
Premiere American Women in Aerospace
These women and others made significant contributions through their careers in aerospace.
What will your contributions be?
1903-2003
100th ANNIVERSARY OF Flight
NASA X-43
Consider a Career in
Aerospace
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NASA

"Consider a Career in Aerospace"

About the poster "Consider a Career in Aerospace" . . .

This poster was developed as a tool to be used to encourage young women to pursue careers in mathematics, science, engineering, and technology. It also provides information and activities for educators to use with their students relating to past, present, and future careers in aerospace. The front of the poster contains three primary elements:

- The center of the poster features four members of the Young Women of NASA's Advisory Council (YWAC) and three Women of NASA mentors: Commander Eileen Collins, Dr. Ellen Ochoa, and Mission Specialist Yvonne Cagle. The council was formed to bring together the ideas, enthusiasm, and the experiences of young women. As a result of this project, unique mentoring alliances and collaborations have been formed to encourage young women to pursue their dreams and establish career goals. Biographies and images of the members of the YWAC are featured on the web site at *http://quest.arc.nasa.gov/women/YWAC*.

- Surrounding the center photograph are examples of outstanding contemporary women who are enjoying successful careers in aerospace. Because these women represent a wide range of professions at NASA, many of them are featured on the Women of NASA web site at *http://quest.arc.nasa.gov/women*. Through on-line "chats," they share their career experiences and advice with young people and help them gain insight into identifying and selecting future careers.

- The perimeter of the poster, "Premiere American Women in Aerospace," recognizes a few of the many women who were the first to succeed in one or more facets of their aerospace-related careers. These women are listed in chronological order based upon the date of one of their significant accomplishments. In the course of researching the women pictured, students will learn about additional women who have made valuable contributions throughout the history of aerospace.

Integrating "Consider a Career in Aerospace" Into Your Curriculum

To the Educator

As students venture into the 21st century, they must be adept at working with technology and communicating on-line. They should be informed about career choices and have access to people who are working in areas of interest to them. This poster is designed to help you emphasize the importance of these skills and to provide you and your students with sources of information about careers in aerospace.

The activities on this poster suggest numerous ways to integrate "Consider a Career in Aerospace" into your classroom. They span multiple disciplines and grades 5–12. The activities are meant to be a springboard to launch your own imaginative lessons based on your personal teaching style, methods of facilitation, and unique students.

A number of NASA resources are provided for you throughout the text of this poster, including a section titled "Resources for Educators." NASA's Education Home Page at *http://education.nasa.gov* is a good place to begin. Additional sites have been listed that may be helpful as your students work through the activities on this poster. The on-line interactive project sites offer learners the opportunity to communicate with NASA scientists and researchers. To learn more about interacting with women working in aerospace at NASA, visit NASA's Learning Technologies Project Quest at *http://quest.arc.nasa.gov/women/intro.html*.

Things to Do On-Line

Real-time Web Chats at
http://quest.arc.nasa.gov/women/won-chat.html

For information on "Chat etiquette" see
http://quest.arc.nasa.gov/women/recruiting/chatdirections.html

"Consider a Career in Aerospace"

Things to Do On-Line . . . continued

- Before participating in chats, ask your students to make three lists of what they enjoy doing (1) at school (e.g., mathematics, art, science), (2) at work, and (3) during their leisure time. These lists will reflect each student's talents and interests and should be helpful to them as they develop a plan to meet their educational and career goals and objectives. The biographies at *http://quest.arc.nasa.gov/women/WON.html* may help your students identify careers that interest them. They can then select an upcoming chat with a woman of NASA who is working in mathematics, science, engineering, or another exciting aerospace career field. Students could also identify additional potential career fields in which their special skills and talents could be utilized. Your students should develop thoughtful questions related to education and career planning to ask during the chat. Following the chat, ask your students to discuss what they have learned and how it will effect their career planning.

- Another way you might use a chat is to have each student or a group of students research the background of a profiled woman before a scheduled chat. Again, they would prepare appropriate questions to ask and then pose their questions during the chat. The students will also have an opportunity to interact with other students on-line in addition to the featured woman. After participating in the chat, have your students reconvene and summarize the answers they were given by the profiled woman. Were they satisfied with the answers? If not, how could your students have rephrased their questions? Was the chat forum the best means of having their questions answered?

Archived Chats

- There may be times when a real-time chat is inconvenient for you to use with your students. Archived chats are available for your use after they have occurred and have the added benefit of being in a text format. Archived chats allow you to review the topics covered and the questions asked before you discuss them with your students. For example, students could research the woman featured in a chat and prepare a list of appropriate questions. After seeing the archived chat, students could discuss the chat and compare their questions to the actual questions posed.

Site Visits

- Encourage your students to visit the NASA mission patch site at *http://www.hq.nasa.gov/office/pao/History/mission_patches.html* to view some mission patches. Students can then research NASA missions—past, current, and future—by reading through "Women of NASA" profiles (*http://quest.arc.nasa.gov/women/intro.html*) and other NASA on-line resources such as *http://www.hq.nasa.gov/office/pao/History/humansp.html* to generate ideas about the key elements that are represented on each patch. Ask small groups of students to choose a mission that is of special interest to them and define its objectives. They then should identify a mission team and design a mission patch. Who are the other "behind the scenes" integral team members not shown on the patch? For example, the women shown in the photograph below each worked behind the scenes in Mission Control at Johnson Space Center. How could you engage teachers and students in other classes (e.g., art, mathematics, technology) to develop a finished patch that could be displayed or worn?

Linda Hamm (Flight Director), Eileen Hawley (Ascent Commentator), and Susan Still (Capcom)

- Encourage students to read the biographies of Tina Herrera, Jennifer Kwong, and Patricia S. Cowings, Ph.D., at *http://quest.arc.nasa.gov/women/bios* (indexed by the women's initials). Have your students list five life skills each woman uses in her career and/or personal life. Ask your students to identify the life skills these women have in common with one another. Discuss why these life skills are important. Help your students identify their own life skills. Ask them to choose one or two additional life skills that would be important for them to attain. Have them formulate a plan to meet this objective.

- Have your students explore the on-line resources listed for the "Premiere American Women in Aerospace" who are pictured on the perimeter of this poster. They can also find other sources, such as interviews with Eileen Collins, at *http://www.rego.gov/interviews/collins.htm*. Assign, or let each student choose, one or more women to research. See the "20 Questions" activity on page 3.

- Students will probably be interested in reading some of the "Young Women of NASA" biographical profiles at *http://quest.arc.nasa.gov/women/YWAC/*. See the "Future Career" writing activity on page 3.

“Consider a Career in Aerospace”

Things to Do Off-Line

20 Questions

■ After your students have researched several of the “Premiere American Women in Aerospace,” using the web sites listed on this poster and/or library resources, have your students play a game of “20 Questions.” One student begins with the statement, “Who am I?” Other students may ask yes/no questions about when this woman's notable “first” event took place, what it was, whether there were other “firsts” in her career, and so on, until the woman is identified.

Future Career

■ Have students read a selection of “Women of NASA” or “Young Women of NASA” biographies to generate ideas for their own future career. Ask students to identify a list of career priorities. Questions they may want to consider are:

- What is your job title?
- With whom do you work?
- What is an average day like in your field?
- What is the most exciting and/or most enjoyable thing about your job?
- Where is your job located?
- What are your work hours?
- Is travel required?
- What is the starting salary?

After they have completed their lists, tell your students: “You have been selected to be featured on a poster similar to this one. Write a biographical profile outlining your life, your education, and your professional and personal goals and accomplishments.” Have your students design their own poster featuring one another.

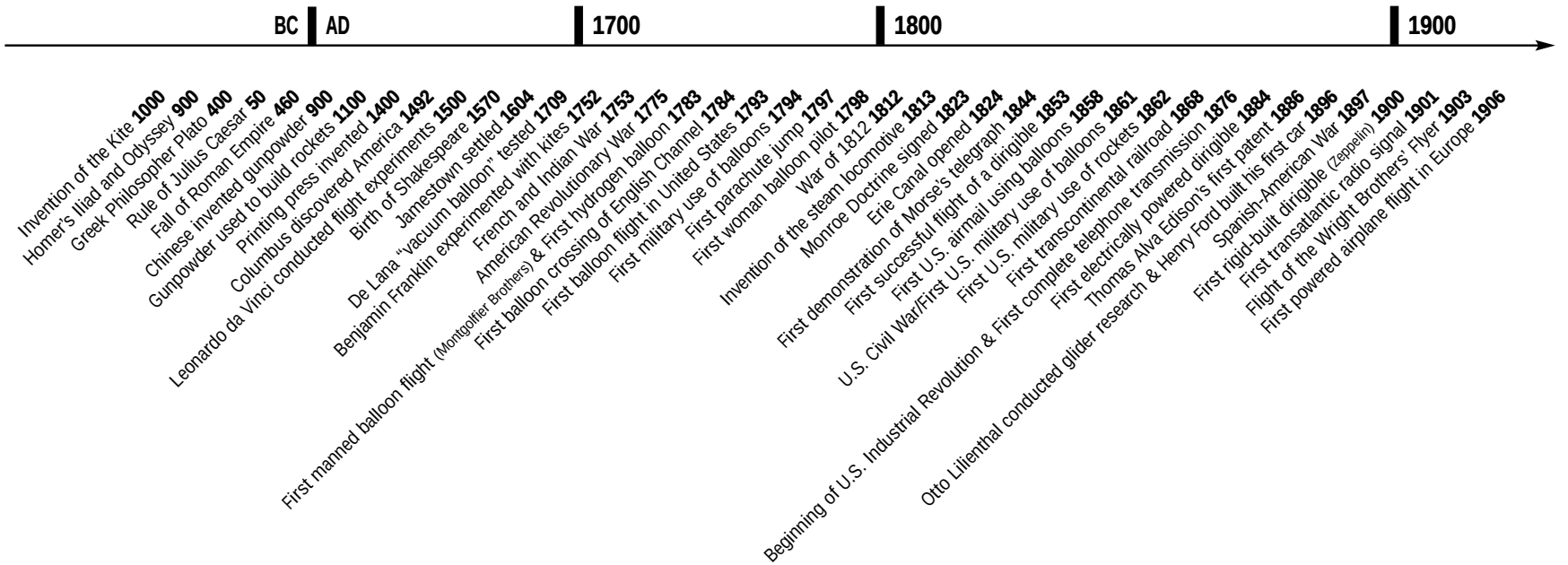
Poster Credits

- This poster was produced at NASA Headquarters by Sonja Godeken, Anne Holbrook, and Debbie Gallaway. Shelley Canright, Deborah Hale, and others too numerous to list provided suggestions that were invaluable.
- The NASA Headquarters Printing and Design Office did the layout and design of the poster. Special thanks to Les Lien for his work on the poster and the design of the “100th Anniversary of Flight” logo. Look for this logo on upcoming NASA materials that will be designed to commemorate this special event.
- Tom Hathorn at Bellarmine Preparatory School in Tacoma,Washington, edited the high school statistics activity.

The following people and organizations provided photographs and information that were used on the “Consider a Career in Aerospace” poster:

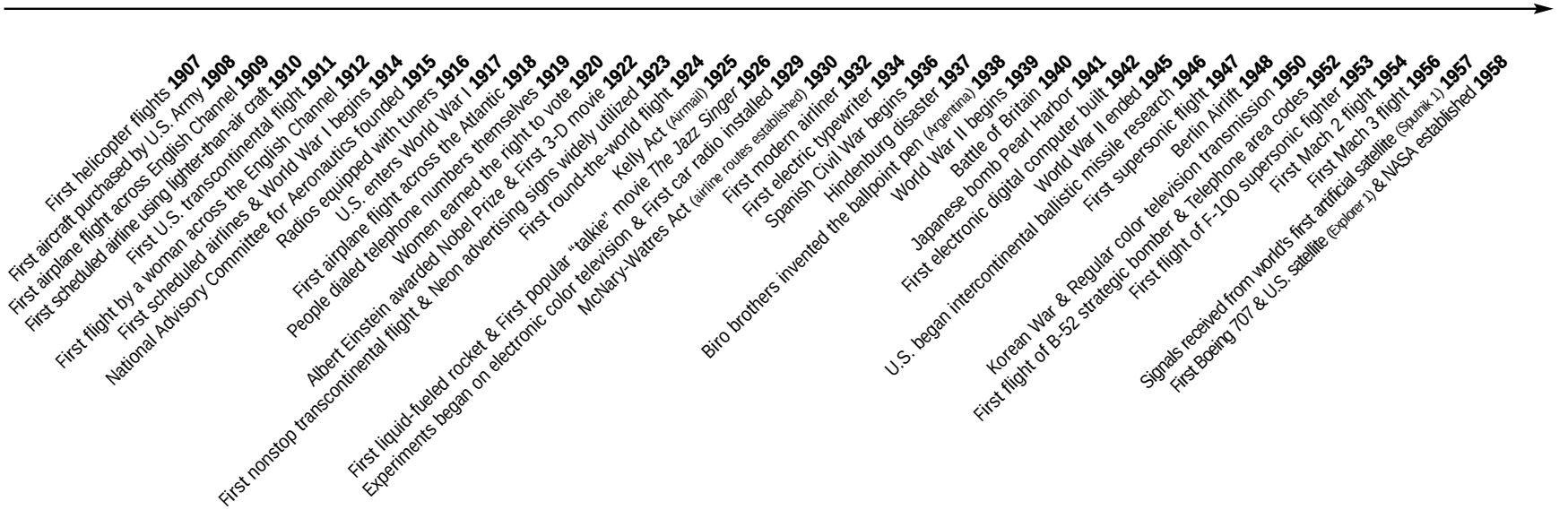
- National Air and Space Museum, Smithsonian Institution (photos #1–11, 13–19, 21–23, 25, 26, 28, 30–33, 35). Special thanks to Dorothy Cochrane, Kate Igoe, and Christine Kaske for their wealth of knowledge and help.
- NASA history and photo archive offices at Ames Research Center, Dryden Flight Research Center, Goddard Space Flight Center, Headquarters, Johnson Space Center, and Langley Research Center (photos #20, 27, 29, 34, 36, 39–41). Special thanks to Ted Huetter at Dryden Flight Research Center for his ideas and suggestions.
- Carolyn Russo, National Air and Space Museum, Smithsonian Institution (photos #43, 45, 47) from her book, *Women and Flight*, Bullfinch Press, 1997.
- Henry M. Holden for information about and from his books, in particular, *Women in Aviation Milestones & Achievements 1854–1998*, Black Hawk Publishing Co., 1999.
- Federal Aviation Administration (photo #46).
- U.S. Air Force (photo #42).
- Civil Air Patrol for information from their “Chronology of Aerospace Events” posters.
- Oregon Historical Society (photo #12, negative #CN013401).
- The Woman's Collection, Texas Woman's University, Denton, Texas (photo #24).
- Mary Feik (photo #44).
- Mark Greenberg, Visions Photo (photo #37).
- Ty Greenlees (photo #38).

Historic Events BC to 2000



Timeline of Interdisciplinary Activities:

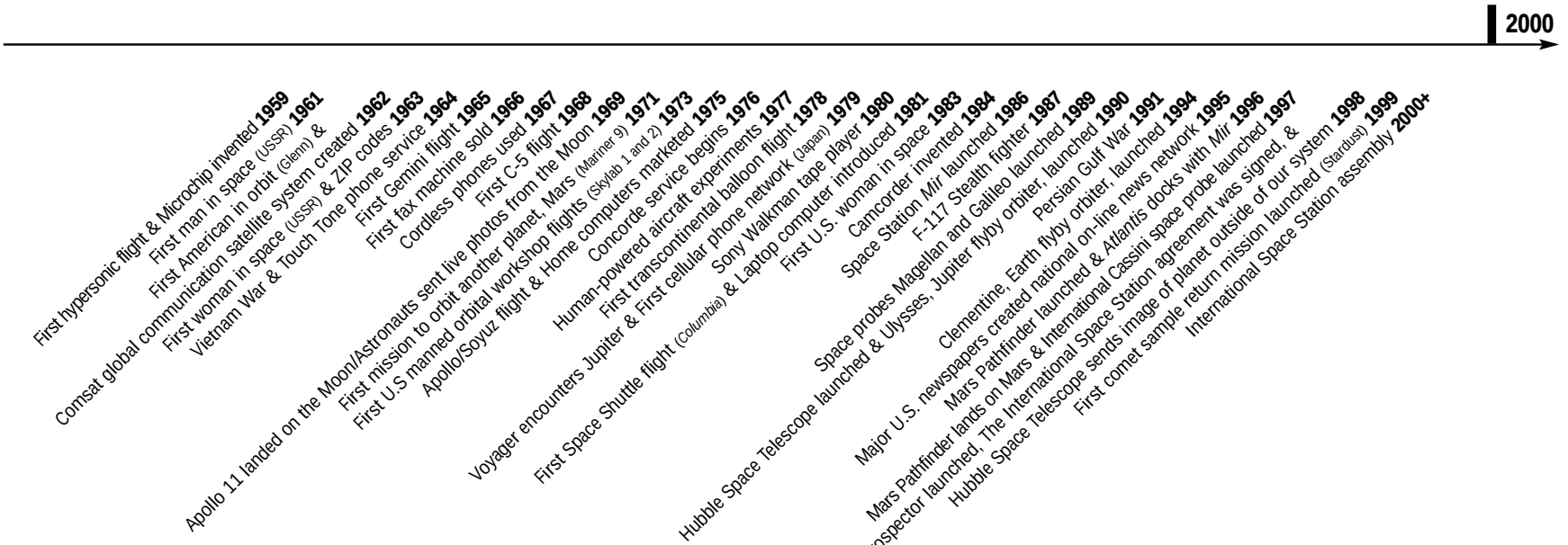
1. Select one or more of the "Premiere American Women in Aerospace" (border pictures). Research their backgrounds and record their names and accomplishments above the timeline in the proper location. The research sites listed on this poster and the historical events on the timeline will help you.
2. Research historical time periods, for example, by decade. What were the significant events that affected the role of women?
3. Research the leaders in government during the time period you selected.
4. Research the clothing, art, literature, music, and dance for the "time."
5. Research the state-of-the-art technology in transportation, commerce, communication.



Tips for searching on the Net:

Be specific.
Use quotation marks around exact match data.
Spell correctly.
Beware of punctuation. (Apostrophes are not universally recognized.)

Get help. (All search engines have a *Help* section.)
Follow the information tree. (Click under search engine directory sites.)
Try independent search tools. (for example, *http://www.searchpad.com*)



Activities

Instructional Activity—Grades 5–8

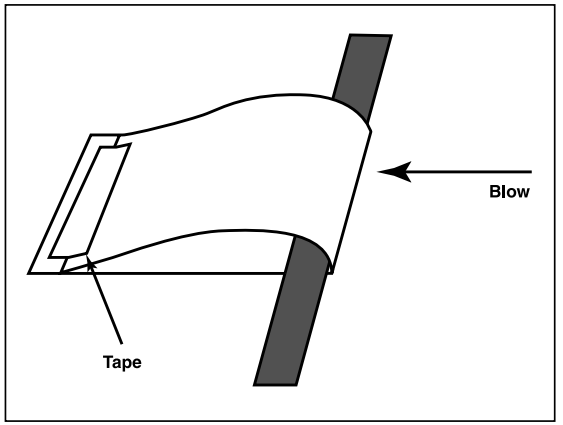
Wing It!

Materials A ruler, a strip of paper (28 cm by 8 cm), tape

Procedure Fold the strip of paper in half and tape the top edge about 3 cm from the bottom. This will make the top surface curved and gives the paper the shape of an airplane wing. Slide the ruler into the fold of the paper. Blow on the front of the wing.

Extension Vary this activity by increasing the size of the curve in the wing by taping the paper farther away from the bottom. Does this make a difference in the lift?

Explanation Because the top surface of the wing is curved, the air has to go faster over the top than under the bottom. This causes a pressure difference. There is more pressure on the bottom than on the top of the wing, which results in lift.



Statistics Activities—Grades 9–12

Year	Total Women Pilots	Total—All Pilots
1940	902	31,264
1942	3,206	100,787
1944	4,829	132,435
1945	5,112	141,280
1960	9,966	348,062
1962	10,512	365,971
1964	14,627	431,041
1966	20,265	548,757
1968	28,401	691,695
1970	29,472	732,729
1972	33,001	750,869
1974	36,943	733,728
1976	41,643	744,246
1980	52,902	827,071

Using graphing calculators and the data above, students will perform the activities below and answer the bulleted questions:

1. Create a scatter plot for "Year vs. Total Women Pilots" and a separate scatter plot for "Year vs. Total—All Pilots."

2. Find the models (also known as functions or regression equations) that best fit the data for each scatter plot. Notice the equations of your models. Draw all "best fit" lines or curves going through your scatter plots.

   - What kind of correlation, if any, do you notice between the scatter plots and the lines/curves? *Note:* The correlation coefficient will not be applicable to all models, most notably the quadratic. It is a good indicator of fitness for linear and exponential models.

3. Predict the number of "Total Women Pilots" and "Total—All Pilots" for the years 1952, 1997, and 2003, based upon your regression equations.

   - Assuming that your data are valid and that all computations are correct, how confident are you in your predictions? Why? (*Hints*: Consider the strength of your model and whether you are extrapolating/interpolating to make your predictions. Are you equally confident in all predictions?) *Note*: Students will often respond that they have confidence because they "used a calculator" or they are not confident because "the data could be wrong." These are not appropriate responses for verifying confidence.

4. Do some research and find the numbers of pilots in those years you predicted.

   - Try to explain any similarities and/or differences that you see between the predictions and the real data.

   - Compare the regression equations/graphs for the "Total Women Pilots" to the "Total—All Pilots" and try to explain any similarities and/or differences between the equations.

   - Create a third column for the percentage of women pilots, and see how that model compares to your others.

Research Sites

"Premiere American Women in Aerospace"

The following web sites will be helpful in researching the women featured on the perimeter of the poster:

Aviation Organization Sites

http://www.avdigest.com/99s/ProfHist.html
http://www.nasm.edu/
http://www.wiai.org/

Special Interest/Profiles Sites

http://quest.arc.nasa.gov/space/frontiers/profiles.html
http://www.af.mil/lib/bio/index.html
http://www.aircruise.com/wia/
http://www.kshs.org/people/AMELIA.HTM
http://www.lihistory.com/specpio/air2.htm
http://www.makeithappen.com/wis/skydive/early.htm
http://www.mtn.org/lindfdtn/
http://www.nasa.gov/hqpao/women_ac.htm
http://www.women-in-aviation.com/

Individual Topics Sites

http://images.jsc.nasa.gov/iams/html/pao/pao.htm
http://twu.edu/library/wasp.html
http://www.faa.gov/apa/BIOS/garvey.htm
http://www.harrietquimby.org/html/bio.html
http://www.jsc.nasa.gov/Bios/
http://www.netsrq.com:80/~dbois/cochran.html
http://www.pattywagstaff.com/
http://www.wasp-wwii.org/wasp/38/38.html
http://www.wic.org/bio/

Ask your students to make a list of additional sources of information they found to be helpful. Students can compare and exchange their sources with one another.

Additional Sites for Educators

National Standards

National Research Council Science Content
http://bob.nap.edu/readingroom/books/nses/html#content

NCTM Mathematics Content Standards
http://standardse.nctm.org/1.0/89ces/Table_of_Contents.html

National Geography
http://www.tapr.org/~ird/Nordick/Standards.html

National Standards for Arts Education
http://artsedge.kennedy-center.org/cs/design/standards

Additional NASA-Related Sites

NASA CONNECT Series
http://edu.larc.nasa.gov/connect/

NASA Jobs
http://www.nasajobs.nasa.gov

NASA Headquarters News Releases
http://www.nasa.gov/releases/1999/

NASA Shuttle Missions
http://www.ksc.nasa.gov/shuttle/missions/missions.html

NASA Jet Propulsion Laboratory Mission Status Reports
http://www.jpl.nasa.gov

NASA Technology Success Stories
http://nctn.hq.nasa.gov/success/index.html

NASA QUEST "WEBCASTS," Interactive Events for Students
http://quest.arc.nasa.gov

NASA Field Center Precollege Contacts
http://education.nasa.gov/precoll.html

NASA Educational Workshops for Teachers
http://education.nasa.gov/new

NASA Student Involvement Program
http://education.nasa.gov/nsip

National Coalition for Aviation Education (NCAE)
http://www.aviationeducation.org

Take Our Daughters to Work
http://iita.ivv.nasa.gov/happenings/event_2.html

NASA Field Center Education Home Pages

Ames Research Center
http://www.arc.nasa.gov/kids.html

Dryden Flight Research Center
http://www.dfrc.nasa.gov/trc/

Glenn Research Center
http://www.grc.nasa.gov/Doc/educatn.htm

Goddard Space Flight Center
http://education.gsfc.nasa.gov

Jet Propulsion Laboratory
http://eis.jpl.nasa.gov/eao/

Johnson Space Flight Center
http://spaceflight.nasa.gov/outreach/index.html

Kennedy Space Center
http://www.pao.ksc.nasa.gov/kscpao/educate/educate.htm

Langley Research Center
http://edu.larc.nasa.gov

Marshall Space Flight Center
http://www1.msfc.nasa.gov/EDUCATION/index.html

Stennis Space Center
http://wwwedu.ssc.nasa.gov/

NASA Resources for Educators

NASA's Central Operation of Resources for Educators (CORE) was established for the national and international distribution of NASA-produced educational materials in audiovisual format. Educators can obtain a catalogue and an order form by one of the following methods:

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

- Phone: (440) 775-1400
- Fax: (440) 775-1460
- Home Page: *http://core.nasa.gov/*
- E-mail: *nasaco@leeca.esu.k12.oh.us*

Educator Resource Center Network (ERCN)
To make additional information available to the education community, the NASA Education Division has created the NASA Educator Resource Center (ERC) network. Educators may preview, copy, or receive NASA materials at these sites. Because each NASA Field Center has its own areas of expertise, no two ERCs are exactly alike. Phone calls are welcome if you are unable to visit the ERC that serves your geographic area. The following is a list of the centers and the regions they serve:

AK, Northern CA, HI, ID, MT, NV, OR, UT, WA, WY
NASA Educator Resource Center
Mail Stop 253-2
NASA Ames Research Center
Moffett Field, CA 94035-1000
Phone: (650) 604-3574

IL, IN, MI, MN, OH, WI
NASA Educator Resource Center
Mail Stop 8-1
NASA Glenn Research Center
21000 Brookpark Road
Cleveland, OH 44135
Phone: (216) 433-2017

CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT
NASA Educator Resource Laboratory
Mail Code 130.3
NASA Goddard Space Flight Center
Greenbelt, MD 20771-0001
Phone: (301) 286-8570

CO, KS, NE, NM, ND, OK, SD, TX
Space Center Houston
NASA Educator Resource
Center for
NASA Johnson Space Center
1601 NASA Road One
Houston, TX 77058
Phone: (281) 244-2129

FL, GA, PR, VI
NASA Educator Resource Center
Mail Code ERC
NASA Kennedy Space Center
Kennedy Space Center, FL 32899
Phone: (321) 867-4090

KY, NC, SC, VA, WV
Virginia Air & Space Center
Educator Resource Center for
NASA Langley Research Center
600 Settlers Landing Road
Hampton, VA 23669-4033
Phone: (757) 727-0900 x 757

AL, AR, IA, LA, MO,TN
U.S. Space and Rocket Center
NASA Educator Resource Center for
NASA Marshall Space Flight Center
One Tranquility Base
Huntsville, AL 35758
Phone: (256) 544-5812

MS
NASA Educator Resource Center
Building 1200
NASA John C. Stennis Space Center
Stennis Space Center,
MS 39529-6000
Phone: (228) 688-3338

NASA JPL Educator
Resource Center
Village at Indian Hill
1460 East Holt Avenue, Suite 20
NASA Jet Propulsion Laboratory
Pomona, CA 91767
Phone: (909) 397-4420

AZ and Southern CA
NASA Educator Resource
Center for
NASA Dryden Flight Research Center
45108 N. 3rd Street East
Lancaster, CA 93535
Phone: (661) 948-7347

VA and MD's Eastern Shores
NASA Educator Resource Center
Visitor Center Building J-17
GSFC/Wallops Flight Facility
Wallops Island, VA 23337
Phone: (757) 824-2298

Regional Educator Resource Centers (RERCs) offer more educators access to NASA educational materials. NASA has formed partnerships with universities, museums, and other educational institutions to serve as RERCs in many states. A complete list of RERCs is available through CORE, or electronically via NASA Spacelink at *http://spacelink.nasa.gov/ercn/*

NASA's Education Home Page serves as a cyber-gateway to information regarding educational programs and services offered by NASA for the American education community. This high-level directory of information provides specific details and points of contact for all of NASA's educational efforts, Field Center offices, and points of presence within each state. Visit this resource at the following address: *http://education.nasa.gov*

NASA Spacelink is one of NASA's electronic resources specifically developed for the educational community. Spacelink is a "virtual library" in which local files and hundreds of NASA World Wide Web links are arranged in a manner familiar to educators. Using the Spacelink search engine, educators can search this virtual library to find information regardless of its location within NASA. Special events, missions, and intriguing NASA web sites are featured in Spacelink's "Hot Topics" and "Cool Picks" areas. Spacelink may be accessed at: *http://spacelink.nasa.gov*

NASA Spacelink is the official home to electronic versions of NASA's Educational Products. A complete listing of NASA Educational Products can be found at the following address: *http://spacelink.nasa.gov/products*

NASA Television (NTV) features Space Shuttle mission coverage, live special events, interactive educational live shows, electronic field trips, aviation and space news, and historical NASA footage. Programming has a 3-hour block—Video (News) File, NASA Gallery, and Education File—beginning at noon Eastern and repeated five more times throughout the day. Live feeds preempt regularly scheduled programming.

NTV Weekday Programming Schedules (Eastern Times)

Video File	NASA Gallery	Education File
12–1 p.m.	1–2 p.m.	2–3 p.m.
3–4 p.m.	4–5 p.m.	5–6p.m.
6–7 p.m.	7–8 p.m.	8–9 p.m.
9–10 p.m.	10–11 p.m.	11–12 p.m.

Check the Internet for programs listings at:
http://www.nasa.gov/ntv

For more information on NTV, contact:
NASA TV
NASA Headquarters
Code P-2
Washington, DC 20546-0001
Phone: (202) 358-3572

Please take a moment to evaluate this product at *http://ehb2.gsfc.nasa.gov/edcats/educational_wallsheet*
Your evaluation and suggestions are vital to continually improving NASA educational materials. Thank you.

EW-2000-02-132-HQ