AVIATION—IN THE KNOW

DESCRIPTION OF SESSION
In this session, Explorers will participate in an overall program review in the form of a game. Use it to add fun to the end of your program.

CATEGORY
- Exploring, Aviation
- US DOE, Transportation
- US DOE, STEM

OBJECTIVES
By the end of this session, participants will be able to:
- Demonstrate their understanding of aviation.

SUPPLIES
- Laptop/computer with PowerPoint game show questions from the Aviation In The Know.zip file. (Note that the slides in the AITK 6.21.13.ppt file also include hints. Advisors are encouraged to add their own questions.)
- Buzzer, bell, or some other way to indicate who gets to answer first. (An easy way to do this is to place a piece of construction paper or a ball between the two players. The first player to grab the paper or the ball gets to answer.)
- Paper and pencil for keeping score

ADVISOR NOTE: Text in italics should be read aloud to participants. As you engage your post in activities each week, please include comments, discussions, and feedback to the group relating to **Character, Leadership,** and **Ethics**. These are important attributes that make a difference in the success of youth in the workplace and in life.

ACTIVITIES
Activity 1
Review Game
Divide participants into two teams and explain the game rules:

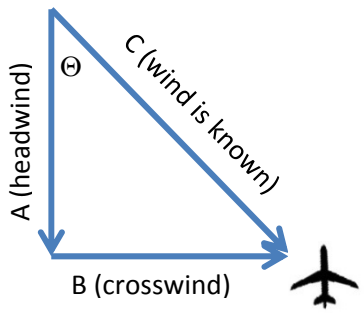
Each team lines up behind a game bell. One person from each team takes a turn standing near the bell. The Advisor shows a single slide with a question on the screen. The first person to ring the bell has three to five seconds to correctly answer the question. If the answer is incorrect, the other team has the opportunity to answer the same question. Teams are awarded one point for each correct answer. The team with the most points at the end of 30 minutes wins.

The Advisor may provide hints if needed. Note that some answers may warrant additional explanation. Often a simple follow-up question of “Why?” is an easy way to solicit more engagement. These might be used as bonus points or consolation points.

To make the game more challenging, you could incorporate a brief discussion about the science, technology, engineering, and math aspects of each question. For example:

- When looking at the different types of planes (crop duster, fighter, aerobatic plane, fire bomber, cargo airplane, jet, propeller plane), discuss the different engineering involved in making the plane have its particular flying strengths. What does an aerobatic plane need that a cargo plane doesn't? What does a fire bomber need to have that a refueling tanker doesn't if it is to dump its entire load at once, while in flight? What characteristics does a propeller plane have that a jet doesn't? Why would you want one and not the other? Why are blimps, dirigibles, and balloons shaped so differently from airplanes and gliders? Why does a helicopter need the tail rotor?
- When looking at the GPS slides, discuss redundancy and why the FAA requires you to have more GPS signals than you need in order to use GPS for certain approaches and navigations. Why are there 27 orbiting satellites worldwide?
- Why is it best to take off and land into the wind? Why would you try to land with the upwind wheel first on a crosswind landing?
- Why do runway numbers require renaming occasionally? (Discuss magnetic changes in the Earth's poles. The Earth's magnetic fields change over time because the Earth's molten core stirs and moves around with the Earth's rotation. While magnetic forces are fairly constant in the short term, they can and do vary over time, requiring runways to be renumbered to the closest magnetic heading. For example, runways at the Oakland, California, airport needed to be renumbered in December 2013.)
- Knowing the wind speed and direction, how can you calculate the crosswind, headwind, or tailwind components in order to tell the ground speed? Why would this be important? (Fuel planning relies on time in the air, not distance along the ground.) Use a flight calculator or a Whizz-Wheel to demonstrate. Or, use the following and discuss:

    —The scientifically accurate way to calculate crosswind (and headwind and tailwind) strength is by using trigonometry. Using a compass rose with the airplane in the center, draw a line pointing to the center to represent the wind direction. Then break it down into the horizontal and vertical components to form the legs of the triangle, with the wind as the hypotenuse.



Θ is known because we know the wind direction.
C is known because we know the wind speed.
So we use trigonometry to calculate A and B:

$B = C \sin \Theta$

$A = C \cos \Theta$

—Of course, pilots don't get their calculators out to do trigonometry when in the air. They use a combination of experience and trial and error. If wind is coming from the right, a 5 degree

correction to the left is tried. If that's too much or too little to stay on course, the pilot will correct a little in the appropriate direction. With experience, this becomes easier. Also, with today's GPS devices, staying on course is much more intuitive and doesn't require a calculator! You follow the line on the screen, correcting as needed to stay on the line. When looking at the different crosswind examples, explain mathematically how you can determine the crosswind correction. There is an excellent discussion of this at the av8n site: http://www.av8n.com/how/htm/xc.html#note152 .

- Why is icing such a big problem? Discuss the changing shape of the airfoil and the degradation of lift when ice accumulates.

REFLECTION

Some sample questions are below. They are designed to help the participants apply what they have learned to their own interests. You are welcome to use these questions or develop your own questions that relate to your post or specific focus area.

- What is one new thing you learned during today's session?
- What other questions about aviation do you have?

ADVISOR AND OFFICER REVIEW

After the meeting, address the following:

- Identify what was successful about the meeting.
- Identify what needed improvement.
- Schedule an officer and Advisor planning meeting to prepare for the next post meeting or activity.

Content for this session provided by Youth Aviation Adventure (http://www.youthaviationadventure.org/yaa/).