The Eye of the Storm

Get ready to fly into the eye of the storm

By Glen Phelan

A plane races down a runway. Engines roar as it lifts off. Today’s weather forecast calls for clear skies and gentle breezes.

*What a perfect day for flying,* thinks the pilot, Lt. Col. Shannon Hailes. Yet he knows trouble is coming. That’s why he’s up in the air. He’s practicing how to fly in and out of bad weather. Soon he will have to do it for real.

A warm winter and spring have turned into a hot summer. That’s a perfect recipe for stormy weather. It heats up the oceans. The warm water fuels monster storms called hurricanes.

Humble Beginnings

A hurricane is the largest kind of storm. It doesn’t start out that way, though. It begins as an ordinary thunderstorm. Storms that grow into hurricanes differ in one big way from other storms. They only form over tropical oceans near the Equator.

Day after day, the sun beats down there. The sun’s energy creates a deep layer of warm water. Hurricane trouble can start when the surface of the water reaches 26° Celsius (80° Fahrenheit).
That's because warm water can evaporate easily. When that happens, it turns into a gas called water vapor. This warm, moist vapor rises and cools. As it rises, it forms storm clouds. As the water heats up, even more clouds and storms may form.

A Hurricane is Born

This rising air also changes the air pressure. Usually, air presses down on Earth's surface. When it rises, air doesn't press down on Earth as hard. This forms an area of low pressure.

Low pressure is like a giant vacuum cleaner. It sucks up air from near the ocean's surface. As the pressure drops, more and more air rushes in and up. Soon winds whirl.

The huge storm starts spinning like a giant pinwheel. Over time, it can grow larger and stronger. When steady wind speeds top 119 kilometers (74 miles) per hour, it's called a hurricane.

Hurricane Hunters

As the hurricane spins across the ocean, its winds churn the water. They whip up waves as tall as 10-story buildings. If the wind and waves hit land, they can wipe out towns.

That's where Hailes comes in. He hunts hurricanes. While most people flee these storms, he flies into this wicked weather. He doesn't do it for the wild ride. His flights can save lives. He and his team collect weather data. Meteorologists, or weather scientists, use this information to track the storm.

Early Warning

The data help scientists predict when and where the storm will hit land. The information also tells them how strong it will be. Their forecasts, or weather reports, let people prepare for the storm and get out of its way.

Today's flight is just a practice run. Hailes knows he could face a real storm any time, though. In the Atlantic Ocean, hurricane season started June 1. By the time the 2012 hurricane season ends November 30, experts predict there will be up to eight hurricanes.

Sky Watch

Back on the ground, Hailes gets a phone call. A storm has formed over the Atlantic Ocean. Practice time is over.
Satellite photos of this storm show a tower of clouds rising 17 kilometers (10.6 miles) high into the sky. That’s a sign the storm may be about to intensify. Sure enough, it does. Within 24 hours, it becomes a hurricane.

Now the storm is heading over the Gulf of Mexico. There, it sucks up more energy from the warm waters. Its winds top 252 kilometers (157 miles) per hour, making it one of the strongest hurricanes ever.

The hurricane is the big story on the news. It’s too early to tell exactly where the storm will hit land, though. Many people wait and wonder if they are in danger.

Hailes and his crew spring into action. His plane’s engines roar to life again. Hailes takes off and heads straight to the storm. Like the practice flight, this one starts smoothly.

**Hunting a Hurricane**

For the first two hours of the flight, skies are clear. Then Hailes sees thick clouds ahead. Within minutes, winds knock the plane around like a toy.

Whump! Thump! Bump! Hailes didn’t expect this. Usually, winds in the outer parts of a hurricane are light. Not this time.

Boom! The sound echoes over the roar of the engines and the thundering storm. A crewmember has released the first dropsonde. This tube holds tools to gather data from the storm. It blasts out of the plane like a cannonball. Then a parachute on the tube opens and it floats to the sea below.

As it drops, it takes the storm’s temperature. It also measures the storm’s air pressure and wind speed. The data help scientists answer two big questions. They learn where the hurricane is going and if it is getting stronger.

The data show that the air pressure is dropping. The storm is getting stronger.

Inside the plane, the rocky ride continues. Hailes feels like he’s in a gigantic washing machine. It’s bad, but the crew hasn’t even faced the most dangerous part of the storm yet. They haven’t faced the eyewall.

**Piercing the Eyewall**

The eyewall is a ring of thunderstorms that surrounds the hurricane’s center, or eye. Winds here are the strongest. In this storm, these winds are spinning 264 kilometers (165 miles) per hour.
Suddenly, the low pressure yanks the plane. It plunges 305 meters (1,000 feet). The
take feels like a runaway roller coaster. Hailes fights for control. The wind could tip
the plane over. Or lightning could strike. That's happened before. The plane's
instruments blinked off briefly. It was the longest two seconds of his life.

Finally, the plane bursts through the eyewall and into the eye of the hurricane. The
pushing and pulling stops. The air here is calm, and the skies above are clear. Yet
all around the plane, the storm still rages.

**Fighting the Winds**

The flight through the hurricane's eye lasts only 10 minutes, so the crew must rush
to finish its work. One crewmember finds the exact center of the storm. That will
help meteorologists track the storm's path.

Boom! Another dropsonde drops. Then the plane reaches the far side of the
eyewall. It's time for another bumpy ride. Hailes flies through and out of the
hurricane.

This flight is far from over, though. Hailes circles around to the storm and flies into
the battering winds again and again.

He crisscrosses through the storm three more times, fighting the winds all the way.
Six hours later, it's time to head home. The crew is worn out. They feel like they've
just run a marathon.

Hailes' mission is a success, though. Now meteorologists can predict where the
storm will strike. The people living along the coast in the strike zone have two days
to get ready and get out.

**Final Preparations**

People take the warning seriously. Within a few hours, shoppers empty store
shelves. They buy all the bottled water, canned food, batteries, and other
emergency supplies.

All along the coast, the sound of pounding hammers fills the air. People nail
plywood over their windows. They hope that will protect their homes and
businesses from high winds.

Cars line up by the dozens at gas stations. Traffic jams the highways as millions of
people flee the coast before the hurricane hits.

Even the animals sense something is wrong. Pelicans fly to lakes farther inland.
Crabs dig deep in the mud. Alligators hide in marshes.
Finally, the hurricane hits. It slams the coast like a bulldozer. Winds whirl at 192 kilometers (120 miles) per hour. The winds peel roofs off buildings and strip leaves from trees. Tree limbs snap. Sparks fly as branches tumble into power lines. Rain falls sideways. Winds howl. Yet the worst is still to come.

**Landfall**

Pushed by the wind, a huge mound of seawater slams into the shore. The giant waves of this storm surge crash against boats and pile them up like toys.

Walls of water wash through towns. Waves flood streets. They push some houses off their foundations. They tear others apart.

Wind and water rip up clumps of marsh grasses. Alligators tumble as the storm surge carries them inland.

The hurricane begins to weaken as it moves over land. Now that it's no longer over warm water, it has lost its fuel.

By the end of the day, the hurricane breaks into smaller thunderstorms. Then it's over. The sky turns blue.

People soon return to their homes. The damage is heartbreaking but everyone pitches in to clean up and rebuild.

Hailes watches the rebuilding on the news. He feels good about giving an early warning. Few people died or were hurt in this storm. It could have been much worse.

Now it's time to rest. Another spot of clouds is building up over the ocean. It may turn into the next monster storm. Once again, Hailes will fly into the eye of the storm.

**What's in a Name?**

A storm's name depends on where in the world it forms.

- Atlantic and eastern Pacific oceans: hurricane
- Indian Ocean: cyclone
- western Pacific Ocean: typhoon

**How a Hurricane Forms**
1. The ocean warms to 26° Celsius (80° Fahrenheit).

2. Warm water evaporates. This warm, moist air rises. Thunderstorms form.

3. The rush of rising air makes winds spin.

4. When spinning winds top 119 kilometers (74 miles) per hour, it's a hurricane.

**Wordwise**

**air pressure:** the force of air pressing down on an area

**evaporate:** to change from a liquid into a gas, such as water into water vapor

**eye:** the center and calmest part of a hurricane

**eyewall:** a ring of thunderstorms around the eye of a hurricane

**hurricane:** a large storm with spinning winds that forms over tropical waters

**Comprehension Strategy:**

As you read, think about the main idea of each section.

**Overview**

**Summary**

- **Hurricanes** are large, dangerous storms. They begin as thunderstorms over tropical oceans.

- **Hurricanes** form when warm, moist air rises and begins to whirl.

- Scientists study **hurricanes** so they can predict their paths and if they will make landfall. This helps people prepare and be safe.

**Learning Objectives**

Students will:
• recognize what **hurricanes** are, how they form, and how they change over time.
• understand how to tell a story in the present tense.

**Materials Needed**

• photos of a rainy day, a windy day, and an afternoon thunderstorm
• National Geographic videos "Hurricane Montage" and "How Katrina Formed":
• a small box
• index cards (4 per pair)

**Resources**

• Watch **hurricanes** form: http://www.nvnl.noaa.gov/MediaDetail2.php?
  MediaID=73&MediaTypeID=2&ResourceID=104295

• Learn more about hurricane hunters: http://hurricanehunters.org

• Learn more about Hurricane Rita: http://www.ncdc.noaa.gov/special-reports/rita.html

• Learn more about hurricane preparedness: http://www.ready.gov/hurricanes

**Background**

• **Hurricanes** are the largest kind of storm.

• A hurricane begins as a thunderstorm over warm oceans. First, ocean water evaporates and turns into water vapor. The water vapor rises and cools to form storm clouds. Then the rising air causes the air pressure to change. It forms an area of low pressure. That area acts like a vacuum cleaner, sucking up air from the ocean’s surface. As more air rushes up and in, the winds start to spin faster and faster, forming a hurricane.
• **Hurricanes** swirl in a circle, like a pinwheel. Once the winds top 119 kilometers (74 miles) per hour, the storm is classified as a hurricane.

• Although the type of weather is the same, the name of a storm changes depending on where in the world it forms. What is called a *hurricane* in the Atlantic and eastern Pacific oceans is called a *cyclone* in the Indian Ocean. In the western Pacific Ocean, this same type of storm is called a *typhoon*.

• There are specific names for the different parts of a hurricane:
  --eye: the center of the hurricane. The air is calm here and the skies are clear.
  --eyewall: the ring of thunderstorms that surrounds the hurricane's center. The winds whirl fastest here.

• **Hurricanes** start over oceans, but they often move over land. When a hurricane makes landfall, it packs high winds and torrential rains. Giant waves pound the shore, and the incoming storm surge can cause great damage. The storm weakens as it moves further inland.

• Meteorologists can track the path of a hurricane and warn people about the storm long before it approaches. People in the path of a hurricane can do many things to prepare for the oncoming storm:
  --Shop early and buy essential items including bottled water, canned food, batteries, flashlights, and other emergency supplies.
  --Nail plywood over all windows to protect homes and businesses.
  --Fill the car with gas. If the authorities call for an evacuation, leave early to avoid traffic jams.

### Fast Facts

• **Hurricanes** are categorized based on wind speed. A Category 1 hurricane has winds between 119-153 kilometers (74-95 miles) per hour. A Category 5 hurricane has winds speeds of 252 kilometers (157 miles) per hour or greater.

• **Hurricanes** can cause a lot of damage. Hurricane Katrina, which hit southeastern Florida, Louisiana, and Mississippi in 2005, caused $108 billion in damages. They can also be deadly. It is estimated that a tropical cyclone that hit Bangladesh in 1970 killed 300,000 people.

• Hurricane names come from a list created by the World Meteorological Organization. This year, the tropical storms that form in the Atlantic Ocean will be named:
Alberto
Beryl
Chris
Debby
Ernesto
Florence
Gordon
Helene
Isaac
Joyce
Kirk
Leslie
Michael
Nadine
Oscar
Patty
Rafael
Sandy
Tony
Valerie
William

See http://www.nhc.noaa.gov/aboutnames.shtml for names for other years and other locations.

Prepare to Read

Activate Prior Knowledge

Severe Storms

1. Prior to this activity, print out photos of a rainy day, a windy day, and an afternoon thunderstorm. Also access the video, "Hurricane Montage," at http://video.nationalgeographic.com/video/environment/environment-natural-disasters/hurricanes/hurricane-montage .

2. Show students photos of a rainy day, a windy day, and an afternoon thunderstorm. Have volunteers describe what they see.

3. Ask students if they have ever been in weather like this. Have volunteers describe what it was like.
4. Next, show students the video. Have students describe what they see. Ask students if they know what type of storm this is.

5. Have students make connections between the photos and the video. Guide them to understand that the video shows what happens during a hurricane.

6. Explain that hurricanes are very severe storms with high winds and lots of rain. Hurricanes begin as thunderstorms.

7. If students have personal experience with hurricanes, ask them to relate what it was like to be in a storm this severe. Have students discuss what they could do to stay safe if they were in a storm like this.

**Vocabulary**

**The Present Tense**

1. Display the projectable edition or write the first paragraph from the article on the board. Have a volunteer read the paragraph aloud and underline each verb. (races, roars, lifts, calls)

2. Point out to students that each of these verbs is in the present tense. Discuss with students what this means. (The action is happening NOW.)

3. Tell each student to write a present tense verb on a slip of paper. Have students put them in a box.

4. Divide the class into two teams. Draw pieces of paper out of the box one at a time. Have the teams act out the verbs as if playing charades.

**Restate Vocabulary in Your Own Words**

1. Tell students that good readers use a variety of strategies to help them understand a text. One strategy is to restate something in your own words. Discuss with students what this means.

2. Have students take out a piece of lined paper and fold it in half lengthwise. Tell them to draw a line down the fold so they can easily see the two halves.

3. Tell students to label the left column, "What the Article Says." Tell them to label the right column, "In My Own Words."

4. Have students turn to the Wordwise vocabulary section of the article.

5. Ask a volunteer to read aloud the first vocabulary term, air pressure, and its definition. Tell students to write the word and its definition on their papers.
6. Next, have a few volunteers restate the definition in their own words. Discuss students’ definitions to ensure that they are accurate. Tell students to write the word and its definition, in their own words, on the right side of the paper.

7. Repeat this procedure with the remaining vocabulary words. Tell students to add information from the article to their papers as they read.

Reading and Writing

Explore Reading

Identify Main Ideas

1. Tell students they will soon be reading an article about hurricanes. Have students brainstorm some overall topics they think might be covered in the article. List the topics on the board.

2. Point out to students that these overall topics are main ideas.

3. Ask students what they could do if they wanted to identify the main ideas of this article in just a few seconds. Work with students to make a general list of clues they should look for in the article. (headline, subheads, boldface words, images on each page)

4. Draw a chart like the one below on the board. Tell students that they will use this chart to record clues that help them understand the article as they read.

<table>
<thead>
<tr>
<th>Clues</th>
<th>Description</th>
<th>What They Tell Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subheads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boldface Words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Images</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Have students complete the chart as they read the article with a partner. Point out that it is often helpful to mark clues with sticky notes as they discover each one.

6. When students have finished reading the article and noting clues, have them form small groups. Have the groups use the completed charts to write a two- or three-sentence summary stating the main idea of the article. Have groups share their summaries with the class.

Extend Reading
Main Ideas in a Graphic

1. Display the graphic on pages 18-19 of the projectable edition.

2. Tell students that graphics like this tell a story of their own and contain many clues to help readers identify their main ideas quickly and accurately.

3. Have volunteers identify the clues in the graphic. (headline, labels, arrows, image, numbered steps) Discuss with students how the graphic’s message would be affected if any of these clues were missing.

Explore Writing

Summarizing Main Ideas

1. Divide students into teams of three. Explain to students that they are now newscasters. Their job is to conduct research to learn about Hurricane Rita and then prepare a news report about the storm.

2. Tell students their news reports should be written in script format and must detail the actual path and the life cycle of Hurricane Rita. Remind students that newscasts cover events as they happen. Their news reports should be written using the present tense.

3. Give teams time to prepare their scripts. Then have them present their news reports to the class.

Extend Writing

Visualizing Main Ideas

1. Have students create a graphic to accompany their newscast. Remind them to include all of the elements that provide clues about the graphic’s main idea.

2. Have students incorporate their graphics into their newscasts as they present to the class.

Science

Explore Science
The Life Cycle of a Hurricane

1. Have students create a time line depicting the life cycle of a hurricane.

2. Tell students to read the article closely to identify the stages in the life of a hurricane. Then have them go online, identify a specific hurricane of their choice, and conduct research that allows them to plot the life of the hurricane.

3. Explain to students that their time lines must include a title, accurate dates and descriptions, and simple visuals to aid understanding.

4. Have students present their time lines to the class and then display them on a classroom wall.

Hurricane Dangers

1. As a class, reread the sections entitled "Final Preparations" and "Landfall." Discuss with students possible dangers people could face during a hurricane and safety precautions they should take.

2. Give each student two slips of paper. On one piece, have them write a possible danger. On the other, have them list a smart safety precaution. Put all of the papers in a box.

3. Draw the pieces of paper out one at a time. Read aloud the slip of paper, and invite students to identify what precautions people should take (if the paper contains a danger) or from what danger the listed protection would protect.

Extend Science

The Formation of Hurricane Katrina


2. Have students explain what happened during the formation of Hurricane Katrina to make it such a devastating storm.

Assessment

Read each question. Circle the correct answer.
1. How does a hurricane start?
   A. as a thunderstorm
   B. as a windy day
   C. as a tornado

2. Where do hurricanes form?
   A. over cool ocean waters
   B. over warm lakes
   C. over warm ocean waters

3. Which happens first when a hurricane begins to form?
   A. The ocean warms.
   B. The winds spin.
   C. Warm water evaporates.

4. What is a tropical cyclone called if it forms over the western Pacific Ocean?
   A. a hurricane
   B. a cyclone
   C. a typhoon

5. Where is the eyewall of a hurricane located?
   A. in the center
   B. around the center
   C. on the outer edges

**Answers**

**Assessment**


**Citations**

MLA 8
APA 6