Introduction to the National Airspace System

Session Time: Four, 50-minute sessions

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

The National Airspace System (NAS) encompasses all of the sky above the United States, and there are many rules and regulations governing flight in the NAS.

ESSENTIAL QUESTIONS

1. What does a pilot need to know about the NAS in order to conduct a safe and legal flight?

LEARNING GOALS

Students Will Know

- The types and classifications of airspace within the two categories of the NAS
- Communication, certification, and weather requirements for flight within the NAS
- How to identify airspace on sectional charts

Students Will Be Able To

- *Identify* different categories and types of airspace. [DOK-L1]
- *Assess* whether or not a particular flight may be conducted based upon pilot qualifications and airspace regulations. [DOK-L3]

ASSESSMENT EVIDENCE

Warm-up
Students will begin by reviewing what they learned regarding sectional charts and their legends and about airspace surrounding airports. Students either use a physical copy of the sectional chart or www.skyvector.com to explore and answer the warm-up questions, which are then discussed as a class.

Formative Assessment
In this assessment, students will demonstrate their knowledge of what they have learned so far regarding airspace, their requirements, and how to examine them on the chart. Students will focus on Class B airspace, particularly Denver International (KDEN), to answer the questions.

Summative Assessment
In this assessment, students will demonstrate their knowledge of what they learned throughout the course to complete two online quizzes: one from Sporty's Pilot Shop and one from the AOPA Air Safety Institute.

LESSON PREPARATION

MATERIALS/RESOURCES

- Introduction to the National Airspace System Presentation
- Introduction to the National Airspace System Student Activity 1
- Introduction to the National Airspace System Student Activity 2
- Introduction to the National Airspace System Student Activity 3
- Introduction to the National Airspace System Student Activity 4
- Introduction to the National Airspace System Student Activity 5
- Introduction to the National Airspace System Student Activity 6
- Introduction to the National Airspace System Teacher Notes 1
- Introduction to the National Airspace System Teacher Notes 2
- Introduction to the National Airspace System Teacher Notes 3
- Introduction to the National Airspace System Teacher Notes 4
- Introduction to the National Airspace System Teacher Notes 5
- Introduction to the National Airspace System Teacher Notes 6
- FAA Aeronautical Chart User's Guide
- Controlled Firing Area Poster Handout
- Air Safety Institute Airspace Flashcards
- **Internet-capable device (per student) or classroom overhead display with internet access**

- **Build Your Own Airspace: Student Activity 5 (per group)**
    - 1 Foam board: 0.9 in. 11.8 in. 17.8 in.
    - 1 Foam cutter (https://www.michaels.com/floracraft-cleankut-foam-cutter/10596502.html) or X-Acto knife
    - Tracing paper
    - Hot glue gun and glue
    - 1 sectional chart showing Class B airspace or "Sporty's Sectional Training Chart: VFR Sectional Chart Segment + Legend"

LESSON SUMMARY

Lesson 1: Introduction to Aeronautical Charts
Lesson 2: Introduction to the National Airspace System

The lesson will begin with a warm-up in which students review what they recently learned regarding sectional charts and their legends. Students will then learn the details regarding controlled airspace surrounding airports, including their sizes, shapes, and requirements; they will also learn how to analyze controlled airspace on charts.

In session 2, students will then complete several activities in which they interpret and discover critical information regarding how controlled airspace is depicted and how to interpret chart data via the legends and FAA Aeronautical Chart User's Guide (CUG). Session 2 will conclude with a formative assessment.

In session 3, students will dig deeper into the other airspace types, including uncontrolled airspace, the six kinds of Special Use Airspaces (SUAs), and other airspaces. Students will then learn how to discover further details and data on these other airspaces, particularly SUAs, as they navigate the CUG, SkyVector, and/or sectional charts.

In session 4, students will practice what they have learned by building 3D airspace models and (time permitting) quizzing each other with flashcards. The lesson will conclude with the **Summative Assessment**, in which students have the option of completing quizzes to demonstrate their knowledge of the National Airspace System. If time allows, Student Activity 6 will help students further visualize how airspace affects aircraft in three dimensions.

BACKGROUND

The air above the United States is called the National Airspace System (NAS). There are many types of airspace. The main types of airspace that pilots encounter are controlled and uncontrolled airspace. Two other types of airspace that a pilot may encounter are Special Use Airspace (SUA) and airspace that is classified as "other airspace."

Six classifications of airspace are identified by letters: A, B, C, D, E, and G (there is no F airspace in the NAS), and they are called "classes." Classes A, B, C, D, and E are where ATC services are commonly provided to pilots. These controlled airspaces are what we generally think of when we visualize pilots flying and talking to ATC. All airspace types are distinguished by communication expectations and rules for operating within them.

MISCONCEPTIONS

The "big sky" theory implies that there is plenty of room in the air above the ground to fly anywhere without creating undue risks to flight safety or the safety of people or objects on the ground. In reality, aircraft tend to concentrate in the vicinity of airports, practice areas, training routes, population centers, and sightseeing areas, and therefore rules and regulations are crucial for maintaining safety in these airspaces.

Controlled airspace is an area where pilots are typically in contact with air traffic control (ATC). While pilots often receive instructions from ATC to maintain the safe flow of air traffic, the pilot in command is the final authority when it comes to responsibility for the safe outcome of a flight (FAR 91.3). This is not to imply that pilots can randomly ignore ATC, but it is a reminder that ATC does not have final authority of the aircraft, even in controlled airspace.

Pilots flying in uncontrolled or non-regulatory airspace may not be talking to ATC, but they are still required to follow certain regulations related to obstacle clearance, minimum altitudes, and aircraft equipment.

DIFFERENTIATION

To support struggling learners in the **EXPLAIN** section of the lesson plan, have students work in pairs when completing the Student Activities. By working in pairs, students can help each other with the material and check their understanding.

Airspace is one of the most challenging topics in aviation—even for certificated pilots. Any supplemental activity that allows students to reinforce the rules and requirements associated with each type of airspace is valuable. For example, Quizlets, matching games, and flashcards are all meaningful practice activities.

LEARNING PLAN

ENGAGE

Teacher Material: Introduction to the National Airspace System Presentation

Session 1

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

Slides 4-6: Conduct the **Warm-Up**.

Warm-Up

In the last lesson, students learned about the sectional chart. This warm-up will review what they learned, as a quick refresher. Have students use either a physical copy of the sectional chart or www.skyvector.com to explore and answer the following questions. Remind them to use the chart legends or the information panels surrounding a sectional chart.

What do the different airspaces surrounding airports on the sectional charts look like?

They are typically circles (with some variations), and are either blue or magenta in color, with solid, dashed, or hazy/faded lines.

What classes of airspace are depicted on sectional charts?

Those depicted classes are Class B, C, D, and E.

Advance to Slide 5.

What are the meanings/descriptions of each of those boundaries/airspaces? Is there a pattern from B through E? Use the legend to answer. Have students take turns reading the legend's airspace information.

Yes, there is a pattern: from B through E, the legend repeats blue then magenta, and solid followed by dashed lines. Furthermore, all hazy lines are variations of class E.

Advance to Slide 6.

Instruct students to find an example of each one of these classes of airspace (B through E) on the chart. Then ask: Based on what is depicted, and on what you recall from previous lessons, why do you think these airspaces have varying sizes and shapes? (The goal is not to correct wrong answers here, but simply to engage students in a classroom discussion, since students will learn if their conclusions are correct as the lesson progresses.)

Answers will vary based on students' existing knowledge. For example, students may mention terrain, populated areas, or airports as reasons different airspaces have different shapes.

EXPLORE

Teacher Materials: Introduction to the National Airspace System Presentation, Introduction to the National Airspace System Teacher Notes 1
Student Material: Introduction to the National Airspace System Student Activity 1

Slide 7: Many of the lines seen on sectional charts tell pilots what type of airspace exists over a certain area. Airspace can appear circular in nature, or may take other geometrical forms such as rectangles, trapezoids, or irregular polygons.

Provide each student with a copy of the **Introduction to the National Airspace System Student Activity 1** worksheet. In this activity, they will build upon the warm-up and go deeper by comparing sectional charts against the FAA's Aeronautical Chart User's Guide (CUG):

- https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/media/editions/cug-complete.pdf

Instruct students to follow the directions to complete the worksheet and answer the questions. Answers are available in **Introduction to the National Airspace System Teacher Notes 1**.

EXPLAIN

Teacher Materials: Introduction to the National Airspace System Presentation, Introduction to the National Airspace System Teacher Notes 2, Introduction to the National Airspace System Teacher Notes 3, Introduction to the National Airspace System Teacher Notes 4
Student Material: Introduction to the National Airspace System Student Activity 2, Introduction to the National Airspace Student Activity 3, Introduction to the National Airspace Student Activity 4

Session 2

Slide 8: The air above the United States is called the National Airspace System (NAS). There are many types of airspace. The main types of airspace that pilots encounter are controlled and uncontrolled airspace. Two other types of airspace that a pilot may encounter are Special Use Airspace (SUA) and airspace that is classified as "other airspace."

Six classifications of airspace are identified by letters: A, B, C, D, E, and G (there is no F airspace in the NAS), and they are called "classes." Classes A, B, C, D, and E are where ATC services are commonly provided to pilots. These controlled airspaces are what we generally think of when we visualize pilots flying and talking to ATC. All airspace types are distinguished by communication expectations and rules for operating within them.

Slide 9: Class A is relatively simple to understand. If a pilot is strictly a VFR or UAS pilot, they will never fly there. Class A airspace covers the 48 contiguous states (all touching each other), Alaska, and the airspace above U.S. coastal waters out to 12 miles. It starts at an altitude of 18,000 feet MSL (also known as flight level [FL] 180) and goes up to 60,000 feet MSL (FL 600). To fly in the flight levels of Class A, pilots need an instrument rating because all flights here must be conducted under instrument flight rules (IFR). Since it covers the entire contiguous United States, it's not depicted on sectional, low, or high altitude charts.

Slide 10: Another simple-to-understand airspace is Class D (Delta). Airspaces have many different shapes, but Class D is typically the simplest airspace classification surrounding an airport because it is in the shape of a cylinder. The radius of the cylinder is typically 4.3 NM (5 SM), and the height of the cylinder is usually 2,500 feet AGL.

Class D airports are where pilots begin to think about controlled airspace because these airports have operating control towers. Talking to air traffic controllers in the tower is required when operating within Class D unless pilots have a communication problem and need to rely on light gun signals.

Class D is easy to find on the sectional chart: look first for a blue airport symbol. Then look for a blue dashed line surrounding that blue airport symbol. The blue dashed line indicates the presence of Class D airspace. There also will be a two-digit number in a box within that blue dashed outline. This is the height of the top of the Class D airspace in hundreds of feet MSL. If a pilot flies above that altitude, then the aircraft is outside Class D.

Slide 11: Provide each student with a copy of the **Introduction to the National Airspace System Student Activity 2** worksheet. Have the students follow the directions to complete Section A only. Answers to questions are available in **Introduction to the National Airspace System Teacher Notes 2: Section A**.

Slide 12: If a pilot is operating under visual flight rules (VFR), then another requirement for entering Class D is adequate weather. The visibility must be at least three statute miles, and pilots must remain 1,000 feet above, 500 feet below, and 2,000 feet horizontally away from any clouds. This is not the case when a pilot is operating under instrument flight rules (IFR), in which case they may penetrate clouds or weather by relying upon/following their navigational instruments.

Finally, a pilot needs at least a student pilot certificate to operate a manned aircraft within Class D.

Slide 13: To recap, the basic Class D airspace has the following components:

- A shape with dimensions
- Communication requirements
- VFR weather requirements
- Entry requirements

Some additional considerations—including Special VFR, the lack of radar at most Class D towers, and speed restrictions—are covered in the FAA CUG and will be covered in the second semester of this course.

Teaching Tips

If time allows, explore the following Boldmethod website to learn additional information regarding Class D airspace:

https://www.boldmethod.com/learn-to-fly/airspace/dont-underestimate-class-d-airspace/

Slide 14: Using those four components as a guide, students will now look at the other controlled airspaces surrounding airports: Classes B, C, and E.

Class C (Charlie) has a central core like a Class D cylinder, and the top of that cylinder is generally 4,000 feet AGL. The radius of that cylinder is 5 NM. Class C also has an outer circle with a radius of 10 NM. The top is also at 4,000 feet AGL, but the base of that outer circle only drops down to 1,200 feet AGL. If you could see the airspace, you would see that it looks like an inverted two-layer wedding cake. The example in the slide is the Billings, Montana airport. On the sectional chart, there are what appear to be fractions within the different magenta rings or segments. The top number is the top of the airspace in feet MSL, and the bottom number is the floor of that segment of airspace in feet MSL.

Slide 15: Looking at the airspace in three dimensions, the slide graphic shows the inverted, two-layer wedding cake.

The expanded outer ring of airspace that begins at 1,200 feet and extends outward from the central core is called the "shelf." Pilots who understand the three-dimensional nature of airspace can take advantage of things like the shelf if they want or need to avoid flying within Class C airspace. Flying 7 miles from the airport at 1,000 feet AGL will keep a pilot out of Class C.

Why would a pilot want to remain clear of Class C? Entering Class C airspace requires two-way radio contact, so if a pilot's radios were inoperative, or the aircraft did not have radios, flying under the shelf would be allowed. Additionally, a transponder is required to fly within and above Class C. Recall the lesson on ATC radar services: Class C ATC controllers have radar that uses the Mode C transponder signal to help identify and track aircraft within their airspace.

When communicating with ATC based at a Class C airport, it is required to establish two-way communication prior to entry. Like Class D, ATC must use the aircraft's full callsign in order to consider communication established.

Slide 16: To maintain VFR flight within Class C, a pilot needs the same minimum weather conditions as those in Class D: minimum visibility 3 SM, and minimum distance of 1,000 feet above, 500 feet below, and 2,000 feet horizontally away from clouds.

Finally, as long as a pilot has a student pilot certificate or higher, the pilot is allowed to operate within Class C airspace.

Have the students refer back to **Introduction to National Airspace System Student Activity 2** and complete **Section B**. Answers to questions are available in **Introduction to the National Airspace System Teacher Notes 2: Section B**.

Teaching Tips

Teaching TipsIf time allows, explore the following Boldmethod website to learn additional information regarding Class C airspace:

https://www.boldmethod.com/learn-to-fly/airspace/the-logic-behind-class-c-airspace/

Slide 17: The inverted wedding cake analogy goes one step further for Class B airspace. Class Bravo tends to be the busiest airspace because it surrounds major airports that maintain daily operations for hundreds of airline, cargo, and

private carriers. In order to choreograph the safe and efficient flow of traffic in and out of these airports, there are strict requirements for Class B airspace.

Class B is represented on sectional charts with a solid blue line. There are 37 Class B airports in the United States, and their airspaces are clearly depicted on 30 Terminal Area VFR and Low IFR Charts. The example on the slide shows the Class B airspace surrounding Boston's Logan International Airport.

Slide 18: Class B airspace is the classic inverted wedding cake shape, often with at least three layers as shown in the 3D rendering on the slide. There is not a fixed, definitive shape or size for Class B airspace because each Class B is shaped specifically for its particular airport operations and surrounding geography and city layout. Given this, the Class B design is still generally that of a central cylinder with increasingly larger shelves expanding outward (akin to Class C). The top of all segments of Class B airspace tends to be 10,000 feet MSL; however, there are exceptions to this.

Slide 19: In the Boston example, the top is only at 7,000 feet MSL. In St. Louis (shown on the slide), the top is 8,000 feet MSL. This is seen by looking at the "fractions" within the blue Class B boundaries. The top number is the ceiling of the airspace in hundreds of feet. The bottom number is the base of the airspace in that sector. In the St. Louis example on the slide, there is a generally circular shape with extensions to the northwest and southeast. Looking at the runways at St. Louis Lambert airport, they are aligned the same way—the airspace extensions allow aircraft on instrument approaches to be within the tightly controlled Class B.

Slide 20: Communication in such a busy environment is key, so two-way radio communication is required just as it is in Class D and C. However, entering Class B is more restrictive than Class D or Class C, because in order to legally enter Class B, the pilot must hear the controller specifically state that the aircraft is "cleared to enter" the Class B airspace. This is a critical difference, and could result in a flight deviation issued by an ATC controller against a pilot if not heeded. Additionally, the pilot's aircraft must be equipped with a transponder that squawks a mode C code which transmits its present altitude. The transponder is required within a 30 NM radius from the airport, regardless of altitude, even if the aircraft has not yet entered the defined Class B airspace.

Slide 21: Because most traffic in Class B is flying under an IFR clearance, they are always in communication with ATC. They are also typically flying an airway route, ATC controller heading, course, arrival, approach, or departure procedure. Therefore, even though they don't apply to IFR aircraft, weather minimums for VFR aircraft (namely cloud clearances), are less restrictive. In Class B, a pilot flying VFR must have three miles of visibility, but only needs to remain clear of clouds (no above/below/horizontal distance requirements).

The level of complexity and high volume of traffic and radio communications means that only pilots with a private pilot certificate or greater are permitted to fly in Class B. It is possible for a student pilot to fly within Class B if the student has received proper training and a logbook endorsement in accordance with FAR 61.94 and 61.95.

Teaching Tips

If time allows, explore the following Boldmethod websites to learn additional information regarding Class B airspace:

https://www.boldmethod.com/blog/article/2016/06/how-class-b-airspace-works/

https://www.boldmethod.com/blog/article/2016/02/vfr-pilot-guide-to-flying-in-class-b-airspace/

Slide 22: Conduct the **Formative Assessment**.

Formative Assessment

Provide each student with a copy of the **Introduction to the National Airspace System Student Activity 3**. Instruct students to follow the directions to answer the questions individually, using sectional charts and FAA CUG or www.skyvector.com. Answers to questions are available in the **Introduction to the National Airspace System Teacher Notes 3**.

[DOK-L1; *identify*]

Session 3

Slide 23: If controlled airspace is not Class A, B, C, or D, then it is Class E. Class E is nearly everywhere, which makes it easy to remember: E for "everywhere." Let's start at the top: 18,000 feet MSL. This is the top of Class E as most pilots know it, and where Class A (the flight levels of FL180-FL600) begins. Class E extends downward to 1,200 feet AGL. In fact, Class E also exists above Class A where it begins at FL600 and has no upper bound.

Around some airports, there is a thick, fuzzy circle around the airport, as in Bowling Green (displayed on slide).

This tells us that the Class E drops below the typical 1,200-foot floor, down to only 700 feet AGL. This indicates that an instrument approach exists at this airport. Controlled airspace drops down an additional 500 feet toward the airport allowing ATC to ensure adequate separation between aircraft making IFR approaches and aircraft flying under VFR in the vicinity.

Slide 24: The image on this slide shows the Altoona-Blair County airport. Like other Class E airspace, it is contained by a thick, fuzzy magenta line, but there is also a magenta dashed line with an extension on it. Within this dashed magenta line, Class E airspace drops all the way down to the surface. This means a few things:

1. There is most likely a precision instrument approach, which allows IFR aircraft to fly very low to the ground in poor weather using only electronic guidance.
2. The airport has weather reporting equipment on the field (ASOS or AWOS).
3. There is a way to reach ATC while on the ground.

Slide 25: Unlike the previously discussed airspaces, there is no mandatory communication requirement for pilots entering Class E airspace while flying under VFR.

Like the previously discussed airspaces, Class E airspace has required weather minimums.

Below 10,000 feet MSL, the weather minimums and cloud clearances are the same as they are for Class C and D airspace.

Above 10,000 feet MSL, aircraft tend to move faster, and therefore the required visibility and distances are increased, which allows pilots a better opportunity (more reaction time) to see and avoid clouds and other aircraft. At these altitudes, the visibility must be at least 5 SM, and pilots must remain 1,000 feet above, 1,000 feet below, and 1 mile horizontally away from clouds.

To fly within Class E, a pilot needs at least a student pilot certificate.

Teaching Tips

If time allows, explore the following Boldmethod website to learn additional information regarding Class E airspace:

https://www.boldmethod.com/learn-to-fly/airspace/class-e/

Slide 26: Those are the basics of controlled airspace. However, there is also uncontrolled airspace, which is Class G. Class G is any airspace that is not Class A, B, C, D, or E. Therefore, Class G is not defined by any shape. However, the highest that Class G goes is 14,500 feet MSL. Communication is not required. All pilots can fly in Class G.

Slide 27: While there may not be certificate or communication requirements in Class G, pilots must still adhere to certain weather minimums. These are especially important in class G because pilots are responsible for avoiding other aircraft without ATC assistance. Good judgement, effective scanning techniques, and high situational awareness are critical here.

For example, if a pilot is in Class G airspace below 1,200 feet AGL, then the minimum visibility is one mile, and pilots only need to remain clear of clouds. Travelling at altitudes that low is typically unwise; however, it does allow pilots to practice VFR patterns at uncontrolled airports.

Let's assume it's daytime, and a pilot is flying to another airport. The pilot plans to fly above 1,200 feet AGL, at which point they would typically leave Class G and enter Class E airspace. However, in the event that the uncontrolled class G airspace extends above 1,200 feet AGL, then the required visibility/cloud distance increases to 1 SM, 1,000 feet above, 500 feet below, and 2,000 feet horizontally from clouds (same as Class E).

At night, both visibility and cloud clearance requirements increase. Flying in Class G at night requires at least 3 SM visibility and for pilots to remain 1,000 feet above, 500 feet below, and 2,000 feet horizontally away from clouds.

If a pilot is flying in Class G airspace and is above both 1,200 feet AGL and 10,000 feet MSL, then the pilot needs 5 SM visibility and must remain 1,000 feet above, 1,000 feet below, and 1 mile horizontally away from clouds (the same requirements for Class E above 10,000 feet MSL).

Slide 28: Since there are so many variations on weather minimums, there are diagrams available (such as the one displayed on the slide) that many pilots find useful. Here is a video which further explains weather minimums:

- "Airspace Memory Aid" (Length 6:21)
  https://video.link/w/AHgs

For teachers who are unable to access Safe YouTube links, the video can also be found here: https://www.youtube.com/watch?v=3f0pUpBo8gg&t=36s

Teaching Tips

If time allows, explore the following Boldmethod website to learn additional information regarding Class G airspace:

https://www.boldmethod.com/learn-to-fly/airspace/class-g-airspace/

Slide 29: Now that students have learned about controlled and uncontrolled airspace, it's time to cover the other two types of airspace: Special Use Airspace (SUA) and Other Airspace.

There are six SUAs:

1.

Prohibited Areas

2.
Restricted Areas

3.
Warning Areas

4.
Military Operations Areas (MOAs)

5.
Alert Areas

6.
Controlled Firing Areas (CFAs)

Slide 30: Distribute a copy of the I**ntroduction to the National Airspace System Student Activity 4** worksheet to each student. Have the students follow the worksheet directions and work individually to complete **Section A** only. Answers to all sections of this activity are available in the **Introduction to the National Airspace System Teacher Notes 4**.

Slide 31: As students noticed in the activity, most SUAs are clearly defined on the charts because they have a distinctive feathered boundary line and identification code. The letter(s) at the beginning (P, R, W, A, or MOA) denote the type of SUA.

In regard to prohibited areas (P), pilots should never fly through them unless they have a special clearance to do so. One example of this is the airspace over Camp David.

Slide 32: Restricted areas, do not necessarily prohibit flight through them, but extremely hazardous activities may be going on within them. If a pilot does not contact the controlling agency or ATC, the pilot flying into a restricted area may be surprised by aerial gunnery, guided missiles, or artillery firing. Check the chart's tabulation (white space on the chart's border) for the SUA's controlling agency information.

Instruct the students to complete **Section B** of **Introduction to the National Airspace System Student Activity 4**.

Slide 33: Warning area codes begin with a W. Look for these areas 3 NM or more off the coast of the United States and extending into international waters. The hazards are similar to those of a restricted area, but the United States government may not have sole jurisdiction over the airspace.

Have the students complete **Section C** of **Introduction to the National Airspace System Student Activity 4**.

Slide 34: Military operations areas (MOAs) have definite boundaries, floors, and ceilings. These areas exist to separate military training aircraft from other aircraft. All pilots transiting a MOA need to be extremely vigilant for any activity that may pose a collision threat. While not required by FARs, contacting the controlling agency is highly recommended before entering a MOA.

Have the students complete **Section D** of **Introduction to the National Airspace System Student Activity 4**.

Slide 35: Alert areas have a high volume of flight training or unusual aerial activities going on, and that can pose a threat to the safety of all nearby aircraft. If flying through an alert area, all pilots share responsibility for collision avoidance, making situational awareness critical in these areas.

Have the students complete **Section E** of **Introduction to the National Airspace System Student Activity 4**.

Slide 36: Finally, controlled firing areas (CFAs) are neither charted nor published in NOTAMs. Pilots will not know if they are flying through them. Military organizations using CFAs have scouts and spotters looking for any aircraft that may be in danger from their activities. When a spotter sees an aircraft coming, all firing activity stops. In addition, notices of such areas may be posted in nearby airports.

Slide 37: Now that all SUAs have been covered, students will discover the "other airspace" category. This generic term encompasses additional airspace that pilots should be aware of. Military Training Routes (MTRs) are identified by lines on sectional charts with codes like "VR207" or "IR037." The lines represent routes (like roads in the sky) where the military conducts high-speed tactical flight training. IR indicates instrument flying is being conducted, and VR indicates flight by VFR. All aircraft should be vigilant when crossing these routes, and it's also best to avoid prolonged flight along these routes.

National Security Areas (NSAs) exist around areas where the government has determined that the security and safety of something on the ground would be enhanced if no aircraft flew overhead. If a National Security Area is depicted on a sectional chart, usually pilots are asked to voluntarily avoid the area. It is possible that flight is prohibited in the area, so be sure to check NOTAMS for the status of the area.

Slide 38: Parachute jump aircraft operations areas are often published in the Chart Supplement or announced via NOTAM, and many well-established jump zones are marked on sectional charts. Since the pilot of a jump plane will declare over CTAF when the jumpers are departing the plane, it is highly recommended that pilots monitor the CTAF of airports marked with the parachute symbol.

Have the students complete **Section F** of **Introduction to the National Airspace System Student Activity 4**.

Slide 39: Terminal radar service areas (TRSAs) are rare but very helpful. Before Class B and Class C, some airports with radar had a TRSA. On a sectional chart, a TRSA looks like a very simple Class B. The TRSA rings are a gray color. All pilots are welcome to contact the ATC facility associated with the TRSA and receive separation from IFR traffic or VFR flight following.

Tethered balloon areas are important to avoid. These usually are airborne radar stations in the southern United States, and they are held aloft by large blimp-like balloons. A cable keeps them from blowing away, but aircraft must avoid the area so they do not collide with the cable or balloon. In one notable accident, a wing was severed from a Cessna by the cable when the pilot flew through the area.

Questions

In the sectional chart excerpt on Slide 39, the MEF is 14,200 feet MSL over the water. Ask students why the MEF would be so high over an area that is at sea level.

Students should be able to observe that the balloon can rise up to 14,000 feet MSL, so 14,200 feet MSL is a safe altitude for avoiding the tethered balloon and its cable.

Slide 40: Wildlife or wilderness areas require pilots to fly at least 2,000 feet above them in order to protect noise-sensitive animals. The National Oceanic and Atmospheric Administration (NOAA) has established similar areas off the coasts. They are called marine areas and have the same 2,000-foot minimum overflight requirement.

Finally, there is the temporary flight restriction (TFR). This airspace can appear anytime and anywhere. Typically, this is an airspace from the surface up to a specified altitude. Wherever the President and Vice President of the United States are located, there is a TFR. Expect a TFR around forest fires to protect the airborne firefighters from general aviation traffic. Spacecraft launches will have TFRs around the launch and recovery zones. Large sporting events like the Super Bowl or Indianapolis 500 warrant TFRs as well. Checking NOTAMs prior to every flight is critical to ensure the pilot is aware of any TFRs along a route of flight.

Have the students complete **Section G** of **Introduction to the National Airspace System Student Activity 4**.

EXTEND

Teacher Materials: Introduction to the National Airspace System Presentation, Introduction to the National Airspace System Teacher Notes 5, Introduction to the National Airspace System Teacher Notes 6
Student Materials: Introduction to the National Airspace System Student Activity 5, Introduction to the National Airspace System Student Activity 6

Session 4

Slide 41: Divide the students into groups of 2–4. Provide each student with a copy of **Introduction to the National Airspace System Student Activity 5**. Instruct students to work together in their groups and follow the directions to complete the activity. Additional guidelines can be found in **Introduction to the National Airspace System Teacher Notes 5**.

Slide 42: Students should complete this activity if time permits.

Teaching Tips

Depending on how long it took students to complete the foam airspace model activity, consider the following flashcard student activity. Be sure to allow enough time for the private pilot and remote pilot test questions and **Summative Assessment** at the end of the lesson.

Provide each student with a copy of **Introduction to the National Airspace System Student Activity 6**. Have students work together and follow the directions in order to complete the activity. Additional guidelines can be found in **Introduction to the National Airspace System Teacher Notes 6**.

EVALUATE

Teacher Material: Introduction to the National Airspace System Presentation

Slides 43-54: Quiz students on the private pilot knowledge and Part 107 remote pilot knowledge test questions.

Slides 55: Conduct the **Summative Assessment**.

Summative Assessment

Direct students to take the following online quiz in groups of 2-3. Students will use the knowledge they have gained throughout the lesson to complete the quiz.

Assist groups as needed with connecting to the quiz website. Groups can share devices. Alternately, you can project the quiz for the entire class to take simultaneously; groups can record their answers on a separate piece of paper. Circulate around your classroom to record group quiz scores. Check for participation.

Sporty's Pilot Shop airspace quiz:
https://studentpilotnews.com/2019/04/29/quiz-know-airspace/

[DOK-L1; *identify*, DOK-L2; *assess*]

Summative Assessment Scoring Rubric

- Follows assignment instructions
- Postings show evidence of one or more of the following:
    - Knowledge of various airspace rules and procedures.
    - Provides details about airspace rules and procedures.
- Contributions show understanding of course of the concepts covered in the lesson
- Contributions show in-depth thinking including analysis or synthesis of lesson objectives

Points	Performance Levels
9-10	Worked actively with the group to answer the quiz questions. Missed at most 1 question.
7-8	Worked sufficiently with the group to answer the quiz questions. Missed at most 3 questions.
5-6	The group did not work together to complete the quiz; more students participated than others. Missed at most 4 questions.
0-4	The group put little to no effort into completing the quiz.

STANDARDS ALIGNMENT

FAA AIRMAN CERTIFICATION STANDARDS

PRIVATE PILOT

I. Preflight Preparation,

Task E. National Airspace System

- Knowledge - The applicant demonstrates understanding of:
    - **PA.I.E.K1** Types of airspace/airspace classes and associated requirements and limitations.
    - **PA.I.E.K2** Charting symbology.
    - **PA.I.E.K3** Special use airspace (SUA), special flight rules areas (SFRA), temporary flight restrictions (TFR), and other airspace areas.
- Risk Management - The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:
    - **PA.I.E.R1** Various classes and types of airspace.
- Skills: The applicant demonstrates the ability to:
    - **PA.I.E.S1** Explain the requirements for basic VFR weather minimums and flying in particular classes of airspace.
    - **PA.I.E.S2** Correctly identify airspace and operate in accordance with associated communication and equipment requirements.
    - **PA.I.E.S3** Explain the requirements for operating in SUA or within a TFR. Explain SATR (special air traffic rules) and SFRA operations, if applicable.

REMOTE PILOT

II. Airspace Classification and Operating Requirements

Task A. Airspace Classification

- Knowledge - The applicant demonstrates understanding of:
  - **UA.II.A.K1** General airspace
    - **UA.II.A.K1a** Class B controlled airspace
    - **UA.II.A.K1b** Class C controlled airspace
    - **UA.II.A.K1c** Class D controlled airspace
    - **UA.II.A.K1d** Class E controlled airspace
    - **UA.II.A.K1e** Class G uncontrolled airspace
  - **UA.II.A.K2** Special-use airspace, such as prohibited, restricted, warning areas, military operation areas, alert areas, and controlled firing areas.
  - **UA.II.A.K3** Other airspace areas, such as Airport Advisory Services, Military Training Routes (MTRs), Temporary Flight Restrictions (TFRs), Parachute Jump Operations, Terminal Radar Service Areas (TRSAs), National Security Areas (NSA) and Visual Flight Rules (VFR) routes.
  - **UA.II.A.K4** Air Traffic Control (ATC) and the NAS.

REFERENCES

AOPA Air Safety Institute, Know Before You Go: Navigating Today's Airspace
http://www.airsafetyinstitute.org/knowbeforeyougo

AOPA Air Safety Foundation Airspace for Everyone (14 pages, excellent graphics and descriptions)
https://www.aopa.org/-/media/files/aopa/home/pilot-resources/asi/safety-advisors/sa02.pdf

AOPA Airspace Reference Card: Airspace-at-a-Glance
https://www.aopa.org/lms/courses/know-before-you-go/pdf/3-4_Airspace_at_a_glance_card.pdf

Boldmethod: The 6 ABCs Of United States Airspace (a brief overview of each lettered airspace)
https://www.boldmethod.com/blog/lists/2018/12/six-abc-of-national-airspace-simplified/

Boldmethod: Don't Underestimate Class D Airspace
https://www.boldmethod.com/learn-to-fly/airspace/dont-underestimate-class-d-airspace/

Boldmethod: What you need to know about Class C Airspace
https://www.boldmethod.com/learn-to-fly/airspace/the-logic-behind-class-c-airspace/

FAA FAASTeam Learning Center Online Course: ALC-42: Airspace, Special Use Airspace and TFRs
https://www.faasafety.gov/gslac/ALC/course_content_popup.aspx?cID=42&sID=237&preview=true

Rod Machado Flight Instructor E-Tools
https://rodmachado.com/pages/free-flight-instructor-elearning-tools
NOTE: This link takes you to a website with useful free information; however, detailed information requires purchase of study units.