A DESCRIPTIVE ANALYSIS OF THE STATUS AND NEEDS FOR AEROSPACE EDUCATION IN THE SCHOOLS OF OKLAHOMA

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PREFACE

The concern of this study has been to analyze the status and needs for aerospace education in the schools of Oklahoma.

I would like to express appreciation to the many people who have contributed to this study.

I gratefully acknowledge the counsel of the chairman of my advisory committee, Dr. Kenneth E. Wiggins, whose interest and wise direction were essential to the conduct of the study.

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I am grateful for the consideration of the former workshop participants and the superintendents who were the willing subjects of this subject.

I am indebted to Dr. N. Jo Campbell who assisted generously in designing the questionnaires and problems of analysis.

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CHAPTER I

NATURE OF THE PROBLEM

Introduction

Today's student is confronted with a world all parts of which are accessible to him through air transportation in a matter of hours; a world in which he is similarly accessible to others whether they wish him well or ill; a world in which moon travel, and even interplanetary travel, are no longer dreams but are projects; a world in which technological advance is so rapid that the curriculum of a few years ago is outdated in certain disciplines; a world of challenging and inspiring social, political and economic effects.[1]

The scientific/technological revolution poses a real challenge to those who must equip tomorrow's citizens. How do you prepare a student for such a world, much less the more complex one he will face when he enters his adult life? This question has stimulated school systems throughout the nation to introduce the concept of aerospace education.[2]

The term aerospace education is used to imply the study of aviation and space and its impact on society. This term includes both an environment and a field of activity. As an environment, it includes the total expanse extending upward and outward from the surface of the earth. As a field of activity, it includes both aeronautics (those things related to flight in the atmosphere) and astronautics (those things related to flight in space).[3]

Aerospace education seeks to communicate knowledge, impart skills, and develop attitudes relative to the scientific and technical as well as the social, economic, and political aspects of aviation and space.[4]

When we consider that in the United States alone 800,000 people board commercial airlines on a typical day; or that scheduled airlines, in 1978, carried over 280 million people;[5] or that there are nearly 200,000 general aviation aircraft, 13,000 airports and 700,000 pilots;[5] or that in 1979, close to one million people are employed in the aerospace industry;[7] or that aviation and space play a vital role in our national security; or that our aerospace foreign trade balance in 1978 was 70 percent of the total United States trade balance;[8] or that the exploration and exploitation of space are benefiting mankind in so many ways than thought possible, then we begin to understand the sociological and technological importance of aviation and space education to our society.

Aerospace education is based on the belief that everyone, our students and the public at large, should: (1) understand and appreciate the enormous impact that aviation and space has on our lives; (2) understand and be aware of the many vocational and career possibilities related to the aerospace industry; and (3) understand and appreciate the potential of aviation and space to serve mankind and to improve our daily lives.[9]

National leaders have pointed out that despite all the other twentieth century achievements of technology, radio, the automobile and television, our era will probably be known best as the Age of Flight.[10]

Statement of the Problem

The problem of this study was to determine the current status and needs for aerospace education in Oklahoma.

The Oklahoma Aeronautics Commission, the State Department of Education, and the state system of higher education have sponsored three-week aerospace education workshops during the summers since 1969, excepting 1974. The primary goals of these workshops were to develop awareness of aviation/aerospace and to provide knowledge of implementation techniques for this newly acquired information.

The purpose of this study was to determine how effective these workshops have been by analyzing data collected by questionnaires to former workshop participants and administrators as to the utilization of training and materials received as a result of these workshops.

Significance of the Study

The Oklahoma Aeronautics Commission through the state legislature, has annually, since 1969, budgeted money to promote aerospace education in Oklahoma through summer workshops. Several leaders in aerospace education have provided extensive time and manpower to plan, coordinate and implement these workshops.

This study should provide information for the Oklahoma Aeronautics Commission, the Oklahoma State Department of Education and any other agencies who might be interested, as to the impact these efforts in aerospace education have had on the schools in Oklahoma.

It should provide information needed by the Oklahoma Aeronautics Commission for study in consideration of continuing financing for the workshops.

This study should also identify needs of teachers and administrators who are interested in aerospace education, and provide background information in regard to teacher training.

Limitations of the Study

The subjects of the study are limited to former Oklahoma Aerospace Education Workshop participants and to superintendents of independent school districts of Oklahoma as listed in the 1977-78 Oklahoma Education Directory.

Statistical analyses are limited to frequency tests and percentage distribution due to the nominal nature of the data.

Assumptions of the Study

1. A questionnaire approach would be a valid method of collecting data for determining the status and needs for aerospace education.
2. Questions that were asked would be suitable for data interpretation.
3. Confidentiality was assured, therefore it was assumed that participants responded candidly.

Research Questions

1. What are the background characteristics of the former workshop participants in terms of sex, age, community size, current teaching status, level of teaching experience, years of teaching experience, method of learning of the Oklahoma

Aerospace Education Workshop, course work in aerospace education and membership in professional organizations?

2. What is the status of aerospace education in the schools of Oklahoma in terms of grade level, structure, relationship to subject matter fields, major emphasis and main value?
3. What is the status of aerospace education in the schools of Oklahoma in regard to interest in developing a program, introduction of aerospace education into the schools, groups who desire aerospace education, student interest and problems in starting a high school program?
4. What is the status of aerospace education in the schools of Oklahoma in terms of instructional materials and activities?
5. What is the status of aerospace education in Oklahoma schools in regard to the number of classes taught and number of students involved?
6. What are the needs of aerospace education in the schools of Oklahoma in regard to teacher preparation, state involvement and areas of recognized deficiencies?
7. Are there differences in the status and needs of aerospace education in Oklahoma as seen by workshop participants and superintendents?

Definition of Terms

Superintendent. The term "superintendent" as used in this study referred to the chief administrator of an independent school district of Oklahoma who responded to a questionnaire.

Workshop Participant. The term "workshop participant" referred to a former participant of one of the Oklahoma Aerospace Education Workshops who responded to a questionnaire.

FOOTNOTES

[1]General Aviation Manufacturers Association, "Learn More About Aviation and Space Education" (Philadelphia, Undated), p. 2.

[2]Ibid.

[3]Raymond J. Johnson and Jean F. Blashfield, "The Scope of Aerospace," in Mervin K. Strickler, Jr. (ed.), An Introduction to Aerospace Education (Chicago: New Horizons, 1968), p. 23.

[4]General Aviation Manufacturers Association, p. 2.

[5]"Wright . . . to Now," Aviation/Space, Vol. 5, No. 7 (November/December, 1978), p. 30.

[6]The American Society for Aerospace Education, The Directory of Aerospace Education (Washington, D.C., 1977), p. 4.

[7]"Aerospace Review and Forecast 1978/79," Aerospace (Winter, 1978), p. 3.

[8]Ibid.

[9]The American Society for Aerospace Education, p. 4.

[10]Ibid.

CHAPTER II

REVIEW OF SELECTED LITERATURE

Aerospace education had its beginning in 1908, only five years after the Wright brothers' flight. It was taught in a physics class at Los Angeles Polytechnical High School.[1]

The earliest concentrated promotion of aerospace education came as a result of Daniel Guggenheim's interest in aviation. This interest resulted in the formation of the Committee on Elementary and Secondary Education of the Daniel Guggenheim Fund for the Promotion of Aeronautics in 1927.

The work of this committee and the resultant funding was directed toward two objectives: developing efficiency and safety of commercial aviation, and stimulating public recognition of these achievements. This committee felt the aviation of tomorrow would depend to a large extent upon the familiarity of young people with aeronautics and airplanes.[2]

Harry F. Guggenheim, president of the fund, decided the committee's purposes as fourfold:

> To promote aeronautical education, both academic and general.
>
> To assist in the extension of fundamental aeronautical science.
>
> To assist in the development of commercial aircraft.

> To further the application of aircraft in business, industry, and other economic and social activities of the nation.[3]

In the early 1920s aviation education began in the schools in Detroit. Model airplane building was the first aerospace activity introduced in two schools, and by 1929 Detroit offered aeronautics from grades nine through twelve throughout the city.

Aviation education for teachers had its beginning at the Kansas City Missouri Teachers College in the early 1920s. Finis E. Engleman taught a course in Aviation for Teachers.

In 1928, New York University offered a summer session for both elementary and secondary teachers in aviation education. This program was supported by the Daniel Guggenheim Fund for the promotion of Aeronautics and was the earliest recorded large-scale effort in aviation education for teachers.[4]

Aviation education was further stimulated by the flight of Charles Lindberg to Paris in May of 1927. The Aeronautical Chamber of Commerce of America, Inc., organized in the late 1920s, established a Committee on Aeronautical Education in the public schools and the First National Conference on Aeronautical Education was held in St. Louis, Missouri, in 1930.

During the 1930s the airlines started programs of working with educators. United Air Lines provided scholarships for teacher training and for the development and distribution of materials to teachers and students.

The 1938 Civil Aeronautics Act established the Civil Aeronautics Authority. This became the Civil Aeronautics Administration in 1940

and provided for general development and educational promotion of aviation in the country.[5]

In 1939 Congress passed the Civil Pilot Training Act, and by the time war was declared on Germany this program had provided training for nearly 100,000 young men.

At this time, efforts in developing aviation education focused on the science of aeronautics for upper grades in secondary schools. This emphasis was due largely to the emergency war needs of armed services in the early years of World War II.[6]

Between 1942-44, a period of intensive development and promotion of aeronautics materials and courses, it was estimated that half of the nation's high schools offered an aviation course.[7] Hackett made a survey of aviation education in high schools of the United States in the 1943-44 school year. The purpose of her study was to analyze what was being done in the way of aviation in the high schools of the United States, specifically: (1) the need for aviation education, (2) the amount of aviation taught in schools before 1942, (3) how aviation classes were conducted as shown in a study of fifteen high school aeronautics classes during 1943-44, (4) how state aviation programs functioned, (5) the content of high school aviation textbooks, and (6) some changes in aviation.[8]

Hackett collected data from fifteen high schools in seven states having flight schools (California, Connecticut, Illinois, Pennsylvania, Tennessee, Texas and Wisconsin). Questionnaires were sent to the fifteen high schools to determine: (1) prerequisites for admission to aviation education courses, (2) characteristics of students as to sex, age, class size, science and mathematics background, and aeronautics

experiences, and (3) characteristics of teachers such as educational backgrounds, degrees, special educational experiences and aeronautics training.

Her findings included: (1) The greatest need for aviation was in defending the nation. Other needs were preparation for vocations and private flying. (2) Prior to 1942 there were few aviation courses. Those that did exist were mostly of a vocational or technical nature. Between 1942-44 there were over 14,000 schools offering aviation education. (3) Aviation was offered either in aeronautics classes or as supplementary material in established courses. (4) One characteristic of state planning programs was universal recommendation of flight experience as laboratory work in connection with high school aviation classes. (5) There were six aviation textbooks used in the high schools. Only four topics were common to all--aerodynamics, meteorology, navigation and engines. (6) Aviation education had experienced a far greater expansion than any other subject. This was justified by world events, economic development and national security.[9]

Prerequisites for admission should be minimal with interest and desire to achieve given priority over past record. Some schools required one year of science and one year of mathematics.

The courses were open to both boys and girls with more boys enrolled. The median age was eleventh and twelfth graders, and the students excelled in science and mathematics. Aviation clubs and model contests proved successful.

Most of the teachers have a science and mathematics background. Hackett recommended that all schools should offer at least one course in aviation, and all teachers of physics, biology, mathematics and

social studies should have studied at least one course in aviation. Her reasoning was these courses could be made richer by incorporating aviation into them. She also recommended that the most important single improvement that could be made regarded keeping aviation textbooks up-to-date.[10]

Following World War II emphasis shifted from specific aviation training of high school students to the infusion of broader based aviation subject matter and its implications into existing science and social studies courses in elementary as well as secondary schools.[11]

Cornwell, in 1947, made a study to develop a resource unit in aviation education for secondary school social studies teachers. He considered the most feasible way of including air-age material was in a general course, built on the unit system.[12]

Cornwell emphasized: (1) knowledge and understanding resulted from the study of aviation and its impact on the community, (2) the community could promote world peace by understanding the implications of aviation education, and (3) a knowledge of air-age education can further improve community safety and health.[13]

Although many of the wartime trained aeronautics instructors and returning veterans going into teaching used their experiences for the enrichment of their courses, there was a tremendous decline in the number of elective high school programs following World War II. Even the degree of enrichment and project work at the elementary level declined. There was no longer the sense of urgency and motivation brought on by the war.

Aviation Education workshops for teachers gained in popularity at this time. By 1948, nearly one hundred teacher training institutions

were attempting to help teachers learn more about how to use aviation for improving teaching. The Civil Aeronautics Administration provided the major leadership efforts. They were joined in the effort by state departments of public instruction.[14]

Strickler, in a 1951 study, proposed an operational definition of aviation education.[15] After analysis of many different definitions and statements concerning aviation education, Strickler stated the following definition.

> Aviation education is that branch of general education concerned with communicating knowledge, skills and attitudes about aviation and its impact upon society. It must be distinguished from that branch of special education known as astronautical education, which is concerned with training specialized aviation workers.[16]

Strickler considered the aviation education programs of aviation manufacturers and commercial airlines of importance in the development of aviation education. He did extensive analysis of the air center in terms of its role in implementing aviation education and found it to be a most effective means of furthering the educational use of aviation content in general education.[17]

By 1952 the Civil Aeronautics Administration was declining as a leader in aerospace education. Because of reductions in budget and staff positions there was also a reduction in aviation education programs. Before the Civil Aeronautics Administration decline, however, the National Aviation Education Council and the Civil Air Patrol had emerged as leaders in aviation education.[18]

The Civil Air Patrol conducts one of the largest aerospace education programs in the nation. It provides leadership at all levels in the public schools, supporting aviation integrated into other courses

or as separate high school courses. The Civil Air Patrol also promotes aerospace learning experiences as a part of extracurricular activities.[19] Civil Air Patrol aerospace education objectives are:

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 science as applied 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. An understanding of the social, economic, and political implications of aerospace technology
7. A knowledge of airports, airport service, and the functions of airport personnel
8. An understanding of existing and proposed government services and regulations that facilitate aerospace operations
9. A knowledge of the materials, personnel, and equipment available as resources for aerospace education programs
10. An understanding of the political, economic, social, and educational problems created by aerospace technology
11. A realization that aerospace vehicles have changed traditional concepts of land masses, water barriers, speed, time, and distance

12. A knowledge of career opportunities in science, engineering, and other fields that result from aerospace vehicle development, manufacture, and operation
13. A knowledge of the impact of aerospace progress on international relationships
14. An understanding of the basic scientific and engineering principles inherent in air and space vehicle development, manufacture, and operation.[20]

Another survey of selected high schools having aviation education programs was conducted in 1955. Kermit Anderson surveyed the status of six aspects of aviation education in one hundred and twenty secondary schools known to have aviation education programs.[21] The six problems he considered were:

1. To determine the method of introducing aviation education into the curriculum.
2. To show the organizational and administrational aspects of aviation education in the selected secondary schools.
3. To determine the professional background and training of the aviation education instructors.
4. To determine the instructional materials and project activities used in the aviation education programs.
5. To determine the financial support of the aviation education programs.

6. To learn how the aviation education programs were promoted.[22]

Seventy percent, or eighty-four of the survey instruments, was considered usable.

Some of Anderson's findings were:

1. Seventy percent of the aviation education programs was an immediate responsibility of the principals of the schools.
2. The Civil Air Patrol had provided the most help to the aviation education programs. Colleges, universities, and state aeronautics programs provided the least help.
3. Twenty percent had obtained films from the United States Air Force, while 33 percent reported they had received no service from the United States Air Force.
4. Fifty-seven percent taught aviation education as a separate unit in other courses.
5. All but one instructor held at least the bachelor's degree. Fifty-two percent held the master's degree and two held doctor's degrees.
6. Thirty-one percent of the instructors held degrees in education. Twenty-five percent indicated they held degrees in mathematics.
7. Twenty-nine percent of the instructors credited the United States Air Force as having influenced their interest in aviation education. Pilot training

influenced 17 percent, while five percent became interested as a result of the National Aviation Education Workshop.

8. Eighty-one percent of the instructors indicated they had been members of some branch of the armed forces. Forty-four percent held a current pilot's license.
9. Eighty-two percent indicated need for materials for study and for more group conferences.
10. Fourteen percent found aviation education workshops to be the most valuable experience in preparing to teach aviation education.[23]

When the first man-made object ever to orbit the earth was successfully launched on October 4, 1957, the Space Age officially began. With this beginning of the Space Age there was an even broader expansion of aviation subject matter to be included in the study of the earth's space environment. Aviation education became aerospace education.

In 1959 Zaharevitz made a study to develop a curriculum for a summer aviation education workshop.[24] He used an open-form questionnaire survey which he conducted by mail and by interview. His subjects were persons who had directed aviation workshops. Zaharevitz received a total of thirty-eight usable replies.

Recommendations made by respondents concerning the optimum length of a workshop ranged from one to eight weeks, with 27 percent favoring a four week workshop. Respondents considered basic fundamentals of aviation and astronautics as the most essential element of a workshop.

The item ranked as second was curriculum planning or individual preparation of aviation curriculum materials for personal use. Orientation flight was third, and field trips or tours was fourth.[25]

Some of Zaharevitz's recommendations were:

1. The workshop shall serve all teachers, administrators, interested laymen and mature students preparing to become teachers.
2. The aviation education workshop shall provide each participant with:
   a. An adequate reading and speaking vocabulary of aviation and astronautics.
   b. The importance of weather to aviation.
   c. A general knowledge and understanding of airplane structure.
   d. A general knowledge and understanding of the simple scientific principles of flight.
   e. An understanding of the place of aviation in peace and war.
   f. An introduction to the social, economic and political implications of current and future aviation development.
   g. A knowledge of available aviation education resources in materials, personnel and equipment for instructional materials.[26]

Sanders, in 1967, made a study to determine the content for a college program that would provide elementary and secondary teachers with a general knowledge of aerospace based on the guidance of

selected aviation and space industries.[27] His study was also concerned with the ways teachers could keep up-to-date with the rapidly changing aspects of aerospace developments and cooperate with industry for mutual benefits.

Data was collected from representatives of aviation and space industries by way of an open-end opinionnaire. In Sander's survey, industries highly favored advisory council meetings between their representatives and educators. They expected teachers to provide career guidance. The industries also encouraged teacher membership in aerospace education associations.[28]

In 1968 Governor Dewey Bartlett was most concerned that although Oklahoma's fastest growing industry was aviation and one out of six people in Oklahoma City derived his income from the aerospace industry, fewer than fifty high school students out of a possible 120,000 were involved in aerospace education programs in the schools.

Bartlett expressed this concern to the news media, and his first attempt to remedy the situation was to appoint a Governor's Air Education Committee.[29] He charged the committee with increasing the number of public schools in Oklahoma which offer air education courses in their curricula. The committee, with the cooperation of the Oklahoma State Department of Education and the Oklahoma Aeronautics Commission, implemented the first annual Oklahoma Aerospace Education Workshop in the summer of 1969.

The Oklahoma Aerospace Education Workshops were effective in meeting the stated goal of Governor Bartlett as demonstrated in a study by Miller.[30] In his assessment of the effects of the 1969 and 1970 aerospace education workshops upon the teaching of aerospace education

concepts in selected schools in Oklahoma, Miller found that 9,301 students had been enrolled in some form of aerospace education units taught by 160 workshop participants who returned his questionnaires. Also, 81.9 percent of the respondents were teaching more aerospace education than they had three years before.

A later study by Romero demonstrated further support for the Oklahoma Aerospace Education workshops. He used an opinionnaire and a questionnaire as survey instruments. The data collected demonstrated that workshop participants had a positive attitude toward aerospace education regardless of their subject matter area.[31]

Two studies of community college aviation education programs were conducted to learn why some aviation education programs failed while other programs, extrinsically similar in many ways, grew and flourished. Three important conclusions, based on an evaluation of the overall survey data and opinions expressed by those surveyed, were:

1. Highly effective programs had similar basic characteristics; however, specific methods of operation were widely divergent.
2. Programs that were loosely organized, inefficiently operated, and unable to attain their stated objectives were not uncommon.
3. Problem areas were of two types: weak leadership, and misunderstandings and misinformation.[32]

Highly effective college aviation programs were generally found to be uniquely characterized by:

1. Administrators who understood and strongly supported the aviation program.

2. Full-time program directors (in the case of career programs) who had extensive experience in the aviation industry and who possessed at least a baccalaureate degree.
3. Counselors and students who were fully informed as to purposes, career alternatives, and job entry requirements.[33]

A 1974 study at the University of Southern Mississippi of participants in an aerospace education workshop evaluated attitudes concerning the following three questions:

1. How do you feel toward aerospace concepts as a part of the public school curriculum?
2. How do you feel toward aerospace concepts as they might influence your effectiveness as a participant?
3. How do you feel toward aerospace concepts as they might influence your effectiveness as a teacher?

Analysis of the data revealed highly significant changes in the attitudes of the participants toward more favorable feelings about aerospace concepts. The results indicated the changes in attitude which occurred during the period of the workshop would be highly unlikely to occur due to chance.[34]

An evaluation of the Tennessee Aerospace Education Workshops was conducted after eight consecutive annual workshops. Dr. A. C. Brewer conducted the study, and his findings indicated students of teachers

who had attended the Tennessee workshops displayed greater growth in the following areas:

1. knowledge of aviation-related facts;
2. interest in aviation-related facts;
3. interest in education as a profession;
4. breadth of interest in aviation.

Additionally, teachers who attended aerospace education workshops:

1. developed richer experiences for their pupils;
2. displayed a greater knowledge of aerospace;
3. utilized new methods and materials;
4. experienced a realization of professional growth;
5. made teaching seem more attractive to children as a profession.[35]

Maupin assessed the effectiveness of selected aerospace education workshops in Tennessee. The purpose of her study was to determine if the five stated goals of the Tennessee Aerospace Education Workshops were being met.[36]

Data from 276 questionnaires were used to establish that the Tennessee Aerospace Education Workshops were successful in reaching their stated goals:

1. To develop a greater awareness of aerospace education at various levels of instruction.

Data from the questionnaires indicated that teachers in kindergarten through grade twelve had integrated aerospace education into their programs.

2. To stimulate interest in aerospace education and its implication for educational activities on the part of teachers.

Eighty-five percent of the participants indicated they were more interested in learning about aerospace since participating in the workshops.

3. To encourage teachers and administrators to incorporate more aerospace education in their teaching-learning activities.

Data revealed that 63 percent of the participants were presently teaching more aerospace units than before taking an aerospace education workshop.

4. To help teachers learn ways of integrating aerospace education with their work at all levels and in various subject areas.

A total positive response of 75 percent of the participants indicated these areas were helpful.

5. To help teachers become qualified and certified in teaching specialized courses in aviation and aerospace at junior and senior high schools.

Eighty-eight participants had completed the Advanced Aerospace Education Workshop which was listed as part of the coursework which led to certification in Aerospace Education in the state of Tennessee.[37]

Maupin's findings reinforced the conclusions drawn in Brewer's study.[38]

Buethe recognized that Indiana schools appeared to have a low degree of involvement in aviation/aerospace in contrast to Illinois and

other nearby state school systems, so he undertook an evaluation of the status of aerospace education in the state.[39]

Responses to a questionnaire sent to administrators indicated a positive attitude toward aerospace education by responding administrators. Seventy percent of the respondents indicated that aerospace education was not offered at any level in the school district. The majority of the Indiana school administrators who responded indicated aerospace education curricula should be expanded from present levels.[40]

In another questionnaire to Indiana aerospace educators, data showed the aerospace teacher wanted to develop aerospace awareness, to motivate, and to enrich teaching.[41]

In Cox's evaluation of aerospace education practices by experts and by practitioners, he identified organizations that helped schools promote aerospace education programs. Those organization were state aeronautics commissions, commercial airlines, aircraft manufacturers and state departments of education.[42]

While Cox's study identified those organizations which helped promote aerospace education, Hatch completed a survey in California which revealed factors contributing to the diminuitive aviation/aerospace education effort.[43] Some of the alleged reasons for the less than favorable attitude toward aviation education in California high schools were:

1. Shortage of qualified aviation teachers.
2. The psychological fear of involving high school students in a flying program and the accompanying fear of district liability.
3. Reluctancy to deviate from the orthodox method of classroom-centered instruction.

4. The high cost of the aviation experience.
5. Confusing aviation education with aviation training.
6. Reluctance to reward poor students with a "high status" activity.

Hatch also attributed a reluctant and poorly organized aviation public relations program to the negative influence on aerospace education.[44]

While Hatch found a reluctance in California to reward poor students with a "high status" activity, Donna (Texas) High School initiated aerospace education courses in the 1978-79 school year in an attempt to provide a means to break the cycle of poverty and undereducation migrant students have experienced in the traditional curriculum.[45]

Migrant students made up over 50 percent of the total school population. Minimum academic requirements for the aerospace courses were eighth grade level skills in reading and mathematics. School officials hoped the courses would provide greater incentives to these students to raise their basic academic skills.[46]

This literature review demonstrated the scope of aerospace education is from elementary to the university levels. It spans areas of study from general applications to specific career occupations. Because of this broad area it can be presented as a distinct discipline or it can serve an integrated curriculum. Through the enrichment approach, standard course offerings are supplemented with pertinent aspects of aerospace.[47]

Aerospace education provides the opportunity to supplement classroom instruction with enriching educational experiences, such as trips to airports, air bases, manufacturing firms, National Aeronautics and

Space Administration installations, and Federal Aviation Administration installations. In addition, many local, state and national agencies, industries and organizations provide aerospace education resources.

Aerospace education has been endorsed by educators and industry because it is relevant, practical, and applicable to almost every school. It has a content of subject matter which is meaningful as general education even if a student does not pursue aviation or space as a career.[47]

Aerospace education has been established as a proper discipline of curriculum. Every state already has approved courses in aerospace education or has given full authority for their inclusion in the curriculum.[49]

The case of enrichment of curriculum through aerospace oriented curricula has been well stated by the American Association of School Administrators.

> Aviation is having a profound effect upon the institutions and peoples of the world. Technology has given mankind a vehicle capable of transporting men, their goods, and their ideas through aerial pathways at fantastic rates of speed. Frequently, in the past, science and invention have speeded ahead of social adjustment, producing dislocations in society. The invention of the airplane and the discovery of atomic energy threaten to produce another period of social lag. Already aviation has influenced events and conditions of life and transformed old patterns of social living. Every objective of education, every social, scientific, and economic area with which education deals has been affected.[50]

A review of the literature also showed that aerospace education workshops are an effective method of preparing teachers to teach aerospace education at both the elementary and secondary levels.

Studies made in Oklahoma indicated the number of students receiving aerospace education has increased and teachers who participated in

Oklahoma Aerospace Education Workshops have a positive attitude toward aerospace education, have increased their competencies in aerospace education, and believe students should visit aerospace-related installations.

The literature did not reveal what aerospace education instructional materials teachers are using, what aviation-related facilities are visited, if administrators are supportive of aerospace education, or special needs of former workshop participants.

Also, an update on the number of teachers and students who are involved in aerospace education in Oklahoma is needed.

FOOTNOTES

[1]Mervin K. Strickler, Jr., ed., "History of Aerospace Education," An Introduction to Aerospace Education (Chicago: New Horizons, 1968), p. 307.

[2]Ibid., p. 308.

[3]Ibid.

[4]Ibid., p. 309.

[5]Ibid., pp. 311-312.

[6]Paul R. Hanna, ed., Aviation Education Source Book (New York: Hastings House Publishers, Inc., 1946), p. vii.

[7]Strickler, "History of Aerospace Education," p. 313.

[8]Mildred Lee Hackett, "Aviation Education in the High Schools in the United States" (unpub. Master's thesis, George Washington University, 1946), p. 1.

[9]Ibid., pp. 115-117.

[10]Ibid., pp. 118-119.

[11]Hanna, p. 1.

[12]John D. Cornwell, "The Impact of the Air Age on the Community" (unpub. Master's thesis, The University of Southern California, 1947), p. 2.

[13]Ibid., pp. 16-17.

[14]Strickler, "History of Aerospace Education," p. 314.

[15]Mervin K. Strickler, Jr., "The Air Center as a Means of Implementing Aviation" (unpub. Doctoral dissertation, Standford University, 1951), p. 162.

[16]Ibid.

[17]Ibid., p. 80.

[18]Strickler, "History of Aerospace Education," p. 314.

[19]Leslie L. Thomason, "Education and Aerospace," in Mervin K. Strickler, Jr. (ed.), An Introduction to Aerospace Education (Chicago: New Horizons, 1968), p. 41.

[20]Strickler, "History of Aerospace Education," pp. 315-316.

[21]Kermit Anderson, "A Survey of Certain Aspects of Aviation Education in Selected Schools in the United States" (unpub. Master's thesis, North Dakota Agricultural College, 1955), p. 28.

[22]Ibid., p. 12.

[23]Ibid., pp. 45-76.

[24]Walter Zaharevitz, "Curricular Experiences for a Summer Aviation Education Workshop" (unpub. Master's thesis, Miami University, 1959), p. 26.

[25]Ibid., pp. 80-82.

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CHAPTER III

DESIGN AND METHODOLOGY

Description of the Sample

The first group of participants in this study was educators who had participated in the three-week Oklahoma Aerospace Education Workships held in 1969, 1970, 1971, 1972, 1973, 1975, 1976, and 1977. Participants for the Aerospace Workshops were selected by the Teacher Workshop Committee of the Governor's Advisory Committee for Aerospace Education. The criteria used for selection were as follows:

1. Representation of all geographical sections of the State of Oklahoma.
2. Close approximation in number between male and female educators.
3. Representation from grade levels kindergarten through grade twelve.
4. Representation from the different curriculum areas in high school.
5. Endorsement of the participant by the school administrator with assurance that the teacher would receive backing in implementation into the curriculum aerospace education concepts presented in the Workshop.

Questionnaires were mailed to 568 former Oklahoma Aerospace Education Workshop participants.

The second group of participants in the study were superintendents of all independent school districts in Oklahoma. Questionnaires were mailed to 459 superintendents.

Collection of Data

Construction of the Questionnaires

The questionnaires were the sole sources of data. Questionnaires were constructed by the author of this study after compiling questions gathered from literature related to the subject and a sample questionnaire provided by Indiana State University.

Questionnaires were reviewed by a member of the Oklahoma State University faculty who teaches behavioral studies research and statistics, and by members of the writer's doctoral committee.

Design of the Questionnaires

The questionnaire sent to workshop participants was composed of 45 items. Thirteen items provided background characteristics of the educators. Twenty-six items were designed to gather data concerning the status of aerospace education in Oklahoma, while six items were to assess the needs of workshop participants in the area of aerospace education. A copy of the questionnaire sent to workshop participants is found in Appendix A.

The questionnaire sent to superintendents consisted of fifteen items, fourteen which were concerned with the status of aerospace

education in Oklahoma, and one item which dealt with needs for aerospace education. A copy of the questionnaire sent to superintendents is located in Appendix C.

There were eight items in common on the two questionnaires, seven relating to status and one to needs for aerospace education. A comparison was made between responses of workshop participants and superintendents.

Items on the questionnaires were both single response and multiple response. Priority ranking was to be applied to those items having multiple responses, with the highest priority response selected first.

Submission of the Questionnaires

A list of all former workshop participants, with addresses, was obtained from the Oklahoma Aeronautics Commission, while the list of superintendents was obtained from the 1977-1978 Oklahoma Educational Directory.

Two questionnaires were distributed by mail, one to all former Oklahoma Aerospace Education Workshop participants, and one to all superintendents of independent school districts in Oklahoma. The questionnaires were self-addressed and postage provided for easy return. Cover letters explaining the purpose of the study were enclosed with the questionnaires (see Appendixes B and D).

Method of Analyzing Data

Since the data collected in the study were nominal in nature, no elaborate statistical interpretations were made. Data related to the research questions of this study were tabulated and frequencies and

percentages determined using the SPSS program in an IBM 360 Computer at Oklahoma State University.

Data were presented in terms of frequency and percentage of response to each item. In the case of multiple response items, data were presented in frequency and percentage of highest priority selection and frequency and percentage of respondents who selected a particular item, regardless of priority of selection.

Comparisons between responses to selected items by workshop participants and superintendents was done by direct comparisons of relative frequencies.

Summary

The purpose of this chapter was to give a general description of the design of the study. Major areas discussed were description of the sample, collection of data, design of the questionnaires, method of submission of the questionnaires and method of analyzing data.

CHAPTER IV

RESULTS OF THE STUDY

Introduction

The purposes of this chapter were to present the data collected during the study and to summarize the results of the analyses of that data.

The evaluations of this study were made entirely from data of the questionnaires given to Oklahoma Aerospace Education Workshop participants and superintendents from the State of Oklahoma.

Data will be presented according to research questions listed in Chapter II. The data was analyzed according to the variables of total workshop participant responses and total superintendent responses.

All data presented in this chapter are presented in terms of percentage of workshop participant and superintendent response to items on the questionnaires which are directly related to each research question.

Information concerning each research question can be found in the tables. Those tables having -A- and -B- sections pertain to questions which had multiple selections possible. The -A- section of those tables represents the number of workshop participants or superintendents responding to a particular item as their first priority, whereas the -B- section of the tables represents the percentage of total respondents who

selected a particular item regardless of priority of selection. Totals were not given in the -B- section as they would not accurately depict a relationship to the number of respondents.

Tables IV, XXV, XXVI, XXVII, XXVIII, XXIX and XXXIII represent multiple selection items where priority concern was not of concern. Again, totals would be misleading, and therefore were not given.

Respondents to Questionnaires

Questionnaires were mailed to 568 former Oklahoma Aerospace Education Workshop participants. Responses were received from 384, or 67.6 percent, of the total mailed. Ninety-seven questionnaires were returned by the post office indicating inability to locate the intended receivers. Of the 471 questionnaires assumed delivered, responses were received from 384, or 81.5 percent.

Questionnaires were mailed to 459 superintendents, and 282, or 61.4 percent, responded.

Characteristics of Participants

Research Question Number One

What are the background characteristics of the former workshop participants in terms of sex, age, community size, current teaching status, level of teaching experience, years of teaching experience, method of learning of the Oklahoma Aerospace Education Workshop, course work in aerospace education and membership in professional aerospace organizations?

To obtain supporting data for this question, items five, six,

seven, twenty-nine, thirty-seven, thirty-nine, forty, forty-one, forty-two, forty-three, and forty-four of the workshop participants' questionnaires were used (see Appendix A).

Items 39-44 are presented in Table I. Findings show that 58.6 percent of the respondents were female and 41.4 percent were male; the majority of teachers (58 percent) were between the ages of 30 and 49; 10.9 percent of workshop participants came from metropolitan communities, while approximately 60 percent were almost equally distributed in communities ranging in size from 1,000 to 49,999. Communities of less than 1,000 population were represented by 20.7 percent of the respondents.

Teachers made up 88.8 percent of the sample, while 7 percent were administrators. Questionnaire data indicated that 85.7 percent of former participants were currently teaching, while 13.3 were not. Fifty-three percent of those not teaching were administrators, and the remainder were retired teachers who did some substitute teaching.

All levels of teaching were represented: the greater percentage (32 percent) were junior high teachers, and the least (1.6 percent) were college teachers. Equal numbers (24 percent) represented upper elementary and high school, while 18.2 percent were lower elementary teachers.

Teachers who responded and had sixteen or more years of experience made up 35.4 percent of the sample. There was almost equal representation of the seven to nine, ten to twelve, and thirteen to fifteen years of experience groups. Only forty of the 384 respondents had six or less years of teaching experience.

TABLE I

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING PARTICIPANT CHARACTERISTICS

Participant Characteristics	Frequency	Percent
Sex		
Female	225	58.6
Male	159	41.4
TOTAL	384	100.0
Age		
Under 25	4	1.0
26 - 29	40	10.5
30 - 39	115	29.9
40 - 49	108	28.1
50 - 59	64	16.7
Over 60	52	13.5
No Response	1	0.3
TOTAL	384	100.0
Community Size		
Population - Over 300,000	42	10.9
Population - 100,000-299,999	7	1.8
Population - 50,000-99,999	21	5.5
Population - 15,000-49,999	75	19.5
Population - 5,000-14,999	68	17.7
Population - 1,000-4,999	83	21.6
Population - less than 1,000	79	20.7
No Response	9	2.3
TOTAL	384	100.0
Position		
Teacher	341	88.8
Administrator	27	7.0
No Response	16	4.2
TOTAL	384	100.0

TABLE I (Continued)

Participant Characteristics	Frequency	Percent
Currently Teaching		
Yes	329	85.7
No	51	13.3
No Response	4	1.0
TOTAL	384	100.0
Level of Teaching Experience		
K - 3	70	18.2
4 - 6	91	23.7
7 - 9	123	32.0
10 - 12	92	24.0
College	6	1.6
No Response	2	0.5
TOTAL	384	100.0
Years of Teaching Experience		
1 - 3	9	2.3
4 - 6	31	8.1
7 - 9	60	15.6
10 - 12	75	19.5
13 - 15	72	18.8
16+	136	35.4
No Response	1	0.3
TOTAL	384	100.0

Table II shows that participants learned of the workshop through a news release (33.3 percent), or from a former participant (34.9 percent), while brochures accounted for 20.8 percent. Other methods of learning of the workshop indicated were: the OEA convention booth, pilot's safety meeting, the school administrator, and the workshop director.

TABLE II

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING METHOD OF LEARNING OF AEROSPACE WORKSHOP

Method of Learning of Workshop	Frequency	Percent
Brochure	80	20.9
News Release	128	33.3
Former Participant	134	34.9
Other	32	8.3
No Response	10	2.6
TOTAL	384	100.0

Table III indicates that the only aerospace education credit 80.2 percent of the participants received was in the workshop. About one-fifth of the participants went on to receive further credit.

Less than one-fourth of the participants held membership in professional organizations, as shown in Table IV. Some participants were members of more than one organization.

TABLE III

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING COLLEGE CREDIT IN AEROSPACE EDUCATION

College Credit	Frequency	Percent
Semester Hours in Aerospace Education		
0	2	0.5
1 - 3	308	80.2
4 - 6	41	10.7
7 - 9	11	2.8
10 or more	21	5.5
No Response	1	0.3
TOTAL	384	100.0
Semester Hours Earned After Participation in Workshop		
0	2	0.5
1 - 3	308	80.2
4 - 6	38	10.0
7 - 9	17	4.4
10 or more	17	4.4
No Response	2	0.5
TOTAL	384	100.0
Aerospace Workshops of One Week or Longer Duration Attended		
1	354	92.1
2	15	3.9
3	6	1.6
4 or more	8	2.1
No Response	1	0.3
TOTAL	384	100.0

TABLE IV

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING MEMBERSHIP IN PROFESSIONAL AEROSPACE ORGANIZATIONS

Membership in Aerospace Organizations	Frequency	Percent
Oklahoma Aerospace Educators Association	92	24.0
American Society for Aerospace Education	12	3.1
Civil Air Patrol	3	.8
Experimental Aircraft Association	4	1.0
Aircraft Owners and Pilots Association	7	1.8
Others	1	.3

Status of Aerospace Education

Research Question Number Two

What is the status of aerospace education in the schools of Oklahoma in terms of grade level, structure, relationship to subject matter fields, major emphasis and main value?

Items one, four, twenty-seven, twenty-eight, and thirty from the participants' questionnaire, and items one, four, seven, eight, nine and ten from the superintendents' questionnaire (see Appendix C), provided data for this question.

In response to item one presented in Table V, participants indicated one-third of the school districts have aerospace education at the elementary level, one-third at the secondary level, and one-third equally at the elementary and secondary levels. Only 2.8 percent indicated aerospace education was not included.

TABLE V

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING THE LEVEL OF AEROSPACE EDUCATION IN SCHOOL DISTRICT

Aerospace Education Mainly at Level	Frequency	Percent
Elementary	130	33.9
Secondary	115	29.9
Equally at Elementary and Secondary	127	33.1
Not Now Included	11	2.8
No Response	1	0.3
TOTAL	384	100.0

Superintendents' responses to the same question, Table VI, showed 58.2 percent of the school did not include aerospace education, with a greater percentage at the high school level of those schools which included the program.

TABLE VI

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING THE LEVEL OF AEROSPACE EDUCATION IN SCHOOL DISTRICT

Aerospace Education Mainly at Level	Frequency	Percent
Elementary	26	9.2
Secondary	55	19.5
Equally at Elementary and Secondary	37	13.1
Not Now Included	164	58.2
TOTAL	282	100.0

Over two-thirds (67.7 percent) of the participants indicated they used an interdisciplinary structure approach, with only 6.8 percent, or 26 participants, teaching it as a distinct discipline (Table VII).

TABLE VII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING COURSE CONTENT STRUCTURE OF AEROSPACE CURRICULUM

Aerospace Curriculum Structure	Frequency	Percent
Interdisciplinary	260	67.7
Distinct Discipline	26	6.8
Independent Study	20	5.2
Phase Elective/Mini-Course	15	3.9
No Response	63	16.4
TOTAL	384	100.0

Tables VIII-X demonstrate that superintendents favored the interdisciplinary approach regardless of grade level. Their strongest support for the distinct discipline approach was at the high school level, and they supported the junior high level using the phase elective/mini-course approach to curricular structure.

Aerospace education has the strongest subject matter field relationship to science, 74.2 percent, and the least relationship was to mathematics, 3.2 percent (see Table XI) as data from participants indicated. Those participants who selected "others" in item four taught

aerospace education in relationship with reading, business, foreign language, NROTC, ground school, aircraft maintenance, and professional aviation.

TABLE VIII

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING STRUCTURE OF AEROSPACE CURRICULUM AT ELEMENTARY LEVEL

Curriculum Structure At Elementary Level Should Be	Frequency	Percent
Interdisciplinary	139	49.3
Distinct Discipline	10	3.5
Independent Study	21	7.4
Phase Elective/Mini-Course	53	18.8
No Response	59	21.0
TOTAL	282	100.0

TABLE IX

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING STRUCTURE OF AEROSPACE CURRICULUM AT JUNIOR HIGH LEVEL

Curriculum Structure At Junior High Level Should Be	Frequency	Percent
Interdisciplinary	123	43.6
Distinct Discipline	15	5.3
Independent Study	29	10.3
Phase Elective/Mini-Course	64	22.7
No Response	51	18.1
TOTAL	282	100.0

TABLE X

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING STRUCTURE OF AEROSPACE CURRICULUM AT HIGH SCHOOL LEVEL

Curriculum Structure At Senior High Level Should Be	Frequency	Percent
Interdisciplinary	80	28.4
Distinct Discipline	72	25.5
Independent Study	36	12.8
Phase Elective/Mini-Course	52	18.4
No Response	42	14.9
TOTAL	282	100.0

TABLE XI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING RELATIONSHIP OF AEROSPACE EDUCATION TO SUBJECT MATTER

Aerospace Education Related To	Frequency	Percent
Industrial Arts, Technology	18	4.7
Mathematics	12	3.2
Science	285	74.2
Social-Political Science	42	10.9
Others	14	3.6
No Response	13	3.4
TOTAL	384	100.0

Superintendents also saw the stronger relationship as being with science, but as shown in Table XII, only at 24.8 percent.

TABLE XII

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING RELATIONSHIP OF AEROSPACE EDUCATION TO SUBJECT MATTER

Aerospace Education Related To	Frequency	Percent
Industrial Arts, Technology	14	5.0
Mathematics	21	7.4
Science	70	24.8
Social-Political Science	8	2.8
Others	5	1.8
No Response	164	58.2
TOTAL	282	100.0

Although more participants emphasized the historical aspect of aerospace course content (see Table XIII), almost equal emphasis was on socio-economic-political-cultural and rockets/space.

The participants' responses to the question regarding the value of aerospace education is found in Table XIV. This table showed 39 percent selecting motivation as their highest priority, while 70.1 percent selected motivation as one of the top three priorities in value. Second in value was general education, while exploration and career education both had high values.

TABLE XIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING AEROSPACE COURSE CONTENT EMPHASIS OF AEROSPACE CURRICULUM

Course Content Emphasis	Frequency	Percent
Historical	103	27
Socio-Economic-Political-Cultural	76	20
Pilot Ground School	23	5
Rockets/Space	76	20
Careers	45	12
Civil Air Patrol	0	0
No Response	61	16
TOTAL	384	100

TABLE XIV

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING VALUE OF AEROSPACE EDUCATION

Main Value of Aerospace Education	Frequency	Percent
-A-		
Career Education	69	18
Exploration	57	15
Motivation	149	39
General Education	81	21
Occupational Preparation	0	0
Others	0	0
No Response	28	7
TOTAL	384	100
-B-		
Career Education	146	38.0
Exploration	174	45.3
Motivation	269	70.1
General Education	184	47.9
Occupational Preparation	31	8.1
Others	4	1.0

Superintendents (Table XV) assessed the highest value to general education, with career education as the second highest value.

TABLE XV

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING VALUE OF AEROSPACE EDUCATION

Main Value of Aerospace Education	Frequency	Percent
-A-		
Career Education	56	20
Exploration	31	11
Motivation	31	11
General Education	73	26
Occupational Preparation	9	3
Others	4	1
No Response	78	28
TOTAL	282	100
-B-		
Career Education	107	37.9
Exploration	73	25.9
Motivation	62	22.0
General Education	122	43.3
Occupational Preparation	59	20.9
Others	4	1.4

Research Question Number Three

What is the status of aerospace education in the schools of Oklahoma with regard to interest in developing a program, introduction of aerospace education into the schools, groups who desire aerospace education, student interest, and problems in starting a high school program?

Supporting data for this question were obtained from items two, three, thirteen, and twenty-six of the workshop participants' questionnaire, and from items two, three, five and six of the superintendents' questionnaire.

Data from items two of the participants' questionnaire are presented in Table XVI, and data from item two of the superintendents' questionnaire are presented in Table XVII.

The interests of educators in developing aerospace education were compared and 34 percent gave enriching present teaching as their highest priority. The highest priority of 26 percent of the participants was in developing awareness of aviation/aerospace, and 21 percent selected motivating students.

Multiple selection revealed that 73.7 percent used aerospace education for developing awareness of aviation/aerospace; 67.2 percent for motivation of students; 55.2 percent for enriching present teaching; and 26.3 percent to provide alternative curricula.

Superintendents also showed strong interest for developing awareness of aviation/aerospace, motivating students and enriching teaching, although only 7 percent selected motivation as the highest priority (see Table XVII).

TABLE XV

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING VALUE OF AEROSPACE EDUCATION

Main Value of Aerospace Education	Frequency	Percent
-A-		
Career Education	56	20
Exploration	31	11
Motivation	31	11
General Education	73	26
Occupational Preparation	9	3
Others	4	1
No Response	78	28
TOTAL	282	100
-B-		
Career Education	107	37.9
Exploration	73	25.9
Motivation	62	22.0
General Education	122	43.3
Occupational Preparation	59	20.9
Others	4	1.4

TABLE XVI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING INTEREST IN DEVELOPING AEROSPACE EDUCATION

Interest in Developing Aerospace Education	Frequency	Percent
-A-		
Starting a New Course	38	10
Enriching Present Teaching	131	34
Providing Alternative Curricula	27	7
Motivating Students	81	21
Developing Awareness of Aviation/Aerospace	99	26
No Interest	3	1
No Response	5	1
TOTAL	384	100
-B-		
Starting a New Course	54	14.1
Enriching Present Teaching	212	55.2
Providing Alternative Curricula	101	26.3
Motivating Students	258	67.2
Developing Awareness of Aviation/Aerospace	283	73.7
No Interest	3	.8

TABLE XVII

RESPONSE TO SUPERINTENDENTS TO THE QUESTION REGARDING INTEREST IN DEVELOPING AEROSPACE EDUCATION

Interest in Developing Aerospace Education	Frequency	Percent
-A-		
Starting a New Course	42	15
Enriching Present Teaching	73	26
Providing Alternative Curricula	19	7
Motivating Students	17	6
Developing Awareness of Aviation/Aerospace	82	29
No Interest	45	16
No Response	4	1
TOTAL	282	100
-B-		
Starting a New Course	53	18.8
Enriching Present Teaching	104	36.9
Providing Alternative Curricula	55	19.5
Motivating Students	92	32.6
Developing Awareness of Aviation/Aerospace	132	46.8
No Interest	50	17.7

Items three on both questionnaires were with regard to who introduced aerospace education into the schools. Data from these items are presented in Tables XVIII and XIX. Participants responded that teachers were responsible 84.4 percent of the time, while superintendents responded with 33 percent. Responses to aerospace education introduced by a pilot, a principal or a superintendent were about equal on participants' and superintendents' questionnaires.

The question usually comes up when discussing the matter of support of aerospace education whether school boards and administrators endorse the program. It was assumed by the author that those who desired an aerospace education program would support the program.

Tables XX and XXI report data concerning the groups who might desire aerospace education. It was interesting to note the workshop participants' highest priority selection was students, and superintendents gave a slight edge to administration (24 percent) over students (23 percent). Both groups indicated that school boards least desired aerospace education in the schools.

Tables XXII and XXIII can be compared for the way workshop participants and superintendents viewed student interest in aerospace education. The largest percent of both groups responded that student interest was stable.

Only superintendents were asked about the problems involved in starting a high school aeronautics program. Data from their responses are presented in Table XXIV. Expense was selected 53 percent of the time as being the greatest problem, followed by lack of qualified teachers being selected 30 percent of the time as the greatest problem. Scheduling was also a problem, but not a dominant one.

TABLE XVIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING INTRODUCTION OF AEROSPACE EDUCATION INTO SCHOOLS

Aerospace Education Introduced By	Frequency	Percent
Teacher	324	84.4
Pilot	10	2.6
Principal	13	3.4
Superintendent	9	2.3
No Response	28	7.3
TOTAL	384	100.0

TABLE XIX

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING INTRODUCTION OF AEROSPACE EDUCATION INTO SCHOOLS

Aerospace Education Introduced By	Frequency	Percent
Teacher	93	33.0
Pilot	5	1.8
Principal	8	2.8
Superintendent	11	3.9
No Response	165	58.5
TOTAL	282	100.0

TABLE XX

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING DESIRAL OF AEROSPACE EDUCATION

Aerospace Education Desired By	Frequency	Percent
-A-		
School Board	8	2.0
Administration	27	7.0
Faculty	73	19.0
Students	226	59.0
Parents	0	0.0
No Response	50	13.0
TOTAL	384	100.0
-B-		
School Board	20	5.2
Administration	109	28.4
Faculty	242	63.0
Students	292	76.0
Parents	82	21.4

TABLE XXI

RESPONSE OF SUPERINTENDENTS TO THE QUESTION
REGARDING DESIRAL OF AEROSPACE EDUCATION

Aerospace Education Desired By	Frequency	Percent
-A-		
School Board	11	4
Administration	68	24
Faculty	28	10
Students	65	23
Parents	4	1
No Response	106	38
TOTAL	282	100
-B-		
School Board	25	8.9
Administration	108	38.3
Faculty	78	27.7
Students	124	44.0
Parents	31	11.0

TABLE XXII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING STUDENT INTEREST IN AEROSPACE

Student Interest in Aerospace	Frequency	Percent
Rising	146	38.0
Declining	23	6.0
Stable	166	43.2
No Response	49	12.8
TOTAL	384	100.0

TABLE XXIII

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING STUDENT INTEREST IN AEROSPACE

Student Interest in Aerospace Education	Frequency	Percent
Rising	60	21.3
Declining	13	4.6
Stable	140	49.6
No Response	69	24.5
TOTAL	282	100.0

TABLE XXIV

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING PROBLEMS INVOLVED IN STARTING A HIGH SCHOOL AERONAUTICS PROGRAM

Problems in Starting A High School Program	Frequency	Percent
-A-		
Expense	149	53
Lack of Qualified Teacher	85	30
Scheduling	9	3
Others	14	5
No Response	25	9
TOTAL	282	100
-B-		
Expense	210	74.5
Lack of Qualified Teacher	189	67.0
Scheduling	125	44.3

Research Question Number Four

What is the status of aerospace education in the schools of Oklahoma in terms of instructional materials and activities?

To collect data for this question, items fourteen through twenty-five on the participants' questionnaire were utilized in addition to items thirteen, fourteen, and fifteen from the superintendents' questionnaire.

Resource materials in aerospace education used by the workshop participants (Table XXV) came mainly from their personal files (81 percent) and free and inexpensive sources (64.1 percent). Participants indicated personal files were developed as a result of the materials they received when attending the Oklahoma Aerospace Education Workshop.

TABLE XXV

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING SOURCE OF AEROSPACE TEACHING MATERIALS

Materials Mainly From	Frequency	Percent
Personal Files	311	81.0
Library Resources	81	21.1
Free and Inexpensive Sources	246	64.1
Oklahoma Aerospace Curriculum Guide	100	26.0
Oklahoma Aerospace Activity Cards	76	19.8
Oklahoma Aerospace Curriculum Supplement	20	5.2
Others	20	5.2

Twenty-six percent of the respondents indicated they were using the Oklahoma Aerospace Curriculum Guide; approximately 20 percent used the Oklahoma Aerospace Activity Cards, and only 5 percent utilized the Oklahoma Aerospace Curriculum Supplement.

Table XXVI presents data concerning the sources for materials which participants received and used. The National Aeronautics and Space Administration supplied education materials which were utilized by 78.9 percent of the participants and Cessna's materials were used by 58.9 percent of the participants.

Resource materials from the Federal Aviation Administration, aviation manufacturers, Aero Products Research, and Jeppesen-Sanderson were utilized by over 10 percent of the participants.

The organizations whose materials best suited the needs of the participants' pupils were the National Aeronautics and Space Administration and the Federal Aviation Administration (see Table XXVII).

Participants were asked to respond to a question regarding the emphasis of commemorative aerospace days. The data included in Table XXVIII revealed that 27.1 percent observed Wright Brothers Day, and 18.2 percent observed the landing of the First Man on the Moon.

Other commemorative days mentioned were Sputnik, Veteran's Day, Amelia Earhart, Lindberg, Apollo Launches, Will Rogers, Goddard's Birthday and Pioneer Astronauts.

One popular aerospace activity was model building. Table XXIX indicated that 59.9 percent of the participants had their students build model spacecraft, and 49.7 percent built model aircraft.

TABLE XXVI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING USE OF AEROSPACE EDUCATION MATERIALS

Regularly Receive and Use Materials From	Frequency	Percent
Civil Air Patrol	19	4.9
Federal Aviation Administration	56	14.6
National Aeronautics and Space Administration	303	78.9
Aviation Manufacturers	57	14.8
Aero Products Research	42	10.9
Beech	20	5.2
Cessna	226	58.9
Piper	7	1.8
Jeppesen-Sanderson	42	10.9
General Aviation Manufacturers Association	19	4.9
Aerospace Education Resource Center	30	7.8
American Society for Aerospace Education	4	1.0
Experimental Aircraft Association	5	1.3

TABLE XXVII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING SUITABILITY OF AEROSPACE EDUCATION MATERIALS

Organizations' Aerospace Education Materials Most Suited to Pupils Needs	Frequency	Percent
Civil Air Patrol	29	7.6
Federal Aviation Administration	201	52.3
General Aviation Manufacturers Association	33	8.6
American Society for Aerospace Education	12	3.1
National Aeronautics and Space Administration	293	76.3
Others	3	.8

TABLE XXVIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING EMPHASIZING COMMEMORATIVE DAYS

Special Emphasis	Frequency	Percent
Wright Brothers Day	104	27.1
First Man on the Moon Day	70	18.2
Others	91	23.7

TABLE XXIX

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING MODEL BUILDING

Students Typically Build	Frequency	Percent
Model Aircraft	191	49.7
Model Spacecraft	211	54.9
Other Models	39	10.2
No Models	80	20.8
An Aircraft	2	.5
No Response	43	11.2

Eleven participants reported that their students built three models. The students of 158 participants built two models. It was noteworthy that students of two participants built an aircraft.

An activity recommended for aerospace education, and especially for aeronautics classes, was an orientation flight. Superintendents were asked if they regarded orientation flights as an asset to an aerospace program. Their responses, presented in Table XXX, indicated that 80.1 percent supported orientation flights. However, 73.8 percent were concerned with the possible liability, 68.1 percent objected to the expense to the students, and 31.6 percent were concerned about public approval of students being involved in school-related flying. Fifty-seven percent indicated their main concern was for liability (see Table XXXI).

TABLE XXX

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING THE VALUE OF ORIENTATION FLIGHTS

Orientation Flights Asset	Frequency	Percent
Yes	226	80.1
No	22	7.8
No Response	34	12.1
TOTAL	282	100.0

TABLE XXXI

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING OBJECTIONS TO ORIENTATION FLIGHTS

Objections	Frequency	Percent
-A-		
Possible Liability	161	57
Expense to Students	54	19
Concern for Public Approval	14	5
Other	11	4
No Response	42	15
TOTAL	282	100
-B-		
Possible Liability	208	73.8
Expense to Students	192	68.1
Concern for Public Approval	89	31.6
Other	16	5.7

Tables XXXII, XXXIII, and XXXIV present data related to field trips. Two-thirds of the participants took their students to visit the local airport, and these local airports were usually less than five miles from the school. Over 40 percent of the airports visited had a fixed base operator who served as a resource person.

TABLE XXXII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING LOCAL AIRPORTS

Local Airport	Frequency	Percent
Field Trip to Airport -A-		
Yes	256	66.7
No	109	28.4
No Response	19	4.9
TOTAL	384	100.0
-B-		
Distance to Airport (Miles)		
0 - 5	252	65.6
6 - 10	54	14.1
11 - 25	38	9.9
26 - 50	24	6.2
Over 50	11	2.9
No Response	5	1.3
TOTAL	384	100.0

TABLE XXXIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING AVIATION FACILITIES VISITED

Types of Facilities Visited	Frequency	Percent
Fixed Base Operator	162	42.2
Commercial Airline	66	17.2
FAA Air Traffic Control	51	13.3
Aircraft Maintenance	53	13.8
Airport	256	66.7
Military Installation	45	11.7
Aerospace Industry	40	10.4
Others	7	1.8

TABLE XXXIV

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING SUPPORT OF FIELD TRIPS

Support Field Trips	Frequency	Percent
Yes	250	88.7
No	8	2.8
No Response	24	8.5
TOTAL	282	100.0

Other facilities visited by students who studied aerospace education were commercial airlines, FAA control towers, aerospace industries, and military installations. Specific industries and military installations listed by participants included Rockwell, Wiley Post, American, Tinker AFB, Vance AFB, McConnell AFB, and the Oklahoma Air National Guard.

Almost 90 percent of the superintendents responded they supported the concept of field trips as a valuable learning experience for aerospace education regardless of the grade level of the students. In several schools where field trips were prohibited, the teachers indicated they brought in speakers from aerospace related companies.

Research Question Number Five

What is the status of aerospace education in Oklahoma schools with regard to the number of classes taught and the number of students involved?

Data supporting this question were obtained from items eight through twelve on the participants' questionnaire, and presented in Table XXXV.

One question of interest was finding the number of participants who taught aerospace education as a distinct discipline. Twenty-six participants indicated they taught aeronautics as a separate course. Thirteen taught one aeronautics class per day; seven taught two classes per day; three taught three classes per day; one taught four classes per day, and two taught five classes per day.

TABLE XXXV

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING TEACHING AEROSPACE EDUCATION

Teaching Aerospace Education	Frequency	Percent
Aerospace Classes/Day		
0	347	90.4
1	13	3.3
2	7	1.8
3	3	.8
4 or more	3	.8
No Response	11	2.9
TOTAL	384	100.0
Number of Students Per Aerospace Class		
0	347	90.4
1 - 15	3	.8
16 - 20	11	2.9
21 - 25	7	1.8
26 - 30	3	.8
31 or More	2	.4
No Response	11	2.9
TOTAL	384	100.0
Unit on Aerospace Education		
Yes	276	71.9
No	103	26.8
No Response	5	1.3
TOTAL	384	100.0
Introduce Aerospace Concepts Into Curriculum		
Yes	352	91.7
No	27	7.0
No Response	5	1.3
TOTAL	384	100.0

TABLE XXXV (Continued)

Teaching Aerospace Education	Frequency	Percent
Number of Students in School Year Introduced to Aerospace Education		
1 - 15	53	13.8
16 - 30	80	20.8
31 - 45	42	10.9
46 - 60	14	3.7
61 - 75	34	8.9
76 -100	54	14.1
Over 100	75	19.5
No Response	32	8.3
TOTAL	384	100.0

A cross-tabulation of the number of aerospace classes taught per day by the average number of students per class revealed that there were approximately 1,205 students in Oklahoma being taught aerospace education as a distinct discipline during a school year.

Over 90 percent of the participants responded they introduced aerospace concepts into the curriculum. Based on the data of their responses to the number of students in a school year who were introduced to aerospace concepts, it was calculated that approximately 20,987 students were exposed to aerospace education.

Grouped data with an interval size greater than one were used. Therefore, in calculating these figures, the midpoint of each interval was used.

Needs for Aerospace Education

Research Question Number Six

What are the needs of aerospace education in the schools of Oklahoma in regard to teacher preparation, state involvement and areas of recognized deficiencies?

To gather supporting data dealing with this question, items thirty-one through thirty-six on the participants' questionnaire, and item six on the superintendents' questionnaire were used.

Workshop participants strongly supported (91.9 percent) receiving their aerospace education preparation at teachers' workshops, with 77 percent feeling this was the best method. Flight experience was considered important by 53.1 percent, with 13 percent considering it most important. Over one-third of the participants thought preparation should include undergraduate aerospace courses (see Table XXXVI).

A number of participants replied that aviation ground school would be beneficial, while others expressed value in meteorology, geology, and physics.

Superintendents' responses to teacher preparation showed over one-half supported teachers' workshops, but only 30 percent considered this the most important way to become prepared. Over 40 percent believed preparation should include flight experience, but only 27 percent thought it was most necessary. Over one-third of the superintendents thought preparation should include undergraduate aerospace courses (see Table XXXVII).

TABLE XXXVI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING PREPARATION IN AEROSPACE EDUCATION

Preparation Should Include	Frequency	Percent
-A-		
Flight Experience	50	13
Teachers' Workshop	296	77
Pilot's License	4	1
Aerospace Industry Experience	0	0
Undergraduate Aerospace Courses	10	3
No Response	24	6
TOTAL	384	100
-B-		
Flight Experience	204	53.1
Teachers' Workshops	353	91.9
Pilot's License	33	8.6
Aerospace Industry Experience	33	8.6
Undergraduate Aerospace Courses	141	36.7

TABLE XXXVII

RESPONSE OF SUPERINTENDENTS TO THE QUESTION REGARDING PREPARATION IN AEROSPACE EDUCATION

Preparation Should Include	Frequency	Percent
-A-		
Flight Experience	76	27
Teachers' Workshops	85	30
Pilot's License	23	8
Aerospace Industry Experience	8	3
Undergraduate Aerospace Courses	25	9
No Response	65	23
TOTAL	282	100
-B-		
Flight Experience	116	41.1
Teachers' Workshops	153	54.3
Pilot's License	86	30.5
Aerospace Industry Experience	49	17.4
Undergraduate Aerospace Courses	96	34.0

Table XXXVIII shows although teachers prefer to receive aerospace education in workshops, they would also like to have in-service training and the services of a resource person.

Tables XXIX and XL present data with regard to participants' responses to state involvement in aerospace education. The three areas which participants strongly supported relative to the state's involvement were: sponsor aerospace workshops, provide for an aerospace curriculum specialist, and provide aerospace materials for the schools.

Eighty percent of the participants saw value in having an aerospace curriculum specialist. They indicated this specialist could assist them by helping secure materials, provide in-service training, and work with administrators to help communicate the values of aerospace education.

Table XLI presents data on participants' responses to deficiencies they had in regard to aerospace education. Of greatest concern was their lack of knowledge of the latest developments in aerospace education, followed closely by their lack of knowledge of available materials. Approximately one-third of the participants expressed concern for deficiencies in their general background in aerospace education.

Another area of concern to participants was a lack of public relations. They expressed a need for more publicity, a need for lobbying for programs and for working more closely with legislators. They were also concerned with the lack of a state-adopted textbook for aeronautics in Oklahoma. Many participants stated they would like to see a concentrated effort to inform administrators, school boards and politicians of the need for, and significance of, aerospace education in the schools of Oklahoma.

TABLE XXXVIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING PREFERRED METHOD OF RECEIVING AEROSPACE EDUCATION

Preferred Method	Frequency	Percent
-A-		
Workshop	348	91
In-service	4	1
Printed Material	0	0
Resource Person	1	0
Undergraduate Classes	8	2
No Response	23	6
TOTAL	384	100
-B-		
Workshop	356	92.7
In-service	215	56.0
Printed Material	65	16.9
Resource Person	196	51.0
Undergraduate Classes	30	7.8

TABLE XXXIX

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING ASSISTANCE BY THE STATE OF OKLAHOMA

Assistance by State	Frequency	Percent
-A-		
Sponsoring Aerospace Workshops	342	89
Aerospace Curriculum Specialist	12	3
Providing Materials	19	5
Others	4	1
No Response	7	2
TOTAL	384	100
-B-		
Sponsoring Aerospace Workshops	370	96.4
Aerospace Curriculum Specialist	260	67.7
Providing Materials	331	86.2
Others	6	1.6

TABLE XL

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING AEROSPACE CURRICULUM CONSULTANT

Aerospace Specialist	Frequency	Percent
Value to Have Aerospace Curriculum Specialist		
Yes	307	79.9
No	66	17.2
No Response	11	2.9
TOTAL	384	100.0
-A-		
Assistance by Consultant		
In-service Training	69	18
Newsletter	8	2
Working with Administrators	77	20
Helping Secure Materials	200	52
No Response	30	8
TOTAL	384	100
-B-		
In-service Training	281	73.2
Newsletter	73	19.0
Working with Administrators	211	54.9
Helping Secure Materials	316	82.3

TABLE XLI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING DEFICIENCIES IN AEROSPACE EDUCATION

Deficiencies	Frequency	Percent
-A-		
Knowledge of Available Materials	69	18
Latest Developments in Aerospace Education	215	56
General Background in Aerospace Education	54	14
Others	8	2
No Response	38	10
TOTAL	384	100
-B-		
Knowledge of Available Materials	262	68.2
Latest Developments in Aerospace Education	276	71.9
General Background in Aerospace Education	121	31.5

Comparisons of Data From Participants and Superintendents

Research Question Number Seven

Are there differences in the status and needs of aerospace education in Oklahoma as seen by workshop participants and superintendents?

In order to answer this question, data collected from responses to items one, two, three, four, thirteen, twenty-six, twenty-seven, and thirty-one on the participants' questionnaire were respectively compared to data from responses to items one, two, three, four, five, six, seven and eleven on the superintendents' questionnaire. These items referred to identical questions asked of workshop participants and superintendents. Items compared were discussed earlier in this chapter, but the purpose of this question was to specifically address any differences in responses.

In reference to Tables V and VI (see page 43) regarding the level of aerospace education, participants indicated one-third of the schools involved in aerospace education were at the elementary level, approximately one-third at the secondary level, and one-third of the schools taught aerospace education equally at the elementary and secondary levels. Only 2.8 percent stated it was not presently included in the curriculum.

Superintendents indicated 58.2 percent of the schools did not presently teach aerospace education, and of those schools which did, 19.5 percent were secondary schools. Only 9.2 percent were elementary, and 13.1 percent of the schools taught aerospace education equally at both the elementary and secondary levels.

The greatest discrepancy exhibited here was between the responses regarding schools where aerospace education was not presently included. Assuming the respondents were answering to the best of their knowledge, it suggested to the author that administrators were not aware of the course content used by individual teachers within their school systems.

It is noteworthy that 7 percent of the participants did not teach aerospace concepts (see Table XXXV, pages 70-71), yet only 2.8 percent indicated aerospace education was not taught in their school district. This difference suggested to the author either there were others involved in teaching aerospace concepts who had not attended one of the Oklahoma Aerospace Education Workshops, or perhaps it was being taught by participants who did not respond to the questionnaires.

Responses to interest in developing aerospace education was presented in Tables XVI and XVII, pages 53 and 54. This data indicated there was general agreement between workshop participants and superintendents as to why they developed an aerospace education program. Both groups used it primarily to develop awareness of aviation/aerospace. The second and third ranked reasons participants developed an aerospace program were to motivate students and to enrich present teaching. Superintendents' choices were the reverse. There was very little percentage separation between either groups in the second and third choices.

Tables XVIII and XIX, page 56, presented data concerning responses to the question regarding who introduced aerospace education into the schools. Both participants and superintendents agreed teachers introduced the course far more often than pilots, principals, and superintendents. The difference in percentage of response, 84.4 percent of

the participants and only 33 percent of the superintendents, was attributed to the high frequency of superintendents who did not respond to this item.

Participants and superintendents agreed aerospace education was more closely related to science than to other subject matter fields. The percentage of teachers who responded to science was three times greater than the percentage of superintendents. This was also attributed to the high incidence of superintendents who did not respond to this item.

Participants ranked the social-political sciences as second in relationship to aerospace education and industrial arts third, whereas superintendents ranked mathematics second and industrial arts third.

The status of student interest in aerospace education was assessed by asking both groups to respond to the question as to whether student interest was rising, declining, or stable.

Almost one-half of each group responded student interest was stable. The two groups were also in general agreement regarding declining student interest. The only difference was in the percentage of those who believed student interest was rising. Once again, the lower percentage cited by the superintendents was attributed to the number who did not respond to this question.

Tables XX and XXI, pages 57 and 58, presented data regarding the groups who desired that aerospace education be taught. Participants and superintendents were in agreement overall that students had the greatest desire for aerospace education, and school boards had the least desire.

In considering the main value of aerospace education (Tables XIV and XV, pages 50 and 52), participants answered with far greater frequency, 70.1 percent, to motivation. Also considered of high value was general education and career education.

Superintendents thought aerospace education for general education was of highest value, 43.3 percent, and overall, ranked motivation fourth. One possible explanation for participants ranking motivation so high was they had perhaps experienced a real difference in student interest as a result of introducing aerospace concepts.

The final item to compare regarded teacher preparation. Data concerning this question was presented in Tables XXXVI and XXXVII, pages 73 and 74. The greatest difference between data collected from responses of participants and superintendents concerned teachers' workshops. Over 90 percent of former workshop participants thought preparation to teach aerospace education should include a workshop for teachers.

Even though superintendents did not feel as strongly in agreement, 54.3 percent did express teacher preparation in aerospace education should include teachers' workshops.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the status and needs for aerospace education in the schools of Oklahoma.

The subjects for the study were former participants of the Oklahoma Aerospace Education Workshops and superintendents of the independent school districts of Oklahoma.

Data was collected by questionnaires mailed to the subjects. Questionnaires were mailed to 568 former participants and returned by 384. A second questionnaire was mailed to 459 superintendents and returned by 282.

Returned data was processed by an IBM 360 computer and analyzed to determine background characteristics of the participants and status and needs for aerospace education in Oklahoma. Data from selected items on the two questionnaires were compared to determine if participants and superintendents responded differently to questions regarding status and needs for aerospace education.

Due to the nominal nature of the data, data are presented in terms of frequency and percentage of response to each item.

The following research questions were discussed:

1. What are the background characteristics of the former workshop participants in terms of sex, age, community size, current teaching status, level of teaching experience, years of teaching experience, method of learning of the Oklahoma Aerospace Education Workshop, course work in aerospace education and membership in professional organizations?
2. What is the status of aerospace education in the schools of Oklahoma in terms of grade level, structure, relationship to subject matter fields, major emphasis and main value?
3. What is the status of aerospace education in the schools of Oklahoma in regard to interest in developing a program, introduction of aerospace education into the schools, groups who desire aerospace education, student interest and problems in starting a high school program?
4. What is the status of aerospace education in the schools of Oklahoma in terms of instructional materials and activities?
5. What is the status of aerospace education in Oklahoma schools in regard to the number of classes taught and number of students involved?
6. What are the needs of aerospace education in the schools of Oklahoma in regard to teacher preparation, state involvement and areas of recognized deficiencies?

7. Are there differences in the status and needs of aerospace education in Oklahoma as seen by workshop participants and superintendents?

Findings

Based on the findings of the study, there was evidence to support the following conclusions regarding participant characteristics:

1. The majority of the participants were female.
2. The majority of the participants were between the ages of 30 and 49.
3. Participants represented communities with populations from fewer than 1,000 to over 300,000.
4. Teachers made up almost 90 percent of the sample, the remainder were administrators.
5. All grade levels were represented with more subjects teaching junior high, and the least teaching college.
6. Over one-third of the teachers had more than sixteen years of teaching experience.
7. Most educators learned of the workshop from former participants and news releases.
8. Almost four-fifths of the participants had only three semester hours credit in aerospace education, and received this as a result of participating in the Oklahoma Aerospace Education Workshop.
9. Less than one-fourth of the participants held membership in professional aerospace organizations.

Findings in regard to the status of aerospace education in Oklahoma were:

1. Aerospace education was taught equally at the elementary and secondary levels.
2. The curriculum approach was most often interdisciplinary.
3. Aerospace education was usually related to science.
4. The major emphases on aerospace content was historical, socio-economic-political-cultural, and rockets/space.
5. The main values for aerospace education were motivation, general education, and career education.
6. Aerospace education was usually taught to develop awareness of aviation/space, to motivate students, and to enrich present teaching.
7. Aerospace education was usually introduced into the schools by teachers.
8. Students had the greatest desire for aerospace education followed by the faculty and the administration.
9. Student interest in aerospace was stable.
10. The major problem in starting a high school program was expense.
11. The sources of teaching materials for most aerospace educators were personal files and free and inexpensive sources.
12. NASA supplied the educators with the most materials which they considered suitable for use. Cessna and the Federal Aviation Administration were also sources for suitable materials.

13. Most educators did not emphasize commemorative aerospace days. Of those who did, most emphasized Wright Brothers' Day and the lunar landings' anniversaries.
14. Model building of aircraft and spacecraft was performed by students of over 80 percent of the participants.
15. Superintendents strongly regarded orientation flights as an asset. However, their main concerns were for liability and expense to the students.
16. Over two-thirds of the participants took their students on a field trip to the airport, and the airports were usually within five miles of the school.
17. Other popular field trip locations were commercial airlines, air traffic control towers, maintenance facilities and military installations.
18. Almost 90 percent of the superintendents supported the concept of field trips.
19. Most participants, 91.7 percent, introduced aerospace concepts into their curricula.
20. Approximately 20,987 Oklahoma students were being introduced to aerospace education concepts as compared to 9,301 in 1972, and fewer than 50 in 1968.
21. Approximately 1,205 students in Oklahoma were being taught aerospace education as a distinct discipline by 26 of the participants.

Findings in regard to the needs of aerospace education in Oklahoma were:

1. Teachers preferred receiving aerospace education in workshops.
2. Flight experience for teacher preparation was considered important by over one-half of the respondents.
3. Over one-third of the participants thought preparation should include undergraduate aerospace courses.
4. Educators, 96.4 percent, strongly endorsed the State of Oklahoma's sponsoring aerospace workshops.
5. In considering the value of having the services of an aerospace curriculum specialist, 79.9 percent responded they could use this type of resource.
6. Participants desired assistance be provided by an aerospace curriculum specialist in the areas of helping former participants secure materials, providing in-service training and working with administrators to gain a more favorable attitude toward aerospace education.
7. Participants recognized they were deficient in knowledge of latest developments in aerospace education and knowledge of available materials.

Findings in regard to comparisons of data between participants and superintendents were:

1. There was general agreement about the grade level of aerospace education when taught; but superintendents indicated 58.2 percent of the schools did not presently teach aerospace education, while participants indicated only 2.8 percent.
2. Both groups would use aerospace education primarily to develop awareness of aviation/aerospace.
3. Participants and superintendents agreed aerospace education was usually introduced into the schools by teachers.
4. There was agreement between groups that aerospace education was more closely related to science than to other subject matter fields.
5. Both groups agreed student interest in aerospace education was stable.
6. It was generally agreed students had the greatest desire for aerospace education and school boards had the least.
7. Participants ranked motivation of students as the main value of aerospace education, while superintendents thought the main value was for general education.
8. Over 90 percent of the participants thought teacher preparation should include an aerospace workshop, and only 54.3 percent of the superintendents felt

the same way. Even though superintendents assigned a lesser value to workshops, they did show strong support for this method of teacher preparation.

Conclusions

In considering the status of aerospace education in Oklahoma, the author found significance in the increasing number of students who were being introduced to aerospace concepts. Fewer than fifty students in 1968 were introduced to aerospace concepts. The Oklahoma Aerospace Education Workshops were implemented in 1969, and in 1972, 9,301 students received aerospace education. This study indicated 20,987 students in 1978 were introduced to aerospace concepts, and therefore supported the trend of an increase in the number of students being made aware of aviation education.

Over 90 percent of the participants who responded introduced aerospace concepts to their classes, while 80 percent taught a separate unit on aerospace education. Twenty-six participants taught aerospace as a distinct discipline. Most participants used an interdisciplinary curriculum approach, integrating aerospace concepts into the existing curricula.

Aerospace education was usually taught to develop awareness of aviation/aerospace and had a high value in motivating students. It was taught equally at elementary and secondary levels.

The two principal needs for aerospace education in Oklahoma, as identified by the participants, were to continue the annual summer workshops and to provide the services of an aerospace curriculum specialist.

Recommendations

Due to the findings of this study, it is recommended by the author that:

1. The State of Oklahoma continue to sponsor aerospace workshops for educators since this is the preferred method of teacher preparation.
2. The State of Oklahoma provide for an aerospace education curriculum specialist.
3. Public relations be improved by a positive approach in presenting aerospace information to the public.
4. An improved means of informing participants of new knowledge and materials in aerospace be developed because of the desire of many for increased information in the field.
5. Membership in professional organizations be encouraged.
6. There be extended communication between teachers and administrators because of differences in some responses to this study.

Recommendations for further research are to undertake an investigation of the schools where there were no aerospace education programs to determine the factors which contributed to this deficiency.

A study might be undertaken to determine teacher evaluation of aerospace education practices in the schools of Oklahoma.

Also, since over one-third of the participants indicated that preparation in aerospace education should include undergraduate aerospace courses, a study might be made of the institutions of higher education in the State of Oklahoma and nationally to determine if they are meeting this need.

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A P P E N D I X E S

APPENDIX A

PARTICIPANT QUESTIONNAIRE

1 2 3

Role
1. teacher
2. administrator ____4

You have been identified as an educator who has attended an aerospace education workshop sponsored by the Oklahoma Aeronautics Commission.

Please assist us in surveying the current status and needs of aerospace education in Oklahoma schools by taking a few minutes to complete this questionnaire. Your responses will be helpful to the Aeronautics Commission and to other Oklahoma agencies who see the value of aerospace education to pupils.

CHOICE RESPONSES. Please write the number that corresponds to an appropriate answer in the spaces to the right. You may mark more than one answer, but no more than three per question. In selecting more than one response, mark according to your priority ranking. Leave any item blank if you are not sure.

1. Aerospace education in my school district is ____5
   1. mainly at elementary level
   2. mainly at secondary level
   3. equally at elementary and secondary
   4. not now included

   If your answer to question 1 is "4" list some of the reasons why at end of questionnaire.

2. My interest in developing aerospace education lies in ____6
   1. starting a new course
   2. enriching my present teaching ____7
   3. providing alternative curricula
   4. motivating students
   5. developing awareness of aviation/aerospace ____8
   6. I have no interest.

3. Aerospace education came to my school mainly through the efforts of a ____9
   1. teacher
   2. pilot
   3. principal
   4. superintendent

4. Aerospace education in my school is most closely related to ____10
   1. industrial arts, technology
   2. mathematics
   3. science
   4. social-political sciences
   5. other disciplines specify_____

5. My formal college preparation in aerospace education, in semester hours equivalent, is ____11
   1. 0
   2. 1-3
   3. 4-6
   4. 7-9
   5. 10 or more specify number_____

6. How many of these hours were earned after your participation in the Oklahoma Aerospace Education Workshop? ____12
   1. 0
   2. 1-3
   3. 4-6
   4. 7-9
   5. 10 or more specify number_____

7. I have attended the following number of aerospace workshops of one week or longer duration. ____ 13
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

8. I typically teach the following number of aerospace classes/day. ____ 14
   1. 0
   2. 1
   3. 2
   4. 3
   5. 4 or more

9. The average number of students per each of my aerospace classes is ____ 15
   1. 0
   2. 1-15
   3. 16-20
   4. 21-25
   5. 26-30
   6. 31 or more

10. Do you teach a unit on aerospace education? ____ 16
    1. yes
    2. no

11. Do you introduce aerospace concepts into your curriculum? ____ 17
    1. yes
    2. no

12. How many students, in a school year, have you introduced to aerospace education, through some teaching technique? ____ 18
    1. 1-15
    2. 16-30
    3. 31-45
    4. 46-60
    5. 61-75
    6. 76-100
    7. over 100 approx. number_____

13. In my school, aerospace education is desired by the
    1. school board ____ 19
    2. administration ____ 20
    3. faculty
    4. students ____ 21
    5. parents

14. A local airport is a part of field trip activity. ____ 22
    1. yes
    2. no

15. My school is approximately the following number of miles from the closest general aviation airport: ____ 23
    1. 0- 5
    2. 6-10
    3. 11-25
    4. 26-50
    5. over 50

16. My aerospace teaching materials come mainly from
    1. personal files
    2. library resources
    3. free & inexpensive sources
    4. Oklahoma Aerospace Curriculum Guide
    5. Oklahoma Aerospace Activity Cards
    6. Oklahoma Aerospace Curriculum Supplement
    7. other sources specify_____

17. My aerospace students typically build
    1. model aircraft
    2. model spacecraft
    3. other models
    4. no models
    5. an aircraft

18. In my aerospace teaching, special emphasis is placed on "commemorative"
    1. Wright Brothers Day
    2. First Man on the Moon Day
    3. Other aerospace events specify_____

19. The following organizations have aerospace education material that most suit my pupils' needs:
    1. Civil Air Patrol (CAP)
    2. Federal Aviation Administration (FAA)
    3. General Aviation Manufacturers Association (GAMA)
    4. American Society for Aerospace Education (ASAE)
    5. National Aeronautics and Space Administration (NASA)
    6. others specify_____

20. At least once per year I receive aerospace materials from
    1. CAP
    2. FAA
    3. NASA
    4. Aviation manufacturers
    5. other sources specify_____

21. I regularly use aerospace materials from
    1. Aero Products Research
    2. Beech
    3. Cessna
    4. Piper
    5. Jeppesen-Sanderson

22. I regularly use aerospace materials from
    1. GAMA
    2. Aerospace Education Resource Centers (AERC)
    3. ASAE
    4. Experimental Aircraft Association (EAA)
    5. others specify _____

23. My students, as part of aerospace education, visit the following types of aviation facilities:
    1. fixed base operator
    2. commercial airline
    3. FAA air traffic control

24. My students, as part of aerospace education, visit the following types of aviation facilities:
    1. aircraft maintenance
    2. airport
    3. military installation specify _____

25. My students, as part of aerospace education, visit the following types of aviation facilities: ____ 51
    1. aerospace industry specify_____
    2. others specify_____ ____ 52

26. In my school, student interest in aerospace is ____ 53
    1. rising
    2. declining
    3. stable

27. The main value of aerospace education in my school is ____ 54
    1. career education
    2. exploration ____ 55
    3. motivation
    4. general education ____ 56
    5. occupational preparation
    6. other specify_____

28. My aerospace course content emphasizes the ____ 57
    1. historical
    2. socio-economic-political-cultural ____ 58
    3. pilot ground school
    4. rockets/space ____ 59
    5. careers
    6. Civil Air Patrol

29. I am now a member of the ____ 60
    1. Oklahoma Aerospace Educators Association (OAEA)
    2. American Society for Aerospace Education (ASAE) ____ 61
    3. Civil Air Patrol (CAP)
    4. Experimental Aircraft Association (EAA)
    5. Aircraft Owners and Pilots Association (AOPA) ____ 62
    6. others specify_____

30. The structure of my aerospace curriculum is ____ 63
    1. interdisciplinary
    2. distinct discipline
    3. independent study
    4. phase elective/mini-course

31. The preparation of an aerospace teacher should include ____ 64
    1. flight experience
    2. aerospace teachers' workshop(s) ____ 65
    3. pilot's license
    4. aerospace industry experience
    5. undergrad aerospace course(s) ____ 66
    6. others specify_____

32. How do you desire to receive your aerospace education training? ____ 67
    1. workshop
    2. inservice ____ 68
    3. printed material
    4. resource person
    5. undergraduate classes ____ 69
    6. other specify_____

33. The State of Oklahoma can best assist aerospace education by ____ 70
    1. sponsoring aerospace workshops for interested teachers
    2. aerospace curriculum specialist with State Department of Education ____ 71
    3. providing materials to be utilized by the schools
    4. others specify_____ ____ 72

34. Do you feel it would be of value to you to have an aerospace curriculum specialist available through the State Department of Education? ____ 73
    1. yes
    2. no

35. An aerospace education consultant can best assist me by
    1. inservice training ____ 74
    2. newsletter ____ 75
    3. working with administrators ____ 76
    4. helping me secure useable materials for the classroom
    5. others specify_____

36. In what areas do you feel most deficient?
    1. knowledge of available materials ____ 77
    2. latest developments in aerospace education ____ 78
    3. general background in aerospace education ____ 79
    4. others specify_____

37. How did you learn of the Oklahoma Aerospace Education Workshop? ____ 80
    1. brochure
    2. news release
    3. former participant
    4. other specify_____

38. What year did you attend the Aerospace Workshop? /1/9/ / / 81 82

39. I am currently teaching in the schools of Oklahoma ____ 83
    1. yes
    2. no

40. Sex
    1. female ____ 84
    2. male

41. Age ____ 85
    1. under 25
    2. 26-29
    3. 30-39
    4. 40-49
    5. 50-59
    6. over 60

42. Years of teaching experience ____ 86
    1. 1-3
    2. 4-6
    3. 7-9
    4. 10-12
    5. 13-15
    6. 16+

43. Level of teaching experience ____ 87
    1. K-3
    2. 4-6
    3. 7-9
    4. 10-12

44. Community in which you now teach could best be described as: ____ 88

1. metropolitan	over 300,000
2. suburban	100,000 - 299,999
3. city, population	50,000 - 99,999
4. city, population	15,000 - 49,999
5. city, population	5,000 - 14,999
6. city, population	1,000 - 4,999
7. city, population	less than 1,000

45. School District_____

APPENDIX B

COVER LETTER TO PARTICIPANTS

February 15, 1978

Dear Former Aerospace Workshop Participant:

The Oklahoma Aeronautics Commission in cooperation with Oklahoma State University is sponsoring a study of all past Oklahoma Aerospace Education Workshops.

As a participant in those workshops you are asked to complete the enclosed questionnaire and return it as soon as possible. Your responses will be strictly confidential, and no individual or school will be named in any report of the study. When completed, simply tape or staple the questionnaire. No envelope is necessary as it has been pre-addressed and postage is provided.

The compiled information will help to determine the future of aerospace education in Oklahoma. Your help in this study is sincerely appreciated.

David Jay Perry, Chairman
Oklahoma Aeronautics Commission

Kenneth E. Wiggins, Director
Oklahoma Aerospace Workshops

Doris K. Grigsby, Research Associate
Oklahoma State University

APPENDIX C

SUPERINTENDENT QUESTIONNAIRE

OKLAHOMA AEROSPACE EDUCATION

STATUS STUDY

1 2 3

4

Please assist us in surveying the current status of aerospace education in Oklahoma schools by taking a few minutes to complete this questionnaire. Your responses will be helpful to the Oklahoma Aeronautics Commission, the Oklahoma State Department of Education, and other Oklahoma agencies who see the value of aerospace education to pupils.

CHOICE RESPONSES. Please write the number that corresponds to an appropriate answer in the spaces to the right. You may mark more than one answer, but no more than three per question. In selecting more than one response, mark according to your priority ranking. Leave any item blank if you are not sure.

1. Aerospace education in my school district is ____ 5
   1. mainly at elementary level
   2. mainly at secondary level
   3. equally at elementary and secondary
   4. not now included

2. My interest in developing aerospace education lies in ____ 6 ____ 7 ____ 8
   1. starting a new course
   2. enriching present teaching
   3. providing alternative curricula
   4. motivating students
   5. developing awareness of aviation/aerospace
   6. I have no interest.

3. Aerospace education came to my school mainly through the efforts of a ____ 9
   1. teacher
   2. pilot
   3. principal
   4. superintendent

4. Aerospace education in my schools is most closely related to ____ 10
   1. industrial arts, technology
   2. mathematics
   3. science
   4. social-political sciences
   5. other disciplines specify_____

5. In my schools, student interest in aerospace is ____ 11
   1. rising
   2. declining
   3. stable

6. In my schools, aerospace education is desired by the ____ 12 ____ 13 ____ 14
   1. school board
   2. administration
   3. faculty
   4. students
   5. parents

7. The main value of aerospace education in my schools is ____ 15 ____ 16 ____ 17
   1. career education
   2. exploration
   3. motivation
   4. general education
   5. occupational preparation
   6. other specify_____

8. The structure of an aerospace curriculum at the elementary level should be ____ 18
   1. interdisciplinary
   2. distinct discipline
   3. independent study
   4. phase elective/mini-course

9. The structure of an aerospace curriculum at the middle school (junior high) level should be ____ 19
   1. interdisciplinary
   2. distinct discipline
   3. independent study
   4. phase elective/mini-course

10. The structure of an aerospace curriculum at the high school level should be ____ 20
    1. interdisciplinary
    2. distinct discipline
    3. independent study
    4. phase elective/mini-course

11. The preparation of an aerospace teacher should include
    1. flight experience ____ 21
    2. aerospace teachers' workshop(s) ____ 22
    3. pilot's license ____ 23
    4. aerospace industry experience
    5. undergrad aerospace course(s)
    6. other specify _____

12. The main problems involved in starting a high school aeronautics program are ____ 24
    1. expense ____ 25
    2. lack of qualified teacher
    3. scheduling
    4. other specify_____ ____ 26

13. If my high schools had an aeronautics (aeroscience) class, I feel that orientation flights would be a valuable asset to the program. ____ 27
    1. yes
    2. no

14. My main objections to orientation flights would be
    1. possible liability ____ 28
    2. expense to students ____ 29
    3. concern for public approval
    4. other specify_____ ____ 30

15. Regardless of grade level of aerospace education, I support the concept of field trips as a valuable learning experience for the students. ____ 31
    1. yes
    2. no

APPENDIX D

COVER LETTER TO SUPERINTENDENTS

February, 1978

Dear Administrator:

The Oklahoma Aeronautics Commission in cooperation with the Oklahoma State Department of Education and Oklahoma State University is sponsoring a study of the status of aerospace education in Oklahoma.

Results of the study will be used to determine future efforts of various state agencies who see the value of aerospace education to pupils. These results will also be used in a doctoral dissertation.

We are requesting that you complete the enclosed questionnaire and return it as soon as possible. Your responses will be strictly confidential, and no individual or school will be named in any report of the study. When completed, simply tape or staple the questionnaire. No envelope is necessary as it has been pre-addressed and postage is provided.

Your help in this study is sincerely appreciated.

David Jay Perry, Chairman
Oklahoma Aeronautics Commission

Kenneth E. Wiggins, Director
Oklahoma Aerospace Workshops

Doris K. Grigsby, Research Associate
Oklahoma State University

VITA[2]

Doris Kay Grigsby

Candidate for the Degree of

Doctor of Education

Thesis: A DESCRIPTIVE ANALYSIS OF THE STATUS AND NEEDS FOR AEROSPACE EDUCATION IN THE SCHOOLS OF OKLAHOMA

Major Field: Curriculum and Instruction

Biographical:

Personal Data: Born in Elk Falls, Kansas, April 8, 1942, the daughter of Joseph Robert and Vera Kinsey Davis.

Education: Graduated from Elk City High School, Elk City, Kansas, in 1960; received the Associate of Arts degree from Independence Community College, Independence, Kansas, in May, 1962; received the Bachelor of Arts degree from Pittsburg State University, Pittsburg, Kansas, with a major in Biology in January, 1965; received the Master of Science degree from Pittsburg State University, Pittsburg, Kansas, with a major in Biology in June, 1967; completed requirements for the Doctor of Education degree at Oklahoma State University in May, 1979.

Professional Experience: Junior high science teacher at Salem Junior High School, Salem, Missouri, spring semester, 1965; graduate assistant, Pittsburg State University, Pittsburg, Kansas, 1965-1966; junior high science teacher at West Junior High School, Norman, Oklahoma, 1967-1968; junior high science teacher, Tahlequah Junior High School, Tahlequah, Oklahoma, 1968-1976; chairman of the science department, Tahlequah Junior High School, 1971-1976; high school science teacher, Tahlequah High School, 1976-1977; research associate, Oklahoma State University, Stillwater, Oklahoma, 1977-1978; assistant professor in biology, Bacone College, Muskogee, Oklahoma, 1978 to present.