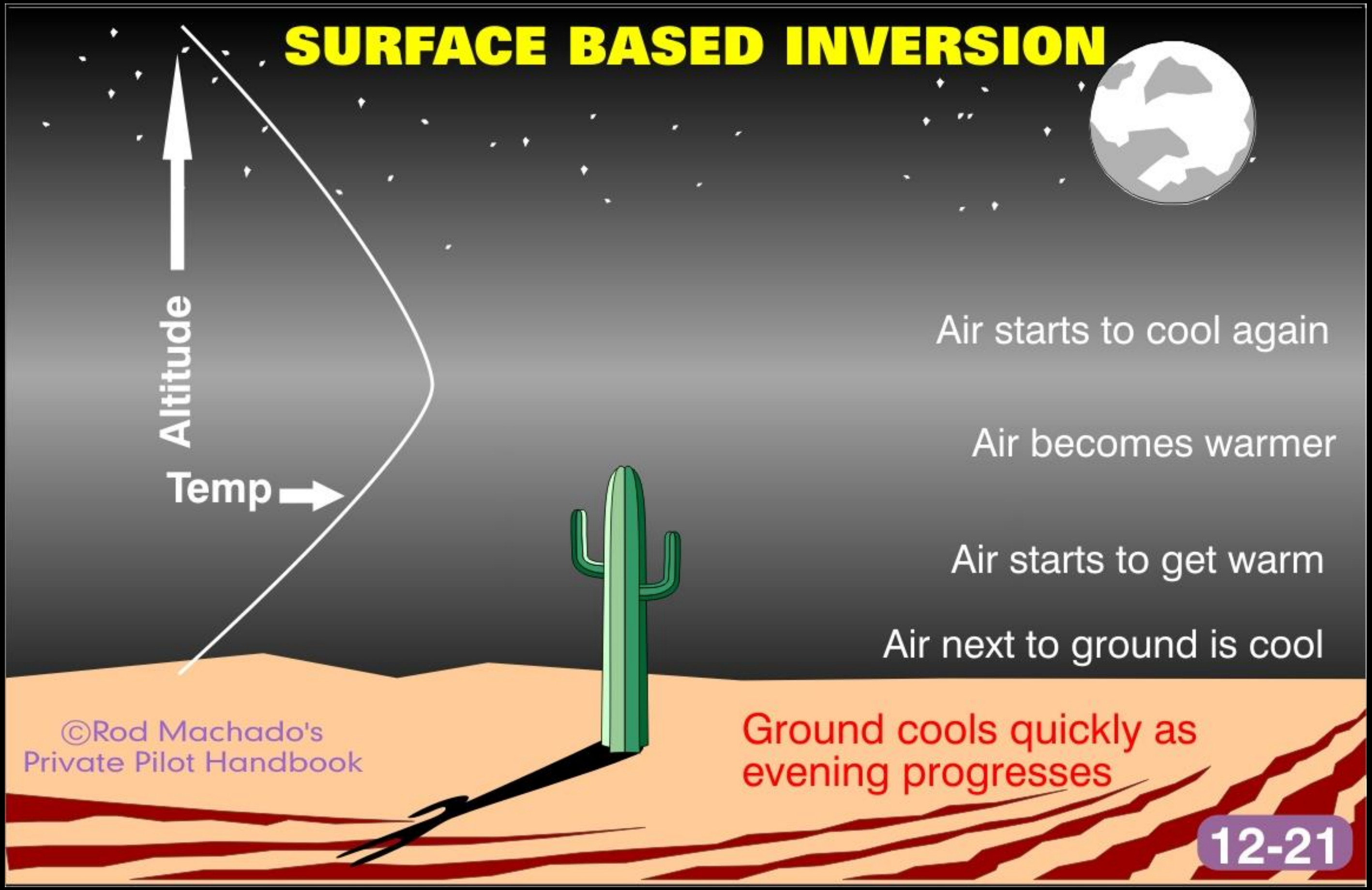
Temperature Inversion

- A temperature inversion is a layer in which the temperature increases with altitude
- If the base of the inversion is at the surface, it is termed a surface-based inversion
- If the base of the inversion is not at the surface, it is termed an inversion aloft

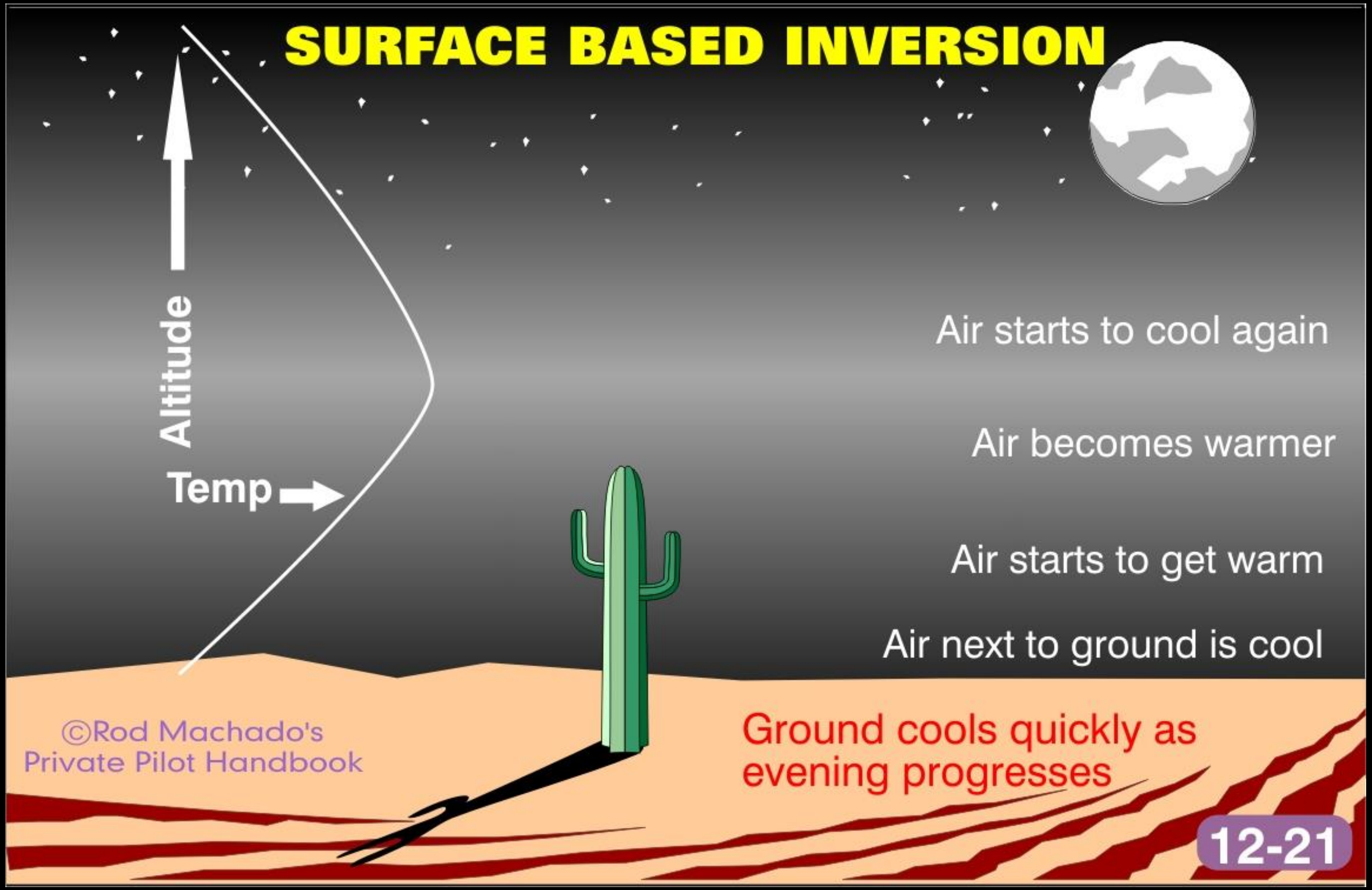


Surface Inversion

- Frequently forms around sunset and lasts until midmorning
- A setting sun allows the surface temperature to drop quickly, especially on cloudless, calm nights
- In the absence of a cloud cover the earth cools off quickly because there is nothing above the surface to absorb the radiant heat



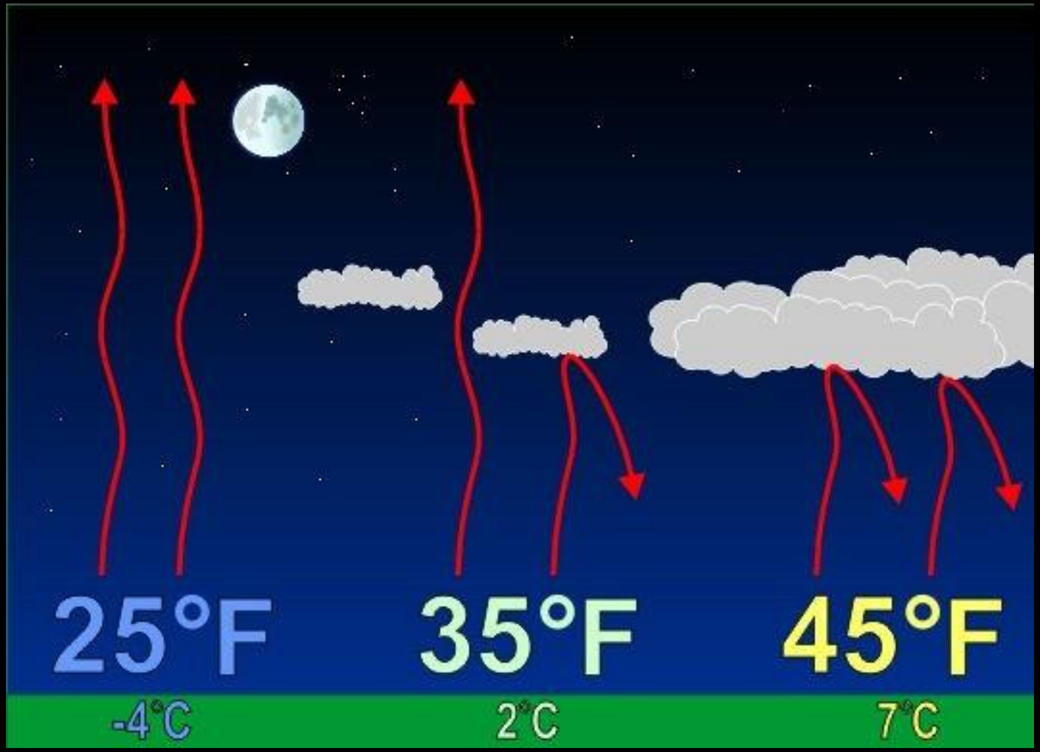
Surface Inversion



- As the earth cools, the air next to it starts to cool
- When there is not a lot of mixing, the layer next to the earth cools, while the air above remains near daytime temperatures
- The base of a surface inversion is located at the surface
- The top of the inversion occurs where the temperature lapse rate resumes its normal decrease with height (within a few hundred feet of the ground)

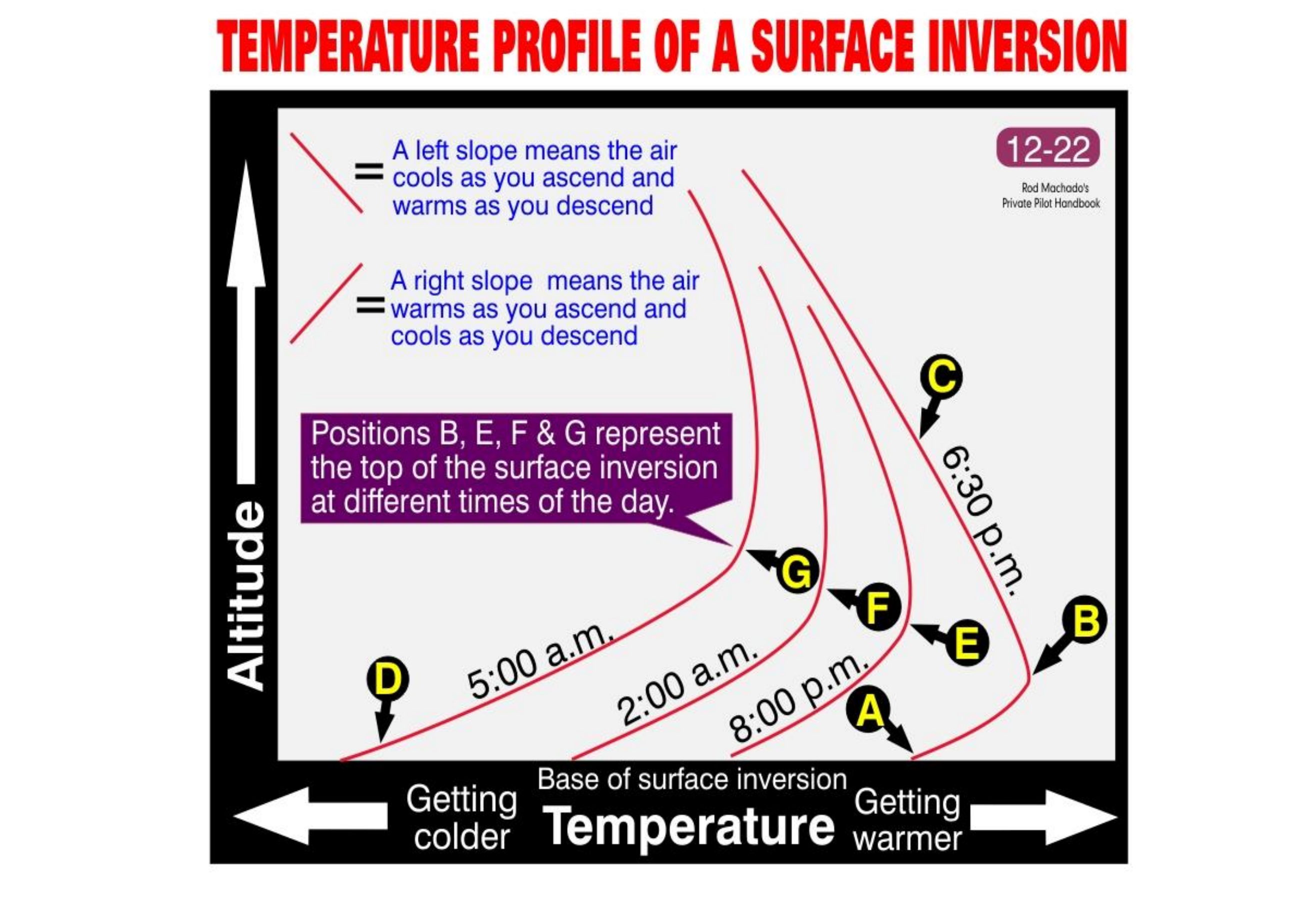
Greenhouse Effect

- Clouds prevent rapid surface cooling
- The water droplets in them absorb radiant heat from the surface
- As they warm, they re-radiate this heat back toward the ground, which absorbs the heat energy again
- This exchange continues all night long and keeps surface temperatures warmer than they would be on a clear night

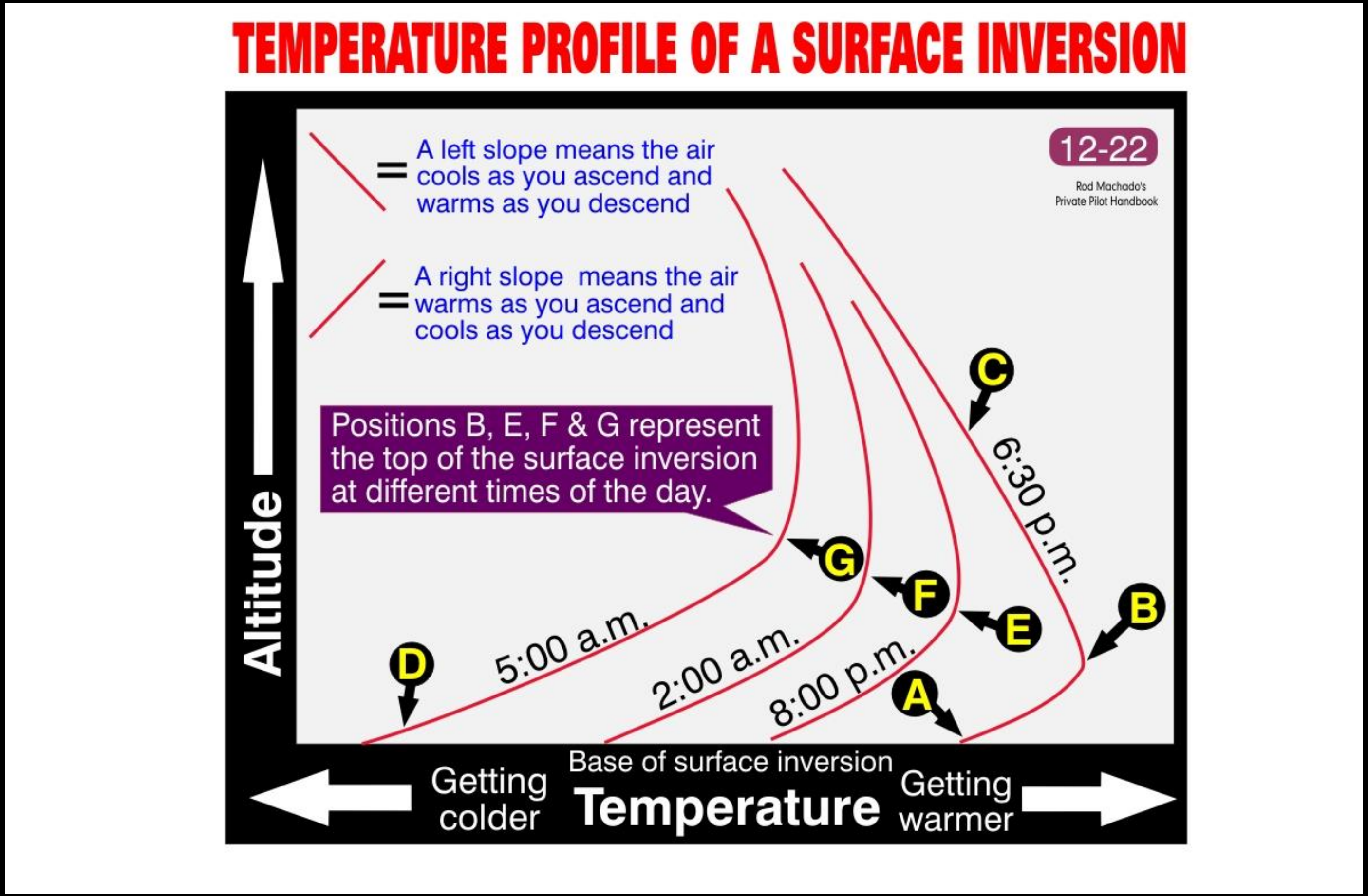


Surface Inversion

- Temperature increases with an increase in altitude up to a point
- Then the temperature plot bends back to the left
- Air is the warmest where the curve bends to the left
- This is the location of the top of the surface inversion
- Above the inversion, the air has a normal (decreasing temperature) lapse rate



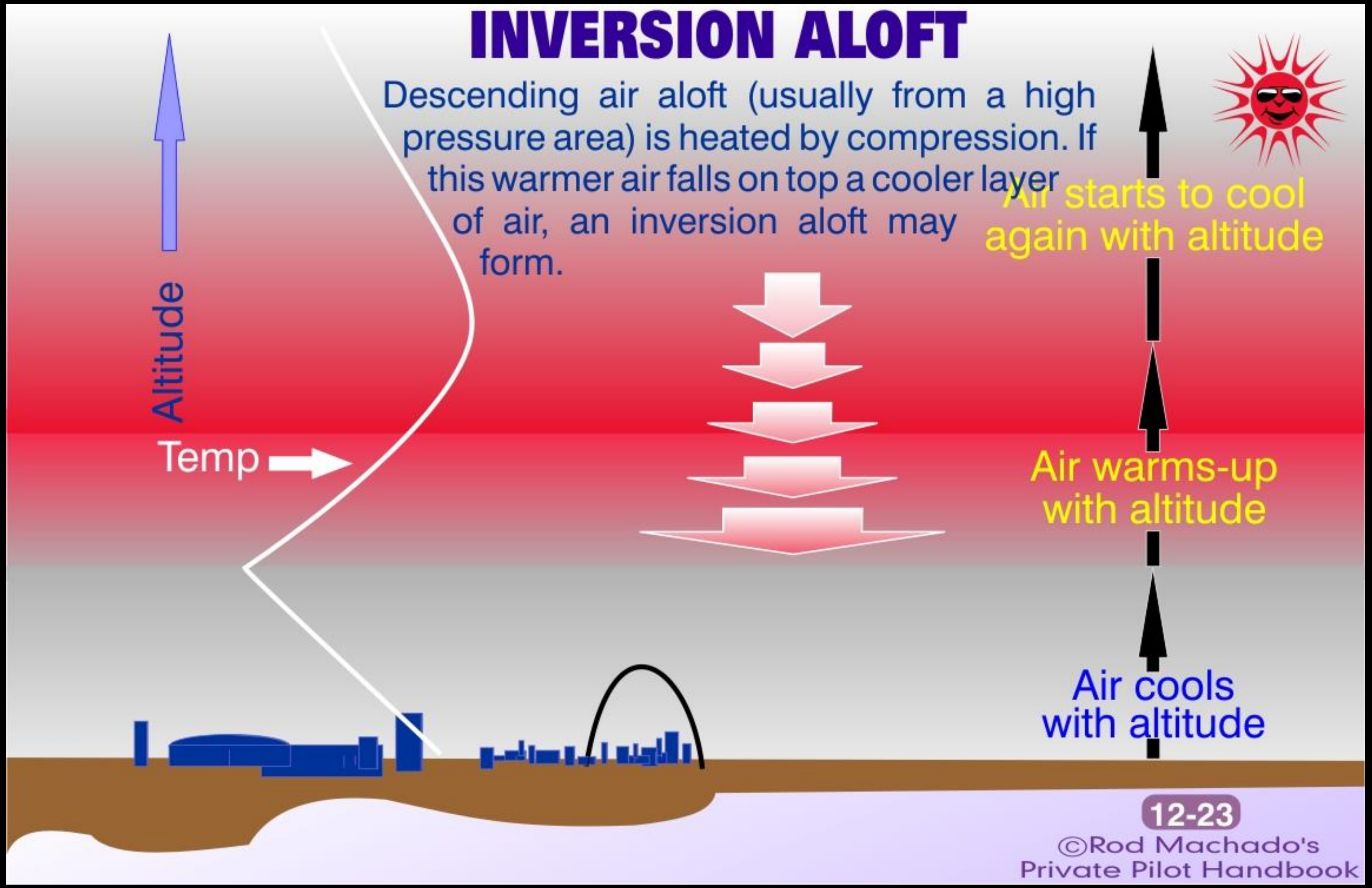
Surface Inversion



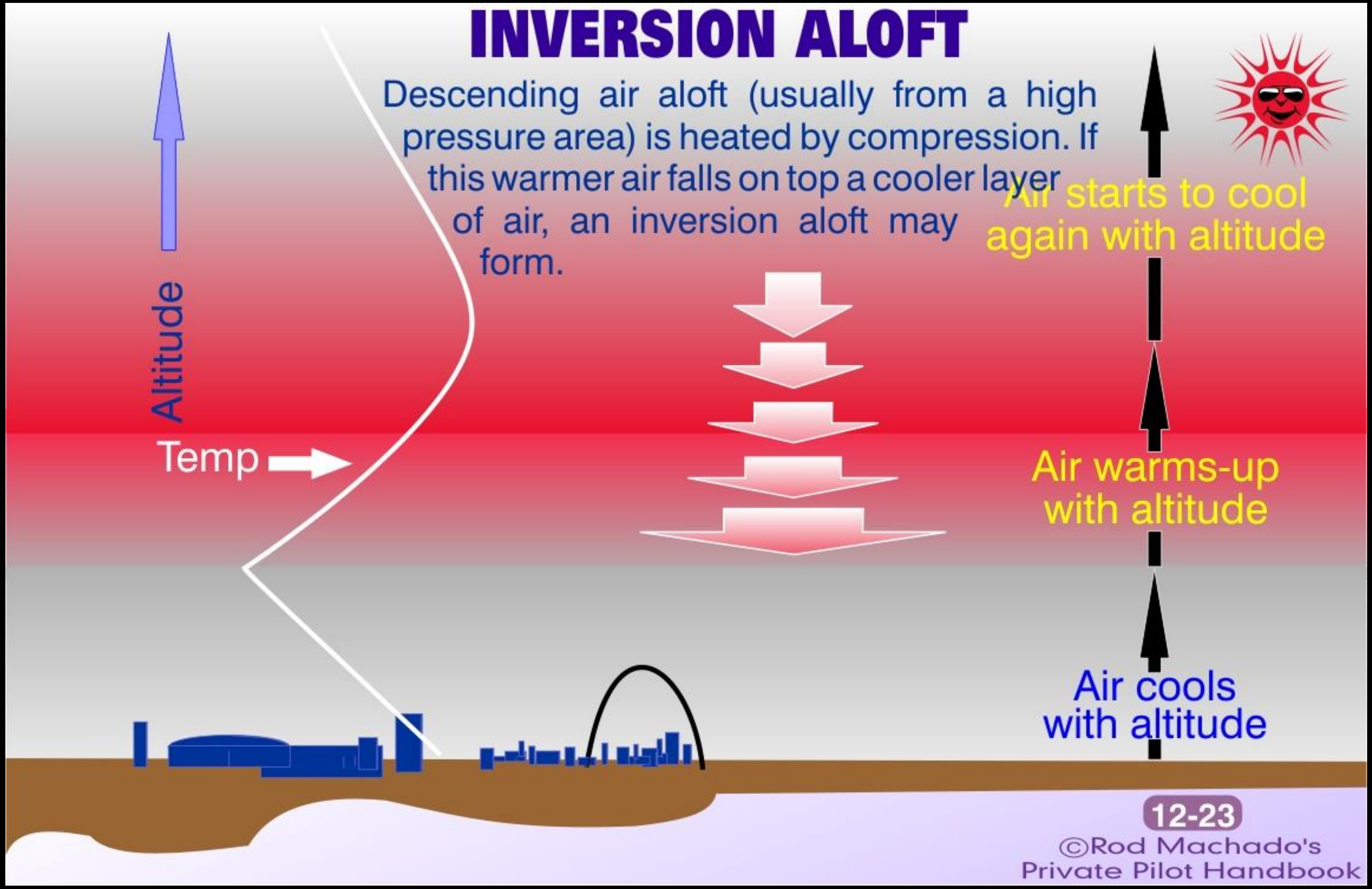
- The 5 AM temperature plot line starts at the far left
- The surface temperature has cooled noticeably during the late evening and early morning
- As night progresses the top of the inversion occurs at progressively higher altitudes (E to F to G) as the layer of colder surface air grows

Inversion Aloft

- Caused by warmer air moving horizontally over colder air or by air aloft that is descending and heated by compression
- Unlike surface inversions, these inversions are typically found at higher altitudes
- High pressure centers in the atmosphere consist of large masses of air descending at rates of hundreds to thousands of feet per day



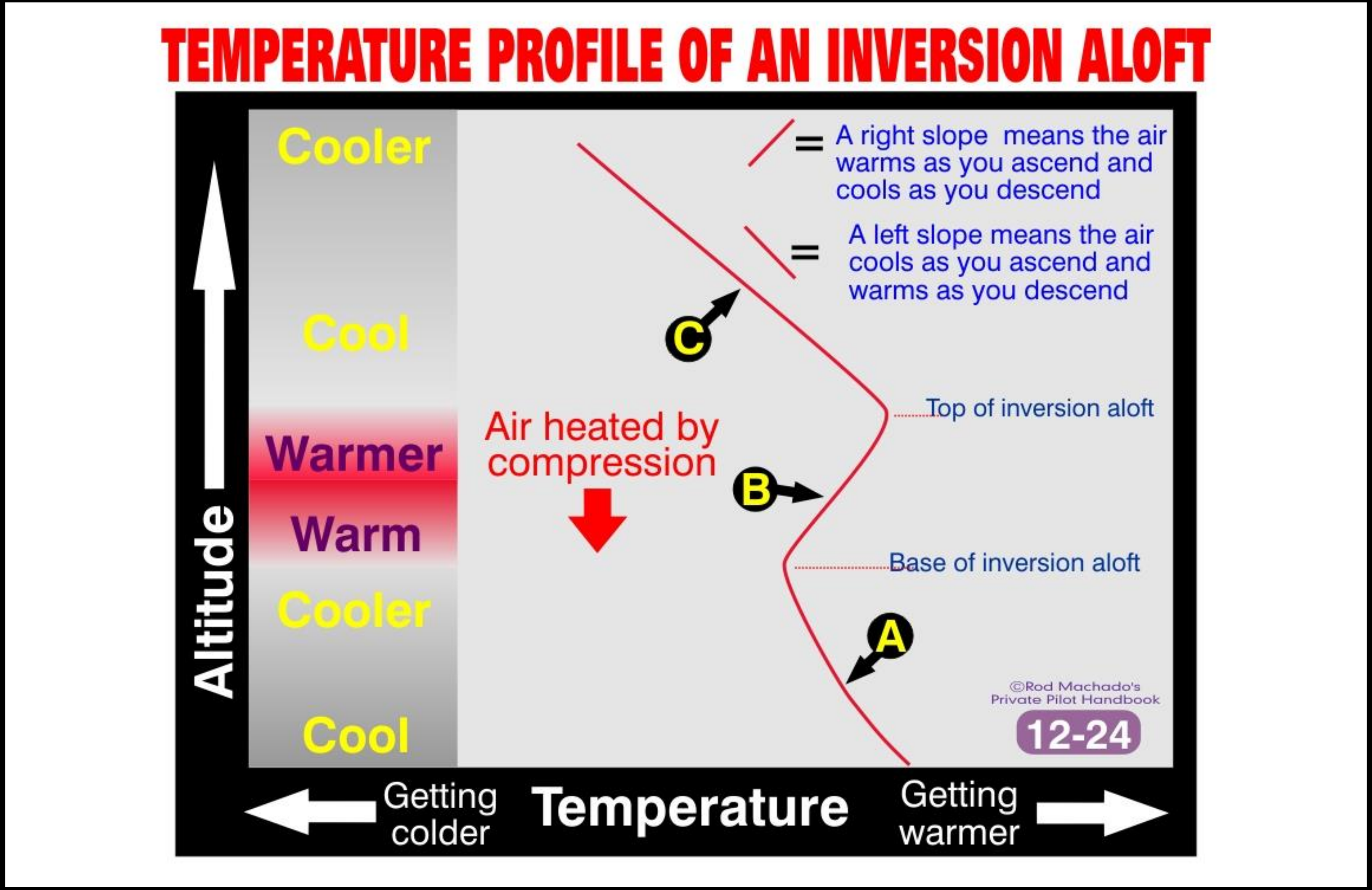
Inversion Aloft



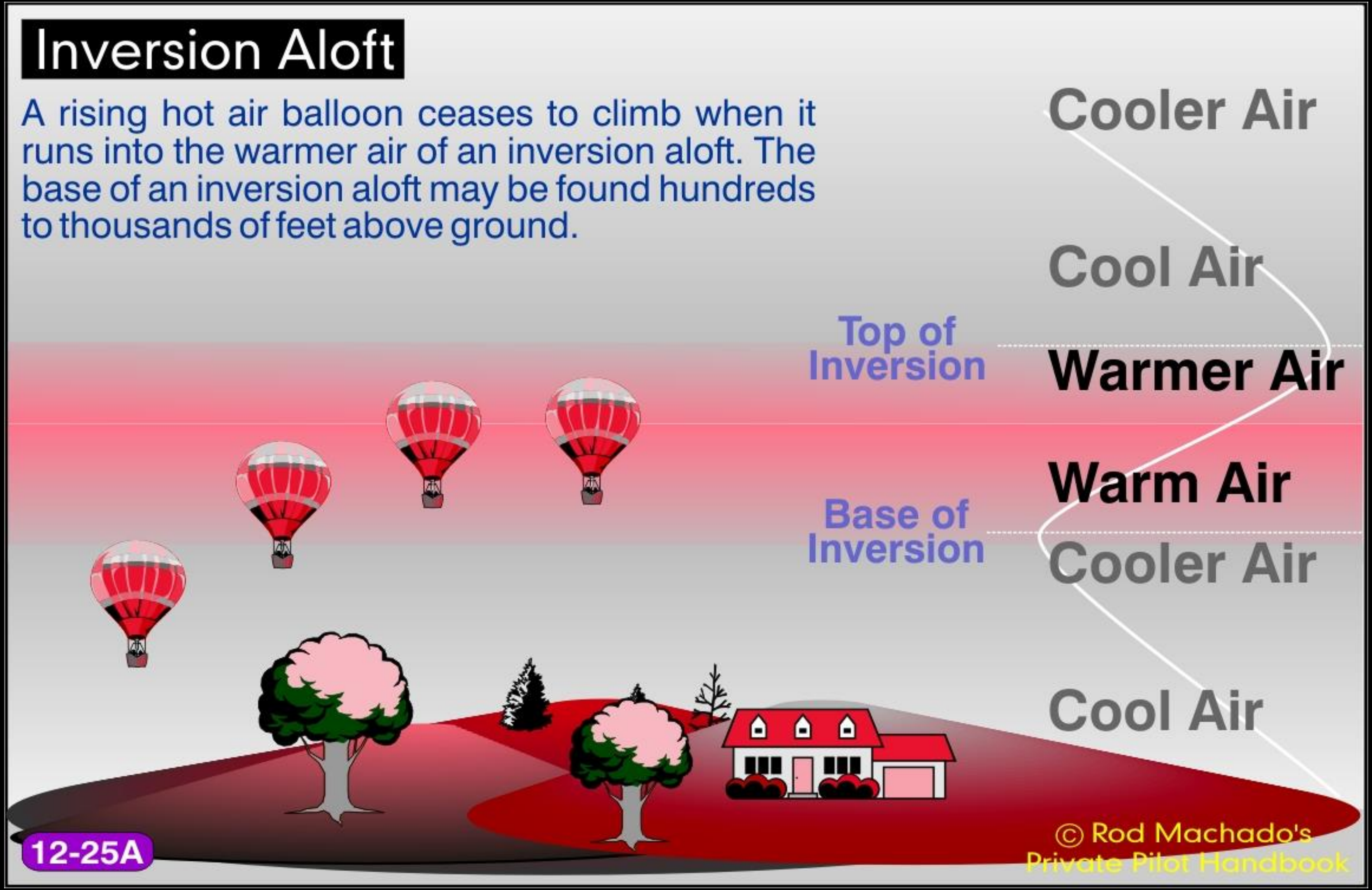
- As this subsiding air descends it experiences an increase in pressure
- An increase in air pressure produces an increase in temperature due to compression
- If this descending layer of warm air comes to rest on a cooler layer of air, a temperature inversion can form aloft

Inversion Aloft Profile

- Pilots experience a decreasing temperature lapse rate when departing an airport beneath the inversion
- The climb is initially made in cool air
- When entering the bottom of the inversion the air becomes warmer as altitude is gained
- At the top of the inversion, a decreasing temperature lapse rate once again occurs



Effect of Inversion Aloft



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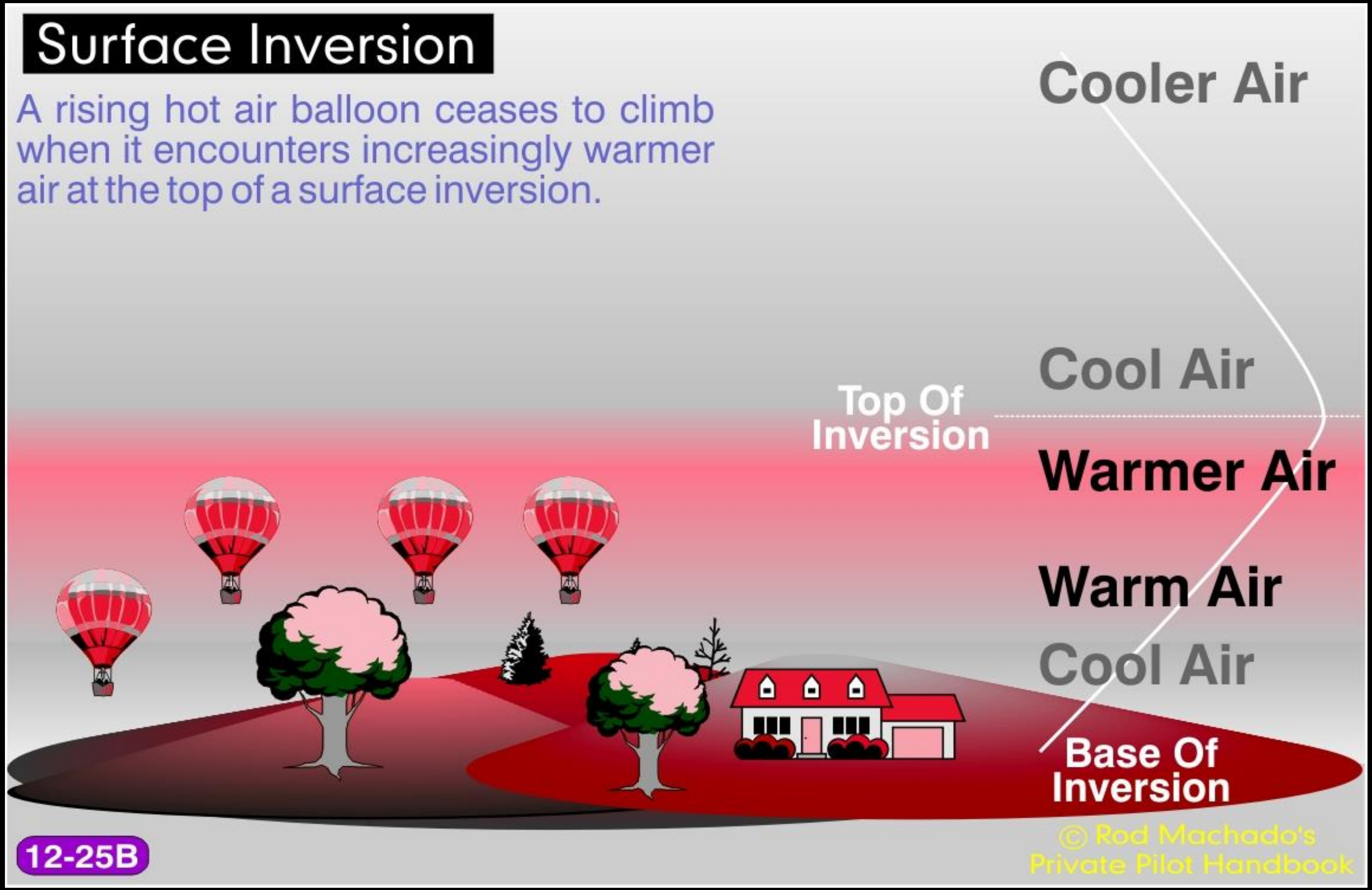
Effect of Surface Inversion



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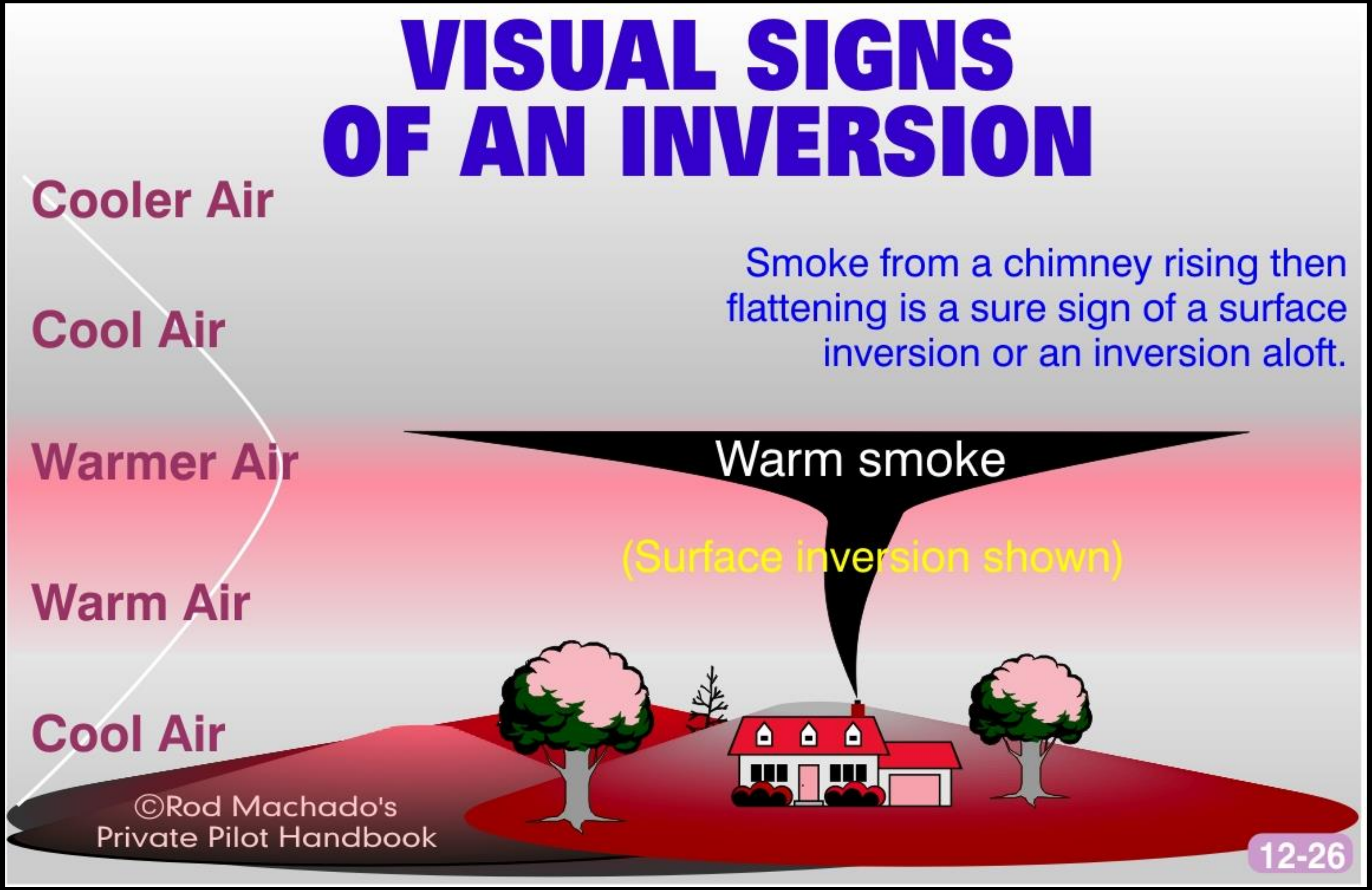
Inversion Signs

- Warm, rising smoke, much like a hot air balloon, cannot ascend through the warmer air of an inversion



Signs of an Inversion

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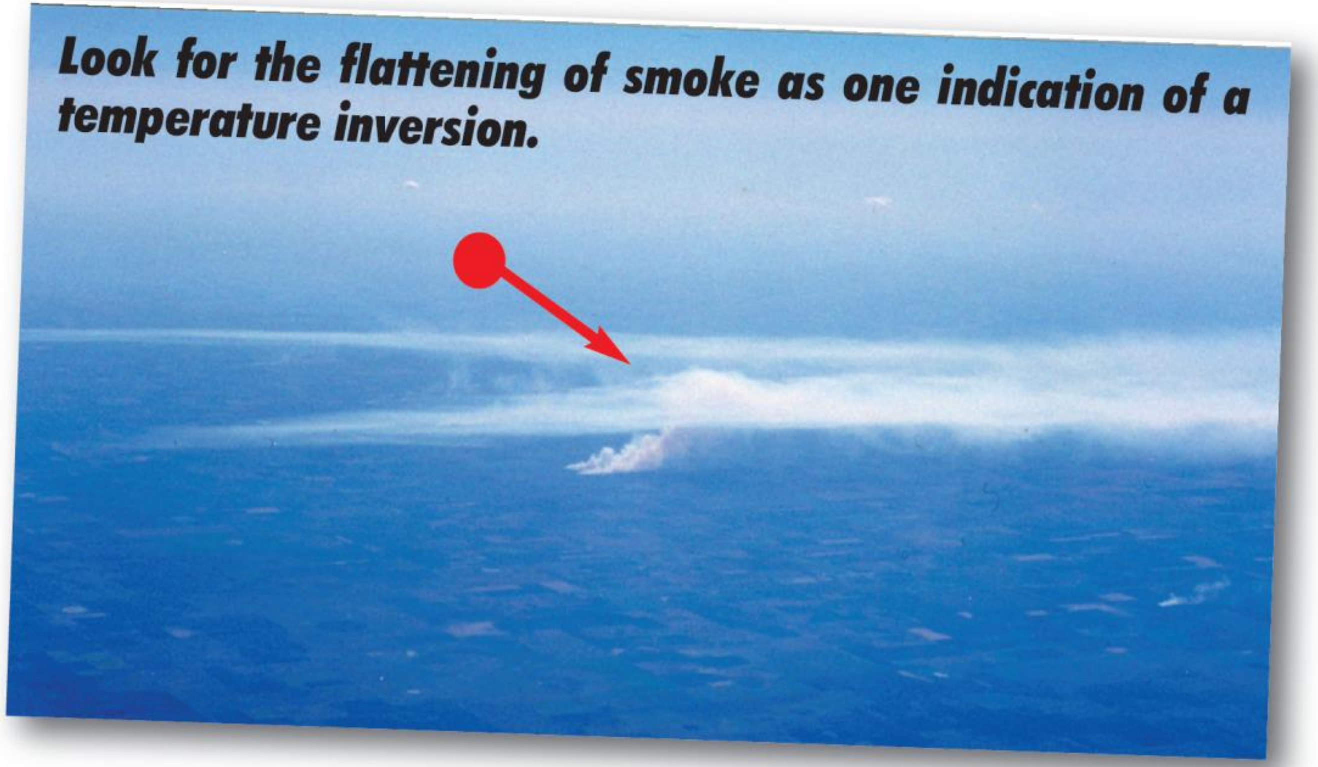
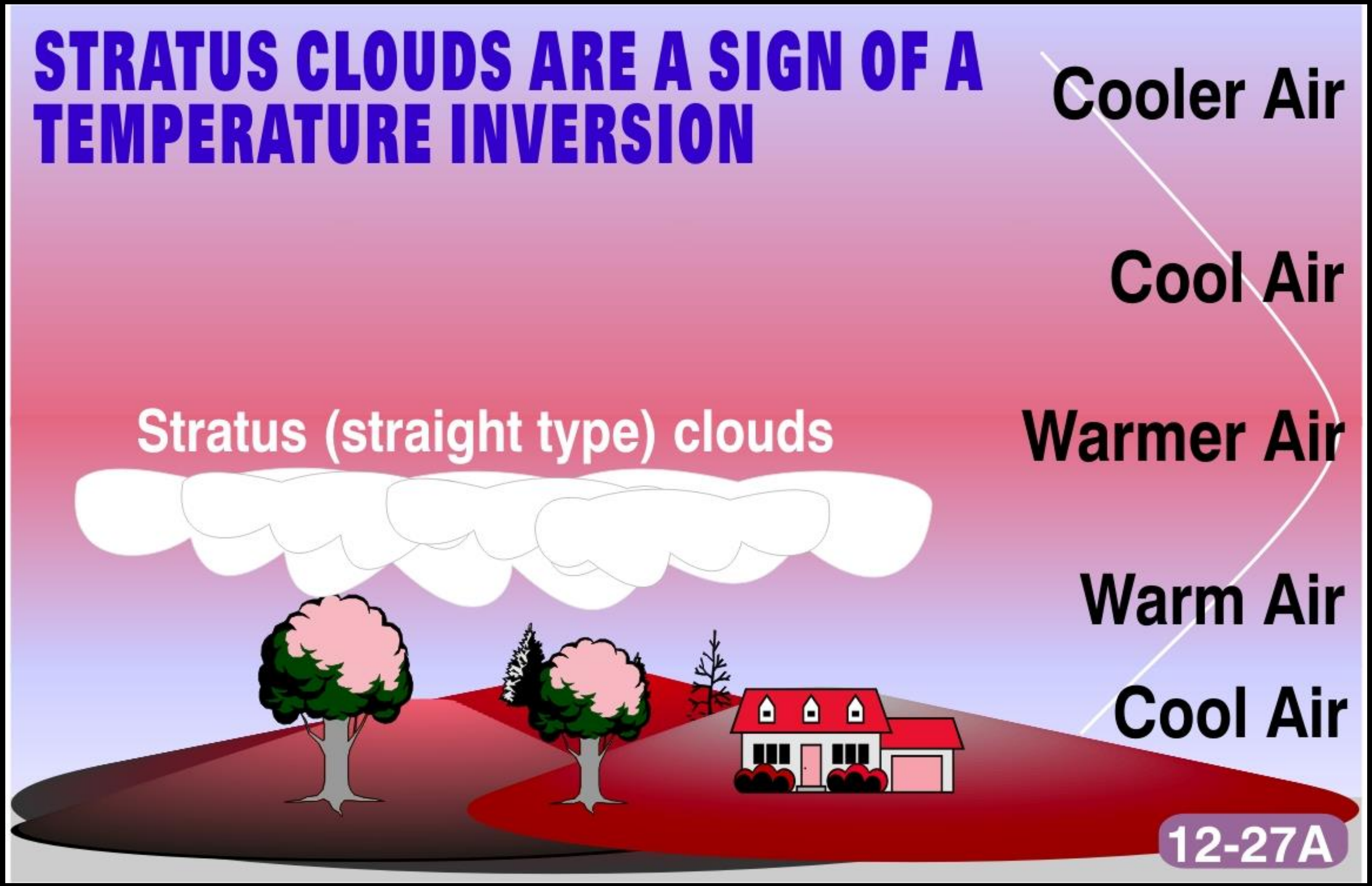
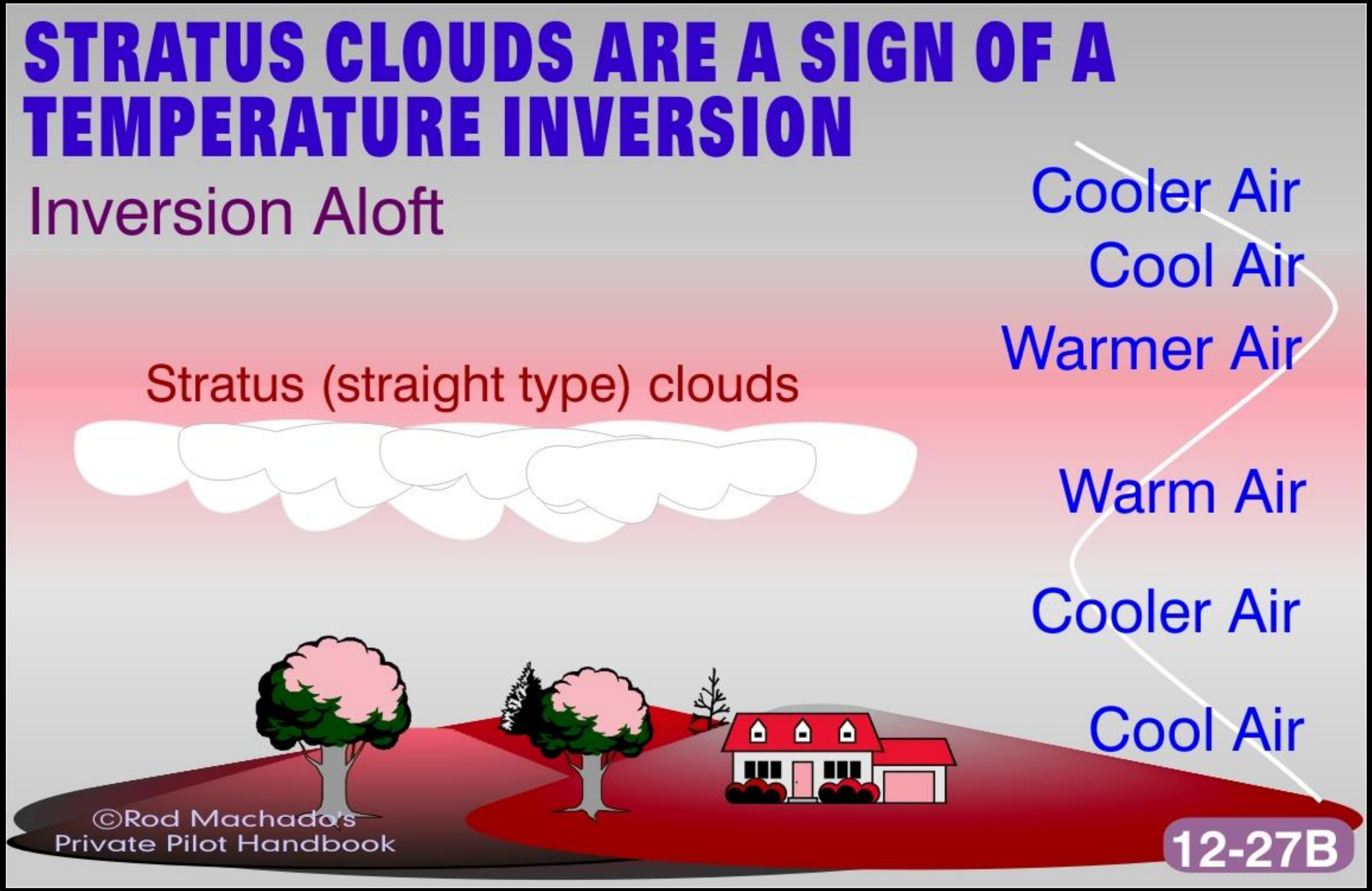


Surface Inversion Signs

- Temperature inversion acts to flatten cloud tops.
- As warm parcels of air rise, expand, and cool they may eventually form clouds
- The inversion acts like a lid that keeps these rising parcels from ascending into the warmer air of the inversion
- Layer-type clouds (stratus) are a visible indication of a temperature inversion



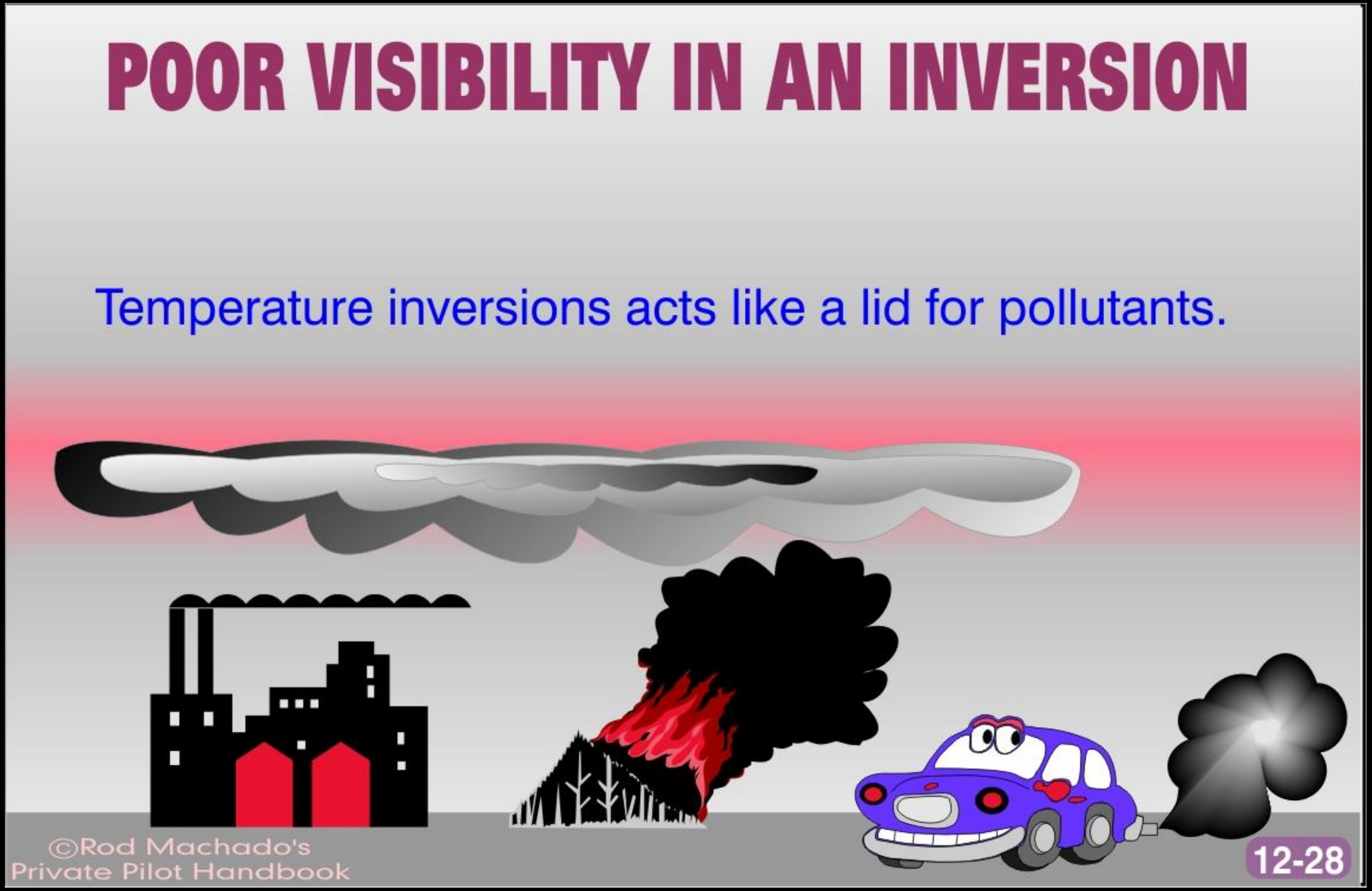
Inversion Aloft Signs



- Layer-type clouds (stratus) are a visible indication of a temperature inversion

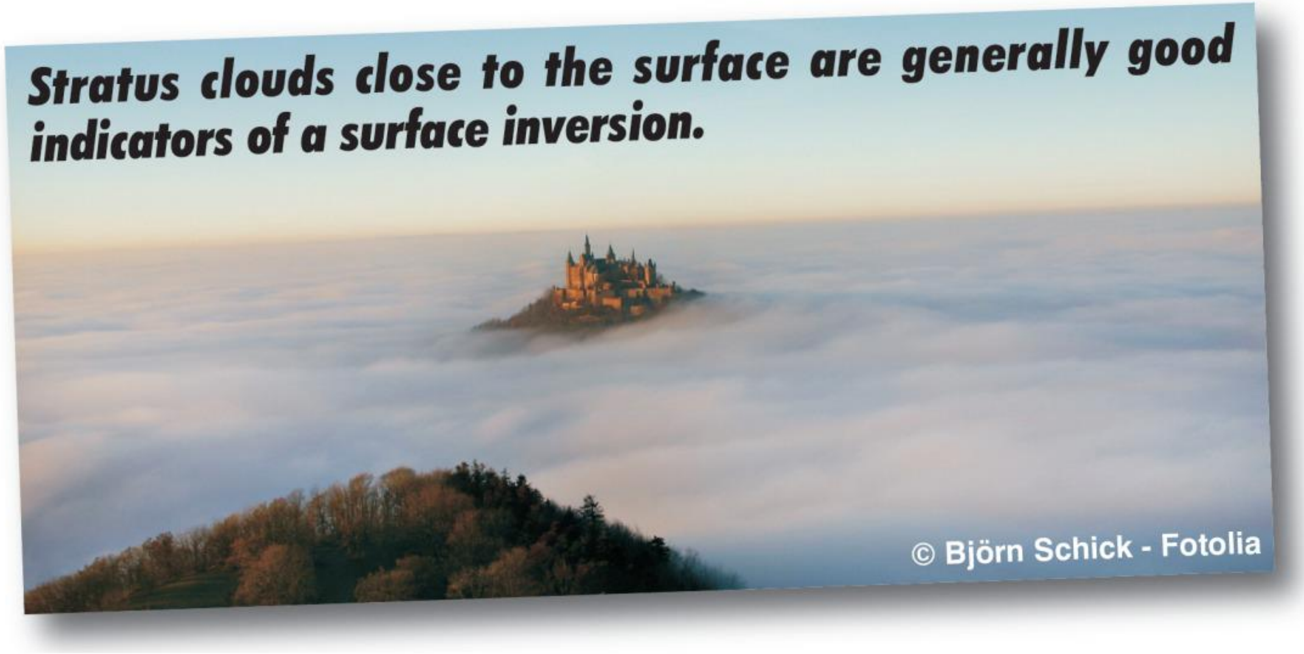
Inversion Effects on Visibility

- The inability of smoke, haze or pollution to move vertically and be carried away by winds at higher altitudes reduces the local flight visibility



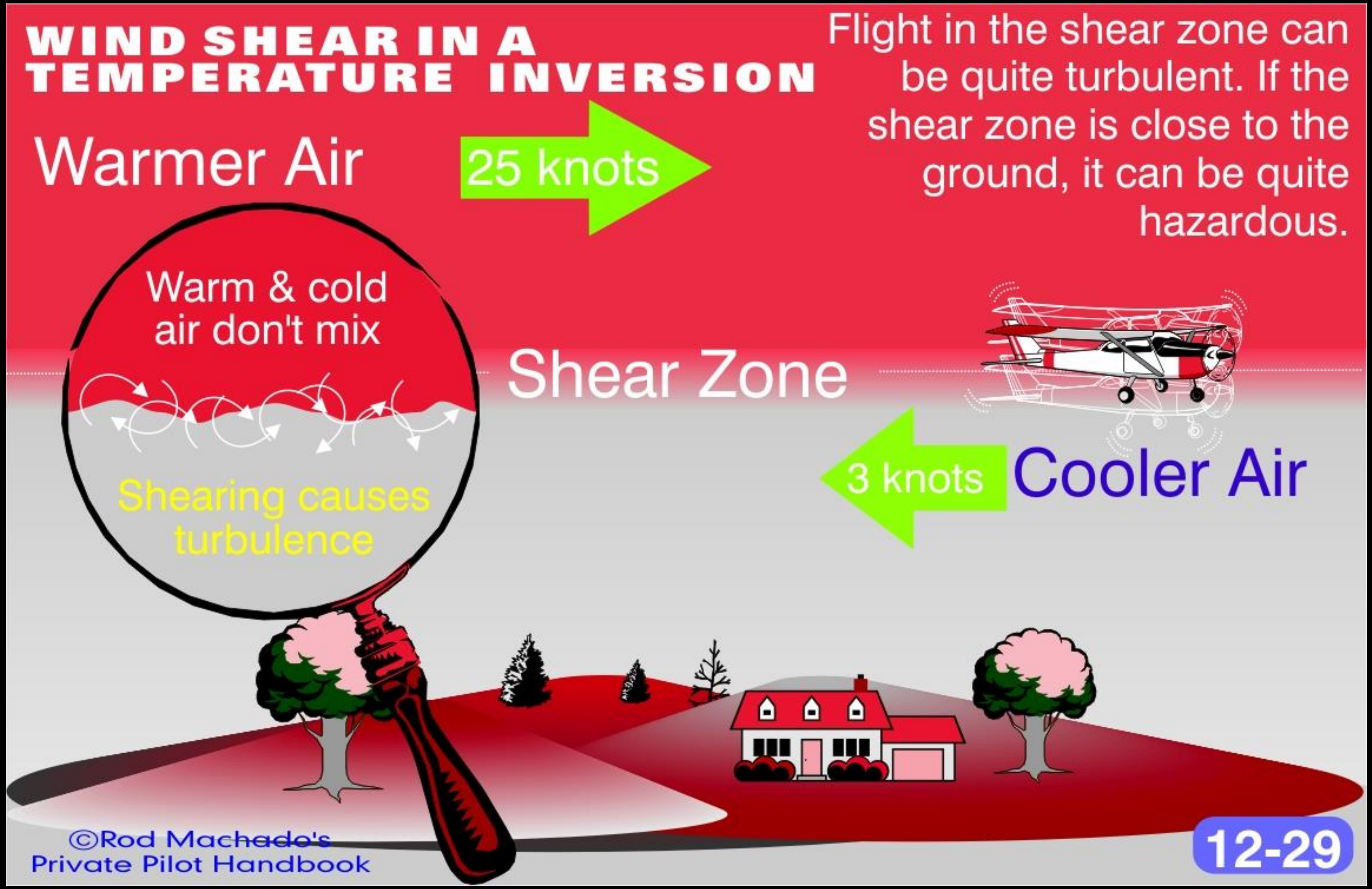
Flight Conditions In Inversions

- Inversions mean an increase in the likelihood of cloud formation
- Since cool air exists at the surface, the air might start to condense, forming fog or low clouds

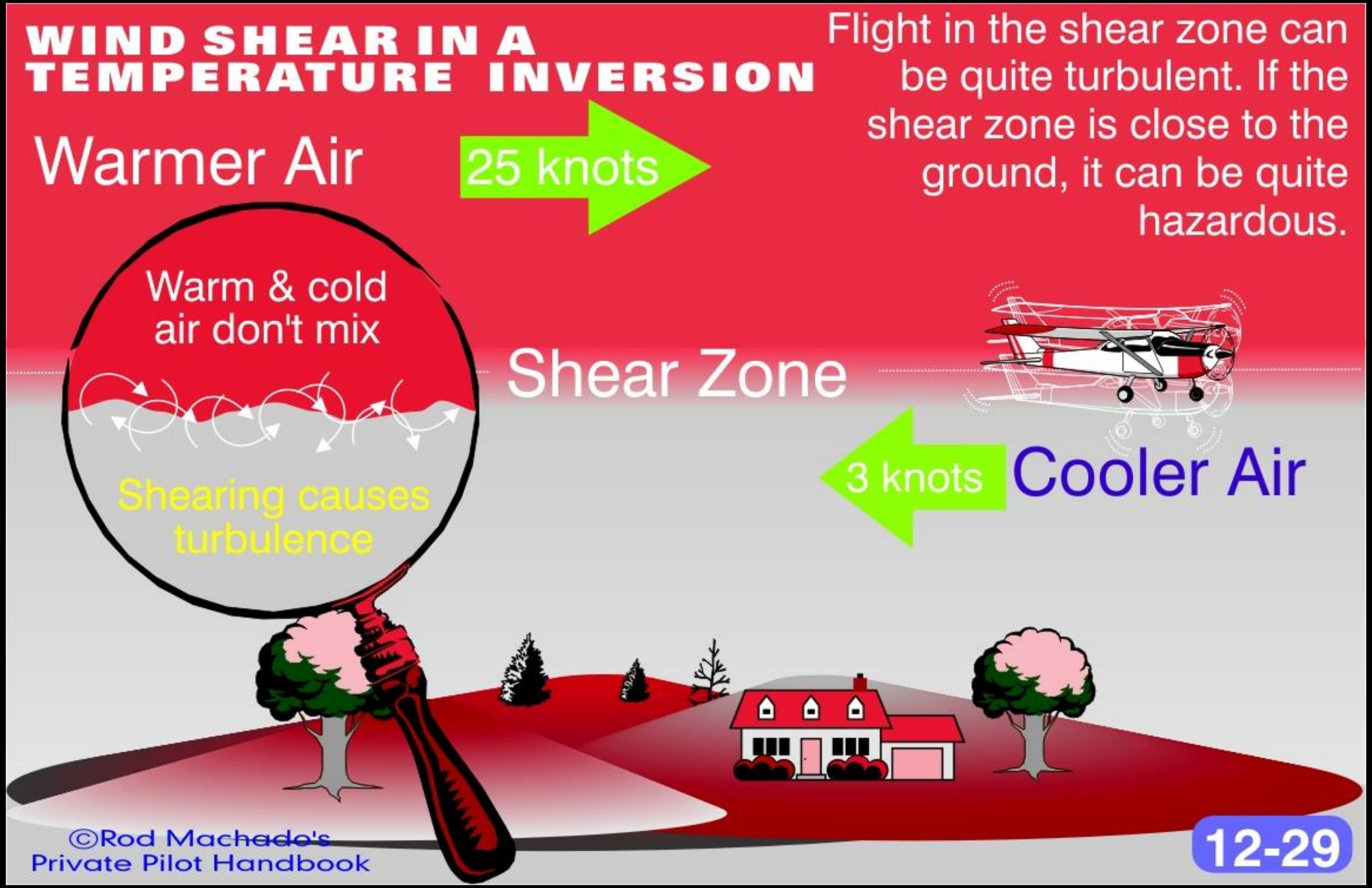


Inversion Induced Wind Shear

- Inversions can indicate the presence of low-level wind shear
- An inversion can allow a warmer, faster layer of air aloft to move unrestricted by surface friction
- Since warmer and colder air are of different densities, they do not mix
- The warmer air aloft slips across the top of the cooler air, creating the formation of a low-level jet stream



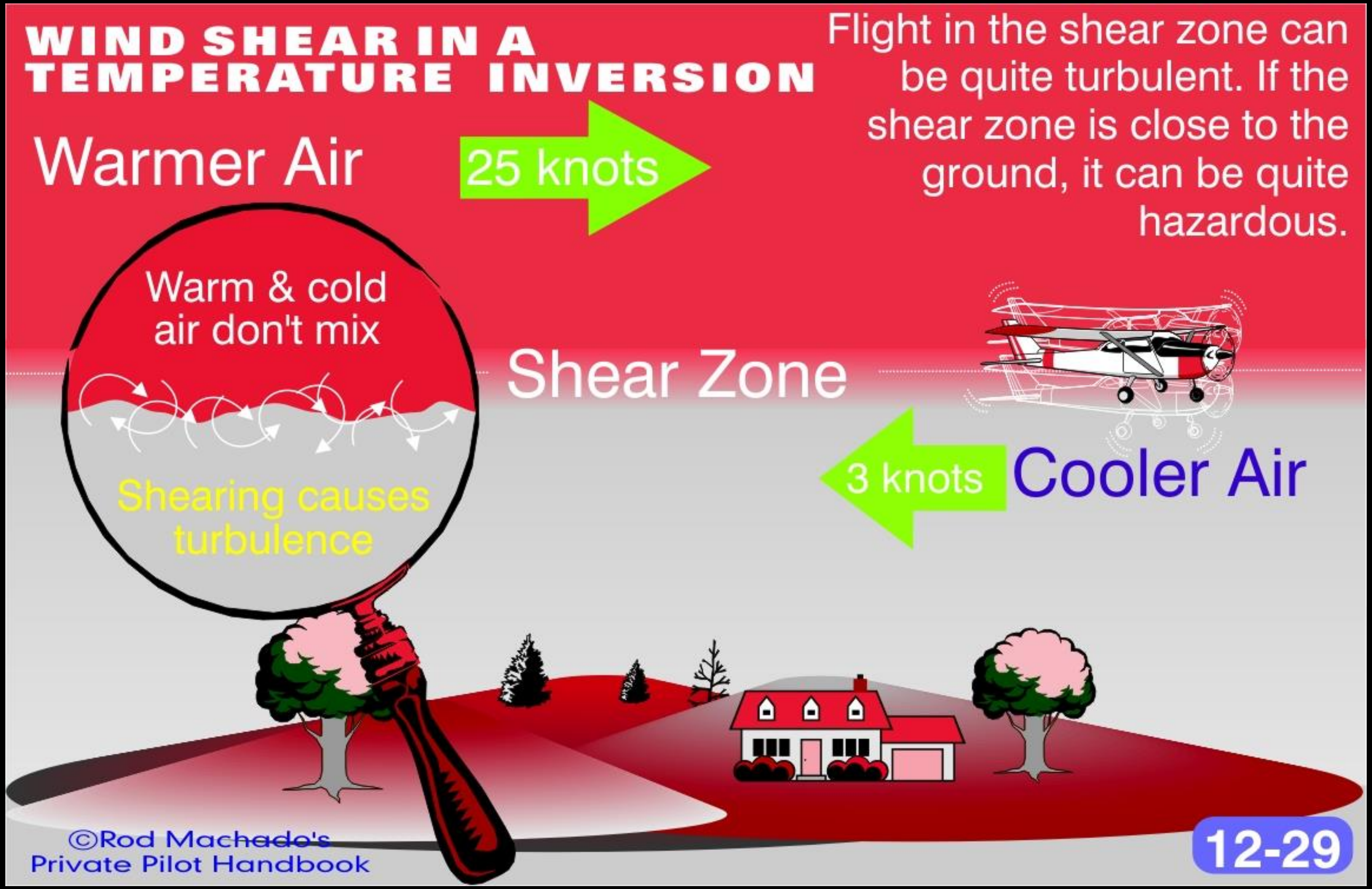
Inversion Induced Wind Shear



- Air within a few hundred to a few thousand feet above the surface can be moving at speeds up to 100 MPH
- If surface winds are calm and winds at a few hundred to a few thousand feet AGL are in the 25-knot range, wind shear is probable

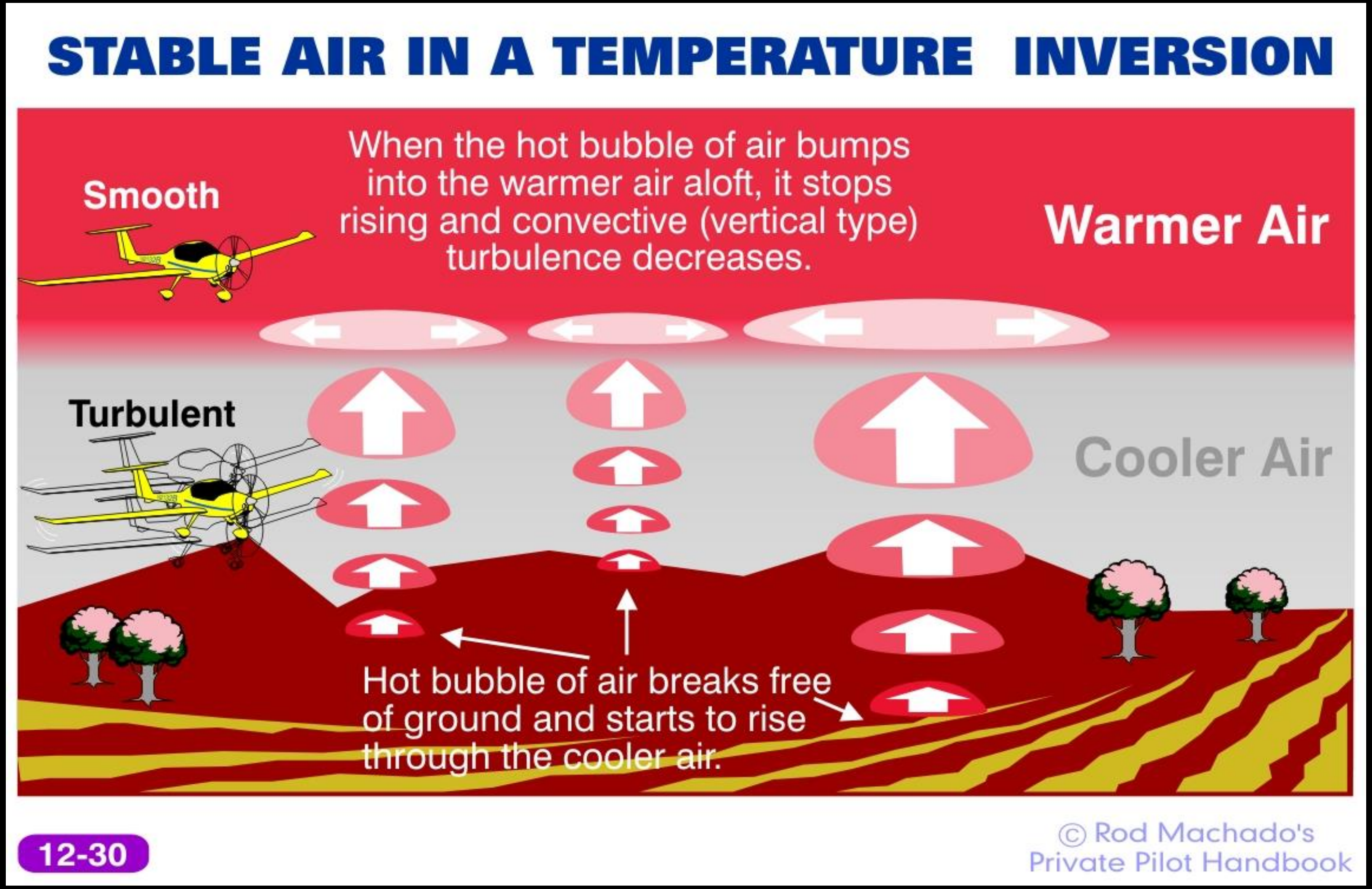
Inversion Induced Wind Shear

- Wind shear is a condition where the velocity and/or direction of the wind changes drastically over a small distance
- Wind shear can occur at all altitudes and in all directions and result in a sudden loss of lift



Stability

- Stability is the tendency of the atmosphere to resist vertical motion
- An inversion impedes the ascension of warmer air in the atmosphere
- Small parcels of warm air attempt to rise but they cannot ascend into the increasingly warmer layers of air aloft
- The atmosphere becomes smoother because the warm parcels of air stop rising



Knowledge Check

All of the Earth's weather is due to

A. The planet's rotation
B. Uneven heating of the surface
C. Upper air circulation
D. Frontal movement

Knowledge Check

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Knowledge Check

Stability of an atmosphere is a measure of?

A. Cloud formation type
B. Atmospheric moisture content
C. Turbulence type
D. Temperature lapse rate

Knowledge Check

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A. ~~Cloud formation type~~
B. ~~Atmospheric moisture content~~
C. ~~Turbulence type~~
D. Temperature lapse rate

Knowledge Check

Generally speaking, wind flow from which direction in Florida?

A. North
B. South
C. East
D. West

Knowledge Check

Generally speaking, wind flow from which direction in Florida?

A. ~~North~~
B. ~~South~~
C. East
D. ~~West~~