



EAA Chapter 100 March 2021 Newsletter

<http://eaa100.org>

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EAA Chapter 100 is a nonprofit association involved in the promotion of aviation through adult and youth education, hands-on training, building and maintenance of experimental aircraft, and through community awareness programs.

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Reader submissions and comments are strongly encouraged.



EARTH-ATMOSPHERE HEAT IMBALANCES

-- FAA Advisory Circular 00-6B

CHAPTER 4.

4.1 Introduction. Weather is not a capricious act of nature, but rather the atmosphere's response to unequal rates of radiational heating and cooling across the surface of the Earth and within its atmosphere. The absorption of incoming solar radiation causes heating, while the emission of outgoing terrestrial radiation causes cooling. However, imbalances in the rate of heating and cooling create temperature gradients. (A gradient describes the rate of change of a feature (in this case temperature) per unit of distance.) Atmospheric circulations and weather are the atmosphere's never-ending attempt to redistribute this heat and achieve equilibrium.

4.2 The Earth-Atmosphere Energy Balance. The Earth-atmosphere energy balance is the balance between incoming energy from the sun (solar radiation) and outgoing energy from the Earth (terrestrial radiation), as seen in Figure 4-1. When solar radiation reaches the Earth, some is reflected back to space by air (8 percent), clouds (17 percent), or the surface (6 percent). Some is absorbed by water vapor/dust/ozone (19 percent) or by clouds (4 percent). The remainder is absorbed by the Earth's surface (46 percent).

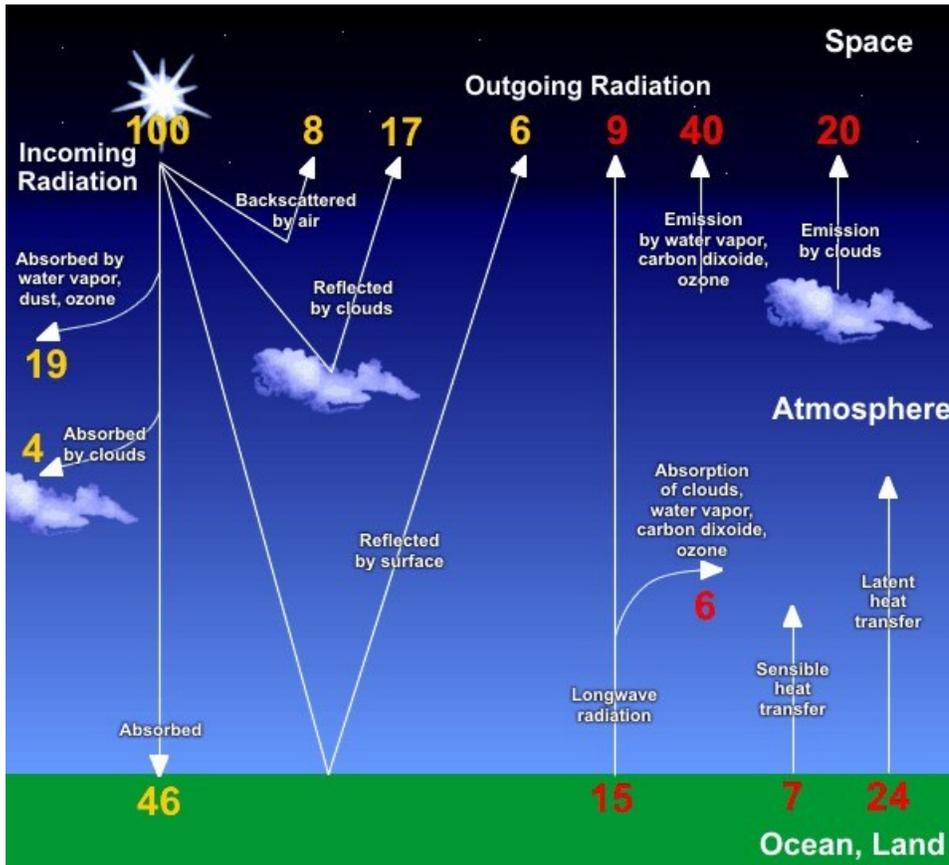
However, since the Earth is much cooler than the sun, its radiating energy is much weaker (long wavelength) infrared energy. We can indirectly see this energy radiate into the atmosphere as heat (e.g., rising from a hot road, creating shimmers on hot sunny days). The Earth-atmosphere energy balance is

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achieved as the energy received from the sun (solar radiation) balances the

Figure 4-1. Earth-Atmosphere Energy Balance



nights when the sky is overcast (see Figure 4-2). Heat energy from the Earth can be trapped by clouds, leading to higher temperatures as compared to nights with clear skies. The air is not allowed to cool as much with overcast skies. Under partly cloudy skies, some heat is al-

lowed to escape, and some remains trapped. Clear skies allow for the most cooling to take place.

4.3 Heat Imbalances Between Earth's Surface and the Atmosphere. The Earth-atmosphere energy balance numbers (see Figure 4-1) indicate that both sensible heat (7 percent) and latent heat (24 percent) processes transfer heat from the Earth's surface into its atmosphere. Both processes are necessary to prevent the Earth's surface from continually heating up and the atmosphere from continually cooling down.

4.3.1 Sensible Heating. Sensible heating involves both conduction and convection. It occurs due to differences in air density. Warm air is less dense than cool air.

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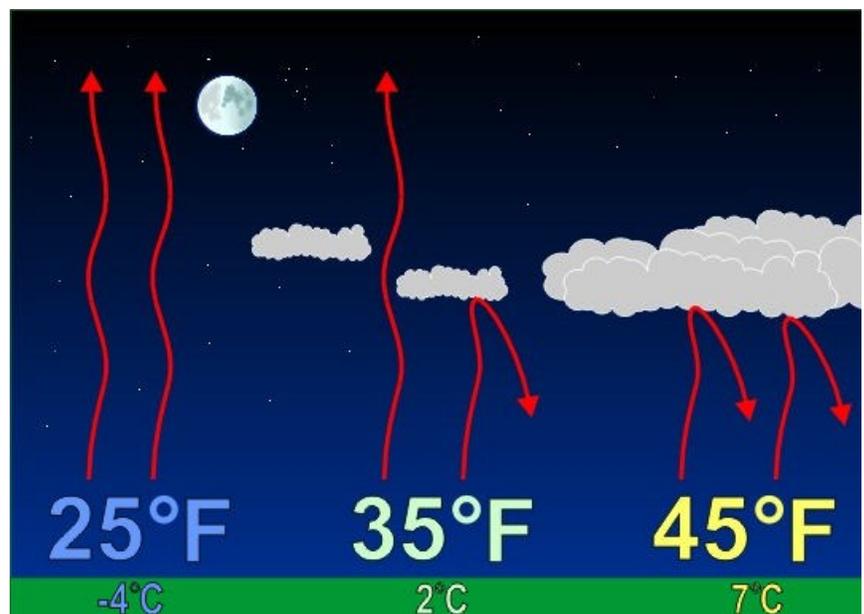
100 units of incoming radiation from the sun is balanced by 100 units of outgoing radiation from the Earth.

energy lost by the Earth back into space (terrestrial radiation). In this way, the Earth maintains a stable average temperature.

The absorption of infrared radiation trying to escape from the Earth back to space is particularly important to the global energy balance. Energy absorption by the atmosphere stores more energy near its surface than it would if there was no atmosphere. The average surface temperature of the moon, which has no atmosphere, is -18 °C (0 °F). By contrast, the average surface temperature of the Earth is 15 °C (59 °F). This heating effect is called the greenhouse effect.

Greenhouse warming is enhanced during

Figure 4-2. Greenhouse Effect on Nighttime Radiational Cooling



Secretary Comments

-- Jeff Hanson

EAA Chapter 100

Chapter 100 meeting 02-12-21

Here are my notes from the February meeting:

- 10 chapter members and 1 guest were present. With the bitter cold temperatures, it was great to see as many people in attendance as there were.
- AirVenture was discussed. EAA is working on changes to accommodate COVID safety. We all hope it goes on as scheduled.
- Member round table discussion followed until meeting adjournment.

Respectfully submitted,

Jeff Hanson

Chapter Secretary

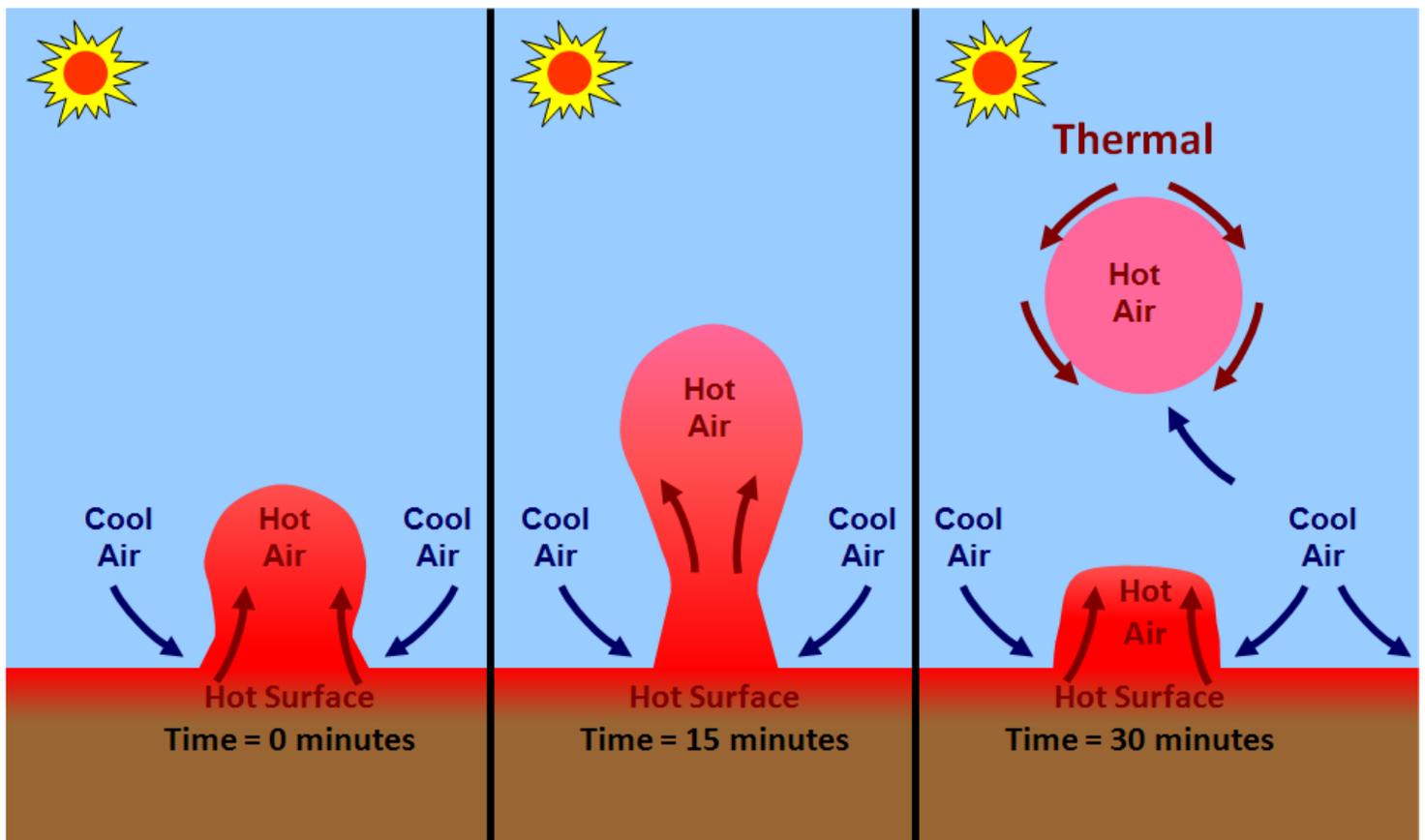
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On warm sunny days, the Earth's surface is heated by incoming solar radiation or insolation. However, the heating is somewhat uneven because certain areas of the Earth's surface absorb more heat from the sun than others. Heat is conducted from the relatively warm ground to the cooler overlying air, which warms a shallow layer of air near the ground. The heated air expands, becomes less dense than the surrounding cooler air, and rises. Through this process, a large bubble of warm air called a thermal rises and transfers heat energy upwards (see Figure 4-3). Cooler, denser air sinks toward the ground to replace the rising air. This cooler air becomes heated in turn, rises, and repeats the cycle.

In this manner, convection transports heat from the Earth's surface into the atmosphere. Because air is a poor conductor of heat, convection is much more important than conduction as a heat transport mecha-

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Figure 4-3. Development of a Thermal



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nism within the atmosphere.

Figure 4-4. Example of Convection in the Atmosphere



4.3.2 Latent Heat. The phase transition of water and associated latent heat exchanges are largely responsible for transferring the excess heat from the surface of the Earth into its atmosphere. As the Earth's surface absorbs radiation, some of the heat produced is used to evaporate (vaporize) water from oceans, lakes, rivers, soil, and vegetation. The water absorbs heat energy due to the latent heat of vaporization. Some of this water vapor condenses to microscopic water droplets or deposits as ice crystals that are visible as clouds. During cloud formation, the water vapor changes state, and latent heat is released into the atmosphere. During this process, the excess heat is transferred from the Earth's surface into its atmosphere.

4.4 Heat Imbalance Variations with Latitude. Global imbalances in radiational heating and cooling occur not only vertically between the Earth's surface and its atmosphere, but also horizontally with latitude. Since the Earth is essentially spherical, parallel beams of incoming solar radiation strike lower latitudes more directly than higher latitudes (see Figure 4-5); that is, the solar zenith angle is lower, and the sun is more directly overhead in equatorial regions than at the poles. At higher latitudes, solar radiation is spread over a larger area and is less intense per unit surface area than at lower latitudes. Thus, the Earth absorbs more solar radiation at lower latitudes than higher latitudes, which creates

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Check Your Data

-- Dick Fetcher



Think the data in your favorite EFB program is correct? Trust it? Maybe you should check to make sure that trust is deserved.

By
Frank Bowlin

Published: December 28, 2019 Updated: March 2, 2021



One of the routes I fly frequently is from my home base in Santa Fe, NM, to the San Francisco Bay Area. Now, the Bay Area isn't known to be particularly inexpensive for anything, but if you shop around you can find not-completely-unreasonable fuel prices. Most times when I'm going that way, my destination is Bryon, CA, C83, because it consistently has the lowest fuel prices in the area.

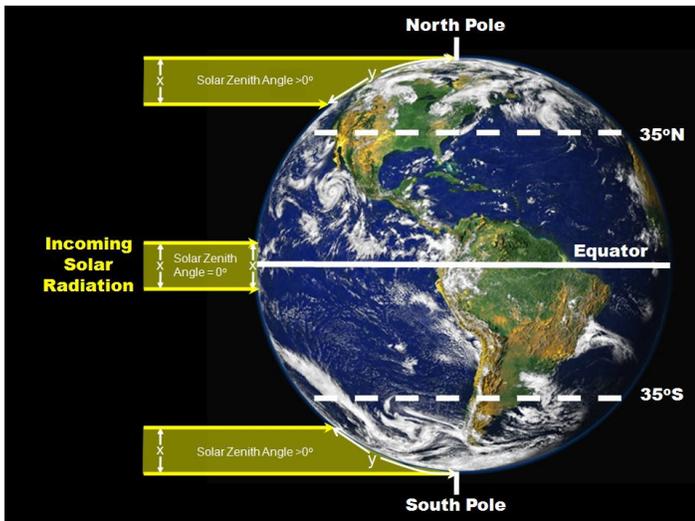
In fact, my trips to the Bay Area are frequent and consistent enough that I've got a stored route: KSAF-PUMPS-KITTN-KATTS-ECA-C83. And, that's where the trouble began on my latest trip.

Editor: Full article is in [IFR Magazine](#). The above problem started with a stored flight plan in the Garmin GTN 650. ECA is a VOR that was discontinued by the FAA. RST will go away also. According to Dick Fetcher, good luck getting a VOR check not too far into the future. Please see [AIM Section 1-1-3. VHF Omni-directional Range \(VOR\)](#)

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heat imbalances and temperature gradients between the Equator and the poles.

Figure 4-5. Solar Zenith Angle Variations with Latitude



The emission of terrestrial radiation also varies by latitude, but less so than the absorption of solar radiation. Terrestrial radiation emission decreases with increasing latitude due to a drop in temperature with latitude. Thus, at higher latitudes, the annual rate of cooling exceeds the rate of warming, while the reverse is true at lower latitudes.

Editor: The full article is in advisory circular [AC 00-6B](#).

This advisory circular (AC) was published by the Federal Aviation Administration (FAA) Flight Standards Service (AFS), with contributions from the National Weather Service (NWS).

COVID-19 Vaccination

-- FAA

Holders of FAA-issued Airman Medical Certificates or Medical Clearances may receive the single dose Johnson & Johnson’s Janssen COVID-19 vaccine; however, a 48-hour “No Fly/No Safety-Related Duty” interval must be observed after the injection.

Editor: Information taken from <https://www.faa.gov/news/updates/?newsId=94991>

Newsletter Editor

-- Art Howard

Spring is just around the corner. This is a welcome relief from the cold snap we had with subzero temperatures this winter. The warm temperature we are now experiencing is just a teaser for the coming spring. We can expect more snowfalls, but hopefully they quickly melt.

Stanton Airfield closed their runways effective February 27 through March 5. All runways were closed by NOTAM. I am not sure why it was closed this early. Grass fields become unusable for a period of time each spring when the frost comes out of the ground. The snow has been melting but the ground is still frozen. I enjoy flying into Stanton Airfield with their grass runways and friendly staff. Try it sometime when the runways are open.

I put an excerpt from AC 00-6B in this edition of our EAA Chapter 100 newsletter. Some food for thought for our members that did not fly during the winter. Spring weather brings stronger winds, rain, and thunderstorms. A good basic understanding of weather is a pilot’s best friend when understanding when a flight should be scrubbed because of weather. Understanding weather that exceeds the capabilities of the pilot and/or aircraft is very important. Good pilots understand that weather can be a real challenge and they stay away from weather that can cause problems.

If interested, keep your calendars open for May 21 and 22 for GMAG (Greater Minnesota Aviation Gathering) at the Buffalo Municipal Airport (KCFE), Buffalo, MN. The Gathering will be Covid-Safe and will feature educational sessions and a variety of vendors of aviation-related products. The “Hangar Flying” sessions will cover a broad range of timely topics, including seaplane operations, survival techniques, VFR and IFR flight operations, Minnesota aviation history, winter operations, engine maintenance, owner assisted maintenance, how we can better work with our local and state governments...and much more!

Submissions to this newsletter are welcome from EAA Chapter 100 members. Please send articles and pictures to newsletter@eaa100.org.

Your newsletter editor, Art Howard

Items for Sale

Editor: Please send me a description and photo, if you have one, and I will place your for sale item here.



Saturday night air show at AirVenture

URL: <https://www.eaa.org/airventure/eea-airventure-news-and-multimedia/airventure-photos>

Editor: The airspace depicted below shows where you need ADS-B out. There is a lot of airspace where you **do not need** ADS-B out, including KRST and KTOB. ([FAA](#))

Editor: This is from the EAA Young Eagles **Pilot Guidelines** brochure: **Pilot Requirements**

The Young Eagles pilot requirements are basic, but **MUST** be followed.

- ◆ Be a current EAA® member and hold an appropriate airman's certificate (sport pilot or greater)
- ◆ Possess a current medical certificate (if applicable)
- ◆ Be current to carry passengers in the aircraft you plan to use
- ◆ Have a current flight review
- ◆ Complete the Young Eagles registration form before the flight, including parent or legal guardian signature, and pilot signature
- ◆ Conduct flights in an aircraft that is in airworthy condition
- ◆ Have aircraft passenger liability insurance for the aircraft used (owned, rented, or borrowed)
- ◆ Adhere to all applicable Federal Air Rules (FARs)
- ◆ Complete both the online training and basic background check as a part of EAA's Youth Protection Policy. For more information, visit [EAA.org/YouthProtection](https://www.eaa.org/YouthProtection).

Editor: Make sure you are current to fly Young Eagles at the EAA Chapter 100 Young Eagles events next summer in 2021. Hopefully, this event will occur next year.

