Flying Aircraft and Drones

Session Time: Four, 50-minute sessions

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

Develop interest in one or more aviation/aerospace career pathways and learn what is required to pursue future employment in the industry. (EU3)

Understand the importance of professionalism, ethics, and dedication as they relate to all aviation/aerospace operations. (EU4)

Gain essential thought processes and life skills, such as good citizenship, critical thinking, informed decision making, which are useful to all learners, whether or not they eventually pursue a career in aviation. (EU8)

ESSENTIAL QUESTIONS

1. Why should I be a pilot?
2. What do you have to do to get paid to fly?

LEARNING GOALS

Students Will Know

- The many types of jobs that career aircraft and drone pilots can have
- The skills and abilities needed to be a successful career pilot
- The training and education required to become a career aircraft pilot or drone pilot

Students Will Be Able To

- *Describe* the process for becoming a career aircraft or drone pilot. (DOK-L2)
- *Summarize* the wide range of career opportunities for pilots. (DOK-L2)
- *Compare* personal strengths/interests against the many types of career aircraft and drone pilots. (DOK-L2)

ASSESSMENT EVIDENCE

Warm-up
Students will provide three reasons why someone would want to become an airline pilot and two challenges that might make an airline pilot's day, or life, challenging.

Formative Assessment

Students will explore flying opportunities outside of being a commercial airline pilot and learn what pilots in their assigned jobs do; demands of the flying jobs; the work environments; the kinds of aircraft and airports these pilots experience; the work schedules; and what makes particular flying jobs interesting, fun, or challenging.

Summative Assessment
Using an authentic context, students will work in small teams and present a professional flying job that interests them.

LESSON PREPARATION

MATERIALS/RESOURCES

- Flying Aircraft and Drones Presentation
- Flying Aircraft and Drones Student Activity 1
- Flying Aircraft and Drones Student Activity 2
- Flying Aircraft and Drones Teacher Notes 1
- Flying Aircraft and Drones Teacher Notes 2
- Flying Aircraft and Drones Teaching Aid 1
- Flying Aircraft and Drones Teaching Aid 2

LESSON SUMMARY

Lesson 1 - Flying Aircraft and Drones

To begin the lesson, students will provide reasons why someone would want to become an airline pilot and identify challenges that an airline pilot might face. In the next activity, students will pair up and explore one of many flying careers other than airline pilot.

At the beginning of the second session, students will learn how to become a commercial pilot. Lead a class discussion that will describe the certificates, licenses, and personal requirements needed to get paid to fly. If a simulator is available, lead students through their “first flying lesson.”

During the third session, students will learn the requirements to become a commercial drone pilot. A research activity will allow students to learn many different ways drones are used today for commercial purposes.

During the fourth session, a class discussion will teach students how they can receive the education and training they need to become commercial aircraft and drone pilots. The presentation also will cover job prospects, pay rates, the skills and abilities that commercial aircraft and drone pilots must have, and the challenges people face in the chosen careers.

As a summative assessment, students will work within an authentic context in small teams and present a professional flying job that interests them.

BACKGROUND

While the decision to become a career pilot is an easy one for many students, navigating the steps to become a career pilot is not as easy. There are many routes and options available to gain the training and experience to become a career aircraft pilot. It is a matter of acquiring aeronautical knowledge, flight proficiency, and experience.

To get paid to fly, an aircraft pilot must receive an FAA commercial pilot certificate. A commercial certificate is a qualification that permits the holders to act as pilots of aircraft and be paid for their work.

Students who are working toward becoming career pilots typically receive their licenses and ratings in the following order:

1. Student pilot certificate
2. Private pilot certificate
3. Instrument rating
4. Commercial pilot certificate
5. Multi-engine rating
6. Airline transport pilot certificate

Each certificate and rating requires that pilots pass a written exam, an oral exam, and a practical flying exam, usually called a check ride. In addition to earning these licenses, many pilots get their certified flight instructor (CFI) rating after they get their commercial certificate. The CFI rating helps them build flight time and experience more quickly and at less personal expense.

Career aircraft pilots can perform many different kinds of flying. These include airline pilot, cargo pilot, corporate pilot, military pilot, flight instructor, air ambulance pilot, law enforcement pilot, firefighting pilot, agricultural pilot, and more.

Commercial drone pilots need significantly less training. In fact, a commercial drone pilot only has to take a written exam (no oral or practical exam is required). The FAA recently created rules that allow drone pilots to fly and operate drones under 55 lbs. for commercial reasons (they can get paid). The certificate is referred to as a "Part 107 remote pilot certificate." The Part 107 portion refers to the way the rules are coded in the federal aviation regulations (FARs).

In AOPA's tenth-grade course, "Introduction to Flight," the first lesson is about learning to fly and provides students with a better understanding of what is involved in flight training. This current lesson in Unit 7 will focus more on flying as a career versus achieving a primary flight certificate. For students currently interested in learning more about flight training, encourage them to visit AOPA's Learn to Fly page (https://www.aopa.org/training-and-safety/learn-to-fly.)

MISCONCEPTIONS

Students may assume that if someone is a commercial pilot, then they are an airline pilot. While it's true that an airline pilot is a type of commercial pilot, the opposite is not always true—a commercial pilot is not necessarily an airline pilot. Being a commercial pilot means that a pilot has the required FAA licenses to get paid to fly.

LEARNING PLAN

ENGAGE

Teacher Materials: Flying Aircraft and Drones Presentation, Flying Aircraft and Drones Teaching Aid 1

Slides 1-3: Introduce the topic and learning objectives of this lesson.

Slide 4: Conduct the **Warm-Up.**

Warm-Up

Ask students to provide two reasons why someone may want to become an airline pilot and two challenges that airline pilots may face. What issues do airline pilots have to contend with? Students should individually write 3-5 sentences in response to this prompt.

When the students are finished, ask volunteers to provide their answers and lead a class discussion about what personally attracts them to becoming a pilot or what impediments they might see to living this lifestyle.

Refer to **Flying Aircraft and Drones Teaching Aid** for information to share with students about an airline pilot's day-to-day work.

[DOK 2; predict]

Questions

Provide two reasons why someone might want to become an airline pilot and two challenges that airline pilots may face.

Possible benefits: *getting paid to do what you love (flying), travel to interesting destinations, meet a lot of people, great views from the front of the airplane, good pay, good time off, free travel benefits that can be shared with family and friends.*

Possible challenges: *takes time to build seniority, takes financial resources to accumulate flight hours, maintaining health and well-being are very important, being away from home and staying at a lot of hotels, stressful delays and cancellations, difficult to stay fit and on an exercise schedule.*

EXPLORE

Teacher Materials: Flying Aircraft and Drones Presentation, Flying Aircraft and Drones Teacher Notes 1
Student Material: Flying Aircraft and Drones Student Activity 1

Slide 5: The word "pilot" often evokes images of commercial airline pilots, flying for major airlines. While that can be a very rewarding career, it's not the only option for those who want to make a living as a pilot. In addition to commercial airlines, corporations, charitable organizations, and government agencies all need pilots, and there's always demand for additional flight instructors. In this section, students will explore various flying careers.

Inform students that flying drones for a living will be covered later in the lesson.

Slide 6: Conduct the **Formative Assessment.** This activity will complete the first session of the lesson.

Formative Assessment

In this assessment, students will explore flying opportunities outside of being a commercial airline pilot. This assessment will introduce students to a few of these opportunities and give them insight into what is involved in each.

Split students into eight teams and assign each team one of the "flying assignments" below. Provide each with their assigned type of flying from **Flying Aircraft and Drones Student Activity 1**.

- Corporate pilot

- Cargo pilot
- Military pilot
- Firefighting pilot
- Law enforcement pilot
- Air ambulance pilot
- Agricultural pilot
- Flight instructor

When the students complete the activity, have each team present the information they discovered about their flying assignment, including what pilots in their assigned job do; demands of the flying job; the work environment; the kind of aircraft and airports these pilots experience; the work schedule; and what makes this particular flying job interesting, fun, or challenging.

Typical answers are provided on **Flying Aircraft and Drones Teacher Notes 1.**

[DOK 3; apprise, assess, DOK 2; summarize]

EXPLAIN

Teacher Materials: Flying Aircraft and Drones Presentation, Flying Aircraft and Drones Teaching Aid 2, Flying Aircraft and Drones Teacher Notes 2
Student Material: Flying Aircraft and Drones Student Activity 2

Slide 7: Flying across the world at the controls of some of the most sophisticated aircraft in existence is, for many, a dream job. Throughout the following slides, students will learn how to become a commercial pilot. Lead a class discussion that will describe the certificates, licenses, and personal requirements needed to get paid to fly.

Slide 8: Commercial airline pilots all start exactly where students are now, thinking about aviation and dreaming of getting into the cockpit. It all starts with the first flight lesson. From there, students will need to obtain several FAA certifications and build flight time and experience flying various aircraft. Many pilots obtain their flight instructor certificate (referred to as CFI) after they earn their commercial certificate. The CFI rating helps them build flight time and experience more quickly and at less personal expense.

Slide 9: "Student pilot" refers to someone learning how to fly, regardless of age. All new pilots start out as student pilots. Before flying solo in the aircraft, students need to obtain a student pilot certificate.

To get a student pilot certificate, one must:

- Be at least 16 years old (14 years old for operating a glider or balloon).
- Be able to read, speak, and understand the English language.
- Apply for a certificate through a flight instructor or a flight school.

Slide 10: Earning a private pilot certificate is the first step along the path to becoming an airline pilot. Students must be 17 years old to achieve this milestone. Becoming a private pilot allows someone to act as pilot-in-command of an aircraft in visual conditions and for personal reasons. Private pilots fly for pleasure or business, but cannot be paid to fly.

A student must obtain at least a third-class medical certificate if they are pursuing a private pilot certificate.

There are classes of physicals, and for learning to fly, a third-class medical is sufficient. A first-class physical is designed for the airline transport pilot (airlines) and a second-class physical is designed for the commercial pilot (might be corporate or another area). Medical certificates can be issued in the case of a disability, but it depends on the particular situation.

For further questions about medical certification, students can call AOPA's Pilot Information Center, 1.800.USA.AOPA (872.2672) during normal business hours.

Slide 11: The instrument rating, which equips pilots with the exacting skills needed to fly in the clouds and under conditions of reduced visibility, is the most frequent "next step" taken by private pilots seeking to advance their aeronautical education. This rating allows pilots to fly "by instruments" — i,e., without visual reference to the ground, horizon, or other landmarks. Instrument-rated pilots can fly through clouds, rain, and fog, all of which restrict visibility.

Slide 12: The commercial pilot certificate can be earned after a private pilot certificate, but often, pilots earn it after achieving their instrument rating. This certificate allows a pilot to be paid for their work. Essentially, pilots do a lot of the same things while working on their commercial that they do for the private; they just have to do them better. The margin for error on the commercial check ride (a sort of airborne driving test) is much more narrow than on the private check ride.

Slide 13: Another common upgrade to the private pilot certificate is the multi-engine rating. This qualifies pilots to fly "twins," or airplanes with two engines. The multi is a virtual necessity for pilots planning a career in aviation. Some people fly twins — which tend to be faster and carry more weight than singles — for personal and business use. Twins also offer the reassurance of a second engine, especially when flying at night, in poor weather, or over water or mountains.

Slide 14: An airline transport pilot certificate (ATP) is the highest certificate a pilot can receive. ATPs are responsible for operating large transport aircraft with advanced systems. To fly a commercial airliner, a pilot must have an ATP, which is acquired by having 1,500 hours of pilot-in-command time.

Slide 15: If students want to fly for a living, chances are they will start out as a certified flight instructor (CFI). It's in the cockpit of trainers that most civilian-trained professional pilots earn flight time before moving on to corporate aviation, commuters, and the major airlines.

Although considered a flight-time-building occupation by many pilots on their way to airline jobs, flight instructing is arguably the most important job in aviation. CFIs are directly responsible for creating the next generation of pilots and keeping current pilots flying. A student's first instructor will make impressions upon them that will last throughout their entire flying careers.

Slide 16: Each certificate and rating requires a pilot to pass three assessments — a written exam, an oral exam, and a practical flying exam, otherwise known as a "check ride."

Students must earn a score of 70 percent or better to pass a written exam. The oral and practical flying exams are given by an FAA evaluator, called a designated pilot examiner (DPE).

A prospective pilot must be able to read, speak, and understand English.

Slide 17: PIlots must meet medical standards, including 20/20 corrected vision and normal color vision, participate in regular medical exams, and have no disqualifying conditions or medications. Provide students a link to AOPA's medical resources that students can use if they are interested in learning more about disqualifying medications they might take, https://www.aopa.org/go-fly/medical-resources. Share with students that pilots live by a high standard, and having a clear record with no convictions for driving under the influence of alcohol or drugs or felonies is critical in pursuing a professional flying career. In addition, what they share on social media is now used in determining if they are worthy candidates for jobs.

Slide 18: This simulator activity will complete the second session of this lesson.

Simulator Extension Powered by Redbird

If a simulator is available, use the scenario found in **Flying Aircraft and Drones Teaching Aid 2** to lead students through their "first flying lesson." The objective is to provide students with a first look at an airplane's primary flight controls.

Slide 19: Show students videos of two very different pilots who fly drones for a living. While they watch the video, ask students to consider the differences between these two kinds of drones pilots and which one appeals to them more.

- "Drones and the Future of Farming" (Length 2:59) (Video Drone A)
  http://video.link/w/tzMd
- "MQ-1 Predator Drone Flight" (Length 3:43) (Video Drone B)
  http://video.link/w/uzMd

Slide 20: A license called a remote pilot certificate is required to fly drones for commercial purposes. The training to earn this certificate can be completed quickly and affordably. The requirements to become a commercial drone pilot are much less onerous than becoming a commercial aircraft pilot. No practical or oral test is required by the FAA for a remote pilot certificate, only the passing of a written test. This means there is no requirement for "flight training," as in manned aviation.

Slide 21: Drones are divided into different classifications according to their weight. A drone weighing under 55 lbs. is referred to as a, "sUAS," short for small, unmanned aircraft system. Part 107 is the section of federal aviation regulations that contains the operational rules for routine commercial use of sUAS. These rules include operational limitations, requirements for certifications, responsibilities of the remote pilot-in-command, and aircraft requirements. A Part 107 remote pilot certificate is in reference to flying a drone, weighing 55 lbs. or less, for commercial reasons (getting paid).

Slide 22: The requirements to fly an sUAS for commercial purposes are very basic and offer students an opportunity to get involved in aviation with fewer requirements than manned flight.

In order to receive a remote pilot certificate, a candidate must be at least 16 years old, pass an FAA written exam, be vetted by the Transportation Security Administration, and read, write, and understand English.

Slide 23: The knowledge test for a remote pilot certificate consists of 60 multiple-choice questions and must be taken at an FAA-approved knowledge testing center.

For more information about earning a Part 107 remote pilot certificate and flying UAS, direct students to AOPA's website, https://www.aopa.org/training-and-safety/drone-pilots.

Teaching Tips

If teachers have access to a drone, demonstrate to students how it operates, and if time allows, provide them with an opportunity to fly. One task is to create a simulation, such as having students fly over land as if they are using the UAS for cartography or agriculture. Ask students what types of features they might look for in inspections of the ground or of man-made structures, like buildings, power lines, houses, etc.

Slide 24: Provide students with **Flying Aircraft and Drones Student Activity 2.** The activity will direct students to explore various ways drones are used today for commercial purposes. Students can complete this activity in class (or for homework if needed). Reference **Flying Aircraft and Drones Teaching Aid 2** for answers.

This activity will complete the third session of this lesson.

EXTEND

Teacher Material: Flying Aircraft and Drones Presentation

Slide 25: Lead a class discussion that describes how students can get the education and training they need to become commercial aircraft and drone pilots. The presentation also will cover job prospects, pay rates, and the skills and abilities that commercial aircraft and drone pilots must have.

Slide 26: There are several ways to receive the training and education students need to become pilots. They may choose to learn to fly at a local flight school. Students may choose an aviation university or college to earn a degree and complete their certificates. A third option is to join the military.

Slides 27-28: Local flight schools offer Part 61 or Part 141 training, which refer to the parts of the federal aviation regulations (FARs) under which they operate. The most common and least important distinction between them is the minimum flight time required for the private pilot certificate — 40 hours under Part 61 and 35 hours under Part 141.

What differentiates the two is structure and accountability. Part 141 schools are periodically audited by the FAA and must have detailed, FAA-approved course outlines and meet student pilot performance rates. Part 61 schools don't have the same paperwork and accountability requirements.

Learning under Part 61 rules can often give students the flexibility to rearrange flying lesson content and sequence to meet their needs, which can benefit to part-time students. Many Part 141 schools also train students under Part 61 rules.

Both methods of training require students to get to the same standard of flying.

Aviation academies offer a fast track to earning all required pilot certificates in a short amount of time, but they are also more expensive.

Slides 29-30: If students are planning a professional flying career, an aviation degree may make them more competitive. A plus in seeking a degree is that in many cases students are eligible for financial aid and scholarships that will assist them, not only in academic endeavors but in flight training as well.

Two- and four-year degrees with aviation specialties may allow a student to earn a restricted ATP certificate. A restricted ATP allows pilots to be hired by an airline between 250 and 500 hours less than the regular 1,500 hours required by a normal ATP. Because you can obtain the restricted ATP earlier, you can work for an airline earlier than you might have otherwise been able to do.

Slide 31: The most restrictive, structured and thorough flight training a pilot can get is through the military. To fly in the military, a student must first have a college education and sign up for officer training through a service academy, such as the U.S. Naval or Air Force academies, an ROTC (Reserve Officers' Training Corps) program or OCS (Officer Candidate School). Physical testing and grades determine whether a person qualifies for flight school and pilot training.

There is no fee for flight training in the military. Instead, pilots pay the time by signing up for several years of military service.

Slide 32: As students learned in the last session, commercial drone pilots only have to take a written exam to earn a remote pilot certificate. There is no practical flight training, check ride, or oral exam required. This greatly reduces the cost to becoming a commercial drone pilot. There are many study tools online that allow an individual to study independently to take the written exam.

Slide 33: Each year, Boeing releases a forecast for the need of pilots and technicians for the next 20 years. This year, Boeing's estimate for pilots in North America has increased by 74 percent over last year's projection. The need for pilots continues to grow, presenting a great career opportunity for students.

Slide 34: While many airlines are currently hiring, the process is still competitive. Many pilots whose goal is to fly for a major airline build time using flight instruction or fly as charter pilots, whose positions require less experience. After pilots gain 1,500 hours of experience (or less if they have earned a restricted ATP), they apply for an airline position.

Slides 35-36: Emphasize to students that starting salaries at regional airlines have increased significantly in recent years. Some regionals advertise that prospective pilots could have one interview for their career when they interview with a regional carrier, affiliated with a major airline. Many regional airlines offer bonuses as well.

Slide 37: Emphasize to students that a good understanding of math and physics is important in a flying career. Pilots need to have a strong ability to learn, study, and critically think on their feet. Additionally, strong communication and leadership skills are essential to becoming a successful pilot. Good health is also important in order to be hired for a career as a pilot.

If a student's goal is to become a professional pilot, the opportunities they will discover also bring an alluring responsibility. Flying can change how they will approach many facets of life. Airlines like well-rounded candidates who cannot only fly well, but are also good communicators and work well with others.

EVALUATE

Teacher Material: Flying Aircraft and Drones Presentation

Slide 38: Conduct the **Summative Assessment.**

Summative Assessment

Using an authentic context, students will present a professional flying job that interests them, describe the training, education, and skills required to get the job, and a description of what makes that job challenging and rewarding.

Split the class into teams of three and provide them the following scenario.

A local middle-school teacher shared that she is hosting a career day for her students. She knows that you and your classmates are taking an aviation class and does not have anyone else who can speak to what it takes to become a pilot, either manned or unmanned. She has asked three of you to provide an oral presentation to her students about one type of professional flying. Each student in your team should plan to participate in the presentation and be sure to include answers to the following questions.

- Which commercial pilot job would you like to share with the students? Pick one and describe in detail why it interests your team.
- Describe the path that you must take to become that type of pilot. What education and training, flying experience, and certifications do you need?
- What skills must you have to be well-suited for this particular flying job?
- What makes this particular career challenging? What strategies might you suggest for overcoming these challenges?

[DOK 3; apprise, assess, DOK 2; summarize]

Summative Assessment Scoring Rubric

- Follows assignment instructions.
- Oral presentation shows evidence of one or more of the following:
    - A description of a particular professional flying job
    - Explanation of the education, training, and skills needed to land the job
    - Understanding of the challenges of a professional flying career, and what it takes to acquire and keep a particular aviation job
- Oral presentation shows an understanding of the concepts covered in the lesson
- Oral presentation shows an in-depth thinking, including analysis or synthesis of lesson objectives
- Oral presentation is 3-5 minutes long, and each student participates in its delivery

Points	Performance Levels
9-10	Consistently demonstrates criteria
7-8	Usually demonstrates criteria
5-6	Sometimes demonstrates criteria
0-4	Rarely to never demonstrates criteria

GOING FURTHER

Invite a commercial airplane or drone pilot into the classroom. This is a great way for students to be able to get a better understanding of the day-to-day life of a commercial pilot. A few organizations offer the capability to request a speaker in the aviation industry:

- Air Line Pilots Association, https://clearedtodream.org/aspiring-aviators/high-school-students
- Organization of Black Aerospace Professionals, https://obap.memberclicks.net/index.php?option=com_mc&view=mc&Itemid=139

Students may want to learn more about the specific requirements that regional and major airlines have for applicants.

For students interested in pursuing flight training, share this video with them, http://video.link/w/8fWd. This video also will be used in the next AOPA course, "Introduction to Flight."

For students who may be interested in learning to fly and have a medical diagnosis, encourage them to use AOPA's medical resources website or contact AOPA's medical team at 1.800.USA.AOPA (872.2672) during normal business hours.

STANDARDS ALIGNMENT

NGSS STANDARDS

Three-dimensional Learning

- HS-ETS1-3 — Evaluate a solution to a complex, real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
    - Science and Engineering Practices
        - Constructing Explanations and Designing Solutions

- Disciplinary Core Ideas
  - ETS1.B: Developing Possible Solutions
- Crosscutting Concepts
  - Influence of Science, Engineering, and Technology on Society and the Natural World

COMMON CORE STATE STANDARDS

- **RL.9-10.4** — Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
- **RST.9-10.1** — Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- **RST.9-10.2** — Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **WHST.9-10.2** — Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **WHST.9-10.4** — Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **WHST.9-10.6** — Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- **WHST.9-10.8** — Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
- **WHST.9-10.9** — Draw evidence from informational texts to support analysis, reflection, and research.

REFERENCES

https://www.faa.gov/licenses_certificates/
http://www.auvsi.org/
http://www.alpa.org/
https://www.aopa.org/training-and-safety/learn-to-fly
http://www.boeing.com/commercial/market/long-term-market/pilot-and-technician-outlook/
https://www.flyingmag.com/pilot-technique/new-pilots/flight-school-part-61-or-part-141#page-2