AVIATION WEATHER

An Aerospace Lesson Plan by Michael Schneider

Summary

Grade Levels: 8-12 (Army JROTC/High School)
Duration: Approx. 60–90 minutes
Lesson Overview: In this lesson, students will explore the components of weather that directly affect aviation safety and flight planning. They will learn the principles of aviation weather theory and develop skills to interpret METAR (Meteorological Terminal Air Report) data. The lesson includes hands-on activities using weather instruments and drawing weather symbols, mapping weather fronts, and reading live weather briefings.
Subject Areas: Aviation Science, Meteorology, Reading, and Interpreting Data

Learning Objectives

- **Aviation Weather Theory:**
  - Explain key weather components that affect aviation: temperature, moisture, wind velocity, visibility, and barometric pressure.
  - Describe the effects of weather fronts (warm, cold, stationary, and occluded) on flight safety.
- **Data Interpretation:**
  - Read and interpret METAR data to assess current weather conditions.
  - Translate weather observations into aviation weather symbols and maps.
- **Instrument Application:**
  - Use anemometers, barometers, and thermometers to gather and record local weather data.
  - Demonstrate the ability to create weather symbols and compose a written METAR for their location.
- **Critical Thinking & Communication:**
  - Engage in group discussions and problem solving regarding real-time weather briefings.
  - Use dry erase boards to collaboratively map weather fronts and annotate weather symbols.

Materials & Resources

Printed Materials:

- ☐ Dry erase boards with a printed outline of the United States
- ☐ Preprinted and blank overlay sheets
- ☐ Airman Knowledge Testing Supplement (FAA-CT-8080-2H)
- ☐ Pilot Handbook of Aeronautical Knowledge (FAA-H-8083-25C)

Instruments and Tools:

- ☐ Wet erase markers
- ☐ Magnifying glass
- ☐ Anemometer
- ☐ Barometer
- ☐ Thermometer

Digital/Online Resources:

- ☐ Computer with internet access
- ☐ Real-time weather briefings from 1800wxbrief or a similar service

Vocabulary

- **Anemometer**
- **METAR**
- **Barometer**
- **Doppler Radar**
- **Standard Briefing**
- **Abbreviated Briefing**
- **Outlook Briefing**
- **Inversion**
- **Warm Front**
- **Cold Front**
- **Stationary Front**
- **Occluded Front**

Instructional Procedures

- **Engage (10 Minutes)**
  - *Activity:*
    - Begin by playing a live or prerecorded weather briefing from 1800wxbrief for a variety of locations. Have students take notes on the weather conditions described.

- *Discussion Prompts:*
  - "What weather conditions are being reported?"
  - "How might these conditions affect flights?"

- **Explore (15 Minutes)**
  - *Activity:*
    - Introduce the different weather components (temperature, moisture, wind velocity, visibility, barometric pressure) and their roles in aviation weather. Facilitate a discussion on how each factor is measured.
  - *Hands-on Component:*
    - In small groups, students will practice reading and drawing common weather symbols and mapping fronts using dry erase boards. Provide preprinted overlay sheets if needed.
  - *Instrument Introduction:*
    - Demonstrate the use of an anemometer, barometer, and thermometer, explaining how each instrument contributes to generating accurate weather reports.
- **Explain (15 Minutes)**
  - *Activity:*
    - Review the METAR format together. Provide a clear explanation of each component of a METAR report and its significance.
  - *Group Work:*
    - Using their dry erase boards, have students annotate a sample METAR report and identify the key weather elements.
  - *Guiding Questions:*
    - "How do the temperature and barometric pressure influence flight decisions?"
    - "What do the abbreviations in a METAR tell us about wind and visibility?"
- **Elaborate (15 Minutes)**
  - *Activity:*
    - With the instruments available, students will work in groups to collect local weather data. They will then create a weather symbol for their location and write a sample METAR that summarizes their findings.
  - *Application:*
    - Challenge groups to compare their own data with the live briefing information. Ask them to explain any differences and discuss how real-time changes might affect flight planning.
  - *Extension:*
    - Map a weather front on the overview of the United States dry erase board using the overlay sheets provided, discussing the effect of different types of fronts (warm, cold, stationary, occluded).

- **Evaluate (10 Minutes)**
  - *Activity:*
    - Using the Airman Knowledge Testing Supplement, conduct a brief quiz or interactive review session where students answer questions about aviation weather and METAR interpretation.
  - *Assessment Options:*
    - Have students exchange their written METARs and weather symbols with another group for peer review.
    - Use dry erase overlays on boards for a quick whole-class exercise mapping weather fronts for different cities.
  - *Exit Ticket:*
    - Ask students to write a brief response: “Explain one way that weather conditions might affect flight safety” or “What did you learn today about how METAR data is used in aviation?”

Standards Alignment

- **NGSS Disciplinary Core Idea:**
  - ESS2.D – Weather and Climate
- **NGSS Cross-Cutting Concepts:**
  - Cause and Effect, Stability and Change, Patterns
- **NGSS Science and Engineering Practices:**
  - Developing and Using Models
  - Analyzing and Interpreting Data
- **Common Core ELA Standard:**
  - RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media.
- **ELD & Communication Criteria:**
  - Emphasize clear, technical language especially when interpreting METAR data and discussing weather phenomena.

Differentiation & Supports

- **For Advanced Learners:**
  - Encourage deeper analysis by asking them to compare METAR data across multiple locations and predict how changing weather could potentially alter flight paths.
- **For Students Needing Extra Support:**
  - Provide visual aids, step-by-step guides, sentence starters, and additional one-on-one explanation of weather symbols and instrument usage.

- **Language Support:**
  - Use bilingual vocabulary cards and provide written definitions of key terms to help English language learners grasp technical concepts.

Teacher Reflection

After the lesson, reflect on the following:

- Did students accurately interpret METAR data and identify key weather components?
- How well did students engage with the hands-on instruments and group mapping activities?
- Were the vocabulary and technical language supports effective in enhancing understanding?
- What adjustments are needed for future lessons on aviation weather?

This lesson plan creates a structured yet interactive environment where students actively engage in understanding aviation weather through real-world data, hands-on instrument use, and collaborative problem solving.
