Preflight Weather Planning

Session Time: Three, 50-minute sessions

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

Safe and efficient aviation operations require pilots use math, science, and technology.

Pilots must know how to use the weather services that are available to help form an understanding of the weather situation and make better flying decisions.

ESSENTIAL QUESTIONS

1. Given the sheer number of weather resources available, how can pilots navigate the information landscape to effectively plan for a flight?

LEARNING GOALS

Students Will Know

- The following types of services used for preflight weather planning: Flight Service Stations (FSS), Transcribed Weather Broadcasts (TWEB), and online tools and apps
- The different types of weather briefings available to pilots, including standard briefings, abbreviated briefings, and outlook briefings
  Information that pilots can expect to receive in weather briefings
- The Perceive—Process—Perform risk management framework as a guide for preflight weather planning

Students Will Be Able To

- *Compare* the different types of weather briefings available and explain when each would be appropriate during flight planning (DOK-L3)
- *Analyze* weather products and services to determine their effectiveness for both preflight planning and inflight updates (DOK-L4)
- *Gather* and *interpret* weather briefing materials from appropriate sources and connect what they' ve learned to make a go/no-go decision (DOK-L3, DOK-L4)

ASSESSMENT EVIDENCE

Warm-up
Students will review their weather diaries, first started in Unit 1, Lesson 1, and discuss any unusual or notable weather. This will segue into a reminder of weather products students learned about in the last two lessons, and a discussion of how pilots can determine the best/right weather for a given flight.

Formative Assessment
Students will individually answer written questions about preflight weather briefings, provided to them on a worksheet, then discuss their answers in class.

Summative Assessment
Students will work in small groups to answer questions on obtaining weather briefings, and then apply the knowledge gained in the lesson to a flight scenario.

LESSON PREPARATION

MATERIALS/RESOURCES

- Preflight Weather Planning Presentation
- Preflight Weather Planning Student Activity 1
- Preflight Weather Planning Student Activity 2
- Preflight Weather Planning Student Activity 3
  - **Internet-capable device with web browser**
- Preflight Weather Planning Teacher Notes 1
- Preflight Weather Planning Teacher Notes 2
- Preflight Weather Planning Teacher Notes 3
- Student Daily Weather Diary

LESSON SUMMARY

Lesson 1: Preflight Weather Planning
Lesson 2: Inflight Weather and Tactical Decision Making

This three-session lesson will begin with a warm-up, wherein students will be asked to compare the forecasts recorded in their weather diaries with the observed weather that actually developed. Students will be reminded of the various weather products available to pilots for use in their flight planning, and will be asked questions about which products would be most useful in given situations (scenarios). Based on their current level of knowledge, students will not be expected to have "correct" answers at this point, but this questioning will spur further inquiry and provide a framework for the learning that takes place during this lesson. Session 1 continues with an explanation of preflight weather briefings, including a historical perspective, and a discussion of the importance of non-official weather information to complete the weather picture.

The lesson continues with a discussion of various service outlets that disseminate aviation weather information, and the three levels of briefings provided to pilots through these outlets. Details of standard, abbreviated, and outlook briefings are provided, as is information about recorded broadcasts and online weather applications. Students will then complete a formative assessment that focuses on sources of weather information and the various types of weather briefings available.

Next students consider the risk-management aspects of weather briefings, introducing the 3-P Model to manage the flow of weather-related information. Details are given for the Perceive, Process, and Perform phases of this model. An activity lets students apply the 3-P model to manage the risk of a given flight. This session goes on to cover more facets of risk management as part of weather planning, including escape options, reserve fuel, terrain avoidance, and passenger expectation management. Additional "best practices for pilots" are discussed, with an eye toward 'safety first' as a guiding principle. Finally, students complete a Summative Assessment, including test questions from the Private Pilot's Knowledge Test.

BACKGROUND

A major risk factor in aviation is weather. Thousands of accidents, many catastrophic, have occurred due to aircraft encountering conditions beyond the limitations of the aircraft or the pilot.

Weather can unleash powerful forces. Being able to predict where these forces might occur has been the goal of aviation meteorologists for over a century. Significant advances in weather forecasting and reporting have been made, and today's pilots now have a wide variety of weather tools available to them for decision making. One of the most important, and most information-rich of these tools, is the preflight weather briefing.

All pilots should obtain a preflight weather briefing as part of their planning. This briefing includes a wide variety of information, including adverse conditions (conditions that could present a hazard), current conditions, and forecasts of weather and winds aloft useful to pilots in route planning. The briefing also might include Notices to Airmen (NOTAMs), special advisories of temporary conditions that may exist at airports or along the route of flight, such as airport or runway closures, radio frequency outages or changes, Temporary Flight Restrictions (TFRs), or drone activity.

MISCONCEPTIONS

The term "weather briefing" is used to describe briefings—offered in a standardized format—that pilots can obtain online, on apps, or over the phone from a flight service station (FSS). These briefings satisfy the meteorological and known flight delay requirements included in the regulation that pilots obtain "all available information" about a flight (FAR 91.103). What can be confusing, however, is that despite being called weather briefings, these briefings contain a variety of other information, including notices to airmen (NOTAMs) unrelated to weather, air traffic control delays, and other information (e.g. radio frequencies). Students should note that when the term "weather briefing" is used, the briefing that is being described is actually more inclusive.

Another related misconception by many pilots is that obtaining an official weather briefing meets all the requirements of FAR 91.103. Pilots are also required to know their fuel requirements and runway lengths at airports of intended landing, and to have alternates available in case their flight cannot be completed as planned. Information satisfying these requirements is not part of the weather briefing, but must be obtained from other sources.

DIFFERENTIATION

To help students deepen their understanding of preflight weather planning, construct a few more scenario questions similar to Student Activity 2 to review in the class discussion. This will help them apply their knowledge to multiple flight scenarios.

LEARNING PLAN

ENGAGE

Teacher Material: Preflight Weather Planning Presentation
Student Material: Student Daily Weather Diary

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

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

Warm-Up

Ask: Is this a good day to fly?

Have students review their weather diaries and answer the following questions.

Were the forecasts you were following accurate?

Was there any unusual or notable weather that was or was not forecast?

What weather products would you use to:

- Forecast weather for tomorrow?
- Obtain the current conditions at your local airport?
- What are the top four weather products to be used on planning a flight for the coming weekend?
- What are the strengths and weaknesses of each?

Answers will vary based on students' current understanding of weather products.

Remind students of weather products they learned about in the last two lessons (METARs, TAFs, PIREPs, graphical forecasts, winds and temperature aloft charts, etc.) Discuss how, with so many sources of information available, pilots can determine the best/right weather products for a given flight.

[DOK-L2; *infer, summarize*]

EXPLORE

Teacher Material: Preflight Weather Planning Presentation

Slide 5: The development of effective weather briefings has been a work in progress. Prior to 1989, preflight weather briefings were only available in two ways:

1. In-person briefings at Flight Service Stations. Flight Service Stations, or FSS, were located at hundreds of airports around the country. Pilots could walk in and request to speak to a briefer. The pilot would tell the briefer about the proposed flight, and the briefer would produce a written briefing and spend the next few minutes going over the weather with the pilot. Pilots would leave with dozens of pages of reports containing available weather observations and forecasts. Not all airports had an FSS on the field, so availability of live, in-person briefings was limited.
2. Telephone briefings from a local FSS specialist. Before the advent of toll-free telephone numbers, FSS specialists could be reached by telephone at their local office. Pilots would call the specialists with information about a proposed flight, and receive a briefing over the phone. These briefings were similar in content to the live briefings, but they were strictly verbal, with no written component.

Slide 6: Today there are hundreds of sources of weather information available, from daily TV and radio news broadcasts, to web-based weather reporting companies, to government-sponsored official briefing channels.

It is a good practice for pilots to obtain an "official" preflight weather briefing from an approved source before each flight. Official sources maintain a written record of each briefing, so it is verifiable that a pilot has received a briefing. These sources include

1. 1-800-WX-BRIEF. This nationwide telephone number will connect a pilot to a briefing specialist at a Flight Service Station, who will provide a verbal briefing to the pilot. Because the briefer records the registration number of the aircraft, there is an official record of the briefing. This service is available in all 50 states and Puerto Rico.
2. www.1800WxBrief.com. This website is an official source for obtaining web-based briefings, and also provides a record of the briefing.
3.

Private companies authorized to provide official weather briefings through their websites. The FAA, NWS and NOAA authorize certain companies to use their weather data to generate and distribute official preflight briefings to pilots through registration-based websites or proprietary apps.

Slide 7: In addition to getting an official preflight weather briefing from an approved source, most pilots go to greater lengths before a flight and consult additional sources of weather information. These other sources can often 'fill in the blanks' left after an official briefing, or can provide additional details useful to pilots in their planning. One popular source is www.aviationweather.gov, a website provided by NOAA. This source is explored further in the next session.

Local and national weather news broadcasts are also useful to pilots, especially for flights planned several days in the future. By watching a weather report, pilots can see the national weather picture at a glance, see the direction of travel of any weather systems, and get a good idea of what to expect on the day of their flight. The Weather Channel broadcasts weather information in most areas 24 hours a day.

Hundreds of weather-related websites and apps also provide high-quality information to pilots. Most pilots have their favorite sources for non-official weather information, and find them to be valuable tools in their preflight planning.

- "ASI Weather Wise" (Plan to stop the video at 3:26)
  https://video.link/w/sJ3r

For teachers who are unable to access Safe YouTube links, the video can also be found here: https://www.youtube.com/watch?v=T5Me18yQOzk&t=204s

Teaching Tips

An early form of online weather briefing was provided by a government-sponsored program called Direct User Access Terminal System (DUATS). Subscribers could log in to special terminals located in flight planning rooms and get a weather briefing. The introduction of more modern web-based technologies rendered DUATS obsolete, and the service was discontinued formally in 2018. By that time, most pilots had migrated to other services, such as www.1800WxBrief.com.

EXPLAIN

Teacher Materials: Preflight Weather Planning Presentation, Preflight Weather Planning Teacher Notes 1
Student Material: Preflight Weather Planning Student Activity 1

Slide 8: Several different kinds of organizations provide critical weather information to pilots. Some of these organizations are government agencies, like the FAA, the National Weather Service, and the National Oceanographic and Atmospheric Administration.

Other such organizations are government contractors, that is, private organizations that obtain government contracts to provide specific weather-related services. Examples include Leidos Flight Service (1-800-WX-BRIEF), and ARINC, two private companies under contract with the federal government to provide official weather briefings and updates to pilots.

In addition to government agencies and contractors, there are private companies that obtain raw data from the National Weather Service and other government sources, format that data into user-friendly reports, and provide official preflight briefings to pilots through apps that run on mobile devices. Examples include Foreflight, WingX, and Garmin Pilot, though there are many more.

Slide 9: Different outlets provide different kinds of services for pilots. For example, Flight Service Stations are mainly concerned with providing preflight weather briefings; however, FSS personnel can also provide in-flight updates by radio on weather and conditions. Though not the only outlet, Flight Service Stations remain an important source of weather information for pilots.

Other outlets are mainly concerned with providing in-flight weather information through recorded broadcasts. While FSS staff can provide live services, other in-flight weather information is recorded . For example, the Hazardous Inflight Weather Advisory Service (HIWAS) is a continuous recorded broadcast heard over select VOR stations across the country. HIWAS delivers hazardous weather updates only, and includes information found in AIRMETs, SIGMETs, Convective SIGMETs, Center Weather Advisories, and urgent PIREPs.

Automated Terminal Information Service (ATIS) and Automatic Weather Observing System (AWOS) are recorded broadcasts of conditions at airports, providing information critical to pilots. ATIS broadcasts are updated hourly or as needed during times of rapidly-changing conditions. AWOS broadcasts are continuously updated as new data comes into the system. In-flight weather sources are explored in detail in the next lesson.

Teaching Tips

Emphasize to students that some pilots prefer to get their briefing through a briefer rather than a website or app, because the briefer can provide context and can answer specific questions. The briefer can also discuss trends in the weather, and can assist the pilot in making the best decisions.

SESSION 2

Slide 10: Prior to every flight, pilots are expected to gather all available information pertaining to the flight. As part of their preflight research, pilots can call a weather specialist at a Flight Service Station (FSS), or obtain a Flight Service briefing online at www.1800wxbrief.com. In either case, the same basic standardized format is used.

There are three types of weather briefings: standard, abbreviated, and outlook. When calling a briefer, a pilot should specify the type of briefing they are requesting, and also provide the following information:

- Flight rules under which the flight will be conducted: visual flight rules (VFR) or instrument flight rules (IFR)
- Aircraft identification and type
- Departure point
- Estimated time of departure (ETD)
- Flight altitude
- Route of flight
- Destination
- Estimated time en route (ETE)

When a pilot calls a weather specialist at an FSS or views a briefing while logged in to certain approved online websites, the information is recorded in the flight plan system and a note is made about the type of briefing that was provided. When briefing information is stored, it can later be referenced to file or amend a flight plan, or to aid in efforts to find an aircraft that is overdue or reported missing. The record can also be used during investigations of violations, or accidents, to confirm that the pilot obtained a preflight briefing.

Slide 11: A standard briefing offers the most complete information available, allowing a pilot to form a comprehensive weather picture. This type of briefing should be obtained prior to any flight and used in the flight planning process. A standard briefing provides the following information about the proposed route of flight, in sequential order

1. Adverse conditions. Each briefing starts with information about conditions that could influence a decision to cancel or alter a route of flight. Adverse conditions may include significant weather, such as thunderstorms or aircraft icing, or other important items such as airport closings.
2. VFR flight not recommended. If the weather for the route of flight is below VFR minimums, or if it is doubtful that the forecast weather would allow the flight to be made under VFR conditions, the briefer may state "VFR flight not recommended." While the decision to fly remains the pilot's, this advisory should be given careful consideration.
3. Synopsis. An overview of the broad weather picture, this includes fronts and major storms that will affect the flight route.
4. Current conditions. Current ceilings, visibility, winds, and temperatures are included, unless the flight time is more than 2 hours away.
5. En route forecast. This provides a summary of the weather forecast for the route that will be flown.
6. Destination forecast. This summarizes the expected weather for the destination airport at the estimated time of arrival (ETA).
7. Forecast winds and temperatures aloft. These are provided for the specific altitude of the proposed flight. During a phone briefing, temperatures are only provided upon request.
8. Notices to Airmen (NOTAM). Information pertinent to the route of flight that has not been published in the NOTAM publication is included in a briefing; published NOTAMs are also available upon request.
9. ATC delays. This advisory informs of any known ATC delays that might affect the proposed flight.
10. Other information. At the end of a standard weather briefing, an FSS specialist provides radio frequencies needed to open a flight plan. If the pilot requested any additional information, it is provided as well.

The following video provides an example of a standard weather briefing:

- "Ep 88: Getting A VFR Weather Briefing- How to Call FSS" (Length 8:26) https://video.link/w/LNEq

For teachers who are unable to access Safe YouTube links, the video can also be found here: https://www.youtube.com/watch?v=KUj-jK7II6I&t=241s

Slide 12: An abbreviated briefing is a shortened version of a standard briefing. Abbreviated briefings are not initial briefings, but should be requested if a departure has been delayed or newer weather information is needed to update a previous briefing. When calling for an abbreviated briefing, pilots should provide the specialist with the time and source of the previous briefing to ensure that necessary weather information is not inadvertently omitted.

Slide 13: If a planned departure is 6 hours or more away, an outlook briefing should be requested. These briefings provide initial forecast information based on weather trends and existing weather in geographical areas at or near the departure airport. They are good sources of flight planning information and can influence important flight decisions, such as route of flight, altitude, and even a go/no-go decision. While outlook briefings are helpful in the early stages of flight planning, they should NOT be the sole briefing that a pilot seeks prior to a flight's departure. A standard briefing close to the time of departure is strongly recommended, as this provides a more complete and up-to-date weather picture.

Slide 14: Pilots in Alaska have access to an additional weather service not available in the other 49 states: a transcribed weather enroute broadcast (TWEB). Like HIWAS, TWEB is a continuous automated broadcast transmitted over selected NAVAID facilities (e.g. VORs or NDBs). It contains adverse conditions alerts, surface weather observations, PIREPS, and a density altitude statement (if applicable). It might include other data as well, such as terminal forecast data and radar reports. For use in either preflight planning or in flight, TWEB can also be accessed by telephone numbers listed in the Alaska Chart Supplement U.S.

Slide 15: Numerous online weather services have become available to pilots in recent years for preflight planning, allowing pilots to consume weather information on computers and mobile devices. Of these, the most popular website for aviation weather is NOAA's Aviation Weather Center, often referred to as ADDs, or aviationweather.gov. The following is a brief ASI video highlighting this site:

- "Weather Wise: The AWC Website" (Length 3:18)
  https://video.link/w/DZEq

For teachers who are unable to access Safe YouTube links, this video is also available here: https://www.youtube.com/watch?v=wswNpid0wTI&t=9s

In addition to this government site, many apps developed by private companies, such as Foreflight and Garmin Pilot, compile information from a wide variety of both government and nongovernment weather sources.

Slide 16: The number of sources that disseminate weather information means that pilots have more freedom than ever before to choose the source they find the most helpful. It is important, however, that pilots educate themselves to be critical consumers of weather information. Being a critical consumer means asking key questions, such as the following:

- Where does a service's weather information originate?
- Exactly what types of information does a particular service provide?
- How timely/current is the information?
- Does the service a pilot uses record that a briefing was obtained?

Slide 17: Complete the **Formative Assessment**.

Formative Assessment

Provide students with **Preflight Weather Planning Student Activity 1** worksheet. Have students answer the questions individually and discuss their answers in class. Potential responses can be found in **Preflight Weather Planning Teacher Notes 1**.

[DOK-L2; *explain*]

EXTEND

Teacher Materials: Preflight Weather Planning Presentation, Preflight Weather Planning Teacher Notes 2, Preflight Weather Planning Teacher Notes 3
Student Materials: Preflight Weather Planning Student Activity 2, Preflight Weather Planning Student Activity 3

SESSION 3

Slide 18: Preflight weather planning is vitally important, as it is the phase in which pilots make strategic weather decisions (decisions that center on avoiding potential hazards). Due to the sheer number of weather resources available to pilots, however, it can be challenging to put everything together.

With so many weather providers and products, it can be hard for pilots to screen out non-essential data, focus on key facts, and then correctly evaluate risk resulting from a given set of circumstances. Pilots need tools to help them evaluate risk based on the information provided and, importantly, when they encounter unexpected or unforecast conditions in flight.

Slide 19: Distribute **Preflight Weather Planning Student Activity 2**, instruct the students to answer the questions individually, then lead a class discussion of the answers provided by students. Possible answers to questions are provided in **Preflight Weather Planning Teacher Notes 2**.

Slide 20: A helpful risk management framework that pilots can use to guide them through both preflight weather planning and in-flight weather decision-making is Perceive—Process—Perform. The basic steps in both circumstances are the following:

1. Perceive weather hazards that could adversely affect your flight.
2. Process this information to determine whether the hazards create risk, which is the potential impact of a hazard that is not controlled or eliminated.
3. Perform by acting to eliminate the hazard or mitigate the risk.

Slide 21: One of the initial challenges in assembling weather information for preflight planning is simply knowing where and how to look for the information needed to **perceive** weather hazards that could affect the flight. While weather briefings obtained over the phone are comprehensive, they can also be difficult to visualize. For this reason, looking up information online can be helpful to put together a better overall picture, as graphics make things easier to visualize. It is a good rule of thumb to pursue more information (dig a little deeper) when the weather looks doubtful.

Slide 22: Obtaining weather information is merely the first step; next, pilots must **process**—study and evaluate— the information to understand how it will apply to their circumstances. When analyzing weather information, it is helpful to keep in mind the three ways that weather can affect a flight. It can

- Reduce visibility
- Create turbulence
- Reduce aircraft performance

Given this, a practical approach to preflight weather planning is to think about how current and forecast conditions might affect these three factors on a flight. For example, METARs, TAFs, and weather charts can be looked to for information about visibility, while pilots might look at winds aloft information, PIREPs, or AIRMETs for information about turbulence. Temperatures should be evaluated to ensure that they will not adversely affect the aircraft's ability to take off, climb, or land in the distance available.

Slide 23: The third step in preflight weather planning should be for a pilot to **perform** an honest evaluation of whether his/her skill and/or aircraft capability are up to flying in a given set of weather conditions. It is important to evaluate both the pilot and the aircraft. Even a proficient and experienced pilot is limited if he or she is flying an aircraft without

weather avoidance equipment. On the other hand, even the most advanced EFD or MFD equipment will be of little use to a pilot who lacks experience in moving maps or datalink weather. Preflight planning should be considered a strategic, "big picture" exercise. Pilots should also consider their physical and emotional fitness to perform the flight. (These issues will be addressed in depth in a later lesson covering aeromedical factors.) Once all potential weather hazards have been identified, plans should be put in place to eliminate or mitigate each one.

Slide 24: Being able to change plans while airborne is a critical element of any weather plan. Weather can change quickly, and can be different from forecast, so it is important that pilots have a plan to escape their current location and find safer conditions elsewhere in the event the weather is worse than expected.

Part of assembling a strategic picture is knowing where good weather can be found within the aircraft's range. Where is it in relation to the weather that might be riskier? In which direction must the pilot turn to find it, and how long will it take to get there? How much fuel is needed to reach that location? Does the aircraft have enough? Before taking off on any flight, the pilot should be familiar with the answers to these questions.

Slide 25: Because escape options are only helpful if a pilot can reach them, it's important to make fuel planning part of weather planning. Taking more fuel will mean access to more alternatives, so it is a good idea to take more fuel than is necessary to maintain the legal reserve requirements. These requirements are 30 minutes of reserve fuel for day VFR and 45 minutes for night VFR, while IFR flights must be capable of reaching a specified alternate airport and flying for 45 minutes beyond it. Having plenty of fuel will also provide peace of mind that can reduce stress in situations where weather has already created a higher cockpit workload.

Slide 26: Another part of weather planning involves planning for terrain avoidance. A leading cause of aviation accidents is controlled flight into terrain or CFIT. Pilots should always know how low they can descend without encountering terrain or obstacles along the flight path. This is particularly true when planning a VFR flight below weather, when there is a small temperature-dew point spread, any expected precipitation, or at night. Terrain information can easily be obtained from a VFR sectional chart; these charts include a maximum elevation figure in each quadrangle.

Slide 27: It is not unusual for a weather accident to be associated with external pressures, such as a pilot's desire to avoid disappointing passengers. There is often pressure to continue a trip to avoid "wasting" passenger time. Weather planning should include setting passenger expectations early by briefing the passengers on the flight and any planned contingencies should the weather deteriorate.

Other good practices in developing a passenger plan include the following:

- Develop personal minimums (the worst conditions you are willing to accept) well in advance of any flight, as these minimums will make go/no-go decisions easier.
- Share these personal minimums with passengers, and let them know that safety is the first priority.
- Decide what will be done in the case of a diversion, and inform passengers of these plans.
- Advise anyone who will be meeting the aircraft at the destination that plans are flexible and dependent upon weather.
- If there is ever doubt, it is better to choose to wait out adverse conditions.

EVALUATE

Teacher Materials: Preflight Weather Planning Presentation, Preflight Weather Planning Teacher Notes 3
Student Materials: Preflight Weather Planning Student Activity 3, **internet-capable device with a web browser (one per group)**

Slide 28-33: Sample FAA Private Pilot Knowledge Exam questions

Slide 34: Conduct the **Summative Assessment**.

Teaching Tips

Although aviationweather.gov was introduced in an earlier video, you may have to assist students in accessing the site and navigating the various reports and forecasts. Let the students browse through the site for a few minutes to get a feel for the variety of information available; it can seem overwhelming at first. Remind them of the difference between reports (observations of actual weather) and forecasts (predictions of future weather). Have them click through the various graphical map pages (all are forecasts except the weather depiction chart). Once they spend a few minutes navigating the site, they will be ready to start reading for content. Even seasoned pilots have trouble with some of these presentations, so expect a wide range of answers from your students.

Summative Assessment

Students are planning a flight from Chicago's O'Hare International Airport (KORD) to Wittman Regional Airport (KOSH) in Oshkosh, WI, to attend the annual AirVenture, the largest gathering of pilots and aviation companies in the world. Their departure time for this one-hour flight is three hours from now and they need to obtain a complete preflight briefing before going.

Break up the class into groups of 4 or 5 students (depending on class size). Confirm that each group has an internet-capable device with a web browser. Distribute the **Preflight Weather Planning Student Activity 3** worksheet, and instruct each group to follow these steps.

1. Log into www.aviationweather.gov/briefing.
2. Obtain a complete briefing for a VFR flight from KORD to KOSH departing three hours from the current time.
3. Provide written answers to the questions found on the worksheet.
4. Participate in a classroom discussion of the scenario and whether the flight could be conducted safely.

Possible answers to questions are provided in **Preflight Weather Planning Teacher Notes 3**.

[DOK-L3; *assess, draw conclusions*]

Summative Assessment Scoring Rubric

- Follows assignment instructions
- Postings show evidence of one or more of the following:
    - Knowledge of the various types of weather briefings available
    - Understanding of which types of advisories are reports and which are forecasts
    - Ability to apply knowledge to a given scenario to make a sound go/no-go decision
- Contributions show understanding of the course material and how it relates to the overall process of preflight planning

- Contributions show an ability to go beyond the rote recitation of facts and, instead, demonstrate a knowledge and understanding of the material at the application and correlation levels.

Points	Performance Levels
9-10	The student answers 12 or 13 of the questions correctly and consistently demonstrates an understanding of the lesson objectives.
7-8	The student answers 9 or 11 of the questions correctly and usually demonstrates an understanding of the lesson objectives.
5-6	The student answers 6 or 8 of the questions correctly and sometimes demonstrates an understanding of the lesson objectives.
0-4	The student answers 5 or less of the questions correctly and rarely demonstrates an understanding of the lesson objectives.

STANDARDS ALIGNMENT

NGSS STANDARDS

Three-Dimensional Learning

- **HS-ETS1-2** - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
    - Science and Engineering Practices
        - Asking Questions and Defining Problems
        - Constructing Explanations and Designing Solutions
    - Disciplinary Core Ideas
        - ETS1.A: Defining and Delimiting Engineering Problems
    - Crosscutting Concepts
        - None
- **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
        - None

COMMON CORE STATE STANDARDS

- **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.
- **RST.9-10.4** - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- **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.

FAA AIRMAN CERTIFICATION STANDARDS

PRIVATE PILOT

Knowledge The applicant demonstrates understanding of:

- **PA.I.C.K1** Acceptable sources of weather data for flight planning purposes.
- **PA.I.C.K2** Weather products and resources required for preflight planning, current and forecast weather for departure, en route, and arrival phases of flight.
- **PA.I.C.K3** Meteorology applicable to the departure, en route, alternate, and destination under VFR in Visual Meteorological Conditions (VMC) to include expected climate and hazardous conditions such as:
    - **PA.I.C.K3a** a. Atmospheric composition and stability
    - **PA.I.C.K3b** b. Wind (e.g., crosswind, tailwind, windshear, mountain wave, etc.)
    - **PA.I.C.K3c** c. Temperature
    - **PA.I.C.K3d** d. Moisture/precipitation
    - **PA.I.C.K3e** e. Weather system formation, including air masses and fronts
    - **PA.I.C.K3f** f. Clouds
    - **PA.I.C.K3g** g. Turbulence
    - **PA.I.C.K3h** h. Thunderstorms and microbursts
    - **PA.I.C.K3i** i. Icing and freezing level information
    - **PA.I.C.K3j** j. Fog
    - **PA.I.C.K3k** k. Frost
- **PA.I.C.K4** Flight deck displays of digital weather and aeronautical information.

Risk Management The applicant demonstrates the ability to identify, assess and mitigate risks, encompassing:

- **PA.I.C.R1** Factors involved in making the go/no-go and continue/divert decisions, to include:
    - **PA.I.C.R1a** a. Circumstances that would make diversion prudent
    - **PA.I.C.R1b** b. Personal weather minimums
    - **PA.I.C.R1c** c. Hazardous weather conditions to include known or forecast icing or turbulence aloft
- **PA.I.C.R2** Limitations of:
    - **PA.I.C.R2a** a. Onboard weather equipment
    - **PA.I.C.R2b** b. Aviation weather reports and forecasts
    - **PA.I.C.R2c** c. Inflight weather resources

Skills The applicant demonstrates the ability to:

- **PA.I.C.S1** Use available aviation weather resources, obtain an adequate weather briefing, and correlate weather information to make a competent go/no-go decision.

REMOTE PILOT

Knowledge The applicant demonstrates understanding of:

- **UA.III.A.K1** Internet weather briefing and sources of weather available for flight planning purposes
- **UA.III.A.K2** Aviation routine weather reports (METAR)
- **UA.III.A.K3** Terminal aerodrome forecasts (TAF)
- **UA.III.A.K4** Weather charts
- **UA.III.A.K5** Automated surface observing systems (ASOS) and automated weather observing systems (AWOS)

REFERENCES

FAA Aviation Weather Services
www.foreflight.com
www.1800wxbrief.com
www.aviationweather.gov