



**National  
Coalition for  
Aviation  
Education**

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ITEMS

ORGANIZATIONS

|   | Aviation Camps | Aviation Museums | Career Information | Conferences/Special Events | Curriculum Materials | Educator Grants | Educator Workshops | Publications | Scholarships | Speakers | Student Competitions | Student Internships | Student Mentoring Programs | Student Programs | Student/Educator Awards | Student Educator Memberships | Videos | Visual Aids | Additional Resources |
|---|----------------|------------------|--------------------|----------------------------|----------------------|-----------------|--------------------|--------------|--------------|----------|----------------------|---------------------|----------------------------|------------------|-------------------------|------------------------------|--------|-------------|----------------------|
| 4-H Aerospace Education Program                             |                |                  | X                  |                            | X                    |                 |                    | X            |              |          | X                    |                     |                            |                  |                         |                              |        |             |                      |
| Academy of Model Aeronautics                                |                | X                |                    |                            | X                    | X               |                    |              | X            |          | X                    | X                   |                            |                  |                         |                              |        |             |                      |
| Aero Club Foundation of Washington                          |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             | X                    |
| Aerospace Education Alliance                                |                |                  |                    |                            | X                    | X               |                    | X            | X            |          |                      |                     | X                          | X                | X                       | X                            |        |             | X                    |
| Aerospace Education Foundation                              |                |                  |                    |                            |                      | X               |                    | X            | X            |          | X                    |                     |                            |                  | X                       |                              |        |             | X                    |
| Aerospace Industries Assoc.                                 |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| AHS International - The Vertical Flight Society             |                |                  |                    |                            | X                    |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Air Line Pilots Assoc.                                      |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Air Traffic Control Assoc.                                  |                |                  |                    |                            |                      |                 |                    | X            | X            |          |                      |                     |                            |                  | X                       |                              |        |             |                      |
| Air Transport Assoc.  |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Aircraft Electronics Assoc.                                 |                |                  |                    |                            |                      |                 |                    | X            | X            |          |                      |                     |                            |                  |                         |                              | X      | X           |                      |
| Aircraft Owners & Pilots Assoc.                             |                |                  | X                  |                            | X                    |                 |                    | X            | X            |          |                      |                     |                            |                  |                         | X                            |        |             |                      |
| Airmobile - Science Museum of Virginia                      |                |                  |                    |                            | X                    |                 | X                  | X            |              |          |                      |                     |                            | X                |                         |                              |        |             |                      |
| Airports Council International - North America              |                |                  |                    |                            |                      |                 |                    | X            | X            | X        |                      |                     |                            |                  | X                       |                              |        |             |                      |
| American Assoc. of Airport Executives                       |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| American Institute of Aeronautics & Astronautics            |                |                  |                    |                            | X                    | X               |                    |              | X            |          |                      |                     | X                          | X                |                         | X                            |        |             |                      |
| Aviation Council of Pennsylvania                            |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         | X                            |        |             |                      |
| Aviation Distributors & Manufacturers Assoc.                |                |                  |                    |                            |                      |                 |                    | X            | X            |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Be A Pilot  |                |                  |                    |                            | X                    |                 |                    | X            | X            |          |                      |                     |                            | X                |                         | X                            |        |             |                      |
| Chicago Youth in Aviation, Inc.                             |                |                  |                    |                            | X                    |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             | X                    |
| Civil Air Patrol  | X              |                  | X                  | X                          | X                    | X               | X                  | X            | X            |          |                      |                     |                            | X                | X                       | X                            |        |             |                      |
| EAA Aviation Foundation                                     | X              | X                | X                  |                            | X                    | X               | X                  | X            | X            |          | X                    | X                   | X                          |                  |                         | X                            | X      |             | X                    |
| Federal Aviation Administration                             | X              |                  | X                  |                            | X                    | X               | X                  | X            | X            | X        | X                    | X                   |                            |                  |                         |                              |        |             | X                    |
| General Aviation Manufacturers Assoc.                       |                |                  |                    |                            | X                    | X               | X                  | X            | X            |          |                      |                     |                            |                  | X                       |                              | X      |             |                      |
| Helicopter Assoc. International                             |                | X                |                    |                            | X                    |                 |                    |              | X            |          |                      |                     |                            |                  |                         | X                            | X      |             |                      |
| International Assoc. of Machinists & Aerospace Workers      |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| International Society of Aviation Maintenance Professionals |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Ken Cook Co.  |                |                  |                    |                            | X                    |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        | X           | X                    |
| Magnet Schools of America, Inc.                             |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| National Aeronautic Assoc.                                  |                | X                |                    |                            | X                    |                 |                    |              |              |          | X                    |                     |                            |                  |                         |                              |        |             |                      |
| National Aeronautics & Space Administration                 |                | X                | X                  |                            | X                    | X               | X                  | X            | X            | X        | X                    | X                   | X                          | X                |                         |                              | X      | X           | X                    |
| National Agricultural Aviation Assoc.                       |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| National Air Carrier Assoc.                                 |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| National Air Transportation Assoc.                          |                |                  |                    |                            |                      | X               |                    |              | X            |          |                      |                     |                            |                  |                         |                              |        |             | X                    |
| National Aircraft Resale Assoc.                             |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| National Assoc. of State Aviation Officials                 | X              |                  | X                  |                            | X                    |                 |                    | X            | X            |          | X                    |                     | X                          |                  |                         |                              |        |             | X                    |
| National Business Aviation Assoc.                           |                |                  | X                  |                            | X                    |                 |                    |              | X            |          |                      |                     |                            | X                | X                       |                              |        |             |                      |
| Naval Sea Cadets  | X              |                  |                    |                            | X                    |                 |                    |              |              |          |                      |                     |                            | X                |                         | X                            | X      |             |                      |
| Professional Aviation Maintenance Assoc.                    |                |                  | X                  |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         | X                            |        |             |                      |
| Regional Airline Assoc.                                     |                |                  |                    |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Richard Klein and Associates                                |                |                  | X                  |                            | X                    |                 | X                  |              |              | X        |                      |                     |                            |                  |                         |                              |        |             | X                    |
| Soaring Society of America                                  |                |                  |                    |                            | X                    |                 |                    | X            |              |          | X                    |                     |                            |                  |                         |                              | X      |             |                      |
| The Ninety-Nines, Inc.                                      |                |                  | X                  |                            | X                    |                 |                    |              | X            |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| The U.S. Centennial of Flight Commission                    |                | X                |                    |                            | X                    | X               | X                  | X            |              |          | X                    | X                   |                            | X                |                         |                              |        |             | X                    |
| U.S. Ultralight Assoc.                                      |                |                  | X                  |                            |                      |                 |                    |              |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| University Aviation Assoc.                                  |                |                  | X                  |                            | X                    |                 |                    | X            | X            |          |                      |                     |                            |                  |                         | X                            | X      |             | X                    |
| Virginia Department of Aviation                             |                | X                | X                  |                            | X                    |                 | X                  | X            | X            |          | X                    |                     |                            |                  |                         | X                            |        |             |                      |
| Washington Times Newspaper in Education Program             |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| West Chester University - Helicopter Museum                 |                |                  |                    |                            |                      |                 |                    | X            |              |          |                      |                     |                            |                  |                         |                              |        |             |                      |
| Wolf Aviation Fund  |                | X                |                    |                            | X                    | X               |                    |              | X            |          |                      |                     |                            |                  |                         |                              |        |             | X                    |
| Women in Aviation, International                            |                |                  | X                  |                            | X                    |                 |                    | X            | X            |          |                      |                     |                            |                  |                         | X                            |        |             |                      |

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# Guide to Aviation Education Resources

**2004**

- K-6 grade level-specific aerospace units that correlate with national standards
  - Source book with curriculum by grade level
  - To be used by all teachers regardless of aerospace background
  - Short videos on activities that motivate students
  - Robotics and computer aerospace
  - Teamwork materials involving multi-courses
  - A way to locate and access available information
  - Activities for small spaces
  - Multimedia units on problem solving using aerospace as basis
  - Comprehensive textbook resource for high school level
  - Plastic working color coded jet engine model with applicable math/science materials
  - Show how historic firsts and innovations of individuals in aerospace enhance daily lives and impact industries and products
  - Kits containing everything a teacher needs to teach a lesson
  - Develop a simulator to teach students to fly a radio controlled airplane
  - Address standards at every grade level
  - Current career information to excite students to consider an aerospace career
  - Hands-on experiences
7. Are you interested in information about aviation/aerospace magnet schools? If so what kind of information?  
ANSWER: A majority expressed an interest in knowing more about where they are located, how to contact them, what kind of curriculum is used, how to become one and what advantages they offer students. Most of the questions seem to indicate a lack of familiarity with the magnet concept in general as it is a relatively new approach to using aerospace education in teaching students at the elementary and secondary educational levels.

## CONCLUSION

As one reviews the many sources of aerospace education information available to educators, it becomes clear that the kind of help requested by those who responded to the National Congress Teacher Survey, and others interviewed from many parts of the country, is available.

In many cases huge amounts of teaching and study materials are available free of charge. In other instances, the costs are very reasonable.

Any educator, volunteer parent or interested student has available tested, validated materials of instruction for every facet of aerospace education.

It is the hope of the authors that you will make full use of the resources that are identified in this publication that relate to your educational interests and needs in carrying out meaningful education in general and aerospace education in particular.

If you have questions or comments about this publication please send an email to:

*aviationed@kencook.com*

- Grant writing information and sources
  - Information sources for parents and kids
  - Learning Packets with activities/software/handouts
  - Books of handout projects with teacher guides
  - Examples of other school programs
  - Units with interdisciplinary choices
  - State level resource centers to provide information, numbers, lists to contact
  - Curriculum framework for content with activities, supplies and equipment
  - A development plan, how to start, market, cost and benefits
  - Practical reproducible material kids can relate to
  - Status of aerospace and the future
3. Would it be helpful to have suggestions for planning strategies to show administrators and boards of education how aerospace education can be used and still attain educational standards?  
ANSWER: The teachers clearly said information on quantifying the results of aerospace education is needed for program approvals.
4. List any examples of teachers doing creative, imaginative work in aerospace education.  
ANSWER: Most teachers participating in the survey were willing to share their work. A listing of examples described or sources mentioned follows:
- NASA educator workshops
  - School/Industry aviation internship programs
  - Wright Flight program for middle school
  - 4H curriculum package
  - CAP AEX Activity Booklets
  - Constructing a Solar System model and observing the Moon for two months activity
  - Hot air balloon designs/moon craters using flour/poof rockets with plastic bottles and straws/moon trip survival items
  - Teacher materials for AMA remote controlled airplanes
  - Construct scale models to full size replicas of historic gliders
  - Starbase lessons on basic principles
  - Space simulations for third, fourth and fifth graders using a 1/3 scale inflatable scale model of the space shuttle Endeavor
- State aerospace teacher association conducting workshops taught by teachers for teachers
  - A one week aviation curriculum for summer camp includes hands-on activities, field trips and guest speakers with a focus on careers
  - Designing your own airplane as part of an aviation curriculum
  - Smithsonian Whipple Observatory outreach program
5. What are some of the best examples of aerospace education materials that you know about or use?  
ANSWER: Of the many suggested, the ones most frequently mentioned are listed below:
- Civil Air Patrol Materials
  - NASA Materials (NASA Connect Series, NASA Resource Centers, Websites- Core, Spacelink, Explorers, NASA Educator unit plan books, Space Place-JPL)
  - Experimental Aircraft Assoc (EAA)
  - 4-H curriculum
  - FAA Activity Booklets
  - Starbase Units
  - Estes Rockets
  - Pitsco aerospace workbooks
  - NBAA Avkids Program
  - Air & Space Magazine
  - Books by Jane Hodges Caballero
  - Wright Flight Program
6. Have you ever said or thought: I wish someone would prepare some aerospace education material that would do the following:  
ANSWER: Selected answers from the wish list follow:
- Grades 7-12 aviation curriculum
  - Aviation internship program
  - Teaching materials for science process skills
  - Quick/easy teacher/student materials
  - Greater variety of age appropriate activities on Aeronautics and Aerospace concepts
  - Central resource to cover the field of aviation/space
  - Secondary math/science/physics aerospace materials
  - Material to explain how aerospace education fits and enhances education for school boards

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# FUTURE CHALLENGES FOR AEROSPACE EDUCATION

## NATIONAL CONGRESS TEACHER SURVEY

At the 2002 National Congress in Arlington, Virginia, an opinion survey was taken of the attending teachers soliciting their ideas on planning and conducting aerospace education activities, projects, course work and special activities to facilitate learning. Over one hundred teachers responded to the survey in detail providing a great amount of information which could be the basis for new or additional development in aerospace education resource material or simply ideas for any other teachers to consider in planning aerospace education teaching in grades K-12. A summary of the survey follows related to the questions asked:

1. Is there aerospace education source information or data that you would like to have in your current educational work? If yes, please indicate what you would like to have.

ANSWERS: The teachers overwhelmingly answered in the affirmative with specific answers that fell into major groups of hands-on learning activities, resource contacts, curriculum units at all grade levels, math/science teaching material using AV aids and text sources at the secondary level. Selected specific comments follow:

- Aviation/Space resources based on surveys for quick review
- How to get and use information
- Career information sources
- Examples of projects
- Best websites
- Practical application materials
- Units to correlate with national/state standards for each grade level

- Activity Books, videos, CDs and student/teacher textbooks
- Focus on resources at each level to save time
- Hands on learning kits for teachers on basic aerospace facts
- Low cost activities based on scientific themes
- Grades aerospace education information that could replace traditional lessons for the same skill such as multiplying by decimals
- Motivational material for career days
- Middle school level physical science material including space technology transfer/spinoff
- Contact information on organized aerospace (grades 9-12) programs
- Material on how to answer common complicated questions from kids

2. If other educators ask for your help in planning an aerospace education activity, describe the kinds of information that would be helpful to you and others.

ANSWERS: Again the suggestions fell into group categories including, Resource/Clearinghouse sources, guides on developing aerospace curriculums, lesson plans and hands on activities examples, information on correlating to state/national and industry standards. Selected specific comments follow:

- Comprehensive guide and website referral
- Contact persons/sources/speakers/field trip sources in local area
- Views of the effect on student learning

# PREFACE

In discussions with hundreds of educators throughout the United States one quickly discovers the great interest on the part of students, teachers, administrators, parents and members of industry and the general public in learning more about aviation and space.

Teachers have learned that they can greatly stimulate and motivate learning by using relevant aviation and space concepts, projects and activities in their regular curricular studies.

This publication is designed to share with you some of the huge resources that are available, from a variety of sources, to help you plan and carry out programs that are proven to facilitate learning of many traditional subjects of study.

The scope of the learning examples that are available range from kindergarten through high school – K-12.

We hope that you will enjoy using this source of aerospace education information to enhance your teaching and the learning of your students, as much as we have enjoyed bringing this to your attention for your use.

Frank G. Mitchell, Ed.D Mervin K. Strickler, Jr. Ed.D

## OTHER SELECTED SOURCES

Listed below are the names, with their websites, of some other organizations that provide specific references to materials and information for aerospace education teachers:

**Aircraft Electronics Association (AEA)** *www.aea.net*

Go to: Careers section and Training & Education section on website.

**Aircraft Owners & Pilots Association (AOPA)** *www.aopa.org*

Go to: Learn to Fly section for listing of aviation education materials.

**Aviation Technician Education Council (ATEC)** *www.atec-amt.org*

Go to: Contacts section for address to obtain a school directory of ATEC members and also access other valuable websites in the same section.

**AVKIDS (Sponsored by NBAA)** *avkids.com*

Entire website designed for aviation education use by teachers and kids.

**General Aviation Manufacturers Association (GAMA)** *www.generalaviation.org*

Go to: the Publications section for On-Line Catalog and click on Aviation Education under categories.

**National Agricultural Aviation Association (NAAA)** *www.agaviation.org*

Go to: Publications section for curriculum guides.

**National Air Transportation Association (NATA)** *www.nata.aero*

Go to: Search section to call up “student and teacher online resources.”

**National Business Aviation Association (NBAA)** *www.nbaa.org*

Go to: Education section for Careers in Business Aviation and other programs.

**University Aviation Association (UAA)** *www.uaa.aero*

Go to: Aviation Education and Resources and Publications sections.

to supplement each lesson plan. A team of educational developers, researchers, writers and teachers was brought together to specifically develop these special aviation education lesson plans.

During the 2003-2004 school year, over 90,000 high school math, science, and social studies teachers received these free Education in Flight materials in addition to the list of Student Aware subscribers. Since that time the materials, including the posters, are available to be downloaded on the US Air Force Centennial of Flight website: [www.centennialof-flight.af.mil/education.shtml](http://www.centennialof-flight.af.mil/education.shtml) using an Adobe Acrobat reader.

The website also contains additional educational links and resources such as other lesson plans, materials and book listings which can be accessed.

At some point, the US Air Force Centennial of Flight will be discontinued and all of the materials listed will be located in the regular US Air Force website: [www.af.mil](http://www.af.mil).

## WRIGHT FLIGHT

Wright Flight, Inc., created in 1986 in Tucson, Arizona, is named for the Wright brothers. The basic concept of the program is that the Wright brothers' example of setting goals and achieving them through hard work and discipline can be used as a model for today's youth.

Therefore, the Mission of Wright Flight is to use the inherent motivational power of aviation as a stimulus for students to set and achieve higher goals in their educational and personal development. From the examples of aviation role models, Wright Flight teaches students that through commitment and hard work they can achieve their own goals, earn the reward of exciting aviation-related experiences, and develop a more positive self-concept.

The program is usually presented and licensed through a school. Occasionally, groups such as the YMCA or a church group will agree to sponsor a summer program. Other non-profit groups, or military units may also license the program. Basically, for

interested schools, the Wright Flight office will identify any Wright Flight licensee in your area and or provide help to set up a program. The license fee is minimal and curriculum materials are provided on a quantity price-break basis.

At present there are three Wright Flight Curricula: A Minuteman Program grades 4-5 consisting of six lessons, The History of Aviation Program grades 6-12 consisting of nine lessons and the Voyager Program grades 7-12 consisting of eight lessons which include a student contract provision specifying the school subjects students desire to improve and listing the steps they will take to achieve their goal. At each course conclusion, successful students in the later two programs are provided a special certificate and other commemorative rewards such as a half-hour flight in a light aircraft with a volunteer pilot.

Students are provided with a notebook and teachers are provided with a teacher's manual and a video cassette for each program. Teacher volunteers need not be pilots or knowledgeable about aviation. The teaching commitment is for a period of about eight to ten weeks, one class hour per week.

Wright Flight is primarily an organization of volunteers with minimal staff support. For example, instructors and staff support have volunteered from local Air Force or Air National Guard installations and local Air Force Association chapters. Funding is usually raised from service clubs and from individual contributors.

Since its founding, Wright Flight programs have been started in ten states in multiple schools with great success. One study commissioned to prepare an evaluation of client satisfaction and program effectiveness said students, parents and teachers all reported positive changes in attitudes toward school, responsibility for school work, dependability, and self-confidence.

Go to: [www.wrightflight.org](http://www.wrightflight.org) for further information and answers to questions on getting started. The mailing address is Wright Flight, Inc., 7075 South Plumer, Suite 14, Tucson, AZ 85706; telephone: (520) 294-0404; E-mail: [sysadmin@wrightflight.org](mailto:sysadmin@wrightflight.org).

# INTRODUCTION

*"Teaching should be such that what is offered is perceived as a valuable gift and not as a hard duty."*

ALBERT EINSTEIN

Dr. Leslie J. Bishop, former Professor of Education, Department of Curriculum and Supervision, University of Georgia, formerly Executive Secretary of the Association for Supervision and Curriculum Development (ASCD) has written a cogent statement of why aerospace education is relevant to our schools in general and education in particular.

Bishop wrote: "It is the responsibility of parents, teachers and educational leaders to make it possible for the mind, spirit and the aspirations of learners to soar as high as our spacecraft. Our environment for learning must be carefully considered and researched. Our instructional plans must be as particularized and as relevant as the calculations to place a man on the moon and to probe the cosmos beyond. The world inside the classroom must be made interesting and significant..."

He went on to point out: "Educators, like parents, have awesome responsibilities. The kindergarten child of today will be the worker, the leader, the parent, the policy maker, the activist of the twenty-first century." Bishop went on to state: "Youngsters in school today will fly...hypersonic transports. Some students...will visit other planets; many of them will help perform the work and still more will provide citizenship understanding, and guidance to the supportive programs that make aviation and space technology possible." <sup>(1)</sup>

From an educational point of view, aerospace is not an end in itself except for those who decide to concentrate on specialized studies and careers. Educators at all levels and in all disciplines have demonstrated that aviation and space studies provide interesting, motivating, meaningful and relevant curricular means to educational goals.

## EARLY EXAMPLE OF AVIATION EDUCATION

It is interesting to note that there is always a substantial lapse of time from the emergence of new technological developments until they become part of curriculum in schools. Aviation is an exception to this. As one considers flying as demonstrated as being a reality by Wilbur and Orville Wright on December 17, 1903, it was shortly after that the first documented study of aviation in a public school in the United States was discovered. In 1908 a creative teacher named H. Lavone Twining of the Los Angeles Polytechnical High School introduced the study of the science of flight in his physics classes.

## WHAT IS THE STATE OF AEROSPACE EDUCATION TODAY

While aerospace education is increasingly recognized as an effective means to attaining learning ends and goals, there are ongoing efforts to determine what needs teachers have to increase aerospace education effectiveness. This publication is designed to give educators and students sources of needed information.

Many groups and organizations help educators study ways to be more effective in using aerospace resources effectively. During the last several years a community of common interests in furthering aerospace education has emerged. A notable example of this is what is known as the Brewer Forum.

## THE ROLE OF THE BREWER FORUM AND REPORT

In 2002 the National Aeronautic Association (NAA), which has a long heritage of interest and involvement in promoting aviation and aviation education dating back to its founding in 1905, took the lead in planning the Frank G. Brewer Invitational Forum on Aerospace Education.

Among the organizations cooperating with the NAA in planning and carrying out the Forum were:

- The National Coalition for Aviation Education (NCAE)
- The Wolf Aviation Fund
- Civil Air Patrol (CAP)

Donald J. Koranda, NAA President and CEO stated October 15, 2002 in part:

*“Aerospace Education will expand our students horizons, enrich our knowledge and better prepare us to assume leadership roles as citizens of a nation state. The Brewer Conference on Aerospace Education Report is a first step toward the goal of enhanced integration of aviation and space education into the classroom environment. We must all act to keep this goal in sight, and to make it a reality. Our future depends on it.”*<sup>(2)</sup>

## WHAT RECOMMENDATIONS RESULTED FROM THE FORUM?

In the Executive Summary of the Brewer Conference on Aerospace Education Report the conference participants examined the issue of how “...providers of aerospace education materials can better assist educators in meeting the needs of today’s students.”<sup>(2)</sup>

“The teacher discussion groups concluded that there were four primary areas of concern. They are:

- The academic worth of aerospace education must be demonstrated.
- (Materials) Must be assessable, grade specific and consider the established national and state standards.
- Teachers must have a way to easily identify the resources available. The establishment of a national internet ‘clearing house’ including an interactive function was encouraged.
- Strong support and endorsement from within the education community, government entities and the various aerospace organizations is needed. A collaborative approach to create an accepted national ‘mission’ statement would enhance the role of interested organizations.

The Brewer Committee is committed to continue a national dialog to facilitate and support the accomplishment of these longer range goals.”<sup>(2)</sup>

## EDUCATOR’S REPORT

Prior to the 2002 National Congress on Aviation and Space Education (NCASE) sixty educators from around the country met in a special session to examine ways in which aerospace organizations can be of assistance and support to educators who want to integrate aerospace education into their classrooms. The participants were asked to respond to five questions based on results of a survey given to educators prior to the Forum. The survey questions were:

1. How do we get information about aerospace-related educational materials into the hands of educators?
2. Where do educators look for information?
3. What support mechanisms can be provided by the aerospace community that help educators now and in the future?
4. What challenges do educators face that impede the use of aerospace related educational materials?
5. What aerospace-related educational resources best meet the needs of educators?

Aviation Exploring is a youth development program centered on aviation careers. Aviation Explorers might choose to take orientation flights in military transports, helicopters, gliders, or single-engine general aviation aircraft. They might take trips to places such as Air Force bases, aviation museums, air shows, or FAA facilities. They might learn to preflight an aircraft. They might take pilot training ground school classes. The bottom line is that Aviation Exploring is action-oriented.

Sponsoring aviation organizations provide the program assistance for Explorer post meetings, activities, and trips through adult volunteer leaders. Organizing an Explorer Post involves key staff members of an aviation organization meeting with a Learning for Life representative to discuss how to begin. The participating organization agrees to recruit adult volunteer leaders, review the Aviation Exploring Career Opportunities Worksheet, develop a list of additional aviation program ideas and provide meeting facilities. Learning for Life provides program development literature, adult and youth leader training, liability insurance, activity planning, ongoing adult volunteer service and local Learning for Life office staff support.

The program of an Explorer Post matches the interests of young adults with the resources and adult expertise of their participating organization. The goal will be to build a well-balanced program around Aviation Exploring’s five areas of program emphasis: career opportunities, leadership experience, life skills, citizenship, and character education. For additional information on promoting the organization of aviation career Explorer Posts, visit the website at: [www.aviationexploring.org](http://www.aviationexploring.org).

Learning for Life also provides another kind of program that is designed to directly support schools and other youth-serving organizations in their efforts toward preparing youth to successfully handle the complexities of today’s society and to enhance their self-confidence, motivation, and self-worth. Nationwide, school demand for character education programs has greatly influenced the dramatic growth of Learning for Life. It has become a program for education with more than 20,000 schools and organizations nationwide, serving more than 1.4 million youth. Aviation education is just one of the options used in this program.

Learning for Life is a classroom-based program that provides an action-learning process with grade-specific lesson plans for grades K-12, plus a complete supplement for special-needs students. Programs are offered for the Elementary School (K-6), Seventh and Eighth Grades, Senior High and Special Needs.

Developed by professional educators and child development leaders, the curriculum has three basic components: school-based learning offering more than 145 lesson plans, connecting activities, and work-based learning. Aviation is one of the subjects offered for the career seminar phase.

In order to implement Learning for Life in schools and organizations, four key steps are necessary:

1. Complete a Memorandum of Understanding between the school, business or sponsoring organization and Learning for Life.
2. Determine the scope of work involved in serving the school.
3. Appoint a committee.
4. Select adults who will give direction.

Learning for Life provides training and support through a nationwide network of over 300 local offices. For further information and direction on how to contact the office in your area, go to: [www.learning-for-life.org](http://www.learning-for-life.org). You can also contact Learning for Life’s national office at: 1325 West Walnut Hill Lane, P.O. Box 152079, Irving, TX 75015-2079, telephone (972) 580-2000.

## UNITED STATES AIR FORCE EDUCATION IN FLIGHT CURRICULUM GUIDES

In celebration of the Centennial of Flight, The US Air Force and Student Aware Communications, Inc. have teamed up to provide secondary teachers with an Education in Flight Package of Math, Science and Social Studies curriculum supplements. Each package contains three 24-page full-color lesson plans, one each for math, science and social studies teachers. Each lesson plan consists of four to six units containing descriptions, illustrations and a test or short quizzes for student feedback. In addition, each package includes a set of four unique and colorful posters

NASA SCIENCE Files – for kids grades 3 through 5. This is a series of free instructional programs consisting of broadcast, print, and online elements. Emphasizing standards-based instruction, problem-based learning, and scientific inquiry, the series seeks to motivate students to become critical thinkers and active problem solvers. Each program supports the national mathematics, science, and technology standards and has three components that include (1) a 60-minute television broadcast, which can be viewed live or taped for later use; (2) a companion educator's guide; and (3) interactive web-based activities and materials. Check out: <http://whyfiles.larc.nasa.gov/treehouse> to learn more about the NASA SCIENCE Files and to register online for this program.

NASA CONNECT – for kids grades 4 through 8. An award winning instructional television series that joins classrooms with NASA researchers in support of national math, science and technology standards. Now in its third year of production, the goals of NASA CONNECT include: showing students how NASA engineers and scientists apply math, science and technology to their jobs; presenting math, science and technology as a process requiring creativity, critical thinking, and problem-solving skills; raising student awareness of careers requiring math, science and technology; overcoming stereotyped beliefs by presenting women and minorities performing challenging engineering and science tasks. The series is free, educators are encouraged to tape the broadcast and copy (or download) the lesson guides. Each program includes: a lesson, classroom experiment and a web-based online interactive component. Go to: <http://connect.larc.nasa.gov/> to learn more about NASA CONNECT and to register online for this program.

NASA's Destination Tomorrow is a Distance Learning program for educators, parents, and lifelong (adult) learners. It is a 30-minute instructional program that communicates knowledge resulting from NASA's aeronautics and space technology programs. Destination Tomorrow will not only seek to increase scientific literacy but will also provide educators, parents and lifelong learners with the understanding and ways of thinking that are essential for all citizens to function in a world shaped by mathematics, science, and technology. Go to: <http://destination.larc.nasa.gov/> to learn more about

Destination Tomorrow and to register online for this program.

The NASA Explorer Schools (NES) program provides opportunities for schools, administrators, students grades 4 through 9 and their families to partner with NASA to improve student learning; participate in authentic experiences with NASA science and technology; apply NASA science, mathematics, and technology knowledge to real-world issues and problems; and participate in special events and other opportunities. Each year the NASA Explorer Schools program establishes a three-year partnership between NASA and 50 school teams, consisting of teachers and education administrators from diverse communities across the country. While partnered with NASA, NES teams acquire and use new teaching resources and technology tools using NASA's unique content, experts and other resources. Schools in the program are eligible to receive funding (pending budget approval) over the three-year period to purchase technology tools that support science and mathematics instruction. For detailed information and the program application, visit: [www.explorerschools.nasa.gov](http://www.explorerschools.nasa.gov)

## LEARNING FOR LIFE AVIATION EXPLORING

Aviation Exploring is Learning for Life's career education program for young men and women who are 14 (and have completed the eighth grade) or 15 through 20 years old. Adults are selected by the participating organization for involvement in the program as mentors. Aviation Career Exploring Posts can be and are sponsored by aircraft businesses of all types, airlines Federal Aviation Administration (FAA) control towers, Experimental Aircraft Association (EAA) Chapters, soaring clubs, college aviation programs or any other aviation organization. Today, 141 Explorer Posts with over 2,200 youth members in the United States are being sponsored by similar organizations.

Aviation Exploring's purpose is to provide experiences to help young people mature and to prepare them to become responsible and caring adults.

## CONCLUSIONS AND RECOMMENDATIONS

Space does not permit providing more details of the Brewer Conference here. However, the Conclusions and Recommendations of the Brewer Committee are very much worth noting. They are as follows:

### Brewer Committee - Conclusions and Recommendations

"The Brewer Conference provided considerable insight into the contemporary views, needs and wants of educators with an active interest in aerospace education. There is widespread agreement within this group that Aerospace education has the potential of enriching the curriculum in the nation's schools, provided that the needs of the teachers and the national/state standards to which they must teach are carefully considered.

In this context the following two principles would apply:

1. The academic worth of aerospace education must be clearly established. The aerospace industry and related associations should understand the premise that aerospace education is a means of sharing in a common goal of improving the education process...not an end in itself.
2. The above must have a well-defined focus supplemented by effective communication and 'delivery' systems supported by the provider organizations. Quality information and resource assistance is a definite requirement.

The Brewer Committee recommends continuation of the process to address an enhanced future role for aerospace education in or related to the overall school curriculum.

An invitation should be extended to all segments of the aerospace industry, related associations, government and educational, to participate in a national forum to enhance the value and recognition of aerospace education as a means for improved student orientation and performance.

The challenge would be to consider:

1. The development of a vision statement that could be supported by a broad coalition of aerospace

industry members, associations, government and education organizations.

2. The establishment of national goals to help focus industry efforts on the positive benefits of aerospace education and to bring about better coordination of local, state and national aerospace programs.
3. Mechanisms by which an improved collaborative effort on the part of industry, government and education organizations could focus the nation's educators on the value of aerospace education as a tool to motivate, inspire, and teach.
4. Actions to insure the quality of aerospace education resources being offered.
5. A highly visible campaign to create a significant awareness among educators as to the benefit or value of incorporating aerospace concepts into the educational process.

The Brewer Committee is committed to continue a national dialog to facilitate and support the accomplishment of these longer range goals.

The key people responsible for planning and carrying out the Brewer Conference on Aerospace Education are the following:

Don Koranda, President, National Aeronautic Association (NAA), and the Steering Committee he Appointed:

Brewer Steering Committee Members

Ray Johnson, Chairman

Vance Abbot, Challenger Center

Shelia Bauer,

Federal Aviation Administration

Debbie Gallaway,

Centennial of Flight Commission

Gordon Hoff,

Minneapolis Community and Technical College

Rol Murrow, Wolf Aviation Fund

John Salvador, Civil Air Patrol

Gordon Shimmel,

Mansfield (CT) Public Schools." (2)

Clearly, the Brewer Conference and Forum represent landmark efforts to bring together a community of mutual interests in helping design, plan and carry out a high quality aerospace education for the United States.

## THE NATIONAL CONGRESS ON AVIATION AND SPACE EDUCATION (NCASE)

The internationally recognized annual meeting of people interested in aerospace education known as the National Congress on Aviation and Space Education (NCASE) has made a huge contribution to education in the United States and other parts of the world for three decades. The National Congress has been attended by nearly forty-thousand people since it was first started.

Teachers at all levels, elementary, secondary and higher education attend the yearly meetings. Many representatives of industry, government and aviation and space related organizations participate in the Congress, provide educationally oriented exhibits and attend the outstanding program elements. The Congress is primarily the result of initiatives of Civil Air Patrol and the United States Air Force. Any educator planning an aerospace education activity, project or full program would benefit from attending annually the National Congresses on Aviation and Space Education. Thousands have.

Information about Congress dates and the program sessions can be obtained on the CAP website under aerospace education:

[www.capnhq.gov](http://www.capnhq.gov)

## NATIONAL COALITION FOR AVIATION EDUCATION (NCAE)

The National Coalition for Aviation Education (NCAE) is a membership organization that was formed in 1993 when the founding member groups signed a formal charter and established a partnership with the Federal Aviation Administration (FAA).

Members of the NCAE are aviation and space related groups, organizations and businesses who recognize the importance of aviation and space education. They believe that aviation and space study contribute toward an informed and interested public.

NCAE member organizations believe that aviation and space study is very motivational for students at all levels of education. Aviation and related space activi-

ties used in the classroom or for clubs or youth groups can serve as a catalyst to encourage young adults to seek careers in industry and government.

The industry, government, labor and educational organizations that are members of NCAE believe that the aerospace and aviation industry offers a multitude of challenging careers for pilots, engineers, scientists, mechanics, teachers, researchers, designers and other professionals. Aviation related opportunities abound in manufacturing, air traffic control, air safety, sales, search and rescue, agriculture, and local, state, national and international governments as well as technology companies and in the legal and political arenas.

Because of the mutual interests of NCAE member organizations and education at all levels – K-12 and colleges and universities - the organization has developed a variety of educational materials and services for educators. Details of NCAE's large amount of resources may be found on their comprehensive website. Their website was created as a one-stop clearinghouse for aviation education materials. You will join thousands of teachers and students in consulting the NCAE website at:

[www.aviationeducation.org](http://www.aviationeducation.org)

## THE UNITED STATES CENTENNIAL OF FLIGHT COMMISSION

The Congress of the United States in 1998 passed the Centennial of Flight Commemoration Act, Public Law 105-389, 105th Congress (November, 13, 1998). The law established the U.S. Centennial of Flight Commission to assist in the commemoration of the centennial of powered flight and the achievements of the Wright Brothers' flight at Kill Devil Hills, N.C. December 17, 1903 and to serve as a national and international source of information for activities commemorating this historic event. Congress intended that the Commission encourage celebration of this single achievement, to include a commemoration of the full 100 years of history that followed.

During several years leading up to 2003, and during that year, millions of adults and young people throughout the United States and around the world experienced a variety of programs, projects, and activi-

As a result of the attraction of the concept of a school offering a curriculum based on a common educational interest and having the motivational theme of aviation, the Federal Aviation Administration (FAA) began supporting the aviation magnet school concept by sponsoring a series of national conferences in the early '90s. As an outgrowth of the conferences, an ongoing survey of aviation and aerospace theme programs was started to keep track of the growth of this type of school at both the high school and elementary level. These periodic surveys have also researched the success factors of these schools and the educational results obtained in using aviation or aerospace as a curriculum theme.

A summary of the latest survey and a complete listing of the schools identified with contacts, addresses and numbers is located on the FAA website under the listing labeled "magnet schools" at:

[www.faa.gov/education](http://www.faa.gov/education)

A number of resources are available to those interested in developing a high school or elementary aviation/aerospace magnet school concept:

1. For general information about magnet schools, history of the movement, directories, resources and references contact Magnet Schools of America at their website: [www.magnet.edu](http://www.magnet.edu).
2. Contact the nearest FAA Regional Aviation Education Representative for Availability of the: "Federal Aviation Administration Curriculum Guide for Aviation Magnet School Programs," Dr. Mervin K. Strickler, Jr., AHT-100-1-94, 1994.
3. "An Identification and Description of Secondary Aviation Magnet Schools in the United States, Dr. Frank G. Mitchell, Oklahoma State University, 1996, #9717964. Order by telephone from UMI dissertation services: (800) 521-0600.

## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA Resources for Educators include a wide variety of education-based activities for all ages. The NASA education home page serves as the education front door for information regarding educational programs and services that are offered 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: [www.education.nasa.gov](http://www.education.nasa.gov).

NASA Spacelink is one of NASA's electronic resources specifically developed for the educational community. Spacelink serves as an electronic library to NASA's educational and scientific resources, with hundreds of subject areas arranged in a manner familiar to educators. Using Spacelink Search, educators and students can easily find information among NASA's thousands of Internet resources. Special events, missions, and intriguing NASA websites are featured in Spacelink's Hot Topics and Cool Picks areas. A complete listing of NASA educational products can also be found here. Spacelink may be accessed at: [www.spacelink.nasa.gov](http://www.spacelink.nasa.gov).

At NASA Langley four educational Distance Learning programs on mathematics and science topics are available to teachers and parents to use at their own sites to access in a flexible, entertaining and instructional format. Each program is aimed at a target grade level to increase scientific literacy and can be obtained by registering online as follows:

NASA's Kids Science News Network (KSNN) – for kids grades K-2. This network is designed not only to help educators and parents meet science needs, but to also turn kids of all ages on to the excitement and fun of mathematics and science. KSNN consists of one minute newsbreaks that feature kids teaching mathematics, science, technology, and facts about NASA to other kids in an entertaining and instructional format. These newsbreaks answer the "why?" questions such as, "Why does popcorn pop?" and "Why is the sky blue?" The newsbreaks engage the students in the excitement of learning and help to dispel many misconceptions in mathematics and science. Go to: <http://ksnn.larc.nasa.gov/> for more information about NASA's KSNN and to register online for this program.

The products of the 4-H Cooperative Curriculum System are developed by teams of university specialists, extension educators, industry representatives, volunteers and youth. Each set of materials has passed rigid 4-H criteria for quality hands-on experiential learning and has been accepted into the National 4-H Collection.

## INVENTING FLIGHT

Inventing Flight For Schools is a multimedia curriculum for sixth, seventh, and eighth graders that guides students through the science and history behind the Wright Brothers' invention of powered flight. The inquiry-based science curriculum was developed by the Agency for Instructional Technology for the Dayton 2003 Centennial Celebration Committee and can be ordered as a kit containing a *Teacher's Guide*, *Instructional Videos*, *DVD Resource Disk*, *Student Worksheets* and *Website Activities and Resources*.

The curriculum, which is correlated to national and state education standards, provides specific content and process standards which are explicitly targeted in each lesson and activity. For example, hands-on activities teach key science concepts by having students fly kites, test gliders and experiment with helicopter propellers and then analyze their results. Students also use multimedia materials to explore the challenges that faced the Wright Brothers. Through unit planned activities, students discover answers to the three critical flight problems of lift, control and propulsion.

Each unit is introduced by a 10-minute video that combines the excitement of the Wright Brothers' discovery process with explanations of key concepts. Additional videos examine the history of flight, the lives of the Wright Brothers, and the impact of powered flight on modern history. Science tutorial videos illustrate the science behind the Wrights' discoveries.

A DVD disk also contains video segments in which an instructor demonstrates how to build each model and conduct each activity in the curriculum. A *Teacher's Guide* is also part of the curriculum kit and can be purchased separately.

A curriculum website offers students additional interactive science games, activities, interesting links and other resources. Teachers and students can connect to experts in the history of flight and the science of flight such as members of the Academy of Model Aeronautics (AMA) which is the internationally recognized organization for model aviation. It is the largest sport aviation organization in the world. The AMA Education Committee is also a co-sponsor of the Inventing Flight for Schools project.

The curriculum also has a Language Arts component which involves writing as an integral part. Included are language arts projects and exercises that help students connect the science of discovery with the Wright Brothers, their world in the early 1900s and their personal challenges. Activities include personal journal exercises, comic book illustration projects and playwriting assignments.

Go to: [www.inventingflightschools.org](http://www.inventingflightschools.org) for more information and access the online address to order the kit. For information about other related programs on the Academy of Model Aeronautics website, go to: [www.buildandfly.com](http://www.buildandfly.com).

## AVIATION MAGNET SCHOOL PROGRAMS

One of the most unique developments in Aerospace Education in the last decade of the twentieth century has been the growth of Aviation or Aerospace Magnet School programs in school districts across the nation. Prior to the '90s the growth of magnet schools in general was the result of federal court decisions that desegregated the nation's schools.

One consequence of desegregation was the creation of high quality special programs called magnet schools in selected neighborhood schools in order to slow the flight of white middle class families away from the schools being desegregated. The effort grew into today's magnet school concept which embraces a much greater variety of curricular interests and serves students of diverse educational and socio-economic backgrounds. The aviation/aerospace type magnet school is a product of this expansion.

ities about the pioneering role of the actions of Wilbur and Orville Wright on December 17, 1903. Many of the creative educational initiatives of the past several years were a direct result of the Centennial of Flight Commission.

One of the single most important contributions to furthering aerospace education that was done by the Commission is the creation of their website which continues to be supported and kept up-to-date. Anyone planning an aerospace education program at any educational level would be well advised to consult this site. In addition to the myriad direct on-line resources, it has links to hundreds of relevant sources of valuable information. The Centennial of Flight Web Site is:

[www.centennialofflight.gov](http://www.centennialofflight.gov)

## FEDERAL LEGISLATION – NO CHILD LEFT BEHIND (NCLB)

This legislation presents both challenges and opportunities for educators, students and parents. For aerospace educators, No Child Left Behind (NCLB) offers opportunities to demonstrate what every aerospace educator knows from first-hand experience: aviation and space contexts enrich learning in nearly every subject taught in school. Literally hundreds of thousands of boys and girls in the nation's schools have been highly motivated to study as a result of resourceful teachers using appropriate areas of aviation and space that relate to the subject under study. Remarkably, examples of such teaching and learning success may be found in every subject area ranging from A to Z – Art to Zoology, Alpha to Omega.

One of the major features of the NCLB legislation is a greatly increased emphasis on testing in our schools at all grade levels. What does this mean for an aerospace educator? Experienced aerospace educators know that students who study various facets of aviation and space, as they relate to their subjects being studied, do better in their tests. This raises the question of just how aerospace education relates to education. Most aerospace education in the United States does not replace any existing subject. Instead, it is integrated into the subject at hand, be it science, mathematics, social studies or other subjects. In recent years more and more specialized elective courses concentrating on a particular area of learning related to

some part of aerospace have been offered in schools and colleges. Some high schools offer actual flight training as an elective subject with all of the required academic so-called ground school subjects offered for credit. Time after time teachers and parents of such students point out that these students regularly do better work in their other subjects because of the motivation and study discipline fostered by their flight courses.

The NCLB, as stated by the U.S. Department of Education, has six major goals. At least five of them have relevance for aerospace educators.

During the 2003 National Congress on Aviation and Space Education (NCASE) Raymond Johnson, Chairman of the Brewer Forum, on behalf of the entire Committee, presented the report on the Brewer Forum and how it relates to the NCLB legislation. He identified the five of the six goals of the law that relate to education and explained how each relates to educators and aerospace education. Following are relevant excerpts from his presentation:

- Goal 1** Create a culture of achievement.
- Goal 2** Improve student achievement.
- Goal 3** Develop safe schools and strong character.
- Goal 4** Transform education into an evidenced-based field.
- Goal 5** Enhance the quality of and access to postsecondary and adult education.

Anyone familiar with the work of the aviation and space education community will immediately see a direct link between their work and these goals.

The aviation profession, and by extension the field of aviation and space education, is implicitly focused on Goal One, creating a culture of achievement. The history of aviation is one of technological advancement, creating a culture of excellence in transportation with a special emphasis on safety and leadership. In addition, the nature of the field in providing meaningful and relevant pathways to understanding complex subjects has made a useful vehicle for student participation and achievement. Subject mastery is a prerequisite of advancement.

Aviation and space education contributes to improving mathematics and science achievement for all students, an objective of Goal 2. By providing real life applications to the study of science and mathematics, the aviation and space education community can make a significant contribution to meeting Goal 2. We must make the case to those who are working on the national education reform effort.

Goal 3 seeks to develop safe schools and strong character. Aviation and space educators consistently refer to the character development and leadership of their students in such areas of study. The fields of aviation and space exploration are filled with examples of men and women who through their perseverance and dedication have made a success of themselves and of all who worked with them. Indeed, the discipline that is necessary for achievement in aviation lends itself to achieving the intent of Goal 3.

Goal 4 seeks to transform education into an evidence-based field. Aviation educators can offer their curricula as a test case for evaluation.

On February 6, 2003, at Department of Education Secretary Paige's Mathematics Summit in Washington, D.C., the Department launched its Mathematics and Science Initiative. Its aim is to achieve three independent goals:

- Engage the public in recognizing the need for better mathematics and science education for every child in our nation's schools.
- Initiate a campaign to recruit, prepare, train and retain teachers with strong backgrounds in mathematics and science.
- Develop an academic research base to improve our knowledge of what boosts student learning in mathematics and science.

Aviation and space education is a proven, applied method for teaching mathematics and science. Indeed, there is ample anecdotal evidence that this is so. The goal of No Child Left Behind (NCLB), however, is that the methods used to teach are 'scientifically proven.' Curriculum will be held to a standard tested by the scientific method. Aviation and space education easily meets these standards because it is a specific subcategory of teaching science, making it an ideal vehicle for engaging hands-on instruction.

Finally, aviation and space education meets Goal 5 through enhancing the quality of and access to post-secondary and adult education. With close ties to the aviation and aerospace industries, aviation and space educators are preparing students for continuing study in mathematics, science, technology, and engineering.

What is the future of aviation and space education? It is the future of flight. What are the bounds? There are none. As we enter the twenty-first century, the job of aviation educators is to demonstrate the worth of the discipline within the President's education reform movement. There are few subjects that can inspire the imagination with relevant activities, and project the possibilities of the future as well as aviation and space education.

In the final analysis, the power of aviation and space education rests with its ability to engage students in exciting hands-on projects and creative problem-solving activities for the classroom. The study of aerospace topics enables students to practice gathering information, examine alternative solutions, test theories and assumptions using real-world activities and then analyze the results. All of these skills are important to the formation of an informed citizenry, the bedrock of a strong democracy. The Brewer Educators' Forum believes that aviation education is in the best position to meet these and other challenges facing the nation as we enter a second century of flight. *The Sky is Not The Limit!*<sup>(3)</sup>

The following sections of this publication consist of additional sources of a huge amount of aviation and space education materials, activities, references, organizations and individuals with successful experience in this important field of study.

References cited in this section include:

1. *Foreword, by Dr. Leslie J. Bishop to An Introduction to Aerospace Education, New Horizons Publishers, Inc., Chicago, 1968.*
2. *Executive Summary, The Brewer Conference on Aerospace Education a Report, Published by the National Aeronautic Association in cooperation with the Wolf Aviation Fund, Civil Air Patrol Aerospace Education, National Coalition for Aviation Education, October 15, 2002.*
3. *Report to the 2003 National Congress on Aviation and Space Education by Raymond Johnson, Chairman, Brewer Forum, entitled: The Brewer Forum and Beyond Reaching out to the Education Community.*

Website: The FAA Aviation Education website listed above is a resource to educators, students and the general public by providing information and resources such as curriculum, career material, calendar of partnership outreach events, student summer camp programs, employment information and links to information on scholarships and grant opportunities.

## 4-H AEROSPACE EDUCATION PROGRAMS

4-H Youth Development programs impact more than five million young people throughout the nation in a variety of educational efforts. 4-H is supported through the Cooperative Extension System which is a county, state and federal partnership for education based in the Land Grant University System. The Federal partner is the U.S. Department of Agriculture. The Cooperative Extension system provides a linkage for education to every county in the United States and its territories.

4-H Aerospace Education is affiliated with and operates through the National Network for Science and Technology, a part of the Cooperative Extension System. In 1994, a strategic plan entitled, "Partnerships for Aerospace Education and Workforce Preparation," was developed for 4-H Aerospace Education. This plan resulted in the creation of a National 4-H Aerospace Curriculum which has been packaged into a grades K-12 set of materials which can be ordered in complete sets or individually in grade groupings. In addition, the materials are available on a CD-ROM and also include a separate Group Activity Helper's Guide and a Community Organizer's Guide. The Organizer's Guide provides tips to recruit youth, form aerospace groups and support volunteers. All materials are available at low cost from the National 4-H Cooperative Curriculum System, Inc. and can be ordered online at [www.n4hccs.org](http://www.n4hccs.org) (You'll also find sample pages, reviews and additional resources). Information and order forms are available by calling (800) 876-8636 or (612) 624-4900 or E-mail orders can be made at: [order@extension.umn.edu](mailto:order@extension.umn.edu).

The following description of the Aerospace Adventures Curriculum shows how the fascination of flying an airplane, launching a rocket, exploring space and becoming an astronaut or pilot will come alive

through the youth activity guides (K-12), group and leader guides:

1. ***Pre-Flight*** (20 pages)  
Youth learn how to talk like a real astronaut, find out how an airplane works and have fun at the same time. Youth practice problem solving, recognizing patterns and communicating. Grades K-2
2. ***Lift-Off*** (40 pages)  
Youth fly kites, participate in airplane contests, launch rockets, explore space, make a glider, construct a straw rocket and experience disorientation. Life skills youth practice include communication, decision making, problem solving, accepting responsibility, teamwork and managing resources. Grades 3-5
3. ***Reaching New Heights*** (40 pages)  
Flying an airplane, launching a rocket, conquering space and becoming an astronaut or pilot are featured in this unit. Controlling flight direction and experiencing shuttle technology add to the fun in this experiential curriculum. Youth will make a shuttle on a string, a Japanese kite, a hang glider and a control panel of an aircraft. The life skills of decision making, problem solving, self-responsibility, wise use of resources, teamwork, and creative thinking will be practiced. Grades 6-8
4. ***Pilot in Command*** (40 pages)  
Students create their own altitude tracker, determine the most fuel efficient routes between airports and make a box kite. Students also explore pilot certification requirements, evaluate past and present navigation systems, and learn about airport issues in their community or state. Life skills practiced include communication, creative thinking, decision making and wise use of resources. Grades 9-12
5. ***Aerospace Helper's Guide*** (40 pages)  
This helper's guide provides several group oriented experiences for students. Many ideas are included in this guide for hands-on experiential group activities, such as an aerospace quiz bowl, skill-a-thons and an airport field day. The group activities help develop teamwork and leadership skills.

AirVenture Museum's Boeing Library. Each enrolled student will be offered an opportunity to fly with an Experimental Aircraft Association (EAA) volunteer pilot as part of the Young Eagles program. A second course, "Advanced Aviation Science," will be available in 2004. Successful completion of both courses will prepare the student to take the Federal Aviation Administration Private Pilot Written Exam. For more information about these web courses, please call (920) 426-6520 or access the Web at:

*www.aviationuniversity.com.*

The EAA website listed above also describes a number of other programs designed for youth such as the Air Academy summer youth camps and Museum Education Programs. Contact Charles Larsen at (920) 426-4815 for additional information.

As the educational arm of EAA, the Aviation Foundation is dedicated to the fulfillment of individual potential through aviation heritage and educational opportunities inspired by the dream of recreational flight.

## **FEDERAL AVIATION ADMINISTRATION (FAA)**

The Federal Aviation Administration's (FAA) Aviation/Aerospace Education (AVED) Outreach Program provides information resources through FAA's education website, *www.faa.gov/education*, consultant services and expertise on various aspects of civil aviation. One regional FAA/AVED Program Manager resides in each FAA region and center as a point of contact resource to the public in support of aviation and aerospace activities, contests, special outreach programs, and career awareness opportunities. The National (AVED) Program Manager is a support to education, industry, and government partnership initiatives. Some AVED programs include:

**ACE CAMPS:** FAA is a co-sponsor in Aviation Career Education (ACE) programs throughout the country. ACE, a summer aviation education program for middle and high school students, reaches approximately 1,500 students annually. These one week day, and in some instances overnight, summer programs expose students to a wide range of aviation career exploration. Students experience instruction in aviation history, the physics of flight, field trips to aviation sites and hands-on activities. Focus is on aviation

career clusters identified by FAA, with emphasis on opportunities for women and minorities. Dates, locations, cost and age requirements vary according to sponsoring organizations. Information can be found on the FAA education website.

**ART CONTEST:** The International Aviation Art Contest is sponsored by the National Aeronautic Association, National Association of State Aviation Officials and Federal Aviation Administration (FAA), in cooperation with the Federation Aeronautique Internationale (FAI). The objective of the contest is to motivate and encourage young people of FAI member nations to become more familiar with and participate in aeronautics, engineering and science. Information on the annual art contest can be found on the FAA education website or by contacting the local state division of aviation which in most states is a part of the State Department of Transportation.

**TEACHER WORKSHOP ASSISTANCE AND CAREER DAYS:** FAA provides educators with resource information, expertise and speakers, when personnel are available. Contact the AVED Program Manager in the FAA Regional Office in your area for assistance.

**JOB SHADOW DAY:** FAA, in many regions, participates in job shadowing through the annual Ground-hog Job Shadow day held annually in February. The special day is the kickoff to a year long national effort that provides students with an up-close look at how skills learned in school are put into action in the workplace.

**AIR BEAR GOES TO SCHOOL:** An aviation education program for students in grades 1 through 5 is available through the regional FAA/AVED Program Manager. Air Bear, dressed in a flight suit and wearing flight goggles is the national mascot of FAA Aviation Education. Air Bear is a guide and companion to students in visits to the classroom helping students to learn about aviation. When Air Bear visits a classroom, students will travel on a simulated airplane flight to Disney World in Orlando, Florida. They can all have fun as they assume the role of aviation workers and as the passengers of Air Bear Airlines. Two videos, one for students and another for teachers, are available along with additional aviation curriculum and lesson plans to enhance the Air Bear Program. Educators should contact the FAA Regional AVED Program Manager in their area for information.

# **PROGRAMS**

## **AEROSPACE EDUCATION FOUNDATION (AEF)**

The Aerospace Education Foundation (AEF) is a non-profit organization created in 1956 and affiliated with the Air Force Association (AFA). The AFA is a non-profit grass-roots organization with chapters in all fifty states, Europe and the Pacific. The foundation is dedicated to strengthening America's aerospace excellence through education. Through numerous scholarships, grants, awards and public awareness, the Foundation provides America with the tools needed to educate the public and our youth on the importance of science and technology to our national defense. The AEF website describing the various programs of the foundation is located at:

*www.aef.org.*

**Visions of Exploration** is a cooperative program between *USA TODAY*, AFA chapters and AEF to encourage the skills necessary for success in math and science among the nation's elementary and middle school children. During the 2003-2004 school year, *Visions* was used in over 1,300 grades 4 through 8 classrooms reaching at least 90,000 students.

*Visions* provides each classroom selected with the *Visions of Exploration Activity Guide*, containing lesson plans for 18 weeks of the best math, science and technology articles previously published in the *USA TODAY* newspaper. Each classroom will also receive 30 copies of *USA TODAY* on the day of the week the teacher selects for 18 weeks, along with *Experience Today*, a daily lesson plan with cross curricular activities centered around each day's news.

Other services listed in the *Visions* Program section of the AEF website include a quarterly *Visions Newsletter* providing resources for teachers and students and access to a *Facilitator's Guide* online. The website also contains an *Expanded Visions* category containing additional math/science and technology K-12 activities, a *100 Years of Flight* section and access to a *Case Studies* listing which includes aeronautics cases for grades 7-12.

To enroll a class in the *Visions of Exploration* program, teachers will need to contact a local AFA chapter for sponsorship because AFA chapters and the Foundation financially co-sponsor the program with *USA TODAY*. Chapter contacts are listed in the links section of the AEF website along with registration forms for the program. There is only one registration period per school year and registrations are due no later than September 30 of each school year. For each class selected, a *Certificate of Accomplishment for Visions Students* is given to each student who completes the program by an AFA representative of the sponsoring chapter. If you have any questions regarding this program, please contact the AEF Manager of Special Programs at 1-800-291-8480.

The *Educator Grant* program is also available to teachers from the AEF which provides up to \$250 per academic year to elementary and secondary classrooms for aerospace education programs, opportunities, innovative activities, and interests when no support is currently available. Grant applications are located in the Financial Aids section of the AEF website and applications must be endorsed by a local AFA Contact. AFA Chapter contact information for your area can be obtained by going to the Links section of the AEF website or by calling 1-800-291-8480. Grant

applications will be accepted between 1 August and 15 November with the Grant awarded by 15 January.

## CIVIL AIR PATROL (CAP)

Civil Air Patrol (CAP) is an aviation-oriented, non-profit, volunteer organization with three missions: Emergency Services in search and rescue and disaster relief, the Cadet Program and the Aerospace Education Program.

For the educational community, CAP's Aerospace Education program focuses on providing materials, networking, and informational resources that support an aviation-related curriculum in schools from kindergarten through high school - K-12. A major contribution is organizing and hosting the annual National Congress on Aviation and Space Education (NCASE) which is the premier conference of its type in the nation. At NCASE each year, each registrant is provided a curriculum resources reference of all of the many sessions that present teacher material in aerospace.

Also each year, CAP supports Teacher Workshops in colleges and universities across the nation reaching thousands of educators. These workshops highlight basic aerospace knowledge and focus on advances in aerospace technology. Learning tools and visual aids geared to stimulate interest in aerospace matters are provided for teachers who enroll in these workshops. A listing of these workshops by location, contacts and dates is published by CAP each spring and is available from CAP National Headquarters.

Through the CAP Aerospace Education Member Program (AEM), classroom teachers at all levels and teacher organizations receive low or no-cost materials and information to use in their classrooms. Among these are a regular newsletter service, lesson plans, themed study units, posters, books, resource listings and grant information. These materials support not only national teaching standards, but also important federal programs such as No Child Left Behind (NCLB) and "Every Child a Graduate." Information about AEM and an application for enrolling is listed in the "Aerospace Education" section of the CAP website: [www.capnhq.gov](http://www.capnhq.gov).

Three other programs are described and listed in the Aerospace Education section of the website under the headings of Aerospace Education Programs/Products, Aerospace Education Resources and Grants and Awards.

The AEM/Products section describes the CAP sponsorship of the Aerospace Education Excellence Award Program for both classroom teachers and for Civil Air Patrol units. Program requirements include six monthly activities and an aerospace day of two or more hours in duration. The aerospace day may be any major activity devoted to aerospace education.

Two volumes of hands-on activities called Aerospace Education Excellent Activity (AEX) booklets have been prepared for this program. AEX I is designed for students in kindergarten through fifth grade; AEX II is for grades six through twelve, including cadets. National education standards have been identified for all of the activities in the AEX volumes.

For the classroom program, three of the monthly activities must come from the AEXI/AEXII activity booklets; the other three may be other aerospace related activities, but a complete lesson plan must be submitted for any activity that does not come from the AEX volumes.

Any member of CAP may participate in the Aerospace Excellence Award program; there is no cost. The AEX volumes are not available for purchase and are distributed only to members signed up for the program.

A second product listed in the section is the textbook, *Aerospace: The Journey of Flight*. The book is for sale and is written for junior and high school students and contains six sections and 27 chapters. An optional teacher's guide is available which includes objectives, lesson plans and sample test.

A third product, for sale is a six module set of learning activities called *Aerospace Dimensions*. The set is supported with student, leader and resource guides designed for use with junior high students. Information on ordering both the textbook and the module set is included in the website section.

A second section under Aerospace Education is Aerospace Education Resources. This section offers activity booklets plus other available free materials for the Elementary Level. For the Middle School level, a variety of comprehensive themed study units on aviation and space topics are offered, including activities for a variety of subject areas. Under the High School Level, prepared science lessons, including classroom activities tied to national standards, are offered.

The third section, Grants and Awards offers special scholarships for the first-time Civil Air Patrol (CAP) teacher as well as \$250 educator grants for teacher members that are sponsored by the Aerospace Education Foundation (AEF). The grants are designed to promote aerospace education activities in classrooms from kindergarten to twelfth grades. The program encourages development of innovative aerospace activities within the prescribed curriculum. The website provides information for applying.

Many of the CAP's educational materials and units described above are available for download on the Aerospace Education Website, which was designated by *USA TODAY* as one of its "Best Bets for Educators." In addition, the Aerospace Education section of the website contains a Links feature which provides connections to a variety of aerospace education websites including the CAP Regions, National Aeronautics and Space Administration (NASA), Museums, Government sources, and an extensive list of Teacher Resources.

## EAA EDUCATION PROGRAMS

The Experimental Aircraft Association (EAA) is the world's leading recreational aviation organization with 170,000 members and 1,000 local chapters. Their website, [www.eaa.org](http://www.eaa.org), contains an aviation education section providing a variety of programs and activities for members, chapters, youth groups and educators.

Young Eagles (Ages 8-17) is a program of the EAA Aviation Foundation that was established in 1992 with a goal of flying one million young people by the 100th anniversary of powered flight in December of 2003. The goal was exceeded on schedule and is ongoing providing opportunities to young people worldwide to have an opportunity to experience flight through the generosity of 35,000 volunteer pilots and

at least twice that many ground support volunteers. Through the Young Eagles program, the EAA continues to show young people that aviation is accessible whether as a career or as a recreational pursuit, and through flight, gives them a new perspective on the world. For more information about Young Eagles, contact the Young Eagles office toll free at 1-877-806-8902 or go online to: [www.youngeagles.org](http://www.youngeagles.org).

For the past several years the EAA Aviation Foundation has been heavily involved in educational projects that involve unique blends of aerospace education materials and resources. Programs were researched, developed and tested in specific areas of science, math and technology especially for the elementary and middle school grade levels. The result of all these efforts will soon be available in a new elementary school program called "The Science of Flight" which will be released nationally in 2005.

Developed in partnership with the Einstein Science Project in Green Bay, Wisconsin, the program is an inquiry-based, hands-on approach which involves a curriculum unit in the form of a "Flight Kit" for grades 3 through 7. The kits with all necessary materials will be sold to teachers or schools and will include opportunities for teachers to fly through the EAA "Flying Start" program. The package will also include opportunities to obtain professional development through a special training academy program. For more information contact the Einstein executive Director, Jon Streu, at 1-888-824-8877 or go online to [www.einsteinproject.org](http://www.einsteinproject.org). Information will also be available on the EAA website.

A program developed for high school students is an Aviation Science Web Course. In partnership with Utah Valley State College, EAA has added this web-based aviation curriculum to its education program. "Fundamentals of Aviation Science" is a quality online course designed for high school students. The course, which runs for 17 weeks and follows National Standards, will be offered for high school science and college credit.

Students interact with certified science teachers and flight instructors over the Internet from any location. The multi-media instructional material, featuring online questions and explanations, uses EAA's award winning photography and the unique resources of the