

AN AEROSPACE EDUCATION WORKSHOP FORMAT FOR  
STATE AEROSPACE EDUCATION WORKSHOPS

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## PREFACE

The concern of this study has been to find an effective aerospace workshop format that will supply the knowledge and materials needed to motivate and assist the Oklahoma teachers to successfully integrate aerospace education into the classrooms of Oklahoma schools.

The following people have contributed greatly to the completion of this study, to them I would like to express the most sincere appreciation:

To Dr. Kenneth E. Wiggins, Chairman of my committee, for his encouragement, interest, expert advice, patient counsel and enthusiasm which turned this task into a very rewarding educational experience.

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## CHAPTER I

### NATURE OF THE PROBLEM

In this day of an accelerated generation of scientific information about aerospace, it is clear that educators need some way to keep current. The kindergarten through high school teachers have the responsibility of educating the young people not only about the past and the present but the future. If the schools are to fulfill the needs of the students, they must see that the teachers bring relevant materials to the students in their classrooms. Oklahoma is aware of this problem as is shown by the appropriations the legislators allocate each year for aerospace education. They realize the need for teacher-training in aerospace education.

Travel in space is not science fiction but reality, and colonization in space is being talked and written about as a possibility. Plans have been drawn for space colonies.<sup>1</sup> Von Braun was the first to draw up plans and to talk about the feasibility of colonization on the moon.<sup>2</sup> Now the scientists see mining the moon--taking the lunar soil, pressing it into pellets which are then jettisoned into space where they are caught 80,000 kilometers away and used in a space colony for manufacturing. Scientists see this as not only practical but profit making.<sup>3</sup>

Another possibility being investigated by the National Aeronautics and Space Administration (NASA) is satellite power as a new



energy source.<sup>4</sup> This is an important space development and should prove pertinent in the education of young people in our schools today. Their needs for new energy sources will be even greater as they grow older and become adults.

With so many new developments teachers need some way to learn about aerospace, to receive needed materials and to be made aware of different ways to integrate aerospace into their subject areas. For many years in-service education has been the method used to bring new knowledge and a broader understanding of both old and new subjects to teachers. Harris states that in-service education is a "major function of supervision which consists of activities which will promote the growth of instructional staff members to make them more effective and more efficient."<sup>5</sup>

Many persons in Oklahoma have realized the importance of teacher education in aerospace. They have also found that the educational workshop is an effective way to get aerospace involvement started, first among a group of teachers then into the Oklahoma classroom by these teachers.

In order to fulfill the needs of the young people in Oklahoma schools, the needs of the towns in which they live and the needs of the state of Oklahoma, aerospace workshops should provide teachers with the very best in training, materials, knowledge, and tools to enable them to provide the students with pertinent knowledge they can use now and in the future. A series of workshops have been sponsored by the Oklahoma State Department of Education, the Oklahoma Aeronautics Commission and the Governor's Advisory Committee for Aerospace Education and planned in order to fill these needs. They should be

evaluated each year, changed where needed and continually improved in order to give the teachers the very best in aerospace education.

#### Statement of the Problem

The general problem is to provide the teachers of Oklahoma and other states with the most effective format for an aerospace education workshop in terms of materials, activities, field trips, speakers, and time in training needed to help them to successfully integrate aerospace education into their classroom, subject areas or aerospace education classes.

The main purpose of this study is to provide a format for Oklahoma workshops which will most nearly fit these needs. To solve the problem and achieve the purpose of this study, questionnaires were sent to workshop directors in all fifty states and Puerto Rico. Another questionnaire was sent to each former Oklahoma workshop participant in order to have his input into the formation of a new format for effective Oklahoma aerospace workshops. A third questionnaire was mailed to the twenty-five selected participants out of the five former workshops held in Oklahoma in 1969 through 1973. This group worked together during the summer of 1975 on aerospace activities for Oklahoma teachers.

#### Significance of the Study

From 1903, the year Orville and Wilbur Wright took to the air at Kitty Hawk, North Carolina, until 1957 when Sputnik was launched into orbit by Russia, the world was interested in the airplane and aviation. Since 1957 the airplane is still popular and airplanes continue to

improve; but the exciting developments in space have increased our interest in a new direction and extended our interests beyond the lower atmosphere.

There is talk of space colonization, which may seem far-fetched; however, it really is not when the advances in technology of the last 19 years are considered. Aerospace is important to all people in the world today. Not only does it provide jobs for thousands of Americans and others around the world; but it also gives us fast transportation for business, pleasure, and emergencies as well as many new medical aids, materials and technology used in many fields. One field that has greatly improved due to space exploration and has been responsible for the reduction of cost is communication via satellites. Who then can doubt that it might also provide the means of relieving the over crowded conditions predicted for the future. Aerospace is certainly one of the important areas of knowledge that children should learn about from the kindergarten through high school. Educators need to teach children in subject areas that are relevant to prepare them for their future. Today the universe is their environment--not just the earth.

One important aspect of aerospace education, and one that has not been talked about, is the adult learning that will also take place. Children take home the exciting things they learn in the classroom. Parents learn many things in this way. Many of these parents do not know much about aerospace, and it is important that they become exposed to this knowledge in order to better understand and adjust to changes in their future.

In order to bring the Oklahoma students the knowledge they need now and in the future, it is important that teachers be trained in special workshops. Large sums of money are appropriated each year by the Oklahoma state legislators for aerospace education. This money is used for aerospace education workshops under the sponsorship of the State Department of Education, the Oklahoma Aeronautics Commission and the Governor's Advisory Committee for Aerospace Education. In order to justify these expenditures of money and time, it is imperative that the workshop format be such that it will fill the needs of the training of teachers for effective aerospace education in the Oklahoma schools. It is hoped that this study will give the future aerospace education workshop directors the information needed to construct an outstanding format to fill these needs.

#### Limitations of the Study

The subjects of the study are limited to former Oklahoma Aerospace Workshop participants and to the workshop directors in the 50 states of the United States and Puerto Rico as listed on the NASA and CAP aerospace workshop directors lists.

#### Definition of Terms

Aerospace. The term "aerospace" is commonly defined as the total expanse extending upward and outward from the surface of the earth. It has also been generally used to identify activities related to either atmospheric or space flight, thereby recognizing their inter-relationship.<sup>6</sup>

Aerospace Education. Aerospace education is that branch of general education concerned with communicating knowledge, skills, and attitudes about aerospace activities and the total impact of air and space vehicles upon society. It must be distinguished from those branches of special education known as aeronautical and/or astronautical education which are concerned with training specialized aerospace workers.<sup>7</sup>

Aerospace Workshop. Aerospace workshops are regular credit courses offered by colleges or universities during the summer session. These courses are constructed to give educators an aerospace background with curriculum planning and activities in aerospace to fit their classrooms. Field trips, lectures, flight experiences, and materials are provided to add to the teachers knowledge in aerospace.

Aerospace Curriculum Guide and Materials Book. The aerospace curriculum guide and materials book is for teachers to use in planning aerospace lessons, units, or courses in aerospace. This book is a guide to be used from kindergarten through the high school grades. It includes materials which can be used to make ditto copies for the students. Guides are used by workshop participants and are assembled at the national or state level.

Aerospace Activity Cards. Aerospace activity cards are a set of cards made up of activities that may be used from kindergarten through the high school for classroom activities. These activities cover all grades and all subject areas.

Workshop Participants. Workshop participants are educators who participate in summer aerospace education workshops. These participants can be knowledgeable on aerospace or can be beginners in aerospace education.

#### FOOTNOTES

<sup>1</sup>Issac Asimov, "The Next Frontier?" National Geographic, Vol. 150 (July, 1976), pp. 76-89.

<sup>2</sup>Wernher von Braun, talk delivered to the National Congress on Aerospace Education, Murfreesboro, Tennessee (April, 1972).

<sup>3</sup>Asimov, p. 85.

<sup>4</sup>Newsletter, National Space Institute, Vol. 1 (April, 1976), p. 3.

<sup>5</sup>B. M. Harris, Supervisory Behavior in Education (New Jersey, 1963), p. 75.

<sup>6</sup>University of Illinois Institute of Aviation, Aerospace Education Workshops and Institutes, University of Illinois Bulletin (1964), p. 6.

<sup>7</sup>Mervin K. Strickler, "The Center as a Means of Implementing Aviation Education." (Unpublished doctoral dissertation, Stanford University, 1951), p. 162.

## CHAPTER II

### REVIEW OF SELECTED LITERATURE

#### The Beginning of Aviation Education

At the Teachers College in Kansas City, Missouri, in the early 1920's, Finis E. Engleman organized and taught a course in aviation for teachers. This was one of the earliest known educational courses for teachers' training in aviation-related subjects.<sup>1</sup>

After Lindbergh's historic flight from New York to Paris there was an awakening of interest in aviation. The young and old were swept with an awareness of this new mode of transportation. Many others realized the potential military significance of the flight. One thing was certain--the American people were suddenly interested in airplanes. School children were enthusiastic about man and the airplane. The high school and college age population dreamed of adventures in the sky. The general public suddenly realized the importance of the airplane on that day in May, 1927, when Charles A. Lindbergh and his monoplane, the Spirit of St. Louis, reached Le Bourget Field in Paris. Lindbergh succeeded in doing what the Wright brothers' historic efforts had failed to do--start Americans thinking of the air and its potential for the people and the country. It finally got the United States awakened to a fact that airplanes were significant to the protection and defense of the country, a fact that Germany, Japan, and France were well aware of, as was evident by their efforts to manufacture airplanes. The



United States was far behind in this field.

With the sudden interest in airplanes the educators realized a need for some form of aviation education. Thomason states it well: ". . . curriculum does not come from the schools. It is usually placed into the educational processes after the fact. It results from demands or needs created by forces outside the schools."<sup>2</sup> This was an outside force that was acting and the schools were beginning, not only to feel but trying to meet this need.

In the summer of 1928 New York University had the first large-scale aviation education course. The course was for elementary and secondary teachers. It was given for credit and was designed to give teachers needed information and ideas to help them meet the aviation education demands in their schools.<sup>3</sup>

The format for the New York University summer course included lectures by knowledgeable people. Many of these lectures would be helpful to teachers today with minor changes to update them.<sup>4</sup> One of these lectures, "Teaching Aeronautical Knowledge by Means of School Activities," would be of special interest to teachers in today's workshops. This large-scale effort was due to Daniel Guggenheim's desire to promote aviation. His Fund for the Promotion of Aeronautics supported this summer session at New York University.<sup>5</sup>

During the same year, 1928, a Stanford University professor of engineering, Dr. William F. Durand, gave an address to the Superintendents of Schools in Boston, Massachusetts on, "The Public Needs Aeronautic Education." With the following well make points he provided educators with sound reasons for aviation education:

1. Aeronautics stands ready to offer to society and to the cause of human progress a service.
2. The public is divided into two classes insofar as aeronautic services are concerned--those who render the service and those who receive it.
3. Education for those rendering aeronautical service must be technical, professional, vocational.
4. For the great public at large--those who receive aeronautical service--the education which is significant is that which will permit them to use wisely and sanely the service offered.
5. There must be developed within the body of society at large something of what is implied in the newly coined word "air-mindedness."

Dr. Durand identified 18 subjects in the high school curriculum concerned with aviation.<sup>7</sup> Today the entire curriculum from kindergarten through high school has connections in many ways with aviation and space. This includes the field of home economics because of space diets, materials and living arrangements, physical education because of exercise, physiology because of the earth-bound humans' physiological changes when they leave the ground, to name but a few of the many areas.

The first National Conference on Aeronautical Education was conducted at St. Louis, Missouri, in February, 1930, under the sponsorship of the Aeronautical Chamber of Commerce and the Daniel Guggenheim Fund Committee on Elementary and Secondary Education. A similar conference was held in April, 1931 at Detroit, Michigan.<sup>8</sup>

The United States Office of Education began to get interested in aviation education beginning in 1932. Two papers were published by them, both by Robert W. Hambrook, Specialist for Trade and Industrial Education, the first was Bulletin No. 142, "Vocational Training for Aviation Mechanics," and the second was, "Aviation in the Public Schools."<sup>9</sup>

It was during this period that the airlines began to work with educators. Western Air Express was the first to get an educator to help them further aviation education. They employed a University of Southern California professor, Earl W. Hill, to help schools and colleges realize and understand the impact of aviation on education.<sup>10</sup>

William A. Wheatley, a former college president, was another pioneer in aviation education, as was the airline he worked for, United Air Lines. His progress provided scholarships for: (1) training teachers, (2) development of materials of instruction, (3) distribution of materials for both teachers and pupils. Ray O. Mertes followed Wheatley in the same work for the next twenty years. The program is still in operation.<sup>11</sup>

Many airlines have contributed to aviation education during the previous thirty years. Following is a partial list of the name of the airline and the education specialist in charge of their aviation education program:

1. Trans World Airlines - John Furbay.
2. Pan American World Airlines - George Gardner.
3. American Airlines - Nicholas Englehardt  
and Kenneth Newland.

Many airlines offer different services, resources and materials to educators, for instance Eastern Airlines offers orientation flights for teachers.<sup>12</sup>

The government, in November, 1936, showed their interest by the publication of an article on aviation education, a cooperative endeavor of the Bureau of Air Commerce and the National Education Association. It appeared in the Journal of the National Education Association and included resource material on numerous aviation subjects. This interest and the promotion of aviation education was increased in 1938 with the establishment of the Civil Aeronautics Authority.<sup>13</sup>

#### Aviation Education Leading Up to and During World War II

Aviation education was stepped up in the late 1930's, due to the war threat. Many high schools and colleges were enlisted to aid with the education of students for the private pilot license, air crew trainees, training preflight students in high schools, and training qualified instructors. This effort really brought aviation education into an estimated one-half of the high schools in the country.<sup>14</sup>

Materials of instruction began to appear due to this World War II educational effort. Contributions of the educational research at Teachers College, Columbia University and the University of Nebraska enabled the largest single production of this type of materials. These publications were known as the Air-Age Education Series. The publication of these books were co-sponsored by the Civil Aeronautical Administration and the Institute of Aeronautical Sciences.<sup>15</sup>

Ben D. Wood, chairman, Education Committee of the Institute of the Aeronautical Sciences, wrote in the foreword of each of these books:

The Air-Age Education Series represents a major step in providing our schools with teaching materials for these purposes [help the American people for constructive living as World citizens in the air age].

This series has two objectives. First, it seeks to provide text and teaching materials for older students in high schools in the field of pre-flight aeronautics. Second, it seeks to provide pertinent aviation materials which may be woven into existing courses in the curricula of the secondary schools and, wherever feasible, of the elementary schools.<sup>16</sup>

In the Aeronautics in the Industrial Arts Program book of the Air-Age Series the teachers are told that the fact they were not prepared to teach aeronautics should not deter them. The book lists six specific suggestions on how the elementary teacher may prepare herself for one of the early aviation activities she should teach elementary children:<sup>17</sup>

A first consideration in developing the program is that the teacher herself shall be interested. The teacher should not only know how to build model planes, but she should also know what makes them fly, as well as knowing the names and functions of the more important parts. Such knowledge cannot be secured entirely from books. The teacher who wishes to promote a successful program of model building must take the necessary time to build some simple models herself. The following suggestions are offered to the teacher who seriously wishes to prepare herself for this work:

1. Start reading and studying about making model airplanes. A number of suggested titles will be found in the bibliography. Those which are starred are especially helpful in the elementary school.

2. Begin looking at and studying airplanes. Visit an airfield or terminal and examine the various types.

3. If you have not already done so, take a ride in an airplane. Children will respect the opinions of one who has actually "been up."

4. Get a kit for constructing a simple glider and assemble it. (If there is an industrial arts teacher in your school he will be glad to help in case you have difficulties.).

5. Follow the glider with a simple flying model. If by now you have caught the spirit of the program, you will want to make two or three models which are more difficult.

6. Call on the industrial arts teacher for help on technical and constructional problems.<sup>18</sup>

The air-age series also lists the specific objectives of aeronautics for the elementary school:

1. To initiate the children into an environment which will be increasingly influenced by the airplane.
2. To vitalize the study of other subjects through the introduction of constructive activities in which the pupils are vitally interested.
3. To teach the pupils about tools and materials.
4. To introduce pupils to an activity which will provide hobby and recreational opportunities.
5. To help in the general program of recognition and identification of aircraft.<sup>19</sup>

In the introduction to the air-age series book, Elementary School Science for the Air Age, Arey points out that:

. . . it is in the elementary school—meaning in the first seven or eight grades—that the intelligent appreciation of flying, which is called for want of a better term "air-mindedness," may commence, and the foundations of knowledge about flying may be laid.<sup>20</sup>

Arey also suggests that now educators need to direct the study of man's biological adaption to the world around him in terms of aviation, instead of drawing examples from other phases of living which teachers felt were closer to the students daily lives.<sup>21</sup>

Today this needs to be taken even more seriously with the problems man faces now and in the future while traveling and living in space.

The FAA has a physiological section in the Medical Center in Oklahoma City at Will Rogers World Airport. These men are available to go all over the United States to give lectures on physiology of flight. They also will have special tours and conduct lectures at the Medical Center for groups near there. They are working in aerospace education for safety.

In The Biology of Flight book of the air-age series, Fitzpatrick and Stiles bring up a very important point when they write about how important it is to educate. For only with knowledge of the dangers of personal health, animal health, and plant health from a world brought so close to every place on earth by air travel, can people learn to recognize and avoid these threats, as much as possible.<sup>22</sup>

#### Aviation Education After World War II

In 1945, George F. Zook, President American Council on Education, wrote that the American Council on Education had cooperated with the Civil Aeronautics Administration since 1941 "in its far-sighted efforts to help the schools of America adjust themselves dynamically to the technological and cultural needs of the Air Age."<sup>23</sup>

The focus of this effort was initially toward the science of aeronautics for the junior and senior high school grades, due to the emergency war needs. With the end of World War II the elementary classrooms began to get materials for their students.<sup>24</sup>

Very few schools failed to respond to the needs in the education field which resulted from aviation. For this reason it was felt that teaching materials were needed in order to help teachers at all levels of education. The Aviation Education Source Book was the result

of this need. It was written by a group of experienced classroom teachers with the assistance of aviation researchers. This book contains material and activities for teachers to introduce aviation in major subject matter areas.<sup>25</sup>

The source book was also written to help the schools meet this obligation:

But there is a more profound reason for this volume than response to requests for assistance. It has become commonplace to say we will be more fundamentally affected by the airplane than by any other single invention man has created to date. Granted that this may be a true evaluation of the airplane one must then ask how will we be equipped to cope with so revolutionary an instrument and the changes that follow in its wake. The schools are obligated to do their part to prepare our citizens to direct this new instrument for the common welfare.<sup>26</sup>

In 1946, a small publication came out which was a bibliography of 147 items to: "Supply teachers at the different grade levels with sufficient references in each area of the social implications of aviation to make possible intelligent and functional fusing of air age problems into social studies courses."<sup>27</sup>

After World War II there was a decline in many of the high school elective courses as well as elementary enrichment and project work. The urgency and motivation of the war was gone. Even though some of the wartime trained instructors of aeronautics and those with aviation experiences used their knowledge to enrich their subject areas it was a very small effort.<sup>28</sup>

The higher education programs that were both popular and effective were Aviation Education Workshops for Teachers. The Civil Aeronautics Administration supplied the major leadership. Their aviation education staff worked through colleges, universities, state departments of



education and local or regional groups, to give first-hand aviation background and experience to classroom teachers. The year 1948 saw nearly 100 colleges and universities for teacher training instituting plans for the education of teachers in how to use aviation to improve their teaching.<sup>29</sup>

In 1952 the Civil Aeronautics Administration had to reduce their aviation education programs due to a reduction in a budget. At this time the National Aviation Education Council was established and with the Civil Air Patrol became leaders in aviation education.<sup>30</sup>

From the beginning of its involvement in aviation education the Civil Air Patrol, a civilian auxiliary of the U. S. Air Force, has undertaken this obligation with serious dedication, enthusiasm and interest. Today its aerospace education program is one of the largest in the nation. Through this organization has come much of the leadership in supporting and sponsoring aerospace programs in the elementary and secondary grades. They helped in integrating aerospace education into elementary and high school courses and the aerospace courses given for credit in the high school. They have for many years promoted aerospace learning experiences for extracurricula activities. The North Central Association of Colleges and Secondary Schools recognized and endorsed the CAP program in 1951:<sup>31</sup>

In those member schools desiring to offer a course in aviation as set by the Civil Air Patrol, this course may be offered for graduation, as well as for college admission as a credit in science, or as an elective, after the following conditions are met . . . .<sup>32</sup>

The provisions included in the resolution were: (1) enrollment must be open to any study; (2) teacher qualification standards had to be met; (3) course description of recommended content. This recognition and

endorsement was reaffirmed again in June, 1960.<sup>33</sup> In its efforts to bring aerospace education to the young people the Civil Air Patrol works with teachers in all 50 states. It assists in both planning and implementing aerospace education workshops for teachers.

The aerospace education objectives of the Civil Air Patrol include the following:

1. A reading and speaking vocabulary of aerospace terms.
2. A knowledge of weather and climate as factors in aerospace operations.
3. A knowledge of the physical and biological sciences as applies in aerospace explorations.
4. A general understanding of the structure of aircraft, rockets, missiles, satellites, and space vehicles.
5. A familiarization with the aerospace industries.
6. A knowledge of the impact of aerospace progress on international relationships.
7. An understanding of the social, economic, and political implications of aerospace technology.
8. A knowledge of airports, airport services, and the functions of airport personnel.
9. An understanding of existing and proposed government services and regulations that facilitate aerospace operations.
10. A knowledge of the materials, personnel, and equipment available as resources for aerospace education programs.
11. An understanding of the political, economic, social, and educational problems created by aerospace technology.
12. A realization that aerospace vehicles have changed traditional concepts of land masses, water barriers, speed, time, and distance.
13. A knowledge of career opportunities in science, engineering, and other fields resulting from aerospace vehicle development, manufacture and operation.
14. An understanding of the basic scientific and engineering principles inherent in air and space vehicle development, manufacture and operation.<sup>34</sup>

In 1951 because of the success of the large number of aviation education courses a committee was appointed by the American Council on Education. The committee on Aviation Education conducted a research program to evaluate the aviation education programs being offered. H. E. Mehrens was the editor of the reports published in the book,

Adventures in Aviation Education. These reports were done by the American Council on Education in cooperation with the Civil Aeronautics Administration and are most helpful as a guide to profitable and successful aviation education programs following World War II.<sup>35</sup>

In this publication the reports from the different schools bring out these things:

1. Importance of community understanding and cooperation.
2. Schools must make use of the resources provided by industrial, civic and governmental groups, if they are to meet the challenge of the present and the future.<sup>36</sup>

Wright and Sinclair in the foreword to this book wrote:

". . . it is through the individual's educational development that he acquires the ability to cope with his environment."<sup>37</sup>

In 1951 when this book was published, 23 out of the 48 states wrote reports. Oklahoma was one of the 23 states writing reports.<sup>38</sup>

The task of this project was to discover ways the educational program could be enriched by the contribution of aviation. It was felt that children throughout their school life could benefit by learning how the impact of aviation extends to their social, political, technical, and economic life and how this concerns business, industry, government and the general public.<sup>39</sup>

This project was interested in how to incorporate aviation educational materials into the classroom without making a drastic change in curricular viewpoint.<sup>40</sup>

A study by H. P. Bruner in 1950 involved 32 of the largest school systems in the United States. In this study it was found that by the use of aviation education certain curriculum improvement trends could be

reinforced. These trends are:

1. Recognition of interest, purpose and guided experiences in relation to child growth and development.
2. Recognition of responsibilities toward: (a) the child's development in understanding the complexity of modern life; (b) his development of the skills and attitudes essential to its improvement; and (c) the student's vocational efficiency.
3. Acceptance of a more integrated organization of the curriculum and the use of the large center of interest as a frame of reference.
4. Greater use of community resources.
5. Recognition of a responsibility for in-service teacher education.<sup>41</sup>

Even before Bruner made this study with these conclusions it was generally agreed that "aviation education could support current educational trends to the benefit of both education and aviation."<sup>42</sup>

How to do this was the problem. School schedules were crowded and adding another subject was not the answer. Another problem was the lack of teachers who felt competent in this area. The children themselves knew more about aviation than either teachers or parents. A third problem was lack of aviation materials published for children.<sup>43</sup>

Significant attention needs to be directed to the objective of education. The school should be responsible for developing the understanding of students to the world around them. Aviation is important to all who live in the world today. With the increasing closeness of all countries to one another, educators must work toward world understanding with their students. This is one of the neglected needs of today's students.

The committee felt that another one of its problems was to find a solution as to how a classroom program could be enriched using new materials, methods and thus aiding the schools in keeping up with the world's realities.<sup>44</sup>

The committee decided that the way to find answers to these problems was through the help of classroom teachers. Each person in the position of superintendent or commissioner of public instruction in every state was contacted. Twenty-seven school systems were chosen following these interviews. The participating teachers in these systems were then chosen by the superintendents together with principals and supervisors.<sup>45</sup>

Aviation background was not one of the criterions for selection. The teachers were to be experienced and successful teachers. Several of these teachers did have a background of aviation experience. Aviation had also been used in the teaching in some of these classrooms.<sup>46</sup>

A conference with the participants was held in Washington, D.C., in June, 1948. They understood the purpose of the project to be:

1. Values to be gained from the use of current aviation events in the classroom.
2. Discover aviation materials and aviation education procedures appropriate to the teacher's specific teaching task.
3. To incorporate these into the classroom program, enriching the experience of the children without violating the school's curriculum viewpoint.<sup>47</sup>

The teachers were furnished materials by the Aviation Education Division of the Civil Aeronautics Administration, airlines, aviation industry and the United States Navy. The Navy also furnished transportation to the Washington conference and entertained them at the Naval Air Station in Patuxent, Maryland.<sup>48</sup>

The book contains the stories written by the teachers about their experiences in solving these problems. They used a great deal of

originality and imagination. Many common elements showed up in the reports and common calculations were reached by many of them, though they were located all over the United States. This was true even though each was asked to pay particular attention to different things in different fields, such as introduction of aviation in social studies or in the sciences. There was also stress placed on not tampering with the school's accepted philosophy.<sup>49</sup>

The reports were optimistic and the teachers had success in incorporating the materials into the classroom programs. The pupils were interested in the airplane and, with the exception of one Ancient History teacher, the current aviation events were brought to these students by their teachers.<sup>50</sup>

In the primary grades the introduction of aviation enrichment was introduced both in learning activities and content. In the intermediate grades the goals were the same as the ones at the primary level but the activities were more complex and the understandings to be attained were much broader, i.e., from local community to distant lands. This brought on a broader understanding of the airplane, the people, economics, industry and much more, not only in the United States, but other countries.<sup>51</sup>

The upper elementary children again had the same goals as the first two groups. The differences were again only in depth and breadth. Group work increased and understanding and appreciation of other students and their contributions became apparent. These children learned to make plans for executing projects. They had many committees to get the needed materials together. The students even suggested different things they wanted to study in aviation education. Many

creative things were done, such as writing poems, stories, articles, painting, dramatic plays, constructing airplanes, model airports, maps, kites, model weather stations and many other things. Bulletin boards were made for the special day, individual and group projects were displayed and dramatic functions prepared for parents and friends to see.<sup>52</sup>

The secondary school used aviation education in English, science, mathematics, geography, agriculture, modern languages and all other areas. The teachers had no trouble in student interest. Projects were chosen, reports given, excursions taken, resource people interviewed, scrapbooks and notebooks made and kept and communication in all forms was extended. The interest of the students stimulated the activity. They investigated, created and used resources close at hand. They learned from these activities and applied their learnings in subsequent activities.<sup>53</sup>

Parents were invited to the schools to see these new programs in action. They were encouraged to see how science applied to education can be as effective as when applied to some of the other professional fields.<sup>54</sup>

One of the contributing teachers said:

Aviation interests enter the classroom situations as something whose relationship cannot be disputed . . . I do not know how any teacher in this day and age can teach social studies without drawing upon the field of aviation.<sup>55</sup>

The teachers agreed that many things happened for the good of all with the addition of aviation education:

1. The daily attendance increased.
2. There was improved parent attitude toward the schools' program.

3. There was an awareness of extra school education facilities offered by the communities' aviation segment.
4. There was a newly awakened enthusiasm by teacher and students.
5. The problem child was completely eliminated.
6. The enthusiasm generated by the program spread throughout the school and community.
7. The press and radio in the community became interested.
8. The aviation education classes were strong contributors to the school's public relations program.
9. The subjects sometimes thought of as dull and uninteresting were vitalized.
10. The students participation was spontaneous.
11. The students were stimulated to study.
12. The students learned about their community in relation to the world.
13. The students learned about human relationships.
14. The students learned about international affairs as well as affairs of their own town and country.
15. The students were shown the importance of geography.
16. The students developed good work habits.
17. The students developed the ability to cooperate with others.
18. The students developed the ability to solve problems.
19. The students developed a sense of responsibility.
20. The students developed the ability to make plans with others.
21. The students learned to meet people which in turn developed poise, conversational ability, and courtesy.



22. The students developed an interest in other fields related to aviation.

23. The students became more aware of the world around them.<sup>56</sup>

The teachers felt their greatest needs in teaching aviation education were more appropriate materials for instruction, more books, films, pictures, maps, grade level stories, textbooks and state aviation education centers established to give every teacher in every state aviation education guidance and orientation.<sup>57</sup>

Some of the teachers working in this program had these things to say:

If education is to be the result of experiences whereby students become more able to adjust themselves to the demands of the changing world, in which they live and work, then I sincerely believe that time spent on aviation in agriculture is not only justifiable, but essential.<sup>58</sup>

The air-age project has been a revelation to me and has revolutionized my entire method of Spanish instruction. It seems to bring alive the subject for the students and to revitalize the interest of all participants--including the teacher.<sup>59</sup>

The class gained a great amount of knowledge, an awareness of the air age, and a new vision of the world about them. However, the most important gain was the gradual development of good attitudes and desirable value patterns for life in an air age. Without realizing it, the students appeared to put democratic group interests above their own, recognizing their responsibilities to their society by accepting roles of leadership and fellowship and by sharing their talents and making friends with members of different races.<sup>60</sup>

Until a subject such as aviation is related to a child's life at home or in school, there will be little creative art relating to aviation. Children draw their homes and the surrounding countryside, so why not try drawing the same things, only this time pretend you are flying over your home. Visualize your picture, with the plane at different heights; and how would seasonal change alter the coloring and pattern of your picture?<sup>61</sup>

A more revolutionary suggestion might be for the federal government to turn over at least one surplus air transport to each state for educational purposes, with the state having this facility under its own education department control. A qualified pilot, perhaps one from the National Guard, could be assigned to fly school children to places of interest. These airplanes would not only provide stimulating and enlightening air experiences, but would also provide a wonderful way of making the pages of the textbooks come to life. What better way is there for teaching aviation than through supplying actual experiences? We are already supplying school bus service for visiting various places, why not school air service?<sup>62</sup> It is difficult to conceive of any center of interest which has more potentialities than aviation for gaining attention, interest and activity on the part of the children, and thus achieving the basic objectives of the elementary school.<sup>63</sup>

Personally, I feel that the incorporation into the classroom program of current events such as aviation is not only the best way to teach, but the only way. My group not only succeeded in their air-age program, but they also were outstanding in other activities; one member was elected best citizen of the school year, another won the poetry contest sponsored by the Book Lover's Club, two became basketball team captains. In a test given to all three sections of the eighth grade, the group having its work correlated with aviation make from 10 to 20 per cent better showing on the subjects tested than the groups taught by the textbook method.<sup>64</sup>

The children in this program had these things to say:

John: This year I have enjoyed math more than I ever have since I came to R.J.H.S.

Everett: We have learned a lot about aviation, but I also got my required math for ninth grade.

Robert: I have enjoyed coming to math class every morning. It is my favorite class. It goes by the fastest of them all.

Francis: Before this year, I hated math and could never get it through my head until we started aeronautical math.<sup>65</sup>

1. I think that aviation was an excellent choice as an outside activity. It is a good thing to know how it has affected our position as a world power.
2. Government was one of the more interesting subjects I took this year. It taught me about the important part aviation is playing in the world today and how it is bound to play an even more important part in world affairs in years to come.

The parents also made comments on the aviation education project:

1. Children were more interested in school, they wanted to go to school.
2. It aroused an interest in world events, newspapers, radio, maps, and other countries.
3. Developed initiative as shown by planning and building of airplanes.
4. Developed good work habits and cooperation.
5. Has helped develop a better understanding of home and family living.
6. School proved to be much more fun.

One teacher heard the following interesting remarks made by parents about the program:

Bob's progress during the past semester has been very noticeable. His reading, arithmetic, and his mental attitude have shown much improvement. He acts older, is more courteous, stable, and even tempered.

Jack has become more dependable; he is more cooperative. He wants to be a pilot. Tommy is more friendly to other children. He enjoys the story hour at school, especially the airplane stories. He and his two elder brothers are busy making model airplanes and reading directions.

Jerry's progress is most noticeable in reading . . . recently he has been buying airplane models and reading the directions.

Mary is much happier in school this year. She tells us much about the airplanes. She plays with children much better. Relatives have noticed a definite change for the better in Mary's behavior.

Mehrens was also the editor of a book written in 1954, Aviation in School and Community. This book was the cooperative effort of the American Council on Education and the Civil Aeronautics Administration. It was prepared by supervisors of instructional programs.<sup>69</sup> The project contributors were from 33 states. Oklahoma had three members. They were: Ted Anderson, Tulsa; Marshall Lakes, Stillwater; and S. Arch Thompson, McAlester.

This book points to the need for concern with aviation and its importance to the destiny of all people; and to the responsibility of educators to bring aviation into the curriculum of the schools. It offers aid to those people in administrative positions in education who would help teachers find sources of information and procedures needed to meet the responsibilities of bringing aviation into the schools.<sup>70</sup>

Many groups and individuals joined together to find ways to help integrate aviation education into the schools. The sponsors for this attempt at informing supervisors of teachers were the industry members of the Air Transport Association, the Aircraft Industries Association, several Chambers of Commerce groups and six State Departments of Aeronautics, among these was the Oklahoma Department of Aeronautics. They felt that aviation education was necessary in order to prepare an individual citizen to successfully live in an aviation age.<sup>71</sup>

These people felt that they should help the educational leaders put aviation education into the schools as soon as possible. They realized that waiting for a new idea to be accepted in education would usually take years. In order to overcome this lengthy wait they decided to use effective educational leadership. In this beginning effort they realized the necessity of cooperation between school and

community. This group realized the importance of using all the available resources and facilities of a community to give the young people direct experience. Mehrens and his group felt the students needed to see what was happening in the aviation industries, what effect aviation has on them, their community and the rest of the world. It was evident to this group that aviation education is very important to both the school and the public. In order to overcome the cultural lag it is now more important than ever to gear general education to what is happening in the world today.<sup>72</sup>

#### Aerospace Education After Sputnik

The Committee on Aviation Education was concerned about the cultural lag in 1952 when they first met. The general public became aware of how far behind the United States was when Sputnik awoke them in 1957. Aviation people were working all across the United States to make people conscious of changes before this event.

The airplane is a familiar aspect of a child's environment. A child is more likely to be interested in the things he sees around him. With the airplane a teacher has an interest that will induce learning. The airplane is familiar and the possibilities as a tool for furthering student understanding are tremendous.<sup>73</sup>

Airports and aircraft factories from a child's viewpoint are very complex. In visiting such places he finds out about the different occupations of men and women. He learns how an airport operates and about the people who operate it. He finds out about the controller in the tower who gives the pilots needed information. He sees how the radar screen works which gives the controller information about severe

weather so he can alert the pilots. He learns about the linemen who help direct the aircraft. He watches the baggage men who load the passenger airplanes with luggage and the cargo planes with freight. In the aircraft factories he sees the parts being put together that go into making an airplane. He learns how many people are needed to plan and build an airplane. Understanding his community and the technological development of aviation is important to the child and it is one that has been left out of the preparation of the child for his life. Education needs to correct this oversight.<sup>74</sup>

The child of today needs to know about the fundamental economic, political and social principles of the world in which he lives. He needs to have a general understanding of the technological and scientific principles which bring about present social changes.<sup>75</sup>

The youth of today need to have their questions about airplanes correctly answered. Both girls and boys need to know the history of aviation in the United States and the world. They need to know how an airplane flies and what the parts are that make flight possible. They need to be aware of the uses of the airplane today and what future uses might develop.<sup>76</sup>

The institute's members felt that every high school student should have a course in aviation, either a general one or a specialized one. The specialized course would need a teacher with special qualifications because of the technical aspects.<sup>77</sup>

They realized the need for personnel in the aviation industry would increase because the industry was increasing. The demand already exceeded the supply. This was felt to be a problem which educational leadership should undertake. General education could help by including

aviation in the curriculum from kindergarten through high school. The administration and teachers could help the students get materials about occupations in aviation. In this way the young people would be aware of aviation's place in the world and the opportunities available in the field of aviation.<sup>78</sup>

There are a few schools which have a supervisor of aviation education. The supervisor helps and encourages the teachers to use aviation education in their curricular fields. He gives these services: (1) aviation information; (2) available aviation resources; (3) plans and arranges for field trips; (4) helps in planning aerospace units; (5) conducts teacher institutes; (6) provides orientation flights; (7) assistance in contacting resource people; (8) teaches specialized courses in aviation for secondary students; (9) makes it easy for teachers to have instructional aids, materials, and devices; (10) is responsible for helping the teachers understand how important aviation education is and how effective it is in motivating students; (11) helps the teachers in discussion groups, action groups and planning groups on aviation procedures for both the needs of the teacher and the needs of the students; (12) have inservice programs for teachers where all areas of relationships between aviation and education could be explored, units planned, techniques demonstrated and explained, cooperative opportunities between school and community surveyed, materials could be evaluated and demonstrations of aviation integrated into the normal classroom work could be given for each grade level and/or subject area.<sup>79</sup>

Besides a supervisor of aviation education a community involved in modernizing education should consider establishing programs for

adult education within the organized educational structure. There might be a need for contributing leadership to a group of adults outside the school.<sup>80</sup>

Teachers need to visit classrooms where aviation education is being taught. The successful classes of aviation education might be called "pilot" classes and be available for teacher education visits.<sup>81</sup>

Encouragement for different people to set up resource centers within their own school districts for aviation education materials is a good idea. This material could be used by other teachers and also checked out by any student.<sup>82</sup> The General Aviation Manufacturing Association has done this throughout the United States. They have established resource centers for each state. These are in different colleges within each state. They send materials from all member firms and these are available to any teacher or interested person. The materials cover a wide range of aerospace interests and may be checked out to use in the classroom or for study. This is one of the most recent aids to aerospace education.

The encouragement should be given for parents to help in some of the activities of aviation education, The parents can and do make valuable contributions to workshops, discussion groups and to educational projects. This can help parents too, by helping them acquire a better understanding of the school program and the work of the teacher. In considering parent involvement and participation in the aviation activities, which the committee suggested, the following ideas might be considered:



- |  |  |   |
|--|--|---|
| <ol style="list-style-type: none"> <li>1. Model Building Clubs           <ol style="list-style-type: none"> <li>a. airplane</li> <li>b. rockets</li> <li>c. airfields</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>2. Hobby Clubs</li> </ol> | <ol style="list-style-type: none"> <li>3. Field Trips           <ol style="list-style-type: none"> <li>a. airports</li> <li>b. aircraft industries</li> <li>c. airline facilities</li> <li>d. FAA</li> <li>e. Museums<sup>83</sup></li> </ol> </li> </ol> |
|--|--|---|

The aviation education program should involve not only the teacher and the student, but the parent, administrators and supervisors with community participation such as the resource people and representatives from industry.

There are several approaches to bringing aviation education into the school:

1. In general education the use of aviation education would be in the different areas with the pupils' needs in aviation education given top consideration.
2. In departmental organizations each special subject would have aviation education to enrich the field. A supervisor could help by encouraging teachers to use significant and relevant facts about aviation.<sup>84</sup>

The importance of aviation education in the vocational education field is very important. The industrial arts instructor can use model building as an approach to aviation, airplanes, rockets, airfields and launch pads. Aviation careers as an exploratory course for vocational education curriculums is a need the students should have fulfilled.<sup>85</sup>

In techniques to use for adapting the classroom program to aviation

the first step would be for the administration with the curriculum planner and the teacher, to plan a program to include aviation. The next step would be for the teacher to provide an aviation environment in the classroom. The third step would be planning with the class the appropriate problems in aviation connected with the unit or course objectives that the class can study, either as a group or in smaller groups for projects.<sup>86</sup>

Individual differences should be recognized and projects or problems selected that would be appropriate for the student's needs. Always providing the opportunity for sharing and working with others is a way of helping the student grow in both knowledge and understanding.

Field trips to different aviation facilities can bring aviation into the classroom in many ways: discussion of the trip, enumerating the different occupations involved in running the industry; different groups working on the projects that developed as special interest areas after observing the facilities, planning future trips, writing the trip up for the school paper, painting different scenes of industry at work for art classes, figuring a payroll for mathematics classes and in home economics class the planning that an industry would have to do to feed these people.

There should be a definite promotion of cooperation between the school and industry.<sup>87</sup> Most aviation industries and agencies are very cooperative and need only to be contacted to give help and assistance by supplying educational materials, resource personnel, or making tours of their facilities available.

The aviation commissions or bureaus in most states are very helpful. These aviation commissions promote aviation and want to get people enthused about aviation. These people are happy and willing to help promote aviation education.

It should be the work of the supervisor of aviation education in a school system to keep the relationship between the school and the many industry, government, and other agencies as smooth, cooperative and effective as possible.<sup>88</sup>

The community needs to be involved in aviation education. It needs to know both the benefits and hazards of aviation. The schools need to extend aviation education to the communities. The adults need to understand the impact of aviation on their lives. This is where the supervisor of education in the school can really do an outstanding service to the school and community. He can offer courses for adults, work with civic organizations, recreational groups and leaders of the community interested in aviation. He will need to be a good communicator in order to spread the knowledge of aviation education in the community.<sup>89</sup>

There are many sources of materials for teachers to use. Aviation industries, aviation organizations and government are all excellent sources for both printed and audio-visual materials. The teachers should be encouraged to develop materials for their special area. These individual efforts should be made known and be available to the supervisor of aviation education efforts.<sup>90</sup>

Aviation education should be brought to all people--children, young adults and adults out of school. Aviation has an influence on all people and due to the international developments it is imperative that people understand the impact it has on the entire world population.

The need for an aviation education program is now. The public should be informed so they will realize this need. It will take the public and education working together to give the people courses that fit their needs.

The following question asked by the committee on aviation are very apropos:

1. How can this tremendous task of bringing aviation education to the people be accomplished within the limitations of our democratic structure in the shortest possible time and to the greatest possible extent?
2. What should be taught to increase general aviation enlightenment?
3. Through what mediums may such enlightenments and subsequent understanding be gained and employed?
4. What methods of instruction will be apropos?
5. What will such a program cost, and how can it be financed? <sup>91</sup>

The aviation education leaders should know what their own community has to offer in the way of materials, resource people, resource organizations, aviation facilities, federal agencies and military establishments. <sup>92</sup>

It is important to make use of every communication device in order to make the public aware of aviation education. Each community has a large number of these devices and can easily make use of them. They will vary from town to town, but generally they will include: newspapers, radio, television, open house nights at the different schools, service clubs, printed bulletins, pamphlets, brochures, posters, film strips, slides, flying clubs, federal agencies, military installations and a program of air marking. <sup>93</sup>

In 1950 a study was made by the chairman of the Committee on Aviation Education of the American Association of School Administrators, Herbert B. Bruner. <sup>94</sup> This study showed there were six trends aviation

education centered around in curriculum improvement. These trends were the recognition of the:

1. Growth and development of the child.
  - a. recognition of important factors in learning, interest, experience, purpose.
2. Responsibility of the school to help students understand the world in which they live. Through education to help students adjust to their world, become responsible adults with concern for improvement of their world.
3. Responsibility of the schools in helping students in vocational education and career planning.
4. Work needed for integration of curriculum and how to use the center of interest for a frame of reference.
5. Use of community resources as aids to learning.
6. Permanent need for curriculum improvement and in-service type of education for teachers.<sup>95</sup>

This report by the committee on Aviation Education, showed that aviation education had these general problem areas: (1) teacher education in appropriate content and techniques; (2) preparation of appropriate and adequate instructional materials; (3) educational policy.<sup>96</sup>

They found that the best and quickest way to get the aviation education movement started was this important step--getting the school administration's attention and interest. Along with this step it helps to get the attention and interest of the school patrons.<sup>97</sup>

They realized that aviation education was only one part of the educational movement and it had the same problems. Aviation education

enters the educational picture because of its importance as a military power and because it has such a great impact upon peaceful pursuits in all fields. It is one of the most powerful of the current social forces.<sup>98</sup>

#### Studies Made in Aerospace Education Since 1957

The survey of the literature for this study would not be complete without the doctoral dissertations and masters theses yielded in the survey. The ones most relevant to this study are summarized as follows:

The purpose of the study made by Zaharevitz,<sup>99</sup> in 1959, was the development of curriculum for aviation education summer workshops. He found after surveying the available literature that there was a definite need for aviation education in our schools and that aviation has a strong reason for having a place in the schools curriculum.

Zaharevitz gave 59 individuals who were experienced in directing aviation workshops a questionnaire survey. He interviewed 11 of these individuals and mailed the questionnaire to 48. Of the questionnaires mailed out there were four returned as "unable to locate," there were no replies from 11 people and six individuals felt they had either too little experience or no experience. The total number of replies came to 38. These usable replies were then validated by five aviation specialists.

On the question for recommendations for the optimum length of a workshop ranging from one to eight weeks, the four-week period was first, five-week duration was second, and the three-week duration was third. The specialists felt that the decision for the length of a

workshop could only be made by the director and his institutional administration. They felt there was no one period of time better than another.

The individuals ranked the "essential" activities or experiences in this order:

1. Basic fundamentals of aviation and astronautics.
2. Curriculum planning or a "plan of action" for personal use.
3. Orientation flights.
4. Field trips or tours.
5. Outstanding resource people.

The specialists ranked the following as their choices:

1. Basic fundamentals of aviation and astronautics (unanimous).
2. Orientation flights.
3. Field Trips.
4. The use, effects, and problems of aviation.
5. Curriculum planning or individual preparation of curriculum materials.

Zaharevitz said that aviation education workshops will have some variation but that the following conclusions can be made on things they do have in common:

1. The clientele should be all teachers, school administrators, laymen interested in aviation education and students preparing to become teachers.
2. The objectives chosen were the 14 objectives listed in the Report of the Aviation Education Committee, American Association of Colleges for Teacher Education.

3. The length of the workshop was left up to the individual director although at least four weeks was felt to be necessary. The feeling was that the objectives would need to be reviewed, leaving out those of lesser importance, or it would be difficult to do a satisfactory job.
4. The activities and experiences for each workshop should include: (1) basic fundamentals of aviation and astronautics; (2) orientation flights; (3) field trips, and (4) curriculum planning or a written plan of action.

These are the workshop objectives from the Aviation Education Committee.

The aviation education workshop shall provide each participant with:

1. An adequate reading and speaking vocabulary of aviation [and astronautics.]
2. [Knowledge of] the importance of weather and climate to successful aviation.
3. A general knowledge and understanding of airplane [and space vehicle] structure.
4. A general knowledge and understanding of the simple scientific principles of flight.
5. An understanding of the place of aviation [and astronautics] in peace and war.
6. An understanding of the effects of air transportation on various levels of international relationships.
7. An introduction to the social, economic and political [and value] implications of current and future aviation [and astronautical] development.
8. An appreciation of the services rendered by airports and their associated personnel.
9. Familiarity with existing and needed basic governmental services, regulations and relationships in aviation [and astronautics.]
10. A knowledge of available aviation education resources in materials, personnel [organizations] and equipment for instructional purposes.



11. The know-how for organizing units of aviation education [for actual use in their own teaching, curricular, or administrative problems] and providing resulting learning experience for children through student or directed teaching.
12. A realization of the growing interdependence of people through aviation.
13. An understanding of problems--political, economic, international and social--that aviation [and astronautics] has created and the institutions society has established to solve these problems.
14. A realization of how the airplane has changed geographic relationships--particularly in terms of mankind's concepts of time, place and distance and mankind's attitudes toward waterways, land masses and land and water barriers.<sup>100</sup>

Sanders<sup>101</sup> in his 1967 study to determine contents for a college program for elementary teachers went to aerospace industries to get information. Through their answers to his questionnaire he hoped to find ideas for a program that would provide a general knowledge of aerospace. His recommendations pertinent to this study were:

1. Important services are available for teachers from aerospace industries: resource people; part-time instructors; pre-planned tours.
2. Teachers should be encouraged to join selected aerospace education associations.
3. Industrial periodicals and educational periodicals should be read by both industry and teachers and used for two-way communication between industry and education.
4. Career guidance is a must for these teachers.
5. The college program for teachers should be divided into three different programs: one for elementary teachers in aerospace education; for secondary teachers in aviation education and also for secondary teachers in space education.

In 1960 Brewer's<sup>102</sup> study to determine the effectiveness of selected aviation education workshops in Tennessee showed that aviation workshops have helped teachers to fulfill the selected educational needs of their students. The aviation workshops have assisted the teachers in successfully developing activities designed to meet these needs.

Brewer based his study on:

1. Materials and information from the teachers in the University of Tennessee's aviation education workshops.
2. Information and materials from the Tennessee State Department of Education.
3. Information and materials from James Martin, Director, Tennessee's Aeronautics Commission.
4. Tennessee Aeronautics Commission's questionnaire administered to all former workshop participants.
5. The pre and post evaluation forms administered to workshop participants.
6. Interviews with former workshop participants.
7. Evaluation forms designed to aviation related interest and knowledge of children.
8. Questionnaires which accompanied each Curriculum Guide for Aviation Education.

The results showed:

Of the teachers, computed according to the mean degree to which they were meeting the educational needs, three-fourths were succeeding. It was found that the activities used by the teachers appeared to apply to the children's specific needs. In this way the teachers were contributing toward the fulfillment of educational need.

The materials, methods used and concepts presented came from the aviation workshops the teachers attended. These were being presented or used by the teachers for the first time.

It was found that it depends upon the purpose of the presentation of aviation-related materials as to whether it is better to present them in separate units or integrated through all the areas. If the purpose is to bring about an awareness of aviation and its implications then separate units would be advisable. If the purpose was depth of understanding in fewer areas, then the presentation of aviation-related materials in context with other materials or other instructional areas would take on more meaning.

The aviation-related activities that former participants in the workshop were using increased the proficiency of their students. This assessment was made through a word picture association test. In this test the students of the workshop participants displayed a greater knowledge of aviation-related principles than did other students.

The students of former workshop participants showed greater interest in aviation-related vocations than did the control groups. With twice the frequency of the control groups the students of the former workshop participants expressed the desire to become teachers, second to the aviation-related vocations. These teachers' personalities, character, or method of classroom procedure due to the aviation workshops tended to contribute to their gain of greater respect from students.

Evidence of the students' breadth of interest was shown when they were given the assignment to write on, "My Trip to the Sky." The aviation education workshop teachers' students used an aviation

vocabulary, more scientific concepts, touched upon many more aviation-related areas and showed more enthusiasm in their writings on the space or aviation story.

These same students showed a more realistic outlook. The evidence which substantiates this was their writing about ideas and things, rather than imaginary creatures or people, scientific occurrences and not superficial social situations, and rather than pure fantasy they wrote about possible occurrences.

Interesting results were gathered by an attitude-measuring device given the workshop participants at the beginning and upon completion of the aviation education workshop. It was found:

1. Approximately three-fourths of the workshop participants changed their opinions on each of the items.
2. Teachers between the ages of 40-48 were less likely than other age groups to change their attitudes.
3. The most flexible high school teachers were those who taught mathematics and social studies. (Numbers considered here were so small as to lend no real significance to the findings.)
4. The junior high school teachers when grouped according to grade levels showed significant difference from the other groups. The junior high school group being less flexible than the others; however Brewer found when the replies were regrouped to those teachers whose opinions remained unchanged there was:
  - a. A very small number of junior high teachers in this group.

b. The greater proportion in this group were elementary and high school teachers.

c. More women than men were in this group.

Brewer found that the former workshop participants were presenting new concepts, facts and methods. The report from the teachers showed that three-fourths of new presentations were a direct result of the aviation workshop. They felt that the workshop had also helped them grow professionally. In the latter area they felt that social awareness and impact of changes were the direction of greater growth.

Brewer's summary of conclusions:

Pupils of teachers who attended aviation education workshops displayed greater growth in the following:

1. Knowledge of aviation-related facts.
2. Interest in aviation-related vocations.
3. Interest in education as a profession.
4. Breadth of interest in aviation.

The teachers who attended aviation education workshops:

1. Developed experiences designed to meet the educational needs of children.
2. Displayed a greater knowledge of aviation-related facts and concepts.
3. Changed their opinions concerning the role of aviation in education and society.
4. Presented new ideas and concepts to their pupils.
5. Utilized new methods and materials.
6. Experienced a realization of professional growth.
7. Planned more interesting classroom experiences, thereby making education seem more attractive to children as a profession.

Teachers who attended aviation workshops displayed individual differences which may be summarized as follows:

1. Teachers ranging in age from 40 to 48 are less likely than other age groups to change their opinions on aviation-related concepts.
2. Women constitute a large proportion of the inflexible group than do men.
3. Elementary and high school teachers constitute a larger proportion of the inflexible element than do the college-administrator or junior high groups.
4. Elementary teachers have a lesser grasp of fundamental aviation-related facts than do other groups.

In Brewer's recommendations he said that if the aviation workshops were to be of the most value to participants and their students the sponsors must recognize the needs of the students. The emphasis should be on how the manner of aviation-related facts effect the students or how they relate to the total state or local school system's educational effort.

The emphasis needs to be on the social aspects as well as the technical. More need for real awareness of the importance of aviation in fostering cultural development, economic growth and world understanding is needed. The participants developed a broader view of aviation during the workshop and carried this to their classrooms in activities for their students. The teachers felt that still greater development needs to be done on attitudes and concepts in future workshops. Most of the teachers view aviation in terms of its military significance.

More administrators or supervisors should be encouraged to participate in aviation education workshops. If this group would participate, then modifications to fit the needs of such a group should be made.

In 1970 Helton<sup>104</sup> sent a questionnaire to 2,007 workshop participants to discover how they felt about the summer aerospace workshop six months after it was over. In 1971 he sent the second questionnaire to a random sample of 500 former workshop participants to record their opinions. Helton's study found the following to be significant:

1. Length of workshop and the number of techniques or activities the teacher includes in lesson plans as a result of the workshop experience. Longer workshops are more effective in inducing the teacher to integrate more aerospace education into lesson plan.

2. Duration of NASA at workshops and the involvement of the teacher as a resource person to his faculty. Longer duration of NASA at the workshop increases the effectiveness of the teachers as a resource person in their school system.

Helton did find a positive relationship in people having worked in subgroups when they include over 16 new techniques or activities in their lesson plans. There is a six to one increase in this group over the people who did not work in subgroups, when over 16 new techniques or activities are used in their teaching. This is a positive increase over the one to one ratio experienced when the teacher had included only one to five new techniques or activities due to attendance at an aerospace workshop.

One of the recommendations resulting from Helton's study is an important one: "The questionnaire should be simple and easy to follow for quickness and a greater surety of answers . . . ." <sup>105</sup>

Following the 1969 and 1970 aerospace education workshops in Oklahoma, Miller <sup>106</sup> made a study to determine to what extent the stated goals of the Oklahoma Aeronautics Commission were met by nearly 200 teachers who were present at the two workshops. Data from the 160 participants who returned the questionnaire was used to establish that the aerospace education workshops were successful in reaching their stated goals. The goals being:

1. To stimulate a widespread awareness of aerospace education at all levels of the curriculum.
2. To develop means to stimulate the teachers' interest in aerospace education.
3. To train teachers and administrators in the application of aerospace education in schools.

4. To make aerospace education available to students in all grade levels.
5. To encourage closer affiliation between educational institutions and aerospace industries.
6. To train teachers for a specialized course in aviation at the high school level.<sup>107</sup>

Among the recommendations made by Miller as a result of his study, and one that still needs consideration, is providing graduate method courses in aerospace education in Oklahoma universities.

In February, 1973, Romero<sup>108</sup> in his study "The Relationship of Aerospace Education Workshops to Practices and Attitudes of Participating Teachers," sent out two questionnaires to randomly selected groups of Oklahoma teachers. One was sent to former aerospace education workshop participants. The second one was sent to workshop applicants who had not been accepted.

The results of the study showed a significant relation between participation in at least one Oklahoma Aerospace Education Workshop and attitudes toward aerospace education; practices regarding teaching aerospace concepts; realization of importance of educational experience derived from field trips to aerospace industries and installations; and need for continuation of aerospace workshops for teacher-training.

One of Romer's recommendations was to emphasize method of teaching aerospace education concepts in order to help teachers gain confidence when using aerospace activities in their classrooms.

Marks<sup>109</sup> in his study on "Aerospace Curriculum and Instruction Utilization After the Completion of an Aerospace Education Workshop in Which NASA Participated," in 1973, gave one of the most concise pictures of NASA's involvement in aerospace education.



Since 1958 when the National Aeronautics and Space Administration was created, the declared policy of Congress has been for peaceful exploration so that all mankind would benefit from aeronautics and space research. The results of NASA research and activities are disseminated for all to view. NASA has the long-range objectives of developing a scientifically-literate community and assisting educators by providing enrichment materials in space science and programs for teacher training.<sup>110</sup>

The educational information is distributed by the Education Programs Division of Public Affairs. Their educational efforts have been concentrated on encouraging publications; stimulating research; and experimenting with workshops.

NASA has many educational services: publications about their programs and projects; films; many models and pictures for exhibits; speakers; the spacemobile; education officers for consultation; and planning assistance for workshops, institutes and courses.<sup>111</sup>

In his study Marks used participants from workshops conducted during the summer of 1974. The workshop must have had NASA participation. Of the 85 aerospace workshops in which NASA participated in the summer of 1975, 16 aerospace workshops giving a geographical representation of the United States were chosen:

Marks found that:

1. Over 76 per cent of the participants were teachers. Supervisors of teachers, curriculum directors, counselors, librarians, and administrators comprise five per cent or under of the population.
2. Over 51 per cent of the participants were incorporating aerospace education concepts into their teaching on a regular basis . . . .

3. . . . provide for more college and university participants.
4. . . . provide for better representation of supervisors of teachers, curriculum directors, and administrators.
5. . . . over 87 per cent of the workshop participants rated the NASA presentation "appropriate . . . ."
6. Over 90 per cent of the participants felt the aerospace education workshop was beneficial to their teaching methods . . . .
7. . . . over 98 per cent of the participants wanted to see aerospace education workshops continued in the future.<sup>112</sup>

Among the recommendations that Marks made that would apply to Oklahoma

Aerospace Education Workshops were:

1. Provide for advanced aerospace workshops based on the present model.
2. Continue to have NASA participation in aerospace education workshops.
3. Place more stress on classroom activities and teaching methods.
4. In order to promote aerospace education, more classroom visits by the workshop directors after the completion of the workshop should be employed.
5. In order to provide better instruction in the aerospace education workshops, better classification of aerospace classroom activities that are used by teachers should be developed.
6. A mid-school year and end-of-school year workshop evaluation should be made, to better meet the needs of the teachers who will participate in an aerospace education workshop.<sup>113</sup>

In October of 1974 the Colorado State Air Force Association had sponsored over the preceding years 53 aerospace education workshops for teachers. This National Workshop for Aerospace Education is held at Lowry AFB in Colorado.<sup>114</sup>

Because the state of Colorado has a large number of aerospace facilities the Air Force Association leaders have a special interest. The workshops always include tours to some of these facilities in the Front Range area from Pueblo to Longmont. These include the Department of Transportation Research Facility in Pueblo, the Air Force Academy

and the North American Aerospace Defense Command in Colorado Springs, a U. S. Army aviation center at Fort Carson, Black Forest Glider Port in Black Forest, the Denver Martin Company (Skylab Project) and Arapahoe County Airport in Littleton, the Federal Aviation Administration (Rocky Mountain Region) and the Air National Guard's Buckley Field (140th TAC Fighter Wing) in Aurora, Continental Frontier Air Lines, United Air Lines Air University and Lowry AFB in Denver, Vall Brothers (Application Satellites) and the National Center for Atmospheric Research Aircraft (Jeffco County Airport) in Bloomfield, and the Air Route Traffic Control Center in Longmont.

The design of the workshop is a general-survey format which is oriented toward the nontechnical teacher. This format gives the workshop a wide scope. Aviation history is covered from mythology to the present. Flight's relation to aerostatics, aerodynamics and aircraft nomenclature is defined. The physiological and psychological limitations of man to flight is defined. Military and commercial aviation's special functions are outlined. The responsibilities of the Federal Aviation Administration in both aviation safety and use of the airspace are outlined.

At the National Convention in Washington, D.C., in 1974 the Colorado Air Force Association received the Air Force Association's Exceptional Service Plaque. The Colorado workshop has been designated the Air Force Association's national effort in aerospace education.

Colorado has an unusually large number of retired Air Force personnel. The Air Force Academy, located in Colorado Springs, is one of the main reasons. The large air base located in Denver, the North American Aerospace Defense Command in Colorado Springs are two more

reasons. The state's climate along with hunting, fishing and winter sports figure into the overall reasons for the large number of retirees.

#### States and Aerospace Education

One of the first states to become interested in aviation education and still a leader in the field, was California. As far back as 1908 a Los Angeles high school, Polytechnical, offered a course called, "Aviation Craftsmanship and Learning to Fly." For 20 years Del Norte County High School in California has had programs for their students in both ground school and flight instruction. The regular faculty members are the instructors.<sup>115</sup>

Alabama in 1910 established a private academy which provided formal flight training. Today the Air University occupies this site in Montgomery, Alabama.<sup>115</sup>

In the Seattle, Washington area the Federal Way School District had an aerospace program for its elementary grades that grew to such proportions that the full time services of an Aerospace Education Director were required. In Tacoma, Washington airplanes are donated to the school by insurance companies or individuals. These airplanes are rebuilt by the students in the Aviation Mechanics Program. They are then used for student flying and some are sold to provide funds for the program. This began in 1945 with five war-surplus airplanes.<sup>117</sup>

In Wichita, Kansas all six high schools have one semester courses in aerospace science. They have flight experiences as an optimal experience. One high school has an Explorer Scout troop which provides flight experience in its own airplane.<sup>118</sup> Marion Stevens, Air Education Specialist with Beech, was a teacher in Chanute, Kansas before joining

Beech. He had the first course in aerospace education in the state.

In Aurora, Colorado the Hinkley High School has had courses in Aviation and Society, Air Transportation and Economics and Theory of Flight for a long time. The school also provides extracurricular experiences through the Thunderbird Aero Club. This high school club offers special lectures, model building, field trips, work in flight simulators, and flight experiences. The administration of this school conducts regular in-service programs in aerospace education for the teachers in the system. Twenty-five to 45 members of the faculty take advantage of this course each semester. Any of the faculty members who have not flown in general aviation aircraft are provided with flight experiences by the superintendent.<sup>119</sup>

Charles Lynch, Director of the Montana Aeronautics Commission wrote in 1966: (Montana) "has sponsored, subsidized and developed a substantial teacher education program in anywhere from three to five of the various branches of the University System during the summer months on aerospace and aviation education workshops."<sup>120</sup> He felt the greatest need was in the secondary field and that Montana was making a concentrated effort to establish aviation courses in numerous high schools.

Nebraska has encouraged public school teachers with financial assistance to learn about aviation in order to have teachers in their schools. They began this program as early as 1942 and have experimented with various techniques. The Air Age Education Division Coordinator has carried out an educational program to improve the public schools knowledge of aviation and the impact it has on society. They have had excellent results from a program for teachers labeled TOGA, Teachers Orientation to General Aviation. They take teachers from elementary,

high school, and college and take them through the flight and ground school course. They hold seminars and workshops in aviation. They found that outstanding programs in aviation education were established by these people.<sup>121</sup>

Until 1968 Pennsylvania had little activity concerning aviation in their schools. The Division of Highway and Aviation Education was created within the Department of Education because of the recognized aerospace education deficiency. Since the new division was created over 107 schools now offer some form of aerospace education.<sup>122</sup>

The first aviation efforts in Tennessee were primarily ground schools where 7500 young people over 16 attended. This was in 1938. In 1944 the state had its first workshop at Austin Peay State College, Clarksville, Tennessee. The training was for ground school instruction and flight instruction. Seven other colleges introduced this type of workshop for teachers due to the success of the first one. In 1946 the Tennessee Bureau of Aeronautics had the objective to have an aviation course in each of their 450 high schools. The Bureau gave scholarships to teachers for flight lessons in order to have well trained teachers for these courses. Tennessee did get aviation into its high schools by bringing together educators in a period in time when the public felt that children should receive instructions in the rudiments of aviation. Aviation materials in the form of model airplane kits were distributed to elementary students by the thousands. By 1953 the Tennessee Aeronautics Commission realized the need for teachers who were qualified to teach aviation. They made the decision that their primary objective was to integrate aviation into all curriculum areas--not specific aviation courses as before. They agreed

to give 100 scholarships annually of \$180 to teachers for aviation workshop attendance at the University of Tennessee, this could be for graduate or undergraduate credit. The workshop would be a five-week course with six hours credit. They believed the best way to overcome educational lag was through modification of the nature of classroom experiences. Major emphasis of the workshop was on activities for the classroom. Thirty-five scholarships were later made available for teachers who wanted to participate in advanced courses.<sup>123</sup>

Oklahoma has been an air-minded state even before a small factory was opened to manufacture airplanes in the 20's by Clyde Cessna and before Wiley Post learned to fly on the pasture airstrips of those early twenties. It is therefore understandable why educators and laymen were concerned about the lack of educational consideration and application in this area. Out of the 120,000 high school students in Oklahoma in 1967, less than 50 were involved in an aviation education course. Kingfisher, Poteau and Wagoner were the only schools in Oklahoma offering an aviation education course. In a state where aviation is the third largest industry this is cause for concern. Governor Dewey Bartlett had this brought to his attention by a group of concerned citizens. His appointment of an air education committee to investigate, stimulate and help get air education into the Oklahoma schools was certainly needed.

On June 9, 1968, Governor Bartlett stated in a news release:

During the past school year, we had only three Oklahoma high schools which had air education classes. There were fewer than 50 students out of 120,000 in the state who were exposed to air education. This does not make sense when one out of six people in Oklahoma City, for example, derives his income from the aerospace industry. It does not make sense when aviation is the fastest growing

industry in Oklahoma. This lack of air education must be remedied. I have therefore appointed a number of people who are most concerned with this problem who are daily working with education, aviation and aerospace industry to serve on my committee. I feel confident that through these appointments and through this committee we can vastly increase the number of public schools in Oklahoma which will offer air education courses in their curricula. This will be our goal. With the help of the committee, we should be able to put Oklahoma at the top of the ladder in this field.<sup>124</sup>

The Oklahoma State Legislature appropriated the money to be allocated for the Teachers' Workshop Program. The first workshop was held in Oklahoma in July, 1969 at Oklahoma State University under the sponsorship of the State Department of Education, the Oklahoma Aeronautics Commission and the Governor's Air Education Committee.

This first Oklahoma aerospace workshop has led to seven additional summer workshops. Sponsors and directors have worked to improve the workshop. Studies mentioned in this chapter have been used as guides in making changes. The teachers and staff have given constructive criticism. There is a cooperative endeavor to provide good workshops for Oklahoma teachers.

In summary, the review of the literature has shown that aerospace education workshops are necessary in order to bring aerospace knowledge, activities and materials to the teachers. While aerospace education has been a part of the educational program in many schools in the nation there are many places where this education has been neglected. There is evidence that the best way to overcome this serious educational neglect is to conduct summer aerospace education workshops for teachers and administrators of the schools. Oklahoma has been doing this. In order to continue improving the workshop offered to teachers and administrators in Oklahoma, this study will endeavor to formulate an



effective format for future Oklahoma aerospace education workshops. Former Oklahoma workshop participants and directors of aerospace education workshops in every state and Puerto Rico will be contacted in order to find the most effective means of helping the teachers of Oklahoma put aerospace education into their classrooms now and keep it there in the years to come.

FOOTNOTES

<sup>1</sup>Mervin K. Strickler, Jr. "History of Aerospace Education," An Introduction to Aerospace Education (Chicago, 1968), p. 309.

<sup>2</sup>Leslie L. Thomason, "Education and Aerospace," An Introduction to Aerospace Education ed. Mervin K. Strickler, Jr. (Chicago, 1968), p. 38.

<sup>3</sup>Strickler, p. 309.

<sup>4</sup>Ibid., p. 310.

<sup>5</sup>Ibid., pp. 307-310.

<sup>6</sup>Ibid., p. 310.

<sup>7</sup>Ibid., p. 311.

<sup>8</sup>Ibid., p. 311.

<sup>9</sup>Ibid., p. 311.

<sup>10</sup>Ibid., p. 311.

<sup>11</sup>Ibid., p. 311.

<sup>12</sup>Ibid., pp. 311-312.

<sup>13</sup>Ibid., p. 312.

<sup>14</sup>Ibid., p. 313.

<sup>15</sup>Ibid., p. 313.

<sup>16</sup>Ben D. Wood, Air-Age Education Series, The Macmillan Company, New York, 1942, p. Foreword.

<sup>17</sup>Gordon O. Wilber and Emerson E. Neuthardt. Aeronautics in the Industrial Arts Program (New York, 1942), p. 8.

<sup>18</sup>Ibid., pp. 20-21.

<sup>19</sup>Ibid., p. 9.

- <sup>20</sup>Charles K. Arey, Elementary School Science for the Air Age (New York, 1942), p. 3.
- <sup>21</sup>Ibid., pp. 3-4.
- <sup>22</sup>Frederick L. Fitzpatrick and Karl A. Stiles, The Biology of Flight (New York, 1942), p. 149.
- <sup>23</sup>Paul R. Hanna, ed. Aviation Education Source Book (New York, 1946), p. vii.
- <sup>24</sup>Ibid., p. vii.
- <sup>25</sup>Ibid., p. vii.
- <sup>26</sup>Ibid., p. ix.
- <sup>27</sup>U. S. Department of Commerce, Civil Aeronautics Administration and Office of Aviation Training. A Selected and Annotated Bibliography on the Social, Political, Economics and International Aspects of Aviation (Washington, D.C., 1946), p. 1.
- <sup>28</sup>Strickler, p. 314.
- <sup>29</sup>Ibid., p. 314.
- <sup>30</sup>Ibid., p. 314.
- <sup>31</sup>Thomason, p. 41.
- <sup>32</sup>Ibid., p. 41.
- <sup>33</sup>Ibid., p. 41.
- <sup>34</sup>Strickler, pp. 315-316.
- <sup>35</sup>H. E. Mehrens, Director and Ed., Adventures in Aviation (Washington, D.C., 1951), p. ix.
- <sup>36</sup>Ibid., p. ix.
- <sup>37</sup>Ibid., p. viii.
- <sup>38</sup>Ibid., p. vii.
- <sup>39</sup>Ibid., p. 1.
- <sup>40</sup>Ibid., p. 2.
- <sup>41</sup>Ibid., p. 2.
- <sup>42</sup>Ibid., p. 3.

- <sup>43</sup>Ibid., p. 3.
- <sup>44</sup>Ibid., p. 3.
- <sup>45</sup>Ibid., p. 3.
- <sup>46</sup>Ibid., p. 4.
- <sup>47</sup>Ibid., p. 5.
- <sup>48</sup>Ibid., p. 5.
- <sup>49</sup>Ibid., p. 6.
- <sup>50</sup>Ibid., p. 6.
- <sup>51</sup>Ibid., pp. 7-9.
- <sup>52</sup>Ibid., pp. 10-11.
- <sup>53</sup>Ibid., pp. 12-16.
- <sup>54</sup>Ibid., p. 17.
- <sup>55</sup>Ibid., p. 18.
- <sup>56</sup>Ibid., pp. 18-20.
- <sup>57</sup>Ibid., p. 21.
- <sup>58</sup>Ibid., p. 309.
- <sup>59</sup>Ibid., p. 289.
- <sup>60</sup>Ibid., p. 245.
- <sup>61</sup>Ibid., p. 236.
- <sup>62</sup>Ibid., p. 194.
- <sup>63</sup>Ibid., p. 150.
- <sup>64</sup>Ibid., p. 321.
- <sup>65</sup>Ibid., pp. 282-283.
- <sup>66</sup>Ibid., p. 351.
- <sup>67</sup>Ibid., p. 67.
- <sup>68</sup>Ibid., p. 148.

<sup>69</sup>H. E. Mehrens, Ed., Aviation in School and Community  
(Washington, D.C., 1954), p. vii.

<sup>70</sup>Ibid., p. vii.

<sup>71</sup>Ibid., pp. ix, 2.

<sup>72</sup>Ibid., p. 3.

<sup>73</sup>Ibid., p. 4.

<sup>74</sup>Ibid., p. 5.

<sup>75</sup>Ibid., p. 5.

<sup>76</sup>Ibid., p. 6.

<sup>77</sup>Ibid., pp. 6-8.

<sup>78</sup>Ibid., p. 14.

<sup>79</sup>Ibid., pp. 21, 22, 23, 29, 37, 38.

<sup>80</sup>Ibid., p. 19.

<sup>81</sup>Ibid., p. 30.

<sup>82</sup>Ibid., p. 31.

<sup>83</sup>Ibid., p. 31.

<sup>84</sup>Ibid., p. 33.

<sup>85</sup>Ibid., p. 34.

<sup>86</sup>Ibid., pp. 34, 35.

<sup>87</sup>Ibid., p. 39.

<sup>88</sup>Ibid., p. 38.

<sup>89</sup>Ibid., pp. 49-58.

<sup>90</sup>Ibid., pp. 49-61, 73.

<sup>91</sup>Ibid., p. 54.

<sup>92</sup>Ibid., pp. 72, 73.

<sup>93</sup>Ibid., pp. 59-61.

<sup>94</sup>Ibid., p. 74.

- <sup>95</sup>Ibid., pp. 74,75.
- <sup>96</sup>Ibid., p. 100.
- <sup>97</sup>Ibid., p. 100.
- <sup>98</sup>Ibid., p. 100.
- <sup>99</sup>Walter Zaharevitz, "Curricular Experiences for a Summer Aviation Workshop," (Unpublished Masters Thesis, Miami University, Oxford, Ohio, 1959.)
- <sup>100</sup>Report of Aviation Education Committee, Washington, D.C., August, 1949, p. 100.
- <sup>101</sup>Leroy John Sanders, "Aerospace Education for Teachers Based on Recommendations of Selected Aviation and Space Industries," (Unpublished doctoral dissertation, Colorado State College, 1967, p. 46.)
- <sup>102</sup>Altern Clair Brewer, "An Evaluation of the Effectiveness of Selected Aviation Education Workshops in Tennessee," (Unpublished Ed.D. dissertation, The University of Tennessee, 1960.)
- <sup>103</sup>Ibid., pp. 77,78.
- <sup>104</sup>Robert Dale Helton, "A Study of Aerospace Education Workshops Which Utilize NASA Materials and Resource Personnel" (Unpublished Ed.D. dissertation, Oklahoma State University, 1973, pp. 77-80.)
- <sup>105</sup>Ibid., p. 81.
- <sup>106</sup>Jerry L. Miller, "An Assessment of the Effects of Aerospace Education Workshops Upon the Teaching of Aerospace Education Concepts in Selected Schools in Oklahoma," (Unpub. Ed.D. dissertation, Oklahoma State University, 1972, pp. 3, 4, 78.)
- <sup>107</sup>Ibid., pp. 3,4.
- <sup>108</sup>Joe Christian Romero, "The Relationship of Aerospace Workshops to Practices and Attitudes of Participating Teachers," (Unpublished Ed.D. dissertation, Oklahoma State University, 1973, pp. 23, 24, 53.)
- <sup>109</sup>Steven K. Marks, "Aerospace Curriculum and Instruction Utilization After the Completion of an Aerospace Education Workshop in Which NASA Participated," (Unpub. Ed.D. dissertation, Oklahoma State University, 1975.)
- <sup>110</sup>Ibid., p. 26.
- <sup>111</sup>Ibid., pp. 26, 27.
- <sup>112</sup>Ibid., p. 70.

- <sup>113</sup>Ibid., pp. 71, 72.
- <sup>114</sup>Robin Whittle, "Teaching Teachers About Aerospace," Air Force, October, 1974, p. 70.
- <sup>115</sup>Leslie L. Thomason, "Education and Aerospace," An Introduction to Aerospace Education, ed. Mervin K. Strickler, Jr. (Chicago, 1968), pp. 39-48.
- <sup>116</sup>Ibid., p. 39.
- <sup>117</sup>Ibid., p. 42.
- <sup>118</sup>Ibid., p. 39.
- <sup>119</sup>Ibid., p. 42.
- <sup>120</sup>Charles A. Lynch. Personal Letter. Helena, Montana, Sept. 22, 1966.
- <sup>121</sup>Department of Aeronautics, Aerospace Education Program (Nebraska), Feb. 1, 1967.
- <sup>122</sup>Richard Butler, Aviation and Aerospace Education in Pennsylvania (Harrisburg, Pa.), 1971.
- <sup>123</sup>Robert E. Bomar, The Tennessee Aeronautics Commission, Tennessee, June 20, 1966.
- <sup>124</sup>Governor Dewey Bartlett, News Release dated Sunday, June 9, 1968.

## CHAPTER III

### DESIGN AND METHODOLOGY

#### Introduction

The purpose of this study was to find the aerospace education workshop format considered by former aerospace education workshop participants and national directors of aerospace education workshops to be the most effective in teaching aerospace education to teachers. This was done by sending questionnaires to former Oklahoma workshop participants and to workshop directors throughout the United States and Puerto Rico. The questionnaires dealt with the formats used in their aerospace workshops. These questionnaires indicate what each person felt was effective in lectures, speakers, field trips, classroom activities and materials. They also gave their opinions on what they felt was needed to improve future aerospace education workshops for teachers.

No elaborate statistical interpretations were made in this study since it is concerned with an historical description of past workshops. The data of this study were tabulated and calculated and presented in terms of numbers and percentages so that significant patterns and relations could be studied.



### Description of the Sample

The first group of participants of this study are educators who attended the past Oklahoma Aerospace Education Workshops from the summer of 1969 through 1973 and belong to the Oklahoma Aerospace Education Association. Several hundred of these workshop participants were selected by the Teacher Workshop Committee of the Governor's Committee on Aerospace Education. The criteria used in the selection were as follows:

1. Representation of all geographical sections of the State of Oklahoma.
2. Close approximation in number between male and female teachers.
3. Representation from all grade levels, kindergarten through twelfth grade.
4. Representation from most of the curriculum areas in high school.
5. The endorsement of the participant by the school administrator.

The second group of participants are the 25 special workshop participants selected in the spring of 1975 by the Teacher Workshop Committee of the Governor's Committee on Aerospace Education to attend a special workshop on the campus of Oklahoma State University. The criteria for the selection of these were as follows:

1. Be former outstanding workshop participants.
2. Be teaching aerospace classes, either as a separate course or integrating aerospace education into their subject area.

3. Be active, outstanding and enthusiastic aerospace educators.
4. Be willing to work on activities for Oklahoma teachers.
5. Be willing to try new materials for aerospace education in their classrooms.

The third group of participants were:

1. Aerospace education workshop directors.
2. Listed on the Civil Air Patrol and NASA workshop directors lists.
3. From every state in the United States and from Puerto Rico.

#### Collection of Data

#### Construction of the Questionnaires

The questionnaires are the sole source of data. The process of determining the adequacy of information to be requested in these questionnaires was:

1. Compiling a preliminary list of questions which were chosen after consultation with workshop directors.
2. Consultation with the chairman of the writer's doctoral committee.
3. Questionnaires reviewed by doctoral students in science education.
4. Revisions made on basis of above people's suggestions.

The questionnaires were then administered to a group of doctoral students who had attended at least one aerospace workshop. Responses and verbalization allowed for an indication of reliability of the instrument.

### Design of the Questionnaires

Ten questions were sent to the first group. These were questions on what they were doing in aerospace, what materials they were using, if they needed help in establishing a course in aerospace education, if they would like ideas on how to incorporate aerospace into their subject area, and what suggestions they had for aerospace education. A copy of the questionnaire is found in Appendix A. The second group got a questionnaire which had three parts: part A had seven questions with two sub-questions about the participants' aerospace activities in the school; group B had three questions with 36 possible items to check under these questions about aerospace education workshops; the third part was a group of 24 items about aerospace materials on a Likert-type scale: used a lot, used often, medium use, used seldom, not used.

The third group was sent a questionnaire with 17 questions on what was considered by the director to have been effective at their respective workshops such as: what presentations and/or lectures, activities, materials provided, field trips, orientation flights and length of workshop. A copy of the questionnaire is found in Appendix D.

### Submission of Questionnaire to Participants

The questionnaire, accompanied by a letter of explanation was mailed to the participants. Each participant was urged to return the completed questionnaire as soon as possible. Each questionnaire was mailed with a stamped, self-addressed envelope for the purpose of an easy return of the completed instrument. A copy of the letter of

explanation to workshop participants is found in Appendix C. A copy of the letter of explanation to workshop directors is found in Appendix E.

#### Method of Analyzing Data

Since the study is not statistical in nature, no elaborate statistical interpretations will be made. Data related to the research questions of this study were tabulated and presented in terms of total number for each question in order to find the presentations and/or lectures, activities, materials, field trips, orientation flights and length of workshop that make up the most effective workshop formats.

#### Summary

In summary, the purpose of this chapter has been to give a general description of the design of the study. The major areas discussed were description of the sample, collection of the data, scope and validity of the instrument and method of analyzing the data.

## CHAPTER IV

### RESULTS OF THE STUDY

The concern of the first three chapters has been a general introduction to the study, a review of related literature, and a discussion of the design of the study.

This chapter is a presentation of the findings from the three questionnaires. All data in this chapter are presented in terms of percentages of participants' responses to items on the questionnaire.

The data will be presented in three sections. The first section will contain responses to the first questionnaire. This questionnaire was sent to participants who attended one of the past Oklahoma Aerospace Education Workshops during the period ranging from the summer of 1969 through the summer of 1973. The percentages will be concerned with the:

1. Teaching of aerospace education.
2. Aerospace activities used in teaching.
3. Use of films pertaining to aerospace.
4. Resource materials used in teaching aerospace.
5. Need for help in establishing a course in aerospace education.
6. Use of an aerospace education teacher as visiting resource person.

The second section will contain responses from the second questionnaire. This questionnaire was sent to the 25 special workshop

participants selected in the spring of 1975 by the Teacher's Workshop Committee of the Governor's Committee on Aerospace Education to attend a special workshop on the campus of Oklahoma State University. The response to this questionnaire was 100 percent. The percentages will be concerned with:

1. The teaching level of the participant.
2. The use of an aerospace curriculum guide.
3. The use of aerospace education concepts on a regular basis.
4. How much time is spent on aerospace education.
5. The need for help in incorporating aerospace education into the subject area.
6. The number presently teaching an aerospace unit.
7. The aerospace activities used in teaching aerospace education.
8. The help given other teachers in the school in using aerospace activities and materials.
9. How the teacher feels about the aerospace education workshops.
10. What the teachers would like to see happen concerning the aerospace education workshop.
11. How the teachers utilized the aerospace materials given to them.
12. Additional materials the teachers feel would be useful.

Section three will contain responses to the third questionnaire from the directors of aerospace workshops throughout all the United States and Puerto Rico. The percentages will be concerned with the:

1. Work done during the workshop on curriculum development, guides or other activities.
2. Presentations and/or lectures the directors found most

- effective.
3. Time devoted to lectures and presentations.
  4. Activities found to be most effective.
  5. Time devoted to activities.
  6. Sources used to provide materials for the workshop participants.
  7. Materials which contributed most in assisting the participant to integrate aerospace concepts into their teaching.
  8. Field trips for participants.
  9. Field trips and their effectiveness in increasing a participant's knowledge of aerospace.
  10. Field trips the directors found most beneficial.
  11. Orientation flights for the participants.
  12. Length of orientation flights.
  13. Financial support for the workshop.
  14. Stipends provided for the participants.
  15. Optimum length of an aerospace workshop.
  16. Participants' help in structuring the workshop.
  17. Follow-up used with the participants.
  18. Frequency the directors used a follow-up.

#### Section One, Former Workshop Participants

Item one was used to see how many former participants were teaching a course and/or unit in aerospace education. From the information obtained it showed that 43.7 percent were teaching a course and/or unit in aerospace education while 47.8 percent were not teaching aerospace education at this time. The second item in the questionnaire was used

to see how many of the participants had put their training to work by previously teaching an aerospace education course and/or unit. The responses indicated that 58.6 percent had previously taught an aerospace course and/or unit. Refer to Table I on the following page for the percentages for all the questions.

In item three of the questionnaire the responses showed that 58.6 percent had already had a field trip or were planning a field trip in connection with aerospace education. Only 28.2 percent had not taken a field trip and were not planning to take one.

In trying to find out if the participants felt the need of a resource person, items 4 and 8 were used. The responses showed that 48.6 percent had used or were planning to use a resource person in their classroom, 28.3 percent of the teachers had not used a resource person and did not plan to use one. In item 8 only 30.4 percent wanted an aerospace teacher from another school to talk to their class while 39.1 percent were not interested in using an aerospace teacher from another school as a resource person.

Item 5 was used to see how well films pertaining to aerospace were being used in the classrooms. The responses showed that 89.1 percent of the teachers used films while only 4.3 percent did not.

In the use of resource materials the responses to item 6 show that 45.6 percent of the students secured aerospace materials to use while only 26 percent did not. There were 76 percent of the teachers who had secured the materials for the students to use and only 13 percent did not. Of the materials ordered 43.4 percent of the responses indicated both teachers and students secured materials.



TABLE I  
QUESTIONNAIRE ONE

Question	Percentage		
	Yes	No	No Re- sponse
1. I am teaching a course in Aerospace Education	45.6	47.8	6.6
2. I have previously taught a course in Aerospace Education.	58.6	34.7	6.7
3. I have had or am planning a field trip in connection with aerospace education.	58.6	28.2	13.2
4. I have had or plan to have an aerospace resource person in the classroom.	58.6	26.0	15.4
5. I have used films or plan to use films pertaining to aerospace education.	89.1	4.3	6.6
6. Students are using resource materials:			
a. They have secured	45.6	26.0	28.4
b. I have secured	76.0	13.0	11.0
c. Both of the above	43.4	-	56.6
7. I need help in establishing a course in aerospace education in my school.	10.8	56.5	32.7
8. I would like to have an aerospace teacher from another school talk to my class.	30.4	39.1	30.5

In trying to find out if the former participants felt they needed help in establishing an aerospace course and/or unit in their school item 7 was used. The response to this question showed that 56.5 percent of the teachers did not feel they needed help and only 10.8 percent felt they could use some help.

The teachers who comprised this first group represented kindergarten through grade 12, vocational-technology and college. The greatest representation was in grades 4, 5, 6, 10, 11 and 12. Table II gives the percentages for each grade. Subjects represented covered the complete range of courses with the exception of the high school subjects of chemistry, English, music and business.

TABLE II  
DISTRIBUTION OF TEACHERS RETURNING  
QUESTIONNAIRES FROM KINDERGARTEN  
THROUGH COLLEGE

K	1	2	3	4	5	6	7	8	9	10	11	12	C
<u>Percentage</u>													
2.1	4.3	6.5	6.5	15.2	19.5	15.2	6.5	6.8	13.0	8.6	13.0	5.2	6.5

To help former workshop participants, these teachers offered a number of suggestions which are listed below in order of the most frequently mentioned to the least frequently mentioned. Their suggestions indicate there is a need for:

1. Information of aerospace education ideas, air shows, air meets, and aerospace people meetings.
2. Names of resource people who would be available to come to the school to talk to students.

3. A list of current, up-to-date materials and where to find them.
4. Brochures or projects in aerospace suitable for kindergarten.
5. More units in elementary aerospace education.
6. A traveling program to go to the schools.
7. Rocket, ERTS and astronomy slides.
8. Stimulating more enthusiasm in the State Department of Education for an aerospace education program in more schools.
9. Ways to and help in convincing "powers that be" of the need for aerospace courses in high school.
10. Information on other activities related to aerospace for all grades.
11. Regional service centers for aerospace materials.
12. Books on aerospace with cassettes would be a very good addition to materials for aerospace education.

#### Section Two, Special Workshop Participants

The first item shows that these teachers represented kindergarten through grade 12. The 10th and 12th grades had the largest representation, the 11th grade was next. Table III shows the percentage of representation for the other grades.

Table IV will show the percentages for each item in the first part of this questionnaire.

The response to item two indicates that 60 per cent of the teachers were using an aerospace education curriculum guide. These teachers had worked during the summer of 1975 on a curriculum guide. This guide had not come off the press until after the questionnaire answers were

TABLE III  
PERCENTAGE OF TEACHERS FROM KINDERGARTEN  
THROUGH HIGH SCHOOL

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K	1	2	3	4	5	6	7	8	9	10	11	12
4	4	4	8	12	16	20	16	12	36	52	38	52

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TABLE IV  
FIRST PART OF QUESTIONNAIRE TWO

Question	Percentage		
	Yes	No	No Re- sponse
A. As a teacher in my school			
2. I am now using an aerospace curriculum guide.	60	20	20
3. I am incorporating aerospace education concepts into my teaching methods on a regular basis:	72	8	20
a. If "Yes," then please mark the following blank that applies:			
0% to 25%	28		
25% to 50%	24		
50% to 75%	16		
75% to 100%	8		
4. I need help in incorporating aerospace education concepts into my subject area.	20	56	24
5. I am presently teaching or have taught a unit dealing with aerospace education.	72	4	24
a. If "Yes," then please mark the following blanks that apply:			
(1) I have or am planning a field trip in connection with the unit	44		
(2) I have had or plan to have a resource person in the classroom	40		
(3) I have used films or plan to use films	64		
(4) Students are using resource material other than the text	64		
(5) Enough material is in our textbook to teach the unit	8		
(6) I plan to teach an aerospace unit in the future	48		
(7) I found my visit to the Houston NASA facility helpful in teaching my unit	56		

TABLE IV (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
6. I have sponsored the following activities for students:			
a. Field trips to airports	52		
b. Field trips to FAA facilities	48		
c. Field trips to military aerospace facilities	20		
d. Model Airplane Clubs	8		
e. Model Rocket Clubs	36		
f. Orientation flights	32		
7. I have helped other teachers in my school by:			
a. Sharing my aerospace materials	72		
b. Helping plan an aerospace unit	28		
c. Giving an aerospace program	24		
d. Giving demonstrations	32		

returned. It is interesting to note that these 60 percent were using the old Oklahoma Curriculum Guide put out by the participants of the 1971 Oklahoma Teachers' Aerospace Workshop.

The information obtained from the responses to item three show that 72 percent of these teachers were incorporating aerospace concepts into their teaching methods on a regular basis, only eight percent of this group were not. The largest percent of the teachers, 28 percent, were using aerospace concepts from zero up to 25 percent of the time and 24 percent were using them 25 to 50 percent of the time. Only a few high school teachers were teaching an aerospace class and these few account for the eight percent who used aerospace concepts 75 to 100 percent of the time.

Even though these teachers had spent at least two summers in aerospace workshops and had taught aerospace education, 56 percent still felt the need for help in incorporating aerospace education concepts into their subject area. This was indicated in the responses to item four. Only 20 percent of the teachers did not feel they needed help.

From the responses to item five 72 percent of the teachers have taught or were teaching a unit dealing with aerospace. It was interesting to note that 44 percent were not teaching aerospace concepts at the present time. Since this group of teachers had been very interested in aerospace education this percent was too high. In follow-up correspondence and personal contact it was found that one superintendent had deleted the aerospace classes in his school in order to have ecology classes. In another high school, with a change of principals, the teacher was not allowed to teach a high school aerospace education class. These 25 teachers asked for help to get the State Department

of Education involved in adding aerospace education to the curriculum of Oklahoma high schools.

The responses to the items listed under 5.a indicate that 44 percent either had or were planning a field trip in connection with the aerospace unit. A resource person had been in the classroom of 40 percent of these teachers. Aerospace films had been used by 64 percent. Only eight percent of these teachers found enough material in the textbook to teach the aerospace unit. There were 48 percent of the teachers who planned to teach an aerospace unit in the future. The Houston NASA trip, which these teachers had taken as one of their field trips in the summer of 1975, was found to be helping 56 percent of the teachers in their aerospace units.

Responses to item six indicate that the teachers had sponsored several aerospace activities for their students. Field trips to airports were used by 52 percent of the teachers. The next activity 48 percent of the teachers felt was a good field trip were the FAA facilities. The model rocket club was an activity that 36 percent of the teachers sponsored while only eight percent sponsored model airplane clubs. Orientation flights were used as an activity by 32 percent of the teachers. Field trips to military aerospace facilities were used by 20 percent of the teachers.

Item seven indicates by the responses that 72 percent of the teachers were sharing their aerospace materials with other teachers in their school. There were 32 percent of the teachers giving demonstrations for other teachers. The teachers in the school were being helped by 28 percent of the participants in planning an aerospace unit. Giving aerospace programs for other teachers was how 24 percent of the



teachers shared their aerospace knowledge. The teachers listed other ways they helped teachers in their schools. These were:

1. Making a set of ERTS slides to share.
2. Ordering rockets for other teachers.
3. Sharing with the other teachers any aerospace films ordered for their class.

The second part of this questionnaire was used to get information about aerospace workshops: What these teachers felt was beneficial about the workshops and what they would like to see offered in future workshops. Table V shows the second part of the questionnaire with percentages of teacher responses for each question.

Item one had to do with the participants' feelings about their aerospace workshop. There were 68 percent of the teachers who felt their workshop was beneficial in developing their teaching methods. Only four percent did not feel it was beneficial. There were 80 percent who indicated they got sufficient materials to teach an aerospace unit. The responses of 76 percent indicate that the speakers provided during the workshop increased the participants' knowledge of aerospace education.

The participants indicate by their responses that 92 percent would like to see the aerospace workshops continue. Responses indicate that 80 percent of the teachers would like to see the future workshops offer more field trips. Their suggestions for field trips were: FAA facilities--72 percent; government installations--72 percent; commercial aircraft industries--64 percent; commercial airlines industries--60 percent.

TABLE V  
SECOND PART OF QUESTIONNAIRE TWO

Question	Percentage		
	Yes	No	No Re- sponse
<b>B. Aerospace Education Workshops</b>			
1. I feel my aerospace workshop:			
a. Was beneficial in developing my teaching methods	68	4	28
b. Gave me sufficient materials to teach an aerospace unit	80		20
c. Provided speakers who increased my knowledge in aerospace education	76		24
2. I would like to see:			
a. Aerospace workshops continue in the future	92		8
b. Future aerospace workshops offer more field trips	80		20
(1) Federal Aviation Facilities	72		
(2) Commercial Aircraft Industries	64		
(3) Commercial Airlines Industries	60		
(4) Government Installations	72		
(a) Air Force Museum at Wright-Patterson AFB	80		
(b) Air Force Training Command at San Antonio	56		
(c) Alabama Space and Rocket Center	76		
(d) Navy Facilities at Corpus Christi	64		
(e) Navy Training at Pensacola	56		
3. I would like to see offered at future workshops:			
a. Activity sessions for classroom use	72		
b. Airports, communication, and air traffic control	44		
c. Aviation and space history	60		
d. Building model airplanes	32		
e. Building model rockets	32		
f. Careers in aviation and space	60		
g. Flying model airplanes	36		
h. Flying model rockets	32		
i. General sessions concerning aviation in Oklahoma	56		

TABLE V (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
j. Meteorology	64		
k. Navigation	48		
l. Physiology of flight	48		
m. Small group sessions on topics related to your grade or subject area	64		
n. Space travel	52		
o. Speakers from:			
(1) FAA	60		
(2) Industry	64		
(3) Military	60		
(4) NASA	72		
(5) Oklahoma Aeronautics Commission	44		
(6) State Department of Education	32		

Under government installations the responses indicate that 80 percent of the teachers felt the Air Force Museum at Wright-Patterson AFB should be a field trip for future workshops. There were 76 percent who felt the Alabama Space and Rocket Center would be a good field trip. Responses of 64 percent of the teachers would place the Navy facilities at Corpus Christi on the field trip list. The teachers' responses indicate that 56 percent thought both the Air Force Training Command at San Antonio and the Navy Training Command at Pensacola would be good field trips.

Item three was used to find out what these teachers felt would be good courses for an aerospace workshop. Their responses indicate activity sessions for classroom use--72 percent; small group sessions--

64 percent; meteorology--64 percent; aviation and space history--60 percent; careers in aviation and space--60 percent; and general sessions concerning aviation in Oklahoma--56 percent. The other courses with the percentages can be found in Table V.

NASA speakers were indicated by 72 percent of the teachers for workshops. The other speakers the teachers thought would be good by the indication of their responses were: industry--64 percent; FAA--60 percent; military--60 percent; Oklahoma Aeronautics Commission--44 percent; and the State Department of Education--32 percent. The teachers had the following suggestions for speakers: having classroom teachers who are teaching aerospace education; have successful aerospace educators from Oklahoma and surrounding states; and persons from local airports.

In Table VI the collected information is reported on a Likert type scale that ranges from used a lot, used often, medium use, used seldom to not used. This scale shows how much the materials given to the participants have been used. By the indications on this scale the materials used most were the Aviation/Aerospace Fundamentals Textbook with 28 percent; Aviation/Aerospace Fundamentals Instructor's Guide with 28 percent; Aviation/Aerospace Fundamentals Student Exercise Book with 24 percent; Aviation Fundamentals Textbook with 24 percent; Aviation Fundamentals Instructor's Guide with 28 percent; NASA information publications with 28 percent; NASA film list with 24 percent; the Estes Rocket Catalog and Estes Rockets both had 16 percent. It is interesting to note that only eight percent of the teachers did not use the NASA information publication. The Estes rockets, launch controller, prota-pad, catalog, rockets and the pamphlets were not used by only

TABLE VI  
AEROSPACE EDUCATIONAL MATERIAL

	Percentage				
	Used a Lot	Used Often	Medium Use	Used Seldom	Not Used
Aerospace Education Curricu- lum Guide (K-12)	12	12	24	24	4
Aerospace Education Magazine	4	12	28	32	4
American Airlines Educational Packet	4	12	40	4	12
Aviation/Aerospace Fundamentals Textbook	28	28	12	--	12
Aviation/Aerospace Fundamentals Instructor's Guide	28	20	12	8	12
Aviation/Aerospace Fundamentals Student Exercise Book	24	20	8	16	12
Aviation Fundamentals Textbook	24	16	8	12	20
Aviation Fundamentals Instructor's Guide	28	12	8	12	20
Aviation Fundamentals Student Exercise Book	20	12	8	16	20
Cessna Activities	12	16	28	16	8
Cessna High School Curriculum Guide	4	12	12	24	16
Cessna Pamphlets	12	16	20	24	4
Estes Altiscope	12	12	24	24	4
Estes Kites	8	16	28	20	4
Estes Pamphlets	4	16	28	4	4
Estes Rockets	16	20	28	4	4
Estes Rocket Catalog	16	24	24	4	4
Estes Rocket Porta-Pad	12	32	20	4	4
Estes Solar Launch Controller	12	32	16	4	16
NASA Activities	12	28	8	8	20
NASA Film List	24	16	8	8	20
NASA Information Publications	28	28	8	4	8
Rockwell International Materials	4	16	12	24	12
TWA History Program	4	4	24	20	20

four percent of the teachers.

The Estes materials are used more than any of the other materials. The NASA information publications, Aviation/Aerospace Fundamentals Textbook and Instructor's Guide and the Aerospace Education Curriculum Guide are used more than the other materials these teachers received from the workshop.

The teachers thought these additional materials would be useful. These are listed in the teacher's own words.

1. Spirit masters for reproduction.
2. Lunar surface material.
3. The tests that go with Sanderson Fundamentals textbooks.
4. Aviation Aerospace Texts plus the overheads would be very useful.
5. Materials over use of textiles and foods (fibers and fabric).
6. Activity cards.
7. Good filmstrip on how airplanes fly.
8. Film on "Women in Aviation".
9. More EROS materials.
10. Slides.
11. Transparencies.
12. Scale models.
13. Activities for classroom use.

Since the questionnaires were returned the teachers have received Oklahoma's first sets of aerospace activity cards. These were cards these participants helped work on in the summer of 1975.

The comments added by these teachers are useful in planning future workshops. They show the activities that have been helpful and what changes might be needed to help future participants. Their comments were:

1. NASA materials helpful in Aerospace course and in other courses also.
2. Most of the materials were very useful.
3. Books used frequently for aviation course.
4. Feel the original workshops were instrumental in increasing this person's interest in aerospace and would like to see workshops continue.
5. Wants new aerospace curriculum guide.
6. Like to see the workshops more like ground school along with the general information.
7. Uses pictures all the time as room decorations and finds this leads to student discussion even when it doesn't fit directly into the unit.
8. Set of activity cards placed in library for individual student work, two were developed further by students and became winners in local science fair.
9. School will not finance field trips, therefore classroom activities are of more value to this participant.
10. Would like to see enthusiastic administrators involved in the workshop.

### Section Three, Workshop Directors

In Table VII the questions with the percentage of responses will

help the reader get an overall picture of the directors' ideas on workshops. This table is long but it follows the questionnaire that was sent to the directors.

TABLE VII  
CURRICULUM DEVELOPMENT

Question	Percentage		
	Yes	No	No Re- sponse
1. Did you work on curriculum development?	71.0	21.6	7.4
2. If "Yes," will you please mark the following blank(s) that applies?			
a. Elementary	19.2		
b. Secondary	20.4		
c. K-12	43.3		
d. Other			
(1) ASE Symposium	1.2		
(2) B.S. Degree programs in Aerotech	1.2		
(3) College	1.2		
(4) Community College Adult Education	1.2		
(5) Government Education (Aerospace) Officer	1.2		
(6) Industrial Education	1.2		
(7) NASA and FAA materials	1.2		
(8) Occupational Education	1.2		
(9) Science	1.2		
(10) University	4.8		
(11) Vo-tech	1.2		
e. State classroom guides	3.6		
f. State activities guides	2.4		
g. Other:			
(1) Airport Guides re: liability and lease agreements	1.2		
(2) CAP	3.6		
(3) Local	4.8		
(4) Community College, resource units	1.2		
(5) Laboratory "task cards"	1.2		



The responses for the first item indicate that 71 percent of the directors had their aerospace workshops working on curriculum. There were 19.2 percent working on elementary curriculum, 20.4 percent working on secondary curriculum and 43.3 percent who worked on both elementary and secondary curriculum. There were several other curriculum levels that different workshops worked on, university--4.8 percent; B.S. degree programs in Aero-Tech--1.2 percent; college curriculums--1.2 percent; industrial education--1.2 percent; and occupational education--1.2 percent. There were 3.6 percent working on state classroom guides; 2.4 percent working on state activity guides and 4.8 percent on local curriculum. Table VII will show a few other curriculums that the directors had their workshops involved in planning.

The responses to item two indicate that 80.7 percent of the directors considered the government (FAA, NASA, etc.) presentations and/or lectures to be the most effective. The military (CAP, Air Force, Navy, etc.) were found to be most effective by 56.6 percent of the directors. The responses indicate that industry presentations and/or speakers were thought by 44.5 percent of the directors to be the most effective. Some of the directors, 3.6 percent, felt that individuals with special interest (sail planing, rocket models, hang gliding) were most effective.

The directors listed the specific presentations and/or lectures they found most effective. These are found in Table VIII. The list is long and adds to our findings on many things about aerospace education--there are many resource people, many presentations by government personnel and industry, available to most classrooms.

TABLE VIII  
PRESENTATION AND/OR LECTURES

Question	Yes (Percent)
2. What presentation and/or lectures have you found most effective?	
a. Government (FAA, NASA, etc.)	80.7
b. Industry	44.5
c. Military (CAP, Air Force, Navy, etc.)	56.6
d. Other:	
(1) Airlines	2.4
(2) Airline pilots (former fighter pilots)	1.2
(3) FAA personnel	1.2
(4) Films and filmstrips	2.4
(5) General aviation (local staff)	1.2
(6) Hobby shop person	1.2
(7) Individuals with special interests (sail planing, rocket models, hang gliding)	3.6
(8) Local model rocket society advisor	1.2
(9) NAEA	1.2
(10) Parks Air College	1.2
(11) Presentations in conjunction with core curriculum	1.2
(12) Reservists or retirees	1.2
(13) Staff from university	2.4
(14) State police helicopter lecture	1.2
(15) Teachers	2.4
(16) Teachers who attended NASA workshop	1.2
(17) Teachers who have used aerospace	1.2
(18) UFO's	1.2
(19) Women in Aviation	1.2
3. Would you please list the specific presentation and/or lectures you found most effective in order of effectiveness:	
<u>First Choice</u>	
Aerospace Doctrine	1.2
Aerospace Education	1.2
Airlines	1.2
CAP	4.8
Cessna	1.2
Commercial Pilot	1.2
Demonstrations and/or Lectures	6.0
FAA	1.2
FAA (air control)	1.2
Government	1.2
History of Aviation	7.2

TABLE VIII (Continued)

Question	Yes (Percent)
Military	
Air Force	2.4
NAEA	1.2
NASA	50.6
Reservists	1.2
Space Travel	1.2
Speakers and/or Personalities	3.6
Theory of Flight	1.2
UFO's	1.2
Weather Stations	2.4
Women in Aviation	1.2
 <u>Second Choice</u>	
Aerial Survey Corporation	1.2
Aerospace Doctrine	1.2
Airlines	3.6
Airports of today	2.4
CAP	9.6
Careers in Aerospace	1.2
Cessna	1.2
Demonstrations and/or Lectures	4.8
FAA	12.0
FAA (air control)	2.4
Field Trips	1.2
Flight Crew Training	1.2
GAMA	1.2
General Aviation	1.2
Industry	2.4
Military	4.8
Air Force	4.8
NASA	12.0
Navigation	2.4
Retirees	1.2
Rocketry	3.6
Speakers and/or Personalities	3.6
 <u>Third Choice</u>	
Aeronautics	1.2
Aircraft Design	1.2
Airlines	7.2
Airports of Today	1.2
ALPA	1.2
CAP	7.2
Cessna	1.2

TABLE VIII (Continued)

Question	Yes (Percent)
Demonstrations and/or Lectures	2.4
FAA	4.8
FAA (air control)	3.6
Gliders (hang)	1.2
Industry	2.4
Instrument Flying	1.2
Military	4.8
Air Force	3.6
Museums	1.2
NASA	7.2
Navigation	2.4
Power plants	1.2
Speakers and/or Personalities	9.6
<u>Fourth Choice</u>	
Aerospace Education	2.4
Airlines	3.6
Airports of today	1.2
CAP	4.8
Curriculum material	1.2
Demonstrations and/or lectures	1.2
FAA	5.8
FAA (air control)	3.6
Field Trips	3.6
General Aviation	3.6
History of Aviation	1.2
Military	2.4
Museums	2.2
NASA	8.4
99's	1.2
Speakers and/or Personalities	3.6
Transportation (Aviation's role in)	1.2
University faculty	2.4
<u>Fifth Choice</u>	
Airlines	2.4
Aviation Lawyers	1.2
Ballooning	1.2
CAP	4.8
Careers in Aviation	1.2
Cybernetics	1.2
FAA	4.8
Field Trips	1.2
Flight Simulators	1.2

TABLE VIII (Continued)

Question	Yes (Percent)
History of Aviation	1.2
Jets	1.2
Military	1.2
Air Force	1.2
NASA	3.6
Speakers and/or Personalities	1.2
State Board of Aeronautics	1.2
Theory of Flight	1.2
Weather Stations	2.4

This list, as long as it is, is not complete, most aerospace educators would be able to make additions to the list. There are many speakers available to teachers in the classrooms who are not being asked to speak, many industry presentations ready for use but are not being used.

In item four the directors' responses indicate that 38.5 percent spent from 25 to 50 percent of the time on lectures and/or presentations. There were 28.9 percent who spent from 50 to 75 percent of the time on presentations and/or lectures, while only 15.6 percent used very little to 25 percent of their workshop for presentation and/or lectures. The 75 to 100 percent time period was used by only 8.4 percent of the directors.

Item five, Table IX, was used to find out how much of the workshops' time was spent in activities. The responses indicate that the 25 to 50 percent allotment was used by 45.7 percent of the directors.

TABLE IX  
WORKSHOP ACTIVITIES

Question	Yes (Percent)
5. What activities did you find most effective, please list in order of effectiveness:	
<u>First Choice</u>	
Airplane Flights	3.6
Ames Research Center	1.2
Audio visual presentations	1.2
Aviation Topics by well qualified people	1.2
Biology Experiments	1.2
Biotelemetry	1.2
Building a model	1.2
Crafts	1.2
Curriculum development	1.2
Description of units by students	1.2
Developing classroom materials	1.2
Developing classroom projects	2.4
Developing teacher made materials	1.2
Field trips	18.0
Field trip to Washington, D.C.	1.2
Films on principles of flight	1.2
Flight instruction	1.2
Flight time	1.2
Group lesson development	1.2
Hot air balloon construction	1.2
Laboratory	1.2
Launching rockets, measuring altitude	1.2
Making a world from a balloon	1.2
Map reading	1.2
Mapping space	1.2
Model airplanes	1.2
Model airplane construction	1.2
Model rocketry	7.2
NASA	3.6
Observations of construction of aircraft	1.2
Rocket building	2.4
Teachers develop demonstrations and demonstrate for workshop	2.4
Theory of flight activities	2.4
Tour of Bay Area in government helicopter	1.2
Trips to aerospace installations	1.2
Useful activities	1.2
Visit to local International Airport	1.2
Visit to Toledo Tower	1.2

TABLE IX (Continued)

Question	Yes (Percent)
<u>Second Choice</u>	
Activities that have classroom application	1.2
Aeronautics classroom experiences	1.2
Airfoil testing	1.2
Building model aircraft	3.0
Charts and posters	1.2
Construction of classroom aides	1.2
Constructing a space capsule in class	1.2
Cratering	1.2
Cross country flight plan and actual flight in University aircraft	1.2
Delta Darts	1.2
Demonstrations	2.4
Egg Drop, "survival in space"	1.2
Field Trips	9.6
Field trips to airports	4.8
Field trip to AFB	2.4
Flight control	1.2
Flight labs	1.2
Flight simulator	1.2
Flying	1.2
Flying a model	1.2
Guest lectures	1.2
Hands on activities	1.2
Helicopter lessons	1.2
Landsat activities	2.4
Lectures	1.2
Military bases	1.2
Models--aircraft and rockets	1.2
Model plane building	3.6
Observations of visual photos of students at work	1.2
Oregon Smoke Jumpers Base	1.2
Projects	1.2
Remote sensing	1.2
Riding in gliders	1.2
Rockets	8.4
Rocket launch with predicted and measuring altitude	2.4
Speakers	1.2
Trips to Corpus NAS	1.2
Visit to AF Museum at Dayton	1.2
Visiting specialist	1.2

TABLE IX (Continued)

Question	Yes (Percent)
<u>Third Choice</u>	
Astronomy	1.2
Beech	1.2
Book and resource people	1.2
Building Delta Darts	1.2
Building models	2.4
Cessna	1.2
Classroom demonstrations	1.2
Demonstrations	3.6
Demonstration hang gliders and glider ride	1.2
Display of children's books on aerospace	1.2
FAA installations	1.2
Field trips	6.0
Films, slides and AV	1.2
Flight in small aircraft	1.2
Flight training	7.2
Fly-in-Drive-In-Cookout-Wrap-Up	1.2
Helicopter flights	1.2
Individual projects	1.2
Model rockets	7.2
Orientation flights	1.2
Photo interpretation	1.2
Presentations	1.2
Physiological ideas	1.2
Science corners	1.2
Seattle's Boeing Plant	1.2
Simulation participants as three-six grades	1.2
Simulator demonstrations	1.2
Social science activities	1.2
Speakers	1.2
Specific lectures (elementary, secondary, etc.)	1.2
Teach aircraft instruction	1.2
Visits to airports	1.2
Weather	1.2
<u>Fourth Choice</u>	
Airlines	1.2
Airline pilots explain parts of airplane	1.2
Air pressure	1.2
Careers as related to towns	1.2
Class reports and projects	1.2
Content coverage	1.2
Delta Dart construction	1.2
Designing and flying paper gliders	1.2



TABLE IX (Continued)

Question	Yes (Percent)
Douglas	1.2
Elementary navigation	1.2
Field trips	2.4
Field trips to airports	1.2
Films	2.4
Flight in large aircraft	7.2
Group work	1.2
Hot air balloon ride	1.2
Kingsley AFB and radar facilities	1.2
McDonald Douglas	1.2
Measuring distances	1.2
Model airplane flying	1.2
Movies and film strips	1.2
Navigation activity with maps, computers, etc.	1.2
Optional study time	1.2
Review sessions	1.2
SAC underground command post	1.2
Simulator	1.2
Taped and viewed TV skits by participants	1.2
 <u>Fifth Choice</u>	
Airspace museums	1.2
FAA tower and weather station	1.2
Field trips	1.2
Field trip to aviation facility and planetarium	1.2
Field trip to Pittsburgh Institute of Aeronautics	1.2
Flying in small aircraft	1.2
Free materials	1.2
Groups presentations	1.2
Group projects	1.2
Institute of Aeronautics	1.2
Local Air Force facility	1.2
Material development for curriculums	1.2
Model rocket construction	1.2
Rapcon	1.2
Visits to places of aerospace interest	1.2
What each part of an airplane does	1.2

The very little to 25 percent allocation was next with 24.0 percent. There were 15.6 percent of the directors who used the 50 to 75 period of workshop time for activities but only 1.2 percent used 75 to 100 percent of the time.

The information in item seven is needed to supply information on what materials workshop directors use and think is effective. What materials they supply their participants, both free and purchased, is also important to all workshop directors. In this way the best materials can be supplied workshop participants. This would save workshop directors from the trouble and unnecessary expense of supplying materials that will not be used. These directors indicate by their responses, Table X, that the materials most used were government--87.9 percent; industry (free)--81.9 percent; industry (purchased)--38.5 percent and state department--31.3 percent.

They indicate that the government materials were most effective in assisting the teachers to integrate aerospace concepts into their teaching--74.6 percent. Industry (free) was next with 42.1 percent; industry (purchased) with 19.2 percent was next and the State Department of Education mandates with 9.6 percent were last. Two other sources of materials were listed, 3.6 percent mentioned National Aerospace Education Association and 1.2 percent listed samples from other schools. The NAEA is an organization which does send out aerospace materials to their members upon request. The last, samples from other schools, will increase with more aerospace workshops and teachers of aerospace education. This will be the developing place of aerospace education material if profitably used.

TABLE X  
MATERIALS PROVIDED FOR WORKSHOP

Question	Yes (Percent)
7. Which of the following sources of materials did you provide for your workshop participants?	
a. Government	87.9
b. Industry (free)	81.9
c. Industry (purchased)	38.5
d. State Department	31.3
e. Other:	
Air Force Association	1.2
CAP	2.4
General Aviation	1.2
Handouts	1.2
Handmade materials	1.2
International publications	1.2
Journal of Aerospace Education	1.2
Locally produced materials	1.2
Local school district	1.2
Materials assembled and duplicated from on-going programs	1.2
Materials you create	1.2
Military	1.2
Minnesota Department of Aeronautics	1.2
NAEA	2.4
NASA	1.2
Oregon Highway Department	1.2
Oregon Museum of Science and Industry materials	1.2
Organizations	1.2
PSA provided	1.2
Sanderson cassettes	1.2
School	1.2
Text on Aerospace Education by Strickler	1.2
Trade Association	1.2
University materials	1.2
f. None of the above	0.0
8. Please indicate which of the following contributed most in assisting the teachers to integrate aerospace concepts into their teaching:	
a. Government	74.6
b. Industry (free)	42.1
c. Industry (purchased)	19.2
d. State Department of Education Mandates	9.6

TABLE X (Continued)

Question	Yes (Percent)
e. Other	
Air Force	2.4
Army	1.2
CAP	6.0
FAA	1.2
Government	1.2
Grade level teacher in charge of the various groups	1.2
Individuals	1.2
Locally generated	1.2
Materials collected or written by workshop director	1.2
Minnesota Department of Aeronautics	1.2
NAEA	7.2
National Association Aerospace Education	3.6
NASA	1.2
Navy	1.2
Nebraska Association of Aerospace Education	1.2
Organizations	1.2
Own efforts	2.4
Samples from other schools	1.2
Self	1.2
Student projects	1.2
Would you please list the above in order of their effectiveness?	
<u>First Choice</u>	
Air Force	1.2
Astronomy	1.2
CAP	4.8
FAA publications	4.8
Guest programs	1.2
Government	26.5
Government for science and higher grade levels	1.2
Industry (free)	20.4
Industry (purchased)	4.8
Locally generated materials	1.2
Materials collected, written and distributed by workshop director	1.2
NAEA	1.2
NASA materials	13.2
NASA Mobile units	2.4
Nebraska Association Aerospace Education	1.2
Student projects	1.2

TABLE X (Continued)

Question	Yes (Percent)
<u>Second Choice</u>	
Aerospace Textbook	1.2
Aerospace Games and Activities by Pauline Maupin	1.2
Aerospace lectures	1.2
CAP	4.8
Cessna	1.2
Delta	1.2
Eastern	1.2
FAA	4.8
Free curriculum materials	1.2
Government	9.6
Industry (free)	12.0
Industry (particularly Cessna)	1.2
Industry (Hobby shop demonstrations)	1.2
Industry for lower grades	1.2
Industry (purchased)	2.4
Journal of Aerospace Education	1.2
Lockheed	1.2
Minnesota Department of Aeronautics	1.2
NASA	3.6
Sanderson	1.2
State Department of Aeronautics	1.2
State Department of Education	1.2
State	1.2
Weather and how it works	1.2
<u>Third Choice</u>	
Airport facilities	1.2
CAP	3.6
Cessna	3.6
FAA	2.4
Government	2.4
Industry (free)	7.2
Industry (purchased)	3.6
Local production	1.2
NAEA	1.2
NASA	1.2
Piper	1.2
State Department	3.6
State Department Mandates	4.8
Text on Aerospace Education by Strickler	1.2

TABLE X (Continued)

Question	Yes (Percent)
<u>Fourth Choice</u>	
CAP publication, "Your Aerospace World"	1.2
Industry (free)	1.2
Industry (purchased)	2.4
NAEA	2.4
Own materials	1.2
State Department	3.6
Teacher made materials	1.2
University follow-up (informal)	1.2

The information from item nine indicates that 79.5 percent of the directors scheduled field trips for the workshop participants and only 13.2 percent did not. The field trips were found to be very effective by 65.0 percent while 14.4 percent found them to be effective. It was interesting to note that not one director used the other two ratings--moderately effective or not effective. Of the 79.5 percent who had field trips everyone found them very effective or effective. Not one director felt them to be moderately effective or not effective. The effectiveness of field trips for helping teachers gain aerospace education knowledge cannot be overlooked. This is one of the best methods for aerospace education that workshops can use.

The reader will find, Table XI, the list of field trips the directors found most beneficial under item 10. The top four are: NASA facilities--44.5 percent; FAA facilities--43.3 percent; museum--36.1 percent; military facilities--28.9 percent. The directors listed the

TABLE XI  
FIELD TRIPS

Question	Percentage		
	Yes	No	No Re- sponse
9. Did you take an extended field trip during your workshop?	79.5	13.2	7.3
If "Yes," will you please mark the following blank that applies:			
a. Very effective	65.0		
b. Effective	14.4		
10. In taking field trips which facility did you find most beneficial?			
a. Federal Aviation facilities	43.3		
b. Commercial Aircraft Industries	22.8		
c. Commercial Airline Facilities	21.6		
d. Military Facilities	28.9		
e. Museums	36.1		
f. National Aeronautics and Space Administration Facilities	44.5		
g. Others:			
(1) Aerial Survey Company	1.2		
(2) Air College	1.2		
(3) Airlift	1.2		
(4) Airports	3.6		
(5) EAA Chapters	1.2		
(6) EAA Convention at Oshkosh	2.4		
(7) Rocket Firing Range	1.2		
(8) Science Centers	1.2		
(9) Vo-tech Schools	1.2		
(10) Weather Bureau	1.2		
11. Would you please list the facilities you visited in order of their effectiveness?			
<u>First Choice</u>			
Airports	5.0		
Batto-Washington International	1.2		
Metro Airport (BNA)	1.2		
JFK and LaGuardia Airports	1.2		
Local	1.2		
International	1.2		
Aircraft Industry	1.2		

TABLE XI (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
Commercial Airlines	1.2		
Delta	1.2		
EAA	1.2		
FAA	3.6		
Traffic Control Center	2.4		
FSS	1.2		
LAMPOC launch	1.2		
Military	18.0		
Air Force	2.4		
Mountain Home AFB	1.2		
National Guard facilities	1.2		
Physiology high altitude chamber	1.2		
USAF Academy	1.2		
Vandenburg AFB	1.2		
140th TAC, NORAD, Wright Patterson AFB	1.2		
Museums	10.8		
Alabama Space and Rocket Center	1.2		
Smithsonian Aerospace	1.2		
USAF, Wright-Patterson AFB	7.2		
NASA	27.2		
Kennedy	16.8		
Langley	1.2		
LBJ	1.2		
Science Centers	1.2		
Vo-Tech schools	1.2		
<u>Second Choice</u>			
Air Lift	1.2		
Airports	4.8		
Massport Logan	1.2		
Commercial Aircraft Industries	7.2		
Commercial Airlines	4.8		
Delta	1.2		
TWA (pilot training and stewardess training facilities)	1.2		
Community College Aviation Facilities	1.2		
EAA Construction Forum Lectures	1.2		
FAA	19.2		
Traffic control center	3.6		
Control tower	2.4		
Toledo tower	1.2		
Military	12.4		
Air Force	2.4		



TABLE XI (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
Edwards AFB	1.2		
SAC Command Post	1.2		
Underground Missile Silos at Jacksonville, Arkansas	1.2		
McChord AFB	1.2		
Navy	6.0		
Museums	6.0		
Alabama Space and Rocket Center	2.4		
USAF, Wright-Patterson AFB	2.4		
NASA	9.6		
Kennedy	1.2		
Moffet Field	1.2		
Weather Bureau	1.2		
<u>Third Choice</u>			
Aerial Survey Company	1.2		
Airports	3.6		
London-Corbin	1.2		
Airport for orientation flights	1.2		
Commercial Aircraft Industries	6.0		
Boeing	1.2		
Cessna	1.2		
Lockheed	1.2		
Piper	1.2		
Commercial Airlines	12.0		
Lockheed R&D	1.2		
Engines (Lycoming)	1.2		
Exhibits (Commercial)	1.2		
FAA	9.6		
Aeronautical Center	1.2		
Radar Installations	1.2		
Traffic Control Center	3.6		
Military	9.6		
Air College	1.2		
Air National Guard	1.2		
Army	1.2		
Navy at Memphis	1.2		
Museums	4.8		
San Diego	1.2		
USAF, Wright-Patterson AFB	2.4		
NASA	2.4		
Goddard	1.2		
Neil Armstrong Space Center	1.2		
Weather Station (local)	1.2		

TABLE XI (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
<u>Fourth Choice</u>			
Airports	2.4		
Commercial Aircraft Industries	2.4		
Douglas	1.2		
Balanca	1.2		
Commercial Airlines Companies	7.2		
Delta	2.4		
FAA	6.0		
FSS	2.4		
Tower	1.2		
Military	3.6		
Maxwell AFB	1.2		
Pensacola NAS	1.2		
Smithsonian Aerospace	1.2		
USAF, Wright-Patterson AFB	2.4		
NASA	2.4		
Kennedy	2.4		
Planetarium	2.4		
Process Demonstrations	1.2		
<u>Fifth Choice</u>			
Airports	1.2		
Commercial Aircraft Industries	2.4		
Commercial Airlines	1.2		
FAA	13.2		
Communications	1.2		
Flight Safety	1.2		
Kansas City Center	1.2		
Traffic Control Center	1.2		
FSS	1.2		
Jet Propulsion Laboratory	1.2		
Museums	2.4		
Fort Rucker	1.2		
NAS	1.2		
NASA	4.8		
Arnold Engineering Facilities	1.2		
Science Center	1.2		
<u>Sixth Choice</u>			
Airports	1.2		
Murfreesboro Airport	1.2		

TABLE XI (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
Commercial Airlines	2.4		
Delta	1.2		
PSA	1.2		
Military	3.6		
Air National Guard	1.2		
Museums	4.8		
Alabama Space and Rocket Center	1.2		
Fort Rucker	1.2		
<u>Seventh Choice</u>			
Commercial Aircraft Industries	1.2		
Lockheed	1.2		
Commercial Airlines	1.2		
Delta	1.2		
Military	2.4		
Maxwell AFB	1.2		
Miramar NAS	1.2		
Museums	1.2		
Fort Rucker	1.2		
NASA	1.2		
Johnson Space Center	1.2		

facilities they found to be most effective, Table XI. The top three in the most effective choice were: NASA--27.2 percent; military--18.0 percent; and museums--10.8 percent. There are many more but the percentages are small because of the many different selections. In the second choice for effectiveness the top three were: FAA--19.2 percent; military--12.4 percent and NASA--9.6 percent. Again there was a wide choice of facilities and while the responses indicate the variety, the percentages show the concentration to be on the above three. This does

not mean the other choices were not effective. In the third choice for effectiveness commercial airlines--12 percent, military--9.6 percent and commercial aircraft industries--6.0 percent. In their fourth choice for effectiveness the directors indicate that the military is first--9.6 percent and second choice is the FAA--6.0 percent. The rest of the choices are listed in Table XI, but the percentages are low. The fifth choices, the FAA with 13.2 percent is first and NASA with 4.8 percent is second with commercial aircraft industries and museums tied for third with 2.4 percent. The low percentages by the third, fourth, fifth, sixth, and seventh choices will not mean too much.

Many workshops will have only one or two field trips while others may not have any field trips. Another reason could be the directors' experience with aerospace workshops--first or second workshop.

The 12th item on orientation flights shows that 60.2 percent of the directors give their participants an airplane flight. One director gave his participants the unusual treat of a glider flight. There were 24.0 percent of the workshops that did not have orientation flights. There were 6.0 percent of the directors who did not respond to this item. Orientation flights are very important to teachers who have never been in an airplane. Many people have the misconception that an airplane flight is not unusual in this day and time. In the first Oklahoma Aerospace Education Workshop in 1969 there were as many teachers who had not been in an airplane as there were those who had flown before. This is interesting because each year the workshop has many participants who have not flown. Orientation flights are necessary for a beginning teacher in aerospace education. This experience

is needed to help the teacher understand more about the theory of flight and get the experience of flying. Refer to Table XII.

TABLE XII  
ORIENTATION FLIGHTS

Question	Percentage		
	Yes	No	No Re- sponse
12. Did you provide orientation flights for your participants?	60.2	24.0	15.8
If "Yes," how long was the flight?			
10 - 25 min.	1.2		
15 min	1.2		
20 - 25 min	1.2		
20 - 30 min	2.4		
30 min	9.6		
40 min	2.4		
45 min	1.2		
1 hr.	8.4		
2 hrs.	6.0		
2 - 3 hrs.	1.2		
3 hrs.	1.2		
4 hrs.	1.2		
5 hrs.	2.4		
8 hrs.	1.2		
Advanced group 5 hrs. plus 1½ hrs. in simulator	1.2		

In the directors' responses to item 13 only 37.3 percent indicate they got financial support for their aerospace workshop, 48.1 percent did not. Check Table XIII for the list of supporters. There are many different sources but the state, through different departments, is the

TABLE XIII  
FINANCIAL SUPPORT FOR WORKSHOPS

Question	Percentage		
	Yes	No	No Re- sponse
13. Did you get financial support for your aerospace workshop?	37.3	48.1	14.6
If "Yes," will you please write in the names of your supporters?			
Aerospace Education Committee	1.2		
Air Force Aerospace Education Committee	1.2		
American Legion	1.2		
Bank	1.2		
Bureau of Aeronautics	1.2		
Bureau of Aeronautics - DOT	1.2		
California State University, Chico, Tehama and Mona County	1.2		
CAP, for field trip only	1.2		
CAP	3.6		
CAP, Alabama Wing	1.2		
CAP, Michigan	1.2		
Cessna Flying Club (underwrote part of 4 hours dual flight instruction)	1.2		
Department of Community Colleges	1.2		
Division of Continuing Education (small percentage of enrollment fees paid)	1.2		
FAA	1.2		
Idaho State University	1.2		
Local School District, \$50 for supplies	1.2		
Michigan Industries (local)	1.2		
Minnesota Aviation Commission	1.2		
Minnesota Department of Aeronautics	1.2		
Montana Aeronautics Division	1.2		
NASA	1.2		
Nashville, Tennessee	1.2		
Nebraska Department of Aeronautics	1.2		
Part of budget from enrollment tuition	1.2		
Pennsylvania Bureau of Aviation	1.2		
Saint Martin's College - scholarships from industry	1.2		
State Department of Aeronautics	1.2		
State Department of Aerospace	1.2		
State Department of Education	2.4		
State Department of Public Works (Division of Aeronautics)	2.4		

TABLE XIII (Continued)

Question	Percentage		
	Yes	No	No Re- sponse
State of Idaho Paid Directors' Salary	1.2		
Superintendent of Schools	1.2		
Title III Teacher Training Funds	1.2		
University	1.2		
University Foundation, Scholarships	1.2		
14. Did you give stipends to your aerospace workshop participants?	20.4	69.8	9.8
If "Yes," will you please write the amount:			
\$10 - \$40	1.2		
\$24	1.2		
\$50--two \$50 tuitions from AF wing	1.2		
\$50 for supplies--local school district	1.2		
\$75	1.2		
\$90	1.2		
\$100--two workshops	1.2		
\$110 per student	1.2		
\$150 - \$200 per day	1.2		
No money--about 1/3 of group tuition scholarships	1.2		

largest contributor with 12.0 percent giving some type of financial support.

The responses to item 14 show that only 20.4 percent of the workshops gave stipends to the participants and 60.8 percent did not give any scholarships or money. The amounts that were given ranged from \$10 to \$200. This covers money for scholarships, supplies, tuition, one was a stipend for two workshops. The information given on the stipends, Table XIII, was not complete enough to analyze.

The responses to item 15 indicate a tie between two weeks and three weeks as the optimum length of a workshop. Both of these had 33.7 percent. The rest of the responses ranged from 1.2 percent to 7.2 percent, Table XIV. This is very interesting for one of the former studies, Zaharevitz in his study mentioned in Chapter II found at that time the four-week period was best, five-week duration was second and the three-week workshop was third in optimum length of a workshop. One of the directors noted that time of workshop would depend upon time in class and facilities.

To find out how much the participants helped in structuring the workshop, Table XIV, item 16 was divided into extensive help, moderate help, very little help and no help. The responses, 44.5 percent, indicate that the directors felt very little help was needed. There were 28.9 percent of the directors who felt moderate help in structuring the workshop was good. Extensive help had only 2.4 percent responses from the directors. There were 13.2 percent of the directors who felt that no help was necessary.

The last item, 17, was needed to see what directors were using as a follow-up method with their workshop participants. The responses indicate the follow-up letter is used most, 44.4 percent. It is interesting to note that the directors indicate visits to the teachers, 25.0 percent, as the second highest. This is an indication that is good to see for there needs to be more visitation between workshop directors and participants. Newsletters were sent by 15.6 percent of the directors and 13.2 percent held small group meetings.



TABLE XIV  
WORKSHOP - LENGTH AND HELP IN STRUCTURING

Question	Yes (Percent)
15. What do you consider to be the optimum length of an aerospace workshop?	
a. One week	7.2
b. Two weeks	33.7
c. Three weeks	33.7
d. Other	
(1) Four weeks	2.4
(2) Five weeks	1.2
(3) Two and one-half weeks	1.2
(4) 13 weeks - one two-hour session a week	1.2
16. To what extent did your participants help in structuring the workshops?	
a. Extensive	2.4
b. Moderate	28.9
c. Very little	44.5
d. None	13.2

There were several follow-up methods listed by the directors, Table XV, which might be helpful to both director and participant. The fourth follow-up method listed under (e) is a very good idea and would prove helpful for new aerospace teachers teachers--evaluation after lessons were used in the classroom. Another idea along with this would be to combine this with small group meetings to discuss the classroom presentations. This would help the teachers on presentations and give the directors feedback on what the workshop needed to do to improve the teachers' presentations.

TABLE XV  
WORKSHOP FOLLOW-UP

Question	Yes (Percent)
17. Please check the kind of follow-up you use with your participants?	
a. Follow-up letter	44.4
b. Newsletter	15.6
c. Visits	25.0
d. Small group meetings	13.2
e. Other:	
(1) Advanced classes	1.2
(2) Annual	2.4
(3) Encouragement	1.2
(4) Evaluation after lessons used in classroom	1.2
(5) Given telephone numbers of resource people and director to call if needed for information. Also members are called occasionally and informed of local and state events, aeronautics classes, etc.	1.2
(6) Irregular visits to resource centers on campus	1.2
(7) Letters	2.4
(8) Most of follow-up done by State Department of Aeronautics	1.2
(9) NAEA	1.2
(10) None	4.8
(11) Once a year	4.8
(12) Personal contact	1.2
(13) Pre-test - post-test	1.2
(14) Seminar-review	1.2
(15) Survey	1.2
(16) Taped critique	1.2
(17) Telephone	3.6
(18) Very little	1.2
(19) Visits on call	1.2
How often:	
(1) Director asks them to set up an Aerospace Day and he brings his rocket firing equipment to shoot rockets	1.2
(2) Each semester for two years	1.2
(3) Infrequent	3.6
(4) Irregular	2.4
(5) Informally, at fairly frequent intervals	2.4
(6) Letters, twice a year	2.4
(7) None	6.0

TABLE XV (Continued)

Question	Yes (Percent)
(8) Not often enough	1.2
(9) Occasionally	2.4
(10) Once	3.6
(11) Once or twice as requested	2.4
(12) Quarterly	1.2
(13) Reunion meetings for sharing slides, etc.	1.2
(14) Telephone communications	2.4
(15) Twice during next school year	3.6
(16) Two or three times annually	1.2
(17) When appropriate	1.2
(18) When contacted for assistance from participant	2.4

## CHAPTER V

### SUMMARY, FINDINGS, , AND RECOMMENDATIONS

#### Summary

The purpose of this study was to find the aerospace education workshop format considered to be the most effective by former Oklahoma aerospace education workshop participants and directors of aerospace education workshops in the United States and Puerto Rico. The Oklahoma aerospace education workshops have been conducted in Oklahoma since 1969, with the exception of 1974 when the workshop was not held. These workshops were sponsored by the Oklahoma Aeronautics Commission, the Oklahoma Department of Education and the Governor's Advisory Committee on Aerospace Education.

The subjects of this study were former participants of the Oklahoma aerospace education workshops; the 25 former Oklahoma aerospace workshop participants who were selected by the Teacher's Workshop Committee of the Governor's Committee on Aerospace Education to attend a special workshop held on the campus at Oklahoma State University during the summer of 1975; and the directors of aerospace education workshops in the United States and Puerto Rico whose names were on the Civil Air Patrol and NASA workshop directors list.

The first questionnaire was mailed to former participants of the Oklahoma Aerospace Education Workshops. This questionnaire was an

effort to find out what former workshop participants were doing in aerospace education.

The second questionnaire was mailed with a cover letter to the 25 special workshop participants who took part in developing activity cards for Oklahoma educators during the summer of 1975. With this questionnaire the information on teacher activity in aerospace education in the classroom and in the school was evaluated. The materials used and how often they were used was noted on a Likert type scale.

How these teachers viewed aerospace workshops and their opinions on field trips, activities, presentations and/or lectures was important to the purpose of this study.

These teachers comprised some of the top teachers from former Oklahoma Aerospace Education Workshops. They had previously taught aerospace education and felt aerospace education important to and for Oklahoma students

The third questionnaire was mailed to aerospace education workshop directors in the United States and Puerto Rico. These directors were from the lists of directors the CAP and NASA compile and keep current. The directors' opinions were sought on presentations, lectures, activities, field trips, materials, orientation flights, length of workshops curriculum development, stipends for participants, follow-up used after workshop, help given by participants in structuring the workshop and time spent in activities and presentations.

In combining the former workshop participants ideas with those of workshop directors some valid data should result which will help formulate an effective format for future Oklahoma aerospace workshops.

## Findings

The responses from the first questionnaire indicated that the Oklahoma workshop participants contacted are putting their aerospace education training to work. They were almost evenly divided on those teaching and those not teaching aerospace education. Many were using aerospace education resource materials, especially films. The students in these teachers' classes are using resource materials which they order as well as the materials the teacher orders. There are substantial numbers using resource people in their classrooms and taking field trips.

The second questionnaire was very satisfactory both in data and in return of the instrument, which was 100 per cent. The participants indicated a substantial number were incorporating aerospace education concepts into their teaching methods. They were using film, resource materials, sharing materials with teachers in their schools and giving demonstrations for their schools. To a great extent these teachers were using state aerospace resources to the advantage of their students.

These teachers feel that aerospace workshops were beneficial and would like to see them continue in Oklahoma. They suggest more field trips to government installations (military bases and museums); FAA and industry. They wanted to see more activity sessions for classroom use offered; aviation and space history and small group sessions on topics related to their grade or subject area. They suggested the speakers from NASA, industry, the military and the FAA would add to the workshops.

The last questionnaire was sent to the directors of aerospace education in the United States and Puerto Rico. The data from these people can be used to great advantage in planning an outstanding format for an aerospace workshop.

The directors thought the optimum length for a workshop should be two or three weeks.

The field trips were found to be most effective in teaching aerospace education concepts to teachers by the directors. They felt that the NASA facilities were the best, the FAA facilities were next with museums and military facilities following in that order.

For presentation and/or lectures the directors were strongly in favor of the government speakers and their presentation. From the breakdown on these questions most of the directors found that NASA had the best to offer aerospace education workshops in the way of lectures and presentations. They also thought the FAA and the military were good. The time spent on lectures and/or presentations by a large number of directors was the 25 to 50 per cent time allotment. The next highest choice was the zero to 25 per cent time allotment.

The workshop directors felt the materials from government were the most effective in helping teachers integrate aerospace into their curriculum area. These were materials from NASA, FAA and the military. The free materials from industry were also considered to be very effective.

Most of the directors felt orientation flights were one of the activities which aerospace workshop teachers should experience. The recommended flight time varied from 10 minutes to five hours. The most frequent times were 30 minutes, one-hour and two-hour flights. This

is one activity that makes a lasting impression on workshop participants. Like a field trip taken in an airplane, the orientation flights give teachers an experience they need. In this way they find out how it feels to fly, how the earth looks from the atmosphere above it and how it makes the earth-bound human feel. These flight experiences have been instrumental in helping the teachers realize the effectiveness of aerospace. The orientation flights have also been the beginning of many teacher-pilots.

The responses from the directors indicated the majority had the participants working on curriculum. This work was done in elementary, secondary, college, university, community college, adult education and technology levels. Only five directors did not work on curriculums.

Financial support for the workshops was given to a little over one-third of the workshops, almost half of the directors did not receive help. The support came from various sources but different state departments were the largest contributors.

Only about one-fourth of the directors gave stipends to their participants while over two-thirds did not. The amounts of the stipend varied from \$24 to \$200. A few tuition scholarships and one tuition scholarship that took care of one-third of the group's tuition were given.

The participants did very little toward structuring the workshop. A few helped moderately but only about 2.4 per cent were extensively involved.

Most of the workshop directors used the letter as a means of follow-up. The greatest number sent these out twice a year, a few sent them out once a year and others send them at irregular intervals.



Recommendations for aerospace education workshops from National directors and state teachers

Oklahoma Aerospace Education Workshop Format for the summer of 1976

- |   |   |
|---|---|
| 1. Small group sessions   | Small groups will work on   |
| 2. Work on curriculum   | activities for classroom use  |
| 3. Lectures and/or presentations. Government (NASA, FAA, military) aircraft industries                          | Presentations and speakers from NASA, Cessna, FAA, teachers, State Department of Education  |
| 4. Materials from NASA, FFA, Military, Industry, (free)   | Teachers received materials NASA, Cessna, FAA, Industry (free) and Industry (purchased)   |
| 5. Orientation Flights<br>30 minutes  | Teachers received 30 minutes of flight instruction.   |
| 6. General sessions<br>One hour or less   | General sessions for special programs, limited to 30 minutes. Speakers invited to remain over night and have informal sessions with different small groups. |
| 7. Field Trips<br>Government Installations-<br>NASA, FAA, Military facilities<br>Industry - aircraft industries | Field trips were conducted to: FAA facilities at Will Rogers World Airport, Beech and Cessna Aircraft Industries, Eglin AFB, Pensacola NAS.                 |
| 8. Time on Activities and time on lectures and/or presentations<br>25-50 per cent                               | The time allotted to activities was between 25 - 50 per cent. The time allotted to presentations and/or lectures 25-50 per cent.                            |
| 9. Length of Workshop<br>Two weeks or three weeks   | The workshop was held for three weeks.  |

It is interesting to note that the correlation between the results of this study and the Oklahoma Aerospace Education Workshop is close to 100 per cent.

Oklahoma has been in the process of evaluating and improving its aerospace education workshop since the first one was held in 1969.

One difference between the results indicated from the study is that the national directors of aerospace education workshops have very little help from the teachers in structuring their workshops. Oklahoma seeks help from former workshop participants in this respect. The teachers who have taught aerospace education in the classroom know what is needed to help beginning aerospace education teachers. With their suggestions the format can be changed and the workshop continually improved to train productive and effective teachers of aerospace education for Oklahoma classrooms.

Directors could get valuable help from teachers in updating their workshop. The follow-up letters so many directors use could provide the means for encouraging feedback.

#### Recommendations

It is recommended that the following information be used in formulating the Oklahoma aerospace education workshop format:

1. Curriculum

Time for curriculum planning should be included in the workshop. This should be in two sections, one for elementary and one for secondary teachers. The secondary section needs to be divided into subject areas. Number of divisions will depend on the number of participants' subject areas.

## 2. Small group sessions

Small group sessions should be homogeneous groupings according to subject areas or grades.

Included in these sessions should be:

- a. Activities for classroom use
- b. Suitable materials
- c. Suitable resources available, both people and places
- d. Lesson plans to help integrate aerospace concepts into grade or subject area

## 3. Speakers

Use these in the general sessions, NASA, industry, the military, and FAA are recommended. One thing to be remembered here is to check the speakers, don't subject the workshop to a mediocre speaker, take the time to find the best. It is better to have one excellent speaker than several average speakers.

## 4. Presentations

Use these in general sessions. If there is a good presentation for elementary teachers or secondary teachers then the small group session would be advisable. As in the case of a speaker, be sure to check out the presentation. There is no time for a presentation that will not be effective in helping teachers teach aerospace education.

## 5. Activities

Time for activities will help the teachers in both learning about aerospace and getting really interested

in aerospace education. Take the time and use it well, pick out the best activities you can find. Try new activities as you find them.

These are a few that have been used successfully:

- a. Model rocket construction and launching
- b. Model airplane construction
- c. Planetarium construction for classroom use
- d. Wind tunnel construction for classroom use

## 6. Field Trips

This is the way to end an aerospace workshop.

There are many excellent field trips. Take the time to plan the most effective field trip that can be managed. Planning the field trip for value to aerospace education, interest and motivation. Participant convenience at over night stops, this is important. All directors should strive for happy participants, take into consideration comfort, accessibility to eating facilities and points of interest after the daytime tour. If night time activities have been planned, give two or three choices if possible. Happy teachers are the best advertisement aerospace education can get. The following tours were recommended by both participants and workshop directors.

- a. NASA facilities
- b. FAA facilities
- c. Museums
- d. Military facilities

e. Industry

#### 7. Orientation Flights

Two orientation flights, one for 30 minutes at the beginning of the workshop and another 30 minutes later in the workshop would be ideal.

Orientation flights are most important to the aerospace workshop

#### 8. Evaluation

An evaluation form to fill out at the end of each session or at the end of the day would be best. This helps the participants and the director. The evaluations are not as valid after the day has passed because people forget. These evaluations will help structure the next workshop. If the workshop participants could be evaluated near the end of the first semester and again in the late spring it would help both the participants and the director to see how well the teachers learned what the workshop taught. Changes in workshop teaching methods or courses might be needed.

#### 9. Follow-up

This needs to be given some extra consideration.

This fits in with the evaluation during the year following the workshop. The necessity for an effective follow-up program is shown by the indication that only about half of the former workshop participants are teaching aerospace education. There is a great need to work with former workshop participants.

10. Recommended for follow-up
  - a. classroom visits by workshop directors or trained personnel
  - b. In-service programs where needed
  - c. Group meetings

Recommendations for future research are:

1. In order to further improve aerospace education throughout the United States it is suggested more detailed analysis of aerospace education workshop programs be conducted.
2. In order to provide teachers with materials they can use, research is needed on materials supplied to teachers in aerospace workshops for effectiveness and usability.
3. In order to provide teachers with the follow-up needed to help them integrate aerospace education concepts into their subject area, an analysis of follow-up methods used by directors of workshops and the effectiveness of the methods should be made.

Special recommendations:

1. A state aerospace education coordinator for Oklahoma should be employed.
2. University method classes for aerospace education, elementary and secondary, should be offered.
3. A short workshop for administrators should be conducted as work is needed in this area in order to improve the possibilities of aerospace education classes (this workshop should be well planned with visits to aerospace

industries, NASA facilities, the FAA, and military bases. Successful aerospace educators and administrators from high schools with good aerospace education programs should be on hand to talk informally to these people).

4. More counselors should be included as workshop participants since this is an area in which aerospace education whould be advanced.
5. A new group of undergraduate education majors should be considered as aerospace workshop participants.

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## APPENDIXES

APPENDIX A

FORMER PARTICIPANT QUESTIONNAIRE

1. I am teaching a course in Aerospace Education:  
Yes \_\_\_\_\_ No \_\_\_\_\_
2. I have previously taught a course in Aerospace Education:  
Yes \_\_\_\_\_ No \_\_\_\_\_
3. I have had or am planning a field trip in connection with aerospace education:  
Yes \_\_\_\_\_ No \_\_\_\_\_
4. I have had or plan to have an aerospace resource person in the classroom:  
Yes \_\_\_\_\_ No \_\_\_\_\_
5. Students are using resource materials:  
They have secured: Yes \_\_\_\_\_ No \_\_\_\_\_  
I have secured: Yes \_\_\_\_\_ No \_\_\_\_\_  
Both of the above: Yes \_\_\_\_\_ No \_\_\_\_\_
7. I need help in establishing a course in aerospace education in school:  
Yes \_\_\_\_\_ No \_\_\_\_\_
8. I would like to have an aerospace teacher from another school talk to my class:  
Yes \_\_\_\_\_ No \_\_\_\_\_
9. I teach \_\_\_\_\_ and would like more ideas on how to incorporate aerospace into my course.
10. The Oklahoma Aerospace Education Association can help me by \_\_\_\_\_  
\_\_\_\_\_

Suggestions and ideas are welcomed:

NAME \_\_\_\_\_

GRADE TAUGHT \_\_\_\_\_

APPENDIX B

SPECIAL WORKSHOP PARTICIPANT QUESTIONNAIRE

## A. As a teacher in my school:

1. I am presently teaching at this educational level:

<input type="checkbox"/> K	<input type="checkbox"/> 4	<input type="checkbox"/> 9
<input type="checkbox"/> 1	<input type="checkbox"/> 5	<input type="checkbox"/> 10
<input type="checkbox"/> 2	<input type="checkbox"/> 6	<input type="checkbox"/> 11
<input type="checkbox"/> 3	<input type="checkbox"/> 7	<input type="checkbox"/> 12
	<input type="checkbox"/> 8	

2. I am now using an aerospace education curriculum guide.

 Yes       No

3. I am incorporating aerospace education concepts into my teaching methods on a regular basis.

 Yes       No

a. If "Yes," then please mark the following blank that applies.

<input type="checkbox"/> 0% to 25%
<input type="checkbox"/> 25% to 50%
<input type="checkbox"/> 50% to 75%
<input type="checkbox"/> 75% to 100%

4. I need help in incorporating aerospace education concepts into my subject area.

 Yes       No

5. I am presently teaching or have taught a unit dealing with aerospace education.

 Yes       No

a. If "Yes," then please mark the following blanks that apply:

- (1) I have or am planning a field trip in connection with the unit.  
 (2) I have had or plan to have a resource person in the classroom.  
 (3) I have used films or plan to use films.  
 (4) Students are using resource material other than the text.  
 (5) Enough material is in our textbook to teach the unit.  
 (6) I plan to teach an aerospace unit in the future.  
 (7) I found my visit to the Houston NASA facility helpful in teaching my unit.

6. I have sponsored the following activities for students:

- a. Field trips to airports.  
 b. Field trips to FAA facilities.  
 c. Field trips to military aerospace facilities.  
 d. Model Airplane Clubs.  
 e. Model Rocket Clubs.  
 f. Orientation flights.  
 g. Other \_\_\_\_\_

7. I have helped other teachers in my school by:

- a. Sharing my aerospace materials.  
 b. Helping plan an aerospace unit.  
 c. Giving an aerospace program.  
 d. Giving demonstrations.  
 e. Other \_\_\_\_\_

## B. Aerospace Education Workshops

1. I feel my aerospace workshop:

- |                              |                             |   |
|------------------------------|-----------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | a. Was beneficial in developing my teaching methods.                    |
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | b. Gave me sufficient materials to teach an aerospace unit.             |
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | c. Provided speakers who increased my knowledge in aerospace education. |

2. I would like to see:

- |                              |                             |   |
|------------------------------|-----------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | a. Aerospace workshops continue in the future.        |
| <input type="checkbox"/> Yes | <input type="checkbox"/> No | b. Future aerospace workshops offer more field trips. |
- (1) Federal Aviation Facilities.  
 (2) Commercial Aircraft Industries.  
 (3) Commercial Airlines Industries.  
 (4) Government Installations.  
 (a) Air Force Museum at Wright Patterson AFB.  
 (b) Air Force Training Command at San Antonio.  
 (c) Alabama Space and Rocket Center.  
 (d) Navy Facilities at Corpus Christi  
 (e) Navy Training Command at Pensacola.  
 (f) Others \_\_\_\_\_

3. I would like to see offered at future workshops:
- a. Activity sessions for classroom use.
  - b. Airports, Communication, and Air Traffic Control.
  - c. Aviation and Space History.
  - d. Building model airplanes.
  - e. Building model rockets.
  - f. Careers in Aviation and Space.
  - g. Flying model airplanes.
  - h. Flying model rockets.
  - i. General sessions concerning aviation in Oklahoma.
  - j. Meteorology.
  - k. Navigation.
  - l. Physiology of flight.
  - m. Small group sessions on topics related to your grade or subject area.
  - n. Space travel
  - o. Speakers from:
    - (1) FAA
    - (2) Industry
    - (3) Military
    - (4) NASA
    - (5) Oklahoma Aeronautics Commission
    - (6) State Department of Education
    - (7) Other \_\_\_\_\_

These materials were given to you in the workshop last summer. How often have you been able to use them in your classroom? Will you please circle the number following the description of the item according to your use of the item.

	Used a Lot	Used Often	Medium Use	Used Seldom	Not Used
1. Aerospace Education Curriculum Guide (K-12) . . . . .	1	2	3	4	5
2. Aerospace Education Magazine . . . . .	1	2	3	4	5
3. American Airlines Educational Packet . . . . .	1	2	3	4	5
4. Aviation/Aerospace Fundamentals Textbook . . . . .	1	2	3	4	5
5. Aviation/Aerospace Fundamentals Instructor s Guide . . . . .	1	2	3	4	5
6. Aviation/Aerospace Fundamentals Student Exercise Book . . . . .	1	2	3	4	5
7. Aviation Fundamentals Textbook . . . . .	1	2	3	4	5
8. Aviation Fundamentals Instructor's Guide . . . . .	1	2	3	4	5
9. Aviation Fundamentals Student Exercise Book . . . . .	1	2	3	4	5
10. Cessna Activities . . . . .	1	2	3	4	5
11. Cessna High School Curriculum Guide . . . . .	1	2	3	4	5
12. Cessna Pamphlets . . . . .	1	2	3	4	5
13. Estes Altiscope . . . . .	1	2	3	4	5
14. Estes Kites . . . . .	1	2	3	4	5
15. Estes Pamphlets . . . . .	1	2	3	4	5
16. Estes Rockets . . . . .	1	2	3	4	5
17. Estes Rocket Catalog . . . . .	1	2	3	4	5
18. Estes Rocket Porta-Pad . . . . .	1	2	3	4	5
19. Estes Solar Launch Controller . . . . .	1	2	3	4	5
20. NASA Activities . . . . .	1	2	3	4	5
21. NASA Film List . . . . .	1	2	3	4	5
22. NASA Information Publications . . . . .	1	2	3	4	5
23. Rockwell International Materials . . . . .	1	2	3	4	5
24. TWA History Program . . . . .	1	2	3	4	5

4. Based on materials given to me at the workshop last summer, I think these additional materials would be useful:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Additional comments or suggestions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



APPENDIX C

COVER LETTER TO PARTICIPANTS

**OKLAHOMA STATE UNIVERSITY • STILLWATER**

Research Foundation  
(405) 372-6211, Ext. 271

74074

February 27, 1976

Dear Workshop Participant:

I have been asked to give a report to the Aeronautics Commission concerning our workshop and related activities. I'm sure that your thoughts will contribute to future planning.

I would appreciate your completing the enclosed questionnaire and returning it to me as soon as possible. I would sincerely appreciate additional comments that you might have concerning all aspects of our aerospace education efforts in the state.

Sincerely yours,

A handwritten signature in cursive script that reads "Elizabeth S. Murphy". The signature is written in black ink and is positioned above the typed name and address.

Elizabeth S. Murphy  
103-12 North University Place  
Stillwater, Oklahoma 74074

Enclosures

APPENDIX D

WORKSHOP DIRECTOR'S QUESTIONNAIRE

DURING YOUR AEROSPACE WORKSHOP:

1. Did you work on curriculum development?

\_\_\_\_\_ Yes \_\_\_\_\_ No

IF "Yes," will you please mark the following blank(s) that applies?

- \_\_\_\_\_ a. Elementary
- \_\_\_\_\_ b. Secondary
- \_\_\_\_\_ c. K-12
- \_\_\_\_\_ d. Other \_\_\_\_\_
- \_\_\_\_\_ e. State classroom guides
- \_\_\_\_\_ f. State activities guides
- \_\_\_\_\_ g. Other \_\_\_\_\_

2. What presentations and/or lectures have you found most effective:

- \_\_\_\_\_ a. Government (FAA, NASA, etc.)
- \_\_\_\_\_ b. Industry
- \_\_\_\_\_ c. Military (CAP, Air Force, Navy, etc.)
- \_\_\_\_\_ d. Other \_\_\_\_\_

3. Would you please list the specific presentations and/or lectures you found most effective in order of effectiveness:

- 1st \_\_\_\_\_
- 2nd \_\_\_\_\_
- 3rd \_\_\_\_\_
- 4th \_\_\_\_\_
- 5th \_\_\_\_\_

4. What percentage of time did you devote to lectures and presentations?

- \_\_\_\_\_ a. 0 - 25%
- \_\_\_\_\_ b. 25 - 50%
- \_\_\_\_\_ c. 50 - 75%
- \_\_\_\_\_ d. 75 - 100%

5. What activities did you find most effective, please list in order of effectiveness:

- 1st \_\_\_\_\_
- 2nd \_\_\_\_\_
- 3rd \_\_\_\_\_
- 4th \_\_\_\_\_
- 5th \_\_\_\_\_

6. What percentage of time did you devote to activities?

- \_\_\_\_\_ a. 0 - 25%
- \_\_\_\_\_ b. 25 - 50%
- \_\_\_\_\_ c. 50 - 75%
- \_\_\_\_\_ d. 75 - 100%

7. Which of the following sources of materials did you provide for your workshop participants?

- \_\_\_\_\_ a. Government
- \_\_\_\_\_ b. Industry (free)
- \_\_\_\_\_ c. Industry (purchased)
- \_\_\_\_\_ d. State Department
- \_\_\_\_\_ e. Other (please list) \_\_\_\_\_
- \_\_\_\_\_ f. None of the above

8. Please indicate which of the following contributed most in assisting the teachers to integrate aerospace concepts into their teaching?

- \_\_\_\_\_ a. Government
- \_\_\_\_\_ b. Industry (free)
- \_\_\_\_\_ c. Industry (purchased)
- \_\_\_\_\_ d. State Department of Education Mandates
- \_\_\_\_\_ e. Other \_\_\_\_\_

Would you please list the above in order of their effectiveness?

- 1st \_\_\_\_\_
- 2nd \_\_\_\_\_
- 3rd \_\_\_\_\_
- 4th \_\_\_\_\_

9. Did you take an extended field trip during your workshop?

Yes  No

If "Yes," will you please mark the following blank that applies?

- a. Very effective  c. Moderately effective  
 b. Effective  d. Not effective

10. In taking field trips which facility did you find most beneficial?

- a. Federal Aviation Facilities  
 b. Commercial Aircraft Industries  
 c. Commercial Airline Companies Facilities  
 d. Military Facilities  
 e. Museums  
 f. National Aeronautics and Space Administration Facilities  
 g. Others \_\_\_\_\_

11. Would you please list the facilities you visited in order of their effectiveness?

- 1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4 4th \_\_\_\_\_  
5th \_\_\_\_\_  
6th \_\_\_\_\_  
7th \_\_\_\_\_

12. Did you provide orientation flights for your participants?

Yes  No

If "Yes," how long was the flight?

13. Did you get financial support for your aerospace workshop?

Yes  No

If "Yes," will you please write in the names of your supporters?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

14. Did you give stipends to your aerospace workshop participants?

Yes  No

If "Yes," will you please write the amount?

\_\_\_\_\_

15. What do you consider to be the optimum length of an aerospace workshop?

- a. One week  
 b. Two weeks  
 c. Three weeks  
 d. Other \_\_\_\_\_

16. To what extent did your participants help in structuring the workshop?

- a. Extensive  
 b. Moderate  
 c. Very little  
 d. None

17. Please check the kind of follow-up you use with your participants?

- a. Follow-up letter  
 b. News letters  
 c. Visits  
 d. Small group meetings  
 e. Other \_\_\_\_\_

How often \_\_\_\_\_

APPENDIX E

COVER LETTER TO WORKSHOP DIRECTORS

**OKLAHOMA AERONAUTICS COMMISSION**

424 UNITED FOUNDERS TOWER 4051 521-2377  
OKLAHOMA CITY, OKLAHOMA 73112

DAVID BOREN  
GOVERNOR

**COMMISSIONERS**

REX H. MADFIRA, LAWTON, CHAIRMAN  
DAVID JAY PERRY, OKLAHOMA CITY, VICE-CHAIRMAN  
PAUL B. ODOM, JR., OKLAHOMA CITY, SECRETARY  
W. HOWARD CLOUD, DIRECTOR

TERRENCE E. TURNER, FREEDOM  
MICHAEL F. GLADSTEIN, McALESTER  
JOE CUNNINGHAM, TAHLEQUAH  
DOYLE BURKE, SHAWNEE

April 16, 1976

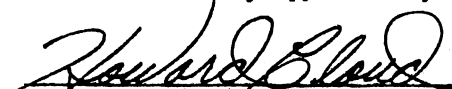
FELLOW AEROSPACE WORKSHOP DIRECTOR:

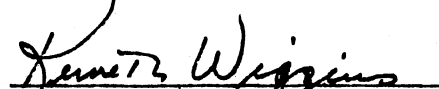
The Oklahoma Aeronautics Commission, the Governor's Advisory Council for Aerospace Education and the Oklahoma State Department of Education have conducted workshops in Aerospace Education for teachers since 1969. They are interested in providing the materials and events that will give the teachers a better foundation for the promotion of aerospace education in the schools of Oklahoma.

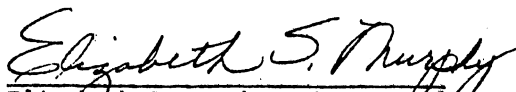
In order to assist in the development of future expanded programs for the State we feel that your expertise will be most valuable.

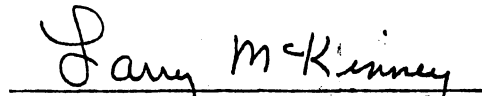
We would appreciate your opinions concerning the topics on the enclosed questionnaire. Please take the time now to check the answers. After you have completed the questionnaire, please return immediately in the enclosed addressed and stamped envelope.

We sincerely appreciate your cooperation.

  
W. Howard Cloud, Director  
Oklahoma Aeronautics Commission

  
Kenneth Wiggins, Chairman  
Governor's Advisory Council for  
Aerospace Education

  
Elizabeth S. Murphy, Director of  
Curriculum, Southeastern Oklahoma  
State University and Study  
Coordinator

  
Larry McKinney, Science Specialist  
State Department of Education



MEMBER - NATIONAL ASSOCIATION OF STATE AVIATION OFFICIALS

VITA<sup>N</sup>

Elizabeth Shores Murphy

Candidate for the Degree of

Doctor of Education

Thesis: AN AEROSPACE EDUCATION WORKSHOP FORMAT FOR STATE AEROSPACE  
EDUCATION WORKSHOPS

Major Field: Higher Education

Biographical:

Personal Data: Born in Ardmore, Oklahoma, the daughter of  
Roy Von and Faye Hamilton Shores.

Education: Graduated from Ardmore High School, Ardmore, Oklahoma;  
received the Bachelor of Science in Education degree from  
East Central Oklahoma State University in 1967 with a major  
in elementary education; received the Master of Teaching  
degree from East Central Oklahoma State University in 1968  
with a major in special education; completed requirements  
for the Doctor of Education degree at Oklahoma State Uni-  
versity in May, 1977.

Professional Experience: Special education teacher at Franklin  
Elementary School, Ardmore, Oklahoma, 1967-68; special  
education teacher at the Special Education Center, Ardmore,  
Oklahoma, 1968-1970; assistant professor in aviation and  
Director of Aviation Curriculum, Southeastern Oklahoma State  
University, 1970-75; graduate research assistant, Research  
Foundation, Oklahoma State University, Stillwater, Oklahoma,  
1975-76; assistant professor in aviation and Director of  
Aviation Curriculum, Southeastern Oklahoma State University,  
1976 to present.