

2017-2018

# DISCOVERY



Resource Guide



## TERRY VIRTS VIEW FROM ABOVE

NATIONAL GEOGRAPHIC *LIVE!*

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**Monday, March 12, 2018**  
**9:30 a.m.**



VICTORIA THEATRE ASSOCIATION  
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Welcome to the 2017-2018 Discovery Series at Victoria Theatre Association. We are very excited to be your education partner in providing professional arts experiences to you and your students!

I have always been fascinated by astronauts and the idea of going to space. There were many nights I would pull out my telescope and look at planets, stars, and of course, the moon. I love hearing about what it's like to travel to space, living on a space station, and seeing images of our beautiful planet from such a unique perspective. So, you can imagine how excited I am for Astronaut Terry Virts to share his stories with all of us here in Dayton!

The information and activities in this resource guide have been carefully crafted to help you and your students explore the many ways a live theatre experience can open up learning opportunities. Grade level icons will help you determine which activities are good for students, too. And don't forget to take advantage of the local resources listed inside to extend the play-going experience and make even more curricular connections for you and your students. Thank you again and welcome!

**Gary Minyard**  
Vice President -  
Education & Engagement



# Curriculum Connections



You will find these icons listed in the resource guide next to the activities that indicate curricular connections. Teachers and parents are encouraged to adapt all of the activities included in an appropriate way for your students' age and abilities. *TERRY VIRTS: VIEW FROM ABOVE* fulfills the following Ohio and National Education Standards and Benchmarks for Grades 3-12:

## Ohio's Learning Standards for Science

- Grade 3-** Life Science (Behavior, Growth & Change), Earth & Space Science (Earth's Resources)
- Grade 4-** Life Science (Earth's Living History), Earth & Space Science (Earth's Surface)
- Grade 5-** Earth, Space, and Science (Cycles and Patterns in the Solar System)
- Grade 6-** Earth and Science (Rocks, Minerals, and Soils)
- Grade 7-** Earth and Space Science (Cycles and Patterns of Earth and the Moon)
- Grade 8-** Earth and Space Science (Physical Earth)
- Grades 9-12-** Environmental Science (Earth Systems: Interconnected Spheres of Earth)  
Physics (Forces, Momentum, and Motion)

## Ohio's New Learning Standards for Social Studies

- Grade 3-6-** Historical Thinking & Skills, Spatial Thinking and Skills & Places and Regions
- Grades 7-8-** Spatial Thinking and Skills
- Grades 9-12-** World Geography

## National Core Arts Theatre Standards

- Grade 2**—TH:Cr1.1.1, TH:Cn10.1.2, TH:Cn11.1.2, TH:Cn11.2.2
- Grade 3**—TH:Cr1.1.3, TH:Cr2-3, TH:Cn11.1.3
- Grade 4**—TH:Cr1.1.4, TH:Cn10.1.4, TH:Cn11.1.4
- Grade 5**—TH:Cr1.1.5, TH:Cn10.1.5, TH:Cn11.1.5
- Grade 6**—TH:Cr1.1.6, TH:Cn10.1.6, TH:Cn11.1.6
- Grade 7**—TH:Cr1.1.7, TH:Cn10.1.7, TH:Cn11.1.7
- Grade 8**—TH:Cr1.1.8, TH:Cn10.1.8, TH:Cn11.1.8
- Grades 9-12**—TH:Cr1.1.1, TH:Pr4.1.1., TH:Pr5.1.1., TH:Re7.1.1., TH:Re8.1.1., TH:Cn10.1.1., TH:Cn11.1.1

This resource guide was created by Amy Handra. All activities are available for distribution and use in the classroom or at home.

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## About Terry Virts

SCIENCE

Terry W. Virts Jr. was born in 1967 in Baltimore, Maryland but grew up in Columbia, Maryland. Upon graduating from Oak Mills High School, Virts attended the United States Air Force Academy where he received a Bachelor of Science degree in Mathematics with a French minor. He went on to receive his Master of Science degree in Aeronautical Science from Embry-Riddle Aeronautical University in 1997.



Photo: Terry Virts

Upon graduating from the Air Force Academy, Terry Virts was commissioned as a Second Lieutenant in 1989 and earned his pilot wings from Williams Air Force Base in Arizona. There, he completed basic fighter lead-in training, followed by formal training in the F-16 Fighting Falcon with the 56th-Tactical Fighting Wing at MacDill Air Force Base. Virts has resided on bases in Florida, New Mexico, Georgia, and international bases, including Osan Air Base in South Korea and Spangdahlem in Germany. In 1997, Virts was selected for Test Pilot School at Edwards Air Force Base in California. Upon graduating, he became an experimental test pilot at the F-16 combined test forces. Since beginning his pilot career, Virts logged over 5,300 flight hours in over 40 different aircrafts.

In July of 2000, Virts was selected by the National Aeronautical and Space Administration (NASA) to become a pilot. Since then, he has been assigned tasks including lead astronaut for the NASA T-38 program, SAIL test crew member, and Expedition 9 support crew member. He was also the pilot for the Space Shuttle Endeavor. On November 23, 2014, Virts was aboard the Soyuz TMA-15M that launched and docked at the International Space Station (ISS), where it remained as an emergency escape vehicle until June 2015. Virts became commander of Expedition 43 while docked at the ISS. Later in 2015, Virts was assigned as a CAPCOM to mission control in Houston, Texas where he communicated with station crews. Virts retired from NASA in August of 2016.

## Ohio Spotlight

SCIENCE

SOCIAL STUDIES

Last year, the National Museum of the United States Air Force completed its \$40.8 million expansion for the fourth wing. In this wing, guests can board a space shuttle, just like Commander Terry Virts, and walk through four of the ten presidential aircrafts including the historic SAM 26000 that flew John F. Kennedy to Dallas and President Richard Nixon to China. The wing also holds the first ever virtual reality motion simulator, "The Voyage." For a small fee of \$10, guests can put on the virtual reality goggles and instantly be aboard the International Space Station, making minor repairs to damages. The new wing also opens three high tech STEM learning classrooms that are open to the public when not reserved for special use. For more information, please visit <http://www.nationalmuseum.af.mil/>.



COMPREHENSION



# Commander Terry Virts' Missions and Aircraft



The **F-16 Fighting Falcon**, better known to most pilots and to Terry Virts as the Viper, first flew on January 20, 1974 and was primarily used by the U.S. Air Force. It was nicknamed Viper because pilots thought it resembled a viper or a snake. This single-engine supersonic fighter aircraft includes a bubble canopy for better visibility, a side panel control stick for easier maneuver, a 30-degree reclined seat to reduce g-forces on the pilot, and a relaxed static stability/fly-by-wire control system that makes the aircraft nimbler.



Image courtesy of Lockheed Martin website

The **Space Shuttle Endeavour** was a partially reusable spacecraft system operated by NASA as a part of the Space Shuttle Program, also known as the STS-130. The final flight of STS-130 was in 2010 and was piloted by Terry Virts. This mission carried the final additions to the International Space Station, Tranquility and Cupola. Cupola is famously known for having the largest number of windows ever flown into space. These seven windows set up in a hemisphere have a panoramic view of Earth.



Image courtesy of Popular Science

**Exhibition 43** launched in December 2014 carrying a Russian Soyuz, a new Orion Spacecraft. The crew, including Terry Virts, was meant to observe the first flight test of the new spacecraft. Virts completed three space walks totaling 19 hours and 2 minutes during his time at the ISS. During these space walks, Virts rigged the wiring for the upcoming delivery of the International Docking Adapters. It was during this mission that Terry Virts was named Commander of the ISS and sent out his R.I.P. tweet to Leonard Nimoy, famous for his role as Spock, with a spectacular view from the Cupola, pictured to the right. Virts logged 213 days in space between Exhibition 42 and Exhibition 43.



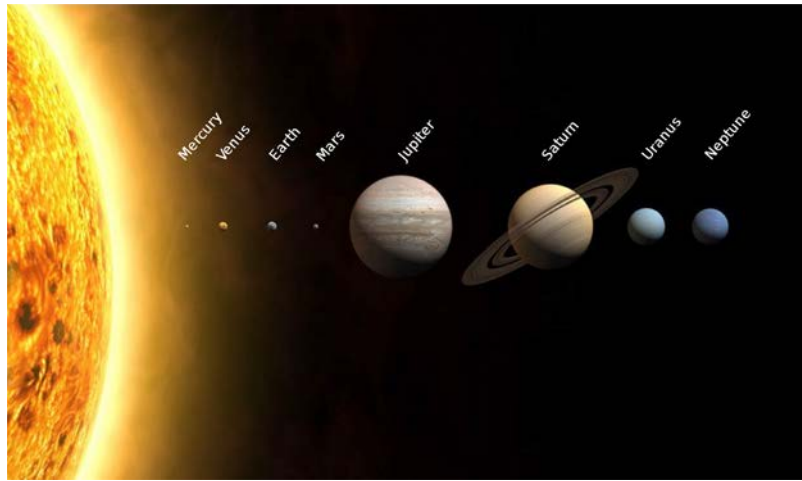
Image courtesy of Lockheed Martin website

COMPREHENSION

# Learn About Space



Much of Terry Virts' life has been spent flying various types of planes through the air, but more recently, he spent over a year photographing the solar system at the International Space Station.



Allow students to spend time familiarizing themselves with the solar system. **Use the following**

**questions to encourage students to infer:**

- Of what does the Solar System consist?
- In what order from the Sun are the planets?
- Is the Sun a star or a planet?
- In what galaxy is Earth?
- What causes the planets to orbit around the Sun?

**Then, allow students to visit a library or website to find answers to the following questions:**

- What is the name of Saturn's largest moon?
- Olympus Mons is a volcanic mountain on what planet?
- Who was the first person to walk on the moon? Who accompanied him as a pilot? What did they place on the moon?
- How many moons does the planet Jupiter have?
- Which is the largest planet in the Solar System? Which one is the smallest? Which one is the hottest? Which one is the coldest?
- In 2006, the farthest planet from the sun, Pluto, was reclassified as what? Why was it reclassified?

## Extension Activity



Have students work in small groups. Assign each group a planet and have students create a poster or brochure about their planet. Then, students should present their planet to the class.

COMPREHENSION

# Know Your Astronauts

SCIENCE

SOCIAL STUDIES



## John Glenn

- Born in Cambridge, Ohio.
- In 1943, completed flight training and became a pilot for the U.S. Marines.
- Flew 59 combat missions during World War II and 90 combat missions during the Korean War.
- In 1962, Glenn became the first American to orbit Earth, circling the globe 3 times in 4 hours and 56 minutes.
- After retiring from NASA, he represented Ohio in the U.S. Senate.



## Neil Armstrong

- Born in Wapakoneta, Ohio.
- Earned his pilot's license AND flew his first solo flight before earning his driver's license!
- Earned Bachelor's and Master's degrees in Aeronautical Engineering.
- In 1958, he was selected to be a part of NASA's Man in Space program; he was one of the first Americans in space and was the first man to walk on the moon.



## Sally Ride

- Earned Bachelor's, Master's and PhD degrees in Physics.
- Was hired by NASA in 1978 as a capsule communicator.
- Was the first American woman in space.
- Head of the committee to determine why the Space Shuttle Challenger disaster occurred. This committee also founded NASA's Office of Exploration.



## Mae Jemison

- From the age of 11, Jemison took dance lessons and considered becoming a professional dancer.
- She attended Stanford College at the age of 16, graduating in 1977 with Bachelor's degrees in both Chemical Engineering and African and Afro-American studies.
- In 1987, Jemison was selected to join the NASA astronaut program.
- Jemison served as a Mission Specialist aboard the STS-47 in 1992 and became the first African-American woman in space.



## Extension Activity

Below are four additional NASA Astronauts who also made a significant contribution to the discoveries of space. What can you find out about each of them? Have you discovered any similarities? Differences?

**Guion Bluford**

**Valentina Tereshkova**

**Christa McAuliffe**

**Yuri Gagarin**

COMPREHENSION

# Take A Trip To Space

SCIENCE

Did you know that the International Space System does not have showers? So, when Commander Terry Virts stayed at the International Space Station for over a year, he never showered! Living in space can be exciting, but it also might present some unique challenges. After all, there is no gravity!

**Part One:** Make a list of your daily activities. Then, group those activities into three categories: those activities you could still do while living in space, those you could do but would have to modify in some way, and those that would become impossible.

**Part Two:** Imagine that like Terry Virts, you are about to be embark on a yearlong space adventure. First, write a paragraph in which you discuss one object you could not live without while traveling for a year in space. Be sure to explain why you could not live without it. Then, describe an activity that you can't do on Earth but that you would like to try while living in space. Finally, create a journal entry, complete with illustrations, chronicling one day of your space adventure.

**Part Three:** Research Terry Virts' blog and gallery by visiting, <http://terryvirts.com/>. Then, create your own space blog. Write and illustrate your blog with entries spanning your year in space. In your blog, describe how you feel, who or what you miss the most, how you spend your days, how your life has changed, and what you are learning.

# Want To Go To Space Camp?

SCIENCE

SOCIAL STUDIES



Launched in 1982, Space Camp, located in Huntsville, Alabama has inspired and motivated young people from around the world. Based at the U.S. Space & Rocket Center, trainees have an unparalleled environment to spur imagination while being surrounded by space, aviation and defense artifacts. Space Camp alumni include NASA and ESA astronauts, engineers, scientists and technologists. Trainees cultivate teamwork, leadership and decision-making skills through simulated missions while gaining personal and professional insights that profoundly impact their futures. Camps are available for fourth grade through high school-age students. Special programs are offered for trainees who are blind or visually impaired, deaf or hard of hearing, and those who have other special needs. For more information about Space Camp, please visit <https://www.spacecamp.com/>.



CONNECTION

# Pilot Wing Worksheet



Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Terry Virts** earned his pilot wings in 1989 from the Williams Air Force base in Arizona. Wings, formally known as U.S Air Force aeronautical rankings, are awarded to pilots in recognition of degrees of achievement and experiences. In the Air Force, among various other badges for different specialties, there are 6 current aeronautical ranking badges.

For more information about the badges, please visit <https://www.thebalance.com/>

**Directions:** Use the website and other resources to research the aeronautical ranking badges. Select three of the six badges and complete the worksheet using the research you collected. Sketch the badge in the box and provide a description.

Badge Name: \_\_\_\_\_  
Description: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Badge Name: \_\_\_\_\_  
Description: \_\_\_\_\_  
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Badge Name: \_\_\_\_\_  
Description: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# Pilot Wing Extension Worksheet



Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** First, complete the **Pilot Wing Worksheet for Grades 3-12**. Then, research the pilots below who have received an aeronautical ranking badge, and complete the worksheet.

**Pilot: Rhonda Cornum**

Flight Badge Received: \_\_\_\_\_

Why did she receive this badge?:

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**Pilot: Daniel James Jr.**

Flight Badge Received: \_\_\_\_\_

Why did he receive this badge?:

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**Pilot: Jane Kendeigh**

Flight Badge Received: \_\_\_\_\_

Why did she receive this badge?:

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**Pilot: Mike R. Campbell**

Flight Badge Received: \_\_\_\_\_

Why did he receive this badge?:

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# Build A Toilet Paper Rocket



## You Will Need:

- Markers
- Crayons
- Glue or Tape
- Construction Paper
- Cardboard Toilet Paper Roll (or some type of tube)
- Cardboard
- Sting or tissue paper (preferably red, yellow, and/or orange)



## Procedure:

**Step One:** Start by wrapping the construction paper around the cardboard toilet paper roll and cut it to fit. Use the extra construction paper to make the cone top of the rocket ship.

**Step Two:** Use markers or crayons to design your rocket ship. Once you are finished, glue or tape the cone top to the cardboard toilet paper roll.

**Step Three:** After you have assembled your rocket ship, cut out 3 triangles from the construction paper and glue them evenly around the bottom of the toilet paper roll. These will be your stands.

**Step Four:** Once the rocket ship is completely assembled with the cone top and the stands at the bottom, cut pieces of string to hang from the bottom of the rocket ship to make it look like it is ready to blast off! If using tissue paper, cut into thin strips and glue strips to the bottom.

## Extension Activity

Have students either go to the hallway or outside and “launch” their rockets! Have students do this 3-5 times. Then, have the students chart how far their rockets go. Did the rockets increase in distance? Did they decrease?

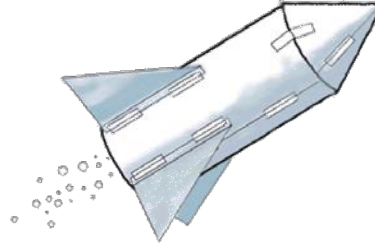
# Launch Your Own Bubble-Powered Spaceship from NASA!



Build your own rocket using paper and fizzing tablets! Watch it lift off. How high does your rocket go? For more information on this activity, please visit <https://spaceplace.nasa.gov/pop-rocket/en/>.

## You Will Need:

- Paper, regular 8-1/2- by 11-inch paper, such as computer printer paper or even notebook paper.
- Plastic 35-mm film canister: The film canister MUST be one with a cap that fits INSIDE the rim instead of over the outside of the rim.
- Cellophane tape
- Scissors
- Effervescent (fizzing) antacid tablet (the kind used to settle an upset stomach)
- Paper towels
- Water
- Eye protection (Eye glasses, sun glasses, or safety glasses)



## Procedure:

**Step One:** Cut out the pieces of your rocket. You may cut it the short way or the long way to make the body of the rocket. There is no one right way to make a paper rocket. Try a long, skinny rocket or a short, fat rocket. Try a sharp nosecone or a blunt nosecone. Try it with fins or without fins. Experiment!

**Step Two:** Wrap and tape a tube of paper around the film canister. Hint: Tape the canister to the end of the paper before you start wrapping.

**Step Three:** Important! Place the lid end of the canister down.

**Step Four:** Roll the circle (with a wedge cut out) into a cone and tape it to the rocket's top.

## BLAST OFF!!

**Step One:** Put on your eye protection.

**Step Two:** Turn the rocket upside down and remove the canister's lid.

**Step Three:** Fill the canister one-third full of water.

## **Now work quickly on the next steps!**

**Step One:** Drop one-half of an effervescent antacid tablet into the canister.

**Step Two:** Snap the lid on tight.

**Step Three:** Stand your rocket on a launch platform, such as your sidewalk.

**Step Four:** Stand back and wait. Your rocket will blast off!

**Fun Fact:** Real rockets work the same way as the pop rocket, but instead of using tablets that fizz in water, they use rocket fuel.

CREATIVITY

# Resources for Students & Teachers

## Publications for Students:

*Sally Ride: A Photobiography of America's Pioneering Woman in Space*, Written by Tam O'Shaughnessy. Roaring Brook Press: 2015.

*Endurance: A Year In Space, A Lifetime of Discovery*, Written by Scott Kelly. Alfred A. Knopf, a division of Penguin Random House LLC: 2017

*Chasing Space: An Astronauts Story of Grit, Grace, and Second Chances*, Written by Leland D. Melvin. Amistad: 2017.

## Publications for Teachers & Parents:

*View From Above*, Written by Commander Terry Virts. National Geographic: 2017.

*No Dream is Too High, Life Lessons from a Man Who Walked on the Moon*, Written by Buzz Aldrin and Ken Abraham. National Geographic: 2016.

*The Hubble Cosmos, 25 Years of New Vistas in Space*, Written by David H. DeVorkin and Robert W. Smith. National Geographic: 2015.

## Websites for Teachers and Students:

<http://terryvirt.com/>; Learn more about Terry Virts, including upcoming events, and images from all his space endeavors!

<http://kids.nationalgeographic.com/>; Nat Geo Kids inspires young adventurers to explore the world through award-winning magazines, books, apps, games, toys, videos, events, and a website, and is the only kids brand with a world-class scientific organization at its core.

<https://www.nasa.gov/audience/forstudents/index.html>; NASA for students provides educational recourses, the latest NASA educational news, and entertaining videos for all different grades. Read about the teacher who spent a year in space, watch how a fidget spinner works on a spaceship, and so much more through NASA's website.

## Victoria Fuse's Local Resource



The Armstrong Air and Space Museum is in Neil Armstrong's hometown of Wapakoneta, Ohio. The museum opened

three years to the day after Armstrong's death in 2012. Since 2015, the museum has focused on other Ohio aviation spotlights including the Wright Brothers, and other astronauts, like Jon Glenn, who have attempted to "defy gravity." Visit the museum and see Neil Armstrong's spacesuit from his Gemini and Apollo missions. For more information about the Armstrong Air and Space Museum, visit <https://www.armstrongmuseum.org/>.





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Matinee presentations are approximately one hour long, including a short question and answer session with the speaker after their talk. National Geographic Live Student Matinees take place in various venues around the United States and some international locations.

For more information, please visit <https://www.nationalgeographic.org/student-matinees/>.

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