Salt Lake City Department of Airports

GENERAL AVIATION NEWS

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KNOW AND FOLLOW THE RULES

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Soon after the Wright brothers' first flight on December 17, 1903, flight rules began to be published. In 1919, flying regulations for the U.S. Army Air Service included the following:

1. Never leave the ground with the motor leaking.
2. Pilots should carry hankies in a handy position to wipe off goggles.
3. Do not trust altitude instruments.
4. Hedge hopping will not be tolerated.
5. Aviators will not wear spurs while flying.
6. You must not takeoff or land closer than 50 feet to the hangar.
7. Joy rides will not be given to civilians.
8. It is advisable to carry a good pair of pliers in a position where both pilot and passenger can use them in case of an emergency.

While the above rules may seem comical when compared with today's flight requirements, they were considered very important at the time. A flight rule that has recently gained significant FAA attention is the requirement to include aircraft identification in all read-backs and acknowledgments. Controllers need your call sign.

Use of the aircraft identification helps controllers ensure the correct aircraft received the clearance or instruction. Confirming aircraft identification in read-backs and acknowledgements becomes very important as radio frequency congestion increases and when aircraft with similar call signs are on the same frequency. When a controller receives a read-back of instructions that does not include the aircraft identification, the controller cannot assume that the correct pilot acknowledged the instruction. Controllers need your call sign.

The rationale for requiring a clear and accurate read back of an altitude or heading assignment is easy to understand. Controllers must place an equal value on a good read back of the aircraft identification. Please let me repeat… they need your call sign!

UNDERSTANDING AIR DENSITY AND ITS EFFECTS

By Jack Williams, USATODAY.com

In simple terms, density is the mass of anything - including air - divided by the volume it occupies.

In the metric system, scientists usually measure density in terms of kilograms per cubic meter.

The air's density depends on its temperature, its pressure and how much water vapor is in the air. Let's address dry air first; which means we're concerned only with temperature and pressure.

In addition to a basic discussion of air density, we will also describe how humidity affects air density – one might be surprised – and the affects of air density on aircraft.

The molecules of nitrogen, oxygen and other gases that make up air are moving around at incredible speeds, colliding with each other and all other objects. The higher the temperature, the faster the molecules are moving. As the air is heated, the molecules speed up, which means they push harder against their surroundings.

If the air is in a balloon, heating it will expand the balloon, cooling it will cause the balloon to shrink as the molecules slow down. If the heated air is surrounded by nothing but air, it will push the surrounding air aside. As a result, the amount of air in a particular "box" decreases when the air is heated if the air is free to escape from the box. In the free atmosphere, the air's density decreases as the air is heated.

Pressure has the opposite effect on air density.

Increasing the pressure increases the density. Think of what happens when you press down the handle of a bicycle pump. The air is compressed (and more dense). Therefore the density increases as pressure increases.

Altitude and weather systems can change the air's pressure. As you go higher, the air's pressure decreases from around 1,000 millibars at sea level to 500 millibars at around 18,000 feet. At 100,000 feet above sea level the air's pressure is only about 10 millibars. Weather systems that bring higher or lower air pressure also affect the air's density, but not nearly as much as altitude.

We see that the air's density is lowest at a high elevation on a hot day when the atmospheric pressure is low, say in Salt Lake City when a storm is moving in on a hot day. The air's

density is highest at low elevations when the pressure is high and the temperature is low, such as on a sunny but extremely cold, winter's day in Montana.

Humidity and air density

Most people who haven't studied physics or chemistry find it hard to believe that humid air is lighter, or less dense, than dry air. How can the air become lighter if we add water vapor to it?

Scientists have known this for a long time. The first was Isaac Newton, who stated that humid air is less dense than dry air in 1717 in his book, *Optics*. But, other scientists didn't generally understand this until later in that century.

To see why humid air is less dense than dry air, one must turn to one of the laws of nature the Italian physicist Amadeo Avogadro discovered in the early 1800s. In simple terms, he found that a fixed volume of gas, say one cubic meter, at the same temperature and pressure, would always have the same number of molecules no matter what gas is in the container. Most beginning chemistry books explain how this works.

Imagine a cubic foot of perfectly dry air. It contains about 78% nitrogen molecules, which each have a molecular weight of 28 (2 atoms with atomic weight 14). Another 21% of the air is oxygen, with each molecule having a molecular weight of 32 (2 atoms with atomic weight 16). The final one percent is a mixture of other gases, which we won't worry about.

Molecules are free to move in and out of our cubic foot of air. What Avogadro discovered leads us to conclude that if we added water vapor molecules to our cubic foot of air, some of the nitrogen and oxygen molecules would leave — remember, the total number of molecules in a cubic foot of air stays the same.

The water molecules, which replace nitrogen or oxygen, have a molecular weight of 18 (one oxygen atom with atomic weight of 16, and two hydrogen atoms each with atomic weight of 1). This is lighter than both nitrogen and oxygen. In other words, replacing nitrogen and oxygen with water vapor decreases the weight of the air in the cubic foot; that is, it's density decreases.

Wait a minute, you might say, "I know water's heavier than air." True, liquid water is heavier, or more dense, than air. But, the water that makes the air humid isn't liquid. It's water vapor, which is a gas that is lighter than nitrogen or oxygen.

Compared to the differences made by temperature and air pressure, humidity has a small effect on the air's density. But, humid air is lighter than dry air at the same temperature and pressure.

So what? The higher the altitude and/or temperature, the less dense the air and the less lift can be produced on a lifting surface (wing, propeller, or rotor blade). So be careful out there this summer with the higher density altitudes (DA). An on-line DA calculator found at; http://www.srh.noaa.gov/epz/?n=wxcalc_densityaltitude

HELPFUL POINTS OF CONTACT

For GA operations, facilities maintenance, aviation newsletter, airfield, and SLC Title 16 questions contact: Steve Jackson, SLCDA General Aviation Manager, (801) 647-5532 or e-mail at steve.jackson@slcgov.com.

For hangar lease and repair questions: Matt Jensen, Airport Properties Specialist at (801) 575-2957 or e-mail him at matthew.jensen@slcgov.com.

For aviation security questions call: Connie Proctor at (801) 575-2401.
For gate access problems call: Airport Control Center at (801) 575-2401.

For emergencies call: at SLCIA, (801) 575-2911
at TVY or U42, 911 then **(**801) 575-2911

For other GA information call the GA Hotline: (801) 575-2443

SLCDA GA NEWS ELECTRONIC OPTION

If you would like to receive the Salt Lake City Department of Airports' monthly general aviation newsletter by e-mail, send a request including your current e-mail address to: steve.jackson@slcgov.com

UPCOMING EVENTS AND NEWS

Leading Edge Aviation at South Valley Regional Airport **(U42)**, West Jordan, UT and at Logan – Cache Airport **(LGU)** hosts multiple events each month including breakfast fly-ins, dinners, and informative classes.

For more information about Leading Edge events, visit: www.leaviation.com

Spanish Fork/Springville Airport (U77) in Spanish Fork, UT will hold an open house tagged *Aeroplanes, Trains, & Automobiles* on **September 8th, 2012.** For more information about the open house, visit: www.u77airport.com

Garfield County Regional Airport, Rifle, CO (RIL) 7th Annual Air Show - July 13 – 14, 2012, "Remembering the Past, Inspiring the Future" featuring 1940's aviation genre aircraft. For more information visit: http://rifleairport.com/rifle_airport-air-show.aspx .

Reno National Championship Air Races are scheduled to be held September 12 – 16 this fall. For more information about the air races, air show, and open house visit: www.airrace.org .

JULY FAA PILOT SEMINARS

No Pilot Seminars are scheduled for July 2012

Upcoming activity and seminar information is available at: www.faasafety.gov under "Upcoming Seminars" or contact Rick Stednitz, FAA Safety Program Manager at (801) 257-5073

Safe summer flying!