

Aviation & Aircraft Instruments

You can fill out this worksheet as we go along to get the most out of time together, or you can use it as a review exercise at the end of the class to see where your strengths are.

What we're going to cover today:

- Air pressure
 - Avionics
 - Turn coordinator
 - Heading indicator
 - Airspeed indicator
 - Altimeter
 - Attitude indicator
 - Vertical Speed indicator
 - Preflight
 - Weather Briefing
-

Write down two things you really want to know about aviation:

1. _____

2. _____

Do this NOW: Write down WHY you want to learn about the things you mentioned above. What will it give you, or provide you with, or make possible for you if you now understand these things that you wanted to learn?

IMPORTANT: During class, you can either fill out the worksheet, OR just set it aside and fill it out after class is over so you can enjoy watching the class.

Answer key is on the last page, so put it in a place where you won't be tempted to peek at the answers until after you've given it your best shot.

Material List for Experiments:

We will be doing experiments during and after class. Gather as many of the materials as you can. It's fine if you don't have everything. You will be able to choose from several different experiments, so pick experiments that you have the stuff for. If you do not have all of these materials, you can still fully participate.

(Asterisk () indicates the materials that are used again in other months)*

- balloon *
- block of foam *
- clean glass jar *
- drill with drill bits *
- empty soda cans (2) *
- food coloring *
- hair dryer *
- hot glue gun *
- clay (golf ball size) *
- index cards (10+) *
- lightweight plastic garbage bag *
- masking tape *
- paper, plastic or foam cups (4) *
- pencil with eraser on top *
- plastic bottle *
- popsicle sticks *
- rubbing alcohol *
- scissors *
- soup can *
- straws (25+) *
- *optional:* [sun print paper](#) or other paper sensitive to light
- tack or pin *
- tape *

Science Experiments: There are so many experiments to choose from! This month we are in Unit 20, so I put together a smaller set (below) to help get you started. You don't need to do all of them, just pick the ones you have time and materials for.

Week 30: Weather, Atmospheres (Unit 20)

- [Thermometer](#)
- [Hygrometer](#)
- [Anemometer](#)
- [Barometer](#)
- [Making Rain Clouds](#)
- [Hot Air Balloon](#)
- [Magic Water Glass Trick](#)
- [Soda Can Trick](#)
- [Squished Soda Can](#)
- [Cloud Tracker](#) (*optional*)

Name _____

During the Lesson:

You can look over the worksheet so you know what to listen for as you go through the class with me, or you can go through it along with me during class. OR... flip it over and forget about it and just enjoy the class. When class is over, flip it back over and fill it out and be amazed at how much you've picked up and learned!

1. Aviation is the _____ side of

aeronautics, including the design, production & operation of

2. A _____ checklist has tasks that are

performed by pilots before takeoff for flight safety.
3. During preflight, pilots will get the most recent

_____ from inside the airplane.
4. The basic six are the _____ indicator,

attitude indicator, vertical speed indicator, heading indicator, altimeter and turn

coordinator.
5. The airspeed indicator shows you how fast you're going by comparing

_____ from different sections on the

plane.
6. Altimeters display the _____ by

measuring air pressure levels.

7. The Vertical Speed Indicator (VSI) tells us how

_____ we're climbing or descending.

8. The Turn Coordinator detects yaw and

9. Attitude indicator senses _____ and

roll and shows where the ground is compared with your wing level.

10. The heading indicator is a compass we use that shows us which

_____ we are headed in.

11. What I didn't know about aviation until class today was:

Aviation & Aerospace Engineering Resource Recommendations

Welcome to our month on Aviation and Aerospace Engineering! Aerospace engineers design and develop aircraft and spacecraft. Aeronautical engineers focus on aircraft that fly through the Earth's atmosphere, and astronautical engineers are the "rocket scientists", dealing with spacecraft and rockets that operate both inside and outside of the atmosphere. Pilots fly both aircraft and spacecraft, and study aviation. Aviation includes fixed-wing (airplanes), rotary wing (helicopters), lighter-than-air (hot air balloons) and airships. We're going to learn about both sides: how to design and develop flying craft as well as how to fly.

I've put together a list of books that supplement our labs. The first thing you'll notice is a list of scientists that really made a contribution to the field. To be honest, there are hundreds of scientists that we could list here, so instead of overwhelming you with options, I will provide you with a few well-known scientists as well as some which may be new to you.

Take this list with you to your local library and see if you can find books, either biographical or historical, and enjoy reading and learning. I also see if I can find an autobiography, because I learn so much more about the scientist when they share their thoughts and tell me their personal story.

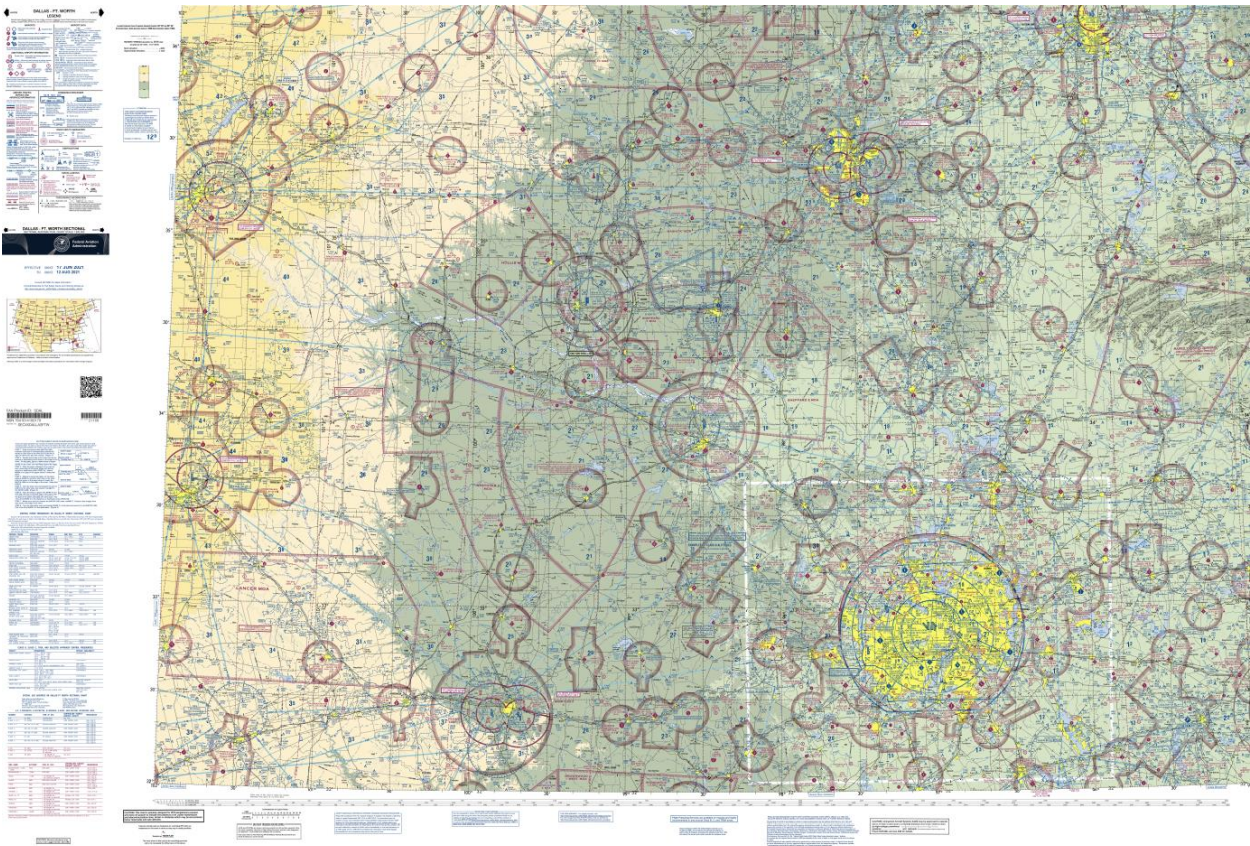
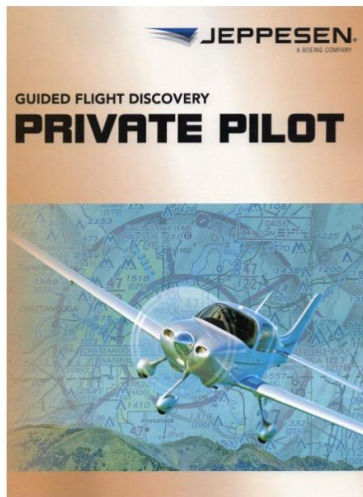
I also recommend skimming the bibliography or "suggested reading" list (usually listed near the back of a book). I've read some amazing books this way that I would never have found on my own. It's like following an unknown path through a forest on your nature walk!

List of Scientists/Engineers/Pilots:

1. Wright Brothers
2. Robert Goddard
3. Kelly Johnson
4. George Cayley
5. Hans von Ohain
6. Chuck Yeager
7. Patty Wagstaff
8. Charles Lindbergh
9. Bob Hoover
10. Jacqueline Cochran

Book Recommendations:

1. *Private Pilot* by Jeppesen (for students with a serious interest in aviation)
2. [Pilot's Handbook of Aeronautical Knowledge](#) (for serious interest in aviation)
3. *Experience Flight* by DK (for younger readers)
4. [Pilot Maps](#) (FAA Sectionals) also [download here](#)



Vocabulary Words:

Air pressure – Describes the weight of air molecules pressing down on the Earth.

Airflow – Describes the motion of air, particularly in relation to the surface of an object, such as an airplane.

Angle of attack – In aviation, it describes the angle (or difference of direction) between the airplane's reference line and the oncoming flow of air.

Atmosphere – Describes the layer of gas that surrounds a planet or other celestial body.

Aviation – The act, practice, or flying of airplanes.

Center of gravity – The point at which the entire weight of a body may be thought of as centered so that, if supported at this point, the body would balance perfectly.

Center of pressure – In regards to flight, the average location of where the force from air pressure is applied. It is where the forces of lift and drag are exerted.

Dihedral – In regards to flight, the upward angle of an aircraft's wings from root to tip, as viewed from directly in front of or behind the aircraft.

Drag – A force which tends to slow the movement of an object through a liquid or gas.

Fin – A flat part which sticks out of the body of an object such as an airplane or rocket which is intended to help control its movement.

Flaps – Hinged parts that the pilot adjusts to increase the size of the wing surface.

Flight instruments – Devices which give the pilot information about the aircraft, such as altitude and airspeed.

Force – Describes the push or pull exerted on an object.

Gravity - A force of attraction that pulls together all matter. The more matter something has, the greater the force of its gravity.

Great circle distance – The largest possible circle that can be drawn on a sphere, one that divides the sphere into equal halves. In navigation, great circles can be used to determine the shortest surface distance between two points on the Earth.

Lift – In aviation, the sum of all forces on a body that force it to move perpendicular to the flow of air.

Navigation – The process or activity of determining one's position and planning and following a route to a destination.

Pressure – The continuous physical force exerted on or against an object by something in contact with it.

Stability – In flight, describes condition of an airplane where it will keep going the same direction even when exposed to uneven air pressure.

Surface area – The measurement of all space that the surface of a three-dimensional shape takes up.

Thrust – A forced or push intended to accelerate (change direction or speed) an object.

Wing – A part of an animal, aircraft, or spacecraft intended to produce lift.

Answer key:

1. Aviation is the practical side of aeronautics, including the design, production & operation of aircraft.
2. A preflight checklist has tasks that are performed by pilots before takeoff for flight safety.
3. During preflight, pilots will get the most recent weather from inside the airplane.
4. The basic six are the airspeed indicator, attitude indicator, vertical speed indicator, heading indicator, altimeter and turn coordinator.
5. The airspeed indicator shows you how fast you're going by comparing air pressure from different sections on the plane.
6. Altimeters display the altitude by measuring air pressure levels.
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