



National Aeronautics and  
Space Administration

Educational Product

Educators

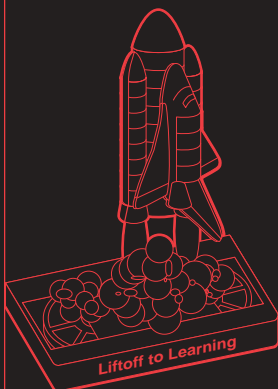
Grades K-12

EP-2002-07-344-HQ

# LIFTOFF to LEARNING



Educational Videotape Series



<http://education.nasa.gov>

# Table of Contents

## *Liftoff to Learning*

Educational Videotape Series . . . . .	1
All Systems Go! . . . . .	3
Assignment: Spacelab! . . . . .	4
The Atmosphere Below . . . . .	5
From Undersea to Outer Space . . . . .	6
Geography from Space . . . . .	7
Go for EVA! . . . . .	8
Let's Talk Robotics . . . . .	9
Living in Space . . . . .	10
Mathematics of Space—Rendezvous . . . . .	11
Microgravity . . . . .	12
Newton in Space . . . . .	13
Plants in Space . . . . .	14
Space Basics . . . . .	15
Tethered Satellites	
Part 1: Forces and Motion . . . . .	16
Part 2: Electrical Circuits in Space . . . . .	17
Toys in Space II . . . . .	18
<i>Voyage of Endeavour</i>	
Then and Now . . . . .	19
NASA Educator Resource Centers . . . . .	20
Videotape Application Matrix by Subject . . . . .	22



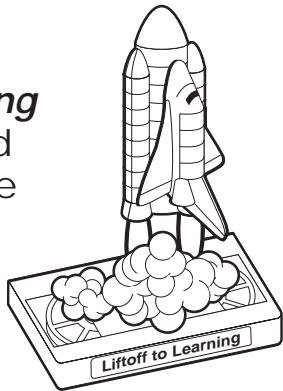
## ***Liftoff to Learning*** ***Educational Videotape Series***

**E**very liftoff of the Space Shuttle is the beginning of a voyage of exploration and discovery. The experiences of Shuttle astronauts capture the imagination of students of all ages. Students study science, mathematics, geography, and technology with crew members aboard Space Shuttle flights. Space becomes the departure point for learning, integrating many other subject areas and bringing them to life.

**R**ecognizing the potential of the Space Shuttle experience in the classroom, NASA's Education Division and the Johnson Space Center's Flight Crew Operations Directorate have joined forces to create a dynamic videotape series to support educators in the classroom. *Liftoff to Learning* captures the excitement of space flight and explains, in basic and practical terms, the scientific, mathematical, and technological concepts that make space flight possible. These learning tools also provide concrete examples of the global perspective space flight offers and the new frontiers of research and exploration space flight has created.

**T**aking advantage of state-of-the-art video production facilities and computer animation capabilities of the NASA Johnson Space Center, *Liftoff to Learning* programs combine the stunning visual images of space flight with clear and entertaining graphics. Each program comes with a printed video resource guide that provides valuable background information for teachers, resources for additional study, and practical hands-on demonstrations of some of the concepts presented in the videotapes.

Obtaining  
***Liftoff to Learning***  
Videotapes and  
Video Resource  
Guides



**A**ll programs and publications in the *Liftoff to Learning* series are available at minimal cost from the NASA Educator Resource Center Network (ERCN). See the ERCN list on pages 20–22 for details on the center that serves your state.

**T**he *Liftoff to Learning* series programs are also available by mail order nationally and internationally through NASA's Central Operation of Resources for Educators (CORE). NASA CORE is a worldwide distribution center for NASA's educational multimedia materials. Educators may request a catalog and order form by writing, calling, faxing, or e-mailing:

**NASA CORE**

Lorain County Joint Vocational School  
15181 Route 58 South  
Oberlin, OH 44074

Phone: (440) 775-1400

Fax: (440) 775-1460

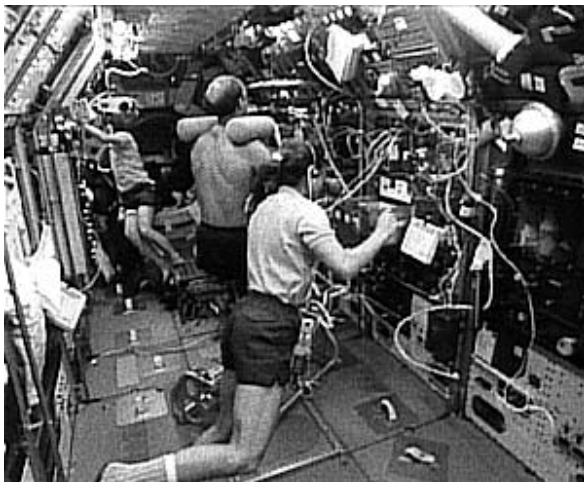
E-mail: [nasa\\_catalog@leeca.org](mailto:nasa_catalog@leeca.org)

NASA CORE Home Page:

<http://core.nasa.gov>

**T**he *Liftoff to Learning* Video Resource Guides that accompany the videotapes can be downloaded from NASA Spacelink at <http://spacelink.nasa.gov/products>. As new videotapes are added to the series, the Video Resource Guides will appear on Spacelink. See the inside cover of this brochure for details about NASA online resources for educators and the NASA Education Home Page.

## *All Systems Go!*



***All Systems Go!*** examines human physiologic changes that occur in astronauts while they are in microgravity and attempts to answer important questions on how the body readapts to Earth's environment. The videotape shows research conducted aboard the Space Shuttle that examines the heart, lungs, blood, muscles, cells, and the immune system as part of six physiological systems. This program is segmented, enabling educators to extract topics that are most relevant to current classroom studies.

Length: 33:34

Grade Level	Applications
5-12	Biology Life Science

## ***Assignment: Spacelab!***



### ***Assignment: Spacelab!***

demonstrates how proper laboratory procedures are as important in space as they are on Earth. This video emphasizes safety as well as reasons for experimental controls and other laboratory procedures. The program begins in a school science classroom where students are conducting an experiment without wearing eye protection. From the orbiter, astronauts reinforce the educator's message and expand the explanation of why proper laboratory procedures are critical to all scientists.

Length: 16:05

Grade Level	Applications
5-8	Life Science Physical Science

# *The Atmosphere Below*

## *The Atmosphere Below*

illustrates the research scientists are conducting from Earth orbit to help understand changes that are taking place in Earth's atmosphere. Space Shuttle astronauts explain the questions scientists hope can be answered by studying Earth's atmosphere from space. Experiments discussed in this videotape focus on infrared detection of atmospheric remnants from volcanic eruptions, ozone concentration levels, and incoming solar ultraviolet radiation with respect to global warming, among others.

Length: 16:00



Grade Level	Applications
5-12	Earth Science



## *From Undersea to Outer Space*



### *From Undersea to Outer Space*

is the story of a life sciences experiment conducted on the first Spacelab Life Sciences Mission flown on the Space Shuttle. More than 2,000 jellyfish were sent into space so that scientists could learn about how living things adapt to the microgravity environment of Earth orbit. Scientists examined how microgravity affects the development of young jellyfish, especially their gravity receptors. The gravity receptors of jellyfish serve a purpose similar to that of the inner ear of human beings for balance and orientation.

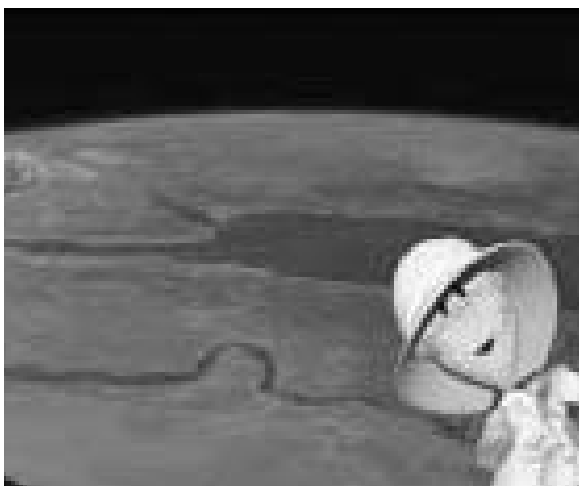
Length: 15:06

Grade Level	Applications
5–8	Life Science

# *Geography from Space*

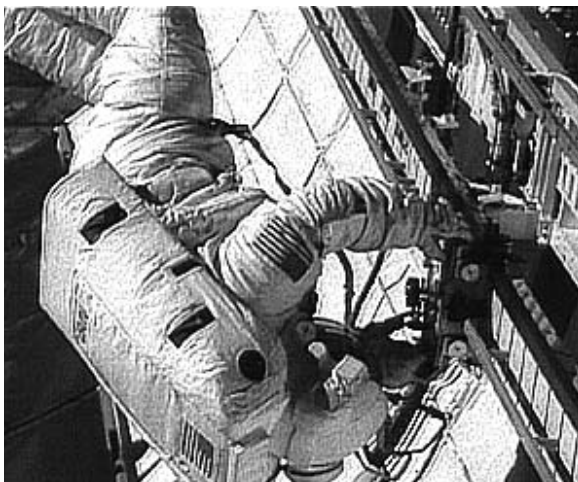
***Geography from Space*** takes students on a fast, fun video tour of Earth's surface as seen from outer space. Through a clever combination of animation and computer graphics, viewers learn how altitude affects perspective. The video then develops into a travelogue on some of the interesting features of Earth's continents (except for Antarctica) as seen from space.

Length: 14:29



Grade Level	Applications
K-8	Earth Science Geography

## *Go for EVA!*



***Go for EVA!*** discusses how spacesuits protect astronauts from the hostile space environment, explains what the components of the spacesuit are, describes how the suit functions, and shows what types of work astronauts perform while spacewalking. Actual footage of spacewalks—also known as Extravehicular Activities (EVAs)—illustrates how spacesuits allow astronauts to operate scientific apparatus, assemble equipment and structures, pilot the Manned Maneuvering Unit, take photographs, and service satellites and space hardware.

Length: 13:48

Grade Level	Applications
K–8	History/Social Studies, Life Science, Science Technology

## *Let's Talk Robotics*

***Let's Talk Robotics*** explores the application of robots to space exploration. Robot terms are explained, and robots used on the Space Shuttle are shown. Animated scenes show how robots will be used to assist in the assembly of the International Space Station. Interspersed in the program are classroom scenes of ways in which intermediate and high school students are constructing and learning about robots.

Length: 14:41



Grade Level	Applications
5-12	Technology Education, Physical Science

## *Living in Space*



***Living in Space*** demonstrates what it is like to live and work in space. Viewers are invited to join the astronauts as they go through their daily routine living onboard the Space Shuttle. This program answers many of the basic questions students ask astronauts about living in space. Students gain insight into the similarities and differences in eating, exercising, relaxing, maintaining personal hygiene, sleeping, and working in space versus on Earth.

Length: 10:00

Grade Level	Applications
K-4	Life Science, Physical Science, Technology Education

# ***Mathematics of Space— Rendezvous***

***Mathematics of Space—  
Rendezvous*** demonstrates the mathematical operations needed to enable the crew of STS-84 to rendezvous with the Russian *Mir* Space Station. Students in a middle school mathematics class are invited to help the crew solve some basic problems. The program has several stopping points where viewers of the tape can try the problems themselves.

Length: 17:00



Grade Level	Applications
5-12	Mathematics

# *Microgravity*



***Microgravity*** describes the restrictions that gravity imposes on scientific experimentation and how these restrictions can be greatly reduced in the exciting research environment of the Space Shuttle and, later, on the International Space Station. The program focuses on four scientific disciplines in microgravity studies: fluid physics, materials science, biotechnology, and combustion. Experiments within these disciplines explore how the effects of buoyancy-driven convection and sedimentation, seen in ground-based laboratories, are diminished in space, allowing scientists to expand their knowledge in these areas.

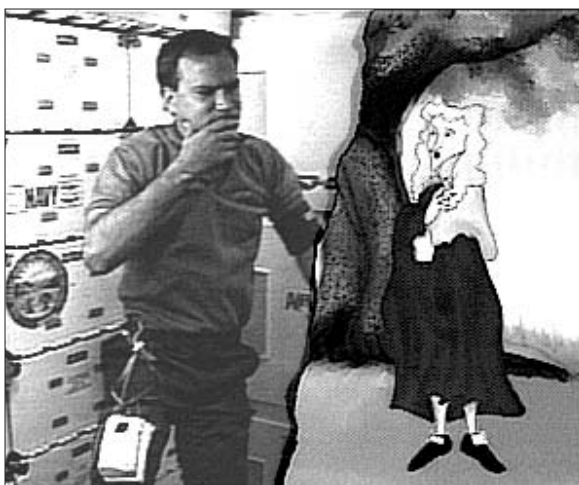
Length: 23:24

Grade Level	Applications
5-12	Physical Science

## *Newton in Space*

***Newton in Space*** offers an introduction to Isaac Newton's Laws of Motion and how these laws apply to space flight. The program explains the difference between weight and mass; the basic principles of balanced and unbalanced forces, as well as actions and opposite reactions; and how the three laws of motion affect the way a rocket operates. Using the microgravity environment of Earth orbit, Space Shuttle astronauts conduct simple force and motion demonstrations in ways not possible on Earth.

Length: 12:37



Grade Level	Applications
5-8	Physical Science



## *Plants in Space*



***Plants in Space*** investigates the effects of microgravity on corn plants grown onboard the Space Shuttle in orbit. Elementary students assist in the experiment by growing control plants in a one-gravity environment on Earth. Plant growth terms such as geotropism and phototropism are explained. Students viewing the program can participate in the experiment by growing similar plants in their classrooms. Instructions for the control experiment are contained in the accompanying guide.

Length: 12:15

Grade Level	Applications
5-12	Life Science

# *Space Basics*

***Space Basics*** answers commonly asked questions about space flight, including how spacecraft travel into space, how spacecraft remain in orbit, why astronauts float in space, and how spacecraft return to Earth. Viewers learn how English scientist Isaac Newton formulated the basic science behind Earth orbit more than 300 years ago.

Length: 20:55



Grade Level	Applications
5-8	History/Social Studies, Physical Science, Technology Education

## *Tethered Satellites Part 1 (Forces and Motion)*



***Part 1: Tethered Satellite—  
Forces and Motions*** demonstrates the principle behind a unique scientific satellite that the Space Shuttle deployed into space attached to the Shuttle by a thin line. Crew members on this joint mission between the United States and Italy describe the project and the many physical principles involved that permit it to work, such as angular momentum, center of mass, Coriolis Effect, and more.

Length: 21:12

Grade Level	Applications
9–12	Physical Science

## ***Tethered Satellites Part 2 (Electrical Circuits in Space)***

### ***Part 2: Tethered Satellite— Electrical Circuits in Space***

continues the topic of tethered satellite systems in space by showing how the system generates electricity as it passes through Earth's magnetic field. Several basic electrical experiments are shown that help explain the concepts and principles involved.

Length: 18:50



Grade Level	Applications
9–12	Physical Science

## *Toys in Space II*



*Toys in Space II* provides a hands-on way for students to investigate the scientific principles that make many common toys function. The Space Shuttle crew invite students to experiment with similar toys in their classrooms and hypothesize how these same toys will operate in microgravity. Scenes of the astronauts operating the toys in space serve as data with which students confirm or reject their hypotheses.

Length: 37:49

Grade Level	Applications
K-12	Physical Science

# *Voyage of Endeavour Then and Now*

*Voyage of Endeavour Then and Now* captures the excitement of the maiden flight of NASA's Space Shuttle *Endeavour* and contrasts it with its namesake, the seventeenth-century research sailing vessel commanded by James Cook. Students will experience *Endeavour's* historic rescue of the stranded INTELSAT VI satellite and the first three-person extravehicular activity (EVA). Cook's voyage provides an apt parallel by charting unexplored land and waters in the South Pacific, New Zealand, and Australia, and by using scientists and artists to collect data on plants, wildlife, and native peoples.

Length: 19:00



Grade Level	Applications
5-12	History/Social Studies, Technology Education

***Liftoff to Learning*** videotapes are available from NASA Educator Resource Centers.

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NASA Ames Research Center  
Mail Stop 253-2  
Moffett Field, CA 94035-1000  
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FAX: (650) 604-3445  
<http://amesnews.arc.nasa.gov/erc/erchome.html>

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<http://www.dfrc.nasa.gov/trc/ERC>

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NASA Educator Resource Center for  
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Village at Indian Hill  
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FAX: (216) 433-3601  
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NASA Educator Resource Center  
NASA Goddard Space Flight Center  
Mail Code 130.3  
Greenbelt, MD 20771  
Phone: (301) 286-8570  
FAX: (301) 286-1781  
<http://www.gsfc.nasa.gov/vc/erc.htm>

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Wallops Island, VA 23337  
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FAX: (757) 824-1776  
<http://www.wff.nasa.gov/~WVC/ERC.htm>

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NASA Johnson Space Center  
Space Center Houston  
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Houston, TX 77058  
Phone: (281) 244-2129  
FAX: (281) 483-9638  
[http://www.spacecenter.org/educator\\_resource.html](http://www.spacecenter.org/educator_resource.html)

FL, GA, PR, Virgin  
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NASA Educator Resource Center  
NASA Kennedy Space Center  
Mail Code ERC  
Kennedy Space Ctr., FL 32899  
Phone: (321) 867-4090  
FAX: (321) 867-7242  
<http://www-pao.ksc.nasa.gov/kscpao/educate/edu.htm>

KY, NC, SC, VA, WV

NASA Educator Resource Center for  
NASA Langley Research Center  
Virginia Air and Space Center  
600 Settlers Landing Road  
Hampton, VA 23669-4033  
Phone: (757) 727-0900, Ext. 757  
FAX: (757) 727-0898  
<http://www.vasc.org/erc>

AL, AR, IA, LA, MO,  
TN

NASA Educator Resource Center for  
NASA Marshall Space Flight Center  
U.S. Space & Rocket Center  
One Tranquility Base  
Huntsville, AL 35807  
Phone: (256) 544-5812  
FAX: (256) 544-5820  
<http://erc.msfc.nasa.gov>

MS

NASA Educator Resource Center  
NASA Stennis Space Center  
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Stennis Space Ctr., MS 39529-6000  
Phone: (228) 688-3338  
Toll Free: (800) 237-1821  
FAX: (228) 688-2824  
<http://education.ssc.nasa.gov/erc/erc.htm>



# Subject Matrix

## Educational Videotape Series

	Biology	Earth Science	Geography	History/Social Studies	Life Science	Mathematics	Physical Science	Technology Education
All Systems Go!	▲ ■			▲ ■				
Assignment: Spacelab				■		■		
The Atmosphere Below		▲ ■						
From Undersea to Outer Space				▲				
Geography from Space		● ▲	● ▲					
Go for EVA!			● ▲	● ▲			● ▲	
Let's Talk Robotics						▲ ■	▲ ■	
Living in Space				●		●	●	
Mathematics of Space— Rendezvous					▲ ■			
Microgravity						▲ ■		
Newton in Space						▲		
Plants in Space				▲ ■				
Space Basics			▲			▲	▲	
Tethered Satellites— Part 1 and 2						▲ ■		
Toys in Space II						● ▲ ■		
Voyage of <i>Endeavour</i> Then and Now			▲ ■				▲ ■	

Grade Level:

● K-4 ▲ 5-8 ■ 9-12

# ***Liftoff to Learning*** **Educational Videotape Series**

Check the following *Liftoff to Learning* Educational Videotape Series programs that you have used in your classroom.

- All Systems Go!
- Assignment: Spacelab!
- The Atmosphere Below
- From Undersea to Outer Space
- Geography From Space
- Go for EVA!
- Let's Talk Robotics
- Living in Space
- Mathematics of Space
- Microgravity
- Newton in Space
- Plants in Space
- Space Basics
- Tethered Satellites Part 1
- Tethered Satellites Part 2
- Toys in Space II
- Voyage of *Endeavour* Then and Now

List the programs you liked best.

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Identify topics of interest for future *Liftoff to Learning* Educational Videotape programs.

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How can we improve the quality of the *Liftoff to Learning* Educational Videotape Series?

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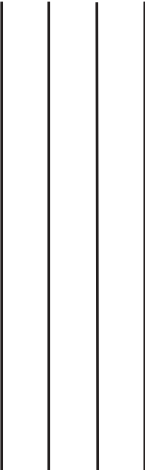
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